Recommendations

for

Designation of Non-Attainment Areas

for the

24-Hour

$PM_{2.5}$ NAAQS

Prepared by:

Alabama Department of Environmental Management

November 2007

ATTACHMENT 1

Alabama 24-hour $PM_{2.5}$ Standard Recommendations

Designated Area	Designation Recommendation
Birmingham MSA	
Jefferson County	Nonattainment
Gadsden MSA	
Etowah County	Nonattainment
Rest of State	Unclassifiable/Attainment
Autauga County	
Baldwin County	
Barbour County	
Bibb County	
Blount County	
Bullock County	
Butler County	
Calhoun County	
Chambers County	
Cherokee County	
Chilton County	
Choctaw County	
Clarke County	
Clay County	
Cleburne County	
Coffee County	
Colbert County	
Conecuh County	
Coosa County	
Covington County	
Crenshaw County	
Cullman County	
Dale County	
Dallas County	
DeKalb County	
Elmore County	
Escambia County	
Fayette County	
Franklin County	
Geneva County	
Greene County	
Hale County	
Henry County	
Houston County	
Jackson County	
Lamar County	
Lauderdale County	
Lawrence County	
Lee County	
Limestone County	
Lowndes County	
Macon County	
Madison County	
Marengo County	
Marion County	

Marshall County	
Mobile County	Unclassifiable/Attainment
Monroe County	
Montgomery County	
Morgan County	
Perry County	
Pickens County	
Pike County	
Randolph County	
Russell County	
St. Clair County	
Shelby County	
Sumter County	
Tallapoosa County	
Talladega County	
Tuscaloosa County	
Walker County	
Washington County	
Wilcox County	
Winston County	

Alabama $PM_{2.5}$ Monitors

$PM_{2.5}$ DATA (2004 TO 2006) FOR THE STATE OF ALABAMA

Units are micrograms per cubic meter ($\mu g/m^3$)

County	AIRS ID	Site	2004 Annual Average	2005 Annual Average	2006 Annual Average	3 Year Average
BALDWIN	10030010	Fairhope	11.4	11.7	11.2*	11.4*
CLAY	10270001	Ashland	13.2	13.4	13.0	13.2
COLBERT	10331002	Muscle Shoals	11.8	13.2	12.6	12.5
DE KALB	10491003	Crossville	14.1	14.2	13.7	14.0
ESCAMBIA	10530002	Brewton	12.7	13.7	13.2	13.2
ETOWAH	10550010	Gadsden	14.3	15.4	14.4	14.7
JEFFERSON	10730023	N. Birmingham[1]	17.7	19.6	18.4	18.6
JEFFERSON	10731005	McAdory	14.6	16.3	15.6	15.5
JEFFERSON	10731009	Providence	12.4	14.5	13.4	13.5
JEFFERSON	10731010	Leeds	14.7	16.7	15.3	15.6
JEFFERSON	10732003	Wylam[1]	15.9	17.9	18.0	17.3
JEFFERSON	10732006	Hoover	14.4	15.7	15.3	15.1
JEFFERSON	10735002	Pinson	13.5	15.2	14.3	14.3
JEFFERSON	10735003	Corner	13.7	15.4	14.5	14.5
MADISON	10890014	Huntsville	13.4	14.4	13.3	13.7
MOBILE	10970003	Chickasaw	11.9	12.8	12.8	12.5
MOBILE	10972005	Bay Road	11.4	11.8*	11.4	11.5*
MONTGOMERY	11010007	Montgomery	13.8	14.4	14.4	14.2
MORGAN	11030011	Decatur	12.2	13.7	13.2	13.0
RUSSELL	11130001	Phenix City	16.1	15.7	15.7	15.8
SHELBY	11170006	Pelham	13.8	14.9	14.1	14.3
TALLADEGA	11210002	Childersburg	13.9	14.2	14.8*	14.3*
TUSCALOOSA	11250004	Tuscaloosa	12.7	13.9	13.5	13.3
WALKER	11270002	Jasper	12.7	14.2	14.1	13.7

*Monitoring data does not meet completeness requirements in 40 CFR Part 50 APP N.

Note: Only monitors that operated during each of the three years are shown on this table.

1 – The North Birmingham and Wylam monitors are a community monitoring zone with a 3-year average of 17.9 $\mu g/m^3$.

24-HOUR $PM_{2.5}$ DATA (2004 TO 2006) FOR THE STATE OF ALABAMA

Units are micrograms per cubic meter ($\mu g/m^3$)

County	AIRS ID	Site	2004 98th Percentile	2005 98th Percentile	2006 98th Percentile	3 Year Average
BALDWIN	10030010	Fairhope	27.5	26.0	25.7*	26*
CLAY	10270001	Ashland	31.4	35.5	28.7	32
COLBERT	10331002	Muscle Shoals	30.6	31.7	28.9	30
DE KALB	10491003	Crossville	33.0	33.1	31.7	33
ESCAMBIA	10530002	Brewton	29.7	28.0	31.5	30
ETOWAH	10550010	Gadsden	35.2	39.2	32.9	36
JEFFERSON	10730023	N. Birmingham	42.3	50.3	39.6	44
JEFFERSON	10731005	McAdory	37.3	35.5	33.9	36
JEFFERSON	10731009	Providence	32.4	39.8	32.7	35
JEFFERSON	10731010	Leeds	31.8	37.6	32.5	34
JEFFERSON	10732003	Wylam	37.8	44.5	40.3	41
JEFFERSON	10732006	Hoover	36.1	34.3	31.9	34
JEFFERSON	10735002	Pinson	29.3	37.2	33.2	33
JEFFERSON	10735003	Corner	34.5	41.8	33.4	37
MADISON	10890014	Huntsville	32.2	40.4	29.8	34
MOBILE	10970003	Chickasaw	31.0	29.2	28.0	29
MOBILE	10972005	Bay Road	28.6	25.8*	25.9	27*
MONTGOMERY	11010007	Montgomery	36.3	32.0	29.1	32
MORGAN	11030011	Decatur	28.6	36.1	29.3	31
RUSSELL	11130001	Phenix City	38	38.8	29.3	35
SHELBY	11170006	Pelham	35.6	32.9	30.0	33
TALLADEGA	11210002	Childersburg	35.4	34.0	30.7*	33*
TUSCALOOSA	11250004	Tuscaloosa	31.5	31.3	27.6	30
WALKER	11270002	Jasper	31.8	33.2	34.9	33

Note: Only monitors that operated during each of the three years are shown on this table.

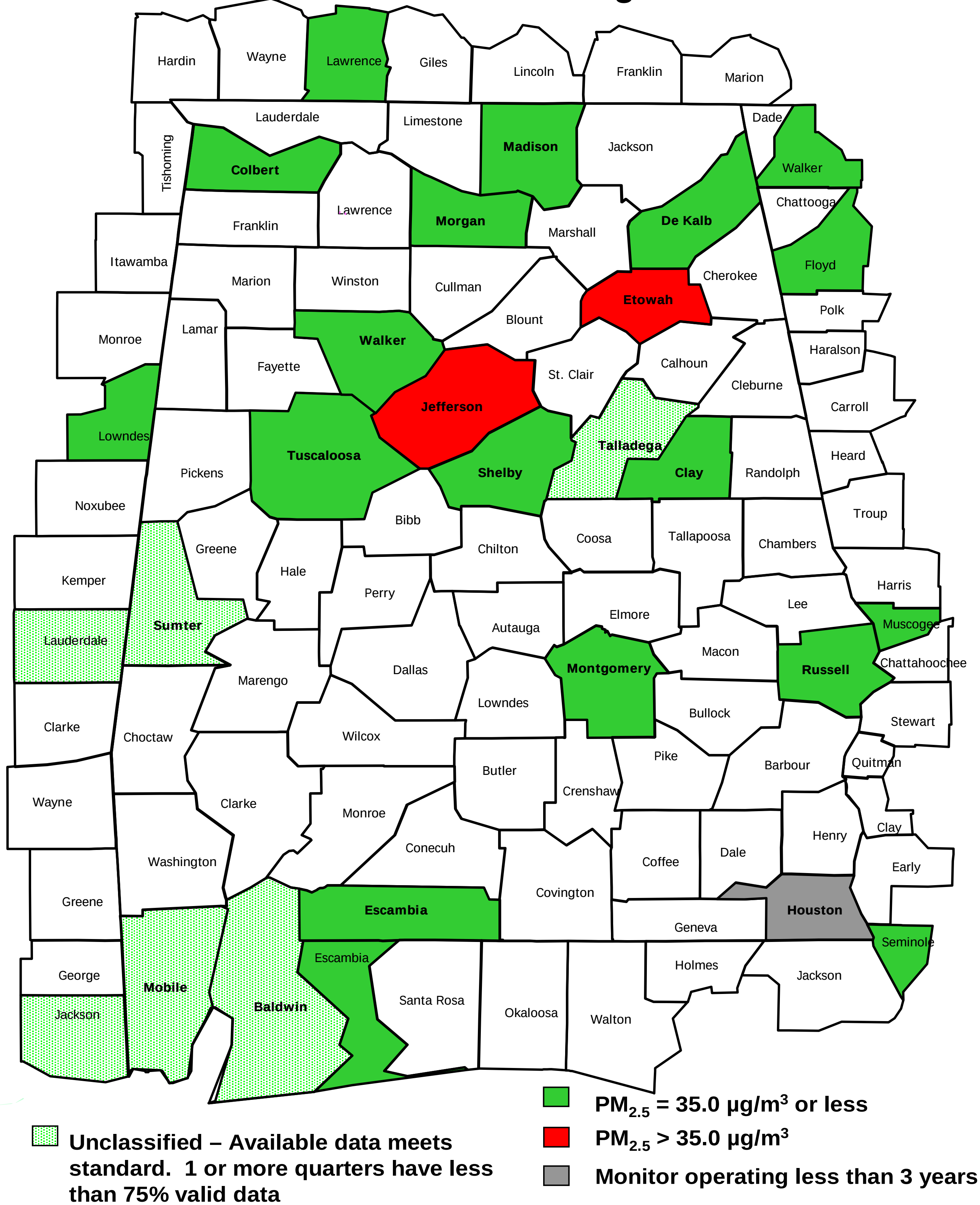
24-HOUR $PM_{2.5}$ DATA (2004 TO 2006) Concentrations in Areas Adjoining Alabama

The table below presents $PM_{2.5}$ monitoring data for states adjacent to Alabama. The data presented are for the counties in those states bordering Alabama. The map on the following page details the location of these counties in relation to the State.

2004-2006 24-Hour $PM_{2.5}$ Averages

AIRS ID	County	3 Year Average
131150005	Floyd Co, GA	34
132150001	Muscogee Co, GA	31
132150011	Muscogee Co, GA	33
132950002	Walker Co, GA	29
120330004	Escambia Co, FL	29
121171002	Seminole Co, FL	23
280750003	Lauderdale Co, MS	30
280870001	Lowndes Co, MS	32
280590006	Jackson Co, MS	29
470990002	Lawrence Co, TN	26

24-hour $PM_{2.5}$ (2004-2006) Concentrations in Alabama and Surrounding Counties



APPENDIX A

ADEM recommends that the Birmingham Nonattainment Area (NAA) for the 24-hour $PM_{2.5}$ NAAQS consist of Jefferson County only and exclude Shelby and Walker Counties. EPA guidance (dated June 8, 2007) encourages states to evaluate each area on a case-by-case basis. The guidance suggests that for each monitor or group of monitors that indicate violations of the standard, nonattainment area boundaries should cover a sufficiently large area to include both the area that violates the standard and the areas that contribute to the violations. EPA recommends that states address how certain factors affect the drawing of the nonattainment boundary when proposing the exclusion of an area that potentially contributes to the ambient air quality of a nearby nonattainment area. Full discussion of each of these factors for the Birmingham NAA is provided in this Appendix.

The factors that provide the most compelling evidence to exclude Shelby and Walker Counties are listed below:

- Total annual emissions in comparison to Jefferson County
- Population density and degree of urbanization in comparison to Jefferson County
- Monitoring Data
- Location of Emission Sources (i.e. Envair Study)
- Traffic (Daily VMT)
- Meteorology

A. Emissions and air quality in adjacent areas

The counties included in the Birmingham Annual $PM_{2.5}$ NAA are depicted in Figure 1. Note that only a small portion of Walker County is included in the NAA. To evaluate emissions for these counties, ADEM obtained the 2002 annual emission estimates from the VISTAS Base G2 emissions inventory. Table 1 lists these emissions which include all anthropogenic sources (i.e. point, area, mobile, and non-road mobile) for the counties that are within the Birmingham Annual $PM_{2.5}$ NAA.

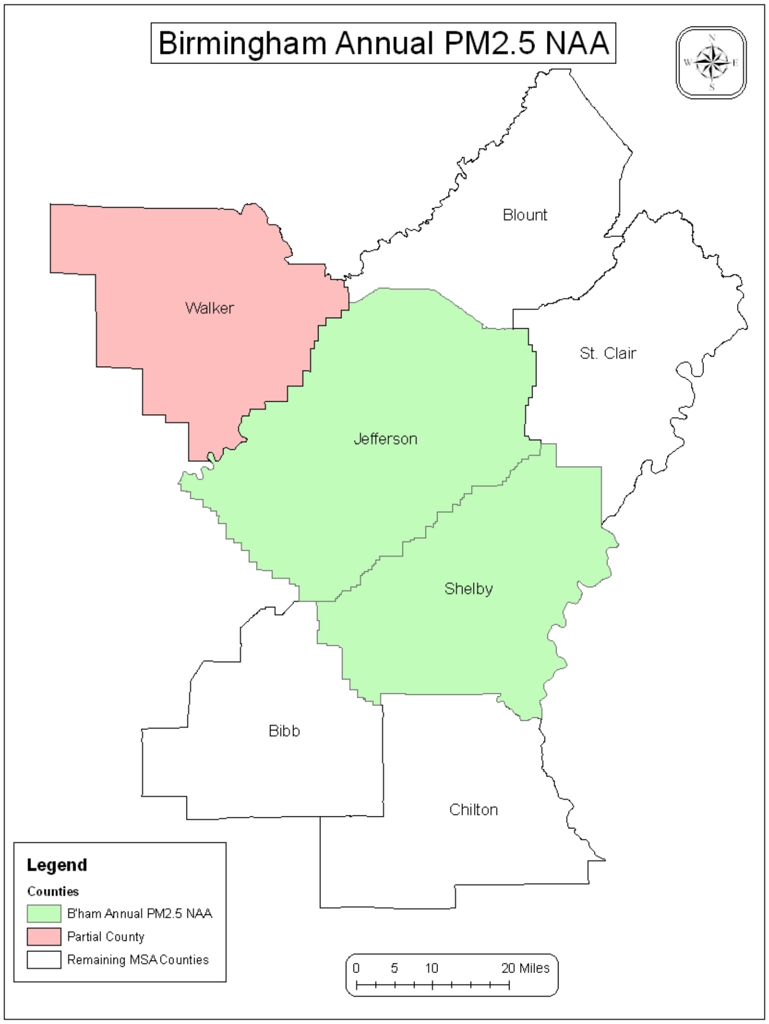


Figure 1 Birmingham Annual $PM_{2.5}$ NAA

Table 1 Annual Emissions for Counties in the Birmingham Annual $PM_{2.5}$ NAA

County	VOC (Tons)	VOC Ranking	NO_x (Tons)	NO_x Ranking	SO_2 (Tons)	SO_2 Ranking	NH_3 (Tons)	NH_3 Ranking	$PM_{2.5}$ (Tons)	$PM_{2.5}$ Ranking
Jefferson	47,549	1	69,393	1	52,761	3	1,001	1	15,062	1
Shelby	11,022	2	40,510	2	130,686	1	288	3	3,241	2
Walker	5,563	3	20,856	3	56,998	2	1,016	2	2,121	3

Emissions in Jefferson County account for 73% of the VOC emissions, 53% of the NO_x emissions, 22% of the SO_2 emissions and 74% of the $PM_{2.5}$ emissions in the Annual $PM_{2.5}$ NAA. While Shelby County has the highest percentage of SO_2 emissions and Walker County the second highest, this is attributable to the large utilities located in these counties. The Clean Air Interstate Rule (CAIR) was promulgated to reduce SO_2 and NO_x emissions from large utilities, and Alabama has an approved CAIR SIP. Further, CAIR is considered RACT for $PM_{2.5}$ Annual Attainment SIPs. <u>This factor fortifies the recommendation to exclude Shelby and Walker Counties from the Birmingham 24-hour $PM_{2.5}$ NAA.</u>

It is unlikely that emissions from Walker County significantly contributed to $PM_{2.5}$ concentrations in Jefferson County given the relative infrequency of winds blowing from Walker County towards Jefferson County on days with elevated $PM_{2.5}$ concentrations. (See Section G.)

The primary basis of the nonattainment designation recommendation of only Jefferson County is identified in the Envair study that was completed in 2005 and will be used as part of the $PM_{2.5}$ State Implementation Plan due in April 2008. This study showed that local sources have a high impact on two of the monitors in Jefferson County, North Birmingham and Wylam. As such, the attainment plan for the $PM_{2.5}$ annual standard will focus on reductions of primary $PM_{2.5}$ emissions in the area surrounding the Wylam and North Birmingham monitors. The study further illustrates the speciation of $PM_{2.5}$ at those monitors and the meteorology associated with elevated concentrations. See appendix A.1 for a summary of the study. The full study is available upon request.

Monitors in Shelby and Walker Counties indicate attainment of the 24-hour $PM_{2.5}$ NAAQS.

B. Population density and degree of urbanization (significant difference from surrounding areas)

To evaluate the various aspects of population, ADEM obtained the 2000 to 2006 population estimates for the Annual $PM_{2.5}$ Birmingham NAA from the Alabama State Data Center[1]. Information on business data (i.e. retail employment and manufacturing employment) was obtained from the U.S. Census Bureau's *County Business Patterns*.

Population densities were calculated by dividing the population estimates by the land area of each county (in square miles). Figure 2 depicts the population densities for the counties in the Annual $PM_{2.5}$ Birmingham NAA. Shelby and Walker Counties have similar land areas of about 795 square miles as compared to Jefferson County with 1,113 square miles. Although the difference in land area skews the impact of the population density factor, Shelby and Walker Counties have a much smaller population density (180 and 89 people per square mile) than Jefferson County (595 per square mile). This population density factor fortifies the recommendation to exclude Shelby and Walker Counties from the 24-hour $PM_{2.5}$ Birmingham Nonattainment Area.

Population trends/data are presented as Figures 3 and 4. Figure 3 demonstrates that Walker County has a population that has remained less than 11% of Jefferson County's population over the years. Shelby County's population has remained less than 28% of Jefferson County's. In addition, Figure 4 demonstrates that the combined population of Walker and Shelby Counties only represents approximately 25% of the total population for the entire tri-county area. These population factors fortify the recommendation to exclude Shelby and Walker Counties from the 24-hour $PM_{2.5}$ Birmingham Nonattainment Area.

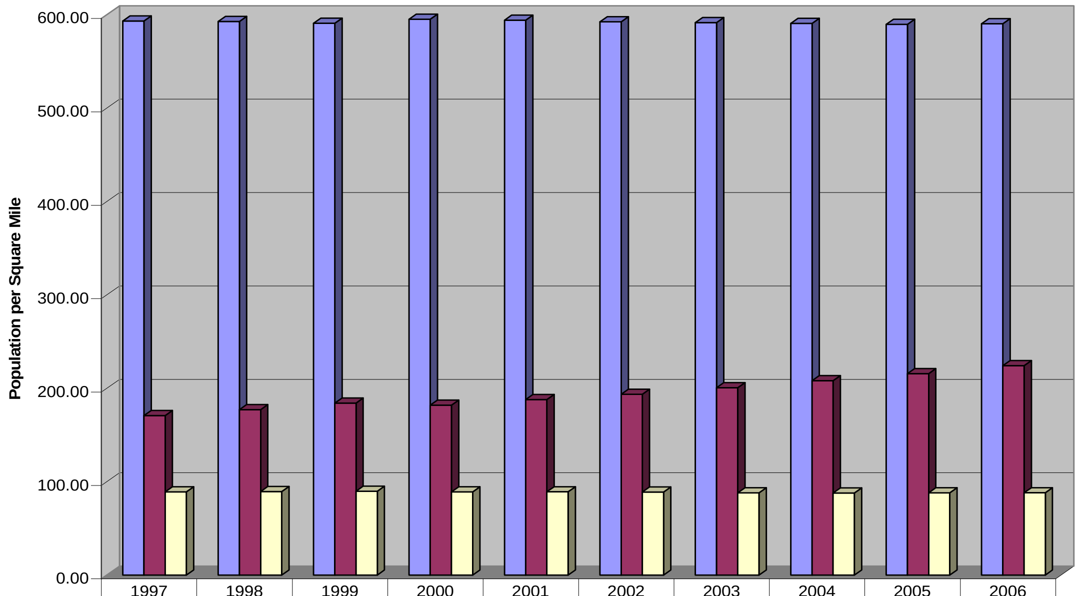
The amount and percent of urban population in the tri-county is presented in Table 2. This data clearly shows that Shelby and Walker Counties have an insignificant urban population in comparison to the urban population of Jefferson County. In addition, the combined urban population of Shelby and Walker Counties only represents approximately 18% of the total urban population for the entire tri-county area. This factor fortifies the recommendation to exclude Shelby and Walker Counties from the Birmingham 24-hour $PM_{2.5}$ Nonattainment Area.

Table 2 Urban Population for Birmingham Annual $PM_{2.5}$ NAA

County Name	% Urban[2]	2006 Population	2006 Urban Population	% of Area Total 2006 Urban Population
Jefferson	89.0%	656,700	584,463	81.8%
Shelby	64.0%	178,182	114,036	16.0%
Walker	23.0%	70,034	16,108	2.3%
Totals	79.0%	904,916	714,607	100.0%

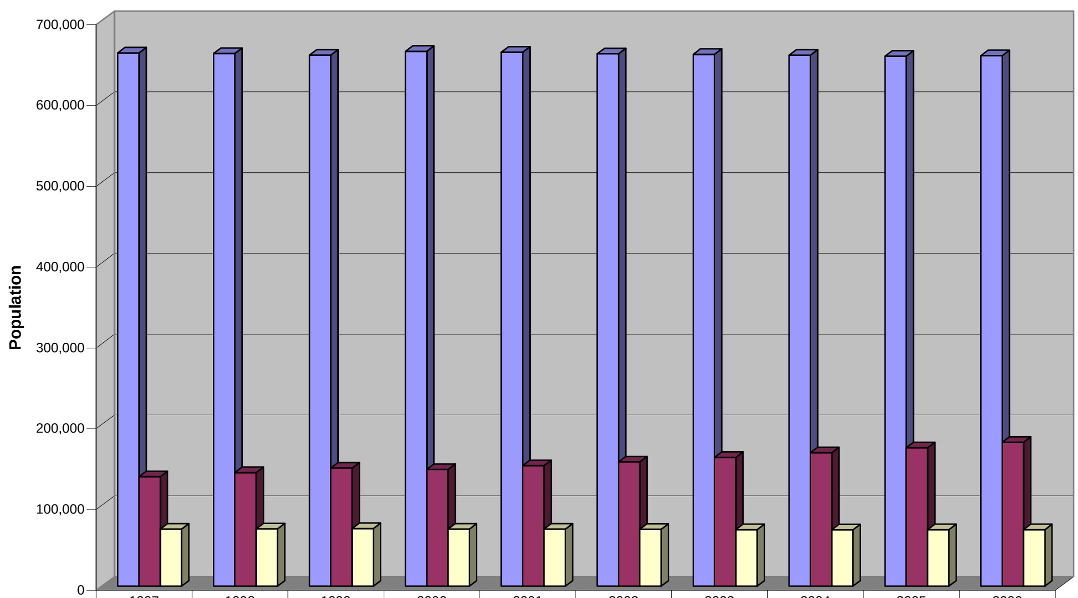
[1] The Alabama State Data Center (ASDC) is a network of 27 public agencies working together through a cooperative agreement with the U.S. Bureau of the Census to facilitate use and delivery of Census and other data to the public. Internet site: http://cber.cba.ua.edu/est_prj.html

[2] Based on 2000 Census



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Jefferson	593.31	592.77	590.88	595.03	594.09	592.29	591.59	590.75	589.62	590.23
Shelby	170.82	177.07	184.21	181.90	187.75	193.54	200.57	208.12	215.65	224.22
Walker	88.98	89.41	89.78	89.00	89.08	88.79	88.14	87.87	88.09	88.16

Figure 2 Population Density for Birmingham Annual $PM_{2.5}$ NAA



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Jefferson	660,119	659,524	657,422	662,041	660,996	658,990	658,213	657,276	656,014	656,700
Shelby	135,752	140,715	146,392	144,557	149,201	153,804	159,393	165,388	171,373	178,182
Walker	70,684	71,027	71,318	70,699	70,764	70,535	70,020	69,802	69,980	70,034

Figure 3 Population Data for Birmingham Annual $PM_{2.5}$ NAA

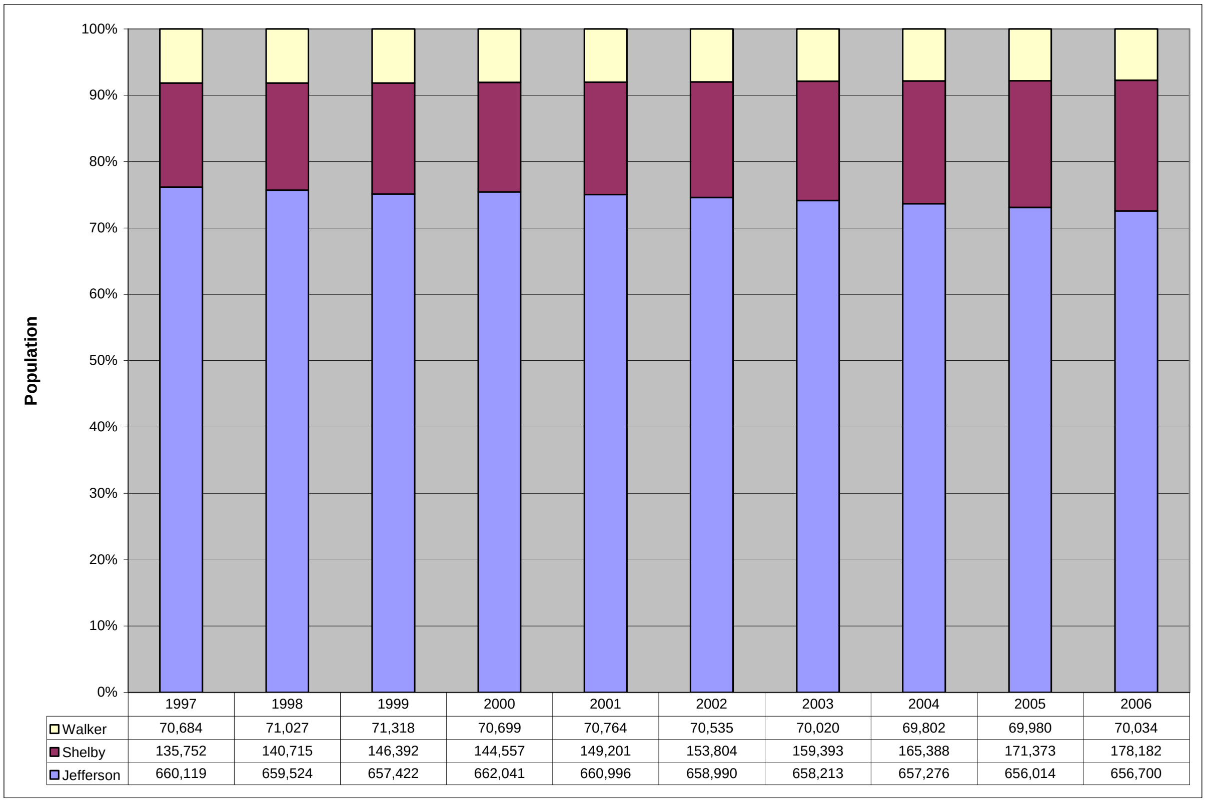


Figure 4 Population Distribution for Birmingham Annual $PM_{2.5}$ NAA

Tables 3, 4 and 5 show the trends in the Total Employment, Manufacturing Employment, and Retail Employment, respectively, for the counties of the Birmingham Annual $PM_{2.5}$ NAA. Figure 5 demonstrates that the number of Total Employees for Shelby and Walker Counties is about 20% of the area total. This factor fortifies the recommendation that the Birmingham 24-hour $PM_{2.5}$ NAA only include Jefferson County.

While Shelby County shows a significant increase (20.4%) in total employment, Shelby County's total employment is less than 16% of the area total.

All counties experienced a decrease in manufacturing employment. While there is an increase in retail employment for Shelby County (31.8%), this increase is dwarfed by the amount of retail employment in Jefferson County. This factor fortifies the recommendation that the Birmingham 24-hour $PM_{2.5}$ NAA only include Jefferson County.

Table 3 Total Employees

	2000	2001	2002	2003	2004	2005	% Change 2000-2006	% of 2006 MSA Total
Jefferson	362,120	356,034	346,939	339,294	349,712	347,274	-4.1%	80.3%
Shelby	57,081	59,016	61,665	64,871	66,058	68,712	20.4%	15.9%
Walker	15,828	14,796	15,070	15,515	15,557	16,469	4.0%	3.8%
Total	435,029	429,846	423,674	419,680	431,327	432,455	-0.6%	100.0%

Table 4 Manufacturing Employment

	2000	2001	2002	2003	2004	2005	% Change 2000-2006	% of 2006 MSA Total
Jefferson	36,189	34,876	30,650	29,659	28,582	29,369	-18.8%	79.6%
Shelby	6,146	5,955	5,577	5,728	5,758	5,937	-3.4%	16.1%
Walker	1,725	1,450	1,454	1,646	1,539	1,603	-7.1%	4.3%
Total	44,060	42,281	37,681	37,033	35,879	36,909	-16.2%	100.0%

Table 5 Retail Employment

	2000	2001	2002	2003	2004	2005	% Change 2000-2006	% of 2006 MSA Total
Jefferson	43,117	42,817	42,374	42,346	44,302	43,066	-0.1%	76.6%
Shelby	7,159	7,416	7,787	8,111	9,648	9,437	31.8%	16.8%
Walker	3,997	3,745	3,705	3,729	3,702	3,719	-7.0%	6.6%
Total	54,273	53,978	53,866	54,186	57,652	56,222	3.6%	100.0%

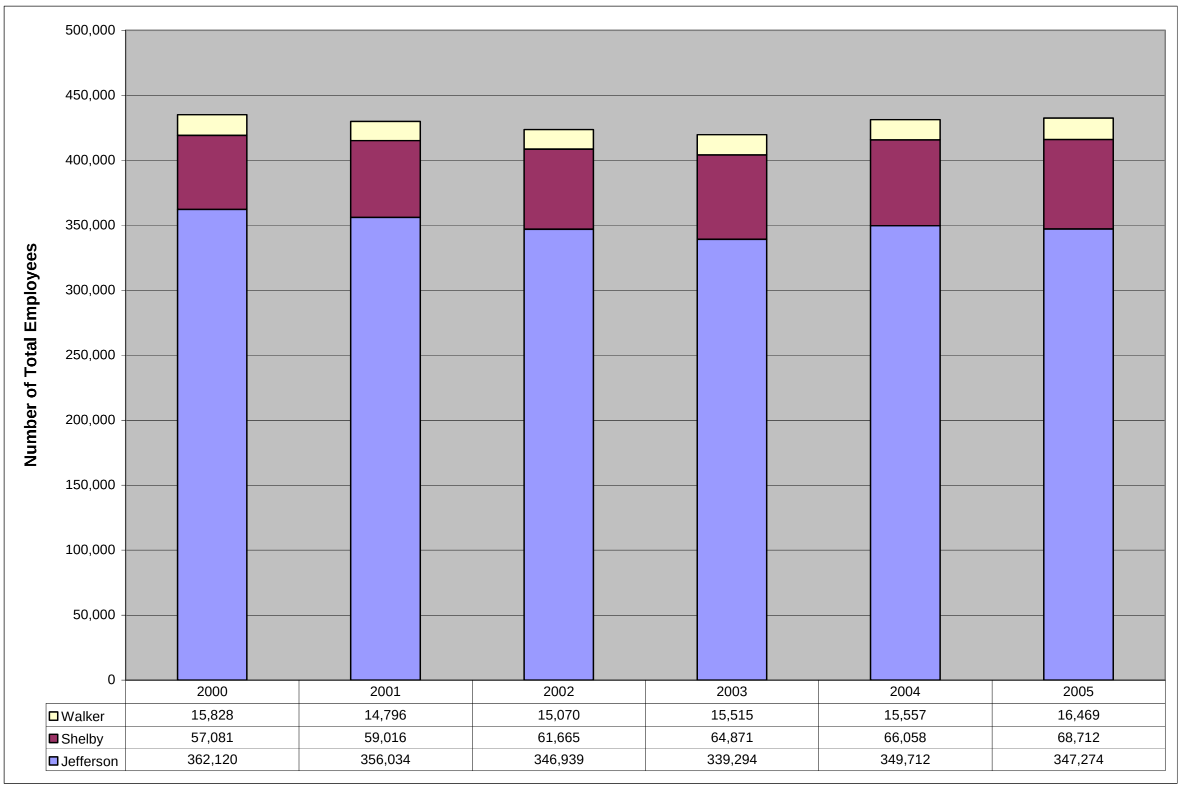


Figure 5 Total Employees for Birmingham Annual $PM_{2.5}$ NAA

C. Monitoring data representing $PM_{2.5}$ concentrations in local areas and larger areas (urban or regional scale)

Table 6 demonstrates that four $PM_{2.5}$ monitors in Jefferson County exceeded the 24-hour $PM_{2.5}$ NAAQS. As previously stated in Section A, the Envair study showed that local sources had a high impact on two of the monitors, North Birmingham and Wylam. Table 6 further demonstrates that Shelby and Walker Counties have an attaining monitor. Figure 6 identifies the $PM_{2.5}$ monitoring sites which provided the 2004, 2005 and 2006 data for the Birmingham Annual $PM_{2.5}$ NAA. <u>This fortifies the recommendation that Shelby and Walker Counties be excluded from the Birmingham 24-hour $PM_{2.5}$ NAA.</u>

Table 6 Monitoring Data

County	AIRS ID	Site	98th Percentile 24-hour $PM_{2.5}$			3-Year Avg. 2004-2006
			2004	2005	2006	
Jefferson	01-073-0023	N. Bham	42.3	50.3	39.6	44
Jefferson	01-073-2003	Wylam	37.8	44.5	40.3	41
Jefferson	01-073-2006	Hoover	36.1	34.3	31.9	34
Jefferson	01-073-1005	McAdory	37.3	35.5	33.9	36
Jefferson	01-073-5002	Pinson	29.3	37.2	33.2	33
Jefferson	01-073-5003	Corner	34.5	41.8	33.4	37
Jefferson	01-073-1009	Providence	32.4	39.8	32.7	35
Jefferson	01-073-1010	Leeds	31.8	37.6	32.5	34
Shelby	01-117-0006	Pelham	35.6	32.9	30.0	33
Walker	01-127-0002	Jasper	31.8	33.2	34.9	33

Figure 6 $PM_{2.5}$ Monitoring Sites in the Birmingham Annual $PM_{2.5}$ NAA

D. Location of emission sources

Figure 7 depicts the location of large point sources in the Birmingham Annual $PM_{2.5}$ NAA. The base map was created using Geographical Information Systems (GIS) with coordinates supplied by the facilities. Tables 7 through 16 present the distribution of emissions (in tons per year of NO_x, VOC, SO_2, $PM_{2.5}$ and NH_3) among point, area, non-road and mobile sources in the Birmingham Annual $PM_{2.5}$ NAA. Figures 8 through 12 illustrate this data. Figure 13 presents the emission densities for the Birmingham Annual $PM_{2.5}$ NAA.

The NO_x emissions from point sources shown in Table 7 have significantly changed since 2002 as a result of NO_x controls installed at utilities. Table 11 shows that Shelby and Walker Counties individually have larger SO_2 emissions than Jefferson County. The overwhelming majority of NO_x and SO_2 emissions in Shelby and Walker Counties are from point sources (over 81% NO_x and over 99% SO_2). The vast majority of the NO_x and SO_2 point source emissions in Shelby and Walker Counties are due to large utilities located in each of the counties. The Clean Air Interstate Rule (CAIR) was promulgated to reduce SO_2 and NO_x emissions from large utilities, and Alabama has an approved CAIR SIP. Further, CAIR is considered RACT for SO_2 and NO_x for $PM_{2.5}$ Annual Attainment SIPs. Also, ADEM has the legal authority to require the installation of controls as necessary on either or both of these utilities if required to meet the NAAQS. Jefferson County $PM_{2.5}$ emissions are 73% of the total area's $PM_{2.5}$ emissions. These factors fortify the recommendation to exclude Walker and Shelby Counties from the Birmingham 24-hour $PM_{2.5}$ NAA.

As previously stated, the primary basis of the nonattainment designation recommendation of only Jefferson County is identified in the Envair study that was completed in 2005 and will be used as part of the $PM_{2.5}$ State Implementation Plan due in April 2008. This study showed that local sources have a high impact on two of the monitors in Jefferson County, North Birmingham and Wylam. As such, the attainment plan for the $PM_{2.5}$ annual standard will focus on reductions of primary $PM_{2.5}$ emissions in the area surrounding the Wylam and North Birmingham monitors. The study further illustrates the speciation of $PM_{2.5}$ at those monitors and the meteorology associated with elevated concentrations. See appendix A.1 for a summary of the study. The full study is available upon request.

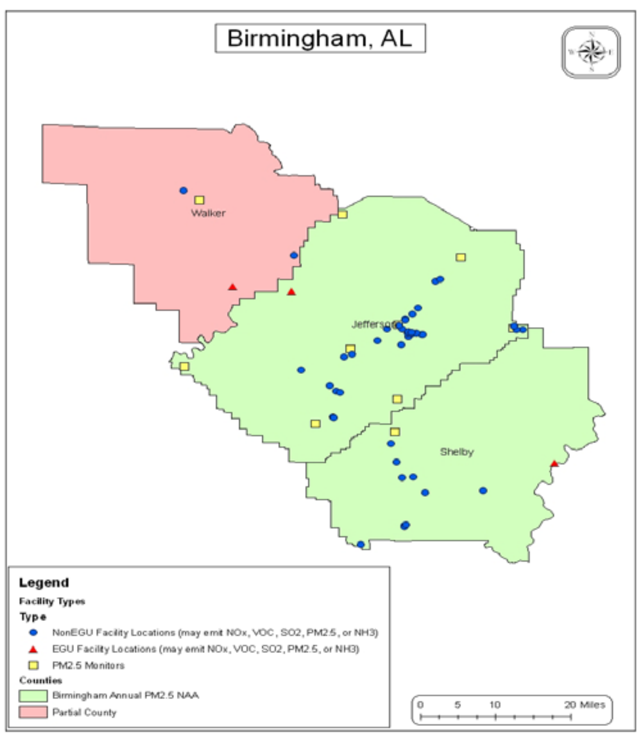


Figure 7 Location of Large Point Sources in the Birmingham Annual $PM_{2.5}$ NAA

Table 7 NO_x Annual Emissions (Tons)

County	*Point*		*Area*		*Nonroad*		*Mobile*		*Total*	
	TPY	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*
Jefferson	36,400	41.9%	3,349	73.3%	8,653	69.5%	20,990	78.1%	69,393	53.1%
Shelby	33,613	38.7%	756	16.6%	2,591	20.8%	3,550	13.2%	40,510	31.0%
Walker	16,856	19.4%	461	10.1%	1,215	9.8%	2,323	8.6%	20,856	15.9%
Total	**86,870**		**4,567**		**12,459**		**26,863**		**130,759**	

Table 8 Cumulative NO_x Contributions

County	**Factor**	**Annual 2002 Emissions (tons)**	**% of Area Total Emissions**	**Cumulative %**
Jefferson	Point Source NO_x Emissions (tons)	36,400	27.8%	27.8%
Shelby	Point Source NO_x Emissions (tons)	33,613	25.7%	53.5%
Jefferson	Mobile Source NO_x Emissions (tons)	20,990	16.1%	69.6%
Walker	Point Source NO_x Emissions (tons)	16,856	12.9%	82.5%
Jefferson	Nonroad Source NO_x Emissions (tons)	8,653	6.6%	89.1%
Shelby	Mobile Source NO_x Emissions (tons)	3,550	2.7%	91.8%
Jefferson	Area Source NO_x Emissions (tons)	3,349	2.6%	94.4%
Shelby	Nonroad Source NO_x Emissions (tons)	2,591	2.0%	96.4%
Walker	Mobile Source NO_x Emissions (tons)	2,323	1.8%	98.1%
Walker	Nonroad Source NO_x Emissions (tons)	1,215	0.9%	99.1%
Shelby	Area Source NO_x Emissions (tons)	756	0.6%	99.6%
Walker	Area Source NO_x Emissions (tons)	461	0.4%	100.0%
	Area Total Emissions	**130,759**		

Table 9 VOC Annual Emissions (Tons)

County	*Point*		*Area*		*Nonroad*		*Mobile*		*Total*	
	TPY	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*
Jefferson	6,505	87.8%	17,583	69.7%	4,618	54.1%	18,843	82.0%	47,549	74.1%
Shelby	571	7.7%	4,890	19.4%	3,309	38.8%	2,252	9.8%	11,022	17.2%
Walker	329	4.4%	2,748	10.9%	603	7.1%	1,883	8.2%	5,563	8.7%
Total	**7,406**		**25,221**		**8,530**		**22,978**		**64,133**	

Table 10 Cumulative VOC Contributions

County	Factor	Annual 2002 Emissions (tons)	% of Area Total Emissions	Cumulative %
Jefferson	Mobile Source VOC Emissions (tons)	18,843	29.4%	29.4%
Jefferson	Area Source VOC Emissions (tons)	17,583	27.4%	56.8%
Jefferson	Point Source VOC Emissions (tons)	6,505	10.1%	66.9%
Shelby	Area Source VOC Emissions (tons)	4,890	7.6%	74.6%
Jefferson	Nonroad Source VOC Emissions (tons)	4,618	7.2%	81.8%
Shelby	Mobile Source VOC Emissions (tons)	2,252	3.5%	85.3%
Shelby	Nonroad Source VOC Emissions (tons)	3,309	5.2%	90.4%
Walker	Area Source VOC Emissions (tons)	2,748	4.3%	94.7%
Walker	Mobile Source VOC Emissions (tons)	1,883	2.9%	97.7%
Walker	Nonroad Source VOC Emissions (tons)	603	0.9%	98.6%
Shelby	Point Source VOC Emissions (tons)	571	0.9%	99.5%
Walker	Point Source VOC Emissions (tons)	329	0.5%	100.0%
	Area Total Emissions	**64,133**		

Table 11 SO_2 Annual Emissions (Tons)

County	Point		Area		Nonroad		Mobile		Total	
	TPY	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*	*TPY*	*% of CMSA Total*
Jefferson	51,032	21.5%	221	20.8%	581	64.6%	927	78.9%	52,761	21.9%
Shelby	130,246	54.9%	55	5.1%	240	26.7%	145	12.3%	130,686	54.4%
Walker	56,030	23.6%	785	74.0%	79	8.8%	104	8.8%	56,998	23.7%
Total	**237,308**		**1,061**		**900**		**1,176**		**240,445**	

Table 12 Cumulative SO_2 Contributions

County	Factor	Annual 2002 Emissions (tons)	% of Area Total Emissions	Cumulative %
Shelby	Point Source SO_2 Emissions (tons)	130,246	54.2%	54.2%
Walker	Point Source SO_2Emissions (tons)	56,030	23.3%	77.5%
Jefferson	Point Source SO_2 Emissions (tons)	51,032	21.2%	98.7%
Jefferson	Mobile Source SO_2Emissions (tons)	927	0.4%	99.1%
Walker	Area Source SO_2 Emissions (tons)	785	0.3%	99.4%
Jefferson	Nonroad Source SO_2 Emissions (tons)	581	0.2%	99.6%
Shelby	Nonroad Source SO_2 Emissions (tons)	240	0.1%	99.7%
Jefferson	Area Source SO_2 Emissions (tons)	221	0.1%	99.8%
Shelby	Mobile Source SO_2 Emissions (tons)	145	0.1%	99.9%
Walker	Mobile Source SO_2 Emissions (tons)	104	0.0%	99.9%
Walker	Nonroad Source SO_2 Emissions (tons)	79	0.0%	100.0%
Shelby	Area Source SO_2 Emissions (tons)	55	0.0%	100.0%
	Area Total Emissions	**240,445**		

Table 13 $PM_{2.5}$ Annual Emissions (Tons)

County	Point		Area		Nonroad		Mobile		Total	
	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total
Jefferson	10,159	85.0%	4,111	56.3%	459	63.0%	332	28.3%	15,062	73.7%
Shelby	1,373	11.5%	1,585	21.7%	219	30.1%	64	5.4%	3,241	15.9%
Walker	421	3.5%	1,606	22.0%	50	6.9%	44	3.8%	2,121	10.4%
Total	**11,952**		**7,302**		**729**		**440**		**20,423**	

Table 14 Cumulative $PM_{2.5}$ Contributions

County	Factor	Annual 2002 Emissions (tons)	% of Area Total Emissions	Cumulative %
Jefferson	Point Source $PM_{2.5}$ Emissions (tons)	10,159	49.7%	49.7%
Jefferson	Area Source $PM_{2.5}$ Emissions (tons)	4,111	20.1%	69.9%
Walker	Area Source $PM_{2.5}$ Emissions (tons)	1,606	7.9%	77.7%
Shelby	Area Source $PM_{2.5}$ Emissions (tons)	1,585	7.8%	85.5%
Shelby	Point Source $PM_{2.5}$ Emissions (tons)	1,373	6.7%	92.2%
Jefferson	Nonroad Source $PM_{2.5}$ Emissions (tons)	459	2.2%	94.5%
Walker	Point Source $PM_{2.5}$ Emissions (tons)	421	2.1%	96.5%
Jefferson	Mobile Source $PM_{2.5}$ Emissions (tons)	332	1.6%	98.2%
Shelby	Nonroad Source $PM_{2.5}$ Emissions (tons)	219	1.1%	99.2%
Shelby	Mobile Source $PM_{2.5}$ Emissions (tons)	64	0.3%	99.5%
Walker	Nonroad Source $PM_{2.5}$ Emissions (tons)	50	0.2%	99.8%
Walker	Mobile Source $PM_{2.5}$ Emissions (tons)	44	0.2%	100.0%
	Area Total Emissions	**20,423**		

Table 15 NH_3 Annual Emissions (Tons)

County	Point		Area		Nonroad		Mobile		Total	
	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total	TPY	% of CMSA Total
Jefferson	0	0.0%	161	12.9%	4	63.7%	837	71.2%	1,001	43.4%
Shelby	4	11.6%	174	14.0%	2	30.8%	108	9.2%	288	12.5%
Walker	28	88.4%	907	73.1%	0	5.5%	80	6.8%	1,016	44.1%
Total	**32**		**1,242**		**6**		**1,143**		**2,423**	

Table 16 Cumulative NH_3 Contributions

County	Factor	Annual 2002 Emissions (tons)	% of Area Total Emissions	Cumulative %
Walker	Area Source NH_3 Emissions (tons)	907	39.4%	39.4%
Jefferson	Mobile Source NH_3 Emissions (tons)	837	36.3%	75.7%
Shelby	Area Source NH_3 Emissions (tons)	174	7.5%	83.2%
Shelby	Mobile Source NH_3 Emissions (tons)	108	4.7%	87.9%
Jefferson	Area Source NH_3 Emissions (tons)	161	7.0%	94.9%
Walker	Mobile Source NH_3 Emissions (tons)	80	3.5%	98.3%
Walker	Point Source NH_3 Emissions (tons)	28	1.2%	99.6%
Jefferson	Nonroad Source NH_3 Emissions (tons)	4	0.2%	99.7%
Shelby	Point Source NH_3 Emissions (tons)	4	0.2%	99.9%
Shelby	Nonroad Source NH_3 Emissions (tons)	2	0.1%	100.0%
Walker	Nonroad Source NH_3 Emissions (tons)	0	0.0%	100.0%
Jefferson	Point Source NH_3 Emissions (tons)	0	0.0%	100.0%
	Area Total Emissions	**2,305**		

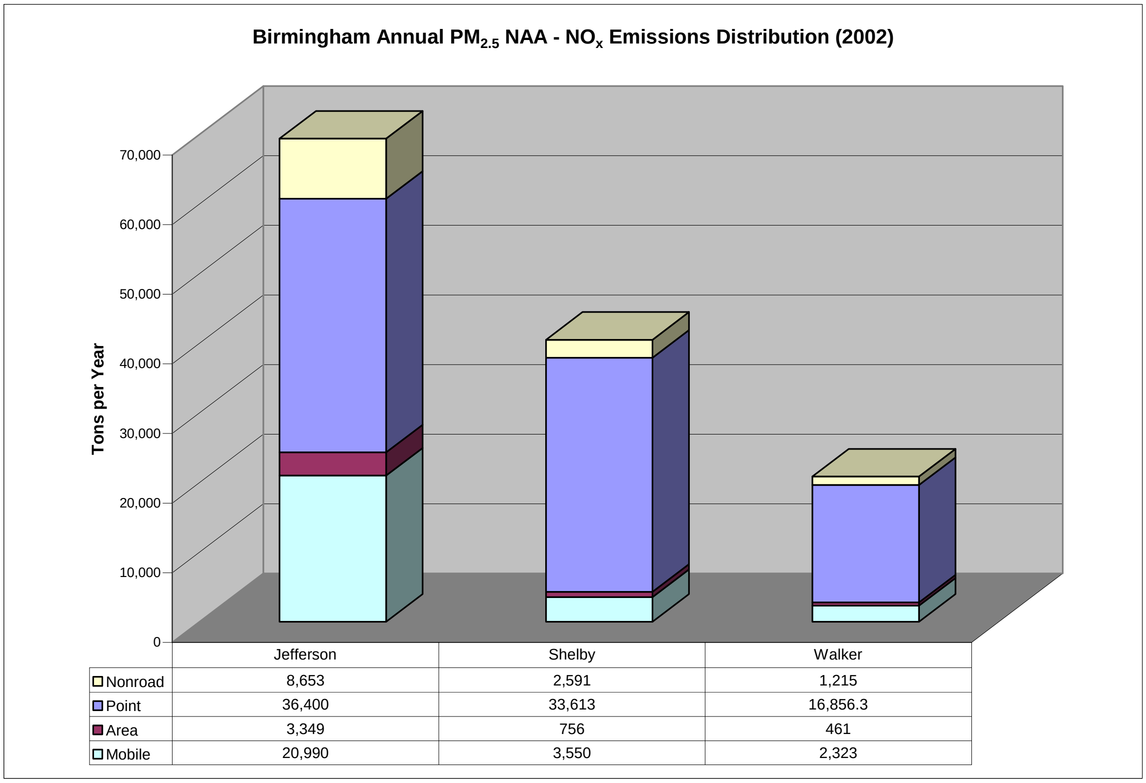


Figure 8 NO_x Emissions for the Birmingham Annual $PM_{2.5}$ NAA

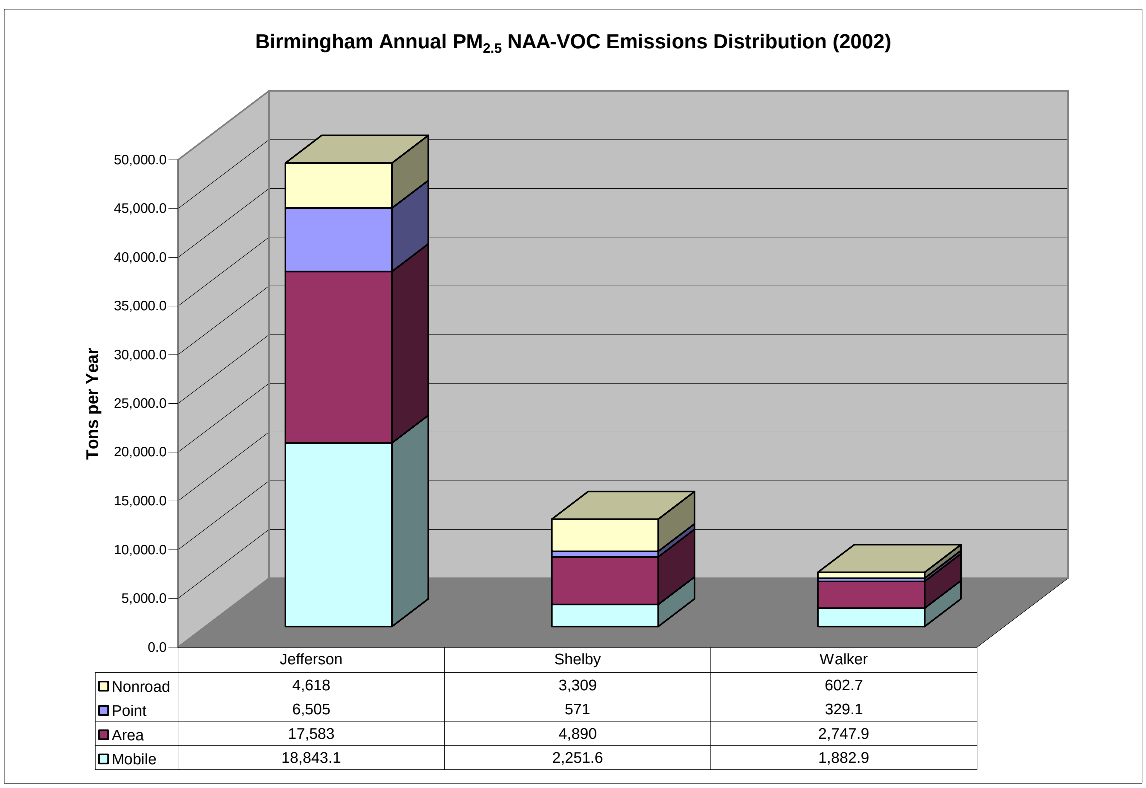
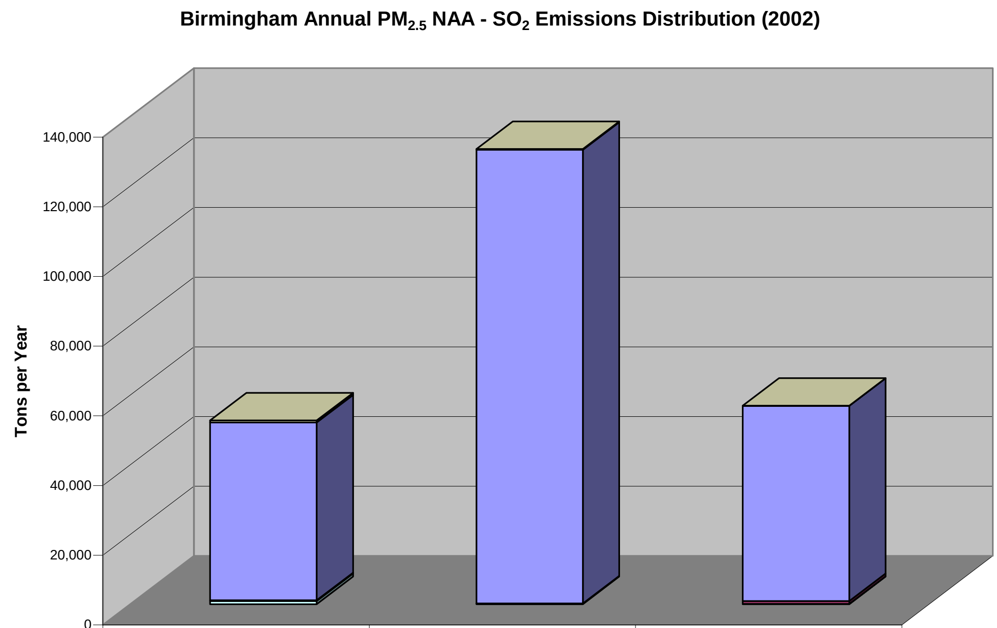
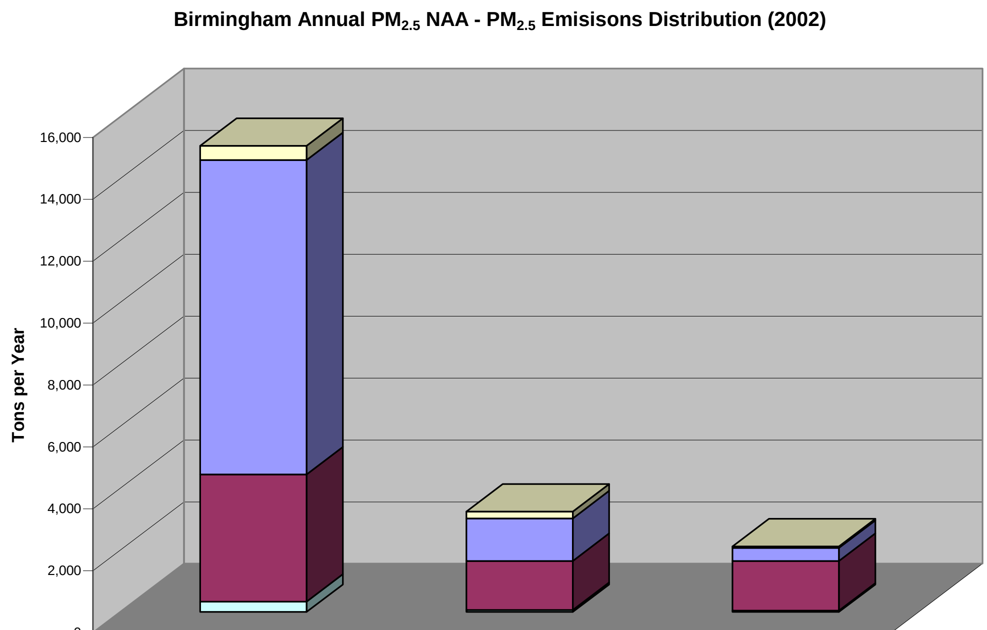


Figure 9 VOC Emissions for the Birmingham Annual $PM_{2.5}$ NAA



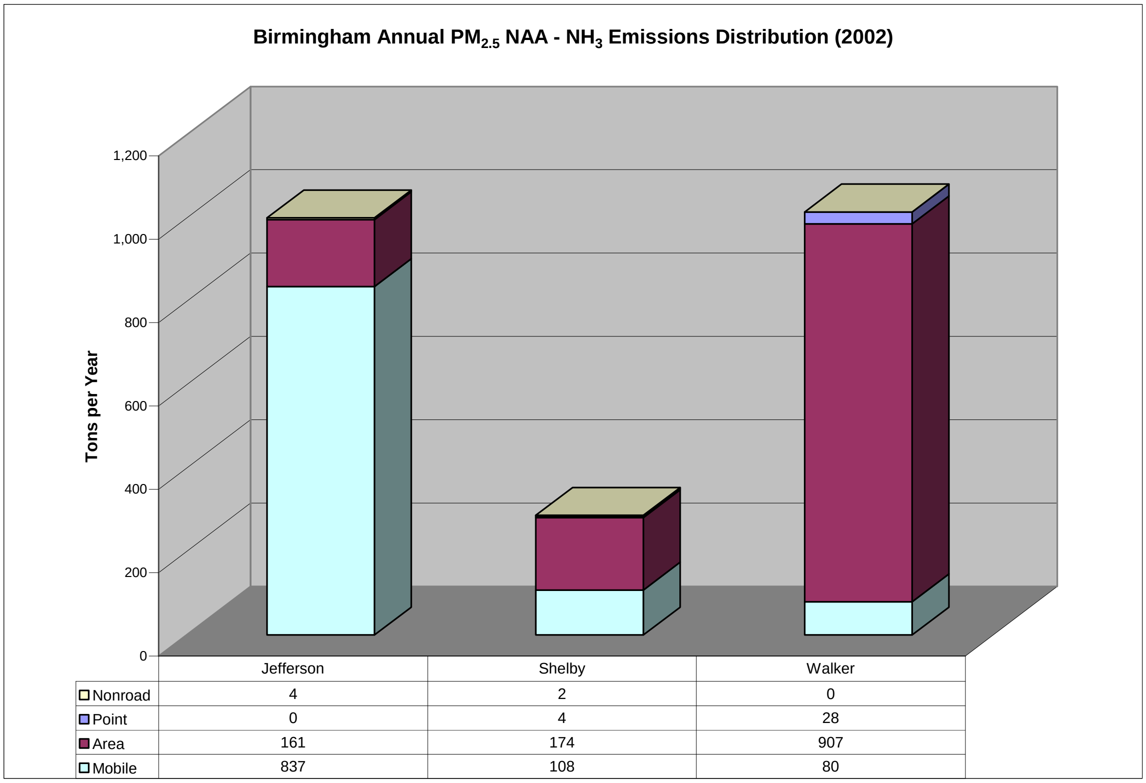
	Jefferson	Shelby	Walker
Nonroad	581	240	79
Point	51,032	130,246	56,030
Area	221	55	785
Mobile	927	145	104

Figure 10 SO_2 Emissions for the Birmingham Annual $PM_{2.5}$ NAA



	Jefferson	Shelby	Walker
Nonroad	459	219	50
Point	10,159	1,373	421
Area	4,111	1,585	1,606
Mobile	332	64	44

Figure 11 $PM_{2.5}$ Emissions for the Birmingham Annual $PM_{2.5}$ NAA



	Jefferson	Shelby	Walker
Nonroad	4	2	0
Point	0	4	28
Area	161	174	907
Mobile	837	108	80

Figure 12 NH_3 Emissions for the Birmingham Annual $PM_{2.5}$ NAA

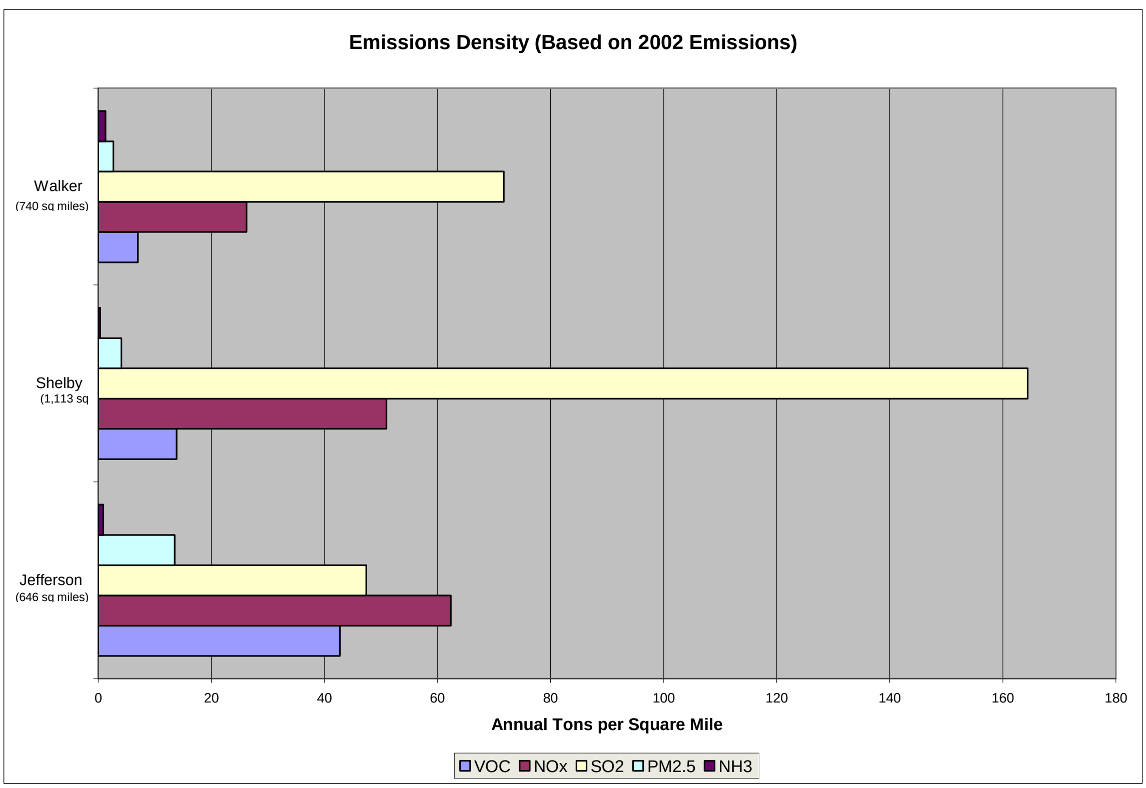


Figure 13 Emissions Density for the Birmingham Annual $PM_{2.5}$ NAA

E. Traffic and Commuting Patterns

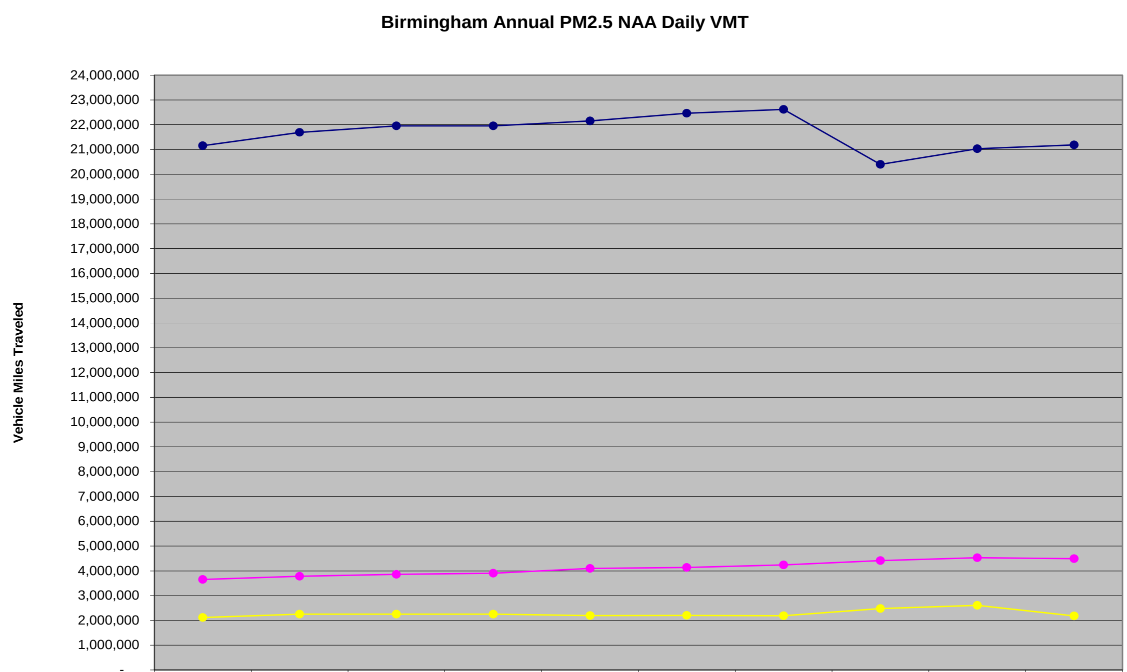
Estimates of the Daily Vehicle Miles Traveled (DVMT) were obtained from the Alabama Department of Transportation and the commuting patterns were obtained from the U.S. Census Bureau web site. The commuting patterns available were based on the 2000 U.S. Census. Table 17 presents the 1997 and 2006 Daily VMT estimates for the Birmingham Annual $PM_{2.5}$ NAA. Figure 14 demonstrates the trend from 1997 to 2006 for each county. Figure 15 presents the breakdown of 2006 Daily VMT into urban and rural. Figure 16 presents the commuting patterns among the Birmingham Annual $PM_{2.5}$ NAA.

Table 17 shows that the Daily VMT for Jefferson County comprises approximately 76% of the combined area total of Daily VMT. Figure 15 shows that Walker County has greater than 75% rural VMT. Shelby County has 62% urban and Jefferson County has 90% urban VMT. Shelby County on-road mobile source NO_x emissions account for only about 15% of the total NO_x emissions in the area. Further, any impact from Shelby County mobile source NO_x emissions is mitigated by Tier II and national low sulfur fuel standards. These factors fortify the recommendation to exclude Shelby and Walker Counties from the Birmingham 24-hour $PM_{2.5}$ NAA.

Figure 16 indicates that Shelby and Walker Counties have some degree of commuting into Jefferson County; however, the impact of this commuting is lessened by Tier II and the national low sulfur fuel standards. Therefore, this factor was not considered to play a significant role in the recommendation that the Birmingham 24-hour $PM_{2.5}$ NAA only include Jefferson County.

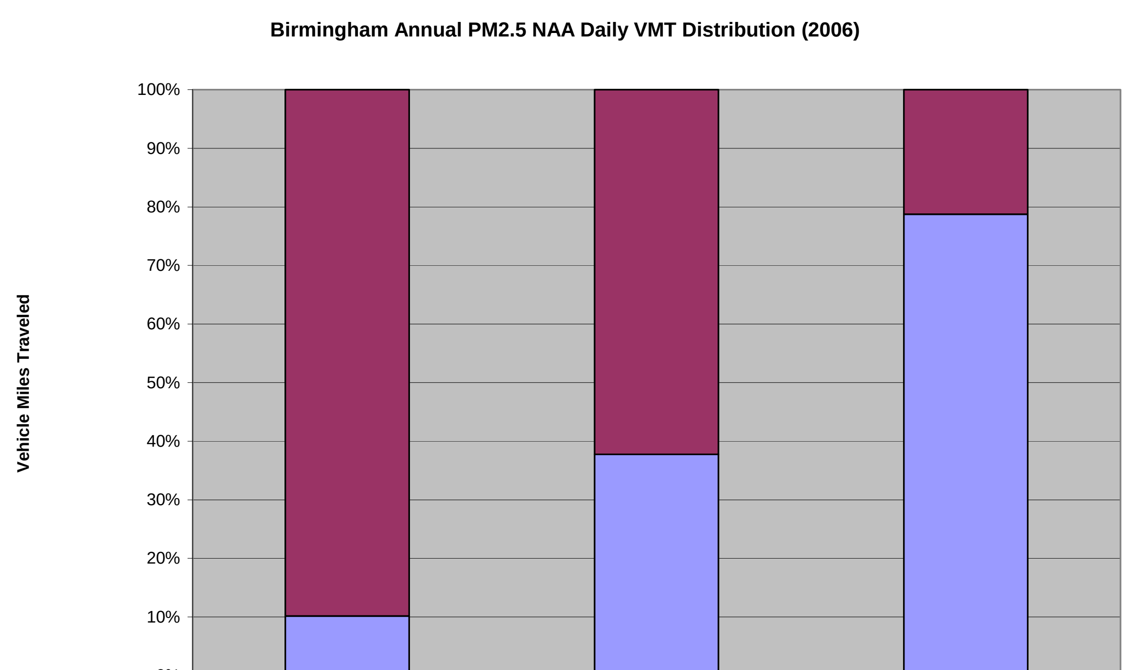
Table 17 Daily VMT for the Birmingham Annual $PM_{2.5}$ NAA

County	1997 Daily VMT	2006 Daily VMT	Daily VMT Change (1997-2006)	% Change	% of MSA 2006 Daily VMT
Jefferson	21,156,010	21,185,334	29,324	0.14%	76.1%
Shelby	3,651,901	4,489,334	837,433	22.93%	16.1%
Walker	2,119,281	2,179,480	60,199	2.84%	7.8%
Total	26,927,192	27,854,148	926,956	3.44%	100.0%



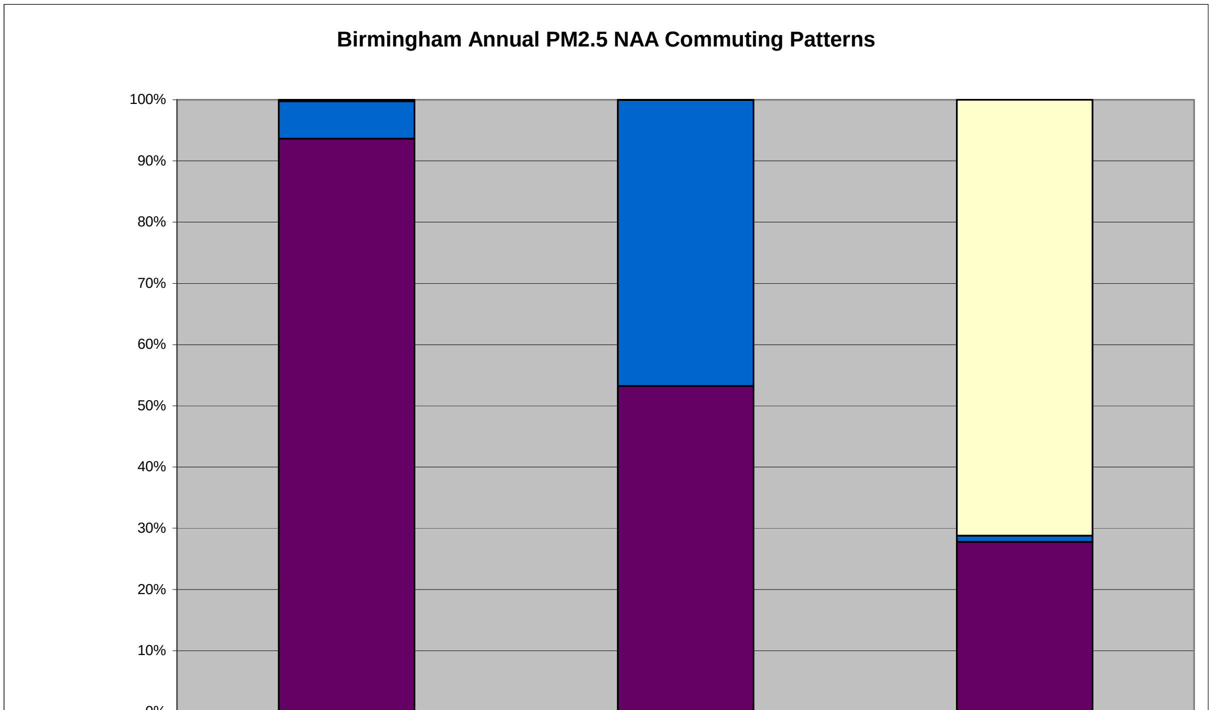
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Jefferson Co	21,156,010	21,690,292	21,951,545	21,953,933	22,148,272	22,462,846	22,617,315	20,400,020	21,028,626	21,185,334
Shelby Co	3,651,901	3,779,696	3,855,247	3,906,718	4,098,753	4,135,243	4,235,533	4,412,909	4,524,384	4,489,334
Walker Co	2,119,281	2,250,681	2,251,511	2,249,780	2,193,250	2,201,665	2,187,722	2,481,539	2,605,589	2,179,480

Figure 14 Daily VMT



	Jefferson Co	Shelby Co	Walker Co
Urban Daily VMT	19,025,843	2,794,166	463,478
Rural Daily VMT	2,159,491	1,695,168	1,716,002

Figure 15 Daily VMT Distribution



	Reside in Jefferson Co	Reside in Shelby Co	Reside in Walker Co
Work in Walker Co	735	28	17,293
Work in Shelby Co	17,351	32,573	245
Work in Jefferson Co	265,661	37,119	6,746

Figure 16 Commuting Patterns

F. Expected Growth (including extent, pattern, and rate of growth)

There is little information available about expected growth. Table 18 provides population growth estimates that were obtained from the Census Bureau for the Birmingham Annual $PM_{2.5}$ NAA. All three counties are expected to have a population increase. Jefferson County's projected population is expected to remain over 65% of the area's total.

Since no other information about expected growth is available, and population growth estimates are not enough to influence a decision about determining a nonattainment area, this factor presents no compelling reason to include any other counties other than Jefferson in the Birmingham 24-hour $PM_{2.5}$ NAA.

Table 18 Population Projections for the Birmingham Annual $PM_{2.5}$ NAA

County Name	2000	2006	2015	2025	% Change 2000-2006	% Change 2006-2015	% Change 2015-2025
Jefferson	662,041	656,700	682,336	701,651	-0.8%	3.9%	2.8%
Shelby	144,557	178,182	216,308	265,083	23.3%	21.4%	22.5%
Walker	70,699	70,034	73,529	73,970	-0.9%	5.0%	0.6%

G. Meteorology

The primary basis for the recommendation to include only Jefferson County in the Birmingham 24-hour $PM_{2.5}$ NAA is identified in the Envair study that was completed in 2005. This study will serve as the basis for the annual $PM_{2.5}$ State Implementation Plan due in April, 2008. This study concluded that local sources have a high impact on two of the monitors in Jefferson County: North Birmingham and Wylam. It further illustrates the speciation of $PM_{2.5}$ at those monitors and the meteorology associated with elevated concentrations. As such, the attainment plan for the $PM_{2.5}$ annual standard will focus on reductions of primary $PM_{2.5}$ emissions in the area surrounding the Wylam and North Birmingham monitors. See Appendix A.1 for a summary of the Envair study.

Meteorology can play a major role in the transport of $PM_{2.5}$ and its secondary formation. While the processes involved in formation of secondary $PM_{2.5}$ are not well understood, the transport issue is somewhat straight forward and lends itself to an analysis based on prevailing wind directions in the region under consideration. Therefore, wind analyses were accomplished to determine the extent to which wind directions in Jefferson County could be correlated with high $PM_{2.5}$ days.

In the first analysis, wind roses from the National Weather Service station at the Birmingham International Airport were developed. During the last three years (2004-2006), the Birmingham area showed the highest frequency of winds from the north with a secondary maximum of southerly winds (see Figure 17). When considering days when the maximum 24-hour average $PM_{2.5}$ in the area was greater than or equal to 35 $\mu g/m^3$, the wind blew from the north through southeast directions, with the most frequent direction being from the east. This phenomenon is clearly seen in Figure 18.

In addition to examining wind roses, backward trajectories were created using the National Weather Service's HYSPLIT program to examine the path air parcels followed for the 24 hours prior to mid-day for the highest day each quarter for the three year period. Of the 24-hour trajectories ending at Birmingham, 66% originated from the north through southeast directions. In addition, several trajectories on elevated days show recirculation patterns and short distances traveled. This demonstrates that air parcels on some high $PM_{2.5}$ days originate from nearby locations and therefore local sources could have a high impact on the Birmingham monitors. Several of these trajectories are included as Figures 19 through 24.

H. Geography/Topography (mountain ranges or other air basin boundaries)

The geography/topography of an area can influence the creation and transport of $PM_{2.5}$. The Birmingham NAA is located in North Central Alabama. The city of Birmingham is situated about 300 miles inland from the Gulf of Mexico in the foothills of the Appalachians. With the hills running northeast to southwest, the city itself lies in the Birmingham-Big Canoe Valley. Off to the north and west the terrain levels out to the Cumberland Plateau. To the south and east, there is rougher terrain, such as the Cahaba Ridge and Valley and the Coosa Ridge and Valley. The northwestern half of Jefferson County is included in the Cumberland Plateau, while all of Shelby County consists of several ridges and valleys.

The topography of the Birmingham area is very complex and it is suspected that it plays a large role in $PM_{2.5}$ formation and transport. However, there are no monitoring data or air quality analyses to demonstrate the extent of its influence. Therefore, data to support the inclusion or exclusion of counties in a MSA based on topography is insufficient.

I. Jurisdictional Boundaries

Bibb, Blount, Chilton, Jefferson, St. Clair, Shelby, Tuscaloosa and Walker Counties are within the Birmingham Metropolitan Intrastate Air Quality Control Region (40 CFR, § 81.41). The Birmingham/Hoover Metropolitan Statistical Area includes Bibb, Blount, Chilton, Jefferson, St. Clair, Shelby and Walker Counties. The Birmingham Annual $PM_{2.5}$ NAA includes Jefferson and Shelby Counties and a small portion of Walker County.

The Jefferson County Department of Health holds jurisdiction within the county boundaries of Jefferson County for which monitoring data demonstrates the county to be exceeding the 24-hour $PM_{2.5}$ standard. The ADEM holds jurisdiction for the other two counties (Shelby and Walker) in the current Birmingham Annual $PM_{2.5}$ NAA. The State monitors in Walker and Shelby Counties support these counties being designated attainment. <u>Discussion elsewhere in this document demonstrates the State's recommendation that the Birmingham 24-hr $PM_{2.5}$ NAA only include Jefferson County.</u>

J. Level of Control of Emission Sources

Since 1979, statewide reasonably available control technology (RACT) has been in place for volatile organic compounds (VOCs) as found under ADEM Admin. Code Chapter 335-3-6. Also in place since 1990 has been the institution of statewide regulations for the control of evaporative emissions in the gasoline marketing chain, commonly referred as 'Stage 1' vapor recovery. Over the history of Alabama's air pollution control program, the State has been delegated the authority to implement other standards of performance such as the New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAPs), and the federal Prevention of Significant Deterioration (PSDS) regulations for protection of degradation of clean air areas.

Additionally, the EPA required a NO_x SIP Call for 22 states, including Alabama that, beginning in 2004, resulted in large reductions in NO_x emissions from major utilities, large industrial boilers, gas turbines and cement kilns. Alabama's NO_x SIP was approved by EPA on July 16, 2001. Further, EPA recently required a SIP known as the Clean Air Interstate Rule (CAIR) for 28 states, including Alabama, that, when fully implemented, will reduce SO_2 emissions in these states by over 70 percent and NO_x emissions by over 60 percent from 2003 levels. Phase I of CAIR begins in 2009 and Phase II in 2015. Alabama's CAIR SIP was approved by EPA on October 1, 2007.

At the national level, EPA has finalized the Tier 2 vehicle/national fuel standards, which took effect beginning in 2004. However, states had already begun to realize the benefits of cleaner vehicles with the National Low Emission Vehicle standards with the 2001 model year vehicles. Further, the Heavy Duty Diesel Rule, which implements more stringent standards for new diesel engines and fuels, took effect this year.

Figure 17 Birmingham Wind Rose – All Hours – 2004-2006

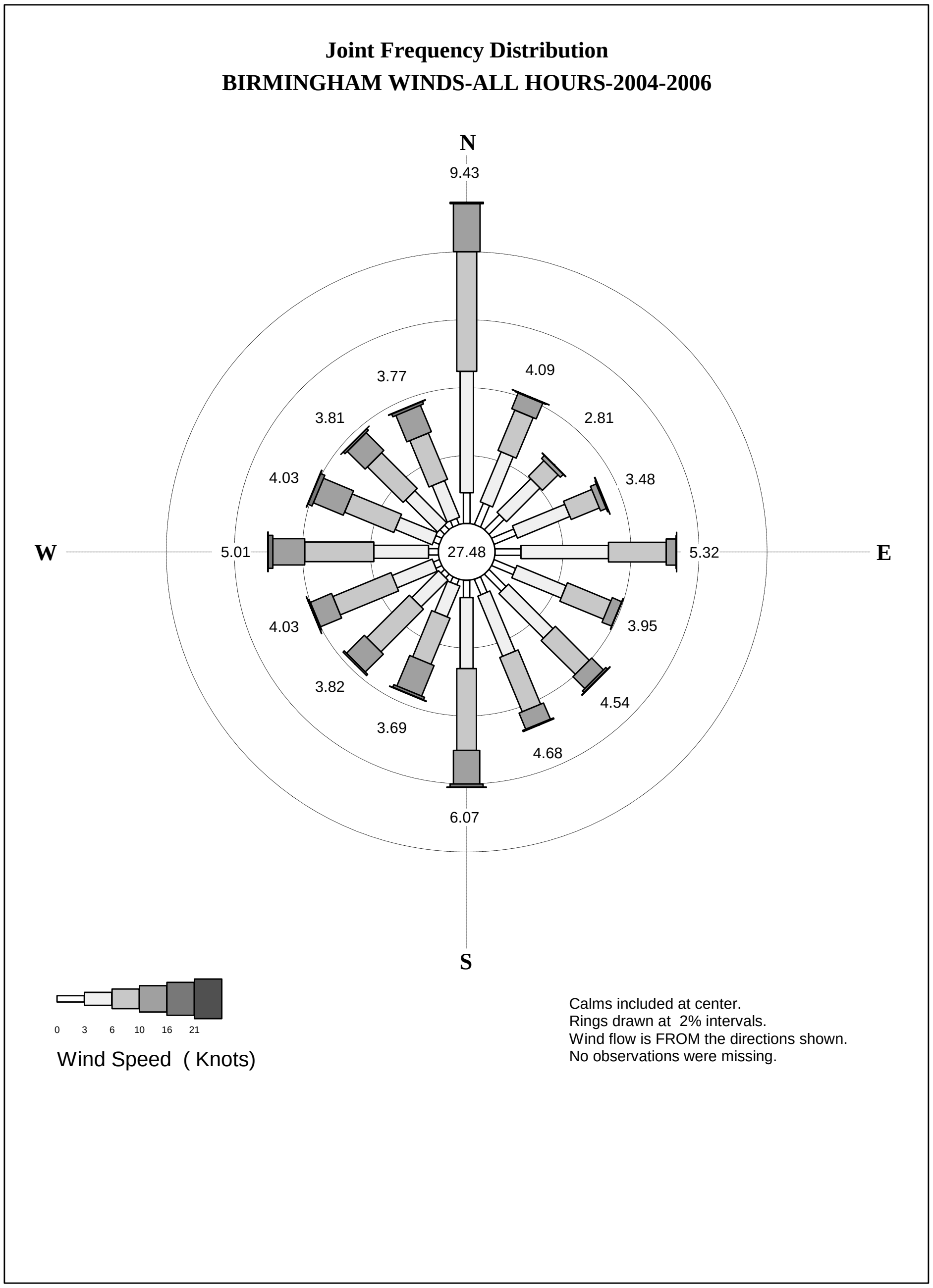
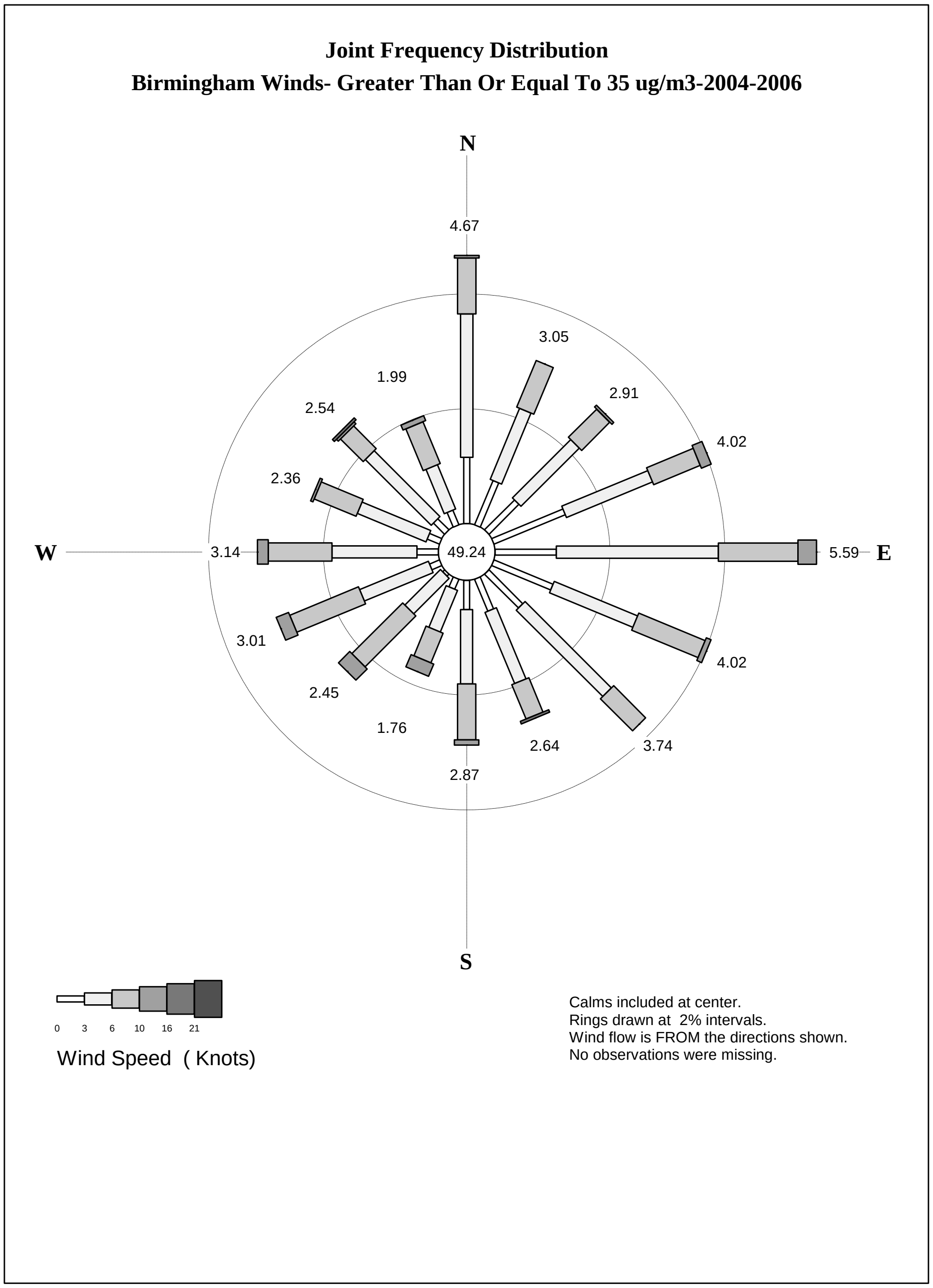
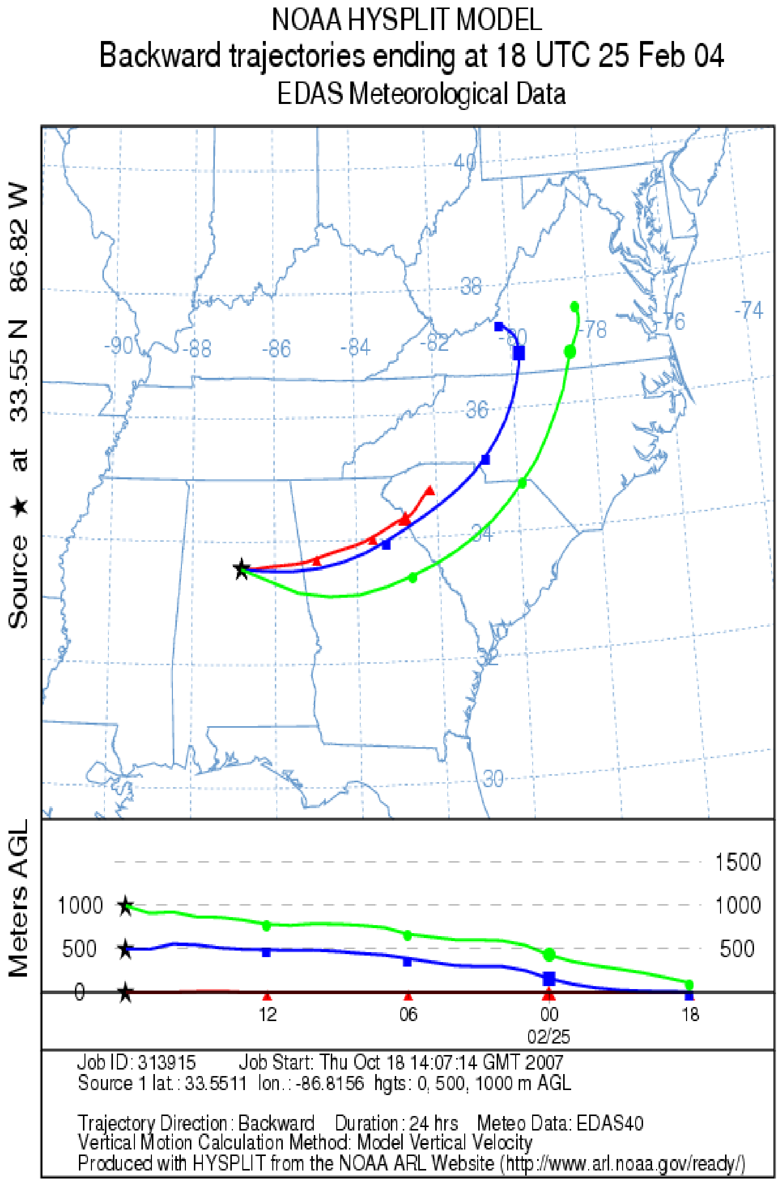
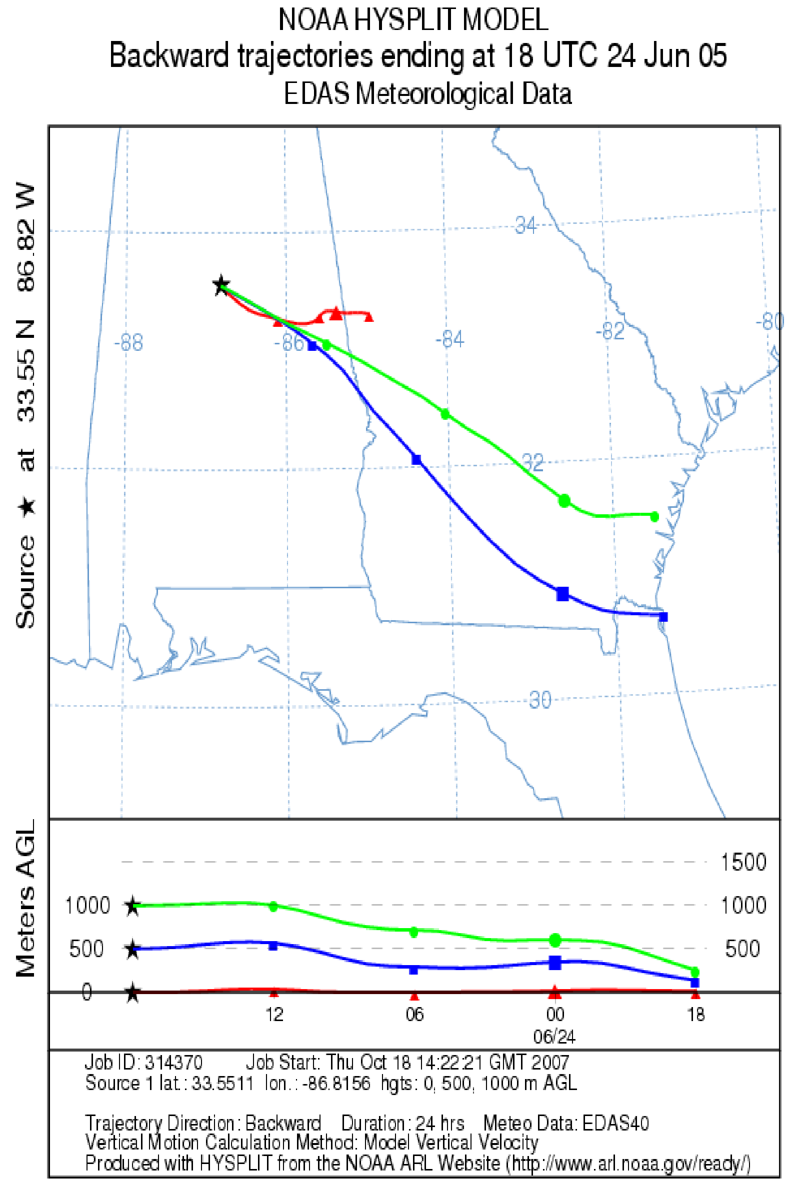


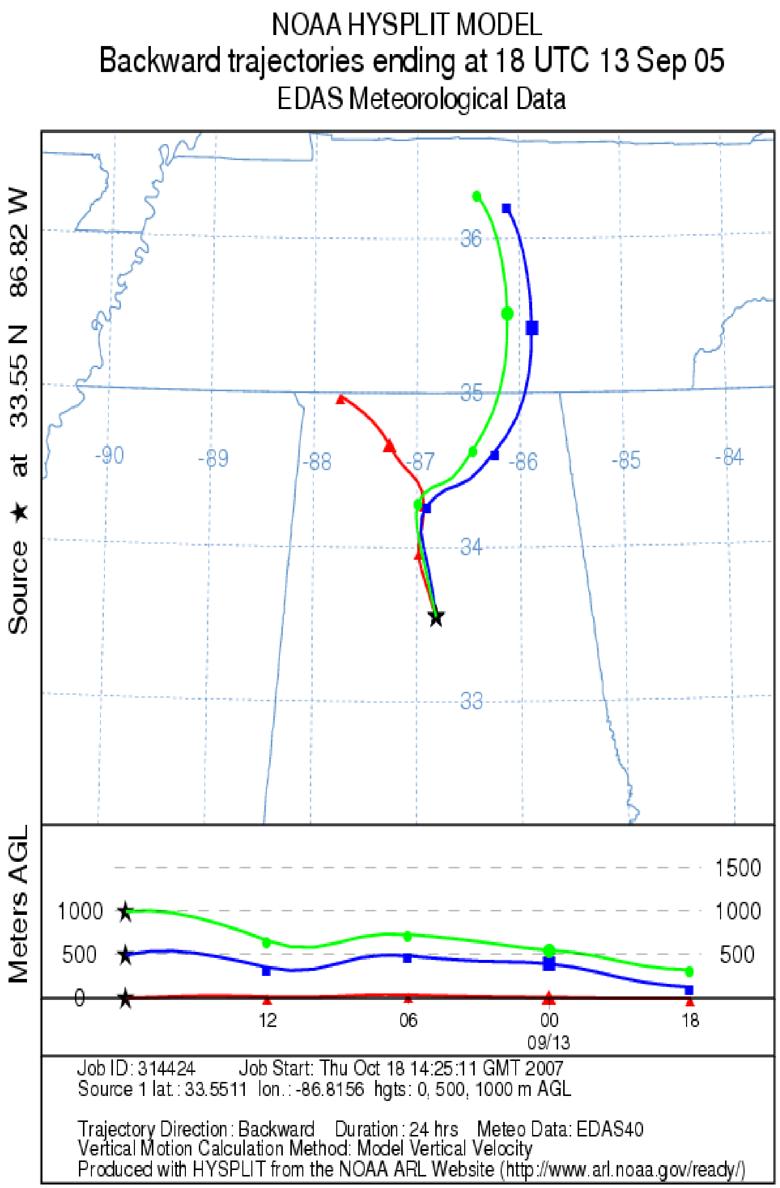
Figure 18 Birmingham Winds – Days $PM_{2.5}$>35µg/m^3 – 2004-2006

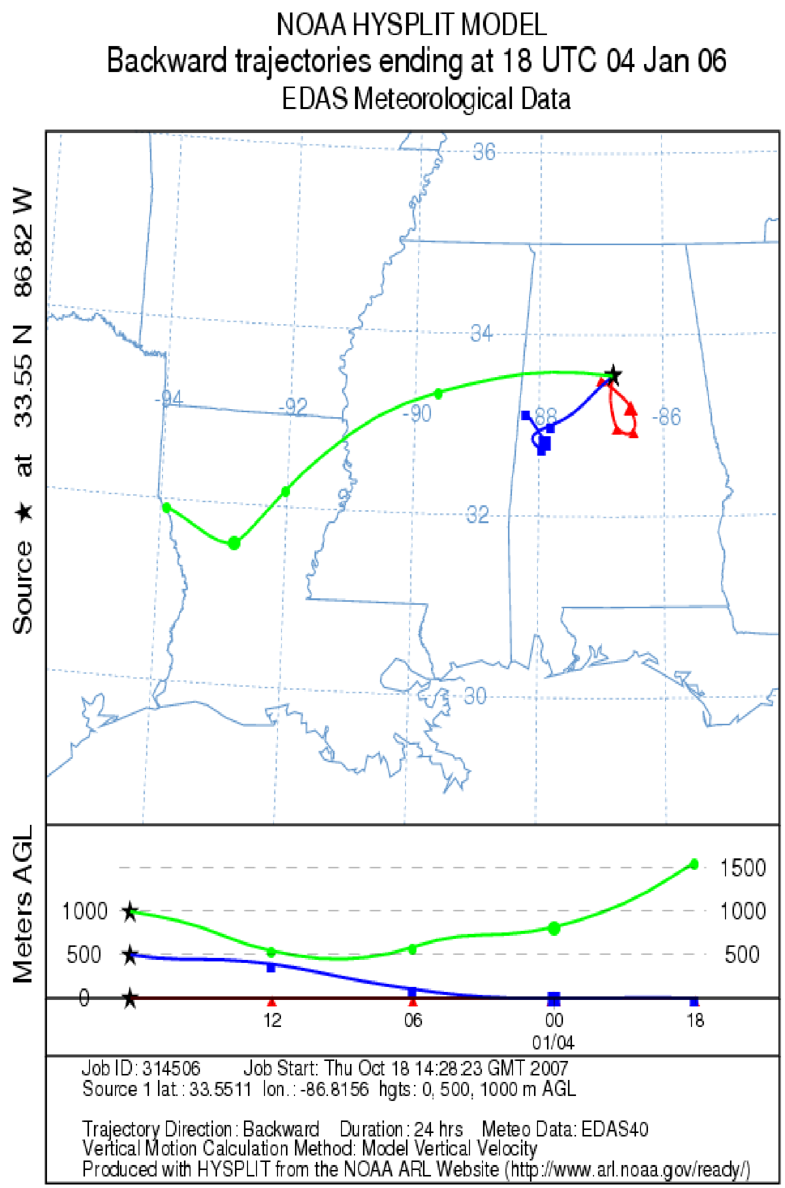




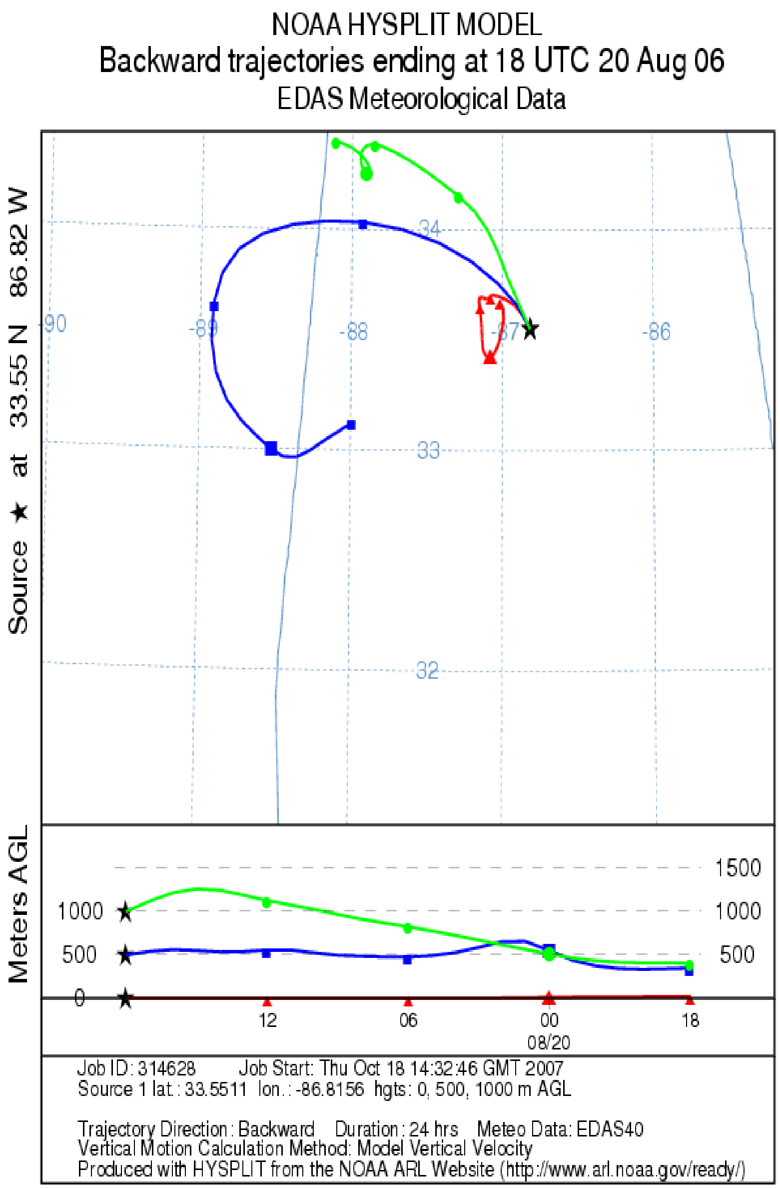


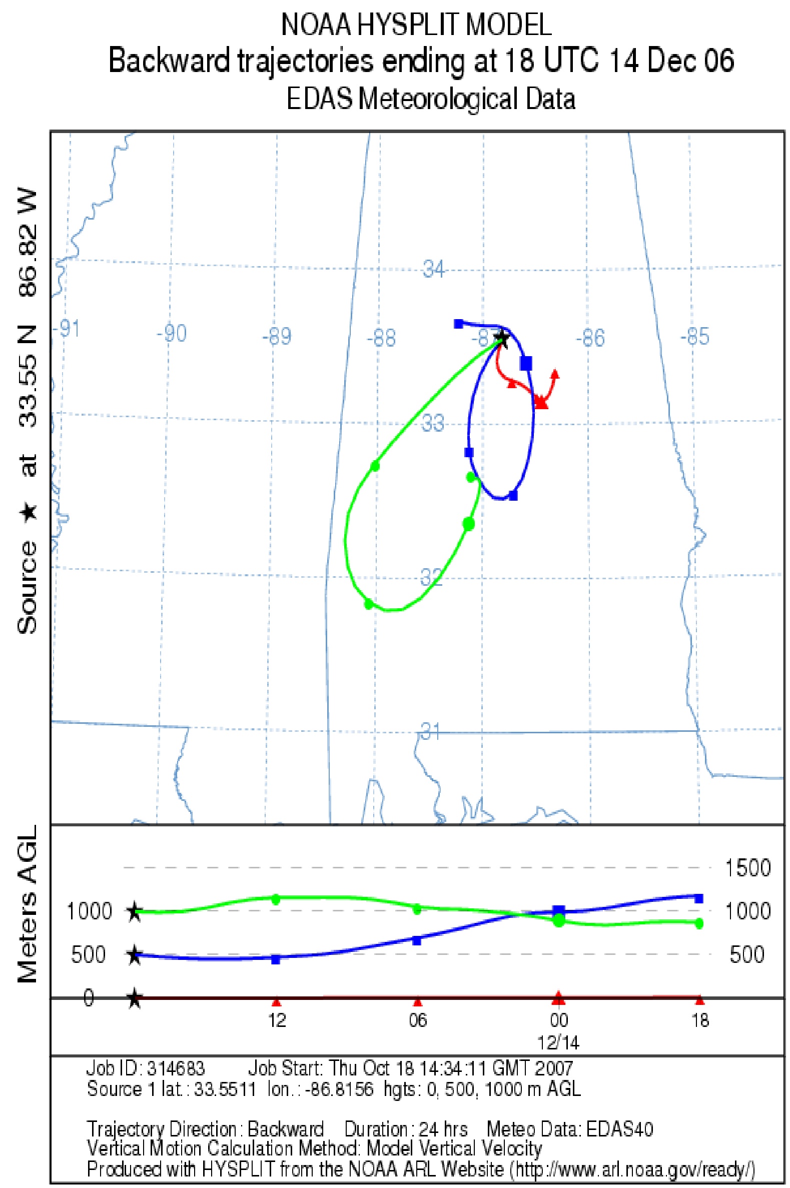
Figures 19 and 20





Figures 21 and 22





Figures 23 and 24

APPENDIX A.1

Particulate Matter Sources in Birmingham, Alabama

Synopsis

July 14, 2006

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SYNOPSIS OF REPORT[3]

The Problem

Measurements of airborne particles at two Birmingham air-quality monitoring sites, located in North Birmingham (NBHM) and Wylam (WYL), show high airborne particle concentrations relative to other sites in urban and non-urban portions of Jefferson County, Alabama. The annual average concentrations of fine particulate matter (fine PM, or particulate matter less than 2.5 micrometer (μm) aerodynamic diameter, $PM_{2.5}$) at NBHM and WYL exceed the current National Ambient Air Quality Standard (NAAQS) (annual average 15 micrograms per cubic meter [$\mu g\ m^{-3}$]), thereby requiring the state to provide formal plans for their reduction. The State Implementation Plan (SIP) for reduction of $PM_{2.5}$ concentrations must be submitted to the U.S. Environmental Protection Agency (EPA) by April 2008. Formally, the SIP must identify specific fine particle emission control measures that will be implemented and that will allow NBHM and WYL to attain the fine PM NAAQS by the 2010 attainment target.

EPA has designated Birmingham a non-attainment area for fine PM, with a 2002-2004 design value (DV, a three-year average of the annual average fine PM mass concentrations) of 16.8 $\mu g\ m^{-3}$, which is a spatial average (community monitoring zone, or CMZ) of the corresponding values of 16.0 $\mu g\ m^{-3}$ at WYL and 17.5 $\mu g\ m^{-3}$ at NBHM. Other sites in Jefferson County where fine particle concentrations are monitored for compliance with the NAAQS are located in Pinson, Corner, Leeds, Providence, McAdory, and Hoover. The 2002-2004 annual average fine PM mass concentrations at these other sites did not exceed the NAAQS; however, the annual averages of 14.3 $\mu g\ m^{-3}$ at Hoover and 14.6 $\mu g\ m^{-3}$ at McAdory were near the level of the NAAQS.

Daily-average PM_{10} (particulate matter less than 10 micrometer (μm) aerodynamic diameter) mass measurements were made at eight additional sites from 2000 through 2004 (Tarrant, Sweet Avenue [ABC], Shuttlesworth Drive [Sloss], Birmingham - 11th Avenue [Northside], Fairfield, Bessemer –Williamson [Dolomite], Bessemer - 1st Avenue [Bessemer], Leeds), with samples collected once every six days.

[3] This synopsis presents project findings of relevance to federal regulatory requirements.

The only locations with fine PM measurements in mid-town Birmingham were WYL and NBHM, and formal plans for compliance will therefore necessarily focus on WYL and NBHM. However, it should be noted that mean annual PM_{10} concentrations at Fairfield, Bessemer 1st Ave, and Tarrant were approximately the same as the corresponding mean annual PM_{10} concentrations at WYL, Sweet Avenue mean PM_{10} concentrations exceeded those at WYL, and Shuttlesworth Drive mean PM_{10} concentrations exceeded those at NBHM. It is therefore possible that fine PM mean concentrations in various portions of Birmingham exceeded the NAAQS level of 15 $\mu g\ m^{-3}$, but are not known simply because no fine PM monitoring record exists for mid-town locations other than NBHM and WYL. Both NBHM and WYL are located in areas of the city that are highly industrialized and that are also partially residential.

Monitoring results indicate that a larger region, including more rural portions of Jefferson County and surrounding portions of the state, has annual-average $PM_{2.5}$ concentrations of 12 to 14 $\mu g\ m^{-3}$, approaching the ambient air quality standard of 15 $\mu g\ m^{-3}$ annual average. Superimposed on these high regional levels is a diffuse urban concentration increment of approximately 2 $\mu g\ m^{-3}$. In the case of NBHM and WYL, an additional highly localized increment of 3 to 4 $\mu g\ m^{-3}$ is also present.

Reduction of both regional and urban source contributions to mean $PM_{2.5}$ mass concentrations will be needed for attaining the $PM_{2.5}$ NAAQS. The regional contribution to annual-average fine PM mass concentrations, which is about 12 to 14 $\mu g\ m^{-3}$, creates a narrow margin for local PM emissions. PM emission regulations that have been adopted by the EPA, and which will apply to both electric utilities and to mobile sources, are projected to lower regional fine PM concentrations by about 1 $\mu g\ m^{-3}$ by 2010. Attainment of the fine PM NAAQS in Jefferson County will also require reductions of local PM contributions, especially around the NBHM and WYL sites.

Regional and General Urban Fine PM

The annual average fine PM concentrations at both urban and non-urban sites are strongly influenced by sulfate (as ammonium salts), carbon compounds, and to a lesser degree, nitrate and elemental species, including a variety of metallic species. Modeling studies project that the regional and general (or diffuse) urban components of $PM_{2.5}$ will decline by about 1 µg m^{-3} over the next several years with reduction in sulfate, nitrate, and carbon concentrations, as a result of controls on emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x= NO + NO_2) applied to large stationary sources and of controls on transportation emissions of NO_x, SO_2, and primary PM (cleaner gasoline and diesel vehicles).

Analyses of carbon isotopes (carbon 14, or ^{14}C) in samples collected at NBHM and at Centreville (CTR), located in Bibb County approximately 85 km southwest of Birmingham, have established the fractions of modern (due to biomass combustion) and fossil (due to fossil-fuel combustion) carbon at this pair of monitoring sites. On average, carbon compounds at NBHM were 60 percent of fossil origin and 40 percent modern. The modern carbon levels at Centreville and North Birmingham (NBHM) were nearly identical from day to day, thus demonstrating the regional character of modern carbon. In contrast, the daily-average fossil carbon concentrations were dramatically greater at North Birmingham than at Centreville, thus unambiguously demonstrating that urban or local sources account for most of the fossil-fuel derived carbon at North Birmingham. These results imply that carbon concentrations at North Birmingham could be reduced by addressing urban transportation emissions as well as emissions from stationary sources that use coal and other fossil fuels.

Carbon compounds (total carbon, or TC) are routinely differentiated by standard measurement methods as organic carbon (OC) and as elemental carbon (EC; alternatively known as black carbon [BC]). The carbonaceous material at North Birmingham was on average approximately 70 percent OC and 30 percent EC. Local emissions contributed to both OC and EC, but in different proportions. OC was approximately two-thirds regional, modern OC and one-third local, fossil OC. EC was primarily due to fossil-fuel emissions and on average was one-third regional and two-thirds local (or urban) EC. Overall, total carbon at NBHM was about one-half regional and one-half urban in origin.

Local Fine PM

The PM chemical composition at NBHM and WYL is similar to that found at regional and non-urban sites, except that additional (mainly fossil C related) carbon (as

OC and EC) is found at NBHM and WYL, along with certain metal concentrations, which are substantially higher than in other cities. Compared with a rural monitor located in Providence, the mean fine mass concentrations were 4.6 $\mu g\ m^{-3}$ higher at WYL and 5.8 $\mu g\ m^{-3}$ higher at NBHM. Inorganic species (sulfate, nitrate, and ammonium) accounted for 1.2 to 1.5 $\mu g\ m^{-3}$ of the excess mass at the two urban sites, and organic carbon represented 1.0 $\mu g\ m^{-3}$ of the excess at WYL and 2.2 $\mu g\ m^{-3}$ of the excess at NBHM. Because the measurements of OC record only the mass of carbon contained in organic carbonaceous compounds, the actual mass of organic material (OM) is conventionally estimated to be about 40 percent greater than the measured OC mass. Elemental carbon represented 0.4 $\mu g\ m^{-3}$ of the excess at WYL and 1.0 $\mu g\ m^{-3}$ of the excess at NBHM. The sum of the elemental concentrations of aluminum, bromine, calcium, chlorine, chromium, copper, iron, lead, magnesium, manganese, nickel, silicon, sodium, titanium, and zinc, denoted here as "elements", added another 1.2 $\mu g\ m^{-3}$ of the excess at WYL and 0.5 $\mu g\ m^{-3}$ of the excess at NBHM, on average. The relative proportions of the species contributions to the excess mass differed at WYL and NBHM, with greater excess OC and EC at NBHM and more excess elemental mass at WYL.

While major species concentrations at Birmingham sites are similar to, or somewhat larger than, at other urban Southeast locations, certain elemental species concentrations are very different. The most striking is zinc, whose average concentrations are two orders of magnitude greater at North Birmingham and Wylam than at any other urban location in the southeastern US. Zinc, therefore, is apparently a chemical marker for emissions that are largely unique to Birmingham. Since mobile source emissions are common to all cities, zinc emissions in Birmingham derive from specific industrial processes occurring there. Other species present at higher concentrations at the Birmingham sites are calcium, copper, chromium, iron, manganese, sodium, and lead. All indicate the presence of specific emission sources that influence local PM levels in Birmingham, but these elements are not necessarily unique to any specific facility.

The topography and weather conditions in Birmingham tend to force prevailing surface winds to be most frequent parallel to a shallow depression running from northeast to southwest. This valley includes most of the manufacturing, industrial and commercial activity of the city and contains most of the heavy highway traffic.

Stationary sources within 10 km of NBHM include three steel pipe manufacturers, two large coking operations, a mineral wool plant, an asphalt batching plant and fugitive sources from coal and coke storage yards, a limestone quarry, and metal fabricating operations. The NBHM site is also near two major interstate highways, and heavy local traffic, including substantial railroad traffic with diesel locomotives, occurs around the nearby manufacturing plants. The highest hourly-average PM concentrations at NBHM occurred when winds were from ~20 to 70 degrees (Figure 1), in line with four major PM sources (no interstate highways are located in this direction). In addition, high hourly-average PM concentrations also occurred when winds were from the southeast, in line with several other PM sources.

At WYL, the local sources potentially of concern include a large steel manufacturing operation to the southwest, including an area for coke and product storage and an extensive area of slag and sludge storage; smaller manufacturing activity also exists ~0.5 km to the east and northeast, including a metal processing company, railroad yards and road or interstate highway traffic. At WYL, the highest mean PM concentrations were associated with winds from ~ 0 to 130 degrees, directions lacking major PM point sources but in line with several small PM point sources, a rail line, and Interstate 20 (Figure 1). Enhanced PM concentrations were also found at WYL with winds from ~200 to 250 degrees, in the direction of a slag pile and the US Steel facility and perhaps manufacturing further down-valley to the SSW (Figure 1).

The local origins of PM emissions affecting the PM concentrations at NBHM are further established through consideration of PM concentrations at monitoring locations upwind of specific emissions sources. With winds from the northeast, hourly PM_{10} concentrations were low at Sweet Avenue, higher at Shuttlesworth Drive, and highest at NBHM (Figure 2), indicating the cumulative impact of four major PM sources and associated industrial activity located between Sweet Avenue and NBHM. Similarly, the nearest upwind $PM_{2.5}$ monitor, located at Pinson High School, showed much lower hourly PM concentrations when winds were from the northeast than did NBHM. The evidence linking specific facilities with $PM_{2.5}$ at NBHM is discussed next.

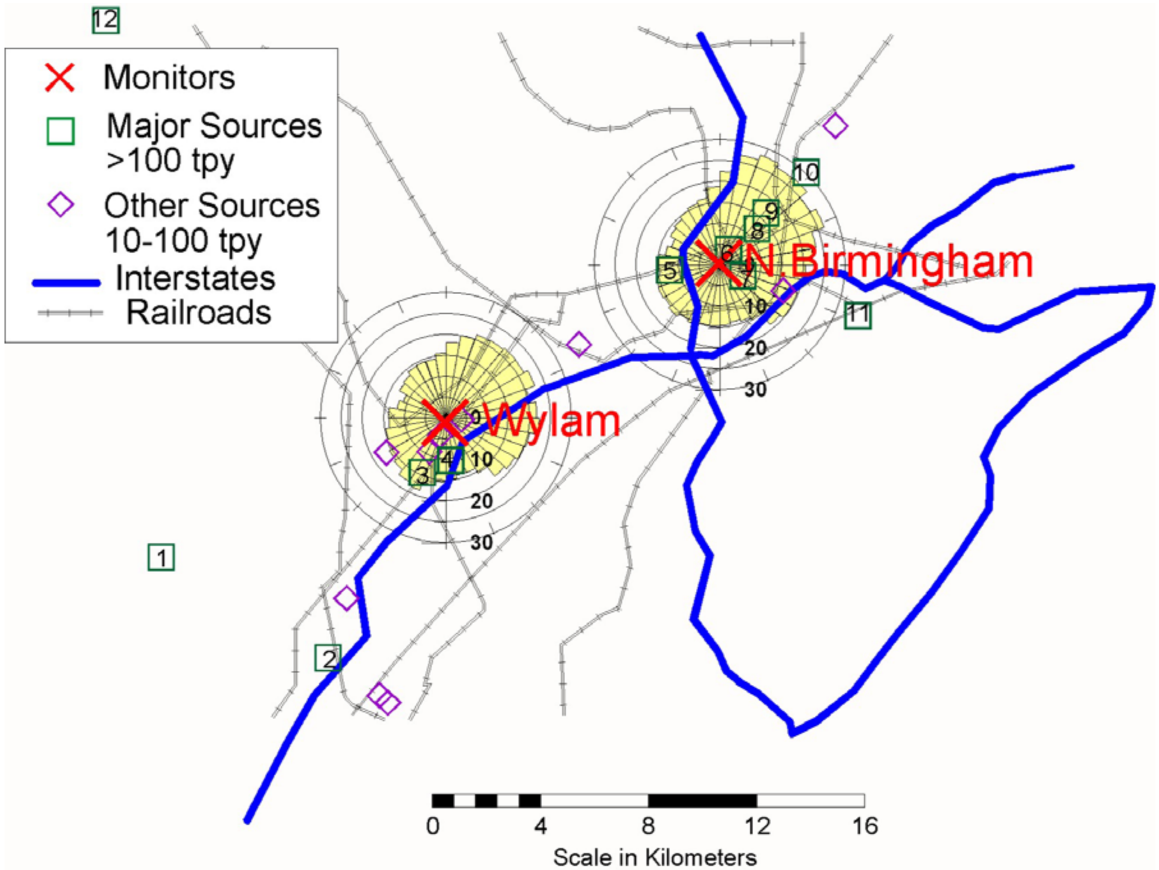

Figure 1. Mean directional $PM_{2.5}$ concentrations at NBHM and WYL compared with the locations of PM emission sources, highways, and railroads. The directions of origin of the winds corresponds to compass degrees. The mean $PM_{2.5}$ concentrations associated with each direction are indicated by the lengths of the bars, with the scale being proportional to the radii of the concentric circles as indicated by their labels (measurement units are µg m^{-3}). Major PM emissions sources are numbered as follows: (1) Oak Grove Resources, LLC, (2) U.S. Pipe & Foundry Company, LLC (Bessemer), (3) U.S. Steel Corporation (Fairfield), (4) U.S. Steel Corporation (Fairfield pipe mill), (5) American Cast Iron Pipe, (6) U.S. Pipe & Foundry Company, LLC (N. Birmingham), (7) Nucor Steel, (8) Sloss Industries (coke), (9) Sloss Industries (mineral wool), (10) ABC Drummond Company, Inc., (11) SMI Steel, (12) Alabama Power Company (Miller plant).

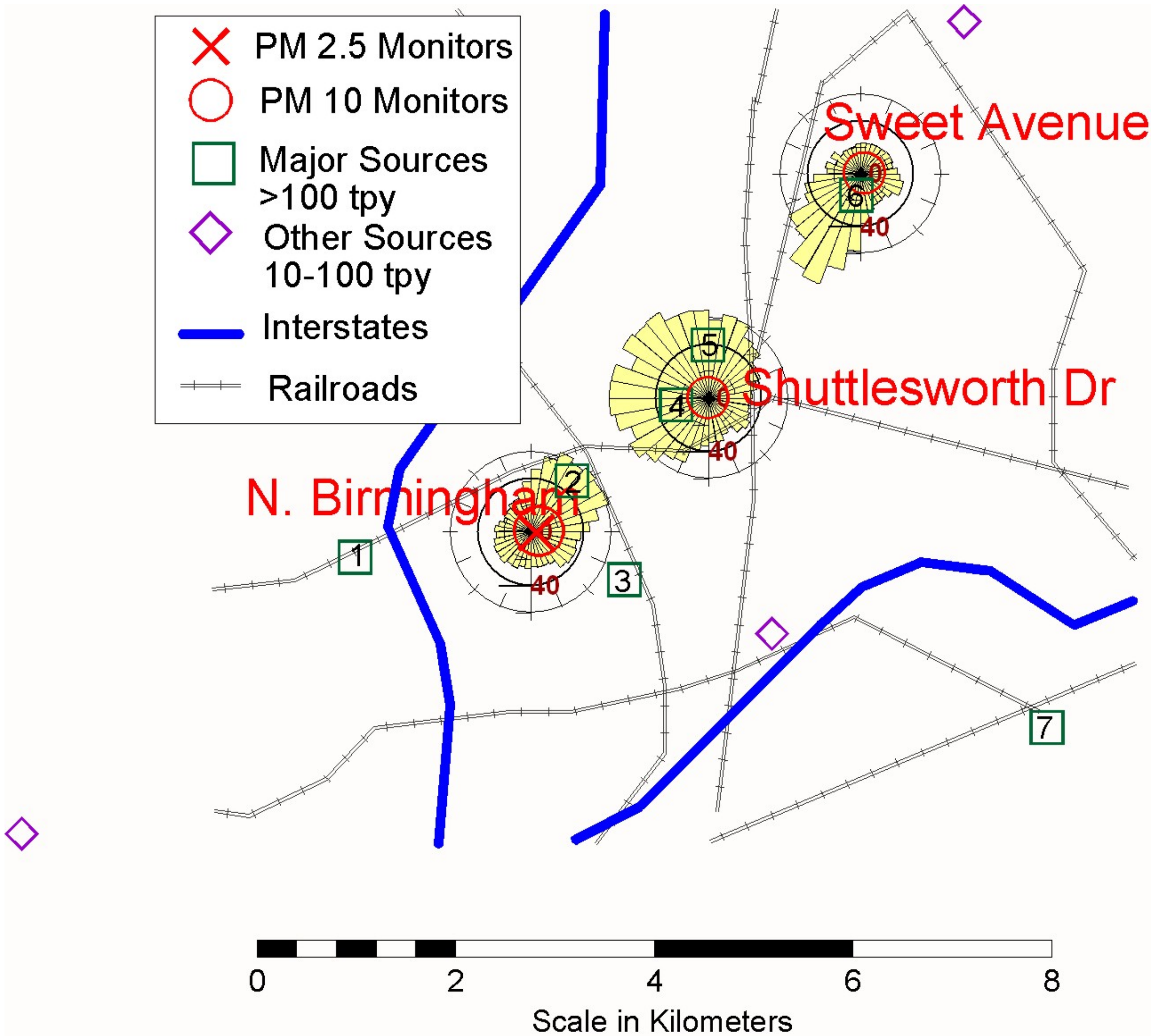

Figure 2. Mean directional PM_{10} concentrations at North Birmingham, Shuttlesworth Drive, and Sweet Avenue compared with the locations of PM emission sources, highways, and railroads. The directions of origin of the winds correspond to compass degrees. The mean PM_{10} concentrations associated with each direction are indicated by the lengths of the bars, with the scale being proportional to the radii of the concentric circles as indicated by their labels (units are $\mu g\ m^{-3}$). Major PM emissions sources are numbered as follows: (1) American Cast Iron Pipe, (2) U.S. Pipe & Foundry Company, LLC (N. Birmingham), (3) Nucor Steel, (4) Sloss Industries (coke), (5) Sloss Industries (mineral wool), (6) ABC Drummond Company, Inc., (7) SMI Steel.

Evidence for Stationary Source Contributions to $PM_{2.5}$ Concentrations at NBHM

U.S. Pipe and Foundry, North Birmingham. The nearest major industrial source to the NBHM site is the U.S. Pipe and Foundry Company, located about 0.45 km east of NBHM. In 2003, it was the ninth-largest fine PM stationary emissions source in Jefferson County. The evidence linking its emissions with fine PM concentrations at NBHM includes:

- Proximity and magnitude of PM emissions.
- Enhanced hourly fine PM concentrations when winds were from the direction of the facility.
- Observed dark plumes emanating from the facility.[4]
- Strong correlations between hourly concentrations of $PM_{2.5}$ mass and gas-phase pollutants emitted as combustion products, including CO, NO, and SO_2.
- Reduced concentrations of elemental carbon (EC) and certain metals, including iron, zinc, and manganese, on Saturdays and Sundays, consistent with process shutdown at this facility on weekends.
- Higher ratios of $PM_{10}/PM_{2.5}$ at NBHM than at WYL and other sites, indicating the importance of nearby emission sources.
- Short-duration (one to three hours) spikes in $PM_{2.5}$ mass concentrations at NBHM that are uncorrelated with hourly PM concentrations at other area monitoring sites and which frequently occurred close to 6 am, usually on weekdays (i.e., indicating proximate emissions potentially associated with intermittent process activities occurring at scheduled times).

Sloss Industries and ABC Drummond, North Birmingham. Two large coke production facilities are situated to the northeast of NBHM; these are the Sloss facility (about 1.8 km northeast), and the ABC Drummond operations (about 4.5 km northeast of NBHM). The Sloss mineral wool plant is adjacent to the Sloss coking operations, about 2.3 km northeast of the NBHM site. An asphalt batch plant is situated just west of the

[4] Such plumes have been observed on occasion but have not been recorded systematically or sampled for PM, so it is not possible to correlate with observations with measurements of fine PM at NBHM.

Sloss coke production plant. A large quarry producing crushed limestone (calcium carbonate) exists adjacent to the ABC plant. In addition to process-related PM emissions from coke and mineral wool production, fugitive emissions are expected to be associated with the coal and coke crushing and storage yards. Also expected are emissions from rail yards, from diesel trucks, and from excavation vehicles used in the quarrying operations. The focus of this analysis is on the largest PM emission sources, namely, the coke and mineral wool production processes; however, fugitive, rail, trucking, and quarrying emissions may also contribute to the overall total within this relatively small area. In 2003, the Sloss coke, ABC Drummond, and Sloss mineral wool facilities were the 3rd, 4th, and 12th largest fine PM stationary emissions sources in Jefferson County. The evidence linking their emissions[5] with fine PM concentrations at NBHM includes:

- Proximity and magnitude of PM emissions.
- Enhanced hourly fine PM concentrations at NBHM when winds were from the direction of the facilities, especially at night and during weekends (i.e., during times of operation for coke production but of process shutdown at many area metals manufacturing facilities).
- Unambiguous increases in PM_{10} concentrations at the Shuttlesworth Drive (Sloss) and Sweet Avenue (ABC Drummond) monitoring locations when winds were from the direction of the facilities (i.e., confirming the existence of high PM emissions indicated by the emission inventory).
- Strong correlations between hourly concentrations of $PM_{2.5}$ mass and gas-phase pollutants emitted as combustion or pyrolysis products, including CO, NO, and gaseous sulfur, as SO_2.
- Ratios of EC/OC averaging 1.3 to 1.7 at fence-line samplers, consistent with elevated EC/OC ratios at NBHM.
- High concentrations of silicon, calcium, potassium, and iron in fence-line samples.[6]

[5] Including possible contributions from fugitive emissions, rail yards, diesel trucking, quarrying, and asphalt production that have not to date been separable from direct process emissions.
[6] Indicating potential contributions of the facilities to these species concentrations at NBHM; other emission sources could also affect NBHM.

- Reduced concentrations of PM_{10} mass concentrations on Saturdays and Sundays at Shuttlesworth Drive, Sweet Avenue, and NBHM (i.e., demonstrating weekend reductions of PM emissions adjacent to coke and mineral wool production facilities[7] and at NBHM).

American Cast Iron Pipe Company (ACIPCO). The ACIPCO facility is located about 1.9 km to the west-southwest of NBHM. In 2003, it was the 5th-largest stationary source of fine PM emissions in Jefferson County, having emissions almost equal to those of ABC Drummond. The evidence linking its emissions with fine PM concentrations at NBHM includes:

- Small hourly PM enhancements when winds were from the direction of the ACIPCO facility (directions from 220 to 250 degrees).
- Higher hourly mean PM concentrations at NBHM than at McAdory and Hoover on days when prevailing surface and upper-level winds were from the southwest, with PM concentration differences of about 5 $\mu g\ m^{-3}$ from midnight to 7 am and about 2 $\mu g\ m^{-3}$ at other hours.
- High concentrations of elements, including silicon, potassium, calcium, and iron, in samples collected at the ACIPCO fence line.

Nucor, McWane, SMI, and Other Facilities. The two largest major PM sources located southeast of NBHM are Nucor Steel, 1.1 km distant, and SMI Steel, 5.7 km away; these facilities are the 13th and 11th largest stationary PM sources, respectively, in Jefferson County, each with emissions approximately equal to those of the Sloss mineral wool plant. Other facilities to the southeast are KMac (0.8 km, no PM emissions), McWane Cast Iron Pipe Company, (2.7 km, 14th largest), Induron Coatings (2.8 km, 24th largest), and other small facilities. Facility-specific impacts on PM at NBHM cannot be determined, but the following evidence collectively links facilities to the southeast of NBHM with PM there:

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[7] These weekend reductions have not been linked with specific processes and potentially include reduced on-site or near-site transportation activities as well as production processes.

- Enhanced hourly fine PM concentrations at NBHM when winds were from the direction of the facilities (southeast).
- Highly elevated metals (nickel and chromium) concentrations in three samples associated with winds from the southeast.
- High concentrations of silicon, calcium, potassium, and iron in fence-line samples.

Evidence for Stationary Source Contributions to $PM_{2.5}$ Concentrations at WYL

USS (USX) Steel Operations-Fairfield. A very large historic steel plant is located to the southwest, with major emissions at approximately 1.6 and 2.2 km from WYL, and with slag piles nearly adjacent to WYL. This plant continues to be capable of operating a large blast furnace, oxygen-induction furnaces, a seamless tube manufacturing operation, and hot and cold rolled sheet metal operation, including galvanized sheet lines. In addition, there is substantial potential for fugitive dust suspension with trucking and railroad activity on-site, including coke storage and transfer, as well as other raw material storage facilities and the slag and debris storage areas. The area includes the Fairfield Pipe Mill (1.6 km from WYL, 8th-largest PM source in Jefferson County), the Fairfield plant (2.2 km, 2nd largest), Harbison-Walker (0.7 km, 20th largest), and Holcim (Midfield Facility, 5.2 km, 15th largest; Holcim at US Steel, 1.4 km, minor PM emissions). The evidence linking this source complex with fine PM concentrations at WYL includes:

- Proximity and magnitude of emissions.
- Moderately enhanced $PM_{2.5}$ concentrations with winds from the southwest.
- Enhanced concentrations of certain metals (chromium, iron, manganese, nickel, and potassium) having an association with fine mass and occurring with a southwesterly direction of origin of winds.
- Highly elevated concentrations of chromium, iron, manganese, nickel, and potassium on Mondays through Thursdays and low levels on Fridays through Sundays.
- Elevated concentrations of calcium, iron, and manganese in fence-line samples.

W. J. Bullock, Inc., Certainteed, and Other Metal-Processing Facilities. W.J. Bullock (nominally minor emissions in 2003) and Certainteed (17th largest) are located approximately 0.6 km southeast and east, respectively, of WYL. The W. J. Bullock, Inc. facilities produce secondary non-ferrous metal products, which include brass, bronze and aluminum ingots. Zinc ingots are used as additives for brass production, along with scrap and copper. Tin and lead are also additives for making products. Zinc and lead are more volatile than other metals, so they will have a tendency to be released preferentially to other metals in non-ferrous metal processes. The evidence linking these facilities or sources in this geographical area with fine PM concentrations at WYL includes:

- Proximity.
- Elevated fine PM mass concentrations at WYL associated with winds from the northeast and the southeast.
- Highly elevated concentrations of zinc, chlorine, sodium, and lead at WYL, nearly all associated with winds from the east or southeast.[8] These elements exhibited their lowest mean levels on Saturdays (i.e., consistent with weekend process shutdown).
- Extremely elevated concentrations of zinc and lead in samples collected adjacent to W. J. Bullock.

Transportation

The degree to which transportation sources affect either NBHM or WYL is not known quantitatively, and cannot be differentiated from other sources influencing the sites based on inspection of PM composition data, or wind-concentration roses. There is some evidence from carbon speciation studies and from receptor modeling of the NBHM data that on average, the contribution of OC to $PM_{2.5}$ is about 2 to 11 percent from diesel truck exhaust, and 2 to 22 percent from gasoline exhaust, based on a few measurements made in the fall of 2003 and winter of 2004 (e.g. Zheng et al., 2005; Liu et al. 2004,

[8] Elevated zinc concentrations also occurred on some samples associated with winds from the northwest, thus indicating one or more additional sources. The alternative Zn sources to N-NW could not be identified as a specific facility, nor could they be accounted for from diesel transportation exhaust emissions or brake lining dust.

2006a). From receptor modeling, a vehicle contribution at NBHM is estimated to be about 16 percent of the $PM_{2.5}$ mass concentration (Liu et al., 2006b).

References

Liu, W.; Wang, Y.; Russell, A.; Edgerton, E.S. 2004. Atmospheric aerosol over two urban-rural pairs in the southeastern United States: chemical composition and possible sources. *Atmos. Environ*. 39: 4453-4470.

Liu, W.; Wang, Y.; Russell, AS.; Edgerton, E., 2006a. Enhanced Source Identification of Southeast Aerosols Using Temperature Resolved Carbon Fractions and Gas Phase Components. Submitted to *Atmos. Environ*.

Liu, W.; Lee, S.; Wang, Y.; Russell, A.; Edgerton, E., 2006b. Source Apportionment of PM2.5 at Four SEARCH Sites: Comparison Between PMF and CMB. Submitted to *Atmos. Environ.*

Zheng, M; Lin, K; Edgerton, E.; Schauer, J.; Dong, M.; Russell, A., 2005. Spatial Distributions of Carbonaceous Aerosol in the Southeastern U.S. using Molecular Markers and Carbon Isotope Data. To be published in *J. Geophys. Res.*

APPENDIX B

ADEM recommends that the Gadsden Nonattainment Area (NAA) for the 24-hour $PM_{2.5}$ NAAQS consist of Etowah County only and exclude the surrounding counties including Marshall, DeKalb, Cherokee, Calhoun, St. Clair, and Blount, which are located outside of the Gadsden MSA. EPA guidance dated June 8, 2007, states that a state must address how certain factors affect the drawing of the nonattainment boundary. Therefore, a discussion of these factors for the Gadsden NAA is provided in this Appendix.

The factors that provide the most compelling evidence to exclude Marshall, DeKalb, Cherokee, Calhoun, St. Clair, and Blount Counties are listed below:

- Total annual emissions in comparison to Etowah County
- Population density and degree of urbanization in comparison to Etowah County
- Traffic patterns (Daily VMT)
- Commuting Patterns
- Location of emission sources (i.e. the lack of significant point sources)
- Regional emission reductions
- Monitoring data
- Meteorology

A. Emissions and air quality in adjacent areas (including adjacent Statistical Areas)

The counties adjacent to the Gadsden MSA are depicted in Figure 1. To evaluate emissions for these counties, ADEM obtained the 2002 annual NO_x, SO_2, VOC, NH_3, and $PM_{2.5}$ emission estimates from VISTAS Base G2 emissions inventory. Table 1 lists these emissions which include all anthropogenic sources (i.e. point, area, mobile, and nonroad mobile) for the counties that are adjacent to Etowah County.

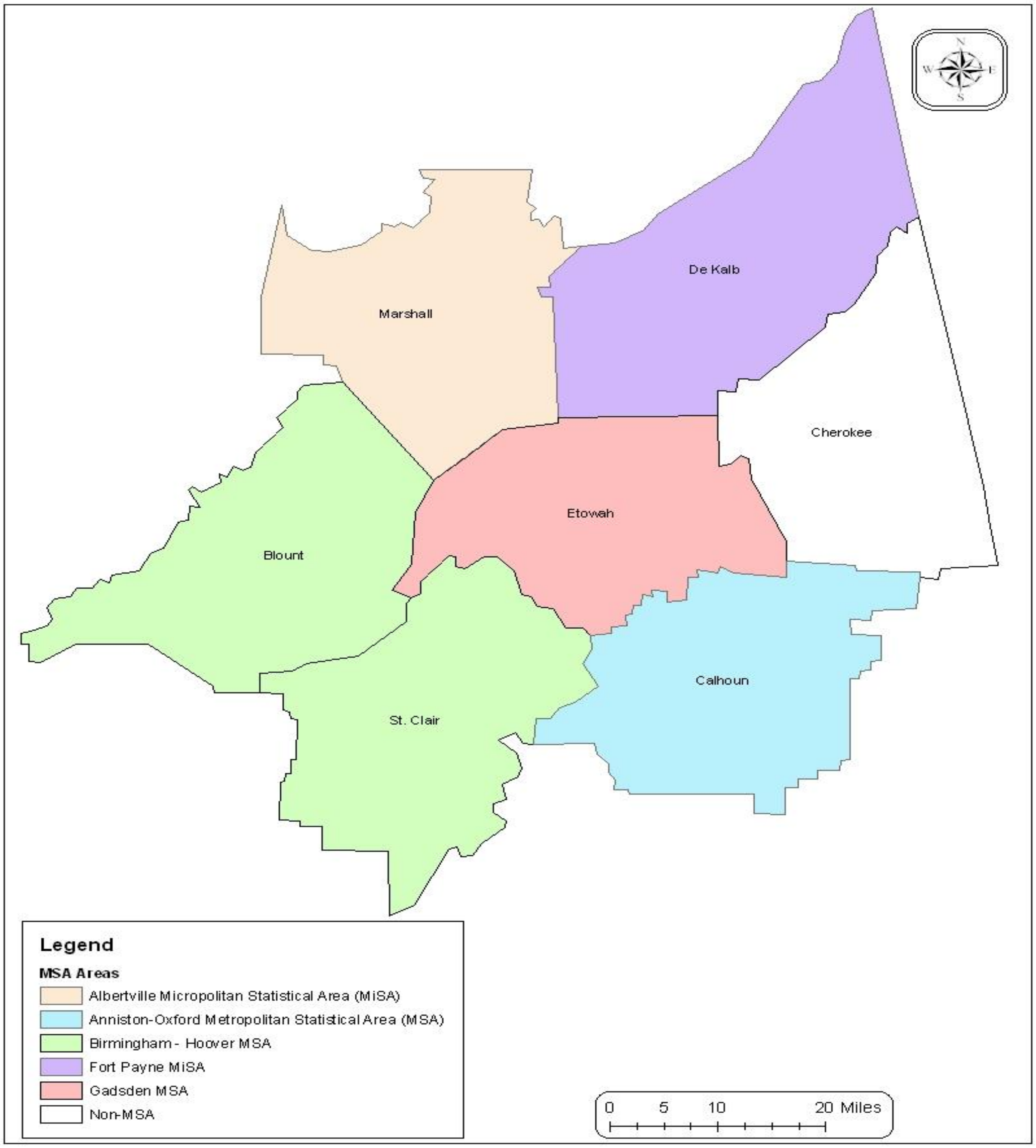


Figure 1 Gadsden MSA and Surrounding Counties

Table 1 2002 Annual Emissions for Counties Adjacent to Etowah County

County	VOC (Tons)	VOC Ranking	NO_x (Tons)	NO_x Ranking	SO_2 (Tons)	SO_2 Ranking	$PM_{2.5}$ (Tons)	$PM_{2.5}$ Ranking	NH_3 (Tons)	NH_3 Ranking
Blount	6,237	6	6,971	2	596	6	1,353	5	2,665	3
Calhoun	9,393	1	4,466	4	2,107	2	2,359	1	669	6
Cherokee	3,678	7	1,448	7	239	7	1,043	7	549	7
DeKalb[M]	6,848	5	3,722	6	912	5	1,581	3	5,960	1
Etowah[M]	8,055	3	6,593	3	10,533	1	1,265	6	1,044	5
Marshall	9,309	2	4,162	5	1,800	3	1,582	2	3,468	2
St.Clair	7,542	4	7,778	1	987	4	1,571	4	1,093	4

[M] County has a PM monitor

As shown in Table 1, Etowah County ranks first among surrounding counties in the emission of SO_2, falls in the middle of the list for NO_x and VOC emissions, and is among the last in NH_3 and $PM_{2.5}$ emissions.

Calhoun County ranks high in VOC, SO_2, and $PM_{2.5}$ emissions. Calhoun ranks second in SO_2 emissions, however, Calhoun County SO_2 emissions are less than 25% of Etowah County SO_2 emissions. Calhoun County ranks first in $PM_{2.5}$ emissions, however, Section H demonstrates that the predominant wind direction on days with elevated $PM_{2.5}$ concentrations is not from the direction of Calhoun County. These factors fortify the recommendation to exclude Calhoun County from the Gadsden 24-hour $PM_{2.5}$ NAA.

Cherokee County ranks last in all pollutant emissions. Emissions of VOC and SO_2 in Blount and DeKalb Counties rank in the middle or near the bottom compared to the other counties and are less than corresponding emissions in Etowah County. Blount and DeKalb Counties have $PM_{2.5}$ emissions similar to Etowah County. $PM_{2.5}$ emissions in all counties are dominated by area sources. These factors fortify the recommendation to exclude DeKalb, Cherokee, and Blount Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.

Table 1 shows that Marshall County ranks in the middle for NO_x and $PM_{2.5}$ emissions compared to the other counties. Marshall County emits less NO_x than Etowah County and its $PM_{2.5}$ emissions are similar to Etowah County. Marshall County ranks second in VOC emissions, which can be attributed primarily to area and non-road mobile sources. Marshall County VOC emissions are similar to Etowah County VOC emissions. St. Clair County ranks in the middle for VOC, $PM_{2.5}$, and NH_3. St. Clair and Blount Counties rank at the top for NO_x, but those emissions are largely attributed to on-road mobile source emissions. National programs such as the Tier 2 standards and on-road diesel regulations are expected to mitigate the impact of mobile source emissions. SO_2 emissions in Etowah County are significantly greater than the surrounding counties. These factors fortify the recommendation to exclude Marshall, Blount, and St. Clair Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.

Based on analyses of wind data, those counties to the east, south, and north of the Gadsden MSA (DeKalb, Cherokee and Calhoun) would not significantly contribute to the nonattainment area's air quality on days with high $PM_{2.5}$ concentrations. This will be discussed in further detail in Section H.

Many rural counties in Alabama, as well as the southeastern U.S., have considerable ammonia (NH_3) emissions resulting primarily from concentrated animal feeding operations and fertilizer production and application. For information purposes, data on estimated ammonia emissions is presented in this section since present knowledge indicates that ammonia emissions can play a key role in $PM_{2.5}$ formation. However, due to a lack of effective controls for these sources of ammonia and the uncertainties in methods for estimating emissions of ammonia, ammonia emissions were not considered to be a significant factor in the determination of which counties to include in $PM_{2.5}$ nonattainment areas. Should effective controls for sources of ammonia become available in the future, the lack of a nonattainment area designation would not preclude ADEM, under its existing regulations, from requiring controls in Blount, Calhoun, Cherokee, DeKalb, Marshall, and St. Clair Counties if such controls are deemed necessary.

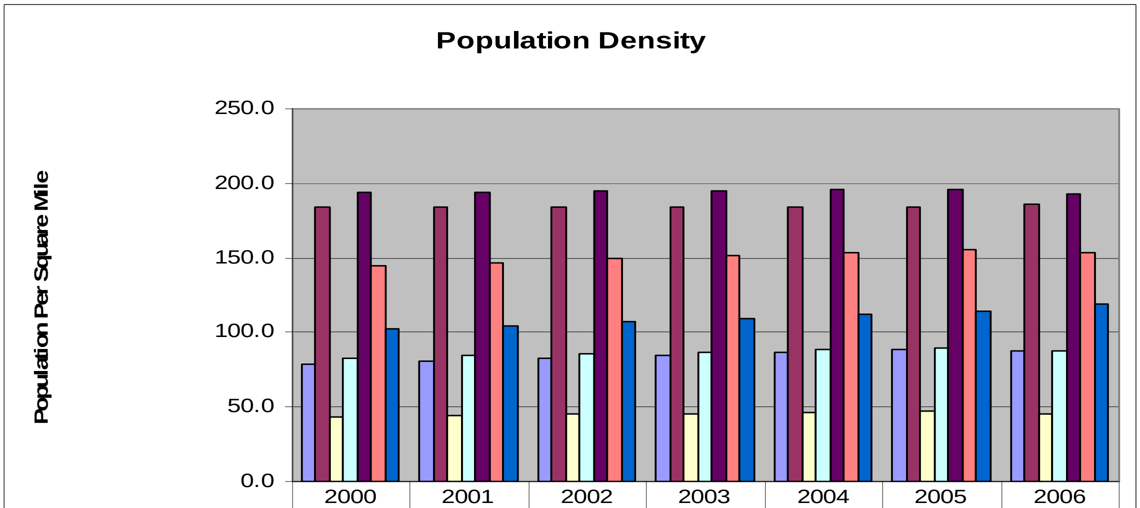
B. Degree of urbanization including commercial development and commuting patterns

The Federal Register (Vol. 65, No.249, pages 82228 -82238) published on December 27, 2000, identifies metropolitan and micropolitan statistical areas (metro and micro areas) as geographic entities defined by the U.S. Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. The term "Core Based Statistical Area" (CBSA) is a collective term for both metro and micro areas. A metro area contains a core urban area population of 50,000 or more, and a micro area contains an urban core population of at least 10,000 (but less than 50,000). Each metro or micro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting patterns) with the urban core. Adjacent counties are included in the metro or micro area if at least 25% of the employed residents of the county work in the central county or if at least 25% of the employment in the adjacent county is accounted for by workers who reside in the central county. The OMB has defined the Gadsden MSA as consisting of only Etowah County after taking into consideration commuting patterns and urbanization. These factors fortify the recommendation to exclude Marshall, DeKalb, Cherokee, Calhoun, St. Clair, and Blount Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.

C. Population Density

To evaluate the various aspects of population, ADEM obtained the 2000 to 2006 population estimates for the Gadsden MSA and surrounding counties from the Alabama State Data Center[9].

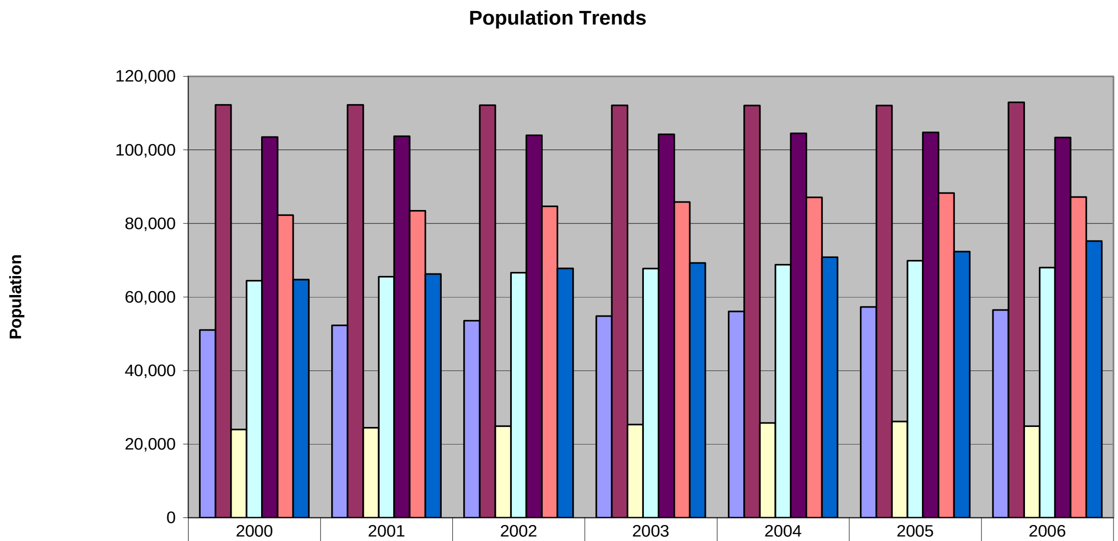
Population densities were calculated by dividing the population estimates by the land area (in square miles) of each county. Figure 2 depicts the population densities for counties in the Gadsden MSA and surrounding counties. Blount, Cherokee, DeKalb and St. Clair Counties have much smaller land areas and population densities than Etowah County. As seen in Figure 2, Calhoun and Marshall Counties have slightly smaller population densities than Etowah County, but Calhoun and Marshall Counties are in their own MSA, as defined by OMB. <u>This factor fortifies the recommendation to exclude Blount, Cherokee, DeKalb, and St. Clair Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.</u>



	2000	2001	2002	2003	2004	2005	2006
Blount County	79.0	81.0	82.9	84.9	86.8	88.8	87.4
Calhoun County	184.5	184.4	184.4	184.3	184.2	184.1	185.6
Cherokee County	43.4	44.2	45.0	45.7	46.5	47.3	45.0
DeKalb County	82.9	84.2	85.6	87.0	88.4	89.8	87.4
Etowah County	193.4	193.9	194.4	194.9	195.4	195.9	193.3
Marshall County	145.0	147.1	149.3	151.4	153.5	155.6	153.7
St. Clair County	102.2	104.6	107.0	109.3	111.7	114.1	118.7

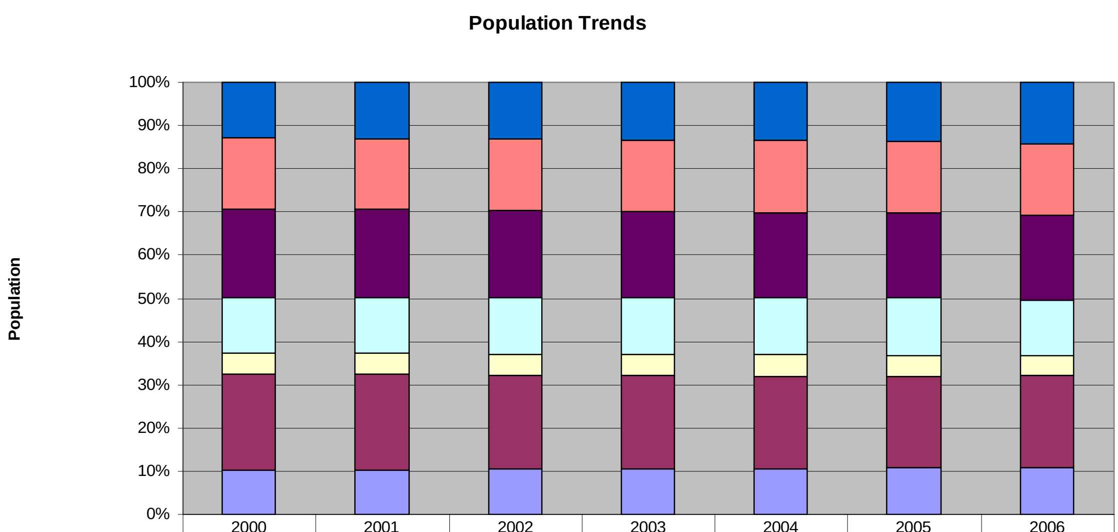
Figure 2 Population Densities for Gadsden MSA and Surrounding Counties

[9] The Alabama State Data Center (ASDC) is a network of 27 public agencies working together through a cooperative agreement with the U.S. Bureau of the Census to facilitate use and delivery of Census and other data to the public. Internet site: http://cber.cba.ua.edu/est_prj.html



	2000	2001	2002	2003	2004	2005	2006
Blount County	51,024	52,284	53,545	54,805	56,066	57,326	56,436
Calhoun County	112,249	112,207	112,171	112,122	112,086	112,044	112,903
Cherokee County	23,988	24,424	24,863	25,291	25,730	26,166	24,863
DeKalb County	64,452	65,532	66,607	67,695	68,770	69,850	68,014
Etowah County	103,459	103,724	103,985	104,239	104,500	104,765	103,362
Marshall County	82,231	83,435	84,639	85,848	87,052	88,256	87,185
St. Clair County	64,742	66,260	67,781	69,295	70,816	72,334	75,232

Figure 3 Population Data for the Gadsden MSA and Surrounding Counties



	2000	2001	2002	2003	2004	2005	2006
St. Clair County	64,742	66,260	67,781	69,295	70,816	72,334	75,232
Marshall County	82,231	83,435	84,639	85,848	87,052	88,256	87,185
Etowah County	103,459	103,724	103,985	104,239	104,500	104,765	103,362
DeKalb County	64,452	65,532	66,607	67,695	68,770	69,850	68,014
Cherokee County	23,988	24,424	24,863	25,291	25,730	26,166	24,863
Calhoun County	112,249	112,207	112,171	112,122	112,086	112,044	112,903
Blount County	51,024	52,284	53,545	54,805	56,066	57,326	56,436

Figure 4 Population Distribution for Gadsden MSA and Surrounding Counties

D. Monitoring data representing $PM_{2.5}$ concentrations in local areas and larger areas (urban or regional scale)

Table 2 presents the $PM_{2.5}$ monitoring data for Etowah and DeKalb Counties. The table shows that the Etowah County monitor exceeded the 24-hr NAAQS for $PM_{2.5}$. Table 2 also shows that the DeKalb County monitor did not exceed the 24-hr NAAQS for $PM_{2.5}$. Figure 2 maps the Etowah and DeKalb County $PM_{2.5}$ monitoring sites which provided the 2004, 2005, and 2006 data for the Gadsden area. There are no other $PM_{2.5}$ monitors located in the area. <u>This factor fortifies the recommendation to exclude DeKalb County from the Gadsden 24-hour $PM_{2.5}$ NAA.</u>

Table 2 Gadsden Area $PM_{2.5}$ Monitoring Data

County	AIRS ID	Site	98th Percentile 24-hour $PM_{2.5}$			3-Year Average 2004-2006
			2004	2005	2006	
Etowah	010550010	Gadsden	35.2	39.2	32.9	36
DeKalb	010491003	Crossville	33.0	33.1	31.7	33

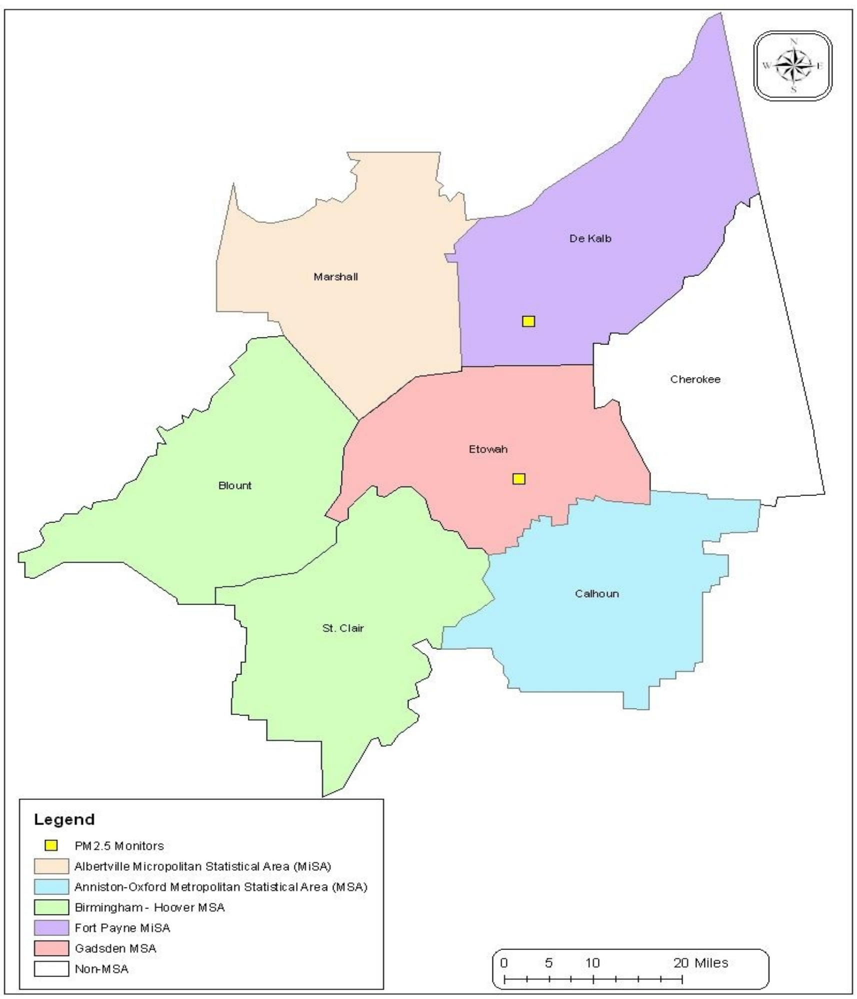


Figure 5 $PM_{2.5}$ Monitoring Sites in the Gadsden MSA and Surrounding Counties

E. Location of Emission Sources

Figure 3 depicts the location of large point sources in the Gadsden MSA and surrounding counties. The base map was created in GIS using coordinates supplied by the facilities. Tables 3-12 present the distribution of NO_x, VOC, SO_2, $PM_{2.5}$, and NH_3 emissions (in tons per year) among point, area, mobile, and non-road mobile sources in Etowah County and surrounding counties. Figures 4-8 illustrate this data. Figure 9 presents the emission densities for the counties in the Etowah County area.

Over 69% of NH_3 and 73% of $PM_{2.5}$ emissions were from area sources in the Gadsden MSA and each surrounding county. The primary emitters of $PM_{2.5}$ were paved and unpaved roads and residential wood waste combustion. The State currently has no regulations in place to control emissions from paved and upaved roads. The primary emitters of NH_3 are agricultural applications. There are also no regulations in place that allow the State to control emissions from these sources. The majority of VOC and NO_X emissions in the area came from on-road mobile and area sources. Over 50% of the NO_x emissions in each county came from on-road mobile sources. National programs such as the Tier 2 standards, ultra low sulfur diesel, low sulfur gasoline, and heavy duty diesel regulations are expected to mitigate the impact of these emissions. <u>These factors fortify the recommendation to exclude Blount, DeKalb, St. Clair, Marshall, and Cherokee Counties from the Gadsden 24-hour $PM_{2.5}$ NAA</u>.

Blount County has no large point sources. In addition, the emissions data clearly shows that emissions from Blount and Cherokee Counties, with the exception of NO_X in Blount County, are well below that of Calhoun and Etowah Counties. <u>This factor fortifies the recommendation to exclude Blount and Cherokee Counties from the Gadsden 24-hour $PM_{2.5}$ NAA</u>.

Calhoun County contributes the majority of the VOC, NOx, and $PM_{2.5}$ to the MSA as a whole. However, Etowah County leads Calhoun County in emissions of SO_2. Analysis of wind data (see Section H) indicates that the wind infrequently blows from the direction of Calhoun County on days with elevated $PM_{2.5}$ concentrations in Gadsden. Therefore, it is unlikely that emissions in Calhoun County significantly impact $PM_{2.5}$ concentrations in Gadsden on days with elevated concentrations. <u>This factor fortifies the recommendation to exclude Calhoun County from the Gadsden 24-hour $PM_{2.5}$ NAA.</u>

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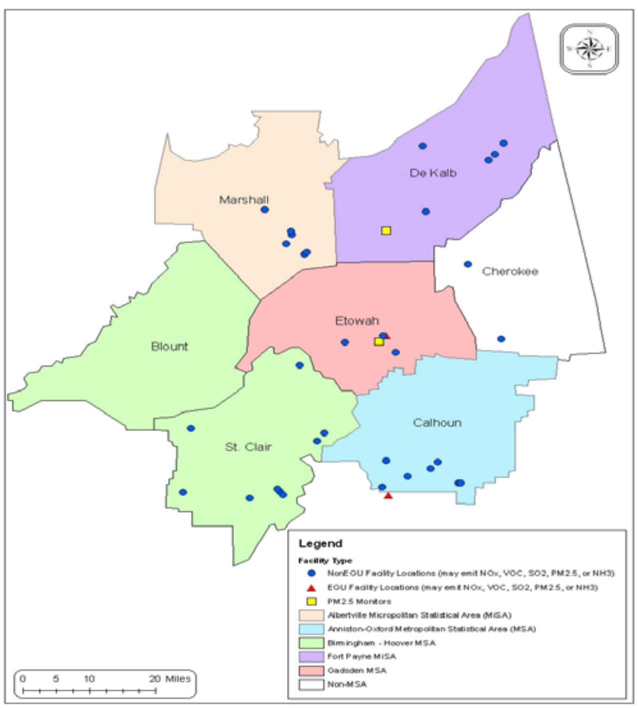


Figure 6 Major Point Sources in the Gadsden MSA and Surrounding Counties

Table 3 NO_x Annual Emissions (Tons)

County	*Point*		*Area*		*Non-Road*		*Mobile*		*Total*	
	TPY	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*
Blount	0	0.0%	448	13.6%	552	8.2%	5,971	28.9%	6,971	19.8%
Calhoun	750	17.1%	743	22.6%	1,140	16.9%	1,834	8.9%	4,466	12.7%
Cherokee	168	3.8%	169	5.1%	201	3.0%	909	4.4%	1,448	4.1%
DeKalb	0	0.0%	440	13.4%	750	11.1%	2,532	12.2%	3,722	10.6%
Etowah	1,919	43.7%	556	16.9%	878	13.0%	3,240	15.7%	6,593	18.8%
Marshall	56	1.3%	532	16.1%	1,555	23.0%	2,020	9.8%	4,162	11.8%
St. Clair	1,496	34.1%	408	12.4%	1,686	24.9%	4,188	20.2%	7,778	22.1%
Total	**4,388**		**3,296**		**6,762**		**20,695**		**35,140**	

Table 4 Cumulative NO_x Contributions

County	Factor	Annual 2002 Emissions (Tons)	% of Area's Total Emissions	Cumulative %
Blount	Mobile Source NO_X Emissions (tons)	**5,971**	17.0%	17.0%
St. Clair	Mobile Source NO_X Emissions (tons)	**4,188**	11.9%	28.9%
Etowah	Mobile Source NO_X Emissions (tons)	**3,240**	9.2%	38.1%
DeKalb	Mobile Source NO_X Emissions (tons)	**2,532**	7.2%	45.3%
Marshall	Mobile Source NO_X Emissions (tons)	**2,020**	5.7%	51.1%
Etowah	Point Source NO_X Emissions (tons)	**1,919**	5.5%	56.5%
Calhoun	Mobile Source NO_X Emissions (tons)	**1,834**	5.2%	61.8%
St. Clair	Nonroad Source NO_X Emissions (tons)	**1,686**	4.8%	66.6%
Marshall	Nonroad Source NO_X Emissions (tons)	**1,555**	4.4%	71.0%
St. Clair	Point Source NO_X Emissions (tons)	**1,496**	4.3%	75.2%
Calhoun	Nonroad Source NO_X Emissions (tons)	**1,140**	3.2%	78.5%
Cherokee	Mobile Source NO_X Emissions (tons)	**909**	2.6%	81.1%
Etowah	Nonroad Source NO_X Emissions (tons)	**878**	2.5%	83.6%
DeKalb	Nonroad Source NO_X Emissions (tons)	**750**	2.1%	85.7%
Calhoun	Point Source NO_X Emissions (tons)	**750**	2.1%	87.8%
Calhoun	Area Source NO_X Emissions (tons)	**743**	2.1%	90.0%
Etowah	Area Source NO_X Emissions (tons)	**556**	1.6%	91.5%
Blount	Nonroad Source NO_X Emissions (tons)	**552**	1.6%	93.1%
Marshall	Area Source NO_X Emissions (tons)	**532**	1.5%	94.6%
Blount	Area Source NO_X Emissions (tons)	**448**	1.3%	95.9%
DeKalb	Area Source NO_X Emissions (tons)	**440**	1.3%	97.1%
St. Clair	Area Source NO_X Emissions (tons)	**408**	1.2%	98.3%
Cherokee	Nonroad Source NO_X Emissions (tons)	**201**	0.6%	98.9%
Cherokee	Area Source NO_X Emissions (tons)	**169**	0.5%	99.4%
Cherokee	Point Source NO_X Emissions (tons)	**168**	0.5%	99.8%
Marshall	Point Source NO_X Emissions (tons)	**56**	0.2%	100.0%
Blount	Point Source NO_X Emissions (tons)	**0**	0.0%	100.0%
DeKalb	Point Source NO_X Emissions (tons)	**0**	0.0%	100.0%
Total Emissions			**35,140**	

Table 5 VOC Annual Emissions (Tons)

County	Point		Area		Non-Road		Mobile		Total	
	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total
Blount	0	0.0%	2,178	8.5%	291	3.5%	3,767	24.4%	6,237	12.2%
Calhoun	214	14.6%	6,739	26.2%	1,232	14.7%	1,209	7.8%	9,393	18.4%
Cherokee	62	4.2%	1,297	5.0%	1,659	19.8%	660	4.3%	3,678	7.2%
DeKalb	0	0.0%	4,011	15.6%	1,014	12.1%	1,823	11.8%	6,848	13.4%
Etowah	157	10.7%	4,212	16.4%	699	8.3%	2,987	19.3%	8,055	15.8%
Marshall	714	48.8%	4,257	16.5%	2,601	31.0%	1,736	11.2%	9,309	18.2%
St. Clair	317	21.6%	3,033	11.8%	904	10.8%	3,288	21.3%	7,542	14.8%
Total	**1,464**		**25,727**		**8,400**		**15,471**		**51,062**	

Table 6 Cumulative VOC Contributions

County	Factor	Annual 2002 Emissions (Tons)	% of Area's Total Emissions	Cumulative %
Calhoun	Area Source VOC Emissions (tons)	**6,739**	16.9%	16.9%
Marshall	Area Source VOC Emissions (tons)	**4,257**	10.7%	27.6%
Etowah	Area Source VOC Emissions (tons)	**4,212**	10.6%	38.1%
DeKalb	Area Source VOC Emissions (tons)	**4,011**	10.1%	48.2%
Blount	Mobile Source VOC Emissions (tons)	**3,767**	9.4%	57.6%
St. Clair	Area Source VOC Emissions (tons)	**3,033**	7.6%	65.2%
Marshall	Nonroad Source VOC Emissions (tons)	**2,601**	6.5%	71.8%
Blount	Area Source VOC Emissions (tons)	**2,178**	5.5%	77.2%
Cherokee	Nonroad Source VOC Emissions (tons)	**1,659**	4.2%	81.4%
Cherokee	Area Source VOC Emissions (tons)	**1,297**	3.3%	84.6%
Calhoun	Nonroad Source VOC Emissions (tons)	**1,232**	3.1%	87.7%
DeKalb	Nonroad Source VOC Emissions (tons)	**1,014**	2.5%	90.3%
St. Clair	Nonroad Source VOC Emissions (tons)	**904**	2.3%	92.5%
Marshall	Point Source VOC Emissions (tons)	**714**	1.8%	94.3%
Etowah	Nonroad Source VOC Emissions (tons)	**699**	1.8%	96.1%
St. Clair	Point Source VOC Emissions (tons)	**317**	0.8%	96.9%
Blount	Nonroad Source VOC Emissions (tons)	**291**	0.7%	97.6%
Calhoun	Point Source VOC Emissions (tons)	**214**	0.5%	98.1%
Etowah	Point Source VOC Emissions (tons)	**157**	0.4%	98.5%
St. Clair	Mobile Source VOC Emissions (tons)	**152**	0.4%	98.9%
Etowah	Mobile Source VOC Emissions (tons)	**124**	0.3%	99.2%
DeKalb	Mobile Source VOC Emissions (tons)	**83**	0.2%	99.4%
Marshall	Mobile Source VOC Emissions (tons)	**74**	0.2%	99.6%
Cherokee	Point Source VOC Emissions (tons)	**62**	0.2%	99.8%
Calhoun	Mobile Source VOC Emissions (tons)	**57**	0.1%	99.9%
Cherokee	Mobile Source VOC Emissions (tons)	**29**	0.1%	100.0%
Blount	Point Source VOC Emissions (tons)	**0**	0.0%	100.0%
DeKalb	Point Source VOC Emissions (tons)	**0**	0.0%	100.0%
Total Emissions		**39,877**		

Table 7 SO_2 Annual Emissions (Tons)

County	Point		Area		Non-Road		Mobile		Total	
	TPY	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*	*TPY*	*% of Total*
Blount	0	0.0%	303	4.7%	42	6.5%	251	28.0%	596	3.5%
Calhoun	11	0.1%	1,938	30.0%	79	12.1%	79	8.9%	2,107	12.3%
Cherokee	0	0.0%	179	2.8%	20	3.0%	41	4.5%	239	1.4%
DeKalb	0	0.0%	741	11.5%	63	9.6%	109	12.2%	912	5.3%
Etowah	8,741	95.3%	1,588	24.6%	61	9.4%	144	16.0%	10,533	61.3%
Marshall	15	0.2%	1,392	21.5%	304	46.8%	89	10.0%	1,800	10.5%
St. Clair	400	4.4%	323	5.0%	81	12.5%	183	20.4%	987	5.7%
Total	**9,167**		**6,464**		**649**		**896**		**17,175**	

Table 8 Cumulative SO_2 Contributions

County	Factor	Annual 2002 Emissions (Tons)	% of Area's Total Emissions	Cumulative %
Etowah	Point Source SO_2 Emissions (tons)	**8,741**	20.3%	20.3%
Blount	Mobile Source SO_2 Emissions (tons)	**5,971**	13.9%	34.1%
St. Clair	Mobile Source SO_2 Emissions (tons)	**4,188**	9.7%	43.9%
Etowah	Mobile Source SO_2 Emissions (tons)	**3,240**	7.5%	51.4%
DeKalb	Mobile Source SO_2 Emissions (tons)	**2,532**	5.9%	57.3%
Marshall	Mobile Source SO_2 Emissions (tons)	**2,020**	4.7%	61.9%
Calhoun	Area Source SO_2 Emissions (tons)	**1,938**	4.5%	66.4%
Calhoun	Mobile Source SO_2 Emissions (tons)	**1,834**	4.3%	70.7%
St. Clair	Nonroad Source SO_2 Emissions (tons)	**1,686**	3.9%	74.6%
Etowah	Area Source SO_2 Emissions (tons)	**1,588**	3.7%	78.3%
Marshall	Nonroad Source SO_2 Emissions (tons)	**1,555**	3.6%	81.9%
Marshall	Area Source SO_2 Emissions (tons)	**1,392**	3.2%	85.1%
Calhoun	Nonroad Source SO_2 Emissions (tons)	**1,140**	2.6%	87.8%
Cherokee	Mobile Source SO_2 Emissions (tons)	**909**	2.1%	89.9%
Etowah	Nonroad Source SO_2 Emissions (tons)	**878**	2.0%	91.9%
DeKalb	Nonroad Source SO_2 Emissions (tons)	**750**	1.7%	93.7%
DeKalb	Area Source SO_2 Emissions (tons)	**741**	1.7%	95.4%
Blount	Nonroad Source SO_2 Emissions (tons)	**552**	1.3%	96.7%
St. Clair	Point Source SO_2 Emissions (tons)	**400**	0.9%	97.6%
St. Clair	Area Source SO_2 Emissions (tons)	**323**	0.7%	98.4%
Blount	Area Source SO_2 Emissions (tons)	**303**	0.7%	99.1%
Cherokee	Nonroad Source SO_2 Emissions (tons)	**201**	0.5%	99.5%
Cherokee	Area Source SO_2 Emissions (tons)	**179**	0.4%	99.9%
Marshall	Point Source SO_2 Emissions (tons)	**15**	0.0%	100.0%
Calhoun	Point Source SO_2 Emissions (tons)	**11**	0.0%	100.0%
Cherokee	Point Source SO_2 Emissions (tons)	**0**	0.0%	100.0%
Blount	Point Source SO_2 Emissions (tons)	**0**	0.0%	100.0%
DeKalb	Point Source SO_2 Emissions (tons)	**0**	0.0%	100.0%
Total Emissions		**43,087**		

Table 9 $PM_{2.5}$ Annual Emissions (Tons)

County	Point		Area		Non-Road		Mobile		Total	
	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total
Blount	0	0.0%	1,214	13.4%	28	6.2%	112	29.7%	1,353	12.6%
Calhoun	454	52.7%	1,796	19.8%	72	16.3%	36	9.6%	2,359	21.9%
Cherokee	30	3.5%	953	10.5%	42	9.4%	18	4.9%	1,043	9.7%
DeKalb	0	0.0%	1,471	16.2%	63	14.2%	47	12.5%	1,581	14.7%
Etowah	48	5.6%	1,120	12.3%	43	9.6%	54	14.5%	1,265	11.8%
Marshall	195	22.7%	1,212	13.4%	139	31.3%	35	9.5%	1,582	14.7%
St. Clair	135	15.6%	1,307	14.4%	57	12.9%	72	19.3%	1,571	14.6%
Total	**862**		**9,073**		**444**		**375**		**10,754**	

Table 10 Cumulative $PM_{2.5}$ Contributions

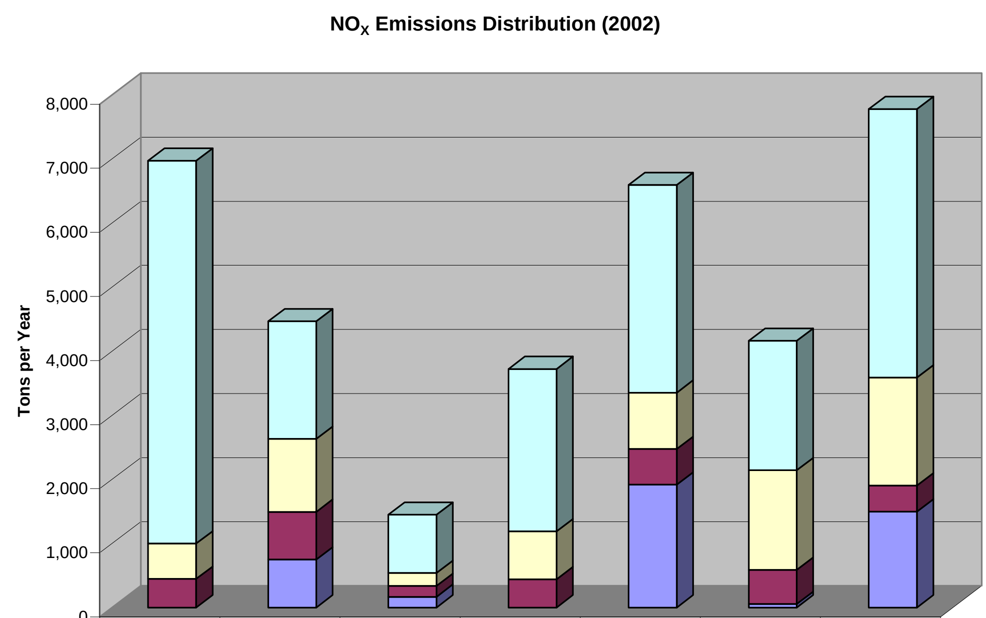
County	Factor	Annual 2002 Emissions (Tons)	% of Area's Total Emissions	Cumulative %
Calhoun	Area Source $PM_{2.5}$ Emissions (tons)	**1,796**	16.7%	16.7%
DeKalb	Area Source $PM_{2.5}$ Emissions (tons)	**1,471**	13.7%	30.4%
St. Clair	Area Source $PM_{2.5}$ Emissions (tons)	**1,307**	12.2%	42.5%
Blount	Area Source $PM_{2.5}$ Emissions (tons)	**1,214**	11.3%	53.8%
Marshall	Area Source $PM_{2.5}$ Emissions (tons)	**1,212**	11.3%	65.1%
Etowah	Area Source $PM_{2.5}$ Emissions (tons)	**1,120**	10.4%	75.5%
Cherokee	Area Source $PM_{2.5}$ Emissions (tons)	**953**	8.9%	84.4%
Calhoun	Point Source $PM_{2.5}$ Emissions (tons)	**454**	4.2%	88.6%
Marshall	Point Source $PM_{2.5}$ Emissions (tons)	**195**	1.8%	90.4%
Marshall	Nonroad Source $PM_{2.5}$ Emissions (tons)	**139**	1.3%	91.7%
St. Clair	Point Source $PM_{2.5}$ Emissions (tons)	**135**	1.3%	93.0%
Blount	Mobile Source $PM_{2.5}$ Emissions (tons)	**112**	1.0%	94.0%
St. Clair	Mobile Source $PM_{2.5}$ Emissions (tons)	**72**	0.7%	94.7%
Calhoun	Nonroad Source $PM_{2.5}$ Emissions (tons)	**72**	0.7%	95.3%
DeKalb	Nonroad Source $PM_{2.5}$ Emissions (tons)	**63**	0.6%	95.9%
St. Clair	Nonroad Source $PM_{2.5}$ Emissions (tons)	**57**	0.5%	96.5%
Etowah	Mobile Source $PM_{2.5}$ Emissions (tons)	**54**	0.5%	97.0%
Etowah	Point Source $PM_{2.5}$ Emissions (tons)	**48**	0.4%	97.4%
DeKalb	Mobile Source $PM_{2.5}$ Emissions (tons)	**47**	0.4%	97.8%
Etowah	Nonroad Source $PM_{2.5}$ Emissions (tons)	**43**	0.4%	98.2%
Cherokee	Nonroad Source $PM_{2.5}$ Emissions (tons)	**42**	0.4%	98.6%
Calhoun	Mobile Source $PM_{2.5}$ Emissions (tons)	**36**	0.3%	99.0%
Marshall	Mobile Source $PM_{2.5}$ Emissions (tons)	**35**	0.3%	99.3%
Cherokee	Point Source $PM_{2.5}$ Emissions (tons)	**30**	0.3%	99.6%
Blount	Nonroad Source $PM_{2.5}$ Emissions (tons)	**28**	0.3%	99.8%
Cherokee	Mobile Source $PM_{2.5}$ Emissions (tons)	**18**	0.2%	100.0%
Blount	Point Source $PM_{2.5}$ Emissions (tons)	**0**	0.0%	100.0%
DeKalb	Point Source $PM_{2.5}$ Emissions (tons)	**0**	0.0%	100.0%
Total Emissions		**10,754**		

Table 11 NH_3 Annual Emissions (Tons)

County	Point		Area		Non-Road		Mobile		Total	
	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total	TPY	% of Total
Blount	0	0.0%	2,480	16.8%	0	5.0%	185	26.3%	2,665	17.2%
Calhoun	1	100.0%	610	4.1%	1	21.6%	57	8.1%	669	4.3%
Cherokee	0	0.0%	519	3.5%	0	11.0%	29	4.1%	549	3.6%
DeKalb	0	0.0%	5,876	39.9%	1	14.5%	83	11.8%	5,960	38.6%
Etowah	0	0.0%	919	6.2%	0	11.9%	124	17.6%	1,044	6.8%
Marshall	0	0.0%	3,393	23.0%	1	23.9%	74	10.5%	3,468	22.5%
St. Clair	0	0.0%	940	6.4%	0	12.0%	152	21.6%	1,093	7.1%
Total	**1**		**14,738**		**4**		**704**		**15,447**	

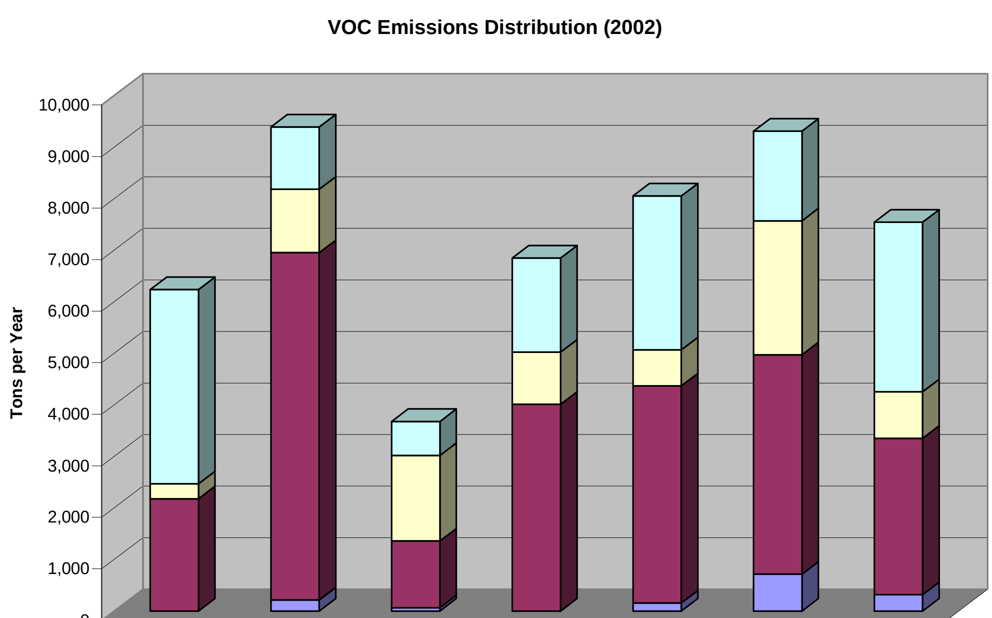
Table 12 Cumulative NH_3 Contributions

County	Factor	Annual 2002 Emissions (Tons)	% of Area's Total Emissions	Cumulative %
DeKalb	Area Source NH_3 Emissions (tons)	**5,876**	38.0%	38.0%
Marshall	Area Source NH_3 Emissions (tons)	**3,393**	22.0%	60.0%
Blount	Area Source NH_3 Emissions (tons)	**2,480**	16.1%	76.1%
St. Clair	Area Source NH_3 Emissions (tons)	**940**	6.1%	82.1%
Etowah	Area Source NH_3 Emissions (tons)	**919**	6.0%	88.1%
Calhoun	Area Source NH_3 Emissions (tons)	**610**	4.0%	92.1%
Cherokee	Area Source NH_3 Emissions (tons)	**519**	3.4%	95.4%
Blount	Mobile Source NH_3 Emissions (tons)	**185**	1.2%	96.6%
St. Clair	Mobile Source NH_3 Emissions (tons)	**152**	1.0%	97.6%
Etowah	Mobile Source NH_3 Emissions (tons)	**124**	0.8%	98.4%
DeKalb	Mobile Source NH_3 Emissions (tons)	**83**	0.5%	98.9%
Marshall	Mobile Source NH_3 Emissions (tons)	**74**	0.5%	99.4%
Calhoun	Mobile Source NH_3 Emissions (tons)	**57**	0.4%	99.8%
Cherokee	Mobile Source NH_3 Emissions (tons)	**29**	0.2%	100.0%
Calhoun	Point Source NH_3 Emissions (tons)	**1**	0.0%	100.0%
Marshall	Nonroad Source NH_3 Emissions (tons)	**1**	0.0%	100.0%
Calhoun	Nonroad Source NH_3 Emissions (tons)	**1**	0.0%	100.0%
DeKalb	Nonroad Source NH_3 Emissions (tons)	**1**	0.0%	100.0%
St. Clair	Nonroad Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Etowah	Nonroad Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Cherokee	Nonroad Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Blount	Nonroad Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Blount	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Cherokee	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
DeKalb	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Etowah	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Marshall	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
St. Clair	Point Source NH_3 Emissions (tons)	**0**	0.0%	100.0%
Total Emissions		**15,447**		



	Blount	Calhoun	Cherokee	DeKalb	Etowah	Marshall	St. Clair
Mobile	5,971	1,834	909	2,532	3,240	2,020	4,188
Nonroad	552	1,140	201	750	878	1,555	1,686
Area	448	743	169	440	556	532	408
Point	0	750	168	0	1,919	56	1,496

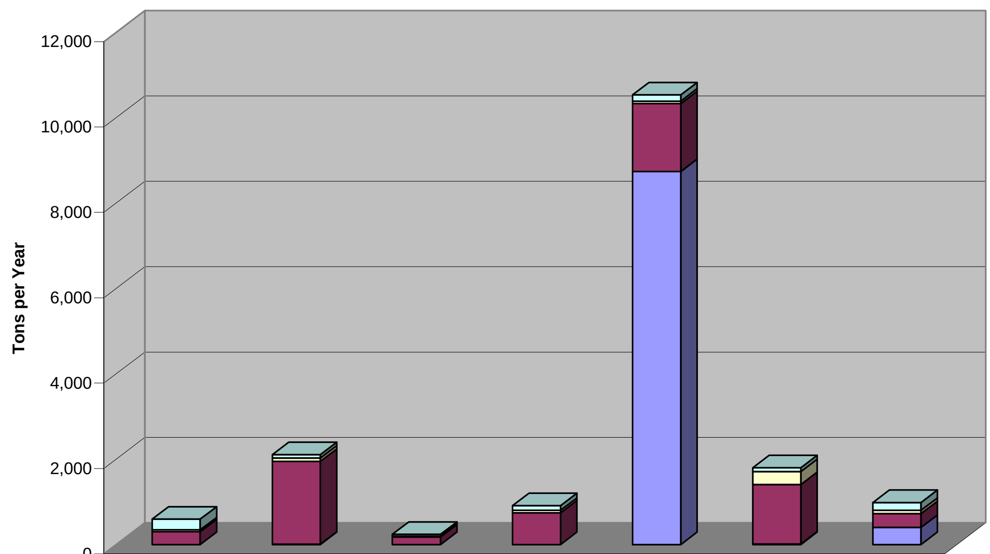
Figure 7 NO$_x$ Emissions for Gadsden MSA and Surrounding Counties



	Blount	Calhoun	Cherokee	DeKalb	Etowah	Marshall	St. Clair
Mobile	3,767	1,209	660	1,823	2,987	1,736	3,288
Nonroad	291	1,232	1,659	1,014	699	2,601	904
Area	2,178	6,739	1,297	4,011	4,212	4,257	3,033
Point	0	214	62	0	157	714	317

Figure 8 VOC Emissions for Gadsden MSA and Surrounding Counties

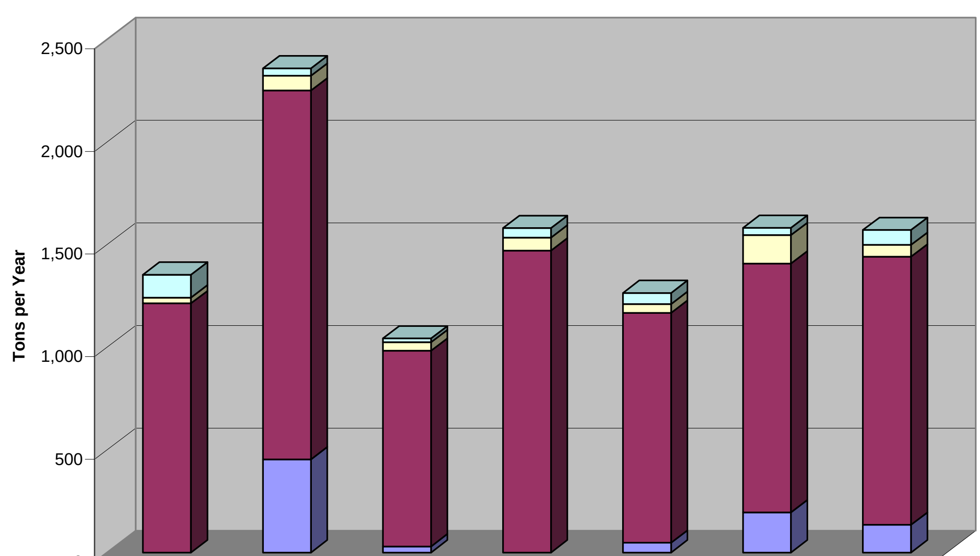
SO_2 Emissions Distribution (2002)



	Blount	Calhoun	Cherokee	DeKalb	Etowah	Marshall	St. Clair
Mobile	251	79	41	109	144	89	183
Nonroad	42	79	20	63	61	304	81
Area	303	1,938	179	741	1,588	1,392	323
Point	0	11	0	0	8,741	15	400

Figure 9 SO_2 Emissions for Gadsden MSA and Surrounding Counties

$PM_{2.5}$ Emissions Distribution (2002)



	Blount	Calhoun	Cherokee	DeKalb	Etowah	Marshall	St. Clair
Mobile	112	36	18	47	54	35	72
Nonroad	28	72	42	63	43	139	57
Area	1,214	1,796	953	1,471	1,120	1,212	1,307
Point	0	454	30	0	48	195	135

Figure 10 $PM_{2.5}$ Emissions for Gadsden MSA and Surrounding Counties

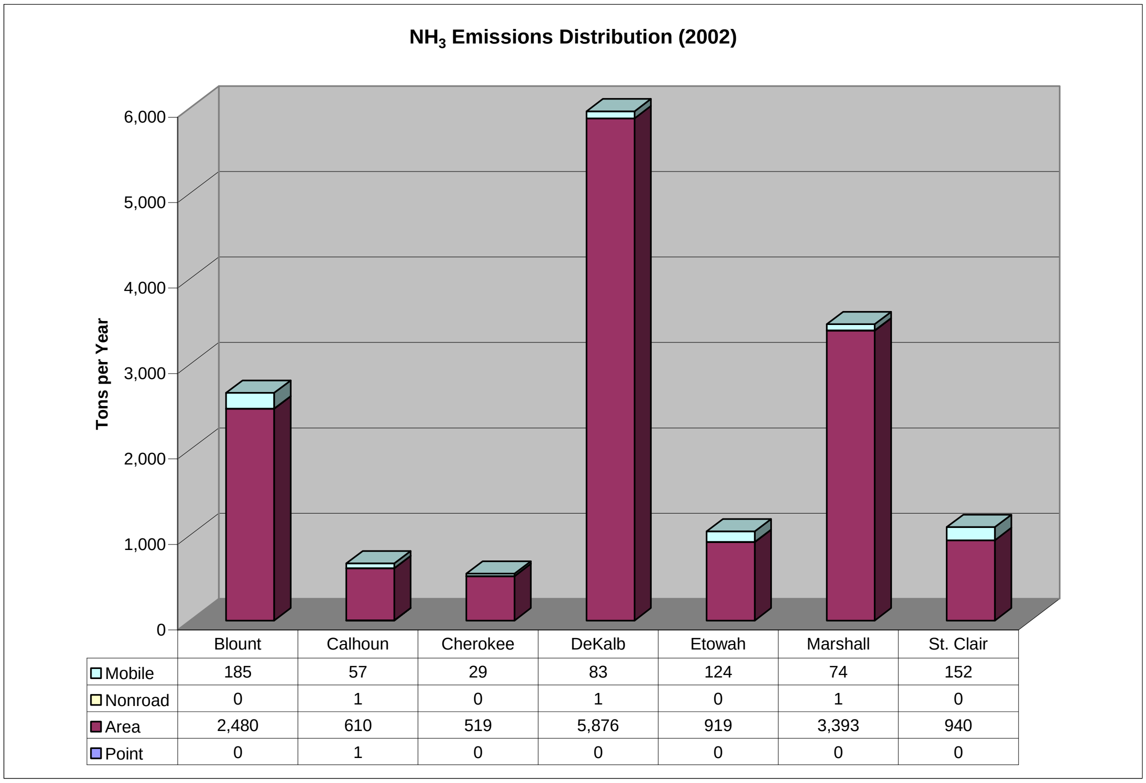


Figure 11 NH_3 Emissions for Gadsden MSA and Surrounding Counties

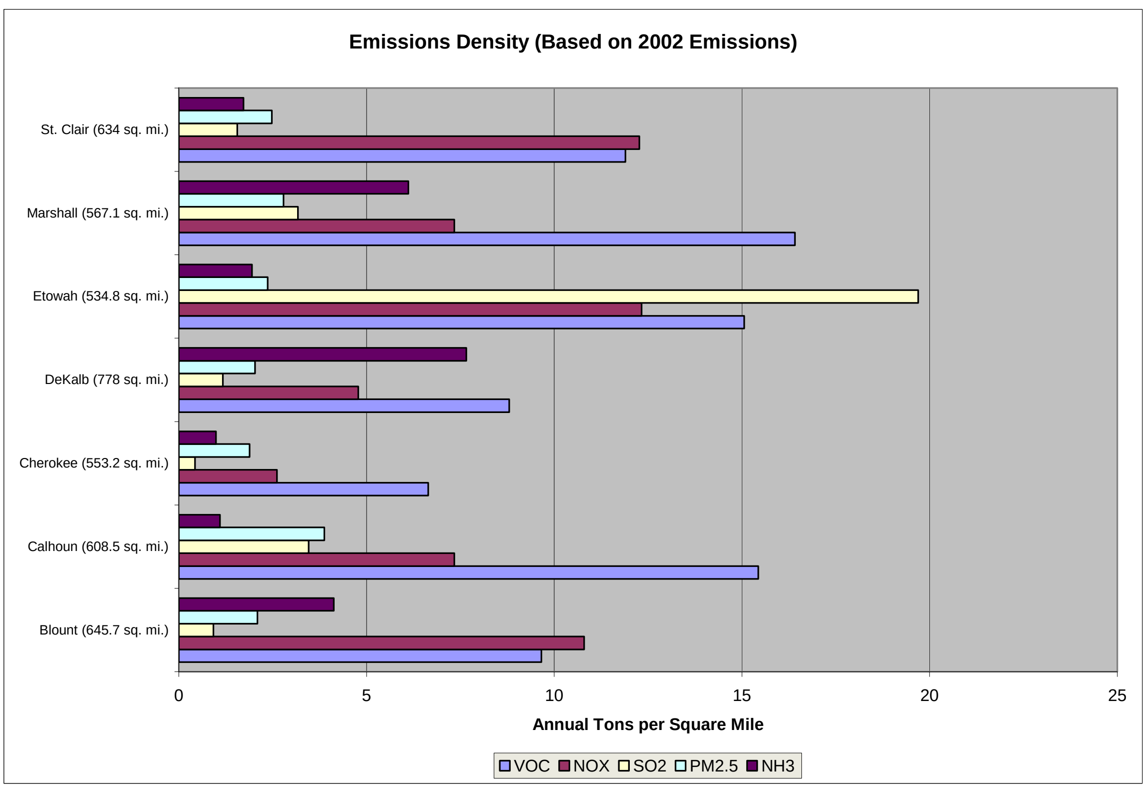


Figure 12 Emission Densities for Gadsden MSA and Surrounding Counties

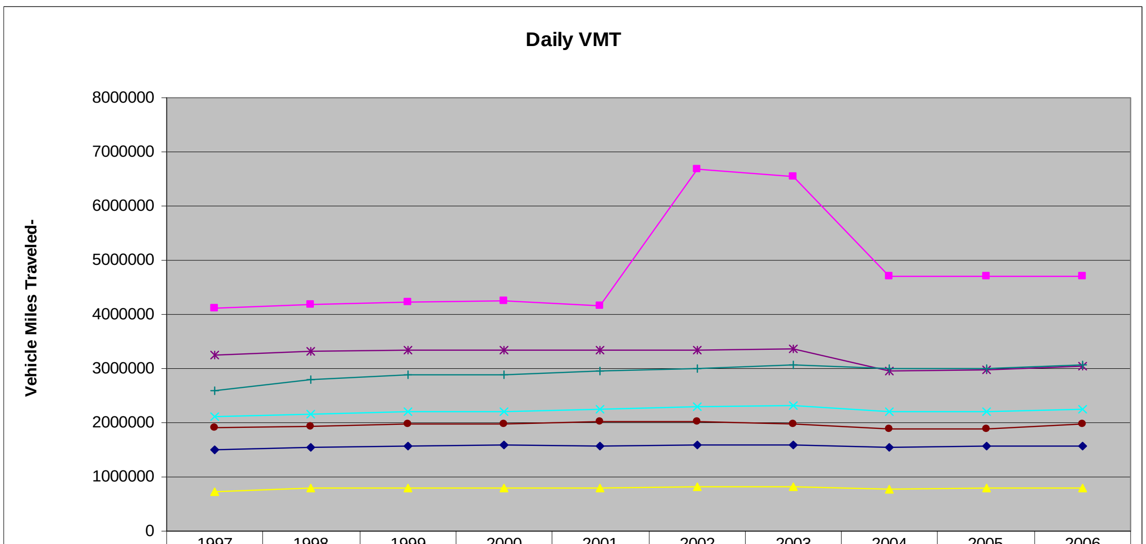
F. VMT

Estimates of the Daily Vehicle Miles Traveled (DVMT) were obtained from the Alabama Department of Transportation. Table 13 presents the 1997 and 2006 Daily VMT estimates for the Gadsden MSA and surrounding counties. Figure 13 demonstrates the trend from 1997 to 2006 for each county. Figure 14 presents the breakdown of 2006 Daily VMT into urban and rural.

Table 13 shows that the Daily VMT for Blount, Cherokee, DeKalb, and Marshall Counties is much smaller than the Daily VMT for Calhoun, Etowah, and St. Clair Counties. Figure 14 shows that Blount, Cherokee, DeKalb, St. Clair, and Marshall Counties have between 45% and 100% rural VMT. National programs such as the Tier 2 standards and on-road diesel regulations are expected to mitigate the impact of mobile source emissions from all counties. These factors fortify the recommendation to exclude Blount, Cherokee, DeKalb, Marshall, and St. Clair Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.

Table 13 Daily VMT for the Gadsden MSA and Surrounding Counties

County	1997 Daily VMT	2006 Daily VMT	Daily VMT Change (1997-2006)	% Change	% of Area 2006 Daily VMT
Blount	1,493,996	1,563,617	69,621	4.7%	9.0%
Calhoun	4,116,996	4,698,518	581,522	14.1%	27.0%
Cherokee	725,103	801,525	76,422	10.5%	4.6%
DeKalb	2,103,094	2,261,041	157,947	7.5%	13.0%
Etowah	3,257,462	3,036,606	-220,856	-6.8%	17.5%
Marshall	1,900,865	1,966,707	65,842	3.5%	11.3%
St. Clair	2,585,118	3,062,259	477,141	18.5%	17.6%



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Blount	1493996	1542384	1571675	1579630.61	1576698	1590666.52	1594687	1552548	1557438.21	1563616.84
Calhoun	4116996	4175824	4225511	4254066.4	4152924.5	6692312.79	6546758	4697222	4703399.82	4698517.9
Cherokee	725103	786899	799627	799636.9	803217.3	814127.7	817401	774126	792513.965	801525.196
DeKalb	2103094	2164267	2212484	2215451	2251254	2294193	2311054	2201557	2215013.13	2261040.6
Etowah	3257462	3308768	3338389	3342679	3343921	3345280	3354096	2952312	2973263	3036606
Marshall	1900865	1936738	1970303	1970958.6	2014013.3	2012446.01	1983406	1875570	1893467.73	1966706.7
St. Clair	2585118	2791197	2894060.5	2886654.32	2962332.11	2996079.81	3078935	2990525	2994831.5	3062259.06

Figure 13 Daily VMT for the Gadsden MSA and Surrounding Counties

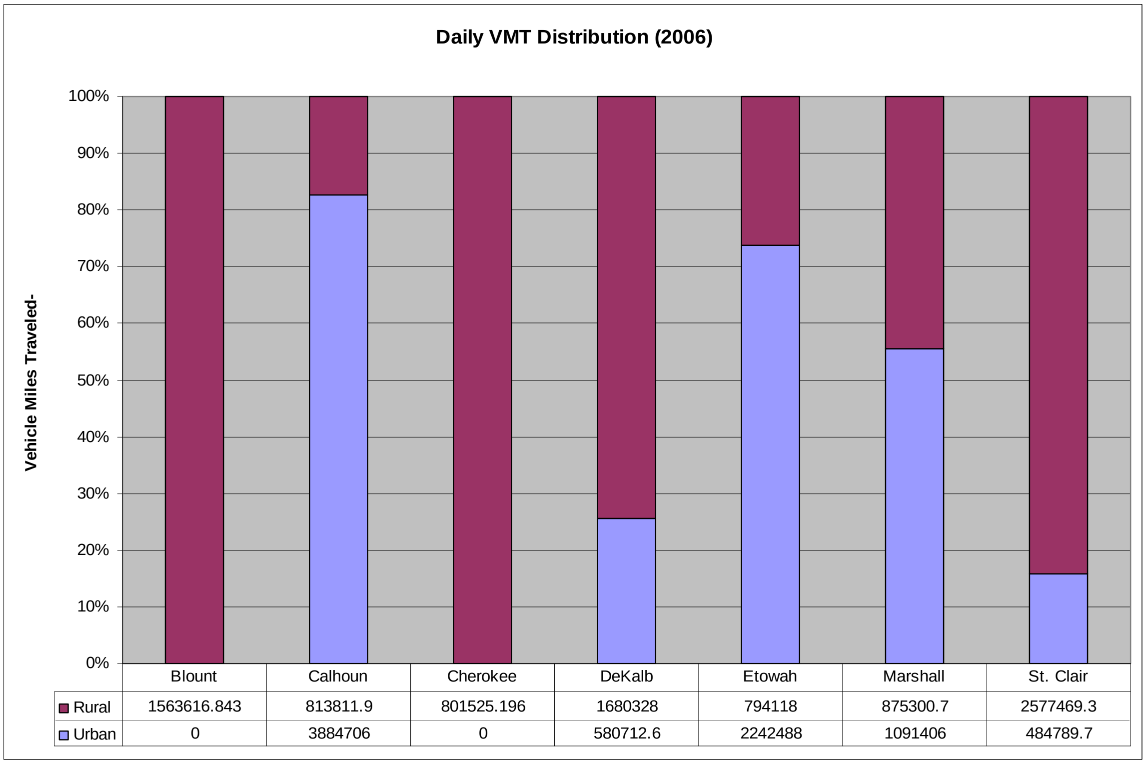


Figure 14 Rural vs. Urban Daily VMT

G. Expected Growth (including extent, pattern, and rate of growth)

There is little information available about expected growth. Table 18 provides population growth estimates that were obtained from the Census Bureau for the Gadsden MSA and surrounding counties. All counties are expected to have a population increase.

Since no other information about expected growth is available, and population growth estimates are not enough to influence a decision about determining a nonattainment area, this factor presents no compelling reason to include any other counties other than Etowah in the Gadsden 24-hour $PM_{2.5}$ NAA.

Table 14 Population Projections for the Gadsden MSA and Surrounding Counties

County Name	2000	2006	2015	2025	% Change 2000-2006	% Change 2006-2015	% Change 2015-2025
Blount	51,024	56,436	70,005	81,713	10.6%	24.0%	16.7%
Calhoun	112,249	112,903	112,392	112,472	0.6%	-0.5%	0.1%
Cherokee	23,988	24,863	30,407	34,220	3.6%	22.3%	12.5%
DeKalb	64,452	68,014	80,919	91,301	5.5%	18.9%	12.8%
Etowah	103,459	103,362	106,945	108,578	-0.1%	3.5%	1.5%
Marshall	82,231	87,185	100,304	111,385	6.0%	15.1%	11.1%
St. Clair	64,742	75,232	87,614	102,121	16.2%	16.5%	16.6%

H. Meteorology

It is clear that meteorology plays a major role in the formation and transport of $PM_{2.5}$. During 2004-2006, $PM_{2.5}$ levels in Gadsden exceeded the 24-hour standard over the three-year period. A wind analysis using wind data from Gadsden was completed to evaluate the predominant wind direction(s) over the 3-year period on all days, and days with daily $PM_{2.5}$ concentrations greater than or equal to 35 µg/m^3. As seen in the wind rose in Figure 15, there is a varying degree of wind directions with the greatest percentage coming from the north through east directions during the 3-year time period. However, on elevated $PM_{2.5}$ days (Figure 16), there are two dominant wind directions, one from the northwest and one from the southwest. Figure 16 also shows secondary dominant wind directions from the north and west. Thus, on days with elevated $PM_{2.5}$ concentrations, winds infrequently blow from the south through northeast of Gadsden. This factor fortifies the recommendation to exclude DeKalb, Cherokee, and Calhoun Counties from the Gadsden 24-hour $PM_{2.5}$ NAA.

In addition to examining wind roses, backward trajectories were created using the National Weather Service's HYSPLIT program to determine the path air parcels followed for the 24 hours prior to mid-day for each day the peak 24-hour $PM_{2.5}$ concentration was greater than or equal to 35 µg/m^3. The 35 µg/m^3 threshold was exceeded on seven days in the three-year period. The trajectories further illustrate that wind on elevated days originated from northwest, southwest, west and east directions. These trajectories are included as Figures 17 through 24. In conclusion, the wind roses and back trajectories are similar in showing predominant wind patterns.

Figure 15 Gadsden Wind Rose – All Hours – 2004-2006

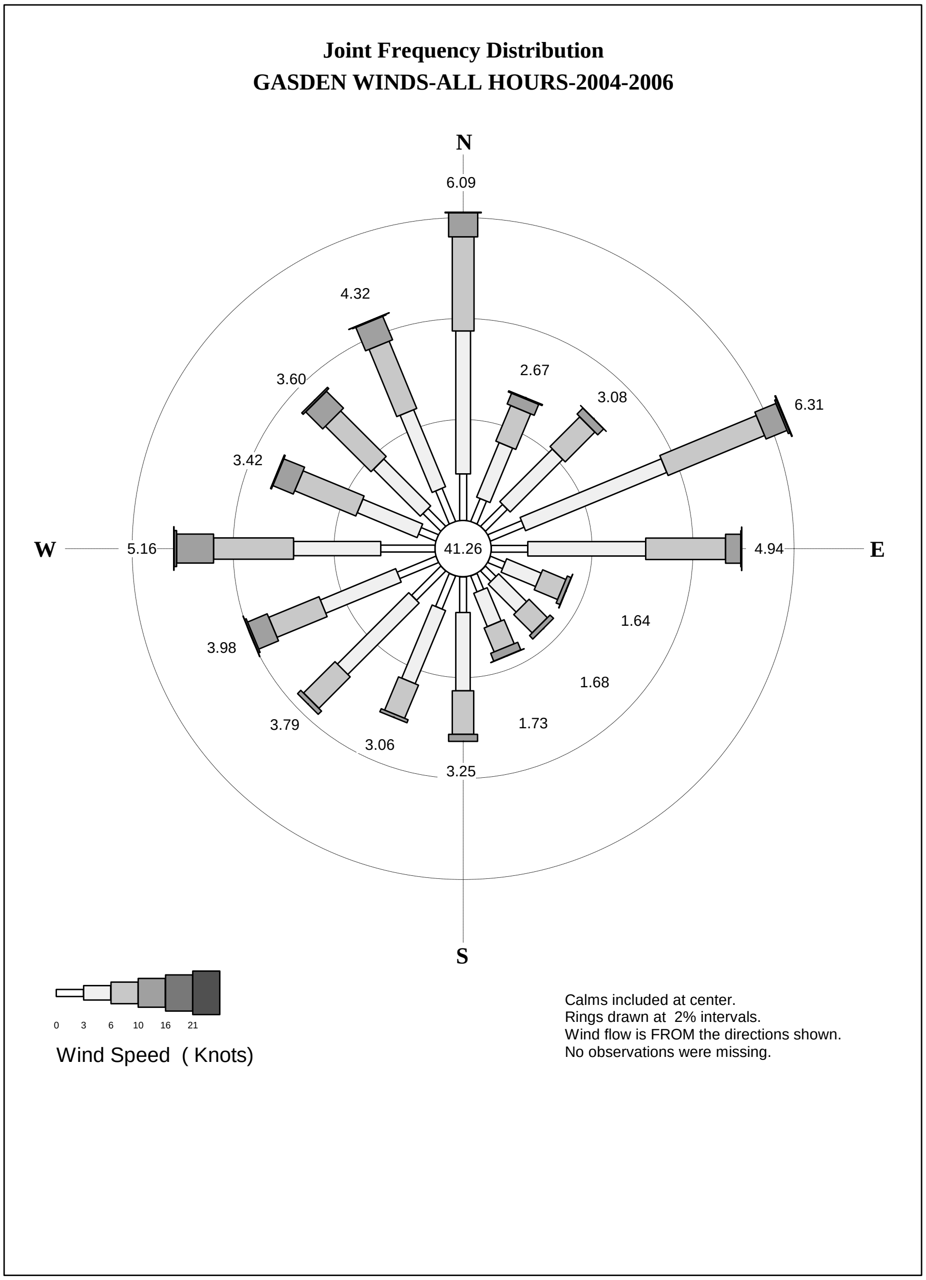
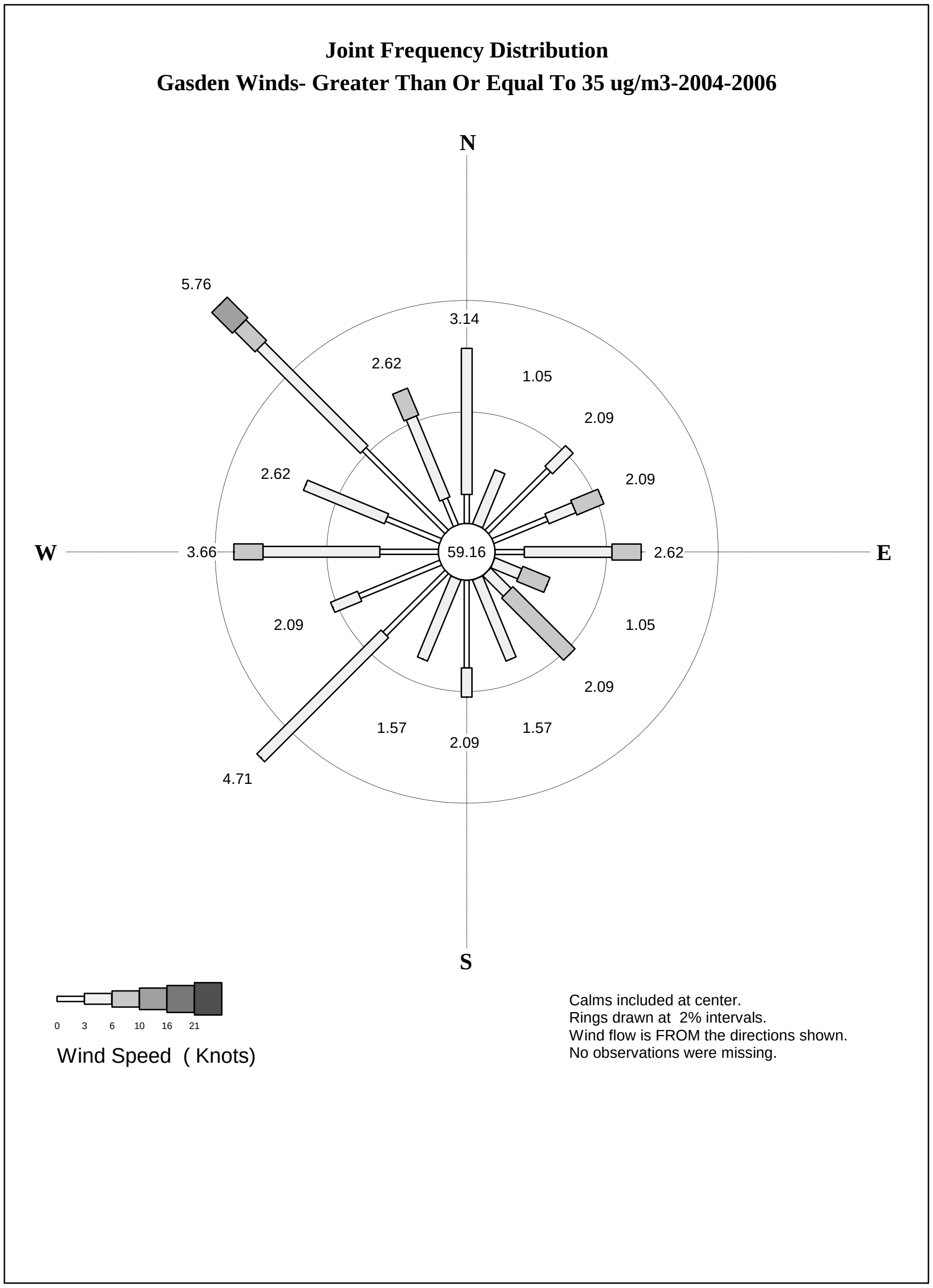
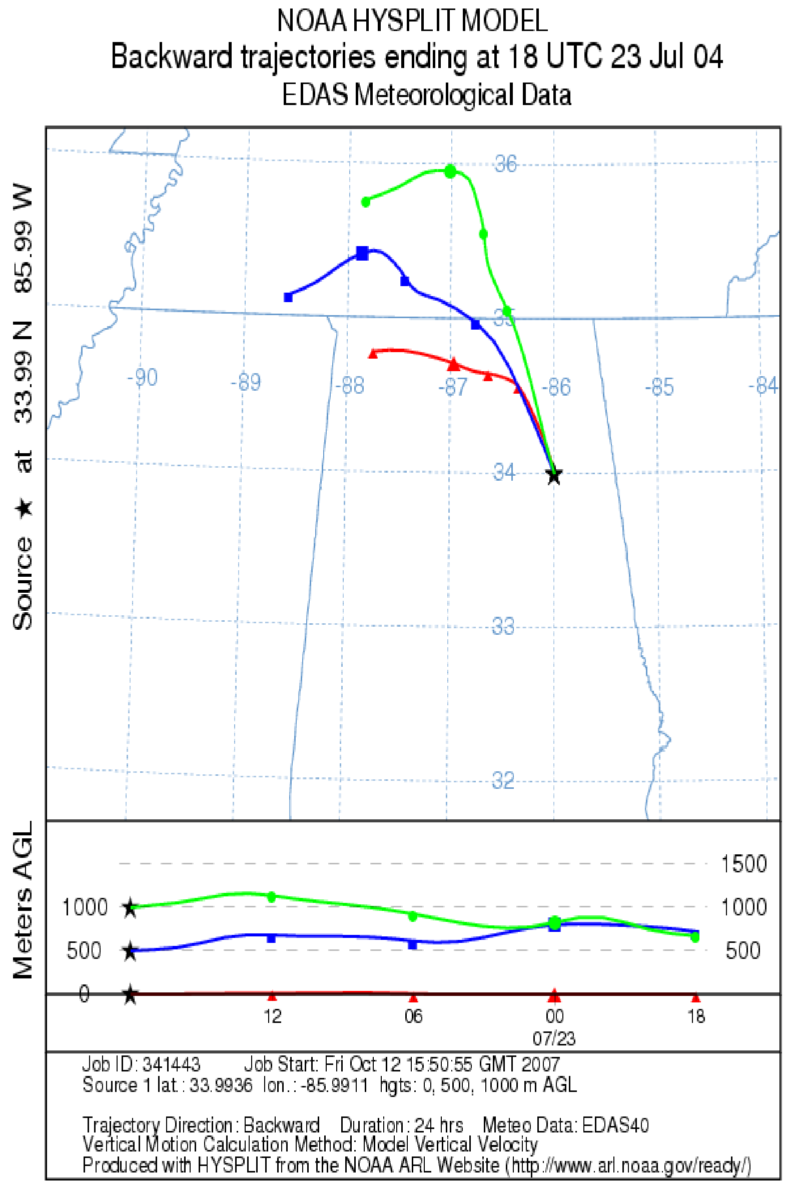
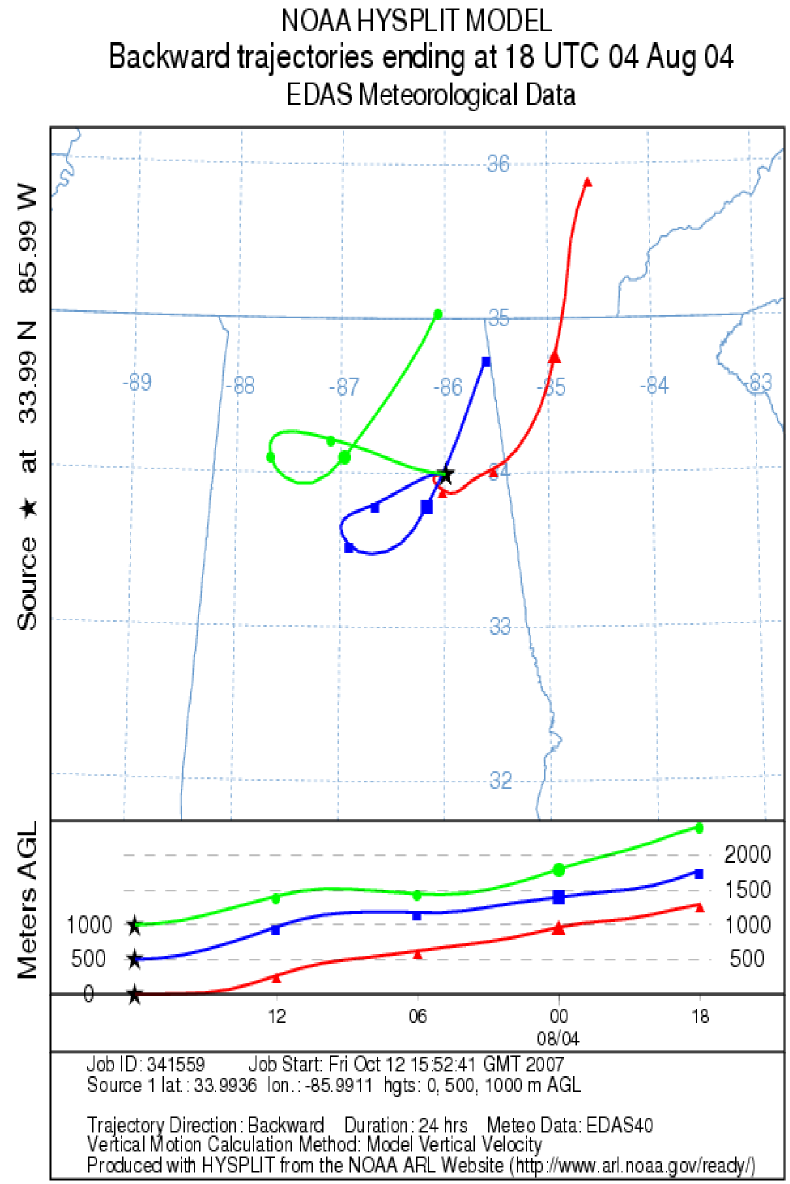


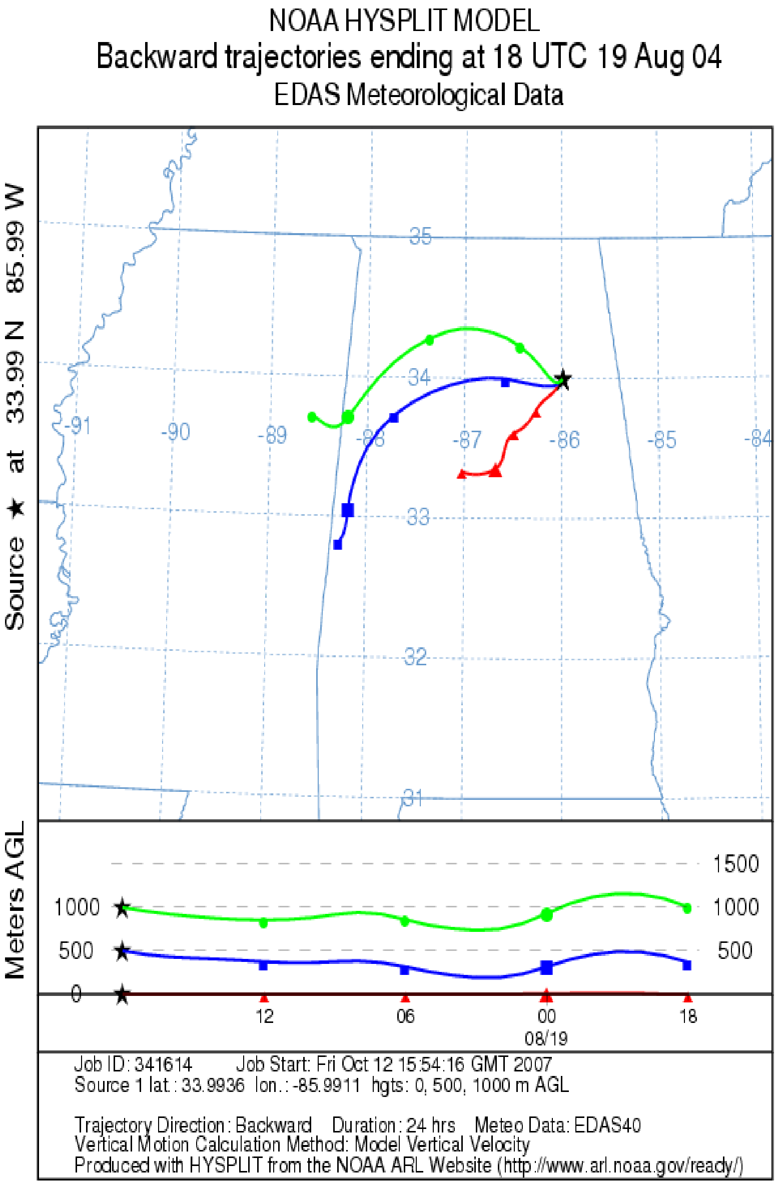
Figure 16 Gadsden Wind Rose – Days $PM_{2.5}$>35μg/m^{3} – 2004-2006

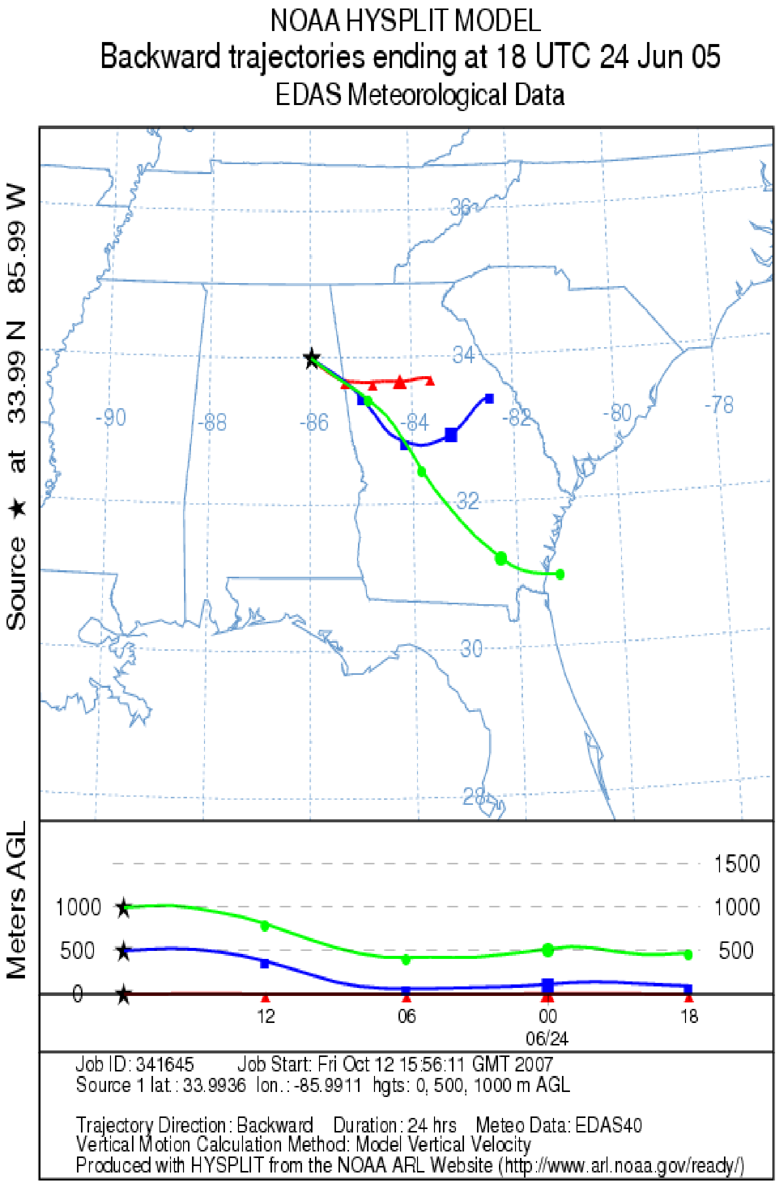




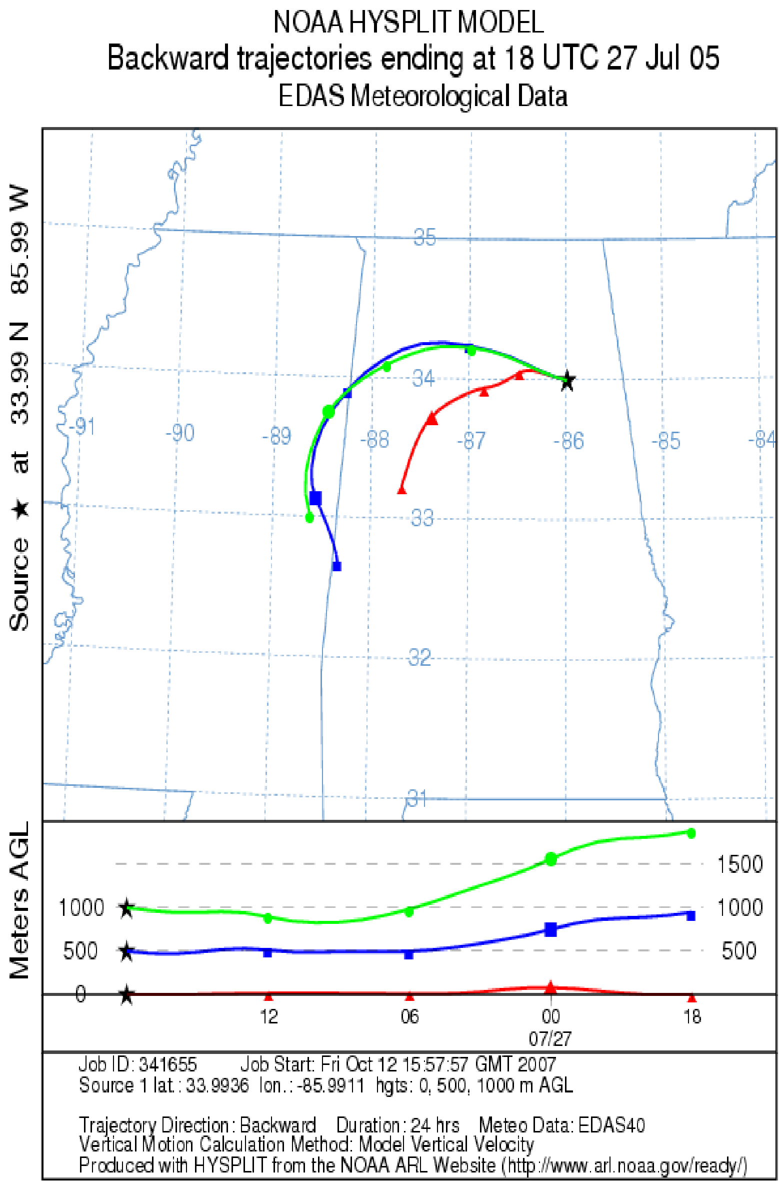


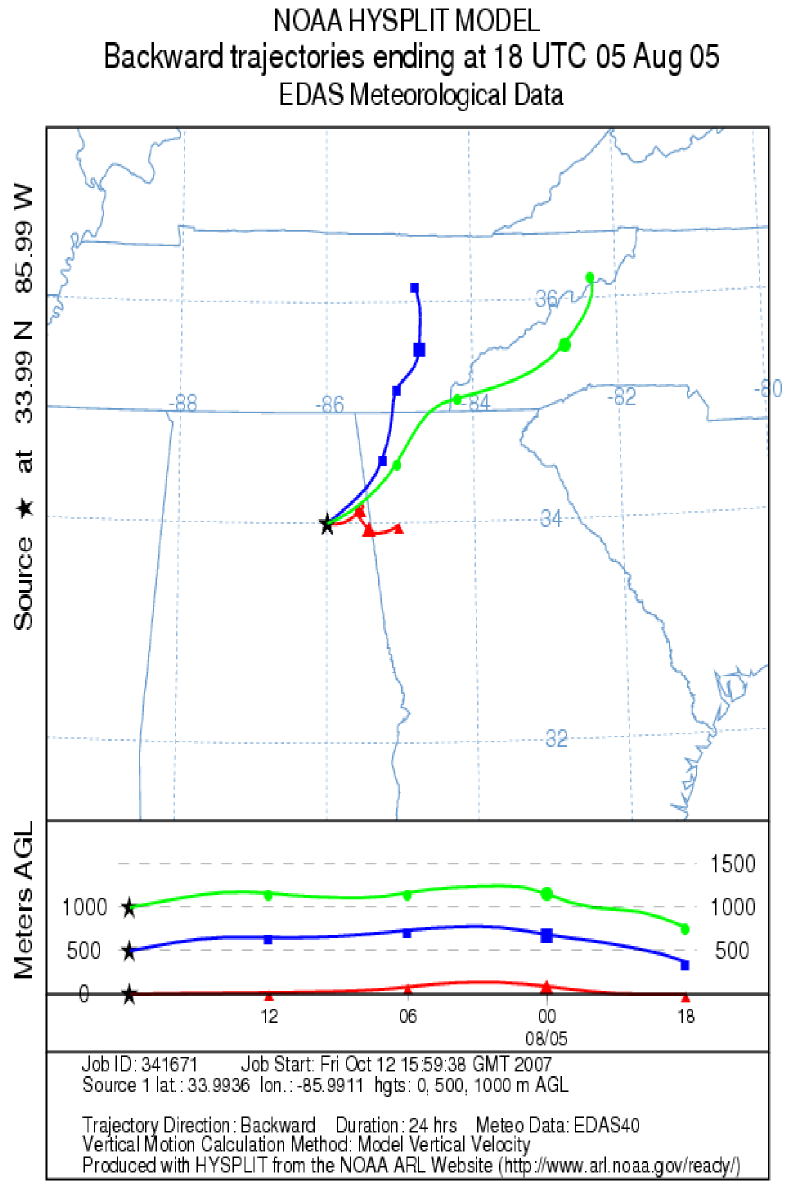
Figures 17 and 18



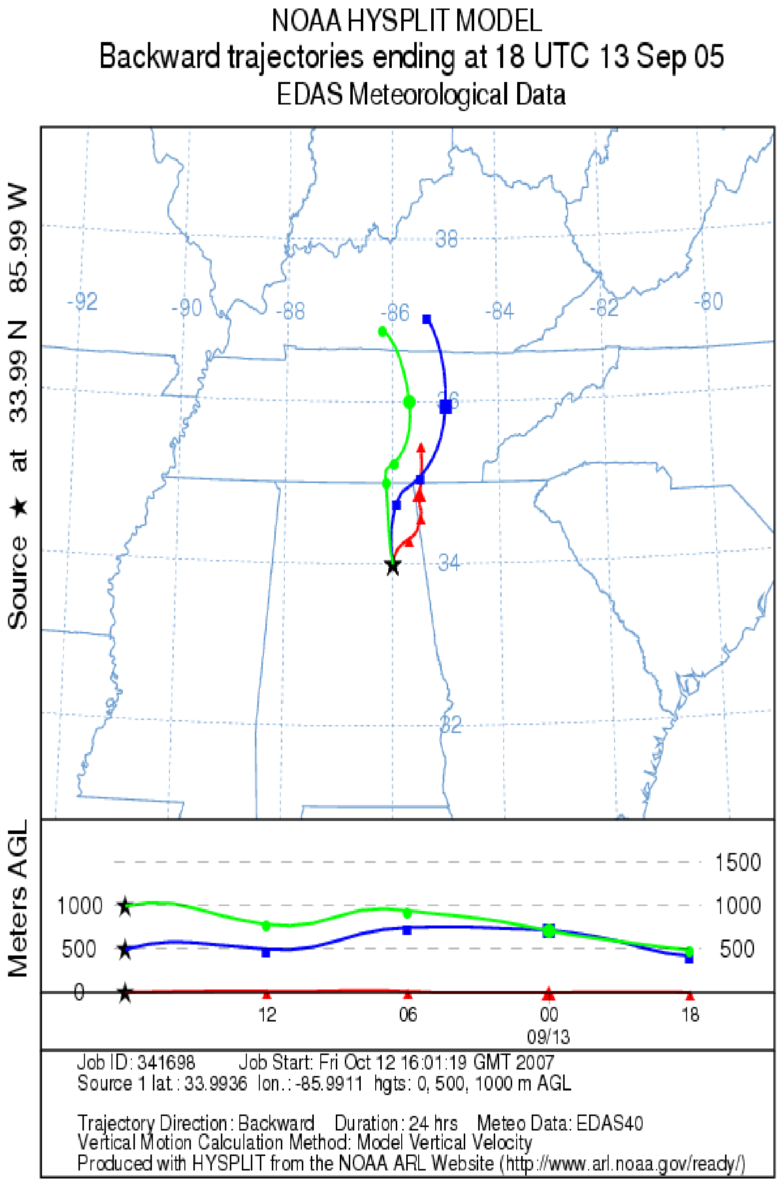


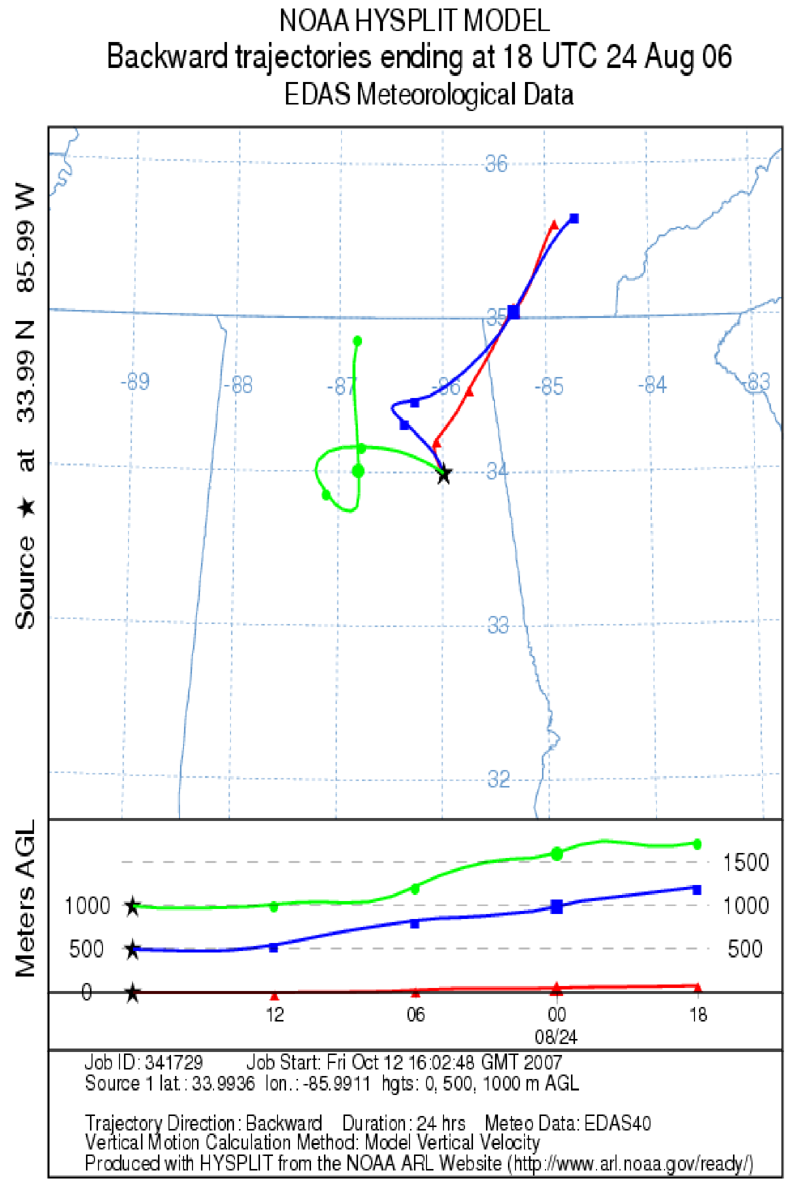
Figures 19 and 20





Figures 21 and 22





Figures 23 and 24

F. Geography/Topography (mountain ranges or other air basin boundaries)

Gadsden is located in Northeast Alabama in Etowah County about 60 miles northeast of Birmingham and 90 miles west/northwest of Atlanta, Georgia. The northwestern half of the county is located in the Cumberland Plateau with ridge lines running from northeast to southwest. The southeastern part of the county is lower in elevation and located in the area called the Alabama Valley and Ridge. Between these two sections, the Coosa River traverses the county from the northeast to southeast through the city of Gadsden.

There is no clear relationship between topography of Etowah County and $PM_{2.5}$ formation and transport in the Gadsden area.

G. Jurisdictional Boundaries

Etowah, Cherokee, and Calhoun Counties are in the East Alabama Intrastate Air Quality Control Region (40 CFR 81.199). Marshall and DeKalb Counties are in the Tennessee River Valley-Cumberland Mountains Interstate Air Quality Control Region (40 CFR 81.72). Blount and St. Clair Counties are in the Metropolitan Birmingham Intrastate Air Quality Control Region (40 CFR 81.41). Etowah, Marshall, DeKalb, Cherokee, Calhoun, St. Clair, and Blount Counties are in the jurisdiction of the State of Alabama under the purview of the ADEM. The State's monitor located in Etowah County supports representative data for Etowah County being recommended as the $PM_{2.5}$ nonattainment boundary. Discussion elsewhere in this document demonstrates the State's recommendations for exclusion of Marshall, DeKalb, Cherokee, Calhoun, St. Clair, and Blount Counties as a part of the $PM_{2.5}$ nonattainment boundary.

H. Level of Control of Emission Sources

Since 1979, statewide reasonably available control technology (RACT) has been in place for volatile organic compounds (VOCs) as found under ADEM Admin. Code Chapter 335-3-6. Also in place since 1990 has been the institution of statewide regulations for the control of evaporative emissions in the gasoline marketing chain, commonly referred as ‘Stage 1’ vapor recovery. Over the 31-year history of Alabama’s air pollution control program, the State has been delegated the authority to implement other standards of performance such as the New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAPs), and the federal Prevention of Significant Deterioration (PSDS) regulations for protection of degradation of clean air areas.

Additionally, the EPA required a NO_x SIP Call for 22 states, including Alabama that, beginning in 2004, resulted in large reductions in NO_x emissions from major utilities, large industrial boilers, gas turbines, and cement kilns. Alabama’s NO_x SIP was approved by EPA on July 16, 2001. Further, EPA recently required a SIP Call known as the Clean Air Interstate Rule (CAIR) for 28 states, including Alabama, that, when fully implemented, will reduce SO_2 emissions in these states by over 70 percent and NO_x emissions by over 60 percent from 2003 levels. Phase I of CAIR begins in 2009 and Phase II in 2015. Alabama’s CAIR SIP was approved by EPA on October 1, 2007.

At the national level, EPA has finalized the Tier 2 vehicle/national fuel standards, which took effect beginning in 2004. However, the states had already begun to realize the benefits of cleaner vehicles with the National Low Emission Vehicle standards beginning with 2001 model year vehicles. Further, the Heavy Duty Diesel Rule, which implements more stringent standards for new diesel engines and fuels, took effect this year.