



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

AUG 18 2008

REPLY TO THE ATTENTION OF:

R-19J

The Honorable Jennifer M. Granholm
Governor of Michigan
Lansing, Michigan 48909

Dear Governor Granholm:

Thank you for your recommendations on the status of fine particle ($PM_{2.5}$) pollution throughout Michigan. As you know, fine particle pollution represents one of the most significant barriers to clean air facing our nation today. Health studies link these tiny particles – about $1/30^{\text{th}}$ the diameter of a human hair – to serious human health problems including aggravated asthma, increased respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, decreased lung function, and even premature death in people with heart and lung disease. Fine particle pollution can remain suspended in the air for long periods of time and create public health problems far away from emission sources. Reducing levels of fine particle pollution is an important part of our nation's commitment to clean, healthy air.

We have reviewed the December 18, 2007, letter from Steven E. Chester, Michigan Department of Environmental Quality Director, submitting Michigan's recommendations on air quality designations for the 2006 24-hour $PM_{2.5}$ standards. We have also reviewed the technical information submitted to support Michigan's recommendations. We appreciate the effort your State has made to develop this supporting information. Consistent with the Clean Air Act, this letter is to inform you that the U.S. Environmental Protection Agency intends to make modifications to Michigan's recommended designations and boundaries.

We have enclosed a detailed description of areas where EPA intends to modify your state recommendations, and the basis for such modifications. Your Environmental Director will also receive a copy of this letter and the enclosure. Should you have additional information that you wish EPA to consider in this process, please provide it to us by October 20, 2008.

EPA has taken steps to reduce fine particle pollution across the country, such as the Clean Diesel Program, which we expect to dramatically reduce emissions from highway, non-road and stationary diesel engines. In addition, State programs to attain the 1997 $PM_{2.5}$ standards will help to reduce unhealthy levels of fine particle pollution.

We intend to make final designation decisions for the 2006 24-Hour PM_{2.5} standards by December 18, 2008. Please also be aware that EPA plans to publish a notice in the Federal Register in the near future in order to solicit public comments on our intended designation decisions. If you have any questions, please do not hesitate to contact me. We look forward to a continued dialogue with you as we work together to implement the PM_{2.5} standards.

Sincerely,

A handwritten signature in cursive script that reads "Lynn Buhl".

Lynn Buhl
Regional Administrator

Enclosure

cc: Steven E. Chester
Director
Michigan Department of Environmental Quality

**Review of Designations in Michigan
For the Particulate Matter Air Quality Standard**

The following table identifies the individual areas and counties comprising those areas in Michigan that EPA intends to designate as nonattainment for the 2006 fine particulate matter ("PM_{2.5}") air quality standard. Following this table is a discussion of each area and the basis for EPA's intended designations, followed by a description of the data EPA examined. EPA intends to designate as attainment/unclassifiable all other Michigan counties not identified in the table below.

Area	Current PM_{2.5} Nonattainment Area	Michigan Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Detroit-Ann Arbor-Flint	Livingston Macomb Monroe Oakland St. Clair Washtenaw Wayne	Livingston Macomb Monroe Oakland St. Clair* Washtenaw Wayne*	Livingston Macomb Monroe Oakland St. Clair Washtenaw Wayne
Grand Rapids	None	Kent	Kent Ottawa

* Michigan recommended that Wayne and St. Clair Counties each be a separate area. EPA intends to designate the seven counties as a single nonattainment area.

On June 8, 2007, in a memorandum from Robert Meyers to the EPA Regional Administrators, EPA issued guidance on a timetable for designation of areas violating the PM_{2.5} air quality standards promulgated in 2006 and factors that EPA urged states to consider as they prepared recommendations for nonattainment area boundaries. This guidance was sent to the Governor of Michigan as an attachment to a letter dated July 9, 2007, requesting the State's recommendations.

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

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns

- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Additional background information on each of the nine factors can also be found in the background section at the end of this document.

EPA also computed a Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of potential impacts of counties in and near an area on violating monitors. While this metric provides a useful synthesis of important relevant information, including weighting the emissions of various pollutants according to estimates of the relative importance of each pollutant, the CES is not the exclusive variable EPA uses to consider these factors. A summary of the CES is included in the background section, and a more detailed description can be found at:

http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Review for the Detroit-Warren-Flint Combined Statistical Area

EPA reviewed relevant information for the seven counties in the area designated nonattainment for the 1997 standards as well as for surrounding counties. There are violating monitors in Monroe, Oakland, St. Clair, Wayne, and Washtenaw Counties. The area designated nonattainment for the 1997 standards also included Livingston and Macomb Counties. Michigan recommended that all seven counties also be designated as nonattainment for the 2006 standards. However, Michigan recommended that the area be subdivided into three separate areas. The first area would include only Wayne County, which Michigan characterized as distinctly industrialized. The second area would include just St. Clair County, which Michigan characterized as being especially influenced by international transport from Canada. The third area would include the remaining five counties.

EPA agrees with the counties to be designated nonattainment but disagrees with Michigan's recommendation to subdivide the area into three separate areas. While some components of the observed concentrations vary in magnitude and significance from location to location, EPA believes that a high fraction of the overall observed PM_{2.5} concentrations reflect common origins, including not only a common regional transported component but also a common metropolitan scale impact from sources throughout the seven counties in the Detroit area. The level of commuting from county to county is also such that planning by necessity must address the area as a single broad area. Indeed, the metropolitan planning organization addresses the seven counties of the existing nonattainment area and thus is already designed to conduct planning for the prospective nonattainment area as a whole. While Michigan may ultimately opt for a mix of control strategies that include controls to address emissions that have especially significant

impacts in particular areas, the particulate matter concentrations in various parts of the area are sufficiently interrelated that it is essential that a single plan be developed for the entire Detroit area that addresses the combined effects throughout the area.

EPA reviewed the relevant information for other counties within the combined statistical area as well as counties adjacent to the combined statistical area in order to determine the appropriate nonattainment area. Genesee County, which includes Flint, has moderately low emissions, and the county has a low CES, reflecting the distance of the county from violating monitors and the relative infrequency with which winds blow from Genesee County to the violating monitors on high concentration days. A further reason for excluding Genesee County is to facilitate planning by providing consistency with other designations, including the exclusion of the county from the nonattainment area defined for the 1997 PM_{2.5} standards and the treatment of Flint as a separate ozone nonattainment area (now maintenance area) from the Detroit area. Lucas County is more commonly upwind of violating monitors, but the emissions of Lucas County are not large in comparison with the emissions of Detroit area counties, Lucas County is somewhat distant from the violations in the Detroit area, and Lucas County (dominated by Toledo) is a separate urban area with little commuting into or other connection with the Detroit area. Other nearby counties have relatively low emissions, and no other factor warranted inclusion of the counties in the nonattainment area. Analysis of the area considering the nine factors suggests Michigan's recommendations of nonattainment counties and attainment counties is appropriate.

Figure 1 is a map of the counties in the Detroit area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

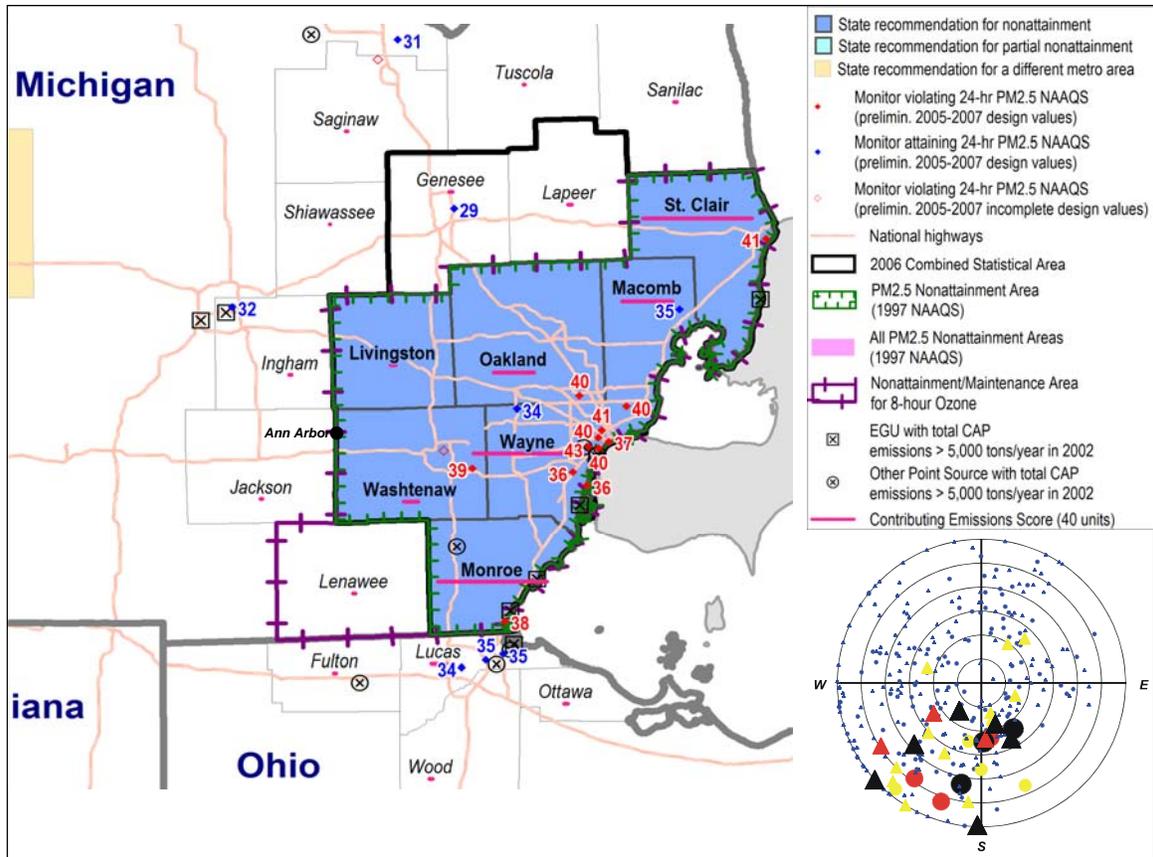


Figure 1

Factor 1: Emissions data

Table 1 shows emissions of PM_{2.5} components (given in tons per year) and the CESs for potentially contributing counties in the Detroit area. Counties that are part of the Detroit area nonattainment area for the 1997 PM_{2.5} NAAQS are shown in boldface. Counties are listed in descending order by CES.

Table 1. PM_{2.5} 24-hour Component Emissions, and CESs.

County	State Recommended Nonattainment?	CES	PM _{2.5} emissions total (tpy)	PM _{2.5} emissions carbon (tpy)	PM _{2.5} emissions other (tpy)	SO ₂ (tpy)	NO _x (tpy)	VOCs (tpy)	NH ₃ (tpy)
Monroe, MI	Yes	100	6,476	752	5,723	129,523	49,678	11,507	937
St. Clair, MI	Yes	100	3,120	547	2,574	69,799	29,200	9,656	470
Wayne, MI	Yes	100	8,401	2,701	5,699	67,359	98,677	80,390	2,442
Macomb, MI	Yes	46	1,834	834	999	5,412	27,287	32,074	1,019
Oakland, MI	Yes	37	3,116	1,556	1,559	7,070	49,789	57,995	1,525
Washtenaw, MI	Yes	13	1,412	560	852	2,042	15,859	16,169	1,194
Livingston, MI	Yes	4	1,383	472	910	937	7,533	9,913	479
Lucas, OH	No	13	2,395	758	1,637	26,551	31,475	23,612	1,780
Genesee, MI	No	3	1,550	602	948	2,029	18,603	20,570	808

Oakland, Macomb, Monroe, St. Clair, and Wayne Counties all have high CES and emissions. Livingston and Washtenaw Counties have relatively lower emissions among the counties in this area. Lucas County, Ohio also has modest emissions and it is in the Toledo area.

Factor 2: Air quality data

The 24-hour PM_{2.5} design values for counties in the Detroit area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment?	Design Values 2004-06 (µg/m ³)	Design Values 2005-07 (µg/m ³)
Monroe, MI	Yes	39	38
St. Clair, MI	Yes	39	41
Wayne, MI	Yes	44	43
Macomb, MI	Yes	36	35
Oakland, MI	Yes	39	40
Washtenaw, MI	Yes	38	39
Livingston, MI	Yes		
Lucas, OH	No	35	35
Genesee, MI	No	30	29

Oakland, Monroe, St. Clair, Washtenaw, and Wayne all have design values in excess of the 2006 PM_{2.5} standards. Livingston County does not have a PM_{2.5} air quality monitor. The other area counties meet the air quality standards. Lucas County, Ohio is included with the counties meeting the standard.

For purposes of its review, EPA used data available from the Chemical Speciation Network and the Interagency Monitoring of Protected Visual Environments (IMPROVE) network to estimate the composition of fine particle mass on days with the highest fine particle concentrations. On high concentration days during cold weather months in this area, EPA found on average a total urban contribution of 10.2 µg/m³, consisting of 1.9 µg/m³ of sulfate, 3.6 µg/m³ of nitrate, 1.8 µg/m³ of organic particles, and 2.9 µg/m³ of miscellaneous inorganic particulate. On high concentration days during warm weather months in this area, EPA found on average a total urban contribution of 7.2 µg/m³, consisting of 1.0 µg/m³ of sulfate, 5.5 µg/m³ of organic particles, 0.7 µg/m³ of miscellaneous inorganic particulate, and no nitrate. These estimates were used for weighting of the emissions of different pollutants in calculating the contributing emissions scores.

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

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data give an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour PM_{2.5} standards. Oakland and Wayne Counties both have over a million

residents. Macomb County trails with a population that is still over 800,000. The population density of these three counties stands out as being above that of the other area counties. Lucas County, Ohio has a population density slightly lower than Oakland County's figure, but it is in the Toledo area which is in attainment of the 2006 PM_{2.5} standards. The populations and population densities of the other area counties are still large enough that this factor does not suggest inclusion or exclusion in the Detroit nonattainment area.

Table 3. Population

County	State Recommended Nonattainment?	2005 Population	2005 Population Density (pop/sq mi)
Monroe, MI	Yes	153,772	275
St. Clair, MI	Yes	171,079	232
Wayne, MI	Yes	1,990,932	3227
Macomb, MI	Yes	828,950	1718
Oakland, MI	Yes	1,213,669	1339
Washtenaw, MI	Yes	342,124	475
Livingston, MI	Yes	181,404	309
Lucas, OH	No	447,410	1290
Genesee, MI	No	442,732	684

Factor 4: Traffic and commuting patterns

Table 4. Traffic and Commuting Patterns

County	State Recommended Nonattainment?	2005 VMT (10 ⁶ mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Wayne, MI	Yes	19,866	816,490	99	819,550	99
Macomb, MI	Yes	6,790	379,440	99	380,980	99
St. Clair, MI	Yes	1,422	74,030	97	75,260	99
Oakland, MI	Yes	13,709	585,240	97	596,830	99
Washtenaw, MI	Yes	4,105	161,830	96	164,460	97
Monroe, MI	Yes	2,058	53,620	78	53,750	78
Livingston, MI	Yes	1,925	39,760	50	76,610	96
Genesee, MI	No	5,447	26,310	14	178,980	96
Lucas, OH	No	4,418	7,740	4	7,780	4

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 PM_{2.5} NAAQS are shown in boldface. The commuting data implies that all the counties that are in bold, the 1997 standards nonattainment area counties, are all integrated into the Detroit area. Commuting data for Lucas County, Ohio show little connection of this county with the Detroit area.

Factor 5: Growth rates and patterns

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Detroit area. Counties are listed in descending order based on VMT change between 1996 and 2005.

Table 5. Population and VMT Growth and Percent Change.

County	Population (2005)	Population % change (2000-05)	2005 VMT (10 ⁶ mi)	VMT % change (1996-2005)
Oakland, MI	1,213,669	1	13,709	42
Monroe, MI	153,772	5	2,058	38
Washtenaw, MI	342,124	5	4,105	37
Genesee, MI	442,732	1	5,447	23
Livingston, MI	181,404	14	1,925	18
Wayne, MI	1,990,932	-3	19,866	10
Lucas, OH	447,410	-2	4,418	8
Macomb, MI	828,950	5	6,790	8
St. Clair, MI	171,079	4	1,422	-23

Livingston County experienced population growth of 14% from 2000 to 2005. The population change was 5% or less in the other counties during the same period. Considering VMT growth, Oakland County had the greatest percent increase. Monroe and Washtenaw also had large VMT growth. The other area counties had more modest VMT growth except for St. Clair County. VMT dropped by 23% in St. Clair County.

Factor 6: Meteorology (weather/transport patterns)

A pollution rose for the Detroit area is provided with the map above. This pollution rose shows that Genesee County is unlikely to influence Detroit area concentrations on high concentration days.

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

The Detroit area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its airshed. All area counties were considered for a contribution to the monitored violations. Therefore, this factor did not play a significant role in the decision-making process.

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

The Southeast Michigan Council of Governments (SEMCOG) is the Metropolitan Planning Organization (MPO) for Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. SEMCOG webpage: <http://www.semco.org/>

This metropolitan area is divided into two ozone areas. The Detroit ozone nonattainment area includes the following counties: Lenawee, Livingston, Macomb, Monroe, Oakland, St Clair, Washtenaw, and Wayne.

The Flint ozone maintenance area includes the following counties: Genesee and Lapeer.

The proposed Detroit nonattainment area is identical to the nonattainment area designated under the 1997 PM_{2.5} standard. EPA is proposing to designate the same seven counties as a single Detroit nonattainment area which keeps it identical. Michigan recommended a change from the area designated under the 1997 PM_{2.5} standard by dividing it into three nonattainment areas.

Factor 9: Level of control of emission sources

The emission estimates on Table 1 include any control strategies implemented in the Detroit area before 2005 that may influence emissions of any component of PM_{2.5} emissions (i.e., total carbon, SO₂, NO_x, and crustal PM_{2.5}).

**Review for the Grand Rapids-Muskegon-Holland
Combined Statistical Area**

Discussion:

Western Michigan is currently designated attainment for the 1997 PM_{2.5} standards. A monitor in Grand Rapids (Kent County) is showing violations of the 2006 standards. Michigan recommended a nonattainment area for the 2006 PM_{2.5} standards consisting solely of Kent County. EPA reviewed relevant information for the six counties in the combined statistical area for Grand Rapids and for surrounding counties.

EPA believes that the appropriate nonattainment area for Grand Rapids consists of Kent and Ottawa Counties. Kent County is violating the air quality standards and contributes to those violations. Ottawa County has greater emissions of most of the relevant pollutants than Kent County, and indeed EPA's CES analysis suggests that Ottawa County contributes more to the violations in Kent County than Kent County itself. A sizable fraction of Ottawa County commuters commute into Kent County. The pollution rose for this area likewise suggests that there is contribution from the direction of Ottawa County towards the violating monitor in Kent. Kent and Ottawa comprise the Grand Rapids ozone maintenance area, so a planning area that consists of these two counties will provide for planning consistent with historical practice.

EPA reviewed relevant information for other counties within the combined statistical area as well as for counties adjacent to the combined statistical area in order to determine the appropriate nonattainment area. Muskegon and Allegan Counties have moderate emissions, but the emissions, population, percentage of commuters commuting into Kent County, and probable impact on violations in Kent County, is substantially lower than that of Ottawa County. Therefore, EPA believes that the Grand Rapids PM_{2.5} nonattainment area should not include these two counties. Other Michigan counties in or near the combined statistical area have relatively low emissions, and no other factor warranted inclusion of the counties in the nonattainment area.

Figure 2 is a map of the counties in the Grand Rapids area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

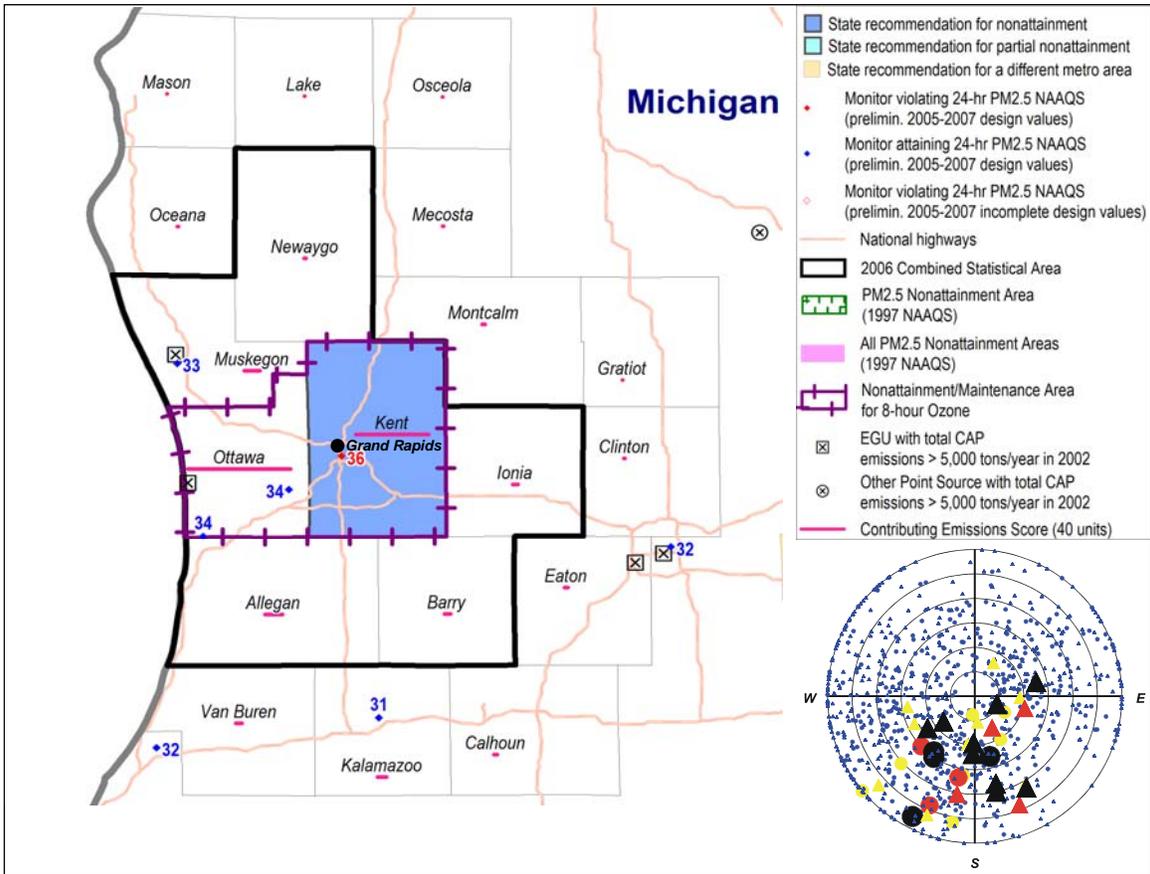


Figure 2

Factor 1: Emissions data

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

Table 1. PM_{2.5} 24-hour Component Emissions, and CESs.

County	State Recommended Nonattainment?	CES	PM _{2.5} emissions total (tpy)	PM _{2.5} emissions carbon (tpy)	PM _{2.5} emissions other (tpy)	SO ₂ (tpy)	NO _x (tpy)	VOCs (tpy)	NH ₃ (tpy)
Ottawa, MI	No	100	3,153	667	2,485	46,545	27,918	14,897	3,837
Kent, MI	Yes	71	2,102	895	1,207	5,005	24,130	33,459	2,152
Allegan, MI	No	17	1,238	423	814	994	5,271	11,625	4,196
Muskegon, MI	No	15	1,808	490	1,317	14,804	11,273	10,400	709
Barry, MI	No	6	764	274	491	287	1,789	4,769	618
Ionia, MI	No	5	823	223	600	375	2,440	3,556	2,122

The CES and emissions of Kent and Ottawa Counties are well above the other counties. Indeed, the CES for Ottawa is higher than that of Kent County. Allegan and Muskegon Counties have moderate emissions, but the relatively low CES for each suggests that these counties would have substantially less impact on Kent County than Ottawa County.

Factor 2: Air quality data

The 24-hour PM_{2.5} design values for counties in the Grand Rapids area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment?	Design Values 2004-06 (µg/m ³)	Design Values 2005-07 (µg/m ³)
Ottawa, MI	No	34	34
Kent, MI	Yes	37	36
Allegan, MI	No	34	34
Muskegon, MI	No	35	33
Barry, MI	No		
Ionia, MI	No		

The Kent County design value is above the 2006 standards. Allegan, Muskegon, and Ottawa meet the 2006 standards.

For purposes of its review, EPA used data available from the Chemical Speciation Network and the Interagency Monitoring of Protected Visual Environments (IMPROVE) network to estimate the composition of fine particle mass on days with the highest fine particle concentrations. On high concentration days during cold weather months in this area, EPA found on average a total urban contribution of 10.9 µg/m³, consisting of 1.2 µg/m³ of sulfate, 5.7 µg/m³ of nitrate, 4.0 µg/m³ of organic particles, and no miscellaneous inorganic particulate. On high concentration days during warm weather months in this area, EPA found on average a total urban contribution of 6.8 µg/m³, consisting of 3.4 µg/m³ of sulfate, 3.1 µg/m³ of organic particles, 0.3 µg/m³ of miscellaneous inorganic particulate, and no nitrate. These estimates were used for weighting of the emissions of different pollutants in calculating the contributing emissions scores.

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

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data give an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour PM_{2.5} standards. Kent County has the largest population in the area. The population exceeds 100,000 people in Ottawa, Muskegon, and Allegan Counties.

Table 3. Population

County	State Recommended	2005 Population	2005 Population

	Nonattainment?		Density (pop/sq mi)
Ottawa, MI	No	255,187	442
Kent, MI	Yes	595,979	685
Allegan, MI	No	113,052	134
Muskegon, MI	No	174,971	333
Barry, MI	No	59,817	103
Ionia, MI	No	64,468	111

Factor 4: Traffic and commuting patterns

Table 4. Traffic and Commuting Patterns

County	State Recommended Nonattainment?	2005 VMT (10 ⁶ mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Ottawa, MI	No	2,024	29,960	25	119,480	99
Kent, MI	Yes	6,342	258,700	91	277,270	98
Allegan, MI	No	1,159	8,380	16	44,550	87
Muskegon, MI	No	1,699	4,510	6	74,240	99
Barry, MI	No	417	6,940	26	19,930	74
Ionia, MI	No	658	7,090	27	20,730	78

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The commuting statistics show that there is limited commuting into Kent County, the only violating county in the area. There is some commuting from Ottawa County to Kent County. There are just a few commuters into Kent County from the other area counties.

Factor 5: Growth rates and patterns

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Grand Rapids area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Growth and Percent Change.

County	Population (2005)	Population % change (2000-05)	2005 VMT (10 ⁶ mi)	VMT % change (1996-2005)
Kent, MI	595,979	3	6,342	31
Muskegon, MI	174,971	3	1,699	24
Barry, MI	59,817	5	417	18
Ionia, MI	64,468	5	658	4
Allegan, MI	113,052	7	1,159	-1
Ottawa, MI	255,187	7	2,024	-5

The populations in the area are all rather stable with the limited growth rates. Kent, Muskegon, and Barry Counties are experiencing strong VMT growth. VMT is declining in Ottawa County.

Factor 6: Meteorology (weather/transport patterns)

A pollution rose for the Grand Rapids area is provided with the map above.

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

The Grand Rapids area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, no counties were excluded on the basis of this factor.

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

The Grand Valley Metropolitan Council is the metropolitan planning organization for Allegan, Barry, Ionia, Kent, Montcalm, and Ottawa Counties in Michigan. Its web site is: www.gvmc.org.

The Grand Rapids, Michigan ozone maintenance area consists of Kent and Ottawa Counties.

Factor 9: Level of control of emission sources

The emission estimates on Table 1 include any control strategies implemented in the Grand Rapids area before 2005 that may influence emissions of any component of PM_{2.5} emissions (i.e., total carbon, SO₂, NO_x, and crustal PM_{2.5}).

Background on Criteria EPA used to define its intended nonattainment areas

On June 8, 2007, in a memorandum from Robert Meyers to the EPA Regional Administrators, EPA issued guidance on a timetable for designation of areas violating the PM_{2.5} air quality standards promulgated in 2006 and factors that EPA recommended states consider as they prepared recommendations for nonattainment area boundaries. This guidance was sent to the Governor of Ohio as an attachment to a letter dated July 9, 2007, requesting the State's recommendations. The guidance identified nine factors: emissions, air quality, population density and degree of urbanization, traffic and commuting patterns, growth rates and patterns, meteorology, geography/topography, jurisdictional boundaries, and level of control of emission sources.

The Clean Air Act dictates that nonattainment areas be defined to include both areas that are violating the standards and nearby areas that are contributing to the violations. Assessment of areas contributing to violations is complicated by the multiple pollutants that are components of fine particulate matter, the variable significance of these multiple components, and the complexities of photochemical formation and dispersion. To facilitate its review of available information, EPA prepared a "Contributing Emissions Score" (CES) for each potentially violating county. EPA derived a CES for each relevant county using information on emissions, air quality, and meteorology. The score for each county is computed relative to the highest scoring county in the area, so that scores range between 0 and 100. These scores represent an estimate of the relative maximum influence that emissions in that County have on a violating county. The weight that the CES plays in determining the boundaries of any violating area varies from area to area depending on how well the CES methodology takes into account characteristics of an area that impact transport and dispersion of PM_{2.5} and depending on the significance of other factors.

Briefly, a CES for each county was derived by incorporating the following information and variables that impact PM_{2.5} transport into the screening approach:

- Major PM_{2.5} components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO₂, NO_x, and inorganic particles (crustal).
- PM_{2.5} emissions for the highest (generally top 5%) PM_{2.5} emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban PM_{2.5} concentration that is in addition to a regional background PM_{2.5} concentration, determined for each PM_{2.5} component
- Distance from each potentially contributing county to a violating county or counties

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

Factor 1: Emissions data

For this factor, EPA looked at county-based levels of emissions of the following PM_{2.5} components: PM_{2.5} emissions total (which includes PM_{2.5} emissions carbon and emissions other), PM_{2.5} emissions carbon (includes organic carbon OC and elemental carbon (EC)), and PM_{2.5} emissions other (which includes inorganic particles (crustal)), as well as emissions of SO₂ and NO_x which are precursors of secondary PM_{2.5} components. Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html. EPA also considered each county's Contributing Emissions Score (CES), whose derivation is briefly described above.

Factor 2: Air quality data

This factor considers the 24-hour PM_{2.5} design values, in µg/m³, for air-quality monitors in counties in each area based on data for the 2004-2006 and 2005-2007 periods. A monitor's design value indicates whether that monitor attains a specified air-quality standard. The 24-hour PM_{2.5} standards are met when the 3-year average of a monitor's 98th percentile values are 35 µg/m³ or less. A design value is only valid if minimum data completeness criteria are met. EPA is only using air quality data collected in accordance with 40 CFR Parts 50, 53, and 58.

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

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

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the area, the percent of total commuters in each county who commute to other counties within area, as well as the total vehicle miles traveled (VMT) for each county in millions of miles. A county with numerous commuters is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source emission control strategies, thus warranting inclusion in the nonattainment area.

The 2005 VMT data used for table 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: <ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/>, in particular in the file named 2002_mobile_nei_version_3_report_092807.pdf. The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor looks at the population and VMT trends for the each area from 2000 to 2005, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered the most representative National Weather Service wind direction and speed data throughout the year, with an emphasis on “high PM_{2.5} days” for each of two seasons (an October-April “cold” season and a May-September “warm” season). These high days are defined as days where any FRM or FEM air-quality monitors had 24-hour PM_{2.5} concentrations above 95% on a frequency distribution curve of PM_{2.5} 24-hour values. For this factor, EPA also considered each County’s CES, which includes an analysis of trajectories of air masses for high PM_{2.5} days.

For each air quality monitoring site, EPA developed a “pollution rose” to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM_{2.5} values by color; days exceeding 35 µg/m³ are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

EPA also conducted trajectory analyses to assess the likelihood that each county was upwind on high concentration days. EPA used these results directly and also used these results in computing each County’s CES. Further documentation of this analysis is provided in the documentation of the derivation of the CES.

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

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

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

The analysis of jurisdictional boundaries considered the planning and organizational structure of the area to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented in the area. The emission estimates under Factor 1 include any control strategies implemented in each area before 2005 that may influence emissions of any component of PM_{2.5} emissions (i.e., total carbon, SO₂, NO_x, and crustal PM_{2.5}).