# RACM ANALYSIS FOR FOUR SERIOUS AREAS DESIGNATED NONATTAINMENT FOR 1-HR OZONE NAAQS

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**RACM ANALYSIS FOR FOUR SERIOUS AREAS DESIGNATED NONATTAINMENT FOR 1-HR OZONE NAAQS**

This paper provides supplemental information for EPA's notices of proposed rulemaking for State implementation plans (SIPs) for four areas designated serious nonattainment for the 1-hour national ambient air quality standard (NAAQS) for ground-level ozone. These nonattainment areas are: Greater Connecticut, Western Massachusetts (Springfield), Metropolitan Washington (DC, MD, VA), and Atlanta, GA. This information addresses comments received on those proposals that questioned EPA's proposed approval of the SIPs regarding the Clean Air Act's (Act's) requirement that SIPs contain reasonably available control measures (RACM).

SUMMARY

EPA has performed an analysis to evaluate emission levels of oxides of nitrogen (NOx) and volatile organic compounds (VOC) and their relationships to the application of current and anticipated control measures expected to be implemented in four serious one-hour ozone nonattainment areas. This analysis was done to determine if additional reasonably available control measures (RACM) are available after adoption of Clean Air Act (Act) required measures for the following serious ozone nonattainment areas: Greater Connecticut, New York-New Jersey-Connecticut; Springfield, Massachusetts; Washington, D.C.-Virginia-Maryland; and Atlanta, Georgia. The EPA performed this analysis in response to comments that were submitted on the proposals on these areas' one-hour ozone attainment demonstrations. The EPA took action to propose approval (and disapproval in the alternative) of these areas' SIPs on December 16, 1999 [Greater Connecticut (64 FR 70332); Springfield (64 FR 70319); Metropolitan Washington (64 FR 70460); and Atlanta (64 FR 70478)]. This information supplements the December 16, 1999 proposals.

Section 172(c)(1) of the Act requires SIPs to contain reasonably available control measures (RACM) as necessary to provide for attainment as expeditiously as practicable. Several commenters have stated that there is no evidence in the four serious ozone attainment demonstrations that were proposed on December 16, 1999 that they have adopted all RACM, and a commenter further stated that the mobile source emission budgets in the SIPs are inadequate by definition because the SIPs do not demonstrate timely attainment or contain the emission reductions required for all RACM. In addition, some commenters stated that for all potential RACM measures not adopted into the SIP, the State must provide a justification for why they were determined not to be RACM. The analysis EPA conducted demonstrates that a number of possible emission control measures have been evaluated for their emission reductions. It further demonstrates that the measures evaluated either (a) are likely to require an intensive and costly effort for numerous small area sources, or (b) do not advance the attainment dates for the four areas, and therefore would not be considered RACM under the Act.

EPA has previously provided guidance interpreting the RACM requirements of 172(c)(1). See 57 FR 13498, 13560. In that guidance, EPA indicated its interpretation that potentially available measures that would not advance the attainment date for an area would not be considered RACM. EPA concluded that a measure would not be reasonably available if it would not advance attainment. EPA also indicated in that guidance that states should consider all potentially available measures to determine whether they were reasonably available for implementation in the area, and whether they would advance the attainment date. Further, states should indicate in their SIP submittals whether measures considered were reasonably available or not, and if measures are reasonably available they must be adopted as RACM. Finally, EPA indicated that states could reject potential RACM measures either because they would not advance the attainment date, would cause substantial widespread and long-term adverse impacts, or for various reasons related to local conditions, such as economics or implementation concerns. The EPA also issued a recent memorandum on this topic, ''Guidance on the Reasonably Available Control Measures (RACM) Requirement and Attainment Demonstration Submissions for Ozone Nonattainment Areas.'' John S. Seitz, Director, Office of Air Quality Planning and Standards. November 30, 1999. Web site: http://www.epa.gov/ttn/oarpg/t1pgm.html.

In response to public comments received on the proposed rulemakings in December, EPA has reviewed the SIP submittals for the four serious areas and determined that they did not include sufficient documentation concerning available RACM measures. Therefore, EPA has itself reviewed numerous potential RACM measures, as documented in the following analysis. Based on this analysis, EPA concluded these measures would either (a) likely require an intensive and costly effort for numerous small area sources, or (b) not advance the attainment date in any of the four areas.

EPA reached this conclusion primarily because the reductions expected to be achieved by the potential RACM measures are relatively small, in the range of 8.4 to 29.7 tons per day of VOC and 4.5 to 16.7 tons per day of NOx for stationary sources and 2.03 to 11.38 tons per day of VOC and 3.56 to 17.07 tons per day of NOx for mobile sources. These potential reductions are far less than the emissions reductions needed within the nonattainment areas to reach attainment.

In addition, all of the four areas rely in part on reductions from outside the nonattainment areas from EPA's NOx SIP call or section 126 rule (65 Fed. Reg. 2674, January 18, 2000) to reach attainment. In the NOx SIP call, 63 Fed. Reg. 57356, EPA concluded that reductions from various upwind states were necessary to provide for timely attainment in various downwind states, including all six of the states discussed in this analysis. The NOx SIP call therefore established requirements for control of sources of significant emissions in all upwind states. However, these reductions were not slated for full implementation until May 2003. Further, the United States Court of Appeals for the District of Columbia Circuit recently ordered that EPA could not require full implementation of the NOx SIP call prior to May 2004. Michigan, et al., v. EPA, D. C. Cir. No. 98-1497, Order of Aug. 30, 2000.

The attainment demonstrations for the four serious areas indicate that the ozone benefit expected to be achieved from regional NOx reductions (such as the NOx SIP call) are substantial. (See the individual attainment demonstrations in the docket for each of these areas.) In addition, many of the measures designed to achieve emissions reductions from within the four nonattainment areas will also not be fully implemented prior to the respective attainment date. Therefore, EPA concludes, based on the available documentation, that since the reductions from potential RACM measures do not nearly equate to the reductions needed to demonstrate attainment, none of these measures could advance the attainment date prior to full implementation of the SIP call or section 126 rule in 2003 or 2004 and all local measures by the respective attainment date, and thus none of these potential measures can be considered RACM for these four areas.

Although EPA encourages areas to implement available RACM measures as potentially cost effective methods to achieve emissions reductions in the short term, EPA does not believe that section 172(c)(1) requires implementation of potential RACM measures that either require costly implementation efforts or produce relatively small emissions reductions that will not be sufficient to allow any of the four areas to achieve attainment in advance of full implementation of all other required measures.

ANALYSIS

The analysis for mobile source categories differs from that for stationary source categories in several respects:

1. The mobile source categories are fewer in number, and therefore the emissions inventory information for the attainment year was more readily available from SIP files for EPA to use. The stationary source categories are more numerous, and detailed category-by-category emissions information for the attainment year was not readily available for the analysis. An available projected 2007 emission inventory was therefore used for the stationary source analysis.
2. Limited emissions control information was readily available for the analysis of both stationary and mobile sources. However, for the mobile source analysis, individual control measures were evaluated. For the stationary source analysis, a “top down” technique was used to estimate the source categories and emissions that are potentially available for additional control, and then supplemented with readily available information specific to each of the four areas.

MOBILE SOURCE ANALYSIS

Attachment 1 is an analysis of a broad range of transportation control measures (TCMs) to determine if they are RACM for the four nonattainment areas in question. Emission reductions that might result from implementation of these TCMs were derived from on-road emissions and vehicles miles of travel (VMT) data in the attainment year emissions inventory for each nonattainment area.

Table 1 shows, for each nonattainment area, attainment year on-road emissions for volatile organic compounds (VOC) and nitrogen oxides (NOx) in tons per day (TPD) in column 3. Light-duty cars and light-duty trucks generally contribute 80% of the on-road VOC inventory, and 70% of the on-road NOx inventory. For the purpose of this analysis, EPA assumes that only light-duty cars and light-duty trucks are affected by the TCMs. Column 4 shows the on-road VOC inventory and NOx inventory reduced by 20% and 30% respectively to account for this assumption. The light-duty vehicle VOC and NOx inventory for each nonattainment area is divided by the average daily attainment year VMT (shown in column 5) for each nonattainment area, to calculate emissions in daily tons per mile (shown in column 6).

Tables 2 - 5 show a range of emissions reductions that could potentially be achieved through the implementation of TCMs in Atlanta, GA; Greater Connecticut; Springfield (Western), MA; and Washington, DC-MD-VA, respectively. Column 1 shows a range of TCMs, widely recognized by the literature, grouped into seven broad categories. The literature also contains estimates of reductions in VMT that could be expected from implementation of these TCMs. The VMT reductions vary in magnitude, depending on the scope and scale of the TCMs, the number of years over which the effects are analyzed, the existing transportation infrastructure and demand management (ie. existing TCMs) in the area, development patterns, and a number of other economic and demographic characteristics. It is important to note that in the United States, empirical evidence of the travel activity effects of TCMs have come primarily from case studies of small scale TCM programs, and that estimates of larger effects have come from studies of theoretical programs for which there is little actual large scale implementation experience. The high range of VMT reductions, as the result of scenarios which may require fundamental changes in infrastructure investment policies, or in the case of "Smart Growth" measures, governmental and other institutional relationships, may, in reality be very difficult to achieve within the timeframe for demonstrating attainment.

Nevertheless, Column 2 shows the range of VMT reductions by percent of total regional VMT, that could occur as a result of TCM implementation according to the literature. By multiplying the attainment year daily VMT (Table 1, Column 5) for each nonattainment area, by the range of VMT reductions by percent, one can estimate the range of VMT reduced in each nonattainment area for each category of TCMs. Column 3, shows this range of daily VMT reduced for each category. The figures in Column 4 show the range of estimated emission reductions in tons per day (TPD). These estimates were calculated by multiplying the emissions, in daily tons per mile (Table 1, Column 6), by the range of daily VMT reduced for each category of TCMs.

Table 6 compares the estimated emission reductions from TCMs for each nonattainment area to the emission reductions necessary for each area to demonstrate attainment. Column 1 shows the total emission reduction needed to demonstrate attainment. Column 2 shows the midpoint of the range of estimated emission reductions (from Tables 2 - 5, Column 6) from TCMs. Column 3 shows the estimated emission reductions as a percent of the total reduction needed to demonstrate attainment. EPA believes it is appropriate to use these figures for the purpose of this analysis, given the wide range of potential emission reduction cited in the literature. As noted above, the emission reductions on the high end of the range, are based on theoretical programs, which would require implementation on a scale and scope unlikely to be manageable within the timeframe for reaching attainment. The literature and implementation experience in urban areas leads EPA to believe that the low to midpoint range of emission reductions are achievable with careful planning, adequate implementation resources, aggressive public information programs and a sustained commitment by the implementing agencies. Using the midpoint of the range of emission reductions provides a liberal estimate of potential reductions from TCMs, to compare against the emission reductions required to demonstrate attainment. When compared to emission reductions necessary for attainment, emission reductions from TCMs that could potentially be implemented are only a small percentage of emission reductions needed. Potential VOC reductions range from 1.4% of the reductions needed for Greater Connecticut, to 5.2% of the reductions needed for Washington, DC-MD-VA. Potential NOx reductions range from 3.3% of the reductions needed for Greater Connecticut, to 11% of the reductions needed for Atlanta, GA. From this analysis, EPA concludes that implementation of these TCMs would not produce emission reductions sufficient to advance the attainment date without obtaining further reductions from sources already regulated, or about to be regulated, to a reasonable level, and that will not be fully achieved until the attainment date. This includes the substantial reductions achieved from the NOx SIP call or EPA's rule under section 126 of the Act (65 FR 2674 (January 18, 2000)), both within and upwind of the relevant States, which will not be achieved until 2003 or 2004.

Additional Area-Specific Information on Mobile Measures for Atlanta–In addition to the above mobile source analysis, EPA had readily available information concerning certain control measures currently in place in Georgia. A list of the SIP-approved transportation control measures and the program activities from the Partnership for a Smog-free Georgia (PSG) are listed in the table below. The table provides an indication of whether the measure is a SIP TCM, in the PSG program or both; the table also indicates where the SIP took emission reduction credit for the measures. For the other SIP measures, they were approved except as noted, but no emission reduction credit was taken. Thus Georgia has actually implemented most of the programs listed in the above analysis. This provides additional justification for EPA's position that the Atlanta SIP has met the RACM requirement of the Act.

| CONTROL MEASURE | EMISSION REDUCTION CREDIT TAKEN IN SIP |
|---|---|
| Employer-Based transportation demand management (TDM) | |
| -van/car pools (SIP TCM/PSG) | X |
| -guarantee ride home (PSG) | X |
| - mid-day shuttles (PSG) | X |
| -transit subsidies (SIP TCM/PSG) | X |
| -telecommuting (PSG) | X |
| Area-wide Rideshare | |

| CONTROL MEASURE | EMISSION REDUCTION CREDIT TAKEN IN SIP |
|---|---|
| -park and ride (SIP TCM) | |
| -ride matching (PSG) | X |
| -Transportation Management Associations (TMA's) (SIP TCM) | |
| Parking Management | |
| -preferential parking for High Occupancy Vehicles (HOV) (PSG) | X |
| Bike/Pedestrian Programs | |
| -designated lanes/routes (SIP TCM) | X |
| -safety enhancements (SIP TCM) | X |
| Improved Public Transit | |
| -express bus (SIP TCM) | |
| -paratransit (PSG) | X |
| -shuttle circulators (PSG) | X |
| Activity Centers | |
| -Multi-Modal transfer centers (PSG) | X |
| -incident/congestion response (PSG) | X |
| Smart Growth (Atlantic Steel) | |
| -infill development (SIP TCM PENDING APPROVAL) | |
| -Transit-Oriented Development (TOD) (SIP TCM PENDING APPROVAL) | |
| -mixed use development (SIP TCM PENDING APPROVAL) | |

STATIONARY SOURCE ANALYSIS

Attachment 2 is a report on an analysis done for EPA to determine what emission reduction controls might be available that would be considered reasonably available control measures. EPA looked at projected 2007 emissions after Clean Air Act mandatory controls and additional regional and national controls, as well as State SIP controls were accounted for. These include the NOx SIP call or section 126 rule reductions in the eastern US and the mobile source Tier II control program. For this analysis, EPA assumed that stationary source categories that have already been controlled nationally, regionally or locally in the SIP would not be effective candidates for additional controls that could be considered RACM, since these categories have only recently installed their level of control or are about to shortly. Controls assumed in the SIP were applied based on national assumptions for those controls and may not match the controls actually documented in the individual SIPs. The area-specific descriptions below, however, address substantial differences that exist and other conditions unique to each area, and appropriate corrections have been incorporated below.

EPA considered 2007 projected emissions regardless of an area's specific requested attainment date because it represents a level of control that will have already occurred by the area's attainment date, or will occur shortly afterward. Also, the 2007 projected emissions inventory was readily available for this analysis, whereas detailed category-by-category projected emission inventories for other earlier dates were not readily available.

As described in Attachment 2, categories and their emissions were identified that would remain after the other national, regional and SIP controls were accounted for. The remaining source categories were then ranked on the basis of emissions by category. The bottom 20 percent of the categories were removed from consideration based on the assumption that their individual category contribution would be considered too small and too numerous to regulate individually, and therefore would not be considered reasonably available. The emissions from top 80 percent of the categories were then totaled. Tables 6 and 7 of Attachment 2 present the summary of the top 80 percent of the "potentially controllable" emissions for each of the four areas. These are summarized for each of the four areas in Table A below; however, where there was area-specific information readily available to provide more accurate information, that is presented in the area-specific discussion below, and Table A reflects these differences. The EPA then assumed a generalized level of control (50 percent) applied to each of these categories; this is also presented in Table A below. Even though approximately 81 percent control was generally assumed to be a default level of control for previous Control Techniques Guidelines for VOC in the past, those CTG's were developed for categories that were more readily controlled. For this RACM analysis, EPA has assumed the lower amount (50 percent) for remaining categories, since controls may not be quite as effective or as readily available.

Next, EPA compared the results of these levels of control possible with the emission reductions needed for attainment. The results of this comparison appear in Table B below.

The NOx controls potentially available range from about 8 percent of the NOx reductions needed for attainment (in Western Massachusetts) to over 10 percent (in Atlanta). Table 7 of Attachment 2 presents the Tier 3 source categories with these potential controls. With the exceptions noted below for Atlanta, it appears that the kinds of categories with the most emissions available for control (e.g., industrial, residential, and commercial/ institutional distillate oil and gas combustion; and waste incineration) generally affect area sources, which are smaller and numerous. Requiring NOx control on these sources would therefore likely require an intensive, costly effort. Also, as noted in EPA's final rule on the NOx SIP call:

> Area Sources. In the NPR, EPA noted that control levels for area sources (i.e., sources other than mobile or point sources) could not be determined based on available information concerning applicable control technologies. Comments to the NPR did not identify specific NOx control technologies that were both technologically feasible and highly cost-effective. Because EPA has no new information on applicable control technologies for area sources, no additional control level is assumed for these sources in this rulemaking. (63 FR 57402, October 27, 1998.)

As a result, controls on these categories are not considered reasonably available.

<u>Atlanta Exceptions</u>:
1. For Atlanta, one of the tier 3 categories from Table 7 is "other industrial processes/mineral products/surface mining" with 5.4 tons NOx/day. Table 14 identifies that these emissions are from one point source, a glass manufacturer. Further investigation revealed that this source already has a permit that requires a RACT level of emissions, and therefore additional NOx controls would not be considered reasonably available.

2. Atlanta has a regulation (i.e., Rule 391-3-1.02, paragraph 2) for NOx emissions from fuel-burning equipment. The regulation applicability is based on heat input capacity (i.e., > or = 10 mmBTU/hr and < or = 250 mmBTU/hr). Because this regulation is not connected to an emission limit, it is likely that some of the stationary area sources listed in Tables 7 and 9 of Attachment 2 could be controlled under this regulation. It should be noted that due to timing constraints, a direct comparison between the sources Georgia has controlled and what was identified in the stationary source analysis of Attachment 2 as potential candidates for control was not possible.

For VOC, individual areas are discussed below.

<u>Western Massachusetts (Springfield)</u>: As shown in the modeled attainment demonstration, this area relies heavily on NOx controls from upwind areas, and further local VOC reductions in this area would not produce significant ozone reductions. However, the potential for additional VOC reductions was still considered as noted below.

Column 5 of Table B indicates that close to 14 percent additional VOC reductions may be possibly available (compared to the reductions needed for attainment from a 1990 baseline). (Note that the actual reductions will be more, since the attainment level of emissions must also account for additional control to offset emissions growth from 1990 to the attainment year.) However, the analysis described above did not account for some of the specific regulations that Massachusetts has already adopted and are approved into the SIP. In Massachusetts, emissions from top 80 percent of the categories that were assumed to be uncontrolled included the following (from Attachment 2, Table 6):

| Springfield, MA categories | | 2007 Uncontrolled |
|---|---|---|
| **Tier2 Name** | **Tier3 Name** | **VOC OSD** |
| | | |
| Surface Coating | industrial adhesives | 6.70 |
| Surface Coating | other | 3.59 |
| Surface Coating | thinning solvents | 2.15 |
| Other Industrial | rubber & plastics mfg | 1.52 |
| Agriculture, Food, & Kindred Products | bakeries | 1.02 |
| Surface Coating | electronic & other electrical | 0.98 |
| Graphic Arts | other | 0.86 |
| | **Totals** | **16.82** |

For the "Surface Coating - industrial adhesives" category, which the largest uncontrolled category listed, it is important to look to see how this category may already be controlled under Massachusetts statewide VOC regulations. In the Massachusetts air pollution control regulations, the definition of "coating" includes adhesives as well as paints, varnishes, sealants and temporary protective coatings. Thus, industrial adhesives are probably already largely controlled under the surface coating regulations that Massachusetts has adopted pursuant to EPA's CTG documents. For the "Agriculture, Food, & Kindred Products - Bakeries" category, Massachusetts regulation 310 CMR 7.18(29), entitled "Bakeries" already covers this category with a reasonable level of control. For "Surface Coating - other," and "Graphic Arts - other,"
regulations adopted by Massachusetts in the early 1990's that were not covered by EPA CTG's address some of these categories. Those rules are 310 CMR 7.18(22), Leather surface coating; 310 CMR 7.18(25), Offset lithographic printing; 310 CMR 7.18(26), Textile finishing; and 310 CMR 7.18(27), Coating mixing tanks. Lastly, for the "Surface Coating - thinning solvents" category,it appears that most of the emissions attributed to this category are from point sources that are known to be subject to surface coating regulations that Massachusetts has adopted pursuant to EPA's CTG documents.

Thus, the amount of reduction potentially available from further controls on these listed categories is most likely very small. Therefore EPA believes it would not advance the attainment date for the western MA nonattainment area, particularly since this area relies heavily on NOx controls from upwind areas, and further local VOC reductions in this area would not produce significant ozone reductions.

Greater Connecticut: Column 5 of Table B indicates that close to 17 percent additional VOC reductions may be possibly available (compared to the reductions needed for attainment from a 1990 baseline).
However, the analysis described above did not account for some of the specific requirements that Connecticut already has in its SIP. In Connecticut, emissions from top 80 percent of the categories that were assumed to be uncontrolled included the following:

| **Greater CT categories** | | **2007 Uncontrolled** |
|---|---|---|
| **Tier2 Name** | **Tier3 Name** | **VOC OSD** |
| | | |
| Surface Coating | industrial adhesives | 27.97 |
| Surface Coating | other | 13.08 |
| Surface Coating | thinning solvents | 5.64 |
| Surface Coating | electronic & other electrical | 4.83 |
| Service Stations: Breathing & Emptying | other | 3.07 |
| Other | other | 2.81 |
| Other Combustion | other | 2.03 |
| | | **59.43** |

For the "Surface Coating - industrial adhesives" category, which the largest uncontrolled category listed, it is important to look to see how this category may already be controlled under Connecticut statewide VOC regulations. In some circumstances, industrial adhesives would be covered by the surface coating regulations that Connecticut has adopted pursuant to EPA's CTG documents. In other circumstances, industrial adhesives would be covered by Connecticut's regulation (i.e., 22a-174-20(f)) governing equipment that emits more than certain amounts of VOC per hour and per day.

For the "Surface Coating - other" category, some of the emissions attributed to this category are from sources that are subject to the surface coating regulations that Connecticut has adopted pursuant to EPA's CTG documents.

For the "Surface Coating - thinning solvents" category, it appears that many of the emissions attributed to this category are from point sources that are known to be subject to either the surface coating regulations that Connecticut has adopted pursuant to EPA's CTG documents or pursuant to Connecticut's non-CTG RACT regulation.

For the "Surface Coating - electronic & other electrical" category, it appears that given that Connecticut's miscellaneous metal parts and products surface coating regulation covers sources under

Standard Industrial Classification (SIC) code of Major Group 36 (electrical machinery), that many of the emissions attributed to this category are covered by that regulation.

For the "Service Stations: Breathing & Emptying" category, some portion of the gasoline dispensing facilities in the state have installed pressure relief valves on their underground storage tank vents already as part of their stage II equipment, which is required throughout the state for all facilities dispensing more than 10,000 gallons per month. These pressure relief valves, where installed, would already substantially reduce the breathing losses from the underground tanks.

The "Other combustion" category refers to structural fires which cannot effectively be controlled with air pollution control regulations.

Thus, the amount of reduction potentially available from further controls on these listed categories is most likely very small, and therefore EPA believes it would not advance the attainment date for the Greater Connecticut nonattainment area.

Furthermore, as shown in the modeled attainment demonstration, Greater Connecticut relies heavily on controls in upwind areas, especially from the NOx SIP call or the section 126 rule and from the metropolitan New York city area. Since New York city has an attainment date of 2007, it is unlikely that all the emission reductions necessary to bring Greater Connecticut into attainment will be obtained until 2007. Furthermore, zero out analyses show that even eliminating all of Connecticut's emissions does not help Connecticut attain by it 1999 attainment date, since the effects of transport are so significant. (See 64 FR 70343) Therefore, additional VOC reductions are not seen as advancing the attainment date for the Greater Connecticut area.

Metropolitan Washington: Column 5 of Table B indicates that 7.3 percent additional VOC reductions may be possibly available (compared to the reductions needed for attainment from a 1990 baseline). (Note that the actual reductions will be more, since the attainment level of emissions must also account for additional control to offset emissions growth from 1990 to the attainment year.) However, for the Metropolitan Washington area, it is highly unlikely that this additional potential reduction would advance the attainment date for the area because of the following reasons:
a. The area relies heavily on control of transported emissions and ozone.
b. The Washington area modeling indicates that NOx emission reductions are generally more beneficial in reducing ozone concentrations, suggesting that the area may be NOx limited. When the maximum ozone response for VOC controls (.029 ppb/ton VOC) is applied to the potential additional VOC emission reductions in the D.C. area due to RACM (10.2 % or approximately 17 tons/day), the result is an ozone benefit of only .49 ppb. See Attachment 4 for a modeling sensitivity analysis (available only in docket for Metropolitan Washington area).

Atlanta:

a.  Table 6 of Attachment 2 indicates that 66.28 tons per day of VOC emissions may be potentially controllable to some level. However, as noted above, the Attachment 2 analysis was performed using nationally available information, whereas EPA has additional readily available information for Atlanta as follows: The category "Waste disposal & recycling--open burning–residential is shown in Table 6 to yield 11.13 tons/day VOC emissions. However, Georgia has a rule prohibiting open burning; therefore EPA is assuming that category as not available for additional control. Therefore the resulting emission reductions should be 66.28 - 11.13 = 55.15 tons/day. This value is presented in the Table A below.

b. Regulations for the managed slash and prescribed open burns exist in the 13-county nonattainment area. A regulation for managed slash burns exist for the attainment counties in their 4-km modeling domain. These emissions amount to 6.78 tons/day in Table 8 and would not be available for further control.

c.  Column 5 of Table B indicates that 8.3 percent additional VOC reductions may be possibly available (compared to the reductions needed for attainment from a 1990 baseline). (Note that the actual reductions will be more, since the attainment level of emissions must also account for additional control to offset emissions growth from 1990 to the attainment year.) It is well known that Atlanta is NOx limited, and therefore relies mainly on a NOx control strategy (see, e.g., Attachment 6, p. 69) . The nonattainment area depends heavily on emission reductions from NOx sources outside the nonattainment area. Therefore, it is unlikely that even as large a possible reduction as indicated here would advance the attainment date.

d. In identifying sources to make up the shortfall identified as needed for attainment, GA has identified more NOx and VOC reductions( i.e., 41 tpd NOx and 27 tpd VOC) than required in the shortfall calculations (i.e., 36 tpd NOx and 21 tpd VOC). Thus, there will be additional VOC reductions that will occur even without consideration of RACM.

e. In applying for a fuel waiver for its additional lower sulfur gasoline, Georgia performed its own analysis of why a number of controls were not considered for implementation. A copy of that analysis appears as Attachment 3 (available only in docket for Atlanta area). That analysis also support a conclusion that further controls are not considered reasonably available.

**TABLE A**
**RACM ANALYSIS–STATIONARY SOURCES–ESTIMATED ADDITIONAL EMISSION REDUCTIONS POSSIBLE**

| | Emission reductions (tons VOC/day) | |
|---|---|---|
| AREA | Col 1 | Col 2 |
| Western MA (Springfield) | 16.82 | 8.4 |
| Greater CT | 59.43 | 29.7 |
| Metro Washington (DC, VA, MD) | 24.22 | 12.1 |
| Atlanta GA | 55.15 | 27.6 |

| | Emission reductions (tons NOx/day) | |
|---|---|---|
| AREA | Col 1 | Col 2 |
| Western MA (Springfield) | 8.97 | 4.5 |
| Greater CT | 24.63 | 12.3 |
| Metro Washington (DC, VA, MD) | 26.41 | 113.2 |
| Atlanta GA | 33.39 | 16.7 |

| | |
|---|---|
| Col 1 | 2007 emissions possible for control – Tables 6 and 7 from Attachment 2 |
| Col 2 | emissions control if 50% control assumed for these categories |

1,841,617,046.4

**TABLE B-- RACM ANALYSIS–STATIONARY SOURCES**
**COMPARISON OF POSSIBLE REDUCTIONS TO REDUCTIONS NEEDED FOR ATTAINMENT**

| | Emission reductions (tons VOC/day) | | | | |
|---|---|---|---|---|---|
| AREA | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 |
| Western MA (Springfield) | 62 | 0 | 62 | 8.4 | 13.6 |
| Greater CT | 176 | 0 | 176 | 29.7 | 16.9 |
| Metro Washington (DC, VA, MD) | 167 | 0 | 167 | 12.1 | 7.3 |
| Atlanta GA | 310 | 21 | 331 | 27.6 | 8.3 |
| | Emission reductions (tons NOx/day) | | | | |
| AREA | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 |
| Western MA (Springfield) | 44 | 0 | 44 | 4.5 | 10.2 |
| Greater CT | 158 | 0 | 158 | 12.3 | 7.8 |
| Metro Washington (DC, VA, MD) | 191 | 0 | 191 | 13.2 | 7.9 |
| Atlanta GA | 120 | 36 | 156 | 16.7 | 10.7 |

| | |
|---|---|
| Col 1 | Attainment year reductions from original attainment demonstration (reductions at the attainment year from 1990) (from material accompanying Administrator's briefing 12/99; located at http://www.epa.gov/ttn/oarpg/t1/fr_notices/citiex.pdf). Note that since these reductions are from a 1990 base, all emissions growth between 1990 and the attainment year would also have to be offset by control to provide an attainment level of emissions, so these reductions do not account for all that additional emission reductions needed to offset growth.<br>Note: The VOC and NOx emissions needed for attainment for Greater Connecticut was revised by the State of Connecticut. Connecticut submitted revised 2007 transportation conformity budgets in February 2000, and this changed both the on-road estimates for 2007 and the emission reductions necessary for attainment. The revisions are reflected in this table. Table C below provides the derivation of the revised numbers.<br>Note: The NOx emission reductions needed for attainment for Western Massachusetts have been updated based on information provided by the EPA Region I office and differ from the amounts in the 12/99 briefing material.<br>Note: The VOC and NOx emission reductions needed for attainment for Atlanta have been updated based on information provided by the EPA Region IV office and differ from the amounts in the 12/99 briefing material. (see Attachment 5–available only in docket for Atlanta SIP). |
| Col 2 | Additional shortfall needed identified by EPA or State (from material accompanying Administrator's briefing 12/99; located at http://www.epa.gov/ttn/oarpg/t1/fr_notices/citiex.pdf) |
| Col 3 | Total reductions needed for attainment (Col 1 + Col 2) |

| | |
|---|---|
| Col 4 | Additional reductions that might be obtained from stationary source measures under possible RACM rules (from Col. 2 of Table A) |
| Col 5 | Percent difference (Col 3 ÷ Col 4) * 100% |

**TABLE C**
**Emissions Summary for 1-Hour Ozone Attainment Demonstrations (tons per day)**
**September 27, 2000**

| Nonattainment Area (attainment year or attainment year requested) | | 1990 Emissions | | Attainment Year Emissions | | Emission Reductions[1] (This does not include "shortfall") | |
|---|---|---|---|---|---|---|---|
| | | VOC | NOx | VOC | NOx | VOC | NOx |
| Greater Connecticut (2007) | Total: | 417 | 354 | 241 | 196 | 176 | 158 |
| | Point: | 34 | 87 | 17 | 48 | 17 | 39 |
| | Area: | 178 | 8 | 148 | 9 | 30 | -1 |
| | On-road: | 127 | 176 | 30 | 77 | 97 | 99 |
| | Non-road: | 78 | 83 | 46 | 62 | 32 | 21 |

[1] These are differences in the nonattainment area total emissions (1990 emissions minus attainment year emissions). Some States are getting additional emission reductions outside the nonattainment area. These additional reductions are not reflected in the table.

**ATTACHMENT 1–MOBILE SOURCE ANALYSIS**

**Table 1. Attainment Year Emissions and Vehicle Miles Traveled (VMT)**

| **Nonattainment Area** (attainment year or requested attainment year) | **Mobile Source Category** | **Attainment Year Emissions** | **Emissions from Light-Duty Vehicles** (VOC = 80%) (Nox = 70%) | **Attainment Year Daily VMT** | **Daily Tons per Mile** (from Light-Duty Vehicles) |
|---|---|---|---|---|---|
| **Atlanta, GA** | | | | 132,000,000 | |
| (2003) | On-road VOC | 132 TPD | 106 TPD | | .0000008 |
| | On-road NOx | 224 TPD | 157 TPD | | .0000012 |
| | | | | | |
| **Greater Connecticut** | | | | 75,590,000 | |
| (2007) | On-road VOC | 31 TPD | 24 TPD | | .0000003 |
| | On-road NOx | 91 TPD | 51 TPD | | .0000007 |
| | | | | | |
| **Springfield, MA (Western MA)** | | | | | |
| (2003) | On-road VOC | 24 TPD | 19 TPD | 23,570,000 | .0000008 |
| | On-road NOx | 49 TPD | 34 TPD | | .0000014 |
| | | | | | |
| **Washington, DC-MD-VA** | | | | 133,300,000 | |
| (2005) | On-road VOC | 105 TPD | 84 TPD | | .0000006 |
| | On-road NOx | 178 TPD | 125 TPD | | .0000009 |

**Table 2. Atlanta, GA - Potential Emission Reductions from Transportation Control Measures (TCMs)**

| TCM Category | Regional VMT Reduction<br>(% Range) | Regional Daily<br>VMT Reduced | Emissions Reduced<br>(Tons per Day) |
|---|---|---|---|
| <u>Employer-based TDM</u><br>-Van/Car Pools<br>-Mid-day Shuttles<br>-Parking Cash-Out<br>-Guaranteed Ride Home<br>-Transit Subsidy<br>-Telecommuting | 0.2 - 3.5 | 264,000 - 4,620,000 | VOC: 0.211 - 3.696<br><br>NOx: 0.317 - 5.544 |
| <u>Area-Wide Rideshare</u><br>-Park and Ride<br>-Ride Matching<br>-Transportation Management Assoc.<br>-Van-Pool Subsidy/Insurance | 0.1 - 0.2 | 132,000 - 264,000 | VOC: 0.106 - 0.211<br><br>NOx: 0.158 - 0.317 |
| <u>Parking Management</u><br>-Preferential Parking for HOV<br>-Parking Pricing<br>-Zoning Requirements<br>-Commercial Vehicle Management | 0.5 - 4.2 | 660,000 - 5,544,000 | VOC: 0.528 - 4.435<br><br>NOx: 0.792 - 6.653 |
| <u>Bicycle/Pedestrian Programs</u><br>-Designated Lanes/Routes<br>-Safety Enhancements<br>-Transit Support Facilities | < 0.1 | < 132,000 | VOC: < 0.106<br><br>NOx: < 0.158 |

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Improved Public Transit<br>-Express Bus<br>-Paratransit<br>-Shuttle Circulators<br>-Coordinated Fare | 0.5 - 3.0 | 660,000 - 3,960,000 | VOC: 0.528 - 3.168<br>NOx: 0.792 - 4.752 |
| Activity Centers<br>-Multi-modal Transfer Centers<br>-Remote Parking<br>-Incident/Congestion Response | 0.1 - 0.2 | 132,000 - 264,000 | VOC: 0.106 - 0.211<br>NOx: 0.158 - 0.317 |
| Smart Growth<br>-Infill Development<br>-Transit Oriented Development<br>-Mixed-Use Development | 0.1 - 8.8 | 132,000 - 11,616,000 | VOC: 0.106 - 9.293<br>NOx: 0.158 - 13.939 |
| | | **Total** | **VOC: 1.638 - 21.12**<br>**NOx: 2.454 - 31.680** |

**Table 3. Greater Connecticut - Potential Emission Reductions from Transportation Control Measures (TCMs)**

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Employer-based TDM<br>-Van/Car Pools<br>-Mid-day Shuttles<br>-Parking Cash-Out<br>-Guaranteed Ride Home<br>-Transit Subsidy<br>-Telecommuting | 0.2 - 3.5 | 151,000 - 2,646,000 | VOC: 0.045 - 0.794<br><br>NOx: 0.106 - 1.852 |
| Area-Wide Rideshare<br>-Park and Ride<br>-Ride Matching<br>-Transportation Management Assoc.<br>-Van-Pool Subsidy/Insurance | 0.1 - 0.2 | 76,000 - 151,000 | VOC: 0.023 - 0.045<br><br>NOx: 0.053 - 0.106 |
| Parking Management<br>-Preferential Parking for HOV<br>-Parking Pricing<br>-Zoning Requirements<br>-Commercial Vehicle Management | 0.5 - 4.2 | 378,000 - 3,175,000 | VOC: 0.113 - 0.953<br><br>NOx: 0.265 - 2.223 |
| Bicycle/Pedestrian Programs<br>-Designated Lanes/Routes<br>-Safety Enhancements<br>-Transit Support Facilities | < 0.1 | < 76,000 | VOC: < 0.023<br><br>NOx: < 0.053 |

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Improved Public Transit<br>-Express Bus<br>-Paratransit<br>-Shuttle Circulators<br>-Coordinated Fare | 0.5 - 3.0 | 378,000 - 2,268,000 | VOC: 0.113 - 0.680<br><br>NOx: 0.265 - 1.588 |
| Activity Centers<br>-Multi-modal Transfer Centers<br>-Remote Parking<br>-Incident/Congestion Response | 0.1 - 0.2 | 76,000 - 151,000 | VOC: 0.023 - 0.045<br><br>NOx: 0.053 - 0.106 |
| Smart Growth<br>-Infill Development<br>-Transit Oriented Development<br>-Mixed-Use Development | 0.1 - 8.8 | 76,000 - 6,652,000 | VOC: 0.023 - 1.996<br><br>NOx: 0.053 - 4.205 |
| | | **Total** | **VOC: 0.352 - 4.536**<br><br>**Nox: 0.822 - 10.133** |

**Table 4. Springfield, MA (Western MA) -Potential Emission Reductions from Transportation Control Measures (TCMs)**

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Employer-based TDM<br>-Van/Car Pools<br>-Mid-day Shuttles<br>-Parking Cash-Out<br>-Guaranteed Ride Home<br>-Transit Subsidy<br>-Telecommuting | 0.2 - 3.5 | 47,000 - 825,000 | VOC: 0.038 - 0.660<br><br>NOx: 0.066 - 1.155 |
| Area-Wide Rideshare<br>-Park and Ride<br>-Ride Matching<br>-Transportation Management Assoc.<br>-Van-Pool Subsidy/Insurance | 0.1 - 0.2 | 24,000 - 47,000 | VOC: 0.019 - 0.038<br><br>NOx: 0.034 - 0.066 |
| Parking Management<br>-Preferential Parking for HOV<br>-Parking Pricing<br>-Zoning Requirements<br>-Commercial Vehicle Management | 0.5 - 4.2 | 118,000 - 990,000 | VOC: 0.094 - 0.792<br><br>NOx: 0.165 - 1.386 |
| Bicycle/Pedestrian Programs<br>-Designated Lanes/Routes<br>-Safety Enhancements<br>-Transit Support Facilities | < 0.1 | < 24,000 | VOC: < 0.019<br><br>NOx: < 0.034 |

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Improved Public Transit<br>-Express Bus<br>-Paratransit<br>-Shuttle Circulators<br>-Coordinated Fare | 0.5 - 3.0 | 118,000 - 707,000 | VOC: 0.094 - 0.566<br>NOx: 0.165 - 0.990 |
| Activity Centers<br>-Multi-modal Transfer Centers<br>-Remote Parking<br>-Incident/Congestion Response | 0.1 - 0.2 | 24,000 - 47,000 | VOC: 0.019 - 0.038<br>NOx: 0.034 - 0.066 |
| Smart Growth<br>-Infill Development<br>-Transit Oriented Development<br>-Mixed-Use Development | 0.1 - 8.8 | 24,000 - 2,074,000 | VOC: 0.019 - 1.659<br>NOx: 0.034 - 2.904 |
| | | **Total** | **VOC: 0.293 - 3.772**<br>**NOx: 0.515 - 6.601** |

**Table 5. Washington, DC-MD-VA - Potential Emission Reductions from Transportation Control Measures (TCMs)**

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Employer-based TDM<br>-Van/Car Pools<br>-Mid-day Shuttles<br>-Parking Cash-Out<br>-Guaranteed Ride Home<br>-Transit Subsidy<br>-Telecommuting | 0.2 - 3.5 | 267,000 - 4,666,000 | VOC: 0.160 - 2.800<br><br>NOx: 0.240 - 4.199 |
| Area-Wide Rideshare<br>-Park and Ride<br>-Ride Matching<br>-Transportation Management Assoc.<br>-Van-Pool Subsidy/Insurance | 0.1 - 0.2 | 133,000 - 267,000 | VOC: 0.080 - 0.160<br><br>NOx: 0.120 - 0.240 |
| Parking Management<br>-Preferential Parking for HOV<br>-Parking Pricing<br>-Zoning Requirements<br>-Commercial Vehicle Management | 0.5 - 4.2 | 667,000 - 5,599,000 | VOC: 0.400 - 3.359<br><br>NOx: 0.600 - 5.039 |
| Bicycle/Pedestrian Programs<br>-Designated Lanes/Routes<br>-Safety Enhancements<br>-Transit Support Facilities | < 0.1 | < 133,000 | VOC: < 0.080<br><br>NOx: < 0.120 |

| TCM Category | Regional VMT Reduction (% Range) | Regional Daily VMT Reduced | Emissions Reduced (Tons per Day) |
|---|---|---|---|
| Improved Public Transit<br>-Express Bus<br>-Paratransit<br>-Shuttle Circulators<br>-Coordinated Fare | 0.5 - 3.0 | 667,000 - 3,999,000 | VOC: 0.400 - 2.399<br><br>NOx: 0.600 - 3.599 |
| Activity Centers<br>-Multi-modal Transfer Centers<br>-Remote Parking<br>-Incident/Congestion Response | 0.1 - 0.2 | 133,000 - 267,000 | VOC: 0.080 - 0.160<br><br>NOx: 0.120 - 0.240 |
| Smart Growth<br>-Infill Development<br>-Transit Oriented Development<br>-Mixed-Use Development | 0.1 - 8.8 | 133,000 - 11,730,000 | VOC: 0.080 - 7.038<br><br>Nox: 0.120 - 10.557 |
| | | **Total** | **VOC: 1.240 - 15.996**<br><br>**NOx: 1.860 - 23.994** |

**Table 6. Comparison of Potential TCM Emission Reductions to Emission Reductions Needed for Attainment**

| Nonattainment Area | Reductions Needed for Attainment (TPD) | Potential Reductions from TCMs (TPD) | TCM reductions as a Percent of Total Reductions Needed |
|---|---|---|---|
| **Atlanta, GA** | VOC - 331<br>NOx - 156 | VOC - 11.38<br>NOx - 17.07 | VOC - 3.4%<br>NOx - 11% |
| **Greater Connecticut** | VOC - 176<br>NOx - 158 | VOC - 2.21<br>NOx - 5.48 | VOC - 1.3%<br>NOx - 3.5% |
| **Springfield, MA (Western MA)** | VOC - 62<br>NOx - 44 | VOC - 2.03<br>NOx - 3.56 | VOC - 3.3%<br>NOx - 8.1% |
| **Washington, DC-MD-VA** | VOC - 167<br>NOx - 191 | VOC - 8.62<br>NOx - 12.93 | VOC - 5.2%<br>NOx - 6.8% |

**ATTACHMENT 2**
**STATIONARY SOURCE ANALYSIS**

September 14, 2000

This attachment contains the results of an analysis of pollutant emissions and control measures for the Atlanta, Georgia; Greater Connecticut; Springfield, Massachusetts; and Washington, DC serious ozone nonattainment areas.

The purpose of this analysis is to evaluate ozone season oxides of nitrogen ($NO_x$) and volatile organic compounds (VOC) emission levels and their relationships to the application of current and anticipated control measures expected to be implemented in each of these four areas. This analysis was performed to provide EPA with data to support their determination if additional Reasonably Available Control Measures (RACM) are available in these areas after adoption of the control measures required by the Clean Air Act (CAA) or proposed in State Implementation Plans (SIPs).

The 2007 emission estimates used in this analysis were developed by E.H. Pechan & Associates, Inc. (Pechan) under a contract for EPA to support the Tier 2 motor vehicle rulemaking. These national inventories contain emission estimates for electricity generating units (EGUs), on-road mobile, non-EGU point, stationary area, and nonroad sources. The 2007 projection year inventory was prepared by applying growth and control assumptions to the 1996 National Emissions Trends (NET) base year inventory. For all the non-EGU point source and stationary area sectors, emissions growth was estimated utilizing Bureau of Economic Analysis Gross Product growth factors at the State level by 2-digit Standard Industrial Classification code. Controls assumptions included implementation of all federal CAA required programs as applicable including: Title III Maximum Achievable Control Technology (MACT), Title I Reasonably Available Control Technology (RACT), and Control Technique Guidelines (CTG). Controls for the Tier 2 motor vehicle standards and the $NO_x$

SIP Call are also included in the 2007 emission estimates. The details of the development of the emission inventories (including growth and control assumptions) are provided in *Procedures for Developing Base Year and Future Year Mass and Modeling Inventories for the Tier 2 Final Rulemaking, E.H. Pechan & Associates, Inc., September 1999*.

In essence, the analysis provides an assessment of the source categories that are not controlled in each area by 2007, either through adoption of the control measures required by the CAA or through those proposed in the SIPs. The emission source categories evaluated in this study include all categories **except** electric generating units (EGU), point source combustion, on-road mobile, nonroad, and biogenics sources (i.e., the analysis focuses on stationary area sources and non-combustion point sources only). The analysis considers only 2007 ozone season daily $NO_x$ and VOC emission estimates since these pollutants are the main precursors of ozone. Note that 2007 is not the proposed attainment date for the four areas and the $NO_x$ and VOC emission estimates utilized for this analysis do not match the post-control emission inventories provided in the State submitted SIPs for each area.

Table 1 provides a listing of the stationary area source and non-combustion point source categories that were determined to have either CAA or SIPs control requirements by 2007. Control measures are required in these categories in severe ozone nonattainment areas through federal rules, MACT, RACT, CTG, and anticipated SIP requirements. In most cases, the controlled categories were defined at the tier1+tier2+tier3 level. Where necessary and/or possible, control categories were defined at the SCC and/or nonattainment area level.

The results are presented in nine summary tables. Tables 2 through 5 present Tier 3 emission summaries for ozone season daily tons of $NO_x$ and VOC for each of the four areas. The columns labeled "1996 " provide emission estimates from the 1996 National Emissions Trends Inventory (NET) developed by EFIG. The columns labeled "2007 " provide 2007 emission estimates that include emissions from ALL sectors. The columns labeled "2007 Sectors" include ONLY emissions from the source sectors under consideration in this analysis (all except: EGU, combustion non-EGU, on-road mobile, nonroad, and biogenic). The columns labeled "2007 Uncontrolled" include emissions from the source sectors that are under consideration in this analysis AND are not listed as controlled in the "2007 " summaries (see Pechan 1999 above for details of the controls included in the 2007 emission inventory).

The columns labeled "2007 % Remaining " show the percentage of VOC and $NO_x$ emissions that remain in uncontrolled categories. For example, the two right most columns in Table 2 shows that in the Atlanta ozone nonattainment area 19% of VOC and 10% of $NO_x$ are emitted from source categories that are expected to be uncontrolled in 2007. Similar results are found in the Greater Connecticut and the Springfield Massachusetts nonattainment areas (about 20% VOC and 10% $NO_x$ remaining). The Washington, DC nonattainment area shows that in total 8% of VOC and 7% of $NO_x$ are expected to be remaining. The largest uncontrolled VOC category in all areas is solvent utilization surface coating.

Tables 6 and 7 list the Tier 3 categories and emissions in each area that account for 80% of the uncontrolled VOC and $NO_x$ emissions, respectively. Tables 8 and 9 provide emissions by source classification code (SCC) for the Tier 3 categories shown in Table 6 and 7 (i.e., source categories in each area that account for 80% of the uncontrolled emissions).

Tables 10 through 17 provide the detailed VOC and $NO_x$ emission estimates for the "2007 Uncontrolled" sources listed in Table 6 and 7. These tables provide point source level details and include sector type (stationary area or point source), state codes, county codes, plant names, plant and point id's, SCC, and SCC descriptions. Tables 10 through 13 provide this information for VOC for Atlanta, Georgia; Greater Connecticut; Springfield, Massachusetts; and Washington DC, respectively. Tables 14 through 17 provide the detailed information for $NO_x$ for the same four areas.

[The tables cited above are found in separate Excel spreadsheet file; name: result_tables.xls]

**ATTACHMENT 3**
**GEORGIA ANALYSIS OF ADDITIONAL MEASURES IN SUPPORT OF GASOLINE FUEL WAIVER.**

(available electronically in separate file: RACMatt3.pdf )

## ATTACHMENT 4
## MODEL SENSITIVITY STUDY FOR METROPOLITAN WASHINGTON AREA

(available only in docket for Metropolitan Washington Area)

A. Washington Area Ozone Sensitivity Modeling

The air quality modeling using the Urban Airshed Model (UAM-IV) was submitted with the attainment demonstration that included modeling of the post-1996 plan and sensitivity runs that looked at the air quality effects of reductions beyond the post-1996 plan.

Several scenarios were developed. The base case "base bs2A2b" effectively modeled the post-1996 plan with OTAG Run I boundary conditions. The sensitively run S1A2b furthered reduce NOx emissions from point sources by 60%. In addition to a 60% reduction in NOx point source emissions in case S1A2B, case S2A2b reduced NOx emissions from mobile and area sources by 30%. Case S3A2b contains the emission reductions in case S1A2b plus an additional 30% reduction in both area and mobile sources. Because point source VOC emissions are so small (less than 4% of the manmade emissions) in the Metropolitan Washington, DC area , the UAM model would not be expected to respond to even a 100% reduction. Therefore, no sensitivity modeling was performed for point source VOC emissions. The results of the sensitivity modeling are located in Tables 7-2 through 7-4 starting on page 25 in appendix C of the April 10, 1998 attainment plan submittal entitled **State Implementation Plan (SIP) Revision, Phase II Attainment Plan for the Washington DC-MD-VA Nonattainment Area --Appendices**.

B. Analysis

Table 1 below provides a summary of the modeling results and effects of the sensitivity run case reductions on the inventory. The modeling results include the peak ozone concentrations and grid cells over 125 ppb in the Washington, DC sub-domain. For each episode day the following are calculated:

The peak ozone decrease in ppb.

The decrease in NOx or VOC emissions in tons per day.

The response of ozone concentrations to reductions, the "ozone response", in ppb per ton reduced. This is the total peak ozone decrease divided by the reductions modeled.

For sensitivity case S1A2b (60% reduction in point source NOx emissions from the base case) the "ozone response" is calculated versus the change in ozone relative to the base case bs2A2b.

For sensitivity case S2A2b (S1A2b plus an additional 30% NOx reduction from base bs2A2b in mobile non-road and on-road and area sources) two response factors are calculated: One is relative to the inventory and ozone predictions of sensitivity case S1A2b. the second is relative to the inventory and change in ozone relative to the base case bs2A2b. The latter "Ozone response" considers the combined effects of the additional 60% reduction in NOx emissions from point sources and an additional 30% reduction in NOx from area and mobile sources.

For sensitivity case S3A2b (S1A2b plus an additional 30% VOC reduction from the base case in both area and mobile emissions) reduction the response is calculated versus the change in ozone relative to the sensitivity case S1A2b (additional 60% reduction of NOx from point sources from the base case).

C. Results

The results are as follows:

Sensitivity case S1A2b (additional 60% reduction of NOx from point sources) shows a slight "ozone response" relative to the base case bs2A2b in the range of 0.013 to 0.056 ppb per ton of NOx reduced. The number of cells over 125 ppb increased or decreased slightly depending upon the episode day.

Sensitivity case S2A2b (case S1A2b plus additional 30% reduction of mobile and area NOx sources )results in an a "ozone response" relative to the case S1A2b in the range of 0.083 to 0.120 ppb per ton of NOx reduced. The number of cells over 125 ppb decreased dramatically on all episode days. Considering the effects of the overall NOX reductions (60% from point sources and 30% from other sources) represented in case S2A2b, the "ozone response" is lower ranging from 0.048 to 0.088 ppb per ton reduced due to the effect of less effective point source emission reductions.

Sensitivity case S3A2b (case S1A2b plus additional 30% reduction of mobile and area VOC sources NOx from point sources) results in an a "ozone response" relative to the case S1A2b in the range of 0.021 to 0.029 ppb per ton of VOC reduced. The number of cells over 125 ppb decreased on all episode days. The lack of modeling of just VOC emission reductions of from mobile and area sources of 30% from the base case bs2A2b without the additional 60% reduction from NOx point sources by is a drawback. However, because the response to reductions from NOx point sources is relatively small, the response to just VOC reductions of 30% from the base case bs2A2b would probably be similar.

E. Conclusions

Thus, for the Washington, DC area, the modeling indicates that NOx emission reductions are generally more beneficial in reducing ozone concentrations, suggesting that the area my be NOx limited.

When the maximum ozone response for VOC controls (.029 ppb/ton VOC) is applied to the potential additional VOC emission reductions in the D.C. area due to RACM (10.2 % or approximately 17 tons/day), the result is an ozone benefit of only .49 ppb.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Table 1: Summary of Sensistiveity Model Runs and Analysis** | | | | | | | | |
| A. | Modeling Inventory Attainment Plan | | | | | | | |
| | | VOC | NOx | | | | | |
| | Point | 12.6 | 174 | | | | | |
| | Area | 152.3 | 53.3 | | | | | |
| | non-road | 70.4 | 92.3 | | | | | |
| | On-Road | 123.5 | 205 | | | | | |
| | | 358.8 | 524.6 | | | | | |
| | | | | | | | | |
| | Modeling Results (Base bs2A2b) | | | | Episode 3 | | Episode 3b | |
| | | | | | July 19, 1991 | July 20, 1991 | July 16, 1991 | |
| | | | | Peak Value | 138.82 | 178.49 | 150.07 | ppb |
| | | | | Cells over 125 ppb | 59 | 365 | 237 | |
| | **Results of sensitivity runs** | | | | | | | |
| B. | S1A2b Additional 60% reduction from base bs2A2b in NOx point sources | | | | | | | |
| | | VOC | NOx | | | | | |
| | Point | 12.60 | 69.60 | Modeled Peak Value | 137.44 | 172.69 | 148.67 | ppb |
| | Area | 152.30 | 53.30 | Cells over 125 ppb | 52 | 361 | 241 | |
| | non-road | 70.40 | 92.30 | Ozone decrease | 1.38 | 5.80 | 1.40 | ppb |
| | On-Road | 123.50 | 205.00 | Reductions | 104.4 | 104.4 | 104.4 | tons NOx |
| | | 358.80 | 420.20 | Ozone response | 0.013 | 0.056 | 0.013 | ppb/ton versus Base bs2A2b |
| | | | | | | | | |
| C. | S2A2b (S1A2b plus an additional 30% NOx reduction from base bs2A2b in mobile (non-road and on-road) and area sources) | | | | | | | |
| | 1. Relative to sensitivity run S1A2b | | | | | | | |
| | | VOC | NOx | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Point | 12.60 | 69.60 | Modeled Peak Value | 125.32 | 160.08 | 139.93 | ppb |
| | Area | 152.30 | 37.31 | Cells over 125 ppb | 1 | 216 | 127 | |
| | non-road | 70.40 | 64.61 | Ozone decrease | 13.50 | 18.41 | 10.14 | ppb |
| | On-Road | 123.50 | 143.50 | Reductions | 105.18 | 105.18 | 105.18 | tons NOx |
| | | 358.80 | 315.02 | Ozone response | 0.115 | 0.120 | 0.083 | ppb/ton of NOx versus S1A2b |
| | | | | | | | | |
| | 2. Relative to base bs2A2b | | | | | | | |
| | | VOC | NOx | | | | | |
| | Point | 12.60 | 69.60 | Modeled Peak Value | 125.32 | 160.08 | 139.93 | |
| | Area | 152.30 | 37.31 | Cells over 125 ppb | 1 | 216 | 127 | |
| | non-road | 70.40 | 64.61 | Ozone decrease | 13.50 | 18.41 | 10.14 | |
| | On-Road | 123.50 | 143.50 | Reductions | 209.58 | 209.58 | 209.58 | |
| | | 358.80 | 315.02 | Ozone response | 0.064 | 0.088 | 0.048 | ppb/ton versus Base bs2A2b |
| | | | | | | | | |
| D. | S3A2B( S1A2b plus an additional 30% VOC reduction from base bs2A2b in mobile (non-road and on-road) and area sources | | | | | | | |
| | | VOC | NOx | | | | | |
| | Point | 12.60 | 69.60 | Modeled Peak Value | 135.3 | 170.51 | 145.62 | ppb |
| | Area | 106.61 | 53.30 | Cells over 125 ppb | 42 | 347 | 189 | |
| | non-road | 49.28 | 92.30 | Ozone decrease | 2.14 | 2.18 | 3.05 | ppb |
| | On-Road | 86.45 | 205.00 | Reductions | 103.86 | 103.86 | 103.86 | tons VOC |
| | | 254.94 | 420.20 | Ozone response | 0.021 | 0.021 | 0.029 | ppb/ton of VOC versus S1A2b |
| | | | | | | | | |

**ATTACHMENT 5**

## RECALCULATION OF EMISSION REDUCTIONS NEEDED FOR ATTAINMENT FOR ATLANTA

(available electronically in separate file: RACMatt5.pdf )

**ATTACHMENT 6**
**SOUTHERN OXIDANTS STUDY**
**1993 DATA ANALYSIS WORKSHOP REPORT**
**(excerpt)**
(available electronically in separate file: RACMatt6.pdf )