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PLAN TO IMPROVE AIR QUALITY IN THE WASHINGTON, DC-MD-VA REGION

State Implementation Plan (SIP)
"Severe Area SIP"

Demonstrating Rate of Progress for 2002 and 2005;
Revision to 1990 Base Year Emissions; and
Severe Area Attainment Demonstration
for the
WASHINGTON DC-MD-VA
NONATTAINMENT AREA

Prepared by:

Metropolitan Washington Council of Governments

for the
District of Columbia Department of Health

Maryland Department of the Environment
and the
Virginia Department of Environmental Quality

on behalf of the Metropolitan Washington Air Quality Committee

June 2, 2003

6/3/03

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EXECUTIVE SUMMARY

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1.0 EXECUTIVE SUMMARY

The Clean Air Act Amendments of 1990 (CAAA or Act) represent an unprecedented commitment to protecting public health and the environment. Title I of the Act classifies areas that exceed national health-based air quality standards based upon the severity of their pollution problem (marginal, moderate, serious, severe, and extreme) and, accordingly, prescribes increasingly stringent measures that must be implemented and sets new deadlines for achieving the standards. The Act also establishes specific emissions reduction requirements to ensure that continual progress toward attainment is made.

High levels of ozone are a health problem. When it is breathed into the lungs, ozone reacts with lung tissue. It can harm breathing passages, decrease the lungs' working ability and cause coughing and chest pains; eye and throat irritation; breathing difficulties even for healthy individuals, but especially for those with respiratory problems such as allergies, asthma, bronchitis and emphysema; and greater susceptibility to respiratory infection.

Not only does ozone pose a threat to human health, but also it poses a threat to the health of natural ecosystems. Scientific evidence suggests that air pollution weakens the immune systems of many types of vegetation and can cause significant crop damage. In addition, rain and snow wash air pollution deposited on vegetation and architectural surfaces into the streams and rivers of the region and finally into the Chesapeake Bay.

This document, the Severe Area Attainment Plan for the Metropolitan Washington Nonattainment Area, is a plan to improve air quality in the Washington region to meet the national air quality standard for ozone (one-hour ozone standard). The Plan consists of two Rate of Progress demonstrations, for the period 1999-2002 and for the 2002-2005; and an attainment demonstration for 2005.

Additionally, the plan includes commitments by the states to meet requirements for severe nonattainment areas, commitments by the states to meet additional EPA requirements for the Washington region including a contingency plan for 1999 rate of progress, contingency plans for the 2002 and 2005 rates of progress, and an analysis of Reasonably Available Control Measures. The plan presents revised emissions inventories for 1990, 2002 and 2005 based on the MOBILE6 mobile emissions model, the revised travel demand model Version 2, and includes technical corrections to the inventories.[i]

The Severe Area Attainment Plan is intended to show the progress being made to improve air quality in the Washington nonattainment area and the efforts underway to assure that all necessary steps are taken to reach the federal health standard for ground-level ozone by 2005. The plan has been prepared by the Metropolitan Washington Air Quality Committee to comply with the Clean Air Act Amendments of 1990 and with EPA requirements for the Washington region as stated in EPA's reclassification of the Washington region (January 2003) and in EPA's conditional approval of the Metropolitan Washington region's State Implementation Plan (April 2003).

TABLE A
SUMMARY OF CONTROL STRATEGIES
VOC and NOx Benefits of Control Measures
(1990-2005)

Ref No.	Control Measure	VOC Reductions tons/day 2002	VOC Reductions tons/day 2005	NOx Reductions tons/day 2002	NOx Reductions tons/day 2005
POINT SOURCE MEASURES					
7.2.5	Non-CTG VOC RACT to 25 tpy	1.2	1.2	0	0
7.2.9	State NOx RACT and Regional NOx Transport Requirement	0	0	203.8	280.0
7.4.7	Expanded State Point Source Regulations to 25 tons/yr	1.7	1.8	0	0
SUBTOTAL		**2.9**	**3.0**	**203.8**	**280.0**
AREA SOURCE MEASURES					
7.2.2	Stage II Vapor Recovery Nozzles	15.1	15.0	0	0
7.2.6	Phase II Gasoline Volatility Controls	2.6	2.3	0	0
7.3.1	Reformulated Surface Coatings	16.4	17.1	0	0
7.3.2	Reformulated Consumer Products	4.0	4.1	0	0
7.3.4	Reformulated Industrial Cleaning Solvents	1.2	1.2	0	0
7.3.5	Standards for Locomotive	0.01	0.02	2.7	2.9
7.4.3	Surface Cleaning/Degreasing for Machinery/Automotive Repair	4.1	4.4	0	0
7.4.4	Landfill Regulations	2.3	2.5		
7.4.5	Seasonal Open Burning Restrictions	7.1	7.1	1.5	1.5
7.4.6	Stage I Expansion (Tank Truck Unloading)	1.5	1.6		
7.4.8	Graphic Arts Controls	3.7	3.9		
7.4.9	Auto body Refinishing	9.3	9.8		
7.4.10	Ozone Transport Commission (OTC) Consumer Products	1.1	1.1		
7.4.11	Ozone Transport Commission (OTC) Portable Fuel	2.3	2.3		
7.4.12	Ozone Transport Commission (OTC) Architectural and Industrial Maintenance Coatings Rule	12.3	12.3		
7.4.13	Ozone Transport Commission (OTC) Mobile Repair and Refinishing Rule	2.6	2.6		
7.4.14	Ozone Transport Commission (OTC) Solvent Cleaning Operations Rule	11.7	11.7		
7.4.15	Additional Area Source Measures	≥0.0	≥0.0		
SUBTOTAL		**[3]97.3**	**[3]99.0**	**4.2**	**4.4**
ON-ROAD MEASURES					
7.2.1	High-Tech Inspection/Maintenance				
7.4.1	Reformulated Gasoline (on-road)				
7.2.3	Federal “Tier I” Vehicle Standards and New Car Evaporative Standards				
7.2.4	Tier 2 Motor Vehicle Emission Standards				
7.3.3	National Low Emission Vehicle Program				
7.3.6	Heavy-duty Diesel Engine Rule				
7.5	Transportation Control Measures	0.3	0.3	0.7	0.7
SUBTOTAL		**55.6**	**80.0**	**46.0**	**85.0**

NON-ROAD MEASURES					
7.2.7	EPA Non-Road Gasoline Engines Rule	21.9	25.9	0	0
7.2.8	EPA Non-Road Diesel Engines Rule	0	0	0	0
7.2.10	Emissions standards for spark ignition marine engines	1.2	3.0	14.8	21.8
7.2.11	Emissions standards for large spark ignition engines	0	0.7	0	0
7.4.2	Reformulated Gasoline (off-road)	2.7	2.8	0	0.4
SUBTOTAL		**25.8**	**32.4**	**14.8**	**22.2**
TOTAL REDUCTIONS		**[3] 181.6**	**214.4**	**268.8**	**391.6**

In 1990 the Environmental Protection Agency (EPA) classified the Metropolitan Washington region as "serious" for ozone nonattainment and required the region to submit to the U.S. Environmental Protection Agency (EPA) revisions to the State Implementation Plans (SIPs) demonstrating how emissions that contribute to the formation of ozone will be reduced by 15% from 1990-1996 and by 3% per year until the area reaches attainment of the standards. The attainment date for the Washington region was November 15, 1999. The Washington region was also required to submit a demonstration, based upon an urban air quality model, to show that ozone concentrations would be reduced to levels below the federal standard by 1999.

The region did not meet the Clean Air Act Amendments deadline of November 15, 1999. Analysis suggests this was due to transported pollution from outside the region. The region's photochemical modeling results demonstrated the effect of transported pollution, which contributed from 20-30% of the pollution on the worst days of summer. EPA issued guidance in 1997 dealing with transported pollution based on photochemical modeling of 23-state region including the northeast, mid-Atlantic and Midwestern states conducted through the Ozone Transport Assessment Group. In January 2001 EPA granted the Washington region an extension of its attainment deadline to November 2005. On July 2, 2002, The U.S. Circuit Court of Appeals for the District of Columbia vacated EPA's extension and remanded the action to EPA in a ruling in *Sierra Club v. EPA*. The Court decided that EPA had a non-discretionary duty under the Clean Air Act to reclassify the region when it failed to attain the standard in November 1999.

In January 2003 EPA reclassified the Washington, DC-MD-VA nonattainment area as a "severe" nonattainment area.[ii] As a severe nonattainment area for one-hour ozone National Ambient Air Quality Standard (NAAQS), the Washington region is required to meet the requirements defined in the Clean Air Act, Section 182 (d) and to attain the standard by November 15, 2005. April 17, 2003, EPA published a final rule to conditionally approve the Washington region's severe area SIP if the three states meet nine commitments to EPA.[iii] The commitments include adopting state regulations to meet CAA Section 182 (d) requirements for severe nonattainment areas and, in addition, to adopt a contingency plan for 1999 Rate of Progress, revise and submit an updated attainment demonstration that reflects revised MOBILE6-based motor vehicle emissions budgets, demonstrate 3 % per year rate of progress from 1999-2002 and from 2002-2005; adopt contingency measures for failure to make rate of progress in those periods, and submit an analysis of Reasonably Available Control Measures for the region.

The Severe Area Attainment Plan for the Washington nonattainment areas has been developed by the Metropolitan Washington Air Quality Committee (MWAQC) in cooperation with Maryland, Virginia and the District of Columbia. Table A identifies the Washington region's control measures to achieve the 18% additional emissions reduction, as required by the CAAA, which demonstrates steady progress in improving air quality by 2005.

Overall, the 2005 rate of progress plan for the Metropolitan Washington region may be summarized as follows:

- 280 tons per day of oxides of nitrogen (NOx) reductions and 3 tons per day of volatile organic compound (VOC) reductions through the regulation of point sources of pollution, such as factories and power plants;
- 99 tons per day of VOC reductions and 4.4 tons per day of NOx reductions from regulating area sources of pollution such as gasoline refueling, automobile repair, consumer products and printing operations;
- 80 tons per day of VOC reductions and 84.9 tons per day of NOx reductions from initiatives relating to cars and trucks, the "on-road" or "mobile" sources of pollution; and
- 32.4 tons per day of VOC reductions and 24.2 tons per day of NOx reductions from non-road sources such as lawn and garden equipment, heavy construction equipment and marine engines.

1.2 The Ozone Problem

Of the six major air pollutants for which ambient air quality standards have been established under the Clean Air Act, the pollutant that has posed the most prevalent and perplexing problem for the Washington metropolitan area, and for many other American urban areas, is ozone, a principal component of "smog."

Why has the ozone problem been so difficult to solve? First, ozone is not discharged directly. It is formed in, and downwind of, urban areas when sunlight and high temperatures cause complex photochemical reactions to occur between emissions of volatile organic compounds (VOCs) and emissions of oxides of nitrogen (NOx). A number of diverse sources emit these ozone precursors. Major sources of VOC emissions include, but are not limited to, gasoline storage facilities, bakeries, gasoline refueling stations, printing facilities, motor vehicles, lawnmowers, consumer products, and boats. In addition, many species of plants emit VOCs. Principal sources of NOx, which is produced by combustion, include motor vehicles, construction equipment, fossil fuel-fired power plants, and open burning.

Second, the ozone problem is further complicated by the fact that weather conditions play a major role in the formation of ozone and in the severity of the problem. Solar energy drives the reactions that create ozone. When a warm air mass stays in one spot, and winds are calm, smog may stay in place for several days at a time creating severe ozone conditions. While it is not always possible to predict weather conditions that create severe ozone problems, more severe and prolonged episodes can be forecast.

Third, scientists are only beginning to understand how weather conditions, topography, and ozone precursors interact to create ozone. Originally, ozone control strategies focused on reducing VOCs. However, new evidence shows that NOx control is also necessary and, in fact, achieving attainment of the standards may be impossible without it. The complexity of the reactions that cause ozone requires reliance upon computer models of ozone formation to guide the region to the correct mix of VOC and NOx controls.

Fourth, given that smog travels across county and state lines, the ozone problem is regional. Therefore, solving the problem requires considerable coordination and consensus building on the part of local and state governments to develop regional emission control strategies. On the East Coast, governments from Maine to Washington, D.C. and Virginia are required under the Act to form the Ozone Transport Commission (OTC) in order to develop ozone control strategies on a regional basis. The OTC has developed additional point source NOx standards and low-emissions vehicle standards, which are intended to reduce ozone levels from Virginia to Maine.

The Ozone Transport Assessment Group (OTAG) worked to quantify and reduce the amount of ozone and its precursors, which move from one state to the next within the 37 eastern states. The work of OTAG led EPA to issue proposed rules, which require many of the eastern states to reduce those pollution emissions most likely to contribute to ozone transport.

1.3 SIP Process

The Act requires states to develop and implement ozone reduction strategies in the form of a State Implementation Plan (SIP). The SIP is the state's "master plan" for attaining and maintaining the National Ambient Air Quality Standards (NAAQS).

Once the Administrator of the EPA approves a state plan, the plan is enforceable as a state law and as federal law under Section 113 of the Act. If the SIP is found to be inadequate in EPA's judgment to attain the NAAQS in all or any region of the state, and if the state fails to make the requisite amendments, under Section110(c)(1), the EPA Administrator may issue amendments to the SIP that are binding.

EPA is required to impose severe sanctions on the states under three circumstances: the state's failure to submit a SIP revision; on the finding of the inadequacy of the SIP to meet prescribed air quality requirements; and the state's failure to enforce the control strategies that are contained in the SIP.

Sanctions include: withholding federal funds for highway projects other than those for safety, mass transit, or transportation improvement projects related to air quality improvement or maintenance beginning 24 months after EPA announcement. No federal agency or department will be able to award a grant or fund, license, or permit any transportation activity that does not conform to the most recently approved SIP.

1.4 Rate of Progress Demonstrated in Previous SIPs

The Clean Air Act requires that serious nonattainment areas ensure progress toward the attainment goal by achieving a 15% reduction in volatile organic chemicals (VOCs) by 1996, and an additional 9% by 1999. To demonstrate attainment, the Act requires the region to demonstrate, through the use of photochemical air quality computer models, that ozone will reach the level of the standard.

MWAQC approved several State Implementation Plans to meet the requirements for serious nonattainment areas: the 15 % Plan, the Phase I Plan and the Phase II Plan. MWAQC

approved the "15% Plan" in January 1994. [iv] MWAQC approved revisions to this plan in February 1998.[v] MWAQC approved the Phase I Attainment Plan, which includes the 9% rate of progress requirements, in October 1997 and revised it in April 1999.[vi] This plan outlined how the region would reduce pollutants by the additional 9% requirement from 1996–1999 and discussed efforts to identify attainment requirements.

MWAQC approved the Attainment Plan (Phase II) in April 1998 and revised it in January 2000.[vii]The Phase II plan summarized the results of photochemical air quality modeling and provided information on trends in actual measured ozone levels. The plan showed that the Washington metropolitan region is likely to attain the federal one-hour standard for ozone in 2005 when the emission control measures currently proposed are fully implemented and after 'ozone transport' is reduced. In July 1998, EPA provided the States and MWAQC with additional modeling analysis performed as part of their efforts in support of the NOx SIP Call. This analysis evaluated the likelihood that the Washington Nonattainment area would reach the one-hour ozone standard after ozone transport is reduced. This evidence has been used to supplement the findings of the local modeling project and strengthens the conclusions of the original Phase II Plan approved by MWAQC.

Due to the use of MOBILE6, EPA's newest approved model for estimating mobile emissions in the Severe Area SIP, the Severe Area SIP inventories are not comparable to those of previous SIPs. The Severe Area SIP builds on previous SIPs by using the attainment demonstration results and the control measures adopted in the previous SIPs. The Severe Area SIP missions inventories and rate of progress calculations differ from previous plans' emissions inventories and target inventories for rate of progress because the mobile inventory portion is modeled differently. For a detailed explanation of the differences in the modeled mobile inventories, see chapters 3 and 4.

1.5 1999-2002 Rate of Progress Plan

The Washington region provided for a 0% reduction in VOC emissions and a 9% reduction in NOx emissions to satisfy the 9% rate of progress requirement for 1999-2002. Growth in VOC that might otherwise occur from 1999-2002 was more than offset by reductions attributable to adopted control measures. Total reductions achieved from 1990-2002 will total at least 178.2 tons per day of VOC and 269.7 tons per day of NOx. These reductions will enable the region to meet its emissions targets of 347.4 tons per day of VOC and 626.1 tons per day of NOx. Table 1-1 summarizes the emission reductions that will be achieved as part of the 2002 rate of progress.

Table 1-1
Washington Nonattainment Area
Control Strategy for the 1999-2002 Rate of Progress
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx
2002 Uncontrolled Emissions, Including Growth Adjustment	525.1	881.3
2002 Controlled Emissions, Including Round 6.3 Growth	346.9	611.6
Emission Reductions from Control Measures	178.2	269.7

1.6 2002-2005 Rate of Progress Plan

The Washington region provided for a 0% reduction in VOC emissions and a 9% reduction in NOx emissions to satisfy the 9% rate of progress requirement for 2002-2005. Growth in VOC that might otherwise occur from 2002-2005 was more than offset by reductions attributable to adopted control measures. Total reductions achieved from 1990-2005 will total at least 200.3 tons per day of VOC and 345.4 tons per day of NOx. These reductions will enable the region to meet its emissions targets of 339.0 tons per day of VOC and 538.8 tons per day of NOx. Table 1-2 summarizes the emission reductions that will be achieved as part of the 2005 rate of progress.

Table 1-2
Washington Nonattainment Area
Control Strategy for the 2002-2005 Rate of Progress
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx
2005 Uncontrolled Emissions, Including Growth Adjustment	539.3	884.2
2005 Controlled Emissions, Including Round 6.3 Growth	328.6	493.1
Emission Reductions from Control Measures	210.7	391.1

1.7 Establishment of a Budget for Transportation Mobile Emissions

As part of the development of the plan, MWAQC in consultation with the Transportation Planning Board (TPB) will establish a mobile source emissions budget or maximum allowable levels of VOC and NOx. This budget will be the benchmark used to determine if the region's long range transportation plan (CLRP) and six year transportation improvements program (TIP) conform with the Clean Air Act Amendments of 1990. Under EPA

regulations the projected mobile source emissions for 2005 becomes the mobile emissions budget for the region unless MWAQC takes actions to set another budget level.

The 2005 mobile emissions inventory reflects the most recent models available, MOBILE6 and the Travel Demand Model Version 2.1, used by COG's Transportation Planning Department, and the most recent data available, namely 2002 vehicle registration data. The methodology used to project the 2005 attainment year mobile inventory and to recalculate mobile inventories for milestone years is discussed in detail in Chapter 3.2.3 and Chapter 4.1.3. VOC = 98.1 tons/day NOx = 237.4 tons/day

Additional Commitments

1.8 Attainment Demonstration

The 2005 attainment demonstration analyzes the progress of the region towards attainment of the one-hour ozone standard. The states in the Metropolitan Washington region performed photochemical modeling in 1997 using the Urban Airshed Model (UAM-IV) to demonstrate attainment of the one-hour ozone standard. The modeling runs were performed for two episodes in 1991. Modeling future year scenarios, the results of the modeling demonstrated that the region would attain but for transported pollution from outside the region.[viii]

EPA undertook a photochemical modeling study to estimate Tier 2 benefits in the year 2007 in major cities including Washington region. This study showed that the design value in Washington region in that year would come down to 116 ppb. Therefore, it seems plausible that the 2005 design value will be equal to or lower than the one-hour ozone standard (124 ppb).

Based on EPA's guidance, a number of Weight of evidence analyses were undertaken to find out if the Washington region has the potential to attain in 2005. One of these analyses included an estimation of the projected attainment year design value. Based on this analysis year 2005 design value was estimated to be less than 119 ppb, which provides further evidence that the region will attain in 2005.

In addition, a comparison of the rates of reduction in mobile source emissions between 1990 and 2005 calculated using two mobile models, MOBILE5b and MOBILE6, indicates the rate of emissions reductions from the 1990 baseline emissions is greater with MOBILE6 than with MOBILE5b calculations. This is further evidence that the region will attain in 2005.

Another comparison was performed for the rates of reduction in total emissions including mobile source emissions for the Severe Area and Phase II SIPs between 1990 and 2005. It was found that the rate of emissions reductions from the 1990 baseline emissions is greater in case of Severe Area SIP emissions (contained MOBILE6 emissions) than the Phase II SIP

(contained MOBILE5b emissions). According to EPA guidance this is another evidence that the region will attain in 2005.

Also, the Rate-of-Progress inventories for the attainment year 2005 are lower than the modeled attainment inventories. This means that the actual attainment year emissions are lower than the limit set for maximum emissions in order to remain below the one-hour standard for ozone, meaning thereby that there is a very strong possibility for the region to attain the one-hour ozone standard in year 2005.

1.9 Analysis of Reasonably Available Control Measures (RACM)

An extensive list of potential control measures was analyzed and evaluated against criteria used for potential RACM measures. Individual measures must meet the following criteria: will reduce emissions by the beginning of the Washington region's 2004 ozone season (May 1, 2004); are enforceable; are technically feasible; are economically feasible, defined as a cost of $10,000 to $20,000 per ton or less; would not create substantial or widespread adverse impacts within the region; and do the emissions from the source being controlled exceed a *de minimis* threshold, defined as 0.1 tons per day. A final short list of RACM measures that met most of the criteria was evaluated against two remaining criteria, the ability to reduce the region's ozone levels to 124 parts per billion by 2004 and the potential for intensive and costly implementation.

Because it is unclear to what extent the NOx SIP Call, a significant NOx control measure, will be implemented by the beginning of the 2004 ozone season, it is extremely difficult to determine how many additional tons the region would need to reduce in order to ensure that 124 ppb is consistently achieved. As a result, the region is taking a conservative approach and estimating that any group of measures that would collectively reduce ozone by 1 ppb or more could enable the region to meet the 124 pbb standard in 2004. In order to reduce 1 ppb of ozone, any RACM measures would need to collectively reduce 8.8 tpd NOx or 34.0 tpd VOC.

If implemented collectively, the short list of RACM measures would reduce 5.1 tons per day VOC and 3.4 tons per day NOx. This does not meet the 34.0 tons per day VOC or 8.8 NOx required to reduce regional ozone levels to 124 parts per billion by May 1, 2004. Chapter 8 contains further details.

1.10 Contingency Measures

In the event that the reductions anticipated in the 2002 or 2005 rate of progress demonstrations or the 2005 attainment demonstration are not realized within the timeframes specified, there must be contingency measures ready for implementation. EPA issued guidance says that contingency measures must provide for a 3% reduction in baseline emissions. The Washington region has adopted measures to satisfy the requirement for contingency measures keyed to the 1996-1999 rate of progress and 1999 attainment demonstrations. The Phase II Reformulated Gasoline (RFG) program reduces in excess of the

required 13 tons per day VOC. The District of Columbia, Maryland and Virginia have committed to identify contingency measures for the 2002 and 2005 rate of progress demonstrations and the 2005 attainment demonstration. The states will identify these measures by March 1, 2004. Chapter 12 contains additional detail on these measures.

1.11 Document Contents

Chapter 2	presents a detailed overview of the Clean Air Act, the region's reclassification to severe nonattainment area, the requirements for severe nonattainment areas, additional commitments by the states to EPA, the region's air quality planning process, the role of the states and the proposed plan.
Chapter 3	presents revisions to the 1990 base year inventory using MOBILE6 and Travel Demand Model Versión 2.1 to revise base year mobile emissions inventories and including corrections to nonroad, area and stationary source emissions.
Chapter 4	presents the 2002 and 2005 projected inventories using MOBILE6 and Travel Demand Model Versión 2.1to revise 2002 and 2005 projected and a discussion of the growth projection methodology.
Chapter 5	presents 2002 rate of progress requirements. These are MWAQC's Calculations of how many tons per day of emissions must be reduced in the Washington region in order to meet the rate of progress requirements and also describes the control strategy and associated target emissions levels for the 9% reduction requirement.
Chapter 6	presents 2005 rate of progress requirements. These are MWAQC's calculations of how many tons per day of emissions must be reduced in the Washington region in order to meet the rate of progress requirements and also describes the control strategy and associated target emissions levels for the additional 9% reduction requirement.
Chapter 7	outlines the strategies that the states will implement to achieve the 3% per year reductions in VOC's and NO_X.
Chapter 8	discusses the analysis of Reasonable Available Control Measures (RACM).
Chapter 9	discusses mobile source conformityissues and establishes the mobile emissions budgets for the Metropolitan Washington region.

Chapter 10 presents the states' schedules and adoption of regulations to meet requirements for severe nonattainment areas and presents the states' April 2003 commitments to EPA.

Chapter 11 presents the Metropolitan Washington region's demonstration of attainment based on UAMIV modeling and weight of evidence.

Chapter 12 presents contingency measures for 1999 rate of progress, contingency mesures for the 2002 rate of progress demonstration and contingency measures for the 2005 rate of progress demonstration.

[ii] EPA 40 CFR Part 81, *Federal Register*, Vol.68, No. 16, , January 24, 2003, pp. 3410-3425.
[iii] EPA 40 CFR Part 52, *Federal Register*, Vol.68, No. 75, April 17, 2003, pp.19106-19133.
[iv] *Plan to Achieve A Fifteen Percent Reduction in Volatile Organic Compound Emissions for the Washington, DC-MD-VA Nonattainment Area*, MWAQC, January 14, 1994.
[v] *Revision to the SIP to Achieve a Fifteen Percent Reduction In VOC Emissions and Revision to the 1990 Base Year Emissions Inventory for Stationary, Anthropogenic, Biogenic Sources and Highway Vehicle Emissions of Ozone Precursors for the Washington DC-MD-VA Nonattainment Area*, MWAQC, February 17, 1998.
[vi] *Revised State Implementation Plan (SIP) Revision, Phase I Attainment Plan, for the Washington DC-MD-VA Nonattainment Area*, MWAQC, April 16, 1999.
[vii] *State Implementation Plan (SIP) Revision Phase II Attainment Plan, for the Washington, DC-MD-VA Nonattainment Area*, MWAQC, February 3, 2000 and *Revision to State Implementation Plan (SIP) Revision, Phase II Attainment Plan, for the Washington DC-MD-VA Nonattainment Area, Establishing Out-Year Mobile Emissions Budgets for Transportation Conformity*, MWAQC, January 19, 2000.
[viii] MWAQC, *State Implementation (SIP) Revision, Phase II Attainment Plan for the Washington DC-MD-VA Nonattainment Area*, Appendices, Appendix B

2.0 INTRODUCTION AND OVERVIEW

This document presents the regional air quality plan for attainment of the federal one-hour standard for ground-level ozone being considered by the Metropolitan Washington Air Quality Committee (MWAQC) for the Washington, D.C. multi-jurisdictional nonattainment area. MWAQC was established, by the governors of Maryland and Virginia and the mayor of the District of Columbia to prepare a regionally coordinated air quality plan to comply with the requirements of the 1990 Clean Air Act Amendments (CAAA or Act). MWAQC was established in accordance with Section 174 of the Clean Air Act.

2.1 Clean Air Act Background

The Clean Air Act was passed in 1970 to protect public health and welfare. Congress amended the Act in 1990 to establish requirements for areas not meeting the National Ambient Air Quality Standards (NAAQS). The Clean Air Act Amendments of 1990 (CAAA) established a process for evaluating air quality in each region and identifying and classifying nonattainment areas according to the severity of its air pollution problem. The CAAA defines ground-level ozone as a criteria pollutant and sets a air quality standard for that pollutant of 0.120 parts per million (or 124 parts per billion). Concentrations of ozone at ground level that are at or above 0.120 parts per million exceeds the one-hour ozone public health standard, or NAAQS. The Clean Air Act also sets National Ambient Air Quality Standards for five other criteria pollutants, carbon monoxide, particulate matter, lead, sulfur dioxide and nitrogen dioxide.

The Clean Air Act classifies nonattainment areas as "marginal," moderate," "serious," "severe," and "extreme" based upon the area's measured levels of ozone compared to the federal one-hour standard. Areas in a higher classification of nonattainment must meet the mandates of the lower classifications plus the more stringent requirements of their class. In 1991 the Washington area was designated a "serious" nonattainment area for the ozone standard. The boundaries of the Washington nonattainment areas are defined in the *Federal Register*. The Washington nonattainment area includes the District of Columbia, Arlington, Fairfax, Loudoun, Prince William, and Stafford counties, and the cities of Alexandria, Falls Church, Fairfax, Manassas, and Manassas Park in Virginia; as well as Calvert, Charles, Frederick, Montgomery, and Prince George's counties and the Cities of Bowie, College Park, Gaithersburg, Greenbelt, Frederick, Rockville, and Takoma Park in Maryland. A map of the nonattainment area is shown in Figure 1.

To meet the federal one-hour standard for ozone, nonattainment areas are required to develop regional plans, state implementation plans or "SIP," to reduce ozone-causing emissions of volatile organic compounds (VOCs) by at least 15 percent by 1996 and at least 3 % more each year until the region's attainment deadline, and to reduce all ozone precursor emissions to a level sufficient to attain the federal one-hour standard. The CAAA requires serious nonattainment areas to meet the one-hour ozone standard by November 15, 1999.

2.2 Region's Reclassification from "Serious" to "Severe"

Under the 1990 Clean Air Act Amendments, the metropolitan Washington region was defined as a "serious" nonattainment area for the pollutant ozone. The region was required to attain the federal one-hour standard for ground-level ozone by November 15, 1999. The region failed to meet the attainment deadline due to transported pollution from outside the region. The region's photochemical modeling results demonstrated the effect of transported pollution, which contributed from 20-30% of the pollution on the worst days of summer. EPA issued guidance in 1997 dealing with transported pollution, based on the basis photochemical modeling of 23-state region including the northeast, midAtlantic and midwestern states conducted through the Ozone Transport Assessment Group. In January 2001 EPA granted the Washington region an extension of its attainment deadline to November 2005.

The U.S. Circuit Court of Appeals for the District of Columbia vacated EPA's extension and remanded the action to EPA in a ruling on July 2, 2002, in *Sierra Club v. EPA*. The Court decided that EPA had a nondiscretionary duty under the Clean Air Act to reclassify the region when it failed to attain the standard in November 1999. The Court also vacated EPA's approval of the 1996-1999 rate of progress plan and the attainment plan. On December 18, 2002, the United States District Court of the District of Columbia ordered EPA to publish proposed rules to approve or disapprove the attainment demonstration and 1999 rate of progress SIPs by February 3, 2003, and to publish final rules taking action on these SIPS by April 17, 2003.

In January 2003 EPA reclassified the Washington, DC-MD-VA nonattainment area as a "severe" nonattainment area.[1] As a severe nonattainment area for one-hour ozone National Ambient Air Quality Standard (NAAQS), the Washington region is required to meet the requirements defined in the Clean Air Act, Section 182 (d) and to attain the standard by November 15, 2005. April 17, 2003, EPA published a final rule to conditionally approve the Washington region's severe area SIP if the three states meet nine commitments to EPA.[2] The commitments include adopting state regulations to meet CAA Section 182 (d) requirements for severe nonattainment areas and, in addition, to adopt a contingency plan for 1999 Rate of Progress, revise and submit an updated attainment demonstration that reflects revised MOBILE6-based motor vehicle emissions budgets, demonstrate 3 % per year rate of progress from 1999-2002 and from 2002-2005; adopt contingency measures for failure to make rate of progress in those periods, and submit an analysis of Reasonably Available Control Measures for the region. Copies of commitment letters from Virginia, Maryland and the District of Columbia are included in Appendix H.

2.3 SIP Requirements for Severe Nonattainment Areas

The Clean Air Act Section 182 (d) requires severe nonattainment areas to submit revisions to the state implementation plan that meet six additional planning requirements that do not exist for serious areas:

- Lower permit threshold for point sources from 50 tons per year to 25 tons per year
- Lower threshold for definition of "Major" source requiring controls to 25 tons per year
- Require new or expanding sources to offset increased emissions by 1.3:1

- Offset emissions growth due to growth in Vehicle Miles Traveled (VMT) by adopting control measures
- Attainment deadline for Severe Areas is November 15, 2005
- Adopt fee for "failure to attain" to be paid by major sources.

2.4 Additional Clean Air Act Requirements for Washington Region

As a result of the court decision in July 2002 in *Sierra Club v. EPA*, EPA requires the Washington region to submit rate of progress plans for two periods, 1999-2002 and 2002-2005; to adopt a contingency plan for 1999 in addition to contingency plans for the two rate of progress plans, and to submit an analysis of Reasonably Available Control Measures. These submittals are required to address deficiencies in the 1999 Rate of Progress Plan ("Phase I Plan"), and the Attainment demonstration ("Phase II Plan"). These SIP documents contain all of the requirements for the severe area state implementation plan or SIP as defined in the CAAA Section 182 and EPA's requirements to address deficiencies in the previous SIPs.

2.5 Rate of Progress Demonstrated in Previous SIPs

The Clean Air Act requires that serious nonattainment areas ensure progress toward the attainment goal by achieving a 15% reduction in volatile organic chemicals (VOCs) by 1996, and an additional 9% by 1999. To demonstrate attainment, the Act requires the region to demonstrate, through the use of photochemical air quality computer models, that ozone will reach the level of the standard.

MWAQC approved several State Implementation Plans to meet the requirements for serious nonattainment areas, the 15 % Plan, Phase I and Phase II Plans. MWAQC approved the "15% Plan" in January 1994. [3] MWAQC approved revisions to this plan in February 1998.[4] MWAQC approved the Phase I Attainment Plan, which includes the 9% rate of progress requirements, in October 1997 and revised it in April 1999.[5] This plan outlined how the region would reduce pollutants by the additional 9% requirement from 1996–1999 and discussed efforts to identify attainment requirements.

MWAQC approved the Attainment Plan (Phase II) in April 1998 and revised it in January 2000.[6]The Phase II plan summarized the results of photochemical air quality modeling and provided information on trends in actual measured ozone levels. The plan showed that the Washington metropolitan region is likely to attain the federal one-hour standard for ozone in 2005 when the emission control measures currently proposed are fully implemented and after 'ozone transport' is reduced. In July 1998, EPA provided the States and MWAQC with additional modeling analysis performed as part of their efforts in support of the NOx SIP Call. This analysis evaluated the likelihood that the Washington Nonattainment area would reach the one-hour ozone standard after ozone transport is reduced. This evidence has been used to supplement the findings of the local modeling project and strengthens the conclusions of the original Phase II Plan approved by MWAQC.

Due to the use of MOBILE6, EPA's newest approved model for estimating mobile emissions in the

Severe Area SIP, the Severe Area SIP inventories are not comparable to those of previous SIPs. The Severe Area SIP builds on previous SIPs by using the attainment demonstration results and the control measures adopted in the previous SIPs. The Severe Area SIP missions inventories and rate of progress calculations differ from previous plans' emissions inventories and target inventories for rate of progress because the mobile inventory portion is modeled differently. For a detailed explanation of the differences in the modeled mobile inventories, see chapters 3 and 4.

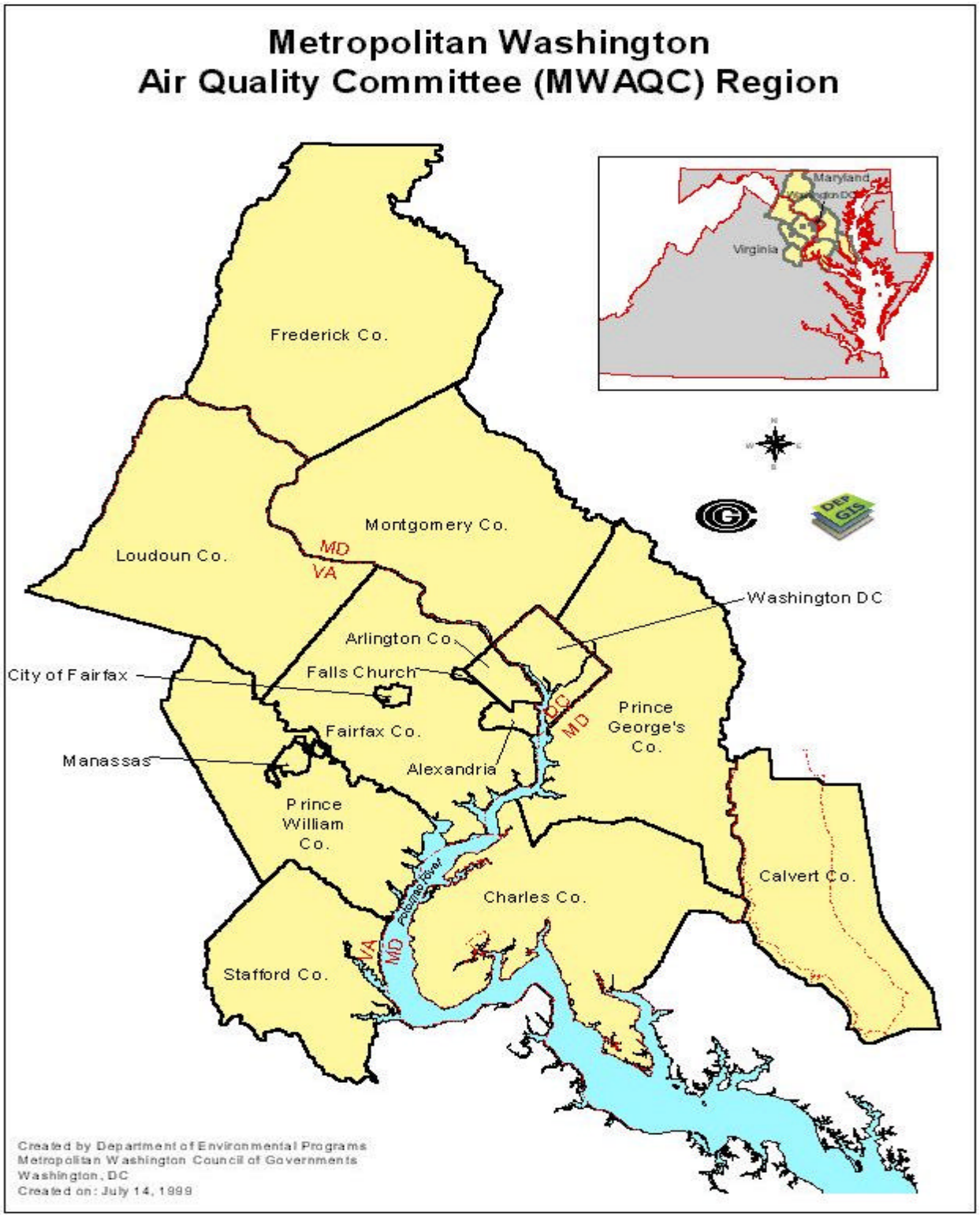

Figure 1: Map of Nonattainment Area

2.6 Sources of Ozone in the Metropolitan Washington Region

Ozone (O_3) is formed through a complex series of chemical reactions when oxygen molecules and atoms (O_2 + O) are combined. The process occurs when volatile organic compounds interact with nitrogen oxides in the presence of sunlight during hot, stagnant, summer days. VOCs are chemical compounds contained in gasoline, furniture polish, cleaning fluids, paint, inks, and other household and industrial products. VOCs also are a residue of combustion. Principal sources of NOx, which is produced by combustion, include motor vehicles, fossil fuel-fired power plants, and open burning. Ozone formation is favored under certain weather conditions, including high temperature, bright sunshine, and light winds. See Figure 2.

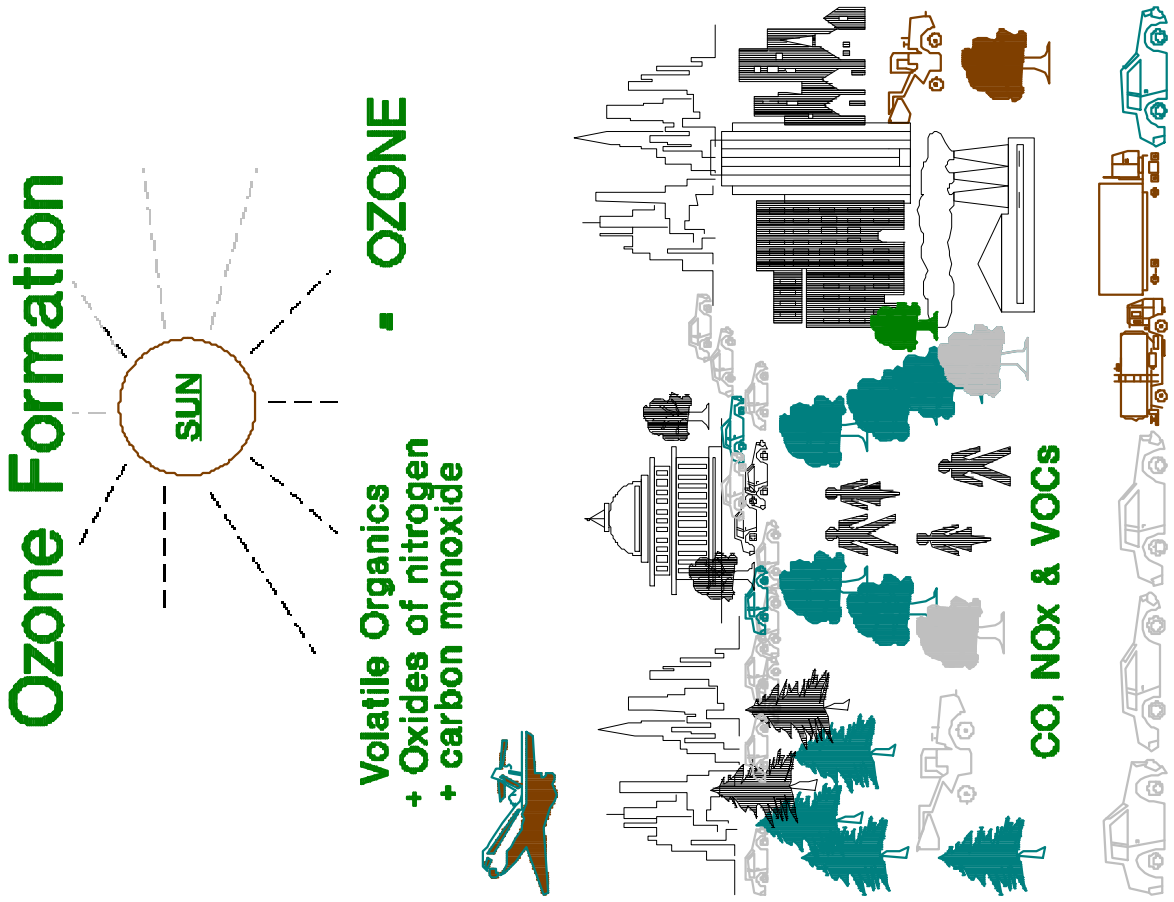

Figure 2: Conditions forOzone Formation

Typically, ozone levels escalate rapidly before noontime, peak in the afternoon, and taper off when the sun goes down. Figure 3 shows hourly ozone concentrations for a typical 24-hour period in our region.

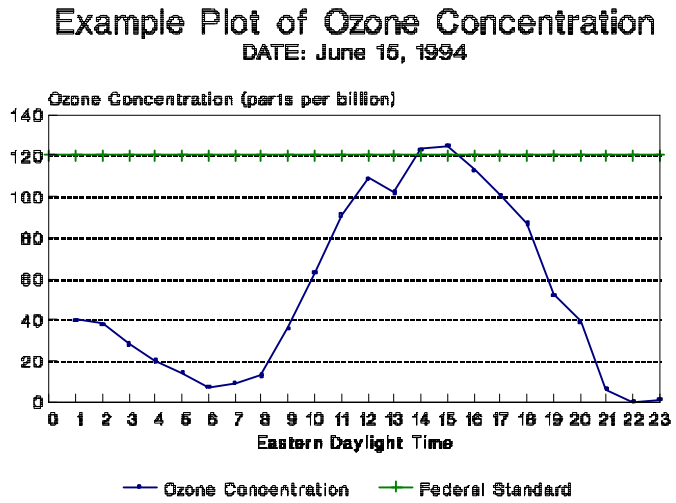

Figure 3: Gradual build-up of ozone levels on a typical summer day. Ozone peaks in the afternoon, then tapers off to lower levels in the evening.

Outer suburban and rural areas share this regional problem. Winds can move a cloud of ozone-containing smog for long distances. Regional data indicate that violations of the ozone standard can occur in either rural, inner suburban, outer suburban, or urban areas or combinations thereof.

While ozone within the region is caused mostly by emissions generated within the region, it also is carried into the metropolitan area by winds from elsewhere. Research conducted through the Ozone Transport Commission (OTC), and the Ozone Transport Assessment Group (OTAG) provides evidence that ozone formed in other parts of the country may drift into and affect air quality in the Washington region.

A number of diverse sources emit the ozone precursors VOC and NOx. Major sources of VOC emissions include, but are not limited to, gasoline storage facilities, bakeries, gasoline refueling stations, printing facilities, motor vehicles, lawnmowers, consumer products, and boats. Principal sources of NOx, which is produced by combustion, include motor vehicles (cars, trucks and buses), fossil fuel-fired power plants, and construction equipment.

In general the anthropogenic (man-made) sources of ozone precursors are grouped into four source categories: point (stationary), area, non-road, and mobile sources.

Point sources are stationary sources that emit more than 10 tons per year (tpy) of emissions. These sources are individually inventoried. Actual emissions measurements are available for some sources from the states and the District of Columbia. Emissions from other sources are estimated using emission factors.

Area source emissions include small industries, such as bakeries and printers; off-highway mobile equipment; and commercial/consumer products and activities. Emissions are not measured directly but are estimated from engineering calculations and estimates of activity levels.

Non-road sources include construction and farming equipment, commercial and residential lawn and garden activities, and recreational boating.

On-road or "mobile source" emissions from transportation sources are estimated from regional transportation models, which provide estimates of the number of vehicle trips, and the distance, location and speed of the trips, combined with a detailed EPA-approved model of per-vehicle emission factors.

A fifth category, "biogenic" emissions, includes all naturally occurring sources of VOC emissions from trees, crops and other forms of vegetation.

The following tables list the top ten sources of VOCs and NOx in the Washington nonattainment area in 1990 and in 2005.

Table 2-1
TOP TEN SOURCES OF MAN-MADE VOLATILE ORGANIC COMPOUNDS (VOCs) IN THE WASHINGTON AREA IN 1990 and 2005 EMISSIONS LEVELS

#	SOURCE CATEGORY	SOURCE	VOCs* TONS/ DAY	
			1990	2005
1	On-Road Mobile	CARS, BUSES, TRUCKS	299	97
2	Non-Road	LAWN & GARDEN EQUIPMENT	38	33
3	Area	OTHER SURFACE COATINGS *(This category includes traffic markings, industrial coatings and special purpose)*	36	50
4	Area	COMMERCIAL CONSUMER SOLVENT USE	34	37
5	Area	ARCHITECTURAL COATINGS	32	31
6	Area	VEHICLE REFUELING	20	20
7	Area	AUTO BODY REFINISHING	15	11
8	Stationary	STATIONARY SOURCES	14	6
9	Non-Road	RECREATION, MARINE	10	11
10	Non-Road	CONSTRUCTION	10	12

**The emissions estimates above are rounded to the nearest whole number. They are MWAQC's best estimates. Total VOC emissions in the Washington area were 955 tons per day in 1990 and 732 tons per day in 2005. Biogenic emissions account for 377 tons of VOC emissions in the Washington region.*

Table 2-2
TOP TEN SOURCES OF NITROGEN OXIDES (NOx) IN THE WASHINGTON AREA IN 1990 and 2005 EMISSIONS LEVELS

#	SOURCE CATEGORY	SOURCE	NOx* TONS/ DAY	
			1990	2005
1.	Stationary	UTILITIES AND OTHER SOURCES	335	84
2.	On-Road Mobile	CARS, BUSES, TRUCKS	376	235
3.	Non-Road	CONSTRUCTION	62	65
4.	Area	NATURAL GAS & LPG CONSUMPTION	15	14
5.	Non-Road	AGRICULTURE	10	8
6.	Area	FUEL OIL CONSUMPTION	10	12
7.	Area	RAILROAD LOCOMOTIVES	7	8
8.	Non-Road	AIRPORT SERVICES	7	7
9.	Area	COAL CONSUMPTION	7	9
10.	Area	COMMERCIAL AVIATION	6	7

**The emissions estimates above are rounded to the nearest whole number. They are MWAQC's best estimates. The total emission of NOx in the Washington area was 875 tons per day in 1990 and 491 tons per day in 2005. These categories account for 98% of the total in 1990. Note: the 1990 mobile number has been recalculated using MOBILE6.*

2.7 The Effects of Ozone

All of the 4.5 million residents of the Washington metropolitan region are likely to feel some of the adverse effects of ozone at one time or another, especially when they are working outdoors or exercising on a day when ozone levels are high.

But some people will feel symptoms at lower levels of exposure (even levels below the federal health standard), or experience more adverse effects at high levels. According to the American Lung Association, 2002, populations at increased risk in the Washington metropolitan region include

- 873,600 children 14 years of age and younger;
- 293,900 asthmatics, including 54,800 children with asthma and 239,100 adults;
- 180,700 residents with other chronic or persistent respiratory diseases, such as chronic bronchitis and emphysema;
- 401,600 residents over the age of 65

Figure 4 shows a breakdown of some of the categories of sensitive populations by sub-region.

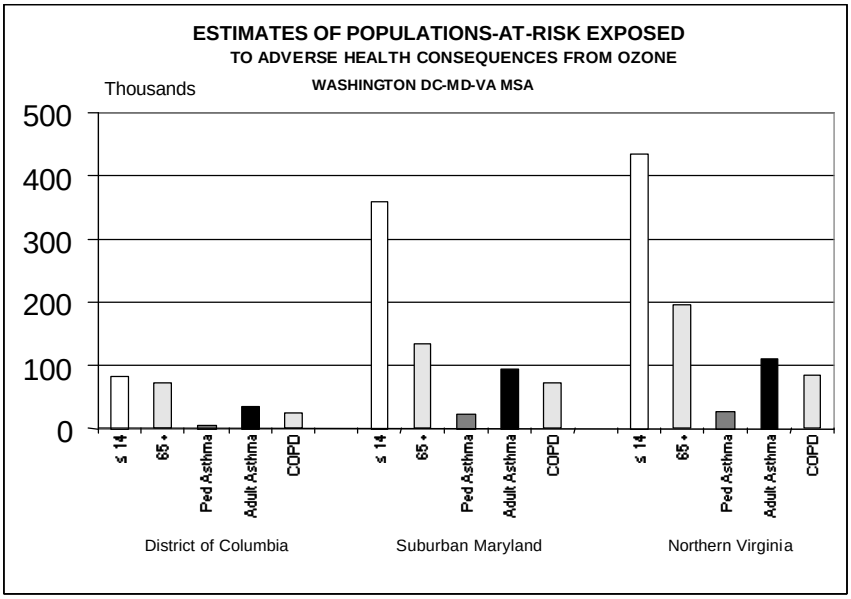

Figure 4: Approximately one-third of the residents of Metropolitan Washington area children, asthmatics over 65, have chronic respiratory diseases, and/or are especially sensitive to ozone. These individuals are more vulnerable to ill effects from air pollution. Source: American Lung Association

As mentioned earlier, ozone poses a threat not only to human health, but also to the health of natural

ecosystems. Scientific evidence suggests that air pollution weakens the immune systems of many types of vegetation and can cause significant crop damage. In addition, rain and snow wash air pollution deposited on vegetation and architectural surfaces into the streams and rivers of the region and finally into the Chesapeake Bay.

2.8 Frequency of Violation of Federal Health Standard for Ozone

The Washington area has exceeded the federal health standard for ozone in all of the last 24 years. The number of ozone exceedance days in a season ranged from a low of 1 to a high of 35. Federal law allows only one violation of the standard a year (averaged over 3 years) in any one location in the region. In an average summer from 1992 - 2002, there have been 4.9 days when Washington's air exceeds the ozone standard.

The federal standard is 0.12 parts per million (124 parts per billion) of ozone averaged over one hour. Figure 5 shows the number of days that the Washington region has violated the ozone standard since 1979. Violations are related to the weather (hot stagnant summers are favorable for ozone formation) and the levels of ozone precursors present in the ambient air.

The Metropolitan Washington Council of Governments (COG) issues an air quality forecast prepared by a regional team of meteorologists each day during the summer. The daily forecast and air quality index (AQI) advise the public of the air quality conditions for the next 24 hours, so that those at risk can take adequate precautions and everyone can take action to reduce ozone causing emissions.

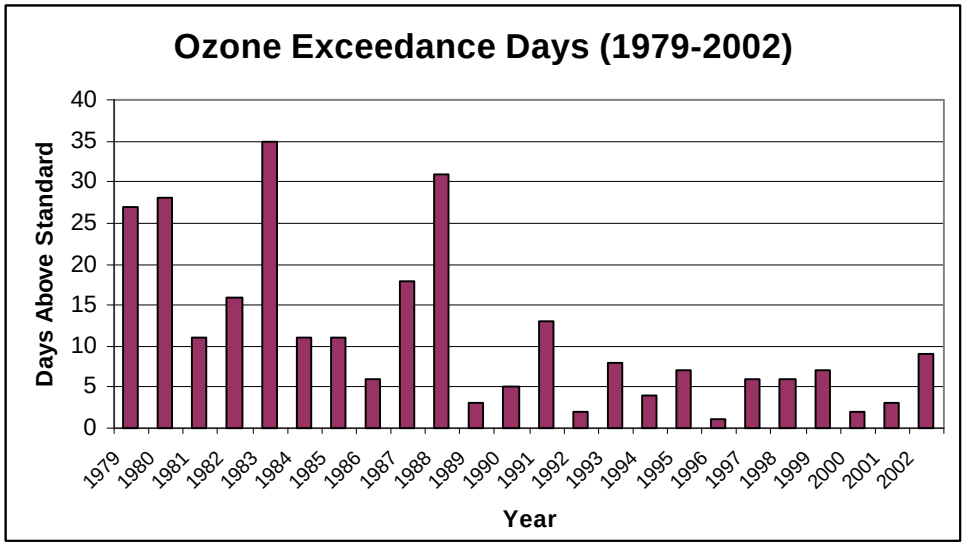

Figure 5: Ozone Exceedance Days in the Metropolitan Washington area

2.9 The Metropolitan Washington Air Quality Committee (MWAQC)

Under Section 174 of the Clean Air Act Amendments, the governors of Maryland and Virginia and the mayor of the District of Columbia certified the Metropolitan Washington Air Quality Committee (MWAQC) to develop specific recommendations for a regional air quality plan in the Washington, DC-MD-VA nonattainment area.

Members of MWAQC include elected officials from the Cities of Bowie, College Park, Frederick, Gaithersburg, Greenbelt, Rockville, and Takoma Park in Maryland, and Alexandria, Fairfax and Falls Church, Manassas and Manassas Park in Virginia; the Montgomery and Prince George's county councils; the Montgomery and Prince George's county executives; the mayor of the District of Columbia and representatives of the Council of the District of Columbia; and representatives of Calvert, Charles, and Frederick counties in Maryland, and Arlington, Fairfax, Loudoun, Prince William, and Stafford counties in Virginia.

Representatives of the general assemblies of Maryland and Virginia, the state air management directors, and the state transportation directors, and the chairman of the National Capital Region Transportation Planning Board also are members of MWAQC. The membership roster is contained in Appendix A.

The Metropolitan Washington Council of Governments, in close cooperation with state air quality and transportation agencies provides technical support to the Metropolitan Washington Air Quality Committee. Additional technical staff support is provided by county and city technical staffs and the Tri-County Council for Southern Maryland.

MWAQC also has established a public advisory committee to provide recommendations regarding public participation in the development of the air quality plans. The Air Quality Public Advisory Committee (AQPAC) works closely with staff and submits formal recommendations to MWAQC. AQPAC members represent academic, business, civic, and environmental groups. AQPAC members are listed in Appendix A.

2.10 Roles of the State Air Management Agencies and the Governors/Mayor

Representatives of the following state air management agencies are members of MWAQC: District of Columbia Department of Health, Environmental Health Administration; Air and Radiation Management Administration of the State of Maryland's Department of the Environment; and the Commonwealth of Virginia's Department of Environmental Quality.

Since the Washington metropolitan nonattainment area crosses state boundaries, the states and the District of Columbia established MWAQC to prepare a regional control plan. MWAQC's recommendations are forwarded to the three state air agencies. In turn, each state will submit a SIP

revision to EPA. In Maryland, the submittal is made by the governor or a designee; in the District of Columbia, by the mayor or a designee; and in Virginia by the Director of the Department of Environmental Quality on behalf of the governor.

2.11 State Commitment/Implementation Assurances

The measures in the SIP must be supported by any necessary legislative authority adopted by the states and the District of Columbia and adopted by the applicable governmental body responsible for their implementation.

Section 110 of the 1990 CAAA specifies the conditions under which EPA approves SIP submissions. These requirements are being followed by MWAQC and the states in developing this air quality plan or SIP. In order to develop effective control strategies, EPA has identified four fundamental principles that SIP control strategies must adhere to in order to achieve the desired emissions reductions. These four fundamental principles are outlined in the General Preamble to Title I of the Clean Air Act Amendments of 1990 at *Federal Register* 13567 (EPA, 1992a). The four fundamental principles are:

a. emissions reductions ascribed to the control measure must be quantifiable and measurable;
b. the control measures must be enforceable, in that the state must show that they have adopted legal means for ensuring that sources are in compliance with the control measure;
c. measures are replicable; and
d. the control strategy be accountable in that the SIP must contain provisions to track emissions changes at sources and to provide for corrective actions if the emissions reductions are not achieved according to the plan.

2.12 Submittal of the Plans

The governors and the mayor (or their designees) are required to submit to the EPA air quality State Implementation Plans to meet the requirements of the CAAA. After MWAQC approves the air quality attainment plan (SIP), each of the states and the District of Columbia will submit the document, along with specific commitments, schedules for adoption or adopted state regulations as appropriate, to EPA's Region III Office in Philadelphia.

2.13 Sanctions

EPA must impose various sanctions if the states or the District of Columbia do not submit a plan; or submit a plan that the EPA does not approve; or fail to implement the plan. These include: withholding federal highway funding; withholding air quality planning grants; and imposing a federal plan ("federal implementation plan."). Failure to submit or implement a plan will have significant consequences for compliance with conformity requirements.

2.14 Rate of Progress Requirements

As a consequence of reclassification to a severe non-attainment area, the Washington region is required to demonstrate continued reductions of 3% per year in NOx or VOC from 1999 until 2002 and from 2002 until the region reaches attainment in 2005. The Severe Area Plan is designed to meet these new requirements. MWAQC has taken the following steps in development of the regional Severe Area Plan:

- Recalculation of 1990 base-year emissions inventory

In January 2002, EPA released a new version of the model used to calculate emissions from automobiles and other mobile sources. EPA requires all regions to adopt the new model, referred to as MOBILE6, for calculation of mobile emission inventories. Because MOBILE6 includes improved data and better methods for estimating the effect of certain control measures, the results of the model are not comparable to the results of MOBILE5b, the previous version. In order to use MOBILE6 to compare emissions from different years, regions must recalculate mobile emissions from each year using the new model. A small number of corrections were also made to emissions from other sectors. The recalculated 1990 base year inventory of man-made pollution sources is 578.3 tons per day (VOC) and 869.2 tons per day of nitrogen oxides (NOx). Chapter 3 provides complete documentation of the revised 1990 base year inventory.

- Recalculation of adjusted base-year inventories for 1996, 1999, 2002, 2005 with MOBILE6

The 1990 CAAA does not allow states to take credit for emissions reduction measures implemented before the Act's passage on November 15, 1990. Consequently, it is necessary to adjust the 1990 base-year inventory to eliminate reductions that would occur in 1996, 1999, 2002 and 2005 due to pre-1990 rules and regulations. Because of the requirement to use MOBILE6 for calculation of the mobile sector inventory, the adjusted base-year inventories for 1996, 1999, 2002 and 2005 were recalculated using MOBILE6.

- The 1990 base year inventory adjusted to 1996 is 455.1 tons per day VOC.
- The 1990 base year inventory adjusted to 1999 is 433.3 tons per day VOC and 779.4 tons per day NOx.
- The 1990 base year inventory adjusted to 2002 is 420.1 tons per day VOC and 756.6 tons per day NOx.
- The 1990 base year inventory adjusted to 2005 is 411.7 tons per day VOC and 735.4 tons per day NOx.

- Calculation of 2002, 2005 emissions reduction requirements

Many of the control measures included in previous air quality plans, including the Revised Phase II Plan, will yield emission reduction benefits during 1999-2005 that are creditable toward the 9% + 9% reduction requirement.

The Washington region provided for a 0% reduction in VOC emissions and a 9% reduction in NOx emissions to satisfy the 9% rate of progress requirement for 1999-2002. Growth in VOC that might otherwise occur from 1999-2002 was more than offset by reductions attributable to adopted control measures. Total reductions achieved from 1990-2002 will total at least 178.2 tons per day of VOC and 269.7 tons per day of NOx. These reductions will enable the region to meet its emissions targets of 347.4 tons per day of VOC and 626.1 tons per day of NOx.

The Washington region provided for a 0% reduction in VOC emissions and a 9% reduction in NOx emissions to satisfy the 9% rate of progress requirement for 2002-2005. Growth in VOC that might otherwise occur from 2002-2005 was more than offset by reductions attributable to adopted control measures. Total reductions achieved from 1990-2005 will total at least 200.3 tons per day of VOC and 345.4 tons per day of NOx. These reductions will enable the region to meet its emissions targets of 339.0 tons per day of VOC and 538.8 tons per day of NOx.

2.15 2005 Attainment Demonstration

The 2005 attainment demonstration analyzes the progress of the region towards attainment of the one-hour ozone standard. The states in the Metropolitan Washington region performed photoochemical modeling in 1997 using the Urban Airshed Model (UAM-IV) to demonstrate attainment of the one-hour ozone standard. The modeling runs were performed for two episodes in 1991. Modeling future year scenarios, the results of the modeling demonstrated that the region would attain but for transported pollution from outside the region. Additional modeling such as EPA's photochemical modeling for Tier 2 and weight of evidence analysis using design values and projected future design values, provide further evidence that the region will attain in 2005. [7]

In addition, a comparison of the rates of reduction in emissions between the two mobile models, MOBILE5b and MOBILE6, indicates the rate of emissions reductions from the 1990 baseline emissions is greater with MOBILE6 than with MOBILE5b calculations. This is further evidence that the region will attain in 2005.

2.16 Analysis of Reasonably Available Control Measures (RACM)

An extensive list of potential control measures was analyzed and evaluated against criteria used for potential RACM measures. Individual measures must meet the following criteria: will reduce emissions by the beginning of the Washington region's 2004 ozone season (May 1, 2004); are enforceable; are technically feasible; are economically feasible, defined as a cost of $10,000 to $20,000 per ton or less; would not create substantial or widespread adverse impacts within the

region; and do the emissions from the source being controlled exceed a de minimus threshold, defined as 0.1 tons per day. A final short list of RACM measures that met most of the criteria was evaluated against two remaining criteria, the ability to reduce the region's ozone levels to 124 parts per billion by 2004 and the potential for intensive and costly implementation. The results show that if implemented collectively, the measures would reduce 5.1 tons per day VOC and 3.4 tons per day NOx. This does not meet the 34.0 tons per day VOC or 8.8 tons per day NOx required to reduce regional ozone levels to 124 parts per billion by May 1, 2004. Chapter 8 contains the list of measures considered.

2.17 Contingency Measures

In the event that the reductions anticipated in the 2002 or 2005 rate of progress demonstrations or the 2005 attainment demonstration are not realized within the timeframes specified, there must be contingency measures ready for implementation. EPA issued guidance says that contingency measures must provide for a 3% reduction in baseline emissions (12.6 tons per day VOC or 22.7 tons per day NOx). The measures proposed as contingency measures are listed in Chapter 12. The proposed measures include adoption of reformulated consumer products, enhanced enforcement of open burning in Virginia, use of auxiliary power units for locomotives, use of cetane additives for on-road and off-road vehicles, enhanced enforcement of graphic arts and surface cleaning, electrified airport ground support equipment, regional wing power purchases, parking impact fee in the District of Columbia, best practices in application of traffic markings, best practices in application of pesticides, agreements with local power plants to reduce emissions, and environmental performance contracting. Chapter 12 contains detail on these measures, how they would be implemented, enforced, and the amount of reduction benefit expected.

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[1] EPA 40 CFR Part 81, *Federal Register*, Vol.68, No. 16, , January 24, 2003, pp. 3410-3425.
[2] EPA 40 CFR Paft 52, *Federal Register*, Vol.68, No. 75, April 17, 2003, pp.19106-19133.
[3] *Plan to Achieve A Fifteen Percent Reduction in Volatile Organic Compound Emissions for the Washington, DC-MD-VA Nonattainment Area*, MWAQC, January 14, 1994.
[4] *Revision to the SIP to Achieve a Fifteen Percent Reduction In VOC Emissions and Revision to the 1990 Base Year Emissions Inventory for Stationary, Anthropogenic, Biogenic Sources and Highway Vehicle Emissions of Ozone Precursors for the Washington DC-MD-VA Nonattainment Area*, MWAQC, February 17, 1998.
[5] *Revised State Implementation Plan (SIP) Revision, Phase I Attainment Plan, for the Washington DC-MD-VA Nonattainment Area*, MWAQC, April 16, 1999.
[6] *State Implementation Plan (SIP) Revision Phase II Attainment Plan, for the Washington, DC-MD-VA Nonattainment Area*, MWAQC, February 3, 2000 and *Revision to State Implementation Plan (SIP) Revision, Phase II Attainment Plan, for the Washington DC-MD-VA Nonattainment Area, Establishing Out-Year Mobile Emissions Budgets for Transportation Conformity*, MWAQC, January 19, 2000.
[7] MWAQC, *State Implementation (SIP) Revision, Phase II Attainment Plan for the Washington*

3.0 THE 1990 BASE-YEAR INVENTORY AND REVISIONS

3.1 Background and requirements

The full original 1990 Base-Year Inventory is published in a separate document, "1990 Base Year Emissions Inventory for Stationary Anthropogenic, Biogenic Sources and Highway Vehicle Emissions of Ozone Precursors in the Washington, DC-MD-VA Metropolitan Statistical Nonattainment Area," (Sept. 22, 1993). This document was prepared for the District of Columbia, Maryland and Virginia by COG under the auspices of MWAQC. It is available for inspection at the Council of Governments' Information Center and at the offices of the District of Columbia, Maryland and Virginia air management agencies.

The emissions inventory covers the Washington DC-MD-VA nonattainment area (identical to the Metropolitan Statistical Area, or MSA), which is classified as a severe nonattainment area for ozone by the U.S. Environmental Protection Agency (EPA). The 1990 emissions inventory is the starting point for calculating the emissions reduction requirement needed to meet the 15% VOC emissions reduction goal by 1996 *and* additional 3% per year reductions (for man-made sources of emissions) thereafter through 2005 to meet rate-of-progress requirements prescribed for severe nonattainment areas by the 1990 CAAA.

This separately published document addresses emissions of volatile organic compounds (VOCs), oxides of nitrogen (NOx), and carbon monoxide (CO) on a typical summer ozone season weekday. Included in the inventory are stationary anthropogenic (man-made), biogenic (naturally occurring), and non-road and on-road mobile sources of ozone precursors. It was used in the preparation of the 1994 15% Plan that was submitted to EPA. Revisions to the original 1990 inventory have been submitted to EPA as part of revisions to the 15% Plan (Final State Implementation Plan Revision to Achieve a Fifteen Percent Reduction in Volatile Organic Compounds Emissions for the Washington DC-MD-VA Nonattainment Area", February 17, 1998). This revised inventory served as the basis for calculating the 15% emissions reduction needed by 1996.

In 2002 and early 2003, MWAQC made changes to the methods for calculating emissions from mobile and stationary sources. These changes, described in succeeding sections, resulted in revisions to the 1990 base year inventory. The revised 1990 base-year inventories for VOC and NOx can be seen in Tables 3-1 and 3-2.

Table 3-1
1990 Base-Year VOC Inventory
(Tons/Day)

	District of Columbia	Maryland	Virginia	Total
Point	1.0	5.7	8.3	15.0
Area	20.1	94.0	77.0	191.1
Non-Road	5.8	33.8	33.8	73.4
On-Road	42.0	133.4	123.7	299.1
Biogenics	3.2	225.9	147.4	376.5
Total	72.1	492.8	390.2	955.1

Table 3-2
1990 Base-Year NOx Inventory
(Tons/Day)

	District of Columbia	Maryland	Virginia	Total
Point	7.8	292.4	61.2	361.4
Area	4.3	15.8	27.6	47.7
Non-Road	5.5	43.7	30.3	79.5
On-Road	41.9	181.7	157.3	380.8
Biogenics	NA	NA	NA	NA
Total	59.5	533.6	276.4	869.5

3.2 Total Emissions by Source

3.2.1 Point Sources

For emissions inventory purposes point sources are defined as stationary, commercial, or industrial operations that emit more than 10 tons per year (tons/year) of VOCs or 25 tons/year or more of NOx or CO. Prior to being reclassified to a severe area, the threshold was 100 tons/year of NOx. The point source inventory consists of actual emissions for the base-year 1990 and includes sources within the geographical area of the Washington DC-MD-VA nonattainment area. The states of Maryland and Virginia and the District of Columbia are responsible for compiling and submitting point source emission estimates.

In 2002, the State of Maryland corrected its methodology for calculating average daily ozone seasons emissions for stationary sources. This correction to emissions from Maryland stationary sources is reflected in the new 1990 baseline NOx and VOC inventories. In addition, the point source numbers have been modified to reflect the new 25 tons/year NOx definition of point sources under the severe nonattainment category. The state air agencies re-visited their 1990 point source inventories to determine if additional sources were to be included due to the lower NOx threshold.

3.2.2 Area Sources

Area sources are sources of emissions too small to be inventoried individually and which collectively contribute significant emissions. Area sources include smaller stationary point sources not included in the states' point source inventories such as printing establishments, dry cleaners, and auto refinishing companies, as well as non stationary sources.

Area source emissions typically are estimated by multiplying an emission factor by some known indicator of collective activity for each source category at the county (or county-equivalent) level. An activity level is any parameter associated with the activity of a source, such as production rate or fuel consumption that may be correlated with the air pollutant emissions from that source. For example, the total amount of VOC emissions emitted by commercial aircraft can be calculated by multiplying the number of landing and takeoff cycles (LTOs) by an EPA-approved emission factor per LTO cycle for each specific aircraft type.

Several approaches are available for estimating area source activity levels and emissions. These include apportioning statewide activity totals to the local inventory area and using emissions per employee (or other unit) factors. For example, solvent evaporation from consumer and commercial products such as waxes, aerosol products, and window cleaners cannot be routinely determined for many local sources. The per capita emission factor assumes that emissions in a given area can be reasonably associated with population. This assumption is valid over broad areas for certain activities such as dry cleaning and small degreasing operations. For some other sources an employment based factor is more appropriate as an activity surrogate.

For this SIP, the baseline area source inventory has been updated with the following information:

- The District requested that baseline emissions from locomotive activity within the District be revised to reflect more accurate data. The correction increases the 1990 nonroad VOC and NOx baseline.

- Vehicle refueling emissions are calculated using MOBILE6 emissions factors. The baseline Vehicle Refueling inventory was recalculated with MOBILE6 factors for Stage II refueling. The previous baseline inventory for refueling emissions was calculated with MOBILE5.

- Emissions from the commercial aircraft category were recalculated using the Emissions Dispersion Modeling Software (EDMS) model to reflect 1990 activity at Dulles and National Airports. This allowed a morw accurate comparison between 2002 and 2005

airport emissions data. The area source category includes emissions from the commercial aircraft operating at Dulles and National airports. Emissions from ground service equipment and auxiliary power units are included in the nonroad inventory. These were also recalculated using EDMS.

3.2.3 Mobile Sources

Emissions from mobile sources were derived from the use of the National Capital Region Transportation Planning Board (TPB) travel demand forecasting procedure, which simulates vehicle travel across the region's transportation system. Travel was simulated on all highways in the region, including both volume and speed of travel for each hour of the day. An EPA emissions model, MOBILE6, was used to determine the emissions characteristics of the vehicle fleet in place in the year 1990. Input for this emissions model includes locally specific information such as age distribution of registered vehicles, evaporation characteristics of motor fuel, and temperature data. The general equation for the estimation of mobile sources is:

(Travel Component) x (Emission Factor) = Emissions

Emissions accounted for in the mobile source inventory include:

Origin:	Emissions include "cold start" and "hot start" emissions occurring during the first few minutes of vehicle operation.
Running:	Emissions occurring on local streets and on the region's network of arterial streets, freeways and non-ramp freeways.
Running Loss:	Emissions due to the heating of fuel and fuel lines.
Crankcase:	Emissions due to blow-by.
Destination:	Evaporative or "hot soak" emissions occurring at the conclusion of a vehicle trip after the engine is turned off.
Diurnal:	Evaporative emissions occurring when the vehicle is at rest due to temperature fluctuations.
Resting Loss:	Emissions due to the permeation of fuel through hoses and fittings.
Auto Access:	Emissions attributable to auto trips to Metrorail stations or to park-and-ride lots.
Bus:	Bus emissions, i.e., Metrobus, Ride-on, etc.

In 2002 and early 2003, MWAQC and TPB undertook a series of improvements and refinements to the methodology used to calculate mobile emissions in the Washington metropolitan area. These improvements included:

- Using the MOBILE6 model to estimate emissions factors;
- Updating the mobile emissions model inputs to reflect the inspections and maintenance programs described in the most recent submissions to EPA by Maryland, Virginia and the District of Columbia, to recognize changes in vehicle type and age reflected in the 2002 registration data, and to account for the Heavy-duty Diesel Vehicle and National Low Emission Vehicle (NLEV) programs;

- Updating the Travel Demand Model (currently Version 2.1) to reflect changes in regional travel patterns and driving habits documented through household surveys, traffic data and transit ridership information

To ensure that the mobile emissions in the 1990 baseline are comparable to the 2002 and 2005 mobile emissions used in measuring rate of progress and attainment, MWAQC recalculated the 2002 and 2005 mobile emissions using the new model. A full description of the methodology for recalculating the 1990 mobile emissions inventory is included in Appendix B.

3.2.4 Non Road Vehicle and Engine Sources

Emissions from this category were obtained from a 1991 EPA contractor's report titled, "Non-Road Engine and Vehicle Emission Inventories for CO and Ozone Nonattainment Boundaries, Washington, D.C. MSA."

To construct the EPA non-road inventory, several factors were estimated: (1) equipment populations in the nonattainment area; (2) annual hours for use of each type of equipment, adjusted for geographic region and for the season of interest for each pollutant studied; (3) average rated horsepower for each type of equipment; (4) typical load factor for each type of equipment; and (5) an emission factor for each of the 79 categories of equipment.

In developing emissions inventories for non-road engines and vehicles EPA used the following formula:

M = N x HRS x HP x LF x EF, where

M = mass of emissions of pollutant during inventory period
N = source population
HRS = annual hours of use
HP = average rated horsepower
LF = typical load factor
EF(i) = average emissions of pollutant per unit of use (e.g., emission factor grams per horsepower-hour)

The product of the annual hours of use, the average rated horsepower, and the load factor is referred to as the per-source usage rate. The product of the equipment population and the per-source usage rate is referred to as the activity level, and is estimated in units of horsepower-hours. By multiplying the seasonally adjusted activity levels by the appropriate emission factor, emission estimates for an ozone season day were developed for each category of non-road equipment and vehicles in the EPA-prepared inventories.

The EPA estimates as provided in the report did not accurately reflect the 1990 summer Reid Vapor Pressure (RVP) of 8.3 psi nor the proper activity split between the weekend and weekday use of recreational boating and lawn and garden equipment. The EPA document reported that a 10.5 psi RVP was used in their analysis. The EPA estimates for the region were adjusted for the RVP and activity split by the Maryland Department of the Environment.

Ground service equipment and auxiliary power units operated at airports are considered nonroad sources and are included in the nonroad category. As mentioned above under the discussion of area sources, these baseline emissions were recalculated using EDMS to allow a more accurate comparison between the baseline and the 2002 and 2005 emissions from these sources.

3.2.5 Biogenic Emissions

An important component of the modeling inventory is biogenic emissions. Biogenic emissions are those resulting from natural sources. Biogenic emissions are primarily VOCs that are released from vegetation throughout the day. Biogenic emissions of NOx include lightning and forest fires. A computer model has been used to estimate biogenic emissions in the modeling domain. Two versions of the model have been used - BEIS1 and BEIS2. EPA has recommended that states use BEIS1 with UAM-4 for attainment demonstrations. OTAG has applied BEIS2 for its modeling due to the fact that BEIS2 is an advanced version of the model. In order to be consistent with the modeling, the most of the modeling analysis is based on the results of the BEIS2 biogenics inventory.

Biogenic emissions are not included in the emission summary tables in this section of the report. The BEIS emission inventories for the Washington nonattainment area are shown in Table 3-3.

Table 3-3
Estimated Biogenic Emissions within the Washington Nonattainment Area
tons per day

	VOC	NOx
BEIS 1	376.0	NA
BEIS 2	720.0	7.4

Source: Virginia Department of the Environment, Biogenic Emissions Estimates (PC-BEIS2.2 Analyses) for July 16, 1991

4.0 The 2002 and 2005 Projected Inventories

The Act requires ozone nonattainment areas classified as moderate and above to achieve a 15 percent reduction in VOC emissions by 1996 and an additional three percent per year until the attainment date for the area. The reduction must be calculated from the anthropogenic emissions levels reported in the 1990 Base-Year Inventory after those levels have been adjusted to reflect the expected growth in emissions between 1990 and the projection year. The 1990 Base-Year Inventory is described in Chapter 3. This chapter presents the 2002 and 2005 Projection Inventories, the estimation of the levels of emissions to be expected in those years before the consideration of emission controls.

The 2002 and 2005 projected uncontrolled inventories are derived by applying the appropriate growth factors to the 1990 Base-Year Emissions Inventory. EPA guidance describes four typical indicators of growth. In order of priority, these are product output, value added, earnings, and employment. Surrogate indicators of activity, for example population growth, are also acceptable methods.

Round 6.2 Cooperative Forecasting results (population, household and employment projections), which are prepared and officially adopted by the Metropolitan Washington Council of Governments (COG), were used to project emissions from area and nonroad sources. The Economic Growth Analysis System (EGAS) model was used by all three jurisdictions to project growth in point source emissions. Projections for onroad were developed using MOBILE6 and the Version 2.1 Travel Demand Model developed by the Transportation Planning Board.

4.1 Growth Projection Methodology

The following sections describe the method followed to determine the projected inventories for 2002 and 2005.

4.1.1 Growth Projection Methodology for Point Sources: EGAS

The growth in point source emissions is projected using EGAS version 3.0. Point source emissions for 1990 are provided from the state data sources and the model is run with the following options selected: projections are run by Source Classification Code; the Bureau of Labor Statistics national economic forecast; and the baseline regional economic forecast. Point source emission projection using EGAS are contained in Appendix C.

In 2002, the State of Maryland corrected its methodology for calculating average daily ozone seasons emissions for stationary sources. This correction to emissions from Maryland stationary sources is reflected in the new 2002 and 2005 NOx and VOC inventories.

4.1.2 Growth Projection Methodology: Area and Non-Road Sources

Base-year area and nonroad source emissions for 1990 were calculated using 1990 population, household, and employment data. Thus, growth factors for the periods of 1990 to 2002 and 1990 to 2005 were derived by dividing Round 6.2 population, household, and employment forecasts for the analysis year by actual 1990 population, household, and employment values for the region. The growth factors used for the 2002 and 2005 projection years are presented in Tables 4-1 and 4-2. The growth factors were applied to emissions categories by specific jurisdictions. The states supplied the gasoline sales growth factors.

Table 4-1
1990-2002 Growth Factors, Round 6.2 Cooperative Forecasts

Jurisdiction	Employment	Population	Household	Gas Use
District of Columbia	0.971	0.890	0.919	1.165
Calvert County	1.388	1.458	1.420	1.165
Charles County	1.325	1.281	1.358	1.165
Frederick County	1.818	1.353	1.408	1.165
Montgomery County	1.222	1.164	1.156	1.165
Prince George's County	1.121	1.104	1.152	1.165
City of Alexandria	1.108	1.144	1.154	1.165
Arlington County	1.119	1.128	1.158	1.165
Fairfax County	1.354	1.219	1.252	1.165
Loudoun County	2.603	2.412	2.399	1.165
Prince William County	1.372	1.371	1.416	1.165
Stafford County	1.785	1.341	1.391	1.165
Maryland Aggregate	1.225	1.170	1.192	1.165
Virginia Aggregate	1.338	1.300	1.319	1.165
Nonattainment Aggregate	1.188	1.177	1.195	1.165

Source: Metropolitan Washington Council of Governments

Table 4-2
1990-2005 Growth Factors, Round 6.2 Cooperative Forecasts

Jurisdiction	Employment	Population	Household	Gas Use
District of Columbia	0.964	0.863	0.899	1.206
Calvert County	1.484	1.573	1.525	1.206
Charles County	1.406	1.351	1.448	1.206
Frederick County	2.022	1.442	1.510	1.206
Montgomery County	1.277	1.204	1.195	1.206
Prince George's County	1.151	1.131	1.190	1.206
City of Alexandria	1.135	1.181	1.192	1.206
Arlington County	1.149	1.159	1.197	1.206
Fairfax County	1.434	1.272	1.313	1.206
Loudoun County	3.004	2.766	2.749	1.206
Prince William County	1.465	1.464	1.520	1.206
Stafford County	1.982	1.426	1.489	1.206
Maryland Aggregate	1.281	1.212	1.240	1.206
Virginia Aggregate	1.423	1.374	1.399	1.206
Nonattainment Aggregate	1.235	1.221	1.243	1.206

Source: Metropolitan Washington Council of Governments

The 2002 and 2005 emissions for area and non-road sources are calculated by multiplying the 1990 base-year area and non-road emissions by the above growth factors for the appropriate year for each jurisdiction. Each area and non-road source category was matched to an appropriate growth surrogate based on the activity used to generate the base-year emission estimates. Surrogates were chosen as follows:

Surface Coating - population growth was chosen since the 1990 emissions are based on population-based emission factors.

Commercial/Consumer Solvent Use - population was chosen as the growth surrogate since 1990 emissions are based on per capita emission factors.

Vehicle Fueling and Underground Tank Breathing - all gasoline marketing categories were based on gasoline sales data since this is the activity level used to determine base-year emissions.

Open Burning - zero growth was applied since open burning emissions in the Washington region are predominately related to land clearing and the number of acres available for open burning is limited and will not increase between 1990 and 2002 0r 2005.

Dry Cleaning - population was chosen as the surrogate since base-year emissions are estimated using per capita emission factors.

Graphic Arts - population was used to estimate growth since emissions are based on per capita emission factors.

Surface Cleaning - employment growth was used as the surrogate since emissions are based on employment in auto repair, manufacturing, and electronic industries.

Tank Truck Unloading - growth in gasoline sales was applied to this category since base-year emissions are calculated using gasoline sales growth factors.

Municipal Landfills - Base-year emissions are estimated using data on total refuse deposited. Population was chosen as a surrogate since deposited waste is from the general population rather than industrial facilities.

Asphalt Paving - population was chosen as the surrogate since base-year emissions are calculated using per capita emission factors.

Bakeries - population was chosen as the surrogate.

Leaking Underground Storage Tanks - zero growth was applied to this category. The number of remediations during the ozone season, used to generate base-year emissions, does not directly correlate to population, households, or employment growth. The number of underground tanks is not expected to increase between 1990 and 1999.

Commercial Aviation and Airport Support Equipment - Emissions from commercial aircraft operations at Dulles and National Airports were provided by the Washington Metropolitan Airports Authority (MWAA). Emissions were calculated using FAA-approved activity data and the Emissions Dispersion Modeling system (EDMS) model.

Lawn and Garden Equipment - employment growth was chosen since the majority of lawn and garden emissions are the result of commercial lawn and garden activities.

Off-Highway Vehicles - population growth was chosen as the surrogate since projected estimates of future activity (e.g., number of motorcycle dealer establishments) are not available.

Recreational Boating - since forecasts of the future marine engine population are not available, population was chosen as the surrogate for projecting emissions.

Industrial Equipment - employment was chosen as the growth surrogate since emissions from this category are directly related to industrial activity.

Construction Equipment - emissions are related to total construction activity. Since reliable forecasts of construction equipment activity for 1999 are not readily available, total regional employment growth was chosen as the surrogate.

Agricultural Equipment - since the number of acres of land devoted to agricultural uses is not likely to increase between 1990 and 1999, a growth factor of 1.000 was applied.

Logging Activities - since the number of persons engaged in logging activities is not likely to increase between 1990 and 1999, a growth factor of 1.000 was applied.

4.1.3 Growth Projection Methodology: Mobile Sources

The 2002 and 2005 mobile source inventories were created through use of transportation and emissions modeling techniques. This involved use of the MOBILE6 emissions factor model and the Version 2.1 Travel Demand Model with a 2002 and 2005 planned highway network. Full documentation of the development of the 2002 and 2005 mobile inventories is included in Appendix C. Appropriate population, household, and employment growth are input through the Round 6.2 Cooperative Forecasting techniques.

4.1.4 Biogenic Emission Projections

Biogenic emission inventories for 2005 are the same as those used for the base-case for the entire domain. As discussed previously, these were derived from BEIS1 and BEIS2 processors. No Biogenic inventory is available for 2002. The biogenic inventory is not used to determine rate of progress.

4.2 Offset Provisions and Point Source Growth

The Act requires that emission growth from major stationary sources in nonattainment areas be offset by reductions that would not otherwise be achieved by other mandated controls. The offset requirement applies to all new major stationary sources and existing major stationary sources that have undergone major modifications. Increases in emissions from existing sources resulting from increases in capacity utilization are not subject to the offset requirement. For the purposes of the offset requirement, major stationary sources include all stationary sources exceeding an applicable size cutoff. In the Washington region these provisions apply to sources with emissions equal to or greater than 25 tons per year.

4.3 Actual vs. Allowable Emissions in Development of the 2005 Projected Emissions Inventory

For the purposes of calculating 2005 projection emissions inventories, EPA guidance specifically outlines the circumstances under which emissions projections are to be based on actual or allowable emissions. For sources or source categories that are subject to a pre-1990 regulation and the state does not anticipate subjecting the source to additional regulation, emissions projections should be based on actual emissions levels. Actual emissions levels should also be used to project for sources or source categories that were unregulated as of 1990. For sources that are expected to be subject to post-1990 regulation, projections should be based on new allowable emissions.

To simplify comparisons between the base-year and the projected year, EPA guidance states that comparison should be made only between like emissions: actual to actual, or allowable to allowable, not actual to allowable. Therefore, all base-year and all projection-year emissions estimates are based on actual emissions.

The term "actual emissions" means the average rate, in tons per year, at which a source discharged a pollutant during a two year period, which preceded the date or other specified date, and which is representative of normal source operation. Actual emissions are calculated using the source's operating hours, production rates, and types of material processed, stored, or combusted during the selected time period.

"Allowable emissions" are defined as the maximum emissions a source or installation is capable of discharging after consideration of any physical, operations, or emissions limitations required by state regulations or by federally enforceable conditions, which restrict operations and which are included in an applicable air quality permit to construct or permit to operate, secretarial order, plan for compliance, consent agreement, court order, or applicable federal requirement.

4.4 Projection Inventory Results

The 2002 and 2005 VOC and NOx projection-year emission inventory results with no control measures applied are summarized by component of the inventory in Tables 4-3 through and 4-6 below.

Table 4-3
2002 Projected Uncontrolled VOC Inventory (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total
Point	7.0	10.8	0.9	18.7
Area	110.5	97.8	18.6	227.0
Non-road	41.8	47.0	5.4	94.2
Mobile	84.3	77.5	18.1	179.9
Total	243.6	233.1	43.0	519.8

Source: COG and state air agencies, 2003
* Small discrepancies may result due to rounding

Table 4-4
2002 Projected Uncontrolled NOx Inventory (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total
Point	310.3	66.8	7.6	384.7
Area	19.0	35.3	4.0	58.2
Non-road	52.2	41.9	5.3	99.3
Mobile	160.1	146.1	28.2	334.4
Total	541.6	290.1	45.1	877.6

Source: COG and state air agencies, 2003
* Small discrepancies may result due to rounding

Table 4-5
2005 Projected Uncontrolled VOC Inventory (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total
Point	7.4	11.6	0.9	19.9
Area	114.7	104.1	18.3	237.0
Non-road	43.0	50.5	5.3	98.8
Mobile	82.0	77.1	17.5	176.6
Total	247.1	243.3	42.0	532.3

Source: COG and state air agencies, 2003
* Small discrepancies may result due to rounding

Table 4-6
2005 Projected Uncontrolled NOx Inventory (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total
Point	313.8	67.8	7.6	389.2
Area	19.8	41.8	3.9	65.4
Non-road	53.4	45.8	5.2	104.5
Mobile	153.2	140.8	26.9	321.0
Total	540.2	296.2	43.6	880.1

Source: COG and state air agencies, 2003
* Small discrepancies may result due to rounding

4.5 Emission Reductions from Control Measures

Chapter 7 of this SIP describes the control measures that have been or will be implemented by 2005 that will reduce emissions. The control measures are required by Federal or State regulations. The results are 2002 and 2005 projected inventories assuming control measures are in place.

Tables 4-7 through 4-10 present the projected 2002 and 2005 emission reductions resulting from implementation of the control measures. Below is a list of the measures. Chapter 7 presents detailed information on the measures and the projected reductions from each.

Point Source Controls
Non-CTG VOC RACT to 50 tons per year
State NOx RACT requirements
Expanded State VOC source regulations to 25 tons per year
Regional Transport NOx Reduction Control on Point Sources
Regional Transport NOx Controls

Area Source Controls
Stage II vapor recovery
Reformulated gasoline refueling benefits
Reformulated surface coatings
Reformulated consumer products
Surface cleaning/degreasing for machinery/auto repair
Landfill regulations
Seasonal open burning restrictions
Stage I expansion (Tank truck unloading)
Graphic arts controls
Autobody refinishing
Reformulated Industrial Cleaning Solvents
Emission Standards for Locomotives

Nonroad Source Controls
Non-road gasoline engines rule
Non-road diesel engines rule
Non-road marine engines rule
Reformulated gasoline (off-road)

Onroad Source Controls
Vehicle Inspection/Maintenance
National Low Emission Vehicle Program
Tier I vehicle standards
Tier 2 Vehicle Emission and Fuel Program
Reformulated gasoline (on-road)
Transportation control measures
Heavy–duty Diesel Engine Rule

4.6 2002 and 2005 Controlled Emissions

The projection of 2002 and 2005 controlled emissions is simply the 2002 or 2005 uncontrolled emissions minus the emission reductions achieved from the control

measures implemented by the Severe Area Plan. This information is presented in Tables 4-7 through 4-10.

Table 4-7
2002 Projected Controlled VOC Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	6.0	9.6	0.6	16.2
Area	66.2	54.0	9.8	129.9
Non-road	31.0	36.0	4.2	71.2
Mobile	58.7	53.5	12.4	124.3
Total	161.9	153.1	27.0	341.6

* Small discrepancies may result due to rounding
** Mobile total includes a reduction of 0.3 tpd due to regional TCMs.

Table 4-8
2002 Projected Controlled NOx Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	135.6	40.8	4.6	181.0
Area	16.8	33.4	3.8	54.0
Non-road	44.2	35.8	4.5	84.5
Mobile	138.5	126.3	24.3	288.4
Total	335.1	236.3	37.2	607.9

* Small discrepancies may result due to rounding
** Mobile total includes a reduction of 0.6 tpd due to regional TCMs.

Table 4-9
2005 Projected Controlled VOC Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	6.4	10.4	0.5	17.3
Area	69.5	59.4	9.5	138.3
Non-road	29.9	35.7	3.8	69.4
Mobile	45.2	41.9	9.8	96.6
Total	151.0	147.4	23.6	321.6

* Small discrepancies may result due to rounding
* Mobile total includes a reduction of 0.3 tpd due to regional TCMs.

Table 4-10
2005 Projected Controlled NOx Emissions (tons/day)
Washington Nonattainment Area

Emission Source	Maryland	Virginia	District of Columbia	Total**
Point	83.9	22.5	3.4	109.8
Area	17.5	39.8	3.7	61.0
Non-road	41.6	36.5	4.1	82.2
Mobile	114.2	102.4	20.1	236.0
Total	257.3	201.2	31.3	489.0

* Small discrepancies may result due to rounding
** Mobile total includes a reduction of 0.6 tpd due to regional TCMs.

4.7 Round 6.3 Forecasts

As mentioned previously, COG used Round 6.2 Cooperative Forecasts to grow the baseline inventory to the 2002 and 2005 projection years and calculate emission reductions. During the period this SIP was under development, COG developed draft Round 6.3 cooperative forecasts for populations, employment, and households in all jurisdictions in the MWAQC region. The draft Round 6.3 forecasts project higher growth in some jurisdictions than projected in Round 6.2 and lower growth in other

jurisdictions. Regionally, growth is forecasted to be higher in the draft Round 6.3 numbers than in Round 6.2. Growth factors for population, employment, and households using the draft Round 6.3 Cooperative Forecasts are presented in Tables 4-11 and 4-12.

Table 4-11
1990-2002 Growth Factors with Draft Round 6.3 Cooperative Forecasts

Jurisdiction	Employment	Population	Household	Gas Use
District of Columbia	0.971	1.000	1.046	1.165
Calvert County	1.498	1.455	1.589	1.165
Charles County	1.368	1.260	1.391	1.165
Frederick County	1.818	1.353	1.360	1.165
Montgomery County	1.218	1.176	1.185	1.165
Prince George's County	1.123	1.140	1.144	1.165
City of Alexandria	1.094	1.182	1.194	1.165
Arlington County	1.116	1.124	1.126	1.165
Fairfax County	1.366	1.221	1.240	1.165
Loudoun County	2.440	2.423	2.415	1.165
Prince William County	1.378	1.451	1.479	1.165
Stafford County	2.309	1.640	1.708	1.165
Maryland Aggregate	1.226	1.189	1.203	1.165
Virginia Aggregate	1.342	1.328	1.333	1.165
Nonattainment Aggregate	1.189	1.214	1.227	1.165

Source: Metropolitan Washington Council of Governments

Table 4-12
1990-2005 Growth Factors with Draft Round 6.3 Cooperative Forecasts

Jurisdiction	Employment	Population	Household	Gas Use
District of Columbia	0.964	1.000	1.057	1.206
Calvert County	1.622	1.569	1.737	1.206
Charles County	1.460	1.325	1.489	1.206
Frederick County	2.022	1.442	1.449	1.206
Montgomery County	1.273	1.221	1.231	1.206
Prince George's County	1.153	1.175	1.180	1.206
City of Alexandria	1.117	1.228	1.242	1.206
Arlington County	1.145	1.155	1.158	1.206
Fairfax County	1.449	1.274	1.298	1.206
Loudoun County	2.800	2.778	2.769	1.206
Prince William County	1.472	1.563	1.599	1.206
Stafford County	2.636	1.800	1.885	1.206
Maryland Aggregate	1.283	1.237	1.254	1.206
Virginia Aggregate	1.427	1.410	1.416	1.206
Nonattainment Aggregate	1.237	1.268	1.283	1.206

Source: Metropolitan Washington Council of Governments

The COG Board passed a resolution on February 12, 2003 that coordinates the cooperative forecast update process with the Transportation Planning Board's air quality conformity analysis schedule. It is expected that the draft 6.3 forecasts will be approved for use in September 2003. This will occur after submittal of this SIP. Therefore MWAQC has decided to reflect the expected increase in the emissions inventory to due to these newer projections.

COG recalculated all area and nonroad emissions using growth factors developed with the draft Round 6.3 numbers, following the same methodology and assumptions used when developing the inventories using Round 6.2 growth factors. In addition, TPB staff conducted a sensitivity analysis to determine the impact of the draft 6.3 forecast changes on vehicle emissions. As the area source sensitivity analysis does not account for implementation of the five Ozone Transport Commission (OTC) measures included as control measures in Chapter 7, the effect of the Round 6.3 forecasts on area sources is

slightly overestimated. The results are presented in Tables 4-13 through 4-16 and compared with emissions using Round 6.2 numbers.

Table 4-13
2002 Projected Controlled VOC Emissions (tons/day)
Round 6.2 vs. Draft Round 6.3 Forecasts
Washington Nonattainment Area

	Round 6.2	Draft Round 6.3	Difference	% Change
Point	16.2	16.2	0.0	0.0%
Area	129.9	133.0	3.1	2.4%
Nonroad	71.2	72.0	0.8	1.1%
On-road	124.3	125.6	1.3	1.1%
Total	341.6	346.9	5.3	1.6%

Table 4-14
2002 Projected Controlled NOx Emissions (tons/day)
Round 6.2 vs. Draft Round 6.3 Forecasts
Washington Nonattainment Area

	Round 6.2	Draft Round 6.3	Difference	% Change
Point	181.0	181.0	0.0	0.0%
Area	54.0	55.3	1.3	2.3%
Nonroad	84.5	84.8	0.3	0.4%
On-road	288.4	290.6	2.2	0.8%
Total	607.9	611.6	3.7	0.6%

Table 4-15
2005 Projected Controlled VOC Emissions (tons/day)
Round 6.2 vs. Draft Round 6.3 Forecasts
Washington Nonattainment Area

	Round 6.2	Draft Round 6.3	Difference	% Change
Point	17.3	17.3	0.0	0.0%
Area	138.3	142.2	3.9	2.8%
Nonroad	69.4	71.1	1.7	2.4%
On-road	96.6	98.1	1.5	1.5%
Total	321.6	328.7	7.0	2.2%

Table 4-16
2005 Projected Controlled NOx Emissions (tons/day)
Round 6.2 vs. Draft Round 6.3 Forecasts
Washington Nonattainment Area

	Round 6.2	Draft Round 6.3	Difference	% Change
Point	109.8	109.8	0.0	0.0%
Area	61.0	62.6	1.6	2.6%
Nonroad	82.2	83.2	1.0	1.3%
On-road	236.0	237.5	1.5	0.6%
Total	489.0	493.1	4.1	0.8%

As shown in the tables, emissions are higher using the draft Round 6.3 forecasts than emissions with Round 6.2. These emissions increases are factored into the ROP calculations presented in the next chapter and will be offset by control measures.

5.0 2002 RATE-OF-PROGRESS REQUIREMENTS

5.1 Introduction

Since 1990, the Clean Air Act has required ozone nonattainment areas to demonstrate progress towards attaining the 1-hour ozone standard. This requirement is referred to as the rate-of-progress (ROP) requirement. Between 1990-1996, nonattainment areas were required to reduce VOC emissions by 15%. Since 1996, regions have been required to demonstrate a 9% rate of progress every three years until the region's attainment date. As discussed in Chapter 2, the Metropolitan Washington region was originally classified as a serious nonattainment area with an attainment date of November 15, 1999. On January 24, 2003, EPA promulgated a Final Nonattainment Determination and Reclassification for the Metropolitan Washington area. This document reclassified the region as a severe nonattainment area, with an attainment date of November 15, 2005. Under severe area requirements, the Washington region is required to submit rate-of-progress demonstrations for the periods 1999-2002 and 2002-2005. However, the reclassification did not occur until after the November 15, 2002 deadline for demonstrating 1999-2002 rate-of-progress. In its Final Reclassification Notice, EPA extended until November 15, 2005 the deadline for the Washington region to meet the 2002 rate-of-progress requirements:

> *The required post-1999 ROP nine percent reduction originally was required by November 15, 2002 under the [Clean Air Act]. However, that date has elapsed. Therefore, in this action EPA is allowing the District, Maryland, and Virginia to demonstrate that the first required post-1999 nine percent ROP is achieved as expeditiously as practicable after November 15, 2002, but in any case no later than November 15, 2005.* (68 FR 3412)

This chapter contains the Washington region's rate of progress demonstration for the years 1999-2002. The region will fulfill the 1999-2002 rate-of-progress requirements by November 15, 2005, as discussed in Section 5.7.

In order to demonstrate rate-of-progress, a region must show that its expected emissions, termed controlled inventories, of NOx and VOC will be less than or equal to the target levels set for the end of the rate-of-progress period, or "milestone year". For the rate-of-progress period 1999-2002, the "target inventories" of emissions are the maximum quantity of anthropogenic emissions permissible during the 2002 milestone year.

This section describes the methodology used to establish the regional target inventories and controlled inventories for 2002. Because the expected NOx and VOC emissions will be less than or equal to the target levels, the Washington region will meet the rate-of-progress requirements for 2002.

5.2 Guidance for Calculating Emission Target Levels

The Clean Air Act Amendments (CAAA) of 1990 provide the primary guidance for calculating the VOC and NOx target levels used in a region's rate-of-progress (ROP) plans. In addition, EPA has issued various guidance documents to assist states in ROP development. This section briefly summarizes the requirements and procedures for calculating the target emission levels required for a ROP demonstration. Rate of progress demonstrations build upon each other, starting from the base year of 1990. Because the Washington region has updated its mobile inventories using MOBILE6, the base year and milestone year inventories have been revised from those submitted in prior SIPs. The intermediate milestones needed to be recalculated in order to develop 2002 target levels.

5.2.1 Guidance Relating to the 15% Plan

The first demonstration, known as the 15% Plan, required nonattainment areas to reduce VOC emissions by 15% from 1990 base year levels during the years 1990-1996. The CAAA included restrictions on the use of control measures to meet the 15% requirements. Reductions in ozone precursors resulting from four types of federal and state regulations could not be used to meet rate of progress. These four types of programs are: Federal Motor Vehicle Control Program (FMVCP) tailpipe and evaporative standards issued by January 1, 1990, federal regulations limiting the Reid Vapor Pressure (RVP) of gasoline in ozone nonattainment areas issued by June 15, 1990, state regulations correcting deficiencies in reasonably available control technology (RACT) rules, and state regulations establishing or correcting inspection and maintenance (I/M) programs for on-road vehicles. The basic procedures for developing target levels for the 15% Plan are described in EPA's *Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15% Rate of Progress Plans.*

5.2.2 Guidance Relating to the Post-1996 Rate of Progress Plans and NOx Substitution

The post-1996 rate-of-progress requirements mandate that nonattainment areas reduce regional VOC emissions by an average of 3% per year, for a total of 9%, during each rate-of-progress period. Section 182(c)(2)(C) of the Clean Air Act allows use of NOx reductions occurring after 1990 when demonstrating a post-1996 rate-of-progress. Procedures for developing target levels for post-1996 rate-of-progress demonstrations are described in EPA's *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration.* NOx emissions reductions may be substituted for VOC emissions reductions at a rate of 1 percent of the adjusted base year VOC inventory for 1 percent of the adjusted base year NOx inventory. If a region chooses to substitute reductions in NOx for reductions in VOC, the substitution must be made in accordance with EPA's *NOx Substitution Guidance*. This guidance states that the sum of all NOx and VOC reductions must average 3% per year over each 3-year ROP period, and that the use of NOx emission reductions must be consistent with the photochemical modeling used in the region's attainment demonstration. As photochemical attainment modeling performed for the Metropolitan Washington region shows that NOx reductions significantly reduce ozone formation, the region can substitute NOx reductions for VOC reductions. Based on this

modeling, the Washington region can substitute NOx reductions for some or all (0-9%) of the required VOC reductions for the 2002 rate-of-progress. Further details are contained in Appendix F.

5.3 Recalculation of Target Levels for Previous Milestone Years

5.3.1 1996 VOC Target Level

The 1996 VOC target level is calculated according to EPA's *Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15% Rate of Progress Plans*. The formula for calculation of the 1996 VOC target level is as follows:

1996 Target Level = (1990 base year inventory) – (reductions required to meet the rate-of-progress requirement) – (fleet turnover correction term) – (RACT rule correction term) [Eq. 5-1]

There are six steps in calculating a target level. These steps are described below.

Steps 1-2 Develop 1990 Base Year and 1990 Rate-of-Progress Base Year Inventories

The revised 1990 base year inventory is an inventory of actual anthropogenic and biogenic VOC emissions on a typical weekday during peak ozone season. The inventory was calculated as described in Chapter 3 and is presented in Table 3-1. The rate-of-progress base-year inventory includes only anthropogenic emissions generated within the Metropolitan Washington nonattainment area. As the 1990 base-year inventory included no emissions generated outside the Metropolitan Washington area, the only difference between the base year inventory and the rate-of-progress base year inventory is the removal of biogenic emissions. The rate-of-progress base year VOC inventory is presented in Table 5-1.

Table 5-1
1990 VOC Rate-of-Progress Base-Year Inventory
(Ozone Season tons per day)

Source	Tons Per Day	Reference
Point	15.0	
Area	191.1	
Non-Road	73.0	
On-Road	299.2	
TOTAL	578.3	(V1)

Note: Small discrepancies may result due to rounding

Step 3 Develop Adjusted Base Year Inventory (1990 Inventory Adjusted to 1996)

According to the 1990 CAAA, reductions necessary to meet the rate-of-progress requirement must be calculated from an emission baseline that excludes the effects of the non-creditable FMVCP and RVP programs described in Section 5.2.1. Therefore the 1990 baseline must be adjusted by subtracting the VOC reductions that will result from these two programs between 1990 and 1996. The resulting inventory is referred to as the "1990 Baseline Inventory Adjusted the "1996 Adjusted Inventory".

As the FMVCP and RVP programs affect the mobile inventory, the first step in deriving the adjusted inventory is recalculating the mobile portion of the inventory to eliminate reductions due to these programs. The FMVCP and RVP emission reductions that occurred between 1990 and 1996 are calculated using MOBILE6, EPA's most recent mobile emissions model. Two changes were made to the MOBILE6 input files in order to calculate the 1996 adjusted inventory. To eliminate the effect of the RVP adjustment, the model must exclude emission reductions resulting from the use of lower volatility gasoline in 1996. This is accomplished by changing the RVP input from 8.2 to 7.8 psi in the base-year MOBILE6 input files.[1]

The effect of fleet turnover due to the FMVCP regulations is eliminated by calculating 1990 mobile emissions as if those emissions were produced by 1996 vehicles. The adjusted inventory uses actual 1990 vehicle miles traveled (VMT), but multiplies the VMT by the emission factors associated with the fleet of vehicles on the road in 1996. The following equations illustrate this difference between the base year and adjusted inventories:

Actual mobile emissions in the base year inventory are given by

E_{act} = (1990 VMT) x (MOBILE6 EMISSIONS FACTORS FOR CALENDAR YEAR 1990) [Eq. 5-2]

Adjusted emissions are given by

E_{adj} = (1990 VMT) x (MOBILE6 EMISSIONS FACTORS FOR CALENDAR YEAR 1996) [Eq. 5-3]

Therefore in calculating the 1990 adjusted emissions, MOBILE6 was run under the same assumptions as used in calculating actual 1990 emission factors except that 1996 was used as the evaluation year and RVP was set to 7.8 psi. The MOBILE6 input files are included in Appendix B. Table 5-2 displays the 1990 VOC Inventory Adjusted to 1996.

Table 5-2
1990 VOC Base-Year Inventory Adjusted to 1996
(Ozone Season tons per day)

Source	Tons Per Day	Reference
Point	15.0	
Area	191.1	
Non-Road	73.0	
On-Road	176.0	
TOTAL	455.1	(V2)

Note: Small discrepancies may result due to rounding

Step 4 Reductions Required to Meet Rate-of-Progress Requirement

The CAAA require nonattainment areas to demonstrate reductions totaling 15% of the 1990 Base Year Inventory Adjusted to 1996. These reductions are calculated as:

Required reductions = 0.15 * (1990 Inventory Adjusted to 1996) [Eq. 5-4]

Description	Tons/day VOC	Reference
1990 Inventory Adjusted to 1996	455.1	(V2)
15% Reduction for Rate-of-Progress Requirement	0.15	(V3)
Reduction Required for Rate-of-Progress	68.3	(V4) = (V2) * (V3)

Step 5 Fleet Turnover and RACT Rule Corrections

Even in the absence of new emission controls on vehicles, vehicle emissions would continue to decrease from year to year as a result of drivers purchasing new cars compliant with the 1990 FMVCP requirements. The effects of fleet turnover are eliminated during calculation of the 1996 adjusted inventory. Therefore fleet turnover can be calculated as:

Fleet Turnover Correction = 1990 Base Year Inventory – 1990 Inventory Adjusted to 1996 [Eq. 5-5]

Description	Tons/day VOC	Reference
1990 Base Year Inventory	578.3	(V1)
1990 Inventory Adjusted to 1996	455.1	(V2)
Fleet Turnover Correction	123.2	(V5) = (V1) - (V2)

As mentioned in Section 5.2.1, EPA guidance does not permit regions to take credit for emission reductions resulting from correction of RACT rule deficiencies. One RACT rule correction was required in the Washington region. The rule affected tank truck emissions in Loudoun County, Virginia. Appendix B of *Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans* describes the methodology for calculating RACT rule corrections. The RACT rule correction totals 0.059 tpd VOC. Calculations are given in Appendix F.

Description	Tons/day VOC	Reference
RACT Rule Correction	0.059	(V6)

Step 6 Calculation of 1996 VOC Target Level

Following Equation 5-1, the VOC target level for 1996 is calculated in Table 5-3 below:

Table 5-3
Calculation of 1996 VOC Target Level
(Ozone Season tons per day)

Description	Tons/day VOC	Reference
1990 Base Year Inventory	578.3	(V1)
Reduction Required for Rate-of-Progress	68.3	(V4)
Fleet Turnover Correction	123.2	(V5)
RACT Rule Correction	0.059	(V6)
1996 Target Level	386.8	(V7) = (V1)-(V4)-(V5)-(V6)

Note: Small discrepancies may result due to rounding

5.3.2 1999 VOC and NOx Target Levels

The post-1996 rate-of-progress requirements mandate that nonattainment areas reduce regional VOC emissions by an average of 3% per year, for a total of 9%, during each rate-of-progress period. As explained in Section 5.2.2, the Washington region can choose to substitute NOx for

some or all of the 9% VOC reduction. In the Revised Phase I Attainment Plan submitted in May 1999, the Washington region demonstrated rate-of-progress for the years 1996-1999 using reductions of 1% VOC and 8% NOx.[2] Therefore these same percentage reductions will be used in recalculation of the 1999 VOC and NOx target levels.

The target levels for post-1996 rate-of-progress plans are calculated according to EPA's *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration*. The general formula for calculation of post-1996 target levels is as follows:

Target Level = (previous milestone's target level) - (reductions required to meet the rate-of-progress requirement) - (fleet turnover correction term) [Eq. 5-6]

For the 1999 VOC target level, this becomes:

1999 VOC Target Level = (1996 VOC Target Level) – (1% VOC reduction) – (fleet turnover correction term) [Eq. 5-7]

Because EPA did not permit NOx substitution to meet the requirements of the 15% Plan, a 1996 NOx target level does not exist. Therefore the 1999 NOx target level is calculated as:

1999 NOx Target Level = (1990 NOx Base Year inventory) – (8% NOx reduction) – (fleet turnover correction term) [Eq. 6-8]

Steps 1-2 Develop 1990 Base Year and 1990 Rate-of-Progress Base Year Inventories

The revised 1990 NOx base year and base year rate-of-progress inventories are inventories of actual anthropogenic and biogenic VOC emissions on a typical weekday during peak ozone season. The inventory was calculated as described in Chapter 3 and is presented in Table 3-2. The base year rate-of-progress inventory includes only anthropogenic emissions generated within the Metropolitan Washington nonattainment area. As the 1990 base-year inventory included no emissions generated outside the Metropolitan Washington area, the only difference between the base year inventory and the rate-of-progress base year inventory is the removal of biogenic emissions. The rate-of-progress base year VOC inventory is presented in Table 5-4.

Table 5-4
1990 NOx Rate-of-Progress Base-Year Inventory
(Ozone Season tons per day)

Source	Tons Per Day	Reference
Point	361.4	
Area	47.7	
Non-Road	79.3	
On-Road	380.8	
TOTAL	869.2	(N1)

Note: Small discrepancies may result due to rounding

Step 3 Develop Adjusted Base Year Inventories (1990 Inventories Adjusted to 1999)

The 1990 base year inventories adjusted to 1999 estimate what 1990 VOC and NOx emissions would have been if they were produced by the fleet mix on the road in the Washington region in 1999. The inventories are calculated as described in Step 3 of Section 5.3.1, except the MOBILE6 emission factors are for calendar year 1999 instead of 1996. The MOBILE6 input files are included in Appendix B. Table 5-5 displays the 1999 Adjusted Inventories for VOC and NOx.

Table 5-5
1990 Base-Year Inventories Adjusted to 1999
(Ozone Season tons per day)

Source	VOC	NOx	Reference
Point	15.0	361.4	
Area	191.1	47.7	
Non-Road	73.0	79.3	
On-Road	154.2	291.0	
TOTAL	433.3	779.4	(V8), (N8)

Note: Small discrepancies may result due to rounding

Step 4 Reductions Required to Meet Rate-of-Progress Requirement

The Washington region chose to fulfill its 1996-1999 rate-of-progress requirement using an 8% reduction in NOx and a 1% reduction in VOC. These reductions are calculated as a percentage of the 1990 Base Year Inventory Adjusted to 1999:

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 1999	433.3	779.4	(V8), (N8)
% Reduction for Rate-of-Progress Requirement	0.01	0.08	(V9), (N9)
Reduction Required for Rate-of-Progress	4.3	62.4	(V10) = (V8) * (V9) (N10) = (N8) * (N9)

Step 5 Fleet Turnover Correction

As discussed in Section 5.3.1, an adjusted inventory predicts how base year emissions would change if the benefits of fleet turnover and RVP adjustments in a given year were credited to the baseline inventory. Therefore the benefits of fleet turnover in a rate-of-progress period can be determined by taking the difference between the adjusted inventories for the relevant milestone years. For VOC, the relevant milestone years are 1996 and 1999. Because NOx reductions could not be used to fulfill the requirements of the 15% Plan, NOx reductions during the entire period 1990-1999 are creditable toward the 1996-1999 rate of progress. Therefore, the NOx fleet turnover correction is also calculated for the period 1990-1999:

VOC Fleet Turnover Correction = 1990 Inventory Adjusted to 1996– 1990 Inventory Adjusted to 1999 [Eq. 5-9]

NOx Fleet Turnover Correction = 1990 Base Year Inventory– 1990 Inventory Adjusted to 1999 [Eq. 5-10]

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Base Year Inventory		869.2	(N1)
1990 Inventory Adjusted to 1996	455.1		(V2)
1990 Inventory Adjusted to 1999	433.3	779.4	(V8), (N8)
Fleet Turnover Correction	21.8	89.8	(V11) = (V2)-(V8) (N11) = (N1)-(N8)

Step 6 Calculation of 1999 Target Levels

Following Equations 5-7 and 5-8, the VOC and NOx target levels for 1999 are calculated in Table 5-6 below:

Table 5-6
Calculation of VOC and NOx Target Levels for 1999
(Ozone Season tons per day)

Description	VOC	NOx	Reference
1990 Base Year Inventory		869.2	(N1)
1996 Target Level	386.8		(V7)
Reduction Required for Rate-of-Progress	4.3	62.4	(V10), (N10)
Fleet Turnover Correction	21.8	89.8	(V11), (N11)
1999 Target Levels	360.6	717.1	(V12) = (V7)-(V10)-(V11) (N12) = (N1)-(N10)-(N11)

Note: Small discrepancies may result due to rounding

5.4 2002 VOC and NOx Target Levels

5.4.1 Emission Reduction Strategy for the 2002 Rate of Progress

As mentioned in Section 5.2.2, the photochemical modeling performed for the Washington region validates the use of either NOx or VOC reductions to fulfill the 9% emission reduction requirement for the 2002 and 2005 rates of progress. See Appendix F for further details. The region is not obligated to use the same VOC and NOx percentages used in any prior rate of progress plan. The ability to substitute NOx for VOC creates an array of VOC and NOx control strategy combinations that fulfill the 9% reduction requirement for the 1999-2002 rate-of-progress. The target levels of emissions and reduction requirements will vary depending on the VOC/NOx strategy chosen. Because the Washington region expects to see large NOx reductions by 2005 due to the NOx SIP call and the new Tier 2 vehicle regulations, among other measures, the region has chosen to demonstrate the 2002 rate-of-progress using reductions of 9% NOx and 0% VOC.

5.4.2 Calculation of 2002 Target Levels

Equation 5-6 gives the general formula for calculating post-1996 target levels. From Section 5.4.1, the region has chosen to demonstrate the 2002 rate-of-progress using 0% VOC reductions and 9% NOx reductions. Therefore the 2002 VOC target level becomes:

2002 VOC Target level = (1999 VOC Target Level) – (0% VOC reduction) – (fleet turnover correction term) [Eq. 5-11]

The 2002 NOx target level becomes:

2002 NOx Target level = (1999 NOx Target Level) – (9% NOx reduction) – (fleet turnover correction term) [Eq. 5-12]

Steps 1-2 Develop 1990 Base Year and 1990 Rate-of-Progress Base Year Inventories

The base year rate of progress inventories for VOC and NOx are the same inventories referenced in Sections 5.2.2 and 5.3.2 during calculation of the 1990-1996 and 1996-1999 target levels.

Step 3 Develop Adjusted Base Year Inventories (1990 Inventories Adjusted to 2002)

The 1990 base year inventories adjusted to 2002 estimate what 1990 VOC and NOx emissions would have been if they were produced by the fleet mix on the road in the Washington region in 2002. The inventories are calculated as described in Step 3 of Section 5.3.1, except the MOBILE6 emission factors are for calendar year 2002 instead of 1996. The MOBILE6 input files are included in Appendix B. Table 5-7 displays the 2002 Adjusted Inventories for VOC and NOx.

Table 5-7
1990 VOC Base-Year Inventories Adjusted to 2002
(Ozone Season tons per day)

Source	VOC	NOx	Reference
Point	15.0	361.4	
Area	191.1	47.7	
Non-Road	73.0	79.3	
On-Road	141.0	268.2	
TOTAL	420.1	761.9	(V13), (N13)

Note: Small discrepancies may result due to rounding.

Step 4 Reductions Required to Meet Rate-of-Progress Requirement

The Washington region is choosing to fulfill the 1999-2002 rate-of-progress requirements using a 9% reduction in NOx and a 0% reduction in VOC. These reductions are calculated as a percentage of the 1990 Base Year Inventory Adjusted to 2002:

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 2002	420.1	756.6	(V13), (N13)
% Reduction for Rate-of-Progress Requirement	0	0.09	(V14), (N14)
Reduction Required for Rate-of-Progress	0	68.1	(V15) = (V13) * (V14) (N15) = (N13) * (N14)

Step 5 Fleet Turnover Correction

As discussed in Section 5.3.1, calculation of an adjusted inventory predicts how base year emissions would change if the benefits of fleet turnover and RVP adjustments in a given year were credited to the baseline inventory. Therefore the benefits due to fleet turnover during a rate-of-progress period can be determined by taking the difference between the adjusted inventories for the relevant milestone years. For VOC and NOx, the relevant milestone years are 1999 and 2002.

Fleet Turnover Correction = 1990 Inventory Adjusted to 1999– 1990 Inventory Adjusted to 2002
[Eq. 5-13]

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 1999	433.3	779.4	(V8), (N8)
1990 Inventory Adjusted to 2002	420.1	756.6	(V13), (N13)
Fleet Turnover Correction	13.2	22.8	(V16) = (V2)-(V13) (N16) = (N1)-(N13)

Step 6 Calculation of 2002 Target Levels

Following Equations 5-11 and 5-12, the VOC and NOx target levels for 2002 are calculated in Table 5-8 below:

Table 5-8
Calculation of VOC and NOx Target Levels for 2002
(Ozone Season tons per day)

Description	**Tons/day VOC**	**Tons/day NOx**	**Reference**
1999 Target Level	360.6	717.1	(V12), (N12)
Reduction Required for Rate-of-Progress	0	68.1	(V15), (N15)
Fleet Turnover Correction	13.2	22.8	(V16), (N16)
2002 Target Levels	347.4	626.2	(V17) = (V12)-(V15)-(V16) (N17) = (N12)-(N15)-(N16)

5.5 Required Emission Reductions for 2002 Rate of Progress

5.5.1 2002 Uncontrolled Inventories

The CAAA require nonattainment areas to prove that the average 3% per year required emission reductions are achieved after offsetting growth in emissions. To determine the total emission reductions required for the 2002 rate-of-progress plan and prove that emissions growth has been

offset, emissions levels during the 2002 milestone year must be estimated. The first part of this estimation is development of a 2002 uncontrolled inventory. The uncontrolled inventory includes VOC and NOx emissions that would have occurred in 2002 if no new control measures had been implemented since 1990. The inventory was calculated as described in Chapter 4 and is presented in Tables 4-3 and 4-4.

5.5.2 Round 6.3 Growth Factor Adjustment

As discussed in Section 4.7, the Board of the Metropolitan Washington Council of Governments is expected to approve a new set of population forecasts, referred to as Round 6.3, for use in September 2003. These forecasts will be approved after submittal of this SIP. However, since draft forecasts are currently available, the region has decided to account for the expected increase in emissions due to use of these new forecasts. As shown in Tables 4-13 and 4-14, use of these new forecasts is expected to increase regional emissions projections for calendar year 2002 by 5.3 tpd VOC and 3.7 tpd NOx. Therefore the region will adjust its growth forecasts by the amount of the Round 6.3 increase, and these expected increases will be offset as part of the plan to offset growth in emissions.

5.5.3 Requirement to Offset Growth in Emissions

The growth in emissions from 1990-2002 can be calculated by subtracting the 1990 base year inventory from the 2002 uncontrolled inventory. Table 5-9 shows emissions growth in VOC and NOx between 1990 and 2002.

Table 5-9
Washington Nonattainment Area
Summary of Emissions Growth Between 1990 and 2002
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2002 Uncontrolled Emissions	519.8	877.6	(V18), (N18)
Growth Adjustment, Round 6.3	5.3	3.7	(V19), (N19)
1990 Inventory Adjusted to 2002[3]	420.1	756.6	(V13), (N13)
1990-2002 Emissions Growth	105.0	124.7	(V20) = (V18)+(V19) – (V13) (N20) = (N18)+(N19) – (N13)

VOC and NOx reductions excluding growth are calculated by taking the difference between the 1990 base year inventory and the 2002 target inventory. Table 5-10 displays the necessary VOC and NOx reductions.

Table 5-10
Washington Nonattainment Area
VOC and NOx Emission Reductions Required Between 1990 and 2002, Excluding Growth
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
1990 Inventory Adjusted to 2002	420.1	756.6	(V13), (N13)
2002 Target Level	347.4	626.1	(V17), (N17)
1990-2002 Reductions Required, Excluding Growth	72.7	130.5	(V21) = (V13)-(V17) (N21) = (N13)-(N17)

Total emission reductions including growth are calculated by summing the emissions growth, shown in Table 5-9, and the reductions required excluding growth, shown in Table 5-10. Table 5-11 summarizes the VOC and NOx reductions necessary for the 2002 rate-of-progress demonstration.

Table 5-11
Washington Nonattainment Area
VOC and NOx Emissions Reductions Required to Offset Growth Between 1990 and 2002
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
1990-2002 Emissions Growth	105.0	124.7	(V20), (N20)
Reductions Without Growth	72.7	130.5	(V21), (N21)
Total Reductions Required, Including Growth	177.7	255.2	(V22) = (V20)+(V21) (N22) = (N20)+(N21)

5.6 Control Strategy for Demonstrating 2002 Rate-of-Progress

In order to demonstrate rate-of-progress for the years 1999-2002, the Washington region must show that expected emissions in 2002 are equal to or less than the 2002 target levels presented in Table 5-8. The region must also show that the total reductions achieved from 1990-2002 are greater than or equal to the required reductions calculated in Table 5-11.

The 2002 controlled inventories are inventories of all anthropogenic VOC and NOx emissions expected to occur in the Washington nonattainment area during 2002. The inventories were developed as described in Chapter 4 and are displayed in Tables 4-7 and 4-8. As summarized in Table 5-12, the 2002 controlled VOC and NOx inventories are less than the 2002 target inventories. The controlled inventories include the benefits of the control measures described in Chapter 7. As shown in Table A, the reductions from these control measures will exceed the 177.7 tpd VOC and 255.2 tpd NOx required. Table 5-13 summarizes the emission reductions from control measures. These two tables demonstrate that the Washington region fulfills the 1999-2002 rate-of-progress requirements.

Table 5-12
Washington Nonattainment Area
Comparison of 2002 Controlled and Target Inventories
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2002 Target Levels	347.4	626.1	(V17), (N17)
2002 Controlled Emissions	341.6	607.9	(V23), (N23)
Growth Adjustment, Round 6.3	5.3	3.7	(V19), (N19)
2002 Controlled Emissions, Including Round 6.3 Growth	346.9	611.6	(V24)=(V23)+(V19) (N24)=(N23)+(N19)

Table 5-13
Washington Nonattainment Area
2002 Control Strategy Projection
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2002 Uncontrolled Emissions	519.8	877.6	(V18), (N18)
Growth Adjustment, Round 6.3	5.3	3.7	(V19), (N19)
2002 Controlled Emissions, Including Round 6.3 Growth	346.9	611.6	(V24), (N24)
Emission Reductions from Control Measures	178.2	269.7	(V18)+(V19)-(V24) (V22) (N18)+(N19)-(N24) (N22)

5.7 Date for Fulfilling 2002 Rate-of-Progress Requirements

As discussed in Section 5.1, EPA's January 2003 reclassification notice ordered the region to achieve the 1999-2002 ROP as expeditiously as practicable after November 15 2002, but no later than November 14, 2005. Table A in Chapter 7 quantifies the benefits of control measures used to fulfill the 2002 ROP requirements. Many of the reductions shown in Table A result from recent state and local commitments to implement control measures for the purpose of demonstrating the 2002 rate-of-progress. Of the measures listed in Table A, area source measures 7.4.10 through 7.4.15 and part of measure 7.5 were not committed to as of November 15, 2002. As Table 5-14 shows, the reductions associated with these measures will total at least 30.2 tons per day VOC. These benefits could not be expediently or cost-effectively achieved through local reduction programs, such as vehicle replacement or transportation demand management. Therefore state regulations were required. As of November 2002, states had already begun rule development for many of regulations listed in Table 5-14. However, the regulatory comment and approval processes are lengthy, especially in the Commonwealth of Virginia. As can be seen in Tables 10-9 through 10-11, these regulations are not expected to be

in effect until late 2003. Compliance will not be required until approximately 2 years later. Therefore, the Washington region expects to fulfill the 2002 ROP requirements on November 15, 2005, which is as expeditiously as practicable given the time required for completion of state regulatory processes.

Table 5-14
Washington Nonattainment Area
Reductions from Control Measures Not Committed to as of November 15, 2002
Ozone Season Daily NOx Emissions (tons per day)

Reference No.	Measure	VOC
7.4.10	Ozone Transport Commission (OTC) Consumer Products	1.1
7.4.11	Ozone Transport Commission (OTC) Portable Fuel Containers	2.3
7.4.12	Ozone Transport Commission (OTC) Architectural and Industrial Maintenance Coatings	12.3
7.4.13	Ozone Transport Commission (OTC) Mobile Repair and Refinishing	2.6
7.4.14	Ozone Transport Commission (OTC) Solvent Cleaning	11.7
7.4.15	Additional Area Source Measures	0.0
7.5	Transportation Control Measures (partial)	0.2
	Reductions from Control Measures Not Committed to as of November 15, 2002	30.2

References

U.S. EPA, “Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for

U.S. EPA, “Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration”, February 18, 1994.

U.S. EPA, “NOx Substitution Guidance”, December 1993.

[1] The 1990 Phase II regulations specify 7.8 psi as the maximum RVP of gasoline being sold in the Washington, DC-MD-VA ozone nonattainment area in 1992.

[2] See MWAQC Phase I Plan Revisions, Chapter 5.

[3] Because the 2002 uncontrolled inventory excludes the effects of the non creditable FMVCP and RVP adjustments, it must be subtracted from the 2002 Adjusted Inventory rather than the 1990 base year inventory.

6.0 2005 RATE-OF-PROGRESS REQUIREMENTS

In addition to the 1999-2002 rate-of-progress (ROP) demonstration contained in Chapter 5, the Washington region must also demonstrate rate-of-progress for the period 2002-2005. In order to demonstrate rate-of-progress, a region must show that its expected emissions, termed controlled inventories, of NOx and VOC will be less than or equal to the target levels set for the end of the rate-of-progress period, or "milestone year". For the rate-of-progress period 2002-2005, the target levels of emissions are the maximum quantity of anthropogenic emissions permissible during the 2005 milestone year. This section describes the methodology used to establish the regional target inventories and controlled inventories for 2005. Because the expected NOx and VOC emissions will be less than the target levels, the Washington region will meet the rate-of-progress requirements by the November 15, 2005 deadline.

6.1 2005 VOC and NOx Target Levels

6.1.1 Emission Reduction Strategy for the 2005 Rate of Progress

As mentioned in Section 5.2.2, the photochemical modeling performed for the Washington region validates the use of either NOx or VOC reductions to fulfill the 9% emission reduction requirement for the 2002 and 2005 rates of progress. See Appendix E for further details. The region is not obligated to use the same VOC and NOx percentages used in any prior rate of progress plan. The ability to substitute NOx for VOC creates an array of VOC and NOx control strategy combinations that fulfill the 9% reduction requirement for the 2002-2005 rate-of-progress. The target levels of emissions and reduction requirements will vary depending on the VOC/NOx strategy chosen. Because the Washington region expects to see large NOx reductions by 2005 due to the NOx SIP call and the new Tier 2 vehicle regulations, among other measures, the region has chosen to demonstrate the 2005 rate-of-progress using reductions of 9% NOx and 0% VOC.

6.1.2 Calculation of 2005 Target Levels

Equation 5-6 gives the general formula for calculating post-1996 target levels. From Section 6.1.1, the region has chosen to demonstrate the 2005 rate-of-progress using 0% VOC reductions and 9% NOx reductions. Therefore the 2005 VOC target level becomes:

2005 VOC Target level = (2002 VOC Target Level) – (0% VOC reduction) – (fleet turnover correction term) [Eq. 6-1]

The 2005 NOx target level becomes:

2005 NOx Target level = (2002 NOx Target Level) – (9% NOx reduction) – (fleet turnover correction term) [Eq. 6-2]

Steps 1-2 Develop 1990 Base Year and 1990 Rate-of-Progress Base Year Inventories

The base year rate of progress inventories for VOC and NOx are the same inventories presented in Tables 5-1 and 5-4 during calculation of the 1990-1996 and 1996-1999 target levels.

Step 3 Develop Adjusted Base Year Inventories (1990 Inventories Adjusted to 2005)

The 1990 base year inventories adjusted to 2005 estimate what 1990 VOC and NOx emissions would have been if they were produced by the fleet mix on the road in the Washington region in 2002. The inventories are calculated as described in Step 3 of Section 5.3.1, except the MOBILE6 emission factors are for calendar year 2005 instead of 1996. The MOBILE6 input files are included in Appendix B. Table 6-1 displays the 2005 Adjusted Inventories for VOC and NOx.

Table 6-1
1990 Base-Year Inventories Adjusted to 2005
(Ozone Season tons per day)

Source	VOC	NOx	Reference
Point	15.0	361.4	
Area	191.1	47.7	
Non-Road	73.0	79.3	
On-Road	132.6	247.0	
TOTAL	411.7	735.4	(V25), (N25)

Step 4 Reductions Required to Meet Rate-of-Progress Requirement

The Washington region is choosing to fulfill the 2002-2005 rate-of-progress requirement using a 9% reduction in NOx and a 0% reduction in VOC. These reductions are calculated as a percentage of the 1990 Base Year Inventory Adjusted to 2005:

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 2005	411.7	735.4	(V25), (N25)
% Reduction for Rate-of-Progress Requirement	0	0.09	(V26), (N26)
Reduction Required for Rate-of-Progress	0	66.2	(V27) = (V25) * (V26) (N27) = (N25) * (V26)

Step 5 Fleet Turnover Correction

As discussed in Section 5.3.1, calculation of an adjusted inventory predicts how base year emissions would change if the benefits of fleet turnover and RVP adjustments in a given year

were credited to the baseline inventory. Therefore the benefits due to fleet turnover during a rate-of-progress period can be determined by taking the difference between the adjusted inventories for the relevant milestone years. For VOC and NOx, the relevant milestone years are 2002 and 2005.

Fleet Turnover Correction = 1990 Inventory Adjusted to 2002– 1990 Inventory Adjusted to 2005 [Eq. 6-3]

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 2002	420.1	756.6	(V13), (N13)
1990 Inventory Adjusted to 2005	411.7	735.4	(V25), (N25)
Fleet Turnover Correction	8.4	21.2	(V28) = (V13)-(V25) (N28) = (N13)-(N25)

Step 6 Calculation of 2005 Target Levels

Following the equations 5-11 and 5-12, the VOC and NOx target levels for 2005 are calculated in Table 6-2 below:

Table 6-2
Calculation of VOC and NOx Target Levels for 2005
(Ozone Season tons per day)

Description	**VOC**	**NOx**	**Reference**
2002 Target Level	347.4	626.1	(V17), (N17)
Reduction Required for Rate-of-Progress	0	66.2	(V27), (N27)
Fleet Turnover Correction	8.4	21.2	(V28), (N28)
2005 Target Levels	339.0	538.8	(V29) = (V17)-(V27)-(V28) (N29) = (N17)-(N27)-(N28)

6.2 Required Emission Reductions for 2005 Rate of Progress

6.2.1 2005 Uncontrolled Inventories

The CAAA require nonattainment areas to prove that the average 3% per year required emission reductions are achieved after offsetting growth in emissions. To determine the total emission reductions required for the 2005 rate-of-progress plan and prove that emissions growth has been offset, emissions levels during the 2005 milestone year must be estimated. The first part of this estimation is development of a 2005 uncontrolled inventory. The uncontrolled inventory includes VOC and NOx emissions that would have occurred in 2005 if no new control measures had been

implemented since 1990. The inventory was calculated as described in Chapter 4 and is presented in Tables 4-5 and 4-6.

6.2.2 Round 6.3 Growth Factor Adjustment

As discussed in Section 4.7, the Board of the Metropolitan Washington Council of Governments is expected to approve a new set of population forecasts, referred to as Round 6.3, for use in September 2003. These forecasts will be approved after submittal of this SIP. However, since draft forecasts are currently available, the region has decided to account for the expected increase in emissions due to use of these new forecasts. As shown in Tables 4-15 and 4-16, use of these new forecasts is expected to increase regional emissions projections for calendar year 2005 by 7.0 tpd VOC and 4.1 tpd NOx. Therefore the region will adjust its growth forecasts by the amount of the Round 6.3 increase, and these expected increases will be offset as part of the plan to offset growth in emissions.

6.2.3 Requirement to Offset Growth in Emissions

The growth in emissions from 1990-2005 can be calculated by subtracting the 1990 base year inventory from the 2005 uncontrolled inventory. Table 6-3 shows emissions growth in VOC and NOx between 1990 and 2005.

Table 6-3
Washington Nonattainment Area
Summary of Emissions Growth Between 1990 and 2005
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2005 Uncontrolled Emissions	532.3	880.1	(V30), (N30)
Growth Adjustment, Round 6.3	7.0	4.1	(V31), (N31)
1990 Inventory Adjusted to 2005[1]	411.7	735.4	(V25), (N25)
1990-2005 Emissions Growth	127.6	148.8	(V32) = (V30)+(V31) – (V25) (N32) = (N30)+(N31) – (N25)

VOC and NOx reductions excluding growth are calculated by taking the difference between the 1990 base year inventory and the 2005 target inventory. Table 6-4 displays the necessary VOC and NOx reductions.

Table 6-4
Washington Nonattainment Area
VOC and NOx Emissions Reductions Required Between 1990 and 2005
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
1990 Inventory Adjusted to 2005	411.7	735.4	(V25), (N25)
2005 Target Level	339.0	538.8	(V29), (N29)
1990-2005 Reductions Required, Excluding Growth	72.7	196.6	(V33) = (V25) – (V29) (N33) = (N25) – (N29)

Total emission reductions including growth are calculated by summing the emissions growth, shown in Table 6-3, and the reductions required excluding growth, shown in Table 6-4. Table 6-5 summarizes the VOC and NOx reductions necessary for the 2005 rate-of-progress demonstration.

Table 6-5
Washington Nonattainment Area
VOC and NOx Emissions Reductions Required To Offset Growth Between 1990 and 2005
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
1990-2005 Emissions Growth	127.6	148.8	(V32), (N32)
Reductions Without Growth	72.7	196.6	(V33), (N33)
Total Reductions Required, Including Growth	200.3	345.4	(V34) = (V32)+(V33) (N34) = (N32)+(N33)

6.3 Control Strategy for Demonstrating 2005 Rate-of-Progress

In order to demonstrate rate-of-progress for the years 1999-2005, the Washington region must show that expected emissions in 2005 are equal to or less than the 2005 target levels presented in Table 6-2. The region must also show that the total reductions achieved from 1990-2005 are greater than or equal to the required reductions calculated in Table 6-5.

The 2005 controlled inventories are inventories of all anthropogenic VOC and NOx emissions expected to occur in the Washington nonattainment area during 2005. The inventories were developed as described in Chapter 4 and are displayed in Tables 4-9 and 4-10. As is summarized in Table 6-6, the 2005 controlled VOC and NOx inventories are less than the 2005 target inventories. The controlled inventories include the benefits of the control measures described in Chapter 7. As shown in Table A of Chapter 7, these reductions will exceed the 200.3 tpd VOC and 345.4 tpd NOx required. Table 6-7 summarizes the emission reductions from control measures. These two tables demonstrate that the Washington region fulfills the 1999-2005 rate-of-progress requirements.

Table 6-6
Washington Nonattainment Area
2005 Controlled and Target Inventories
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2005 Target Levels	339.0	538.8	(V29), (N29)
2005 Controlled Emissions	321.6	489.0	(V35), (N35)
Growth Adjustment, Round 6.3	7.0	4.1	(V31), (N31)
2005 Controlled Emissions, Including Round 6.3 Growth	328.6	493.1	(V36)=(V35)+(V31) (N36)=(N35)+(N31)

Table 6-7
Washington Nonattainment Area
2005 Control Strategy Projection
Ozone Season Daily Emissions (tons per day)

Description	VOC	NOx	Reference
2005 Uncontrolled Emissions	532.3	880.1	(V30), (N30)
Growth Adjustment, Round 6.3	7.0	4.1	(V31), (N31)
2005 Controlled Emissions, Including Round 6.3 Growth	328.6	493.1	(V36), (N36)
Emission Reductions from Control Measures	210.7	391.1	(V30)+(V31) – (V36) > (V34) (N30)+(N31) – (N36) > (N34)

References

U.S. EPA, "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15% Rate of Progress Plans"

U.S. EPA, "Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration", February 18, 1994.

U.S. EPA, "NOx Substitution Guidance", December 1993.

[1] Because the 2005 uncontrolled inventory excludes the effects of the non creditable FMVCP and RVP adjustments, it must be subtracted from the 2005 Adjusted Inventory rather than the 1990 base year inventory.

7.0 CONTROL MEASURES

Chapters 5 and 6 present the emission reduction estimates and target levels of emissions for the 2002 and 2005 Rate of Progress demonstrations. Chapter 4 presents the 2002 and 2005 inventory projections. Table A is an overall summary table of emission reductions from each control measure that will be in effect for each rate of progress demonstration. Documentation for the estimates provided in Table A is provided throughout the remainder of this Chapter. This Chapter documents the methodologies used and provides example calculations for the emission reduction estimates for each control measure.

7.1 Reductions For Control Measures

TABLE A
SUMMARY OF CONTROL STRATEGIES
VOC and NOx Benefits of Control Measures
(1990-2005)

		VOC Reductions tons/day		NOx Reductions tons/day	
Ref No.	***Control Measure***	***2002***	***2005***	***2002***	***2005***
POINT SOURCE MEASURES					
7.2.5	Non-CTG VOC RACT to 25 tpy	1.2	1.2	0	0
7.2.9	State NOx RACT and Regional NOx Transport Requirement	0	0	203.8	280.0
7.4.7	Expanded State Point Source Regulations to 25 tons/yr	1.7	1.8	0	0
SUBTOTAL		**2.9**	**3.0**	**203.8**	**280.0**
AREA SOURCE MEASURES					
7.2.2	Stage II Vapor Recovery Nozzles	15.1	15.0	0	0
7.2.6	Phase II Gasoline Volatility Controls	2.6	2.3	0	0
7.3.1	Reformulated Surface Coatings	16.4	17.1	0	0
7.3.2	Reformulated Consumer Products	4.0	4.1	0	0
7.3.4	Reformulated Industrial Cleaning Solvents	1.2	1.2	0	0
7.3.5	Standards for Locomotive	0.01	0.02	2.7	2.9
7.4.3	Surface Cleaning/Degreasing for Machinery/Automotive Repair	4.1	4.4	0	0
7.4.4	Landfill Regulations	2.3	2.5		
7.4.5	Seasonal Open Burning Restrictions	7.1	7.1	1.5	1.5
7.4.6	Stage I Expansion (Tank Truck Unloading)	1.5	1.6		
7.4.8	Graphic Arts Controls	3.7	3.9		
7.4.9	Auto body Refinishing	9.3	9.8		
7.4.10	Ozone Transport Commission (OTC) Consumer Products	1.1	1.1		
7.4.11	Ozone Transport Commission (OTC) Portable Fuel	2.3	2.3		
7.4.12	Ozone Transport Commission (OTC) Architectural and Industrial Maintenance Coatings Rule	12.3	12.3		
7.4.13	Ozone Transport Commission (OTC) Mobile Repair and Refinishing Rule	2.6	2.6		
7.4.14	Ozone Transport Commission (OTC) Solvent Cleaning Operations Rule	11.7	11.7		
7.4.15	Additional Area Source Measures	≥0.0	≥0.0		
SUBTOTAL		**[3]97.3**	**[3]99.0**	**4.2**	**4.4**
ON-ROAD MEASURES					
7.2.1	High-Tech Inspection/Maintenance				
7.4.1	Reformulated Gasoline (on-road)				
7.2.3	Federal "Tier I" Vehicle Standards and New Car Evaporative Standards				
7.2.4	Tier 2 Motor Vehicle Emission Standards				
7.3.3	National Low Emission Vehicle Program				
7.3.6	Heavy-duty Diesel Engine Rule				
7.5	Transportation Control Measures	0.3	0.3	0.7	0.7
SUBTOTAL		**55.6**	**80.0**	**46.0**	**85.0**

NON-ROAD MEASURES					
7.2.7	EPA Non-Road Gasoline Engines Rule	21.9	25.9	0	0
7.2.8	EPA Non-Road Diesel Engines Rule	0	0	14.8	21.8
7.2.10	Emissions standards for spark ignition marine engines	1.2	3.0	0	0
7.2.11	Emissions standards for large spark ignition engines	0	0.7	0	0.4
7.4.2	Reformulated Gasoline (off-road)	2.7	2.8	0	0
SUBTOTAL		**25.8**	**32.4**	**14.8**	**22.2**
TOTAL REDUCTIONS		**[3] 181.6**	**[3] 214.4**	**268.8**	**391.6**

7.2 Detailed Descriptions of Emission Control Measures

This section describes each of the control measures appearing in Table A. Each control measure is described and emission reduction calculations are presented in the remainder of this Chapter. Actual implementation dates and regulation names were supplied by the States and are included in Appendix H. Actual emission reductions may vary slightly from the estimates appearing in this Chapter since these estimates are based on EPA guidance, and not necessarily actual data from the in-situ emission control measures.

The following onroad emission reduction measures that are discussed in this section are calculated using the MOBILE6 emission factor model:

- Enhanced I/M, 7.2.1
- Federal Tier 1 Vehicle Standards, 7.2.3
- Federal Tier 2 Vehicle Standards, 7.2.4
- National Low Emission Vehicle Standards, 7.3.3
- Reformulated Gasoline, 7.4.1
- Heavy Duty Diesel Engine Rule, 7.3.6

Typically, the ROP document would present the emission reduction from each of these measures individually, and then sum the total reductions to get a controlled onroad inventory for 2002 and 2005. Isolating the emission reductions from each measure requires a separate MOBILE6 run, as well as post processing for each measure with the TPB's travel demand model outputs. Due to time constraints, COG staff was not able to complete this detailed breakdown of the individual onroad measures and present the breakdown. The total reductions from the above measures were developed. These are presented below and used in the ROP calculations.

Projected Reductions from all onroad measures estimated with MOBILE6

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	5.7	33.4	16.2	55.3
2005 VOC Reductions	7.7	48.7	23.3	79.7

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 NOx Reductions	3.9	29.4	12.0	45.3
2005 NOx Reductions	6.9	54.0	23.4	84.3

7.2.1 Enhanced Vehicle Emissions Inspection and Maintenance (Enhanced I/M)

This measure involves requiring a regional vehicle emissions inspection and maintenance (I/M) program with requirements stricter than "basic" programs, as required under 42 U.S.C. §§ 7511a(c)(3) and 7521. Before 1994, "basic" automobile emissions testing checked only tailpipe emissions while idling and sometimes at 2,500 rpm. The new procedures include a dynamometer (treadmill) test checks the car's emissions under driving conditions. In addition, evaporative emissions and the on-board diagnostic computer are checked.

Source Type Affected

This measure affects light-duty gasoline vehicles and light-duty gasoline trucks.

Control Strategy

Maryland, the District of Columbia, and Virginia committed to EPA Performance Standard Enhanced I/M programs in the 15% VOC Emissions Reduction Plan. Each affected vehicle in the region is given a high tech emissions test every two years. In Maryland and the District of Columbia emissions tests are performed at test-only stations. Virginia tests vehicles in stations that may also perform repairs.

Implementation

District of Columbia - Department of Public Works, Dept. of Consumer and Regulatory Affairs
Maryland - Motor Vehicles Administration
Virginia - Dept. of Environmental Quality

Appendix B contains detailed information regarding implementation of I/M programs in the District, Maryland, and Virginia.

Projected Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

To obtain emission factors, five scenarios are run using MOBILE6. Each scenario is referred to as a Case, as follows:

Case 0: 1990 I/M program (Basic I/M program); and No CAA controls
Case 1: 1990 I/M program (Basic I/M program); and CAA controls
Case 2: Enhanced I/M program; CAA controls
Case 4: Enhanced I/M program; CAA controls; and Reformulated Gasoline program

Case 5NoHDD: Enhanced I/M program; CAA controls; Reformulated Gasoline program; NLEV program

Case 5: Enhanced I/M program; CAA controls; Reformulated Gasoline program; NLEV program; and HDDV rule

Using these cases allows the effects of certain control measures to be isolated by subtracting one case from another, thereby avoiding double counting of emission reductions.

VOC and NOx emission reductions associated with enhanced I/M were calculated by taking the difference between total motor vehicle emissions for two mobile source emissions inventories, "case 1" (basic I/M with CAA controls) and "case 2" (enhanced I/M with CAA controls). The MOBILE6 inputs for enhanced I/M are based upon the I/M Implementation Plans submitted to EPA by Maryland, Virginia and the District of Columbia.

The MOBILE6 emission factors were applied to 2002 and 2005 travel characteristics as described in detail in 2002 & 2005 base (current control) projection inventory documentation. The difference in the results of each analysis yields the 1990-2002 and 1990-2005 NOx reduction benefits from enhanced I/M. Benefits shown reflect the incremental benefits of enhanced over basic I/M programs.

No credits are taken for bringing state basic I/M programs up to the performance standard required as of November 15, 1990.

Due to their voluminous nature, the MOBILE6 input streams and output statements have been placed on CD. Copies of the diskettes may be acquired upon written request to the appropriate state air management agency and the District of Columbia.

References

U.S. Environmental Protection Agency, "Inspection/ Maintenance Program Requirements," Final Rule, 57 *Federal Register* 52950 (November 5, 1992).

U.S. Environmental Protection Agency, "I/M Costs, Benefits, and Impacts Analysis," Draft, February 1992.

7.2.2 Stage II Vapor Recovery

As a serious ozone nonattainment area, Washington is required, under 42 U.S.C. § 7511a(b)(3) and 7511a(c), to install stage II vapor recovery systems at gasoline pumps.

Source Type Affected

This measure affects gasoline service stations and will reduce vehicle refueling emissions. Refueling emissions are attributed to the evaporation of gasoline-rich vapors displaced from the storage tank during refueling. The system is composed of a nozzle covering the fill-pipe and a vapor line returning from the fill-pipe to the storage tank. The stage II system captures the fuel rich vapors from the vehicle fill-pipe and returns them to the storage tank. Returning saturated vapors to the storage tank reduces emissions by maintaining liquid/vapor equilibrium in the storage tank, thereby decreasing the evaporation potential.

Control Strategy

Stage II nozzles have been in place in the District of Columbia since 1977. Implementation of stage II is required in the Washington nonattainment regions of Maryland and Virginia by operation of the Clean Air Act Amendments of 1990, 42 U.S.C. § 7511a(b)(3) and 7511a(c). Those sections require adherence to a schedule of implementation, and set forth a standard for applicability (i.e., to stations of what size or what amount of gasoline sold per month). Maryland and Virginia adopted stage II regulations as a part of their November 15, 1992 SIP revisions.

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0	8.1	7.1	15.2
2005 VOC Reductions	0	8.0	7.0	15.0

Emission Benefit Calculations

Vehicle refueling emissions are estimated using MOBILE6 emission factors in combination with gasoline throughput estimates as delineated in the 1990 base-year inventory documentation. Stage II benefits were measured for 2002 and 2005 projection years by subtracting the emissions calculated with stage II emission factors from the emissions calculated without stage II.

The Reformulated Gasoline (RFG) Program default RVP values were used in 2002 and 2005 MOBILE6 modeling (the emission reduction associated with lowering the RVP from 8.2 psi to 7.8 psi is not creditable). Minimum and maximum temperatures of 68.5^{o} and 95^{o} F were used. Stage II was assumed to be fully implemented in 1996 at an overall control effectiveness of 77% in Virginia

and 70% in Maryland and based on annual inspections and size cutoffs of 10,000/50,000 gallons per month for dependents/ independents (EPA, 1991). (Control effectiveness is an input to the MOBILE model.) Refueling rates were determined for each jurisdiction with and without Stage II and weighted using gasoline sales data to obtain weighted refueling factor for each jurisdiction.

References

U.S. Environmental Protection Agency, *Technical Guidance -- Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispersing Facilities*, Volume 1, EPA-450/3-91-022a, November 1991.

1990 Base Year Emissions Inventory for Stationary, Anthropogenic, Biogenic Sources and Highway Vehicle Emissions of Ozone Precursors in the Washington, DC-MD-VA Metropolitan Statistical Nonattainment Area, Prepared for The District of Columbia, Maryland, and Virginia by the Metropolitan Washington Council of Governments, September 22, 1993.

7.2.3 Federal "Tier I" New Vehicle Emission and New Federal Evaporative Emissions Standards

Under 42 U.S.C. §7521, EPA issued a new and cleaner set of federal motor vehicle emission standards (Tier I standards), which were phased in beginning with model year 1994.

Source Type Affected

These federally implemented programs affected light-duty vehicles and trucks.

Control Strategy

The Federal Motor Vehicle Control Program requires more stringent exhaust emission standards as well as a uniform level of evaporative emission controls, demonstrated through the new federal evaporative test procedures. Under 42 U.S.C. §7521(g), all post-1995 model year cars must achieve the Tier I (or Phase I) exhaust standards, which are as follows. ***Emissions are in grams per mile, and are related to durability timeframes of 5 yrs/50,000 miles and 10 yrs/100,000 miles.***

Vehicle Type	*5 yrs/50,000 mi*			*10 yrs/100,000 mi*		
	VOCs	CO	NOx	VOCs	CO	NOx
Light-duty vehicles; light-duty trucks (loaded weight #3,750 lbs)	0.25	3.4	0.4*	0.31	4.2	0.6*
Light-duty trucks (loaded weight of 3,751 to 5,750 lbs)	0.32	4.4	0.7**	0.40	5.5	0.97

*For diesel-fueled light-duty vehicles and for LDTs at #3,750 lbs, before model year 2004, the applicable NOx standards shall be 1.0 at 5 yrs/50,000 mi and 1.25 at 10 yrs/100,000.

**This NOx standard does not apply to diesel-fueled trucks of 3,751 to 5,750 lbs.

Implementation

This program is implemented by the EPA under 42 U.S.C. §7521.

Projected Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

On average, Tier I cars will emit 0.077 fewer grams of VOCs per mile than their predecessors. The emission benefits of the Tier I tailpipe emissions standards and the evaporative emissions standards

were combined for the purposes of the mobile source modeling. MOBILE6 automatically applies these controls. The emission benefits were calculated by subtracting case 1 motor vehicle emissions (which includes CAA controls) from case 0 (excludes CAA controls) emission benefits. The base case (case 0) modeling is described in Chapter 3. See Appendix B for documentation detailing emission reductions for mobile source controls.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

7.2.4 Tier 2 Motor Vehicle Emission Regulations

The U.S. EPA promulgated a rule on February 10, 2000 requiring more protective tailpipe emissions standards for all passenger vehicles, including sport utility vehicles (SUVs), minivans, vans and pick-up trucks. These regulations also require lower levels of sulfur in gasoline, which will ensure the effectiveness of low emission-control technologies in vehicles and reduce harmful air pollution.

Source Type Affected

These federally implemented programs affect light-duty vehicles and trucks.

Control Strategy

The new tailpipe and sulfur standards require passenger vehicles to be 77 to 95 percent cleaner than those built before the rule was promulgated and will reduce the sulfur content of gasoline by up to 90 percent.

The new tailpipe standards are set at an average standard of 0.07 grams per mile for NOx for all classes of passenger vehicles beginning in 2004. This includes all light-duty trucks, as well as the largest SUVs. Vehicles weighing less than 6000 pounds will be phased-in to this standard between 2004 and 2007.

Beginning in 2004, the refiners and importers of gasoline will have the flexibility to manufacture gasoline with a range of sulfur levels as long as all of their production is capped at 300 parts per million (ppm) and their annual corporate average sulfur levels are 120 ppm. In 2005, the refinery average will be set at 30 ppm, with a corporate average of 90 ppm and a cap of 300 ppm. Finally, in 2006, refiners will meet a 30 ppm average sulfur level with a maximum cap of 80 ppm.

As newer, cleaner cars enter the national fleet, the new tailpipe standards will significantly reduce emissions of nitrogen oxides from vehicles by about 74 percent by 2030.

Implementation

This program is implemented by the EPA, under 40 CFR Parts 80, 85, and 86.

Projected Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

The VOC and NOx emissions reductions associated with the Tier 2 Rule were calculated using MOBIULE6.

References

U.S. Environmental Protection Agency, "Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements," Final Rule, 65 *Federal Register 6697,* February 10, 2000.

7.2.5 Non-CTG VOCs RACT to 25 tons per year

This measure involves extending the required Reasonably Available Control Technology (RACT) standards to point sources emitting in excess of 25 tons per year (tpy) of VOCs. The Washington, D.C. metropolitan area, when designated as serious nonattainment for ozone, was obligated under the CAAA to implement RACT for major sources (50 tpy) not covered by EPA's Control Technique Guidance (CTG) documents. Under this measure, "reasonably available" control technologies were determined and implemented for industry sources with the potential to emit greater than 50 tpy.

Source Type Affected

RACT consists of a variety of control techniques that are generally available and cost-effective. Usually the EPA will issue a CTG, which documents the cost per ton of the control method and the size of the source that can best benefit from the control based on cost and technological feasibility. A CTG can include add-on equipment as well as emissions limits. If a CTG is not issued for a category that contains a major source, the state must develop a RACT regulation for that category.

This measure affects point sources with the potential to emit 50 tpy or more of VOCs.

Control Strategy

Point sources are regulated through a state permit process in Maryland, Virginia and D.C. The states were required to develop and implement new RACT regulations for all non-CTG point sources emitting more than 50 tpy which had not been previously regulated.

Maryland already required RACT on major sources with the potential to emit 100 tpy of VOCs or more in Montgomery and Prince George's counties. In 1993, Maryland revised its existing RACT regulations, COMAR 26.11.19, .11, and .13, to lower the major source threshold to include sources with allowable emissions of 50 tpy or more, and to extend the geographic applicability of the regulation statewide. This required RACT for the first time in Calvert, Charles, and Frederick counties. These counties were previously not included in the Washington DC-MD-VA nonattainment area.

Specifically, Maryland requires the use of RACT coatings with emission limits of 3.5 pounds per gallon for miscellaneous metal coatings.

Bakeries are subject to the requirements of COMAR 26.11.19.21. This regulation became effective on July 3, 1995.

Auto body refinishing activities are subject to COMAR 26.11.19.23, which was approved as a SIP submittal on August 4, 1997.

CanAm Steel has agreed to voluntarily make reductions. COMAR 26.11.19.13-3 makes these enforceable.

Virginia has adopted a generic rule for major non-CTG sources. Virginia has identified sources that will be affected by this rule and has determined the potential control effectiveness for these sources.

In November 1993 the District of Columbia enacted regulations requiring RACT for non-CTG sources with potential to emit 50 or more tons per year of VOCs [20 DCMR §715.4]. Additional regulations were published in 1998 for offset-lithography and were effective October 2, 1998. Currently there are two non-CTG point sources in the District of Columbia emitting 50 tpy or more, U.S. Government Printing Office and Bureau of Engraving and Printing.

Implementation

District of Columbia – Environmental Health Administration
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0.32	0.29	0.57	1.18
2005 VOC Reductions	0.34	0.31	0.59	1.24

Emission Benefit Calculations

Emission benefits were calculated by identifying point sources emitting greater than 50 tpy, and applying a reduction potential to the base-year emissions. Table 7-1 lists the applicable point sources, the estimated reduction potential, and the expected reductions for sources in Virginia. Tables 7-2 and 7-3 present similar information for Maryland and the District.

Table 7-1
Non-CTG VOC RACT to 25 tpy (VA) and
Sources no Longer Subject to RACT

Source Name	Uncontrolled Emissions (tpd)	Reduction Potential (%)	Reductions (tpd)
2002			
Tuscarora Plastics[c]	0.355	39	0.138
Insulated Building Systems [a]	0.247	100	0.247
Treasure Chest Ad.[b]	0.309	60	0.185
2002 Totals	**0.911**		**0.570**
2005			
Tuscarora Plastics[c]	0.373	39	0.145
Insulated Building Systems [a]	0.247	100	0.247
Treasure Chest Ad.[b]	0.333	60	0.200
2005 TOTALS	**0.953**		**0.592**

[a] Insulated Business Systems is a shutdown, effective January, 1991
[b] Treasure Chest Ad. is no longer subject to RACT. It is subject to a permit. See Appendix F for further documentation.
[C] Case-by-case RACT determination.

Table 7-2
Non-CTG VOC RACT to 25 tpy (MD)

Source Name	Uncontrolled Emissions (tpd)	Reduction Potential (%)	Reductions (tpd)
2002			
Giant Food – Silver Spring	0.220	63	0.140
CanAm Steel	1.157	13	0.150
2002 Totals	**1.377**		**0.290**
2005			
Giant Food – Silver Spring	0.225	63	0.143
CanAm Steel	1.293	13	0.168
2005 TOTALS	**1.518**		**0.311**

Table 7-3
Non-CTG VOC RACT to 25 tpy (DC)

Source Name	Uncontrolled Emissions (tpd)	Reductions (tpd)
2002		
Bureau of Engraving and Printing	0.476	0.215
Government Printing Office	0.233	0.105
2002 Totals	**0.709**	**0.320**
2005		
Bureau of Engraving and Printing	0.476	0.228
Government Printing Office	0.233	0.109
2005 TOTALS	**0.709**	**0.337**

References

Reduction potential estimates were supplied by staff engineers at the Virginia Department of Environmental Quality, the Maryland Department of the Environment, and the District of Columbia Environmental Health Administration.

7.2.6 Phase II Gasoline Volatility Controls

This measure takes credit for lower refueling emissions resulting from the effects of federally mandated reductions in gasoline volatility, as required under 42 U.S.C. §§7545 (h) and (k). The measure affects emissions from light-duty gasoline vehicles and light-duty gasoline trucks.

Control Strategy

The volatility reductions under §7545 (h) became effective in summer 1992. Further volatility reductions required under §7545 (k) are associated with the reformulated gasoline (see measures 6.4.1 and 6.4.2) that began selling in the Washington nonattainment area on January 1, 1995.

Implementation

This program is implemented by the EPA under 42 U.S.C. §§7545 (h) and (k).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.1	1.3	1.2	2.6
2005 VOC Reductions	0.1	1.2	1.0	2.3

Source: Recalculation of 2005 reductions using MOBILE6 (COG)

Emission Benefit Calculations

Vehicle refueling emissions are estimated using MOBILE6 emission factors in combination with gasoline throughput estimates as delineated in the 1990 base-year inventory documentation. Phase II benefits were calculated for 2005 by subtracting the emissions calculated with Phase II refueling emission factors from the refueling emissions calculated without Phase II. Minimum and maximum temperatures of 68.5^{o} and 95^{o}F were used, consistent with the motor vehicle modeling.

References

1990 Clean Air Act Amendments, 42 U.S.C. §§7545 (h) and (k).

7.2.7 Phase I and Phase II Emissions standards for gasoline-powered non-road utility engines

This measure takes credit for VOC emissions reductions attributable to emissions standards promulgated by the EPA for small non-road, spark-ignition (i.e., gasoline-powered) utility engines, as authorized under 42 U.S.C. §7547. The measure affects gasoline-powered (or other spark-ignition) lawn and garden equipment, construction equipment, chain saws, and other such utility equipment as chippers and stump grinders, wood splitters, etc., rated at or below 19 kilowatts (an equivalent of 25 or fewer horsepower). Phase 2 of the rule applied further controls on handheld and non-handheld outdoor equipment.

Control Strategy

Federal emissions standards promulgated under §7547 (a) apply to spark-ignition non-road utility engines. The EPA's Phase 1 Spark Ignition Nonroad final rule on such emissions standards was published in 60 *Federal Register 34581* (July 3, 1995), and was effective beginning August 2, 1995. Compliance was required by the 1997 model year. The Phase 2 final rule for handheld nonroad equipment was published in 65 *Federal Register* 24267 (April 25, 2000). The Phase 2 final rule for non-handheld equipment was published in 64 *Federal Register* 36423 (July 6, 1999.

Implementation

This program was implemented by the EPA, under 42 U.S.C. §7547 (a).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	1.2	10.7	10.0	21.9
2005 VOC Reductions	1.2	12.5	12.2	25.9

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 NOx Reductions	0	0	0	0
2005 NOx Reductions	0	-0.01	0	-0.1

Emission Benefit Calculations

The emission reductions associated with the new federal small engines rule are calculated according to methods detailed in the regulatory impact analysis (RIA) document for the EPA's proposed rule. The controls engineered to reduce VOC emissions from these small engines increase NOx emissions slightly.

For the gasoline equipment covered by Phase 1 of the rule, the RIA calculates for 2002 a 29.35% VOC reduction and a NOx disbenefit of 46.3%. For 2005, the VOC reduction is 30.5% and the NOx disbenefit is 50.7%.

The second phase of the rule will result in the following reductions:

- Handheld engines 2002: 4% reduction in HC, no change in NOx
- Nonhandheld engines 2002: 9% reduction in HC, 9% reduction NOx
- Handheld engines 2005: 12% reduction in HC, no change in NOx
- Nonhandheld engines 2005: 14% reduction in HC, 14% reduction NOx.

The detailed nonroad inventory is contained in Appendix D.

References

EPA Guidance Memorandum, "Future Nonroad Emission Reduction Credits for Court-Ordered Nonroad Standards" from Emission Planning and Strategies Division, Memorandum from Phil Lorang, Director, Emission Planning and Strategies Division, November 28, 1994.

U.S. Environmental Protection Agency, "Emission Standards for New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts", Final Rule, 60 *Federal Register* 34581 (July 3, 1996).

U.S. Environmental Protection Agency, “Phase 2 Emission Standards for New Nonroad Spark-Ignition Nonhandheld Engines At or Below 19 Kilowatts”, Final Rule, 64 *Federal Register* 36423, (July 6, 1999)

U.S. Environmental Protection Agency, “Phase 2 Emission Standards for New Nonroad Spark-Ignition Handheld Engines at or Below 19 Kilowatts”, Final Rule, 65 Federal Register 24267 (April 25, 2000)

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

7.2.8 Emissions standards for diesel-powered non-road utility engines of 50 or more horsepower

This measure takes credit for NOx emissions reductions attributable to emissions standards promulgated by the EPA for non-road, compression-ignition (i.e., diesel-powered) utility engines, as authorized under 42 U.S.C. § 7547. The measure affects diesel-powered (or other compression-ignition) construction equipment, industrial equipment, etc., rated at or above 37 kilowatts (37 kilowatts is approximately equal to 50 horsepower).

Control Strategy

Federal emissions standards applicable to compression-ignition non-road utility engines were promulgated under §7547 (a). The EPA's final rule on such emissions standards was published in 59 *Federal Register* 31306 (June 17, 1994), and was effective on July 18, 1994.

Implementation

This program will be implemented by the EPA under 42 U.S.C. § 7547 (a).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0	0	0	0
2005 VOC Reductions	0	0	0	0

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 NOx Reductions	0.8	7.9	6.1	14.8
2005 NOx Reductions	1.0	11.6	9.2	21.8

Emission Benefit Calculations

The emission reductions associated with the new federal compression-ignition engines rule are calculated according to methods detailed in the regulatory impact analysis (RIA) document for the EPA's final rule. The RIA estimates NOx reductions in the year 2002 of: 15.7% for engines in the 50-100 HP range, 16.4% for engines in the 100-175 HP range, and 17.4% for engines greater than 75

HP. In 2005, the percentage reductions are: 23.8% for engines of 0-100 HP; 23.1% for engines of 100-175 HP, and 23.1% for engines greater than 175 HP.

The detailed nonroad inventory is contained in Appendix D.

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

EPA Guidance Memorandum, "Future Nonroad Emission Reduction Credits for Court-Ordered Nonroad Standards" from Emission Planning and Strategies Division, Memorandum from Phil Lorang, Director, Emission Planning and Strategies Division, November 28, 1994.

U.S. Environmental Protection Agency," Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression-Ignition Engines At or Above 37 Kilowatts", Final Rule, 59 *Federal Register* 31306 (June 17, 1994).

7.2.9 NOx RACT and Regional NOx Transport Requirements

This section documents credit for NOx emissions reductions attributable to federal and regional NOx requirements on point sources. These credits include Reasonably Available Control Technology ("RACT"), as required under 42 U.S.C. § 7511a (f) (read in conjunction with §§ 7511a (b)(2) and (c)); "NOx Budget" rules that require a second phase of stationary source NOx reductions as part of a coordinated regulatory initiative by the Ozone Transport Region (OTR) states to further reduce NOx emissions in the Northeast; and the "NOx SIP Call" to reduce ozone transport in the Eastern United States.

Control Strategy

Major point sources of NOx are subject to RACT requirements created by D.C., Maryland and Virginia in response to §7511a (f).

Maryland and the District adopted "NOx Budget" rules to require a second phase of stationary source NOx reductions as part of a coordinated regulatory initiative by the OTR states to further reduce NOx emissions in the Northeast. The rules require large stationary sources to reduce summertime NOx emissions by approximately 65% from 1990 levels. The regulation also includes provisions allowing sources to comply by trading "allowances." This regulation requires affected sources to reduce their emissions to meet these requirements by May 2001.

In late 1998, the U.S. EPA adopted a rule called the "NOx SIP Call" to reduce ozone transport in the Eastern United States. This regional NOx reduction program requires 22 states, including Maryland and Virginia, and the District of Columbia, to submit regulations and a revision to State Implementation Plans (SIPs) to further reduce NOx emission by 2007. The SIP Call rules result in approximately 23% additional NOx reductions, effective in 2003.

The controls are a phased approach to controlling emissions of NOx from power plants and other large fuel combustion sources, with the RACT rules taking effect first, followed by the NOx Budget rules by the 2002 timeframe, and finally the NOx SIP Call rules by the 2003 timeframe.

NOx reductions resulting from these controls are presented by source for Maryland in Table 7-4, for Virginia in Tables 7-5 and 7-6, and for the District in Table 7-7. In Maryland, the expected emission reductions for 2002 and 2005 were calculated using the listed allowances within MDE's NOx Budget Rule or NOx SIP Call regulations. Because the program allows trading under a NOx "cap" the expected emissions reductions are not allocated to a particular source but are listed in Table 7-4 as a total reduction for the affected sources.

Tables 7-5 for Virginia contain three sources that were originally identified for NOx RACT and underwent New Source Review (NSR) for the replacement of equipment which were RACT, prior to the deadline for implementing RACT. In each case, the NOx emission limit was at least as stringent as the presumptive NOx RACT limit. BACT was also applied to emission units that were not required to meet the presumptive RACT. The permits were issued via SIP approved Minor New Source Permit regulations.

See Appendix E for further documentation.

Table 7-4
NOx RACT Reductions for Maryland

Source	Uncontrolled Emissions (tpd)	Reductions (tpd)
2002		
Potomac Electric Dickerson	39.49	-
Potomac Electric Chalk Point	120.73	-
Potomac Electric Morgantown	131.5	-
Total 2002	**239.5**	**174.74**
2005		
Potomac Electric Dickerson	39.38	-
Potomac Electric Chalk Point	122.98	-
Potomac Electric Morgantown	131.50	-
Total 2005	**293.86**	**229.92**

Table 7-5
2002 NOx RACT Reductions (tpd) for Virginia

Source Registration #	Plant	Uncontrolled Emissions (tpd)	Reductions (tpd)
70225	Dominion Virginia Power	23.79	8.98
71958	Transco	5.64	4.85
70151	Washington Gas Light	1.43	0.64
	DC Corrections	0.19	0.19
Sub-Total		31.05	14.66
Sources Subject to MWC Rule			
71814	Covanta (Alex)	1.87	0.55
71920	Covanta (Fax)	4.99	1.69
Sub-Total		6.86	2.24
Sources Subject to NSR Permit			
70005	National Airport	0.05	0.02
70030	Pentagon Utilities Plant	0.16	0.00
70367	USMC-Quantico	0.42	0.02
Sub-Total		0.63	0.04
Total		38.54	16.94
	Mirant-Potomac River [a]	26.39	9.11

[a] The emission reductions from PEPCO facilities are the result of combining regional PEPCO emissions into a "bubble".

Table 7-6
2005 NOx RACT Reductions (tpd) for Virginia

Source Registration #	Plant	Uncontrolled Emissions (tpd)	Reductions (tpd)
70225	Dominion Virginia Power	24.15	17.04
71958	Transco	5.67	4.88
70151	Washington Gas Light	1.44	1.24
	DC Corrections	0.17	0.17
Sub-Total		31.43	23.33
Sources Subject to MWC Rule			
71814	Covanta (Alex)	1.87	0.55
71920	Covanta (Fax)	4.99	1.69
Sub-Total		6.86	2.24
Sources Subject to NSR Permit			
70005	National Airport	0.05	0.02
70030	Pentagon Utilities Plant	0.16	0.0
70367	USMC-Quantico	0.40	0.0
Sub-Total		0.61	0.02
Total			
	Mirant-Potomac River [a]	27.01	20.35

[a] The emission reductions from Mirant facilities are the result of combining regional PEPCO emissions into a "bubble".

Table 7-7
NOx RACT Reductions for the District of Columbia

Source	Uncontrolled Emissions (tpd)	Reductions (tpd)
2002		
PEPCO - Benning	4.41	2.12
Capitol Power Plant	0.67	0.23
GSA West & Central Heating	0.67	0.34
Georgetown Univ Power Plant	0.63	0.11
PEPCO - Buzzard	0.73	0.21
US Soldiers Home	0.05	0.01
Total 2002	**7.16**	**3.02**
2005		
PEPCO - Benning	4.41	3.12
Capitol Power Plant	0.68	0.23
GSA West & Central Heating	0.64	0.48
Georgetown Univ Power Plant	0.61	0.11
PEPCO - Buzzard	0.73	0.21
US Soldiers Home	0.04	0.01
Total 2005	**7.11**	**4.16**

Implementation
District of Columbia - Environmental Health Administration
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Appendix L contains more detailed information regarding implementation.

Projected Reductions

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 NOx Reductions	3.02	174.74	26.05	203.81
2005 NOx Reductions	4.16	229.92	45.94	280.02

Emission Benefit Calculations

The emission reductions associated with the state NOx requirements on point sources were supplied by the staffs of the Maryland Air and Radiation Management Administration, the District of Columbia Environmental Health Administration, and the Virginia Department of Environmental Quality Air Division.

References

1990 Clean Air Act Amendments, 42 U.S.C. §§7511a (f), (b)(2), and (c).

7.2.10 Emissions standards for spark ignition marine engines

This EPA measure controls exhaust VOC emissions from new spark-ignition (SI) gasoline marine engines, including outboard engines, personal watercraft engines, and jet boat engines. Of nonroad sources studied by EPA, gasoline marine engines were found to be one of the largest contributors of hydrocarbon (HC) emissions (30% of the nationwide nonroad total).

Control Strategy

EPA is imposing emission standards for 2 – stroke technology, outboard and personal watercraft engines. This will involve increasingly stringent HC control over the course of a nine-year phase-in period beginning in model year 1998. By the end of the phase-in, each manufacturer must meet an HC and NOx emission standard that represents a 75% reduction in HC compared to unregulated levels. These standards do not apply to any currently owned engines or boats.

Implementation

This program will be implemented by the EPA under 42 U.S.C. § 7547 (a).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.1	0.1	1.0	1.2
2005 VOC Reductions	0.3	0.2	2.5	3.0

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 NOx Reductions	0	0	0	0
2005 NOx Reductions	0	0	0	0

Emission Benefit Calculations

The Code of Federal Register (40 CFR Parts 89, 90 and 91) rule entitled Control of Air Pollution; Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts lists the projected inventory reductions for outboard/personal watercraft (OB/PWC) engines. These reduction percentages are reproduced

below.

PROJECTED INVENTORY REDUCTIONS	
Year	Percent reduction in OB/PWC HC inventory
2000	4
2005	26
2010	52
2015	68
2020	73
2030	75

The regulatory impact assessment for the rule presents data showing the percent reduction for each year beyond 2000. For 2002, the HC percentage reductions from the affected marine engine fleet is 10.94%, with a NOx disbenefit of 10.94%. The NOx disbenefit in 2005 is 20.6%. It should be noted that NOx emissions from these engines are minor.

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

Code of Federal Register (40 CFR Parts 89, 90 and 91) rule entitled Control of Air Pollution; Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts

Regulatory Impact Analysis "Control of Air Pollution Emission Standards for New Nonroad Spark-Ignition Marine Engines", U.S. EPA, June 1996

7.2.11 Emissions standards for large spark ignition engines

This EPA measure controls VOC and NOx emissions from several groups of previously unregulated nonroad engines, including large industrial spark-ignition engines, recreational vehicles, and diesel marine engines.

Control Strategy

The new EPA requirements vary depending on the kind of engine or vehicle, taking into account environmental impacts, usage rates, the need for high performance models, costs and other factors. The emission standards apply to all new engines sold in the United States and any imported engines manufactured after these standards begin.

Controls on the category of large industrial spark-ignition engines are first required in 2004. Controls on the other engine categories are required beginning in years after 2005. Large industrial spark-ignition engines are those rated over 19 kW used in a variety of commercial applications; most use liquefied petroleum gas, with others operating on gasoline or natural gas.

EPA adopted two tiers of emission standards for Large SI engines. The first tier of standards, scheduled to start in 2004, are based on a simple laboratory measurement using steady-state procedures. The Tier 1 standards are the same as those adopted earlier by the California Air Resources Board for engines used in California. The Tier 2 standards starting in 2007

Implementation

This program will be implemented by the EPA under 42 U.S.C. § 7547 (a).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0	0	0	0
2005 VOC Reductions	0.1	0.3	0.3	0.7

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 NOx Reductions	0	0	0	0
2005 NOx Reductions	0	0.2	0.2	0.4

Emission Benefit Calculations

EPA's "Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines," (EPA420-R-02-022, September 2002), presents the emission reductions to be expected from the large industrial spark-ignition engine category in 2005. HC emissions will be reduced 24% and NOx emissions reduced 21% in 2005. These reductions were applied t the appropriate category types in the nonroad inventory.

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

U.S. Environmental Protection Agency, "Control of Emissions From Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based)," Final Rule, 67 Federal Register 68241 (November 8, 2002).

U.S. Environmental Protection Agency, Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines," EPA420-R-02-022, September 2002.

7.3 Federal programs

7.3.1 Reformulated surface coatings

This measure involves adopting the federal rule resulting from the National Regulatory Negotiation for Architectural and Industrial Maintenance (AIM) Coatings, which restricts the VOC content of architectural, industrial maintenance, special industrial, and highway markings surface coatings sold and used in the Washington, D.C. ozone nonattainment area. This rule was adopted on September 11, 1998 (63 FR 48819), corrected on. June 30, 1999 (64 FR 34997) and amended on February 16, 2000 (65 FR 7736). Compliance is required by September 13, 1999, or March 10, 2000.

Source Type Affected

This measure affects makers of architectural, industrial maintenance, special industrial, and highway markings surface coatings.

Control Strategy

The proposed measure is based on the national regulatory negotiation for AIM coatings. According to the most recent EPA guidance the final rule is expected to yield a 20% reduction in VOC emissions from AIM coating sources. This estimate includes consideration of rule effectiveness and rule penetration.

Reductions for AIM coatings are achievable through product reformulations, product substitution, and consumer education. Reformulations include altering the components of the coating to achieve a lower VOC content, replacing VOC solvents with water or alternative non-VOC solvents, and increasing the solids content of the coating thereby reducing the volume applied. Product substitution is accomplished by replacing higher-VOC coatings with currently available lower-VOC coatings. Consumer education will provide information on the relative cost of lower-VOC coatings and encourage careful, efficient use of such products. Specific VOC content limits included in the regulatory negotiations are not yet published.

In a memorandum from John S. Seitz, director of EPA's Office of Air Quality Planning and Standards, EPA has given permission for states to take VOC emissions reduction credits for applying the pending federal rule to the architectural and industrial maintenance coatings emissions.

Implementation

This program is implemented by the EPA under 42 U.S.C. §7511 (b).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	1.61	8.43	6.33	16.37
2005 VOC Reductions	1.58	8.81	6.74	17.13

Emission Benefit Calculations

Staff applied a 20% reduction factor to the 2002 and 2005 projection of VOC emissions from architectural, industrial maintenance, special industrial, and highway markings coatings.

The VOC emission reduction is calculated as:

	Architect Coatings	Traffic Markings	Industrial Products	Special Purpose	Total	Reduction (20%)
	2002 Uncontrolled Emissions by Source					
DC	4.42	0.52	0.62	2.49	8.05	1.61
MD	17.15	2.01	19.58	3.42	42.16	8.43
VA	16.28	1.91	4.42	9.05	31.66	6.33
Total	37.85	4.44	24.62	14.96	81.87	16.37
	2005 Uncontrolled Emissions by Source					
DC	4.29	0.50	0.62	2.48	7.89	1.58
MD	17.78	2.09	20.60	3.58	44.05	8.81
VA	17.20	2.02	4.79	9.67	33.68	6.74
Total	39.27	4.61	26.01	15.73	85.62	17.13

References

National Volatile Organic Compound Emission Standards for Architectural, Preamble Section IV.A.1 (63 FR 48819), September 11, 1998.

U.S. Environmental Protection Agency, "Credit for the 15% rate-of-progress Plans for Reductions from Architectural and Industrial Maintenance Coating Rule ", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, March 22, 1995.

U.S. Environmental Protection Agency, "Credit for the 15% rate-of-progress Plans for Reductions from Architectural and Industrial Maintenance Coating Rule and the Autobody Refinishing Rule", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, November 21, 1994.

Meeting the 15-Percent Rate-of-Progress Requirement Under the Clean Air Act: A Menu of Options, STAPPA/ALAPCO, September 1993.

7.3.2 Reformulated consumer products

This measure requires that certain consumer products sold in the Washington, D.C. ozone nonattainment area be reformulated to reduce their VOC content. The measure is based upon regulations that, under 42 U.S.C. 7511b(e)(3), EPA was required to publish by November 15, 1995. The final regulation was adopted on September 11, 1998 (63 FR 48848).

Source Type Affected

The measure affects manufacturers of the various specialty chemicals that EPA will select, after conducting a study consistent with 42 U.S.C. 7511b(e)(2).

Control Strategy

The proposed measure relies upon federal implementation of a rule mandating reformulation of certain "consumer or commercial products" (as that term is defined under 42 U.S.C. 7511b(e)(1)(B)). Under §7511b(e)(3), EPA must create by November 15, 1995, regulations to require reformulation of one-fourth of the "consumer or commercial products" that are responsible for at least 80% of photochemically reactive VOC emissions from such products.

Recent EPA guidance from John Seitz specifies a 10% total reduction of emissions from a regulated subset of consumer products. EPA estimated the regulated subset to be approximately 3.9 pounds per capita annually. Consequently, a total of 10% of the "commercial or consumer products" are expected to be subject to reformulation requirements by November 15, 1999. EPA guidance also allows states to retain emission reduction estimates for consumer and commercial product reformulations in their 15% Plans.

Implementation

This measure will be federally implemented under a federal regulatory calendar initially issued in *60 Federal Register 15264*, finalized in *63 Federal Register 48791* and amended in *64 Federal Register 13422* (March 18, 1999). This program is implemented by the EPA under 42 U.S.C. §7511 (b).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.47	1.81	1.71	3.99
2005 VOC Reductions	0.45	1.87	1.81	4.13

Emissions Benefit Calculations

The calculation based on the most recent EPA guidance for emission reductions in 2005 follows:

	2002 Uncontrolled	10% Reduction
DC	4.66	0.47
MD	18.07	1.81
VA	17.14	1.71
	2005 Uncontrolled	**10% Reduction**
DC	4.52	0.45
MD	18.73	1.87
VA	18.12	1.81

References

National Volatile Organic Compound Emission Standards for Consumer Products, Preamble Section III.A. (63 FR 48848), September 11, 1998.

1990 Clean Air Act Amendments, 42 U.S.C. 7511b(e).

U.S. Environmental Protection Agency, "Regulatory Schedule for Consumer and Commercial Products under Section 183 (e) of the Clean Air Act", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, June 21, 1995.

Commercial and Consumer Products: Schedule for Regulation (64 FR 13422), March 18, 1999.

7.3.3 National Low Emission Vehicle Program

Under the National LEV program, auto manufacturers have agreed to comply with tailpipe standards that are more stringent than EPA can mandate prior to model year (MY) 2004. Once manufacturers committed to the program, the standards became enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable. The program went into effect throughout the Ozone Transport Region (OTR), including Maryland, Virginia, and the District of Columbia, in model year 1999 and will be nationwide in model year 2001.

Source Type Affected

These federally implemented programs affect light-duty vehicles and trucks.

Control Strategy

The National Low Emission Vehicle Program requires more stringent exhaust emission standards than the Federal Motor Vehicle Control Program Tier I (or Phase I) exhaust standards.

Implementation

This program is implemented by the EPA, under 40 CFR Part 86 Subpart R. Nine states within the OTR, including the MWAQC states, have opted-in to the program as have all the auto manufacturers. EPA found the program to be in effect on March 2, 1998.

Projected Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

The VOC and NOx emissions reductions associated with the National Low Emission Vehicle Program were calculated by determining the difference between 2002 & 2005 mobile source inventories with all CAA and local requirements in place (Case 4) and 2002 & 2005 mobile source inventories with all those measures plus the National Low Emissions Vehicle Program (Case 5noHDD) but excluding the Heavy Duty Diesel Engine Standards.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

7.3.4 Reformulation of Industrial Cleaning Solvents

This measure requires that certain industrial cleaning solvents sold in the Washington, D.C. ozone nonattainment area be reformulated to reduce their VOC content. The measure is based upon regulations that, under 42 U.S.C. 7511b(e)(3), EPA was required to publish by November 15, 1995. The industrial cleaning solvent standards were adopted in 2001.

Source Type Affected

The measure affects manufacturers of the various specialty chemicals that EPA will select, after conducting a study consistent with 42 U.S.C. § 7511b(e)(2).

Control Strategy

The proposed measure relies upon federal implementation of a rule mandating reformulation of certain "consumer or commercial products" (as that term is defined under 42 U.S.C. § 7511b(e)(1)(B)). Under § 7511b(e)(3), EPA must create by November 15, 1995, regulations to require reformulation of one-fourth of the "consumer or commercial products" that are responsible for at least 80% of photochemically reactive VOC emissions from such products.

EPA guidance from John Seitz specifies a 10% total reduction of emissions from a regulated subset of consumer products. This is used as a benchmark for estimating reductions in industrial cleaning solvents.

Implementation

This program was implemented by the EPA in 2001 under a schedule adopted on March 18, 1999. The program is implemented under 42 U.S.C. §7511 (b).

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0.26	0.42	0.49	1.17
2005 VOC Reductions	0.26	0.44	0.52	1.22

Emission Benefit Calculations

2002

DC (0.259 tons per day) x (0.1 emission reduction) = 0.26 tons per day
MD (4.174 tons per day) x (0.1 emission reduction) = 0.42 tons per day

VA (4.902 tons per day) x (0.1 emission reduction) = 0.49 tons per day

2005

DC (0.257 tons per day) x (0.1 emission reduction) = 0.26 tons per day
MD (4.378 tons per day) x (0.1 emission reduction) = 0.44 tons per day
VA (5.239 tons per day) x (0.1 emission reduction) = 0.52 tons per day

References

1990 Clean Air Act Amendments, 42 U.S.C. 7511b(e).

U.S. Environmental Protection Agency, "Regulatory Schedule for Consumer and Commercial Products under Section 183 (e) of the Clean Air Act" , Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, June 21, 1995.

Federal Register Vol. 64 No. 52, Thursday, March 18, 1999 (AD FLR-6311-9) p. 13422 – 13424

7.3.5 Emissions Controls for Locomotives

This sets NOx standards for locomotive engines remanufactured and manufactured after 2001.

Source Type Affected

This program includes all locomotives originally manufactured from 2002 through 2004. It also applies to the remanufacture of all engines built since 1973. Regulation of the remanufacturing process is critical because locomotives are generally remanufactured 5 to 10 times during their total service lives, which are typically 40 years or more.

Control Strategy

Three separate sets of emissions standards have been adopted, with the applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) applies to locomotives and locomotive engines originally manufactured from 1973 through 2001, any time they are manufactured or remanufactured. The second set of standards (Tier 1) apply to locomotives and locomotive engines originally manufactured from 2002 through 2004. These locomotives will be required to meet the Tier 1 standards at the time of manufacture and at each subsequent remanufacture. The final set of standards (Tier 2) apply to locomotives and locomotive engines originally manufactured in 2005 and later. Electric locomotives, historic steam-powered locomotives and locomotives manufactured before 1973 do not significantly contribute to the emissions problem and, therefore, are not included in the regulation.

The District of Columbia reports that majority of the switching yard locomotives in the District may not be subjected to the new locomotive standards in 2005. This is mainly due to the engine re-build/re-manufacture schedule, which triggers such requirement. As a result, only one third of the available credit from EPA's locomotives regulation was assumed when calculating the locomotive emission reductions in the District.

Implementation

This program is implemented by the EPA under the *Final Emissions Standards for Locomotives* (EPA420-F-97-048) published in December 1997.

Projected Reductions

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 NOx Reductions				
2005 NOx Reductions				

Emission Benefit Calculations

2005 VOC

	Uncontrolled	Reduction (3.3%)
DC	0.110	0.001 (one-third of credit)
MD	0.206	0.007
VA	0.224	0.007
Total	0.540	0.015

2005 NOx

	Uncontrolled	Reduction (27.8%)
DC	1.391	0.128 (one-third of credit)
MD	4.803	1.335
VA	5.168	1.437
Total	11.362	2.900

References

Regulatory Update, EPA's Nonroad Engine Emissions Control Programs, EPA, Air and Radiation, EPA420-F-99-001, January 1999

Final Emissions Standards for Locomotives, EPA420-F-97-048, December 1997

7.3.6 Heavy-Duty Diesel Engine Rule

Under the Heavy-Duty Diesel Engine Rule, truck manufacturers must comply with tailpipe standards that are more stringent by 2004. The standards are enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable.

Source Type Affected

These federally implemented programs affect heavy-duty diesel engines used in trucks.

Control Strategy

The Heavy-Duty Diesel Engine Rule requires more stringent exhaust emission standards.

Implementation

This program is implemented by the EPA, under 40 CFR Parts 9 and 86 Control of Emissions of Air Pollution From Highway Heavy-Duty Engines; Final Rule.

Projected Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

The VOC and NOx emissions reductions associated with the Heavy Duty Diesel Engine Rule (HDD) Program were calculated by determining the difference between the 2002 & 2005 mobile source inventory with all measures with the exception of the HDD Rule in place (Case 5noHDD), and the 2005 inventory with all measures including the HDD in place (Case 5).

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

40 CFR Parts 9 and 86 Control of Emissions of Air Pollution From Highway Heavy-Duty Engines; Final Rule (62 FR 54694), October 21, 1997.

7.4 State and local measures

7.4.1 Reformulated gasoline use in on-road vehicles

This measure requires the use of federal reformulated gasoline in the Washington nonattainment area. This is accomplished through an opt-in to the federal program, which is mandatory in more severe ozone nonattainment areas.

Source Type Affected

All gasoline-powered vehicles (non-road source benefits are documented under Section 6.4.2) are affected by this measure. Vehicle refueling emissions at service stations are also reduced.

Control Strategy

Federal reformulated gasoline has been sold in the Washington, DC-MD-VA ozone nonattainment area since January 1, 1995.

Implementation

Implementation occurs through a state "opt-in" process. The governors of Maryland and Virginia and the mayor of the District of Columbia have "opted in" for, and EPA has approved, delivery of reformulated gasoline in their respective portions of the Washington, DC-MD-VA ozone nonattainment area. All gasoline sold in the nonattainment area on or after January 1, 1995, must be reformulated gasoline.

Projected Emission Reductions

As discussed above, the emission benefits of this onroad control have not been calculated separately from the other onroad measures that are calculated with MOBILE6.

Emission Benefit Calculations

The emission reductions associated with reformulated gasoline were calculated by subtracting "Case 2" motor vehicle emissions (federal CAA plus enhanced I/M) with "Case 4" motor vehicle emissions (Federal CAA plus enhanced I/M plus reformulated gasoline). Modeling reformulated gasoline in MOBILE6 requires providing the "Fuel Program" command along with the other two parameters set to "2 S" referring to the "Reformulated Gasoline" program and the "Southern" region respectively. This automatically overrides the input RVP values with its own default value depending on the year being modeled.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE6.0*, Chapter 2, January 2002.

7.4.2 Reformulated gasoline use in non-road motor vehicles and equipment

This measure involves taking credit for reductions due to the use of federally reformulated gasoline in non-road mobile sources. The reformulated gasoline will be available as a result of Virginia's, Maryland's, and the District of Columbia's "opting-in" on delivery of reformulated gasoline in the Washington, D.C. ozone nonattainment area. Areas that opt-in on delivery of reformulated gasoline receive such gasoline beginning in 1995.

Source Types Affected

This measure affects the various non-road mobile sources that burn gasoline.

Control Strategy

Federal reformulated gasoline has been sold in the Washington, DC-MD-VA ozone nonattainment area since January 1, 1995.

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.1	1.2	1.4	2.7
2005 VOC Reductions	0.2	1.2	1.4	2.8

Emissions Benefit Calculations

Refueling emissions for on-road sources are already calculated in the Washington, D.C. ozone nonattainment area's mobile source inventory.

In an August 18, 1993, memorandum, EPA’s Office of Mobile Sources lists several factors for use in computing reduction credits for the use of reformulated gasoline in non-road equipment. Using the EPA memorandum, the emissions reduction factor is 3.324%, and the calculated emissions reductions therefore are as follows:

(Uncontrolled 2002 non-road mobile source emissions) x (0.03324 reduction factor) x (gasoline component of non-road mobile sources inventory) = tons/day reduction.

(95.1 tons VOC/day) * (0.03324 reduction factor) * [1-(10.786 diesel VOC/70.417 total VOC)] = 2.68 tons VOC/day reduction.

Implementation

District of Columbia - Implemented by EPA via mayor's formal request to opt-in to federal program.
Maryland - Implemented by EPA via governor's formal request to opt-in to federal program.
Virginia - Implemented by EPA via governor's formal request to opt-in to federal program.

References

U.S. Environmental Protection Agency, "Regulation of Fuels and Fuel Additives: Standards for Reformulated Gasoline", Proposed Rule, 58 *Federal Register* 11722, February 26, 1993.

"VOC Emission Benefits for Non-Road Equipment with the Use of Federal Phase I Reformulated Gasoline", memorandum from Phil Lorang, U.S. EPA Office of Mobile Sources to Air Directors, EPA Regions 1-10, August 18, 1993.

7.4.3 Surface cleaning and degreasing for machinery and automobiles repair

This measure amended regulations for surface cleaning (often called "cold cleaning and degreasing") devices and operations, to require more stringent emissions control techniques, and to require, where possible, the use of low- or no-VOC solvents.

Source Type Affected

All cold cleaning and degreasing equipment and operations.

Control Strategy

Maryland has regulations on cold cleaning and degreasing equipment and operations (COMAR 26.11.19.09). The regulations require a decrease in vapor pressure of degreasing material for cold degreasers, installation of a condenser or air pollution control device, and good operating practices to minimize VOC losses.

The District of Columbia and Virginia have adopted regulations on cold cleaning and degreasing equipment and operations. Credit is taken for two types of control measures: (1) The first measure proposes following equipment controls: solvent tank evaporation controls, carry-out emission controls, and enclosure/add-on controls; and the following operational controls: proper equipment use, and reduced disturbance of solvent-air interface. (2) The second measure will require the use, where feasible, of alternative solvents.

Implementation

District of Columbia - Environmental Health Administration
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.08	2.46	1.57	4.11
2005 VOC Reductions	0.082	2.59	1.68	4.35

Emissions Benefits Calculations

The calculation based on the most recent EPA guidance for emission reductions in 2005 follows:

	2002 Uncontrolled	Reduction
DC (32% reduction)	0.259	0.083
MD (59% reduction)	4.174	2.463
VA (32% reduction)	4.902	1.569
	2005 Uncontrolled	**Reduction**
DC (32% reduction)	0.257	0.082
MD (59% reduction)	4.378	2.587
VA (32% reduction)	5.239	1.676

See Appendix E for details

7.4.4 Landfill regulations

Landfills emit gases as a result of decomposition of materials buried in them. While most of these gases are methane, which is not photochemically reactive, landfills do contribute to VOC emissions, and, thus, ozone formation. A federal rule for the control of new landfills and guidelines for existing landfills has been proposed under Section 111 of the Clean Air Act Amendments.

Source Type Affected

Municipal landfills are those that receive primarily household and/or commercial waste.

Control Strategy

The 15% VOC Reduction Plan required adoption of the federal guidelines for municipal landfills (see 56 *Federal Register* 24468). The proposed guidelines require installation of gas collection systems followed by flares, to either destroy the VOCs or burn them for fuel. The rule would require capture and control systems to capture at least 80% of the VOC emissions and rout them to a 98% destruction efficiency control device.

Implementation

Federal standards for existing landfills will be promulgated under Section 111 of the Clean Air Act Amendments. The following state agencies will have to independently adopt regulations consistent with the federal standards:

Maryland - Air and Radiation Management Administration - MD 26.11.19.20, 3/9/98
Virginia - Department of Environmental Quality – 9 VAC 5-40-5800, 4/1/96

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0	1.3	1.1	2.4
2005 VOC Reductions	0	1.3	1.2	2.5

Emission Benefit Calculations

Following the EPA guidance on this measure, a 98% emissions reduction factor was used, with a default capture efficiency of 80% and a default rule effectiveness factor of 80%. These figures

were applied to emissions to determine reductions. For Virginia reductions, see Appendix L, which provides further documentation.

2002 MD: (1.956 tpd) x (0.98) x (0.8) x (0.8) = 1.27 tpd
2005 MD: (2.031 tpd) x (0.98) x (0.8) x (0.8) = 1.27 tpd

2002 VA: (1.743 tpd) x (0.98) x (0.8) x (0.8) = 1.09 tpd
2005 VA: (1.835 tpd) x (0.98) x (0.8) x (0.8) = 1.15 tpd

References

U.S. Environmental Protection Agency, *Standards of Performance for New Stationary Sources and Guidelines for Existing Sources: Municipal Solid Waste Landfills*, 56 *Federal Register* 24468, May 30, 1991.

U.S. Environmental Protection Agency, *Air Emissions From Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines*, EPA-450/3-90-011a, March 1991.

7.4.5 Seasonal open burning restrictions

This measure involves amending and/or adopting state regulations to ban the open burning of such items as trees, shrubs, and brush from land clearing, trimmings from landscaping, and household or business trash, during the peak ozone season. The measure is authorized by state regulations, but is enforced by the local governments.

Source Type Affected

The measure affects all citizens and businesses that burn solid waste.

Control Strategy

Under the 15% VOC Reduction Plan, Maryland and Virginia adopted state regulations to prohibit open burning during peak ozone season in the Washington, D.C. ozone nonattainment area. The emissions benefits will remain constant throughout 2005.

Implementation

District of Columbia - Environmental Health Administration.
Maryland - Air and Radiation Management Administration; local government enforcement.
Virginia - Department of Environmental Quality; local government enforcement.

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0	4.4	2.7	7.1
2005 VOC Reductions	0	4.4	2.7	7.1

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 NOx Reductions	0	0.9	0.6	1.5
2005 NOx Reductions	0	0.9	0.6	1.5

Emissions Benefit Calculations

For emissions reductions, the calculation is as follows:

(Projected uncontrolled emissions) x (emissions reduction factor) x (rule compliance factor) = tons NOx/day benefit

MD
A rule effectiveness factor of 96.8% is used. This factor was obtained from a study prepared by Mid-Atlantic Regional Air Management Association/Mid-Atlantic Northeast Visibility Union (MARAMA/MANE-VU) regarding emission factors and rule effectiveness for open burning.

(4.587 tons VOC/day) x (1.0 reduction factor) x (0.968 rule compliance) = 4.440 tons/day VOC reduction

VA
A rule effectiveness factor of 80% is used. The MARAMA/MANE-VU report did not study this factor in Virginia jurisdictions.

(3.323 tons VOC/day) x (1.0 reduction factor) x (0.80 rule compliance) = 2.658 tons/day VOC reduction

DC
No open burning is assumed in the 1990 baseline inventory or the 2002 or 2005 projection inventories.

References:

"Open Burning in Residential Areas, Emissions Inventory Development Report," E.H. Pechan & Associates, Inc., January 31, 2003. Prepared for the Mid-Atlantic/Northeast Visibility Union.

7.4.6 Stage I vapor recovery system expansion

This measure involves applying the federal Control Technique Guideline's "balanced submerged" underground storage tank refilling method at gas stations located in newly designated nonattainment counties.

Source Type Affected

All filling of underground storage tanks not currently controlled will be affected.

Control Strategy

In the 15% VOC Reduction Plan, balanced submerged fill requirements were extended to Calvert, Charles and Frederick counties in Maryland and Stafford counties in Virginia. All other counties in the nonattainment area already were required to use balanced submerged fills.

Implementation

Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0	0.937	0.563	1.500
2005 VOC Reductions	0	0.970	0.582	1.552

Emission Benefit Calculations

For the Maryland portion of this source, projected 2002 and 2005 emissions for Frederick, Charles, and Calvert counties were multiplied by a 90% emissions reduction factor and a 91% rule effectiveness factor.

For the Virginia portion of this source, projected 2002 and 2005 emissions for Stafford County were multiplied by a 90% emissions reduction factor and an 80% rule effectiveness factor.

MD 2002: (1.144) x (0.9) x (0.91) = 0.937 tpd
VA 2002: (0.782) x (0.9) x (0.80) = 0.563 tpd

MD 2005: (1.184) x (0.9) x (0.91) = 0.970 tpd
VA 2005: (0.809) x (0.9) x (0.80) = 0.582 tpd

References

Maryland Department of the Environment, Air Management Administration, *Stage I Vapor Recovery Inspection Program*, (Beth Murray, September 30, 1991).

7.4.7 Extend state point source regulations to sources of 25 tons VOC per year

This measure involves extending emission standards to point sources with the potential to emit in excess of 25 tons per year (tpy) of VOCs. The Washington D.C. metropolitan area, designated as serious nonattainment for VOCs, is obligated by law under the CAAA to implement regulations for major sources (greater than 50 tpy) not covered by EPA's Control Technique Guidance (CTG) documents. Under this measure, "reasonably available" control technologies would need to be determined, and implemented for industry sources emitting between 25 and 50 tpy.

Source Type Affected

Point sources with the potential to emit between 25 and 50 tpy.

Control Strategy

Under the 15% VOC Reduction Plan, states agreed to develop and implement new regulations for point sources with the potential to emit between 25 and 50 tpy not already regulated or required to be regulated under the major source definition (50 tpy).

Implementation

District of Columbia - Environmental Health Administration will not be implemented since there are no applicable sources
Maryland - Air and Radiation Management Administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0	1.69	0	1.69
2005 VOC Reductions	0	1.79	0	1.79

Emission Benefit Calculations

Emission benefits for Maryland were calculated using the proposed limit on emissions from miscellaneous metal coatings sources. The RACT limit is set to 3.5 pounds per gallon of coating as applied. Reduction potentials for bakery emissions are based on using an add-on control at the oven vent. The emission reductions creditable from extending RACT into Calvert, Charles, and Frederick are also included. Tables 7-8 and 7-9 present the specific point sources, reduction potentials, and the expected reductions for sources in Maryland.

Table 7-8
Maryland VOC Non-CTG RACT to 25 tpy

Source Name	Current Control Emissions (tpd)	Reduction Potential (%)	Reductions (tpd)
2002			
Andrews AFB	0.300	90	0.270
Stone Industrial	0.138	50	0.069
2002 TOTAL	0.438		0.339
2005			
Andrews AFB	0.311	90	0.280
Stone Industrial	0.141	50	0.071
2005 TOTAL	0.40		0.351

Table 7-9
Maryland Extended State Point Source Regulations to 25 tons VOCs per year

Facility Name	Uncontrolled Emissions (tpd)	Reduction Potential %	Reduction (tpd)
2002			
Naval Surface Warfare Center – Indian Head	1.222	44	0.534
Automated Graphic Systems	0.063	70	0.044
Moore Communications Services	0.119	70	0.083
Metlfab – Grove Road	0.048	44	0.021
EU Services	0.178	70	0.125
Editors Press	0.162	70	0.113
Craftsman Press – Holladay Tyler	0.333	70	0.233
Printers II	0.152	44	0.067
Peake Printers	0.241	44	0.106
Corporate Press – Brightseat Road	0.057	44	0.025
		2002 TOTAL	1.351
2005			
Naval Surface Warfare Center – Indian Head	1.249	44	0.550
Automated Graphic Systems	0.069	70	0.048
Moore Communications Services	0.129	70	0.090
Metlfab – Grove Road	0.049	44	0.022
EU Services	0.194	70	0.136
Editors Press	0.177	70	0.124
Craftsman Press – Holladay Tyler	0.363	70	0.254
Printers II	0.166	44	0.073
Peake Printers	0.263	44	0.116
Corporate Press – Brightseat Road	0.062	44	0.027
		2005 TOTAL	1.440

Because of the overlap between reductions that will be achieved by this measure and those achieved through the existing RACT rules, it is difficult to precisely quantify emission reduction benefits in Maryland. The estimate presented in the Expected Reductions table was provided by the Maryland Department of the Environment.

7.4.8 Graphic arts controls

Controls for offset lithography have been adopted as a new CTG. These controls apply to small printers and sources. VOCs are emitted from the inks used for printing, fountain solutions, and from the solvents used to clean the printing equipment.

Source Type Affected

This regulation affects small printers not currently regulated under RACT measures. Lithographic printing facilities include heatset web, non-heatset web, non-heatset sheet-fed, and newspaper non-heatset web sources.

Control Strategy

The 15% VOC Reduction Plan contained measures based on the draft CTG, which included the following controls:

Emission Source	Recommended Control
Inks	90% control (condenser filters) for heatset plants
Fountain Solution	1.6% isopropyl alcohol (IPA) for heatset plants (90% reduction) alcohol substitution for non-heatset (99% reduction) 5% IPA for sheet-fed (50% reduction)
Cleaning Solutions	30% VOC content limit (70% reduction)

Implementation

District of Columbia - Environmental Health Administration: 20 DCMR Sec. 716, 5/1/99
Maryland - Air and Radiation Management Administration: 26.11.19.11 & .18, 6/5/95 & 11/7/94
Virginia - Department of Environmental Quality: 9 VAC 5-40-7800, 4/1/96

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.513	1.571	1.653	3.737
2005 VOC Reductions	0.502	1.620	1.766	3.888

Emission Benefit Calculations

Based on the draft CTG (based on employment), it was assumed that offset lithographic printing accounts for 64% of total graphic arts emissions. This percentage contribution was applied to total graphic arts area source emissions, to estimate total emissions from offset lithography. There is a margin of uncertainty with this calculation, as the exact percentage of lithographic printers in the Washington MSA was not available.

The draft CTG estimated overall reductions for four model plants: heatset web, non-heatset web, non-heatset sheet-fed, and newspaper non-heated web. Since the CTG did not classify the population of sources into these model plants, the numerical average of the overall sources was used for the nonattainment area reductions.

In Virginia and the District, the average control efficiency of 75%, with 80% rule effectiveness and 64% penetration, was applied to area source graphic art emissions to determine total reductions.

In Maryland, the graphic arts category was divided into lithography, flexography, and rotogravure sub-categories. Based on a November 1996 EIIP document entitled Graphic Arts, the estimated percentage of product market share for rotogravure printing is 18 percent and the estimated percentage of market share for flexographic printing is 18 percent. This percentage contribution was applied to total graphic arts area source emissions, to estimate total emissions from either flexographic or rotogravure printing. The average control efficiency for flexographic printers is assumed to be 60% (from COMAR 26.11.19.10) * 90% (estimated percent of emissions attributable to evaporation of ink solvent). The average control efficiency for rotogravure printers is assumed to be 70% (from COMAR 26.11.19.10) * 90% (estimated percent of emissions attributable to evaporation of ink solvent). The average control efficiency for each type of printing operation and the 18 % penetration were applied to area source graphic art emissions to determine total reductions. Therefore, each category was controlled as follows:

Graphic Arts Controls Lithography (64%):	75% reduction factor * 80% rule effectiveness * 64% Penetration
Graphic Arts Controls MD-Flexography (16%):	60% reduction factor * 90% emissions from ink solvent evaportion * 80% rule effectiveness * 18% Penetration
Graphic Arts Controls MD-Rotogravure (16%):	70% reduction factor * 90% emissions from ink solvent evaportion * 80% rule effectiveness * 18% Penetration

<u>Sample 2005 Calculations:</u>

DC: (1.309 tpd) x (0.75) x (0.80) x (0.64) = 0.502 tpd

VA: (4.600 tpd) x (0.75) x (0.80) x (0.64) = 1.766 tpd

MD: (1.877 tpd) x (0.75) x (0.80) +
(0.528 tpd) x (0.60) x (0.90) x (0.80) +

(0.528 tpd) x (0.70) x (0.90) x (0.80) = 1.620 tpd

References

U.S. Environmental Protection Agency, *Control Techniques Guideline for Offset Lithographic Printing*, Draft, December 14, 1992.

7.4.9 Auto body refinishing

EPA has crafted a national rule for emissions from auto body refinishing. The rule requires reformulated auto body coatings. This source category was originally targeted as a new Control Technique Guideline (CTG), and a draft CTG is available for use in creating a state rule.

Source Type Affected

EPA expects all auto body refinishing facilities to be affected. This category includes the application of base coats, primer coats, finish coats, and sealer/clear coats.

Control Strategy

The 15% VOC Reduction Plan contained a measure that required reduced-solvent coatings for precoats, primer surfaces, primer sealers, and topcoats. The measure also required the use of spray gun cleaners that recycle solvents, and the use of high-volume, low- pressure application equipment.

Implementation

EPA adopted a National Rule for Autobody Refinishing on August 14, 1998.
Maryland - Air and Radiation Management Administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.46	5.70	3.15	9.31
2005 VOC Reductions	0.46	5.99	3.37	9.82

Emission Benefit Calculations

EPA signed the national rule to control VOC emissions from autobody refinishing on August 14, 1998. These coatings are typically used by industry and small businesses or by vehicle owners. The national rule targets the formulation of these surface coatings. The national rule allows Virginia and the District of Columbia to claim a 35.7% emission reduction due to the new requirement. A total reduction of 35.7% was applied based on EPA guidance to estimate reductions in Virginia and the District of Columbia. This reduction was applied to the base case 2005 projections to estimate the overall benefit. Maryland has a more stringent rule that yields a 60% reduction, and its reductions are calculated accordingly.

2002:
DC: (1.294 tpd) x (0.357) = 0.462 tpd

VA: (8.815 tpd) x (0.357) = 3.147 tpd
MD: (9.502 tpd) x (0.60) = 5.701 tpd

2005:
DC: (1.285 tpd) x (0.357) = 0.459 tpd
VA: (9.430 tpd) x (0.357) = 3.367 tpd
MD: (9.979 tpd) x (0.60) = 5.987 tpd

References

U.S. Environmental Protection Agency, Chemicals and Petroleum Branch, Research Triangle Park, North Carolina, *Automobile Refinishing Control Techniques Guideline*, Final

EPA Reference Docket Number A-95-18

Maryland Department of the Environment, Air and Radiation Management Administration, Baltimore, Maryland, *Summary and Economic Impact of New Regulation .23 under COMAR 26.11.19, Control of VOC Emissions from Vehicle Refinishing* (October 18, 1994)

7.4.10 Ozone Transport Commission (OTC) Consumer Products

This measure requires reformulation of approximately 80 types of consumer products to reduce their VOC content. It uses more stringent VOC content limits than the existing Federal consumer products rule. The rule also contains requirements for labeling and reporting.

Source Type Affected

Manufacturers of various specialty chemicals named in the rule, such as aerosol adhesives, floor wax strippers, dry cleaning fluids and general purpose cleaners.

Control Strategy

The District of Columbia, Maryland and Virginia and are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products. The rule will apply to all counties in the nonattainment area. Reductions from this rule are expected to first occur in calendar years 2005 and 2006. Because Maryland and Virginia do not expect to see benefits from this rule by November 15, 2005, the District of Columbia credit from the OTC Consumer Products measure appears in this rule, while the reminder appears as a contingency measure in Section 12.2.3.1.

Manufacturers are expected to demonstrate compliance with the rule primarily through a California Air Resources Board (CARB) test method. If complying with the VOC contents becomes difficult, flexibility options are provided.

Implementation

District of Columbia - Environmental Health Administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	1.1	0	0	1.1
2005 VOC Reductions	1.1	0	0	1.1

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emissions Benefits Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. Further details are available from Reference 1.

References

E.H. Pechan, “Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules”, March 31, 2001.

7.4.11 Ozone Transport Commission (OTC) Portable Fuel Containers Rule

This measure introduces performance standards for portable fuel containers and spouts. The standards are intended to reduce emissions from storage, transport and refueling activities. The rule also included administrative and labeling requirements. Compliant containers must have: only one opening for both pouring and filling, an automatic shut-off to prevent overfill, an automatic sealing mechanism when not dispensing fuel and specified fuel flow rates, permeation rates and warranties.

Source Type Affected

Any person or entity selling, supplying or manufacturing portable fuel containers, except containers with a capacity of less than or equal to one quart, rapid refueling devices with capacities greater than or equal to four gallons, safety cans and portable marine fuel tanks operating with outboard motors, and products resulting in cumulative VOC emissions below those of a representative container or spout.

Control Strategy

The District of Columbia and Virginia are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers. Maryland adopted this rule in January 2002. The rule will apply to all counties in the nonattainment area. Reductions from this rule are expected to increase annually beginning in calendar year 2004. The credit from the OTC Portable Fuel Containers measure that is expected to occur by November 2005 appears in this rule. Further credit appears as a contingency measure in Section 12.2.3.2.

Implementation

Maryland - Air and Radiation Management Administration

Virginia - Department of Environmental Quality

District of Columbia - Environmental Health Administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2002 VOC Reductions	0.1	1.8	0.4	2.3

2005 VOC Reductions	0.1	1.8	0.4	2.3

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emission Benefit Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. These calculations assumed 2.5 years of implementation by 2005. As the District of Columbia and Maryland are not expected to require compliance with the rule until May 2005, the benefits from the Pechan analysis were scaled down as shown below.

State	Assumed Compliance Date	Pechan Estimate (2.5 yr benefits)	Reductions Per Year	Nov 2005 Reductions
District of Columbia	May 2005	0.43	0.17	0.09
Northern Virginia	May 2005	2.0	0.80	0.43

The Maryland Air and Radiation Management Administration provided an estimate of benefits for the Maryland portion of the Washington nonattainment region, based on E.H. Pechan calculations.

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

7.4.12 Ozone Transport Commission (OTC) Architectural and Industrial Maintenance Coatings Rule

This rule requires manufacturers to reformulate various types of coatings to meet VOC content limits. Affected products include architectural coatings, traffic markings, high-performance maintenance coatings and other special-purpose coatings. It uses more stringent VOC content limits than the existing Federal consumer products rule.

Source Type Affected

The measure affects all manufacturers of affected coatings.

Control Strategy

The District of Columbia, Maryland and Virginia are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Architectural and Industrial Maintenance Coatings. The rule will apply to all counties in the nonattainment area.

The VOC content limits in this rule are based on a Suggested Control Measure (SCM) adopted by the California Air Resources Board (CARB) and a State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Officials (STAPPA/ALAPCO) model rule or OTC coatings. Manufacturers are expected to comply with this rule using primarily EPA Test Method 24.

Implementation

District of Columbia - Environmental Health Administration

Maryland - Air and Radiation Management Administration

Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	1.1	6.2	5.0	12.3
2005 VOC Reductions	1.1	6.2	5.0	12.3

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emissions Benefit Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. Further details are available from Reference 1.

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

7.4.13 Ozone Transport Commission (OTC) Mobile Repair & Refinishing Rule

This rule establishes VOC limits for paints using in mobile repair and refinishing. The VOC limits are consistent with Federal limits for mobile equipment refinishing materials. The rule also requires improved transfer efficiency application equipment, enclosed spray gun cleaning, and minimal training.

Source Type Affected

All manufacturers of paints used in mobile repair and refinishing and operators of mobile repair and refinishing facilities.

Control Strategy

The District of Columbia and Virginia are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Mobile Repair and Refinishing. The rule will apply to all counties in the nonattainment area. The State of Maryland had rules in place by 1996 that contain limits comparable to the OTC model rule. Therefore the OTC model rule has already been implemented in Maryland.

Implementation

District of Columbia - Environmental Health Administration

Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	0.6	0	2.0	2.6
2005 VOC Reductions	0.6	0	2.0	2.6

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emission Benefit Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. Further details are available from Reference 1.

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

7.4.14 Ozone Transport Commission (OTC) Solvent Cleaning Operations Rule

This rule establishes hardware and operating requirements and alternative compliance options for vapor cleaning machines used to clean metal parts. These machines are used in manufacturing operations to clean grease, wax, oil and other contaminants from parts when a high level or cleanliness is necessary. The rule also affects cold cleaners, which are used in automobile and maintenance facilities and industrial maintenance shops.

Source Type Affected

Manufacturers and operators of vapor cleaning or cold cleaning machines

Control Strategy

The District of Columbia and Virginia are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Solvent Cleaning Operations. The rule will apply to all counties in the nonattainment area. The State of Maryland had rules in place by 1996 that contain limits comparable to the OTC model rule. Therefore the OTC model rule will not be implemented in Maryland.

Standards for vapor cleaning machines are based on Federal Maximum Available Control Technology (MACT) standards for chlorinated solvent vapor degreasers. Cold cleaner solvent volatility provisions are based on regulatory programs in place in several states, primarily Maryland and Illinois.

Implementation

District of Columbia - Environmental Health Administration

Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions	2.7	0	9.0	11.7
2005 VOC Reductions	2.7	0	9.0	11.7

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emission Benefit Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. Further details are available from Reference 1.

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

7.4.15 Additional Area Source Reductions

MWAQC may identify additional VOC reductions from Measures 7.4.15.1 and 7.4.15.2, described in this section, and/or Measures 12.2.3.1 through 12.2.3.17, described as contingency measures in Chapter 12. The latter measures, if not selected as contingency measures, could be used to fulfill control measure requirements.

7.4.15.1 "Cash for Clunkers" Gas Cans

This measure establishes a voluntary program providing free or discounted gas cans to residents or businesses located in the Washington nonattainment area. The program provides a free or discounted gas can for participants who trade in their existing gas can for a new, low-emission can sold under the OTC Portable Fuel Containers rule. See Section 7.4.11 for a description of the OTC Portable Fuel Containers rule.

Source Type Affected

Private and commercial owners of portable fuel containers affected under measure 7.4.11.

Control Strategy

Increase, through advertising and subsidy, the rate of turnover of gas cans redesigned under measure 7.4.11, OTC Portable Fuel Containers. State and/or local agencies within the District of Columbia, Maryland and Virginia will develop, fund and administer a program to offer free or discounted gas cans to residents and commercial businesses in the Washington nonattainment area. Advertising and promotional materials will be utilized to encourage widespread participation. Start and end dates for the program have yet to be determined.

Implementation

District of Columbia - Environmental Health Administration

Maryland - Air and Radiation Management Administration; local government coordination, funding and administration

Virginia- Department of Environmental Quality; local government coordination, funding and administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions				0.43

2005 VOC Reductions				0.43

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emission Benefit Calculations

Emission benefits calculations are based upon the calculations for Measure 7.4.11, OTC Portable Fuel Containers. Measure 7.4.11 assumes, based on research performed for the Ozone Transport Commission by E.H. Pechan, that over each 12-month period following implementation of the Portable Fuel Containers rule, 10% of the existing stock of gas cans will be replaced with the redesigned model. This measure will increase the rate of turnover by 2.5%, resulting in 12.5% of gas cans being replaced in the first year. The VOC benefits from the extra 2.5% of cans replaced are calculated as follows:

From the analysis for Measure 7.4.11, replacing 10% of the gas cans in the Washington nonattainment area would reduce 0.2 tpd VOC in the District of Columbia and 0.8 tpd VOC in Virginia. Maryland Department of the Environment has determined from the E.H. Pechan analysis that 10% turnover in the Maryland portion of the Washington nonattainment area would reduce emissions by 0.7 tpd VOC. Therefore, the benefit of an additional 2.5% turnover in the nonattainment area would be 0.42 tpd, as shown below.

Jurisdiction	Reductions from 10% Turnover	Reductions from 2.5% Turnover
District of Columbia	0.2	0.04
Maryland	0.7	0.18
Virginia	0.8	0.20
TOTAL	1.7	0.42

References

E.H. Pechan, “Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules”, March 31, 2001.

7.4.15.2 "Cash for Clunkers" Lawn & Garden

This measure establishes a voluntary program providing subsidies to residents of the Washington nonattainment area who turn in old lawnmowers in exchange for a coupon providing a discount on the purchase of an electric or push lawnmower.

Source Type Affected

Owners of residential lawn-mowing equipment

Control Strategy

State and/or local agencies within the District of Columbia, Maryland and Virginia will develop, fund and administer a program to offer discounted electric or push lawnmowers to residents of the Washington nonattainment area. Advertising and promotional materials will be utilized to encourage widespread participation. Start and end dates for the program have yet to be determined.

Implementation

District of Columbia - Environmental Health Administration

Maryland - Air and Radiation Management Administration; local government coordination, funding and administration

Virginia- Department of Environmental Quality; local government coordination, funding and administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions				0.1
2005 VOC Reductions				0.1

*Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

Emission Benefit Calculations

Detailed emission calculations can be found in Appendix J.

7.5 Transportation control measures (TCMs)

Section 108(f) of the Clean Air Act Amendments provides examples of Transportation Control Measures (TCMs) that can be implemented to reduce emissions from mobile sources. Most TCMs are designed to reduce vehicle miles traveled or vehicle trips or improve the flow of traffic.

In conjunction with state departments of transportation and local transit authorities, state air agencies have identified a number of projects designed to reduce vehicle travel and mitigate traffic congestion in the Metropolitan Washington nonattainment area. These measures include purchase of alternative-fueled vehicles, improvements to bicycle and pedestrian facilities, and improvements to transit services and access to transit facilities. All responsible agencies have committed to implementation of these projects by November 15, 2005. Commitment letters and specific project descriptions are contained in Appendix G.

Source Type Affected

Transportation-related activities in the Metropolitan Washington nonattainment area

Implementation

District of Columbia – Department of Transportation

Maryland - Department of Transportation

Virginia - Department of Transportation

Washington Metropolitan Area Transit Authority

Northern Virginia Local Governments

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 VOC Reductions				0.3
2005 VOC Reductions				0.3

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 NOx Reductions				0.7
2005 NOx Reductions				0.7

*Emission reduction estimates were supplied by the District of Columbia Department of Transportation, the Maryland Department of Transportation, the Virginia Department of Transportation and the Washington Metropolitan Area Transit Authority (WMATA). See Appendix G for details. Estimates have been rounded to the nearest tenth. Because the requirements for both the 1999-2002 and the 2002-2005 rate of progress demonstrations will be met on November 15, 2005, reductions credited to the 2002 and 2005 demonstrations are the same.

8.0 REASONABLY AVAILABLE CONTROL MEASURE (RACM) ANALYSIS

Section 172(c)(1) of the Clean Air Act requires state implementation plans (SIPs) to include an analysis of reasonably available control measures (RACM). This analysis is designed to ensure that the Washington region is implementing all reasonably available control measures in order to demonstrate attainment with the 1-hour ozone standard on the earliest date possible. This chapter presents a summary of analyses conducted to determine whether the SIP includes all reasonably available control measures. Full details of the analysis are included in Volume II of the Appendix. The Metropolitan Washington Council of Governments (MWCOG) conducted this RACM evaluation in coordination with the District of Columbia Department of Health (DC-DOH), Maryland Department of the Environment (MDE) and the Virginia Department of Environmental Quality (VA DEQ).

8.1 Analysis Overview and Criteria

The RACM requirement is rooted in Section 172(c)(1) of the Clean Air Act, which directs states to "provide for implementation of all reasonably available control measures as expeditiously as practicable". In its 1992 General Preamble for implementation of the 1990 Clean Air Act Amendments (57 FR 13498) EPA explains that it interprets Section 172(c)(1) as a requirement that states incorporate in a SIP all reasonably available control measures that would advance a region's attainment date. However, regions are obligated to adopt only those measures that are reasonably available for implementation in light of local circumstances. In the Preamble, EPA laid out guidelines to help states determine which measures should be considered reasonably available:

If it can be shown that one or more measures are unreasonable because emissions from the sources affected are insignificant (i.e. de minimis), those measures may be excluded from further consideration…the resulting available control measures should then be evaluated for reasonableness, considering their technological feasibility and the cost of control in the area to which the SIP applies…In the case of public sector sources and control measures, this evaluation should consider the impact of the reasonableness of the measures on the municipal or other government entity that must bear the responsibility for their implementation. [See Reference 1]

In its opinion on *Sierra Club v. EPA*, decided July 2, 2002, the U.S. Court of Appeals for the DC Circuit upheld EPA's definition of RACM, including the consideration of economic and technological feasibility, ability to cause substantial widespread and long-term adverse impacts, collective ability of the measures to advance a region's attainment date, and whether an intensive or costly effort will be required to implement the measures. Consistent with EPA guidance and the U.S. District Court's opinion, the region has developed specific criteria for evaluation of potential RACM measures. Individual measures must meet the following criteria:

- Will reduce emissions by the beginning of the Washington region's 2004 ozone season (May 1, 2004)[1]

- Enforceable
- Technically feasible
- Economically feasible (defined as a cost of $10,000-$20,000 per ton or less)
- Would not create substantial or widespread adverse impacts within the region
- Emissions from the source being controlled exceed a de minimis threshold, defined as 0.1 tons per day

In addition, any RACM measures, as a group, must meet the following criteria:

- Measures will enable the region to reduce ozone levels to 124 ppb during the 2004 ozone season
- Measures can be implemented without an intensive or costly effort

An explanation of these criteria is given in succeeding sections.

8.1.1 Implementation Date

EPA has traditionally instructed regions to evaluate RACM measures on their ability to advance the region's attainment date. This means that implementation of a measure or a group of measures must enable the region to reduce ozone levels to the 124 ppb required to attain the one-hour ozone standard at least one year earlier than expected. As the Washington region currently expects to reduce ozone levels to 124 ppb during the 2005 ozone season, any RACM measures must enable the region to meet the 124 ppb standard by May 1, 2004, the beginning of the 2004 ozone season.

8.1.2 Enforceability

When a control measure is added to a SIP, the measure becomes legally binding, as are any specific performance targets associated with the measure. If the state or local government does not have the authority necessary to implement or enforce a measure, the measure is not creditable in the SIP and therefore cannot be declared a RACM. A measure is considered enforceable when all state or local government agencies responsible for funding, implementation and enforcement of the measure have committed in writing to its implementation and enforcement.

In addition to theoretical enforceability, a measure must also be practically enforceable. If a measure cannot practically be enforced because the sources are unidentifiable or cannot be located, or because it is otherwise impossible to ensure that the sources will implement the control measure, the measure cannot be declared a RACM. One exception is voluntary measures, such as those implemented under EPA's Voluntary Mobile Emission Reduction Program (VMEP).

8.1.3 Technological Feasibility

All technology-based control measures must include technologies that have been verified by EPA. The region cannot take SIP credit for technologies that do not produce EPA-verified reductions.

8.1.4 Economic Feasibility and Cost Effectiveness

EPA guidance states that regions should consider both economic feasibility and cost of control when evaluating potential RACM measures. Therefore, the Washington region has specified a cost-effectiveness threshold for all possible RACM measures. Measures for which the cost of compliance exceeds this threshold will not be considered RACM.

In setting this threshold, the region took into consideration two major factors. First, EPA has issued guidance regarding the relationship between RACT and RACM. In its RACM analysis for the Dallas/Forth Worth nonattainment area (see Reference 4), EPA states:

"RACT is defined by EPA as the lowest emission rate achievable considering economic and technical feasibility. RACT level control is generally considered RACM for major sources."

In the Washington region, installation of Reasonably Available Control Technology (RACT) costs approximately $8,000 to $10,000 per ton of emissions reduced. Therefore, it seems reasonable to adopt this cost effectiveness for area, nonroad and mobile sources in addition to stationary. Secondly, the National Capital Region Transportation Planning Board (TPB) frequently adopts Transportation Emissions Reduction Measures (TERMs) to offset mobile emissions for the purpose of conformity. The majority of TERMs adopted by TPB in the past ten years for the express purpose of reducing mobile emissions have cost less than $10,000 per ton.[2]

In order to avoid excluding otherwise worthy measures that slightly exceed the cost effectiveness threshold, the region has specified a threshold of $10,000-$20,000 for cost effectiveness. All measures costing under $20,000 per ton NOx or VOC reduced will be evaluated against the remaining criteria to determine whether they meet the requirements for a RACM measure.

8.1.5 Substantial and Widespread Adverse Impacts

Some candidate RACM measures have the potential to cause substantial and widespread adverse impacts to a particular social group or sector of the economy. Due to environmental justice concerns, measures that cause substantial or widespread adverse impacts will not be considered RACM.

8.1.6 *De Minimis* Threshold

In the General Preamble, EPA allows regions to exclude from the RACM analysis measures that control emissions from insignificant sources and measures that would impose an undue administrative burden (see Section 8.1.7). Under severe area RACT requirements, the smallest major source subject to RACT emits 25 tpy, or approximately 0.1 tpd. Following these requirements and the precedent set by the San Francisco RACM

analysis (see Reference 5), the region will not consider control measures affecting source categories that produce less that 0.1 tpd NOx or VOC emissions.

8.1.7 Advancing Achievement of 124 ppb Standard

In order for measures to be collectively declared RACM, implementation of the measures must enable the region to demonstrate one or fewer exceedances of the 124 ppb ozone standard one full ozone season earlier than currently expected. As discussed in Section 8.1.1, the Washington region currently expects to demonstrate one or fewer exceedances in 2005. Therefore, any RACM measures would need to enable the region to meet the 124 ppb standard during the 2004 ozone season.

The attainment modeling described in Chapter 12, which was conditionally approved by EPA on April 17, 2003 as part of a new severe area SIP, shows that the region would not be able to attain the one-hour ozone standard without reduced transport of ozone and ozone precursors from upwind sources.

The problem of regional NOx controls will be addressed when the NOx SIP Call is fully implemented on May 31, 2004. Because there is a variable operating cost associated with operating of many types of pollution control equipment, it is possible that many plants may choose not to operate such equipment outside of the ozone season. Furthermore, because the SIP Call requires plants to meet a seasonal average emission rate rather than a daily average, it is possible that many plants will not have control equipment operating by May 31.

The Washington region has historically experienced exceedances early in the ozone season, including the month of May. The most recent May exceedance took place in 2001. Because it is unclear to what extent the SIP Call will actually be implemented by the beginning of the Washington region's 2004 ozone season, it is impossible to determine how many additional tons the region would need to reduce in order to ensure that exceedances are not registered. Therefore, the region is taking a conservative approach and estimating that any group of measures that would collectively reduce ozone by 1 ppb or more could enable the region to meet the 124 pbb standard one year earlier.

Photochemical modeling performed as part of the Washington region's attainment demonstration concludes that reducing one ton of low-level NOx results in a maximum ozone response of 0.1141 ppb, while reducing one ton of low-level VOC results in a maximum response of 0.0294 ppb. See Chapter 11 for details. Therefore in order to reduce 1 ppb of ozone, any RACM measures would need to collectively reduce 8.8 tpd NOx or 34.0 tpd VOC.

8.1.8 Intensive and Costly Effort

When considered together, the implementation requirements of any RACM measures cannot be so great as to preclude effective implementation and administration given the budget and staff resources available to the Washington region.

8.2 RACM Measure Analysis

8.2.1 Analysis Methodology

Over the last decade, the Metropolitan Washington Air Quality Committee (MWAQC) has compiled an extensive list of potential control measures. MWCOG has also researched measures used as air quality control strategies in other metropolitan regions. These lists of control measures were compiled into a master list of candidate measures for the RACM analysis. The sources of strategies analyzed for the Metropolitan Washington region include the following:

- Clean Air Act Section 108(f) measures (Transportation Control Measures)
- Transportation Emissions Reduction Measures (TERMs) listed in recent Transportation Improvement Programs (TIPs) for the Metropolitan Washington region
- Measures identified in a 1993 MWAQC review of Air Pollution Control Measures
- Measures considered in Baltimore, Atlanta and Houston RACM analyses

These measures were then evaluated against the criteria discussed in Section 8.1 as documented in Volume II of the Appendix.

8.2.2 Analysis Results

Tables 8-1 through 8-4 provide lists, organized by source sector, of potential measures evaluated against the RACM criteria. The tables show which measures were determined to meet the individual measure criteria described in Sections 8.1.1 through 8.1.6. Those measures meeting the preceding criteria are labeled “Possible”, in the RACM column, while the other measures are labeled “No” and the “Reason” column indicates which criterion the measures failed to meet.

Table 8-5 summarizes those measures meeting the criteria for individual RACM measures. The measures in Table 8-5 were evaluated against the two remaining criteria: ability to reduce the region’s ozone levels to 124 ppb by 2004 and potential for intensive and costly implementation.

Table 8-1: Potential Stationary RACM Measures for the Metropolitan Washington Region

Identifier	Measure Name	Definition	RACM	Reason
P1	NOx Limit For Power Plants	Cap the emission rate from each utility boiler and turbine below NOx SIP Call limits	No	Would not deliver benefits by May 2004
P2	Specific Control Technology For Power Plants	Require all power generators to install specific types of control equipment (i.e. SCR, SNCR, low-NOx burners)	No	Would not deliver benefits by May 2004
P3	Controls on Power Plants Outside Nonattainment Area	Require power plants operating in counties adjacent to Washington nonattainment area to install nonattainment area controls	No	Would not deliver benefits by May 2004
W1	Reduced Emissions from Wastewater Systems	Adopt SCAQMD Rule 1176: Sumps and Wastewater Separators	No	No creditable emission reductions
X1	NOx Controls on Commercial Power Generating Equipment	Adopt OTC Additional NOx Controls Rule throughout nonattainment area (applies to industrial boilers, stationary combustion turbines and reciprocating engines, emergency generators, load shavers and cement kilns)	No	Would not deliver benefits by May 2004
X2	Enhanced Rule Compliance at Existing Stationary Sources	Step up enforcement of and compliance with existing rules for emissions control by stationary sources	No	No creditable emission reductions

Table 8-2: Potential Area RACM Measures for the Metropolitan Washington Region

Identifier	Measure Name	Definition	RACM	Reason
B1	Bakeries	Adopt SCAQMD Rule 1153: Commercial Bakery Ovens	No	Would not deliver benefits by May 2004
C1	Episodic limits on asphalt paving and traffic marking activities	Prohibit road paving and traffic marking on ozone action days	Possible	
C2	Low-Emission Asphalt	Adopt SCAQMD Rules 1108: Cutback Asphalt (less than 0.5% VOC evaporating at 260F) and 1108.1: Emulsified Asphalt (less than 3% VOC evaporating at 260F)	No	De minimis
F1	Low-Emission Water Heaters	Adopt SCAQMD Rule 1121: Control of NOx from Residential Type Natural Gas Fired Water Heaters	No	Would not deliver benefits by May 2004
F2	Low-Emission Furnaces	Adopt SCAQMD Rule 1111: NOx Emissions from Natural Gas Fired, Fan-Type Central Furnaces (no more than 40 nanograms of NOx per joule of useful heat)	No	Would not deliver benefits by May 2004
L1	Control Locomotive Idling	Seek voluntary agreement or implement regulations to reduce idling of locomotives at switchyards through installation of APUs or other methods	Possible	
L2	Retrofit/Repower Locomotives	Provide financial incentives to retrofit or repower locomotives operating in the nonattainment area for cleaner burning diesel or alternative fuels	No	Would not deliver benefits by May 2004
O1	Open Burning	Eliminate open burning in counties adjacent to nonattainment area	No	Would not deliver benefits by May 2004
P1	Reduced Emissions from Petroleum Storage Tanks	Adopt SCAQMD Rule 1178: Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities	No	Would not deliver benefits by May 2004
X1	Implement OTC Beyond Nonattainment Area	Take credit for reductions due to implementation of OTC measures beyond nonattainment area	No	No creditable emission reductions
X2	Episodic controls on pesticide application	Prohibit application of pesticides on forecasted ozone exceedance days	No	Substantial adverse impacts
X3	Enhanced enforcement	Enhance enforcement of existing area source regulations	No	Would not deliver benefits by May 2004
X4	Implement VOC RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of VOC RACT rules beyond nonattainment area	No	No creditable emission reductions
X5	Implement NOx RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of NOx RACT rules beyond nonattainment area	No	No creditable emission reductions

Table 8-3: Potential Nonroad RACM Measures for the Metropolitan Washington Region

Identifier	Measure Name	Definition	RACM	Reason
A1	Agricultural equipment use restrictions	Mandatory restrictions on use of agricultural equipment during Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
A2	Agricultural equipment retrofits	Require agricultural equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
A3	Require low-NOx fuel for agricultural equipment	Require agricultural equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
A4	Low-emissions agricultural equipment	Require sale of low-emissions agricultural equipment in region	No	Would not deliver benefits by May 2004
C1	Construction equipment use restrictions	Restrict use of construction equipment during expected ozone exceedance days	No	Not economically feasible
C2	Construction retrofits	Require construction equipment operating on state and local contracts to be retrofitted with particulate fitlers and/or oxidation catalysts	No	Not economically feasible
C3	Require low-NOx fuel for construction equipment	Require construction equipment operating on state of local contracts to use low-NOx fuel during ozone season	No	No creditable emission reductions
C4	Idling restrictions for construction equipment	Limit idling by construction equipment	No	Would not deliver benefits by May 2004
C5	Low-emissions construction equipment	Require sale of low-emissions construction equipment in region	No	Would not deliver benefits by May 2004
C6	Preference for low-emissions construction equipment	In bids for government construction contracts, award extra points to bidders using low-emission construction equipment	No	Not economically feasible
G1	Episodic restrictions on lawn & garden equipment	Restrict use of lawn and garden equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
G2	Lawn & garden equipment retrofits	Require commercial gas-powered lawn & garden equipment to be retrofitted with emissions controls or low emission engines	No	Would not deliver benefits by May 2004
G3	Require low-NOx fuel for lawn & garden equipment	Require lawn & garden equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
G4	Idling restrictions for lawn & garden equipment	Limit idling by commercial lawn & garden equipment	No	No creditable emission reductions
G5	Low emissions lawn & garden equipment	Adopt EPA lawn & garden equipment rules before they become effective in 2007	No	Would not deliver benefits by May 2004
G6	Preference for low-emissions lawn & garden equipment	In bids for government contracts, award extra points to bidders using low-emission lawn & garden equipment	Possible	

Identifier	Measure Name	Definition	RACM	Reason
G7	"Cash for Clunkers" lawn & garden program	Offer $75 for owners to turn in old, 2 and 4-stroke lawn & garden equipment and purchase electric or push mower	No	Not economically feasible
I1	Episodic restrictions on use of industrial equipment	Moratorium on use of industrial equipment during Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
I2	Industrial equipment retrofits	Require industrial equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
I3	Require low-NOx fuel for industrial equipment	Require industrial equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
I4	Idling restrictions for industrial equipment	Limit idling by industrial equipment	No	No creditable emission reductions
I5	Low-emissions industrial equipment	Require sale of low-emissions industrial equipment in region	No	Would not deliver benefits by May 2004
I6	Industrial equipment replacement	Subsidize replacement of fossil-fuel fired industrial equipment with electric industrial equipment	No	Would not deliver benefits by May 2004
I7	Preference for low-emissions industrial equipment	In bids for government contracts, award extra points to bidders using low-emission industrial equipment	No	Not economically feasible
M1	"Cash for Clunkers" outboard motor program	Offer small cash reward for owners to turn in old, high-emission outboard motors	No	Not economically feasible
M2	Idling restrictions for recreational marine equipment	Limit idling by recreational marine equipment during ozone season	No	Would not deliver benefits by May 2004
M3	Recreational marine equipment use restrictions	Moratorium on use of recreational marine equipment on Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
M4	Require low-NOx fuel for recreational marine equipment	Require diesel-fired recreational marine equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
M5	Graduated registration fees for recreational boats	Levee additional registration fee for registration of boats with old, high-emission engines	No	Would not deliver benefits by May 2004
R1	Episodic restrictions on recreational equipment use	Restrict use of recreational equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
R2	"Cash for Clunkers" recreational equipment program	Offer small cash reward for owners to turn in old, high-emission recreational equipment	No	Not economically feasible
R3	Require low-NOx fuel for recreational equipment	Require recreational equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
R4	Recreational equipment retrofits	Require recreational equipment to be retrofitted with particulate fitlers and/or oxidation catalysts	No	No creditable emission reductions
S1	Subsidize electric airport ground service equipment (GSE)	Subsidize, through direct contributions or tax breaks, installation of electric ground service equipment and/or charging stations at regional airports	No	Would not deliver benefits by May 2004
S2	Require low-NOx fuel for airport GSE	Require airport GSE to use low-NOx fuel during ozone season	No	No creditable emission reductions

Identifier	Measure Name	Definition	RACM	Reason
S3	Airport GSE retrofits	Subsidize the retrofit of airport GSE with emissions control equipment	No	Would not deliver benefits by May 2004
S4	Reduce idling by airport GSE	Develop voluntary program to encourage operators to limit idling of airport GSE	Possible	
S5	Control aircraft auxiliary power units	Seek voluntary agreement to reduce use of aircraft APUs through use of gate-provided services or other strategies	No	Not economically feasible
T1	Light commercial equipment use restrictions	Restrict use of light commercial equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
T2	Light commercial equipment retrofits	Require light commercial equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
T3	Require low-NOx fuel for light commercial equipment	Require light commercial equipment to use low-NOx fuel during ozone season, if applicable	No	No creditable emission reductions
T4	Idling restrictions for light commercial equipment	Limit idling by light commercial equipment	No	No creditable emission reductions
T5	Low-emissions light commercial equipment	Require sale of low-emissions light commercial equipment in region	No	Would not deliver benefits by May 2004
T6	Preference for low-emission light commercial equipment	In bids for government contracts, award extra points to bidders using low-emission light commercial equipment	No	Not economically feasible
X1	EPA Tier II Emissions Standards for Large SI Engines	Adopt EPA Tier II standards before they become effective in 2007	No	Would not deliver benefits by May 2004
X2	Biodiesel for Off-Road Equipment	Require all off-road diesel equipment to burn biodiesel during ozone season	No	Not technologically feasible

Table 8-4: Potential Mobile RACM Measures for the Metropolitan Washington Region

Identifier	Measure Name	Definition	RACM	Reason
A1	Bose Anti-Air Pollutant and Energy Conservation System	Fund trial of Bose system in local vehicle fleets. The Bose system is a mechanical system that uses high-speed centrifugal separation to remove light combustible gases from the exhaust stream. The system can be used with all types of fuel.	No	Not technologically feasible
A2	W15-590 Diesel Fuel Additive	Fund trial of the fuel additive W15-590 to reduce NOX emissions. The additive can be mixed with the fuel before or after delivery from the distribution center.	No	Not technologically feasible
A3	CNG Buses Instead of New Diesel	Purchase additional CNG buses for local transit authorities instead of normally scheduled replacement diesel bus purchases. This would also require expanded CNG fueling and maintenance facilities.	No	Not economically feasible
A4	State & Local Fleet Replacement	Replace public sector gasoline-fueled automobile fleet with hybrid vehicles (i.e. Toyota Prius)	No	Not economically feasible
A5	CNG Fueling Stations for DC Metro Region	Build new modular CNG fueling stations	No	Not economically feasible
A6	Fleet ILEV for light-duty gasoline vehicles	Require fleets operating in nonattainment area to be comprised of a percentage of ILEV vehicles	No	Would not deliver benefits by May 2004
A7	International Green Diesel Retrofit	Fit 500 transit buses running on ultra low sulfur diesel with a quad-catalytic filter	No	Not economically feasible
A8	ZEV program	Adopt California ZEV program	No	Would not deliver benefits by May 2004
A9	Expand WMATA Fleet with Hybrid-Electric Buses	Purchase hybrid electric buses instead of clean diesel as part of WMATA fleet expansion	No	Would not deliver benefits by May 2004
A10	CNG Rental Cars	Purchase CNG rental cars for use in the region	No	Not economically feasible

Identifier	Measure Name	Definition	RACM	Reason
A11	CNG Refuse Haulers	Purchase new CNG powered trash trucks instead of conventional diesel vehicles	No	Would not deliver benefits by May 2004
A12	CNG Taxicabs	Replace regional taxicabs 7 years or older with CNG or other alternative fuel vehicles	No	Not economically feasible
B1	Bike Lockers at Metro Stations, Park & Ride Lots, Other Locations	Expand existing bike lockers at Metrorail stations, install bicycle storage spaces in parking lots	No	Not economically feasible
B2	Bike Racks on Transit Buses	Provide external bike racks on WMATA and other local transit buses	No	Not economically feasible
B3	Improvements to Bicycle and Pedestrian Access	Provide incentives to developments that speed improvements to bicycle/pedestrian access. This includes improvements to sidewalks, curb ramps, crosswalks, lighting, etc.	No	Not economically feasible
B4	Employers Provide Free Bicycles for Midday Use	Require employers to provide one bicycle per 50 employees for mid-day business or personal use.	No	Would not deliver benefits by May 2004
B5	Bike/Pedestrian Paths	Fund construction of additional bicycle/pedestrian paths in the region	No	Not economically feasible
B6	Bicycle Racks in DC	Install bicycle racks at various locations throughout the region	Possible	
E1	4 Day Work Week/Flexible Work Schedules	Encourage employers to adopt a shorter work week, with employees working 4 10-hour days	No	Would not deliver benefits by May 2004
E2	Build Park & Ride Lots at Major Intersections of Commuter Highways	Construct new park & ride commuter lots along HOV facilities	No	Would not deliver benefits by May 2004
E3	Telecommuting Centers	Telecommuting centers, including marketing activity, consultant support, commuter and employer information and assistance	Possible	
E4	Commuter Operations Center	Provides commuter assistance services, including carpool and vanpool ridematching	No	Not economically feasible

Identifier	Measure Name	Definition	RACM	Reason
E5	Vanpool Programs	Create programs and incentives designed to increase the number of vanpools in the region.	No	Not economically feasible
E6	Express Buses From Outyling Areas	Implement direct bus service from outlying Park & Ride lots and far suburbs to major work centers	No	Would not deliver benefits by May 2004
E7	New Surface Parking at Transit Centers	Add new parking spaces at transit centers (bus, Metrorail, MARC) parking lots	No	Not economically feasible
E8	Express Reverse Commuter Buses	Implement reverse commute express buses from the District to major outlying work centers	No	Would not deliver benefits by May 2004
E9	Free Reserved Carpool/Vanpool Spaces	Provide free reserved parking spaces for all carpools or vanpools	No	Would not deliver benefits by May 2004
E10	Government Actions (ozone action day similar to snow day)	Implement a liberal leave policy for local, state and federal employees on Code Red Ozone Action Days, permitting employees to work from home or take unscheduled leave	Possible	
E11	Guaranteed Ride Home	Provides free rides home in event of unexpected emergency or unscheduled overtime to commuters using public transport	No	Not economically feasible
E12	Integrated Rideshare	Provides transit, park & ride, and telecenter information to all commuters on a matchlist	Possible	
E13	Mandatory Employee Commute Reduction	Mandatory employer trip reduction to reduce trips by regional average of 20%	No	Would not deliver benefits by May 2004
E14	Student & staff based college & university rideshare programs	Create rideshare program focused on students and staff at regional universities	No	Would not deliver benefits by May 2004
E15	Vanpool Insurance	Establish a special risk pool to underwrite the cost of vanpool insurance	No	Would not deliver benefits by May 2004

Identifier	Measure Name	Definition	RACM	Reason
F1	Expand HOV Network on the Freeway System	Construct additional HOV lanes on regional freeways, for example I-95 and I-695	No	Would not deliver benefits by May 2004
F2	Extend Ramp Metering	Install signals to control flow of vehicles at selected freeway ramp entrances to maintain level of service	No	Would not deliver benefits by May 2004
F3	Permit Right Turn on Red	Reduce vehicle idling time by permitting right turn on red, where safety allows	Possible	
F4	Replace Traffic Signals with Lesser Controls	Install roundabouts in place of signalized intersections	No	Would not deliver benefits by May 2004
F5	Signals to Flashing Yellow 12am-5am	From midnight until 5am, set intersection signals to flashing yellow in predominant direction and flashing red in minor direction for all low volume intersections where safety permits	No	Would not deliver benefits by May 2004
F6	Speed Limit Adherance	Increase speed limit enforcement on portions of the freeway system where speeding is a problem so that more vehicles are traveling at or below the posted limit	No	Would not deliver benefits by May 2004
F7	Regional Traveler Information/Assistance Systems	Regional traveler information/assistance systems to facilitate efficient traffic management during incidents and accidents.	No	Not economically feasible
L1	Smart Growth and Infill Development Programs	Encourage development/redevelopment of land in designated growth areas, encouraging local governments to place greater emphasis on land development near transit stations	No	Would not deliver benefits by May 2004
L2	Convenience Commercial Centers in Residential Areas	Change zoning ordinances to allow neigborhood-serving retail establishments in residential areas	No	Would not deliver benefits by May 2004
L3	Proximity Commuting (Live Near Your Work)	Provides financial incentives to homebuyers moving to designated neighborhoods near their workplaces	No	Would not deliver benefits by May 2004

Identifier	Measure Name	Definition	RACM	Reason
L4	Incentives for Mixed Use at Transit Centers	Include incentives for mixed-use development at transit centers to reduce sprawl and VMT	No	Would not deliver benefits by May 2004
M1	Parking Impact Fee	Levy a $250 annual fee on every commuter parking space in the Washington nonattainment area	No	Would not deliver benefits by May 2004
M2	Annual Gasoline Vehicle Pollution Fee	Levy an annual fee on petroleum-powered vehicles based on mileage driven and emission rates.	No	Would not deliver benefits by May 2004
M3	Cash for Clunkers	Purchase pre-1980 vehicles with minimal/no emissions controls	No	Would not deliver benefits by May 2004
M4	Commuter Choice Tax Credit	Employers subsidize employees' monthly transit or vanpool costs and receive a tax credit for incurred expenses.	No	Not economically feasible
M5	Congestion Pricing on Low Occupancy Vehicles	Impose a fee on vehicles containing two or fewer persons that use designated roadways during the peak AM period	No	Would not deliver benefits by May 2004
M6	Gas Tax Increase	Increase state and local gas taxes to add 10% to purchase price of gasoline. Use proceeds to fund regional transit operations.	No	Would not deliver benefits by May 2004
M7	Graduated Vehicle Registration Fee Based on Number of Vehicles	Assess graduated vehicle registration fee/car tax on every privately owned vehicle in the region. Households with multiple vehicles pay higher tax on each additional vehicle	No	Would not deliver benefits by May 2004
M8	Market Based Parking Charges at Federal Facilities	Require all federal work sites to charge the equivalent of commercial parking rates.	No	Would not deliver benefits by May 2004
M9	Commuter Choice - State & Local Government Employees	Provide the region's local, state and municipal employees with transit benefits	No	Not economically feasible

Identifier	Measure Name	Definition	RACM	Reason
M10	Pay-as-you-drive auto insurance ($/gal)	Offer auto insurance rates linked to number of gallons of fuel consumed by vehicle	No	Would not deliver benefits by May 2004
M11	VMT Tax (2 cents/mile)	Charge VMT tax of $0.02 per mile for all vehicles registered or garaged in the region	No	Would not deliver benefits by May 2004
M12	Voluntary Employer Parking Cash-Out Subsidy	Employers who provide free parking would be encouraged to provide the cash equivalent of the parking subsidy to employees who do not drive to work.	No	Would not deliver benefits by May 2004
M13	Half Price Fares on Feeder Bus Service	All metro bus and local bus services to Metrorail and commuter rail stations reduce fares by half.	No	Would not deliver benefits by May 2004
M14	Free Parking for Carpools	All employers must provide free parking spaces for all carpools or vanpools.	No	Would not deliver benefits by May 2004
M15	Tax Parking Spaces Above Code Minimum	Discourage developers from providing parking in excess of code minimum by imposing a graduated tax on excess spaces.	No	Would not deliver benefits by May 2004
M16	Reduce Parking Fees at Facilities Outside the Beltway Adjacent to Metro	Reduce parking fees at Metro parking facilities or county/city managed facilities outside of the Beltway that are located near Metro stations.	No	Would not deliver benefits by May 2004
O1	Bike to Work Day	Conduct a one-day bike to work event. Provide outreach activities, education on the bike-to-work option, and assistance in trying bike-to-work	No	Will not reduce emissions
O2	Clean Air Partners Program	This program motivates individuals to take voluntary actions to reduce emissions on Ozone Action Days	No	Not economically feasible
O3	Clean Commute/Try Transit Week	Promotes use of alternative transportation, including transit, by daily commuters for one week per year	No	Will not reduce emissions
O4	Employer Outreach (Private Sector)	Provide regional outreach to encourage large private-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites	Possible	

Identifier	Measure Name	Definition	RACM	Reason
O5	Employer Outreach (Public Sector)	Provide regional outreach to encourage public-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites	No	Not economically feasible
O6	Mass Marketing Campaign	6 year marketing effort involving business-to-business advertising campaign in print media and on world wide web. Aims to increase transit, ridesharing and other travel demand management programs	Possible	
P1	Control Parking at Schools	Restrict high school students from driving to and parking at high schools when bus service is available.	No	Would not deliver benefits by May 2004
P2	Restrict Construction of New Parking	Restrict construction of new parking at employment centers based on distance from transit and urban core	No	Would not deliver benefits by May 2004
T1	Transit Prioritization -- Queue Jumps	Provide queue jumps for buses at over-capacity signalized intersections throughout the region. Queue jumps allow buses to use a shoulder or other designated lane to bypass intersection queues and move forward towards the stop line.	Possible	
T2	Flat Fare For All Transit Trips	Single price all public transit services with a flat $1.10 fare and free transfers all day, 7 days per week	No	Would not deliver benefits by May 2004
T3	Access to Jobs Program	Identifies gaps in transit service between places of residence and places of work for low wage workers	No	Would not deliver benefits by May 2004
T4	Automatic Vehicle Locator System	System would provide bus location information to WMATA dispatchers. This would decrease wait time and improve on-time arrival/departure.	No	Would not deliver benefits by May 2004
T5	College 33 Pass System	Expand Baltimore college bus fare program to DC area. Program allows students to receive reduced fares near 19 participating schools in the region.	No	Would not deliver benefits by May 2004
T6	Expand Peak Period Metrorail Service	Extend peak-period service on Metrorail so trains run at 6 minute frequency from 6-11 am and 3-8 pm.	No	Would not deliver benefits by May 2004

Identifier	Measure Name	Definition	RACM	Reason
T7	Free Bus Service Off-Peak	Institute free off-peak bus service from 10-2 on weekdays and all day on weekends.	No	Would not deliver benefits by May 2004
T8	Free bus-to-rail / rail-to-bus transfers	Institute free bus-to-rail transfer similar to free rail-to-bus transfer currently in place.	No	Would not deliver benefits by May 2004
T9	Free Rail Use 10-3	Free Metrorail trips for all riders from 10AM-3PM on weekdays	No	Would not deliver benefits by May 2004
T10	Free Transit Passes to Students	Free transit passes for high school and college students, subsidized by schools or through student registration fee	No	Would not deliver benefits by May 2004
T11	Increase Commuter Rail Frequency	Increase frequency of MARC service to every 15 minutes on Penn and Camden lines and every 10 min on the Brunswich line. Increase VRE frequency to every 15 minutes	No	Would not deliver benefits by May 2004
T12	Interactive Rideshare Kiosks	Transportation Information Kiosks in Maryland, Virginia and the District of Columbia	No	Not economically feasible
T13	New MARC Coaches	Purchase additional coaches for MARC to accommodate increased ridership	No	Would not deliver benefits by May 2004
T14	Employer Metro Shuttle Bus Services	Provide incentives for businesses to provide employee shuttle service to the nearest rail or transit stop	No	Not economically feasible
T15	Metrorail Feeder Bus Service & Fare Buydown	Improve Metrorail feeder bus service at underutilized park & ride lots, implement fare buydown program	No	Not economically feasible
T16	Mobile Commuter Stores	Fund mobile commuter stores in suburban commercial areas	No	Not economically feasible

Identifier	Measure Name	Definition	RACM	Reason
T17	Real-Time Bus Schedule Information	Expand trials of real-time bus schedule information to local transit providers	No	Would not deliver benefits by May 2004
T18	Discount Multi-Trip Bus Fares	Introduce discount programs reducing cost of multiple bus rides through purchase of pass books (e.g. 10-trip tickets)	No	Not economically feasible
T19	Shorter Distance from Buildings to Bus Stops	For existing buildings, re-route traffic to allow buses to come closer to the building. For new buildings, alter setback requirements to allow closer bus access	No	Would not deliver benefits by May 2004
T20	Additional Transit Stores	Establish additional stationary transit stores in the region	No	Would not deliver benefits by May 2004
T21	Universal Transportation Access (MD + WMATA)	SmarTrip card will allow users to pay fares on all rail and bus systems in the region (including parking in Metrorail lots) using one electronic card	No	Not economically feasible
T22	Expand VRE Train Service	Expand VRE train service to include additional departures	No	Would not deliver benefits by May 2004
T23	WMATA Bus Information Displays with Maps	Install additional information boxes with maps and schedule information. Would include schedules in languages other than English in neighborhoods where most residents speak another language	No	Would not deliver benefits by May 2004
T24	Regional bus service expansion	Expansion of Metrobus and other regional bus services.	No	Not economically feasible
T25	Rush Hour Shift	Shift Metrorail AM and PM rush hours to start 30 min earlier and end 30 min earlier	No	Would not deliver benefits by May 2004
U1	Trip reduction ordinances	Prohibit drivers from traveling during certain periods, based on vehicle tags or other easily identifiable criteria. Can be a permanent or episodic control.	No	Widespread and adverse impacts

Identifier	Measure Name	Definition	RACM	Reason
V1	Control Extended Idling of Buses and Trucks	Step-up enforcement of existing regulations to prevent extended vehicle idling	No	Would not deliver benefits by May 2004
V2	High cetane diesel fuel for onroad vehicles	Require onroad diesel vehicles to use high cetane fuel	No	Would not deliver benefits by May 2004
V3	Light-duty diesel I/M	Develop I/M program for light-duty diesel vehicles	No	Would not deliver benefits by May 2004
V4	Remove Trash Trucks From Area Streets	Reduce use of trash trucks through transport of trash by barge	No	Would not deliver benefits by May 2004
V5	Early Bus Engine Replacement	Replaces high-polluting diesel engines in WMATA buses with new diesel engines	No	Not economically feasible
V6	Taxicab Replacement - Conventional Vehicles	Replace taxicabs with new "conventional" LDGVs	No	Would not deliver benefits by May 2004
V7	Zero I/M waivers and exemptions	Eliminate all waivers and exemptions in the I/M program	No	Would not deliver benefits by May 2004
V8	Car Sharing Program	Fund incentives for new car sharing customers (I.e. Flexcar or Zipcar services)	No	Not economically feasible
W1	CARB Diesel Fuel (On-Road)	Implement CARB diesel fuel standards	No	Would not deliver benefits by May 2004
W2	Biodiesel (On-Road)	Require regional use of biodiesel fuel for on-road vehicles	No	Not economically feasible

Identifier	Measure Name	Definition	RACM	Reason
W3	Low-NOx Diesel Fuel (On-Road)	Require regional use of low-NOx fuel for on-road diesel vehicles	No	Not economically feasible
X1	Telecourses at Local Colleges and Universities	Encourage local colleges and universities to offer telecourses. This would reduce vehicle trips.	No	Would not deliver benefits by May 2004
X2	ATM Machines Installed at Metro Stations	Install ATMs near metro stations for rider convenience	No	Unenforceable

Table 8-5: Potential RACM Measures From All Source Sectors Meeting Criteria Described in Sections 8.1.1-8.1.6

Source Sector	Measure Number	Measure Name	Measure Description	NOx (tpd) [3]	VOC (tpd) [2]
Area	C1	Episodic limits on asphalt paving and traffic marking activities	Prohibit road paving and traffic marking on ozone action days	N/A	2.91
Area	L1	Control Locomotive Idling	Seek voluntary agreement or implement regulations to reduce idling of locomotives at switchyards through installation of APUs or other methods	0.01	0.01
Non-Road	G6	Preference for low-emissions lawn and garden equipment	In bids for government contracts, award extra points to bidders using low-emission lawn & garden equipment	N/A	0.13
Non-Rroad	S4	Reduce idling by airport GSE	Develop voluntary program to encourage operators to limit idling of airport GSE	0.17	0.04
On-Road	B6	Install Bicycle Racks	Install bicycle racks at various locations throughout the region	0.00	0.00
On-Road	E3	Telecommuting Centers	Telecommuting centers, including marketing activity, commuter and employer information and assistance	0.26	0.14
On-Road	E10	Government Actions (ozone action day similar to snow day)	Implement a liberal leave policy for local, state and federal employees on Code Red Ozone Action Days, permitting employees to work from home or take unscheduled leave	1.58	0.94
On-Road	E12	Integrated Rideshare	Provides transit, park & ride, and telecenter information to all commuters on a matchlist	0.11	0.06
On-Road	F3	Permit Right Turn on Red	Reduce vehicle idling time by permitting right turn on red, where safety allows	0.07	0.14
On-Road	O4	Employer Outreach (Private Sector)	Provide regional outreach to encourage large private-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites	1.07	0.63
On-Road	O6	Mass Marketing Campaign	Marketing effort involving business-to-business advertising campaign in print media and on world wide web to increase transit, ridesharing and other travel demand management programs.	0.15	0.09

Source Sector	Measure Number	Measure Name	Measure Description	NOx (tpd) [3]	VOC (tpd) [2]
On-Road	T1	Transit Prioritization – Queue Jumps	Provide queue jumps for buses at over-capacity signalized intersections throughout the region. Queue jumps allow buses to use a shoulder or other designated lane to bypass intersection queues and move forward towards the stop line.	0.01	0.01
TOTAL				3.4	5.1
THRESHOLD FOR RACM (from Section 8.1.7)				8.8	34.0

8.3 RACM Determination

If implemented collectively, the measures included in Table 8-5 would reduce 5.1 tpd VOC and 3.4 tpd NOx. This does not meet or exceed the 34.0 tpd VOC or 8.8 tpd NOx required to reduce regional ozone levels to 124 ppb by May 1, 2004. Therefore there are no reasonably available control measures (RACM) appropriate for the Washington region's severe area SIP.

Though the measures listed in Tables 8-1 through 8-4 did not meet the criteria for RACM, many of the measures are worthwhile measures that effectively reduce emissions. These measures will continue to be considered for future SIPs prepared for the Washington region.

References

US EPA, "State Implementation Plans; General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990", (57 FR 13498), April 16, 1992.

US EPA Region VI, "Reasonably Available Control Measures (RACM) Analysis for the Dallas/Fort Worth Ozone Nonattainment Area", December 2000.

Bay Area Air Quality Management District, Metropolitan Transportation Commission and Association of Bay Area Governments, "Bay Area 2001 Ozone Attainment Plan," October 24, 2001, Appendix C.

[1] See discussion in "Approval and Promulgation of Air Quality Implementation Plans; District of Columbia, Maryland, Virginia; Post 1996 Rate-of-Progress Plans and One-Hour Ozone Attainment Demonstrations; Final Rule (April 17, 2003, 68 FR 19106).

[2] Though several expensive TERMS have been adopted in recent years, these measures were designed for congestion mitigation or other transportation purposes. Emission reductions were credited as an ancillary benefit, and the projects would have proceeded even if no emission credits were generated.

[3] Benefits shown as zero were rounded to zero, as the relevant control measure produced benefits of less than 0.005 tpd VOC or NOx.

9.0 MOBILE SOURCE CONFORMITY

In order to balance growing metropolitan regions and expanding transportation systems with improving air quality, EPA established regulations ensuring that enhancements to existing transportation networks will not impair progress towards air quality goals. Under the Clean Air Act Conformity Regulations, transportation modifications in an ozone or carbon monoxide nonattainment area must not impair progress made in air quality improvements. These regulations, published in EPA's Transportation Conformity rule on November 24, 1993 in the Federal Register and amended in a final rule signed on July 31, 1997, require that transportation modifications "conform" with air quality planning goals established in air quality SIP documents. To be found in "conformity" with air quality plans before the attainment plan is approved by EPA, the VOC, NOx, and carbon monoxide emissions generated by mobile sources when a transportation plan is implemented must meet certain emission tests:

- When a mobile source emissions budget SIP has been submitted and found adequate, mobile source emissions must not exceed the mobile emissions budget established in the SIP;
- In areas without a mobile source emissions budget, mobile source emissions must be less than mobile source emissions in 1990 and projected emissions with the improvements included in the transportation plan (action scenario) must be less than projected emissions without the improvements (base scenario).

Mobile Emissions Budget and the Washington Area Transportation Conformity Process

Mobile source emissions in the Constrained Long Range Plan (CLRP) and five-year Transportation Improvement Plan (TIP) cannot exceed the mobile emissions budget. The transportation plans are required to conform to the mobile budget established in the SIP for the short-term TIP years, as well as for the forecast period of the long-range plan, which must be at least twenty years.

In the metropolitan Washington area, modifications to the existing transportation network are advanced through the Transportation Planning Board (TPB) state, regional and local transportation agencies through a TIP. A TIP is updated annually for the metropolitan Washington area and includes transportation modifications and improvements on a six-year program cycle. Pursuant to the conformity regulations, the TIP and long-range transportation plan must contain an analysis of the motor vehicle emissions estimates for the region resulting from the transportation improvements. These analyses must show that the transportation improvements in the TIP and the plan do not result in a deterioration of air quality goals established in the SIP.

9.1 Budget Level for On-Road Mobile Source Emissions

As part of the development of the SIP, MWAQC, in consultation with the Transportation Planning Board (TPB), establishes a mobile source emissions budget. This budget will be the benchmark used to determine if the region's constrained long range transportation plan (CLRP)

and six year transportation improvements program (TIP) conform with the Clean Air Act Amendments of 1990. Under EPA regulations the projected mobile source emissions for 2005 becomes the mobile emissions budget for the region unless MWAQC takes actions to set another budget level.

The 2005 mobile emissions inventory reflects the most recent models available, MOBILE6 and the Travel Demand Model Version 2.1, used by COG's Transportation Planning Department, and the most recent data available, namely 2002 vehicle registration data. The methodology used to project the 2005 attainment year mobile inventory and to recalculate mobile inventories for milestone years is discussed in detail in Chapter 3.2.3 and Chapter 4.1.3.

The mobile emissions budget for attainment is based on the projected 2005 mobile source emissions accounting for all the mobile control measures including Transportation Control Measures and adjusting for growth in mobile emissions attributed to an estimated increase in population forecasts for 2005.[1]

The Mobile Emissions Budget for attainment, based upon the projected 2005 mobile source emissions and accounting for all the mobile control measures, including the Transportation Control Measures:

VOC = 98.1 tons/day NOx = 237.4 tons/day

9.2 Transportation Control Measures (TCMs)

Each time the Constrained Long Range Transportation Plan (CLRP) or the six-year Transportation Improvement Plan (TIP) is amended, the TPB will estimate the emissions from the regional transportation network and compare the expected emissions against the mobile emissions budget set in this SIP. This determination will take into account the projects included in the region's transportation plans and the TCMs shown in Table A, which amount to 0.3 tpd VOC and 0.7 tpd NOx. Further information on TCMs can be found in Section 7.5 and in Appendix G.

In anticipation of possible mobile emissions mitigation needs associated with TPB plans and programs, the TPB Technical Committee Travel Management Subcommittee has analyzed a wide range of transportation emissions reduction measures (TERM)s. Emission reduction strategies for conformity purposes are identified on an as-needed basis during the development of the TIP and CLRP.

[1] Draft Intermediate Population Forecasts, Round 6.3 Cooperative Forecasts, Metropolitan Planning Committee, Metropolitan Washington Council of Governments.

10.0 SEVERE AREA PLAN COMMITMENTS

Achieving the results shown in this Plan requires a commitment to implement the regulatory measures upon which the plan is based. The locally adopted measures included in the analysis are those included in Table A. Chapter 7 provides documentation of the reductions achieved by those measures. The States and the District are also taking action to implement regional measures to reduce ozone transport. Tables 10-1, 10-2, 10-3 and 10-4 provide information on the implementation of each measure by Maryland, Virginia and the District of Columbia.

Commitments for regulations required by the CAAA Section 182 (d) for severe nonattainment areas are shown in Tables 10-5, 10-6, and 10-7.

10.1 Schedules of Adopted Control Measures

Table 10-1.1
District of Columbia Schedule of Adopted Control Measures
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
	Federally Mandated Measures		
6.2.1	High Tech Inspections & Maintenance	18 DCMR** Chapters 4, 6, 7, 10, 11; 26 DCMR Chapter 26	4/30/99
7.2.2	State II Vapor Recovery Nozzle	20 DCMR Sec. 705	2/1/85
7.2.3	Federal Tier I Vehicle Standards and new Car Evaporative Standards	40 CFR part 86	Model Year 1994-1996; Evap Stds. 1996
7.2.4	Non-CTG RACT	20 DCMR Sec 715	102/98
7.2.5	Phase II Gasoline Volatility Controls	N/A	N/A
7.2.6	EPA Non-Road Gasoline Engines Rule	40 CFR parts 90 and 91	12/3/96
7.2.7	EPA Non-Road Diesel Engines Rule	40 CFR Part 9 et al.	Model Year 2000-2008 depending on engine size
7.3.3	National Low Emissions Vehicle Program	20 DCMR, Sec 915	1/20/2000

No.	Control Measure	Regulation Number	Effective Date
7.5.9	EPA Nonroad Spark Ignition Marine Engine Rule	40 CFR Parts 89, 90, 91	1998 Model Year
7.3.5	Emissions Controls for Locomotives	63 FR 18998	6/15/98
7.3.6	Heavy-duty Diesel Engine Rule	62 FR 54694	12/22/97
7.2.8	State NOx RACT Requirements	20 DCMR Sec. 805	11/19/93
	Pending Federal Programs		
7.3.1	Reformulated Surface Coatings	Proposed	Not determined
7.3.2	Reformulated Consumer Products	62 FR 44672 (CTG)	
7.3.4	Reformulated Industrial Cleaning Solvents	20 DCMR Sec 708	10/2/98
	State and Local Measures		
7.4.1	Reformulated Gasoline (on-road)	Federal - local opt-in	1/1/95
7.4.2	Reformulated Gasoline (off-road)	Federal - local opt-in	1/1/95
7.4.3	Surface Cleaning/Degreasing for Machinery/Automobile Repair	20 DCMR Sec. 708.9-708.12	5/1/99
7.4.4	Landfill Regulations	N/A	N/A
7.4.5	Seasonal Open Burning Restrictions	20 DCMR Sec. 604	2/1/85
7.4.6	Stage I Expansion	N/A	N/A
7.4.7	Expanded Point Source Regulations to 25 tpy	N/A	N/A
7.4.8	Graphic Arts Controls	20 DCMR Sec. 716	5/1/99
7.4.9	Autobody Refinishing	Adopting Federal Regulation	
	Regional Control Measures		
11.2	Regional Transport NOx Reductions	20 DCMR Ch. 10	1/20/2000

* This information was obtained from the DC Environmental Health Administration.
**District of Columbia Municipal Regulations.
*** For measures not yet adopted, an anticipated schedule for adoption is provided.

Table 10-1.2
Maryland Schedule of Adopted Control Measures
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
	Federally Mandated Measures		
7.2.1	High Tech Inspections & Maintenance	11.14.08	1/2/95
7.2.2	State II Vapor Recovery Nozzle	26.11.24	2/15/93
7.2.3	Federal Tier I Vehicle Standards and new Car Evaporative Standards	40 CFR part 86	Model Year 1994-1996; Evap Stds. 1996
7.2.4	Non-CTG RACT	See Table 10-3	
7.2.5	Phase II Gasoline Volatility Controls	03.03.03.05	10/26/92
7.2.6	EPA Non-Road Gasoline Engines Rule	40 CFR parts 90 and 91	12/3/96
7.2.7	EPA Non-Road Diesel Engines Rule	40 CFR Part 9 et al.	Model Year 2000-2008 depending on engine size
7.3.3	National Low Emissions Vehicle Program	26.11.20.04	3/22/99
7.5.9	EPA Nonroad Spark Ignition Marine Engine Rule	40 CFR Parts 89, 90, 91	1998 Model Year
7.3.5	Emissions Controls for Locomotives	63 FR 18998	6/15/98
7.3.6	Heavy-duty Diesel Engine Rule	63 FR 54694	12/22/97
7.2.8	State NOx RACT Requirements	26.11.29.08	5/10/93
	Pending Federal Programs		
7.3.1	Reformulated Surface Coatings	Proposed	Not determined
7.3.2	Reformulated Consumer Products	62 FR 44672 (CTG)	
7.3.4	Reformulated Industrial Cleaning Solvents	Proposed	Not determined, Schedule Proposed
	State and Local Measures		

No.	Control Measure	Regulation Number	Effective Date
7.4.1	Reformulated Gasoline (on-road)	Federal - local opt-in	1/1/95
7.4.2	Reformulated Gasoline (off-road)	Federal - local opt-in	1/1/95
7.4.3	Surface Cleaning/Degreasing for Machinery/Automobile Repair	26.11.19.09	6/5/95
7.4.4	Landfill Regulations	26.11.19.20	3/9/98
7.4.5	Seasonal Open Burning Restrictions	26.11.07	5/22/95
7.4.6	Stage I Expansion	26.11.13.04C	4/26/93
7.4.7	Expanded Point Source Regulations to 25 tpy	26.11.19.01B(4)	5/8/95
7.4.8	Graphic Arts Controls	26.11.19.11 & .18	6/5/95 & 11/7/94
7.4.9	Autobody Refinishing	26.11.19.23	5/22/95
	*Regional Control Measures***		
11.2	NOx Phase II Controls	26.11.27 & .28 26.11.29 & 30	10/18/99

*This information was obtained from the Maryland Department of the Environment.
** For measures not yet adopted, an anticipated schedule for adoption is provided.

Table 10-1.3
Maryland Non-CTG RACT
Washington Nonattainment Area

Overall requirement in COMAR 26.11.19.02G effective 4-26-93 (20: Md. R 726)
The following case-by-case RACT regulations have been adopted to ensure consistency.

RACT Regulation	Regulation Number	Effective Date	MD Register
Definition of Gasoline to include JP-4	26.11.13.01	8-11-97	24:16 Md R. 1161
Plastic Parts Coating	26.11.19.07E	6-5-95	22:11 Md R 823
Printing on Plastic	26.11.19.07F	9-8-97	24:18 Md R 1298
Aerospace Coating Operations	26.11.19.13-1	9-22-97	24:19 Md R 1344
Yeast Manufacturing	26.11.19.17	11-7-94	21:22 Md R 1879
Expandable Polystyrene Operations	26.11.19.19	7-3-95	22:13 Md R 970
Commercial Bakery Ovens	26.11.19.21	7-3-95	22:13 Md R 970
Vinegar Generators	26.11.19.22	8-11-97	24:16 Md R 1161
Leather Coating	26.11.19.24	8-11-97	24:16 Md R 1161
Explosives and Propellant Manufacturing	26.11.19.25	8-11-97	24:16 Md R 1161
Reinforced Plastic Manufacturing	26.11.19.26	8-11-97	24:16 Md R 1162
Marine Vessel Coating Operations	26.11.19.27	10-20-97	24:21 Md R 1453

Table 10-1.4
Virginia Schedule of Adopted Control Measures
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
	Federally Mandated Measures		
7.5.1	High Tech Inspection & Maintenance	9 VAC 5 Chapter 91	4/2/97
7.5.2	Stage II Vapor Recovery Nozzle	9 VAC 5–40-5220	1/1/93
7.5.3	Federal Tier I Vehicle Standards and new Car Evaporative Standards	40 CFR part 86	Model Year 1994-1996; Evap Stds. 1996
7.5.4	Non-CTG RACT - VOC	9 VAC 5-40-5220	1/1/93
7.5.5	Phase II Gasoline Volatility Controls	2 VAC 5 420-10	7/28/93
7.5.6	EPA Non-Road Gasoline Engines Rule	40 CFR parts 90 and 91	12/3/96
7.5.9	EPA Nonroad Spark Ignition Marine Engine Rule	40 CFR Parts 89, 90, 91	1998 Model Year
7.5.7	EPA Non-Road Diesel Engines Rule	40 CFR part 9 et al.	Model Year 2000-2008 depending on engine size
7.5.8	Non-CTG RACT - NOx	9 VAC 5-40-310; 9 VAC 5-40-311	1/1/93
	Federal Programs		
7.6.1	Reformulated Surface Coatings	Proposed	Per regulatory calendar
7.6.2	Reformulated Consumer Products	62 FR 44672 (CTG)	Per regulatory calendar
7.6.3	National Low Emissions Vehicle Program	9 VAC 5-200	4/14/99

7.6.4	Reformulated Industrial Cleaning Solvents		Per regulatory calendar
7.6.6	Heavy-duty Diesel Engine Rule	63 FR 54694	12/22/97
7.6.5	Emissions Controls for Locomotives	63 FR 18998	6/15/98
	State and Local Programs		
7.7.2	Reformulated Gasoline (off-road)	Federal - local opt-in	1/1/95
7.7.3	Surface Cleaning/Degreasing for Machinery/Automobile Repair	9 VAC 5-40-3260 et. seq.	4/1/96
7.7.4	Landfill Regulations	9 VAC 5-40-5800 et. seq.	4/1/96
7.7.5	Seasonal Open Burning Restrictions	9 VAC 5-40-5630	4/1/96
7.7.6	Stage I Expansion	9 VAC 5-40- 5200	1/1/99
7.7.7	Expanded Point Source Regulations to 25 tpy - VOC	9 VAC 5-40-300	4/1/96
7.7.8	Graphic Arts Controls	9 VAC 5-40-7800 et. seq.	4/1/96
7.7.9	Autobody Refinishing	9 VAC 5 40-3860 et. seq.	7/1/91
	*Regional Control Measures***		
11.2	Regional Transport NOx Reduction Controls	By permit or compliance agreement	6/25/98

*This information was obtained from the Virginia Department of Environmental Quality.

10.2 Stationary Source Threshold Revision

The Clean Air Act Amendments, Section 182 (d) requires the states in severe nonattainment areas to adopt lower permit thresholds for point sources from 50 tons per year to 25 tons per year. Maryland, Virginia and the District of Columbia are committing to adopt these measures, listed in Tables 10-2, on the schedule shown.

Table 10-2
Schedule of Stationary Source Revisions
Washington Nonattainment Area

No.	State	Control Measure	Regulation Number	Effective Date
7.2.9	Maryland	Control of NOx Emissions for Major Stationary Sources	COMAR 09.08	Adoption: 10/03
7.2.5 and 7.2.9	Virginia	Emissions Standards for General Process Operations	9 VAC 5-40-240 of Part II of 9 VAC 5 Ch.40, specifically 9 VAC 5-40-300 (VOCs), 9 VAC 5-40-310 (NOx)	Adopted: 4/7/03 Effective: 6/4/03
7.2.5 and 7.2.9	District of Columbia	Major Source Thresholds	20 DCMR Sections 715.2,715.3,715.4 (VOC RACT)	8/29/03

10.3 New RACT Rules Applicability

Virginia, Maryland and the District have committed to adopt additional reasonably available control technology (RACT) rules for sources subject to the new lower major source applicability size threshold. The requirements for VOCs have been in the regulations for some time due to earlier regulatory actions. The latest regulatory actions lower the major source threshold to 25 tons per year for major stationary sources of NOx and the new sources are subject to RACT rules.

Table 10-3
New RACT Rules Applicability
Washington Nonattainment Area

No.	State	Control Measure	Regulation Number	Effective Date
7.2.9	Virginia	Non-CTG RACT	9 VAC 5-40-240	6/4/03
7.2.9	Maryland	Control of NOx Emissions	COMAR 9.08	

7.2.9	District of Columbia	Major Source Thresholds	20 DCMR sections 805.1,805.6,805.7 (NOx RACT)	8/29/03

10.4 Revision of New Source Review (NSR) Regulations

The states are required to lower thresholds for definition of "Major" sources requiring controls to 25 tons per year (from 50 tons per year) and to revise New Source Review (NSR) regulations to apply the 1.3:1 offset requirement to major stationary sources of VOC and NOx.

The nonattainment New Source Review permit regulations in Virginia are structured so that the pertinent requirements such as major source threshold, offset ratio**,** are self-implementing depending upon changes to the list of nonattainment area classification.

Table 10-4
Schedule for Revision of NSR Regulations
Washington Nonattainment Area

State	**Control Measure**	**Regulation Number**	**Effective Date**
Maryland	Requirements for Major New Sources and Modifications: Definitions and General Conditions	COMAR 17.01 and COMAR 17. 03	Adoption: 10/03
Virginia	Permits for Major Stationary Sources and Major Modifications Locating in Nonattainment Areas	9 VAC 5-80-2000 of Part II of 9 VAC 5 Chapter 80	Adopted: 2/27/02 Effective: 5/1/02
Virginia	Nonattainment Areas (NSR permit regulations)	9 VAC 5-20-204	Adopted: 4/7/03 Effective: 6/4/03
District of Columbia	Nonattainment Areas (NSR Permit Regulations)	20 DCMR sections 715.2,715.3,715.4,805.1,805.6,805.7,20 DCMR section 204.4	8/29/03

10.5 Vehicle Miles Traveled (VMT) Offset Provision

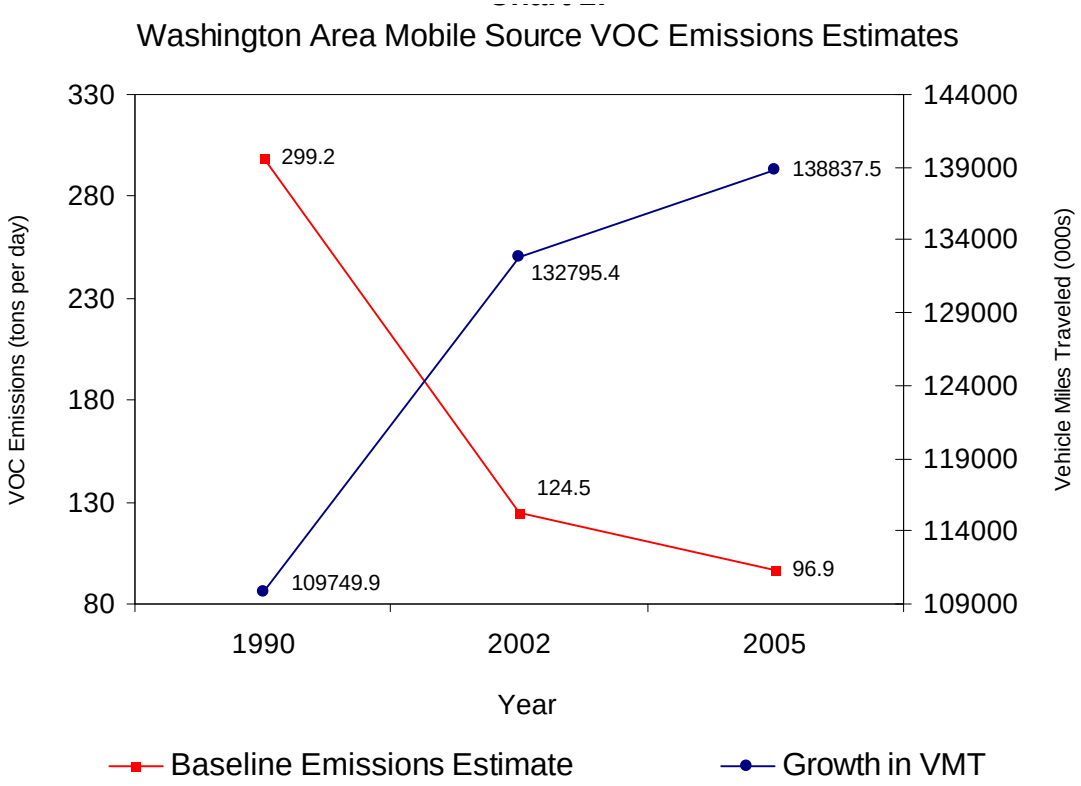
Section 182(d)(1)(A) of the Clean Air Act requires states containing ozone non-attainment areas classified as severe, pursuant to section 181(a) of the Act, to adopt transportation control strategies and Transportation Control Measures (TCMs) to offset increases in emissions growth in Vehicle Miles Traveled (VMT) or numbers of vehicle trips and to obtain reductions in motor vehicle emissions as necessary (in combination with other emission reduction requirements) to comply with the Act's reasonable Further Progress milestones (section 182(b)(1) and (c)(2)(B)) and attainment demonstration requirements (section 182(c)(2)(A)).[1] The EPA general Preamble (57 FR 13498, 13521-13523, Aril 16, 1992) explains how to demonstrate that the VMT requirement is satisfied. Sufficient measures must be adopted so that projected motor vehicle VOC emissions will stay beneath a ceiling level established through modeling of mandated transportation-related controls. When growth in VMT and vehicle trips would otherwise cause a motor vehicle emissions upturn, this upturn must be prevented by TCMs. If projected motor vehicle emissions during the ozone season in one year are not higher than during the previous ozone season due to the control measures in the SIP, the VMT offset requirement is satisfied. This requirement applies to projected emissions in the years between the submission of the SIP revision and the attainment demonstrations. [2]

Calculation of Mobile Source Baseline Emissions Estimates and Ceiling

The mobile source baseline emissions estimates for the Washington Ozone Nonattainment Area covers 1990 through 2005 (see Chart 1 "Baseline Emissions Estimates" curve). MWCOG prepared an analysis and projection of mobile source emissions of VOC from 1990 to 2005, including the effects of all federally mandated programs. These estimates include the net effect of increases and decreases in emissions from growth in VMT and the implementation of mandated control programs such as Federal Motor Vehicle Control Program (FMVCP) for new vehicles, low-Reid Vapor Pressure fuel, reformulated gasoline, and vehicle emissions testing (Details given below). As long as the curve does not turn upward (indicating the control programs are offsetting increases in emissions from growth in VMT), new transportation control measures are not necessary. The lowest point of this baseline curve, 96.9 tons/day VOC, does not occur until the year 2005. This defines the horizontal ceiling line, which future mobile source emissions in the area may not exceed. As seen in the chart 1, 2005 mobile emissions are lesser compared to 2002 even though there is a 4.5 % increase in VMT during these two years. Since 2002 and 2005 are the years of submission of the SIP revision and the attainment demonstrations respectively and motor vehicle emissions have not increased between these two years, according to the EPA preamble discussed above VMT offset requirement is satisfied and no new TCMs are necessary.

The following is a list of the mobile source control programs identified as producing the emissions reductions to offset emissions increases due to growth in VMT:

- The Federal Motor Vehicle Control Program (FMVCP) for new vehicles, including the Tier I and Tier II standards.



- A fuel volatility, or Phase II RVP, of 7.8 pounds per square inch (psi). This control was replaced by the Reformulated Gasoline program.

- Reformulated Gasoline Program, which started in January 1995.

- Vehicle Emissions Testing: Enhanced I/M Program including both exhaust and evaporative programs.

References:

1. Federal Register – Vol. 66, No. 132, July 10, 2001, page 35903.
2. Federal Register – Vol. 57, No. 74, April 16, 1992, page 13522.

10.6 Fee Requirement (Section 185) for Failure to Attain

Maryland, Virginia and the District of Columbia committed to submit to EPA no later than April 17, 2004, a regulation to meet the fee requirement of Section 185 of the Clean Air Act for major stationary sources of VOCs and NOx. These regulations would be implemented should the states and the District fail to attain the one-hour ozone National Ambient Air Quality Standard (NAAQS) by November 15, 2005.

10.7 Regional Transport NOx Reduction Controls

Maryland and the District will meet this requirement by controlling the level of emissions in two phases. By regulation, identified NOx sources will first comply with 65% reduction in emissions using 1990 emissions as a baseline or meet a 0.2 mm BTU limit, which is applicable in 1999; and then by complying with a limit of 85% reduction or 0.15 mmBTU beginning in 2003. Virginia will issue State Operating Permits to the two facilities in the Virginia portion of the area, thereby controlling their emissions to 0.15lbs/million BTU by 2003. Any of these facilities in any of these jurisdictions may obtain these emissions reductions through the banking and trading program, i.e., obtaining reductions elsewhere and applying them to the inventory in this area.

Projected Reductions

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2002 NOx Reductions	0	0	0	0
2005 NOx Reductions	1.1	227.9	19.3	248.3

Emission Benefit Calculations

The emission reductions associated with the NOx SIP call requirements will vary from source to source, since they are intended to exceed NOx RACT benefits. NOx RACT benefits vary in their emissions rates relative to the cap of 0.15 pounds NOx per million BTU.

The staffs of the Maryland Air and Radiation Management Administration, the Virginia Department of Environmental Quality and the District of Columbia Department of Health provided NOx SIP benefits.

10.8 Commitment to Meet Rate-of-Progress Requirements

The control measures appearing for 2002 and 2005 in Table A meet the rate of progress requirements in the metropolitan Washington region for Maryland, Virginia, and the District of Columbia. Emission reductions for the 1999-2002 rate of progress requirements will be at least 179.6 tons per day of VOC and 255.3 tons per day of NOx. Emission reductions for the 2002-2005 rate of progress requirements will total at least 217.9 tons per day of VOC and 390.2 tons per day NOx. The total emission reductions committed to by each jurisdiction are shown in Tables 4-7 through 4-10 and Table 10-8-1. This Plan demonstrates that the Metropolitan Washington Ozone Nonattainment Area meets the rate-of-progress requirements.

Table 10-8.1
Emission Reduction Commitments to Meet ROP Requirements for the Washington Metropolitan Region through 2005
(tons per day)

		District of Columbia	Maryland	Virginia	Regional Total
VOC	2002 ROP	10.4	81.6	56.8	148.8
NOx	2002 ROP	7.9	214.2	51.7	269.2
VOC	2005 ROP	12.8	100.1	67.3	180.2
NOx	2005 ROP	12.3	297.9	75.5	385.7

Maryland, Virginia and the District of Columbia have committed to adopting five regulations to reduce VOC emissions to meet the rate of progress requirements. These regulations are discussed in greater detail in Chapter 7.

Table 10-8.2
Maryland Schedule to Adopt Additional Control Measures for ROP
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
7.4.10	Consumer Products	26.11.32	
7.4.11	Portable Fuel Containers	26.11.13.07	12/21/01
7.4.12	Architectural & Industrial Maintenance Coatings (AIM)	26.11.33	
7.4.13	Mobile Equipment Repair & Refinishing	26.11.19.23	
7.4.14	Solvent Cleaning	26.11.19.09	

Table 10-8.3
Virginia Schedule to Adopt Additional Control Measures for ROP
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
7.4.11	Portable Fuel Containers	9 VAC 5-40-5700	Adoption: 11/03
7.4.12	Architectural & Industrial Maintenance Coatings (AIM)	9 VAC 5-40-7120	Adoption: 1/03
7.4.13	Mobile Equipment Repair & Refinishing	9 VAC 5-40-6970	Adoption: 11/03
7.4.14	Solvent Cleaning	9 VAC 5-40-6820	Adoption: 11/03

Table 10-8.4
District Schedule to Adopt Additional Control Measures for ROP
Washington Nonattainment Area

No.	Control Measure	Regulation Number	Effective Date
7.4.10	Consumer Products	20 DCMR 719	6/30/04
7.4.11	Portable Fuel Containers	20 DCMR 720	6.30/04
7.4.12	Architectural & Industrial Maintenance Coatings (AIM)	20 DCMR 722	6/30/04
7.4.13	Mobile Equipment Repair & Refinishing	20 DCMR 718	6/30/04
7.4.14	Solvent Cleaning	20 DCMR 721	6/30/04

10.9Commitment to a Midcourse Review of Progress toward Attainment

A midcourse review of progress toward attainment will be performed in 2004 after the end of the ozone season. The midcourse review will include an evaluation of trends in monitor data, local emissions, implementation of local emissions strategies, and comparison to the state implementation plans to determine progress the region is making towards attainment of the one-hour ozone standard. MWAQC and the States commit to work with EPA in a public consultative process to develop a methodology for performing the midcourse review and developing the criteria by which adequate progress will be judged. Due to the Washington area's need for interstate NOx reductions to achieve attainment of the one-hour ozone standard, the outcome of the mid-course review will depend on the implementation of NOx reductions over a large interstate region to reduce transport to the Washington area.

11.0 Attainment Demonstration

The Severe Area Plan analyzes the potential of the Washington metropolitan area to achieve attainment of the one-hour ozone standard. The demonstration of achieving the one-hour ozone standard is based on several analyses including Urban Airshed Modeling, EPA's Tier 2 modeling results, and two Weight of Evidence tests namely, Attainment Year Design Value and Relative Rate of Reduction tests. Details of each of these tests are being provided below.

11.1 Modeling Demonstration (Previous SIP)

The Washington D.C. Metropolitan Statistical Area (MSA) was earlier designated as a "Serious" ozone non-attainment area by the U.S. Environment Protection Agency (EPA) based on the air quality data during the period form 1987 to 1989 and then more recently in 2003 was bumped up to a "Severe" ozone non-attainment area. In accordance with the provisions of Section 182(C)(2)(A) of the Clean Air Act as amended on November 15, 1990, "serious" and "severe" ozone (O3) non-attainment areas must submit, as part of their State Implementation Plan (SIP), an attainment demonstration using photochemical grid modeling by the applicable date. For the Washington D.C. ozone non-attainment area, the attainment of the one-hour ozone NAAQS has to be achieved by the year 2005.

For the reason mentioned above, a photochemical modeling study was undertaken by the Washington metropolitan area during 1997 to demonstrate attainment of the one-hour ozone NAAQS. Salient features of this modeling study is being discussed below, complete details of which can be found in the Phase II Attainment SIP.[1]

- The modeling domain selected for the UAM-IV modeling covered the Baltimore-Washington region.

- Base case modeling runs were performed for the two ozone episodes in 1991 namely, July 14-16 and July 18-20 for the Washington region.

- Episode specific 1991 emission inventory was prepared from the base case 1990 emission inventory of the region.

- Two future year base case and eight sensitivity scenarios were modeled.

- The results of local modeling suggest that attainment can be reached on those days when only local emissions are a factor once modeled inventory is achieved.

The local modeling is less conclusive for those days when ozone transport is overwhelming. However, EPA's analysis of OTAG regional modeling concludes that the reductions in ozone levels as a result of measures to reduce NOx transport will be sufficient to bring the Washington area into attainment of the one-hour ozone standard.[2] Following this modeling study, EPA

adopted the NO_X SIP call, requiring 23 states to reduce NO_X emissions by up to 85%, beginning in 2003/2004.

11.2 EPA's Tier2 Modeling

EPA undertook a photochemical modeling study to estimate the effects (benefits) of Tier 2 regulations on ozone levels in 2007 and 2030.[3] This study concluded that the design value of Washington region would come down to 116 ppb in 2007 after Tier 2 regulations are implemented by that year. The study also concluded that even in the absence of Tier 2 regulations, design value would come down to 117 ppb taking into account other federal and state control measures planned to be taken by that time in this region. Since 2002 design value is 131 ppb lower by 15 ppb compared to 2007 design value, it seems plausible that by year 2005 design value in the Washington region will come down to a value below 125 ppb (one-hour ozone NAAQS).

Weight of Evidence Tests

Urban Airshed model (UAM-IV) has inherent uncertainties. Over or under prediction may result from uncertainties associated with emission inventories, meteorological data, and representation of ozone photochemistry in the model. Previous photochemical modeling performed for the Washington region using UAM-IV model over predicted ozone levels. Therefore, EPA guidance provides for other evidence (Weight of Evidence) to address these model uncertainties so that proper assessment of the probability to attain one-hour ozone standard can be made.

There were two Weight of Evidence tests employed to test the potential of Washington region to attain the one-hour standard in 2005. They were:

- Attainment Year Design Value Test and,
- Relative Rate of Reduction test

Details of each of these two tests are being provided below.

11.3a Attainment Year Design Value Test

Design value was calculated for the attainment year 2005 using a procedure suggested by EPA, which utilized previous photochemical modeling results for the region. Therefore it is a not an independent test, rather it utilizes the modeling results to project future year design value. Attainment year design value is calculated using following formulae:

Attainment Year Design Value = Base Year Design Value * RRF

Where, RRF = Relative Reduction Factor

Relative reduction factor is the ratio of modeled 1-hour maximum ozone concentrations of

attainment and base case years. These two values were calculated from the previous modeling outputs referred above in the discussion. As the modeling runs were performed for three episode days in July 1991 specifically, July 16th, 19th, and 20th, there were three corresponding 1-hour maximum ozone levels modeled by the UAM-IV model. These three modeled value were averaged. Similarly, the three corresponding base case year monitored 1-hour maximum ozone levels were also averaged. The ratio of these two average values provided the RRF.

$$\text{RRF} = \frac{\text{Three day average of the attainment year 1-hour maximum ozone level (modeled)}}{\text{Three day average of the base case year 1-hour maximum ozone level (modeled)}}$$

$$= \frac{155.7}{177.7} = 0.88 \text{ (Based on July 1991 modeling)}$$

July 1991 modeling utilized inventories, which had Mobile5a based mobile source inventories in it. Severe Area SIP mobile inventories are created based on the Mobile6 model and so there are differences in both base case and attainment year inventories for mobile sources and this has led to differences in the total inventories as well. While the new total base case year inventory is higher compared to the one used in the modeling study, attainment year inventory is a little bit lower in comparison. Even though ozone levels do not change proportionately with the change in NOx and/or VOC, any increase or decrease in emission levels of these pollutants is expected to cause an increase or decrease in ozone levels. Based on this premise, the new modeled 1-hour maximum attainment year ozone level is expected to be higher, while the new modeled RRF is being calculated as follows:

$$\text{RRF} = \frac{\text{New three day average of the attainment year 1-hour maximum ozone level (modeled)}}{\text{New three day average of the base case year 1-hour maximum ozone level (modeled)}}$$

$$= < \frac{155.7}{> 177.7} = < 0.88 \text{ (Expected ozone levels based on new Severe Area SIP inventories)}$$

So, new RRF will be any value below the previous calculated RRF based on July 1991 modeling.

Since, Attainment Year Design Value = Base Year Design Value * RRF

Base Year Design Value = Average of design values for three years (1991-93). Design values for these three years (1991, 1992, and 1993) include consideration of monitored data for 1991, which was the base case year for modeling.

Therefore, Attainment Year Design Value = 136 * (< 0.88) = < 119.2 ppb

Since this value is below 125 ppb (1-hour ozone NAAQS), possibility of attaining 1-hour ozone standard in the attainment year 2005 is strongly indicated.

11.3b Relative Rate of Reduction Test

EPA guidance memorandum suggests using a Relative Rate of Reduction (RRR) test to demonstrate if the Severe Area SIP still shows attainment. The RRR test consists of two sub-tests:

- Comparison of rates of reduction of Mobile6 and Mobile5b based mobile emissions only between 1990 and 2005.
  - If Mobile6 RRR is greater than the Mobile5b RRR, then the attainment is demonstrated.

- Comparison of rates of reduction of total emissions (including Mobile6 and Mobile5b based mobile emissions) for Severe Area SIP and Phase II Plan SIP between 1990 and 2005.
  - If the RRR of total emissions of the Severe Area SIP is greater than the corresponding RRR of total emissions of the Phase II Plan SIP, then the attainment is demonstrated.

Results:

Comparison of rates of reduction of Mobile6 & Mobile5b based mobile emissions only between 1990 and 2005

Rates of reduction of Mobile6 and Mobile5b based mobile emissions between 1990 and 2005 were compared. Mobile6 RRR was found to be greater than the Mobile5b RRR and this demonstrates that the Washington region is still able to show attainment of the 1-hour ozone standard.
Figure 11-1 shows the same results in graphical form.

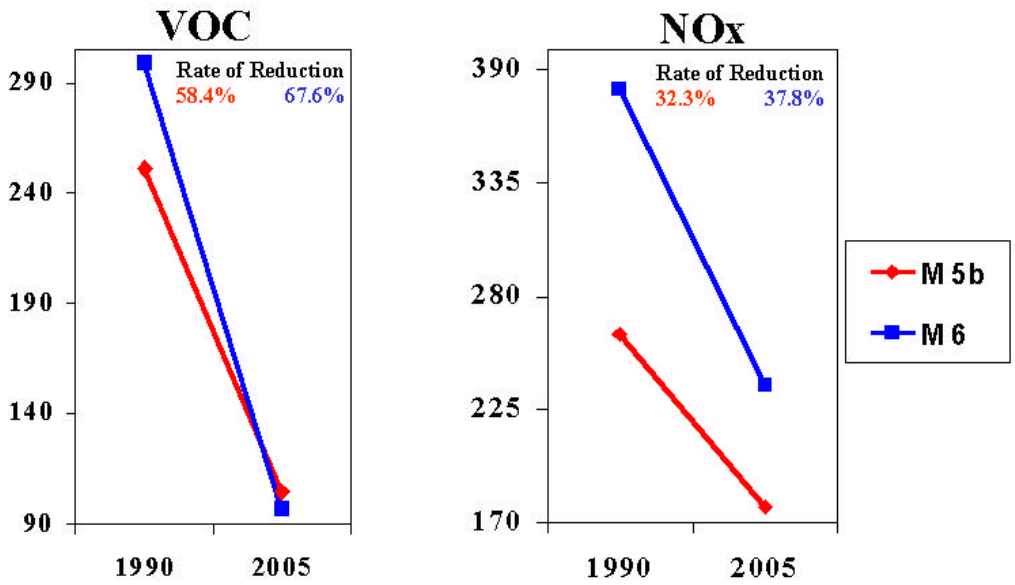


Figure 11-1

Comparison of rates of reduction of total emissions (including Mobile6 and Mobile5b based mobile emissions) for Severe Area SIP and Phase II Plan SIP between 1990 and 2005

Rates of reduction of Severe Area SIP and Phase II Plan SIP emissions between 1990 and 2005 were compared. The RRR for Severe Area SIP emission was found to be greater than the Phase II Plan SIP emission RRR and this once again demonstrates that the Severe Area SIP is still able to show attainment of the 1-hour ozone standard.
Figure 11-2 shows the same results in graphical form.

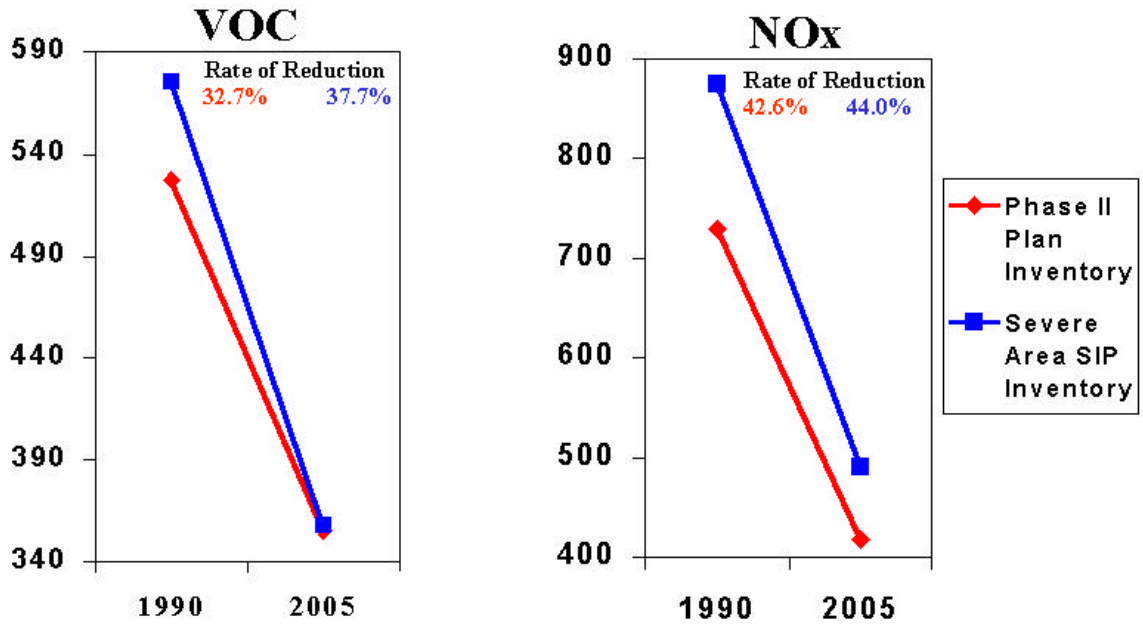


Figure 11-2

11.4 Comparison of Modeled Vs. Controlled 2005 Inventories Test

The projected emissions in the attainment year (now projected for 2005) must be equal to or less than the total of the local emissions used in the previous July 1991 modeling study in order to still demonstrate attainment of the 1-hour ozone standard.

The current projected emissions for 2005 are compared with the modeled emissions inventory in Table 11-1.

Table 11-1
Projected Controlled 2005 Emissions vs. Modeled Attainment Emissions

Emissions Type	VOC	NOx	VOC	VOC	NOx	NOx
	Modeled (tpd)	Modeled (tpd)	Controlled 2005 (tpd) (Round 6.2)	Controlled 2005 (tpd) (Round 6.3)	Controlled 2005 (tpd) (Round 6.2)	Controlled 2005 (tpd) (Round 6.3)
Point	15.6	171.1	17.3	17.3	109.8	109.8
Area	153.8	54.3	138.3	142.2	61.0	62.6
Mobile	123.5	196.8	96.6	98.1	236.0	237.5
Non-road	66.8	93.1	69.4	71.1	82.2	83.2
Total	**359.7**	**515.3**	**321.6**	**328.7**	**489.0**	**493.1**

*Small discrepancies may result due to rounding

It is clear from the above Table 11-1 that both NOx and VOC projected controlled emissions in the attainment year 2005 are lower than the modeled attainment inventories and thus attainment is demonstrated in the year 2005.

11.5 Overall Conclusion

Based on the results from the July 1991 modeling, EPA's Tier 2 modeling, comparison of projected controlled 2005 and modeled attainment inventory, and the two Weight of Evidence tests; there is evidence that the Washington region will attain the 1-hour ozone standard in the year 2005.

References:

1. State Implementation Plan (SIP) Revision, Phase II Attainment Plan for the Washington DC-MD-VA Nonattainment Area, Prepared by the Metropolitan Washington Council of Governments, February 3, 2000.
2. *Ozone Transport Assessment group Executive Report 1997*, Environment Council of the States (ECOS) pp. 53-55. (http://www.epa.gov/ttn/otag)
3. Technical Support Document for the Tier 2/Gasoline Sulfur Ozone Modeling Analyses, EPA420-R-99-031, December 1999.

12.0 CONTINGENCY PLAN

The General Preamble defines the requirements for identification of contingency measures for rate-of-progress and attainment demonstrations. For post-1996 rate-of-progress and attainment demonstrations, contingency measures may reduce emissions of either VOC or NOx. One set of contingency measures is required for each milestone year. The same set of measures can be used for both a rate-of-progress demonstration and an attainment demonstration, if the two demonstrations involve the same milestone year. Air quality plans must include sufficient contingency measures to account for up to 3% of the VOC base-year inventory adjusted to the appropriate milestone year.

12.1 Contingency Measures for the 1999 Rate of Progress Demonstration

12.1.1 Background

In its January 2003 Determination of Nonattainment and Reclassification, EPA determined that the Washington region failed to attain the one-hour ozone standard by November 15, 1999. This finding of failure to attain triggered a requirement to adopt contingency measures for the 1999 attainment demonstration, as explained in the April 2003 approval of the region's severe area SIP. The Revised Phase I Attainment Plan, submitted in May 1999, included contingency measures to fulfill the 1996-1999 rate-of-progress requirement. However, EPA deemed these contingency measures inadequate. It its April 17, 2003 conditional approval of the Washington region's attainment plan, EPA required the Washington region to revise the 1996-1999 portion of the severe area ROP plan to include a contingency plan containing adopted measures that qualify as contingency measures for the 1996-1999 rate-of-progress and the 1999 attainment demonstration. This section fulfills that requirement.

The region was first notified of the need to identify additional contingency measures in early 2003, via EPA's finding of failure to attain and approval of the severe area SIP. In the approval, EPA required the states to submit adopted contingency measures keyed to the 1999 ROP and attainment demonstrations by April 17, 2004. As a result, the adopted contingency measures must be able to deliver benefits by this date. The contingency measures identified by the Washington region delivered benefits in 2002, fulfilling this requirement.

12.1.2 Required Reductions

The contingency measures for the 1999 rate-of-progress and attainment demonstrations must total 3% of the 1990 base year inventory adjusted to 1999. The inventory is calculated as described in Section 5.3.2. Table 12-1 shows the calculation of the necessary reductions.

Table 12-1
Calculation of 1999 Contingency Measures
(Ozone Season tons per day)

Description	VOC	NOx	Reference
1990 Inventory Adjusted to 1999	433.3	779.4	(V8), (N8)
3% Reduction for Contingency Measure Requirement	0.03	0.03	
Total Contingency Measures Required (VOC or NOx)	13.0	23.4	

12.1.3 Identified Contingency Measures

Implemented contingency measures identified for 1999 must deliver the required benefits in calendar year 2000. The Phase II Reformulated Gasoline (RFG) program was implemented in the Washington region on January 1, 2000. See Section 7.7.2. In calendar year 2000, the benefits of this program totaled 23.2 tons per day of VOC and 8.7 tons per day NOx. See Appendix I for details of this calculation. The benefits from this program exceed the required 13.0 tons per day VOC; therefore this measure fulfills the region's contingency measure requirement for 1999.

12.2 Contingency Measures for the 2002 Rate of Progress Demonstration

12.2.1 Background

The Washington region must identify contingency measures to be implemented in the event that measures included in the 2002 Rate of Progress Plan fall short of their projected emission reductions. As was discussed in Chapter 5, the Washington area was reclassified as a severe nonattainment area in January 2003. As a severe area, the region is required to submit rate of progress demonstrations for the periods 1999-2002 and 2002-2005. As the deadline for achieving the 2002 ROP had already elapsed when the region was reclassified, EPA extended the deadline for the region to fulfill the 2002 ROP requirements. The region must meet the requirements as expeditiously as practicable, but no later than November 15, 2005. As discussed in Section 5.7, the region plans to meet these requirements by November 15, 2005. In its January 2003 Reclassification Notice, EPA notes that it is allowing the region to "key contingency measures for the 2002 ROP milestone to this new date" (68 Federal Register 3412). Therefore a determination that the Washington region failed to meet the 2002 ROP requirements would be made no earlier than November 15, 2005, and contingency measures would be implemented in 2006. As a result, the evaluation year for contingency measures for the 2002 ROP is 2006.

12.2.2 Required Reductions

The contingency measures for the 2002 rate-of-progress demonstration must total 3% of the 1990 base year inventory adjusted to 2002. The 2002 adjusted inventory is calculated as described in Section 5.4. Table 12-2 shows the calculation of the necessary reductions.

Table 12-2
Calculation of 2002 Contingency Measures
(Ozone Season tons per day)

Description	VOC	NOx	Reference
1990 Inventory Adjusted to 2002	420.1	756.6	(V13), (N13)
3% Reduction for Contingency Measure Requirement	0.03	0.03	
Total Contingency Measures Required (VOC or NOx)	12.6	22.7	

As Table 12-2 shows, the Washington region must identify 12.6 tons per day of VOC or 22.7 tons per day of NOx reductions to satisfy the contingency requirement.

12.2.3 Identified Contingency Measures

As discussed in section 12.2.1, contingency measures identified for 2002 must deliver the required benefits in calendar year 2006. The District of Columbia, Maryland and Virginia commit to identifying contingency measures to meet or exceed this requirement by March 1, 2004. Table 12-3 shows potential contingency measures under consideration in the Washington region. States will select from Table 12-3 contingency measures that will deliver benefits of greater than or equal to 12.6 tons per day VOC or 22.7 tons per day NOx. Sections 12.2.3.1 through 12.2.3.17 detail the benefits of these measures.

Table 12-3
Potential Contingency Measures for 2002 Rate-of-Progress
(Ozone Season tons per day)

Ref. No.	Contingency Measure	VOC (tons/day)	NOx (tons/day)
12.2.3.1	Ozone Transport Commission (OTC) Consumer Products	5.9	0
12.2.3.2	Ozone Transport Commission (OTC) Portable Fuel Containers	3.2	0
12.2.3.3	Enhanced Enforcement of Open Burning, Northern Virginia	0.5	0.1
12.2.3.4	Enhanced Enforcement of Surface Cleaning Regulations	0.8	0
12.2.3.5	Enhanced Enforcement of Graphic Arts Regulations	0.8	0
12.2.3.6	Locomotive Idling – Virginia Railway Express	0	0.1
12.2.3.7	Locomotive Idling – CSX	0	0.2
12.2.3.8	Cetane Enhanced Diesel Fuel for On-Road Vehicles	0	1.6
12.2.3.9	Cetane Enhanced Diesel Fuel for Off-Road Vehicles	0	1.7
12.2.3.10	Cetane Enhanced Diesel Fuel for Local School Bus Fleets	0	0.1
12.2.3.11	Electrification of Airport Ground Service Equipment	0.5	2.1
12.2.3.12	Regional Wind Power Purchases	0	0
12.2.3.13	Parking Impact Fee, District of Columbia	0	0
12.2.3.14	Best Practices in Application of Traffic Markings	0	0
12.2.3.15	Best Practices in Application of Pesticides	0	0
12.2.3.16	MOU with Local Power Plants	0	0
12.2.3.17	Environmental Performance Contracting	0	0
TOTAL REDUCTIONS[i]		**11.7**	**5.8**
TOTAL REDUCTIONS, VOC EQUIVALENT[ii]		**14.9**	

12.2.3.1 Ozone Transport Commission (OTC) Consumer Products

This measure requires reformulation of approximately 80 types of consumer products to reduce their VOC content. It uses more stringent VOC content limits than the existing Federal consumer products rule. The rule also contains requirements for labeling and reporting.

Source Type Affected

Manufacturers of various specialty chemicals named in the rule, such as aerosol adhesives, floor wax strippers, dry cleaning fluids and general purpose cleaners.

Control Strategy

The District of Columbia, Maryland and Virginia and are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products. The rule will apply to all counties in the nonattainment area. Reductions from this rule are expected to occur during calendar years 2005 and 2006. The District of Columbia credit from the OTC Consumer Products measure will occur before November 15, 2005, so it appears as a control measure in Section 7.4.10. The Maryland and Virginia rules will deliver benefit during 2006. Therefore their benefits appear here a contingency measure.

Manufacturers are expected to demonstrate compliance with the rule primarily through a California Air Resources Board (CARB) test method. If complying with the VOC contents becomes difficult, flexibility options are provided.

Implementation

Maryland – Air and Radiation Management Administration

Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	2.9	3.0	5.9
NOx Reductions	0	0	0	0.0

Emissions Benefits Calculations

E.H. Pechan calculated state-by-state emission benefits from the consumer products rule for the OTC region. Further details are available from Reference 1.

References

E.H. Pechan, “Control Measure Development Support Analysis for the Ozone Transport
rch 31, 2001.

12.2.3.2 Ozone Transport Commission (OTC) Portable Fuel Containers Rule

This measure introduces performance standards for portable fuel containers and spouts. The standards are intended to reduce emissions from storage, transport and refueling activities. The rule also included administrative and labeling requirements. Compliant containers must have: only one opening for both pouring and filling, an automatic shut-off to prevent overfill, an automatic sealing mechanism when not dispensing fuel and specified fuel flow rates, permeation rates and warranties.

Source Type Affected

Any person or entity selling, supplying or manufacturing portable fuel containers, except containers with a capacity of less than or equal to one quart, rapid refueling devices with capacities greater than or equal to four gallons, safety cans and portable marine fuel tanks operating with outboard motors, and products resulting in cumulative VOC emissions below those of a representative container or spout. Reductions from this rule are expected to accrue beginning in calendar year 2004. The credit from the OTC Portable Fuel Containers measure that is expected to occur by November 2005 appears as a control measure in Section 7.4.11. Additional credit expected between November 2005 and November 2006 appears here as a contingency measure.

Control Strategy

The District of Columbia, Maryland and Virginia are in the process of adopting the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers. The rule will apply to all counties in the nonattainment area.

Implementation

District of Columbia - Environmental Health Administration

Maryland - Air and Radiation Management Administration

Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0.3	1.5	1.4	3.2
NOx Reductions	0	0	0	0.0

Emission Benefit Calculations

Emission benefits calculations are based upon the calculations for Measure 7.4.11, OTC Portable Fuel Containers. Measure 7.4.11 assumes, based on research performed for the Ozone Transport Commission by E.H. Pechan, that over each 12-month period following implementation of the Portable Fuel Containers rule, 10% of the existing stock of gas cans will be replaced with the redesigned model. From the analysis for Measure 7.4.11, replacing 10% of the gas cans in the Washington nonattainment area would reduce 0.2 tpd VOC in the District of Columbia and 0.8 tpd VOC in Virginia. Maryland Department of the Environment has determined from the E.H. Pechan analysis that 10% turnover in the Maryland portion of the Washington nonattainment area would reduce emissions by 0.7 tpd VOC

The Maryland Air and Radiation Management Administration provided an estimate of benefits for the Maryland portion of the Washington non-attainment region, based on E.H. Pechan's calculations.

The Washington region would be notified by EPA in April 2006 of a need to implement contingency measures. The region would have 18 months from the date of notification to implement the measures. Therefore any benefits accrued from the Portable Fuel Containers rule between November 16, 2005 and October 1, 2007 could be used as contingency measures.

State	**Pechan Estimate (2.5 yr benefits)**	**Reductions Per Year**	**Nov 15, 2005 Reductions**	**Additional October 1, 2007 Reductions**
District	0.4	0.17	0.09	0.32
Virginia	2.0	0.80	0.43	1.50
Maryland	N/A	0.70	1.82	1.38

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

12.2.3.3 Enhanced Enforcement of Open Burning in Virginia

This measure involves enhancing enforcement of the Virginia portion of Measure 7.4.5, which bans the open burning of such items as trees, shrubs, and brush from land clearing, trimmings from landscaping, and household or business trash during the peak ozone season. The measure is authorized by state and local regulations and is enforced by state and local governments.

Source Type Affected

The measure affects all citizens and businesses that burn solid waste.

Control Strategy

Virginia DEQ will conduct a study to determine the rule effectiveness of the current open burning rule in Northern Virginia. If necessary, DEQ will then develop a plan to improve the rule effectiveness from the currently assumed 80% to 95%. DEQ and Northern Virginia jurisdictions will implement the plan. DEQ will then perform a follow-up study to ensure that the rule effectiveness improvement has taken place. The emissions benefits will remain constant throughout 2005.

Implementation

Virginia - Department of Environmental Quality; local government enforcement

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
VOC Reductions	0	0	0.5	0.5
NOx Reductions	0	0	0.1	0.1

Emission Benefit Calculations

Open burning emissions are estimated to be the same for calendar years 2002 and 2005. From the 2002 and 2005 area source inventories, open burning emissions for Northern Virginia are estimated at 3.323 tpd VOC. Estimated reductions are shown below.

Description	VOC (tpd)	NOx (tpd)
Uncontrolled VA Open Burning Emissions	3.32	0.70
Emissions @ 80% Compliance	0.66	0.14
Emissions @95% Compliance	0.17	0.01
Total Reductions	0.50	0.13

12.2.3.4 Enhanced Enforcement of Surface Cleaning Regulations

This measure involves enhancing enforcement of Measure 7.4.3, surface cleaning and degreasing for machinery and automobile repair. This measure amended regulations for surface cleaning (often called "cold cleaning and degreasing") devices and operations to require more stringent emissions control techniques, and to require, where possible, the use of low- or no-VOC solvents.

Source Type Affected

The measure affects all cold cleaning and degreasing equipment and operations.

Control Strategy

MWAQC will conduct studies to determine the rule effectiveness of the current surface cleaning rules in the Washington nonattainment area. MWAQC will then develop and recommend to the states a plan to improve the rule effectiveness from the currently assumed 80% to 95%. County environmental personnel will implement the enforcement plans for each jurisdiction in the nonattainment area, where permitted by state law. State personnel will implement enforcement plans where use of county personnel is not permitted. MWAQC will perform a follow-up study to ensure that the intended rule effectiveness improvements have taken place.

Implementation

District of Columbia - Environmental Health Administration

Maryland – local governments

Virginia- Department of Environmental Quality; local government enforcement

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0.3	0.5	0.8
NOx Reductions	0	0	0	0.0

Emission Benefit Calculations

The 2005 Controlled Area source inventory in the severe area SIP predicts 3.5 tpd VOC due to surface cleaning in 2005. National rule effectiveness is assumed at 100%, while state rule effectiveness is currently assumed at 80%. Estimated reductions from a 15% increase in state rule effectiveness are calculated below.

Calculation for Maryland

Description	**VOC (tons/day)**
Uncontrolled MD Surface Cleaning Emissions	4.4
% Reduction Per Current Rules	73.857% reduction from state rules + 20% reduction from national standards
Emissions @ 80% Compliance	4.4 tpd * (1-(80% compliance * 73.857% state standards + 20% national standards))
Emissions @ 80% Compliance	0.9
Emissions @ 95% Compliance	4.4 tpd * (1-(95% compliance * 73.857% state standards + 20% national standards))
Emissions @ 95% Compliance	0.4
Total Reductions	0.5

Calculation for District of Columbia & Virginia

Description	**District of Columbia (tons VOC/day)**	**Virginia (tons VOC/day)**
Uncontrolled Surface Cleaning Emissions	0.3	5.2
% Reduction Per Current Rules	40% reduction from state rules + 20% reduction from national standards	
Emissions @ 80% Compliance	tpd VOC * (1-(80% compliance * 40% state standards + 20% national standards))	
Emissions @ 80% Compliance	0.1	2.5
Emissions @ 95% Compliance	tpd VOC * (1-(95% compliance * 73.857% state standards + 20% national standards))	
Emissions @ 95% Compliance	0.1	2.2
Total Reductions	0.0	0.3

12.2.3.5 Enhanced Enforcement of Graphic Arts Regulations

This measure involves enhancing enforcement of Measure 7.4.8, graphic arts controls. This measure controls offset lithography and applies to printers and small sources. VOCs are emitted from the inks used for printing, fountain solutions, and from the solvents used to clean the printing equipment.

Source Type Affected

This measure would affect small printers not currently regulated under RACT measures. Lithographic printing facilities include heatset web, non-heatset web, non-heatset sheet-fed, and newspaper non-heatset web sources.

Control Strategy

MWAQC will conduct studies to determine the rule effectiveness of the graphic arts controls in the Washington nonattainment area. MWAQC will then develop and recommend to the states a plan to improve the rule effectiveness from the currently assumed 80% to 95 County environmental personnel will implement the enforcement plans for each jurisdiction in the nonattainment area, where permitted by state law. State personnel will implement enforcement plans where use of county personnel is not permitted. MWAQC will perform a follow-up study to ensure that the intended rule effectiveness improvements have taken place.

Implementation

District of Columbia - Environmental Health Administration

Maryland – local governments

Virginia- Department of Environmental Quality; local government enforcement

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0.1	0.3	0.4	0.8
NOx Reductions	0	0	0	0.0

Emission Benefit Calculations

The 2005 Area source inventory in the severe area SIP predicts 5.0 tpd VOC due to surface cleaning in 2005. State rule effectiveness is currently assumed at 80%. Estimated reductions from a 15% increase in state rule effectiveness are calculated below.

Calculation for Maryland

Description	**VOC (tons/day)**
Uncontrolled MD Surface Cleaning Emissions	2.9
Emissions @ 80% Compliance	2.9 * (1 -((75%*64% + 60%*90%*18% + 70%*90%*18%) * 80% rule effectiveness)
Emissions @ 80% Compliance	1.3
Emissions @ 95% Compliance	2.9 * (1 -((75%*64% + 60%*90%*18% + 70%*90%*18%) * 95% rule effectiveness)
Emissions @ 95% Compliance	1.0
Total Reductions	0.3

Calculation for District of Columbia & Virginia

Description	**District of Columbia (tons VOC/day)**	**Virginia (tons VOC/day)**
Uncontrolled Surface Cleaning Emissions	1.3	4.6
% Reduction Per Current Rules	40% reduction from state rules + 20% reduction from national standards	
Emissions @ 80% Compliance	tpd VOC * (1 -(75% reduction * 80% rule effectiveness * 64% penetration))	
Emissions @ 80% Compliance	0.8	2.9
Emissions @ 95% Compliance	tpd VOC * (1-(95% compliance * 73.857% state standards + 20% national standards))	
Emissions @ 95% Compliance	0.7	2.5
Total Reductions	0.1	0.4

12.2.3.6 Locomotive Idling – Virginia Railway Express

This measure involves signing a Memorandum of Understanding (MOU) between the Virginia Department of Environmental Quality and Virginia Railway Express (VRE), a commuter rail operator in the Metropolitan Washington region. VRE will install electrified wayside power units for 13 of its trainsets. The installation of wayside power units reduces fuel consumption and emissions from idling locomotive engines.

Source Type Affected

The measure affects trainsets operated by Virginia Railway Express.

Control Strategy

VRE will commit to procure, install and operate electrified wayside power units for 13 trainsets located in the Washington region.

Implementation

Virginia Department of Environmental Quality

Virginia Department of Transportation

Virginia Railway Express

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions				0.0
NOx Reductions				0.1

Emission Benefit Calculations

Emission benefit calculations are documented in Appendix I.

12.2.3.7 Locomotive Idling – CSX Transportation

This measure involves signing Memoranda of Understanding (MOUs) between the Maryland Department of the Environment, the District of Columbia Department of Health and CSX Transportation (CSX), a freight railroad operating switchyards in the Metropolitan Washington region. CSX will install APUs on 22 switching locomotives in the region. The installation of APUs reduces fuel consumption and emissions from idling locomotive engines.

Source Type Affected

The measure affects locomotives operated by CSX Transportation in the Metropolitan Washington region.

Control Strategy

CSX will commit to procure, install and operate auxiliary power units (APUs) on 23 switchyard locomotives.

Implementation

Maryland - MWAQC

District of Columbia Department of Health

CSX Transportation

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions				0.0
NOx Reductions				0.2

Emission Benefit Calculations

Emission benefit calculations are documented in Appendix I.

12.2.3.8 Cetane-Enhanced Diesel Fuel for On-Road Vehicles During Ozone Season

The District of Columbia, Maryland and Virginia will adopt regulations requiring the use of a cetane additive to increase the minimum cetane number of on-road diesel fuel sold in the Metropolitan Washington area to 50. Use of cetane-enhanced fuel will be required only during the ozone season (May 1- September 30).

Source Type Affected

The measure affects all owners and operators of diesel-fueled on-road vehicles.

Control Strategy

The District of Columbia, Maryland and Virginia will implement regulations requiring a cetane enhancement program for on-road diesel fuel if the region is notified by EPA that it failed to demonstrate the 2002 rate-of-progress or the 2005 rate-of-progress or failed to attain the one-hour ozone standard by November 15, 2005.

Implementation

This measure will be implemented via regulation in the District of Columbia, Maryland and Virginia with the concurrence of EPA.

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions				0.0
NOx Reductions				1.6

Emission Benefit Calculations

Emission benefit calculations are documented in Appendix I.

12.2.3.9 Cetane-Enhanced Diesel Fuel for Off-Road Vehicles During Ozone Season

The District of Columbia, Maryland and Virginia will adopt regulations requiring the use of a cetane additive to increase the minimum cetane number of off-road diesel fuel sold in the Metropolitan Washington area to 50. Use of cetane-enhanced fuel will be required only during the ozone season (May 1- September 30).

Source Type Affected

The measure affects all owners and operators of diesel-fueled off-road vehicles.

Control Strategy

The District of Columbia, Maryland and Virginia will implement regulations requiring a cetane enhancement program for off-road diesel fuel if the region is notified by EPA that it failed to demonstrate the 2002 rate-of-progress or the 2005 rate-of-progress or failed to attain the one-hour ozone standard by November 15, 2005.

Implementation

This measure will be implemented via regulation in the District of Columbia, Maryland and Virginia with the concurrence of EPA.

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions				0.0
NOx Reductions				1.7

Emission Benefit Calculations

Emission benefit calculations are documented in Appendix I.

12.2.3.10 Cetane-Enhanced Diesel Fuel for Local School Bus Fleets During Ozone Season

This measure involves signing Memoranda of Understanding (MOUs) between the MWAQC, the District of Columbia Department of Health, the Virginia Department of Environmental Quality and public school districts in the Metropolitan Washington nonattainment area. School districts will commit to the purchase of diesel fuel containing a cetane additive that increases the minimum cetane number of the fuel to 50. Use of cetane-enhanced fuel will be required only during the ozone season (May 1- September 30).

Source Type Affected

The measure affects all public school districts located within the Metropolitan Washington nonattainment area.

Control Strategy

Public school districts within the Metropolitan Washington nonattainment area will commit to procure and use cetane-enhanced diesel fuel in all public school buses during the ozone season.

Implementation

District of Columbia Department of Health

Maryland - MWAQC

Virginia Department of Environmental Quality

Public school districts within the Metropolitan Washington nonattainment area

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions				0.0
NOx Reductions				0.1

Emission Benefit Calculations

Emission benefit calculations are documented in Appendix I.

12.2.3.11 Low-Emission Airport Ground Service Equipment (GSE)

This measure involves signing a Memorandum of Understanding (MOU) between the Virginia Department of Environmental Quality, the Metropolitan Washington Airports Authority (MWAA), and the operators of airport ground service equipment (GSE) at Ronald Reagan Washington National and Dulles Airports to reduce emissions from GSE operating at those airports.

Source Type Affected

The measure affects all GSE operating at Ronald Reagan Washington National and Dulles Airports.

Control Strategy

MWAA and the airport GSE operators will commit to reducing GSE emissions by 80% be replacing currently operated GSE with electric or other low-emissions equipment.

Implementation

Virginia Department of Environmental Quality

Metropolitan Washington Airports Authority (MWAA)

Operators of aircraft GSE at Ronald Reagan Washington National and Dulles Airports

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0	0.5	0.5
NOx Reductions	0	0	2.0	2.0

Emission Benefit Calculations

From the 2005 controlled inventory, airport GSE emissions are expected to be 0.7 tpd VOC and 2.6 tpd NOx. The table below calculates the emission reductions resulting from an 80% decrease in GSE emissions.

	VOC	**NOx**
2005 Controlled Emissions	0.7	2.6
% Reduction	80%	80%
Total Emission Reductions	0.5	2.0

12.2.3.12 Regional Wind Power Purchases

Under this measure, local governments in the nonattainment area would commit to purchasing a specific number of megawatt-hours of power per ozone season day from wind turbines instead of from the power plants that would normally supply power to the Metropolitan Washington region. This will decrease power generation from coal, oil, and/or gas-fired sources, reducing NOx emissions from those sources. Governments would commit to participation by signing an MOU with the appropriate state air agency.

Source Type Affected

The measure affects local governments within the Metropolitan Washington nonattainment area.

Control Strategy

Local governments will sign long-term commitments with wind power distributors for the purchase of a fixed quantity of power.

Implementation

Local governments within the Metropolitan Washington nonattainment area

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
VOC Reductions				0.0
NOx Reductions				0.0

Emission Benefit Calculations

Though these actions serve to reduce ozone formation, the benefits of this measure cannot be quantified for use as a contingency measure at this time. Therefore, the region proposes to take zero credit for this measure.

12.2.3.13 Parking Impact Fee, District of Columbia

Under this measure, the District of Columbia would adopt a $250 annual parking impact fee on every commuter parking space located within the District of Columbia. This will reduce demand for commuter parking and increase use of alternative transportation, decreasing vehicle trips and mobile emissions.

Source Type Affected

The measure affects all owners of commuter parking garages and lots and all commuters utilizing daily commuter vehicle parking in the District of Columbia.

Control Strategy

The District of Columbia will pass a regulation requiring payment of a parking impact fee. The District will enforce collection of the fee. Imposition of the fee will reduce demand for commuter parking and increase use of alternative transportation, such as Metrorail, Metrobus and bicycle. This will decrease commuter vehicle trips and vehicle miles traveled (VMT), reducing mobile emissions.

Implementation

District of Columbia

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0	0	0
NOx Reductions	0	0	0	0

Emission Benefit Calculations

Though this action would serve to reduce ozone formation by reducing the demand for commuter parking in the District of Columbia, the benefits of this measure cannot be quantified due to an inability to identify that number of parking spaces affected. Therefore, the region proposes to take zero credit for this measure.

12.2.3.14 Best Practices in Application of Traffic Markings

Under this measure, state or local governments would commit to reducing the contribution of road striping activities to regional ozone formation. Counties may commit to restricting the hours during which paints can be applied or banning application of traffic paint on Code Red days.

Source Type Affected

The measure affects state and local governments and any state or local government contractors involved in traffic marking activities.

Control Strategy

State or local governments will develop a policy on reduced emissions from traffic markings and commit to the policy through an MOU with MWAQC.

Implementation

State or local governments

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0	0	0
NOx Reductions	0	0	0	0

Emission Benefit Calculations

Though these actions serve to reduce ozone formation, the benefits of this measure cannot be quantified for use as a contingency measure. Therefore, the region proposes to take zero credit for this measure.

12.2.3.15 Best Practices in Application of Pesticides

Under this measure local governments would commit to reducing the contribution of pesticide application to regional ozone formation. Counties may commit to restricting the hours during which pesticides can be applied or banning application of pesticides on Code Red days.

Source Type Affected

The measure affects local governments and any local government contractors involved in pesticide application.

Control Strategy

Local governments will develop a policy on reduced emissions from pesticide application and commit to the policy through an MOU with MWAQC.

Implementation

Local governments

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0	0	0
NOx Reductions	0	0	0	0

Emission Benefit Calculations

Though these actions serve to reduce ozone formation, the benefits of this measure cannot be quantified for use as a contingency measure. Therefore, the region proposes to take zero credit for this measure.

12.2.3.16 MOU With Local Power Plants

Under this measure, MWAQC or local air agencies will negotiate Memoranda of Understanding (MOUs) with the operators of power plants located in the Metropolitan Washington nonattainment area. These memoranda would commit to reducing emissions from the power plants through installation of additional emissions reduction technology, fuel switching or other methods.

Source Type Affected

The measure affects operators of power plants in the Metropolitan Washington nonattainment area.

Control Strategy

Power plant operators will reduce emissions through installation of additional control technology, fuel switching or other methods.

Implementation

District of Columbia Department of Health

Maryland Air and Radiation Management Administration

Virginia Department of Environmental Quality

Power plant owners and operators

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
VOC Reductions	0	0	0	0
NOx Reductions	0	0	0	0

Emission Benefit Calculations

Though these actions serve to reduce ozone formation, at this time the benefits of this measure cannot be quantified for use as a contingency measure due to uncertainty about the interaction of this measure with the requirements of the NOx SIP Call . Therefore, the region proposes to take zero credit for this measure.

12.2.3.17 Environmental Performance Contracting

Under this measure local governments would commit to amending their contracting processes to include incentives for bidders to use low emissions equipment. This could apply to construction contracts, lawn and gardening contracts, among others.

Source Type Affected

The measure affects contractors to state and local governments in the Metropolitan Washington area.

Control Strategy

State and local governments would alter the contracting process to include extra bid points for contractors committing to use low emission equipment throughout the duration of the contract. Contracting agencies would commit to implementation of this measure by signing MOUs with MWAQC.

Implementation

State and local governments

Projected Reductions

	Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
VOC Reductions	0	0	0	0
NOx Reductions	0	0	0	0

Emission Benefit Calculations

Though these actions serve to reduce ozone formation, at this time the benefits of this measure cannot be quantified for use as a contingency measure. Therefore, the region proposes to take zero credit for this measure.

12.3 Contingency Measures for the 2005 Rate of Progress and Attainment Demonstrations

12.3.1 Required Reductions

The Washington region must also identify contingency measures to be implemented in the event that the region does not attain the one-hour ozone standard in 2005, or measures included in the 2005 Rate of Progress Plan fall short of their projected emission reductions. The contingency measures for the 2005 rate-of-progress and attainment demonstrations must total 3% of the 1990 base year inventory adjusted to 2005. The 2005 adjusted inventory is calculated as described in Section 6.1.2. Table 12-4 shows the calculation of the necessary reductions.

Table 12-4
Calculation of 2005 Contingency Measures
(Ozone Season tons per day)

Description	Tons/day VOC	Tons/day NOx	Reference
1990 Inventory Adjusted to 2005	411.7	735.4	(V23), (N23)
3% Reduction for Contingency Measure Requirement	0.03	0.03	
Total Contingency Measures Required (VOC or NOx)	12.4	22.1	

12.3.2 Identified Contingency Measures

Because the Washington region expects to fulfill the requirements of the 2002 rate-of-progress, the same contingency measures identified for the 2002 rate-of-progress can be used to fulfill the contingency measure requirement for the 2005 rate-of-progress and attainment demonstrations.

As any determination that the Washington region failed to either attain the one-hour standard or achieve the 2005 rate-of-progress would be made after November 15, 2005, the evaluation year for control measures for the 2005 rate-of-progress is 2006. As detailed in Section 12.2.3, the contingency measures identified for the 2002 rate-of-progress would reduce at least 12.6 tons per day of VOC or 22.7 tpd of NOx. These reductions meet the requirement of 12.4 tons per day VOC or 22.1 tons per day NOx. Therefore, the measures that will be listed in Table 12-3 will fulfill the region's contingency measure requirements for 2005.

References

U. S. EPA, “State Implementation Plans; General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990”, Proposed Rule, 57 *Federal Register* 13498 (April 16, 1992).

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[i] The NOx total is not equal to the sum of the values of the individual measures because the benefits from Measure 12.2.3.10 are contained in Measure 12.2.3.8.

[ii] Comparing the 2002 Adjusted VOC inventory to the 2002 Adjusted NOx inventory yields a conversion factor of 1.8 tons NOx : 1 ton VOC.