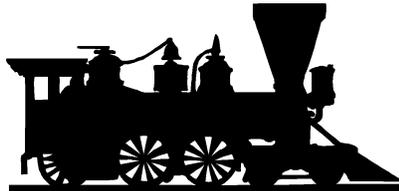


**Analysis of Potential
Area Source RACM Measures
for the Metropolitan Washington Region's
Severe Area SIP**

May 2003



DRAFT 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

Explanation of "Identifier" Field	
Abbreviation	Explanation
A	Airports
B	Commercial Businesses
C	Coatings and Solvents
F	Fuel Consumption
L	Locomotives
O	Open Burning/Fires
P	Petroleum Storage or Transport
X	Other/Multiple Categories

Measure B1: Bakeries

Measure Number: B1
Measure Name: Bakeries
Description: Adopt SCAQMD Rule 1153: Commercial Bakery Ovens

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

- This measure would affect not only large bakeries categorized as stationary sources, but also many smaller bakeries classified as area sources. As such, this measure has to potential to financially impact small businesses.
- This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure C1: Episodic limits on asphalt paving and traffic marking activities

Measure Number:	C1	Description:
Measure Name:	Episodic limits on asphalt paving and traffic marking activities	Prohibit road paving and traffic marking on ozone action days
RACM Determination:	Possible	
Reason:		

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	\$ 3,163
Estimated Reductions (VOC)	2.91

Issues

- Because private parties generally do not pave or mark roads, this could be enforced through state and county commitments
- Activities limited by this measure already do not occur on certain days for weather-related reasons, e.g. rain
- This measure would have a limited impact on the private sector, as most of these actions are maintenance activities performed by state or county employees.
- This measure is already implemented by MDOT and Montgomery County

Assumptions

- The 2005 area source controlled inventory in the severe area SIP predicts the following VOC emissions:
 - 3.687 tpd traffic markings
 - 0.025 tpd asphalt paving
- Asphalt paving emissions are de minimis.
- Consistent with source inventory, use population as a proxy for growth in traffic markings
- From cooperative forecasts, regional population in 2005 will be 101.2% of 2004 population
- Assume 80% rule compliance
- The region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002
- Assume 50% of traffic marking requires payment to a contractor for days lost to weather
- From Transportation Research Board's National Cooperative Highway Research Program (NCHRP) Synthesis 306, "Long Term Pavement Marking Practices", Appendix C, in the year 2000:
 - Virginia DOT spent an average of \$622 per centerline mile in annual pavement marking expenditures
 - Virginia DOT marked 38,410 centerline miles
 - Maryland DOT spent an average of \$3,890 per centerline mile in annual pavement marking expenditures
 - Maryland DOT marked 5,142 centerline miles
 - No data was available for the District of Columbia, so calculate costs for MD and VA only
- Assume the proportional of traffic marking activities on urban vs rural roads is the same as proportion of overall centerline miles
- From FHWA Highway Statistics 2001, Table HM-10, total public road length in urban areas is as follows:
 - Virginia: 27% urban
 - Maryland: 47% urban
 - District: 100% urban
- Allocate road length to the MSA by % of urban population
- All counties in MWAQC region are zoned "metro" (urban) by US Dept of Agriculture Economic Research Service
 - In Virginia, MWAQC counties make up 31% of the statewide metropolitan population
 - In Maryland, MWAQC counties make up 42% of the statewide metropolitan population

- BLS Producer Price Index for Construction of Highways and Streets was:
 - 1997 year end: 124.6
 - 2000 year end: 136.5
 - 2002 year end (preliminary): 133.7
- Use straight-line extrapolation from 1997-2002 to project a value for 2004: 137.3

Emission Reductions: Traffic Markings

$$\begin{aligned} \text{Total Reductions} &= (3.687 \text{ tpd} * 80\% \text{ compliance}) / 101.2\% \\ \text{Total Reductions} &= 2.91 \text{ tpd VOC} \end{aligned}$$

Cost Effectiveness

$$\begin{aligned} \text{Annual VA Traffic Marking \$} &= \$622 / \text{mile} * 38,410 \text{ miles} * 27\% \text{ of miles urban} * 31\% \text{ of urban population in Washington region} * \\ &\quad (137.3/136.5) \text{ inflation adjustment} \end{aligned}$$

$$\text{Annual VA Traffic Marking \$} = \$ 2,011,398$$

$$\begin{aligned} \text{Annual MD Traffic Marking \$} &= \$3,890 / \text{mile} * 5,142 \text{ miles} * 47\% \text{ of miles urban} * 42\% \text{ of urban population in Washington region} * \\ &\quad (137.3/136.5) \text{ inflation adjustment} \end{aligned}$$

$$\text{Annual MD Traffic Marking \$} = \$ 3,971,611$$

$$\text{Daily Weather Payment} = (\$2,011,398 + \$3,971,611) * 50\% \text{ require payment} / 365 \text{ days per year}$$

$$\text{Daily Weather Payment} = \$ 8,196$$

$$\text{Annual Expenditure} = \$8,196 \text{ per day} * 6.3 \text{ Code Red OAD}$$

$$\text{Annual Expenditure} = \$ 51,634$$

$$\text{VOC Reductions Excluding DC} = (3.687 - 0.403) \text{ tpd} * 80\% \text{ compliance} / 101.4\% \text{ growth}$$

$$\text{VOC Reductions Excluding DC} = 2.59$$

$$\text{Cost-effectiveness (\$/ton)} = \$51,634 / (\text{tons per day} * 6.3 \text{ Code Red Ozone Action Days})$$

$$\text{Cost-effectiveness (VOC)} = \$ 3,163$$

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure C2: Low-Emission Asphalt

Measure Number:	C2	Description:
Measure Name:	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)
RACM Determination:	No	
Reason:	<i>De minimis</i>	

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Asphalt emissions in the region are only 0.025 tpd, which is below the *de minimis* threshold of 0.1 tpd

Summary Analysis

Emissions from asphalt paving do not exceed the *de minimis* threshold of 0.1 tpd. Therefore this measure is not a RACM.

Measure F1: Low-Emission Water Heaters

Measure Number:	F1	Description:
Measure Name:	Low-Emission Water Heaters	Adopt SCAQMD Rule 1121: Control of NOx from Residential Type Natural Gas Fired Water Heaters
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

- This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.
- This measure would not require replacement of current water heaters; rather it would require newly purchased water heaters to meet a performance standard. Because the lifetime of a water heater often exceeds 20 years, turnover in the first few years of compliance will produce only negligible benefits.
- Even if states could require compliance with this measure in 2004, the benefits would be approximately zero.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure F2: Low-Emission Furnaces

Measure Number:	F2	Description:
Measure Name:	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)
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

- This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.
- This measure would not require replacement of current furnaces; rather it would require newly purchased furnaces to meet a performance standard. Because a furnace can last for over 40 years, turnover in the first few years of compliance will produce only negligible benefits.
- Even if states could require compliance with this measure in 2004, the benefits would be approximately zero.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure L1: Control Locomotive Idling

Measure Number:	L1	Description:
Measure Name:	Control Locomotive Idling	Seek voluntary agreement or implement regulations to reduce idling of locomotives at switchyards through installation of APUs or other methods
RACM Determination:	Possible	
Reason:		

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton NOx)	\$ 1,250
Estimated Reductions (NOx)	0.06

Issues

- CSX has approached the District of Columbia regarding installation of APUs on switchyard locomotives
- CSX hoped to have the credits certified for sale. This would only be acceptable if the region agreed to purchase generated credits at the market price and retire them.
- As locomotives idle most during the winter months, it is unclear to what extent APU installation would reduce ozone formation
- Negotiations on this measure have been ongoing for over a year with little progress. State air agencies do not believe an MOU could be effective by 2004.
- VRE has already implemented wayside power units for 14 trainsets.
- As FY 04 budgets are complete, additional units could not be funded until FY 05, after the beginning of the 2004 ozone season

Assumptions

- 14 VRE locomotives and trainsets operate on auxiliary power for 95 hours per week (M-F at night, all weekend)
- 7 VRE locomotives and trainsets operate on auxiliary power for 30 hours per week (M-F midday)
- Locomotives/trainsets would burn 2 gallons/hour at idle
- Without APUs, yard emissions would be:
 - 0.0506 lb VOC/gal
 - 0.5044 lb NOx/gal

Emission Reductions

$$\text{Total VOC Reductions} = \frac{((14 \text{ trainsets} * 95 \text{ hours/wk} + 7 \text{ trainsets} * 30 \text{ hours/wk}) * 2 \text{ gal/hour} * 0.0506 \text{ lb VOC/gal})}{(14 \text{ days/wk} * 2000 \text{ lb/ton})}$$

$$\text{Total VOC Reductions} = 0.006 \text{ tons VOC}$$

$$\text{Total NOx Reductions} = \frac{((14 \text{ trainsets} * 95 \text{ hours/wk} + 7 \text{ trainsets} * 30 \text{ hours/wk}) * 2 \text{ gal/hour} * 0.5044 \text{ lb NOx/gal})}{(14 \text{ days/wk} * 2000 \text{ lb/ton})}$$

$$\text{Total NOx Reductions} = 0.055 \text{ tons NOx}$$

Cost Effectiveness

· EPA estimates cost effectiveness of operating APU for switcher unit at \$750-1,250 per ton.

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NO_x or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure L2: Retrofit/Repower Locomotives

Measure Number:	L2	Description:
Measure Name:	Retrofit/Repower Locomotives	Provide financial incentives to retrofit or repower locomotives operating in the nonattainment area for cleaner burning diesel or alternative fuels
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

- Recent federal regulations will require retrofits of all repowered locomotives beginning in 2005.
- Most locomotives operating in the District of Columbia are fairly new and will not require a rebuild/repower for 5-10 years
- Local jurisdictions' budgets for FY04-05 (July 1 2003 - June 30 2004) have been completed. Funds could not be allocated for this program until FY 05, beginning July 2004. Equipment could not be purchased before the fiscal year begins.
- A similar program, implemented in California as part of the Carl Moyer program, has met with little to no response.

Summary Analysis

This program could not be implemented in time to deliver benefits by May 2004. Additionally, similar programs in other areas of the country have been unsuccessful in recruiting participants.

Measure O1: Open Burning

Measure Number:	O1	Description:
Measure Name:	Open Burning	Eliminate open burning in counties adjacent to nonattainment area
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

- This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.
- In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.
- This accounting change would not decrease emissions within the Washington area.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure P1: Reduced Emissions from Petroleum Storage Tanks

Measure Number: P1
Measure Name: Reduced Emissions from Petroleum Storage Tanks
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Adopt SCAQMD Rule 1178: Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Estimated Cost	N/A
Estimated Reductions	N/A

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure X1: Implement OTC Beyond Nonattainment Area

Measure Number:	X1	Description:
Measure Name:	Implement OTC Beyond Nonattainment Area	Take credit for reductions due to implementation of OTC measures beyond nonattainment area
RACM Determination:	No	
Reason:	No creditable emission reductions	

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

- MDE plans to implement the OTC measures statewide.
 - Virginia has taken statewide implementation of the measures to the Air Pollution Control Board but is unsure whether statewide rules will be approved.
 - In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.
 - This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.
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Measure X2: Episodic controls on pesticide application

Measure Number:	X2	Description:
Measure Name:	Episodic controls on pesticide application	Prohibit application of pesticides on forecasted ozone exceedance days
RACM Determination:	No	
Reason:	Substantial adverse impacts	

Criterion Summary

Year of First Benefits	2004+
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

- Maryland Department of the Environment says that approximately 80% of pesticide applications in the region are for agricultural purposes.
- The remaining 20% of spraying is for government or public use. Most government uses are for public health reasons, such as prevention of West Nile virus or malaria. Delaying this type of spraying could have serious public health effects. Therefore, this measure would prohibit only pesticide spraying that is not necessary for public health.
- Farmers already try to limit the days on which they apply pesticides to reduce runoff affecting local water quality.
- Because current farming practices advocate minimal use of pesticide, when application is necessary the need is often critical. Crops can be decimated within days. Therefore this measure could have a substantial adverse impact on local farmers.
- Additionally, enforcement of this measure would be extremely difficult, as farmers are widely dispersed within the nonattainment area and enforcement would require in-person visits to farms.
- This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure would have substantial adverse impacts on public health if applied to spraying by the public sector. A regulation affecting the private sector could not deliver benefits by May 2004. Therefore this measure is not a RACM.

Measure X3: Enhanced enforcement

Measure Number:	X3	Description:
Measure Name:	Enhanced enforcement	Enhance enforcement of existing area source regulations
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2005+
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

- For each affected group of sources, an initial study must be completed to document current rule effectiveness.
- From EPA's "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans", enhanced rule effectiveness over the EPA default value of 80% must be demonstrated through preparation and implementation of an enforcement plan and the subsequent completion of a study documenting enhanced rule effectiveness.
- The region has not prepared a plan to increase enforcement. Because FY 04 budgets are complete, preparation and implementation of a plan and completion of a follow-up study could not be funded until FY 05. Until a plan is completed, there is no basis for the region to claim that it could increase compliance. Even if the study were funded immediately, it could not be completed, approved and implemented by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure X4: Implement VOC RACT Beyond Nonattainment Area

Measure Number:	X4	Description:
Measure Name:	Implement VOC RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of VOC RACT rules beyond nonattainment area
RACM Determination:	No	
Reason:	No creditable emission reductions	

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

- Maryland VOC RACT measures are statewide.
- Virginia is considering extending RACT rules statewide.
- In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.
- This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.

Summary Analysis

This measure results in no creditable emissions reductions for the Washington region. Therefore it is not a RACM.

Measure X5: Implement NOx RACT Beyond Nonattainment Area

Measure Number:	X5	Description:
Measure Name:	Implement NOx RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of NOx RACT rules beyond nonattainment area
RACM Determination:	No	
Reason:	No creditable emission reductions	

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (\$/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

- Maryland NOx RACT measures are statewide.
- Virginia is considering extending RACT rules statewide.
- In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.
- This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.

Summary Analysis

This measure results in no creditable emissions reductions for the Washington region. Therefore it is not a RACM.