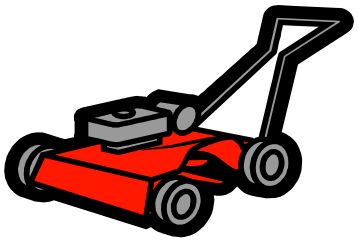
Analysis of Potential

Non-Road Source RACM Measures

for the Metropolitan Washington Region's Severe Area SIP

May 2003



DRAFT Potential Non-Road 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	
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

DRAFT Potential Non-Road RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
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
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

DRAFT Potential Non-Road RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
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

Explanation of "Identifier" Field	
Abbreviation	**Explanation**
A	Agricultural Equipment
C	Construction Equipment
G	Lawn & Garden Equipment
I	Industrial Equipment
M	Recreational Marine Equipment
R	Personal Recreational Equipment
S	Airport Service Equipment
T	Light Commerical Equipment
X	Other/Multiple Categories

Measure A1: Agricultural equipment use restrictions

Measure Number: A1
Measure Name: Agricultural equipment use restrictions

Description:
Mandatory restrictions on use of agricultural equipment during Code Red Ozone Action Days

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

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· No registry of farmers or operators of agricultural equipment exists, such that they could be provided with Ozone Action Day notices in a timely manner. Affected operators may not use email and may be unwilling to check call in numbers daily.

· Enforcement of this measure would be difficult and costly due to the wide geographical area to be patrolled. A daily visit by an inspector would not ensure that equipment was not being operated before or after the visit.

· Because states do not have the personnel to enforce this rule, they would need to rely on local enforcement or hire additional staff. This could not be accomplished until at least FY 05.

· Compliance with this measure could reduce crop yields, especially in the case of multi-day exceedance episodes

Summary Analysis

This measure could not deliver benefits by May 2004. Enforcement of this measure would also be prohibitively difficult, as there is no registry of affected equipment operators nor is there an effective method for ensuring they comply with the rule. Therefore the measure is not a RACM.

Measure A2: Agricultural equipment retrofits

Measure Number: A2
Measure Name: Agricultural equipment retrofits

Description:
Require agricultural equipment to be retrofitted with emissions controls

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

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· An extended compliance period might be required because of the need for farmer education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as agricultural equipment are not registered with the state

· Many farmers would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

· The District would be unaffected by this measure, as no agricultural equipment operates there.

Summary Analysis

This measure could not be implemented fast enough to deliver benefits by May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on some farmers.

Measure A3: Require low-NOx fuel for agricultural equipment

Measure Number: A3

Measure Name: Require low-NOx fuel for agricultural equipment

Description:
Require agricultural equipment to use low-NOx fuel during ozone season

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
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.

· There is no agricultural equipment operating in the District.

· This measure could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, farmers would likely not receive subsidies towards the higher cost of the low-NOx fuel

· Many farmers live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

· Any increase in VOC due to the effect of PuriNOx would have to be offset by additional VOC control measures in order for the region to continue to demonstrate Rate of Progress.

Assumptions

· Evaluate regional fleet of agricultural equipment to determine whether this measure would reduce emissions

· Measure will have 80% compliance rate

· From 2005 controlled non-road inventory in severe area SIP, emissions from MD diesel-fired agricultural equipment will be:
  - · 7.96 tons NOx
  - · 2.05 tons VOC

· As in SIP, assume no growth in agricutural emissions from 2004-2005

· Ozone season lasts 153 days

· From 2002 Transportation Energy Data Book[4], Table 2.4
  - · Agriculture industry used 479.2 trillion BTU of diesel in 2000 = 3,454,938,717 gallons
  - · Agricultural diesel usage decreases by ~3.3% annually

· From EPA NONROAD model[2], in 1997 MD and VA portions of Washington MSA had 0.113% of the nation's harvested cropland, as follows:
  · Frederick: 134,181 acres
  · Montgomery: 45,878 acres
  · Prince George's: 24,211 acres
  · Calvert: 15,721 acres
  · Charles: 22,184 acres
  · Loudoun: 69,572 acres
  · Fairfax: 1,675 acres
  · Prince William: 12,565 acres
  · Stafford: 6,939 acres
  · US Total: 295,406,519 acres
· Assume region uses 0.113% of nation's diesel agricultural fuel
· From EPA "Nonroad Engine and Vehicle Emission Study"[5], in the mid-Atlantic area:
  · 40% of agricultural activity occurs in the summer
  · 6% of agricultural activity occurs in the winter
  · Therefore 54% of activity occurs in shoulder months
· Therefore 67% of agricultural activity occurs during ozone season (3 summer months + 2 shoulder months)
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is 1.8 tpd NOx : 1 tpd VOC
· For diesel vehicles, VOC = HC * 1.053
· From regional NONROAD model data[2] (Total Pieces) and EPA Non-Road Engine Study[5] (all other data):

Description	SCC	HP Cat	HP	Hours	Load %	Loaded HP-Hrs	Total Pieces	NOx g/hp-hr	Exhaust VOC g/hp-hr	Tons/yr NOx	Tons/yr VOC
Agricultural Tractors	2270005015	0-100	98	448	70%	N/A	2,519	11.21	2.23	13.94	2.77
Combines	2270005020	100-175	132	129.5	70%	N/A	381	11.50	1.26	0.63	0.07
Balers	2270005025	0-100	74	97.5	58%	4,185	6	7.78	2.23	0.22	0.06
Sprayers	2270005035	0-100	92	87	50%	4,002	38	7.78	2.23	1.30	0.37
Tillers > 6HP	2270005040	0-100	7	238.5	78%	1,302	-	8.00	1.2	-	-
Swathers	2270005045	0-100	79	95.5	55%	4,149	77	11.50	0.9	4.05	0.32
Hydro Power Units	2270005050	0-100	35	715	48%	12,012	8	7.78	2.23	0.82	0.24
Other Agricultural Equipment	2270005055	0-100	57	344.5	51%	10,015	34	11.12	1.82	4.17	0.68

* Emission rates for agricultural tractors and combines are in g/hr

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	Tpy NOx	Tpy VOC
0-100	19.3%	99.4%	104.7%	98%	98%
100-175	17.0%	80.1%	84.3%	2%	2%
175-300	18.8%	72.8%	76.7%	0%	0%
300+	20.2%	30.0%	31.6%	0%	0%

Emission Reductions

Daily Reductions (NOx) = 7.96 tpd * (98% emissions * 19.3% reduction + 2% emissions * 17% reduction) * 80% compliance

Daily Reductions (NOx) = 1.23 tpd NOx

Annual Reductions (NOx) = 1.23 tpd * 153 days per ozone season

Annual Reductions (NOx) = 187 tpy NOx

Daily Increase (VOC) = 2.05 tpd * (98% emissions * 104.7% increase + 2% emissions * 84.3% increase) * 80% compliance

Daily Increase (VOC) = 1.71 tpd VOC

Annual Increase (VOC) = 1.71 tpd * 153 days per ozone season

Annual Increase (VOC) = 262 tpy VOC

Net Decrease (NOx-VOC) = 1.23 tpd NOx - (1.71 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -1.86 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure A4: Low-emissions agricultural equipment

Measure Number: A4
Measure Name: Low-emissions agricultural equipment

Description:
Require sale of low-emissions agricultural equipment in region

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	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· Because there are no regional standards for low-emissions agricultural equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure could not be implemented fast enough to deliver benefits by May 2004.

Measure C1: Construction equipment use restrictions

Measure Number: C1
Measure Name: Construction equipment use restrictions

Description:
Restrict use of construction equipment during expected ozone exceedance days

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

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

Estimated Cost ($/ton NOx)	$	177,496
Estimated Reductions (tpd NOx)		10.9

Issues

· This is an episodic measure

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

· Construction occasionally stops for other weather-related reasons, such as severe thunderstorms

· By 2004, this measure could only be implemented voluntarily on state contracts

Assumptions

· Measure will have 80% compliance rate

· From 2005 controlled non-road inventory in severe area SIP, emissions from construction equipment will be:
  · 65.5 tons NOx
  · 12.34 tons VOC

· As in non-road inventory, use employment as proxy for growth in construction

· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005

· The cost of this regulation would be the cost, if applicable, of paying contractors for each day they did not work. Assume 50% of contractors are paid for weather-related stoppages, while the other 50% assume weather risks

· Region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002

· From EPA NONROAD model[2], dollars spent on construction in Washington region in 1997:
  · Northern Virginia = $3,364,219,000
  · Southern Maryland = $2,383,910,000
  · District of Columbia = $672,873,000
  · Total = $6,421,002,000

· BLS Producer Price Index for New Construction[3] was:
  · 1997 year end: 134.6
  · 2002 year end (preliminary): 138.8

· Use straight line extrapolation to project a value for 2004: 140.5

· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)

· Assume this translates to 21% of regional construction emissions and fuel usage

Emission Reductions

Daily Reductions (NOx) = 65.5 tpd * 80% compliance * 21% state and local / 1.013 adjustment to 2004

Daily Reductions (NOx) = 10.9 tpd NOx

Daily Reductions (VOC) = 12.34 tpd * 80% compliance * 21% state and local / 1.018 adjustment to 2004

Daily Reductions (VOC) = 2.0 tpd VOC

Cost Effectiveness

2005 Regional Construction $= $6,421,002,000 * (140.5/134.6) inflation

2005 Regional Construction $= $ 6,702,457,511

Daily State& Local Constr $ = $6,702,457,511* 21% state & local / 365 days per year

Daily State& Local Constr $ = $ 3,856,208

Daily Weather Payment = $3,856,208 * 50% of contracts pay for weather-related stoppages

Daily Weather Payment = $ 1,928,104

Annual Expenditure= $1,928,104 per day * 6.3 Code Red Ozone Action Days

Annual Expenditure= $ 12,147,057

Cost-effectiveness ($/ton) = $12,147,057 / (tons per day * 6.3 Code Red Ozone Action Days)

Cost-effectiveness (NOx) = $ 177,496

Cost-effectiveness (VOC) = $ 946,790

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure C2: Construction retrofits

Measure Number: C2
Measure Name: Construction retrofits

RACM Determination: No
Reason: Not economically feasible

Description:
Require construction equipment operating on state and local contracts to be retrofitted with particulate fitlers and/or oxidation catalysts

Criterion Summary

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

Estimated Cost ($/ton VOC)	$ 66,426
Estimated Reductions (VOC)	0.90

Issues

· Contractors would include cost of retrofits in contract bid price

· Almost every retrofit requires use of ultra-low sulfur diesel fuel (ULSD)

· ARTBA representatives have expressed concern about lubrication problems that can result from using ULSD in older equipment engines

Assumptions

· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel construction equipment will be:
  · 10.34 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)
· Assume this translates to 21% of regional construction emissions and fuel usage
· Measure will have 80% compliance rate
· From EPA Voluntary Diesel Retrofit Program verification list, installation of oxidation catalysts will reduce HC emissions by 50%.
· For diesel vehicles, VOC = HC * 1.053
· Therefore catalysts will reduce VOC emissions by 52.7%
· From EPA NONROAD model (v 2.2.0):
  · Population of construction equipment grows at approximately 2.2% per annum
  · In 1998, District of Columbia had 3,854 pieces of diesel construction equipment
  · In 1998, the Maryland portion of the Washington nonattainment area had 13,683 pieces of diesel construction equipment
  · In 1998, the Virginia portion of the Washington nonattainment area had 19,311 pieces of diesel construction equipment
· Oxidation catalyst costs $2500 per piece of equipment
· ULSD costs $0.15 per gallon more than regular low-sulfur diesel
· Retrofits average 6 year lifespan
· From 2002 Transportation Energy Data Book[4], Table 2.8
  · Construction industry used 2,589,383,000 gallons of diesel in 2000
  · Construction diesel usage increases by ~3.6% annually
· From EPA NONROAD model[2], Washington MSA has approximately 4.7% of nation's diesel-fired construction equipment.
· Assume region uses 4.7% of nation's diesel construction fuel

Emission Reductions

Total VOC Reduced = 10.34 tons * 21% state & local * 52.7% reduction * 80% compliance / 1.013 adjust to 2004
Total VOC Reduced = 0.90 tpd VOC

Cost Effectiveness

Total Equipment in 2004 = (3,854 District + 13,683 MD + 19,311 VA) * (1.022)^6
Total Equipment in 2004 = 41,987 pieces of equipment

Total Cost to Retrofit = 41,987 pieces equipment * $2,500 per piece
Total Cost to Retrofit = $ 104,968,576

Increased Fuel Costs = $0.15 per gallon * 2,589,383,000 gallons nationally in 2000 * (1.036^4) increase by 2004* 4.7% used locally * 21% state & local contracts
Increased Fuel Costs = $ 4,416,149

Annual Expenditure= ($104,968,576 / 6 year lifespan) + $4,416,149
Annual Expenditure= $ 21,910,912

Cost-effectiveness ($/ton) = $21,910,912 / (0.90 tpd * 365 days per year)
Cost-effectiveness (VOC) = $ 66,426

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure C3: Require low-NOx fuel for construction equipment

Measure Number: C3
Measure Name: Require low-NOx fuel for construction equipment

RACM Determination: No
Reason: No creditable emission reductions

Description:
Require construction equipment operating on state of local contracts to use low-NOx fuel during ozone season

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	0

Issues

· Currently, PuriNOx is the only low-NOx additive verified by EPA to produce reductions

· PuriNOx is not currently blended in the area. Lubrizol will install a blender if demand exceeds 25 million gallons per year. Otherwise, the fuel would be trucked from NYC at an additional $0.10 per gallon

· If existing contracts cannot be altered to mandate use of PuriNOx, benefits in 2005 would drop sharply over this estimate. However, higher benefits would occur in future years as the percentage of participating contracts increases

· State-wide use of low-NOx fuel would require regulation and could not be implemented by May 2004. However, state and local governments could require use.

Assumptions

· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel construction equipment will be:
  · 65.20 tons NOx
  · 10.34 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau[1], state and local construction comprised 21% of total construction spending in 2001
· Ozone season lasts 153 days
· From 2002 Transportation Energy Data Book[4], Table 2.8
  · Construction industry used 2,589,383,000 gallons of diesel in 2000
  · Construction diesel usage increases by ~3.6% annually
· From Lubrizol, cost premium for PuriNOx is approximately $0.10 per gallon, assuming 25 million gallons of annual usage
· From EPA NONROAD model[2], Washington MSA has approximately 4.7% of nation's diesel-fired construction equipment.
· Assume region uses 4.7% of nation's diesel construction fuel
· From EPA "Nonroad Engine and Vehicle Emission Study"[5], in the mid-Atlantic area:

· 38% of construction activity occurs in the summer

· 15% of construction activity occurs in the winter

· Therefore 54% of construction activity occurs during ozone season (3 summer months + 2 shoulder months)

· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:

· 1.8 tpd NOx : 1 tpd VOC

· For diesel vehicles, VOC = HC * 1.053

· From regional NONROAD model data[2] (Total Pieces) and EPA Non-Road Engine Study[5] (all other data):

Description	SCC	HP Cat	HP	Hours	Load %	Loaded HP-Hrs	Total Pieces	Exhaust NOx g/hp-hr	Exhaust VOC g/hp-hr	Tons NOx	Tons VOC
Pavers	2270002003	0-100	91	690	62%	38,930	562	10.3	0.6	248.40	14.47
Plate Compactors	2270002009	0-100	8	448	43%	1,541	186	9.3	0.8	2.94	0.25
Rollers	2270002015	0-100	99	614.5	56%	34,068	1,975	9.3	0.8	689.76	59.33
Scrapers*	2270002018	300+	311	845.5	72%	N/A	556	5.7	0.7	2.95	0.36
Paving Equipment	2270002021	0-100	99	535	53%	28,071	711	11.1	1.01	244.21	22.22
Signal Boards/Light Plants	2270002027	0-100	6	713	82%	3,508	1,199	8	1.2	37.09	5.56
Trenchers*	2270002030	0-100	60	530.5	75%	N/A	1,401	10.02	1.54	8.21	1.26
Bore.Drill Rigs*	2270002033	175-300	209	405.5	75%	N/A	410	11.01	1.41	2.02	0.26
Excavators*	2270002036	100-175	143	752	57%	N/A	2,416	10.73	0.7	21.49	1.40
Concrete/Industrial Saws*	2270002039	0-100	56	501.5	73%	N/A	52	11.01	1.41	0.32	0.04
Cement & Mortar Mixers	2270002042	0-100	11	231	56%	1,423	112	11.01	1.01	1.93	0.18
Cranes*	2270002045	175-300	194	721.5	43%	N/A	1,693	10.3	1.26	13.87	1.70
Graders*	2270002048	100-175	172	714	61%	N/A	1,500	9.6	1.54	11.33	1.82
Off-Highway Trucks*	2270002051	300+	489	1510	51%	N/A	322	9.6	0.84	5.15	0.45
Crushing/Proc. Equipment*	2270002054	100-175	127	878.5	78%	N/A	178	11.01	1.41	1.90	0.24
Rought Terrain Forklifts*	2270002057	0-100	93	592.5	60%	N/A	1,991	8	1.58	10.40	2.05
Rubber Tire Loaders*	2270002060	100-175	158	757	54%	N/A	3,724	10.3	0.84	32.01	2.61
Rubber Tire Dozers*	2270002063	300+	356	840.5	59%	N/A	85	9.6	0.84	0.76	0.07
Tractors/Loaders/Backhoes*	2270002066	0-100	77	987.5	55%	N/A	5,893	10.1	1.4	64.79	8.98
Crawler Tractors*	2270002069	100-175	157	861	50%	N/A	3,623	10.3	1.26	35.42	4.33
Skid Steer Loaders*	2270002072	0-100	42	691.5	55%	N/A	7,365	9.6	2.1	53.89	11.79
Off-Highway Tractors*	2270002075	175-300	214	885	65%	N/A	538	11.91	2.46	6.25	1.29
Dumpers/Tenders*	2270002078	0-100	23	435.5	38%	N/A	10	9.6	0.84	0.05	0.00
Other Construction Equipment*	2270002081	100-175	161	562	62%	N/A	236	11.01	1.41	1.61	0.21

* Emission rates are in g/hr

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	91%	90%
100-175	17.0%	80.1%	84.3%	7%	8%
175-300	18.8%	72.8%	76.7%	1%	2%
300+	20.2%	30.0%	31.6%	1%	1%

Emission Reductions

Daily Reductions (NOx) = (65.20 tpd * 21% state and local contracts * (91% emissions * 19.3% reduction + 7% emissions * 17% reduction + 1% emissions * 18.8% reduction + 1% emissions * 20.2% reduction) * 80% compliance) / 1.013 adjustment to 2004

Daily Reductions (NOx) = 2.07 tpd NOx

Annual Reductions (NOx) = 2.07 tpd * 153 days per ozone season

Annual Reductions (NOx) = 317 tpy NOx

Daily Increase (VOC) = (10.34 tpd * 21% state and local contracts * (90% emissions * 104.7% increase + 8% emissions * 84.3% increase + 2% emissions * 76.7% increase + 1% emissions * 31.6% increase) * 80% compliance) / 1.013 adjustment to 2004

Daily Increase (VOC) = 1.75 tpd VOC

Annual Increase (VOC) = 1.75 tpd * 153 days per ozone season

Annual Increase (VOC) = 268 tpy VOC

Net Decrease (NOx-VOC) = 2.07 tpd NOx - (1.75 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -1.08 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure C4: Idling restrictions for construction equipment

Measure Number: C4
Measure Name: Idling restrictions for construction equipment

Description:
Limit idling by construction equipment

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	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· According to EPA OTAQ, no studies have been completed on idling emissions from nonroad vehicles. Therefore estimates of benefits are very uncertain.

· Construction equipment idling is more prevalent in winter months
· Current idling restrictions for motor vehicles are poorly enforced because personnel are not available to observe vehicles. Realistically, this rule cannot be enforced by random observation alone.

· Idle timers can be installed to automatically shut equipment off after a specified period of idle time. Timers cost approx $100.

· With approximately 41,000 pieces of regional construction equipment, this measure would have a $4.1 million capital cost.

· FY 04 budgets in the region are already complete. This measure could not be budgeted until FY 05 (July 2004), after the beginning of the 2004 ozone season.

· A state regulation would be needed to require equipment operators to install the timers. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Therefore this measure could not be implemented in an enforceable manner in time to deliver benefits in 2004.

Summary Analysis

The benefits of this measure are unclear. The only method of implementation ensuring a reasonable level of compliance is through installation of idle timers. This would require a state regulation, which could not deliver benefits by May 2004. Therefore, this measure is not a RACM.

Measure C5: Low-emissions construction equipment

Measure Number: C5
Measure Name: Low-emissions construction equipment

Description:
Require sale of low-emissions construction equipment in region

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	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· Because there are no regional standards for low-emissions construction equipment, rule development would be time consuming. The standard compliance period might also have to be extended to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure could not deliver benefits by May 2004.

Measure C6: Preference for low-emissions construction equipment

Measure Number: C6
Measure Name: Preference for low-emissions construction equipment
RACM Determination: No
Reason: Not economically feasible

Description:
In bids for government construction contracts, award extra points to bidders using low-emission construction equipment

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	$ 40,777
Estimated Reductions	0.01

Issues

· This measure would require an MOU with state and local governments in the nonattainment area

· ARTBA representatives expressed concern that contract preferences would advantage larger companies, who could more easily afford to install retrofits

· Benefits from this program will increase as old contracts expire. Benefits could eventually reach 2 tpd VOC

Assumptions

· From 2005 draft non-road inventory emissions from construction equipment are:
  · 65.5 tons NOx
  · 12.3 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)
· Assume 10% of new contracts will be awarded to low-emission vendors (optimistic compared to experiences in other areas of the country)
· New contracts will comprise 10% of total construction
· From EPA Voluntary Diesel Retrofit Program verification list, installation of retrofits will reduce HC emissions by at least 50%.
· For diesel vehicles, VOC = HC * 1.053
· Assume "low-emission" vendors will reduce VOC emissions by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year

Emission Reductions

Total Reductions (VOC) = 12.3 tpd * 21% of construction eligible * 10% awarded to low-emission * 10% is new construction * 52.7% VOC reduction / 1.013 adjustment to 2004

Total Reductions (VOC) = 0.01 tpd NOx

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 365 days)

Cost-effectiveness (VOC) = $ 40,777

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure G1: Episodic restrictions on lawn & garden equipment

Measure Number: G1

Measure Name: Episodic restrictions on lawn & garden equipment

Description:

Restrict use of lawn and garden equipment during expected ozone exceedance days

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	Yes
Intensive or Costly Effort	No

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

Issues

· This is an episodic measure

· The region has averaged 6.3 Code Red Ozone Action days per year in the past three years.

· Many lawn and garden workers are low-income, and many are self-employed. Preventing these workers from earning money for over one week during the summer months would have significant impacts on the workers and their families.

· 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 not deliver benefits by May 2004, and would have substantial adverse impacts on workers in the lawn and garden industries. Therefore it is not a RACM.

Measure G2: Lawn & garden equipment retrofits

Measure Number: G2
Measure Name: Lawn & garden equipment retrofits

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

Description:
Require commercial gas-powered lawn & garden equipment to be retrofitted with emissions controls or low emission engines

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
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

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

· An extended compliance period might be required because of the need for farmer education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as lawn & garden equipment are not registered with the state

· Many owners would be unable to afford the cost of retrofits.

· As FY 04 budgets are complete, states could not fund this measure until FY 05, beginning July 2004.

Summary Analysis

This measure could not be implemented in time to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on residents or owners of commercial lawn and garden services. Therefore it is not a RACM.

Measure G3: Require low-NOx fuel for lawn & garden equipment

Measure Number: G3

Measure Name: Require low-NOx fuel for lawn & garden equipment

Description:
Require lawn & garden equipment to use low-NOx fuel during ozone season

RACM Determination: No

Reason: No creditable emission reductions

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 NOx)	N/A
Estimated Reductions (NOx)	0.06

Net Benefit (NOx-VOC)	0
Net Estimated Cost ($/ton)	N/A

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 could be implemented by 2004 on a voluntary basis only by state and local governments.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of lawn and garden equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel lawn & garden equipment will be:
  · 0.37 tons NOx
  · 0.06 tons VOC
· As in non-road inventory, use employment as proxy for growth in lawn & garden equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· All lawn & garden equipment is 100 hp or less
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC increases 104.7%
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Daily Reductions (NOx) = 0.37 tpd * 19.3% reduction * 80% compliance / 1.013 adjustment to 2004
Daily Reductions (NOx) = 0.06 tpd NOx

Daily Increase (VOC) = 0.06 tpd * 104.7% increase * 80% compliance / 1.013 adjustment to 2004
Daily Increase (VOC) = 0.05 tpd VOC

Net Decrease (NOx-VOC) = 0.06 tpd NOx - (0.05 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.03 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure G4: Idling restrictions for lawn & garden equipment

Measure Number: G4
Measure Name: Idling restrictions for lawn & garden equipment

RACM Determination: No
Reason: No creditable emission reductions

Description:
Limit idling by commercial lawn & garden equipment

Criterion Summary

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

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

Issues

· Lawn and garden equipment is not left in idle for safety reasons. Also, operators are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

Summary Analysis

This measure would not reduce emissions. Therefore it is not a RACM.

Measure G5: Low emissions lawn & garden equipment

Measure Number: G5
Measure Name: Low emissions lawn & garden equipment

Description:
Adopt EPA lawn & garden equipment rules before they become effective in 2007

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	N/A
Adverse Impacts	No
Intensive or Costly Effort	No

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

Issues

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

· Because there are no regional standards for low-emissions agricultural equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits.

Summary Analysis

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

Measure G6: Preference for low-emissions lawn & garden equipment

Measure Number: G6
Measure Name: Preference for low-emissions lawn & garden equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission lawn & garden equipment

RACM Determination: Possible
Reason:

Criterion Summary

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

Estimated Cost ($/ton VOC)	$ 7,238
Estimated Reductions (VOC)	0.13

Issues

· This measure would requires an MOU with state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

Assumptions

· From 2005 draft non-road inventory emissions from commercial lawn & garden equipment are:
  · 26.29 tons VOC
  · 0.95 tons NOx
· As in non-road inventory, use employment as proxy for growth in lawn & garden
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· State & local government use or contracts accounts for 10% of all use of this equipment
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 100% through use of electric equipment or hand-powered equipment
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment operates April - October = 214 days per year
· Assume contracts turn over at rate of 50% per year

Emission Reductions

Total Reductions (VOC) = 26.29 tpd * 10% local govts * 50% contract turnover * 10% low-emission * 100% VOC reduction / 1.013 employment growth

Total Reductions (VOC) = 0.13 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (0.13 tpd * 214 days)

Cost-effectiveness (VOC) = $ 7,238

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 G7: "Cash for Clunkers" lawn & garden program

Measure Number: G7
Measure Name: "Cash for Clunkers" lawn & garden program

RACM Determination: No
Reason: Not economically feasible

Description:
Offer $75 for owners to turn in old, 2 and 4-stroke lawn & garden equipment and purchase electric or push mower

Criterion Summary

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

Estimated Cost ($/ton VOC)	$ 45,806
Estimated Reductions (VOC)	0.02

Issues

· No program of this type has been demonstrated in the northeast on a large scale

· MDE sponsored a small demonstration program of this type in the 1990s

· Participation rates are extremely difficult to estimate

· Montgomery County sponsored a multi-day program in 2003.

· Counties or states might be able to fund this program in 2004 if startup costs were minimized and low participation was expected. As FY 04 budgets are complete, a large scale program could not be funded until FY 05 (July 2004).

Assumptions

· Only residential users will participate in the measure, because electric and push mowers do not fulfill the needs of most commercial lawn care services

· From EPA NONROAD model, there were approximately 782,000 residential mowers in the Washington region in 1997.

· Measure would have 0.5% participation rate, or approximately 3,900 mowers

· From 2005 controlled non-road inventory in severe area SIP, emissions from residential lawnmowers or lawn tractors will be:

  · 4.74 tons VOC

  · 0.08 tons NOx

· Program costs would be $75 per mower, plus an outreach/recruitment/monitoring program at $200,000 per year

· Assume 100% emission reduction for each mower turned in

· As in nonroad inventory, use employment as proxy for growth in lawn & garden

· From regional cooperative forecasts, employment willl grow 1.3% from 2004-2004

· Ozone season lasts 153 days

· Assume 0.5% participation results in 0.5% reduction in emissions

· New mowers have 10 year useful life

· Mowers operate April - October = 214 days per year

Emission Reductions

Daily Reductions (NOx) = 0.08 tpd * 0.5% reduction / 1.013 adjustment to 2004

Daily Reductions (NOx) = 0.001 tpd NOx

Daily Reductions (VOC) = 4.74 tpd * 0.5% reduction / 1.013 adjustment to 2004

Daily Reductions (VOC) = 0.02 tpd VOC

Cost Effectiveness

Annual Expenditure= (($75 per mower * 782,334 mowers * 0.5% participation)/10 year lifespan) + $200,000
Annual Expenditure= $ 229,338

Cost-effectiveness ($/ton) = $229,338 / (tons per day * 214 days per year)

Cost-effectiveness (NOx) = $ 1,550,861
Cost-effectiveness (VOC) = $ 45,806

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure I1: Episodic restrictions on use of industrial equipment

Measure Number: I1
Measure Name: Episodic restrictions on use of industrial equipment

Description:
Moratorium on use of industrial equipment during Code Red Ozone Action Days

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

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· Use of industrial equipment is vital to the operation of thousands of area businesses. Shutting these businesses down for 6 days of the summer could have serious financial impacts on the businesses.

· This equipment is not registered with the state, and there is no way to enforce this measure except by random inspections of local businesses. This is an extremely ineffective and time-intensive mechanism.

· Many operators of this equipment are low income, and this measure would put them out of work on Ozone Action Days.

Summary Analysis

This measure would not deliver benefits by May 2004, is unenforceable from a practical viewpoint, and would adversely affect the operators of the affected equipment. Therefore it is not a RACM.

Measure I2: Industrial equipment retrofits

Measure Number: I2
Measure Name: Industrial equipment retrofits

Description:
Require industrial equipment to be retrofitted with emissions controls

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

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

· An extended compliance period might be required because of the need for owner education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as industrial equipment is not registered with the state

· Many owners would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

Summary Analysis

This measure could not be implemented in time to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on residents or owners of commercial lawn and garden services. Therefore it is not a RACM.

Measure I3: Require low-NOx fuel for industrial equipment

Measure Number: I3

Measure Name: Require low-NOx fuel for industrial equipment

RACM Determination: No

Reason: No creditable emission reductions

Description:

Require industrial equipment to use low-NOx fuel during ozone season

Criterion Summary

Year of First Benefits	N/A
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 could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, states are unable to subsidize higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of industrial equipment to determine whether this measure would reduce emissions

· Measure will have 80% compliance rate

· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel industrial equipment will be:
  - · 1.77 tons NOx
  - · 0.26 tons VOC

· As in non-road inventory, use employment as proxy for growth in industrial equipment

· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005

· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  - · 1.8 tpd NOx : 1 tpd VOC

· In 2001, non-construction off-highway diesel fuel consumed in region was:
  - · District of Columbia: 0

· Maryland: 2,709,000 gallons

· Virginia: 12,762,000 gallons

· After construction, agricultural equipment is primary consumer of off-highway diesel fuel (60% of non-construction use)

· Allocate fuel usgae based on % of farmland located in Washington region of MD/VA

· Maryland: 17% of farmland located in Washington nonattainment area

· Virginia: 3.7% of farmland located in Washington nonattainment area

· Industrial diesel equipment comprises approximately 13% of non-construction offroad diesel emissions in Washington area

· Assume industrial diesel equipment comprises approximately 13% of non-construction offroad diesel consumption in Washington area

Emission Reductions

Description	SCC	HP Cat	HP	Hours	Total Pieces	Exhaust NOx g/hr	Exhaust VOC g/hr	Tons NOx	Tons VOC
Aerial Lifts	2270003010	0-100	43	536	145	14	1.57	1.20	0.13
Forklifts	2270003020	0-100	83	1633	444	14	1.57	11.19	1.25
Sweepers/Scrubbers	2270003030	0-100	97	1250.5	146	14	1.57	2.82	0.32
Other General Indust Equip	2270003040	100-175	107	830	291	14	1.57	3.73	0.42
Other Material Handling Equip	2270003050	100-175	111	414.5	22	14	1.57	0.14	0.02

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	80%	80%
100-175	17.0%	80.1%	84.3%	20%	20%

Emission Reductions

Daily Reductions (NOx) = (1.77 tpd * (80% emissions * 19.3% reduction + 20% emissions * 17% reduction) * 80% compliance) / 1.013 adjust to 2004

Daily Reductions (NOx) = 0.26 tpd NOx

Daily Increase (VOC) = (0.26 tpd * (80% emissions * 104.7% increase + 20% emissions * 84.3% increase) * 80% compliance) / 1.013 adjust to 2004

Daily Increase (VOC) = 0.21 tpd VOC

Net Decrease (NOx-VOC) = 0.26 tpd NOx - (0.21 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.11 tpd NOx equivalent

Therefore this measure increases emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure I4: Idling restrictions for industrial equipment

Measure Number: I4
Measure Name: Idling restrictions for industrial equipment

Description:
Limit idling by industrial equipment

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Industrial equipment is rarely left in idle for safety reasons. Also, owners are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

Summary Analysis

This measure would not reduce emissions. Therefore it is not a RACM.

Measure I5: Low-emissions industrial equipment

Measure Number: I5
Measure Name: Low-emissions industrial equipment

Description:
Require sale of low-emissions industrial equipment in region

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

· Because there are no regional standards for low-emissions industrial equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits. This could not be accomplished by 2004.

Summary Analysis

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

Measure I6: Industrial equipment replacement

Measure Number: I6
Measure Name: Industrial equipment replacement

Description:
Subsidize replacement of fossil-fuel fired industrial equipment with electric industrial equipment

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	N/A
Estimated Reductions	N/A

Issues

· Due to budget crises, state and local governments do not have funds to undertake a project of this scale at this time.

· Electric equipment may not meet the same specifications of perform the same tasks as fossil fuel fired equipment

· It would take a significant investment of time to identify feasible replacements for equipment used by individual businesses, and then convince those businesses to replace their familiar, reliable equipment

· Because of the need for charging equipment, electric equipment usually requires a much higher capital investment than conventionally fueled equipment

· As the budgets for FY04 (July 1 2003 - June 30 2004) are already complete, this measure could first be funded in FY 05, beginning in July 2004. Because of the time required to recruit participants, select low emissions equipment, secure funding and take delivery of the equipment, this program could not deliver benefits by the end of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by 2004. Therefore it is not a RACM.

Measure I7: Preference for low-emissions industrial equipment

Measure Number: I7
Measure Name: Preference for low-emissions industrial equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission industrial equipment

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

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

Estimated Cost	$ 138,587
Estimated Reductions	0.004

Issues

· This measure requires commitments from state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

· Contractors could reduce emissions by using low-NOx, retrofitted or electric equipment

Assumptions

· From 2005 draft non-road inventory emissions from industrial equipment are:
  · 3.20 tpd NOx
  · 1.53 tpd VOC
· Local government use or contracts account for 5% of all use of this equipment
· As in non-road inventory, use employment as proxy for growth in industrial equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 50%
· For diesel vehicles, VOC = HC * 1.053
· Assume "low-emission" vendors will reduce VOC emissions by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment will operate 355 days per year
· This analysis overestimates benefits and underestimates cost by assuming that all contracts are awarded annually

Emission Reductions

Total VOC Reduced = 1.53 tpd * 5% eligible * 10% awarded * 52.7% reduction / 1.013 adjustment to 2004
Total VOC Reduced = 0.004 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 355 days)

Cost-effectiveness (VOC) = $ 138,587

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure M1: "Cash for Clunkers" outboard motor program

Measure Number: M1
Measure Name: "Cash for Clunkers" outboard motor program

Description:
Offer small cash reward for owners to turn in old, high-emission outboard motors

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

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

Estimated Cost ($/ton HC+NOx)	$ 77,853
Estimated Reductions (HC+NOx)	0.13

Issues

· From non-road inventory, vast majority of personal watercraft NOx and VOC emissions in the region come from 2-stroke spark ignition outboard motors

· Most recent rule controlling emissions from gasoline spark ignition marine engines is 61 FR 52088, published October 4, 1996.

· Counties or states might be able to fund this program in 2004 if startup costs were minimized and low participation was expected. As FY 04 budgets are complete, a large scale program could not be funded until FY 05 (July 2004).

Assumptions

· From 2005 non-road inventory, all outboard emissions come from 2-stroke motors.
· 2005 regional emission due to outboard motors will be:
  · 11.61 tons VOC
  · 0.12 tons NOx
· As in non-road inventory, use population as proxy for growth in industrial equipment
· From regional cooperative forecasts, population will grow 1.2% from 2004-2005

· From NONROAD model, population of outboard motors is:
  · 75% < 10 hp
  · 25% > 100 hp
  · 15,648 in Washington region

· Program would encourage trade-ins of MY 1997 and older engines
· Assume these engines meet MY 1998 standards for <6 hp motors: 278 g/kW-hr HC+NOx
· MY 2004 standards for motors < 6 hp will be 130 g/kW-hr HC+NOx
· 6 HP ~= 4.3 kW
· Motors have 10 year useful life
· Assume 25% of life is left at trade-in
· Motors operate 35 hours per year
· Motors operate 1 day per week during ozone season = 22 days per year
· Assume 1% response rate on trade-in offer
· From Wisconsin DNR study, program must offer at least $520 to incentivize trade-in
· Cost would be $520 per motor plus outreach/recruitment/monitoring program at $200,000 per year

Emission Reductions for One Motor

Net NOx+HC Reduced = (278 g/kW-hr - 130 g/kW-hr) * 4.3 kW * 35 hours per year / (907,185 grams per ton * 22 operating days per year)

Net NOx+HC Reduced = 0.0011 tons per engine-day

Cost Effectiveness for One Motor

Annual Expenditure= $520 * 1 motor / 2.5 years remaining life
Annual Expenditure= $ 208

Cost-effectiveness ($/ton) = $208 / (0.001 * 22 days)

Cost-effectiveness (VOC) = $ 9,455

Emission Reductions for Entire Program

Total Motors Traded In = 15,648 2-stroke outboard motors * 75% under 10 hp * 1% return rate
Total Motors Traded In = 117 motors

Net NOx+HC Reduced = 117 motors * 0.0011 tons per motor-day
Net NOx+HC Reduced = 0.13 tons per day

Cost Effectiveness for Entire Program

Annual Expenditure= ($520 * 117 motors / 2.5 years remaining life) + $200,000 monitoring program
Annual Expenditure= $ 224,336

Cost-effectiveness ($/ton) = $224,336 / (tons per day * 22 days)
Cost-effectiveness (NOX+HC) = $ 77,853

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold.

Measure M2: Idling restrictions for recreational marine equipment

Measure Number: M2
Measure Name: Idling restrictions for recreational marine equipment

Description:
Limit idling by recreational marine equipment during ozone season

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

Criterion Summary

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

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

Issues

· All three states require well over 12 months to develop, pass, and require compliance with a regulation. This measure would require regulation, and therefore cannot deliver benefits by 2004.

· According to EPA OTAQ, no studies have been completed on idling emissions from nonroad vehicles. Therefore estimates of benefits are very uncertain.

· In-person enforcement would be time-consuming and costly. Neither the personnel nor a coordination mechanism are available.

Summary Analysis

This measure could not deliver benefits by May 2004 and is therefore not a RACM.

Measure M3: Recreational marine equipment use restrictions

Measure Number: M3
Measure Name: Recreational marine equipment use restrictions

Description:
Moratorium on use of recreational marine equipment on Code Red Ozone Action Days

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

· This measure was proposed in the early 1990s and was not implemented due to public outcry

· This is an episodic measure that would be effective only on Code Red Ozone Action Days.

Summary Analysis

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

Measure M4: Require low-NOx fuel for recreational marine equipment

Measure Number: M4

Measure Name: Require low-NOx fuel for recreational marine equipment

RACM Determination: No

Reason: No creditable emission reductions

Description:

Require diesel-fired recreational marine equipment to use low-NOx fuel during ozone season

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	N/A
Estimated Reductions	N/A

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 could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to go to the next county to get cheaper fuel that is not low-NOx

Emission Reductions

· Evaluate regional fleet of recreational marine equipment to determine whether this measure would reduce emissions

· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel-fired pleasure craft will be:

  · 0.11 tons NOx

  · 0.02 tons VOC

· As in non-road inventory, use population growth as proxy for growth in pleasure craft emissions

· From regional cooperative forecasts, population will grow 1.2% from 2004-2005

· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:

  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Description	SCC	HP Cat	HP	Gallons	Total Pieces	Exhaust NOx g/gal	Exhaust VOC g/gal	Tons NOx	Tons VOC
Inboard/Sterndrive	2282020005	175-300	250	651	335	172.49	24.39	41.47	5.86
Outboard	2282020010	N/A	N/A	651	-	172.49	24.39	-	-
Sailboat Auxiliary Outboard	2282020025	N/A	N/A	33.5	-	163.29	122.45	-	-

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	0%	0%
100-175	17.0%	80.1%	84.3%	0%	0%
175-300	18.8%	72.8%	76.7%	100%	100%

Emission Reductions

Daily Reductions (NOx) = (0.11 tpd * 18.8% reduction * 80% compliance) / 1.012 adjust to 2004

Daily Reductions (NOx) = 0.02 tpd NOx

Daily Increase (VOC) = (0.02 tpd * 76.7% increase * 80% compliance) / 1.012 adjust to 2004

Daily Increase (VOC) = 0.01 tpd VOC

Net Decrease (NOx-VOC) = 0.02 tpd NOx - (0.01 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.005 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure M5: Graduated registration fees for recreational boats

Measure Number: M5
Measure Name: Graduated registration fees for recreational boats

Description:
Levee additional registration fee for registration of boats with old, high-emission engines

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	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· All three states require well over 12 months to develop, pass, and require compliance with a regulation. This measure would require regulation, and therefore cannot deliver benefits by 2004.

· Virginia has rolled back its car tax, and many other personal taxation proposals have been defeated in the last 12 months.

· This measure could adversely affect fisherman and tour-boat operators

Summary Analysis

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

Measure R1: Episodic restrictions on recreational equipment use

Measure Number: R1

Measure Name: Episodic restrictions on recreational equipment use

Description:

Restrict use of recreational equipment during expected ozone exceedance days

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

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 is an episodic measure that would be effective only on Code Red Ozone Action Days.

· The region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002

· Enforcement of this measure would be nearly impossible because of the wide geographic area to be patrolled.

Summary Analysis

This measure would not deliver benefits by May 2004 and is unenforceable from a practical standpoint. Therefore this measure is not a RACM.

Measure R2: "Cash for Clunkers" recreational equipment program

Measure Number: R2
Measure Name: "Cash for Clunkers" recreational equipment program

RACM Determination: No
Reason: Not economically feasible

Description:
Offer small cash reward for owners to turn in old, high-emission recreational equipment

Criterion Summary

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

Estimated Cost	$ 22,293
Estimated Reductions	N/A

Issues

· As there is no documentation of a program of this type ever being implemented, it would be extremely difficult to gauge public response rates.

· As new standards will be phased in during 2007-8, encouraging purchase of new vehicles now will delay benefits from standards

Assumptions

· From EPA NONROAD model (v. 2.2.0), 105,555 2-stroke off-road motorcycles or ATVs were operational in the Metropolitan Washington region in 1998

· Of the 2-stroke recreational vehicles in the US, approximately 45% are off-road motorcycles and 55% are ATVs

· Assume 45% = 47,500 of these vehicles are 2-stroke ATVs

· 2-stroke ATVs tend to be used for small children or beginners, while 4-stroke ATVs are purchased for adults or more experienced riders. Since the different engines types cater to different market segments, it is not practical to encourage consumers to purchase one type over the other

· For 2-stroke ATVs and off-road motorcycles, EPA estimates emissions over vehicle lifetime to deteriorate by:
  · 20% for VOC (53.9 g/mi to 64.7 g/mi)
  · 0% for NOx (0.15 g/mi)

· For 4-stroke ATVs and off-road motorcycles, EPA estimates emissions over vehicle lifetime to deteriorate by:
  · 15% for VOC (2.4 g/mi to 2.76 g/mi)
  · 0% for NOx (0.41 g/mi)

· From NONROAD model, EPA estimates annual ATV usage at 1,570 miles per year

· From NONROAD model, EPA estimates average ATV lifetime at 13 years

· In 2001, average retail cost of an ATV was $5,123

· Assume 10% ($500) payment would be required to incentivize owners to scrap 4-stroke ATV instead of reselling

· Because 2-stroke ATVs are outgrown rather than worn out, assume 50% ($2,500) payment would be required to incentivize owners to scrap instead of reselling

· Assume ATVs operate 9 months per year

· Many ATVs are used for agricultural purposes. These vehicles will operate 7 days/week.

· Non-agricultural ATVs operate 1-2 days per week

· Assume average ATV operates 5 days per week

· Off-road motorcycles have an average lifespan of 8 years

· Off-road motorcycles travel 6,210 miles during lifetime

· In 2001, average cost of an off-road motorcycle was $2,123

· Assume 10% ($210) payment will be required to incentivize owners to scrap 4-stroke off-road motorcycle instead of reselling

Emission Reductions for One Vehicle

For One 2-Stroke ATV

· Trading in one end-of-life ATV for one new ATV would yield the following annual emission benefits:

Tons Reduced (VOC) = ((64.7 g/mi old - 53.9 g/mi new) * 1,570 miles per year) / 907,185 grams per ton
Tons Reduced (VOC) = 0.019 tons per year

For One 4-Stroke ATV

· Trading in one end-of-life ATV for one new ATV would yield the following annual emission benefits:

Tons Reduced (VOC) = ((2.76 g/mi old - 2.4 g/mi new) * 1,570 miles per year) / 907,185 grams per ton
Tons Reduced (VOC) = 0.001 tons per year

For One 2-Stroke Off-Road Motorcycle

· Trading in one end-of-life motorcycle for one new motorcycle would yield the following annual emission benefits:

Tons Reduced (VOC) = ((64.7 g/mi old - 53.9 g/mi new) * 6,210 miles per life) /(907,185 grams per ton * 8 year life)
Tons Reduced (VOC) = 0.009 tons per year

For One 4-Stroke Off-Road Motorcycle

· Trading in one end-of-life off-road motorcycle for one new motorcycle would yield the following annual emission benefits:

Tons Reduced (VOC) = ((2.76 g/mi old - 2.4 g/mi new) * 6,210 miles per life) / (907,185 grams per ton * 8 year life)
Tons Reduced (VOC) = 0.0003 tons per year

Cost Effectiveness for One Vehicle

For One 2-Stroke ATV

Annual Expenditure= $ 2,500
Cost-effectiveness ($/ton) = $1,000 / (tons per year * 6 years lifespan left)
Cost-effectiveness (VOC) = $ 22,293

For One 4-Stroke ATV

Annual Expenditure= $ 500
Cost-effectiveness ($/ton) = $500 / (tons per year * 2 years lifespan left)
Cost-effectiveness (VOC) = $ 401,267

For One 2-Stroke Off-Road Motorcycle

Annual Expenditure= $ 210
Cost-effectiveness ($/ton) = $210 / (tons per year * 1 year lifespan left)
Cost-effectiveness (VOC) = $ 22,724

For One 4-Stroke Off-Road Motorcycle

Annual Expenditure= $ 210
Cost-effectiveness ($/ton) = $210 / (tons per year * 1 year lifespan left)
Cost-effectiveness (VOC) = $ 681,728

· On a vehicle-by-vehicle basis, a cash for clunkers program would not be cost effective for any of the four vehicle types. A full program would include administrative fees as well, decreasing the cost effectiveness.

Summary Analysis

This measure is not economically feasible because it does not meet the cost-effectiveness threshold.

Measure R3: Require low-NOx fuel for recreational equipment

Measure Number: R3
Measure Name: Require low-NOx fuel for recreational equipment

Description:
Require recreational equipment to use low-NOx fuel during ozone season

RACM Determination: No
Reason: No creditable emission reductions

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	N/A
Estimated Reductions	N/A

Issues

· Because Virginia is a Dillon rule state, this measure requires state-level regulation. Virginia requires at least 2 years to implement and require compliance with a new regulation, so this regulation could not deliver benefits in Virginia by 2004.

· It is unlikely that Maryland or the District would be able to require compliance with this regulation by 2004

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of recreational equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, regional emissions from diesel recreational equipment will be:
  · 0 tons NOx
  · 0 tons VOC

Summary Analysis

As this sector has no emissions, this control measure would produce no benefits. Therefore this measure is not a RACM.

Measure R4: Recreational equipment retrofits

Measure Number: R4
Measure Name: Recreational equipment retrofits

Description:
Require recreational equipment to be retrofitted with particulate fitlers and/or oxidation catalysts

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	N/A
Estimated Reductions	0

Issues

· From analysis of Measure R3, there will be no diesel-fired recreational equipment in the Washington region in 2005. Because retrofits are only applied to diesel equipment, this measure would have no benefit.

Summary Analysis

As this sector has no emissions, this control measure would produce no benefits. Therefore this measure is not a RACM.

Measure S1: Subsidize electric airport ground service equipment (GSE)

Measure Number: S1
Measure Name: Subsidize electric airport ground service equipment (GSE)
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Subsidize, through direct contributions or tax breaks, installation of electric ground service equipment and/or charging stations at regional airports

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	N/A
Estimated Reductions	N/A

Issues

· Electric ground service equipment requires a large capital investment for charging equipment.

· A handful of US airports have installed electric GSE with substantial support from a grant program administered by FAA.

· Airlines and GSE operators have been loathe to use electric GSE equipment without significant direct financial support. Given the current bankruptcies in the airline industry, this reticence will likely continue.

· Charging stations cost approximately $40,000 each. At a minimum, 2 stations would be needed at Reagan National and 3 stations at Dulles. This would result in $160,000 expenditure.

· All GSE would also need to be replaced. There are approximately 420 GSE in the region, and they would cost $30,000 each. With chargin stations, this totals $12.8 million in expenditures.

· States would need to allocate funds for this in annual budgets. As budgets for FY 04 (July 1 2003 - June 30 2004) are complete, this measure could not be funded until FY 05 (July 2004).

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure S2: Require low-NOx fuel for airport GSE

Measure Number: S2
Measure Name: Require low-NOx fuel for airport GSE

Description:
Require airport GSE to use low-NOx fuel during ozone season

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	0

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because air travel is interstate commerce, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines or GSE operators.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, state and local governments cannot afford to subsidize the increased fuel cost. Given the current problems with airline cost structure, airlines will likely be extremely unwilling to pay $0.15 more per gallon for low-NOx diesel fuel.

· GSE manufacturers have not guaranteed that PuriNOx will not void equipment warranties. Until this guarantee is made, it is extremely unlikely that any owners or operators would agree to use the fuel.

Assumptions

· Evaluate regional fleet of GSE to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD = 2.21
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD = 0.52
· Dulles mobile lounges are diesel fired. They contribute 0.48 tpd NOx in 2005 and 0.32 tpd in 2002, or 0.43 tpd in 2004
· Mobile lounges contribute 0.02 tpd NOx in 2005 and 0.015 tpd in 2002, or 0.018 tpd in 2004
· Remaining GSE are both gasoline and diesel fired. Assume 80% diesel, 20% gasoline.
· As in non-road inventory, use employment as proxy for growth in airport GSE
· From regional cooperative forecasts, employment will grow 1.8% from 2004-2005
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Total Diesel GSE (NOx) = (2.21 tpd - 0.43 tpd mobile lounges) * 80% + 0.43 tpd mobile lounges
Total Diesel GSE (NOx) = 1.85

Total Diesel GSE (VOC) = (0.52 tpd - 0.018 tpd mobile lounges) * 80% + 0.018 tpd mobile lounges
Total Diesel GSE (VOC) = 0.42

Description	SCC	HP Cat	HP	Tpd NOx	Tpd VOC
Mobile Lounge	N/A	0-100	78	0.48	0.02
Aircraft Support Equipment	2270008005	100-175	157	1.31	0.20

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	27%	9%
100-175	17.0%	80.1%	84.3%	73%	91%

Daily Reductions (NOx) = (1.85 tpd * (27% emissions * 19.3% reduction + 73% emissions * 17% reduction) * 80% compliance) / 1.018 adjustment to 2004
Daily Reductions (NOx) = 0.26 tpd NOx

Daily Increase (VOC) = (0.42 tpd * (9% emissions * 104.7% increase + 91% emissions * 84.3% increase) * 80% compliance) / 1.018 adjustment to 2004
Daily Increase (VOC) = 0.28 tpd VOC

Net Decrease (NOx-VOC) = 0.26 tpd NOx - (0.28 tpd VOC * 1.8 tpd NOx per VOC)
Net Decrease (NOx-VOC) = -0.256 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure S3: Airport GSE retrofits

Measure Number: S3
Measure Name: Airport GSE retrofits

Description:
Subsidize the retrofit of airport GSE with emissions control equipment

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	N/A
Estimated Reductions	N/A

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because air travel is interstate commerce, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines or GSE operators.

· Given current airline bankruptcies, airlines will not agree to voluntarily replace or retrofit GSE equipment unless the cost is subsidized.

· States would need to allocate funds for this in annual budgets. As budgets for FY 04 (July 1 2003 - June 30 2004) are complete, this measure could not be funded until FY 05 (July 2004).

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure S4: Reduce idling by airport GSE

Measure Number: S4
Measure Name: Reduce idling by airport GSE

Description:
Develop voluntary program to encourage operators to limit idling of airport GSE

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 NOx)	$ 3,155
Estimated Reductions (NOx)	0.17

Issues

· Neither states nor MWAA has the authority to regulate airport GSE emissions. This measure would be enforceable through a voluntary MOU signed with airlines or GSE operators.

· Virtually no data is available on the idling behavior of airport GSE, so estimates of benefits from this measure are very uncertain.

· Virginia DEQ thinks it is unlikely that an MOU could become effective by May 2004

Assumptions

· Measure will have 80% compliance rate
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD = 2.21
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD = 0.52
· As in non-road inventory, use employment as proxy for growth in airport GSE
· From regional cooperative forecasts, employment will grow 1.8% from 2004-2005
· From NESCAUM survey of airport GSE fleets, GSE load factors when adjusted for fuel consumption are much lower than load factors assumed in EPA modeling
· For example, load factors for baggage tugs were reduced from 55% to 2%, while load factors for belt loaders were reduced from 50% to 7%
· Assume this reduced average load factors is due to greater-than-assumed idling time
· Assume emissions can be reduced by 10% by voluntary idling agreements
· Assume cost is a monitoring/verification program at $200,000 per year
· Equipment operates 365 days per year

Emission Reductions

Daily Reductions (NOx) = 2.21 tpd * 10% reduction * 80% compliance / 1.018 adjustment to 2004
Daily Reductions (NOx) = 0.17 tpd NOx

Daily Increase (VOC) = 0.52 tpd * 10% reduction * 80% compliance / 1.018 adjustment to 2004
Daily Increase (VOC) = 0.04 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 365 days)

Cost-effectiveness (VOC) = $ 13,409
Cost-effectiveness (NOx) = $ 3,155

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 S5: Control aircraft auxiliary power units

Measure Number: S5
Measure Name: Control aircraft auxiliary power units

RACM Determination: No
Reason: Not economically feasible

Description:
Seek voluntary agreement to reduce use of aircraft APUs through use of gate-provided services or other strategies

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 NOx)	$ 27,796
Estimated Reductions (NOx)	0.250

Issues

· States do not have the authority to regulate aircraft emissions. This measure would be enforceable through a voluntary MOU.

· The Metropolitan Washington Airports Authority (MWAA) controls use of airport services. The Authority can require airplanes to use preconditioned gate air iand gate electricity instead of idling to generate power.

Assumptions

· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD
· In 2005, APUs emitted 0.04 tpd VOC and 0.43 tpd NOx
· This is 6% of GSE/AGE/APU/Mobile Lounge VOC emissions and 17% of NOx emissions
· Assume these percentages hold for 2004
· Therefore APUs will emit 0.03 tpd VOC and 0.38 tpd NOx in 2040
· Assume all APU emissions occur at gate
· Overall compliance with measure will be 80% (EPA mandated estimate)
· From MWAA, approximately 70% of flights currently use gate services, but this is not accounted for in the airport inventories
· Cost of this measure is cost to MWAA of O&M for additional 30% of flights to use preconditioned air
· From EPA, "Technical Data to Support FAA's Advisory Circular on Reducing Emissions from Commercial Aviation" (Sept 1995), O&M cost for operating a 400-Hz preconditioned air system at DCA was $1.945 million at 44 gates.
· Washington Dulles has 120 gates
· Because Dulles has 2.7 as many gates as Reagan National, assume O&M costs are 2.7 times as high

Emission Reductions

Total VOC Reductions = 0.03 tons * 80% reduction
Total VOC Reductions = 0.02 tons VOC

Total NOx Reductions = 0.38 tons * 80% reduction
Total NOx Reductions = 0.30 tons NOx

Cost Effectiveness

Estimate cost if preconditioned air were used by every aircraft instead of the current 70%

Expenditure for All Aircraft=	($1,945,000 at National + 2.7* $1,945,000 at Dulles) * (100%/70%) increased usage	
Expenditure for All Aircraft=	$	10,280,714
Expenditure for 30% of Aircraft=	$10,280,714 * 30%	
Expenditure for 30% of Aircraft=	$	3,084,214
Annual Expenditure=	$	3,084,214
Cost-effectiveness ($/ton) =	$3,084,214 / (tpd * 365 days per year)	
Cost-effectiveness (NOx) =	$	27,796
Cost-effectiveness (VOC) =	$	352,079

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T1: Light commercial equipment use restrictions

Measure Number: T1
Measure Name: Light commercial equipment use restrictions

Description:
Restrict use of light commercial equipment during expected ozone exceedance days

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

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This is an episodic measure

· The region has averaged 6.3 Code Red Ozone Action days per year in the past three years.

· Use of light commercial equipment is vital to the operation of thousands of area businesses. Shutting these businesses down for 6 days of the summer could have serious financial impacts on the businesses.

· This equipment is not registered with the state, and there is no way to enforce this measure except by random inspections of local businesses. This is an extremely ineffective and time-intensive mechanism.

· Many operators of this equipment are low income, and this measure would put them out of work on Ozone Action Days.

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

Summary Analysis

This measure is unenforceable from a practical viewpoint, could not become effective by May 2004 and could adversely affect the operators of the affected equipment. Therefore it is not a RACM.

Measure T2: Light commercial equipment retrofits

Measure Number: T2
Measure Name: Light commercial equipment retrofits

Description:
Require light commercial equipment to be retrofitted with emissions controls

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	N/A
Estimated Reductions	N/A

Issues

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

· Enforcement of this measure would be difficult, as industrial equipment are not registered with the state

· Many owners would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

Summary Analysis

This measure could not be implemented fast enough to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on equipment owners

Measure T3: Require low-NOx fuel for light commercial equipment

Measure Number: T3
Measure Name: Require low-NOx fuel for light commercial equipment

Description:
Require light commercial equipment to use low-NOx fuel during ozone season, if applicable

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
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 could be implemented by 2004 on a voluntary basis only by state and local governments.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of light commercial equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel light commercial equipment will be:
  · 0.63 tons NOx
  · 0.09 tons VOC
· As in non-road inventory, use population as proxy for growth in light commercial equipment
· All light commercial equipment is less than 100 hp
· From regional cooperative forecasts, population will grow 1.2% from 2004-2005
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC increases 104.7%
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Daily Reductions (NOx) = (0.63 tpd * 19.3% reduction * 80% compliance) / 1.012 adjust to 2004
Daily Reductions (NOx) = 0.10 tpd NOx

Daily Increase (VOC) = (0.09 tpd * 104.7% increase * 80% compliance) / 1.012 adjust to 2004
Daily Increase (VOC) = 0.07 tpd VOC

Net Decrease (NOx-VOC) = 0.10 tpd NOx - (0.07 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.038 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure T4: Idling restrictions for light commercial equipment

Measure Number: T4
Measure Name: Idling restrictions for light commercial equipment

Description:
Limit idling by light commercial equipment

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	0

Issues

· Industrial equipment is not left in idle for safety reasons. Also, owners are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

· 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 not reduce emissions. Therefore it is not a RACM.

Measure T5: Low-emissions light commercial equipment

Measure Number: T5

Measure Name: Low-emissions light commercial equipment

Description:
Require sale of low-emissions light commercial equipment in region

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	N/A
Estimated Reductions	N/A

Issues

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

· Because there are no regional standards for low-emissions light commercial equipment, rule development would be time consuming. A long compliance period would be required to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T6: Preference for low-emission light commercial equipment

Measure Number: T6
Measure Name: Preference for low-emission light commercial equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission light commercial equipment

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure requires an MOU with state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

· Benefits from this program will increase as old contracts expire. Benefits could eventually reach 2 tpd VOC

· Contractors could reduce emissions by using low-NOx, retrofitted or electric equipment

Assumptions

· From 2005 draft non-road inventory emissions from industrial equipment are:
  · 3.20 tpd NOx
  · 1.53 tpd VOC
· As in non-road inventory, use employment as proxy for growth in industrial equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· Assume local government use or contracts account for 5% of all use of this equipment
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 50%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC emissions would be reduced by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment will operate 312 days per year
· This analysis overestimates benefits and underestimates cost by assuming that all contracts are awarded annually

Emission Reductions

Total VOC Reduced = 1.53 tpd * 5% eligible * 10% awarded * 52.7% reduction / 1.013 adjustment to 2004
Total VOC Reduced = 0.004 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 312 days)

Cost-effectiveness (VOC) = $ 161,069

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure X1: EPA Tier II Emissions Standards for Large SI Engines

Measure Number: X1
Measure Name: EPA Tier II Emissions Standards for Large SI Engines

Description:
Adopt EPA Tier II standards before they become effective in 2007

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

Criterion Summary

Year of First Benefits	2007
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

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

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure X2: Biodiesel for Off-Road Equipment

Measure Number: X2
Measure Name: Biodiesel for Off-Road Equipment

Description:
Require all off-road diesel equipment to burn biodiesel during ozone season

RACM Determination: No
Reason: Not technologically feasible

Criterion Summary

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

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· EPA has not certified biodiesel to provide emission reductions for off-road vehicles. Therefore this measure is not technologically feasible.

Summary Analysis

This measure is not technologically feasible. Therefore it is not a RACM.