

Preliminary “High-Level” Evaluation Tool  
for Supporting Initial Prioritization of Ozone Reduction Measures

Area Sources Subcommittee  
September 9, 2011

**Strategy Overview Table**

**Strategies Included:**

- VOC Content Limits for Architectural & Industrial Maintenance and Consumer Products (Paper #12)
- Tree Planting Guidelines/Urban Forest Management (Paper #20)
- Zero Emissions Lawn and Garden Equipment (Commercial) – Incentives for replacement of spark ignition gas mower equipment (Paper # 23)
- Zero Emissions Lawn and Garden Equipment (Residential)- Incentives for replacement of hand-held equipment (Paper # 24)
- Indirect Source Rule (Paper #25)
- Operational Indirect Source Rule (Paper #26)
- State Funded Off-Road Diesel Emissions Reduction Program– Incentive to repower/replace/retrofit large off- road equipment (Paper #27)

**Preliminary Draft for Discussion Only**

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# RAQC Area Source Subcommittee

## Draft Summary of Strategies and Control Options

Paper No. & Measure	Description of Measure	Experience in Colorado / Other Areas	Existing Authority or Needed Approvals	Estimated Emission Reduction	Implementation/ SIP Feasibility	Additional Analysis Needed	Subcommittee Recommendation and Next Steps
12 - VOC Content Limits for Architectural & Industrial Maintenance and Consumer Products	Adopt California-like regulations for consumer products.	No current experience in Colorado. Twelve other states have adopted similar regulations.	Legislative action would be necessary for approval of additional APCD enforcement staff that would likely be needed to administer this type of rule.	Target pollutant would be VOCs. Perhaps up to 10 tpd may be reduced from this measure.	Other states have taken SIP credit for this measure. Specifically how they have done this needs to be further understood.	Update 2008 survey of how many of these lower VOC products are currently on the shelf in CO. Determine what the requirements from EPA would be in terms of enforcement to take SIP credit for this measure.	Continue exploring the status of the federal rule implementation, and how this measure may be implemented in Colorado's SIP.
20 - Tree Planting Guidelines/Urban Forest Management	Development of urban forest management program including low VOC emitting trees. Outreach to government agencies, residential and commercial development managers, landscape companies and citizens	Small studies in Colorado have assessed benefit of trees in terms of building cooling. No attempt to include urban forest management in a SIP. Other areas that have actively promoted urban forest management have not included it as a SIP measure.	Even with a statutory requirement, ultimate authority for implementation of a regulatory urban forest management program would probably fall to county and local government through ordinances.	Target pollutant would be VOC emissions from trees. No potential estimate has been developed.	There is no demonstrated ability to take SIP credit for this measure on a regional scale at this time. Some studies have shown that the combined simulated benefits from reforestation are smaller than the uncertainties inherent in the experimental modeling.	Establish current baseline of urban forest including inventory of tree species and canopy, potential improvements available, costs to achieve improvements, potential benefit in terms of changes in emissions and temperature moderation.	Possibly pursue on a voluntary basis as an outreach program to government agencies, residential and commercial development managers, landscape companies and citizens
23 - Zero Emissions Lawn and Garden Equipment (Commercial) - Incentives for replacement of spark ignition gas mower equipment	Providing incentives to permanently retire older, gasoline-powered commercial-grade lawn equipment and replace with cleaner technologies and/or alternative fueled equipment.	No current experience in Colorado. In Texas, a pilot program that exchanged gasoline-powered equipment with propane-fueled equipment was implemented. A relatively small amount of emissions were reduced due to limited funding.	The RAQC has the ability to implement such a program with funding.	The inventory contribution from commercial lawn equipment is approximately 23 TPD of VOCs and 6.5 TPD of NOx. No emission reduction estimates have been completed to date.	As a voluntary strategy, this program would likely not be included in the SIP for credit.	Work with Division staff to determine if there is a way to quantify emissions reduction for SIP level quality.	Continue to keep on the list pending ability to quantify emissions reductions.
24 - Zero Emissions Lawn and Garden Equipment (Residential) - Incentives for replacement of hand-held equipment	Providing incentives to permanently retire older, gasoline-powered residential-grade lawn equipment and replace with cleaner technologies and/or alternative fueled equipment.	The RAQC has operated a voluntary lawnmower trade-out program in place for the past nine years. Many other states have a similar program in place.	The RAQC has the ability to implement such a program, and has for nine years with various funding levels.	The RAQC's program has had funding to replace approximately 300 mowers each year which equates to an approximate 14,700 pound reduction in VOCs each year, equivalent to approx. 0.05 tpd.	As a voluntary strategy, this program would likely not be included in the SIP for credit.	Analysis of additional funding sources.	Park this strategy due to the low emissions benefits, but continue to implement as a voluntary program.

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## Draft Summary of Strategies and Control Options

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25 - Indirect Source Rule	Construction Mitigation to reduce off - road construction emissions from new development for large projects.	Currently Colorado mitigates PM emissions from new development sites greater than 25 contiguous acres and 6 months in duration. Other states have adopted indirect source regulations specific to off-road sources at these locations.	Legislative action would be necessary for approval of additional APCD enforcement staff that would likely be needed to administer this type of rule.	Target pollutant would be VOC and NOx emissions from off-road equipment. No potential estimate has been developed.	Other states have taken SIP credit for this measure. Specifically how they have done this needs to be further understood.	Establish current baseline of construction site emissions inventory, potential improvements available, costs to achieve improvements, potential benefit.	Continue exploring how other states take SIP credit for this measure, and refine cost estimates.
26 - Operational Indirect Source Rule	Reduce mobile emissions associated with new development of large commercial and residential projects after project completion through land use planning.	Other areas that have actively promoted urban development but it is unknown how this is included as a SIP measure.	The APCD would support and encourage the implementation of this measure, however the APCD may not have the authority to directly implement this measure through regulation.	Target pollutant would be VOC and NOx emissions from mobile sources. No potential estimate has been developed.	It would be difficult to take SIP credit for this strategy due to the uncertainties in cost, emissions reductions and enforceability issues.	Quantify the emission reductions associated with this measure.	Consider this strategy under implementation of land use measures previously developed.
27 - State Funded Off-Road Diesel Emissions Reduction Program - Incentive to repower/replace/retrofit large off-road equipment	Create a state funded off-road diesel retrofit and repower program similar to the Texas Emissions Reduction Program (TERP) to reduce emissions from construction sources.	Texas has the largest program in the US focused on off-road construction vehicles and has expended close to \$1B over the last 10 years. The RAQC has worked with industry to install off-road vehicle repowers (new engines) and performed limited vehicle retrofits to reduce construction emissions.	Legislative action would be required to develop a funding source for a program similar to Texas. AQCC could develop regulatory framework if required.	Texas' program achieves 7 tpd Nox reduction in the Dallas-Fort Worth and Houston-Galveston-Brazoria nonattainment areas. Benefits are also achieved in other areas not designated non-attainment.	Texas does not include this as a SIP measure due to concerns the State Legislature will reduce program funding and any Nox benefits committed to in a SIP will not be met. This occurred in the last legislative session and the TERP budget was significantly reduced. Texas does include this in their SIPs Weight of Evidence section.	None at this time.	Table this strategy due to issues regarding developing a funding source and any enforcement mechanism required for such a program. Continue with the voluntary RAQC program.

Preliminary “High-Level” Analysis Evaluation  
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DRAFT: For Discussion Only.

**Measure Tracking Number: 12**

**Measure type:** VOC Content Limits for Architectural and Industrial Maintenance and Consumer Products

**Measure name and description:** Statewide VOC content limits (beyond federal requirements) for Coatings and Consumer Products. This measure is evaluated at the statewide level because any potential Colorado-specific VOC regulation for these source categories would need to apply statewide to maintain consistency and to reduce any burden to product distributors. However, VOC emissions for the nonattainment are estimated for purposes of evaluating potential benefits.

Volatile Organic Compound (VOC) emissions from Architectural and Industrial Maintenance (AIM) Coatings and Consumer Products (CP)--including Household Products, Personal Care Products, Architectural Coatings (residential, institutional and industrial), other Industrial Maintenance products, and Automotive Aftermarket products-- are estimated at 52 tons per day in the 8-Hour Ozone nonattainment area and 80 tons per day statewide in 2008 (based on June 2011 preliminary estimates). Preliminary projections for 2020 emissions from these source categories are still being refined but are estimated at about 64 tons per day in the nonattainment area. Very preliminary estimates indicate that such regulations could provide perhaps up to ~10 tons per day reduction in VOC emissions statewide.

Previous VOC reduction credit taken/ Adjustments for Future Projections

Because EPA had anticipated adopting more stringent AIM/CP limits through federal rule by 2009, states, including Colorado (2008), were allowed to use a VOC emission reduction credit that should be reevaluated in any future VOC emission inventory updates. Based on written EPA guidance, an emission reduction credit of 22.5% was assumed when projecting 2010 VOC emissions for AIM and CP in the current 8-Hour Ozone SIP. At that time, a technical analysis by the Division indicated that adopting AIM/CP VOC limits beyond federal requirements would have resulted in about 8 tons per day VOC reduction statewide. (NOTE: The more stringent AIM/CP VOC limits were not adopted into the 2008 Colorado Ozone SIP, or into State-only rules but were reflected in the future VOC emission inventory.)

Rescission of the emission reduction credit for 2010 and beyond, plus anticipated growth in VOC emissions from AIM/CP appear likely to result in somewhat higher VOC emissions from these categories. In such case, adoption of more-stringent-than federal VOC limits for these source categories could result in VOC emission reductions of up to about 10 tons per day statewide. On the other hand, AIM/CP VOC emissions are mitigated by the fact that, increasingly, more products are designed to meet the more-stringent-than federal VOC standards, as they have been adopted by more than a dozen states. Product surveys as well as updated population projections are needed reduce the uncertainties in this analysis.

Federal and State AIM/CP Rules

Currently, EPA rules for AIM and CP are based on the 1996 version of California Air Resources Board (CARB) rules. The EPA had contemplated revising Federal rules between 2008 and 2011 to make them more stringent, but this has not occurred to date, and is not likely to occur prior to 2013.<sup>1</sup>

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1. Based on conversations and e-mails with EPA OAQPS staff in March and April, 2011.

## AIM/CP Rules in Other States

Twelve states have adopted more stringent AIM/CP rules, most often based on the Ozone Transport Commission (OTC) 2006 Model Rule, which is nearly the same as California Air Resources Board (CARB) regulations. The states include California, Connecticut, Delaware, Illinois, Indiana, Maine, Massachusetts, Maryland, Michigan, New Hampshire, New Jersey, and Ohio. Portions of Virginia and the District of Columbia have also adopted the 2006 OTC model rule provisions. (NOTE: Certain California counties have adopted VOC limits for a small number of AIM/CP that are even more stringent than 2006 OTC Model Rule provisions. In addition, the OTC has proposed an updated Model Rule for 2014 that contains a limited number of more stringent VOC limits for AIM and CP. However, Colorado should probably focus on the existing 2006 Model Rule as this rule is readily available for incorporation into the control measure analysis.)

### **Preliminary sense of anticipated air quality benefits:**

Regulation of VOC content in AIM and CP based on the 2006 OTC Model Rule may reduce VOC emissions statewide by up to 10 tons per day. This very rough and preliminary estimate takes into account likely higher projected 2010 VOC emissions from AIM and CP categories, which is somewhat mitigated by increased distribution/availability of Model Rule-compliant AIM and CP in the USA.

It should be noted that if most of the AIM and CP on Colorado store shelves is already mostly compliant with the OTC Model Rule, actual benefits of this measure could be considerably less than 10 tons per day.

### **Preliminary sense of anticipated costs:**

Costs to industry associated with a statewide rule will depend largely on reformulations needed. Reformulation costs can be high up front, sometimes requiring research and/or processing changes.

Administrative costs would include any agency costs associated with ensuring regulatory compliance. The OTC Model Rule contains provisions for record-keeping and reporting by manufacturers and distributors of applicable AIM/CP to the applicable State agency. There are also provisions for agency enforcement activity, including: review of product information and sales records; product-testing for VOC content; alternative control plan development and monitoring; oversight of surplus VOC reductions and potential trading of surplus reduction credits; issuing of notices of violations, and NOV fee collections. The APCD/CDPHE could adopt this enforcement model, modify it, or potentially use language that approves products deemed acceptable in other states with such rules and enforcement programs.

The CARB indicated in 2008 that a “from-scratch” AIM regulation would cost \$2,240 per ton reduction. In 2008, California’s South Coast Air Quality Management District indicated that it purchased 2,500 product samples annually to test VOC content. It found violations and settled 52 cases from 2007 to 2008, resulting in \$2 million in penalties. It is possible that states could share product test information, so as not to duplicate efforts.

The Indiana Department of Environmental Management recently estimated costs of \$4,800 per ton for both AIM and CP regulation. However, Indiana noted that the cost estimate assumed that all products would require reformulation, when in reality “much of this transition may have already taken place.” It is not clear whether such reformulation has occurred for products on store shelves throughout Colorado or the U.S., and this question could be investigated via formal product survey(s). The Indiana DEM told its legislature it could implement OTC Model Rule provisions with current staffing levels.

**Additional technical analysis needed to refine benefits/costs estimates:**

To refine the air quality benefits estimate the following activities are recommended:

1. Update and make more comprehensive the 2008 survey of AIM and CP/VOC content currently on Colorado store shelves;
2. Work with State Demographic Office to further refine population projections for Colorado;
3. Update VOC projections for AIM/CP source categories based on findings from survey;
4. Incorporate any additional relevant Colorado-specific factors.

**Implementation feasibility of OTC Model Rule Provisions:**

Implementation of such regulations is feasible, as many manufacturers and marketers of coatings and consumer products are already subject to OTC-type VOC limits in several states containing large populations/markets. Thus, such products have already formulated/re-formulated their products to the OTC Model Rule specifications.

**Demonstrated ability to take "SIP Credit" for the measure:**

SIP credit for adopting OTC Model Rule-type VOC limits would depend on rule enforceability, thus an enforcement program may be required if more reduction credit is needed for the SIP. Actual SIP credit would be further reduced by rule effectiveness which must be factored into the estimated VOC reduction.

**Likelihood that measure could be in place in time for SIP inclusion (approx 2015):**

SIP inclusion of phased-in VOC limits and other provisions from the OTC Model Rule appears to be feasible, however, more analysis needed.

**Preliminary Assessment of Co-benefits:**

The co-benefits of more stringent VOC limits for AIM and CP include reduced public exposure to toxic air pollutants during the application or use of coatings and personal products.

**Other Considerations/Comments:**

Emission Inventory for Architectural and Industrial Maintenance Coatings and Consumer Products

Category	8-Hour Ozone Non-Attainment Area		Colorado Statewide	
	2008 [tpd]	2020 [tpd]	2008 [tpd]	2020 [tpd]
<i>Adhesives and Sealants</i>	2.57		3.86	
<i>Architectural Coatings LBS</i>	13.60		20.44	
<i>Automotive Aftermarket</i>	6.13		9.20	
<i>Coatings and Related Products</i>	4.28		6.43	
<i>Consumer Solvents, Misc. Prod.</i>	0.32		0.47	
<i>Cutback Asphalt Tons</i>	0.14		0.23	
<i>Emulsified Asphalt Tons</i>	0.04		0.06	
<i>FIFRA-regulated/Consumer Prod.</i>	8.02		12.04	
<i>Household Cleaning Products</i>	8.11		12.18	
<i>Personal Care Products</i>	8.56		12.86	
<i>Traffic Paints (signs and roadway markings)</i>	0.64		2.67	
<b>Totals</b>	<b>52.4</b>		<b>80.4</b>	

NOTES: \*Based on preliminary Emission Inventory Information as of June 13, 2011

Next Steps:

To better quantify emission reductions and SIP credits that may be possible, the Division is researching VOC content of products on Colorado store shelves, as well as other states' SIP credit demonstrations, and actual experience with rule implementation.

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**September 2, 2011**

**Measure Tracking Number: 20**

**Measure type:** Biogenic Sources

**Measure name and description:** Tree Planting Guidelines/Urban Forest Management

This strategy involves developing an urban forest management program including low VOC emitting trees and providing outreach to governmental agencies, residential and commercial development managers, landscape companies and citizens concerning urban forest management in this region to reduce or improve the impact of the urban forests on ozone concentrations.

Urban vegetation can directly and indirectly affect local and regional air quality by altering the urban atmospheric environment. The four main ways that urban trees affect air quality are:

- Temperature reduction and other microclimatic effects
- Removal of air pollutants
- Emission of volatile organic compounds and tree maintenance emissions
- Energy effects on buildings

Urban forest management strategies to help improve air quality include:

- Increase the number of healthy trees (increases pollution removal).
- Sustain existing tree cover (maintains pollution removal levels).
- Maximize use of low VOC emitting trees (reduces ozone and carbon monoxide formation).
- Sustain large, healthy trees (large trees have greatest per tree effects).
- Use long-lived trees (reduces long-term pollutant emissions from planting and removal).
- Use low maintenance trees (reduces pollutants emissions from maintenance activities).
- Reduce fossil fuel use in maintaining vegetation (reduces pollutant emissions).
- Plant trees in energy conserving locations (reduces pollutant emissions from power plants).
- Plant trees to shade parked cars (reduces vehicular VOC emissions).
- Supply ample water to vegetation (enhances pollution removal and temperature reduction).
- Plant trees in polluted areas or heavily populated areas (maximizes tree air quality benefits).
- Avoid pollutant sensitive species (increases tree health).
- Utilize evergreen trees for particulate matter reduction (year-round removal of particles).

**Preliminary sense of anticipated air quality benefits (e.g. NO<sub>x</sub>/VOC reductions? Potential reduction amount?):**

At this time we have no estimate of the anticipated air quality benefits, if any, for the DMA/NFR region. Some other areas that have investigated urban forest management or reforestation found the following:

- New York City estimates a reduction of less than one half a percent in ozone concentration due to their tree canopy.
- Milwaukee estimates a little over 1 tpd in ozone reduction based on their current urban forest.

- Houston estimated a range in peak ozone changes of -1.5 ppb to + 2.1 ppb and concluded that the combination of effects overwhelmed the beneficial effects.

### **Preliminary sense of anticipated costs and economic impacts**

There is currently no cost estimate for the region to address improvement to urban forest management for air quality benefits.

### **Additional technical analysis needed to refine benefits/costs estimates:**

- Establish current baseline of urban forest for DMA/NFR
- Establish potential improvements in urban forest that could result in improved ozone air quality
- Establish costs to achieve improvements, including maintenance and energy effects on buildings.
- Establish potential benefit in terms of changes in emissions and temperature moderation due to urban forest management and impact on emissions due to urban forest maintenance and energy effects on buildings.
- Photo chemically model improvements to establish ozone reduction, if any

### **Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):**

The RAQC, with sufficient funding, could engage a contractor to assess the current urban forest baseline and develop a recommended plan that includes low emitting trees.

If a model urban forest management program were to be developed as a state rule, the implementation of the program would ultimately fall to the county and local government level and require changes to building and development ordinances. If the RAQC were to pursue a Commission rule, keep in mind that the governor recently signed an Executive Order with the following terms:

- To the extent authorized by law, no state agency shall promulgate any regulation creating a mandate on local governments unless:
  - The mandate is specifically required by federal or state law;
  - The agency consults with local governments prior to promulgation of the regulation; and
  - The state government provides the funding necessary to pay for the direct costs incurred by local governments in complying with the mandate.

Another avenue to possibly consider would be to make it illegal to sell, buy etc. high VOC emitting trees in the NAA, but this would limit the pallet of landscape architects, ignores other considerations of water requirements, longevity, etc. and require field inspections etc. by APCD staff.

This measure, if developed and pursued, is possibly better suited as a voluntary program, including the development of a best practices manual and outreach.

### **Demonstrated ability to take "SIP Credit" for the measure:**

**There is no demonstrated ability to take SIP credit for this measure on a regional scale available at this time. Even areas that have promoted urban forest management have not included it as a SIP measure**

**Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):**

It would require 10-15 years to begin to experience any potential benefit from an urban forest management program, and therefore is beyond the SIP timeframe.

**Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):**

- Carbon sequestration
- Energy impacts
- Water conservation
- Stormwater management

**Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):**

Low VOC emitting species include certain types of pine, hawthorne, walnut, juniper, linden and maple trees. High VOC-emitting trees include eucalyptus, sycamore, willow, aspen and certain oak varieties. Thus, maximizing the net benefits of trees and other vegetation requires careful selection of species for each individual location

There are a myriad of small studies that can demonstrate benefits to planting low VOC emitting trees or expansion of canopy or energy effects of tree planting, but other studies also show that the combined simulated benefits from reforestation are smaller than the uncertainties inherent in the experimental modeling.

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**September 1, 2011**

**Measure Tracking Number: 23**

**Measure type:** Area Sources

**Measure name and description:** Incentives to retire commercial-grade gasoline-powered lawn equipment

This strategy involves providing incentives to permanently retire older, polluting gasoline powered commercial lawn care equipment in exchange for a discount on lower-emissions models. This would assist public and private lawn care maintenance entities in obtaining earth-friendly lawn equipment at reduced rates.

Commercial lawn equipment is available in several types of alternative fuels including electric, propane, compressed natural gas (CNG) and biodiesel. Equipment prices are competitive with their gasoline-powered counterparts with electric equipment that ranges from \$3,000 to \$7,000; compressed natural gas-powered equipment priced around \$20,000 per unit; and, propane equipment that ranges from \$8,000 to \$17,000 per unit. Many retailers in the Denver-metro area are easily able to order these types of equipment.

There are other commercial companies offering lawn services such as Clean Air Lawn Care in the Denver area that offer “green” lawn care services and only use battery-operated or electric residential-grade equipment for lawn care services. This equipment is “green” and their fertilizers and lawn treatments are all organic, natural products.

A pilot program in the Dallas/Fort Worth, TX area replaced gasoline-powered commercial lawn equipment with cleaner burning propane equipment.

According to the U.S. Department of Energy propane is a clean burning alternative fuel and readily available via an existing infrastructure making it easy to obtain. Manufacturers of propane fueled equipment claim that it burns much cleaner than gasoline and as of December 2010 the U.S. Department of Energy says though there is a “substantial benefit” to replacing a gasoline-engine with propane however, there is currently no study of the actual benefits of propane over small gasoline-engines such as lawnmowers.

In 2008, the EPA revised emissions standards for non-road equipment under 25 horsepower that is estimated to reduce emissions from these sources by approximately 34 percent by 2030. The new standards take effect with the 2011 and 2012 model years.

**Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):**

In the preliminary 2020 emissions inventory, commercial lawn equipment accounts for approximately 6.5 percent or 23.8 TPD of VOCs and nearly 3 percent or 6.5 TPD of NOx.

Air quality benefits would be tied to reduced emissions from commercial lawn care including refueling and spillage. The pilot program in Texas had a budget of approximately \$82,000 and purchased two riding mowers, four walk-behind mowers, four smaller electric mowers, as well as four each of new trimmers and blowers. With this equipment, an estimated NOx reduction of about 0.00363 tons per day was achieved at a cost of \$82,000.

#### **Preliminary sense of anticipated costs and economic impacts**

Program costs and funding vary depending on the scale of implementation.

Equipment manufacturers claim a 30 percent reduction in operating costs when using propane instead of gasoline, but so far no study to date has quantified this benefit either.

#### **Additional technical analysis needed to refine benefits/costs estimates:**

- Work with the APCD staff to determine if there is a way to quantify emissions reductions using the current model or another tool.

#### **Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):**

The RAQC has the ability to implement such a program and has had a voluntary regional residential program in place for the past nine years.

#### **Demonstrated ability to take "SIP Credit" for the measure:**

A commercial lawn equipment exchange program provides some air quality benefit however, as voluntary program it would most likely not be included in the SIP for credit. SIP credit for this type of strategy could be developed with a substantial amount of record keeping.

#### **Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):**

See above. As a stand alone voluntary strategy, this would most likely not be included in the SIP, but with funding and record keeping this type of strategy could be included in the next SIP.

#### **Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):**

- Decreased commercial fuel usage and therefore fuel savings
- Increased quality of life due to decreased noise pollution
- Increased quality of life due to decreased inhalation of fumes from mowing
- Possibly an increased energy usage for the business

**Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):**

- There is a voluntary program in place throughout California but it is unknown at this time how these programs are quantified in the SIP.
- There may be other ways to cut down on the need for mowing such as operational considerations including specific times of day (evening hours) and the encouragement of xeriscaping or types of native grasses that may grow slower and require less mowing and water usage.

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**Measure Tracking Number: 24**

**Measure type:** Area Sources

**Measure name and description:** Incentives for citizens to retire gasoline-powered lawn equipment

This strategy involves providing incentives for citizens to trade-in an older, polluting gasoline powered lawnmower in exchange for a discount on a lower-emissions model. This strategy would assist citizens in obtaining earth-friendly lawn equipment at reduced rates. Similar programs exist on a voluntary basis around the country including California, South Carolina, Iowa and many others.

In 2008, the EPA revised emissions standards for nonroad equipment under 25 horsepower that is estimated to reduce emissions from these sources by approximately 34 percent by 2030. The new standards take effect with the 2011 and 2012 model years.

**Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):**

In the preliminary 2020 emissions inventory, residential lawn equipment accounts for nearly 2 percent of VOCs or 6 TPD and about 0.3 percent of NOx or 0.7 TPD.

Air quality benefits would be tied to reduced emissions from lawn care including refueling and spillage. In Colorado, each retired gasoline-powered mower reduces approximately 49 pounds of VOCs over the summer ozone season. In past years, the RAQC has been able to retire and replace nearly 300 mowers per year which equates to approximately 14,700 pounds of VOCs reduced or 0.05 tons per day.

**Preliminary sense of anticipated costs and economic impacts**

Program costs and funding vary depending on the scale of implementation. The RAQC has built a program over the past nine years offering incentives for citizens to voluntarily retire gasoline-powered lawn equipment in exchange for discounted earth-friendly equipment. Funding amounts vary although a general cost is \$100 per mower.

**Additional technical analysis needed to refine benefits/costs estimates:**

- Additional analysis of funding sources.

**Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):**

The RAQC has the ability to implement such a program and has had a voluntary regional program in place for the past nine years.

**Demonstrated ability to take "SIP Credit" for the measure:**

A residential lawn equipment exchange program provides some air quality benefit, yet is voluntary and therefore would most likely not be included in the SIP for credit.

**Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):**

See above. As a stand alone strategy, this would most likely not be included in the SIP.

**Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):**

- Decreased residential fuel usage
- Increased quality of life due to decreased noise pollution
- Increased quality of life due to decreased inhalation of fumes from mowing
- Possibly an increased energy usage per household

**Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):**

- There are voluntary programs in place throughout California but it is unknown at this time how these programs are quantified in the SIP.
- Emissions from residential equipment are so small that it would be difficult to make a large enough impact with an exchange program to make a difference.

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Measure Tracking Number: 25

Measure type: Point/Area Source

Measure name and description: Indirect Source Rule - Construction Mitigation to reduce off-road construction emissions from new development for large projects. Generally this strategy is merged with the Operational Indirect Source Rule (described in Measure Number 26)

This measure helps developers of large projects to design the location and decisions associated with the creation of the project in order to reduce air pollution. The pollution, specifically criteria pollutants (NO<sub>x</sub>, CO, SO<sub>2</sub>, PM, and PM<sub>10</sub>) and greenhouse gases is caused by energy consumption, vehicles used in the development project, and long-term use of the facility. In areas where this measure is employed, the developers apply for a permit and either employ emission reduction measures or pay a fee for their emissions. Emission reduction strategies may include using cleaner fuels, add on controls, cleaner construction equipment, reducing idling or building near public transit.

Note: In other states where this strategy is employed it is generally merged with the Operational Indirect Source Rule (described in Measure Number 26)

Currently, the Colorado Air Pollution Control Division (APCD) has permitting requirements for construction projects exceeding 6 months in duration or twenty-five contiguous acres, primarily for fugitive particulate matter (PM) emission control, as the APCD does not regulate combustion emissions from mobile equipment at this time. This rule would take these requirements a step further in order to look at the cumulative impacts from individual construction projects to potentially reduce air pollution emissions.

The specific language in Colorado’s Regulation 3 is the following:

II.D.1.j. Disturbance of surface areas for purposes of land development, that do not exceed twenty-five contiguous acres and that do not exceed six months in duration. (This does not include mining operations or disturbance of contaminated soil).

Preliminary sense of anticipated air quality benefits:

It is difficult to quantify the anticipated air quality benefits from this measure, due to the fact that each construction site is unique. The variability of equipment type, size and use are very individual and catered to the specific project site’s needs and goals. Therefore, this measure would have benefits to air quality, but these benefits would not be quantifiable and able to be put into a State Implementation Plan without significant work to quantify these emissions and ensure they are enforceable.

Preliminary sense of anticipated costs:

The cost to employ this measure would need to be understood more fully including how many sources may be affected by this change and what type of oversight might be required (modeling, monitoring, field inspection), as well as frequency of these activities to ensure compliance. The Division would need

to reach out to the industry to determine the additional workload to track and quantify the emission reductions from work practice changes.

Additional technical analysis needed to refine benefits/costs estimates:

In calendar year 2010, the APCD issued 89 general permit coverage letters, 32 construction permits, and 22 exemption letters for land development activities that were either over 25 contiguous acres or 6 months in duration. In order to understand potential emissions from individual construction projects, surveys, extensive stakeholder meetings, and research would need to be conducted.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

Although the APCD may have the authority to implement this measure, it would be difficult to enforce because conducting inspections on this type of source would be incredibly labor intensive. However, this could be a voluntary measure for companies to reduce their impact on the environment.

Demonstrated ability to take "SIP Credit" for the measure:

At this point it would be very difficult to take SIP credit for this measure due to the fact that these types of reductions are not even quantifiable at this time. Perhaps in the future, if this measure is encouraged as a voluntary measure, then these emission reductions can be quantified for the SIP in the future and an appropriate enforcement schedule can be established.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later:

It is very unlikely that this measure could be in place for inclusion in the SIP for 2015 due to the fact that there are many uncertainties in the quantity of emissions that may be reduced and it would be incredibly labor intensive and costly to have inspections on this type of source category.

Preliminary Assessment of Co-benefits:

There are co-benefits to this measure including improved air quality, increased fuel efficiency and perhaps longer life of work equipment. Also, this measure would improve the quality of life for the people working on the construction site, immediate surrounding area, and general air quality.

Other Considerations/Comments:

This measure is employed in the San Joaquin Valley in California, as well as other areas of the country. At this time, the San Joaquin Valley employs approximately 14 full time employees with respect to the Indirect Source Rule in order to accomplish the following tasks: issue permits, do compliance assurance, and manage fees. Exactly how other areas of the country calculate emission reductions from the Indirect Source Rule for inclusion in their SIP is unknown at this time, but is a topic the APCD is looking at further.

Preliminary “High-Level” Evaluation Tool for Supporting Initial Prioritization  
Of Ozone Reduction Measures  
DRAFT: For Discussion Only.

**Measure Tracking Number: 26**

**Measure type:** Area Source

**Measure name and description:** Operational Indirect Source Rule: reduce mobile emissions associated with new development of large commercial and residential projects after project completion through land use planning. Generally this strategy is merged with the Indirect Source Rule (described in Measure Number 25)

This measure looks at the source of mobile emissions associated with a land use project after completion. This includes designing a community around the needs of the residents in the area including: grocery stores, shopping, coffee shops, restaurants, etc. in order to reduce vehicle trips and distance traveled. Additionally, development areas would be more densely populated and mixed between residential and commercial use. This mixed-use planning would allow residents to quickly and easily commute between work and home. Bike lanes and bus stops would be prevalent and well placed to encourage the use of these modes of transportation as opposed to single driver vehicles. These types of measures are used in combination with the Indirect Source Rule (Measure Number 25) in order to achieve required emission reductions.

Denver Regional Council of Governments’ Metro Vision 2035 Plan lays out the long-term vision for improving a future for the residents of the metro area. One of the aspects covered as part of the vision includes improving air quality through land development, growth, and regional transportation.

**Preliminary sense of anticipated air quality benefits:**

The anticipated air quality benefits include a reduction in NO<sub>x</sub> and VOCs due to reduced mobile source emissions, more public transportation options, less vehicle trips and distance traveled. However, it is difficult to quantify the amount of anticipated air quality benefits (NO<sub>x</sub>/VOC reductions) due to the fact that this strategy is very unique to a particular neighborhood’s design, transportation options, and zoning. Site specific modeling would need to be conducted in order to understand the potential emission reductions.

**Preliminary sense of anticipated costs:**

It is difficult to quantify the anticipated costs of this measure, as there would be both costs and cost savings on many levels.

**Additional technical analysis needed to refine benefits/costs estimates:**

Additional technical analysis that is needed to refine the benefits/costs estimates. Research into how the San Joaquin Valley has employed this measure may illuminate more details of what type of technical analysis would be needed to refine the cost/benefit estimates.

**Implementation feasibility:**

Because this strategy falls outside the traditional area of regulation, it is unclear whether the Commission has the authority to adopt an operational indirect source rule. The Division supports and encourages implementation of this measure on a voluntary basis if it is not employed in regulation. As previously mentioned, DRCOG developed the Metro Vision 2035 long-range planning document as the

primary policy tool in promoting land development principals based on a collaborative process involving numerous stakeholders in the Denver Metro Area.

**Demonstrated ability to take "SIP Credit" for the measure:**

It appears that it would be extremely difficult to take SIP credit for this measure due to the fact that there are so many uncertainties in the associated costs, the anticipated emission reductions, and the enforceability of this measure with EPA.

**Likelihood that measure could be in place in time for SIP inclusion (approx 2015):**

It is very unlikely that this measure could be in the 2015 SIP, due to the fact that the planning horizon for this strategy reaches far beyond 2015, the emission reductions have not been quantified and the actions to ensure enforceability have not yet been determined. Perhaps in the future, this option could be more closely examined with EPA for inclusion in the SIP.

**Preliminary Assessment of Co-benefits:**

A preliminary assessment of this strategy shows many co-benefits including those to air quality, economy, quality of life, and transportation. This strategy would improve air quality due to the fact that well planned urban communities would encourage alternative modes of transportation, including walking, cycling, or using public transportation. Vehicle trips would be shorter and less frequent due to the close proximity of residential areas and commercial development. The benefits to the economy include encouraging smart urban growth for residential living and commercial businesses. Additionally, the benefits to transportation include structuring the city in a way that promotes alternative transportation, as well as shorter and less frequent vehicle trips.

**Other Considerations/Comments:**

This measure is employed in the San Joaquin Valley in California, as well as other areas of the country, however it is generally merged with the Indirect Source Rule (Measure Number 25). Exactly how other areas of the country calculate emission reductions from the Indirect Source Rule for inclusion in their SIP is unknown at this time, but is a topic the APCD is looking at further.

Preliminary “High-Level” Analysis Evaluation  
for Supporting Initial Prioritization of Ozone Reduction Measures  
Draft: For Discussion Only

September 2, 2011

**Measure Tracking Number: 27**

**Measure type:** Motor Vehicles

**Measure name and description:** State Funded Off-Road Diesel Emissions Reduction Program

The Texas Emission Reduction Program (TERP) is a voluntary state funded grant system created in 2001 to address a variety of emissions reduction projects. TERP primarily awards money to businesses that replace older on-road and non-road diesel equipment with newer units that have lower NOx emissions. Retrofits and energy efficiency projects are also eligible under TERP. This paper covers only the off-road portion of the TERP program.

According to the TCEQ, “A primary purpose of the TERP is to replace, through voluntary incentive programs, the reductions in emissions of oxides of nitrogen that would have been achieved through two mandatory measures that SB5 directed the TCEQ to remove from the State Implementation Plan (SIP) for the Dallas–Fort Worth (DFW) and Houston-Galveston (HGA) ozone nonattainment areas. Those reductions totaled 35.2 tons per day (tpd), to be achieved in 2007. The two strategies that were removed were:

- A limit on the use of construction and industrial equipment from 6 a.m. to 10 a.m.; and
- A requirement that the owners and operators of diesel-powered construction, industrial, commercial, and lawn and garden equipment 50 hp and above replace their affected equipment with newer Tier 2 and Tier 3 equipment within certain designated deadlines.”

The program is administered by the Texas Commission on Environmental Quality (TCEQ). While the TCEQ administers general TERP grants statewide, the North Central Texas Council of Governments administers TERP Partnership Program grants locally through an agreement with the TCEQ. The program is funded primarily through vehicle title fees and surcharges on the sale of trucks and heavy duty diesel equipment. A number of elements are contained in TERP. These include:

- Emissions Reduction Incentive Grants (ERIG) Program: The ERIG is administered by the TCEQ. The program provides grants in affected counties to offset the incremental cost of activities to reduce emissions of NOx from high-emitting diesel mobile sources. ERIG funds will fund the upgrading or replacement of on-road vehicles, non-road equipment, locomotives, marine vessels, stationary equipment and infrastructure systems (i.e., truck stop electrification, etc.).
- Rebate Grants Program: The Rebate Grants Program is a simplified application process under the ERIG. Rebate grants are only available for diesel on-road and non-road replacement and repower projects.
- Texas Clean Fleet Program: The Texas Clean Fleet Program offers grants to replace heavy-duty and light-duty on-road diesel vehicles with alternative fuel and hybrid vehicles.

- New Technology Research and Development Program: The New Technology Research and Development Program (NTRD) provides financial incentives to encourage and support research, development, and commercialization of technologies that reduce pollution in Texas.

**Preliminary sense of anticipated air quality benefits (e.g. NO<sub>x</sub>/VOC reductions? Potential reduction amount?):**

The TERP covers two nonattainment areas in Texas in addition to other affected counties in high population areas. The first is the Dallas/Fort-Worth (DFW) Nonattainment Area. The 2008 DFW NONROAD model emissions inventory indicates that 77 come from non-road sources. The benefits for this area from the TERP program are approximately 3.4 tpd.

The other area is the Houston-Galveston-Brazoria (HGB) Nonattainment Area. The 2008 HGB NONROAD model emissions inventory indicates that 65 tpd come from non-road sources. The benefits for this area from the TERP program are approximately 3.6 tpd.

**Preliminary sense of anticipated costs and economic impact:**

From 2001 to February of 2010, the TERP has expended \$786M. Of this amount, \$250M was expended on non-road projects. The remainder of the program expenditures are from other aspects of the program.

The overall program cost per ton of NO<sub>x</sub> reduced is \$5,000. For non-road projects, the cost per ton is \$7,000.

This program is funded through fees and surcharges established by the Texas Legislature. Annual program expenditures vary depending on the cash flow to the program and the amount of revenues received. The average annual cost of the program over the past 10 years is \$78M - \$79M.

**Additional technical analysis needed to refine benefits/costs estimates:**

Additional development of this strategy is required in order to fully understand its costs and benefits. Specifically, we must determine what types of diesel vehicles reside in the Denver metropolitan area and what types of technologies can be used to reduce their emissions. EPA's 2006 ***Diesel Retrofits: Quantifying and Using Their Benefits in SIPs and Conformity Guidance for State and Local Air and Transportation Agencies*** discusses the use of the National Mobile Inventory Model 2005 (NMIM) with MOBILE6.2 and NONROAD2005 to quantify program benefits in SIPs and conformity determinations.

Additional analysis would also need to include how effective other state programs might be if applied in Colorado.

**Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):**

Voluntary efforts to repower, replace, retrofit and refuel diesel vehicles are underway by the RAQC, CDPHE and the City and County of Denver as well as by private fleets using their own funding. Many states have voluntary efforts in place.

A funding source could be developed as a part of the program similar to the TERP or California's Diesel Retrofit Program, known as the Carl Moyer Program.

**Demonstrated ability to take "SIP Credit" for the measure:**

This program is not included as a SIP measure but is instead discussed in the Texas SIP's Weight of Evidence section. The primary reason for this is the potential for the TERP program to be ended by the Texas Legislature. In the last legislative session, significant budget cuts were made. In addition, the TERP program is difficult to estimate SIP credit for due to the timing of emissions reductions and estimating program vehicle usage.

**Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):**

This effort could be developed in time for SIP inclusion.

**Preliminary assessment of co-benefits (e.g. other air quality, economic, quality of life, transportation etc):**

Diesel particulate matter is a known human carcinogen. Reductions of this pollutant would increase quality of life.

Reductions of black carbon from diesel PM offers an added benefit to reducing climate change due to its high global warming potential. Black carbon is estimated to be up to 4,500 times higher than that of CO<sub>2</sub> on a per gram of emission basis (MECA, 2009, Retrofitting Emissions Controls for Diesel Powered Vehicles).

In addition, significant fuel savings are realized by not idling the truck's main engine. This also provides cost savings through less wear and tear on the engine.

**Other considerations/comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):**

The RAQC has operated a voluntary diesel retrofit program since 2003. CDPHE and the City and County of Denver have been performing diesel retrofits for the past three years.