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# Roanoke Area Clean Air Plan

# 2nd Semi-Annual Status Report

For

# The Roanoke Ozone Early Action Compact Area

December 31, 2003

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# Roanoke Area Clean Air Plan

## INTRODUCTION & PROJECT BACKGROUND

The Roanoke MSA entered into an Early Action Compact (EAC) with both the Commonwealth of Virginia and EPA for the area including Botetourt and Roanoke Counties, the Cities of Roanoke and Salem, and the Town of Vinton. All the parties involved signed and submitted the Compact to the EPA by December 31, 2002. The area then established and commissioned the Roanoke Early Action Plan Task Force to serve as the major stakeholder group to coordinate the development of the early action plan (EAP) for the area. The goal of an EAP is to develop a comprehensive strategy that will bring the area into attainment of the 8-hour ozone standard by 2007. We will achieve this goal by selecting and implementing local ozone precursor pollutant control measures that when combined with other measures on the state and national level, are sufficient to bring the area into compliance with the standard.

This 2nd Semi-Annual Status Report fulfills the second reporting milestone to EPA required by the EAC. It describes the significant events and progress made since submittal of our 1st Semi-Annual Status Report on June 30, 2003, the public participation process, and the continuing technical support activities that support the overall planning effort.

## PROGRESS SUMMARY

On June 30, 2003, we submitted our 1st Semi-Annual Status Report to EPA. That report fulfilled the first reporting milestone required by the EAC.

This 2nd Semi-Annual Status Report provides a list of the control measures under consideration for adoption by the Roanoke areas. The table on the next three pages lists and describes each measure and provides the likely implementation dates, a current assessment of the amount of emission reductions expected to be achieved through implementation of the measure, and the geographical area in which each control measure is anticipated to apply.

The specific process used to select and evaluate the potential local control measures being carried forward for further consideration and presented in this report is presented below:

- During the August taskforce meeting, all participating members cast initial votes for potential control measures to be carried forward in process from the original June 16th potential local control measure list that was submitted to EPA. The top measures from this voting were those the group generally believed were most likely to be effective and acceptable if included in the final local control plan.

- Three subcommittees made up of taskforce members were established during the September meeting to individually evaluate each potential local control measure that was previously voted forward in the process. These subcommittees covered the following categories of potential local controls:

    1. Heavy Duty Diesel and Diesel equipment strategies
    2. Air-quality action day, public education, and stationary sources strategies
    3. Lawn and garden equipment strategies

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- The individual committees met continuously during October to define, evaluate, and quantify (to the extent possible), the measures in each category. Once this process was completed, a draft local control plan was developed and presented to the whole task force in November and accepted for inclusion in the current status report during the December taskforce meeting.

**Updated Stakeholder Involvement and Meeting**

This summary is intended to log the public information, education and participation related efforts concerning the Ozone Early Action Plan (EAP).

* Note: The Ozone EAP Task Force is a broad based stakeholder committee established to guide the consultant (E.H. Pechan Associates) and Roanoke Valley-Alleghany Regional Commission (RVARC) staff in the development of the EAP, when it is not practical to engage the public at large on every minor detail. In this sense the Task Force "represents" the public throughout the process. The public at large is engaged and will continue to be engaged periodically, such as during the May 29, 2003 public input meeting (see below).

The "Task Force" is staffed by the RVARC, making Wayne Strickland the ex-officio director of the "Task Force." Thus far, we have not turned away any stakeholder interested in serving on the Ozone EAP Task Force. Thus, the complete make-up of the Task Force is not static; however, its approximate current makeup includes representation from the following organizations at a minimum ***( Blue Ridge Bicycle Club, Roanoke Regional Chamber of Commerce, Blue Ridge Environmental Network, US Forest Service, Piedmont Environmental Council, RIDE Solutions, Salem – Roanoke County Chamber of Commerce, Virginia Tech, Norfolk Southern Corp., Southern Environmental Law Center, Clean Valley Council, Roanoke Valley Greenways Commission, Roanoke Valley Asthma and Air Quality Coalition, Sierra Club – Virginia Chapter, Roanoke Valley Economic Development Partnership, Roanoke Valley Resource Authority, Virginia Health Department, City of Roanoke, City of Salem, County of Roanoke, County of Botetourt, Town of Vinton, Virginia DEQ, Virginia DOT (VDOT), Federal Highway Administration)*** Many other organizations have participated on an ad hoc basis. There is room for new organizations to participate as the planning process continues.

- ***Monday December 16, 2002*** Early Action Compact (EAC) Signing Ceremony, Public and Press Invited, Press Releases preceded the event, a media pack was developed in conjunction with RVARC's on call PR Consultant.
- ***January 14, 2003*** Ozone EAP Task Force Kickoff meeting (*see Task Force Makeup Above)
- ***Wednesday February 19, 2003*** – EAP was featured in Leadership Roanoke Valley Air Quality Program at Roanoke County Fire and Rescue Training Center (LRV Quality of Life Program – All Day)

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- ***February 28, 2003*** – EAP Task Force Meeting – Consultant Presentations and Selection of finalist for contract.
- ***March 28,2003*** – **EAP Task Force Meeting** – Air Quality Modeling Presentation and Discussion – Virginia DEQ
- ***March 10, 2003*** – Oral Presentation to Cosmopolitan Club (Mark McCaskill, Lunch Meeting, Q&A included)
- ***April 10, 2003*** – Oral Presentation to Roanoke Regional Chamber of Commerce Transportation Committee concerning the EAP. (Mark McCaskill, 12:00 pm, Q&A included)
- ***April 23, 2003*** – Oral Presentation to Roanoke Valley Greenways Commission concerning the EAP. (Mark McCaskill, 5:00 pm, Q&A included)
- ***May 1, 2003*** – Media Interview Channel 10 6:00 O'clock News
- ***May 2, 2003*** – **EAP Task Force Meeting** – E.H. Pechan Associates – Draft Strategies Menu Discussion
- **May 15, 2003** Advertisement sent to ***Roanoke Times*** and ***Roanoke Tribune*** for May 29, 2003 public input meeting. Advertisement will run in the Sunday May 18, 2003 Edition (Roanoke Times) and Thursday May 22, 2003 edition (Roanoke Tribune).
- ***May 16, 2003*** – Distribution of Draft Strategies List to "Regional Mayor's and Chairs" meeting (Local Elected and Chief Administrative Officers for the Region)
- ***May 16, 2003*** – Notice of May 29th public meeting in Roanoke Regional Chamber's Monthly Electronic Newsletter "Member Connections"
- ***May 19, 2003*** – **EAP Task Force** teleconference meeting with E.H. Pechan concerning draft strategies.
- ***May 19, 2003*** – May 29th meeting **press release** to following recipients (Joe McKean, WDBJ-TV; Melissa Preas, WSLS-TV; Ray Reed, The Roanoke Times; Chris Kahn, Associated Press; William Little, Fincastle Herald; Claudia Whitworth, The Roanoke Tribune; Jeff Walker, The Vinton Messenger; Meg Hibbert, Salem Times Register; Rick Mattioni, WVTF-FM (Public Radio); Kevin LaRue, WFIR-FM (Roanoke's News Radio)
- ***May 27, 2003*** – Retransmission of above press release
- ***May 29, 2003*** – Interview with Dan Heyman WVTF News concerning public meeting
- ***May 29, 2003*** – Article published in Roanoke Times concerning public meeting (see file)
- ***May 29, 2003*** – Public Meeting Roanoke County Headquarters Library

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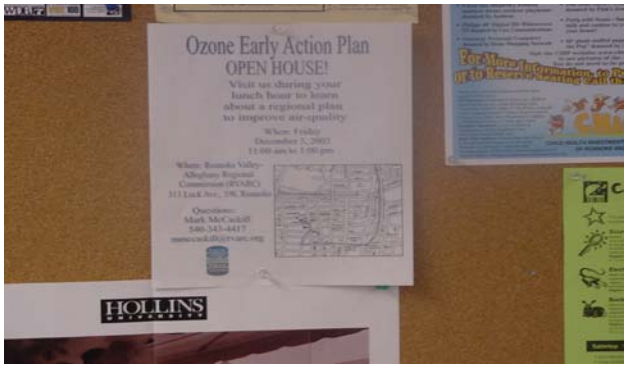
(28 Attendees) – Public comments cataloged and transmitted to consultant (E.H. Pechan) for revision of draft strategies list.

- ***June 25, 2003*** – Isak Howell (The Roanoke Times) requests the list of potential strategies to do an Ozone related story.
- ***June 26, 2003*** – Isak Howell story appears in The Roanoke Times and mentions the Ozone EAP and public participation.
- ***July 30, 2003*** – Ozone EAP featured in July 29, 2003 edition of "Legislative Connection" email distributed by Roanoke Regional Chamber of Commerce.
- ***August 8, 2003*** – Ozone EAP Task Force meeting. Initial "Voting" on strategies.
- **SEPTEMBER** – Article featuring Ozone EAP process and the Roanoke Valley's participation featured in the National Association of Development Organizations' (NADO) "Economic Development Digest" September Edition – Kelly Novak Author
- ***September 4, 2003*** – Ozone EAP Task Force meeting and establishment of "subcommittees" to evaluate strategies.
- ***September – November,*** 2003 Various subcommittee meetings.

- ***November 14, 2003*** – Ozone EAP Task Force Meeting.
- ***November 26, 2003*** – Press Release to announce December 5, 2003 EAP Open House
- ***November 30, 2003*** – Advertisement of December 5, 2003 in *Roanoke Times*
- ***December 1, 2003*** – Notices placed at City of Roanoke Main, Gainsboro, Jackson, Melrose and Williamson Road Library Branches.
- ***December 2, 2003*** – City of Roanoke Environmental Information Officer placed November 26 Press Release in the City's "My Roanoke" email newsletter.
- ***December 2, 2003 –*** Notices announcing Open House placed at Harrison Museum of African American Culture as well as Refugee & Immigration Services.

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- ***December 5, 2003 –*** Ozone Open House 11:00 am to 1:00 pm.
- ***December 5, 2003 –*** Ozone Task force meeting. Decision made to move forward with the draft local control measures.
- ***December 19, 2003*** – Ozone Task force meeting. Presentation on the modeling exercise and results to date.

**December 5, 2003 Open House**

**Local Control Measures Still Under Consideration**

Described below is a summary of the potential local control strategies that remain under consideration for inclusion in the final Early Action Plan. These control measures are grouped according to the categories and subcommittees established by the Taskforce to evaluate these measures. **A detailed description all these potential control measures and projected implementation dates is presented in Attachment A.**

***Heavy Duty Diesel and Diesel Equipment Strategies***

#1 – Reduction of locomotive idling and resulting emissions. Through a local voluntary agreement, the Norfolk Southern Railroad Company would implement an internal policy to limit locomotive idling at its facilities/yards in the City of Roanoke. This measure will reduce emissions of both $NO_X$ and fine particulate matter (PM) and will be in addition to emission reductions from federal locomotive controls. A detailed estimate of these reductions is currently under development.

#2 – Limitation of idling times for local school bus fleets. This measure would involve the expansion of existing school bus idling restrictions to the entire EAP area. An initial estimate of reductions expected from this measure is 0.7 tons/year of $NO_X$ and an undetermined amount of PM.

#3 – Retrofit control technology for 100 Roanoke County school buses. This measure will involve the installation of oxidation catalysts on 100 school buses. An initial estimate of the reductions expected from this measure is 0.3 tons/year of VOCs, 0.07 tons/year of PM, and 1.2 tons/year of Carbon Monoxide (CO). It is likely that the City of Roanoke will also participate in this program which will increase the reduction estimate.

#4 – Purchase and use of bio-diesel compatible solid waste trucks by the City of Roanoke. This measure would involve the conversion of five new garbage trucks to use bio-diesel fuels. An initial estimate of the reductions expected from this measure is approximately 250 kilograms/year of $NO_X$ and 8 kilograms/year of PM.

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#5 – Purchase and use of ethanol compatible alternative fuel vehicles by the City of Roanoke. This measure would involve the purchase and use of up to 26 alternatively fueled vehicles. The estimate of reduction from this measure will developed once the details are determined.

#6 – Purchase of bio-diesel ready truck by the City of Roanoke. This measure involves the prior and future purchase and use of waste trucks utilizing bio-diesel fuels. The estimate of reduction from this measure will developed once the details are determined.

#7 – Purchase of hybrid vehicles by the City of Roanoke. This measure would involve the purchase and use of up to four hybrid vehicles. The estimate of reduction will depend on the number of vehicles purchased and will be developed once this is determined.

#8 – Purchase of more efficient, low-emission, or alternative fuel vehicles by Roanoke County. A plan is currently being develop by the County for these purchases, and the reductions anticipated will be calculated once this plan is completed and approved.

#10 – Educational and training program of vehicle use by Roanoke County. The County has implemented an educational program on “effective environmental driving”. Reductions will be estimated based on observed fuel use reductions achieved after the completion of the training.

***Air Quality Action Day, Public Education, and Stationary Sources Strategies***

The center piece of the proposed local control plan will be a comprehensive air quality (ozone) action day program which will require restrictions on ozone precursor pollutant producing activities by state/local governments and encourage voluntary restrictions of similar activities on local businesses and the public. The DEQ already issues local forecast of ozone levels for the Roanoke area during the typical ozone season. An enhanced forecasting tool for the Roanoke area is currently under development and will be used as part of this action day program. Another key component of this program will be an ongoing public awareness and education program to notify and inform the public on action they can take to reduce their individual impact on the area’s air quality. To facilitate this program, regional and local air quality coordinators will be assigned to implement and coordinate the efforts involved. The main components of the air quality action day program, along with several longer-term support activities are as follows:

#11 – Air quality action day program (hybrid approach). This program would consist of two main efforts. First, local governments would make commitments to limit or ban certain ozone precursor forming activities during predicted high ozone days. These activities would include landscaping, pesticide application, refueling vehicles, and use of other solvent based products. The State Department of Transportation, which performs many of the same activities in the local area, would also make this commitment. Secondly, voluntary restrictions on these same activities would be requested of local business and the general public during potential high ozone days. At the same time businesses and the public would be encouraged to make alternative commuter choices such as car or vanpools, public transit, telecommuting, and trip-chaining.

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#12 – Early morning or late evening refueling of vehicles. This measure would also have a mandatory and voluntary component. Local governments and state agencies would restrict vehicle refueling during high ozone days to the evening. At the same time, local gasoline distributors would be encouraged to provide incentives to the public to refuel early or late in the day during high ozone days.

#13 – Promotion of alternative fuel vehicles. As part of the public awareness and education program, the environmental and economic benefits of alternative fuel vehicles would be identified as encouragement to purchase these vehicles.

#14 – Media and public relations concerning air quality action days. A comprehensive and year-round media and public relations program would be implemented and coordinated by a regional air quality and ride-sharing coordinator and assisted by local coordinators.

#15 – Public transit incentives (transit passes) for college students and local employers. This would involve the purchase of at least 300 transit passes to be distributed to students and employers for use during high ozone days or year-round.

#16 – Bicycle infrastructure and amenities. This program would encourage bicycle use during high ozone days and encourage the expansion of bicycle related infrastructure.

#17 – School (K-12 and adult education) based public education. This would involve expansion of an ongoing educational program to identify air quality issues and individual action that can be taken to reduce ozone precursor emissions at area primary and secondary schools.

#18 – Tree canopy/ urban forestry. This would involve an area-wide comprehensive tree-planting program with the goal of reducing concentrations of certain pollutants including ozone and $NO_X$ .

#19 – Roanoke to Blacksburg public transit. Establishment of a bus route from Roanoke to Blacksburg (where Virginia Tech is located), and point in between. This would reduce vehicle trips within the compact area and produce a 0.9 ton/year reduction of $NO_X$ and 2 ton/year reduction of VOC.

Although it is very difficult to estimate ozone precursor emission reduction that will be achieved from these individual actions, it is not unreasonable to assume that all these actions combined will have the desired impact of reducing emissions to some extent. Through the evaluation of these types of programs in other areas, a general range of emission reductions that can be expected from these measures is from 1 to 3% of total area emissions. Therefore, an initial estimate of a 2% reduction in ozone precursor emissions in the Roanoke area will be produced by the combination of these measures during predicted high ozone days. This equates to a daily reduction of 0.9 ton/day of VOC and 1 ton/day of $NO_X$. A more refined estimate of the reductions expected from this program as a whole will be provided in the final early action plan.

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***Lawn and Garden Equipment Strategies***

#20 – Replacement of gasoline golf carts with electric carts. This measure will involve obtaining commitments from up to four local golf courses to replace some or all of their golf carts with electric carts. Replacement of 100 gas carts with electric carts would produce a VOC reduction of 25 tons over three years.

#21 – Gasoline powered lawnmower buyback program. This would involve providing incentives for the public to trade in gasoline powered lawnmowers for zero emissions equipment (electric or manual). The Taskforce is currently working to identify an funding source for this program.

#22 & #23 – Restrictions on the use of lawn and garden equipment. This would be another two-part control measure with mandatory restrictions the use of gasoline powered lawn and garden equipment for state/local governments and voluntary restrictions on local businesses and the public, during predicted high ozone days. Assuming a five- percent reduction in lawn & garden emissions from this measure, VOC emissions would be reduced by 0.2 tons/day.

**State & Federal Control Measures**

In addition to the local control measures identified in the preceding discussion, there several state and federal actions that have or will produce substantial ozone precursor emission reductions both inside and outside of the Roanoke Valley area. These reductions are aimed at reducing local emissions and the movement (transport) of pollution into the area. These measures, when combined with the local control program, are expected to lower area ozone concentrations to the level at or below the ozone standard.

At the state level, several significant actions have been taken. First, in response to EPA's call for the reduction of $NO_X$ emissions from large combustion sources (i.e., the $NO_X$ SIP Call), the state has adopted and will implement a program to significantly reduce emissions on $NO_X$ as part of a regional program to reduce ozone transport. This program alone is predicted to reduce ozone forming $NO_X$ emissions by up to 30,000 tons per ozone season in Virginia. Secondly, the state opted into the National Low Emission Vehicle program that began to require less polluting vehicles in the state, beginning in 1999. Also in 1999, Stage I vapor recovery systems were required at gasoline stations in the Roanoke area. To further address local emissions, the state has recently adopted Reasonably Available Control Technology (RACT) controls for industries in the area, to further reduce the local contribution to ozone formation. The emission reduction expected from RACT in the area is currently being evaluated on a source-by-source basis. Compliance with the RACT rule will be required by the end of 2005.

On the federal level, numerous EPA programs have been or will be implemented to reduce ozone pollution. These programs cover all the major categories of ozone generating pollutants and are designed to assist many areas to come into compliance with the federal ozone standard. A brief description of these measures is provided below:

***Stationary & Area Source Controls:*** In addition $NO_X$ SIP Call program, the EPA has developed a number of control programs to address smaller "area" sources of emissions that

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are significant contributors to ozone formation. These programs reduce emissions from such sources as industrial/architectural paints, vehicle paints, metal cleaning products, and selected consumer products.

***Motor Vehicle Controls:*** The EPA continues to make significant progress in reducing motor vehicle emissions. Several federal programs have established more stringent engine and associated vehicle standards on cars, sport utility vehicles, and large trucks. These programs combined are expected to produce progressively larger emission reductions over the next twenty years as new vehicles replace older ones.

***Non-Road Vehicle & Equipment Standards:*** The category of "non-road" sources that covers everything from lawn & garden equipment to aircraft, has become a significant source of air pollutant emissions. In response, EPA has adopted a series of control measures to address these sources. These programs include engine emission standards for lawn & garden equipment, construction equipment, boat engines, and locomotives.

All these measure have been developed to address both the creation of ozone producing emissions in the local area, as well as reducing the movement of ozone into the area as a comprehensive approach to reducing ozone levels. A full summary of these state and federal measures is presented in Attachment B.

## Air Quality Technical Support Activities

In the first status report, the technical discussion described the process generally used to evaluate air pollution problems and the tools used to do this evaluation. The report then went on to present the base year air pollutant emissions inventory for a typical ozone season day during calendar year 1999. This base year was selected because of the availability of comprehensive emissions inventory through the National Emissions Inventory (NEI) data base maintained by EPA, which has also served as the data source for the photochemical modeling domain that is part of the technical analysis needed to support the EAP process.

For comparison purposes, and to document any trend of emissions in the Roanoke Valley area, a typical ozone season day emissions inventory for calendar year 2002 is summarized in this status report. As in the previous status report these emissions are categorized by large facilities (stationary point sources), small sources (area sources), motor vehicles (mobile sources), and other motorized vehicles and equipment (nonroad sources)

Summaries of the local interim (2002) inventories for the two major ozone precursors, volatile organic compounds (VOC) and oxides of nitrogen ($NO_X$) are presented below. The emissions from for all the early action jurisdictions are combined to produce a single summary of area emissions. Figure 1 and the associated data table presents the VOC emissions summary and Figure 2 (and table) presents the $NO_X$ emissions summary.

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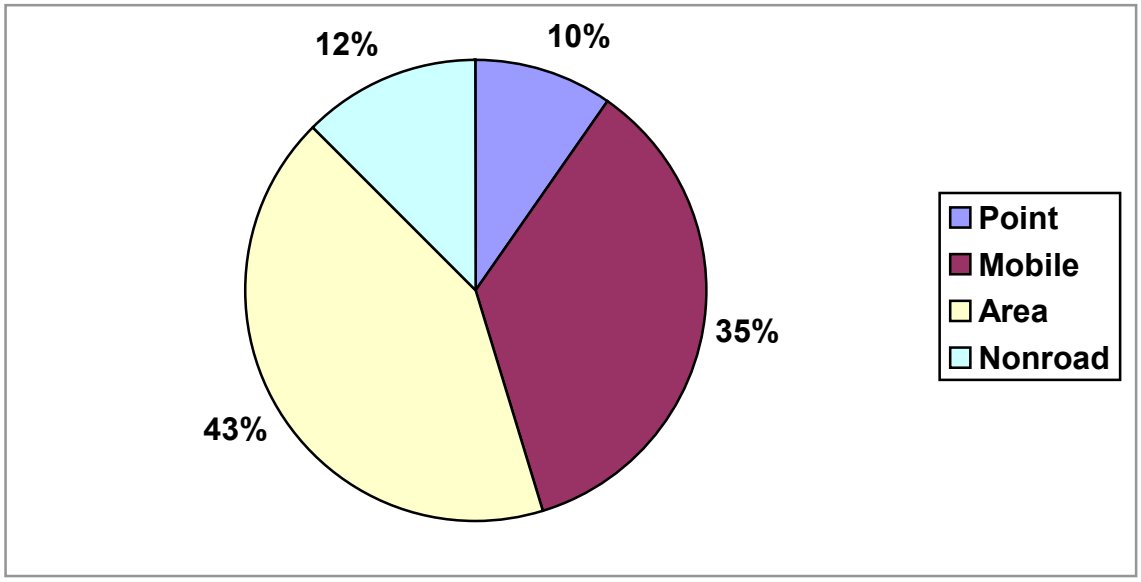
**Figure 1: Roanoke Valley Area Emissions Inventory – 2002 Ozone Season Daily Emission of Volatile Organic Compounds (VOC)**




| Summary of the Roanoke Valley Area VOC Emissions Inventory for Calendar Year 2002 | |
|---|---|
| Major Source Categories | Emissions (tons/day) |
| ***Major Stationary Point Sources*** | |
| 28 individual facilities (Botetourt: 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4) - Description: Includes cement production, metal works, minerals production, gas terminals & others. | 4.48 tpd |
| ***On-Road Mobile Sources*** | |
| Motor Vehicles on all roads – **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks. Also, vehicle traffic on all other public roads from major arterials to local roads. | 16.19 tpd |
| ***Area Sources*** | |
| Use of solvent-based products – Description: paints, cleaners, consumer products, & others. | 11.43 tpd |
| Gasoline distribution & Marketing – Description: Gasoline storage & transfer operation at terminals and service stations | 5.80 tpd |
| All Others – description: Open burning, landfills, & others | 2.13 tpd |
| ***Non-Road Mobile Sources*** | |
| Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats. | 5.54 tpd |
| All others – Description: Locomotives & aircraft | 0.14 tpd |
| **Total** | **45.71 tpd** |

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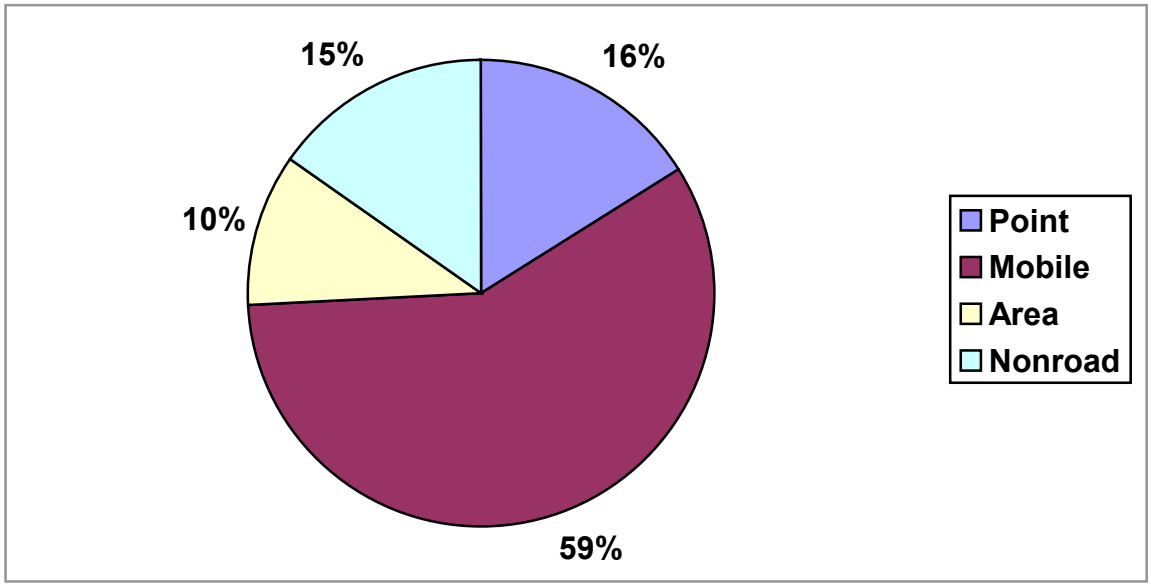
**Figure 2: Roanoke Valley Area Emissions Inventory – 2002 Ozone Season Daily Emission of Oxides of Nitrogen ($NO_X$)**




| Summary of the Roanoke Valley Area $NO_X$ Emissions Inventory for Calendar Year 2002 | |
|---|---|
| Major Source Categories | Emissions (tons/day) |
| ***Major Stationary Point Sources*** | |
| 28 individual facilities (Botetourt: 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4) - Description: Includes cement production, metal works, minerals production, gas terminals & others. | 8.14 tpd |
| ***On-Road Mobile Sources*** | |
| Motor Vehicles on Interstates – **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks. Also, vehicle traffic on all other public roads from major arterials to local roads. | 29.17 tpd |
| ***Area Sources*** | |
| Fuel Consumption – Description: Fuel consumption for heating, cooling, and other purposes in all sectors. | 4.82 tpd |
| All Others – description: Open burning, landfills, & others | 0.43 tpd |
| ***Non-Road Mobile Sources*** | |
| Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats. | 5.35 tpd |
| All others – Description: Locomotives & aircraft | 2.36 tpd |
| **Total** | **50.27 tpd** |

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In terms of air pollutant emissions trends, the total level of ozone precursor emissions in the early action area have remained relatively constant between 1999 and 2002, with a slight increase in VOC emissions and a slight decrease in $NO_X$ emissions. It is expected that emissions will begin to decrease at a quicker pace in the near future due to the state and federal emission reduction measures described earlier, along with the local control program to be implemented through the early action plan. The 2007 base case and control case emissions inventories are currently under development and will be presented in detail in the next semi-annual status report.

## Air Quality Modeling

Air Quality analyses are used to simulate the combination of meteorology, emissions, and atmospheric chemistry that promote ozone formation and higher ambient concentrations in a given area. Once a representative scenario, or episode conducive to ozone formation, based on an actual observed ozone event is selected and validated, various emission reduction strategies can be tested to predict whether they would succeed in reducing ozone and attaining the ozone standard. The major steps involved in photochemical modeling is as follows:

- Selection of type and geographic scale of photochemical model
- Selection of representative ozone episode(s)
- Base case episode modeling and validation
- Future year projection and attainment demonstration modeling

The specific Virginia early action modeling plan is discussed below:

### Model and Domain Selection

Due to the regional nature of ground level formation and transport that is prevalent in the Eastern United States, combined with the reasonable assumption the early action area is impacted by ozone transport, a regional photochemical modeling exercise has been selected for this project. This selection will allow for the evaluation of the impact of transport on the study area, as well as the impact of regional and national control strategies in reducing ozone transport into these areas.

The initial photochemical model selected for this purpose in EPA's MODELS3/CMAQ model that is EPA's latest modeling platform for such analyses. The meteorological inputs required to run the model will be developed using the MM5 meteorology model, and the emissions inputs will be developed using the SMOKE emissions preprocessor model. The purpose of these model data input preprocessors is to temporally and spatially allocate these inputs to a grid system used by the photochemical model to recreate the atmospheric interaction of all these factors in promoting ozone formation.

Due the need to model a larger region for ozone transport assessment, a regional domain that covers a large portion of the Mid-Atlantic States has been chosen to support the early action modeling. This domain has been used in previous analyses by the State to assess transport and the regional effect of emission reductions. The domain will consist of a series of

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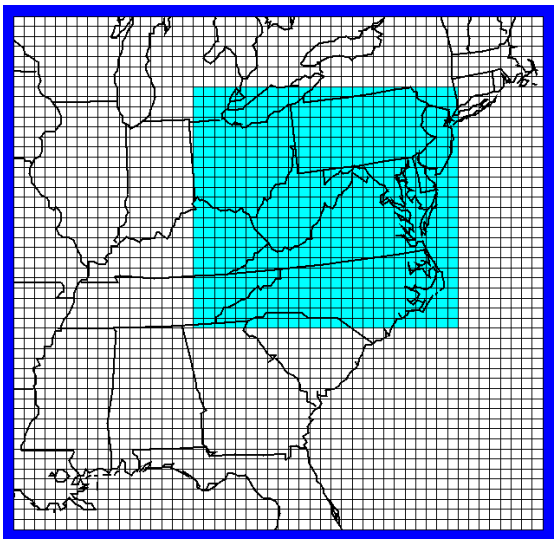
descending grid cells from 36 kilometers (km) at the edges of the domain, to 12 km in the Mid-Atlantic area. A local 4 km exercise for the project area may be added later to provide further resolution. In this way the resolution of the model and modeling results will be the highest in and around the early action planning areas. This modeling domain is shown in Figure 4.

**Figure 3: Early Action Modeling Domain of 36 km & 12 km Resolution**



Episode Selection

One of the key aspects of a modeling analysis of a particular area and air pollution problem is to select one or more representative episodes to model. The selection process should reflect one or more of the prevailing meteorological and emissions conditions that produce higher levels of ozone in the subject area. An additional consideration for this project is that EPA guidance requires that the baseline emission inventory and subsequent episode(s) selected for an early action plan are no older than 1999. Finally, since three states are developing plans in the same general area, an episode common to all three was selected.

The result of this process produced an ozone episode that occurred on August 12$^{th}$ and 13$^{th}$ in 1999. This episode was selected mainly because exceedences of the ozone standard were observed at all the area monitors involved in this effort (including Roanoke), during this period. This episode also involved the transport of ozone into Virginia from both the West and Southwest. To adequately simulate the events leading up and following this episode, a 10 day period from August 8$^{th}$ to the 18$^{th}$ will be modeled. After the completion of this modeling exercise, an additional episode, probably in 2002, will be selected and modeled to retest and confirm the results of the initial modeling and to begin the analysis of other nonattainment areas in Virginia. The EPA ozone maps of the August 12$^{th}$ & 13$^{th}$, 1999 episode are shown in Figure 5.

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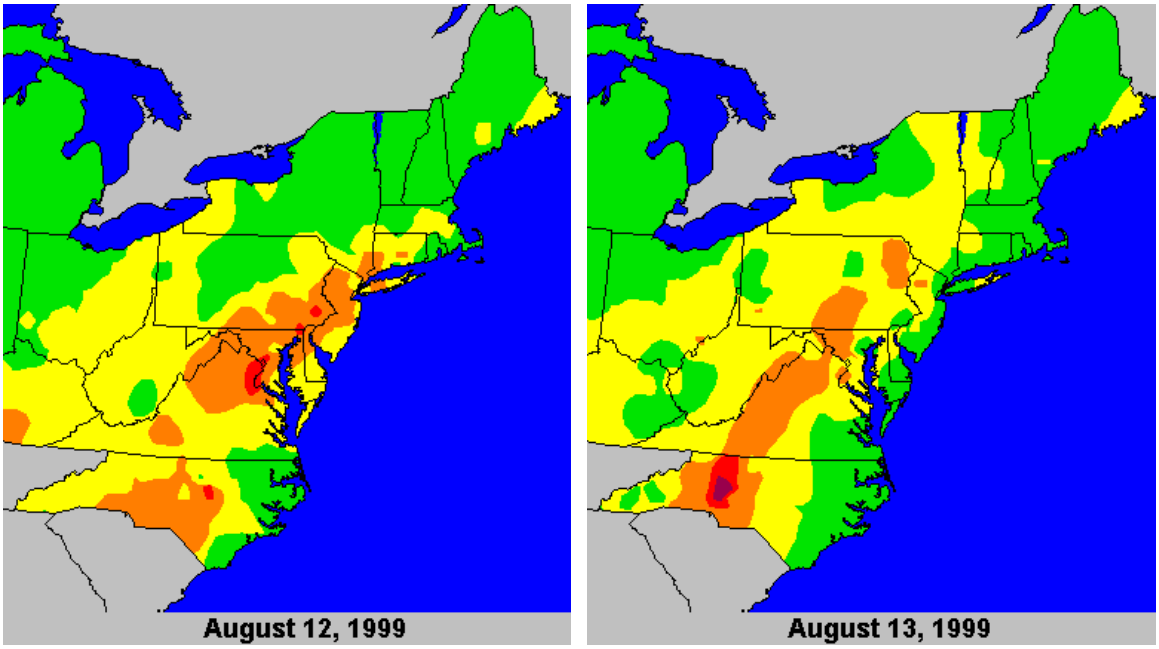
**Figure 4: The Ozone Episode of August 12th & 13th, 1999**




Episode Meteorological Conditions

**August 12th** – The surface weather map on the morning of August 12th indicated a trough of low pressure extending from coastal New England, through the Delmarva region into central Virginia. South and east of the trough, surface winds were generally from the southeast and higher dew point temperatures, indicative of maritime air. West of the trough, surface winds were calm and variable with lower dew point temperatures, indicative of ozone–conducive continental air. Haze was reported over a large area from Maine into Tennessee and Georgia. Surface winds remained light into the afternoon. Surface and 1500 meter 48-hour back trajectories for Roanoke ending that afternoon indicated that air passed over the Ohio River Valley and West Virginia. The evening surface weather map indicated the trough of low pressure separating maritime from continental air persisted from New England southwestward through Maryland and Richmond, extending into central North Carolina. Maximum temperatures east of the trough were around 90 degrees. West of the trough, high temperatures reached into the low to mid 90s.

**August 13th** – The surface weather map on the morning of August 13th indicated the trough extended from Washington, D.C. through central Virginia into central North and South Carolina. Again, higher dew point temperatures and southerly winds east of the trough indicated maritime air. Lower dew points and calm winds west of the trough indicated the presence of a continental air mass. Forty- eight hour surface and 1500 back trajectories for Roanoke ending that afternoon originated from the Great Smokey Mountains region of northeastern Tennessee and north central Tennessee, respectively. The surface trough separating the maritime air from the

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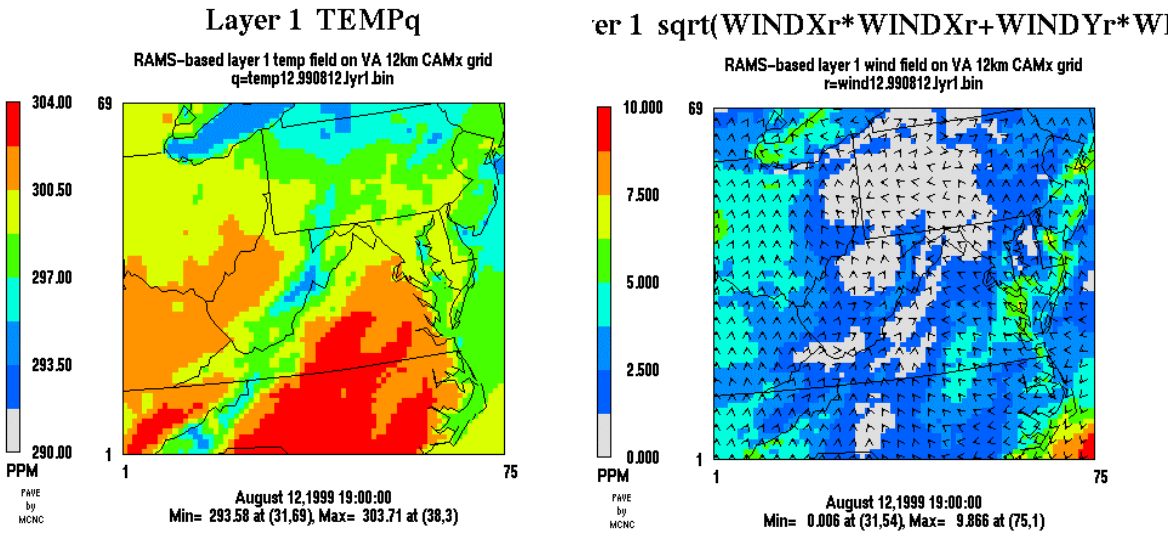
continental air persisted into the evening. High temperatures reached the mid-to-upper 90s in the region.

Modeling Progress to Date

A 1997 episode was originally selected to support the development of the early action plan since emissions and meteorological data were readily available and quality assured. However, subsequent to this decision, EPA early action plan guidance required that inventories and episodes no older than 1999 had to be used in this effort. As a result, the episode described above as been selected to support the air quality planning effort. However, this change in the modeling plan and episode has resulted in a change to the modeling project schedule as well.

As of the date of this document, the DEQ has obtained the necessary meteorological data for the 1999 episode and has successfully completed the processing of the data through the MM5 meteorological model. Several MM5 runs were required to adequately simulate the relatively complex meteorological conditions that existed during the selected ozone episode as previously described.

**Figure 5: Meteorological Modeling – Selected Results for Temperature and Winds**




Emissions data for 1999 from all state in the modeling domain has also been obtained from the NEI. This emissions data has been supplemented with state specific data from Virginia and West Virginia. The conversion of this data to SMOKE input files and the preprocessing of this data through the SMOKE emission model has also been completed. Several problems were encountered during the processing of the emissions data that delayed the commencement of base case modeling efforts. The most difficult problem dealt with the EPA requirement that all EAC modeling efforts used MOBILE6-based emissions for mobile sources. To do this we had to use the latest draft version of the SMOKE emissions preprocessor (Version 1.5). Numerous problems were encountered in attempting to install and run the mobile emissions through this

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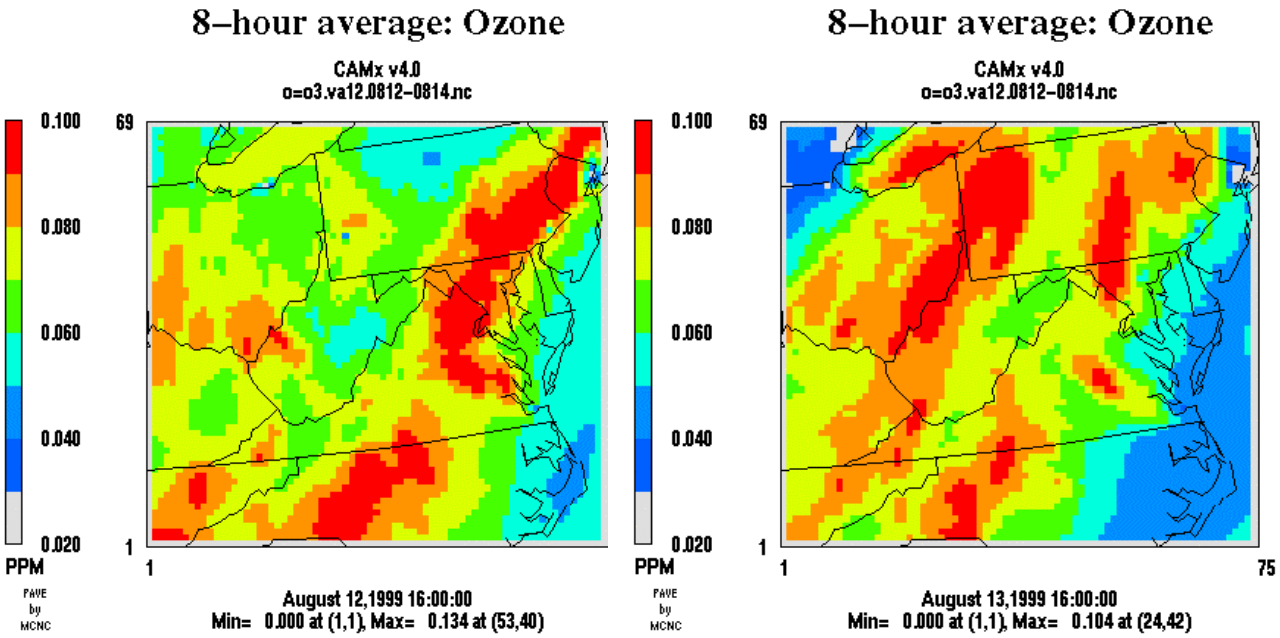
version of the emissions model. Ultimately, the DEQ contracted the developers of SMOKE (Carolina Environmental Program to solve these problems and process the emissions data through this latest version of the emissions preprocessor. With this external assistance, the emissions preprocessing step has also been completed (end of September 2003).

Once all the preprocessing steps were completed, the regional photochemical modeling exercise was begun. After several runs using the CMAQ model were completed, it became obvious that the performance of the model was not up to EPA standards using the selected episode. After internal consultations, it was decided to change photochemical models from CMAQ to the Comprehensive Air Quality Model with Extensions (CAMx). The modeling platform was thus changed to use this alternative air quality model. After several runs using CAMx, base case modeling results were produced that meet or exceed EPA's acceptance criteria for model performance.

**Figure 6: CAMx Photochemical Model Results – Base Case Modeling**




With the base case modeling step coming to a close, attention has now moved on to the development of the future case (2007) projected emissions inventory. This inventory is currently under development and should be completed by the end of the calendar year. Once this is completed, modeling will begin on the future base case and control scenarios. It is now anticipated that the entire modeling project will be completed on time by the end of March 2004.

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# Attachment A

# Roanoke Valley Area
# Ozone Early Action Plan (EAP)
# Local Strategies

***DRAFT***

## Section I of III
## Heavy Duty Diesel and Diesel Equipment Strategies

## Table of Contents:

1.) Reducing Locomotive Idling ....2
2.) Limiting Idling Times for School Buses ....3
3.) Retrofit Roanoke County School Buses ....4
4.) City of Roanoke – Purchase 5 Bio-diesel Compatible Solid Waste Trucks....5
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10.) County of Roanoke – Fleet Management Education/ Training ....10

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# Ozone Early Action Plan Control Measure Profile
## Heavy Diesel Equipment and Vehicles

| Title of Measure | **Reducing Locomotive Idling** |
|---|---|
| Pollutants reduced | PM, NOX |
| Costs | N/A |
| Sources affected | Locomotives |
| Geographical area | City of Roanoke? |
| Implementation date | Completed by Norfolk Southern Railroad Company |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | Yes |
| Description of measure | To increase operating efficiency and reduce emissions from Transportation activities Norfolk Southern Railway Company has implemented a operating policy to reduce emissions from idling locomotives as allowable by ambient conditions being greater then 32 degrees. |

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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| Title of Measure | **Limit Idling Times for School Buses** |
|---|---|
| Pollutants reduced | PM, Nox (~0.74 tpy) |
| Costs | Zero costs other than normal operational costs. |
| Sources affected | Mobile Sources – Buses |
| Geographical area | County of Roanoke, County of Botetourt, and Town of Vinton (note: City of Roanoke, and the City of Salem already have school bus idling restrictions per 9VAC5-20-201) |
| Implementation date | ASAP |
| Requires approval by State Air Pollution Control Board? | Yes - 9VAC5-20-201 needs to be administratively updated with the 2000 census data. Bob Mann with the VDEQ is checking to see if this update can be handled administratively. |
| Enforceable? | Yes. Idling restriction already exist for the City of Roanoke and part of Roanoke County and the City of Salem. |
| Quantifiable? | Yes, will need to determine the number of buses, model, year, and an estimated idling time for buses in this area. Assumptions: 300 HDD 1995 buses, idle 30 minute/day, 25g/hour NOX, 180 day/yr = 300*25/2 *180 *1000g/kg=675 kg/year or 0.74 ton/year. |
| Description of measure | This emission reduction strategy involves increasing public awareness and enforcing the existing idling restrictions and expanding the idling restrictions as necessary based on the 2000 census data. A school bus burns ½ gallon of fuel for each hour it idles. If a school system with 50 buses reduce idling times by 30 minutes a day, the savings at $1 a gallon will be $2,250 a year in fuel costs. |



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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| Title of Measure | **Retrofit Roanoke County School Buses** |
|---|---|
| Specific Project | Retrofit 100 Roanoke County school buses |
| Pollutants reduced | PM (0.07tpy), CO (1.24tpy), HC (0.26tpy) |
| Costs | The costs of the Roanoke City and County school bus retrofit project will be paid for by a court settlement.<br><br>Oxidation catalysts cost about $1,500 to $2,500 each, and diesel particulate filters cost about $5,000 to $8,000 each. Costs should decrease with large-volume orders as more fleets participate. Ultra-low sulfur fuel will initially be priced at 8 cents per gallon more than conventional fuel at the refinery. |
| Sources affected | Heavy-Duty Diesel School Buses |
| Geographical area | County of Roanoke and City of Roanoke |
| Implementation date | July 2004 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | N/A –Retrofit are currently underway |
| Quantifiable? | Yes – The VDEQ projected the emissions benefit of Roanoke County diesel bus retrofit project to be 0.26 tpy HC, 1.42 tpy CO, and 0.07 tpy PM |
| Description of measure | Roanoke County will be retrofitting 100 school buses with:<br>• Diesel oxidation catalysts—pollutants and particulate matter are chemically oxidized to water vapor and carbon dioxide. |



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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| Title of Measure | **City of Roanoke - Purchase more efficient, Bio-diesel compatible alternative fuel solid waste trucks** |
|---|---|
| Pollutants reduced | PM (~7.8 kg/yr), NOX (~250 kg/year) |
| Costs | In the long run, the city expects to save money. |
| Sources affected | Mobile Sources – Solid Waste Trucks |
| Geographical area | City of Roanoke |
| Implementation date | 2003 – 2007 |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (City Commitment – letter attachment) |
| Quantifiable? | Yes<br>5 trucks*1.5hr less operating time/truck*4 day/week *52 weeks/year * 20mph = 31,200 miles/year reduction.<br>NOX= 31,200 miles/yr * 8 g/mi *1000g/kg = 250 kg/year or 0.27 tons/yr<br>PM = 31,200 miles/year * 0.25 g/mi = 7.8 kg/year |
| Description of measure | In 2003, Roanoke city purchased five new garbage trucks, which can be converted to bio-diesel (Heil automated trucks with Python method). These trucks are more efficient and will have a 20 percent savings in the amount of time it takes to complete the route. Instead of the average of 8 seconds for can pick up, these new trucks will average 6 seconds. Roanoke city picks up trash four days a week. As these new trucks are integrated into the routes, the routes will be adjusted to reduce the driving time. These new trucks will save from 1 to 1 ½ hour each day. Roanoke has a total of 13 garbage trucks. Usually, only 10 trucks are on the road because of maintenance. As the fleet is replaced, the city will purchase the same type vehicle. This will reduce maintenance time because they will be newer vehicles and they will be the same style allowing for quicker maintenance. |



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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| Title of Measure | **Purchase/Use of ethanol compatible alternative fuel vehicles** |
|---|---|
| Pollutants reduced | NOX, VOC |
| Costs | In the beginning, slightly higher than normal vehicle replacement. Once alternative fuel supply is improved, price may decrease. |
| Sources affected | Mobile Sources – City of Roanoke vehicles |
| Geographical area | City of Roanoke |
| Implementation date | 2003 – 2007 |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (City Commitment – letter attachment) |
| Quantifiable? | Yes |
| Description of measure | In 2003, City of Roanoke purchased eleven sedans and station wagons that are ethanol fuel compatible. By 2007, the city will purchase an additional fifteen ethanol fuel compatible vehicles. While the use of ethanol fuel is being pursued, the city is evaluating the option of outsourcing all fleet fueling operations. If outsourcing is initiated, the city would be dependent upon the selected vendor(s) to provide ethanol fuel. Therefore, at this time the city cannot establish an accurate timetable for integrating the use of alternative fuels. |

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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| | |
|---|---|
| Title of Measure | **City of Roanoke – Purchase new cleaner waste trucks that will operate using bio-diesel as an alternative fuel to diesel** |
| Pollutants reduced | PM, VOCs |
| Costs | In the beginning, slightly higher than normal vehicle replacement. Once alternative fuel supply is improved, price may decrease. Biodiesel (B20) cost ~$0.15 more per gallon than diesel. |
| Sources affected | Mobile Sources – City of Roanoke vehicles |
| Geographical area | City of Roanoke |
| Implementation date | 2003 – 2007 |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (City Commitment – letter attachment) |
| Quantifiable? | Yes |
| Description of measure | In 2003, City of Roanoke purchased nine new trucks that will operate using bio-diesel fuel. By 2007, City of Roanoke will purchase an additional twelve bio-diesel fuel compatible vehicles. While the use of bio-diesel is being pursued, the city is evaluating the option of outsourcing all fleet fueling operations. If outsourcing is initiated, the city would be dependent upon the selected vendor(s) to provide bio-diesel. Therefore, at this time the city cannot establish an accurate timetable for integrating the use of alternative fuels. |



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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| | |
|---|---|
| Title of Measure | Purchase/Use of hybrid vehicles |
| Pollutants reduced | PM, VOCs, NOx |
| Costs | In the beginning, higher than normal vehicle replacement. Price will decrease as hybrid vehicle price declines. |
| Sources affected | Mobile Sources – City of Roanoke vehicles |
| Geographical area | City of Roanoke |
| Implementation date | 2003 – 2007 |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (City Commitment – letter attachment) |
| Quantifiable? | Yes |
| Description of measure | In 2003-2004 fiscal year, City of Roanoke will purchase one 2004 Toyota Prius hybrid vehicle. Dependant upon favorable evaluation and field-testing, the city will purchase an additional three Toyota Prius vehicles or similar vehicles. |

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# Ozone Early Action Plan Control Measure Profile
# Heavy Diesel Equipment and Vehicles

| Title of Measure | **Purchase of more efficient, low-emission and alternative fuel vehicles** |
|---|---|
| Pollutants reduced | PM, VOCs, NOx |
| Costs | |
| Sources affected | Mobile Sources – County Fleet |
| Geographical area | Roanoke County |
| Implementation date | 2004 - ? |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (Letter/Attachment to EAP) |
| Quantifiable? | Yes (? Only after vehicles are purchased) |
| Description of measure | ** By Dec. 31, 2003, Roanoke County anticipates the approval of a plan that will consider purchasing alternative fuel and low-emission vehicles when making vehicle purchases. |



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# Ozone Early Action Plan Control Measure Profile
# Education and Awareness

| | |
|---|---|
| Title of Measure | Education and Information Training |
| Pollutants reduced | PM, VOCs, NOx |
| Costs | |
| Sources affected | Mobile Sources – Roanoke County |
| Geographical area | Roanoke County |
| Implementation date | 2003 - 2004 |
| Requires approval by State Air Pollution Control Board? | NO |
| Enforceable? | Yes (Letter/Brochure Attachment to EAP) |
| Quantifiable? | Yes (? Measure any fuel reduction that occurred after training) |
| Description of measure | On August 8, 2003, Roanoke County distributed a brochure to all its employees urging them to reduce the environmental impact of driving both County and personal vehicles. Items focused on car-pooling, planning trips, and reduction of idling and warm up periods. In addition, all drivers of County vehicles will receive "effective environmental driving" classroom training by June 30, 2004. |

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# Roanoke Valley Area

# Ozone Early Action Plan (EAP)
# Local Strategies

## *DRAFT*

## Section II of III
## Air-Quality Action Day, Public Education and Stationary Sources Strategies

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14.) Media and Public Relations Concerning Air Quality Action Days.....18
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16.) Bicycle Infrastructure and Amenities.....21
17.) School (K-12 and Adult Education) Based Public Education.....22
18.) Tree Canopy/ Urban Forestry.....23
19.) Roanoke to Blacksburg Public Transit.....26

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# Ozone Early Action Plan Control Measure Profile

| | |
|---|---|
| Title of Measure | Voluntary EAC Pledges and Air Quality Action Day Commitments from Local Businesses |
| **Pollutants reduced** | PM, VOCs, NOx |
| **Costs** | Implementing this strategy will consume a considerable amount of time. Associated costs will include the amount of funding needed to partially support a position with the Regional Commission. The RVARC will be filling the Ride Solutions Coordinator vacancy in the near future. The requirements of this position have been expanded to include Ozone Action Day Coordinator duties as they relate to transportation issues. Other minor personal costs would be those associated with providing internships for students from local schools and universities at the RVARC. It is anticipated that interns will assist the Ride Solutions Coordinator.<br><br>Additionally, the cost of distributing educational materials such as posters and brochures (videos?) should be included in the analysis. To help alleviate this expense, EAC members could request that businesses agree to partially (or fully) pay for the educational materials they distribute as part of their EAC pledge. (Although this may decrease our chances of meeting our established goal.) EPA has already produced some very nice brochures and educational materials we could utilize (rather than reinventing the wheel). **A definite funding source will have to be identified in order to provide the educational materials, which are the basic element of this strategy.** |
| **Sources affected** | **Roanoke's largest employers**<br>(With in the EAC area there are approximately 243 businesses that have 100 or more employees, the largest ones will be targeted first.) |
| **Geographical area** | Roanoke CMSA |
| **Implementation date** | 2003 – 2007 |
| **Implementation date** | 2003 – 2007 |



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| | |
|---|---|
| **Requires approval by State Air Pollution Control Board?** | NO<br>This is a voluntary pledge on the part of local business; therefore it would not require SAPCB approval. |
| **Enforceable?** | NO |
| **Quantifiable?** | NO<br>Actual emissions reductions from this measure cannot be quantified and incorporated in the modeling. Although the emissions reductions will not be quantifiable, the strategy will have a *quantifiable goal* of exposing at least 10,000 people to the educational material through their place of employment. The committee feels this goal can be easily achieved if the Roanoke area's largest employers agree to sign the pledge. |
| Description of measure | This measure falls in the realm of public education, and is aimed at altering or modifying the behavior of local citizens to remedy the air quality problem.<br><br>In this measure, the targeted business would make a voluntary pledge to participate in Roanoke's ozone action program. As a basic requirement of this pledge, the employer provides educational materials on ozone to it's employees. The educational package will include ozone action day posters to be displayed in the workplace, as well as brochures explaining the effects of ozone and what individuals can do to lower ozone concentrations. The pledge would also require each business to dedicate an employee(s) who is responsible for checking and posting the daily ozone forecast (http://www.deq.state.va.us/ozone/) during the ozone season.<br><br>Individual businesses will be encouraged to take initiative and further develop their own air quality programs beyond the basic pledge. Further development could include measures such as holding AQ workshops for their employees, providing environmental awards or merits to employees who take initiative in the program, and depending on the type of business, consumer based incentives which would alter the behavior of the consumer. Businesses could also opt to participate in VA DEQ's Environmental Excellence Program.<br><br>Presenting this program to the local businesses will be the most time consuming and challenging aspect of this strategy's implementation. The most time effective manor, in which this strategy could be presented, would be to invite representatives |



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| | |
|---|---|
| | from targeted businesses to a meeting providing information on the strategy. The meeting would also provide background information on the EAC, its purpose and why it would be advantageous for local businesses to get involved. The RVARC and various EAC members who represent the local business community would be instrumental in providing contacts and setting up the meeting.<br><br>Part of this measure may involve partnerships with EPA and VA DEQ. |
| Additional Information | An EPA EMPACT program document titled "Ozone Monitoring, Mapping, and Public Outreach – Delivering Real-Time Ozone Information to Your Community" (EPA, 1999) provides detailed information about implementing these types of public education programs in your community. It also has several great examples of similar types of programs that were successfully implemented in other cities and states. Though these programs did not provide "quantifiable" emissions reductions, they did have measurable success in creating greater public awareness.<br><br>It is important to note that that if the State of Virginia, or a specific locality chose to launch an air quality awareness campaign, in order for it to truly be successful they would need a staff (or staff person) whose major duties are dedicated to the program on a year round basis. In fact, the North Carolina Department of Air Quality, which has a successful Air Awareness program, recommends "even if budgets are tight, air quality agencies should dedicate a full-time staffer to manage their ozone outreach programs all year long." (Ozone Monitoring, Mapping and Public Outreach, EPA 1999) If the Roanoke EAC members choose to implement the various public awareness and outreach strategies, it would be in the city's best interest (since we will be committed to following through on these activities) to provide a staff person who can lead and coordinate these activities with the help of volunteers from the EAC.<br><br>Finally, since many of the public education measures are inter-related, and it would be beneficial for the committee members of the various public education strategies to work together. |

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# Ozone Early Action Plan Control Measure Profile

| Title of Measure | **Voluntary Program with Gas Stations to promote fueling early in the morning or later at night. Mandatory agreement from local governments to refuel vehicle fleets either early in the morning or later at night.** |
|---|---|
| Pollutants reduced | VOC |
| Costs | The cost of any incentive |
| Sources affected | Gasoline Stations, General public, Local Governements |
| Geographical area | Region wide |
| Implementation date | Ozone Season 2004 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | Yes Easily determined by looking at previous and present hourly filling rates. |

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| | |
|---|---|
| Description of measure | The following area businesses have been contacted and have given initial willingness to cooperate by offering some incentive for filling cars prior to 8:00 am and after 5:00 pm. Letters from these companies will be forwarded to the MPO shortly informing them of each individual effort.<br><br>Kroger<br>Sheetz<br>Workman Oil<br>PM Transport<br>Other businesses that are currently considering participation in this effort are:<br>Jasraj Inc. Patel Brothers<br>Go Mart<br>7-11<br>ETNA<br>These sources likely control 60% of impacted area stations.<br>Incentives could be<br>Free coffee to fill in AM prior to 8 AM<br>Free small drink to fill after 5PM<br>Free gas with 10 fill-ups at a station before 8AM or after 5PM<br>Free sub during next visit with purchase of drink and chips with 5 fill-ups prior to 8AM or after 5PM.<br>Free groceries with 10 fill-ups prior to 8AM or after 5PM.<br>Price reduction on gas when filling during those hours.<br>Press release to general public advising public of the need for compliance with this voluntary program. Then follow up with additional informational press release advising public of how the program is doing. This should get other businesses to join in and work toward reducing emissions.<br><br>Local Governments will be asked to refuel local fleets before 8:00 am or after 5:00 pm on days predicted to be nonattainment for Ozone. |



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| Title of Measure | **Encouragement of Consumer Purchase of Fuel Efficient Vehicles** |
|---|---|
| Pollutants reduced | VOC, NOX |
| Costs | This strategy will be incorporated into marketing costs for public relations/ education strategies and/or in kind contributions from private entities. |
| Sources affected | Vehicle Dealerships |
| Geographical area | Region wide |
| Implementation date | Ozone Season 2004 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No (Voluntary) |
| Quantifiable? | No |
| Description of measure | As a part of the general public education/ relations efforts (see page 18) individual consumers, private fleets and local governments will be encouraged to purchase fuel efficient and/or hybrid vehicles whenever possible. |

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# Ozone Early Action Plan Control Measure Profile
## Education and Awareness

| Title of Measure | **Media and Public Relations Regarding Air Quality Action Days** |
|---|---|
| Pollutants reduced | PM, VOCs, NOx |
| Costs | ½ Full-time staff hours (RIDE Solutions) – minimum supplies |
| Sources affected | General |
| Geographical area | Region Wide |
| Implementation date | 2005 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | No |

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| Description of measure | Summary of suggestions - Revised 11/10/03<br>Notes: 1. This list is intended to avoid duplicating Strategy #1.<br>2. This list does not include paid advertising.<br><br>I. PREPARATION<br>A. Develop a distinctive, memorable name for ozone action days.<br>B. Conduct a contest to develop a name, logo and letterhead.<br>C. Develop a simple, consistent message.<br>D. Develop a standard power-point presentation.<br>E. Develop or obtain brochures and other handout material.<br>F. Draft prototype articles for inclusion in newsletters, house organs, etc.<br>G. Prepare public service announcements for radio and TV.<br>H. Develop a list and schedule of organizations to contact.<br>I. Develop a web site, possibly piggybacked on RideSolutions.<br>J. Sign up service organizations to sponsor an educational project.<br><br>II. GENERAL INFORMATIONAL CAMPAIGN<br>A. Newspaper articles (at least once each year).<br>B. Letters to the editor and op-ed articles.<br>C. PSA spots on commercial radio and TV stations.<br>D. Programs and PSA spots on government access cable TV.<br>E. Donated billboards.<br>F. Presentations to service organizations and other groups.<br>G. Submit sample articles for use in newsletters and house organs.<br>H. Annual awards program for participating organizations.<br>I. Periodic news releases listing participating organizations.<br><br>III. AIR QUALITY ACTION DAYS<br>A. Notice and suggestions in daily newspaper that morning.<br>B. Suggestions for actions in TV and radio weather forecasts.<br>C. Update the web site with alert information and suggested actions.<br><br>IV. MEASURABLE GOALS<br>A. Annual number of published newspaper articles.<br>B. Annual number of published letters and op-ed articles.<br>C. Annual number of TV and radio programs.<br>D. Annual number of newsletters and house organs.<br>E. Annual number of billboards.<br>F. Annual number of presentations and/or audience members. |
|---|---|

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# Ozone Early Action Plan Control Measure Profile

| | |
|---|---|
| Title of Measure | **Transit pass for college students and employees** |
| Pollutants reduced | PM, VOCs, NOx |
| Costs | |
| Sources affected | Mobile Sources – Valley Metro Transit |
| Geographical area | Roanoke Valley |
| Implementation date | 2005 - 2007 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | No |
| Description of measure | Work with area colleges and employers to annually purchase at least 300 Valley Metro transit passes. These passes would be used with their voluntary Ozone Action Day plans and/or throughout the year. This is a voluntary measure but has a committed goal of 300 passes per year. |

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# Ozone Early Action Plan Control Measure Profile

| | |
|---|---|
| Title of Measure | **Bicycle Infrastructure and Amenities** |
| Pollutants reduced | PM, VOCs, NOx |
| Costs | Infrastructure – Local Government |
| Sources affected | Mobile |
| Geographical area | Region Wide |
| Implementation date | 2005 - continuing |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | Yes (Need inventory of Infrastructure and Amenities) |
| Description of measure | o Encourage local governments to increase pedestrian/bicycle infrastructure spending.<br>  o make presentations to City Councils and County Board of Supervisors<br>o Establish a safe network of bike routes with effective signs and lane markings.<br>  o continue work with RVARC on Regional Bicycle Suitability Study and with VDOT<br>o Educate public about bringing bikes onto public transit (i.e., Valley Metro).<br>  o work with Valley Metro to advertise this feature<br>o Encourage installation of bike racks at public and private-owned buildings.<br>  o racks at City/County buildings, libraries, civic centers, schools – funding for these goes back to first item on this list, encouraging local governments to increase spending for bicycle infrastructure and amenities<br>  o encourage developers to provide bike infrastructure and amenities, see City and County Comprehensive Plans on this topic<br><br>Note: Roanoke County Zoning Administrator stated that we could not require a private entity to provide bicycle infrastructure and amenities, only recommend and encourage them. He said it could be worked into one of the proffers of a rezoning application, but would be case-specific. |



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# Ozone Early Action Plan Control Measure Profile

| Title of Measure | **School Based Public Education K-12 and Adult Education** |
|---|---|
| Pollutants reduced | PM, VOCs, NOx |
| Costs | Volunteers |
| Sources affected | General |
| Geographical area | Region Wide |
| Implementation date | 2005 - continuing |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | No |
| Description of measure | The Roanoke Valley Clean Valley Council (CVC), which is funded jointly by the state and the Roanoke Valley Resource Authority, plus private donations, serves the four Valley governments plus Botetourt County. One of its major functions is an education program under which a staff member visits the area schools on an invitation basis and makes presentations to students regarding litter control and recycling. The primary focus is the elementary school level, but some presentations are made to middle and high school students, particularly when environmental issues are part of the curriculum. The intent is to educate students regarding these issues, and through them to influence their parents.<br><br>The strategy is to have the CVC educator include a component regarding clean air and actions that can be taken to reduce air pollution including ozone. There may be a need for additional funds for materials and additional staff time. These funds could come from the local governments or voluntarily from the business community. The program would be designed to augment an exisiting program conducted in schools by the Virginia Department of Environmental Quality (DEQ), and not to compete with it. |

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# Ozone Early Action Plan Control Measure Profile

| Title of Measure | **Tree Canopy/ Urban Forestry** |
|---|---|
| Pollutants reduced | PM, VOCs, NOx |
| Costs | • Cost of actual trees, plus labor for planting and maintenance<br>• We must consider what size/age/species of tree would be most effective to purchase.<br>• Costs would presumably be covered by localities. (Roanoke City, Roanoke County, Vinton, Salem, and Botetourt)<br>• An possibility that would raise awareness, community involvement, and provide funding, would be to invite private sector to participate. Members of the Roanoke College community have expressed interest in adopting Salem planting, integrating the planting and upkeep into the student community service program. The college might also be able to fund the Salem effort.<br>• Other members of private sector might be able to sponsor either a planting, or a particular area. Perhaps a donation of $X.00 would entitle the donating business or group to a plaque at the site. We could also offer option that people could simple donate money, but no time, using city staff to actually do the planting, but having the trees and supplies covered by donation.<br>• We should also look into grants specific to tree programs, such as Trees Virginia.<br>• For "memorial trees," each locality would specify the donation amount required, which might involve considerations of location, size and species of tree, etc. |
| Sources affected | General |
| Geographical area | Region Wide |
| Implementation date | 2005 - continuing |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | No |
| Quantifiable? | Yes - |



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Description of measure

- In calculating actual pollution reduced, it is probably not realistic to expect that we will have concrete numbers, although we do know some estimates on the capabilities of tree filtration. The following numbers came from the Roanoke City Vision Urban Forestry Plan, 2001-2002.

Annual Air Pollution Uptake
$16 per tree
Energy Savings Related to heating/cooling buildings
$10 per tree
Stormwater Runoff Reduction $
7 per tree

Trees serve to remove the following pollutants:

- ozone: more than 1 lb annually
- carbon dioxide : 26 lbs annually
- nitrogen dioxide : more than 2 lbs annually (including sulfur dioxide)
- sulfur dioxide : see above
- carbon monoxide : information on amount filtered unavailable
- particulate matter less than 10 microns in size : information on amount filtered unavailable

Based on these numbers, we could plant X number of trees, multiply that by the pollution savings, and project an idea of how much difference the trees might make. We would also have to consider the size and age of the trees. Because we do not yet have any final numbers, we can only estimate based on available information, and the probability that since trees planted before 2007 will be relatively young, and therefore less efficient than mature ones at filtering air pollution. One large tree can filter up to 60 pounds of pollutants per year. (Source: www.wastediversion.org) For purposes of calculation, **we will assume that trees planted by 2007 will filter one-third as many pollutants as a mature tree** (20 lbs total per tree rather than 60 lbs)

Reasonable suggestion for **total number of trees to be planted** (to be approved by Early Action Compact Committee):

Approximately **10,000** trees

This number was arrived at by assuming that Roanoke City will follow through with committed plans to plant 188,000 trees over the next decade, and taking into consideration that we do not want to set unreachable goals in the Early Action Compact. All localities would



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| | |
|---|---|
| Description of measure - Continued | If 10,000 trees were planted before 2007, the region would begin to benefit from efforts that eventually could reduce **300 tons** annually of pollutants from air in the region. Based on our estimate that the trees existing in 2007 would filter only one third of the pollutants that a mature tree would, this number would likely be closer to **100 tons**.<br><br>This number was arrived at by assuming that Roanoke City will follow through with committed plans to plant 188,000 trees over the next decade, and taking into consideration that we do not want to set unreachable goals in the Early Action Compact. All localities would need to participate to effectively reach this goal, and this estimate is made with the assumption that they would. This total would still fall short of the ideal 40% coverage, but would be a great improvement on the region's present status, and has the potential to significantly improve air quality.<br><br>The City of Roanoke adopted an **Urban Forestry Plan** as an **Element** of its comprehensive plan, **Vision 2001-2020**, on April 21, 2003. **Dan Henry**, the city's urban forester, is actively working to implement the **Urban Forestry Plan's** recommendations for increasing tree canopy through tree planting, community involvement, public/private partnerships, ordinance revisions, and increased protection of the existing tree canopy. City Council approved additional tree planting funds for fiscal year 2003-2004. Funding for future years has not been determined as of December 2003."<br><br>**Anita McMillan** with the Town of Vinton will address the local tree committee in an effort to get a commitment to plant a set number of trees by 2007. **James Vodnik** with Roanoke County reports that Roanoke County is committed to planting 100 trees a year. **Beth Carson**, the horitculturist for the City of Salem has committed the city to planting its already-mandated 100 new trees each year, and said that in addition, the city has allocated $100,000 to "green-up" West Main Street in Salem.<br><br>The City of Roanoke has initiated a Commemorative Trees Program whereby individuals or groups can donate $250 and have a tree planted on public land in honor of friends, family, or special occasions. The first Commemorative Tree was planted on October 23, 2003 in Highland Park. |



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# Ozone Early Action Plan Control Measure Profile

| Title of Measure | **New Bus Service between Roanoke, Salem, Blacksburg and Christiansburg** |
|---|---|
| Specific Project | New Bus Service |
| Pollutants reduced | NOx ( 0.92 tpy), VOC (2.3 tpy) |
| Costs | Valley Metro has received approval for a State of Virginia Demonstration Grant to initiate this service. The funding for operating expenses (~$600k) for this project has been secured through Fiscal Year 2006. The funds (~$350k) to purchase new buses for this route have also been secured. |
| Sources affected | Mobile |
| Geographical area | Roanoke Region |
| Implementation date | April 2004 – June 2006 |
| Requires approval by State Air Pollution Control Board? | No |
| Enforceable? | N/A |
| Quantifiable? | Yes – The estimated lifespan emissions benefit of this new bus route is 2.767 tons of NOX and 6.96 tons of VOC. The life span for this project is April 2004 through June 2006. |
| Description of measure | Valley Metro will begin operating a new bus service between Roanoke, Salem, Christiansburg and Blacksburg. Funding for this project has been approved through fiscal year 2006. |

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# Roanoke Valley Area

# Ozone Early Action Plan (EAP)
# Local Strategies

## ***DRAFT***

## Section III of III
## Lawn and Garden Equipment Strategies

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# Ozone Early Action Plan Control Measure Profile

## Overview

Gasoline-powered golf carts and turf care equipment used at public and private golf courses are collectively a source of both ozone precursor pollutants (VOC & $NO_X$). A local control strategy would consist of voluntary local commitments from a number of area golf courses to replace gasoline-powered golf carts with electric golf carts to reduce ozone precursor emissions. A mandatory measure on this source category is not warranted due to the relatively low reduction potential of such a control measure, and because it would probably require a source of funds for subsidies or other forms of financial assistance.

| | |
|---|---|
| Title of Measure | Replacement of gasoline golf carts & turf care equipment with low or zero emitting (electric) equipment |
| Pollutants reduced | VOC & $NO_X$ |
| Costs | Electric golf carts appear to be slightly less expensive than gasoline equivalents. However, some capital investment is required in converting facilities to support the use of electric equipment. |
| Sources affected | Public & private golf courses. |
| Geographical area | Entire EAC area. |
| Implementation date | End of 2005. |
| Requires approval by State Air Pollution Control Board? | A voluntary program and agreements would not require SAPCB approval. |
| Enforceable? | Implemented through voluntary agreements. |
| Quantifiable? | Yes - under development. |
| Description of measure | Voluntary pilot program at area golf courses to replace gasoline-powered golf carts and turf equipment with low emitting or electric equipment. Each jurisdiction will commit to obtaining a voluntary commitment from one or more golf courses to make the transition from gasoline-powered to electric equipment. Program could have two phases with a firm initial commitment to be included in the early action plan, and a longer second phase as a maintenance measure. |



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# Ozone Early Action Plan Control Measure Profile

## Overview

Gasoline-powered lawn mowers and other lawn care equipment used local governments, private companies, and the general public, are collectively a significant source of VOC, $NO_X$ and CO. A local control strategy would consist of a cash incentive program to buyback older working lawn & garden equipment with electric or manual equipment. We will work with willing local governments to commit to the purchase of a certain percent of electric/manual equipment as part of their normal purchasing process.

| | |
|---|---|
| Title of Measure | Buy back program for old lawn & garden equipment and the purchase of electric or manual equipment |
| Pollutants reduced | VOC, $NO_X$, & CO |
| Costs | Cash rebate of $40 to $100 on the purchase of new electric or push mowers or similar L&G equipment (weedwhackers, etc.). $50k program ($50 rebate) could remove 1,000 gas-powered mowers per year. |
| Sources affected | Local governments, lawn care companies, pubic |
| Geographical area | Entire EAC area. |
| Implementation date | 2004/2005. |
| Requires approval by State Air Pollution Control Board? | A voluntary program and agreement would not require SAPCB approval. |
| Enforceable? | Could be enforced voluntarily and by mandate depending on source sector. |
| Quantifiable? | Yes – 10 tons VOC reduction and 80 tons CO reduction |
| Description of measure | Combination of a voluntary or mandatory program to replace gas-powered Lawn & garden equipment with electric or manual equipment. General public would be targeted through a rebate program and local governments would mandate the purchase of electric equipment. **A definite funding source would have to be identified to implement this control strategy.** |



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# Ozone Early Action Plan Control Measure Profile

## Overview

Gasoline-powered lawn & garden equipment used by local governments, private companies, and the general public are collectively a significant source of VOC, $NO_X$ and CO. A local control strategy would consist of a voluntary restriction or moratorium on the operation of lawn & garden equipment on predicted high ozone nonattainment days. This measure would be coordinated with the ozone action days program, and promoted through the overall public education/awareness program established through the early action plan.

| | |
|---|---|
| Title of Measure | Episodic restriction on the general use of lawn & garden equipment during predicted ozone nonattainment days. |
| Pollutants reduced | VOC & $NO_X$ |
| Costs | No direct costs, but could result in lost revenue due to decreased activities for private landscaping firms and/or local governments |
| Sources affected | General public, private landscaping firms, local governments. |
| Geographical area | Entire EAC area. |
| Implementation date | 2004. |
| Requires approval by State Air Pollution Control Board? | A voluntary program and agreement would not require SAPCB approval. Any mandatory local requirement (ordinance or other) would require approval. |
| Enforceable? | Could be enforced voluntarily or by mandate. |
| Quantifiable? | Yes – under development. |
| Description of measure | Voluntary and/or mandatory program to restrict the use of gas-powered lawn & garden equipment on ozone action day (days when high ozone is predicted). Program would be voluntary for the general public and private companies. Each jurisdiction will attempt to obtain voluntary compliance of one or more private companies as part of this program.<br><br>If after 2005 selected indicators (to be determined) show that overall area emission reduction and/or ozone exceedance targets are not being met, the area would consider modifying this control measure to become partially or fully mandatory. |



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# Ozone Early Action Plan Control Measure Profile

## Overview

Gasoline-powered lawn & garden equipment used by local governments, private companies, and the general public are collectively a significant source of VOC, $NO_X$ and CO. This local control strategy would consist of a mandatory ban on the operation of lawn & garden equipment by state/local governments on predicted ozone nonattainment days. This measure would be coordinated with the ozone action days program.

| | |
|---|---|
| Title of Measure | Episodic ban on the use of lawn & garden equipment by state & local governments during predicted ozone nonattainment days. |
| Pollutants reduced | VOC & $NO_X$ |
| Costs | No direct costs, but could result in lost time for state & local government employees |
| Sources affected | State & local government entities. |
| Geographical area | Entire EAC area. |
| Implementation date | 2004. |
| Requires approval by State Air Pollution Control Board? | A mandatory requirement on state/local governments would be accomplished through internal policies and/or agreements. |
| Enforceable? | Enforced by mandate. |
| Quantifiable? | Yes – under development. |
| Description of measure | Mandatory program to restrict the use of gas-powered lawn & garden equipment on ozone action day (days when high ozone is predicted). Program would be mandatory for state and local governments. |



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# ATTACHMENT B
# STATE & REGIONAL/NATIONAL OZONE PRECURSOR CONTROL MEASURES THAT SUPPORT THE ROANOKE VALLEY OZONE EARLY ACTION PLAN

| Emission Control Measure & Description | Program Status *Implemented By:* | *Start Year* | Pollutant Controlled | Emissions Reductions |
|---|---|---|---|---|
| ***STATIONARY POINT & AREA SOURCE CONTROLS*** | | | | |
| **Regional $NO_X$ controls to reduce the transport of ozone ("$NO_X$ SIP Call")** **Description:** Emission rate & reduction requirements for large utility and industrial boilers. To be regionally implemented in most eastern states. | Federal rule & State regulation | 2004 | $NO_X$ | Up to 30,000 tons per ozone season in VA (may vary due to trading) |
| **Stage I gasoline vapor recovery** **Description:** Installation of vapor recovery controls at gasoline terminals, bulk plants, service stations, & tank trucks. Controls applied in Roanoke MSA (except Botetourt Co.). | State regulation | 2000 | VOC | 90% from uncontrolled levels |
| **Emission control area regulations for existing sources:** Presumptive RACT requirements for existing stationary sources. Controls vary based on industrial activity and emission potential | State regulation | 2005 | VOC & $NO_X$ | 70 to 80% reduction based on industry type |
| **Lower solvent paints for industrial purposes** **Description:** National rule that requires lower solvent (VOC) content in architectural & industrial maintenance coatings. | Federal rule | 2000 | VOC | 20% from uncontrolled levels |
| **Lower solvent consumer products** **Description:** National rule that requires lower solvent (VOC) content in a number of consumer products. | Federal rule | 2000 | VOC | 10% from uncontrolled levels |
| **Lower solvent industrial cleaning products** **Description:** National rule that requires lower solvent (VOC) content in products used for various metal cleaning operations. | Federal rule | 2002 | VOC | 10% from uncontrolled levels |

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| | | | | |
|---|---|---|---|---|
| **Lower solvent refinishing products for motor vehicles**<br>**Description:** National rule that requires lower solvent (VOC) content in vehicle refinishing paints. | Federal rule | 2002 | VOC | 36% from uncontrolled levels |
| ***ON-ROAD MOTOR VEHICLE CONTROLS*** | | | | |
| **National Low Emission Vehicle (NLEV) standards**<br>**Description:** National rule that requires more stringent light-duty vehicle tailpipe standards earlier than 2004 | Regional agreement & state rule | 1999 | VOC & $NO_X$ | 70% cleaner than Tier 1 vehicles |
| **Tier 2 motor vehicle emission standards**<br>**Description:** More stringent vehicle tailpipe standards for light duty cars, trucks, & SUVs along with lower fuel sulfur content requirements. | Federal rule | 2004 | VOC & $NO_X$ | 65% cleaner than NLEV vehicles |
| **Heavy-duty diesel Truck engine standards**<br>**Description:** More stringent tailpipe standards for heavy-duty diesel truck engines along with lower fuel sulfur content requirements. | Federal rule | 2004 and 2007 | VOC & $NO_X$ | 40% cleaner engines in 2004<br><br>90% cleaner engines in 2007 |
| **OFF-ROAD VEHICLE & EQUIPMENT CONTROLS** | | | | |
| **Phase 1 & 2 engine standards for small gasoline-powered engines**<br>**Description:** Emission standards for various small gasoline-powered off-road equipment engines used in lawn & garden, and light construction equipment. | Federal rule | 1997 & 2002 | VOC | 30% in 2005 |
| **Engine standards for diesel-powered engines**<br>**Description:** Emission standards for various heavy-duty diesel-powered off-road equipment engines used for a variety of purposes such as construction & agriculture. | Federal rule | 2002 | $NO_X$ | 25% reduction in new engines by 2005 |
| **Engine standards for gasoline-powered marine engines**<br>**Description:** Emission standards for recreational marine vessel gasoline-powered engines. | Federal rule | 1998 | VOC | 25% reduction in new engines by 2005 |
| **Engine standards for large gasoline-powered engines**<br>**Description:** Emission standards for various large gasoline-powered off-road equipment engines. | Federal rule | 2000 | VOC & $NO_X$ | 20% reduction of both pollutants by 2005 |

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| | | | | |
|---|---|---|---|---|
| **Engine standards for locomotive engines**<br>**Description:** Tiered emission standards for new or remanufactured locomotive engines implemented between 2001 & 2005. | Federal rule | 2001 to 2005 | VOC & $NO_X$ | 30% reduction by 2005 |

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