History: Ozone Strategy Development
August 21, 2007

Background

Since the fall of 1998 there have been four stakeholder and/or regulatory processes in the metropolitan-Denver region to develop, evaluate and recommend ozone control strategies to address the 8–hour Ozone National Ambient Air Quality Standard as follows:

#	Date	Process	Goal	Report
1.	Fall 1998/ Spring 1999	RAQC/APCD Voluntary Measures Ad Hoc Committee	Develop voluntary measures to be implemented before the 1999 summer ozone season.	Ad Hoc Voluntary Ozone Measures Subcommittee Update, May 11, 1999
2.	Fall 2002	RAQC/AQCC Ozone Stakeholder Group requested by Governor.	Brainstorm available regulatory and voluntary control strategies and measures	Reducing Ozone in the Denver Region – Recommendations for Future Actions, November, 26, 2002
3.	Spring 2003	RAQC/AQCC Early Action Compact (EAC) Strategies for Consideration – Ozone Stakeholder Group	Develop list of Potential Control Measures to meet the EAC June 16, 2003 Planning Milestone	Ozone EAC Potential Strategies for Consideration during Local Planning Process, June 16, 2003
4.	Summer 2003/ Winter 2004	RAQC/APCD State Implementation Plan (SIP) & AQCC Regulatory Public Hearing Process	Develop SIP strategy package to demonstrate attainment of the 8-hour Ozone NAAQS	EAC Ozone Action Plan (OAP), March 14, 2004

Frequently Used Acronyms

APCD	State's Air Pollution Control Division
AQCC	Air Quality Control Commission
CDPHE	Colorado Department of Public Health and Environment
RAQC	Regional Air Quality Council
EAC	Early Action Compact
OAP	Ozone Action Plan
SIP	State Implementation Plan

Major Control Strategies and Measures

Major control strategies and measures were addressed, developed and implemented as follows. The region considers voluntary control measures as an integral part of the EAC, but has taken no reduction credit for such control measures in the OAP.

Major Measures Implemented	Process Where Considered	Status
– PUBLIC OUTREACH & EDUCATION STRATEGIES –		
Ozone Alert Days	1	The Air Pollution Control Division technical services staff developed a system to forecast imminent meteorological conditions that support the development of ozone concentrations above 75 parts per billion (ppb). Alerts to the public are announced by the RAQC. The program officially started on June 1, 1999. The program typically runs from June 1 through August 31 and continues with refinements in 2007.
Voluntary Public Education and Outreach Program *The RAQC's Voluntary Public Education and Outreach Program has been designed to develop and promote the voluntary programs recommended by the noted stakeholder processes as funding has become available.*	1, 2, 3, 4	In the spring of 1999, the RAQC and CDPHE staff launched a low budget education and outreach effort to promote awareness about the effects of summer ozone pollution. The ozone campaign consisted of six elements which include the following. • The development of an Ozone Advisory system • The voluntary reduction of the Reid Vapor Pressure (RVP) of gasoline through a partnership with the petroleum refinery industry • A "Stop at the Click" sticker distribution program in cooperation with local petroleum marketers • Outreach to local governments to raise awareness of ozone reduction measures • A series of events to aid media representatives in understanding ozone pollution and the new advisory program • The development of a variety of outreach materials including brochures and fact sheets Aided by federal Congestion Mitigation and Air Quality funds, the RAQC's 2000 voluntary ozone reduction program built upon the efforts developed in 1999 and expanded the program to include the following components. • The use of the Smart Sign to expand awareness about high-emitting vehicles • Outreach to the landscape and building owner and management industries • The development of a "Put a Cap on Ozone" gas cap replacement program, with funding through the Colorado Department of Transportation The 2001 ozone outreach and education program built upon the added efforts in 2000 to include the following new programs. • The use of targeted public service announcements on local radio stations • Targeted advertising on RTD buses • The planning and implementation of the Conoco Clean Car Clinic RAQC's efforts continued in 2002, adding the following events. • Implementation of the "Mow Down Pollution" lawn equipment exchange event in cooperation with The

		Home Depot and Black and Decker, which offered discounts on alternatives to gasoline-powered equipment • The implementation of a fall Car Care Clinic with Boulder County Health Department and NAPA RAQC increased its efforts again in 2003 by adding new, or enhancing existing, programs to include the following. • Implementation of six Care Car Fairs, working with NAPA and local governments • Continued outreach to local governments and media, hosting a special educational event for municipal public information staff • The development of web page designed specifically for local government representatives • The launch of the "Repair Your Air Campaign," which identified high-emitting vehicles using remote sensing technology and repaired such vehicles by offering vehicle owners up to $500 in repair assistance The 2004 program included a continuation of its previous efforts, with funding and assistance from the CDPHE, Envirotest Systems, Inc., Colorado Select NAPA Auto Care Group and local governments. The 2004 program expanded in participation in public events, such as the Denver Regional Council of Government's (DRCOG) Bike to Work Day and RTD's RideSmart Thursdays events. In 2005, RAQC received significant funding ($1.1 million) from CMAQ, and administered through DRCOG and CDOT, for an expanded three-year public outreach and education program. The "Let's Take Care of our Summer Air" program expanded on previous efforts and added components for which there was not prior funding. Other significant funding sources included the Strategic Environmental Project Pipeline Foundation, Envirotest Systems, Corp and a CDPHE Community-Based Clean Air Grant. The enhanced program included the following components. • Increased media outreach and education • The utilization of television, radio, outdoor, print and online paid media components to further the reach of the messages • The implementation of 21 Car Care Fairs with support from NAPA's Colorado Select group and Envirotest • The development of a new ozone-dedicated web site, OzoneAware.org • A partnership with Tri-County Health Department to subsidize the cost of non-spill, impermeable gas cans at their Household Chemical Round-up events • The completion of pre- and post-campaign research to gauge effectiveness of the enhanced campaign and help alter messages, as needed, for future years • The development of a sub-grant program to encourage local government public information staff to help further the RAQC's campaign messages • An AirWaves High School Radio Scholarship Program to reach adolescents, sponsored by Envirotest • The development of the "Clean Air Crew," a multi-cultural youth dance group who performed an ozone song and dance to engage the public and community events The 2006 and 2007 programs continued the efforts developed in 2005 and expanded and refined the campaign as follows. • The development of a 30-minute educational program on ozone pollution that aired on municipal cable stations, Comcast's MetroBeat TV series and emissions testing centers • Implementation of the summer "chill" campaign, seeking behavioral change by encouraging individuals to

		take a pledge to reduce ozone-forming activities on the sunniest days of the summer • The development of a sub-grant program to encourage local government public information staff to help further the RAQC's campaign messages • The development of a web page hosted on OzoneAware.org where homeowners can research and buy low- and zero-emission lawn equipment and products • The development of post-campaign research to understand the effectiveness of the overall campaign
–MOBILE SOURCE STRATEGIES –		
Reid Vapor Pressure (RVP) Reduction	1, 2, 3, 4	Rocky Mountain Oil and Gas Association (RMOGA) and five major refiners voluntarily agreed to reduce Reid Vapor Pressure (RVP) from 9.0 pounds per square inch (psi) to 8.5 psi beginning with the 1999 ozone season as part of the RAQC's Voluntary Ozone Reduction program. The industry annually agreed to this reduction in 2000, 2001, 2002 and 2003, typically averaging 8.1 to 8.2 psi each ozone season. The EAC OAP in March, 2004 included a control strategy requirement of 8.1 psi RVP starting with the 2004 summer ozone season. However, because of the violation of the 8-hour ozone standard in 2003, the EPA required the national RVP limit of 7.8 psi to be met starting with the 2004 summer ozone season.
Implement high emitter identification and repair program	2, 3, 4	The RAQC first implemented the voluntary Repair Your Air Campaign (RYAC) in 2003, which is a high emitter identification and repair assistance program (currently up to $1000) using remote sensing technology. This program continues today. During its 2006 session, the Colorado General Assembly enacted HB 1302, development of a Clean Screen/High Emitter Program, which required the development of a plan by the CDPHE and the emissions testing Contractor by 12/31/06 to increase the use of remote sensing to identify clean and dirty vehicles.
– POINT/STATIONARY SOURCE STRATEGIES –		
Emissions Controls for O&G Flash Tanks	2, 3, 4	Oil and gas industry exploration and production flash tanks were largely uncontrolled in 2002. The industry and the CDPHE worked to establish emissions factors to establish tank emissions based on throughput. Air Pollution Emissions Reports available in 2002-03 were used to establish a flash tank emissions inventory. Revisions to Air Quality Regulation No. 7, requiring 47.5% total reduction of VOC emissions for flash tanks and scheduled reporting were incorporated into the EAC OAP of March 2004 as a control strategy. In December 2006, due to unanticipated growth in uncontrolled flash tank emissions, Regulation No. 7 and the EAC OAP were revised by the AQCC to require 75% total reduction of VOC emissions from flash tanks.
Emissions Controls for other O&G industry equipment	2, 3, 4	Revisions to Regulation No. 7 to address these emissions reductions from using non-selective catalytic converters and air fuel ratio controllers for rich-burn engines, oxidation catalysts for lean-burn engines and condensers for glycol dehydrators were included in the March 2004 OAP as control strategies. Additional revisions to Regulation No. 7 refining emission limits for engines and dehydrator units were incorporated into the OAP in the December 2006 AQCC rulemaking, but did not result in additional emissions reduction estimates.
– REGULATORY PLAN –		
Develop Early Action Compact	2, 3, 4	In December 2002 state and regional entities responsible for air quality and transportation planning entered in to a Memorandum of Agreement (MOA) with the EPA Region 8 called the Early Action Compact. Signatories

for 8-hour Ozone		to the agreement included: the RAQC, AQCC, CDPHE, DRCOG, CDOT and EPA Region 8. In January and February 2003 the county commissioners of Elbert, Larimer, Morgan and Weld counties agreed to join the Early Action Compact (EAC) and sign the MOA. The Compact entails a commitment to develop and implement an Ozone Action Plan, which addresses 8-hr ozone 2-3 year earlier than would have been required under the normal State Implementation Plan process, in return for deferring any potential nonattainment designation for the EPA's 8-hour ozone standard. The Compact outlines several planning milestones (including progress reports every 6 months) that must be met, culminating in attainment of the 8-hour standard by December 2007.

Other Measures Considered

During the EAC OAP process other measures were suggested or recommended for consideration. The current status of those other measures is presented as follows:

Other Measures Considered	Process Where Considered	Status
– MOBILE SOURCE STRATEGIES –		
Improve effectiveness of the I/M program	1, 2, 3, 4	Various improvements to the current I/M program, such as changing cut points, model year exemptions, OBD, increased frequency of I/M testing for failed vehicles etc. have been suggested and reviewed over time. The AQCC/APCD/RAQC reviewed an extensive listing of possible improvements at regular AQCC meetings during the winter-spring of 2006 which ceased upon passage of HB1302 and the focus on developing a high-emitter program. Further consideration of model year exemptions was considered in December 2006 and tabled by the AQCC in favor of pursuing the implementation plan developed by the APCD and approved by the AQCC for the HB 1302 Clean Screen/High Emitter Program which includes off cycle testing for failed vehicles.
Reduce avoidance of I/M testing	2	HB1302 Clean Screen/High Emitter plan includes off cycle testing for failed vehicles and an out of area commuter element that addresses a vehicle remotely identified 4 times with in a set period.
Encourage early introduction of low sulfur fuel	2, 3, 4	There were some constraints to early introduction of low sulfur fuels due to federal geographical phase-in requirements for the Rocky Mountain area. The region, however, began to receive low sulfur fuels by the end of 2006, in time for the 2007 ozone season. Available emissions reductions were reflected in the 2007 inventories in the OMP.
Voluntarily eliminate ethanol blending in gasoline during ozone season	2, 4	Ethanol blended gasoline has a higher volatility rating than non-blended gasoline. As a result the Clean Air Act grants ethanol-blended gasoline 1.0 psi RVP waiver greater than the applicable RVP limitation for gasoline. This strategy was recommended during the fall of 2002, based on higher evaporative emissions due to higher volatility. Though ethanol was not required, during the 2002 timeframe, typically 20-30% of the gasoline in the Denver market contained ethanol blended gasoline. Discussion during the EAC OAP addressed a proposed ethanol ban and a disallowance of the 1.0 psi RVP waiver, which raised questions regarding the authority of the state to ban ethanol and disallow the 1.0 psi RVP waiver. Ethanol-blended gasoline was 65% of the market share in 2006 and is currently 85% in 2007.

Require federal reformulated gasoline (RFG)	2	RFG as a strategy was considered but not recommended in fall 2002. Industry representatives did not consider RFG feasible for the Denver area at that time. Most of the reductions come from lower RVP limits so it made sense to recommend lower RVP requirements first. This strategy would require a long lead time and capital investment by the refiners, and would result in increased cost for the consumer.
Encourage Alternative Fuels	2, 4	In 2004, the RAQC worked with 15 local school districts to pilot the use of over 1.1M gallons of B20 biodiesel fuel. In 2005, the RAQC in conjunction with Big Clean Trucks developed a CMAQ funded project to convert diesel and gasoline powered vehicles to compressed natural gas. In 2005, the RAQC in conjunction with Colorado Corn began the "E85 Hangtag Project" through a CMAQ grant focused on advertising E85 compliant vehicles at dealerships and installing E85 pump infrastructure at fueling stations. The Governor's Biofuels Coalition is developing E85 and biodiesel infrastructure in the State of Colorado. RAQC staff is a part on the Coalition team.
Limit Vehicle Idling	2	Various committees looking into CO reductions, smoking vehicle identification as well as the Ozone Stakeholder Group, have considered limiting idling. There are local ordinances limiting idling throughout the region. Enforcement varies by jurisdiction. The RAQC addressed idling of school buses through the Clean Air Fleets program by helping to install engine pre-heaters as an alternative.
Free transit on ozone alert days	2	This measure has been investigated and financial and logistical considerations precluded its use from moving forward as a strategy with the current equipment and system.
Expand van pools for commuters on ozone alert days	2	The concept of DRCOG van pools does not lend itself to episodic programs, but rather it is based on a total behavioral change. The RTD however with expansion of the Light Rail system to the southeast in November 2006 did provide the additional opportunity for episodic use of transit, as well as a total behavioral change to transit use.
Cash for Clunkers	2	The RAQC has continued to refine the voluntary Repair Your Air Campaign, a high-emitter identification and repair assistance program, and by August 2007 will be offering a “Cash for Clunkers” salvage program with Supplemental Environmental Project funds through the CDPHE.
Identify and repair leaky gas tanks	3,4	Initially suggested as a program to walk/drive through parking lots with monitoring equipment to detect “leakers,” but not pursued because it was too labor intensive. Recently, the APCD Mobile Source Program staff has been experimenting with identification of leaky fuel systems with remote sensing.
– POINT/STATIONARY SOURCE STRATEGIES –		
Take into account currently planned, enforceable reductions at point sources (not otherwise required by regulation)	3, 4	As required in ozone SIP development, the current point source inventory is an estimate of actual emissions that takes into account current reductions. However, an analysis of future planned reductions has not been conducted.
Encourage early implementation of Maximum Achievable Control Technology (MACT) standards	2	Division staff has indicated that legal and logistical challenges exist for early implementation of MACT standards. In the EAC OAP process there were uncontrolled sources (primarily in the oil and gas industry) that could be controlled for the needed reductions. Pursuing reductions through early implementation of MACT standards was unnecessary at the time considering the challenges. Today most of the major source MACT standards are already in place and those left on the list for development are very specialized and will have little or no effect in Colorado. For new area source MACT standards which will

		have an effect in Colorado, the Division staff still believes that early implementation will create legal and logistical challenges.
Improve leak detection at major sources	2,4	The APCD Planning Program staff prepared a brief paper, "Analysis of Stationary Sources", October 2003, and determined that the relatively small amount of emission reduction potential available from leaks and the rapid timeframe for implementing control measures (by December 31, 2005) under the Early Action Compact, it was not anticipated that further regulation of leaks would be necessary at that time.
Consider revisions to Regulation No 7 to address VOC emissions from other stationary sources.	2,4	The APCD Planning Program staff prepared a brief paper, "Analysis of Stationary Sources", October 2003, and determined that approximately 22 tons per day (TPD) came from Stage I controlled gas stations, approximately 20 TPD came from major sources with various levels of control, and 16 TPD came from approximately 1800 minor sources. Based on detailed review of the approximately 20 TPD of major sources with various levels of control, including, Regulation No. 7 RACT controlled (8 TPD), and marginally (5 TPD) controlled sources, the only emission sources that appeared to be good candidates for controls were the uncontrolled (approximately 8 TPD) internal combustion engines, and dehydration units at oil & gas facilities, which were addressed in the initial OMP as discussed above.
Stage II Vapor Recovery	2	This strategy was considered but not recommended in the fall of 2002. An alternative to gasoline refueling vapor control, on-board vapor recovery (OBVR), has been phased in for light duty cars beginning with 1998 through 2000 and for light duty truck beginning in 2001 through 2003. Since Stage II and OBVR target the same emissions, the benefits of Stage II will steadily diminish as vehicles with on-board controls enter the fleet. In the past year the EPA has indicated that many areas have past the point of no return for installing Stage II VR due to the overwhelming percentage of newer vehicle with OBVR. Also, in some cases, according to EPA, OBVR and Stage II VR have been found to be incompatible. Based on the Denver Metro Area's current registration distribution, 54% of the fleet is equipped with an OBVR system. In 2015 approximately 82% will have an OBVR system.
Require Best Available Control (BACT) Technology	3, 4	A detail BACT analysis for the region's point sources was not completed during the OAP in lieu of the APCD Planning Program paper, "Analysis of Stationary Sources", October 2003, which identified previously uncontrolled oil and gas industry condensate flash tanks, engines and glycol dehydrators.
Other natural gas industry emissions	2, 3	The Division staff continues to work with the industry to identify and quantify other emissions.
Continue to promote Pollution Prevention (P2) efforts	2, 4	Integral part of RAQC's public ozone education and outreach program since 1999. The CDPHE has promoted P2 efforts through its P2 Program, which has annually funded a variety of programs submitted from around the state for a number of years.
– AREA SOURCE STRATEGIES –		
Mitigate impacts of fire, especially Prescribed Fire	3	Current state regulations govern prescribed burning. Prescribed burns are not allowed on high ozone days. In addition, restricted meteorological conditions are often included in burn permits as well as adherence to the general "burn forecast" issued by the APCD.
Regulate improved gas cans/nozzles	2,3	Because standard gas cans are so inexpensive, the manufacturers of impermeable gas cans with non-spill nozzles will not market their product in states without a regulation requiring sale of only impermeable gas cans with non-spill nozzles. California and Texas have established a regulation.
Reduce use of two stroke engines	3, 4	Primarily aimed at commercial landscape/public works industry with large scale use of hand held gas driven trimmers, blowers etc. Switching to electric units is not considered generally feasible. Newer engines come into use rapidly since the level of use causes high turnover of equipment. Message has been to delay use on high ozone alert days.

Encourage low VOC products	1, 2, 3, 4	Base message in voluntary ozone reduction program. California has regulations that require the use of low VOC commercial and consumer products.
Restrict use of solvent based paints in June/July	1, 2, 3, 4	Base message in voluntary ozone reduction program has been to reschedule use of solvent based products when possible.
– NO_x CONTROL STRATEGIES –		
NOx controls	1	In the initial work in the region on 8-hour ozone in fall 1998, current scientific evidence determined that the region was VOC limited unlike the eastern states which tend to be NOx limited. Therefore the region has focused primarily on VOC reduction strategies to reduce ozone. Modeling for the EAC OAP indicates that NOx reduction strategies may be counter productive for the metro area. In addition, NOx reductions, however, continue to be achieved through federal tailpipe standards, non-road mobile controls for new vehicles/equipment, and BART stationary source controls for the regional Haze Rule and the Rocky Mountain National Park Nitrogen Deposition initiative. VOC reductions are often needed to balance the impact of these NOx controls. However there is some evidence that indicates that the region today could be VOC OR NOx limited depending on the day, time of day etc. Therefore consideration of NOx controls will be addressed in future SIP modeling and analysis.