

COLORADO DEPARTMENT OF TRANSPORTATION

Air Quality Action Plan

Implementation of Air Quality Policy 1901.0

May 23, 2012

**Division of Transportation Development
Environmental Programs Branch**

4201 E. Arkansas Avenue, Denver, Colorado 80222

Noise Program (303) 757-9016

Table of Contents

Introduction	3
Air Regulatory Background	3
Air Quality Conditions	3
Air Quality Policy Directive 1901	4
Action Plan Implementation	5
Strategies	6
Action Program and Initiatives	13
Monitoring and Reporting	18
Summary/Conclusion	19
Exhibit I, Matrix of Air Quality Action Plan Strategies and Actions	20
Glossary of Terms and Acronyms	26
References and Resources	28

CDOT AIR QUALITY ACTION PLAN

INTRODUCTION

This Air Quality Action Plan is the first step in implementing the CDOT Air Quality Policy Directive 1901. CDOT's air quality policy promotes a forward looking vision of sustainable fleet management to effectively control internal transportation emissions and guides public outreach and education to further the understanding of greenhouse gas (GHG) emissions and mobile source air toxics (MSATs). This Air Quality Action Plan outlines proactive strategies designed to reduce transportation related GHG, air toxics and other related pollutant emissions statewide, thereby reducing the need to negotiate such measures in an ad hoc manner in subsequent National Environmental Policy Act (NEPA) documents initiated by CDOT. The Air Quality Action Plan targets program development encompassing transit and sustainable community development, multi-modal freight movement and efficiency, operational highway management, congestion and idling reduction, innovations in fueling, engine maintenance and monitoring, retrofits, and alternative vehicle technologies.

AIR QUALITY REGULATORY BACKGROUND

Transportation agencies across the country have a vital role in implementing the laws and regulations established to protect the nation's air quality. The primary law governing air quality is 42 USC 85, the Federal Clean Air Act. Under the Clean Air Act and its Amendments (CAAA), EPA establishes air quality standards to protect public health, including the health of "sensitive" populations such as people with asthma, children, and older adults. EPA also sets limits to protect public welfare. This includes protecting ecosystems, including plants and animals, from harm, as well as protecting against decreased visibility and damage to crops, vegetation, and buildings.

The Environmental Protection Agency has set national air quality standards for six principal air pollutants referred to as criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO₂), ozone, particulate matter (PM₁₀ and PM_{2.5}), and sulfur dioxide. Transportation contributes to four of the six criteria pollutants: CO, NO₂, ozone, and particulate matter. If monitored levels of any of these pollutants violate the National Ambient Air Quality Standards (NAAQS), then the EPA, in cooperation with the State, will designate the contributing area as "nonattainment" and a plan to restore air quality to acceptable NAAQS will be developed. Transportation planning agencies play an important role in setting nonattainment area boundaries by providing essential information on commuting and travel patterns.

AIR QUALITY CONDITIONS

As of April 2012, the state of Colorado is in attainment for all criteria pollutants except for ground-level ozone. All former CO and PM₁₀ nonattainment areas have demonstrated several years of successful Statewide Implementation Plan (SIP) air quality control measures, reducing pollutant concentrations consistently below the NAAQS. The following areas have been re-designated to attainment/maintenance status by EPA:

- Denver metropolitan area CO, 1-hour ozone (revoked standard) and PM₁₀ areas
- Longmont, Greeley, Fort Collins, and Colorado Springs CO areas
- Steamboat Springs, Telluride, Aspen, Canyon City, and Pagosa Springs Rural PM₁₀ areas

The Denver metropolitan and North Front Range Ozone Nonattainment area was designated by EPA in 2007 for 9 counties in the northern Front Range where ozone concentrations exceeded the 1997 for 8-hour ozone. In September 2011 a Presidential Executive Order determined that the 2008 standard will be the currently applicable NAAQS for 8-hour ozone. The timeframe for the 2008 NAAQS ozone nonattainment re-designations expected in spring 2012. The decision to implement the more stringent 8-hour primary ozone standard of 60 to 70 parts per billion (ppb) has been deferred to the normal EPA regulatory re-evaluation schedule and will be formally assessed in 2013. A new secondary ozone standard is also under consideration for protection of the general public welfare and the environment.

MSATs are not regulated by EPA under existing NAAQS. Although the seven priority hazardous air pollutants are identified for their link as known carcinogens and for other detrimental human health impacts, they have no specified ambient health-based standards. Monitoring of various MSATs in Colorado is limited both temporally and geographically; including Denver, Boulder, Grand Junction, and the Four Corners area.

State *FASTER* legislation SB 90-108 includes specific line item direction to reduce GHG emissions and to address emissions reductions in transportation project planning. Further, CDOT is directed by the Governor's executive order EO2010-006 for the Greening of Government, which is designed to lower energy use and costs by state government agencies, setting the goal of GHG emissions reductions of twenty percent below 2005 levels by 2020, and eighty percent by 2050. Another Governor's executive order EO D004-08 mandates lowering GHG emissions statewide through a variety of Public Utility and other emissions reduction program venues. These executive orders and legislation shape the direction for CDOT in both day-to-day facilities, operational practices and transportation project applications.

Transportation sources of greenhouse gases including carbon dioxide (CO₂) and methane are not monitored in Colorado. In addition to new federally approved GHG models, CDOT has developed a proprietary GHG calculator for estimating statewide emissions associated with fuel consumption and the highway transportation network. Further discussion of this topic is found in the section on ***Statewide Greenhouse Emissions Baseline***.

Air Quality POLICY DIRECTIVE 1901

The CDOT Air Quality Policy Directive 1901 was approved through the Air Quality Control Commission effective May 21, 2009. This air quality policy directive was initially developed as a collaborative, working agreement whose purpose was to address unregulated mobile source air toxics (MSATs) and greenhouse gases (GHGs) produced from Colorado's state highways, interstates, and construction activities. It is the result of a collaboration of multiple agency insight and expertise: Colorado Department of Public Health and Environment's Air Pollution Control Division (APCD), the U.S. Environmental Protection Agency Region 8, the Regional Air Quality Council (RAQC), the Federal Highways Administration Colorado Division (FHWA), the Federal Transit Administration (FTA), Denver Regional Transportation District (RTD), and the Colorado Department of Transportation (CDOT).

The impetus behind development of an air quality policy/agreement is summed up as follows:

- The public, State and Federal agencies are requesting more information on air quality issues related to transportation projects.

- Discussions regarding the approach for MSATs and GHGs among agencies occur frequently, but there has been little development on a consistent approach. This has resulted in confusion at the project level as to what the best course of action is, and has created project delays.
- To help CDOT, Colorado's largest state agency, work proactively toward the Governor's Greening Government initiative with the hope other state/local agencies will follow suit.
- Assist CDOT with meeting the goals established by Executive Orders Reducing Greenhouse Gases in Colorado, signed by Governor Bill Ritter April 2008. This Executive Order prescribes specific goals for reducing greenhouse gas emission statewide and specifically identifies the transportation sector as an area that will need to be addressed.

The conclusion that much of the burden involving unregulated transportation emissions reductions resides with CDOT, resulted in a realization that a procedural agreement is not the most effective implementation tool. As a result, the statewide CDOT policy directive was developed from the proposed procedural agreement.

ACTION PLAN IMPLEMENTATION

CDOT as a transportation agency has taken a regional, programmatic approach to emissions reductions, targeting statewide vehicle mobility where the Department has the most direct influence. This Air Quality Action Plan facilitates implementation of CDOT Air Quality Policy by defining the CDOT program responsibilities, framing strategies that will reduce unregulated emissions, implementing new or identification of existing programs and pilots to evaluate the effectiveness of strategies, and to provide programmatic mitigation for GHG and unregulated pollutants in NEPA evaluation of CDOT transportation projects.

The following goals have been defined to mirror CDOT Air Quality Policy to focusing on targeted emissions reductions:

- 1) Promote and develop a forward looking vision of sustainable fleet management to effectively control and reduce transportation emissions by
 - a. Modifying the composition of vehicle fleets to increase alternative vehicles;
 - b. Increasing usage of alternative fuels;
 - c. Promoting diesel vehicle retrofits on heavy truck fleet and construction vehicles.
- 2) Promote public outreach and education to further the understanding of GHG and mobile source air toxics as well as ozone and precursor pollutant emission sources and reduction strategies.
- 3) Develop and implement proactive programs to reduce transportation related GHG and air toxics emissions at the source by
 - a. Streamlining the number of vehicles operating on the Colorado roadway network; and
 - b. Identifying highway operational strategies to reduce congestion and emissions.

- 4) Encompass transit and sustainable community development, multi-modal freight movement and efficiency, and innovations in fueling, engine maintenance and monitoring, retrofits, idling, and alternative vehicle technologies through CDOT's planning and environmental processes.

This CDOT Air Quality Action Plan, through a series of programmatically directed efforts, promotes an overarching expectation of emissions reduction in all facets of mobility development and transportation project planning. In concert with Colorado Greening initiatives for GHG emissions reductions, CDOT Sustainability Program for fleet management, and together with communities, metropolitan planning organizations, and other air quality agencies and boards, CDOT will investigate, implement, and/or actively foster strategies developed to be flexible to changing economic and technological conditions, and ultimately to furnish realistic best management practices for GHG and mobile air source toxics emissions reductions across the state.

CDOT endorses the importance of shared benefits from programmatic GHG and MSAT reduction strategies for reduction of harmful ground-level ozone and ozone precursor emissions of nitrogen oxides (NOx) and volatile organic hydrocarbons (VOCs).

STRATEGIES

The following strategies have been identified to provide an initial plan to guide the development of wider reaching GHG and MSAT emission reduction efforts within the context of CDOT transportation planning, project development, environmental study, facilities management, and maintenance and construction practices.

The following implementation strategies are guided by the principles of coordination and consultation among local government agencies and interagency cooperation on technical studies, field work and other initiatives related to achieving the goals and objectives of the CDOT Air Quality Policy Directive 1901. Due to the inherent nature of air quality, it is more effective to utilize a programmatic approach to implement emissions reduction strategies, which can also be applicable as mitigation for new NEPA environmental documents.

1. *Evaluate the effects of CDOT air quality policy and regulatory options on the achievement of air quality goals.*
 - Instigate a broad reaching examination of CDOT policies, strategies and programs to evaluate the perceived and actual emissions reduction effectiveness.
 - Evaluate Environmental Programs Branch air quality program interagency involvement to assess success of implementation of action plan goals.
2. *Coordinate, as appropriate, in the development of public and media outreach materials to explain the status of and need to address unregulated air quality issues.*
 - Develop public educational brochures and pamphlets for vehicle emissions, MSAT and GHG emissions and public health effects understanding.
 - Develop multi-media emissions reduction campaign to educate the public on GHG and vehicle related emissions sources, personalizing vehicle reduction strategies such as decreasing idling, routine car maintenance, alternative fuels, etc.

3. *Research the opportunity to participate in an existing or implement a new pilot project to evaluate a Vehicle Miles Traveled (VMT) fee in Colorado.*
 - Investigate Long-term Policy Options to Address the Impact of Decreased Infrastructure Revenues from Increased Penetration of Alternative Fuels and Fuel Efficient Vehicles including the impact of alternative fuel vehicles and high efficiency vehicles on the state's ability to continue to support infrastructure maintenance and construction.
 - Congestion pricing encourages peak spreading for better utilization of existing infrastructure and increasing the incentive for use of alternative modes of travel in the peak periods, further reducing air pollution and GHG emissions. Colorado is particularly interested in the potential and the implications of corridor congestion management, where fees are based on congestion of the individual route, rather than area or cordon congestion management where fees are based on crossing into a particular area. A pilot study should examine in detail the potential magnitude of these and any other possible benefits.
 - Research project to report case studies of congestion management application and pricing effectiveness.
 - An expected benefit of this research is the potential for a decrease in VMT in Colorado. Reduced VMT reduces air pollution and greenhouse gas emissions. There is also the potential for benefits from the congestion management standpoint achieved by charging real-time VMT rates for use of congested facilities at peak times.
 - Investigate participation in a VMT Fee Pilot Program.
 - Investigate current state of OBM on-board monitoring technology.
4. *Examine truck routes/restrictions with the goal of identifying truck traffic in proximity to facilities, including schools, with sensitive receptor populations.*
 - As part of the evaluation of proposed projects in NEPA, CDOT currently examines alternatives to determine if there will be any negative effects to existing and planned developments near proposed project sites and corridors. If a proposed transportation capacity-increasing project is determined to potentially affect a school or other sensitive receptor, such as a nursing home or hospital, CDOT, in consultation with APCD, will discuss the best course of action for the health and welfare of those sensitive receptors. The NEPA evaluation and public involvement process incorporates this information while considering all factors including alternative lifecycle costs and the needs of the traveling public in determining alternatives development. It should be noted that realignment could increase overall emissions by lengthening routes, however.
 - Research opportunities to modify truck routing, delivery scheduling, etc. to minimize MSAT and other pollutant exposure to vulnerable populations such as schools, hospitals, etc.
 - Assess CDOT proposed corridor planning in context of increased MSAT exposure to vulnerable populations.
5. *Continue researching asphalt and concrete durability opportunities with goals to reduce the frequency of resurfacing and/or reconstruction projects and reduce overall emissions from construction.*
 - CDOT has a pavement research division and Materials and Geotechnical Branch that evaluates processes, specifications and products. By researching innovative ways to increase asphalt and concrete durability, CDOT can greatly reduce the energy required to reconstruct facilities and the frequency of repaving operations. Construction operations inherently require large

amounts of energy; therefore, any process or product improvement that reduces the need for additional construction benefits overall air quality and reduces unregulated air emissions by default. Additionally, decreasing emissions related to idling traffic during construction, diversion of traffic into other areas, and use of diesel construction equipment is reduced.

- Quantify air quality improvements caused from maintenance schedule streamlining due to pavement durability.
 - Research into life-cycle pollutant emissions (Criteria pollutants, MSATs, GHGs) from various paving methodologies such as warm-mix and hot-mix asphalt paving processes, heater-scarified, cold-mix recycled pavements, etc.
- A second focus is research on the various pavement mix additives that benefit overall emissions. Energy consumption is a significant environmental concern with cement and concrete production. Cement production is an energy intensive manufacturing process utilizing a considerable amount of energy. The industry's heavy reliance on coal leads to especially high emission levels of CO₂, nitrogen oxide, and sulfur, among other pollutants. For example, CDOT current concrete specifications require Portland cement to contain a 20% fly ash mixture, requiring considerably less energy to create the concrete.
 - Research life-cycle pollutant emissions and efficiencies from concrete processing and road construction, increased use of fly-ash, etc

6. *Develop air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools.*

- Aggregate the best examples of these air quality improvement outreach programs. These examples will be evaluated for their applicability and if determined by signatory agencies to be a good fit for Colorado, they will be “repackaged” and distributed to agencies and groups well-suited to spreading the message.
- Implement outreach programs to inform their citizens about air quality issues (e.g., information on anti-idling, ozone awareness, alternative commuting options, etc.) that will be used as informational sources to complement the development of Colorado specific educational materials.

7. *Offer outreach to communities to integrate land use and transportation decisions to reduce growth in vehicle miles traveled (VMT), such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.*

- Develop a program to educate communities on land use planning techniques to reduce VMT.
- Demonstrate collaborative partnerships to help identify regional differences preserve and protect the transportation system, promote cooperation among local and state transportation agencies, and recognize that transportation revenues are limited.

8. *Explore Transportation Demand Management (TDM) and other operations-focused efforts statewide to better utilize the existing transportation mobility network.*

TDM refers to various strategies that change travel behavior (how, when and where people travel) in order to increase transportation system efficiency and achieve specific planning objectives.

- Research exploring new TDM strategies and to build upon those already in place. Develop additional ways to maximize the existing infrastructure throughout the State while reducing the need for costly expansion projects. Operational management of roadways will play a greater role in the future as CDOT continues to explore new TDM strategies and to build upon those already in place. CDOT will utilize and improve the TDM Tool Kit (2002).
 - CDOT is funding a large study to determine the most effective TDM efforts for Colorado. Included in this study is an evaluation of some commuter trip reduction efforts already in place within the Front Range region to determine what the best approaches in Colorado are. This information will be quite valuable to assist agencies and businesses interested in establishing a commuter trip reduction program. Specific areas of interest are:
 - What technique(s) were most effective and why?
 - Specifically identify how these results are affected by factors such as participating company or agency size, geographic location in the region, and availability of free parking nearby.
 - What improvements could be implemented to improve effectiveness of the respective programs?
 - What were the barriers to the commuter trip reduction program implementation/operation and any suggestions to overcome those barriers.
 - What are the key elements of a commuter trip reduction program that could be used to develop future model or pilot programs?
9. *Continue to diversify the CDOT fleet, retrofit diesel vehicles where appropriate and cost-effective, specify the types of vehicles and equipment contractors could use through bidding incentives, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner burning fuels where feasible.*
- Per the Governor’s Greening Government initiative, the following information will be gathered in order to best utilize the State fleet:
 - Appropriate vehicle utilization rate and size of agency fleets
 - Appropriate age and mileage for vehicle turnover to maximize performance and minimize maintenance costs and environmental impact
 - Environmental costs and benefits of personal vehicle use and reimbursement policies
 - Strategies for improving the overall efficiency of acquiring, using and maintaining all vehicles in the state fleet
 - Make green transportation easy and attractive. CDOT Multimodal and Planning Branch is making significant investments in public transit, walking and cycling infrastructure, which make cleaner choices easier and more accessible for Coloradans:
 - Cost effectiveness of car-sharing services
 - Increasing opportunities for employee use of ride-sharing and mass transit on business travel
 - Employee Eco Pass program for Denver metro transit use
 - CDOT has tremendous purchasing power in the marketplace and can use that power to influence development of more environmentally friendly choices to public fleets, private fleets, and individual consumers. CDOT Fleet Management is developing an environmentally responsible procurement strategy. For example, by encouraging the use of biodiesel in heavy duty vehicles, CDOT supports ongoing efforts to make biodiesel more commercially available.

- Develop system for fleet biodiesel tracking and availability.
- Environmentally responsible strategies are being incorporated into CDOT's sustainability policies regarding buildings, vehicle fleets and the purchase or lease of other goods and services. CDOT already operates a fleet of 127 hybrid-electric and alternate fuel vehicles – along with the Division of Wildlife; CDOT has one of the two largest fleets (843 units) in Colorado. By September 2010, CDOT has completed diesel retrofit filters on seven older heavy duty vehicles.
 - Consolidate Alternative Fuel/Advanced Vehicle Procurement for Public Fleets to aggregate the demand for alternative fuel and advanced technology vehicles for public fleets through a single bid process to improve vehicle availability and reduce costs through economies of scale.
 - Identify opportunities to encourage sustainable construction practices for CDOT projects including the development of a comprehensive list of design and construction activities, an evaluation process, and recommended performance goals for sustainable construction evaluations that reduce GHG and diesel emissions.
 - Promote public/private partnerships and shared station agreements to support electric (EV) and natural gas vehicle (NGV) use in fleets. This strategy would identify opportunities to establish public-private partnerships among government and private fleets and the natural gas industry to develop a statewide network of liquefied natural gas (LNG) and CNG fueling infrastructure and expand deployment of natural gas vehicles in public and private fleet applications.

10. Explore congestion, lane restrictions, and/or speed limitations for motor carriers.

- Lane restrictions limit certain types of vehicles to specified lanes. The most common type of lane restriction addresses truck traffic. A large presence of trucks, both in rural and urban areas, can degrade the speed, comfort, and convenience experienced by passenger car drivers. Some states, to minimize these safety and operational effects, have implemented truck lane restrictions or have designated exclusive truck lane facilities.
 - CDOT will explore opportunities with the trucking industry to designate right-lane only locations, congestion restrictions, and/or time of day lane restrictions, and to report on these opportunities to the Colorado Transportation Commission and the Air Quality Control Commission. It is likely this will take considerable effort and potentially may require legislative action, however.
 - Speeds in excess of 60 miles per hour (mph) dramatically decrease a vehicle's fuel economy. A small mile per hour speed decrease results in a 4 to 5 percent savings in fuel costs. Pilot tests in Canada have shown fuel savings of as much as 2,700 gallons of diesel fuel per year by a typical tractor-trailer unit when using a speed governor. The Engine Control Module in most current vehicles can be used to limit road speed, idling times and maximum revolutions per minute (RPM).
 - Research is needed to investigate the impact of 65 mph speed or engine controls on all heavy diesel trucks.

11. *Promote truck parking electrification and idle reduction for commercial motor vehicles and facilitate funding, where possible*

- Every year, a typical inter-city tractor trailer unit spends 1,800 hours idling. This is equivalent to 75 days of wasting fuel, costing money and releasing fine particulate matter and greenhouse gases into the air. The problem is partly due to the fact that many tractor trailers have refrigeration units and other critical systems that cannot be shut down until they reach their destination.
- Additionally, the Federal Motor Carrier Safety Administration’s hours of service rules generally require commercial vehicle drivers to rest for a ten-hour (consecutive) off-duty period after accumulating 11 hours of driving time or being on-duty for 14 hours. During these 10-hour off-duty periods, drivers are likely to engage in long-duration idling. Drivers who are too far away to sleep at home commonly spend off-duty periods in sleeper berths of trucks parked at private truck stops, public rest areas, freight terminals, or other locations. During hot or cold weather, drivers have few options other than to idle the large 400–500 horsepower engines to power loads that typically require less than 10 horsepower to operate. This causes the main engine to run for long periods of time at low efficiency and with disproportionately high emissions.
 - Develop opportunities to fund a pilot truck parking electrification at a CDOT rest area along interstate corridors. Establishing feasibility and cost effectiveness of electrification facilities can be used to facilitate private industry’s adoption of these technologies.
 - CDOT will promote implementation and utilization of weigh-in-motion freight systems to reduce idling time at Ports of Entry within the state. Weigh-in-motion (WIM) devices are designed to capture and record truck axle weights and gross vehicle weights as they drive over a sensor. Unlike older static weigh stations, current WIM systems do not require the subject trucks to stop making them much more efficient. This system of weighing freight trailers while en route utilizing road sensors and in-cab transponder reporting reduces the number of heavy trucks idling in queue at Ports of Entry weigh stations, thereby reducing the time in queue and resulting idling emissions. In addition to weight data, WIM sites collect a variety of traffic data including traffic volume, speed, directional distribution, lane distribution, date and time of passage, axle spacing, and vehicle classification.
 - Pursue pilot programs testing effectiveness of diesel vehicle retrofit technology for diesel exhaust and engine emissions reductions.

12. *Build a statewide anti-idling movement.*

- Vehicle idling is a significant source of air pollution. Older commercial and industrial vehicles can emit up to 60 times more fine particulate matter than those with new, modern engines. The EPA estimates that an idling vehicle produces about 4.8 grams of carbon monoxide per minute while idling. That means one minute of idling produces more carbon monoxide than the smoke from 3 packs of cigarettes. In Metro Denver, idling is estimated to contribute over 40,000 tons of harmful air pollution a year. Every year over 40 million gallons of fuel is wasted on idling, costing residents and businesses over \$100 million annually.

- If vehicles are not stuck in traffic, there is no need for idling. Contrary to popular belief, it's not an effective way to warm up a vehicle – today's engines are designed to allow a driver to drive away after only 30 seconds in most weather conditions. Additionally, idling for just 10 seconds burns more fuel than shutting down and re-starting the engine.
 - Develop an anti-idling outreach program to help communities identify areas where idling restrictions could be effective in reduction of tailpipe emissions.
 - Develop a statewide idling reduction program for educational programs to lessen avoidable idling at schools.

13. *Research additional ways to improve freight movement and efficiency statewide.*

- Understanding future freight activity is important for matching infrastructure supply to demand and for assessing potential investment and operational strategies. CDOT initiated the Freight Roadmap study to understand the needs and priorities of the freight and hauling industries and to make freight movement more efficient throughout the State. The Transit and Intermodal Committee of the Colorado Transportation Commission frequently discusses these matters and reports findings to the full Commission regularly. A recent discussion item concerned relocation of freight rail lines outside of the congested Front Range to improve freight efficiency and under-utilization of some existing lines, and to free up the rails for eventual passenger rail.
 - Participate and support Smartway Transport Partnership in collaboration with the Rocky Mountain Clean Diesel Collaborative to assist in identifying technologies and strategies to reduce adverse effects of diesel truck pollutant emissions.
- Research emissions benefits from new and innovative ways to improve freight movement throughout the State.

14. *Develop low-VOC emitting maintenance and landscaping procedures.*

- CDOT has developed a portfolio of low-VOC landscaping plants that may reduce ozone precursors and thereby have a positive effect on air quality. A computer simulation of the Los Angeles basin estimated that increased planting of low-emitting VOC trees would lower ozone concentrations, while increased planting of medium- to high-emitting VOC trees would increase ozone concentrations. Implementation in Colorado would most benefit urban landscaping scenarios.
- CDOT will develop low VOC maintenance practices through investigation of existing green maintenance programs to compile best management practices from other states and municipalities. CDOT will incorporate GreenLITES style certification and best management practices program to implement through CDOT maintenance.
- CDOT will investigate the benefit of roadside vegetative barriers for local reduction of MSATs and other vehicle exhaust emissions.

ACTION PROGRAMS AND INITIATIVES

The following section chronicles the existing and under-development CDOT programs and CDOT supported initiatives fulfilling the programmatic GHG, MSAT and shared-benefit, ozone emissions reduction strategies. These programs are included in **Exhibit 1**.

CDOT Sustainability Council

In response to the Governor Ritter's Greening of State Government Executive Orders D011 07 and D012 07, CDOT initiated a Greening Government research study in 2007. The final report- completed in December 2007- provided a pre-implementation plan for CDOT's greening activities. The report was followed by the establishment of a CDOT Greening Government Council in 2008. The Council sought to address ways in which the Department could implement green practices, and to coordinate in achieving the requirements set forth in the Executive Order. The Council prepared a report documenting the Department's existing greening activities, future activities and recommendations. The Greening Government Council served as an interim body to provide initial recommendations on meeting the Governor's goals. One of the Council's recommendations was the formation of a standing CDOT Sustainability Council, which now continues the work of addressing issues of sustainability within the Department. CDOT's Division of Transportation Development (DTD) has also formed a Sustainability Working Group to expand upon the Sustainability Council's work within the Division responsible for planning and environmental programs.

Transportation Environmental Resource Council (TERC) Sustainability Subcommittee

CDOT also participates on the Transportation Environmental Resource Council (TERC) Sustainability Subcommittee. The TERC Sustainability Subcommittee addresses sustainability issues at the state and regional levels in cooperation with federal, state and regional entities. Current efforts include the development of a contract to define sustainability, development of sustainable performance measures and templates for planning and NEPA, establishment of principles and goals, and discussions on agency partnerships to promote more sustainable development.

Statewide Sustainability Principles

CDOT is engaged with other state, federal, and local agencies in developing a proposal for a unified set of statewide sustainability principles applicable to all state agencies. A cohesive set of principles will help agencies work cooperatively to achieve sustainability objectives, and identify opportunities for the state. Additionally, a single set of principles provides a single definition of accountability for the manner in which agencies act as stewards of state revenues. Federal, local, and other agencies will be welcome to adopt the principles as well. In addition to the sustainability principles proposal, CDOT is working with other agencies in developing a proposal for a sustainability clearinghouse to assist state, federal, and local agencies in identifying best practices and opportunities for cooperative sustainability projects. Work is underway (2012) to outline the format for the clearinghouse as well as which agency or organization should maintain the clearinghouse and how operation of the clearinghouse should be funded.

EnergySmart Transportation Initiative

A collaboration of federal and state agencies, Metropolitan Planning Organizations, and rural planning partners came together to leverage resources, and promote efficiency and effectiveness among agencies by collectively exploring ways to develop "energy smart transportation" strategies. The initiative developed approaches to incorporating energy efficiency and GHG emissions in transportation planning, strategies to increase energy efficiency and reduce GHG emissions from transportation, and

methods to measure and analyze the GHG impact of potential strategies. Several of the specific near-term strategies identified by the EnergySmart Transportation Initiative are included in the Summary matrix of Air Quality Action Plan Strategies and Actions, Exhibit 1.

Engines Off! Colorado and Clean Air for Schools Engines Off!

CDOT has adopted Engines Off! an idling reduction education outreach program developed by the Denver Department of Environmental Health (DEH) to help communities, individuals and commercial fleets to identify areas where idling restrictions could be effective in reduction of tailpipe emissions and venues to promote implementation of idling restriction programs or ordinances. One of the goals of the Engines Off! program is to utilize social marketing to reduce idling of commercial vehicles at large public venues. The Engines Off! Colorado program developed in conjunction with Denver DEH has created an idling reduction web-based tool kit available on the DEH Engines Off website for community and local agency idling ordinance development, commercial fleet idling programs, citizen tips for idling reduction, and a variety of other functional linkages. The DEH website is linked to CDPHE and CDOT websites to facilitate easy public outreach.

CDOT has utilized the Clean Air for Schools Engines Off! (CASEO) program to provide schools with idling emissions curricula to reduce idling vehicles on school campus. The program actively involves students, staff and parents to identify measure and modify idling behaviors on campus over the school year. The program provides a framework of activities, educational materials, and program evaluation metrics that provide meaningful measurement of emissions reductions and promotes sustained program participation for progressive grade levels and succeeding school years. CASEO is being promoted and supported by CDOT in collaboration with CDPHE, the RAQC, EPA, DEH, and the American Lung Association to reach school systems both within the ozone nonattainment area and in areas where School Bus Retrofit Programs have already been implemented by EPA and CDPHE. This collaboration among programs reinforces the consistent messaging of GHG and MSAT emissions and idling reductions to achieve less pollution.

Bicycle and Pedestrian Policy Directive

On October 22, 2009, CDOT adopted a groundbreaking policy that states: “The needs of bicyclists and pedestrians shall be included in the planning, design, and operation of transportation facilities, as a matter of routine.” There are three exceptions to the policy: when the law prohibits bicyclists and pedestrians from using a roadway; when the cost exceeds 20% of the overall project; or when the scarcity of population identifies a lack of need.

In conjunction with the policy, a procedural directive was approved in February 2010 that outlines the implementation of the policy. Among other requirements, the procedural directive requires CDOT to develop a statewide bicycle and pedestrian plan; a specific chapter on bicycle and pedestrian design for the Roadway Design Manual; and actions regarding maintenance, education and enforcement.

Land Use and Transportation Integration Study

CDOT has undertaken a study to examine the possibilities for greater integration in land use and transportation planning. The purpose of the study is to develop a framework for a potential future pilot project in a non-urban area for scenario planning directed at the transportation effects of various land use decisions. The study will focus on the approach, partnerships and tools that could be used in integrating land use and transportation planning. CDOT’s intention is to develop collaborative partnerships to integrate land use and transportation planning, including user friendly, affordable models for small town or rural area scenario planning that would support local land use decision making.

This effort will include coordination with representatives from the federal level through the US DOT/HUD/EPA Partnership for Sustainable Communities, state level (CDOT, DOLA, CDPHE), and local level to further develop the most applicable approaches, partnerships, and tools for integrating land use and transportation planning as well as establishing a framework for a pilot project. Project goals include:

- Identify the key factors that must be in place, based on the experience of other states, to successfully partner on integrating transportation and land use planning
- Identify scenario planning models appropriate for use in a non-urbanized area
- Build on the federal partnership formed by DOT/HUD/EPA and facilitate a collaborative Colorado based partnership with federal, state and local participants, identifying roles and responsibilities
- Develop a framework for a future pilot project including roles of participants and an estimate of staffing and budget needed

Mileage Based User Fee for Colorado: Pilot Study Framework

CDOT, like most transportation agencies, is facing funding shortfalls due to declining revenues from fuel tax and increasing costs of doing business. At the same time CDOT is concerned about the continuing contribution of GHG emissions to climate change. CDOT also sees considerable potential to improve the efficiency of use of existing infrastructure through congestion management. Mileage Based User Fee (MBUF) is seen as having potential to address the revenue shortfall, provide congestion management benefits and reduce total VMT, thus reducing carbon footprint of transportation as well as better allocating the costs to maintain transportation infrastructure in Colorado. This research study will explore a conceptual framework for a pilot project evaluating the feasibility and effectiveness of introducing MBUF in Colorado.

Transportation Demand Management (TDM) Program

CDOT's TDM program primarily consists of grant administration and technical assistance. Recent CDOT supported efforts in transportation demand management include:

Go Boulder- Marketing Campaign

In 2007 the City of Boulder's Go Boulder office targeted 4,000 individual households in north Boulder and offered specific travel information to help them shift from driving alone to walking, biking or using the bus. Of these 4,000 households, 642, representing approximately 1,400 residents, were selected to participate. Participants increased their bicycle mode share for all trips by 26%, and their bus mode share for all trips increased by 66%. Single occupancy vehicle travel was reduced by 14% over the study period of September to October 2007.

Downtown Denver Partnership- 'Get Downtown Unconventionally'. The Downtown Denver Partnership (DDP) developed an on-line program that registered 1,150 employees who worked in Downtown Denver during the Democratic National Convention. In exchange for incentive items, participants were required to use transit, bike, walk or carpool, instead of driving alone, at least 15 times during the month of August 2008. DDP also provided daily information and outreach regarding travel delays, schedules, road closures, and encouragement to use alternative modes. Participants saved more than 400,000 miles and 30,000 trips that otherwise would have been taken in single occupancy vehicles.

[eGo CarShare](#)- Establishment of CarShare Pods in Denver neighborhoods eGo CarShare has begun to purchase and/or lease 46 vehicles for a car sharing program at 20-30 pod locations in core Denver neighborhoods with the goal to provide alternatives to individual car ownership, thereby reducing the environmental and social impacts associated with motor vehicle use. eGo Carshare also provides service in Boulder.

[Fort Collins TransFort](#) Diesel Retrofit Project

The City of Fort Collins replaced three diesel buses with compressed natural gas (CNG) buses. Since the purchase in December 2008, these three CNG buses have logged over 116,000 miles and have directly reduced over 2 million grams of Nitrogen Oxide (NOx) and 23,000 grams of VOCs by utilizing CNG instead of diesel fuel. During that same timeframe, the three CNG buses have provided over 328,600 trips, reducing 1,860,000 VMT.

[Regional Air Quality Council](#) (RAQC) Diesel Idling Reduction/New Energy Fleets

RAQC installed over 1,040 diesel emission reducing units on public and private fleets in 2007 and 2008. Through this effort the RAQC also provided outreach, educating drivers on idling reduction and other ways to limit fuel usage.

Congestion Mitigation and Air Quality (CMAQ) Program

Congress established the CMAQ program in the early 1990s under the Intermodal Surface Transportation Efficiency Act (ISTEA), expanded it under the Transportation Equity Act for the 21st Century (TEA-21), and continued it under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The primary focus of the CMAQ program has been on air quality improvement, reflecting the requirements placed on the transportation sector by the Clean Air Act Amendments of 1990 to help meet national air quality goals. The CMAQ program provides flexible funding for States to use in nonattainment areas and maintenance areas to help them address air quality concerns from transportation sources. Over time, the CMAQ program has become a key mechanism for supporting investments that help areas to meet air quality goals, encourage alternatives to driving alone, and improve traffic flow.

Federal CMAQ money is allocated to CDOT to fund transportation related activities or projects that contribute to a reduction in emissions for CO, Nitrogen Oxides (NOx), Volatile Organic Compounds (VOC), and particulate matter. While the CMAQ program does not directly address CO₂ emissions, the most important greenhouse gas to climate change, the projects and programs funded by CMAQ do have substantial benefit in CO₂ reduction through the reduction of VMT. It is estimated that in FY 2007-2008 the CMAQ program resulted in a reduction of 518,681,000 VMT.

Outreach and Collaboration Emission Reduction Programs

Partnerships with other agencies, and outreach activities are an important component of CDOT's efforts to address climate change and greenhouse gas reduction. Recent efforts include:

- CDOT offers other programs that either directly or indirectly reduce CDOT employees' fuel consumption. Examples of these programs include: providing RTD ECO transit passes and Commuter Checks to encourage transit use, flexible work schedules, telecommuting, statewide video conferencing, etc.

- *Colorado's EnergySmart Transportation Initiative*- A multi-state initiative to develop “smart transportation” solutions, sponsored by the Rockefeller Foundation and the Center for State Innovation. Participants include CDOT and 13 other DOTs.
- *AASHTO/CDOT Climate Change Workshop*- Held in June 2010, included attendees from an array of government agencies. This 2-day workshop provided an update on climate change science and policy, and included inter-agency discussions on possibilities for collaboration.
- *Planning and Environmental Linkages Program*- Program designed to improve the project delivery process by identifying how and when various environmental issues as well as NEPA decision-making actions can be incorporated into the standard transportation planning process, and by developing standards and materials to assist in the development of more robust transportation planning studies that can be incorporated directly into the project development process thereby reducing delay and leading to more cohesive and responsive projects.
- *Environmental Stewardship Guide*- Guide describing CDOT's environmental ethic and supporting practices.
- *GreenLITES Pilot Project*- A pilot project is underway to evaluate the NYDOT's GreenLITES (Leadership in Transportation and Environmental Sustainability) program and examine its applicability to CDOT projects.
- *Green Maintenance Program*- Recently completed pilot program developed to foster environmental compliance and promote the development of a culture and commitment to actively utilize environmental Best Management Practices (BMP) and pollution prevention techniques. The program is currently being considered for statewide implementation.
- *Assessment of CDOT Rest Areas for Sustainability Improvements and Highway Corridors and Facilities for Alternative Energy Source Use*- Research study examining resource consumption, energy costs, emissions and waste treatment at CDOT rest areas, and possibilities for improvements or retrofits. Also includes an examination of the possibility of utilizing CDOT right-of-way for alternative energy generation.
- *CDOT Off-Road Fleet Retrofit Project*- CDOT is investigating demonstration project opportunities to evaluate the operational and cost effectiveness of retrofitting heavy duty off-road fleet vehicles with emissions reducing devices such as diesel oxidizing catalysts. The project will generate data to gauge the benefit of emissions reducing retrofits on off-road equipment. If successful, the program could be applied to the CDOT off-road fleet statewide, and could potentially be used to support retrofit requirements for construction vehicles on CDOT roadway projects.
- *CDOT Pre-heater Retrofit Demonstration Project* - CDOT is evaluating the emissions, cost and fuel savings resulting from the elimination of avoidable snow plow idling by installation of pre-heater devices to heat cabin and engine components during winter operations.
- *Energy Performance Audits*- In cooperation with the Governor's Energy Office, CDOT has contracted with a consultant to conduct an audit of CDOT facilities and the Department's energy use.
- *Fuel Reduction Plan*- Identifies ways to reduce fuel spending and outlines how CDOT will manage its fleet in compliance with the Governor's Executive Orders on Greening of State Government.

MONITORING AND REPORTING

The relative success of the proposed programmatic initiatives and programs on our Colorado air environment requires that measurable air quality indicators be identified and performance measures established, results monitored, and that information be collected and documented.

Air Quality Indicators

To measure progress in protecting air quality, we use indicators. One indicator can reflect trends in multiple pollutants. Indicators can provide an assessment of the current situation and, in some cases, provide a measurement of parts of the problem that are within our control.

Exhibit 2 outlines general air quality indicators suggested for the evaluation of qualitative interim effects and benefits resulting from programs and initiatives associated with the Air Quality Action Plan.

Exhibit 2. General Air Quality Indicators

Indicator	Metric	Desired Qualitative Result
Compliance with National Ambient Air Quality Standards	Ozone – ppm Carbon Monoxide – ppm ₃ Particulates – µg/m ³	No violations
Ambient Air Pollution Levels	Maximum recorded concentration over time	Decreasing concentrations
VMT growth rate	Annual growth rate (%)	Decreasing rate
VMT reduction program performance	Number vehicle miles reduced from start-date baseline	Decreasing VMT
Fleet average tailpipe emissions (CO, PM10, PM2.5, NOx, VOCs, MSATs)	Grams per mile as estimated by current version of EPA's MOVES Model	Reductions over previous years
Greenhouse Gas Emissions	Statewide or Regional emissions of CO2e (tons per year)	Reductions over previous years

Before each plan implementation action can be adequately employed, a set of indicator parameters should be tailored to best provide meaningful and measurable results. It is suggested that an indicator from the table above be selected to provide a measuring stick for program benefits and emissions reduction profiles. The monitored goals should be two-fold: a general qualitative (or quantitative) target, and a quantitative air quality indicator of emissions reductions reflecting the best estimate of actual regional or statewide air quality benefits resulting from the program. For example, if the measure pertains to Maintenance Fleet goals of meeting the governors Greening Initiatives of 20% cleaner vehicles by 2020, then a general target might be to retrofit 100 of the total 500 pre-CAFE heavy diesel truck vehicles by 2012, or replace 30% of heavy vehicle fleet with hybrid-diesel engine and/or alternative fuel vehicles by 2015. The secondary measure of benefit might include a tally of tons per year reduced emissions or a life-cycle emissions benefit such as the tons of diesel emissions reduced

annually, or savings from estimated tons of diesel particulate matter per truck that was not emitted over 15 year remaining life of heavy vehicles due to added retrofit technologies.

To assure that the Action Plan provides the maximum air quality benefits possible, project schedules should address time allowed for CDOT processes to adequately propose, acquire funding and implement the measures contained in the plan. A more specific timeline with performance or exposure milestones should accompany each program once it is implemented, to assure that the program can fulfill its intended purpose and performance expectations. This should include quantification of the expected cost and resource impacts of the proposed measures, by when they can be expected and, where possible, an indication as to whether funds will be sufficient to meet sustainability and performance goals.

Specific action program metrics and schedules should be reported annually, and appended to an Air Quality Action Plan *SharePoint* library to provide transparent access among project sponsors, management, technical, and planning staff. This electronic repository will act as a recording and documentation venue for interactive project progress reporting, fiscal maintenance and performance monitoring updates.

Statewide Greenhouse Emissions Baseline

CDOT is currently developing a Greenhouse Gas Calculator tied to fuel sales to produce a reasonable statewide GHG baseline estimate. This calculator will be module attached to the CDOT revenue modeling system. This system utilizes actual county-based fuel consumption and generalized vehicle-miles traveled to derive a regional baseline of CO₂e from which more detailed comparisons can be refined and generated in the future. The immediate goals include:

- Establish baseline year and GHG statewide and/or regional CO₂e emissions baseline
- Determine transportation GHG emissions rate trends
- Estimate GHG reduction effort benefits and their impact on overall emissions levels

In the longer-term, as the Statewide Mobility Transportation Model is developed, more accurate CO₂e estimates will be derived from statewide application of EPA MOVES emissions modeling, FHWA GHG calculator Energy and Emissions Reduction Policy Analysis Tool and incorporation of MPO modeling results.

SUMMARY/CONCLUSION

CDOT, by direction of the Air Quality Policy Directive, and through the mechanisms identified in this Air Quality Action Plan, will continue to develop the strategies and plans to reduce VMT, related vehicle emissions and fuel consumption. Additionally, CDOT plans furtherance of cooperative efforts and endorsements with local agencies, organizations and governments to encourage denser development and focused growth within transit corridor development boundaries.

The implications of adding GHG reductions to statewide planning are more likely envisioned as establishing GHG emissions baselines and achievable reduction targets, and the identification of effective statewide emissions reduction and energy saving measures. The CDOT and Governor's Energy Office have collaborated to form the Energy Smart Transportation Initiative to focus efforts on reasonably implemented strategies and conceptual development to further GHG and other emissions reductions, and carbon fuel savings and efficiencies through statewide energy education and strategic

programming and planning. Continued coordination with statewide MPOs, Transportation Planning Regions, air quality planning and compliance organizations is required to identify existing GHG policies and strategies, and define the context and relevance of GHG and mobile source air toxics reduction strategies necessary to be employed within the framework of the statewide planning process.

Exhibit 1. Matrix of Air Quality Action Plan Strategies and Actions

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<i>Evaluate the effects of CDOT air quality policy and regulatory options on the achievement of air quality goals.</i>	a. Instigate a broad reaching examination of CDOT policies, strategies and programs to evaluate the perceived and actual emissions reduction effectiveness.	SSTI Framework to incorporate addressing GHG emissions in the LRTP; EnergySmart Transportation Initiative	Private Grant/ \$600,000	CDOT DTD Planning	GEO, FHWA, FTA, HUD, RAQC, CDPHE, RTD, MPOs, STAC	Jul2011-Mar2012	Short term initiatives identified for development
	b. Evaluate Environmental Programs Branch air quality program interagency involvement to assess success of implementation of action plan goals.	Planning and Environmental Linkages Program	FHWA funds, CDOT SPR	TERC; CDOT DTD EPB	FHWA, DOLA, MPOs	Ongoing	Application available for use
		Climate Change Workshop	AASHTO	AASHTO, CDOT DTD	DOLA, CDPHE, MPOs, TPRs	Jun2010	Complete
<i>Coordinate, as appropriate, in the development of public and media outreach materials to explain the status of and need to address unregulated air quality issues.</i>	a. Develop public educational brochures and pamphlets for vehicle emissions, MSAT and GHG emissions and public health effects understanding.	Ozone Aware Program Statewide Outreach		RAQC	CDOT DTD, APCD, Area TPRs and MPOs		Ongoing
	b. Develop multi-media emissions reduction campaign to educate public on GHG and vehicle related emissions sources, personalizing vehicle reduction strategies.	Engines Off! Colorado	SPR, CMAQ	DEH	CDOT DTD EPB, CDPHE, ALA	Jun2010-Jun2012	Ongoing
		TBA Clean Fuels programs		Clean Cities Colorado			
<i>Research the opportunity to participate in an existing or implement a new pilot project to evaluate a Vehicle Miles Traveled (VMT) fee in Colorado.</i>	a. Investigate participation in VMT Fee Pilot Program extension	Mileage Based User Fee for Colorado: Pilot Study Framework		CDOT DTD SMT			In progress
	b. Research project to report on case studies of congestion management application and pricing effectiveness.	Congestion Mitigation and Air Quality (CMAQ) Program	Federal	CDOT DTD Planning	Nonattain/Maint area MPOs	Ongoing	Ongoing
	c. Investigate current state of OBM on-board monitoring technology	TRB/NCHRP Research		TRB, NCHRP			In progress

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<i>Examine truck routes/restrictions with the goal of identifying truck traffic in proximity to facilities, including schools, with sensitive receptor populations.</i>	a. Research opportunities to modify truck routing, delivery scheduling, etc to minimize MSAT ad other pollutant exposure to vulnerable populations such as schools, hospitals, etc	Air Quality Programmatic Strategies Cost-Benefit Analysis (2008) evaluated truck routing feasibility and potential benefits.	NPS	CDOT DTD EPB		Aug2008-Oct2008	Study complete; program development not yet initiated
	b. Assess CDOT proposed corridor planning in context of increased MSAT exposure to vulnerable populations						
<i>Continue researching asphalt and concrete durability opportunities with goals to reduce the frequency of resurfacing and/or reconstruction projects and reduce overall emissions from construction.</i>	a. Quantify air quality improvements caused from maintenance schedule streamlining due to pavement durability.	Air Quality Programmatic Strategies Cost-Benefit Analysis (2008) evaluated pavement durability potential benefits.	NPS	CDOT DTD EPB		Aug2008-Oct2008	Study complete; in progress.
	b. Research into life-cycle pollutant emissions from various paving methodologies such as warm-mix and hot-mix asphalt paving processes, heater-scarified, cold-mix recycled pavements, etc						
	c. Research life-cycle pollutant emissions and efficiencies from concrete processing and road construction, increased use of fly ash, etc	Air Quality Programmatic Strategies Cost-Benefit Analysis (2008) evaluated feasibility and potential benefits of using fly ash in concrete manufacture.	NPS	CDOT DTD EPB	Pending EPA regulation	Aug2008-Oct2008	Study complete; pending EPA regulation.
<i>Develop air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools.</i>	a. In conjunction with strategy no.2 compile community outreach programs to inform citizens about air quality issues (e.g., information on anti-idling, ozone awareness, commuting options, etc.) that will be used as informational sources to complement the development of Colorado specific educational materials.						
	Implement outreach programs to inform their citizens about air quality issues that will be used as informational sources to complement the development of Colorado specific educational materials.	GreenLITES Pilot Project	SPR	CDOT EPB	CDOT R3	Jun2011-Nov 2012	Complete

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<p><i>Offer outreach to communities to integrate land use and transportation decisions to reduce growth in vehicle miles traveled (VMT), such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.</i></p>	<p>a. Develop a program to educate communities on land use planning techniques to reduce VMT.</p>	<p>Land Use and Transportation Integration Study</p>	<p>SPR - \$70,000</p>	<p>CDOT DTD Planning</p>	<p>DOT/HUD /EPA Partnership for Sustainable Communities, DOLA, CDPHE, CCI, CML, local entities</p>		
	<p>b. Demonstrate collaborative partnerships that help to identify regional differences, preserve and protect the transportation system, promote cooperation among local and state transportation agencies, and recognize that transportation revenues are limited.</p>	<p>CDOT Sustainability Council & (TERC) Sustainability Subcommittee</p>		<p>CDOT EMT & DTD</p>	<p>DOT/HUD /EPA Partnership for Sustainable Communities, DOLA, CDPHE, CCI, CML, local entities</p>	<p>Ongoing</p>	
<p><i>Explore Transportation Demand Management (TDM) efforts statewide to better utilize the existing transportation mobility network.</i></p>	<p>a. Research exploring new TDM strategies and to build upon those already in place. Utilize and improve TDM Tool Kit (2002).</p>	<p>Transportation Demand Management (TDM) Program</p>	<p>SPR</p>	<p>CDOT DTD Planning</p>	<p>CDOT Regions, CDOT ITS</p>		
		<p>Air Quality Programmatic Strategies Cost-Benefit Analysis (2008) evaluated TDM measure feasibility and potential benefits.</p>	<p>NPS</p>	<p>CDOT DTD EPB</p>		<p>Aug2008-Oct2008</p>	<p>Study complete; program development not yet initiated.</p>
	<p>b. CDOT is funding a large study to determine the most effective TDM efforts for Colorado. Included in this study is an evaluation of some commuter trip reduction efforts already in place to determine what are the best approaches in Colorado.</p>	<p>Go Boulder</p>		<p>CDOT DTD</p>	<p>City of Boulder</p>	<p>Ongoing</p>	
		<p>Downtown Denver Partnership</p>		<p>CDOT DTD</p>	<p>Downtown Denver Partnership</p>	<p>Ongoing</p>	
	<p>eGo CarShare</p>		<p>CDOT DTD</p>	<p>CarShare PODs</p>	<p>Ongoing</p>		

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<p><i>Continue to diversify the CDOT fleet, retrofit diesel vehicles where appropriate and cost-effective, specify the types of vehicles and equipment contractors could use through bidding incentives, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner burning fuels where feasible.</i></p>	<p>a. Per the Governor's Greening Government initiative, the following information will be gathered in order to best utilize the State fleet:</p> <ul style="list-style-type: none"> • Appropriate vehicle utilization rate and size of agency fleets • Appropriate age and mileage for vehicle turnover to maximize performance and minimize maintenance costs and environmental impact • Environmental costs and benefits of personal vehicle use and reimbursement policies • Strategies for improving the overall efficiency of acquiring, using and maintaining all vehicles in the state fleet 	Fuel Reduction Plan		CDOT Branch Maint/Sustainability Unit			
		Air Quality Programmatic Strategies Cost-Benefit Analysis (2008) evaluated potential benefits of ultra-low sulfur fuels.	NPS	CDOT DTD EPB		Aug2008-Oct2008	Study complete; implemented.
	<p>b. Continue programs encouraging ride-sharing, ecompass program transit ridership, bike-ped programs, etc</p>	TDM and Bicycle and Pedestrian Programs; Statewide Bicycle and Pedestrian Plan	Work Program and Federal (CMAQ, Enhancement)	CDOT DTD Planning	Local and Regional Agencies	Ongoing	Ongoing
	<p>c. Fleet biodiesel fuel tracking and availability.</p>			CDOT Fleet Management			
	<p>d. Develop environmentally responsible procurement strategy.</p>			CDOT Fleet Management			
	<p>e. Identify opportunities to encourage sustainable construction practices for CDOT projects including the development of a comprehensive list of design and construction activities, an evaluation process, and</p>	Energy Smart Transportation Initiative (2012) Clean Construction recommendation		CDOT DTD EPB, Planning	EPA		
	<p>f. Promote public/private partnerships and shared station agreements to support electric (EV) and natural gas vehicle (NGV) use in fleets.</p>	Energy Smart Transportation Initiative (2012) recommendation; Pilot Project Electrification Rest Area					In progress
		FEVER Obstacles to Electric Vehicle Implementation		Many, CDOT DTD EPB	Over 50 partners	Mar2011-	In progress
		NGV Alternative Fuel Vehicle Program					
<p>g. Environmentally responsible strategies are being incorporated into CDOT's policies regarding buildings, vehicle fleets and the purchase or lease of other goods and services.</p>	Energy Performance Audits		CDOT DTD Research	GEO	-Dec2011	Completed; report pending	

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<i>Explore congestion, lane restrictions, and/or speed limitations for motor carriers.</i>	a. CDOT will to explore opportunities that may exist with the trucking industry to designate right-lane only locations, congestion restrictions, and/or time of day lane restrictions, and to report on these opportunities to the Colorado Transportation Commission and the Air Quality Control Commission.						
	b. Research to investigate and verify impact of 60 mph speed governor or engine control module installation on all trucks.						
<i>Promote truck parking electrification/idle reduction for commercial motor vehicles and facilitate funding, where possible</i>	a. Develop system of electrified truck stop areas along major freight and interstate transport routes	Assessment of CDOT Rest Areas for Sustainability Improvements and Highway Corridors and Facilities for Alternative Energy Source Use		CDOT Research			Study completed
		Truck Electrification Pilot Project	SPR, \$200,000	CDOT IMB		Jun2012-	Under development
	b. Promote implementation and utilization of weigh-in-motion freight systems to reduce idling time at Ports of Entry within the state.			City Ft. Collins	CDOT DTD		
	c. Deveop pilot programs to test effectiveness of diesel retrofit technologis.	Fort Collins TransFort Diesel Retrofit Project	CMAQ	City of Ft. Collins	R4, RAQC, EPB		
		Engine Pre-heater Retrofit Demo Project	SPR to date \$51,000	CDOT DTD EPB	CDOT Fleet, Maint R2	Sep2011-	In progress
		Off-Road Fleet Retrofit Demo Project	CDOT SPR Funded Pilot \$83,500	RAQC	CDOT Fleet, Maint R3	Jun 2010 - Jun 2011	Cancelled

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Partners	Timeframe	Target Completion (current 04/19/2012)
<i>Build a statewide anti-idling movement.</i>	a. Develop an anti-idling outreach program to help communities identify areas where idling restrictions could be effective in reduction of tailpipe emissions and venues to promote implementation of idling restriction programs or ordinances.	Diesel Idling Reduction/New Energy Fleets	CMAQ, CDOT SPR Funded web tool kit \$12,500	CDOT EPB	Denver, RAQC	Jun2010-Jun2012	Web tool-kit available
	b. Develop a statewide idling reduction curricula for educational programming to lessen avoidable idling at schools.	Clean Air at Schools Engines Off	CDOT SPR to date \$32,500	CDOT EPB	ALA, CDPHE, Denver, EPA, LAS	SYR 1 Falcon Apr10-Jun12; SY2 Garfield Nov11-May12; SY3	In progress
<i>Research additional ways to improve freight movement and efficiency statewide.</i>	a. Participate and support Smartway Transport Partnership in collaboration with the RMCDC to assist in identifying technologies and strategies to reduce adverse effects of diesel truck emissions.	Smartways Transportation Partnership, Freight Advisory Committee, IMB		EPA, RMCDC	CDOT		
		Energy Smart Transportation Initiative (2012) Truck SmartWays recommendation		CDOT DTD EPB, Planning	EPA		Study complete; program development not yet initiated.
	b. Research emissions benefits from new and innovative ways to improve freight movement throughout the State such as Freight Roadmap.	Freight Roadmap; Statewide Passenger and Freight Rail Plan	Federal	CDOT IMB	Freight Advisory Committee Railroads, CASTA, etc.		
<i>Develop a low-VOC emitting maintenance and landscaping procedures.</i>	a. Develop portfolio of low-VOC landscaping plants may reduce ozone precursors and thereby have a positive effect on air quality.	Landscape Specs for existing xeroscape and native low VOC plant list.	Unknown	CDOT DTD EPB	USDA/FS	c.2009	Available
	b. Develop low VOC maintenance practices by investigating and existing green maintenance programs to compile best management practices in other states and municipalities.			CDOT DTD EPB			
	c. Investigate benefit of roadside vegetative barriers for local reduction of MSATs and other highway vehicle exhaust emissions.	Vegetative Barrier Research Project	SPR \$55,000	CDOT DTD EPB	DEH	FY13	Under development

GLOSSARY OF TERMS AND ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
ALA	American Lung Association
APCD	Air Pollution Control Division of the Colorado Department of Public Health and Environment
AQCC	Air Quality Control Commission
BMP	Best Management Practice
CAAA	Clean Air Act and Amendments
CASEO	Clean Air at School Engines Off program
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CMAQ	Congestion Management and Air Quality program
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalents
DEH	City and County of Denver Department of Environmental Health
DOLA	Colorado Department of Local Affairs
DRCOG	Denver Regional Council of Governments
DTD	Colorado Department of Transportation Division of Transportation Development
EO	Governor's Executive Order
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GEO	Colorado Governor's Energy Office
GHG	Greenhouse gas
GVMPO	Grand Valley Metropolitan Planning Organization
HUD	United States Department of Housing and Urban Development
ISTEA	Intermodal Surface Transportation Efficiency Act
Maint	Colorado Department of Transportation Maintenance
Mph	Miles per hour
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxic
NAAQS	National Ambient Air Quality Standard
NCRHP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NFRMPO	North Front Range Metropolitan Planning Organization
NO ₂	Nitrogen Dioxide
NO _x	Oxides of nitrogen
NYDOT	New York Department of Transportation
OBM	On-board vehicle monitoring equipment
PACOG	Pueblo Area Council of Governments
PM ₁₀	Particulate matter less than 10 microns in size
PM _{2.5}	Particulate matter less than 2.5 microns in size
PPACG	Pikes Peak Area Council of Governments
Ppb	Parts per billion

Ppm	Parts per million
RAQC	Regional Air Quality Council
RPM	Rotations per minute
RTD	Regional Transportation District
SAFETEA-LU	Safe Accountable Flexible Efficient Transportation Equity Act – A Legacy for Users
SIP	State Implementation Plan
STAC	Statewide Transportation Advisory Committee
TDM	Transportation Demand Management
TEA-21	Transportation Equity Act for the 21 st Century
TERC	Transportation Environmental Resource Council
TPR	Transportation Planning Region
TRB	Transportation Research Board of the National Academies
µg /m ³	Micro-grams per cubic meter
USC	United States Code
VMT	Vehicle miles traveled
VOC	Volatile Organic Hydrocarbons
WIM	Weigh-in motion truck scale

REFERENCES and RESOURCES

Colorado Department of Transportation, 2009. CDOT Policy on Air Quality – Policy Directive 1901.0. May.

Colorado Department of Transportation. 2011. National Environmental Policy Act Manual, Version 2. December.

Colorado Department of Transportation. 2012a. Operating Manual for MPO Transportation Planning. February.

Colorado Department of Transportation. 2012b. The Colorado EnergySmart Transportation Initiative – A Framework for Considering Energy in Transportation. March.

General Assembly of the State of Colorado. 2009. Senate Bill 09-108 Funding Advancement for Surface Transportation and Economic Recovery.

Spensley & Associates. 2008. Air Quality Programmatic Strategies Cost-Benefit Analysis. October.

State of Colorado, Governor's Energy Office. 2007. Colorado Climate Action Plan. November.

USEPA Clean Air Act and its Amendments.
<http://www.epa.gov/air/caa/> accessed September 2010.

USEPA National Ambient Air Quality Standards 40 CFR 50.
<http://www.epa.gov/air/criteria.html> accessed March 2012.

USEPA Transportation Conformity Rule 40 CFR 93. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr93_main_02.tpl accessed June 2010, March 2012.