

Appendix J: Air Quality Action Plan

CDOT AIR QUALITY ACTION PLAN

INTRODUCTION

This Air Quality Action Plan is the first step in implementing the CDOT Air Quality Policy Directive 1901 developed through extensive inter-agency cooperation. The 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 programs to reduce transportation related GHG and air toxics emissions at the source by streamlining the number of vehicles operating on the Colorado roadway network and reducing the statewide vehicle miles traveled (VMT). Air Quality Action Plan goals encompass transit and sustainable community development, multi-modal freight movement and efficiency, and 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 (CAA). Under the Clean Air Act and its Amendments, 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, lead, nitrogen dioxide (NO₂), ozone, particulate matter, and sulfur dioxide. Transportation contributes to four of the six criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, and particulate matter. If monitored levels of any of these pollutants violate the national ambient air quality standards, then the EPA, in cooperation with the State, will designate the contributing area as "nonattainment." Transportation agencies play an important role in setting nonattainment area boundaries, providing essential information on commuting and travel patterns.

DEVELOPING SIPS

State air, environmental or health agencies are responsible for the development of state implementation plans (SIPs) that explain how the nonattainment area will meet the requirements of the CAA. State and local transportation agencies are required to implement these measures, so it is important that they take an active role in development of the SIP. A SIP is required for each pollutant for which the nonattainment area violates the National Ambient Air Quality Standards. A SIP describes the measures a State will use to bring nonattainment areas into attainment, including public involvement. EPA must approve each SIP, and if a SIP isn't acceptable or the State fails to submit one, EPA must impose sanctions and ultimately assume responsibility for enforcing the Clean Air Act in that State. Transportation measures are a key component of SIP development. Depending on the severity of nonattainment, the CAA requires various transportation-related activities, programs and strategies. States also have the option of choosing among a variety of additional voluntary transportation measures.

One of the first steps in the development of a SIP is the preparation of an emissions inventory, which is based on the actual or modeled emissions from all sources of air pollution within the nonattainment area. The inventory of mobile source emissions is further categorized by on-road and non-road emissions. The emissions inventory helps define the extent of the pollution problem, relative to the air quality standards in current and future years. The on-road mobile source portion of the inventory should be developed in very close cooperation with State and local transportation agencies. Emission estimates for on-road mobile sources are usually based on the combination of two fundamental measures: vehicle miles of travel (VMT) and emissions rates (the rate of pollutants emitted in the course of travel based on vehicle speed and other factors). The EPA and the U.S. DOT have developed a series of tools and models to estimate the emissions produced by on-road mobile sources. The development of an emissions inventory for on-road mobile sources for an area requires a cooperative effort between air quality agencies and transportation agencies. Once the emissions inventory is completed, including emissions estimates for all sources, air quality modeling or some analytical method may be required to determine the total needed emissions reductions. Once the total emissions reductions target is determined, control strategies must be determined to demonstrate how emissions are to be reduced to that level.

Of the control strategies States may choose to implement, some may be on-road mobile source measures to reduce vehicle use or change traffic flow or congestion conditions. These measures are known as transportation control measures (TCMs). A TCM is any measure that is specifically identified in the SIP for the purpose of reducing emissions or concentrations of air pollutants from transportation sources. The SIP must provide for the implementation and enforcement of TCMs. TCMs should be developed jointly by transportation and air agencies as part of the transportation planning process, and incorporated into the SIP. In addition, many transportation plans and TIPs include TCM-like projects such as transit investments or HOV lanes, which are not included in the SIP. These measures can help improve air quality but are not considered legally enforceable commitments unless they are identified as TCMs in the SIP.

The allocation of emissions reductions and control strategies results in an emission reduction target for all sources. For on-road mobile sources, this target can be translated into an area's motor vehicle emissions budget (MVEB), which identifies the allowable on-road emissions levels to attain the air quality standards. These budgets are, in effect, a cap on emissions and represent the "holding capacity" of the area. The motor vehicle emissions budget that is explicitly identified in the SIP will be used in the transportation conformity process to cap the emissions allowed by motor vehicles on the regional transportation network as planned.

Transportation conformity, as required by the CAA, ensures that Federally-funded or approved transportation plans, programs, and projects conform to the air quality objectives established in the SIP. Transportation conformity regulations are developed by EPA, with the U.S. Department of Transportation's (DOT's) input and concurrence. FHWA and FTA are responsible for implementing the conformity regulation (40 CFR 93) in nonattainment and maintenance areas. EPA has a consultative role in the analysis and findings that are required. In terms of transportation plans and transportation improvement programs (TIPs), FHWA/Federal Transit Administration's joint conformity determination is based on a quantitative demonstration that projected motor vehicle emissions from the planned transportation system do not exceed the motor vehicle emissions budget established in the SIP. The budget provides the upper limits for

emissions in specific years that serve as milestones intended to bring the area into attainment of the air quality standards. If the transportation plan or TIP cannot meet the motor vehicle emissions budget, then changes may need to be made to the transportation plan or TIP, or the SIP.

Air Quality POLICY DIRECTIVE 1901

The CDOT Air Quality Policy Directive 1901 was approved through the Air Quality Control Commission (AQCD) 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 and greenhouse gases 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 (EPA), 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.

The CDOT Air Quality Policy Directive is summed up in these five policy statements:

- A. Use CDOT's unique statewide perspective to address transportation and air quality needs at the state, regional, and local levels through collaboration with varied public and private sector stakeholders.

B. Promote a transportation system that is environmentally responsible by working to research and promote actions and technologies that assist areas of the state which currently violate air quality standards to achieve compliance and to prevent the occurrence of new violations of air quality standards elsewhere in the state.

C. Advocate the integration of local, regional and statewide transportation and air quality priorities through a coordinated decision-making process that balances long range transportation, land use planning, and quality of life needs in Colorado by working with the general public and federal, state, regional and local transportation and air quality interests.

D. Maintain a partnership with the Colorado Department of Public Health and the Environment and other air quality agencies to improve understanding of the role of CDOT in contributing to solutions to, and preventing the occurrence of new, air quality problems.

E. To pursue coordinated, proactive and programmatic options for addressing air quality concerns related to transportation related pollutants in a manner that is more effective given the regional nature of air quality hazards.

AIR QUALITY CONDITIONS

As of July 2010, the state of Colorado is in attainment for all criteria pollutants except for ground-level ozone. All former carbon monoxide and particulate matter PM₁₀ nonattainment areas have demonstrated several years of successful Statewide Implementation Plan (SIP) air quality control measures, reducing pollutant concentrations consistently below the National Ambient Air Quality Standards (NAAQS). The following areas have been re-designated attainment/maintenance status by EPA:

- Denver metropolitan area carbon monoxide, 1-hour ozone and PM₁₀ areas
- Longmont, Greeley, Fort Collins, and Colorado Springs carbon monoxide areas
- Steamboat Springs, Telluride, Aspen, Canyon City, and Pagosa Springs 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 President Obama 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 March 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.

A March 2010 NAAQS revision includes a new nitrogen dioxide standard for 1-hour duration threshold and roadside monitoring requirements for high traffic volume highways. In September 2010 areas within the state that currently have NO₂ monitoring have been designated by EPA to be in attainment. The remaining areas, which do not have ambient monitoring in place, have been designated as attainment/unclassified status. NO₂ monitoring is now required along major

transportation corridors of urban centers with a population greater than 250,000. The state air quality agency, CDPHE-APCD is currently evaluating the sites for NO₂ monitoring which will affect Denver and other metropolitan areas meeting EPA criteria for this pollutant monitoring program.

Mobile source air toxics are not regulated by EPA under existing NAAQS. Although the seven priority air toxics 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. CDOT has developed a GHG calculator for estimating statewide emissions associated with the vehicle transportation network. Further discussion of this topic is found in the section on ***Statewide Greenhouse Emissions Baseline***.

The APCD reports daily air quality and visibility for general health purposes for several metropolitan regions across the state. The Air Quality Index (AQI) is the scale used for reporting daily air quality, reporting cleanliness or the unhealthy nature of local air conditions, and the potential associated health effects. The AQI is calculated for four major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution, carbon monoxide, and sulfur dioxide. An unhealthy air quality level for the general public is reached at an AQI of 150; unhealthy air quality conditions for sensitive groups are over 100 AQI. Air quality considered by EPA to be hazardous exceeds a 300 AQI. In 2010, the only unhealthy air quality days recorded by APCD were for a region-wide dust storm in the southwestern portion of the state and for areas surrounding a forest fire west of Boulder. Other than these two natural events, no unhealthy air alerts were issued in 2010.

The highest statewide pollutant AQIs were below unhealthy levels for the general public: ground-level ozone zone levels were recorded at Manitou Springs at an AQI equivalent of 127 and a PM_{2.5} AQI of 114 occurred in Grand Junction.

CDOT TRANSPORTATION PLANNING PROCESS

Under state and federal laws and regulations, CDOT is required to prepare a comprehensive long-range (20+ years) multimodal statewide transportation plan that incorporates the priorities and needs of Colorado's 15 transportation planning regions (TPRs) and sets the vision for transportation in the state. In addition to development of the statewide transportation plan, the process includes the development of the TPR's long-range multimodal Regional Transportation

Plans (RTPs) and a Statewide Transportation Improvement Program (STIP) that identifies short-term project needs and priorities.

CDOT carries out a continuing, cooperative, and comprehensive statewide multimodal transportation planning process with the 15 TPRs and federal and state planning partners. Assistance is provided to the TPRs in developing their RTPs and ensuring that the needs of all of Colorado's communities are incorporated into the plan. Through public involvement activities and monthly meetings of the Statewide Transportation Advisory Committee, transportation needs and priorities are established and approved by the Transportation Commission. The Statewide Transportation Plan is corridor-based, including approximately 350 corridors statewide. Corridor visions include strategies aimed at meeting each corridor's unique transportation needs. Corridor visions comprise an integrated transportation network reflecting long-range local, regional and statewide travel needs in response to community values, economic development and environmental considerations. Together the individual corridor visions present a statewide vision that links transportation goals and strategies to investment decisions. Corridor improvements focus on the following four investment categories: safety, system quality, mobility and program delivery.

During the development of the statewide and regional transportation plans planning meetings are held to define the corridor visions, goals and strategies. Resource agencies are engaged early on to determine any issues that CDOT and the TPRs should be aware of in planning for the corridors and to identify activities that could be used to mitigate impacts to protected environmental resources. Each corridor vision contains an environmental component. The STIP is updated every four years through the Project Priority Planning Process (4P). The 4P effort incorporates the state statutory requirement that CDOT formally hear the transportation needs of Colorado's 64 counties through meetings with the Transportation Planning Regions. The 4P process also meets the federal requirement that CDOT work cooperatively with the MPOs to develop TIPs prior to incorporating the TIP into the STIP.

A key issue in transportation planning is air quality. While at the state level, air quality conformity is not required, the TPRs that are in non-attainment or maintenance areas must have a transportation plan that is in conformity with air quality standards. Projects identified in the plan must not worsen air quality conditions or create an exceedance of National Ambient Air Quality Standards. Emission "budgets" are established in the State Implementation Plan that is approved by the Air Quality Control Commission.

CDOT is actively engaged in looking at ways to reduce air quality impacts associated with the transportation system. CDOT has implemented several strategies to reduce the impacts of its construction and maintenance operations, such as reducing winter sanding operations and implementing best management practices during construction to reduce dust and diesel emissions. Through transportation demand management programs, CDOT improves mobility and reduces congestion on the system. CDOT's bicycle and pedestrian program promotes and educates the public on these two modes of travel. A recent policy directive requires, as a matter of routine, that the needs of bicyclists and pedestrians be included in the planning, design and operation of transportation facilities. The new Division of Transit and Rail will also be instrumental in providing more travel choices to the public.

Through the planning process, CDOT can look at ways to address air quality issue through how investments are made and focus on corridor strategies that reduce the need for automobile trips by providing a multimodal transportation system. Improvements, such as transportation demand management, intelligent transportation systems, and transportation systems management strategies can reduce the severity and duration of congestion and enhance overall mobility by improving the balance between demand for travel with a roadway's capacity to handle travel demand with minimal construction activities. The next plan update will address greenhouse gas emissions and will incorporate a new Statewide Bicycle and Pedestrian Plan, Statewide Freight and Passenger Rail Plan, and a Statewide Transit Plan.

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. The following goals have been defined to focus CDOT policy 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;
 - b. Reducing the statewide vehicle miles traveled.
- 4) Encompass transit and sustainable community development, multi-modal freight movement and efficiency, and innovations in fueling, engine maintenance and monitoring, retrofits, and alternative vehicle technologies through CDOT's planning process.

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, 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 wide reaching GHG and MSAT emission reduction efforts within the context of CDOT transportation planning, project development, facilities management, and maintenance and construction practices.

The following implementation strategies are guided by the overarching principles of coordination and consultation among local government agencies and interagency cooperation on technical studies, field work and other initiatives related to achieving the goal(s) and objectives of the CDOT Air Quality Policy Directive 1901. Due to the inherent nature of air quality, it is more efficient to utilize a programmatic approach to implement emissions reduction strategies which can also be applicable as mitigation for new National Environmental Policy (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.*
 - Participate with the Regional Air Quality Commission (RAQC) in development of public educational brochures and pamphlets promoting public understanding about vehicle emissions, MSAT and GHG emissions and public health effects.
 - 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.
 - Similar to heavy-duty trucks, transit buses can be in service for up to 30 years or more. Even as new, cleaner models become available, it is prudent to clean up the older models that are still in use. CDOT is working with the RAQC, EPA, APCD, and the Rocky Mountain Clean Diesel Collaborative (RMCDC) to develop a plan to reduce PM_{2.5} emissions from transit buses through retrofits and other improvements, such as the use of biodiesel. CDOT supports the use of existing School Bus Retrofit programs to decrease public exposure to harmful vehicle emissions by student focused educational materials and local outreach tied to retrofit and anti-idling programs.

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.*
 - 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 a higher VMT rate for use of congested facilities at peak times.
 - 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.
 - a. CDOT sees considerable potential to improve the efficient use of existing infrastructure through congestion management. The use of VMT fees is seen as having potential to address the revenue shortfall, provide congestion management benefits and reduce total VMT, thereby reducing the carbon footprint of transportation in Colorado. This research study will explore a conceptual framework for a pilot project evaluating the feasibility and effectiveness of introducing a VMT fee in Colorado.
 - b. Governor Ritter's Blue Ribbon Transportation Panel requested CDOT conduct a pilot project to study a VMT fee in Colorado. This study is intended to develop a scope of work for the pilot project.
4. *Examine truck routes/restrictions with the goal of identifying truck traffic in proximity to facilities, including schools, with sensitive receptor populations.*
 - A recent study in California found that children attending schools near highways are at higher risk of developing asthma or other serious health conditions. In response to this, the Colorado Legislature introduced, but ultimately defeated, House Bill 06-1293 that would have required school boards to consult with the state health department regarding health risks for new school sites before building new schools. The bill also would have required CDOT to consult the APCD before building new roads near schools. It is clear there is growing unease among Colorado citizens, and CDOT will need to consider proximity to schools and respond to these concerns.
 - 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 determine the best course of action for the health and welfare of those sensitive receptors, considering all factors including alternative lifecycle costs and the needs of the traveling public. It should be noted that realignment could increase overall emissions by lengthening routes, however.

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.*

- 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 construction equipment is reduced.

CDOT has a pavement research division and Materials and Geotechnical Branch that evaluates processes, specifications and products to meet these goals. This Branch continues to focus on finding new innovations to reduce the need to repave or reconstruct facilities in Colorado's diverse and challenging environment while considering overall lifecycle costs. New findings from this continuing research and specification improvement effort will ultimately result in modifications to CDOT's design and construction requirements.

- 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.
 - CDOT commits to researching available technologies for cement and asphalt substitutes in order to reduce the energy requirements to produce pavement.
 - CDOT commits to researching pavement options and selection guidelines minimizing the life cycle energy and CO₂ footprints associated with production, delivery and maintenance of these pavements over time.
6. *Develop air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools.*
- Communities throughout the United States have implemented outreach programs to inform their 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.
 - CDOT commits to aggregating the best examples of these outreach programs by the end of 2010. 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 (e.g., RAQC, MPOs, etc.).

A research pilot project is currently underway to evaluate a modified New York DOT GreenLITES construction environmental certification program to CDOT roadway projects.

- CDOT Environmental Programs Branch commits to funding these outreach opportunities. Once the materials have been created, CDOT will make them widely available to the public (e.g., posted on CDOT website, available at public meetings and open houses, etc.). If applicable, findings from these materials may be included in CDOT design guidelines.

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.*

CDOT is currently in the early stages of developing a program to educate communities on land use planning techniques to reduce VMT. This effort attempts to implement the following:

- Consider transportation as a component of local land use planning. Utilize the research on Land Use Planning and CDOT TDM Tool Kits.
- Consider land use impacts to the regional transportation systems.
- 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) 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.

CDOT currently is working to identify additional ways to maximize the existing infrastructure throughout the State while reducing the need for costly expansion projects. TDM 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).

Through the NEPA process, CDOT evaluates TDM as a component of project alternatives and mitigation opportunities. CDOT commits to evaluate TDM as a compliment or project alternative in future NEPA documents where appropriate.

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 them.
- 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 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 its own environmentally responsible procurement strategy. For example, by encouraging the use of biodiesel in government vehicles, CDOT supports ongoing efforts to make biodiesel more commercially available.

Biodiesel is a renewable fuel made from plant or animal-based fats and oils. It is most often blended with diesel fuel and can be used wherever diesel is used, with few or no equipment modifications. Communities with a biodiesel supply have the opportunity to divert waste from businesses such as restaurants and rendering plants away from sewers and landfills.

Environmentally responsible strategies are being incorporated into CDOT's 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 and is evaluating

off-road diesel retrofit cost effectiveness through a CDOT Maintenance retrofit demonstration project in the Grand Valley area

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.

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 commits to 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. Research is needed to investigate the impact of 65 mph speed controls on all heavy diesel trucks. 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).

11. Promote truck parking electrification/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.

Technologies currently available, such as Auxiliary Power Units (APU) and in-cab heating/air conditioning units, can prevent this unnecessary idling, but are rarely implemented. CDOT commits to exploring, with the assistance of the APCD, opportunities to either fund truck parking electrification or facilitate private industry's adoption of these technologies.

It is understood these APUs are quite heavy, therefore CDOT will work to exempt this additional weight at ports of entry throughout the state.

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. 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.

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. Research should be undertaken to develop an implementation program and funding source (grant start-ups, special funding pools, self-sourcing transponder fees, etc) to install WIM systems on major haul routes, and provide active promotion and incentives targeted at independent truckers and private hauling corporate management to utilize the system.

CDOT will work with EPA and the RAQC to obtain grants to retrofit older diesel truck fleets with APUs and emission upgrades.

12. Build a statewide anti-idling movement.

The sight and smell of diesel fumes from heavy-duty engines are unappealing. Older commercial and industrial vehicles can emit up to 60 times more fine particulate matter than those with new, modern engines. A growing number of communities, businesses and schools across Colorado have introduced their own anti-idling campaigns.

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. CDOT will develop an anti-idling education 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.

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.

The Smartway Transport Partnership in collaboration with EPA and the RMCDC will be utilized to assist in identifying technologies and strategies to reduce adverse effects of pollutant emissions.

CDOT will continue to utilize the Transit and Intermodal Committee to propose new and innovative ways to improve freight movement throughout the State.

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

Developing a portfolio of low-VOC landscaping plants 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.

CDOT will develop low VOC maintenance practices through investigation of existing green maintenance programs in other states and municipalities. CDOT will incorporate GreenLITES style certification and best management practices program to implement through CDOT maintenance.

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Exhibit 1. Summary matrix of Air Quality Action Plan Strategies and Actions

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Collaboration
Evaluate the effects of CDOT air quality policy and regulatory options on the achievement of air quality goals.	a. Instigate a broad reaching examination of CDOT policies, strategies and programs to evaluate the perceived and actual emissions reduction effectiveness.	Environmental Stewardship Guide; SSTI Framework to incorporate addressing GHG emissions in the LRTP.	Private Grant	CDOT EPB; CDOT Planning	
	b. Evaluate Environmental Programs Branch air quality program interagency involvement to assess success of implementation of action plan goals.	Planning and Environmental Linkages Program Climate Change Workshop	AASHTO	CDOT EPB AASHTO/CDOT	DOLA, CDPHE,
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.	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 EPB	RAQC, APCD, Area TPRs and MPOs
	b. Develop multi-media emissions reduction campaign to educate public on GHG and vehicle related emissions sources, personalizing vehicle reduction strategies. E.g. decreasing idling, routine car maintenance, alternative fuels.	Engines Off! Colorado		APCD	CDOT, RAQC, RMCDC
		TBA Clean Fuels programs		Clean Cities Colorado	
	c. Generate student focused educational materials and local outreach tied to retrofit and anti-idling programs.			RAQC??	RAQC, APCD
Research the opportunity to participate in an existing or implement a new pilot project to evaluate a Vehicle Miles Traveled (VMT) fee in Colorado.	a. Investigate participation in VMT Fee Pilot Program extension	Mileage Based User Fee for Colorado: Pilot Study Framework		CDOT DTD Research	RACQ
	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 Research	Nonattainmt , Maint area MPOs
	c. Investigate current state of OBM on-board monitoring technology	NA		CDOT DTD Research??	check AQC25 groups
Examine truck routes/restrictions with the goal of identifying truck traffic in proximity to facilities, including schools, with sensitive receptor populations.	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				
	b. Assess CDOT proposed corridor planning in context of increased MSAT exposure to vulnerable populations			CDOT DTD- Planning	

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Collaboration
<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.			Research? Materials?	
	b. 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			Research? Materials?	
	c. Research life-cycle pollutant emissions and efficiencies from concrete processing and road construction, increased use of fly-ash, etc			Research? Materials?	
<i>Develop air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools.</i>	a. In conjunction with strategy no.2 develop 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.	Colorado's Main Streets Program			RAQC, APCD, MPOs
	b. Research pilot project is currently underway to adapt the NYDOT GreenLITES program to Colorado to evaluate the design of transportation projects and rate its overall sustainability. environmentally construction-	GreenLITES Pilot Project		CDOT EPB	CDOT R3
	c. Instigate a statewide distribution and publicity program	Outreach Program Manual		CDOT DTD Planning	CDOT PR
<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>	a. CDOT is currently in the early stages of developing a program to educate communities on land use planning techniques to reduce VMT.	Land Use and Transportation Integration Study	SPR Funds - \$70,000	CDOT DTD Planning	DOT/HUD/EPA Partnership for Sustainable Communities, DOLA, CDPHE, CCI, CML, local entities
	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.	CDOT Sustainability Council & (TERC) Subcommittee on Sustainability Subcommittee		CDOT EMT & DTD	DOT/HUD/EPA Partnership for Sustainable Communities, DOLA, CDPHE, CCI, CML, local entities

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Collaboration
Explore Transportation Demand Management (TDM) efforts statewide to better utilize the existing transportation mobility network.	a. Research exploring new TDM strategies and to build upon those already in place. Utilize and improve TDM Tool Kit (2002).	Transportation Demand Management (TDM) Program	SPR Funds	CDOT DTD Planning	CDOT Regions, CDOT ITS
	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.	Go Boulder	CDOT DTD	City of Boulder	Planning
		Downtown Denver Partnership	CDOT DTD	Downtown Denver Partnership	Planning
		eGo CarShare	CDOT DTD	CarSharePODs	Planning
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.	a. Per the Governor's Greening Government initiative, the following information will be gathered in order to best utilize the State fleet: <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	
	b. Continue programs encouraging ride-sharing, eco-pass program transit ridership, bike-ped programs, etc	TDM and Bicycle and Pedestrian Programs; Statewide Bicycle and Pedestrian Plan	Work Program and Federal (CMAQ, Enhancement)	CDOT DTD Planning	Local and Regional Agencies
	c. CDOT Fleet Management is developing its own environmentally responsible procurement strategy.			CDOT Fleet Management	
	d. Fleet biodiesel fuel tracking and availability			CDOT Fleet Management	
	e. Environmentally responsible strategies are being incorporated into CDOT's policies regarding buildings, vehicle fleets and the purchase or lease of other goods and services.	Energy Performance Audits		CDOT Research	Governor's Energy Office

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Collaboration
<i>Explore congestion, lane restrictions, and/or speed limitations for motor carriers.</i>	a. CDOT commits 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 65 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	
	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. Continued diesel retrofit programs	Fort Collins TransFort Diesel Retrofit Project	CMAQ	City of Ft. Collins	R4, RAQC, EPB
		Off-Road Fleet Retrofit Project	CDOT SPR Funded Pilot \$83500	RAQC	CDOT Fleet, Maintenance R3
<i>Build a statewide anti-idling movement.</i>	a. CDOT will 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 kite \$12500	CDOT EPB	Denver, RAQC
			CDOT SPR Funded school pilot \$12500	CDOT EPB	CDPHE, Denver

Strategy	Implementation Plan	Action	Funding Source/ Estimated Cost	Project Lead	Collaboration
<i>Research additional ways to improve freight movement and efficiency statewide.</i>	a. The Smartway Transport Partnership in collaboration with EPA and the RMCDC will be utilized to assist in identifying technologies and strategies to reduce adverse effects of pollutant emissions.	Smartways Transportation Partnership		EPA, RMCDC	CDOT
	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.	See Mike Bano - existing xeroscape and native low VOC plant list?			
	b. Develop low VOC maintenance practices through investigation of existing green maintenance programs in other states and municipalities. Incorporate GreenLITES style certification and best management practices program to implement through CDOT maintenance.	TBA Green Maintenance Program		CDOT EPB	

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 outlined 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 (August 2011) 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.

CDOT is partnering with successful emissions reduction programs such as Denver's [Engines Off!](#) anti-idling program and the RAQC's [Ozone-Aware](#). Engines Off! Developed by the City and County of Denver, utilizes social marketing and creative local focus projects to educate the public and commercial enterprises about the health and air quality impacts of prolonged engine idling. Engines Off! is refining a menu-based approach to anti-idling solutions to provide local agencies a way to develop customized emissions reduction programs. Ozone Aware provides a wealth of educational information on ozone and ozone precursors, air quality status, personalized emissions reduction suggestions, and outreach opportunities for the Denver and Northern Front Range Ozone Nonattainment Area.

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 (CCI, CML, local entities) 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

The initial study is expected to be completed in spring 2011, with a potential pilot project to follow.

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 Vehicle Miles of Travel (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 Volatile Organic Compounds (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 Carbon Monoxide (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

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:

- 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.
- Colorado's Main Streets Program- CDOT is partnering with other state agencies in an initiative to improve the economic competitiveness and sustainability of main streets in three rural Colorado communities and one Metro Denver neighborhood.
- AASHTO/CDOT Climate Change Workshop- To be held in June, and include attendees from an array of government agencies. This 2-day workshop will provide an update on climate change science and policy, and include inter-agency discussions on possibilities for collaboration.

Other Efforts

- *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*- Pilot project 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 initiating a demonstration project 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.
- *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 Particulates – ug/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, VOC, MSATs)	Grams per mile as estimated by EPA’s MOVES2010a 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/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 tons per year reduced emissions tally 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 the performance goals.

Specific action program metrics and schedules should be 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 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 MOVES emissions modeling and incorporation of MPO modeling results.

SUMMARY/CONCLUSION

As a multi-modal transportation agency responsible for providing sustainable statewide mobility, CDOT will continue to develop strategies to address not only GHGs and MSATs, but ozone, precursor NO_x, VOCs, and other air quality issues related to future transportation system use. CDOT will strive to implement emissions reduction programs that provide co-benefits among problematic pollutants within the state and region.

The current transportation infrastructure is historically skewed for highway connectivity across our state and throughout our urban centers. Although considerable effort has been invested in RTD's FasTracks network in the Denver metro region, financial impediments remain formidable for implementation of sustainable transit infrastructure to create the necessarily broad systemic reach to induce effective VMT reduction, and thus GHG reductions and transfer of regional and local mobility to alternate transportation modes.

Realistically even a substantial alternative fuel and alternative propulsion vehicle fleet will not be able to reduce Colorado target levels of exhaust emissions, and it will do little to relieve growing congestion on the state highway system.

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 highway VMT 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.

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