I-70 Mountain Corridor Mobility and Operational Assessment

I-70 Mountain Corridor CSS
Partnerships Powered by Context

August 2011

DOT
DEPARTMENT OF TRANSPORTATION

SUMMARY

What is the purpose of this report?

This report summarizes results of a week-long workshop focused on improving traffic operations and mobility on the I-70 Mountain Corridor through potential low cost and no cost solutions.

Who was involved in this effort?

Hosted by the Colorado Department of Transportation (CDOT), participants in the workshop included technical experts from the state and abroad and many I-70 Mountain Corridor Stakeholders. Representatives included towns and counties along the Corridor, Colorado State Patrol, Colorado Motor Carriers Association (CMCA), Denver Regional Council of Governments (DRCOG), University of Colorado Denver, Winter Park Resort, and Federal Highway Administration (FHWA). In total, over 90 stakeholders were invited to participate and attendance ranged from 30-60 each day of the workshop.

Focus areas

Workshop participants evaluated low-cost solutions related to:

- Slow moving vehicles, truck traffic, and enforcement
- Maintenance and operations
- Active traffic management and travel demand management
- Traveler information

What happened in the workshop?

The week-long workshop was held between May 23 and 27, 2011 in Golden and Lakewood, CO. Goals included developing, exploring, and documenting new and existing ideas to improve mobility and operations along the I-70 Mountain Corridor. In total, 142 ideas were generated as part of this effort and are presented starting on page 3. Ideas from this assessment were grouped based on potential implementation to improve mobility and operations in the short-, mid-, and long-term time frames.

What are the next steps?

The 142 ideas have not been prioritized or screened for feasibility. CDOT has not determined which, if any, ideas should be implemented and whether funding is available for implementation. Should funding become available, CDOT will work with stakeholders as appropriate within the context sensitive solutions (CSS) process to evaluate which ideas may be fully developed for implementation along the corridor.

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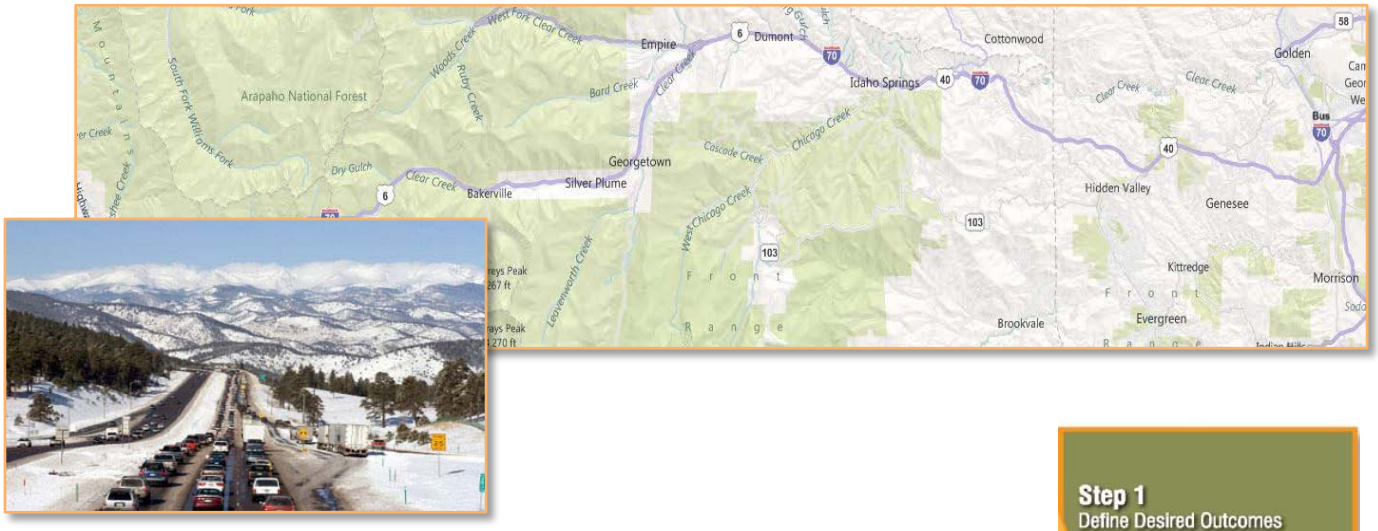
ASSESSMENT PROCESS

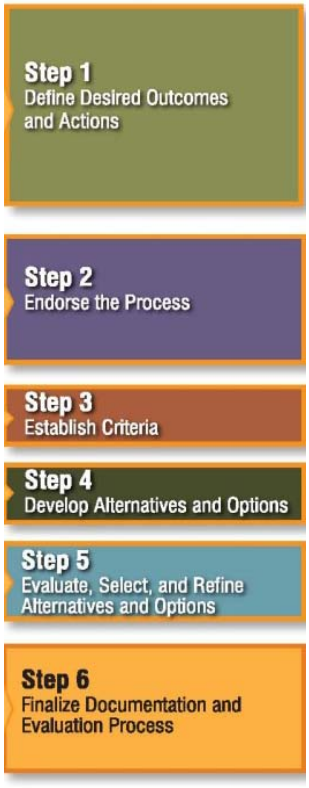
Background

The I-70 Mountain Corridor features mountainous terrain, increasing traffic congestion during peak travel times, and challenging weather conditions. Traffic congestion is especially high for weekend motorists as private automobiles, recreational vehicles, trucks, motorcycles, and others all share I-70 as they travel between mountain destinations and Front Range communities. Building on continued local and state collaboration, CDOT initiated a week-long workshop with technical experts and stakeholders to develop potential solutions to improve traffic operations and mobility along the I-70 Mountain Corridor.



Context Sensitive Solutions (CSS) framework

This workshop was held in a manner consistent with CDOT's CSS framework, which is described in detail on CDOT's CSS website (i70mtncorridorcss.com). The framework ***ensures collaboration*** based on a six-step process. The process begins with defining desired outcomes and leads to evaluating and refining alternatives and finalizing documentation. Ideas carried forward from this assessment may be fully evaluated within the six-step CSS process.



Workshop

The workshop was hosted the week of May 23rd, 2011 as a venue to explore low cost and no cost solutions and maximize existing resources to improve traffic congestion along I-70. This workshop did not include evaluation of major capital improvement projects. The agenda for the week-long, fast-tracked workshop is provided in **Appendix A**. A summary of objectives for each day is summarized below.

Date	Accomplished objective
Monday, May 23	Presented overview of existing conditions and goals for workshop. Stakeholders shared concerns and ideas
Tuesday, May 24	Received technical presentations and initiated focus area "brainstorming" sessions
Wednesday, May 25	Continued detailed evaluation and documentation of ideas
Thursday, May 26	Continued detailed assessment of ideas and consolidated concepts
Friday, May 27	Reviewed and confirmed idea documentation and highlighted ideas with maximum benefits

CDOT invited independent technical experts in planning, communications, engineering, and related fields to participate. From the pool of applicants, 19 professionals were selected to provide insight from their specialty areas. Attendance ranged from 32 to 61 participants over the course of five days. **Appendix D** provides a detailed summary of invitees and attendees at the workshop. Workshop participants also included representatives from towns and counties along the Corridor, Colorado State Patrol (CSP), Colorado Motor Carriers Association (CMCA), Denver Regional Council of Governments (DRCOG), University of Colorado Denver, Winter Park Resort, and Federal Highway Administration (FHWA).

Focus areas

Participants divided into working groups to analyze the four areas listed below:

- Slow moving vehicles (SMVs), truck traffic, and enforcement (Enf)
- Maintenance and operations (M/O)
- Active traffic management (ATM) and travel demand management (TDM)
- Traveler information

Throughout the workshop the four groups joined together to discuss and compare ideas and examine common issues and possible synergies.

Presentations

Throughout the week, technical experts shared current practices, new ideas, potential solutions, and lessons learned. Many of the technical experts had a deep knowledge base of transportation issues on I-70 and throughout the mountain west. For a broader perspective, CDOT included international transportation consultants to share mobility strategies underway in the United Kingdom and in the Netherlands. Copies of these presentations are included in **Appendix B**. For additional background, **Appendix E** includes a summary of efforts CDOT implemented in the last decade to improve mobility along the corridor. **Appendix F** references recent closure and congestion data and highlights CDOT's current successes with winter programs to improve operations.

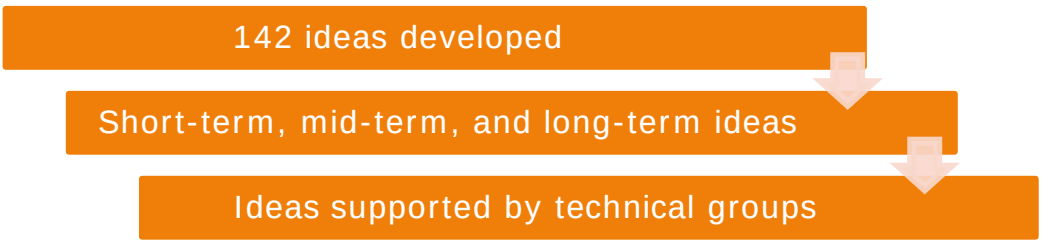
IDEAS FOR MOBILITY AND OPERATIONAL IMPROVEMENTS

Participants in the workshop developed 142 ideas to improve mobility and operations along the I-70 Mountain Corridor. The tables on the following pages summarize all of these ideas. For more detailed information, **Appendix C** includes the actual notes captured during the workshop.

Delivery time

All 142 ideas were grouped based on timing for potential implementation. Some groups developed similar ideas. These common threads were discussed together during a large group session to focus the ideas and incorporate different perspectives.

Additionally, each of the four focus groups highlighted ideas they felt had the greatest potential to provide mobility and operational improvements along the corridor. Summaries of these ideas are provided in pages 12 through 31 of this report.



CDOT is committed to implementing both short-term and long-term solutions on the I-70 Corridor. Therefore, the timing of delivery for each idea was assessed to understand when benefits can be realized on the corridor. Delivery time is defined as a function of:

- ***Legislative updates*** through the Colorado General Assembly or ***agency policy changes***
- ***Anticipated project costs*** ranging from low (less than $1 million), moderate ($1 million to $5 million), and high (greater than $5 million)
- ***Level of environmental documentation*** to disclose potential community and environmental impacts to the public and decision makers. Documentation relates to the anticpated level of environmental impacts:
    - Categorical Exclusion (Cat Ex) – Significant impacts are not anticipated
    - Environmental Assessment (EA) – Significance of potential impacts is uncertain (generally requires 24 to 30 month process)
    - Environmental Impact Statement (EIS) – Significant impacts are expected (generally requires 3 to 5 year process)

Delivery Time

Short-term	Mid-term	Long-term
by June 2012 - no or minor legislative or agency policy changes - minimal capital costs - environmental analysis: Cat Ex	**by June 2014** - more significant legislative or agency policy changes - minimal to moderate capital costs - environmental analysis: Cat Ex or EA	**beyond June 2014** - more significant legislative or agency policy changes - minimal to high capital costs - environmental analysis: Cat Ex, EA, or EIS

The following tables briefly list the ideas and implementation timeframes. **Appendix C** includes additional detail about each idea, and the icon [S] denotes that a one-page summary is available—as introduced on page 10—to highlight the idea.

Short-term implementation

The following 83 ideas could be implemented to provide relief by next summer, with implementation by June 2012. These ideas require minor or no legislative or agency policy changes, minimal capital costs, and minimal environmental documentation (a Cat Ex). The number **(#)** next to each idea represents the "Report ID" in **Appendix C**, where additional background information is available. The ***ideas have not been prioritized***, so this number does not represent a ranking. The icon [!] denotes the idea has potential for immediate delivery by December 2011.

Short-term	
Group	Idea
SMV/Enf	• Increase driver education for snow and mountain conditions **(1)** ! S • Develop public information campaign to emphasize to passenger vehicle drivers that fines exist for inadequate tires **(2)** ! • Increase passenger vehicle enforcement options for inadequate snow tires **(4)** ! S • Develop proactive education for truckers on chain law and corridor conditions **(6)** ! • Expand methods to distribute current condition information and corridor driving tips to drivers while they are on the corridor **(9)** • Close Dumont point of entry (POE) during peak volume periods **(11)** ! • Increase enforcement of unsafe speeds and condition violations **(14)** S • Allow fines collected on the corridor to be utilized for increased enforcement on the corridor **(15)** • Provide CSP with electronic survey equipment designed to document an accident scene quickly in order to reopen I-70 faster **(17)** • Disseminate high truck accident location data **(20)** ! • Implement shipper management working group to coordinate off-peak use of corridor **(23)** ! S • Allow long combination vehicles to reduce overall truck volume **(28)** • Increase enforcement of minimum speeds in the left lane **(30)** ! • Increase SMV passing zones at specific locations **(31)**
M/O	• Increase local and State enforcement options **(34)** ! • Increase snow and ice control maintenance level of service **(36)** ! S • Include weather source/data (Meridian MDSS) in all maintenance trucks **(37)** ! S • Initiate preemptive closures in extreme weather events **(39)** ! • Close Dumont POE during peak travel/bad weather **(40)** !

Short-term	
Group	Idea
M/O cont'd	• Share equipment and personnel with I-70 from other locations as temporary and supplemental winter support **(42)** ! • Use accident alert for "30 minutes clear of accidents" and remove vehicles from travel lanes ASAP **(43)** • Improve on accident removal depending on status of peak period and traffic flow obstructions **(44)** ! • Develop automated spray systems at tunnels and bridges **(45)** • Offer employee transit and commuting opportunities from lower cost to higher cost areas **(46)** ! • Restrict heavy and tow vehicles to right lane during peak period year round **(47)** • Expand use of multiple plows running parallel **(48)** ! • Improve striping delineation **(49)** ! • Retain experienced employees by supporting affordable housing **(50)** • Initiate one-lane tunnel metering **(51)** ! • Implement short-term closures at interchanges with services when metering is in effect **(53)**
Traveler Information	• Develop/expand smart phone mobile applications **(62)** ! S • Develop incentive program to encourage travel off-peak **(63)** S • Create CoTrip enhancements including alternate routes **(65)** ! • Survey and research I-70 traveler and stakeholder information needs **(70)** ! • Develop public information campaign to raise awareness about existing and developing I-70 info tools **(72)** ! • Create editorial content and syndicate a series with interesting characters conveying corridor travel information **(73)** ! • Expand existing social media platforms to foster a sense of community and encourage positive traveler behavior **(74)** ! • Expand trucker education programs and offer enhanced information stream **(75)** S • Generate revenue with public private partnership (P3) advertizing on CoTrip, mobile application (app), GovText, etc. **(77)**
ATM/TDM	• Expand use of ramp metering **(81)** • Initiate a Transportation Management Organization (TMO) to develop TDM, education, and outreach **(85)** S • Implement queue detection and warning at specific locations **(86)** S • Coordinate with resorts to encourage alternate travel times **(88)** • Utilize "predictive traveler information" **(89)** ! • Offer driver training program for I-70 conditions to inexperienced drivers **(90)** !

Short-term	
Group	Idea
ATM/TDM cont'd	• Institute emergency response uses on hard shoulders **(92)** • Use variable message signs (VMS) to encourage good driving **(95)** ! • Institute quick response and quick clearance for all incidents **(96)** • Expand "Casino Model" for customer travel programs **(97)** • Provide safety information at visitor centers and rental car companies **(98)** • Hire private firm to provide "Icy Falcon" pilot services **(99)** ! • Apply tech tools to reduce incident clearance times **(100)** • Publicize and market information on fines and statutes **(101)** ! • Provide dedicated I-70 staff along corridor **(102)** • Develop hard shoulders from US6 east for at least one mile **(103)** • Provide tools/programs to address "following too closely" driver behavior **(104)** ! • Enhance park and rides with bus service to major destinations **(106)** • Offer vehicles at mountain destinations such as rental or shuttle cars **(107)** • Manage closures/restrictions and convey traveler information more effectively **(108)** • Develop programs that punish bad and reward good behavior **(109)** • Convey to public costs and benefits of avoiding peak hour travel **(111)** • Develop applications of Disney ride “fast cut” concept **(112)** • Utilize rubberneck blinder, which could be funded privately **(114)** • Develop partnership to create ski pass programs that limit dates or times **(115)** • Partner toward community restrictions on trucking and shipping patterns **(118)** • Partner toward programs to package resort visits **(119)** • Enhance partnerships with rental car community **(120)** • Utilize dummy cameras/perceived enforcement **(122)** • Develop program to coordinate ride with guaranteed return trip **(124)** ! • Enhance ongoing communication with communities over project goals/benefits **(125)** ! • Develop Bus queue hop **(127)** • Initiate phase 1 of speed harmonization (speed limit spaced pavement markings and other tools to reduce tail gating) **(129)** • Institute Bakerville to Silver Plume Pilot Project **(130)** • Establish employee flex schedules to allow midweek recreation travel **(131)** • Expand TMO functions **(132)** • Initiate junction control at major intersections **(133)** • Initiate pre-emptive closures to conduct speed maintenance operations **(134)** ! • Initiate pre-emptive closures to avoid incidents **(135)** ! • Institute variable speed limits **(136)** • Initiate voluntary car inspections **(138)** ! • Utilize cameras and "dummy cameras" to support enforcement **(140)** ! • Manage the volume of vehicles moving onto the corridor **(141)** • Add emergency refuge areas off hard shoulders **(142)**

Mid-term implementation

The following 46 ideas could be implemented to provide relief by June 2014. These ideas require more significant legislative or agency policy changes, minimal to moderate capital costs, and a Cat Ex or EA as the highest level of environmental documentation. The number **(#)** next to each idea represents the "Report ID" in **Appendix C**, where additional background information is available. The ***ideas have not been prioritized***, so this number does not represent a ranking.

Mid-term	
Group	Idea
SMV/Enf	• Initiate mandatory vehicle inspections for traction **(3)** • Expand collaboration with rental car companies over winter driving equipment and education **(5)** • Work with CSP to expand "Icy Falcon" pilot car program **(7)** • Initiate electronic automated speed enforcement **(8)** • Lengthen acceleration and deceleration lanes with striping on hard shoulders where possible **(10)** • Post more CSP Officers on the corridor **(12)** • Utilize TACT Program for tail gating enforcement **(13)** • Locate hazardous material (hazmat) and fatality response teams on the corridor to minimize closure times **(16)** • Implement corridor wide closure plan to enhance parking options and disseminate information to stranded motorists **(18)** • Expand state-wide campaign against distracted driving **(19)** • Provide more truck parking and improve communication regarding alternate parking options **(21)** • Restrict SMVs from corridor during adverse weather conditions **(22)** • Seek voluntary compliance for keeping SMVs out of left lane **(25)** • Restrict SMVs from corridor during peak hours **(29)** S • Restrict single drive axle trucks **(32)** S • Review hazmat clean-up law as it pertains to highway closures **(33)**
M/O	• Change contract with quick tow/courtesy patrol so user pays **(35)** S • Restrict single drive axle combination trucks during adverse weather **(38)** • Establish a one level commercial vehicle/heavy vehicle chain law **(41)** • Conduct CDOT fleet replacement **(52)** • Develop a fire suppression system in the Eisenhower Johnson Memorial Tunnel (EJMT) **(55)** S • Program repaving on a more frequent basis **(56)** • Close Loveland Pass **(58)** • Privatize I-70 Corridor operations **(60)**

Mid-term	
Group	Idea
Traveler Information	• Make historical traffic data readily available to the general public in an easily understood format **(61)** • Offer communication Touch Point Kiosks at park and rides, resorts, rest areas, etc. **(64)** • Offer special event messaging **(66)** • Develop connected vehicle technologies **(67)** • Establish reservation system to travel during peak periods **(68)** • Establish system to allow travelers to pay for access to front of traffic queue **(69)** • Develop enhanced traveler information marketing campaign **(71)** S • Improve communication of chain requirements to truckers **(76)** S • Generate revenue through strategic partnerships with major brands **(78)** • Generate revenue with "title sponsorship" **(79)** • Generate revenue with government and other agency/non-profit/economic development grants **(80)**
ATM/TDM	• Institute speed harmonization **(82)** S • Establish peak time tolling at Twin Tunnels **(83)** S • Utilize frontage roads and hard shoulders to move additional traffic including "reversible frontage roads" **(87)** • Allow other uses on "express lanes" for alternative transportation modes **(91)** • Establish high occupancy toll (HOT) lanes on hardened shoulders **(93)** • Implement congestion pricing at tunnels **(94)** • Consider highly managed "UK Model" for operating on hardened shoulders **(105)** • Establish integrated I-70 ATM program with frontage roads/adjacent local roads **(117)** • Consider active lane management and additional ATM (UK Model) **(121)** • Develop truck climbing/descending lanes **(126)** • Establish speed harmonization with variable speed limit signs **(128)**

Long-term implementation

The following 13 ideas could be implemented to provide relief beyond June 2014. These ideas require more significant legislative or agency policy changes, minimal to high capital costs, and a Cat Ex, EA, or EIS. The number **(#)** next to each idea represents the "Report ID" in **Appendix C**, where additional background information is available. The ***ideas have not been prioritized***, so this number does not represent a ranking.

Long-term	
Group	Idea
SMV/ Enf	• Allow hazmat trucks through EJMT at night **(24)** • Restrict SMVs on I-70 over weekends **(26)** • Allow hazmat trucks through EJMT under specific and controlled circumstances **(27)**
M/O	• Keep Loveland Pass open all the time **(54)** • Develop a hazmat tunnel bore **(57)** • Utilize an automated avalanche system such as GAZEX **(59)**
ATM/TDM	• Develop selected segments for hard shoulder running at peak times, including eastbound from US-40 to Twin Tunnels **(84)** S • Support P3s for the creation of destinations where travelers would be willing to wait out peak traffic **(110)** • Convert hard shoulders to full time or peak time running lanes **(113)** • Focus restrictions on westbound (WB) travel to maximize economic benefit **(116)** • Change/improve the "safety culture" of the corridor **(123)** • Develop a bar code that prohibits text message transmittals in automobiles **(137)** • Support P3s to create full service truck stops at strategic locations on the corridor **(139)**

Location specific ideas

While many of the ideas developed could be implemented corridor-wide, some ideas relate to specific locations. These site-specific ideas are mapped on the next page.

Summary of ideas supported by each group

The workshop did not include any effort to prioritize these ideas. In fact, a goal of the workshop was to develop and assess as many ideas as possible without precluding or dismissing available options.

As the workshop concluded, each technical group was asked to identify four or five ideas that they believed had greatest potential to improve mobility and operations in the near future. Many of these ideas include minimal to moderate costs. The following descriptions beginning on page 12 contain summaries of these ideas that showcase important details from **Appendix C**. As noted, these ideas ***do not represent CDOT's project priorities***. Instead, the following one-page summaries present options supported most strongly by the working groups involved in the week-long effort. As described further in the last section of this document (***Next Steps***), CDOT will consider and evaluate all of the ideas in **Appendix C**.

Key for location specific ideas as summarized by working group

Slow moving vehicles, truck traffic, and enforcement

1. Allow hazmat trucks through EJMT at night **(24)**

Maintenance and operations

1. Close Dumont POE in peak travel/bad weather **(11)**
2. Develop automated spray systems at tunnels and bridges **(45)**
3. Offer employee transit and commuting opportunities from lower cost to high cost areas **(46)**
4. Retain experienced employees by supporting affordable housing **(50)**
5. Develop a fire suppression system in the EJMT **(55)**

Active traffic management and travel demand management

1. Develop selected segments for hard shoulder running at peak times, including eastbound from US 40 to the Twin Tunnels **(84)**
2. Institute speed harmonization **(82)**
3. Utilize frontage roads and hard shoulders to move additional traffic including "reversible frontage roads" **(87)**
4. Need shoulder widening and structure modifications at exit 240 (part of **(87)**)
5. Develop hard shoulders from US 6 east for at least one mile **(103)**
6. Develop truck climbing/descending lanes **(126)**

Traveler information

1. Offer communication Touch Point Kiosks at park and rides, resorts, rest areas, etc. **(64)**

The number **(#)** next to each idea represents the "Report ID" in **Appendix C**, where additional background information is available. The ***ideas have not been prioritized***, so this number does not represent a ranking.

Increase driver education for snow and mountain conditions

Enforcement Delay Reduction Accident Prevention Influencing Driver Behavior

Delivery: Short-term (possibly immediate)

Cost: Low

Lead Team: CSP, CDOT, and private partners

Location: Corridor-wide

Appendix C Report IDs:
Primary: SMV/Enf 1
Others: SMV/ Enf 2

Description
To increase the percentage of passenger vehicles with adequate tires and traction devices, a public relations campaign could be designed to emphasize the following points: (a) the importance of proper tires in our mountain environment, (b) existing regulations require adequate traction, (c) fines may be given to drivers involved in an accident who do not have adequate tires, and (d) braking ability on snow and ice depends on tread design and depth and is not improved by 4-wheel drive capabilities. Many states, including Colorado, have launched winter driving safety campaigns based on the "Ice and Snow, Take it Slow" theme. Wisconsin's Clear Roads campaign distributes scripts to radio stations for public service announcements. This campaign would emphasize the importance of traction. Consider partnerships with tire retailers to get more air time. Consider a themed campaign where the public will get to know characters over time. Appeal to Coloradoan's sense of independence and resilience: "Real Colorado: Real Snow Tires." CDOT could also consider whether to implement requirements for rental car companies to equip vehicles with snow tires.

Benefits
Reduction in accidents caused by passenger vehicles will reduce delays, increase highway capacity, and increase safety.

Concerns
Possible increased cost to individual passenger vehicle owners to improve their equipment. Additional enforcement would be necessary. Educating out-of-state drivers may be a challenge.

How will safety be maintained or improved?
Increase awareness of traction relative to safe travel. Reduce occurrence of and/or severity of traction-related accidents.

How will mobility be improved?
Reduce delays. Increase safety.

Increase passenger vehicle enforcement options for inadequate snow tires

Enforcement Delay Reduction Accident Prevention Influencing Driver Behavior

Delivery: Short-term (possibly immediate)

Cost: Low

Lead Team: CSP

Location: Corridor-wide

Appendix C Report IDs:
Primary: SMV/ Enf 4
Others: SMV/ Enf 14

Description
To increase the percentage of passenger vehicles with adequate tires and/or traction devices, existing regulations and enforcement of these regulations would be strengthened. Current law allows an Officer to issue a citation to a driver whose vehicle does not have adequate tread depth. Nevertheless, CSP representatives have noted that citations for inadequate tread depth frequently do not stand up in court, and the current fine amount does not serve as an effective deterrent. The required traction standards of tires would be clarified (and publicized). Officers would have the ability to issue a citation if a vehicle with sub-standard tires disrupts the traffic flow. Fines associated with this citation would be increased. This idea may require legislative action.

Benefits
Reduction in accidents caused by passenger vehicles will reduce delays, increase highway capacity, and increase safety.

Concerns
Individual citizen dissatisfaction with increased level of fines.

How will safety be maintained or improved?
Increase awareness of traction relative to safe travel. Reduce occurrence of and/or severity of traction-related accidents.

How will mobility be improved?
On the I-70 Corridor accidents caused by lack of traction often cause a severe disruption to traffic flow. A minor accident can back up traffic for miles; a major accident can block the highway. Prevention of these accidents can free up CSP officers for other duties on the corridor and improve safety for all.

Increase enforcement of unsafe speeds and condition violations

Enforcement Accident Prevention Delay Reduction

Delivery: Short-term

Cost: Neutral (potential for self funding with increased ticket revenue)

Lead Team: CDOT, CSP, local law enforcement

Location: Corridor-wide

Appendix C Report IDs:
Primary: SMV/ Enf 14
Others: SMV/ Enf 1, 4, 12, 15

Description
Increase local and CSP enforcement of speeds and travel during inclement weather and high volume periods. Provide additional enforcement presence during peak volume periods. Allow for proactive enforcement of truck chain laws at ports of entry including ticketing for not carrying chains between September 1 and May 31.

Benefits
Accident prevention and delay reduction from better compliance with truck chain laws and speed limits. A larger law enforcement presence will allow for proactive actions toward more unsafe driving practices and quicker responses to incidents. A larger visible CSP presence will increase voluntary compliance and promote better driver behavior. Could be self funding if fines were increased and revenue from citations remained on the corridor to support CSP mountain corridor operations.

Concerns
Additional staff and equipment costs for enforcement would be necessary. Difficult to retain staff on the corridor because of harsh working conditions and high costs of living. Additional disruption to traffic flow when violators are pulled over onto the shoulder.

How will safety be maintained or improved?
Increase awareness of chain law requirements. Reduce occurrence of and/or severity of accidents on roadways, at POEs, and at truck chain-up stations.

How will mobility be improved?
Improve safety and mobility with proactive enforcement of chain laws and aggressive driving. Greater opportunity to prevent accidents.

Expand trucker education program and offer enhanced information stream

Traveler Information Accident Prevention

Delivery: Short-term

Cost: Low

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report IDs:
Primary: Traveler Info 75
Others: Traveler Info 76 and SMV/ Enf 1, 2, 6, 12

Description
Expand the existing public relations campaign targeting truck drivers to increase awareness of I-70 Mountain Corridor travel challenges. Existing efforts and programs include: CMCA's I-70 Mountain Corridor DVD; select web-based and classroom trainings; and brochures, web-resources, and/or articles about winter mountain conditions, chain law requirements, and truck parking options. With additional funding these resources could be expanded for truck drivers to include updated and expanded information and additional media outlets, such as radio, television, and smart phone applications. An additional recommendation for expanding the truck driver education program includes "branding" the I-70 Mountain Corridor as a unique environment for drivers, which requires special equipment and driving skills.

Benefits
Better driver preparation will improve safety, decrease accidents, and subsequently decrease congestion.

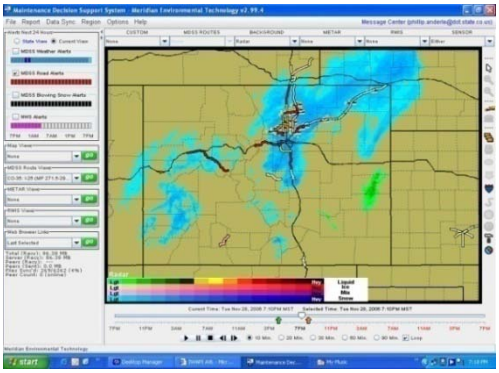
Concerns
Campaign may not be as effective for cross country drivers entering the corridor for the first time.

How will safety be maintained or improved?
Greater potential to reduce occurrence and/or severity of accidents caused by truck travel in challenging conditions and/or inclement weather.

How will mobility be improved?
Reduce congestion. Decrease accident rate.

Include weather source/data (Meridian MDSS) in all maintenance trucks

Maintenance and Operations Weather Forecasting Software



Delivery: Short-term (possibly immediate)

Cost: Low (under $500,000 + annual service/maintenance)

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: M/O 37

Description
CDOT currently utilizes a Maintenance Decision Support System (MDSS) in a portion of their maintenance trucks. This system is a web-based weather forecasting tool where operators can input real time weather information and road conditions. The system then can make application recommendations by route for the type, amount, and timing of road treatment products.

Benefits
Main benefit is that it helps each truck operator plan and schedule maintenance activities. General benefits include: (a) Manages chemicals (deicing) to reduce environmental impacts, (b) Recommendations guide staff to better respond to changing weather conditions, (c) Improves CDOT management of resources and operator safety with real time camera shots of weather and location tracking, and (d) Tracks and records location and timing of maintenance activities in both summer (chip seal, weed spraying) and winter (plowing, deicing). Supports work projections/budgeting and customer service inquiries.

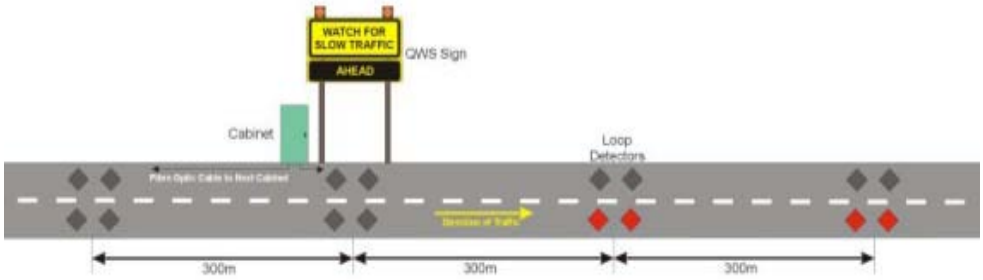
Concerns
MDSS would require additional maintenance. Sensor equipment is delicate and currently is maintained by only one trained mechanic. Additional training for operators and supervisors is required to use the system and address concerns with geo-tracking the trucks.

How will safety be maintained or improved?
Faster maintenance and improvement of road conditions could reduce occurrence and severity of accidents.

How will mobility be improved?
Optimize staff deployment. Tuned application of deicing agents will reduce the amount of time I-70 is snow packed, which will decrease accidents and maintain capacity.

Implement queue detection and warning at specific locations

Active Traffic Management Reduced Crashes Improved Driver Expectancy



From Highway 402 Queue Warning System, Brown and Byrne, 2008

Delivery: Short-term

Cost: Low ($500,000)

Lead Team: CDOT

Location: Key locations like US6, Georgetown and US40 intersections

Appendix C Report ID:
Primary: ATM/TDM **8**6

Description

Queue warning systems use detection devices to determine when average travel speeds are slowing and provide real time warnings to oncoming drivers so they can reduce their speeds. This concept requires detection devices and variable message signs placed at key locations on the corridor. Like speed harmonization, the goal is to reduce "turbulence" that causes accidents and thereby creates more congestion.

Benefits

Reduces rear-end and other crashes and lowers speeds to reduce intensity of injuries. It also provides real time road condition expectations for travelers. Lower cost than a full speed harmonization program and can provide spot benefits in areas that experience frequent bottleneck conditions. If consistent VMS and detection equipment is used, it can be integrated into speed harmonization and other traveler information programs.

Concerns

Depending on placement, the additional signage may have a negative visual impact on the corridor.

How will safety be maintained or improved?

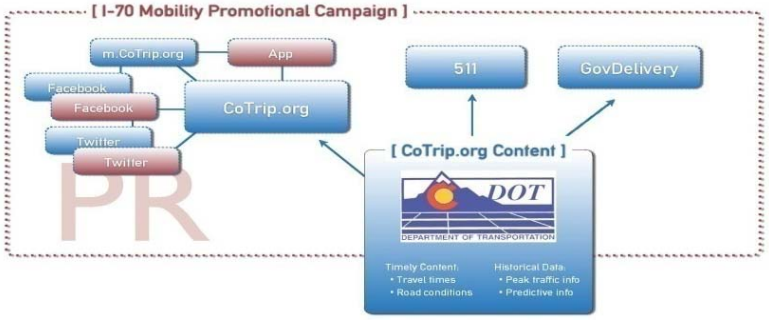
Offers information for drivers to make better informed decisions about travel speed. Has potential to reduce occurrence and severity of accidents, which has potential to result in increased mobility.

How will mobility be improved?

Queue warning systems can improve safety and manage traffic flow by reducing turbulence and accidents. On I-70, it could be useful upstream of interchanges at US 6 and US 40, port of entry stations, and near other areas with limited sight distances or known congestion points.

Develop/expand smart phone mobile applications

Traveler Information Influencing Traveler Behavior



Delivery: Short-term (possibly immediate)

Cost: Low

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: Traveler Info **62**

Description

Deliver a mobile app using historical data to influence traveler behavior and encourage travel during off-peak periods. The simply designed app would utilize existing historical data to project congestion periods on I-70. For example, skiers using this app would find that traffic volumes are considerably less through the corridor before 7am on a Saturday, westbound and before or after 3:00 – 6:00pm on a Sunday, eastbound during the ski season. A longer term, multi-faceted app could also be developed on a multi-platform promotional campaign targeting travelers from a variety of formats including smart phone apps, websites, mobile web access, Facebook and Twitter, 511 and GovDelivery. The app would also be hands-free to ensure safe driving.

Benefits

Delivery time for initial app could meet corridor demands for 2011-2012 ski season. These tools would provide information to travelers to change travel behavior pre-trip to allow for reduced traffic congestion. It would deliver information to users in an enhanced manner and provide improved customer service through ongoing, real time communication. With added interaction tools on the app between corridor stakeholders, a broader conversation about influencing travel behavior could be inspired. Ultimately, CDOT could collect GPS data from smart phones, or "probes" to feedback into real time app information. This effort could potentially reduce the cost of ATM. It is scalable and could be replicated in other corridors in the state.

Concerns

The initial app with historical projections would not account for condition changes, such as weather, so it could not predict current traffic congestion. To manage expectations, clear messaging to the public about the app's limitations would need to be explicit. A "hands-free" app would need to be developed as quickly as possible to ensure greatest safety for drivers. The app would require upgrades and maintenance. Outsourcing these tasks is recommended.

How will safety be maintained or improved?

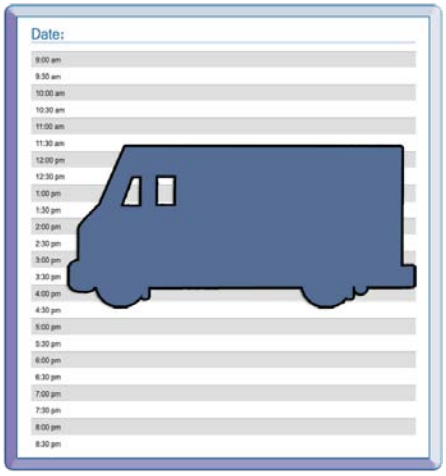
Developing a "hands-free" app would be necessary to ensure optimal driver safety.

How will mobility be improved?

A user friendly app could provide travelers with information to make better informed decisions about how to avoid peak congestion.

Implement shipper management working group to coordinate off-peak use of corridor

Slow Moving Vehicles Traveler Information Managing Driver Behavior



Delivery: Short-term (possibly immediate)

Cost: Low

Lead Team: CDOT, CMCA

Location: Corridor-wide

Appendix C Report ID:
Primary: SMV/ Enf 23
Secondary: Traveler Info 61

Description
Expand coordination between CDOT, the shipping industry, and business communities regarding restricted truck deliveries and improved corridor mobility during peak congestion periods. Encourage truck companies to schedule deliveries and through-travel for off-peak periods. CDOT is a strong partner to CMCA in this effort. CDOT initiated a series of work sessions with CMCA and business communities to identify and develop strategies for reducing truck traffic impacts on I-70 while still meeting industry needs. These meetings are based on technical and engineering data provided by CDOT. Results of this collaboration will be published by CDOT. In addition, CDOT will continue to offer and expand services (VMS, CoTrip, 511, etc) to inform and educate truck drivers about institutional, legal, and operational matters. CDOT will also offer historical engineering data to CMCA for analysis to maximize schedule efficiency and motorist safety.

Benefits
If possible, avoiding the corridor during peak congestion hours could benefit commercial shippers by reducing costs and limiting stress on truck drivers. The traveling public would benefit from lower truck volumes on I-70 during peak congestion periods.

Concerns
Individual shipping companies consider a variety of options when scheduling operations. I-70 congestion is only one factor for consideration. It may be possible for some companies to implement this idea effectively, but other companies may not participate.

How will safety be maintained or improved?
This option does not directly affect safety.

How will mobility be improved?
This option may reduce congestion during peak travel periods.

Improve communication of chain requirements to truckers

Traveler Information Accident Prevention Slow Moving Vehicles

Delivery: Mid-term

Cost: Low ($25,000-$35,000)

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: Traveler Info 76
Secondary: SMF/Enf 6

Description
An unintended consequence of truck chain laws is that drivers stop immediately on shoulders to chain up when they see the chain requirement has gone into effect or if the requirement is not in effect but other truckers are chaining up on the shoulders. CSP reports frequently that trucks park to chain up on the shoulders even though space is available in an upcoming, nearby chain station. This action primarily poses safety concerns for drivers and nearby motorists. As a secondary matter, this action impedes traffic flow and reduces mobility by limiting road visibility ahead and creating obstacles for motorists. This situation could be improved with a system that monitors and reports available space in chain stations. Drivers could receive that communication in advance and make better informed decisions about where and when to apply chains to their tires.

Benefits
Highway capacity decreases when visibility and shy distance is reduced by encroachments on the shoulder. This is particularly true when the object on the shoulder is a large truck, and the driver is stepping out into the travel lane while chaining up. Both capacity and safety will be improved by reducing the current practice of chaining up on the shoulder when it is not necessary.

Concerns
The exact method/technology to implement a chain communication system has not been identified. Chain stations may be monitored by camera with communication through variable message signs.

How will safety be maintained or improved?
Reduce/prevent accidents along shoulders related to truck chain-up.

How will mobility be improved?
Increase highway capacity by reducing obstacles on shoulders.

Increase snow and ice control maintenance level of service

Maintenance and Operations Snow Removal

Delivery: Short-term (possibly immediate)

Cost: Moderate

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: M/O 36

Description
Maintain roads as "wet" longer during the storm and bring roads back to "wet" sooner after the storm. Increase use of chemical deicers to maintain roads (liquid deicers as the storm begins and granular deicers throughout the storm). As snow starts to fall, ensure resources are available to manage the storm and proactively prepare the roadway instead of reacting only after the storm has begun.

Benefits
Better road conditions (less snow pack) for the traveling public. Faster deployment and proactive maintenance will remove more snow before it is packed into ice by travelers. Fewer accidents. More consistent speeds.

Concerns
Higher costs for materials, additional storage, and snowplow upgrades to the MDSS. Potential motorist complaints and environmental impacts. May require additional plows and personnel.

How will safety be maintained or improved?
Potentially reduce severity and occurrence of accidents related to inclement road and weather conditions by improving snow and ice control maintenance.

How will mobility be improved?
Optimized staff deployment and tuned application of deicing agents will reduce I-70 snow pack, decrease accidents, and maintain capacity.

Institute speed harmonization

Active Traffic Management Reduces collisions Improved Throughput

Delivery: Mid-term

Cost: High

Lead Team: CDOT

Location: Eisenhower to Twin Tunnels; WB approach to Floyd Hill (at lane drop)

Appendix C Report ID:
Primary: ATM/TDM 82
Secondary: ATM/TDM 128

Description
Speed harmonization uses frequent variable speed limit signs and enhanced enforcement to reduce speeds to manageable steady flows to reduce the "turbulence" that causes accidents and thereby creates more congestion. The program uses speed and queue detection devices to determine when to activate speed reductions. Though a full program takes more time to implement, CDOT can begin immediately installing more variable speed limit signs and speed and queue detection as part of small scale programs. This phased approach could provide some initial mobility benefits for I-70.

Benefits
Speed harmonization provides safety benefits to reduce rear-end and other collisions and reduces speed which may lead to less severe injuries when accidents do occur. It provides better travel expectations for travelers, better throughput, and reduced travel times.

Concerns
Initiation of this program will require an outreach campaign since drivers may not understand reasons/importance of reduced speed limits. The optimal version of this program would require additional enforcement and communications equipment. Additional signage may have a negative visual impact on the corridor.

How will safety be maintained or improved?
Offers information for drivers to make better informed decisions about travel speed. Has potential to reduce accident occurrence and severity.

How will mobility be improved?
Speed harmonization will improve mobility on I-70 by anticipating turbulence in order to maintain speeds and reduce the number and severity of accidents.

Initiate a transportation management organization to develop TDM, education, and outreach

ATM/TDM Enforcement Passenger Vehicles Education

Examples of similar TMO programs

Delivery: Short-term

Cost: Low ($300,000)

Lead Team: CDOT, DRCOG, local communities, I-70 Coalition

Location: Corridor-wide

Appendix C Report ID:
Primary: ATM/TDM 85
Secondary: ATM/TDM 132

Description
A TMO would work to coordinate transportation efforts of state agencies, local municipalities, employers, and regional destinations. The goal of the TMO is to expand the understanding and availability of alternative travel times and alternative travel modes to improve user experience on the corridor.

Benefits
TMOs provide a venue for stakeholders to work together to create education campaigns and safety and incentive programs. The program would help users of the I-70 corridor anticipate and avoid problems related to congestion and weather delays. It could also work directly with the trucking industry and help build consensus about future capital improvements.

Concerns
This organization would be advisory only and would be governed by a board of representative stakeholders from the corridor. This organization would need to fundraise from those representatives and government organizations. However, it would not be under the direct control of any one agency or stakeholder.

How will safety be maintained or improved?
Offers information for drivers to make better informed decisions about trips relative to safe travel.

How will mobility be improved?
TMO campaigns can help improve safety, reduce traffic volumes, and provide an opportunity for users to become engaged in solutions for the I-70 corridor.

Develop enhanced traveler information marketing campaign

Raise Awareness and Education Traveler Information

Delivery: Mid-term (12 months)

Cost: Low ($250,000)

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: Traveler Info 71

Description
Create a reciprocal arrangement with media outlets to use CDOT data in exchange for marketing time, separate from existing public service announcement services. Currently local television stations have access to limited numbers of CDOT cameras. Hardware (currently housed at ITS) was purchased and installed by television stations but is outdated and limited in its ability to transmit more than 10 of CDOT's 400 cameras. Television channels would be able to access all cameras in real time. CDOT would upgrade the equipment and access in exchange for marketing airtime for its communication programs. CDOT would need to negotiate and amend existing agreements with television stations.

Benefits
CDOT will gain media exposure for travel behavior programs.

Concerns
Competition with private sector marketing (which is willing to pay cash) may be challenging. A formidable traveler behavior program (mobile app, incentive program) must be ready to launch upon completion of equipment upgrades.

How will safety be maintained or improved?
This option does not necessarily affect safety.

How will mobility be improved?
Increased awareness in travel behavior programs will increase participation and potentially decrease congestion during peak hours.

Develop incentive program to encourage travel off-peak

Incentive Program Traveler Information Influencing Traveler Behavior

MOUNTAIN MILES
TRAVEL FASTER IN THE I-70 MOUNTAIN CORRIDOR

Delivery: Short-term

Cost: Low ($25,000-$35,000)

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: Traveler Info 63

Description
The incentive program would encourage users with tangible financial or other incentives to travel the I-70 Mountain Corridor in off-peak hours. Travelers would accrue points to qualify for specific rewards, similar to many airline frequent flyer or credit card reward programs. The program would be developed on the CoTrip.org platform and accessed via the web, mobile app, mobile website, and social media. This allows for participants to change travel behavior during pre-trip planning or during their trip. Once becoming members of the program, participants would register at the beginning of their trip using their smart phone (with GPS capability). Location and time would be recorded throughout the trip to verify travel during off-peak hours. A similar process would occur for their return trip. The program would need to work in conjunction with and support of mountain corridor businesses (restaurants, hotels, resorts, ski areas, gas stations, etc.)

Benefits
Reward system for changed travel behavior would improve mobility during peak hours in all seasons on all days of the week, including holidays. It offers an opportunity for CDOT to raise its national profile to create a program that influences traveler behavior using high-tech, relatively low cost solutions for congestion. GPS "probes" to collect data for CDOT are provided voluntarily and at no cost to CDOT.

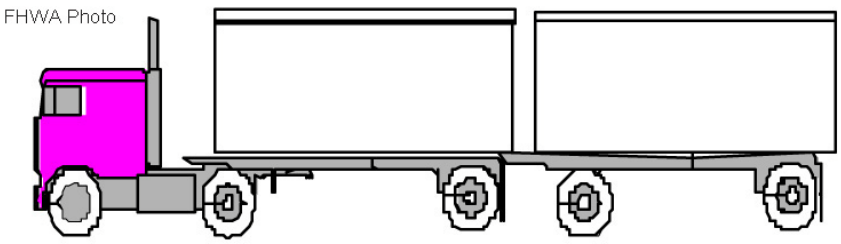
Concerns
Sensitivity to local mountain stakeholders will be key to this program's success. The outreach to communicate this program and involve as many stakeholders as possible must be extensive. The program will compete with other "offers" and potential participants may have "offer fatigue" thus making active participation difficult.

How will safety be maintained or improved?
Developing a "hands-free" app would be necessary to ensure optimal driver safety.

How will mobility be improved?
Reward system for changed travel behavior would improve mobility during peak hours in all seasons on all days of the week, including holidays.

Restrict single drive axle trucks

Slow Moving Vehicles Accident Prevention Influencing Driver Behavior



Western Double

Delivery: Mid-term

Cost: Low

Lead Team: CSP

Location: Corridor-wide

Appendix C Report ID:
Primary: SMV/Enf 32

Description
Restrict single drive axle western doubles during inclement weather. This truck configuration has been identified by representatives of both CSP and CMCA as having unique traction problems in the I-70 Mountain Corridor environment. Reducing the numbers of these vehicles on the corridor during inclement weather, either voluntarily or through regulation, would reduce the number of accidents and associated capacity reductions. This idea may require studies and legislative action.

Benefits
Conservative estimates of the cost of blocking I-70 are $800,000 per hour. Reduction in accidents and lane blockages caused by single drive axle western doubles will reduce delays, increase highway capacity, and increase safety.

Concerns
Limited options exist for alternate truck routes when adverse weather occurs. Potential economic hardship to shipping fleets, which are based on this truck configuration. Legislation and truck industry acceptance would be necessary for complete restriction.

How will safety be maintained or improved?
Has potential to reduce accident occurrence and severity related to truck travel in inclement weather.

How will mobility be improved?
Reduction in accidents caused by this truck configuration will reduce delays, increase highway capacity, and increase safety.

Restrict SMVs from corridor during peak hours

Capacity Improvement Managing Driver Behavior Accident Prevention

Delivery: Mid-term

Cost: Low

Lead Team: CDOT, CSP

Location: Corridor-wide

Appendix C Report ID:
Primary: SMV/Enf 29

Description
Restrict SMVs during known peak travel times. SMVs prominently influence mobility along the I-70 Mountain Corridor because of (a) extended steep grades along the Corridor, (b) the influence that steep grades have as SMVs pass other SMVs and thereby slow traffic in all travel lanes, and (c) the lack of reasonable alternatives for trucks making deliveries along the Corridor. In addition, accident rates increase as speed differentials increase. Current regulations prohibit SMVs from the left lane in certain areas, however enforcement is difficult. Regulations prohibiting SMVs from the corridor during specified time periods would alleviate these problems during these periods. This idea may require legislative action.

Benefits
Increase in highway capacity and increase in safety.

Concerns
Shippers may have difficulty avoiding the corridor during known peak periods given the lack of reasonable route alternatives. Recreational vehicle operators are drawn into the corridor during peak periods. All SMVs may not be readily identified until they are on the corridor blocking traffic. (Currently oversize and overweight commercial vehicles are already prohibited during peak periods.) Restricting SMVs during peak hours may increase problems during other time periods and would require additional enforcement. Legislation and truck industry acceptance would be necessary for complete restriction.

How will safety be maintained or improved?
Has potential to reduce rear-end collisions and overall accident occurrence and severity.

How will mobility be improved?
Restricting SMVs during known peak volume periods will increase in highway capacity and increase in safety during those periods.

Change contract with quick tow/courtesy patrol so user pays

Maintenance and Operations Public Private Partnerships Restore Capacity Accident Recovery

Delivery: Mid-term (12 months)

Cost: Neutral

Lead Team: CDOT

Location: Corridor-wide

Appendix C Report ID:
Primary: M/O 35

Description
To establish a self sufficient program not reliant on tax payers, change contract with quick tow/courtesy patrol so the user pays. The current response time is approximately 20 minutes. Would provide same prompt service from dedicated wrecker, but shift costs to user by sending a bill. Drivers would not have the option to decline service or request a different service, which avoids the need to await arrival of towing services that are not located near the scene. CDOT currently funds this service during peak congestion periods to keep roads open. Funds used for this program could be re-allocated to other projects that would improve mobility.

Benefits
Continues to remove blocked lane quickly to reduce congestion but places cost on the user. Hours of service could be expanded.

Concerns
Challenge with charging for what is currently a free service. Some motorists do not have the means to pay/may not pay. The program would have to be mandatory, so drivers could not refuse service because of cost. General concerns exist over tow rotation and private wrecker contracts. If not implemented correctly could defeat quick clearance benefits.

How will safety be maintained or improved?
This option would not necessarily affect safety.

How will mobility be improved?
Potentially self-funding program providing faster return to normal highway capacity by clearing blocked lanes and roadside distractions quickly. Funds used for this program could be re-allocated to other projects that would improve mobility.

Develop a fire suppression system in the EJMT

Maintenance and Operations Fire Response

Delivery: Mid-term

Cost: High

Lead Team: CDOT, CSP, FHWA

Location: EJMT

Appendix C Report ID:
Primary: M/O 55

Description
Install fire suppression within EJMT. The system can target specific fire locations. Rapid fire incident response in tunnel regardless of congestion.

Benefits
Improve emergency response and reduce employee exposure for fires, which is safer for all. Could reduce the need for metering all vehicles. A fire suppression system could also prompt other options for hazardous materials routing. CSP is responsible for routing hazardous material vehicles and would have to determine, in collaboration with CDOT and FHWA, if free flow of hazardous material carrying trucks is possible through the Tunnel.

Concerns
Additional maintenance demands/costs. System may discharge by mistake, but low risk. Would need additional space for storage for water. Not extensively used in US.

How will safety be maintained or improved?
This option allows for more expedient fire suppression in the event of an emergency. Protects motorists and emergency responders from fire hazards.

How will mobility be improved?
Currently, when Loveland Pass is closed, regular traffic is stopped every hour to allow hazmat trucks to convoy through the EJMT by themselves. If a fire suppression system would allow for policy change for hazmat trucks to free flow, then regular traffic would not be stopped and throughput would be increased. Rapid fire incident response in tunnel. CDOT could shift resources from Loveland Pass to I-70 at the EJMT.

Establish peak time tolling at Twin Tunnels

ATM/TDM Congestion Management Better Throughput Limited Footprint

Delivery: Mid-term

Cost: Moderate ($2,500,000 which could quickly be recovered from the tolls generated)

Lead Team: CDOT, FHWA, local communities

Location: Twin Tunnels

Appendix C Report ID:
Primary: ATM/TDM 83

Description
This concept would manage congestion by implementing variable rate toll charges at the Twin Tunnels to encourage people to use alternate modes or travel outside of peak times (7-11 am weekend mornings and 2-7pm on Sundays). Rates would be highest in the middle of peak, with lower rates during the edge hours, and no tolls in the off peak. Tolls would be collected via monthly mailed invoices from license plate photos and toll tags. This location was selected because of its eligibility as a tunnel and relative equity in terms of charging all I-70 users.

Benefits
Tolling could deter discretionary trips and help maintain a certain operating speed to improve safety. Providing predictable times that the tolls would be charged would allow people to plan their trips and to avoid paying a toll.

Concerns
This is likely to have a very high level of political controversy and will require approval by FHWA and local communities. CDOT will need to coordinate with local municipalities to minimize or eliminate impacts on local residents. Tolls must be placed to eliminate drivers taking alternate routes though local communities to avoid tolls.

How will safety be maintained or improved?
This option would not necessarily affect safety.

How will mobility be improved?
Lower peak traffic volumes will reduce congestion and accidents. This helps maintain speeds to boost overall capacity of the corridor.

Develop selected segments for hard shoulder running at peak times

Active Traffic Management Additional Capacity Limited Footprint

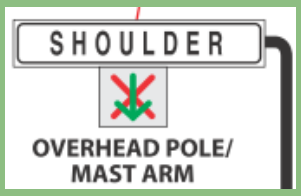
Delivery: Long-term

Cost: High

Lead Team: CDOT, FHWA, local municipalities, private sector

Location: US40 to the Twin Tunnels

Appendix C Report ID:
Primary: ATM/TDM 84



Description
Without expanding the roadway footprint, provide a third eastbound lane for use during high congestion periods from US 40 through the Twin Tunnels and through to the next feasible three-lane segment of I-70. This idea assumes implementation of the Twin Tunnels widening. Ultimately, the goal is not to shift the "bottle neck" merging effect. This concept would require CDOT to add emergency access road crossing locations and emergency pullouts, restripe the highway to provide at least a 10 foot shoulder lane, and install a series of new informational signs to allow traffic to use the shoulder lane at certain times.

Benefits
Add capacity for critical travel times at key locations. Has the flexibility to be used in this or other locations as a congestion management tool, general purpose lane, truck climbing lane, or a high occupancy/transit-vehicle lane. It could eventually be expanded to add capacity traveling east from the merge point at US 6.

Concerns
Requires approval by FHWA and coordination with local municipalities. Operations at highway exits and the pier pinch point at MM 103 will require careful attention. Coordination with local communities will also be important especially since some additional pavement will be necessary for improvements at pinch points, road crossings, and pullouts. NCHRP Report 369 provides guidance for hard shoulder running applications.

How will safety be maintained or improved?
This option would not necessarily affect safety.

How will mobility be improved?
When congestion reduces traffic speeds to below 60 miles per hour, operation of a hard shoulder as a third lane allows a more steady flow of traffic volumes at controlled speeds. This idea is likely to be most effective if CDOT is also able to actively control the speed limit in the corridor with variable speed limit signs and speed harmonization.

The following table summarizes ideas presented in the one-page summaries. As noted, these ideas ***do not necessarily represent CDOT's project priorities***. The number **(#)** next to each idea represents the "Report ID" in **Appendix C,** where additional information is available.

Action	Timeframe	Cost	Type of action
Increase driver education for snow and mountain conditions **(1)**	Short-term/immediate	Low	Education
Increase passenger vehicle enforcement options for inadequate snow tires **(4)**	Short-term/immediate	Low	Enforcement
Increase enforcement of unsafe speeds and condition violations **(14)**	Short-term	Neutral	Enforcement
Expand trucker education program and offer enhanced information stream **(75)**	Short-term	Low	Education
Include weather source/data (Meridian MDSS) in all maintenance trucks **(37)**	Short-term/immediate	Low	Maintenance improvement
Implement queue detection and warning at specific locations **(86)**	Short-term	Low	Traffic management
Develop/expand smart phone mobile applications **(62)**	Short-term/immediate	Low	Traveler information
Implement shipper management working group to coordinate off-peak use of corridor **(23)**	Short-term/immediate	Low	Communication
Improve communication of chain requirements to truckers **(76)**	Mid-term	Low	Communication
Increase snow and ice control maintenance level of service **(36)**	Short-term/immediate	Moderate	Maintenance improvement
Institute speed harmonization **(82)**	Mid-term	High	Traffic management
Initiate a transportation management organization to develop TDM, education, and outreach **(85)**	Short-term	Low	Communication
Develop enhanced traveler information marketing campaign **(71)**	Mid-term	Low	Communication
Develop incentive program to encourage travel off-peak **(63)**	Short-term	Low	Traffic management
Restrict single drive axle trucks **(32)**	Mid-term	Low	Restriction
Restrict SMVs from corridor during peak hours **(29)**	Mid-term	Low	Restriction
Change contract with quick tow/courtesy patrol so user pays **(35)**	Mid-term	Neutral	Traffic management
Develop a fire suppression system in the EJMT **(55)**	Mid-term	High	Traffic management
Establish peak time tolling at Twin Tunnels **(83)**	Mid-term	Moderate	Traffic management
Develop selected segments for hard shoulder running at peak times **(84)**	Long-term	High	Traffic management

NEXT STEPS

This assessment indentifies short-term, mid-term, and long-term ideas to improve mobility and operations on the I-70 Mountain Corridor. CDOT is actively seeking partnerships and funding to implement mobility solutions. As funding becomes available, CDOT will work with stakeholders within the CSS process to evaluate which ideas may be fully developed for implementation on the corridor.

Ideas may be developed in a phased approach. Some ideas that can be implemented within the next six months may be the first step of a larger program. For example, effective communication to influence traveler behavior is a good example of taking initial steps within a larger program. Other ideas may be dependent on timing of other improvements, such as projects near the Twin Tunnels.

Phased Approach
Influencing Traveler Behavior

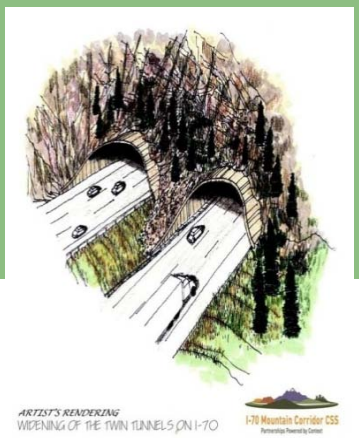
Immediate: mobile app showing historic congestion/travel time

Short-term: multi-platform promotional campaign targeting travelers pre-trip and en-route that could access user-friendly CDOT data from a variety of formats

Phased Approach
Improvements near Twin Tunnels

Mid-term: Improvements at twin tunnels developed from March 2011 Design Workshop for the Twin Tunnels and planned CSS and environmental studies

Mid-term: Hard shoulder running options may further improve mobility after tunnel improvements are completed



Additionally, many ideas share the common themes of public relations and education and sustainable funding.

Public Education – Successful implementation of many of the ideas developed would also require public education campaigns to inform corridor users of new technologies, practices, or regulations. This campaign could be part of an integrated and dedicated approach to enhance

public education services to I-70 Mountain Corridor users. Existing ATM/TDM and intelligent transportation system (ITS) tools may be included and expanded (such as vehicle chain laws, 511, CoTrip.org) to distribute the messages through new technologies including mobile apps and social media. Additionally a long-term forward-looking approach should be integrated into the campaign as part of a multi-stepped effort to generate a robust public education vision for the I-70 Mountain Corridor. Public education campaigns assume voluntary compliance and could be strengthened with enforcement.

Sustainable Funding – Funding is constrained for many aspects of the I-70 Mountain Corridor including maintenance, operations, enforcement, public education campaigns, ITS tools, and planned improvements. Ideas that identify reductions in costs, increased revenues, or self-funding, could benefit the corridor as a whole by freeing up funds to support new or under-funded programs.

Self-funding/sustainable funding is an innovative business model mechanism using P3s to create sustainable low cost/no cost solutions. The partnership allows CDOT to leverage its assets in a synergistic manner with partners to realize sustainability of a project.

One idea includes developing and leveraging an integrated CDOT communication platform (integrates use of an app, 511, GovDelivery, Facebook, Twitter, CoTrip and other social media). Funding is provided by external sources to offset program costs while CDOT provides access to data and leverages its assets to its partners. Sources of funding include advertising, sponsorships, reciprocal partnerships, and grants. P3s can be structured in a variety of ways. Opportunities for self funding are also identified with ideas related to enforcement, employee housing, towing, and tolling.

Next Steps

I-70 Mountain Corridor Mobility and Operational Assessment has been posted on http://i70mtncorridorcss.com/ to share with stakeholders.

As funding becomes available, ideas will be developed though the 6-step CSS process.

APPENDIX A – AGENDA

Monday, May 23

Location: CDOT Region 1 - Golden Residency - 425C Corporate Circle, Golden

Welcome – Stacey Stegman and Tony DeVito

Overview of Project - Jim Bemelen

Introductions

Workshop Schedule and Roles – Mary Keith Floyd

Overview of Existing Operation and Mobility Conditions

- Slow Moving Vehicles and Truck Traffic – Bernie Guevara
- Enforcement – Captain Ron Prater
- Maintenance and Operations – Mike DeLong / Mike Salamon
- Active Traffic Management / Travel Demand Management – Clark Roberts
- Traveler Information – Ken DePinto / Stacey Stegman

Stakeholder Discussion

Wrap Up

Tuesday, May 24

Location: Michael Baker, 165 South Union Boulevard, Suite 200, Lakewood

Large Group – Traffic Data Presentation – Bryan Allery

Large Group – Netherland's Congestion Management Pilot Projects – Dirk Grevink

Large Group – Idea Documentation – Mary Keith Floyd

Breakout into Small Group - Data and Current Practices

- Slow Moving Vehicles and Truck Traffic
- Enforcement
- Maintenance and Operations
- ATM /Travel Demand Management
- Traveler Information

Tuesday, May 24 (cont.)

Large Group Presentations:

- Shoulder Lanes – Best Practices from other States – Craig Siracusa
- Speed density related to accidents - Jake Kononov

Large Group – Wrap Up

Wednesday, May 25

Location: Michael Baker

Large Group Discussion – Corridor wide and location specific ideas

Breakout into Small Groups - continue to brainstorm and document ideas

Large Group - report out ideas

Thursday, May 26

Location: Michael Baker

Large Group – Consolidate ideas and shift groups

Breakout into Small Groups – brainstorm ideas

Large Group – Review and update corridor wide and location specific ideas

Wrap Up

Friday, May 27

Location: Michael Baker

Large Group – Review all ideas and confirm idea documentation

Slow Moving Vehicles and Enforcement Groups - Restrictions

Large Group – Identify packages of Ideas which complement each other

Wrap Up / Next Steps

APPENDIX B – TECHNICAL PRESENTATIONS

Slow Moving Vehicles and Truck Traffic

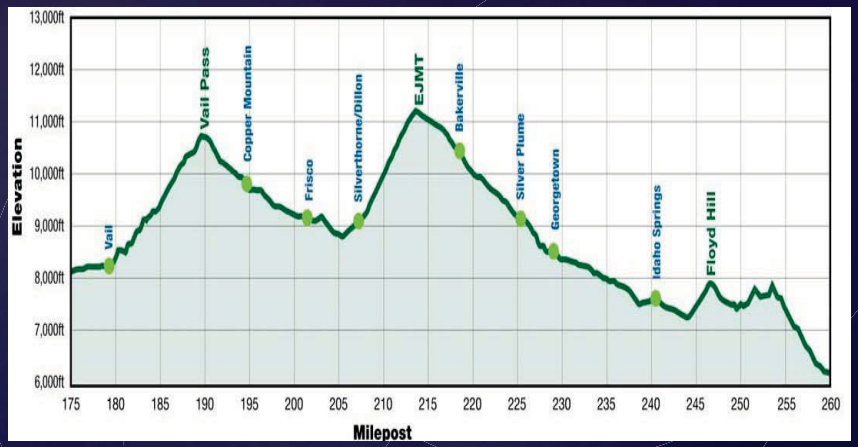
Bernie Guevara

May 23, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

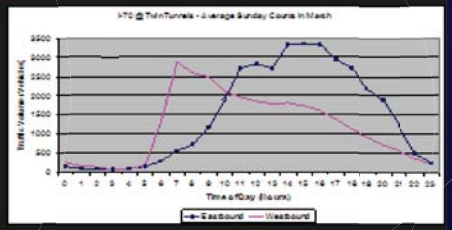
Slow Moving Vehicles and Truck Traffic



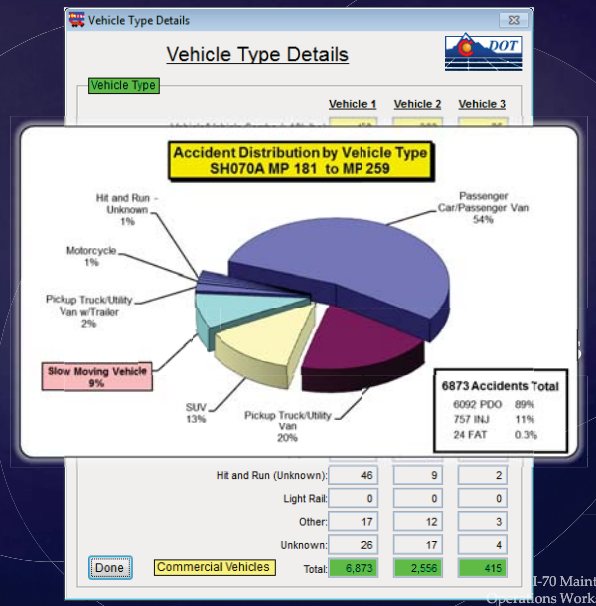
Current Conditions & Challenges : Steep Grades, weather conditions, sharp curves, capacity, traffic mix

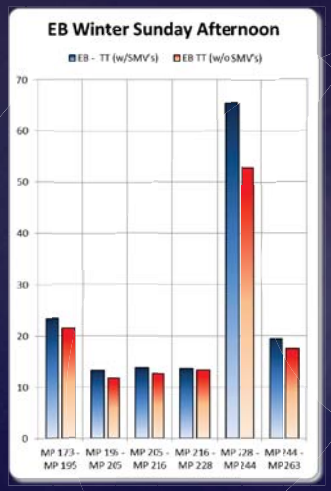
Eastbound I-70, Sunday Afternoon, Georgetown to Twin Tunnels

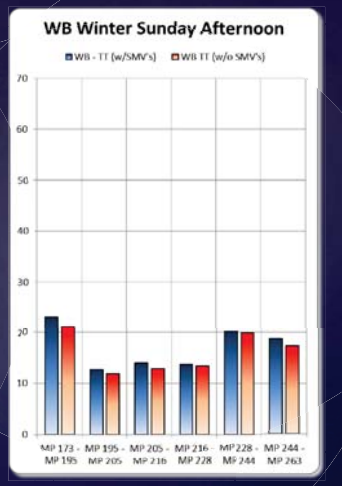
- Congestion occurs 2:30 p.m. – 7 p.m.
- Traffic is very directional both AM and PM in opposite directions.
- Represents worst traffic delays of weekend.



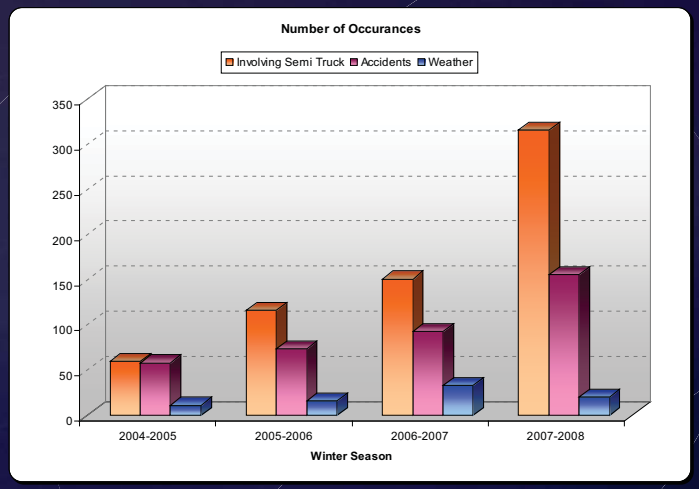
Current Conditions & Challenges: Directional Split







Travel Times



2007- 08 Number of Occurrences

Typical Sunday travel time (Georgetown – Evergreen) = 79 mins
Diversions to frontage roads
Tunnel metering
Emergency Services delayed

Time to recover takes several hours
Highway Closure cost = $800,000 per hour

2007 Legislation to ease I70 Congestion

Violations

- "The fine for not carrying chains between mileposts 163 and 259 on the I-70 corridor during the specified season is $50 plus a surcharge.
- Statewide, the fine for not chaining up when the chain law is in effect is $500 plus a surcharge.
- The fine for not chaining up and subsequently blocking the highway is $1,000 plus a surcharge, and will result in a Class B traffic infraction."

Traffic Operations Strategies

More Legislations…

Legislative Strategy #2: Senate 10-173 : Left Lane Restriction

Legislative Strategies #3: Senate Bill 10-184: Reversible Lane

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Current Performance…….

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I-70 Closures

Weather		Both	EB	WB	Total		Total Time Closed
2007-2008	Road	6	7	7	20		93h 32m
	Lane	0	0	0	0		0
Year Total		6	7	7	20		93h 32m
2008-2009	Road	11	9	5	25		69h 17m
	Lane	0	0	0	0		0
Year Total		11	9	5	25		69h 17m
2009-2010	Road	6	2	4	12		34h 47m
	Lane	0	0	0	0		0
Year Total		6	2	4	12		34h 47m
2010-2011	Road	5	5	7	17		56h 03m
	Lane	0	0	0	0		0
Year Total		5	5	7	17		56h 03m

Closures due to Weather

I-70 Closures

Accidents		Both	EB	WB	Total		Total Time Closed
2007-2008	Road	3	29	29	61		159h 57m
	Lane	1	30	64	95		100h 38m
Year Total		4	59	93	156		260h 35m
2008-2009	Road	0	11	12	23		44h 57m
	Lane	0	18	6	24		23h 11m
Year Total		0	29	18	47		68h 08m
2009-2010	Road	4	9	11	24		68h 04m
	Lane	0	17	7	24		82h 29m
Year Total		4	26	18	48		150h 33m
2010-2011	Road	3	6	5	14		66h 36m
	Lane	0	1	2	3		7h 37m
Year Total		3	7	7	17		74h 13m

Due to accidents

Winter Season	# of CV cleared	# of lanes cleared	Clearance Time*	Cost Savings (million)
2007-2008	184	217	28 min 51 sec	$21.37
2008-2009	212	245	26 min 6 sec	$23.68
2009-2010	199	232	17 min 44 sec**	$27.97
Average	**198**	**231**	**24 min 14 sec**	**$24.34**



Quick Lane Clearance - Heavy Tow Program

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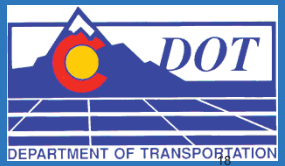
ENFORCEMENT…….

18

- Chain Law compliance
- Unfamiliar to driving conditions
- { Speed, speed, speed
- Not paying attention
- Hazmat Processing @ EJMT
- CSP staffing

Recurring Problems

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Chain Law Enforcement in Progress……

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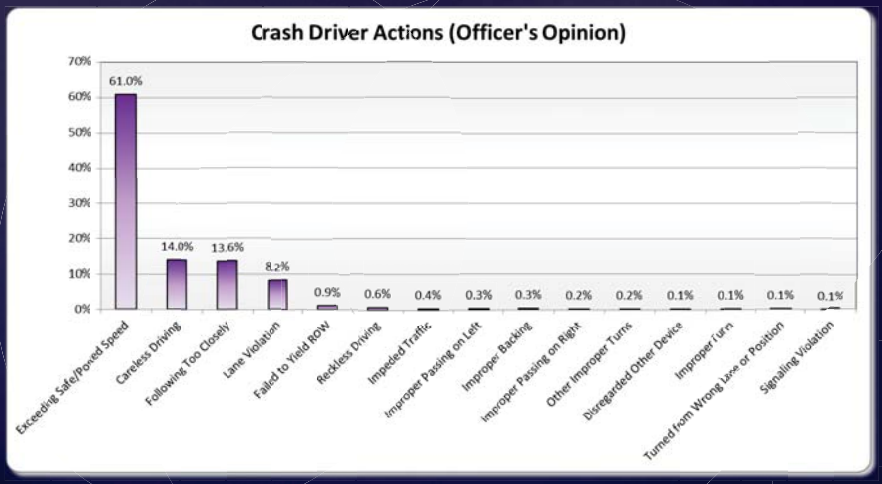
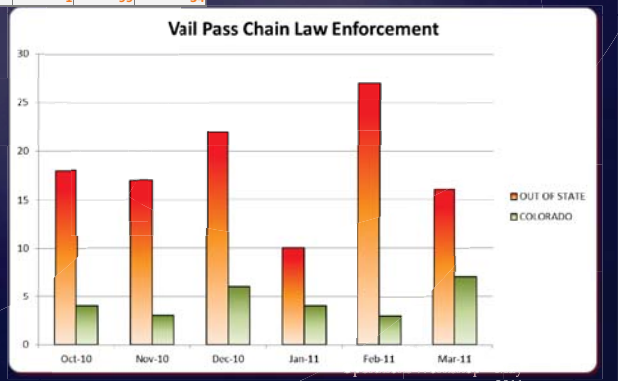


I-70 Closures

VAIL PASS CHAIN LAW ENFORCEMENT						
			I-70 MP	FINE AMOUNT		
MONTH	OUT OF STATE	COLORADO	MOST COMMON	$ 135.50	$ 581.50	$ 1,159.50
Oct-10	18	4	185	1	11	9
Nov-10	17	3	182		17	3
Dec-10	22	6	184		20	6
Jan-11	10	4	187		10	4
Feb-11	27	3	182		23	7
Mar-11	16	7	185		18	5
TOTALS	110	27		1	99	34



Questions?

I-70 Visioning Collaboration Overview

Mike Salamon

May 23, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

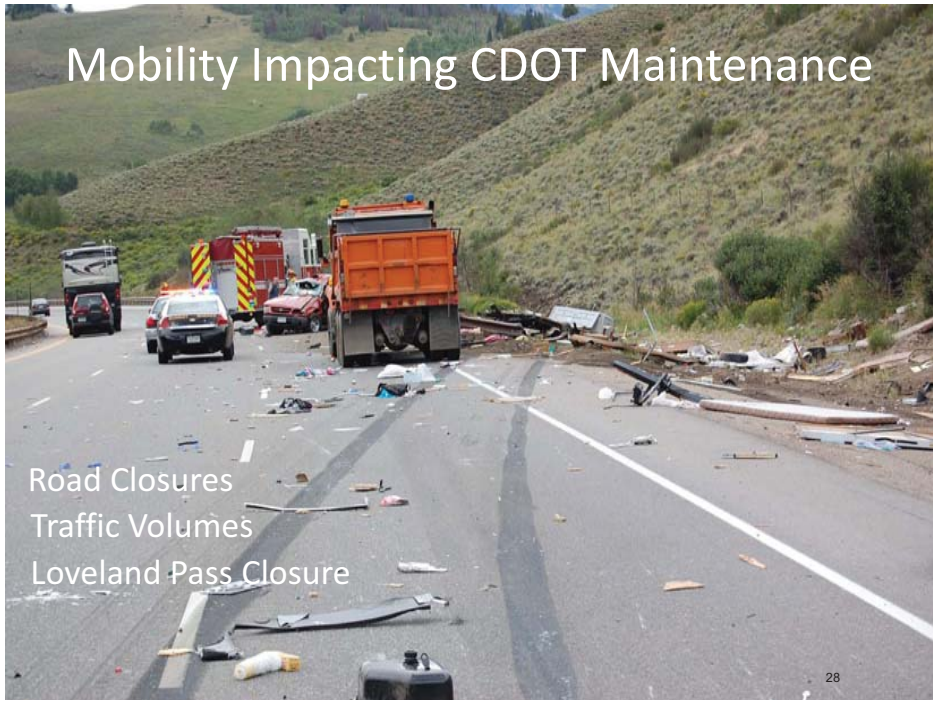
I-70 Mountain Corridor CSS
Partnerships Powered by Context

Does CDOT Maintenance impact mobility or does mobility impact CDOT Maintenance?

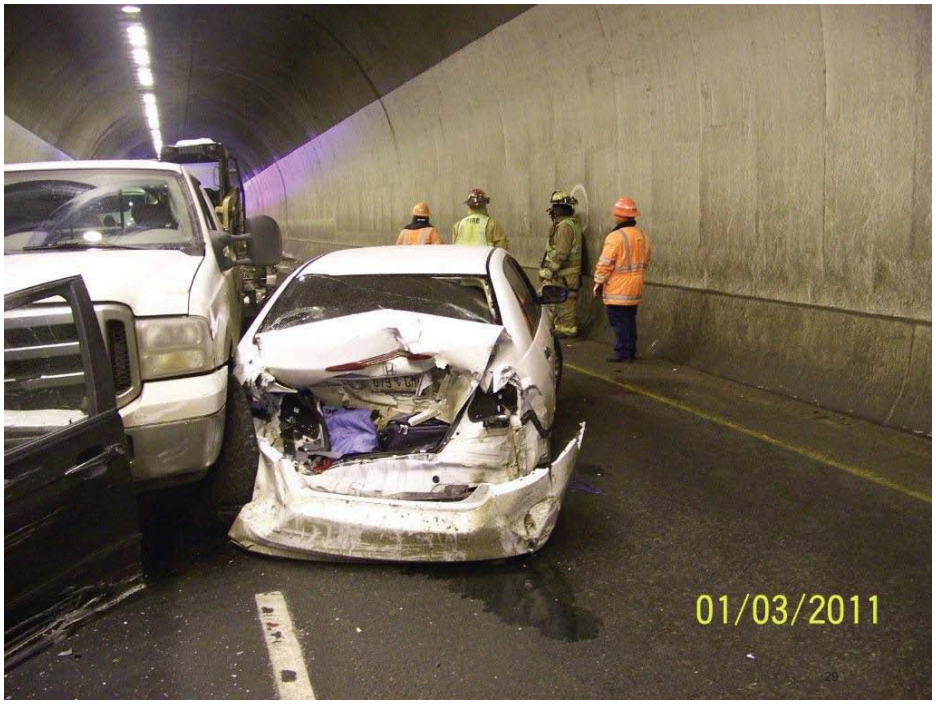
CDOT Maintenance Impacting Mobility

Retention of Employees
Location/Functional Facilities
Avalanche Control
Age of Fleet
Work Process

Mobility Impacting CDOT Maintenance



Road Closures
Traffic Volumes
Loveland Pass Closure



I-70 Mountain Corridor Mobility

Mike Salamon

May 23, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

I 70 Mountain Corridor Mobility

- Mountain Corridor Mobility and Operational Assessment
  May 2011

I 70 Mountain Corridor Mobility

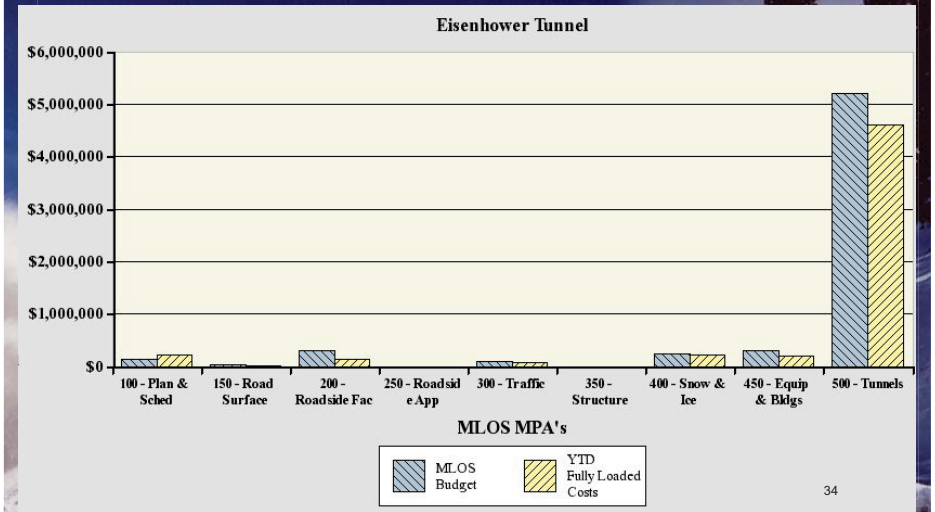
- Mike Salamon,
  EJMT Superintendent (CDOT)

I 70 Mountain Corridor Mobility

- Eisenhower/Johnson Memorial Tunnels
  - Eisenhower Opening March 1973
  - Edwin Johnson Opening December 1979

I 70 Mountain Corridor Mobility

MLOS for Eisenhower Tunnel FY 2011



I 70 Mountain Corridor Mobility

- Hazardous Material Program
  - When Loveland Pass Closes Only.
  - Tunnel Allows Haz-Mat on the Hour.
  - Public Traffic Held.

Year	HazMat Used the Tunnel	Loveland Pass Closure Time	
2008	3950	16 days 11 hours	
2009	2717	10 days 7 hours	
2010	3172	16 days 17 hours	
2011	3471	19 days 13 hours	jan through april

I 70 Mountain Corridor Mobility

- Tunnel Metering Data (continued)
  - *Summit Daily Article 01/22/11*

Metering usually happens on eastbound lanes on peak travel days, particularly Sunday afternoons and holidays in both the summer and the winter when skiers or tourists are heading back to Denver. Traffic is generally held up to 20 minutes as needed until the tunnel clears out.

I 70 Mountain Corridor Mobility

- Tunnel Metering Data (continued)
  - *Summit Daily Article 01/22/11 (continued)*

CDOT officials begin metering the tunnel when volumes increase to between 2,800 and 3,100 vehicles through the tunnel per hour, depending on how the traffic is flowing. Issues such as accidents or bad weather can also cause backups bad enough to require metering.

I 70 Mountain Corridor Mobility

- Tunnel Metering Data (continued)
  - *Summit Daily Article 01/22/11 (continued)*

CDOT holds traffic by activating a stop light just outside the tunnel, which causes already slow-moving traffic to stop. Bob Wilson said metering, a process that has been in place for 20 years, does not usually cause drivers additional delays because traffic is moving so slowly on the other side of the tunnel as well. On busy Sunday afternoons CDOT stops traffic an average of three to six different times.

I 70 Mountain Corridor Mobility

- Tunnel Metering Data (continued)

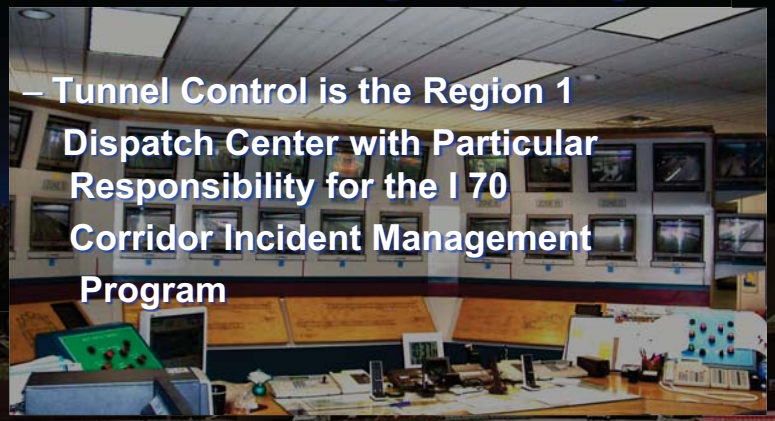
Year	number of meterings	total time for each year
08/09	50 times	10.9 hours
09/10	40 times	10.5 hours
10/11	84 times	17.7 hours

I 70 Mountain Corridor Mobility

- Tunnel Traffic Statistics
  - 1973 projected average daily traffic by year 2000: 14,000 vehicles
  - 2000 actual average daily traffic: 28,123 vehicles
  - 2010 Average Daily Traffic 31,210
  - Current total actual traffic count as of April 30, 2011 : 291,308,594

I 70 Mountain Corridor Mobility

- I 70 Incident Management Program



– Tunnel Control is the Region 1 Dispatch Center with Particular Responsibility for the I 70 Corridor Incident Management Program

I 70 Mountain Corridor Mobility

Traffic & Security Management Practices

I-70 Mountain Corridor
Incident Management Program
Response Manual
for the Eisenhower/Johnson
Memorial Tunnels

Prepared for:

DOT

Summit County

Clear Creek County
COLORADO

I 70 Mountain Corridor Mobility

- Tunnel Staffing
  - 50 Full Time Employees
  - 1 Superintendent
  - 2 LTC Ops I
  - 3 TM IIIs
  - Tunnel Mechanics
  - Electronics
  - Wastewater/Water
  - A&E Mechanics
  - Utility
  - Store Room
  - Administration Staff

I 70 Mountain Corridor Mobility

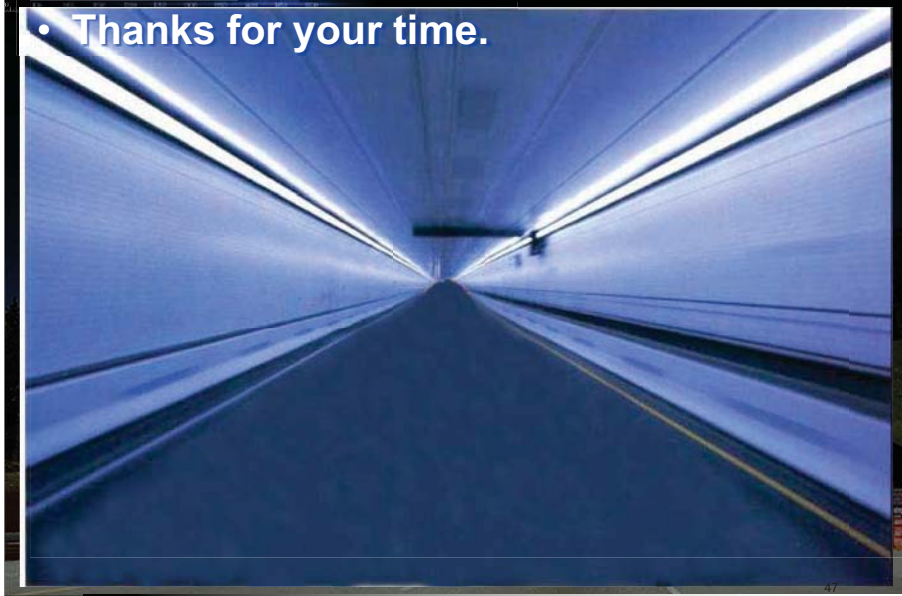
- E/JMT Avalanche Reduction Program
  - 4 Employees in Program
  - 440 rounds deployed FY 10/11

- Specialized Equipment

Tunnel Pumper Deluge System with Foam

- Specialized Equipment

- Thanks for your time.



Active Traffic Management

Clark Roberts

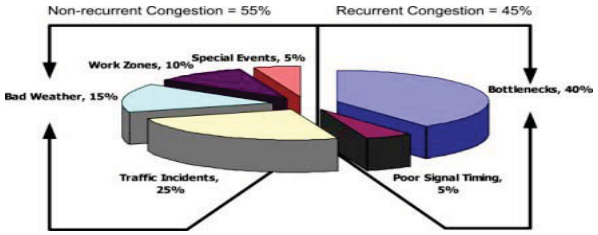
May 23, 2011

Active Traffic Management

What exactly is Active Traffic Management or ATM ?

- It is the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing traffic conditions.
- It is the ability to increase throughput and safety using integrated systems and new technology, to dynamically deploy traffic management strategies.
- It is the ability to optimize the efficiency of the existing highway facility by focusing on trip reliability.

Causes of congestion in the United States



From FHWA International Programs website

Active Traffic Management

ATM Strategies include:

- **Lane Use Management**

Managed lanes, a component of congestion management, are defined as highway facilities or a set of lanes in which operational strategies are implemented and managed (in real time) in response to changing conditions to preserve unimpeded flow.

Examples include:
- HOV Lanes
- HOT Lanes
- Reversible Lanes
- Bus Lanes
- Truck Lanes

Active Traffic Management

ATM Strategies include:

- **Hard shoulder Running**:

This strategy provides additional capacity during times of congestion and reduced travel speeds on a facility. The shoulder lanes are generally limited to peak hour use and controlled by electronic signing and video camera detection. Additionally, "active management" systems monitor the lanes and shut them down in the event of emergency, weather, or accident situations.

Active Traffic Management

ATM Strategies include:

- **Speed Management/Speed Harmonization**

This strategy consists of dynamically adjusting speed limits on a freeway corridor based on the level of congestion, the running speeds of downstream traffic, or other traffic flow criteria. This reduces the risk of accidents (both primary and secondary in nature), the severity of accidents, and generally optimizes the flow of vehicles through the corridor.

Active Traffic Management

ATM Strategies include:

- **Queue Detection/Queue Warning**

This strategy consists of identifying slow moving or potentially stopped traffic on a existing facility and displaying information to traffic upstream. This informs motorists of traffic conditions ahead, preparing them to slow down/stop, or potentially to select alternate routes or lanes and reduce queue buildup.

Active Traffic Management

ATM Strategies include:

- **Ramp Metering**

This strategy consists of maintaining smooth freeway mainline flow by breaking up platoons of entering vehicles and/or limiting vehicle entry at entrance ramps

Active Traffic Management

ATM Strategies include:

- **Dynamic Re-routing:**

This strategy consists of providing information to the traveling public regarding downstream traffic conditions during periods of heavy congestion or incident management on a highway facility. Alternate route guidance is provided to motorists move traffic to less congested facilities.

Active Travel Demand Management

ATDM is the intervention to modify travel decisions making alternative modes of transportation appealing and reducing the number of single occupancy car travel during congested periods on an existing facility.

ATDM Strategies include:

- **Enhanced travel alternatives in actively managed corridors**
- **Incentives to reduce traffic volumes on congested facilities**
- **Promotion of TDM at major trip generators in corridors**
- **Multimodal traveler information to encourage mode shift**

Challenges to consider

The Section of Interstate 70 Mountain corridor is a rural corridor and while ATM solutions are use largely in urban areas, any ATM applications deemed beneficial for the I-70 Mountain Corridor will need to consider the environment in which they are to be applied.

Strategies that have already been applied include:

- Ramp Metering
- Queue Detection/ Queue Warning

Benefits of ATM and ATDM

ATM and ATDM Strategies can be used individually, or in combination to address congestion on existing highway facilities.

ATM strategies respond to prevailing Road, Traffic and Weather conditions in real time, in order to improve safety, operational capacity and trip consistency in the I-70 Mountain Corridor.

ATM Strategies can be deployed on the I-70 Mountain Corridor quickly, with less funding, and with less construction impacts.

ATDM Strategies can encourage travelers in the I-70 Mountain Corridor to select alternative modes of transportation

ATDM Strategies reduce the number of single occupant vehicles during the peak travel hours on the I-70 Mountain Corridor.

I-70 Mobility and Operational Assessment "Traveler Information"

Ken DePinto and Stacey Stegman

May 23, 2011

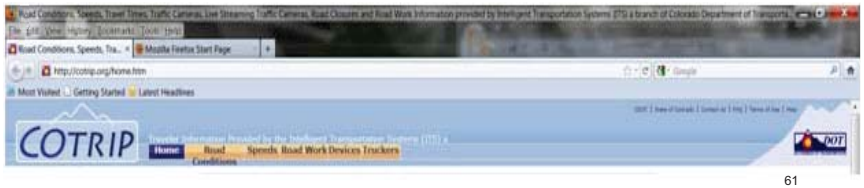
COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

I-70 Mobility and Operational Assessment "Traveler Information" Presented by the CDOT Intelligent Transportation Systems (ITS) Branch

Background Information

- Cotrip.org Web site
- CTMS Operations Package
- 511 HIVR Automated Phone System
- Browser-based Mobile Application for COTRIP
- Gov Delivery (text alerts)
- Media, Video, Travel Time, Other
- Pubic Private Partnerships
- Oracle Data Base Management
- Variable Message Boards – Travel Times
- Twitter / Social Media
- Traditional Media



Cotrip.org Web site

CoTrip.org is the official CDOT web site dedicated to:

•Statewide traveler information
•Features include as a minimum:
•Google map base
•CCTV camera streaming video and still shots
•Road and weather information
•Construction reports
•Variable message real time data
•Travel time
•Other

Cotrip.org Web site Continued

There is a strong demand for the information as evidenced by the table that shows an exponential increase in web requests from 2007 to 2010.

	KBytes	Visits	Pages	Files	Hits
2010	18477159136	16058234	258909438	1966146292	2023233401
2009	7215158893	8368264	139590850	1020569478	1306386886
2008	6440570192	5667989	76107781	500496548	718823619
2007	6128949238	7615012	78895433	505468352	604748840

CTMS Operations Package

The Colorado Transportation Management System (CTMS) is the core operating system for the Colorado Transportation Management Center's (CTMC) statewide ITS infrastructure and the CoTrip web site., and also provides an interface with the 511 HIVR automated phone system (ie: I-70 Trip Travel Time).

511 HIVR Automated Phone System

Features:

•Updated messages regarding Closures, Chain Laws, Special Messages, Event messaging
•Real-time travel times on selected corridors
•Voice recognition prompts
•Ability to transfer to RTD's and other transportation provider's traveler information systems

511 HIVR Automated Phone System Continued

In 2010 the 511 system received 2.3 million calls. Due to the enhancements that were made, CDOT routinely uses the VMS to direct travelers on the roadway to the 511 system to provide more detailed traveler information.

Browser-based Mobile Application for COTRIP

In 2002 CDOT developed a basic browser based mobile application for cellular phones prior to the advent of the smart phones (eg. DROID, I phone, Blackberry)

Gov Delivery (text alerts)

8000 plus Subscribers to date are signed up. Online self subscriptions are available with customized alert options:

•82% of subscribers use GovDelivery for Highway Corridor Traffic and Travel
•80% of subscribers feel like they are getting the right amount of information through GovDelivery
•Nearly 30% of subscribers use GovDelivery to commute to work
•21% use it for mountain destination commute
•32.4% use it for a both commuting and mountain travel; for work such as emergency responders or to keep customers informed.

Media, Video, Travel Time, Other

In 2002 CDOT entered into an agreement with Denver local media to allow installation of media equipment in the CTMC to provide media the ability to select and switch CCTV camera images.

In addition CDOT now shares its data and images with over 60 partners through a data feed at no cost to the users.

Pubic Private Partnerships

•In 1996 the Colorado Legislature enacted a law allowing CDOT to enter into PPPI provided that certain provisions, terms and conditions were satisfied.
•The Department first used the PPPI in 1998 with Adesta, which provided Adesta access to selected highway rights-of-way to install fiber optic cable in exchange for fiber optic cable.
•More recently, CDOT entered into a twenty-year agreement with Comcast to lease two strands of fiber on I-70 in exchange for annual cash compensation and in-kind engineering and maintenance services.
•Currently, CDOT is in the process of executing a twenty-year agreement with Crown Castle to allow access to SH 119/US 6 to install fiber optic cable and a cellular communication's system in exchange for fiber optic cable, cash, other infrastructure, electrical power and annual in-kind maintenance services.

Oracle Data Base Management

•All data reported to CTMS and posted on COTRIP with the exception of camera images are saved in an Oracle data base for about the last 5 years.
•The data can be queried to provide reports regarding messages posted on sign, travel times, speeds, volumes, weather station road conditions such as wind speed/ temperature/other, etc.

Variable Message Boards-Travel Times

•CDOT provides traveler information in many formats such as the web (COTRIP), Variable Message Signs (VMS), media/others via data feeds and 511 (I-70 only to date).
•The travel time program has expanded in the past 5 years and is now visible on I-70 from Golden to Denver, I-25 from South Denver to Colorado Springs, SH6 from Golden to I-25 and is slowly migrating into the metro area.
•While most travel times are posted on the web in the metro area the next phase which consists of utilizing the overhead VMS will be implemented over the next year.

Twitter/Social Media

•Twitter site launched in January of 2009 and we current have about 7000 followers.
•This site is used primarily to provide information on road conditions/chain laws and other incidents although some other CDOT information is distributed via Twitter as well.
•CDOT has been exploring the use of Facebook and expects to launch a new site this year but will focus on other CDOT issues rather than traveler information via this forum.

Traditional Media

•CDOT also uses traditional media to get information out via GovDelivery and other distribution channels.

Questions?

I-70 Mountain Corridor Mobility and Operational Assessment

Mary Keith Floyd

May 23, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

Taking care to get you there

I-70 Mountain Corridor CSS
Partnerships Powered by Context

I-70 Mountain Corridor Mobility and Operational Assessment

May 23 to 27, 2011

Welcome
to the
I-70 Mountain Corridor Mobility and Operational Assessment

I-70 Mountain Corridor CSS
Partnerships Powered by Context

Overview of Project

Goals for the I-70 Mountain Corridor Mobility and Operational Assessment:

To develop, explore, and document both new and existing ideas to improve mobility and operations within the CSS framework.

I-70 Mountain Corridor CSS
Partnerships Powered by Context

Idea Documentation

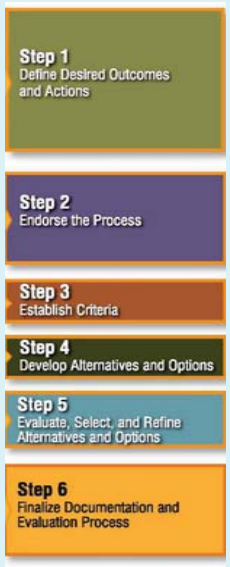
Document how well an idea meets our goals and objectives. We will identify:

- Benefits
- Drawbacks
- Timeframe to deliver
- Cost
- Lead agencies
- Successful applications and best practices

…and document each idea for potential to move forward within the CSS process.

I-70 Mountain Corridor CSS
Partnerships Powered by Context

How this fits into the CSS Process



Develop and document ideas to be utilized within this process.

Introductions

Bringing together ideas from across the state and globe

Schedule Overview

- Monday – Review current conditions and share issues and concerns.
- Tuesday – Review detailed operational data.
- Wednesday – Brainstorming ideas in small groups.
- Thursday – Continued to develop and document ideas.
- Friday – Review idea documentation and identify packages.

Roles

- Stakeholders – sharing ideas and concerns
  - Presenters – share data, current practices, and examples
  - Technical Experts – identify ideas and applications
  - Facilitators – document ideas

Small Technical Groups

- Slow Moving Vehicles and Truck Traffic
- Enforcement
- Maintenance and Operations
- Active Traffic Management and Travel Demand Management
- Traveler Information

Existing Conditions

Slow Moving Vehicles and Truck Traffic

Bernie Guevara

Existing Conditions

Enforcement

Captain Ron Prater

Existing Conditions

Maintenance and Operations

Mike DeLong
and
Mike Salamon

Existing Conditions

Active Travel Management and
Travel Demand Management

Clark Roberts

Existing Conditions

Traveler Information

Ken DePinto
and
Stacey Stegman

Stakeholder Discussion

- **Slow Moving Vehicles and Truck Traffic**
- **Enforcement**
- **Maintenance and Operations**
- **Active Traffic Management and Travel Demand Management**
- **Traveler Information**

Stakeholder Discussions – Wrap Up

Now the Technical Team will …

- Take the issues and concerns we have discussed and form ideas for analysis
- Evaluate the pros and cons of all ideas
- Develop a report to document all ideas to share with Stakeholders
- As funding becomes available, ideas may then move forward within the CSS process

Taking care to get you there

I-70 Mountain Corridor CSS
Partnerships Powered by Context

Thank You

I-70 Maintenance and Operations Assessment Workshop: Silverthorne to Morrison

Bryan Allery

May 24, 2011

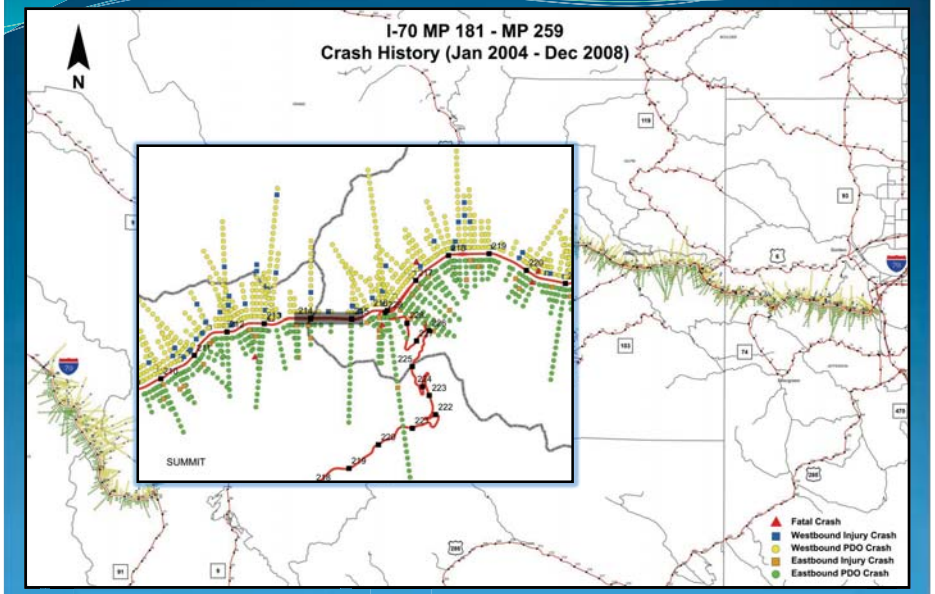
I-70 Mountain Corridor CSS
Partnerships Powered by Context

I-70 Maintenance and Operations Assessment Workshop

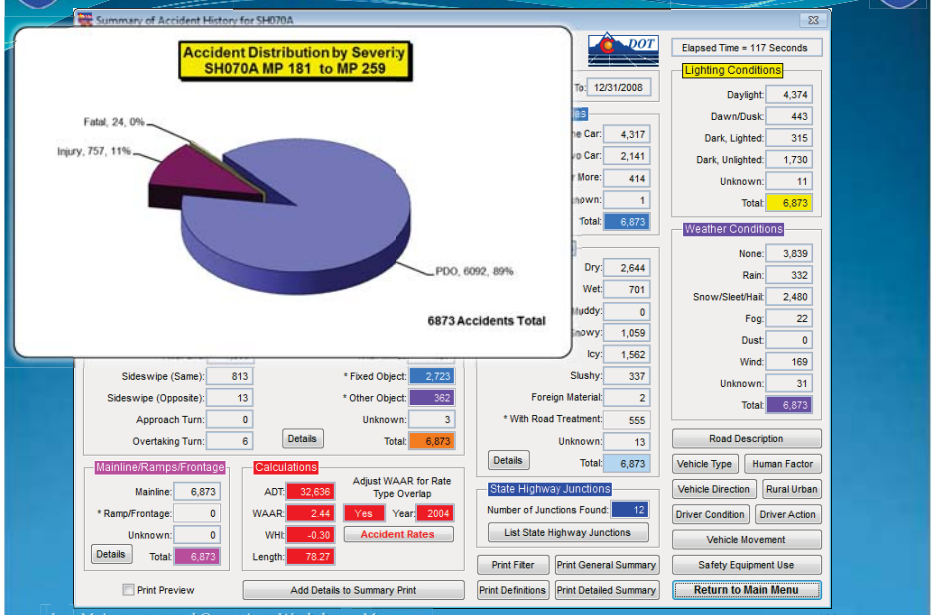
Silverthorne to Morrison
MP 205 to MP 259

I-70 Crash Data Trends

I-70 Crash Data Trends



I-70 Crash Data Trends



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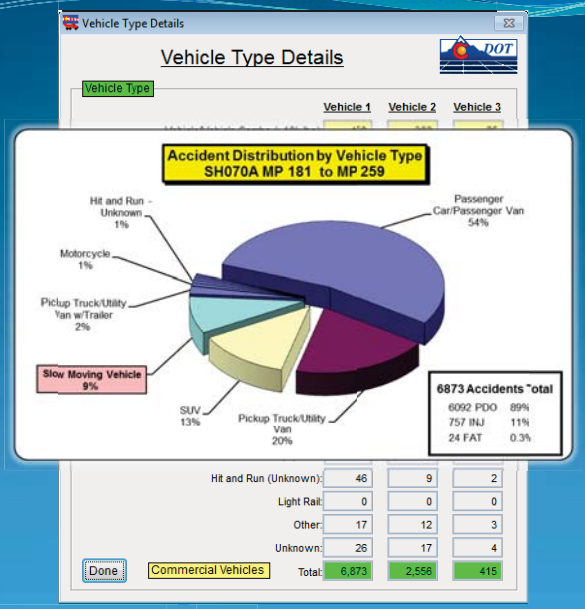

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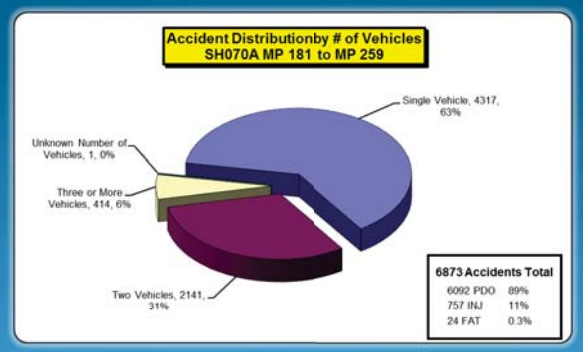

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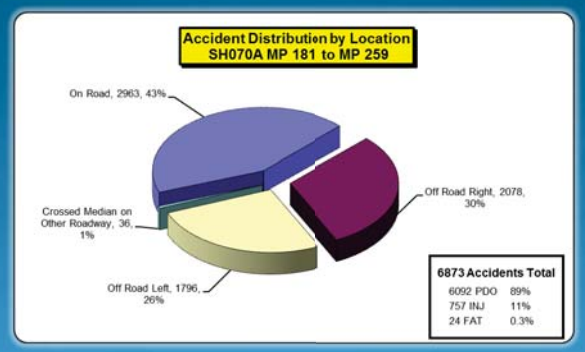

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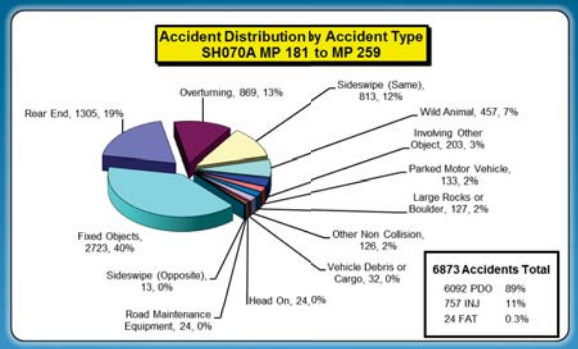

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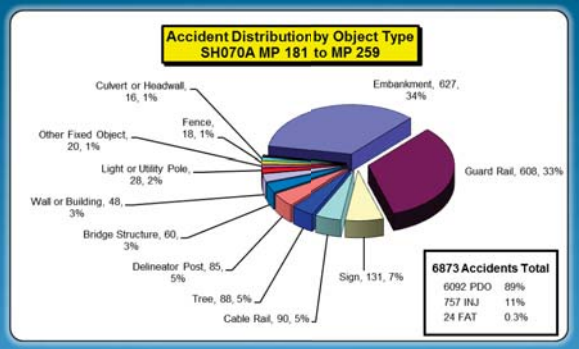

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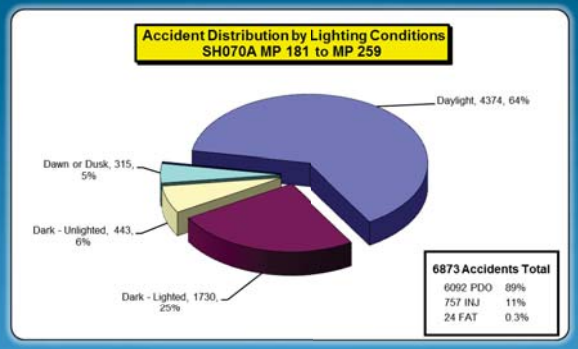

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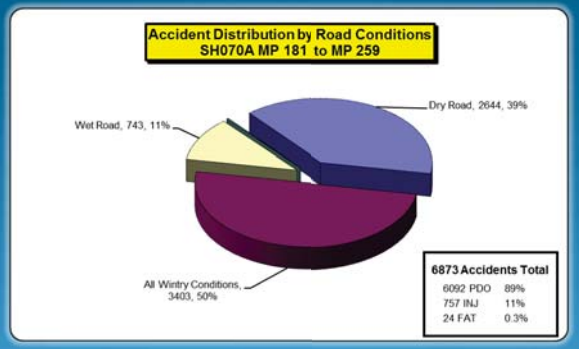

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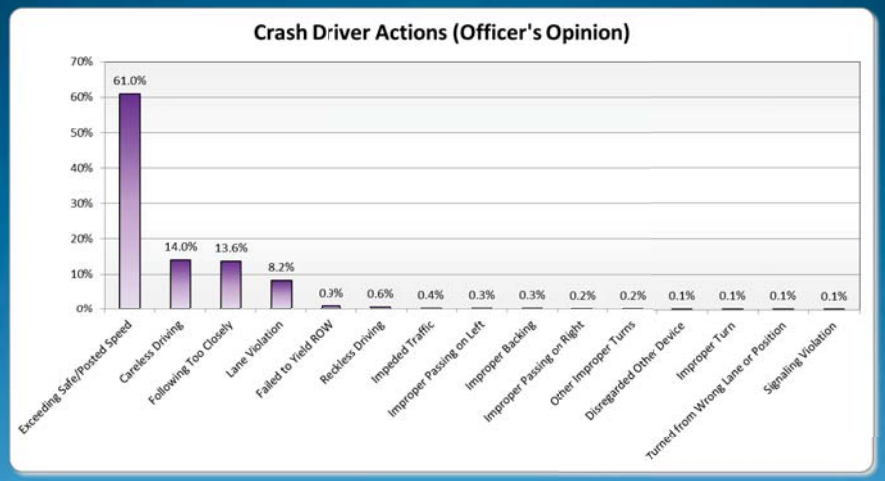


I-70 Crash Data Trends

Safety Performance Functions (SPF)

The SPF reflects the complex relationship between traffic exposure measured in Average Annual Daily Traffic (AADT), and accident count for a unit of road section measured in Accidents Per Mile Per Year (APMPY).

The SPF models provide an estimate of the normal or expected accident frequency for a range of AADT among similar facilities. The SPF allows us to assess the magnitude of the safety problem from a frequency standpoint.

I-70 Crash Data Trends

Develop Safety Performance Segments

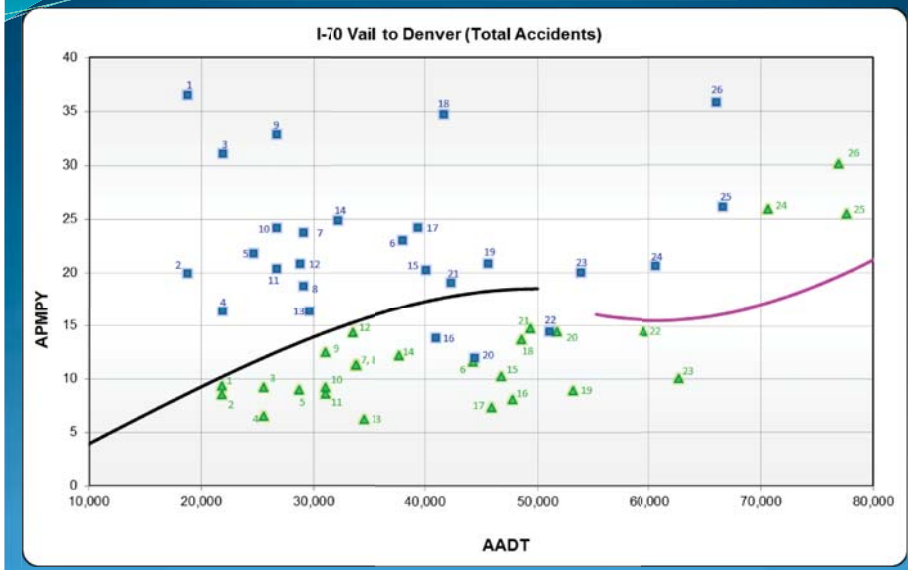
Roadway is Divided up into Segments from Interchange to Interchange

I-70 Crash Data Trends

Segment	Highway	From	To	Location
1	70A	179.87	190.09	Vail East Interchange to Vail Pass Interchange
2	70A	190.10	195.25	Vail Pass Interchange to Copper Mountain Interchange - Jct Sh 91A
3	70A	195.26	198.00	Copper Mountain Interchange to Officers Gulch Interchange
4	70A	198.01	200.99	Officers Gulch Interchange to Frisco/Main Street Interchange
5	70A	201.00	202.34	Frisco/Main Street Interchange to Frisco/Breckenridge Interchange
6	70A	202.35	205.41	Frisco/Breckenridge Interchange to Dillon Silverthorne Interchange
7	70A	205.42	213.64	Dillon Silverthorne Interchange to Eisenhower Johnson Tunnels West Portal
8	70A	213.65	216.18	Eisenhower Johnson Tunnels West Portal to Loveland Pass Interchange Sh 6
9	70A	216.19	218.34	Loveland Pass Interchange Sh 6 to Herman Gulch Interchange
10	70A	218.35	221.29	Herman Gulch Interchange to Bakerville Interchange
11	70A	221.30	225.71	Bakerville Interchange to Silver Plume Interchange
12	70A	225.72	227.90	Silver Plume Interchange to Georgetown Interchange
13	70A	227.91	231.88	Georgetown Interchange to Empire Junction Sh 40A Interchange
14	70A	231.89	234.20	Empire Junction Sh 40A Interchange to Downieville Dumont Interchange
15	70A	234.21	238.88	Downieville Dumont Interchange to Idaho Springs West Interchange
16	70A	238.89	239.64	Idaho Springs West Interchange to Mount Evans Interchange
17	70A	239.65	241.12	Mount Evans Interchange to Idaho Springs Interchange
18	70A	241.13	244.25	Idaho Springs Interchange to Central City Golden Interchange
19	70A	244.26	246.59	Central City Golden Interchange to Floyd Hill Hyland Hills Interchange
20	70A	246.60	247.59	Floyd Hill Hyland Hills Interchange to Beaver Brook Interchange
21	70A	247.60	251.31	Beaver Brook Interchange to Evergreen Pkwy Sh 74 Interchange
22	70A	251.32	252.23	Evergreen Pkwy Sh 74 Interchange to Chief Hosa Interchange
23	70A	252.24	253.52	Chief Hosa Interchange to Us 40 Genesee Park Interchange
24	70A	253.53	255.96	Us 40 Genesee Park Interchange to Lookout Mtn Interchange
25	70A	255.97	258.71	Lookout Mtn Interchange to Us 40 Golden Morrison Interchange
26	70A	258.72	259.75	Us 40 Golden Morrison Interchange to C-470 Interchange

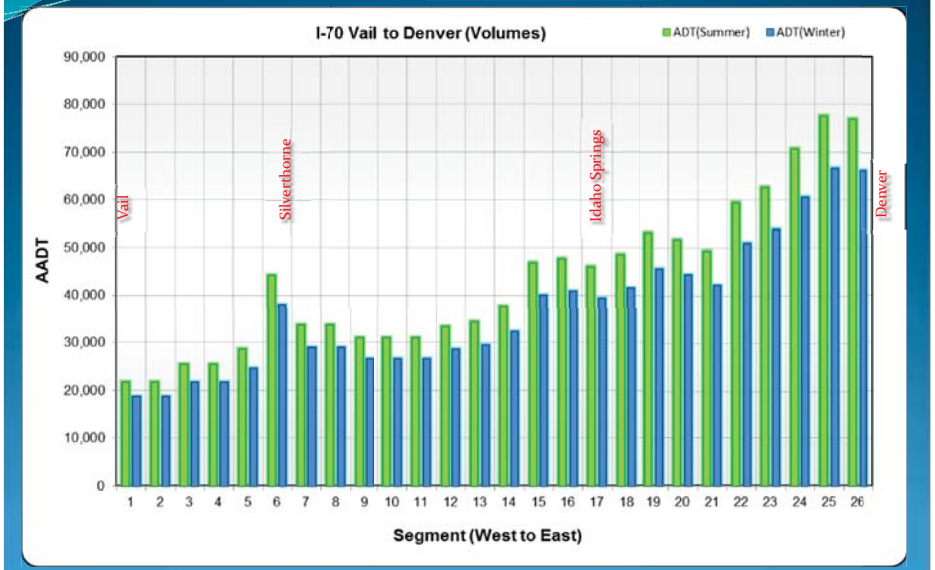
I-70 Crash Data Trends

Safety Performance Function – Winter vrs Summer



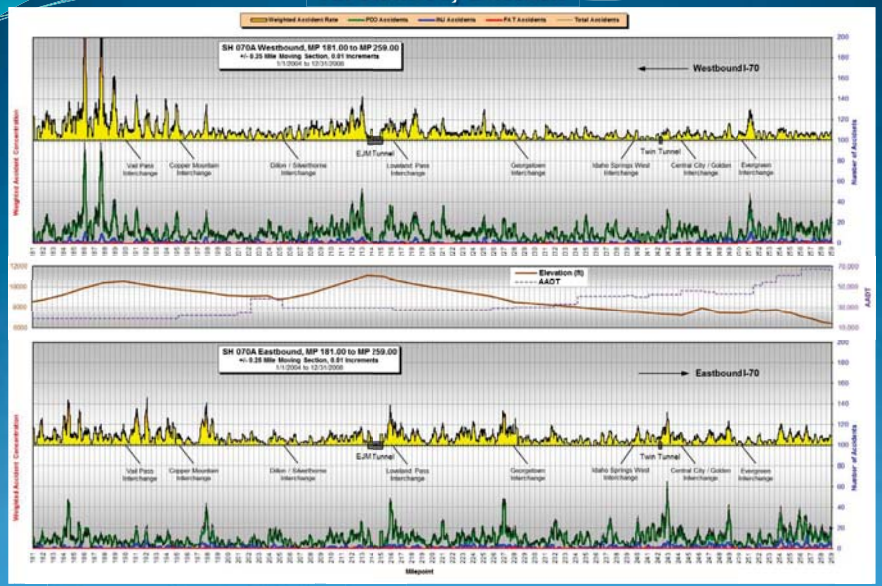
I-70 Crash Data Trends

Summer vrs Winter Traffic Volumes



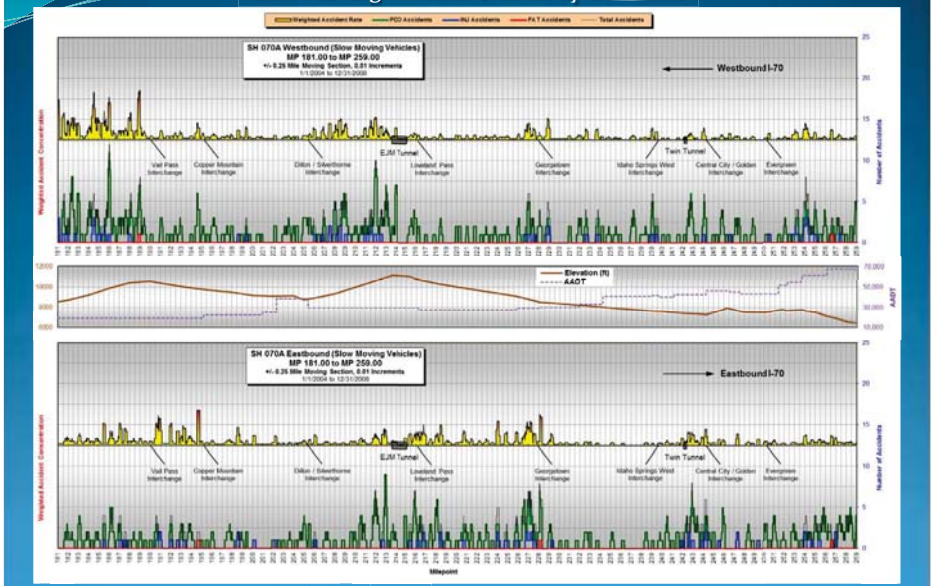
I-70 Crash Data Trends

All Crashes by Direction



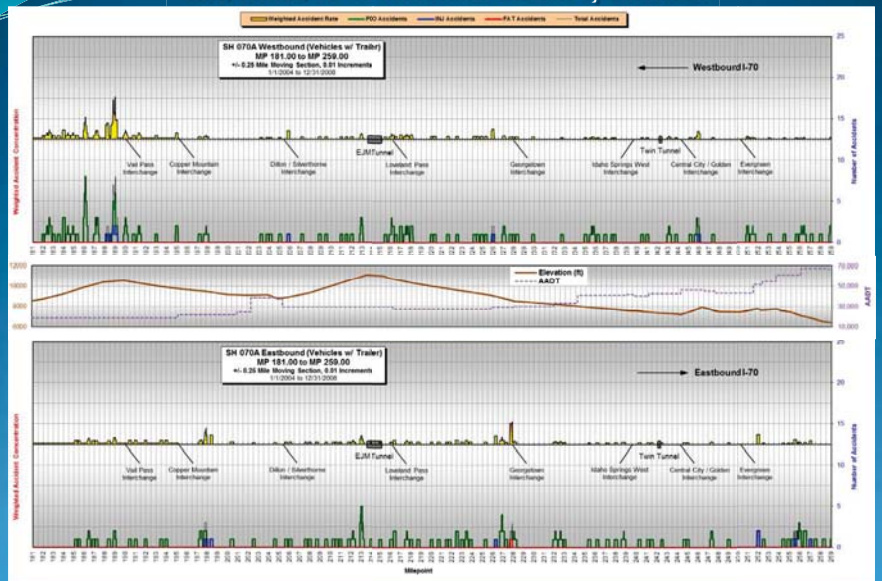
I-70 Crash Data Trends

Slow Moving Vehicles Crashes by Direction



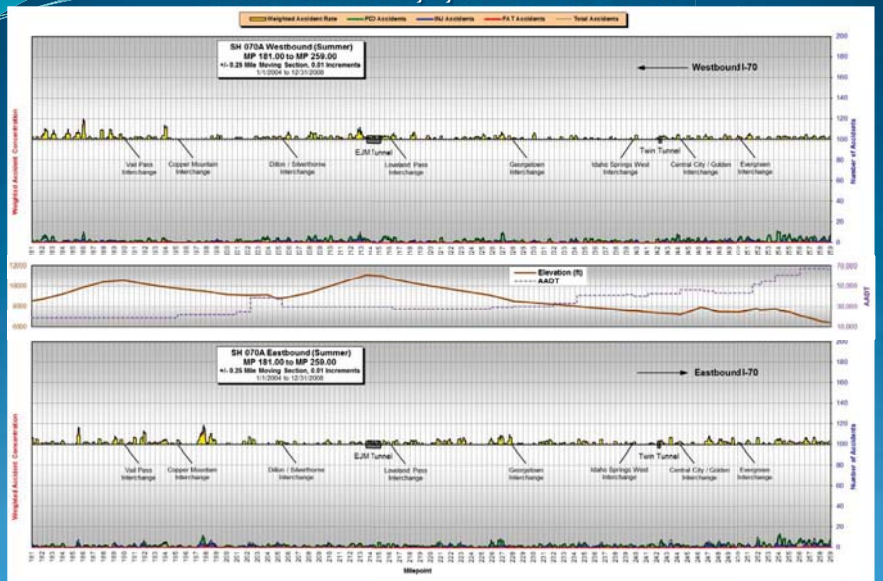
I-70 Crash Data Trends

Cars/Trucks/SUV's with Trailer Crashes by Direction



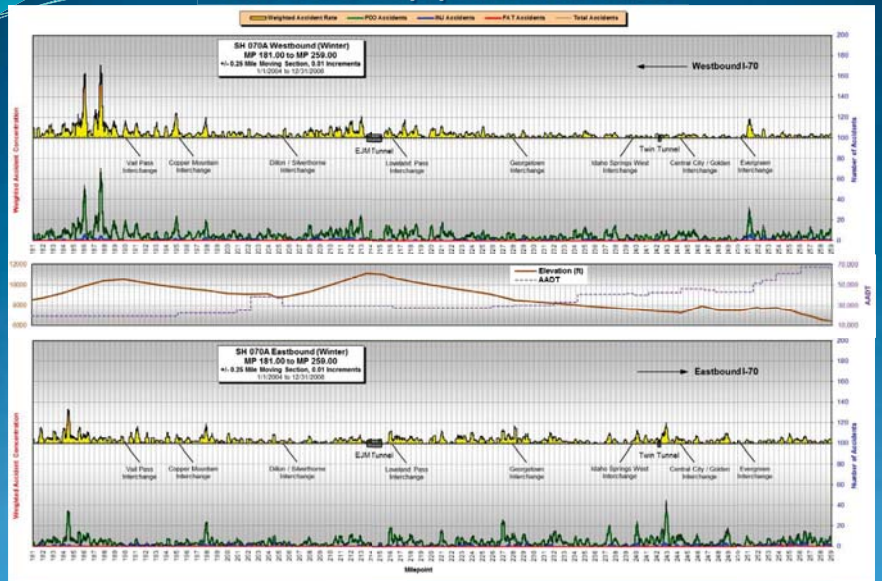
I-70 Crash Data Trends

Summer Crashes Only by Direction All Vehicles



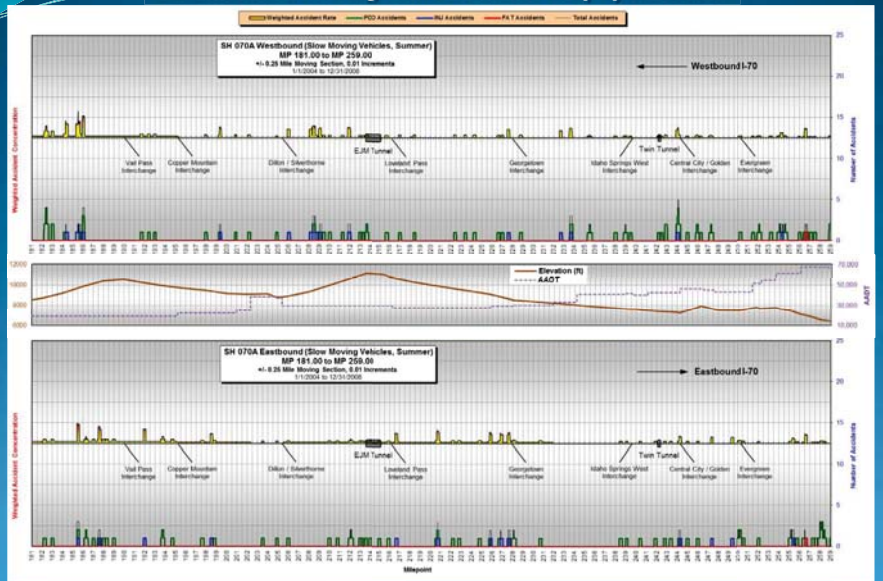
I-70 Crash Data Trends

Winter Crashes Only by Direction All Vehicles



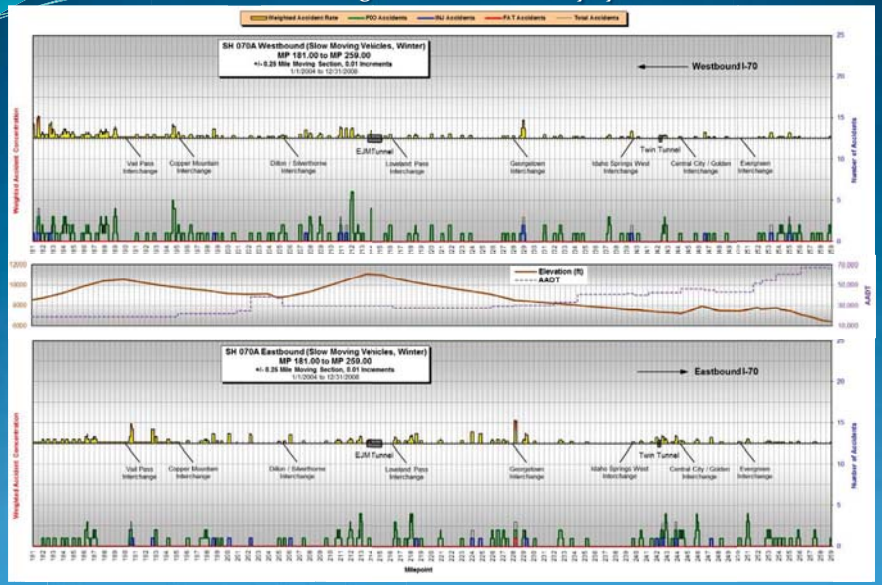
I-70 Crash Data Trends

Summer Slow Moving Vehicle Crashes Only by Direction



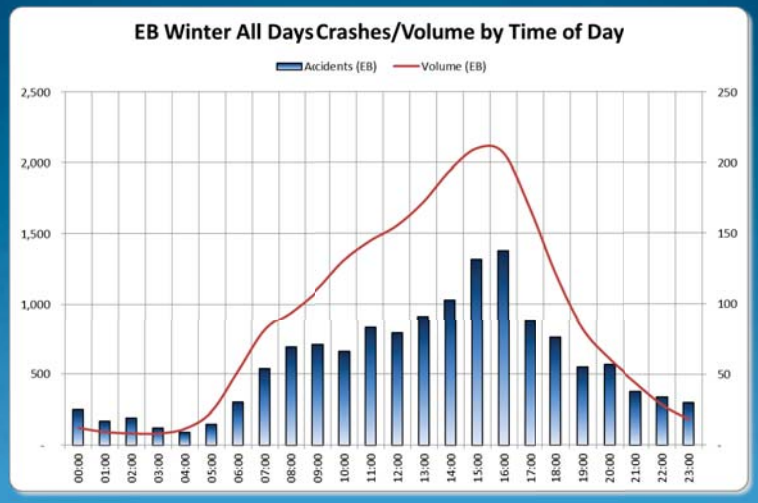
I-70 Crash Data Trends

Winter Slow Moving Vehicle Crashes Only by Direction



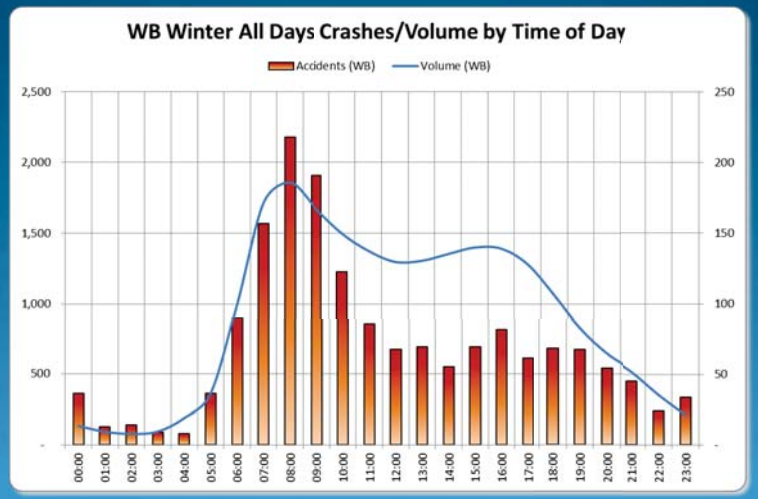
I-70 Crash Data Trends

EB Overall Winter Volumes and Vehicle Crashes by Direction



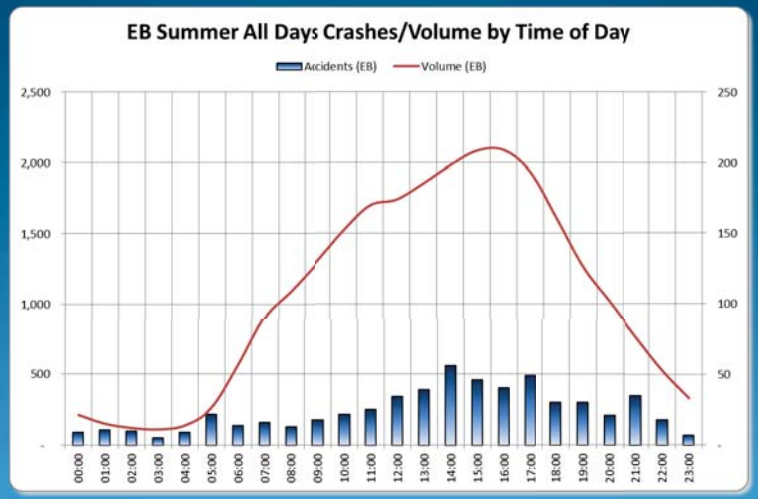
I-70 Crash Data Trends

WB Overall Winter Volumes and Vehicle Crashes by Direction



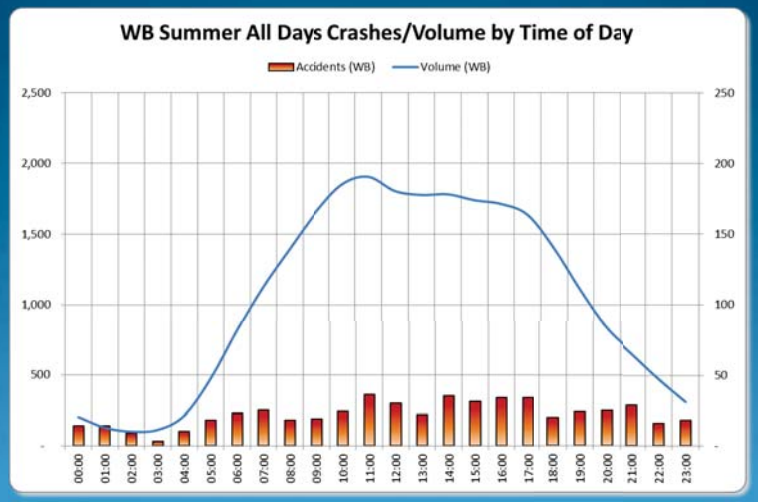
I-70 Crash Data Trends

EB Overall Summer Volumes and Vehicle Crashes by Direction



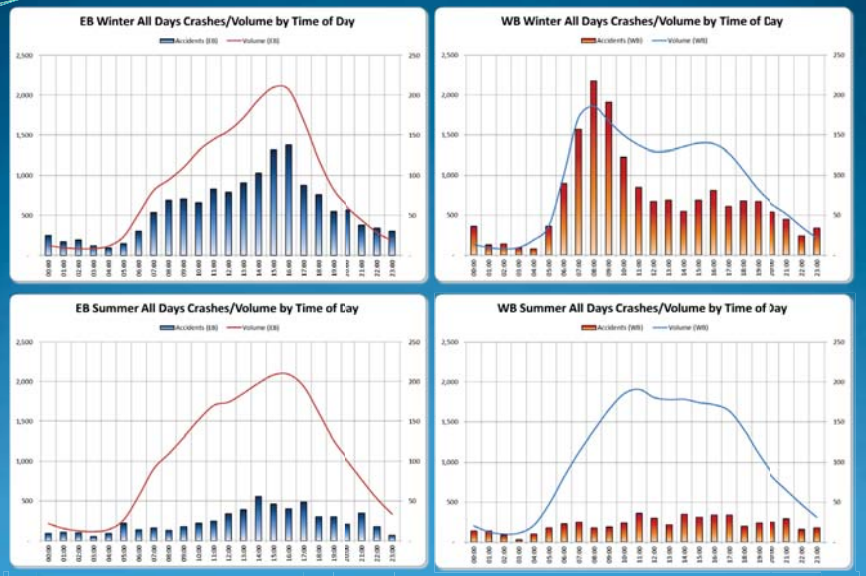
I-70 Crash Data Trends

WB Overall Summer Volumes and Vehicle Crashes by Direction



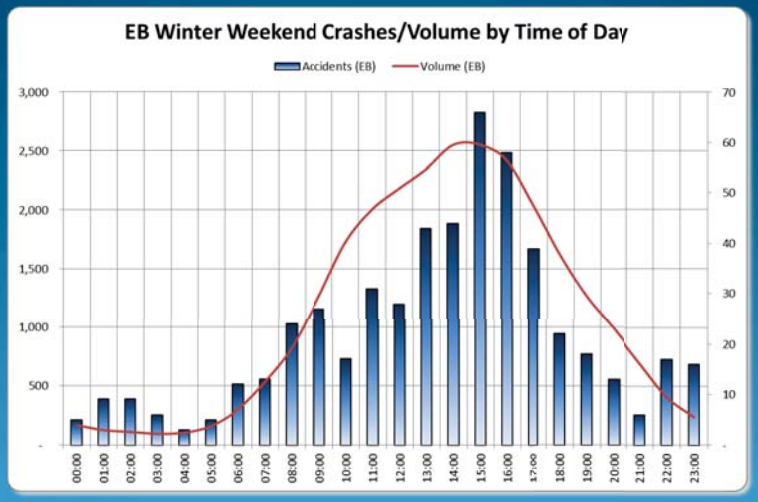
I-70 Crash Data Trends

EB/WB Overall Summer/Winter Volumes and Vehicle Crashes by Direction



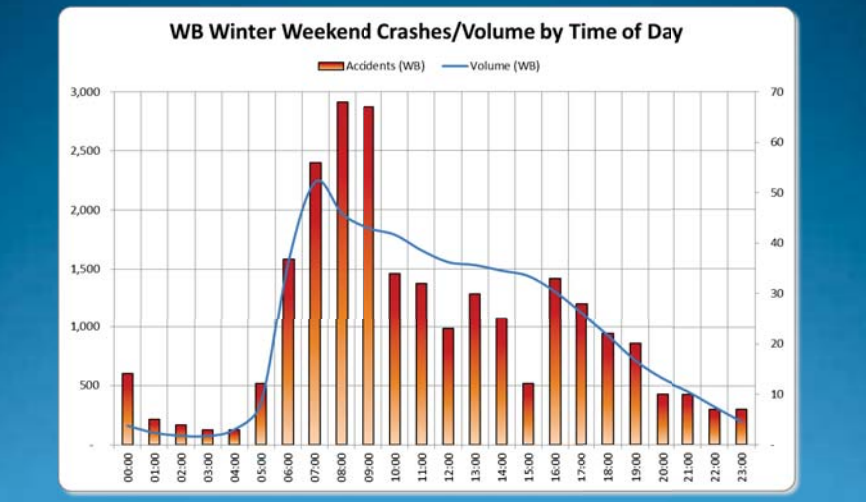
I-70 Crash Data Trends

EB Winter Weekend Volumes and Vehicle Crashes by Direction



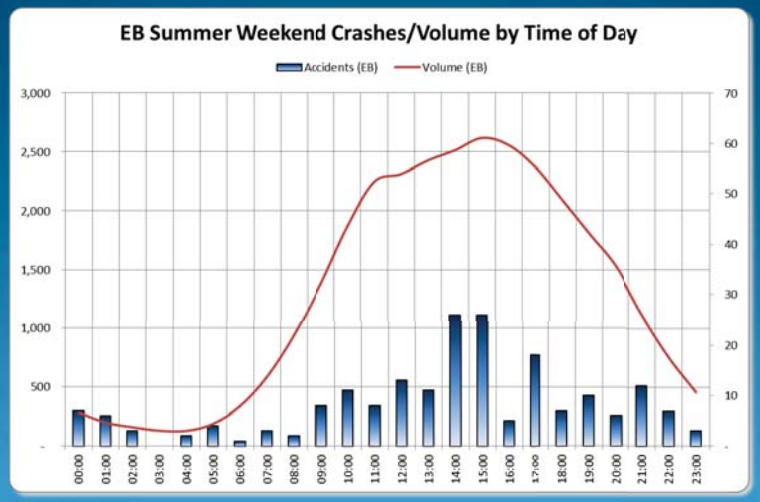
I-70 Crash Data Trends

WB Winter Weekend Volumes and Vehicle Crashes by Direction



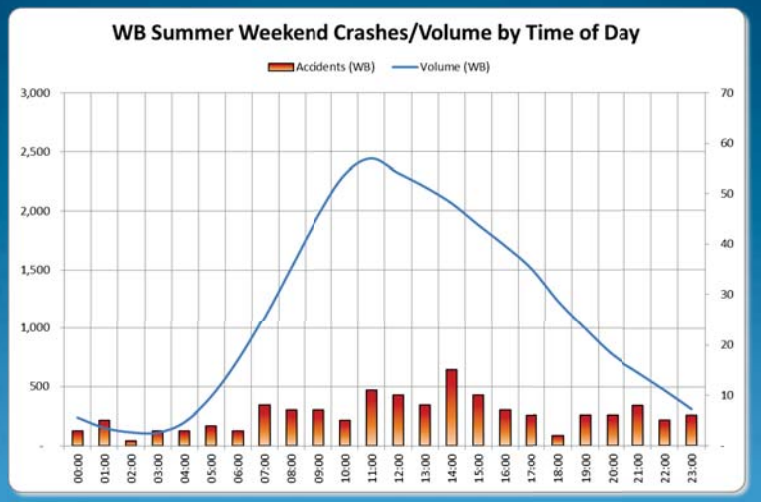
I-70 Crash Data Trends

EB Summer Weekend Volumes and Vehicle Crashes by Direction



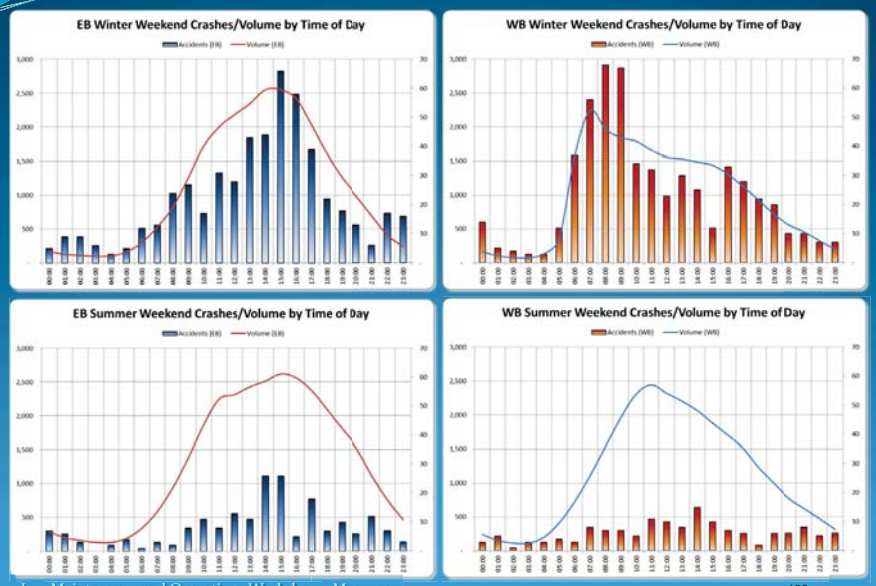
I-70 Crash Data Trends

WB Summer Weekend Volumes and Vehicle Crashes by Direction



I-70 Crash Data Trends

EB/WB Winter/Summer Weekend Volumes and Vehicle Crashes by Direction



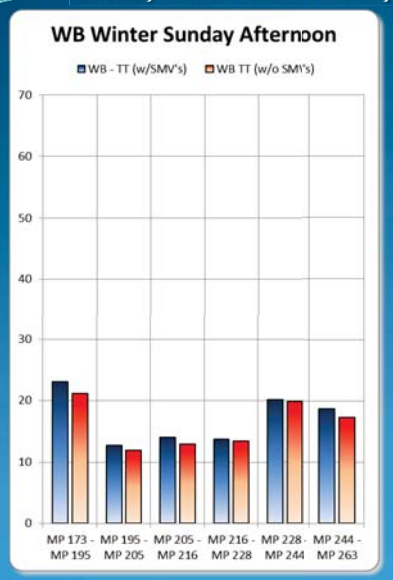
I-70 Crash Data Trends

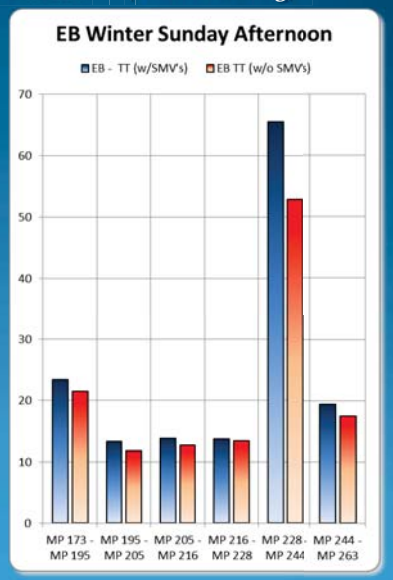
Questions/Comments?

I-70 Travel Times

I-70 Travel Times

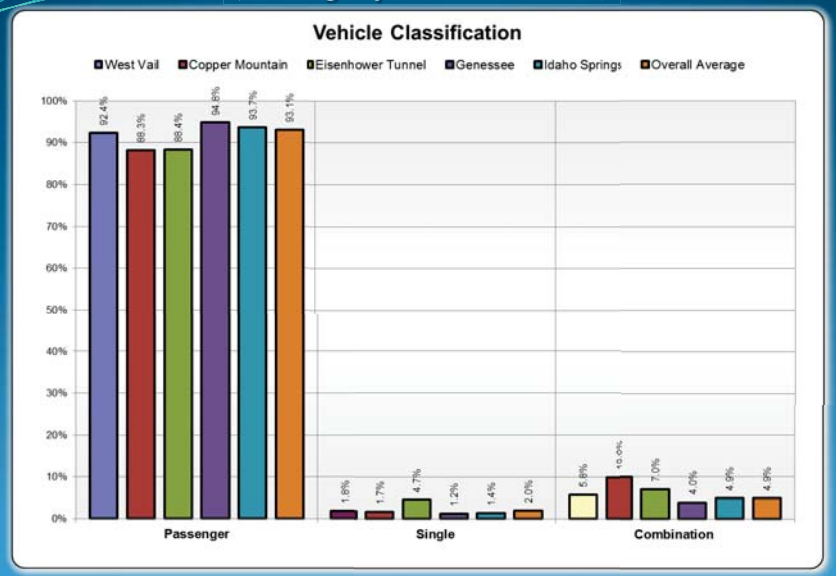
Sunday Winter Travel Times by Direction – (From Modeling)





I-70 Travel Times

Percentages by Vehicle Classification



I-70 Travel Times

Questions/Comments?

I-70 Maintenance and Operations Assessment Workshop

Silverthorne to Morrison

MP 205 to MP 259

BNV Mobility: Avoiding rush hours

Dirk Grevink

May 24, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

BNVmobility

BNV Mobility

Avoiding rush hours

May 2011

BNVmobility

1. BNV MOBILITY
2. AVOIDING RUSH HOURS

A. FOUNDING SHAREHOLDERS

Brisa

- 40 years of experience in highways PPPs and operations
- **+1600 km in operation today**
- Leading expertize in Intelligent Transport Systems

NedMobiel

- 5 years of specialization in Dutch infrastructures
- **Highly regarded Dutch Governments PPP advisor**
- **Expertize in financial operations and maintenance models**

50% - 50%

BNVmobility
Brisa NedMobiel Venture

B. CORPORATE AND GOVERNANCE STRUCTURE

- Dutch (Breda) based company
- Access to staff and references parents
- Board of Directors
  - Dirk Grevink, Chairman and Business Development
  - Pedro Mourisca, CFO and O&M Services
  - Alinda Kooistra, Mobility Services
  - Pedro Baptista, Business Development

B. CORPORATE AND GOVERNANCE STRUCTURE

16 million people

C. SCOPE BNV MOBILITY

Metropolitan Congestion Management

- Road charging
- Avoiding rush hours
- Annaways: Mobility budgets

O&M Services

- Consultancy
- O&M Service provision

SpitsScoren A15

Mobility projects in the Dutch Road Pricing Scheme

ToC

1

1. Mobility Projects in Dutch Road Pricing
2. SpitsScoren: Mobility Project in Rotterdam
3. The SpitsScoren concept
4. The recruitment and retention of participants
5. Learning experiences

Road Pricing in The Netherlands

- Road pricing has been the centre of political debate for many years;
- Six successive ministers have proposed road pricing schemes. So far, without much success.
- Never been so close: 'Anders Betalen for Mobiliteit' (='Paying Differently for Mobility') based on stakeholder participation.
- But 2010: end of Road Pricing

ABvM: 'Paying differently'

Congestion problems: the effective measures are not feasible, the feasible ones are not effective

ABvM: budget neutral for all passenger cars. Price per kilometer, differentiated for time, place and environmental features.

Public support is crucial to get road pricing started. This support depends heavily on two questions:

- Is the instrument fair?
- Is the instrument effective?

Mobility Projects: getting started

Mobility projects are introduced in 5 heavily congested areas:

1. To relief congestion;
2. To prove the instrument of pricing is effective and stimulates rush hour avoidance;
3. To make people aware of the alternatives for their daily commute;

BNV Mobility Projects: 2 projects

- BNV Mobility is managing two Projects in The Netherlands
  - In Rotterdam, *SpitsScoren* project
    - From October 2009 to July 2012
    - So far, the most successful mobility project in The Netherlands
  - In Utrecht, *Spitsvrij* project (just awarded)
    - From July 2011 to March 2013
- Projects managed by a Consortium, in which BNV is the operational partner

ToC

2

1. Mobility Projects in Dutch Road Pricing
2. SpitsScoren: Mobility Project in Rotterdam
3. The SpitsScoren concept
4. The recruitment and retention of participants
5. Learning experiences

OUR BRAND:

SPITSSCOREN 30 60 90 120

OUR PARTNERS:

ABN·AMRO

Technolution

Goudappel Coffeng
Adviseurs verkeer en vervoer

Outline of the problem

- 530 rush hour rides 6 – 9 am

26 October 2009 – 1 July 2012

- Client:
  - "De Verkeersonderneming"
  - Collaborating public bodies (local, regional, national + Port of Rotterdam)
- Anchoring:
  - Road pricing
  - Task force mobility management
  - Regional agreement to reduce 5% traffic during rush hours
- Budget: 10M Euro
  - At risk

ToC

3

1. Mobility Projects in Dutch Road Pricing
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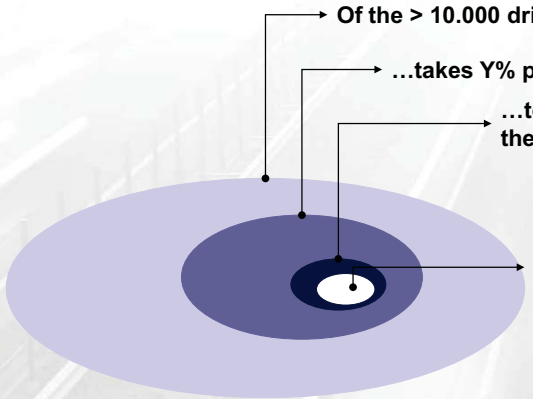
The question



Of the > 10.000 drivers

…takes Y% part in SpitsScoren

…to avoid the rush hour in Z% of the cases

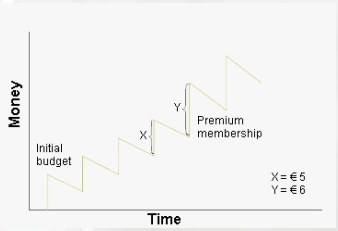
…in which a minimum of 530 participants is necessary to make the effect on the traffic noticeable.

Recruitment participants

1. **During 8 weeks pictures of license plates are taken (ANPR). Bases on best 4 week during this period a weekly reference is defined**
2. **Licenses plates seen > 3 days/ week: request for name and address owner national data base**
3. **Sending invitation to participate by offering 4 weeks budget based on weekly reference.**
4. **Budget defined on € 5,- multiple weekly reference multiple 4 weeks (so maximum of € 100,- / 4 weeks)**

The SpitsScoren Rewarding Structure

Statement: To reward the driver for avoiding the rush hour, he or she will get € 5,-



How it works

1. Participant receives a smartphone with GPS and SpitsScoren app
2. The participant has to prove that he/she avoids driving during rush hours.
3. To do so he/she daily has to give its intention if he/she will avoid rush hours by using an app which is linked to our back office (see example next slide)
4. During rush hours the smartphone has to be switch on so we can trace the GPS track.
5. ANPR controls if participant is really not driving on A15.
6. In case participant can not prove that he/she did avoid driving during rush hours the budget is reduced with € 5 ,-

Intention and control Spitsmijden

The OBU: T-Mobile G2 Touch

The Smartphone functions as the medium for services

Supervision Spitsmijdingen

Traffic Information

SpitsScoren 'community'

SpitsScoren G2 applicatie

Value Added Services

alternatives to travelling

How can participants avoid the rush hour?

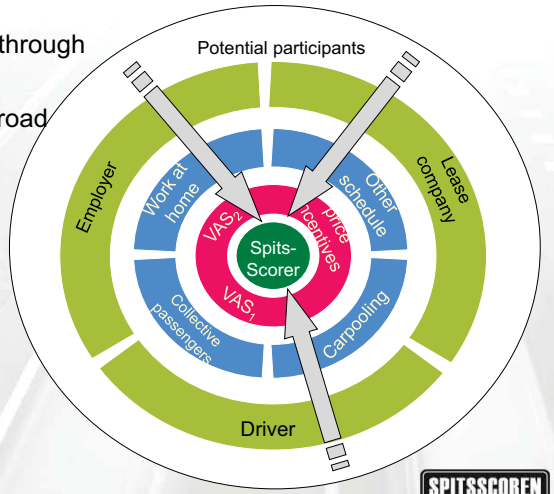
- Telework and travel to the office later;
- Car-share with a colleague;
- Car-share via “Pooll”, digital search system (social network);
- Working in the Dialogue Port;
- Alternative vehicles: bicycle or motorcycle;
- Public Transport:
  - (Train);
  - (Metro);
  - Bus.

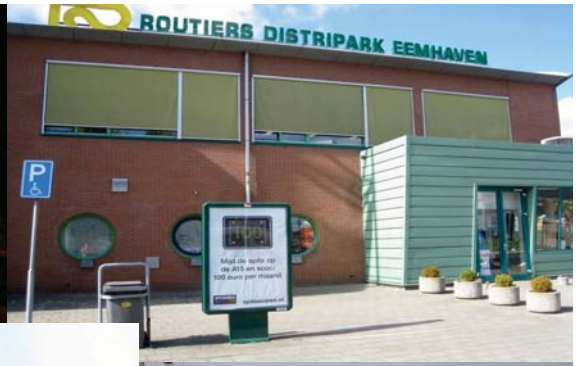
ToC

4

Principle of participant recruitment

Participants are recruited through their employer, their lease company and through a broad commercial marketing campaign, aimed at local commuters.





“SpitsScoren starts here!”

SpitsScoren ‘community’

ToC

5

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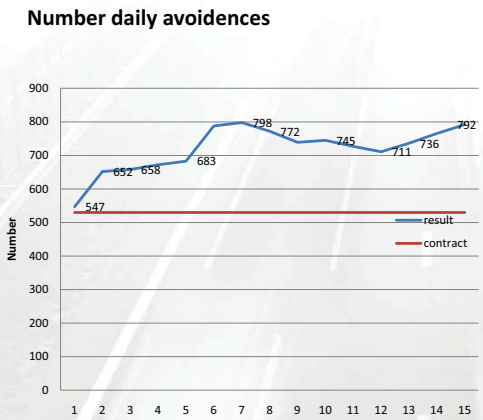
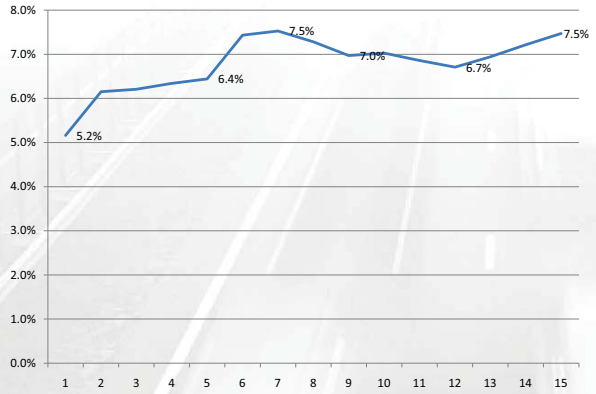
Participants

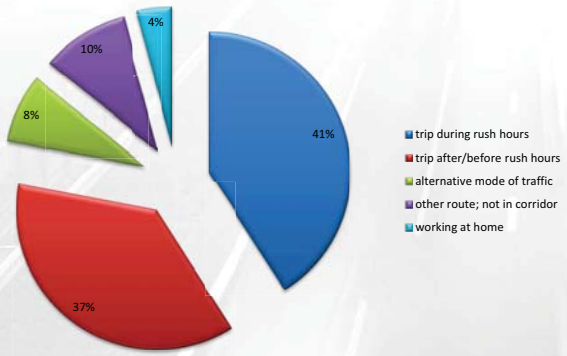
Result: # Spitsmijdingen



Reduction of traffic



Daily pattern



Learning experiences so far:

- People are willing to alter their travel behaviour when there is an incentive
- People have more alternatives than appears on first notice;
- Behavioural change is not a gradual, but rather a ‘step-by-step’ phenomenon. By this, I mean that people only reconsider their daily routine when it’s triggered by some external factor. Projects can be succesful when they aim at this ‘trigger’, not the long term factor.

"SpitsScoren ends here!"

SpitsScoren is a service of:

BNV Mobility
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Shoulder Lanes

Craig Siracusa

May 24, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

SHOULDER LANES

Presented by:
Craig Siracusa

SHOULDER LANES

PRESENTATION OUTLINE

1. Presenters Background
2. What Are Shoulder Lanes?
3. Experience Elsewhere
4. Issues and Opportunities

SHOULDER LANES

Presenters Background

- Transportation Experience
- NYSDOT Commissioner White's Challenge
- Long Island Expressway Shoulder Lane
- CDOT

SHOULDER LANES

WHAT ARE SHOULDER LANES?

- Use of shoulders as travel lanes
- Hours of Operation – fixed or dynamic
- Use Restrictions – autos, buses, trucks
- Operational Requirements
- Trade-offs

SHOULDER LANES

SHOULDER LANES

EXPERIENCE ELSEWHERE

- Massachusetts
- Virginia
- Minnesota
- New York

SHOULDER LANES

Massachusetts

- Hyundai of Shoulder Lanes
- Fixed Hours – 5 hrs in AM, 4 hrs in PM
- I-93, I-95, SR 3
- Limited upgrades to shoulders
- Ground Mounted Signing
- No trucks
- Ramps scary

SHOULDER LANES

Massachusetts

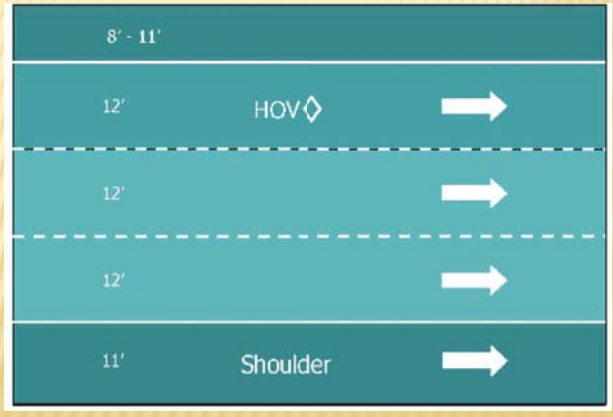
SHOULDER LANES

Virginia

- Cadillac of Shoulder Lanes
- I-66 – 6.5 mi. dual HOV/Shoulder Lane
- Fixed Hours – 5.5 hr. in AM, 6 hr. in PM
- 11 ft. wide upgraded shoulder
- No trucks
- Overhead signing

SHOULDER LANES

Virginia



SHOULDER LANES

Virginia

SHOULDER LANES

Minnesota – Buses on Shoulder (BOS)

- 290 mi. of Freeways & Arterials
- Bus speed limited to 15 mph above
- Buses yield to entering/exiting vehicles
- Buses merge into ML when shldr is obstructed

SHOULDER LANES

- Minnesota

SHOULDER LANES

New York

- I-495 Long Island Expw – eastbound 5 mi.
- Shoulder Upgraded and widened
- Fixed hours – 4-7 pm
- No Trucks, buses or trailers
- Entrance/Exit Ramp modifications
- Ground mounted signing
- Taken out of service when HOV Lanes added

SHOULDER LANES

New York

SHOULDER LANES

Issues and Opportunities

- Conflicts at ramps
- Disabled vehicles – loss of shoulder
- Speed differential
- Debris on shoulder
- Shoulder pavement structure
- Shoulder width/cross slope
- Fixed Hours – Dynamic Hours

SHOULDER LANES

Issues and Opportunities Continued

- Emergency Response
- Bridge Clearances
- Signing – overhead?
- Vehicle Restrictions?
- Where to Begin/End
- Accident Profile – before/after implementation
- Environmental Considerations –
  - Air Quality
  - Noise
  - Roadside Disturbance

SHOULDER LANES

Information Sources

- FHWA-HOP-10-023 Efficient Use of Highway Capacity, May 2010 TTI for FHWA

Contact Info – email

craigsiracusa@gmail.com

SHOULDER LANES

QUESTIONS?

BNV Mobility: Mobility projects in the Dutch Road Pricing Scheme

Dirk Grevnik

May 24, 2011

COLORADO DOT DEPARTMENT OF TRANSPORTATION

I-70 Mountain Corridor CSS
Partnerships Powered by Context

SpitsScoren A15

Mobility projects in the Dutch Road Pricing Scheme

BNVmobility

0 INTRODUCTION

BNV: Founding Shareholders

Brisa

- 40 years of experience in highways PPPs and operations
- **+1600 km in operation today**
- Leading expertize in Intelligent Transport Systems

NedMobiel

- 5 years of specialization in Dutch infrastructures
- **Highly regarded Dutch Governments PPP advisor**
- **Expertize in financial operations and maintenance models**

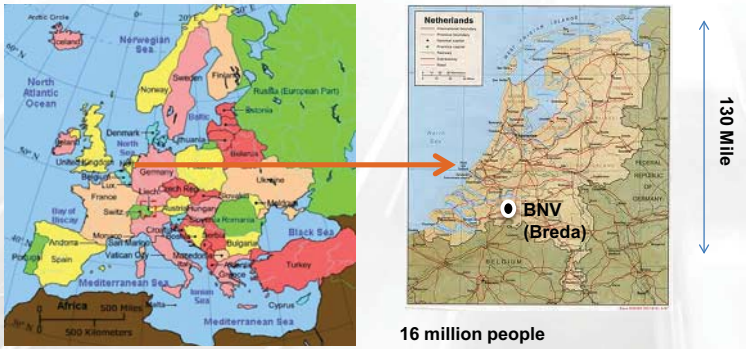
50% - 50%

BNVmobility
Brisa NedMobiel Venture

Corporate structure

- Dutch (Breda) based company
- Access to staff and references parents
- Board of Directors
  - Dirk Grevink, Chairman and Business Development
  - Pedro Mourisca, CFO and O&M Services
  - Alinda Kooistra, Mobility Services
  - Pedro Baptista, Business Development

BNV Mobility: office



16 million people

Scope

Metropolitan Congestion Management

- Road charging
- Avoiding rush hours
- Annaways: Mobility budgets

O&M Services

- Consultancy
- O&M Service provision

AVOIDING RUSH HOURS

1

1. Mobility Projects in Dutch Road Pricing
2. SpitsScoren: Mobility Project in Rotterdam
3. The SpitsScoren concept
4. The recruitment and retention of participants
5. Learning experiences

Road Pricing in The Netherlands

- Road pricing has been the centre of political debate for many years;
- Six successive ministers have proposed road pricing schemes. So far, without much success.
- Never been so close: 'Anders Betalen for Mobiliteit' (='Paying Differently for Mobility') based on stakeholder participation.
- But 2010: end of Road Pricing

ABvM: 'Paying differently'

Congestion problems: the effective measures are not feasible, the feasible ones are not effective

ABvM: budget neutral for all passenger cars. Price per kilometer, differentiated for time, place and environmental features.

Public support is crucial to get road pricing started. This support depends heavily on two questions:

- Is the instrument fair?
- Is the instrument effective?

Mobility Projects: getting started

Mobility projects are introduced in 5 heavily congested areas:

1. To relief congestion;
2. To prove the instrument of pricing is effective and stimulates rush hour avoidance;
3. To make people aware of the alternatives for their daily commute;

BNV Mobility Projects: 2 projects

- BNV Mobility is managing two Projects in The Netherlands
  - In Rotterdam, *SpitsScoren* project
    - From October 2009 to July 2012
    - So far, the most successful mobility project in The Netherlands
  - In Utrecht, *Spitsvrij* project (just awarded)
    - From July 2011 to March 2013
- Projects managed by a Consortium, in which BNV is the operational partner

2 AVOIDING RUSH HOURS

1. Mobility Projects in Dutch Road Pricing
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OUR BRAND:

OUR PARTNERS:

Outline of the problem

- 530 rush hour rides 6 – 9 am

26 October 2009 – 1 July 2012

- Client:
  - "De Verkeersonderneming"
  - Collaborating public bodies (local, regional, national + Port of Rotterdam)
- Anchoring:
  - Road pricing
  - Task force mobility management
  - Regional agreement to reduce 5% traffic during rush hours
- Budget: 10M Euro
  - At risk

AVOIDING RUSH HOURS

3

1. Mobility Projects in Dutch Road Pricing
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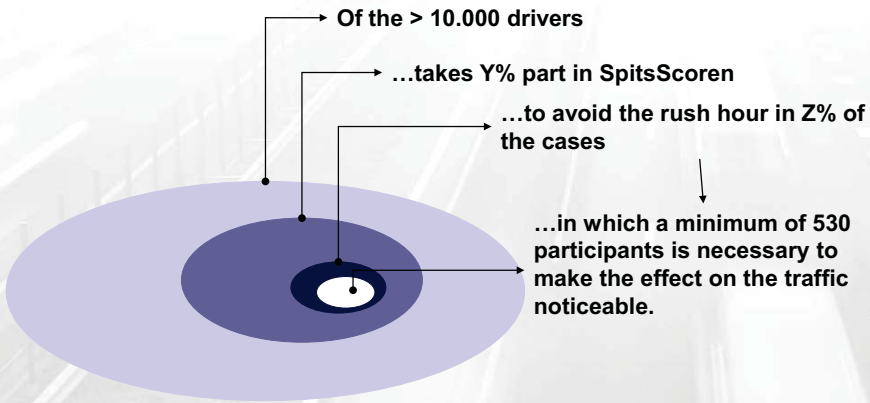
The question

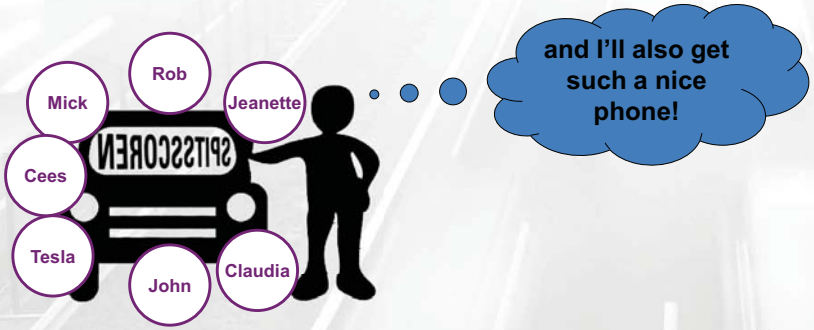


Recruitment participants

1. During 8 weeks pictures of license plates are taken (ANPR). Bases on best 4 week during this period a weekly reference is defined
2. Licenses plates seen > 3 days/ week: request for name and address owner national data base
3. Sending invitation to participate by offering 4 weeks budget based on weekly reference.
4. Budget defined on € 5,- multiple weekly reference multiple 4 weeks (so maximum of € 100,- / 4 weeks)

The SpitsScoren Rewarding Structure

Statement: To reward the driver for avoiding the rush hour, he or she will get € 5,-



How it works

1. Participant receives a smartphone with GPS and SpitsScoren app
2. The participant has to prove that he/she avoids driving during rush hours.
3. To do so he/she daily has to give its intention if he/she will avoid rush hours by using an app which is linked to our back office (see example next slide)
4. During rush hours the smartphone has to be switch on so we can trace the GPS track.
5. ANPR controls if participant is really not driving on A15.
6. In case participant can not prove that he/she did avoid driving during rush hours the budget is reduced with € 5 ,-

Intention and control Spitsmijden

The OBU: T-Mobile G2 Touch

The Smartphone functions as the medium for services

Supervision Spitsmijdingen

Traffic Information

SpitsScoren 'community'

SpitsScoren G2 applicatie

Value Added Services

alternatives to travelling

How can participants avoid the rush hour?

- Telework and travel to the office later;
- Car-share with a colleague;
- Car-share via “Pool”, digital search system (social network);
- Working in the Dialogue Port;
- Alternative vehicles: bicycle or motorcycle;
- Public Transport:
  - (Train);
  - (Metro);
  - Bus.

AVOIDING RUSH HOURS

4

1. Mobility Projects in Dutch Road Pricing
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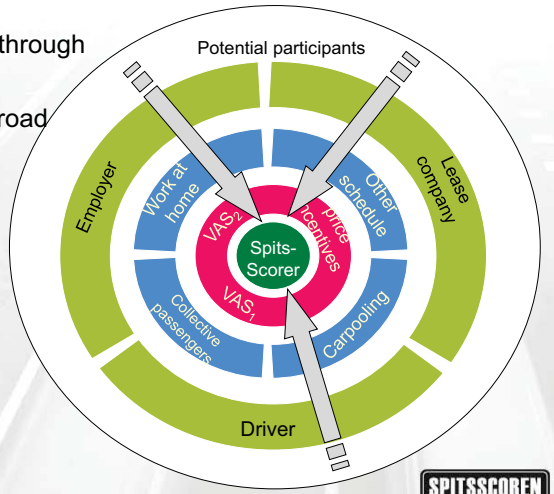
Principle of participant recruitment

Participants are recruited through their employer, their lease company and through a broad commercial marketing campaign, aimed at local commuters.



"SpitsScoren starts here!"

SpitsScoren 'community'

5 AVOIDING RUSH HOURS

1. Mobility Projects in Dutch Road Pricing
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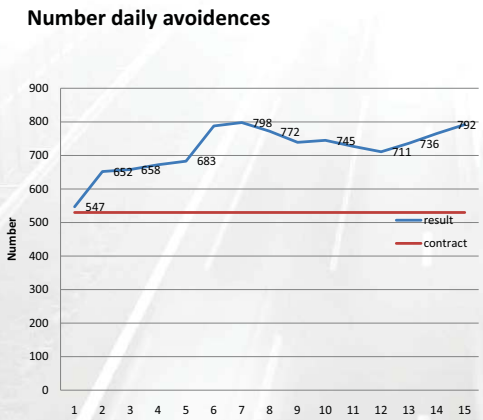
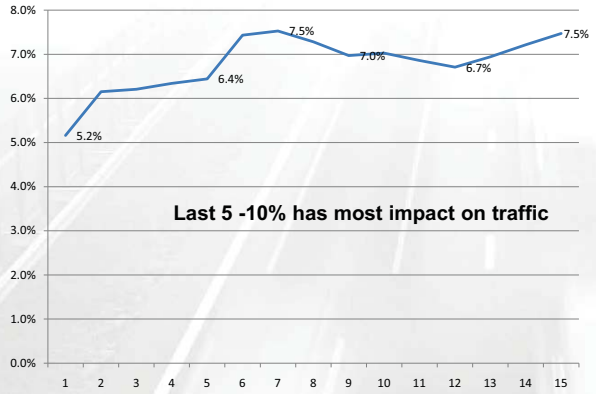
BNVmobility

Participants

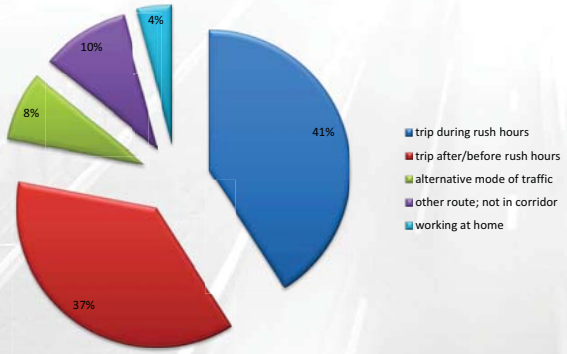
Result: # Spitsmijdingen



Reduction of traffic



Daily pattern



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The Netherlands

Dirk Grevink
d.grevink@bnvmobility.com
+ 31 6 5317 5578

Dirk Grevink (47)

- Civil Engineer and Urban Designer. Graduated in 1987
- 12 year career as a public officer at the local, regional and national level
- 6 years working as a Project Leader, Manager of Operations (start up phase) and Deputy Managing Director resp. for business development) of Westerscheldetunnel, a 6,6km tunnel in the Province of Zeeland
- Co-founder of NedMobiel in 2006
- CEO of NedMobiel (2006 -)
- Co-founder of Movenience in 2007
- Co-founder of BNV Mobility in 2010
- Chairman Board of Directors of BNV Mobility, very much focused on business development
- Dirk lives in Eindhoven (Netherlands)
- Married and 2 sons

APPENDIX C – IDEA MATRICES

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
1A - Traction, Automobiles									
1	Increase driver education for snow and mountain conditions PR campaign (DVD , brochure or news media campaign targeting all drivers of all ages including trucks and other slow moving vehicles of the potential challenges they may face navigating I70 west.	Increase driver education for snow and mountain conditions.	Traffic Safety, Reduced Congestion	Time and effort to create and deliver the message and in what format.	Short-term (Immediate)	Low	CDOT PR office , CSP, private partners	Various applications: CMCA currently has a DVD for truckers. This can be updated.	Other PR campaigns on winter driving
2	Develop public information campaign to emphasize to passenger vehicle drivers that fines exist for inadequate tires Education given to drivers before they start their journey to obtain compliant driver behavior. May include media campaigns, leaflets, radio etc.	PR campaign to emphasize to passenger vehicle drivers that there are fines for inadequate tires. Increase these fines.	Compliant driver behavior leading to reduced congestion and safer roads	Time and cost to identify what information is required and where the information should be distributed to reach all customers.	Short-term (Immediate)	Low	CSP, Legislature	UK and other States	Need to link with Traveler information and ATM. This can be a component of Idea 7.
3	Initiate mandatory vehicle inspections for traction Goal to get all drivers to have Proper Traction	Mandatory vehicle inspections - including passenger cars tires - similar to Donner Pass	Reduced accidents caused by cars, reduce delays, increase capacity	Queuing traffic to inspect, cost to public physical location to conduct,	Mid-term legal authority now - to implement 1 year	Low	CSP	Donner Pass Donner Pass is reported to have lower traffic volumes than I-70 in Colorado.	Applies not only to trucks, also to front and rear wheel drive vehicles. Promote purchasing chains (e.g., offer coupons) for folks who can't necessarily afford new tires -- carry chains Need adequate place for chain-up Current law states "adequate snow tires;" in court tread depth would be considered and applied Review/update regulations to provide clearer direction Examples of corridor locations: Straight Creek (Tunnel to Silverthorne), Vail Pass. Tunnel grades, Georgetown hill Consider utilizing fines collected for I-70 fund instead of General Fund.
4	Increase passenger vehicle enforcement options for inadequate snow tires 1) Enforcement occurs when stalled vehicle creates problem and/or needs to be towed and is therefore given a ticket. 2) Better education about adequate vehicle preparation and more experience with driving in winter conditions.	Enforcement of passenger car chain laws/traction devices. (Although front wheel and all-wheel drive is better than rear-wheel drive, adequate tire tread is necessary. Stopping is the same for all drive wheel configurations and depends on adequate tread and driver actions.)	Improved safety and reduced congestion	Cost of adequate, comprehensive education program. Manpower for enforcement	Short-term (Immediate) 1-6 months for coordination of enforcement protocols and education program	Low -- potential exists for self-funding with increased ticket revenue	CDOT, CSP, local law enforcement	CalTrans/Donner Pass? WashDOT/Stevens Pass?	Truck-relate chain up education
5	Expand collaboration with rental car companies over winter driving equipment and education Rental car companies need to better educate customers about winter driving conditions and vehicle options (possible ideas - website info when making reservation and email message to follow-up once reservation is made). Work with companies to make sure vehicles going to mountains are properly equipped (tires, sand, shovel, etc.) .	Idea not carried forward: Is the rental fleet supplying snow tires (Rental cars probably have adequate all season tires because cars are low mileage.)? Chains (probably not available but 4-wheel drive is for a handsome fee)? Will they (This probably won't change until fine for obstruction by inadequate vehicle goes to car owner, not driver)?	Improved safety and reduced congestion	Cost of snow tires would be high (only required for Colorado mountains). Tires need to be changed for summer. Rental companies would successfully lobby against enforcement.	Mid-term	Low	CSP	CalTrans/Donner Pass? WashDOT/Stevens Pass?	Don't necessarily need a separate campaign -- if CDOT mandates, they may have to follow

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
1B - Traction, Trucks									
1	Increase driver education for snow and mountain conditions PR campaign (DVD , brochure or news media campaign targeting all drivers of all ages including trucks and other slow moving vehicles of the potential challenges they may face navigating I70 west.	Driver education for snow and mountain conditions	Traffic Safety, Reduced Congestion	Time and effort to create and deliver the message and in what format.	Short-term (Immediate) Repeats from Above...	Low	CDOT PR office , CMCA	Various application (CMCA DVD)	Other PR campaigns on winter driving
6	Develop proactive education for truckers on chain law and corridor conditions See # 4, #18, Focus on out of state driver	Proactive education for truckers on the chain law levels - Assure that the trucks chain up by level and not at once			Short-term (Immediate)				
2 - Maintaining smooth traffic flow									
1	Increase driver education for snow and mountain conditions PR campaign (DVD , brochure or news media campaign targeting all drivers of all ages including trucks and other slow moving vehicles of the potential challenges they may face navigating I70 west.	Driver education for snow and mountain conditions	Traffic Safety, Reduced Congestion	Time and effort to create and deliver the message and in what format.	Short-term (Immediate) Repeats from Above	Low	CDOT PR office , CMCA	Various applications - Existing CMCA DVD	Other PR campaigns on winter driving
7	Work with CSP to expand "Icy Falcon" pilot car program A marked car is used to escort traffic at a lower, safer and consistent speed eliminating accidents.	CSP to expand "Icy Falcon" pilot cars	Traffic moves at a uniform and safe speed. Delays related to accidents and closures are prevented.	Unpopular with the public. Insufficient resources and calls for service makes this a limited practice.	Mid-term Adding additional troopers would require 18 months. Internal procedural changes would require 6 months.	Med. Significant costs for increasing staffing.	CSP/ CDOT	Recommend a separate funding source for I 70 CSP staffing like gaming does.	Can be effective with speed harmonization
8	Initiate electronic automated speed enforcement The automatic enforcement of speed limits displayed will ensure that drivers comply and would mean that enforcement is not solely reliant on patrol cars.	Electronic (automated) enforcement of speed limits in targeted areas and at targeted times Consider average speed enforcement (#50) *Variable speed limits -- incorporate other notes* (work zones are separate issue)	Compliant driver behavior leading to reduced congestion and safer roads	Cost to implement and may face stakeholder issues against provision of speed cameras	Mid-term Probably covered better by ATM Group...	Med		UK and other States	Need to link with Traveler information and ATM. We cannot consider this resource in lieu of CSP officers Still need people power (e.g., Amber alerts, catching felons with routine traffic stops)
9	Expand methods to distribute current condition information and corridor driving tips to drivers while they are on the corridor Goal: consider measures (i.e. the provision of information) that can be implemented to encourage drivers to comply with the speed limits and other instructions. This may include consideration of the type of messages displayed, lane markings on road, GPS, etc.	Methods to relay tips to drivers while they are on the road	Compliant driver behavior leading to reduced congestion and safer roads	Time to identify how information can lead to compliant driver behavior and where it is required. Cost to implement.	Short-term May Overlay with Traveler Info Group:	Low	CDOT	UK and other States	Need to link with Traveler information and ATM. Ex: fixed signage, mobile apps Apps discussion: Go Delivery (Text Message or Twitter feed); Cotrip.org; Trip Manager. Current CDOT app: Are you buzzed? (for gauging impairment to prevent DUIs). How can apps help truckers? Need to convey what is chain law, how to chain up, where to chain up? Signing campaign may be beneficial. Also need supplemental source for information. Possibly incorporate ITS/signing. Discussed Vail Pass scenario near 178/179 (Midvale) -- obvious concerns and lack of understanding. Signs that do work: Truckers slow down, curves ahead; Bridge freezes before roads; Truckers use low gears

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
10	Lengthen acceleration and deceleration lanes with striping on hard shoulders where possible Evaluate existing Accel/Decel lanes with respect to trucks merging and diverging operations.	Improve accel/decel lanes with restriping (when possible)	By improving the merging/diverging operation by trucks would reduce queuing.	Ramp closure required during construction.	Mid-term 1 year (design and const.)	Low	CDOT, POE	Other CDOT redesign/reconst. Projects	Truck Parking/Chain Law Strategies. Specific locations for feasibility: Dumont, interchange on-ramps in general
11	Close Dumont point of entry (POE) during peak volume periods Westbound Dumont Port is at the base of an upgrade on I-70. Trucks pull out and must build speed on the upgrade affecting traffic. Closure of the Port during peak periods would eliminate this problem.	Closure of Dumont POE during peak periods	Better traffic operations on I-70 as performance in right lane improves	Potential enforcement concerns; potential loss of safety check (e.g., chains); possible operational impact	Short-term (Immediate)	None	CSP and CDOR	Currently done but only when requested by CSP or CDOT	Improved operational performance on I-70. WB Sat AM -- low priority; EB Sun PM -- high priority
3A - Insufficient Resources, Enforcement/Compliance									
12	Post more CSP Officers on the corridor Due to dangerous and harsh working conditions and high home ownership costs, 75% of I 70 troopers and supervisors transfer within two years.	More CSP Officers on the corridor. Incentives to keep the experienced ones	shortened crash investigation times, more effective patrolling strategies, community partnerships, problem solving activities	Difficulty determining an effective incentive. No sustainable funding source exists - state budget deficits, political climate	Mid-term: Need time to research the specifics of the incentive. Implementation by FY 2012/ 2013	High	CSP	Wyoming Highway Patrol Teton County practices.	Relates to all enforcement issues. (example: Wyoming State Patrol, Teton County)
13	Utilize TACT Program for tail gating enforcement Targets the 3 main accident casual factors with enforcement within a CMV context. Involves education through media campaign.	Tail gaiting enforcement - especially at high seeds in the left lane (Look at TACT Program)	Education combined with targeted enforcement results in changes in driving behavior and awareness	Dependent on federal grant funding and budget. Media campaign is manpower and time intensive.	Mid-term: Scheduled: March through August 2012	$920,000 cost and 4,000 citations	CSP/ FMCSA CSU assessing success of program		Federal grant (March 2012 through Summer 2010) I-70 west of Denver and I-25 North Needs support in public info/media/comm outreach Perceived/self-enforcement -- educational component is critical
14	Increase enforcement of unsafe speeds and condition violations In addition to enforcement include maintenance, engineering and education solutions to reduce accidents at high incidence locations.	More enforcement to targeted to unsafe speed for conditions violations and incident response.	Slower, safer speeds in inclement driving conditions reduces accidents thereby increasing traffic volumes	Not sustainable - very costly a time of significant state budget deficits and revenue short falls including Tabor issues	Short-term if funded	High	CSP		75% of accidents are: Running off the Road, Unsafe speed for conditions. Enhance down-grade from Tunnel and enhance Ten Mile Canyon -- improvements are necessary (e.g., a third run-away truck ramp near Tunnel)
15	Allow fines collected on the corridor to be utilized for increased enforcement on the corridor Improve operations by providing increased resources to respond to I-70 incidents. Permit revenue from tickets issued for new chain laws and automated speed enforcement to remain in the I-70.	Provide source of funding for increased enforcement and incident response -- create funding mechanism			Short-term	Low	CDOT, communities along corridor, Legislature	Ken Caryl, Forest City	Create allocation system that focuses on I-70 congestion Need to change performance measures as foundation for new culture CCC -- Initial goal of coalition was to develop preferred alt and PEIS. Next steps for coalition are being considered. Discuss possible CDOT/CSP/Coalition partnership to implement preferred alt

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
3B - Insufficient Resources, Maintenance									
15	Allow fines collected on the corridor to be utilized for increased enforcement on the corridor Improve operations by providing increased resources to respond to I-70 incidents. Permit revenue from tickets issued for new chain laws and automated speed enforcement to remain in the I-70.	Provide source of funding for increased enforcement and incident response -- create funding mechanism			Short-term Repeats from Above...		CDOT, communities along corridor	Ken Caryl, Forest City	Yes - Provides asset to fund efforts referenced above. Create allocation system that focuses on I-70 congestion Need to change performance measures as foundation for new culture CCC -- Initial goal of coalition was to develop preferred alt and PEIS. Next steps for coalition are being considered. Discuss possible CDOT/CSP/Coalition partnership to implement preferred alt
4A - Incident Management - Minimize impact/closure									
16	Locate hazardous material (hazmat) and fatality response teams on the corridor to minimize closure times Current practices require expert personnel to respond from Denver which significantly extends length of closures.	HazMat CSP technician and fatality response team - Relocate existing resource teams onto the corridor or add additional team on corridor to improve response time and minimize lane closures.	Reduce closure times and corresponding economic losses.	Requires an investment in expert personnel in the inter-mountain areas of the corridor. Current personnel would not consent to reassignment.	Mid-term: Two to three years to recruit and train staff.	High: Significant costs for increasing staffing.	CSP		
17	Provide CSP with electronic survey equipment designed to document an accident scene quickly in order to reopen I-70 faster Survey equipment exists to quickly record the physical layout of an accident/crime scene.	Technology to document accident scenes faster so highway can be reopened sooner.			Short-term	Medium	CSP		Funding, Training, and Deployment.
18	Implement corridor wide closure plan to enhance parking options and disseminate information to stranded motorists Confusion at restrictions cause delays and public frustration. Examine practices at each planned location and develop a strategy for: 1. parking, 2.dissemination of information, 3. allowing local residents to get home.	Improve corridor wide traffic management when Interstate closes.	Public acceptance and public making better choices	none	Mid-term: 1 - 2 years	Low	CDOT, CSP, locals	Where cities open up shelters (Limon) or at the bottom of mountain passes (Monarch) Eagle County	Ex: Floyd Hill closure -- CSP officer helps disseminate info and manage closure
4B Incident Management - Improve Safety									
19	Expand state-wide campaign against distracted driving The three highest type of accidents were run off the road, rear end, sideswipe - same direction. CSP reports distracted driving is under-reported. It is suspected that distracted driving could be a contributor to many more accidents than reported.	Campaign against distracted driving	Reduction in accidents	Difficulty developing the information. Potential privacy and intrusion issues. May need legislation expanding anti-texting laws.	Mid-term	low	CSP and CDOT	Cell phone bans are relatively new in many jurisdictions. Some cities have implemented these bans.	Investigate Eagle County template. Can be a statewide campaign Trucking industry -- Federal law prohibits cell phone use while driving

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
20	Disseminate high truck accident location data CDOT does this currently however dissemination of information with other groups could be helpful. Truck Accident Data (Specific locs)	Identify high accident locations for trucks and recommend strategies.	Best Value for Safety/Congestion Strategy	None	Short-term (Immediate)	Low	CDOT HQ - Traffic & Safety	Standard National Practice	Other CDOT Safety projects. Need feedback loop that relates to Brian's work with STRAC CSP follows federal standards for data gathering, need method for effective data application Need multi-discipline effort to analyze crash data and relay info to appropriate stakeholders
5 - Demand/capacity management									
21	Provide more truck parking and improve communication regarding alternate parking options Same as workshop id 12	Provide emergency truck parking in Summit County.			See report Id 21				
21	Provide more truck parking and improve communication regarding alternate parking options Provide additional space on/near the corridor to correct identified truck parking shortages	More truck parking and Better communication of alternate parking locations	Provides locations for trucks, particularly unfamiliar drivers, to wait out incidents and weather events, help ensure properly rested drivers	very expensive to add space on the corridor due to terrain and environmental constraints, noise and air quality concerns of idling trucks	Mid-term 1-3 years	medium to high depending on location and quantity	CDOT (and US Forest Service?)	Non-mountainous Interstate corridors	Consider working with businesses (e.g., Big Box Stores), using chain-up areas as parking areas when chain law is not in effect.
22	Restrict SMVs from corridor during adverse weather conditions Restriction applied to trucks and all Vehicles > 26,000 lbs from traveling I70 from MP 170 to 260 or portions thereof during adverse weather conditions as determined by CDOT.	Truck Restrictions (from Corridor) with weather related triggers (winter)	Reduce congestion and accidents involving vehicles > 26,000 lbs,	Towns and communities may run out of groceries and other supplies. May be in violation of Federal Interstate laws. May need a special legislation to implement.	Mid-term Would require studies to prove safety concerns and may require legislative action	Could be low cost delivery but high cost impact to the State.	CDOT, CMCA, CSP	Donner Pass, Calif.	Need for more parking opportunities in Summit County identified. See P6 SMV Restrictions Tab
23	Implement shipper management working group to coordinate off-peak use of corridor Seek whether some of the existing shipments may be moved to off-peak periods through working group among transporters and shippers	Shipper/Transporter management -- working group to optimize delivery periods	Reduced truck traffic during peak periods	Could affect delivery schedules and costs could be increased to businesses and consumers. Much of the traffic though does not have discretion to change schedules.	Short-term (Immediate)	Low	CMCA and CDOT	CMCA has worked on cooperative efforts in other areas to align	Improved operational performance on I-70
24	Allow hazmat trucks through EJMT at night Goal: Reduce tunnel closures for (hourly) haz mat passage	Route HazMat trucks through EJMT at night.	Reduce delays, reduce truck traffic during peak periods, increase truck safety,	Accident causing closure of tunnel could affect I-70 for long period of time.	Long-term: Legal authority now - to implement 1 year for low end solution. Probably up to 5 years to obtain funding and implement fire suppression system	Low Cost - If for Limited access for Hazmat truck traffic under controlled conditions and limited periods of time. High (approx. $12 M to add fire suppression system which might allow for free flow of Hazmat trucks on a 24-7 basis.	CDOT and CSP	Hazmat trucks operate through Twin Lakes and Hanging Lakes Tunnels today as well as many other tunnels in the country. Hazmat truck operations though are not operating in tunnels of the length of EJMT.	Yes - Maintenance on Loveland Pass

Slow-Moving Vehicles and Enforcement

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
6 - Restrictions									
25	Seek voluntary compliance for keeping SMVs out of left lane	Keep SMVs out of left lane in good weather (voluntary compliance).	Improve public sentiment Reduce travel time Reduce driver aggression/frustration May be practical in some locations	Concept may not be implemented by truckers (Ineffective)	Mid-term	Low	CDOT, CSP, Legislature		Per CCC, solve the problem on steep grades with slow moving vehicles Review effectiveness of uphill signage; Could add more effective language "uphill on steep grades" Law 42.4.1103 already includes language -- Consider adding DSMD sign for left lane that reads and reports speed limits (possible enforcement ties, but don't lose the law, concept must make sense to public) Opportunity for automated enforcement? Makes sense EB Sunday PM in bad weather
26	Restrict SMVs on I-70 over weekends	Complete closure to SMVs on weekends.			Long-term				IMPOSSIBLE!
27	Allow hazmat trucks through EJMT under specific and controlled circumstances	Allow HazMat through tunnel under very specific (controlled) circumstances.	Get trucks off of Loveland Pass Better maintenance opps for Loveland Pass Opportunity to restrict hazmat trucks out of peak hours Reallocation of maintenance	Magnitude of potential accidents Magnitude of risk is undefined Cost of risk mitigation Potential loss of life Concentration of volume during authorized hours Potential staging problems Economic development impacts LOS issues, parking issues, hours of operation/delivery issues; Magnitude of risk needs to be assessed.	Long-term				Fire suppression? Targeted materials (levels of hazmat severity) -- can standards be adjusted on what is considered hazardous and can be carried through w/o suppression? Downhill portion (subject segment is Tunnel entrance to Silverthorne) would require enhancements. Other capital costs are necessary: ramp, more explicit signs (gears/speed) (see previous study); fire suppression system (MO) Time of day and day of week restrictions? Permit/certification for authorized/premiere specified companies? Previous study resulted in negative conclusion
28	Allow long combination vehicles to reduce overall truck volume	Permit long combination vehicles.	Efficiency Reduce number of trucks Emission reduction Restrict by permit travel during peak periods and inclement weather	Requires regulatory/statutory changes	Short-term	Low			Enforcement at POE At present, oversized and overweight vehicles cannot travel during peak periods
29	Restrict SMVs from corridor during peak hours Volume triggers can be converted to time of day/specific days based on historical data.	Restrict slow moving vehicles based on volume triggers.	More uniform traffic flow Greater throughput	Requires regulatory/statutory/legal changes Enforcement (may need to relate to TDM) Communication of current travel conditions	Mid-term	Med			Consider implementing incentives, congestion pricing Encourage SMV travel during low congestion times Education necessary
30	Increase enforcement of minimum speeds in the left lane	Increase enforcement of minimum speeds in left lane.	Greater throughput Higher travel speeds	Resources (man power) Adverse public image Presently not effective	Short-term (Immediate)	High			Impeding statute presently exists Minimum left lane speed provides target
30	Increase enforcement of minimum speeds in the left lane	Link to 106 above: Enforce SMVs passing other SMVs.		Time based vs. location based restrictions?	Short-term (Immediate)	High			Consider with passing lanes and minimum speed requirements

Slow-Moving Vehicles and Enforcement

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30	Increase enforcement of minimum speeds in the left lane Link to SMV passing	Link to 106 above: Manage individual trucks with capabilities to travel at different speeds on steep grades.			Short-term (Immediate)				This was more of a comment that not all trucks are slow and should be kept out of the left lane - some running empty can pass at the speed limit. Consider with passing lanes and minimum speed requirements Goal is to not prevent truck who can travel at speed limit from traveling that speed limit (trucks have different performance capabilities)
31	Increase SMV passing zones at specific locations	Increase SMV passing zones (climbing lanes or hard shoulder running).	Greater travel speeds in corridor Less rear-end accidents	SMVs merging back into traffic flow (on two lanes) -- safety and operational issues Magnitude of vehicle breakdowns on shoulder (poses conflicts)	Short-term	Med			More CSP/Stipend or differential to solve retention problems. Enforcement is a key component of each strategy.
29	Restrict SMVs from corridor during peak hours See report id 29	Restrict SMVs during peak hours.	Increase throughput during historically congested periods Improved travel time reliability for all vehicles Reduced emissions from lack of idling along corridor Reduces time necessary for maintenance at chain station areas Less speed differential (may improve safety)	Interstate Commerce Clause Insufficient SMV parking Driver hours of service Economic development Delivery schedules Increased noise and emissions near parking areas Insufficient facilities Large influx of SMVs onto corridor following lift of restriction	Mid-term	Low			Based on historical volume conditions Consider accident potential
32	Restrict single drive axle trucks	Restrict single drive axle western doubles during adverse weather conditions	Less traction-related problems Fewer closures Improved safety Frees CSP and CDOT resources Simplifies chain law	Implementation issues Some existing fleet are still on single drive axles	Mid-term Would require studies to prove safety concerns and may require legislative action	Low	CSP, Legislature		Further investigation is necessary Keep restrictions high level -- develop process to solve the problem Single drive axle creates problems (from lack of traction) during adverse weather Fleet changes from single drive axle may be resolved over time with fleet turnover
33	Review hazmat clean-up law as it pertains to highway closures Certain aspects of this law require highway closure for relatively benign substance spills. Need further research before carrying forward.	Review Details of "Haz Waste Remove It Law"			Mid-term				

Maintenance & Operations

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
34	Increase local and State enforcement options Ensure staffing available to write ticket for truck non-compliance during accident (did not have on chains) and proactive enforcement of not carrying chains (September 1 through May 31). Options include: -Additional local and CSP enforcement at peak travel - target weekends to increase perception of heavy enforcement. -CSP DOT inspectors check for chains at POE and write tickets -CSP Hazmat units - when not responding to incidents, enforce chain law -Increase fees for non-compliance	Increased local and State enforcement options	Additional revenue from enforcement Reducing accidents / spinouts and associated traffic delay Increase of enforcement resources dedicated to the corridor	Additional cost and man hours for enforcement Additional disruption of traffic to write this ticket Very small window to do major overlay during peak summer travel times Lack of resources/enforcement from areas the trooper comes from	Short-term (Immediate)	Could be self funding with increased ticket fees, especially if revenues remained in corridor	CSP and local law enforcement	Local enforcement currently responds as requested on corridor	Combine with enforcement ideas. Consider truck chain exchange program; Consider voluntary auto inspection for winter conditions (similar to car seat program)(Service/Tire Stations)
35	Change contract with quick tow/courtesy patrol so user pays CDOT currently funds this service to keep road open - response in approx. 20 minutes. Would provide same prompt service from dedicated wrecker, but shift costs to user by sending a bill. Drivers would not have the option to decline service or request a different service.	Change contract with quick tow/courtesy patrol so user pays	Continues to removes blocked lane and reduces congestion but places cost on the user.	Challenge with changing a free service. Some motorists do not have the means to pay/may not pay. Would have to be mandatory, so drivers could not refuse service due to cost. Current concerns over tow rotation and private wrecker contract. If not implemented correctly could defeat quick clearance benefits	Mid-term	cost neutral	CDOT	UK - funding concept based on placing cost of service on user	Compliance/effectiveness of heavy tow program related to fee - Truck drivers may challenge relocation assistance from H.T. contractor if they have a different preferred tower.
36	Increase snow and ice control maintenance level of service Maintain roads in a wet condition longer during storm and bring roads back to a wet condition after the storm - sooner. Use more chemical deicers, both liquids at start of storm and granular deicers throughout storm. Can also be proactive to prepare roadway for an incoming storm rather than reacting after the storm has hit.	Improve snow and ice control maintenance LOS	Better road conditions (less snow pack) for the traveling public. More proactive maintenance of snowfall to avoid traffic driving on snow and packing it to ice. Fewer accidents and more consistent speeds.	Cost more for materials, additional storage, and upgrade some snowplows (MDSS to all trucks). If applying de-icier early - lots of customer complaints. If it doesn't snow, deicers can cause reduced roadway friction. Potential environmental impact with additional materials. This is not consistent with current funding trends. MO budget has not been increased. Requires more frequent cycle/turnaround time, but less lane miles per truck moderate cost.	Short-term (Immediate)	Moderate Existing trucks to maintain, add granulars, add storage. More materials/different More equipment, people, storage (10 additional trucks at least for corridor). Can be incremental increase.	CDOT	CDOT R6 uses all chemicals and no sand	MDSS software upgrades

Maintenance & Operations

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
37	Include weather source/data (Meridian MDSS) in all maintenance trucks Maintenance Decision Support System - weather forecasting tool. Operator places in real time information. Makes recommendations by route on type, level of resources to use (deicers, etc.). Helps reduce environmental impacts by not over using products. Started using in some trucks 2003. CSP also uses to schedule troopers to	Weather source/data - Maintenance Decisions Support System (MDSS) in all maintenance trucks	Helps operator to plan and schedule equipment. Most effective in trucks so real -time weather can be put into model. Tool to help train/guide inexperienced staff to respond to different weather conditions. Reduces chlorides on environment - and overall use of product. Weather forecasts are better than NOAA/TV. Truck is tracked, location, activity (plow up or down, deicing, etc.) so this can track productivity and best practices. If a complaint that a road was not covered, CDOT can respond when, where, and what. Can be used in summer for spraying, chip seal, any maintenance activity. Real time camera shots of what truck driver is seeing.	High maintenance to keep system running - delicate system. Things fall off truck and sensitive to moisture and corrosion. Loss cell coverage - need better tower coverage. Training of operators and mechanics (currently only one mechanic can work on system). Easy to use, but operators feel like they are being tracked. Additional education/training and supervisor support. Low drawbacks	Short-term (Immediate)	$3,500 per trucks * 11 trucks $33 for monthly cell service additional maintenance/upkeep costs change in yearly fee/training? Estimated under $500,000 implementation + annual maintenance/service	CDOT	currently in use and well received	traffic operations and agency cooperation (can provide detailed data of what CDOT is doing) Expand MDSS use in the corridor - all trucks as well as stations
38	Restrict single drive axle combination trucks during adverse weather Additional restriction limiting single axle combo trucks from driving on corridor during weather events (even with chains).	single axle combination trucks - weather restrictions	less tie ups with traffic spin out removing trucks less suited to bad weather conditions removing slow moving vehicles during weather/congestion high benefits	Additional truck parking and notification Pushback from trucking industry. Delayed product to consumers (deliveries). Would need legislative change. More enforcement required. High drawbacks	Mid-term	Medium to CDOT, truck parking maxed out, need more property or FS easement. Cost for additional signs/ notification Medium to CSP High to truckers	CDOT to initiate legislation and implement restriction FS and communities for parking locations CSP to enforce CMCA - shift in policy	Caltrans	Enforcement, ATM-VMS, trucking industry Restrict doubles (single drive axle) from corridor in winter months; See SMV - CMCA working with trucking company - (also covered by enforcement/slow moving vehicles group)
39	Initiate preemptive closures in extreme weather events Preemptive closures due to weather. Allows travelers to get off at safe and convenient locations. Put into effect sooner than what CDOT is doing now. How often is storm severity very close to the forecasts?	Preemptive closures in extreme weather events. Close sooner in advance of oncoming storm.	gets traffic out of way for maintenance vehicles - easier clean up after storm passed Currently in incident management plan (but not used widely). Safety for CDOT and traffic High benefit	Not widely used - who makes the call? Inconvenience/anger traveling public/communities Loss of revenue High drawbacks ; may be difficult to forecast/predict storm weather; fall easy to predict; spring difficult Extremely difficult to do for the person making the call	Short-term (Immediate)	Loss of revenue when road closed.	CDOT	Do for avalanches all the time - McClure Pass	communication - predictive travel. Preemptive short term closure, that enables clearance/plowing of the road and quick re-opening
40	Close Dumont POE in peak travel/bad weather	Close Dumont POE in peak travel/bad weather	keep speeds up and reducing weaving Able to do currently high benefit Can be done easily	Cannot preemptively enforce chain Overweight trucks on road low drawbacks	Short-term (Immediate)	no cost	CDOT in conjunct with Dept of revenue	Currently used on Monument Hill	Similar to idea in SMVs, more important East bound than West bound

Maintenance & Operations

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
41	Establish a one level commercial vehicle/heavy vehicle chain law CDOT to enact code 18.	One level commercial vehicle/heavy vehicle chain law	Easier to understand and enforce	pushback from trucking industry wear and tear on surface More chain stations One level is counterproductive - requires better signing/information to address the issue	Mid-term legislation/rule making or CDOT policy (code 18),	low/moderate cost	CDOT	Red Mountain, Coal Bank, Molas	ATM
42	Share equipment and personnel with I-70 from other locations as temporary and supplemental winter support Bring in trucks and equipment from other areas to provide increased coverage during peak travel times. Week shifts or could bring in day support from R6 (OT).	More CDOT maintenance equipment and personnel from other locations for temporary winter support	Adding dependable trucks to patrol. Opportunity for existing fleet preventative maintenance. Allows employees assigned to that patrol a break/relief. Improves employee safety. Reduces down time of equipment Option to address chronic understaffing Volunteer opportunity for additional overtime Reduce need for temporary support (11 temp and 11 perm. part time)	Cost - staff, equipment, and travel (hotel) Inefficient use of materials and personnel Putting people unfamiliar with corridor on that road Could lower LOS in other parts of state Stress on traveling employee	Short-term (Immediate)	OT for equipment and staff, per diem, fuel, assume 55 OT and 20 trucks to provide round the clock coverage (Nov - April) less than $400,000 a season low	CDOT	standard practice	
43	Use accident alert for "30 minutes clear of accidents" and remove vehicles from travel lanes ASAP Open road to traffic as soon as possible. Implement accident alert and remove from accident scene and file a cold report. Implement a 30 minute clear of accidents increase communication with emergency service providers. Limit lane blocks of EMS. Explore options instead of actual investigation of scene (ART from Golden) mobilize, set up and investigate - use other technologies (3D camera)	Use Accident Alert on I-70 Mtn. Corridor for 30 minute clear of accidents	opens corridor to traffic faster after accidents	Change in CSP protocol Troopers on road would need additional equipment/training. low drawbacks	Short-term	cost neutral	CDOT and CSP	Denver metro area	
44	Improve on accident removal depending on status of peak period and traffic flow obstructions if not obstructing hwy, no reason to remove when traffic levels are high	Education on accident removal. If not obstructing traffic, during peak hours, wait to remove vehicle in off-peak.	less traffic obstruction Safer for tower	Delay for vehicle owner Additional training for CDOT/CSP	Short-term (Immediate)				

Maintenance & Operations

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
45	Develop automated spray systems at tunnels and bridges Automatically put deicing products when they start to freeze. Location specific bridge EB at Loveland interchange bridge, Floyd Hill westbound, EB at Hidden Valley, all tunnel approaches. Can pump up to 0.5mi.	Automated spray systems (tunnels and bridges)	To ensure bridges and tunnel approaches are in as good of condition as the rest of the roadway. Reduce accidents and congestion.	Additional maintenance requirements - someone does have to maintain Perception they do not work	Short-term	Per site: $250,000 to install (but less for smaller areas like Loveland Bridge). OM - additional cost low/moderate cost	CDOT	all over US. R4 and R6 successful applications	LOS
46	Offer employee transit and commuting opportunities from lower cost to higher cost areas "crew car" or van to shuttle employees from front range to potential locations include Silverthorne shop, Frisco, Empire, and EJMT tunnel. Shuttle and shifts has to avoid peak travel times.	Employee transit - commuting opportunities from lower cost areas to high cost	Employee benefit for retention and reducing stress Reduces traffic volumes and environmental impacts Access to affordable housing in front range. Voluntary - full participation when previously available at EJMT. Reduce parking demand at work Moderate/high benefit	More difficult to manage shifts/staffing in differing conditions Public/agency perception of frivolous benefit Response time Possible loss of extreme hard to fill pay less flexibility to address family emergencies low drawbacks	Short-term (Immediate)	Cost of van and gas Would have to pay overtime to commute - unless AG ruled otherwise (potential 8 hrs a week overtime) Can avoid overtime with opportunities to obtain/use DRCOG van low cost	CDOT	Glenwood and Grand Junction - has commuter transport - CDOT van shuttles employees	CDOT engineering, CSP DRCOG, TMO could facilitate. How often is this necessary during peak weekend periods?
47	Restrict heavy and tow vehicles to right lane during peak period year round Heavy vehicles and tow vehicles required to remain in right lane during peak periods.	Right lane restriction for all heavy vehicles and tow vehicles during peak period year round.	Keeps potential slower traffic in right lane. Potentially higher capacity on left	Pushback from industry and rec. users harder on pavement in right lane Signing/change in CDOT policy Enforcement	Short-term	low	CDOT	Glenwood canyon	
48	Expand use of multiple plows running parallel clearing lanes at same times. Plow equal to icy falcon	Multiple plows running parallel	Reduced accidents due to slower speeds clear entire road at once - more effectively Speed harmonization low/moderate benefit	Congested traffic behind Can trap other operations - lack of service can impact downside perception of traveler to CDOT impede traffic moderate/high drawbacks	Short-term (Immediate)	similar	CDOT	currently in practice at certain times	
49	Improve striping delineation Striping hard to maintain. Improve recognition	Improve striping delineation	more visible improves safety more durable	doesn't last, freeze. Sand gets into grooves cost congestion	Short-term (Immediate)	low	CDOT	Industry standards	If overhead gantries Installed for VSL or other ATM uses, is there an opportunity to install overhead lane delineation especially exiting the tunnel where confusion is high?

Maintenance & Operations

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50	Retain experienced employees by supporting affordable housing CDOT has property in middle of Frisco for employees trailers. (almost a block). Opportunities to work with Town of Frisco and other agencies to sell/swap/develop affordable housing by redeveloping or selling this parcel. Need improved affordable housing due to high cost of living. Need employees close to duty station so can respond in a timely manner. If decent place to rent/live, would improve employee retention. More mobile to respond and in area affected by the weather they are responding to.	Options to maximize/improve affordable housing for joint use by agencies.	Decent/convenient housing is an important employee benefit in all economic climates. Faster response time for employees. Opportunities for joint agency partnerships - CSP, FS, etc. Consistent with local and employer goals to provide affordable housing in the region. Proactively addressing Town of Frisco zoning with old trailers - time may be limited. High benefits	CDOT prefer not to be landlords. Several options have been pursued - need a champion. Low drawbacks	Short-term CDOT ROW would meet with Town to initiate. Land swap sell. At least a year.	Cost of upkeep of property if CDOT remains land owner. Continued subsidy cost. Funds from sale/swap of Frisco property could be a revenue source to develop	CDOT, Frisco, CSP - other agencies looking for affordable housing	Eagle County - sanitation district provided affordable housing for CDOT employees.	Staff satisfaction
51	Initiate one-lane tunnel metering Allow one lane of traffic through tunnel during metering, rather than shutting down both lanes	One-lane tunnel metering	Allows some traffic flow through tunnel and meets objective of metering traffic, but doesn't shut off the flow completely. Still allows emergency access even if that single lane backed up through the tunnel Option with speed harmonization	Very negative public complains that EJMT is deliberately slowing traffic -- i.e., complaints of unnecessary closure during peak times Does not improve overall mobility Backups will go further to neck down for one lane. Single lane will still stop/slow when it reaches traffic ahead.	Short-term (Immediate) Could reduce PR concerns by conducting public education campaign	low. Setting up cones for lane closure	CDOT	EJMT past experience - not positive	speed harmonization
52	Conduct CDOT fleet replacement Due to aging fleet and mechanical failure 61 trucks + other equipment	Fleet replacement	newer technology Dependable fleet - reduces downtime of equipment	Cost Would require maintenance facility upgrades	Mid-term	replace 61 trucks at least $15 million to replace vs. increasing cost of continued maintenance			Message short of funding for overall maintenance to continue to move traffic
53	Implement short-term closures at interchanges with services when metering is in effect Proactive diversion/removal from highway. Staged closures at point that can handle the traffic and traveler services. More of a process like staged closures. Would need to be included in incident management updates. Need to determine how to meter /closure most effectively.	Short term closure at interchanges with services when metering is in effect	Can provide an alternate route Can access services Don't have traffic stalled straight creek hill - safety, frustration, spin outs limit stranding	plug up Silverthorne and Frisco. Need new/more parking. 2800 vehicles per hour dumping into town affect local EMS and community access Inadequate signage - limited VMS Enforcement at ramps to close	Short-term 6 - 12 mo	Moderate - for signs and management	Lead - CDOT support from local communities	Eagle County TIM plan	Update incident management plans and Need new VMS further away from I-70,apps, and/or PR campaign. Need coordination with all locals

Maintenance & Operations

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54	Keep Loveland Pass open all the time Heavy weather makes keeping open a challenge esp. with avalanches. Would require snow sheds (sisters and other areas), more technology on CDOT maintenance vehicles, and much more maintenance	Keep Loveland Pass open all the time	Would not have to meter hazmat traffic at tunnel. If tie up on Straight Creek - alternative route to Denver. Medium/high benefits	Intense cost and maintenance requirements Safety factors - avalanches, visibility, no guardrail, visibility of hitchhikers/snowboarders Wind/visibility Environmental - lots more deicing products May add queue at tunnel, because of access at pass High drawbacks Cost effectiveness	Long -term environmental/ public process to approve.	Environmental process cost - Construction costs - snow sheds, barrier, widen road OM costs - Very high cost	CDOT and CSP		
55	Develop a fire suppression system in the Eisenhower Johnson Memorial Tunnel Install fire suppression within EJMT tunnel. System can target specific fire locations. This may potentially allow hazmat trucks can potentially go through in a free flow condition.	Fire suppression in EJMT	Potential for free flow hazmat trucks based on legislative changes. Improve emergency response and reduce employee exposure for fires - safer for all. Could reduce the need for metering for all vehicles - can potentially queue in tunnel. Reduction in responsibilities for TM1s (no longer have to stage hazmat trucks) High benefits	Misting system - can freeze tunnel. Will have to heat trace. Other suppression options like foam/dry system - but not as likely. Additional maintenance demands/costs. System may discharge by mistake - low risk To allow free flow hazmat would require legislative / policy change. Would still need to restrict hazmat trucks during extreme weather to hold so not stalled on steep slopes. Need additional space for storage for water (possible) Not extensively used in US. Environmental concerns with hazmat spills and extensive tunnel closure. Medium/high drawbacks and controversial	Mid-term Feasibility study completed; Confirm options and test - one year; Design/installation - at least a year.	$10m design and installation $10,000 annually for maintenance/testing	CDOT, CSP, FHWA	Australia, UK, Central Artery in Boston, Seattle	
56	Program repaving on a more frequent basis Asphalt requires every three years repaving. Potholes to be repaired - but limited resources during winter due to snow removal. Limited options with extreme weather conditions - Rutting, chains, freeze thaw.	Program repaving on a more frequent basis	Smoother road/drivability Safer Ruts reduced so less snowpack/hydroplane potential Reduces lane use (out of service in extreme deterioration) low benefits	Additional cost and man hours Additional construction - disruption of traffic, Very small window to do major overlay during peak summer travel times Higher speed traffic Moderate drawbacks	Mid-term Need to get on STIP - two years one construction season	$1million a mile	CDOT	France	
57	Develop a hazmat tunnel bore additional tunnel for hazmat	Hazmat tunnel bore	Dedicated full time safe route	COST and environmental impacts. Additional CDOT maintenance (or would need to be privatized)	Long-term	$3-4B	CDOT and everyone	none	

Maintenance & Operations

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58	Close Loveland Pass Close all winter and open in spring. A Basin would have to go west route. Would have to have a fundamental change in hazmat policy - lots of hazmat questions to be resolved.	Close Loveland Pass	Can pull manpower and costs to support I-70 (Nov - May) reduce winter long avalanche maintenance Eliminates queue down from tunnel Saves maintenance time and dollars - removes cost to shoot slides and keep open Low/medium benefits	Out of direction travel to access ABasin from east. Loss of alternate route. Limiting access to backcountry recreation. Need additional chain up space at Silverthorne because have to chain up at 205 now (Loveland has 3 chain up on west side). Closer chain up station to tunnel (need something closer to tunnel at Herman's gulch for hazmat/fuel) Current under capacity for all chain up anyway. Would add additional traffic on I-70 at a different location (Silverthorne to US 6) Cost to open in the spring Without fire suppression - would have to shut down tunnel to meter for hazmat. increased hazmat spill risk to I-70 Medium/high drawbacks	Long-term environmental process and legislative 3 to 5 years implement (gate) - week	Cost to implement - low $5m Secondary impact costs cost to operate - some savings Cost: Moderate	CDOT but heavy local buy in	Statewide - many closures - Independence Pass Trail Ridge No plowing overnight on smaller state highways (7pm to 5am) - had previously been maintained, but now reducing maintenance. Grand Mesa,	fire suppression. ADT over Loveland pass? How much more will it congest I-70 What about oversize loads?
59	Utilize an automated avalanche system such as GAZEX	Automated avalanche systems (GAZEX)	automated safety	very expensive cost significant environmental. impact - pipes/propane in every avalanche starting zone. Huge visual impact helicopter to fill tanks backcountry skiers Forest Service special use permit process	Long-term EIS required - years	very high	CDOT / FS	some ski areas or limited/remote avalanche areas	
		Tow plow snow removal (2nd blade) used in flatter places		not applicable in this mountainous terrain.	NA				
60	Privatize I-70 Corridor operations Opportunity to privatize this function to provide a higher level of service because recouping all the cost (chain violation, tows, flexibility to implement new innovations). Dedicated funding stream. Long term, comprehensive package - law enforcement, maintenance, operation, management, etc..	Privatization of I-70 Corridor Operations	Save money Generate revenue - capture true costs Higher level of service and enforcement Synergize all ides - incentive based Can toll - self funding and added capacity	Contract has to be long enough to recoup investment Overcoming community concerns, political will and significant cultural change. Can toll - controversial Insurance for avalanche and other operations Risk to CDOT	Mid-term	Public process for CSS process to implement $5-10 million Depends on contract model. Revenue neutral and or current I-70 funds freed up for other portions of the state. Moderate/High cost	CDOT and CSP	E470, Northwest Parkway, Indiana, FL, etc.	

Traveler Information

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
INFLUENCING TRAVEL BEHAVIOR									
61	Make historical traffic data readily available to the general public in an easily understood format Showing traveler through tools to make different travel behavior; Make sure information is specific by day of week, hour, and direction	Provide historical travel time modeling/data via cotrip.org	Change behavior pre-drive	Based on historical data, doesn't account for change in conditions/	Mid-term Some data exists now. Procuring the tool to take data readable and consumable by Sept 1. Cogknows. Software and tool. Report developed expected May 2012	No incremental cost. Included in 2012 budget	ITS Branch and Public Relation. Need Senior Management Support	other CO state agencies that use this tool.	these three ideas have great potential when put together: APP, historical models, and incentives
62	Develop/expand smart phone mobile applications Reduce/smooth out traffic congestions; Delivering information to users in an enhanced/improved manner, customer service; ongoing communication with user; using facility as is; vehicle to engage other I-70 stakeholders ; CDOT collecting GPS data; App becomes the GPS and CDOT doesn't have to purchase the data; reduce cost of ATM ($1M statewide main + cap/yr); scalability Statewide; cost off-setting with probes	App	Using the app while driving; requires upgrades & maintenance -would require outsourcing; Ski areas have limited flexibility on hours of operation due to day light (particularly for most of the ski season and need for maintenance/grooming activities during the night and early morning)	Low Development: $100-500k (for all platforms) - keep it simple in phase I to communicate data. Future phases increase in budget to address additional value - state wide	Short-term (possibly immediate) Development - 3- 6 months; can be iterative to upgrade	ITS Branch and Public Relation. Need Senior Management Support	Berkeley; Beat the Traffic, Fuel Finder	In conjunction with SMVs - add chain-up and chain law information for truckers. Ski areas should have been participants at workshop.	
63	Develop incentive program to encourage travel off-peak Provides users with tangible financial or other incentive. Accrue points to qualify for certain things when you reach a certain number of points. "Mountain Miles." would apply differently to different ski areas	Incentive program	Reward behavior changes and improve mobility. Raise CDOT's national leadership in innovation; create GPS based probes to collect data and deliver incentives.	No matter what/who we promote, other mountain entities will be offended. Perceived bitching and politics that may ensue (although all will be given an equal chance to participate). And will it be hard to get adoption due to "offer fatigue", i.e. so many groupon like sites already exist?	Short-term 6 months to implement after research/campaign	Development:$ 25-35k Negotiating: Self funded Maintaining: Self funded	ITS Branch and Public Relation. Need Senior Management Support	One possible way to avoid politics: make it a free portal for business to self supply their offers	Consider using and incentivizing regular corridor users to act as pace cars to support compliance with speed harmonization
64	Offer communication Touch Point Kiosks at park and rides, resorts, rest areas, etc.. Hog back parking lots, ski areas, Georgetown rest area, Rental Car Offices, Casinos, Outlets, Visitor Centers. Broadcast information in a messaged theme. Focus on feeder markets and historical behavior Pre-trip and en-route. Target messaging for location/touch point/kiosks that provide info + private sector marketing. Outreach to non-commercial vehicles that a traction/snow tire requirements exists. Information must be accurate and timely.	Communication at Touch Points	Influence travel behavior at those points.	Idea would be to install in multiple locations. Capital costs could be required by CDOT or end user (ski area).Requires maintenance	Mid-term Parallels with CoTrip development & Maintenance	CDOT would have to provide data electronically. End user would have capital cost.	ITS Branch and Public Relation. Need Senior Management Support		
65	Create CoTrip enhancements including alternate routes Provide information for travelers to potentially use alternative routes away from I-70. Would use ATM/CoTrip to message; Information must be accurate and timely	Alternative Routes	Reduce traffic congestion during peak hours	Alternative routes unreliable; limited video access to monitor routes; Extensive out-of-direction travel subject to same weather/road conditions; increased maintenance/limited budget	Short-term -- could be implemented immediately	Minimal	ATM/ ITS Branch		ATM
66	Offer special event messaging Coordinate messaging with events such as Sniagrab	Events	Access to audience likely to use corridor during peak congestion hours	may have minimal impact	Mid-term 9 months to collate data into a PR package and distribute	ITS & PR Staff time + PR package costs	ITS Branch and Public Relation.		

Traveler Information

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
67	Develop connected vehicle technologies Vehicle computers receiving data. Can provide speed, time travel. Also includes vehicle to vehicle information and Vehicle to roadside information; Trucking companies have computers in trucks which is an opportunity for specific information distribution	Connected Vehicle Technologies	Will change how CDOT collects data/analyze, manage data; App may be a pre-cursor to collect data in a similar manner	Not low cost	Mid-term; 18 months +	MOVE TO ATM?	ATM; ITS Branch and Public Relation.		Would need to coordinate with automobile industry
68	Establish reservation system to travel during peak periods requirement to have X number of people in your car during certain peak times. Link license number to cycle of access.	Reservations	Reduction in vehicles during peak congestion hours	Unenforceable	Mid-term 9 months to develop and deliver on CoTrip	ITS & PR Staff time	ITS Branch and Public Relation.		
69	Establish system to allow travelers to pay for access to front of traffic queue Use app to pay to get in front of traffic and know when congestion is.	Disney app	Encourages behavior change to reduce congestion during peak traffic hours	Unenforceable. If already in traffic, no way to get to front of the line	Mid-term 12 months to research, develop and launch	Outsource task to consultant: $30k-50,000	ITS Branch and Public Relation.		ATM?
RAISE AWARENESS & EDUCATION									
70	Survey and research I-70 traveler and stakeholder information needs Study to understand I-70 market and stakeholders and key needs. Also make it scalable	Research/survey Traveler & I-70 stakeholders (resorts)	to inform forward product and communication developments + informs multiple products in information umbrella + will identify target audience	Cost - outsource.	Short-term -- could be implemented immediately 3 months	$50,000	ITS Branch and Public Relation. Need Senior Management Support	Basic product development	include all items within 1 RFQ to increase continuity. Ski areas used to be partners in activities
71	Develop enhanced traveler information marketing campaign To create a reciprocal arrangement with media outlets to use CDOT data in exchange for marketing time not including as a PSA. Use bartering to avoid revenue generation	Enhanced traveler info marketing	To gain media exposure for travel behavior programs. Allows channels to stream cameras on to their websites; This swap (camera feeds to news stations in exchange for advertising of awareness programs) has the best potential for marketing at low cost	How do you change behavior of media? Will become political. Can't compete with private sector	Mid-term 12 months to amend agreement, install new equipment	CDOT offer to upgrade equipment in exchange for marketing. Approx $250,000 in capital cost. Service agreement. Nominal maintenance.	ITS Branch and Public Relation. Need Senior Management Support	Upgrade of existing technology and increasing capacity	ATM/TDM
72	Develop public information campaign to raise awareness about existing and developing I 70 info tools Dedicate and expand PR services to I-70 and spread awareness of the tools. Marketing/public education via 511 & CoTrip, (ie. Vehicle chain laws - key, fines, variable speed limits)	Public Relations	Generate awareness to increase the public use of tools. Address unique needs of I-70 corridor.	Possible additional cost. Building unattainable expectations	Short-term with Management Support -- could be implemented immediately	In-house. No cost	ITS Branch and Public Relation. Need Senior Management Support	Washington DOT, Montgomery County, MD/V?	As other groups develop/implement new ideas/laws, incorporate into PR efforts. (Harmonization) Enforcement
73	Create editorial content and syndicate a series with interesting characters conveying corridor travel information Create a series of content to facilitate consumption. Telling travelers a story that is interesting. Connects with audience in a different way than they are used to knowing CDOT	Editorial Content and Syndication	Attracts more travelers to CDOT media access points. Can be used by other media (traveler stakeholders - visitors bureau)	creation and distribution of it, but can be maintained at a minimal cost	Short-term -- could be implemented immediately 2 months for freelance for initial content + maintenance	Could be done in-house; Externally - $10 - $20k	Collaborate with tourism industry	Colorado Tourism Office, visit Denver; CVBs; Oregon	

Traveler Information

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
74	Expand existing social media platforms to foster a sense of community and encourage positive traveler behavior Foster a community and traveler behavior change. Expanding on existing platform	Social Media	gets buy-in from the user	Requires real-time management	Short-term -- could be implemented immediately Minimal to build/add content	In-house. No cost. Managed by PR	ITS Branch and Public Relation. Need Senior Management Support	White House; Oregon Tourism	
65	Create CoTrip enhancements including alternate routes Use CoTrip as the base platform from which all content distribution comes. Such as: manage alternative routes & instrument it	CoTrip enhancements							
75	Expand trucker education programs and offer enhanced information stream Provide faster and Better traffic and road conditions information to truck drivers via Qualcomm, PeopleNet and other avenues such as CB Wizard. Communicate restrictions to trucks and passenger vehicles. Info at point of restriction so can park or turn around. Utilize truckstops. Update the DVD and CD programs for Crossing the Rockies for Truck driving. Better outreach to trucking publications and websites.	Trucker Education; Communication updates to truckers for conditions	Coordinate CoTrip info data and make available to truckers. Data & PR material already exists; Smart phone applications, etc.; all popular data outlets should be considered	May cause PR fatigue for minor issue	Short-term, partly in effect now	Low	ITS Branch and Public Relation. Need Senior Management Support		Slow Moving Vehicles, ATM
76	Improve communication of chain requirements to truckers Single vs. double axle. Truckers often chain up when not required. Better communication prior to and at chain-up stations. Ie. CB Wizard or other ITS solution	Better chain up communication	less traffic back up, better compliance	Additional maintenance and reduction in visual aesthetics	Mid-term 12 months	Low	ITS and PR		Slow Moving Vehicles, ATM
SELF FUNDING & SUSTAINING PROGRAMS									
77	Generate revenue with public private partnership (P3) advertizing on CoTrip, mobile application (app), GovText, etc. CoTrip, mobile, 511, GovText (bundle together for 1 integrated package); Targeted audience of interest to advertisers; structure agreement with P3 that risk is on private sector (also impacts return); need to time planning with advertising cycle	Advertising	Self Sustain; Provide value in deals to incent change in space; provide funding for infrastructure maintenance; stakeholder participation and buy-in; opportunity for P3	Perception of commercialism in public sector; increased operation management of CoTrip with added advertisements; Risk is that advertising doesn't pay back	Short-term 9 months	Self-funding based on product mix	ITS Branch and Public Relation. Need Senior Management Support		
78	Generate revenue through strategic partnerships with major brands Media exposure with a barter with the media; Email program to opt into a program for data info	Strategic Partnerships	Bring in major brand to fund program with out spending anything new. (Local news channels). Ie. Casinos and Outlets	Perception of who they are partnering with; negotiation takes lots of time, don't come together easily	Mid-term 12 months	Self-funding based on product mix; labor intensive to work the deal	ITS Branch and Public Relation. Need Senior Management Support; Lobbyist		Could be facilitated by TMO
79	Generate revenue with "title sponsorship" In-kind barter for providing services	Title Sponsorship	Large corporate sponsor can bring larger dollars to gain exposure. Streamlines advertising efforts. Dedicated revenue stream.	Difficult to land single title sponsorship. Higher risk because there are fewer candidates - all your eggs are in one basket.	Mid-term 6 -12 months	Requires outsourcing to quantify assets and sell assets	ITS Branch and Public Relation. Need Senior Management Support		
80	Generate revenue with government and other agency/non-profit/economic development grants DOT, EPA, Sustainability Grants, DRCOG ITS; coordinate with CDOT lobbyist	Government & Other agency/non-profit/ Economic Development Grants	Offset capital cost; CDOT as national model;	Can have restrictions on end user product and reduce effectiveness; timing to award; application & reporting requirements onerous; application is time intensive	Mid-term 9-12 months	Usually require local match	ITS Branch and Public Relation. Need Senior Management Support; Lobbyist		

ATM/TDM

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
81	Expand use of ramp metering Use of traffic signals at freeway on-ramps to manage the rate of automobiles entering the freeway	Ramp Metering			Short-term				
82	Institute speed harmonization Speed harmonization via Variable Speed Limit Signs from Eisenhower Tunnel to Twin Tunnels; Empire Junction to Twin Tunnels in conjunction with HSR	Speed Harmonization	Provides safety benefits to reduce rear-end and other crashes as well as reducing speed to reduce intensity of injuries. Better expectations for traveler. Better throughput and reduced travel time. Reduces rear-end crashes.	Need CSS coordination related to additional signage. Increases staffing for ITS, CSP and maintenance. Requires PR and outreach. Hidden Cost for PR/awareness campaign reason - drivers may not understand reasons/importance of this; Could get negative very quickly without education. Software issues with cost and maintenance, but required for corridor monitoring along with additional equipment	Mid-Term 2 years (CatEx w/ CSS - 1yr add 3 months to finalize design, 3 months to advertise, 6 months construction)	$2M for signage, $2M for wiring. Additional ITS and enforcement $150K/yr. Might need an additional allocation for algorithm software and speed detection infrastructure. 60- 70% of equipment is already existing, but will have some integration costs. May require some initial staff for up-start. ITS requires 3.5% of capital cost to install & maintain. Estimate $20,000 for 4 months work for a PR firm. Cost estimate should be much higher.	CDOT and FHWA with coordination with adjacent local municipalities	Seattle, Missouri, Birmingham UK, Florida on I-4, Netherlands, Australia.	TMO and enforcement synergies and would work with photo radar. Speed harmonization program Frisco to Floyd Hill. MOS Eisenhower to Twin Tunnels
83	Establish peak time tolling at Twin Tunnels Implement toll charges at the Twin Tunnels to reduce peak time demand (weekend morning and afternoons). Could this be coupled/replaced with an incentive program (see Traveler Info). Tolling for truckers as well. Include offset program for locals and emergency vehicles. Other scenarios for tolling include entire corridor, Eisenhower tunnel, etc.	Peak time tolling at Twin Tunnels	This helps maintain a certain operating speed to improve safety and boost overall capacity of the corridor. Increased public deterrence of the use of I-70 during peak periods (7-11 am weekend mornings and 2-7pm on Sundays)	Very high level of political controversy. Jurisdictional and public resistance. Concern for environmental justice and local populations and how to reduce or eliminate costs. Opposition from up-mountain ski resorts. Drivers may take alternative routes on local frontage roads/through communities to get around toll thus negatively impacting local community; If the Dutch aren't able to implement congestion pricing due to political considerations we have zero chance in Colorado	Mid-Term Equipment installation is relatively easy - 1 year. Political process timing undefined.	Moderate -- Toll equipment $1M. Annual operation $1.5M / year for management. $5 per car average toll generates $3M per year to cover administration costs and possibly to fund local improvements. (assumes 600k cars/year). To change behavior would require $15- $20/car to affect behavior change. . Revenue should be put back into the corridor to incentives for behavior change.	Federal agency coordination to toll an existing facility. HPTE and CDOT and coordination with local jurisdictions	Golden Gate Bridge, 520 Bridge in Seattle	Coordinate with Twin Tunnels EA. Toll intent is to manage demand and the excess revenue can used to mitigate impacts or improve similar goals. Idea is to toll trucks and hazmat differently. Instead of rolling consider an incentive program like Norway's. Possibly tied to purchase of ski pass. Implement toll charges at the Twin Tunnels in order to provide demand management in order to achieve a certain safe operating speed and therefore level of travel time reliability and safety by tolling the 650K annual peak time trips. Rationalization - to reduce congestion during the highest demand time weekend mornings and afternoons.
84	Develop selected segments for hard shoulder running at peak times, including eastbound from US-40 to Twin Tunnels Relieve EB congestion from US40 to the Twin Tunnels. Assumes minimal additional pavement to allow peak use on at least a 10 ft shoulder lane for very minor widening at key locations, additional emergency access locations and 4 additional emergency pullouts, shoulder use and VSL signage(18 of each type, plus hard shoulder notification signs every 3000ft), restriping, detection and cctv, increased courtesy patrol and it staff during operations. (Other shoulder widening options might include truck climbing lanes and hard shoulder options at additional locations)	Select segments of hard shoulder in peak times	Additional capacity in peak times to improve travel time. Proves that CDOT is working within the footprint as much as possible in a way that minimizes impact to the environment.	Need to provide additional safety features to offset reduced buffer. Need to provide a plan for emergency access vehicles and need to provide locations for emergency breakdown locations. Any construction that adds to the footprint including bridgework and additional pavement.	Long-Term EA is 18 months. Final design is 6-9 months- maybe 12 with speed harmonization. Construction may take 2 years(Could be coordinated with opening of twin tunnels)	EA costs $1M. Final design $1M. Construction $6-$10M. O and M $250k/yr. ($50K for courtesy patrol/yr and $100K for IT O and M, maintenance truck run $50K, $50k for enforcement) Assumes minimal additional pavement to allow peak use on at least a 10 ft shoulder lane for very minor widening at key locations, additional emergency access locations and 4 additional emergency pullouts (pavement cost $1M), shoulder use and VSL signage ($3M signs), restriping ($300K) , detection and cctv, increased courtesy patrol and it staff during operations.	FHWA - will need an EA for this improvement. Coordination with local agencies. Possibly a PPP to have private sector install equipment and collect revenue.	If we needed to provide a lane behind the pier at 103 - we can cite Chung's experience form other places.	Speed harmonization and increased ATM and the Twin Tunnels project. Potential to have the best results when paired with variable speed limits. Identify additional locations in the corridor where large shoulders could be used for truck climbing/passing lanes and expand queue detection to other locations. Generally, corridor has 38' of pavement 2'/11'/12'/11'/2'. Could be coordinated with speed harmonization to take appropriate advantage of the hard shoulder running. Need to confirm available vertical clearance. Situation at 103 might require placement of a gate or sand barrels to block shoulder during non-operating time. Relieve congestion in the EB direction from US 6 to Twin Tunnels . MOS is from US40 to the Twin Tunnels. Assumes minimal additional pavement to allow peak use on at least a 10 ft shoulder lane for very minor widening at key locations, additional emergency access locations and 4 additional emergency pullouts, shoulder use and VSL signage(30 of each signs - 30 Tweener full color matrix signs and 30 static sings with dynamic messaging), restriping, detection and cctv, increased courtesy patrol and it staff during operations. (Other shoulder widening options might include truck climbing lanes and hard shoulder options at additional locations) Comment - Assume 2 people at $100K each for everything
85	Initiate a Transportation Management Organization (TMO) to develop TDM, education, and outreach Take on education, "following too closely" and staffing recommendations. Could take on a larger role in the corridor. This would be an independent group from CDOT with a clearly defined role to advocate mobility. Many of the ideas generated could be addressed by the TMO. They would be advisory only. Community groups, Chambers of Commerce, Cities/Towns, Counties, employers, etc. Would have staff that could advise how to run a campaign to enhance mobility. Incentive based.	Initiate a TMO that can develop TDM, education and outreach	A TMO can involve the business community (ski community and mountain retail?) as well as CDOT and other government stakeholders. It can be its won entity with a public face and clear mission. It can provide a forum to implement many of the ideas that our groups are working on.	Needs a sustained revenue source - $200-$400K per year. It can help corridor demand and evaluate programs. It complicates the politics of the corridor with a mission overlapping CDOT and I-70 Coalition goals as well as perception of limiting access to the corridor business. Good idea but limited focus.	Short-term 1-year: Need funding commitment from some initial partners, development of a charter, identification of a champion, and a list of initial stakeholders	$200-$400k to begin with a staff of 2 and provide initial advertising budget.	Initial sponsorship by CDOT and I-70 Coalition. Ongoing coordination with DRCOG, CDOT, and local communities	US 36 Commuting Solutions. Non-commuter focus gives this TMO a different type of trip and participant. Fitzsimmons, 36 Commuting Solutions,	Helps outreach to the truckers and all other traveler information and education campaigns, enforcement strategies. Its an Umbrella. TMOs work to successfully coordinate transportation efforts of various stakeholders including: employers, developers, residents and government agencies. Additionally, communities that have growth restrictions or trip reduction ordinances have found TMOs to be economically efficient in promoting alternative modes and for complying with ordinances. The goal of the TMO is to improve access to employment and retail centers while reducing traffic congestion and its resulting pollution. Take on education, "following too closely" and staffing recommendations
86	Implement queue detection and warning at specific locations	Queue detection/warning locations	Lower cost and increased safety benefit. Can be integrated into many of the other ideas to achieve.		Short-term	Low	CDOT		
	Deferred to Slow Moving	*Affects of Hazmat timing Tunnel vs. US6*							
	Deferred to Slow Moving	*Trucker notification re: chain station location to keep them moving to those site to change*							*Develop communication system/technology to provide truckers real time information about chain area locations to reduce truckers chaining on shoulders*

ATM/TDM

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
87	Utilize frontage roads and hard shoulders to move additional traffic including "reversible frontage roads" Begin the shoulder lane from Eisenhower to Floyd Hill - Shortest implementation phase 1 is from Empire to Twin Tunnels	Use additional pavement to move more traffic-shoulders, reversible, frontage	9 miles of additional capacity in peak periods	Need shoulder widening and structure modifications (103/exit 240)	Mid-term Planning - 1 yr, Final design - 1 yr - and time implementation to open with tunnel widening	Medium cost $3M	All	Virginia I-66 (Siracusa examples)	
88	Coordinate with resorts to encourage alternate travel times tied to 34, incentivize "secret pass" programs for bus or HOV travelers or people that arrive earlier or later	Resort coordination to encourage alternative travel times			Short-term				
	Deferred to Enforcement	*Distracted driving concerns regarding Lane Violations*							
89	Utilize "predictive traveler information" High local traffic does not allow much route choice	Providing expanded information outreach to facilitate route choice "predictive traveler information"; management of state as a system	Traveler assurance if sign location can allow prediction of I-70 vs. Loveland vs. 285 choices	Limited alternate routes, are there liabilities with sending travelers to congested or less safe route?	Short-term (Immediate)				
90	Offer driver training program for I-70 conditions to inexperienced drivers Could the information about winter driving be given out with ski passes - and with successfully passing a test you get an incentive freebie. Potential to do a short movie to encourage safer driving. Possibly target inexperienced drivers, visitors, SUV drivers	Driver training regarding I-70 conditions for inexperienced drivers	Low - but helps brand CDOT and flexible to deliver information about different programs.	Best addresses winter problems and is difficult to implement	Short-term (Immediate)	Not too expensive.	Stacey / Governors role / PSA	LA Metro style campaign	Would work well with announcement of another new element on the corridor. Could the rental car community have a CD, or a DVD to play on a screen
91	Allow other uses on "express lanes" for alternative transportation modes	Other uses on "express lanes" to encourage alternative mode uses			Mid-term				
92	Institute emergency response uses on hard shoulders already happens	Emergency response uses on hard shoulders			Short-term				
87	Utilize frontage roads and hard shoulders to move additional traffic including "reversible frontage roads" not applicable Same as idea ID 10	Reversible time on hard shoulder lane			Mid-term				
93	Establish high occupancy toll (HOT) lanes on hardened shoulders not effective as HOV, but maybe toll	HOT lanes on hardened shoulders	HOV useful if the load if 4 or 6 plus		Mid-term				
94	Implement congestion pricing at tunnels Dynamic tolling at either Twin Tunnel (would be fairer) or Eisenhower Tunnel to control and divert demand	Congestion pricing at tunnels	Directly influences travel time choices. Available technology, fiber is available.	rerouting of some traffic, frontage road enforcement	Mid-term	Ongoing O and M and administration costs. $500K for equipment and installation - just license plate tolling. Environmental cost could be cleared through the Twin Tunnels	Requires coordination with federal agencies to consider tolling on tunnels and bridges		Leverage existing toll tags
95	Use variable message signs (VMS) to encourage good driving Provide VMS and fixed signs to link to websites for driver training..."stuck in a queue, learn to drive"	Use VMS to encourage good driving			Short-term (Immediate)				
96	Institute quick response and quick clearance for all incidents ATM/TDM aspects are limited and reactive based on the needs of the maintenance and operations programs	Quick response/quick clearance for all incidents (accident & Hazmat)			Short-term				
97	Expand "Casino Model" for customer travel programs Limited to applications of ski train or p-n-r bus operations	Model of Casino customer travel programs	Identified programs could be implemented by a TMO		Short-term				
98	Provide safety information at visitor centers and rental car companies Brief version of the key safety measures - possibly also for rental car locations	Information provided at Welcome Centers, and coordinate with local visitor centers			Short-term				

ATM/TDM

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99	Hire private firm to provide "Icy Falcon" pilot services Regular drivers of the corridor can get incentives operating as a pace car (who get incentives) to travel within reasonable speeds on the corridor. Could be coupled with a PR campaign.	Private firm escorts for "Icy Falcon" AKA "operation snow turtle"			Short-term (Immediate)	60K per vehicle			
100	Apply tech tools to reduce incident clearance times In-barrier detection to allow quick location and to relay automatic information on nearby VMS signage. Photo reconstruction tools can help reduce time on location and facilitate quicker clearance. State Patrol may benefit.	Apply tech tools to reduce incident clearance time			Short-term				
101	Publicize and market information on fines and statutes Integrate into other marketing efforts	Market statutes + fines to improve compliance	Identified programs could be implemented by a TMO		Short-term (Immediate)				Coordinate with enforcement
	Deferred to Slow Moving	*Clarify messaging a bout chain laws to truckers (timing, vehicle type, location) or change to "1 level" chain law*							
102	Provide dedicated I-70 staff along corridor Review of the staffing structure based on the amount of resources (CDOT and consultant) that are currently allocated to the facility. recommendations - especially for weekend	Dedicated I-70 staff	The amount of fiber and equipment in the corridor require additional ITS, maintenance support. Jim is the start	Cost of living and existing lifestyle challenges may make it hard to add people to an on-site regional facility	Short-term		Public private sector partnership	Boston Big Dig coordination	Potential for an integrated system with CSP, IT, Maintenance people
103	Develop hard shoulders from US6 east for at least one mile	Hard shoulders from US6 east for at least a mile or two		Only if enforcement and infrastructure concerns are thoroughly vetted and addressed with money and resources (Safety)	Short-term				
104	Provide tools/programs to address "following too closely" driver behavior Integrate into other marketing efforts or provide some chevrons with a signing package to remind people to leave a gap	Tools to address following "too close" issue	Could this be automated to ticket tailgaters with photo radar.	striping may be maintenance issue, could be done with roadside signs	Short-term (Immediate)	very low	CDOT / DMV inform action book	UK chevron application, Federal Trucking "no zone" campaign, LTAP program, rollout of HCM decade of safety	Maintenance, enforcement
105	Consider highly managed "UK Model" for operating on hardened shoulders	Lots of UK applications of ATM - hard shoulder running for general purpose			Mid-term				
106	Enhance park and rides with bus service to major destinations Bus service would have to be local /private service and CDOT could provide parking	Park and ride enhancements with bus service to major destination	If a private company would use the hogback lot - at their cost - then the private sector would provide the service	Winter season only, and limited audience	Short-term		TMO		
107	Offer vehicles at mountain destinations such as rental or shuttle cars Shared vehicles at the resort.	Vehicles available at mtn. destinations - rental or shuttle cars		Limited audience	Short-term				
	Deferred to Slow Moving	*Restrictions for trucks in certain weather - restrictions for passenger vehicles*							
108	Manage closures/restrictions and conveying traveler information more effectively Location of signage to notify people of conditions is critical to capture travelers before they get on the interstate	Information management of what people should do when CDOT has closures / restrictions			Short-term				
109	Develop programs that punish bad and reward good behavior non-specific	Programs that punish bad and reward good behavior	Identified programs could be implemented by a TMO		Short-term				
110	Support P3s for the creation of destinations where travelers would be willing to wait out peak traffic Could this be done in a way that does not create an additional trip attraction? Could this be done at CDOT facilities - maintenance facilities? Chain stations? Scenic overlooks?	Is there a place for PPP destinations for travelers to wait out traffic	Possible if coordinated with existing businesses through coupons at certain locations	Too expensive to create a new place	Long term		The market has not provided this already - why isn't it done already?		

ATM/TDM

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
111	Convey to public costs and benefits of avoiding peak hour travel Providing information about travel time and costs for gas, etc, (maybe this could rely on new IBM trip predicting software)	Convey costs and benefits of avoiding peak hour problems	Provides ski lift type sign to provide predicted travel time route by route and/or different departure signs		Short-term		TMO messaging		
112	Develop applications of Disney ride "fast cut" concept Program that allows people to reserve space in the corridor. Potential to use as part of a controlled lane - possible combination with hard shoulder running - or an HOV bypass on the ramp.	Applications of Disney ride fast cut concept	Secret skier concept allows us to spread out the	Hard to implement	Short-term		Coordination with ski resorts		
113	Convert hard shoulders to full time or peak time running lanes	Option to convert hard shoulders to full time general purpose lane		Need to avoid conflicts with PEIS	Long term				
114	Utilize rubberneck blinder, which could be funded privately	Rubberneck blinder - which could be privately funded	limited benefit, and challenging implementability		Short-term				
115	Develop partnership to create ski pass programs that limit dates or times	Ski pass programs that limit dates or times		Not implementable	Short-term				
95	Implement congestion pricing at tunnels repeat - see idea id 19	Congestion pricing at tunnels			Mid term				
116	Focus restrictions on westbound (WB) travel to maximize economic benefit	Focus restrictions on WB travel so we can get the full economic benefit		politically infeasible	Long term				
117	Establish integrated I-70 ATM program with frontage roads/adjacent local roads Use ATM to discourage local road use with signal coordination	Integrated ATM for I-70 with frontage road and adjacent local roads	Potential in Summit County to use the traffic signal at interchanges as ramp meters		Mid term			I-95 example to deter detour traffic	
118	Partner toward community restrictions on trucking and shipping patterns Work with state or local governments to establish regulations to shift truck travel time	Community restrictions impact on trucking and shipping patterns			Short-term				
119	Partner toward programs to package resort visits Combine with resort coordination strategies	Programs to package resort visits			Short-term				
	transferred	*Understand the value of app*							
	transferred	*Connected vehicle technologies*							
	transferred	*Meridian DSS program to forecast weather*							
120	Enhance partnerships with rental car community Potential to use Park n Ride locations to couple with transit service and allow car use (ex on US40)	Rental car community partnerships		Very small audience	Short-term				
121	Consider active lane management and additional ATM (UK Model) Good example to follow eventually	UK lane management allows high level of control		Potential aesthetic negative effect	Mid term	High cost and infrastructure investment			
122	Utilize dummy cameras/perceived enforcement With or without variable speed limits, we could expand the current law to establish a program to enforce speeds with photo radar and install cameras.	Dummy cameras/ perceived enforcement	Even if not all of them are functional, there will be better compliance through perceived enforcement.		Short-term				
95	Implement congestion pricing at tunnels repeat - see idea id 19	Roadway Pricing			Mid term				
123	Change/improve the "safety culture" of the corridor umbrella strategy	Change the safety culture of the corridor			Long term				
124	Develop program to coordinate ride with guaranteed return trip CDOT provides a place to help arrange a place to carpool - coordination with Ride Arrangers to provide arrange carpools	Program to coordinate rides and guarantee a return trip for ski "slugs"	Low		Short-term (Immediate)				

ATM/TDM

Report ID	Report idea title Brief description	Workshop idea title	Benefits	Drawbacks	Time to deliver	Costs	Lead agencies	Applied best practices	Notes and synergies with other ideas
125	Enhance ongoing communication with communities over project goals and benefits	Need to make sure project benefits are communicated back to the communities			Short-term (Immediate)				
126	Develop truck climbing/descending lanes Provide up Georgetown Hill, Dumont port of entry station. For SMV and trucks. Need to identify a length that is long enough for tucks to merge back into traffic. Minimum of 1 mile requirement.	Truck climbing/descending lanes	More beneficial in dry road and summer conditions I if the facility is at 1 mile bare minimum	Need to clarify that the shoulders are structurally sound. Merge locations are challenging. Steep grades uphill/downhill usually needed for emergency vehicles and vehicle breakdowns.	Mid term				
127	Develop Bus queue hop At the 4 EB direction meters	Bus queue hop		Not enough buses to determine	Short-term				
128	Establish speed harmonization with variable speed limit signs Possibly look at Eisenhower / US6 interchange and Twin Tunnels and US40 and other potential locations	Install speed harmonization with variable speed limit signs	Need to make sure there is enough benefit of this project to make sure it is seen as successful		Mid term	Need VSL signs, speed detection equipment, prediction model, supplemental message boards, PR campaign, enforcement > $5 mill	CDOT		
129	Initiate phase 1 of speed harmonization	Phase 1 approach of speed harmonization			Short-term				
130	Institute Bakerville to Silver Plume Pilot Project	Bakerville to Silver Plume Pilot Project			Short-term				
131	Establish employee flex schedules to allow midweek recreation travel	Employee flex schedules to allow midweek recreation travel			Short-term				
132	Expand TMO functions	TMO functions			Short-term				
86	Implement queue detection and warning at specific locations See idea id 6 for specifics	Queue detection/warning locations			Short-term				
133	Initiate junction control at major intersections	Junction control at major intersections			Short-term				
134	Initiate pre-emptive closures to conduct speed maintenance operations Expand upon the programs identified in Summit County incident management plan	Pre-emptive closures to do speed maintenance operations			Short-term (Immediate)				Coordinate with maintenance/operations
135	Initiate pre-emptive closures to avoid incidents Expand upon the programs identified in Summit County incident management plan	Pre-emptive closures to avoid incidents			Short-term (Immediate)				Coordinate with maintenance/operations
136	Institute variable speed limits	Variable Speed Limits			Short-term				
137	Develop a bar code that prohibits text message transmittals in automobiles Barcode on the inside of cars that prohibits texts being received with a message back to texter that recipient is driving.	Barcode that prohibits Texting.			Long-term				
138	Initiate voluntary car inspections Similar to fire department child seat safety inspection. With potential to sell related items (snow tires).	Voluntary Car Inspection			Short-term (Immediate)				
139	Support P3s to create full service truck stops at strategic locations on the corridor Need to identify the economic incentive. Year around stop. Study indicates that corridor is several hundred spaces short.	PPP Full service Truck Stop	CDOT study shows that extreme areas are best suited. Truck Parking is being developed in Bennett	Economics don't work which is why there is not one existing in the corridor today, thus PPP would be required. NIMBY factor to be considered. Clear Creek County not interested. Not low cost/no cost	Long term				
106	Consider highly managed "UK Model" for operating on hardened shoulders See idea id 31	UK model for hard shoulder running			Mid term				
140	Utilize cameras and "dummy cameras" to support enforcement	Cameras / dummy cameras			Short-term (Immediate)				
141	Manage the volume of vehicles moving onto the corridor	Managing the volume of vehicles moving on the corridor			Short-term				
142	Add emergency refuge areas off hard shoulders CDOT needs to determine how regularly these refuge points should be available	Add emergency refuge areas off hard shoulders			Short-term				

APPENDIX D – INVITEES

I-70 Mountain Corridor Mobility and Operational Assessment
Invitees

Last Name	First Name	Organization	23-May	24-May	25-May	26-May	27-May
Aldrete	Laura	PB	x	x	x	x	x
Allery	Bryan	CDOT	x	x			
Ballah	Art	CMCA	x	x	x	x	x
Baziar	Medhi	CDOT					
Bemelen	Jim	CDOT	x	x	x	x	
Boswell	Alastair	Mouchel	x	x	x	x	x
Bowes	Margaret	I-70 Coalition					
Brown	Allan	Atkins	x	x	x	x	x
Buntrock	Tim	Baker	x	x	x	x	x
Cheroutes	Michael	CDOT					
Coltharp	Bruce	CDOT	x	x			x
Cooley	Steve	Mouchel	x	x	x	x	x
Costa	Pedro	Northwest Parkway		x		x	x
Crane	Mindy	CDOT					
Cutting	Shaun	FHWA	x				
Daugherty	Tom	Breckenridge	x				
Day	Kevin	Headwaters Content	x	x	x	x	x
DeLong	Mike	CDOT	x	x	x		x
DePinto	Ken	CDOT	x	x	x	x	x
DeVito	Anthony	CDOT	x				x
Drumm	Angie	CDOT	x				
Dull	Bernie	Solutions Engineering					
Eller	David	CDOT					
Etler	Kathy	Grand County					
Floyd	Mary Keith	Baker	x	x	x	x	x
Fulton	Greg	CMCA	x	x			x
Gagen	Tim	Breckenridge					
Gill	Mike	Stantec	x	x	x	x	x
Greene	Eric	The Greenhouse Strategy	x	x	x	x	x
Guevara	Bernie	CDOT	x	x		x	x
Hattan	David	FHU	x	x	x	x	x
Hirsch	Art	Terralogic	x				
Hollenbeck	Todd	Mesa Co.					
Janson	Bruce	UC Denver	x				x
Jensen	Randy	FHWA	x				
Jones	Gloria	CDOT					
Keefe	Tamara	Baker					
Kononov	Jake	CDOT	x	x			
Kozinski	Peter	CDOT	x	x	x		x
Krueger	Don	Clear Creek Sheriff	x				
Livecchi	Leo	CDOT					
Lone	C.A.	Winter Park	x				
Longsdorf	Jason	PB	x	x	x	x	x
Lovlie	Mary Jane	Idaho Springs					
Lupton	Wayne	EnviroTech	x	x	x	x	x
Lynch	Zeke	CH2M Hill	x	x	x	x	x
Macy	Bill	Idaho Springs	x	x	x		
Marsh	Paul	Mouchel	x	x	x	x	x
Martinez	Al	CDOT	x		x		x
McGuire	Brendan	Vail Resorts					
McKinnon	Greg	DRCOG	x				
Mead	Rod	CDOT		x	x	x	x
Melcher	Bert	Sierra Club					
Millar	David	Fehr & Peers	x		x	x	x

I-70 Mountain Corridor Mobility and Operational Assessment
Invitees

Last Name	First Name	Organization	23-May	24-May	25-May	26-May	27-May
Morgan	Jack	Idaho Springs	x	x			
Muscatell	John	URS	x	x	x	x	x
Neely	Cindy	Georgetown					
Nelson	John	CDOT	x	x	x		
Nelson	Melissa	CDOT					
Noll	Thad	Summit Co.					
Olson	Cindy	Idaho Springs	x				
Omalley	Kevin	Clear Creek County					x
Pavlick	Monica	FHWA				x	x
Penny	Michael	Frisco	x	x			
Pitkin	Jim	CDOT	x	x	x		x
Prater	Ron	CSP	x	x	x	x	x
Primus	Chris	Jacobs	x	x	x	x	x
Reeves	David	CDOT		x			
Roberts	Clark	CDOT	x	x		x	x
Rossill	Jennie	Jefferson County		x			
Rudy	Steve	DRCOG					
Salamon	Mike	CDOT	x	x	x	x	x
Sarchet	Rich	CDOT	x				
Schulz	Fred	Stantec	x	x	x		x
Siracusa	Craig	CDOT		x			
Smith	Ron	CDOT	x	x		x	x
Smith	Tammie	CDOT		x			
Snyder	Jodie	Baker		x	x	x	x
Sobhi	Saeed	CDOT	x	x	x	x	x
Sorensen	JoAnn	Clear Creek County	x				x
Sprague	David	Atkins	x	x	x	x	x
Stavish	Darin	CDOT		x			x
Stegman	Stacey	CDOT	x	x			x
Stolz	Elizabeth	CDOT		x			
Swaim	Jeff	MOOV	x	x	x	x	x
Swenka	David	CDOT	x				
Tatkenhorst	Jeff	CDOT	x		x		
Tran	Chung	FHWA	x	x	x		x
Urban	Melinda	FHWA	x		x		
Wallach	Wendy	CDOT					
White	Rebecca	CDOT					
Wickman	Tom	Frisco	x				
Williams	John	CDOT	x				
Wilson	Eva	Eagle County					
Znamenacek	Zane	CDOT					
Richrath	Scott	CDOT					x
Totals			**61**	**49**	**37**	**32**	**46**

APPENDIX E – PREVIOUS AND CURRENT CDOT INITIATIVES TO IMPROVE I-70 MOBILITY

The following lists summarize initiatives and programs CDOT has undertaken in the last decade to improve mobility and operations on the I-70 West Corridor (Denver to Vail).

Slow Moving Vehicles/Truck Traffic and Enforcement

1) **Chain stations** – Spent $10 million to add and improve chain stations, including the addition of 7 new chain stations. Includes an additional 137 truck parking spaces (52 eastbound/85 westbound) to the existing 185 spaces, providing a safer environment for chain installation or removal. Also added lighting to stations, which provides needed visibility when the chain law is in effect at night or during other low visibility periods.

2) **CB Wizard** – Initiated the use of CB Wizard which is a radio broadcast device that transmits pre-recorded or on-site messages to inform truck drivers of available truck parking at chain stations and other pertinent truck related issues within two miles of their location. More devices will be deployed pending feedback from truck drivers.

3) **Truck/shipper delivery management** – Collaborating with Colorado Motor Carriers Association (CMCA) and businesses to streamline truck deliveries within mountain communities.

4) **Hot brakes** – Monitoring research on infrared technology to detect defective truck brakes. At this time, technology cannot handle higher speeds travelled on I-70.

5) **Chain assistance program** – Developed public-private partnership to provide chain assistance. Along the corridor, chains are sold and installed for a fee when needed. This winter service benefits truck drivers unfamiliar with mountain driving and overall I-70 mobility. This service is provided between Dotsero and Denver West Boulevard and is performed at no cost to CDOT as truck drivers pay for the service. During one winter season, this program sold a total of 252 chains and installed chains on 445 trucks.

6) **Autosock™** – Reviewed, evaluated, and recommended approval of fabric traction device that slips over a vehicle's outer driving wheels. It provides extra traction on snowy and icy roads. In 2008, Autosock was approved for use in Colorado. This option is easier and faster to install than steel chains (with an installation time of 30 minutes). Truck drivers are permitted to carry Autosock instead of chains during the I-70 winter chain law period between Dotsero and C-470.

7) **Truck parking lots** – Constructed the Dotsero truck parking lot, which accommodates up to 60 semi-trucks. The Department is also working with Bennett Truck Stop to provide holding areas for truck drivers awaiting improved weather conditions. By allowing truckers to await road re-opening in a lot instead of along the shoulder, CDOT can plow the highway more safely and effectively and reopen it more quickly. The Dotsero Truck Parking Lot has alleviated congestion along Vail Pass during snow storms.

8) **Truck parking management** – Improved commercial truck parking management and communications during inclement weather at four locations along I-70. Includes installing various truck parking management components such as electronic signs, closed-circuit cameras, and power and communications systems. The additional components will help direct commercial drivers to the nearest chain station, which ultimately provides a safer environment for those chaining up or chaining down and for the rest of the traveling public.

9) **Truck maps** – Created and distributed more 10,000 copies of Colorado Truck Parking maps. These maps highlight specific parking locations, which is critical information for route planning.

10) **Left lane restriction for trucks** – Implemented on all uphill grades greater than 6 percent per recent legislation (SB 10-173). The Region installed signs along the corridor restricting trucks over 26,000 pounds from being on the left lane when ascending grades over 6 percent.

11) **CMCA coordination** – Holds meetings with CMCA and other I-70 stakeholders to collaborate over mobility and operational matters. These meetings were expanded from monthly meetings during the winter season to monthly meetings year-round. The goal of CDOT's collaboration with CMCA is to disseminate important information and updates about the I-70 corridor and to coordinate over concerns and suggestions from both the trucking industry, CDOT, and other corridor stakeholders.

12) **Heavy tow program** – Implemented a successful quick lane clearance program designed to assist truck drivers with traction problems that cause lane blockages. Has reduced historical lane closures by approximately 50 percent. Prior to the program, tow assist and eventual lane clearance would take 52 minutes because tow units had to originate from their shops. With the quick clearance program, 3 heavy tow units are strategically located at frequent incident occurrence sites. The wreckers can be quickly dispatched to move commercial vehicles from traffic lanes to a safe location during weekends, holidays and other adverse weather days. The operations protocol has been refined over the last 4 years and has reduced lane clearance time down to 24 minutes. CDOT's program cost is $500,000, but the total savings equates to over $15 million per season.

13) **Reversible lane** – SB 10-184 mandated CDOT to examine feasibility of implementing reversible lane on I-70. Following investigation, CDOT recommended the benefit/cost ratio of this alternative is not acceptable.

14) **Accident photogrammetry and enforcement** – Exploring the use current technology to speed up accident investigation for the purpose of accelerating highway openings after an accident.

15) **Expanded use of local enforcement** – Overtime contracts opened and offered to local police and sheriff departments to assist CSP during winter enforcements.

Maintenance and Operations

1) **Icy Falcon** – Implementing snow plowing operations performed intermittently to prepare the highway ahead of traffic by stopping traffic for a short period of time. Further enhancement of this operation (manual speed harmonization) is currently under development for implementation.

2) **Incident Command Center** – Created at the Eisenhower Johnson Memorial Tunnel (EJMT) to coordinate all major incidents with all stakeholders.

3) **Incident management plan** – Worked with local agencies to develop an incident management plan for improved response, clearance, and communications in Eagle, Summit, Clear Creek, and Jefferson Counties. All agencies are now working at an unprecedented level of service in responding to incidents on the I-70 mountain corridor, which has resulted in reduced closure frequencies and durations and improved safety. Implementation of these plans include:

a) Annual Incident Exercise performed by Clear Creek, Summit, and Eagle Counties.

b) Monthly I-70 Coordination meetings with all stakeholders (CDOT, counties, enforcement agencies, emergency response entities, CMCA, etc.) to discuss pertinent I-70 operations and maintenance issues.

4) **Resource sharing** – Developed partnerships between CDOT patrols and/or Regions to share maintenance resources (manpower and equipment) with I-70 West Corridor.

5) **Tunnel lighting** – Completed the installation of new tunnel lighting in 2000 and 2005 at the EJMT. These projects greatly improved tunnel luminance and helped mitigate the "black hole" effect, which causes motorists to be apprehensive and slow down as they approach a tunnel.

6) **Variable message sign (VMS) boards** – Installed new VMS boards in 2005 and 2008 that are much narrower than the original boards. These new signs prompted rule changes that raise height clearances for commercial vehicles and have prevented hundreds of over-height vehicle stoppages each year.

7) **Improved parking** – Constructed a new and improved Hogback Parking Facility at I-70 and Morrison Road, which tripled parking capacity for commuters and recreational users that utilize the lots for car pooling and transit access. The Wooly Mammoth lot includes 918 new parking spaces. The Hogback Parking Facility now has 1181 parking spaces, which includes 15 spots designated for Jefferson County Open Space users.

Active Traffic Management & Travel Demand Management

1) **Smart phone (app) discount program** – Currently working with University of Arizona to develop a discount program whereby motorists can gain "rewards" for not being on I-70 West during peak travel times.

2) **Ski bus** – Explored offering a Ski Bus to Copper Mountain during 2006. This option lost popularity because of perceived high bus fare costs and because of rider interest in creating "party bus" atmosphere.

3) **Active traffic management (ATM)** – Introduced the concept of ATM for I-70 in 2006. The Department installed the first variable speed limit signs in 2009 as part of its chain law enforcement program. For both fiscal years 2012 and 2013, $5 million dollars are budgeted (from FASTER funds) for expanding implementation of ATM on I-70 West. These projects may be delayed because of stakeholder concerns from the CSS process.

4) **Queue detection systems** – Installed a warning system last year on Georgetown Hill (eastbound) to detect and warn approaching traffic of any developing congestion from Georgetown westward.

5) **Hard shoulder running** – Introduced by the Region for use on I-70 West in early 2010 as temporary congestion relief. The concept is currently being implemented in many States and countries to open shoulders for traffic use during congestion.

6) **Courtesy Patrol** – Provides drivers of passenger and other smaller vehicles free roadside assistance for services such as flat tires, fuel or water transfer, jump starts, short-distance towing, accident scene protection and minor mechanical assistance. Three trucks patrol I-70 between the top of Floyd Hill and Silverthorne looking for disabled vehicles. This program is offered primarily on weekends and holidays during the winter and summer months. The annual cost to CDOT is approximately $300,000. Over 1100 cars were assisted last season.

Traveler Information

1) **Fiber optics and intelligent transportation system (ITS) devices** – Invested approximately $11 million toward installing 90 miles of fiber optics along I-70 West between Officer's Gulch and the Town of Vail. This resource has enabled CDOT to quickly deploy traffic messages, obtain visual access via closed circuit television, and conduct critical communications. Compared with cell phone technology (which was used previously), fiber optics offer instantaneous communication with needed devices. To reduce CDOT's construction cost and further leverage the project, CDOT partnered with:

(a) Xcel Energy, who installed electric power lines from Officer's Gulch to Vail Pass to upgrade and provide reliable service in the area.

(b) Town of Vail, who installed fiber optic cable from Vail Pass to Town to provide interconnectivity to the ITS network.

2) **VMSs, cameras, speed radars, and remote weather information systems** – Continually installing these electronic devices and systems to provide flexible traffic messaging, visual detection, and traffic and weather data on I-70.

3) **511** – Manages phone-based public information system through the CTMC. 511 has been expanded for capacity and is a reliable and current source of feedback for travelers who call into the service.

4) **CoTrip.Org** – Manages internet website that provides updated traveler information.

5) **Travel time** – Implemented real-time trip-travel times displayed on overhead VMSs to provide travel time information along the corridor. Provides the public reasonable accuracy in predicting total travel time from point A to B. This system has been in operation for 5 years and is continually being enhanced by the CTMC.

6) VPN – Provides direct internet link to various government agencies (police, CSP, emergency management services, etc.) and business establishments (resort hotels, ski kiosks, restaurants, etc.) with streaming data from Cotrip.org to inform viewers of travel times, weather conditions, traffic congestion, etc.

APPENDIX F – SUCCESSFUL SEASON FOR I-70 WEST PROGRAMS

Source: http://www.coloradodot.info/news/2011news/06-2011/successful-season-for-i-70-west-winter-programs

Successful Season for I-70 West Winter Programs

June 8, 2011 - Heavy Tow Quick Clearance, Chain Assistance and Courtesy Patrol aided Travelers - DENVER – The Colorado Department of Transportation's (CDOT) wintertime programs continued to reduce traffic congestion and delays along the Interstate 70 West corridor last winter.

Quick Clearance is a program that provides standby heavy wreckers at strategic locations along I-70, between Floyd Hill and Vail Pass, allowing stalled and spun-out commercial vehicles to be moved quickly from traffic lanes to a safe location. CDOT contracted with USAC/Drive America to provide the service.

The 2010-2011 program began Thanksgiving weekend and ended in late April. It included all weekends and holidays and two other separate occasions – one severe storm and when I-70 was closed during the day for rock removal at Georgetown Hill in early April. Overall:

- 193 commercial vehicles relocated
- 214 lanes cleared
- Average clearance time – ***reduced to 22 minutes***

"We're very pleased that the clearance times for Heavy Tow continue to go down each year," says CDOT Regional Transportation Director Tony DeVito. "It's been a major success at reducing lane closures and the delay times on I-70 which, in turn, enhances highway safety for all users."

The average clearance time before implementation of the Quick Clearance program was approximately 50 minutes. It averaged 27 minutes during the program's first season, in late 2008; 23 minutes during the 2009/2010 season.

CDOT also put its Chain Assistance program into service for a third straight year. By law, commercial vehicles are required to carry chains for travel on I-70 between Dotsero and the Morrison exit from September 1 through May 31. To help truckers comply when the chain law is in effect, drivers can ***purchase*** chains and chain-up service from approved vendors when they are present at any one of the 21 chain stations along I-70.

During the 2010/2011 winter season, three companies sold 252 sets of chains and installed 445.

"When we look at the number of closures we experienced on the corridor, it's gone down significantly from 2007-2008 – the season before we put Heavy Tow and Chain Assistance into operation," added DeVito. "These programs have directly addressed those non-accident problems, such as having no chains and vehicle break downs."*

The Courtesy Patrol provided drivers of passenger and other smaller vehicles with free roadside assistance for services such as flat tires, fuel or water transfer, jump starts, short-distance towing, accident scene protection and minor mechanical assistance. Three trucks patrolled I-70 between the top of Floyd Hill and Silverthorne on weekends and holidays, from Thanksgiving to the end of March. During the 2010-2011 winter season, the Courtesy Patrol assisted 766 vehicles.

"All of these programs have been effective at reducing congestion and delay times on the I-70 Corridor," said DeVito. "I-70 can lose about 50% of its capacity when just one lane is closed, and 65% when two lanes are blocked, which can cost thousands of dollars in lost revenue and hours of travel delays. Providing these services allows us to get traffic moving again in a timely manner, providing benefits for trade, tourism and recreation that far outweigh the cost, which is just over $695,000 a year."

Studies have shown that for every hour the I-70 West Corridor is closed to traffic, it can have an economic impact of up to $800,000, with a majority of those revenues affecting surrounding communities.

***Summary of I-70 Events between Vail Pass and Morrison Road Interchange**

September 1, 2007 to April 30, 2008 (to East Vail)

- Implemented Chain Law: 316
- Total Accidents: 297 (Commercial Vehicles 156/Non-Commercial Vehicles 141)

(including both single & multi-vehicle crashes or property damage only)

- Closures due to adverse weather: 20 (93 hours, 32 minutes)
- Other Closures: 317 (No chains, breakdowns, out of fuel, etc.)

September 1, 2008 to April 30, 2009 (to East Vail)

- Implemented Chain Law: 284
- Total Accidents: 133 (Commercial Vehicles 47/Non-Commercial Vehicles 86)
- Closures due to adverse weather: 25 (69 hours, 17 minutes)
- Other Closures: 134 (No chains, breakdowns, out of fuel, etc.)

September 1, 2009 to April 30, 2010 to

- Implemented Chain Law: 217
- Total Accidents: 63 (Commercial Vehicles 48/Non-Commercial Vehicles 15)
- Closures due to adverse weather: 12 (34 hours, 47 minutes)
- Other Closures: 104 (No chains, breakdowns, out of fuel, etc.)

September 1, 2010 to April 30, 2011

- Implemented Chain Law: 220
- Total Accidents: 159 (Commercial Vehicles 39/Non-Commercial Vehicles 120)
- Closures due to adverse weather: 31 (84 hours, 4 minutes)
- Other Closures: 4 (Sun glare; medical emergency, grass fire, rock mitigation)