2014 Ski Season Key Strategies

• Reduce I-70 bottlenecks
• Improve snow plowing procedures and staffing during peak periods
• Reduce the impact of CMV on traffic flow
• Improve incident clearance procedures
• Spread peak period volume
• Promote passenger vehicle traction devices
• Improve traveler information at ski resorts
### Snowfall Comparisons at Different Locations Near I-70

**Mountain Corridor**

<table>
<thead>
<tr>
<th>Location</th>
<th>2012-2013</th>
<th>2013-2014</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper Mountain</td>
<td>236</td>
<td>347</td>
<td>+47%</td>
</tr>
<tr>
<td>Breckenridge</td>
<td>274</td>
<td>381</td>
<td>+39%</td>
</tr>
<tr>
<td>Keystone</td>
<td>157</td>
<td>264</td>
<td>+68%</td>
</tr>
<tr>
<td>Vail</td>
<td>281</td>
<td>255</td>
<td>-10%</td>
</tr>
</tbody>
</table>

### Last Season Comparison

<table>
<thead>
<tr>
<th>Category</th>
<th>2013-2014</th>
<th>2012-2013</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season Snowfall*</td>
<td>474”</td>
<td>341”</td>
<td>+ 39%</td>
</tr>
<tr>
<td>Snowfall: January - February*</td>
<td>166”</td>
<td>63”</td>
<td>+163%</td>
</tr>
<tr>
<td>Volume at EJMT** (both directions)</td>
<td>5,633,311</td>
<td>5,658,705</td>
<td>- 0.4%</td>
</tr>
<tr>
<td>EJMT Metering</td>
<td>9 times</td>
<td>11 Times</td>
<td>- 18%</td>
</tr>
<tr>
<td>CDOT Courtesy Patrol Relocations</td>
<td>186</td>
<td>82</td>
<td>+ 126%</td>
</tr>
<tr>
<td>Loveland Pass Closures</td>
<td>49/897 hours</td>
<td>20/372 hours</td>
<td>+145%/+ 141%</td>
</tr>
<tr>
<td>Closures MP 180-195</td>
<td>50/78:09</td>
<td>26/89:02</td>
<td>+ 92%/- 12%</td>
</tr>
</tbody>
</table>

*Measured at Loveland Ski Resort
** “EJMT” is Eisenhower-Johnson Memorial Tunnels
I-70 Mountain Corridor Performance

Operational Improvements

US 40 On-Ramp to EB I-70

• Extremely high volumes: 800+ Vehicles per hour at peak
• Catastrophic system failure when incident occurs downstream

Improvements

• Restricted ramp meter timing to give priority to interstate
  • Improved traffic flow on I-70
• CSP peak-hour enforcement at on-ramp
  • Used to hold all ramp traffic in the event of an incident on I-70

Below: Traffic queued on the US 40 on-ramp to EB I-70

US 6 On-Ramp to EB I-70

• 3000’ acceleration lane, 100’ used during peak hour congestion
• Notorious early merge location
• Contributed to back-ups into EJMT

Improvements

• Added 700’ of delineation between acceleration lane and GP lane
  • Reduced early merging by forcing late merging
  • Made ramp meter more effective
  • Reduced EB back-ups to EJMT
• Traffic Control at Loveland Ski Area
  • Prevented back-ups under slide area which prevented queue override of ramp meter
Transportation Demand Management Strategies

• I-70 Coalition partnership with CDOT Mobile App
  o GoI70.com content in CDOT Mobile App
    ➢ 2x more visits to GoI70.com than last year (99,510)
  o Peak Time Deals - Over 100 participating businesses, including restaurants in Winter Park and Empire
  o Businesses reporting good results from offering peak time deals

Transportation Demand Management Strategies

• Traveler Information
  o Push Notifications on CDOT Mobile App
  o Portable Variable Message Signs at Winter Park and Keystone Resorts
  o Continued aggressive messaging of expected/current delays
  o Change Your Peak Time campaign

• Bus-on-Shoulder Test
  o Tested on 10’ or greater segments of shoulder
  o Safely tested with a 55 passenger bus during peak hours
  o Showed travel time savings
Commercial Vehicle Management Strategies

- Worked with industry to reduce eastbound trips on Sundays
- Improved CMV targeted traveler information
- Changed Dotsero truck parking from Emergency only to Sundays and Holiday Mondays to encourage parking during peak hours
- CSP hazmat technician stationed in Summit County
- Dumont Port of Entry inspected for chains on all level 1 inspections
- Expanded CSP chain enforcement team operations and chain law compliance counts

Commercial Vehicle Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>2013-2014</th>
<th>2012-2013</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Vehicle Volume*</td>
<td>24,296</td>
<td>27,012</td>
<td>- 10%</td>
</tr>
<tr>
<td>% of trucks receiving Heavy Tow assistance without chains when chain law in effect</td>
<td>35%</td>
<td>47%</td>
<td>- 26%</td>
</tr>
<tr>
<td>Chain Law Implementation</td>
<td>276 times</td>
<td>168 times</td>
<td>+ 64%</td>
</tr>
<tr>
<td>Chain Law Violation</td>
<td>151 citations</td>
<td>112 citations</td>
<td>+ 35%</td>
</tr>
<tr>
<td>CDOT Heavy Tow Relocations</td>
<td>293</td>
<td>128</td>
<td>+ 129%</td>
</tr>
<tr>
<td>Road Closure due to CMV Involved Accidents</td>
<td>116 hours</td>
<td>90 hours</td>
<td>+ 29%</td>
</tr>
<tr>
<td>Closure due to CMV involved accidents as % of Total Road Closure</td>
<td>57%</td>
<td>68%</td>
<td>- 11%</td>
</tr>
</tbody>
</table>

* Eastbound at Copper Mountain for Saturday and Sunday during the peak period (10AM to 8PM)
Traffic Incident Management

- FHWA Incident Quick Clearance Training
  - Trained over 100 corridor stakeholders in November 2013

- Clearance with Alternative Traction Devices (ATD)
  - Used for Quick Clearance by CDOT Courtesy Patrol on Feb 9th - reduced clearance times by 75%
  - Used by CDOT personnel after Feb 9th
  - Obtained FHWA Waiver to allow commercial sales of chains & ATDs to passenger vehicles by our current chain vendors

- CDOT Courtesy Patrol
  - 186 relocations - 126% increase from previous year

Costs of Maintenance/Operational Programs & Improvements

<table>
<thead>
<tr>
<th>Program/Improvement</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp Metering Enforcement</td>
<td>$15,000</td>
</tr>
<tr>
<td>US 6 Delineator</td>
<td>$121,000</td>
</tr>
<tr>
<td>Overtime costs</td>
<td>$609,000</td>
</tr>
<tr>
<td>I-70 Heavy Tow</td>
<td>$850,000</td>
</tr>
<tr>
<td>I-70 Courtesy Patrol</td>
<td>$600,000</td>
</tr>
<tr>
<td>Chain Law Enforcement</td>
<td>$180,500</td>
</tr>
<tr>
<td>“Change Your Peak” Campaign</td>
<td>$137,000</td>
</tr>
<tr>
<td>Total Costs</td>
<td>$2.51M</td>
</tr>
</tbody>
</table>
I-70 Mountain Corridor Performance

5 Highest Eastbound Delays
Average of the 5 highest delays from all weekends, Holidays and Holiday Mondays

<table>
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<th>Location</th>
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<th>2013-2014</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frisco - C470</td>
<td>130</td>
<td>165</td>
<td>+34%</td>
</tr>
<tr>
<td>EJMT - Georgetown</td>
<td>80</td>
<td>70</td>
<td>-14%</td>
</tr>
<tr>
<td>Georgetown - Idaho Springs</td>
<td>100</td>
<td>84</td>
<td>-16%</td>
</tr>
</tbody>
</table>

Target: 84 minute highest delay for season

I-70 Mountain Corridor Performance

Average Eastbound Delays
Averages of all delays on weekends, Holidays and Holiday Mondays

<table>
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<th>Location</th>
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<th>Change</th>
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</thead>
<tbody>
<tr>
<td>Frisco - C470</td>
<td>13</td>
<td>18</td>
<td>+36%</td>
</tr>
<tr>
<td>EJMT - Georgetown</td>
<td>4</td>
<td>7</td>
<td>+66%</td>
</tr>
<tr>
<td>Georgetown - Idaho Springs</td>
<td>12</td>
<td>7</td>
<td>-40%</td>
</tr>
</tbody>
</table>
Safety Performance Measures

Crash Data Comparison

Fatalities
- 2012-2013: 6
- 2013-2014: 2
- Increase: +17%

Serious Injuries
- 2012-2013: 22
- 2013-2014: 15
- Decrease: -32%

Mobility Performance Measures

Planning Time Index (PTI) Vail to Golden During Sundays Eastbound

- 2012-2013: 1.65
- 2013-2014: 1.9

The planning time index represents how much total time a traveler should allow to ensure on-time arrival.
Factors & Causes

• Loveland Pass Closed - all A-Basin & Keystone traffic must go through Silverthorne
• High eastbound volume
• 10” of snowfall
• Slow eastbound traffic coming out of EJMT caused back-ups into tunnel
• Metering of EJMT implemented to let back-ups clear
• Vehicles stopped for metering on approach to EJMT lost traction

Effects

• 56 spun-out passenger vehicles
• 11 spun-out semis requiring Heavy Tow on approach to EJMT
• 2.16 hour peak delay from Silverthorne to EJMT (reports of 3+ hour delay)
• 2 hour travel time from Keystone to Silverthorne on US 6
• 8 hour hard closure of EB I-70 at Vail
• 3 hour hard closure of EB I-70 at Silverthorne
• 1,741 vehicle-hours of delay
What did we change?

- Top Priority: Minimize metering of EJMT
  - Plow Escorts from Silverthorne to EJMT
    - Led by CDOT snow plows and CSP
    - Used to conduct proactive closures to clear snow/ice and prevent metering at EJMT
    - Reduced speed differential of traffic exiting EJMT
  - Reduced hazmat carriers through EJMT during peak hours when Loveland Pass is closed
  - Metered on ramps to EB I-70 at Silverthorne and Frisco

- Established new operating procedures in six days following February 9th
- Increased management presence on weekends
- Increased communication to locals
- Portable Variable Message Signs at Keystone Resort
- Spin-out quick clearance using Alternative Traction Devices
- Experimented with the “Tow-Plow”
I-70 Mountain Corridor Performance

Improved Real-Time Traffic Management Results

Results

• 67% decrease in vehicle hours of delays
• 32% decrease in closure time
• 87% decrease in PV spin-outs
• 95% decrease in CMV spin-outs
• 45% more EB volume through EJMT

Travel Time
Frisco to Georgetown

Before After

Travel Time (Minutes)

Free-Flow Travel Time

Greatest Success of the Season

The magnitude of the delays on February 9th and the resulting public perception of the unpredictable unreliability of the corridor tested the ability of CDOT to rapidly respond and adapt to a situation with complex operational factors.

CDOT Regions, CDOT HQ, and local partners worked together to change long standing procedures, practices, and culture in order to proactively manage the corridor through Real-Time Traffic Management strategies.

CDOT and its partners met the challenge and prevented further peak travel days from reaching the magnitude of February 9th.

We began to earn back public trust and the trust of our local partners in being able to provide more reliable travel times and safety through our management of the corridor’s operations.

- Well defined Vision, Mission, Goals, and Performance Objectives
- Highway Incident Commander - *Friday-Monday incident patrolling*
- Corridor Operations Manager - *to oversee all operational activities*
- Comprehensive Commercial Vehicle Management
- New metering location for EJMT at MP 207 - *pending FHWA approval*
- More cameras on Vail Pass, approach to EJMT, Speed detection in EJMT
- Ramp meters at Silverthorne, Frisco, Copper Mountain
- Passenger Vehicle Chain legislation - *current law is not practical to enforce*
- Passenger Vehicle Chain/ATD sales waiver from FHWA
- Alternate route planning - Hwy 9 & US 285