

AGENDA
TRANSPORTATION ADVISORY COMMITTEE
Monday, October 22, 2018
1:30 p.m.

1001 17th St.
1st Fl. Aspen Conference Rm.

1. Call to Order
2. Public Comment
3. September 24, 2018 TAC Meeting Summary
(Attachment A)

INFORMATIONAL ITEMS

4. Update on TIP Regional Share project submittals.
(Attachment B) Todd Cottrell
5. Briefing on CDOT I-25 Central PEL (Planning and Environmental Linkages) Study
(Attachment C) Steve Cook – Steve Sherman, CDOT
6. Briefing on 2017 Annual Report on Roadway Traffic Congestion in the Denver Region
(Attachment D) Robert Spotts
7. Briefing on Regional Smart Mobility (Denver, Smart Cities Alliance, CDOT, RTD)
(Attachment E) Ron Papsdorf and multiple presenters

ADMINISTRATIVE ITEMS

8. Member Comment/Other Matters
9. Next Meeting – November 19, 2018
10. Adjournment

Persons in need of auxiliary aids or services, such as interpretation services or assisted listening devices, are asked to contact DRCOG at least 48 hours in advance of the meeting by calling (303) 480-6744.



ATTACHMENT A

MEETING SUMMARY TRANSPORTATION ADVISORY COMMITTEE Monday, September 24, 2018

MEMBERS (OR VOTING ALTERNATES) PRESENT:

| | |
|---------------------------|---|
| Kent Moorman | Adams County-City of Thornton |
| Dave Chambers | Arapahoe County-City of Aurora |
| Megan Davis | Boulder County-City of Louisville |
| George Gerstle | Boulder County |
| Sarah Grant (Alternate) | Broomfield, City and County |
| Gregg Moss | Business |
| Tim Kirby (Alternate) | Colorado Dept. of Transportation, DTD |
| David Krutsinger | Colorado Dept. of Transportation, DTR |
| Jim Eussen (Alternate) | Colorado Dept. of Transportation, Reg 1 |
| David Gaspers | Denver, City and County |
| Ryan Billings (Alternate) | Denver, City and County |
| Ron Papsdorf | Denver Regional Council of Governments |
| John Cotten (Chair) | Douglas County-City of Lone Tree |
| Tom Reiff (Alternate) | Douglas County-Town of Castle Rock |
| Greg Fischer | Freight |
| Debra Baskett | Jefferson County-City of Westminster |
| Steve Durian | Jefferson County |
| Stephen Strohming | Non-MPO Area |
| Dawn Sluder (Alternate) | Non-RTD Transit |
| Michael Silverstein | Regional Air Quality Council |
| Bill Sirois (Alternate) | Regional Transportation District |
| Sylvia Labrucherie | Senior |
| Ted Heyd | TDM/Non-motor |
| Kevin Ash | Weld County-Town of Frederick |

OTHERS PRESENT:

| | |
|-----------------------------|--|
| Mac Callison (Alternate) | Arapahoe County-City of Aurora |
| Phil Greenwald (Alternate) | Boulder County-City of Longmont |
| Kathleen Bracke (Alternate) | Boulder County-City of Boulder |
| Barry Gore (Alternate) | Business |
| Doug Rex (Alternate) | Denver Regional Council of Governments |
| Chris Hudson (Alternate) | Douglas County-Town of Parker |
| Aaron Bustow (Non-voting) | Federal Highway Administration |
| Kristin Kenyon (Non-voting) | Federal Transit Administration |
| Mike Whiteaker (Alternate) | Jefferson County-City of Lakewood |
| Amanda Brimmer (Alternate) | Regional Air Quality Council |

Public: Stephanie Holden, CDOT; JoAnn Mattson, CDOT; Danny Herrmann, CDOT Region 1; Justin Begley, Denver; Jamie Hartig, Douglas County; Josie Ortiz, City of Greenwood Village; Myron Hora, WSP

DRCOG staff: Jacob Riger, Todd Cottrell, Matthew Helfant, Andy Taylor, Beth Doliboa, Emily Lindsey, Mark Northrop, Casey Collins

Call to Order

Chair John Cotten called the meeting to order at 1:30 p.m.

Mike Silverstein, RAQC, was introduced as the new RAQC representative member.

Public Comment

There was no public comment.

Summary of August 27, 2018 meeting

The meeting summary was accepted.

ACTION ITEMS

Discussion on amendments to the 2018-2021 Transportation Improvement Program (TIP).

Todd Cottrell presented seven proposed amendments:

- **2012-116 Region 4 2013 Flood-Related Projects Pool** (Add funding)
- **2012-118 Region 1 2013 Flood-Related Projects Pool** (Add funding)
- **2016-055 I-25: 120th Ave to SH-7 Managed Lanes** (Add funding)

The following amendments provide clarity to the Wadsworth Blvd widening project from 35th Ave to 48th Ave, by moving existing TIP funds from various CDOT TIP projects and funding sources to the existing Wadsworth Blvd project. Of the \$7,200,000 being added to the Wadsworth Blvd project, only \$500,000 is new funding through this amendment.

- **2007-073 Region 1 Hazard Elimination Pool** (Remove funding)
- **2007-075 Region 1 Traffic Signal Pool** (Remove funding)
- **2007-096 Region 1 Surface Treatment Pool** (Remove pool project and funding)
- **2016-020 Wadsworth Blvd Widening: 35th Ave to 48th Ave** (Add funding)

George Gerstle MOVED to recommend to the Regional Transportation Committee the attached amendments to the *2018-2021 Transportation Improvement Program (TIP)*. The motion was seconded and passed unanimously.

Discussion on FAST Act performance targets.

Beth Doliboa presented the proposed infrastructure condition and system performance targets, as federally required by the FAST Act. They include 2-year and 4-year targets for NHS bridges by deck area; pavement infrastructure conditions for the interstate system and non-interstate systems; level of travel time reliability for interstate and non-interstate NHS routes; and truck travel time reliability index for the interstate system.

CDOT coordinated with DRCOG to develop statewide targets. DRCOG staff determined it would not be useful for DRCOG to set separate targets for the Denver region, as there are data and methodology limitations. Staff recommended supporting CDOT's targets for all measures applicable to DRCOG.

Tim Kirby, CDOT, presented an overview of CDOT's statewide targets.

The MPO deadline for submitting targets is November 15, 2018. The mid-year review of the first performance period is anticipated in 2020, when CDOT will have an opportunity to adjust 4-year targets, if necessary. 2022 is the end of first performance period, when CDOT will submit the final performance report, and significant progress determination will be made by FHWA.

George Gerstle MOVED to recommend to the Regional Transportation Committee the proposed targets for infrastructure condition and system performance targets as part of the performance-based planning requirements of the *Fixing America's Surface Transportation (FAST)* Act. The motion was seconded and passed unanimously.

Discussion on eligibility and evaluation criteria for the FY 2018 and FY 2019 Station Area Master Plan/Urban Center (STAMP/UC) set-aside.

Andy Taylor presented eligibility and evaluation criteria for use in selecting projects in the upcoming FY 2018 and FY 2019 STAMP/UC call for projects. The total set-aside funding amount available for fiscal years 2018 and 2019 is \$1.4 million (\$1.2 million in FY 2018-FY 2019 plus a \$200,000 rollover from FY 2016- FY 2017).

Mr. Taylor noted the proposed criteria are very similar to previous Board-adopted versions that set eligibility and help guide evaluation and selection of proposed studies. The most significant proposed revisions to the previous STAMP/UC criteria are due to anticipated changes to program and contract administration (moving from RTD to CDOT); and a requirement for DRCOG staff to be involved as a member of the project management team or equivalent group charged with study development. He reviewed updates of the proposed criteria:

Eligibility criteria updates

- Applied local match approach from the TDM set-aside criteria.
- Created a clear and understandable example of the funding breakdown
- Updated to reflect language specific to the new Metro Vision

Evaluation criteria updates

- Updated to reflect language specific to Metro Vision objectives
- Updated regional prioritization criteria
 - reflects changes to Metro Vision
 - links to the MVRTP
 - prioritizes efforts related to access to opportunity
 - prioritizes efforts that increase transferability throughout the region
 - prioritizes communities that have not previously been awarded funding

It was clarified there is no sequential order to the priority bullet points in the evaluation criteria. There was discussion on removing evaluation criteria that would prioritize communities that have not previously been awarded funding.

Gregg Moss MOVED to recommend to the Regional Transportation Committee the eligibility and evaluation criteria, with the removal of evaluation criteria language prioritizing communities that have not previously been awarded funding, for FY18-19 Station Area Master Plan/Urban Center funding. The motion was seconded and passed unanimously.

INFORMATIONAL ITEMS

Discussion on DRCOG becoming the direct recipient for Federal Transit Administration Section 5310 (*Enhanced Mobility of Seniors & Individuals with Disabilities*) Program funding.

Matthew Helfant presented an informational briefing on a proposal for DRCOG's to become the direct recipient for FTA 5310 Program funds. The program allocates just under \$2 million annually in the Denver region (Denver-Aurora large urbanized area).

He cited several key points:

- DRCOG has previous experience selecting projects for the 5310 program (and a preceding program) for RTD.
- Integration and leveraging of multiple funding sources will improve efficiencies, reduce duplication, and increase the number of trips provided for vulnerable populations in need.
- The combination of funding sources is a primary recommendation of both the *2016-2019 DRCOG Area Plan on Aging* and the *DRMAC Transportation Coordination Systems Study*.

- DRCOG Area Agency on Aging (AAA) is experienced at administering transportation projects funded through the Older Americans Act (OAA).
- FTA allows OAA funding on transportation projects to count towards local match requirement on 5310 projects.
- The new 2020-2023 TIP Human Service Transportation set-aside (\$1 million annually for 4 years) can also be combined with the OAA and 5310 funding, with potential for other funding types.
- FTA 5310 direct recipients can use up to 10% of the annual allocation to cover the costs associated with administration, with no local match requirement.
- Mr. Helfant noted potential synergy with the Veterans Transportation & Community Living Initiative (VTCLI) federal grant deliverable of a *Regional Trip Exchange Hub*, an online regional trip coordination service for veterans and vulnerable populations, that is currently in development by DRCOG.

CDOT, FTA and RTD have indicated support for the proposal. DRCOG and CDOT staff met on September 17 with current 5310 grantees to discuss the proposal. That group had several questions and concerns that DRCOG and CDOT staffs are working together to address. There will be further conversations on details of structure, process and logistics before bringing the proposal for action to the Board at a later date.

Mr. Helfant said, if approved, 5310 administration would begin in early 2020. DRCOG will reach out prior to that time to coordinate with other urbanized areas in the region (Boulder, Lafayette, Louisville, Longmont, as well as Boulder County and Weld County). George Gerstle encouraged having more conversations prior to commencing 5310 administration.

Update on 2020-2023 Transportation Improvement Program (TIP) Regional Share project submittals.
Todd Cottrell reviewed the list of 20 applications received for the 2020-2023 TIP Regional Share call for projects that closed on September 21. He noted \$109.2 million was requested for the \$32.5 million in available Regional Share funding.

Staff is currently reviewing and scoring projects over the next two weeks. He noted CDOT has reaffirmed the Central 70 project. Mr. Cottrell reviewed the TIP Regional Share Review Panel's tentative meeting schedule:

- October 3 - introduction to the review process
- October 17 – review applications and DRCOG scores and identify Tier 1 projects
- October 24 – Tier 1 project presentations
- November 8 – final panel recommendations

He said staff expects to bring Regional Share recommendations to TAC in November.

Briefing on draft Active Transportation Plan.

Emily Lindsey presented an update of the draft of the DRCOG Active Transportation Plan. She reviewed various stakeholder and public outreach efforts at workshops and Bike to Work Day events and gave a high-level overview of the draft document.

A draft of the Active Transportation Plan will be released in Oct 2018 for a 30-day public comment period. Staff anticipates bringing the final draft through the DRCOG committees for Board action in December.

Briefing on shared-use mobility data.

Emily Lindsey asked about interest in working together to discuss the benefits of coordinating regionally regarding shared-use mobility data and its implications. She noted the timing is

advantageous, particularly as many jurisdictions are now incorporating bike-share, dockless bike pilot programs and other emerging mobility services into their systems. RTD and TMAs have expressed interest.

After discussion, Chair Cotton noted the TAC is in consensus to have DRCOG continue to pursue this concept and define what DRCOG's role could be.

Bill Sirois said RTD recently had its Transportation Transformation (T2) Summit and will be posting on YouTube the [presentation from the Shared-use Mobility Center and small group breakouts](#).

ADMINISTRATIVE ITEMS

Member Comment/Other Matters

- Chair Cotton noted CDOT's Colorado Transportation Summit will be held on September 28.

The meeting adjourned at 2:49 p.m. The next meeting is scheduled for October 22, 2018.

ATTACH B

ATTACHMENT B

To: Chair and Members of the Transportation Advisory Committee

From: Todd Cottrell, Senior Transportation Planner
(303) 480-6737 or tcottrell@drcog.org

| Meeting Date | Agenda Category | Agenda Item # |
|------------------|-----------------|---------------|
| October 22, 2018 | Informational | 4 |

SUBJECT

2020-2023 *Transportation Improvement Program* (TIP) Regional Share process.

PROPOSED ACTION/RECOMMENDATIONS

No action requested. This item is for information only.

ACTION BY OTHERS

N/A

SUMMARY

DRCOG staff will brief the committee on the progress of the Regional Share process, including the TIP Regional Share Project Review Panel and timeline for project recommendations. Attachment 1 provides an outline of both the Regional and Subregional Share processes.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

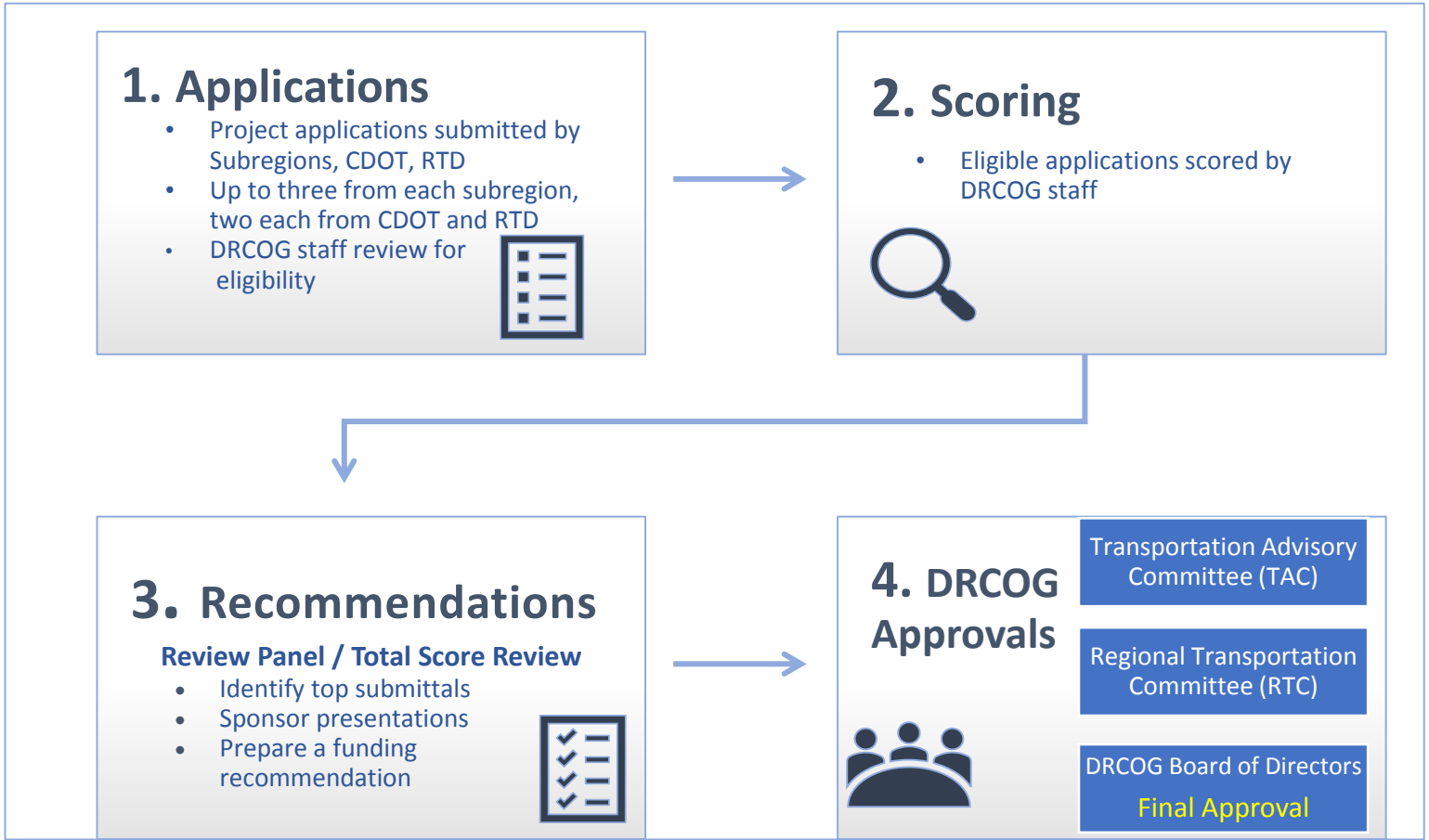
ATTACHMENT

1. 2020-2023 Regional and Subregional Share Process

ADDITIONAL INFORMATION

If you need additional information, please contact Todd Cottrell, Senior Transportation Planner, Transportation Planning and Operations at 303-480-6737 or tcottrell@drcog.org.

2020-2023 Regional Share Process



1. Applications submitted by each subregional forum, CDOT, and RTD. DRCOG staff reviews submitted applications for eligibility.
2. A panel of DRCOG staff then scores eligible applications against criteria. DRCOG produces an average score for each application.
3. The Regional Share TIP Project Review Panel is comprised of one technical member from each of the eight subregions, one CDOT representative, one RTD representative, and three subject matter experts (one member each from the RAQC, Bicycle Colorado, and the Colorado Motor Carriers Association). The panel:
 - a. Reviews DRCOG scoring and identifies the top tier of submittals (approximately twice the available funds).
 - b. Hears presentations from project sponsors for top tier submittals.
 - c. Develops a final funding recommendation.
4. The panel’s funding recommendation will be taken through the MPO approval process (TAC, RTC, and Board).

ATTACHMENT 1

2020-2023 Subregional Share Process

1. Preparation (October - December 2018) – Subregional forums prepare for subregional allocation process.
 - Subregional application: Subregions can use the regional application as is or may change the weighting and/or add additional questions. If the application is adjusted, it must be reviewed by DRCOG staff.
 - During this time, DRCOG will release a subregional application template.
2. Applications (January – February 2019)
 - The Subregional Share Call for Projects opens for 8 weeks after the regional projects have been selected.
 - DRCOG assigns funding targets to each subregion by funding type and year.
 - Develop project lists: Subregional applications are submitted to the subregional forums. Goal is that total projects submitted equal at least 200% of funding target.
 - CDOT/RTD concurrence will be due soon after call opens. Applicants are responsible for requesting required concurrence.
3. Scoring (March 2019)
 - Staff from each forum will score projects.
 - Each forum prioritizes and prepares a funding recommendation within their funding target.
4. Recommendation (April 2019)
 - Each forum’s funding recommendation is due to DRCOG in early April.
 - Subregions present their recommendations to the Board of Directors.
 - DRCOG works with sponsors on project scopes and funding types to begin development of the draft TIP document.
5. Approval (April - May 2019)
 - TAC and RTC recommendation on the subregional projects.
 - Board action on the subregional projects.
6. Final TIP Adoption (June – August 2019)
 - TIP public hearing document is released.
 - TIP public hearing.
 - TAC and RTC recommendation on TIP document.
 - Board action on TIP document.

ATTACH C

ATTACHMENT C

To: Chair and Members of the Transportation Advisory Committee
From: Steve Cook, Transportation Modeling and Operations Manager
(303) 480-6749 or scook@drcoq.org

| Meeting Date | Agenda Category | Agenda Item # |
|------------------|-----------------|---------------|
| October 22, 2018 | Information | 5 |

SUBJECT

Briefing on CDOT Central I-25 Planning and Environmental Linkages (PEL) Study.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

CDOT has initiated the [I-25 Central PEL study](#) for the six-mile segment of I-25 between Santa Fe Drive and 20th Street in central Denver. Like other [PEL studies](#), this effort will consider environmental, community, and economic goals early in the planning process to inform project development, design, and future construction.

The corridor includes a location (just south of Colfax Ave.) with one of the highest average daily traffic volumes in the state (~270,000 vehicles carrying over 350,000 people). However, I-25's geometry, bridges, and access points date from the 1950s Valley Highway era.

Several areas along the corridor include very large land redevelopment proposals. This PEL is also unique in that it intends to focus on the potential role of technology to address the corridor's traffic, safety, and mobility issues. The PEL study is anticipated to be completed in late 2019.

At the October TAC meeting, CDOT staff will provide an overview of the I-25 Central PEL study.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

ATTACHMENT

1. CDOT presentation

ADDITIONAL INFORMATION


If you need additional information, please contact Steve Cook, Transportation Modeling and Operations Manager, at (303) 480-6749 or scook@drcoq.org.



I-25 Central PEL

Denver Regional Council of Governments DRCOG

Oct 22, 2018

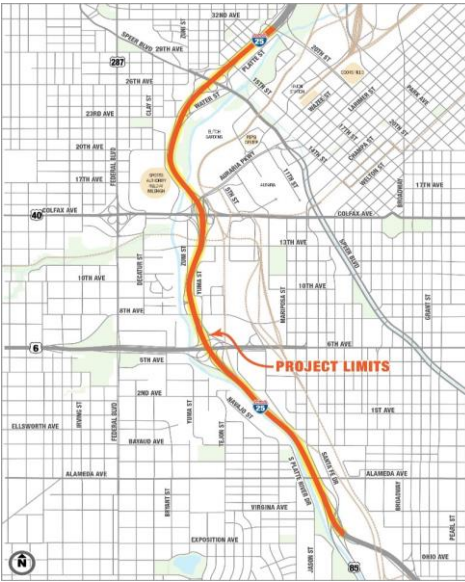


I-25 Central PEL

Study Overview

Planning and Environmental Linkages (PEL) Study

- 5-mile segment of I-25 between Santa Fe Drive and 20th Street with no substantive programmed improvements
- Critical north/south facility with the highest traffic volume in Colorado
- 1950s Valley Highway era geometry, bridges, and access



2

What is a PEL?

At a high-level, planning scale, a PEL:

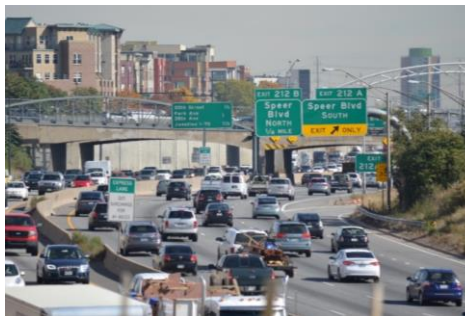
- Identifies corridor needs
- Solicits stakeholder input
- Performs detailed traffic analysis
- Defines and evaluates potential improvements
- Reviews existing environmental resources and possible impacts from proposed alternatives
- Develops a vision and implementation plan for priorities large and small.
- Sets stage for further design and NEPA analysis

Need: Reduce Traffic Congestion

More than 250,000 vehicles per day on some portions of I-25



Morning Peak: 3 hours
Evening Peak: 5.5 hours



Typical peak travel times can be 3.5 times greater than free flow times and vary by up to 88%

Reduce Traffic Congestion

ATTACHMENT 1

CO I-25 Central PEL



Need: Improve Safety

High number of crashes
1,000 crashes per year within project limits

Map labels: 20th Street, Speer Boulevard, 23rd Avenue, 17th Avenue, I-70 BL (Colfax), 8th Avenue, US 6 (8th Avenue), SH 26 (Alameda), US 85

5

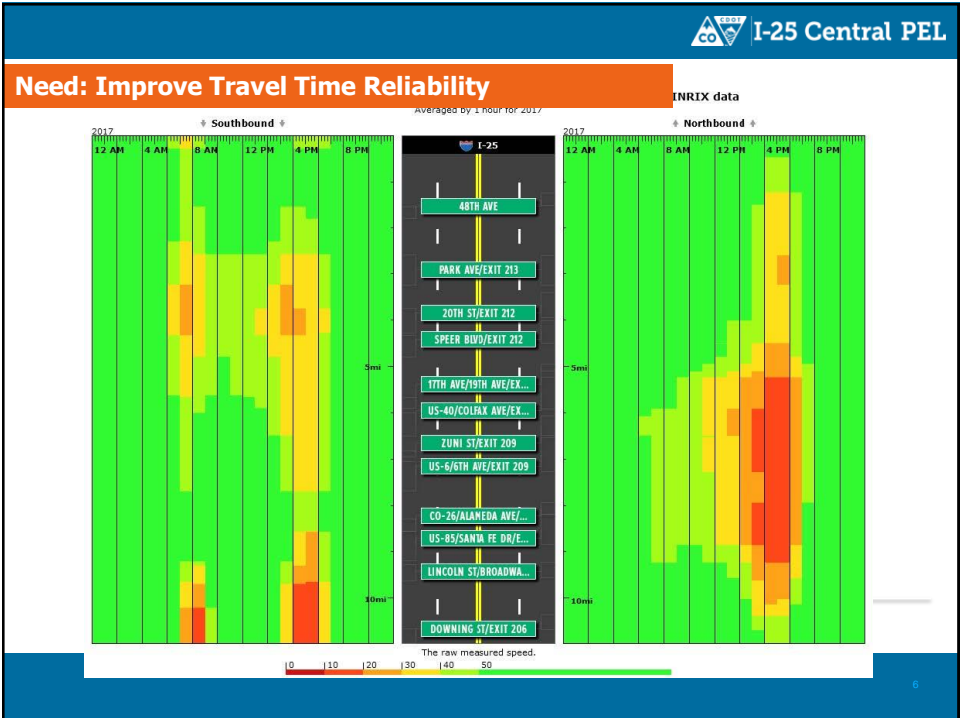
CO I-25 Central PEL

Need: Improve Travel Time Reliability

INRIX data

Averaged by hour for 2017

2017 Southbound 2017 Northbound



Legend: 10, 10, 20, 30, 40, 50

The raw measured speed.

6



I-25 Central PEL

Purpose Statement

The purpose of the recommended transportation improvements in the I-25 Central Corridor between approximately Santa Fe Drive and 20th Street is to reduce congestion and improve safety and travel-time reliability for the movement of people and goods. The improvements will also consider access to and from I-25 as well as connectivity across I-25 for bicycles, pedestrians, transit and local traffic.

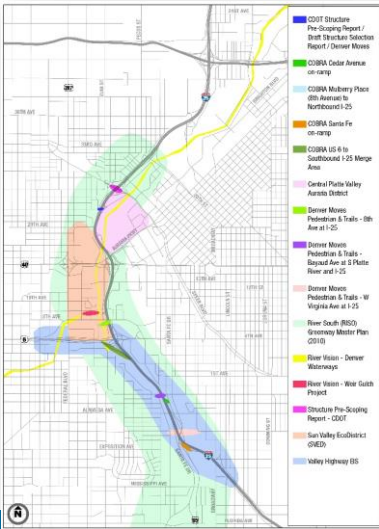
Traffic Study Area

- The traffic analysis study area is much larger than the project study area



Areas of change

- Additional studies examining surrounding land uses and the local transportation network
- Major Land Use changes
 - Elitches/River Mile
 - Mile High
 - Sun Valley
 - Burnham Yards



Environmental Resources and Constraints



- South Platte River and Trail
- Railroad
- Numerous parks and recreational opportunities along the corridor
- Historic resources
- Environmental justice communities

11

Parallel efforts:

- Valley Highway EIS remaining phases
 - Phase 2 (Alameda and I-25)
 - Phase 3 (CML Railroad Realignment and I-25 template improvements from Alameda to 6th Ave)
- 23rd and Speer Bridges
- Denver Master Plan revisions, Denver Moves (Transit), Vision Zero, etc.
- South Platte River and Trail improvements

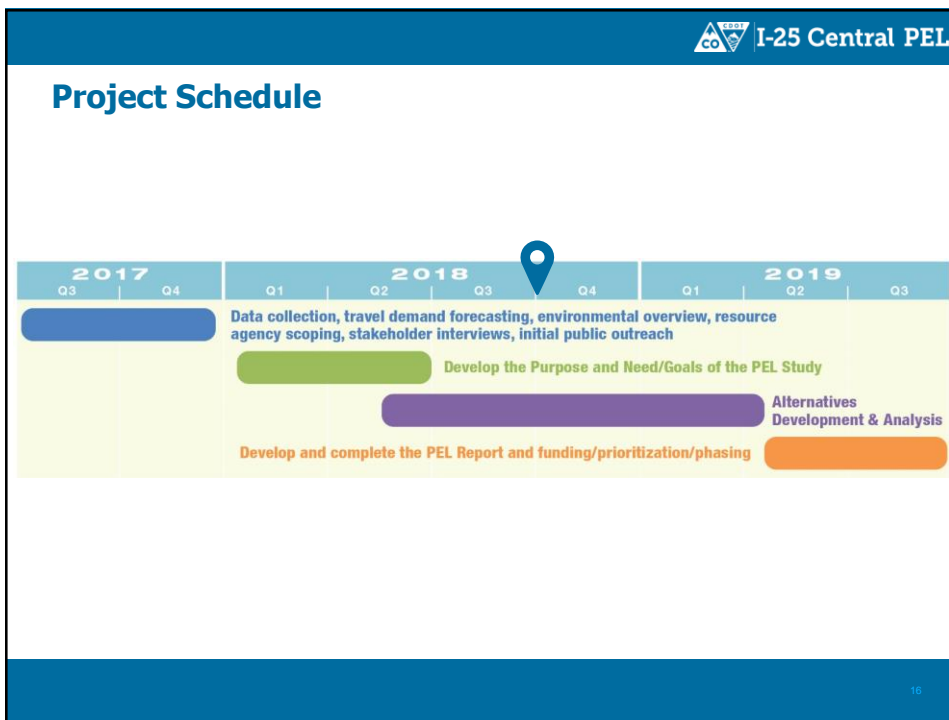
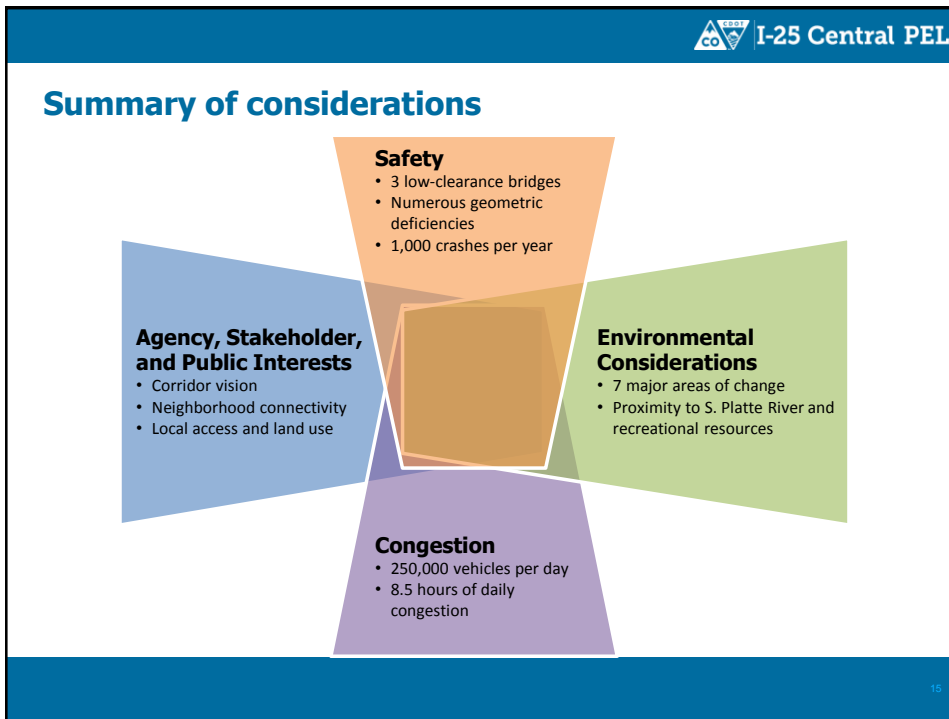
Stakeholder Engagement Plan

Engagement at each milestone (P&N, Alt Creation, Alt evaluation) :

- Technical Advisory Committee (TAC):
 - CDOT, Extended Denver Staff, DRCOG, FHWA, and RTD
- Executive Oversight Committee (EOC):
 - CDOT, Denver, DRCOG, and FHWA
- Stakeholder Focus Groups (SFGs):
 - Focused community representative interaction with NGOs, RNOs, businesses, etc
- Public meeting mid-alternative evaluation

Stakeholder involvement so far:

- | | |
|---|--|
| ▪ Auraria Campus | ▪ Denver Mayor’s Office |
| ▪ CCD - Office of Economic Development | ▪ Denver Metro Chamber of Commerce |
| ▪ CCD - Public Works | ▪ Denver Police Department |
| ▪ CCD - Community Planning and Development | ▪ Elitch Gardens |
| ▪ CDOT - Colorado Transportation Management Center | ▪ Freight Advisory Council (FAC) |
| ▪ Children’s Museum | ▪ Greenway Foundation |
| ▪ Colfax Business Improvement District (BID) | ▪ Jefferson Park United Neighbors |
| ▪ Denver Aquarium | ▪ Joshua Station |
| ▪ Denver Broncos | ▪ Metropolitan Football Stadium District |
| ▪ Denver City Council: Brooks, Clark, Espinoza, Ortega, Lopez | ▪ Mile High Ministries |
| | ▪ Pepsi Center |
| | ▪ RTD |





I-25 Central PEL

Questions/Comments ?

ATTACH D

ATTACHMENT D

To: Chair and Members of the Transportation Advisory Committee

From: Robert Spotts, Senior Transportation Planner
(303) 480-5626 or rspotts@drcog.org

| Meeting Date | Agenda Category | Agenda Item # |
|------------------|-----------------|---------------|
| October 22, 2018 | Information | 6 |

SUBJECT

Briefing on *2017 Annual Report on Traffic Congestion in the Denver Region*.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

DRCOG maintains a federally-required congestion management process (CMP). One component of the process is the calculation of congestion measurements for roadways in the DRCOG region, and presentation within an annual report on traffic congestion. The annual reports have been prepared since 2006.

Staff will provide an overview of the *2017 Annual Report on Roadway Traffic Congestion in the Denver Region*, including topics such as vehicle miles traveled in the region, the impacts of economic growth on congestion, results and benefits of past mitigation projects, and the potential impacts of emerging vehicle, roadway, and mobility service technologies. The report will be made available at the meeting.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

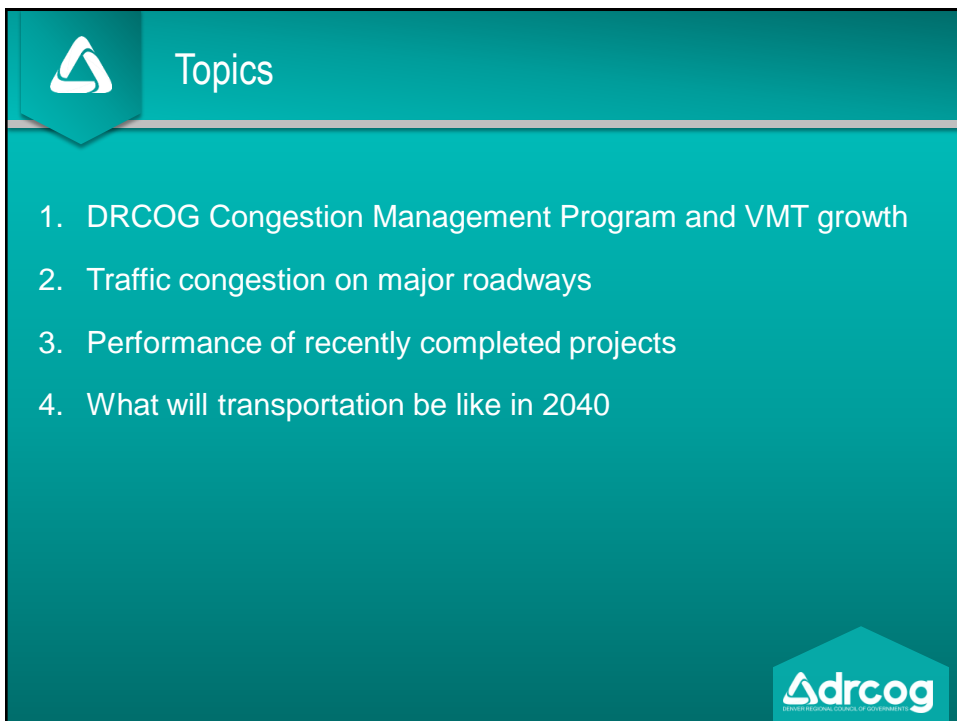
ATTACHMENT

1. Staff presentation

ADDITIONAL INFORMATION

If you need additional information, please contact Robert Spotts, Senior Transportation Planner, at (303) 480-5626 or rspotts@drcog.org.


ATTACHMENT 1

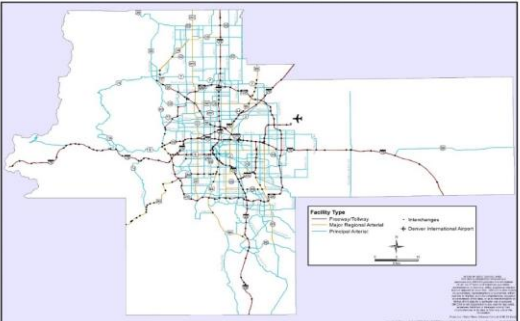


1. CONGESTION MANAGEMENT PROGRAM AND VMT GROWTH

DRCOG Congestion Management Process

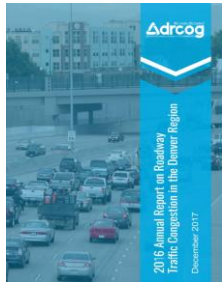
- MPOs are federally required to monitor congestion.
- DRCOG Annual Reports on Congestion since 2006
 - Report regional vehicle (VMT) and person (PMT) miles traveled
 - Roadway network info: physical traits, traffic volumes, transit routes
 - Used for TIP and RTP planning and project evaluation

 **Figure 3**
DRCOG Regional Roadway System




Facility Type

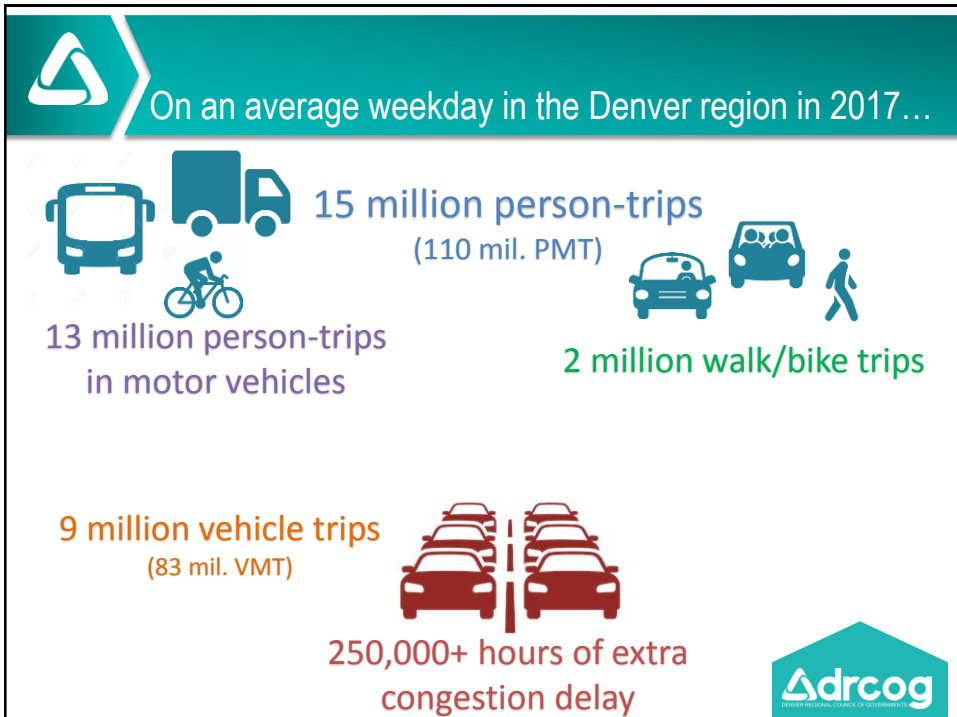
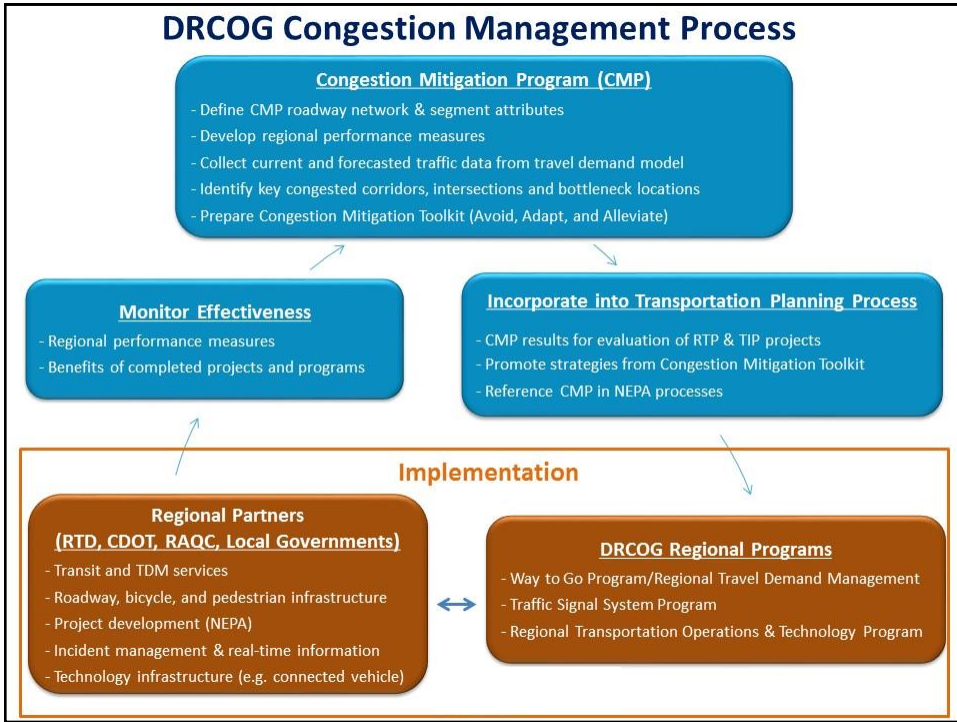
- Interchanges
- Major Regional Arterial
- Minor Regional Arterial
- Principal Collector
- Collector
- Local Street
- Other International Airport



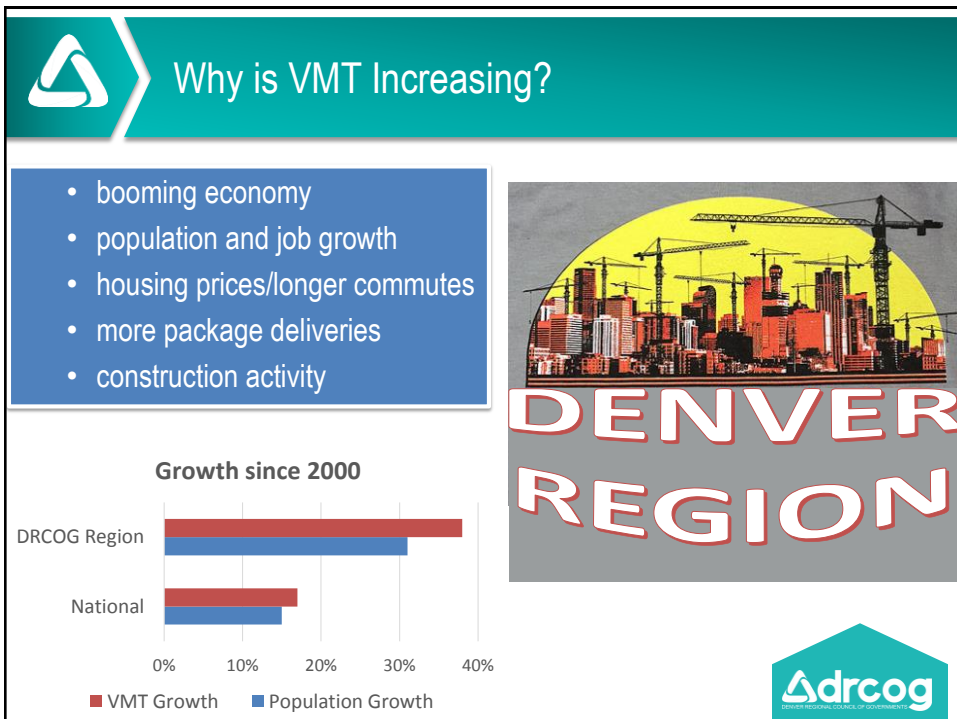
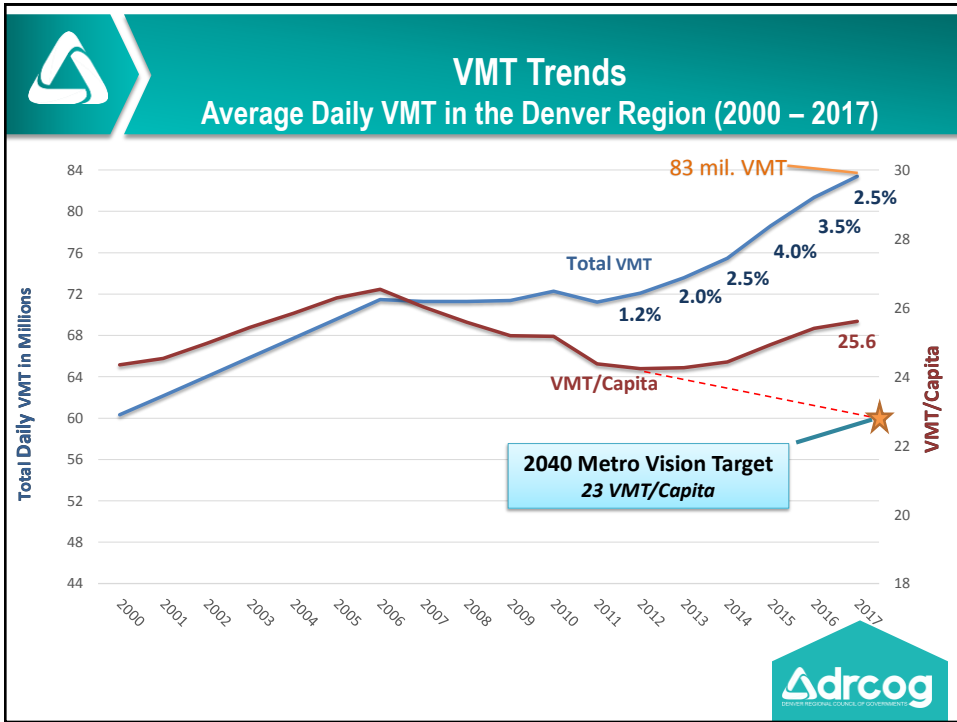
2016 Annual Report on Roadway Traffic Congestion in the Denver Region
December 2017



ATTACHMENT 1

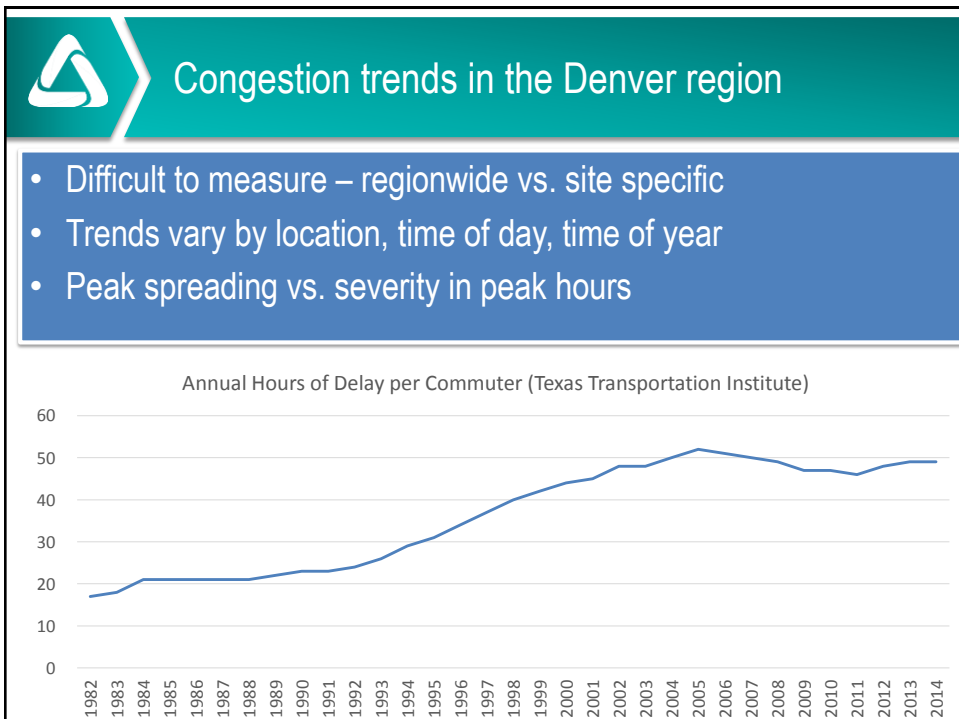


ATTACHMENT 1

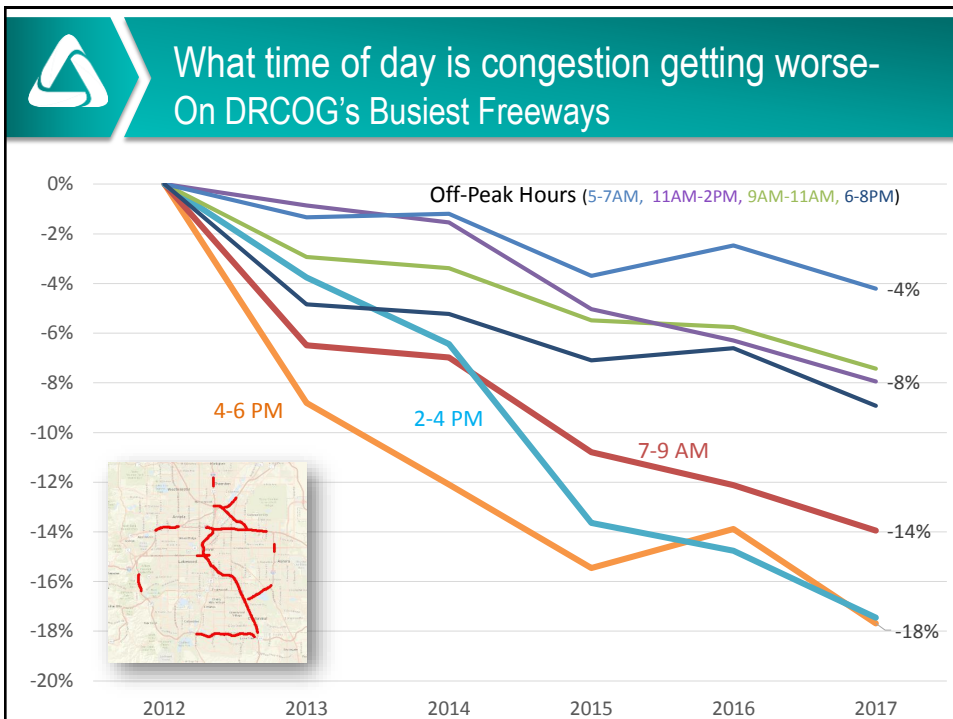
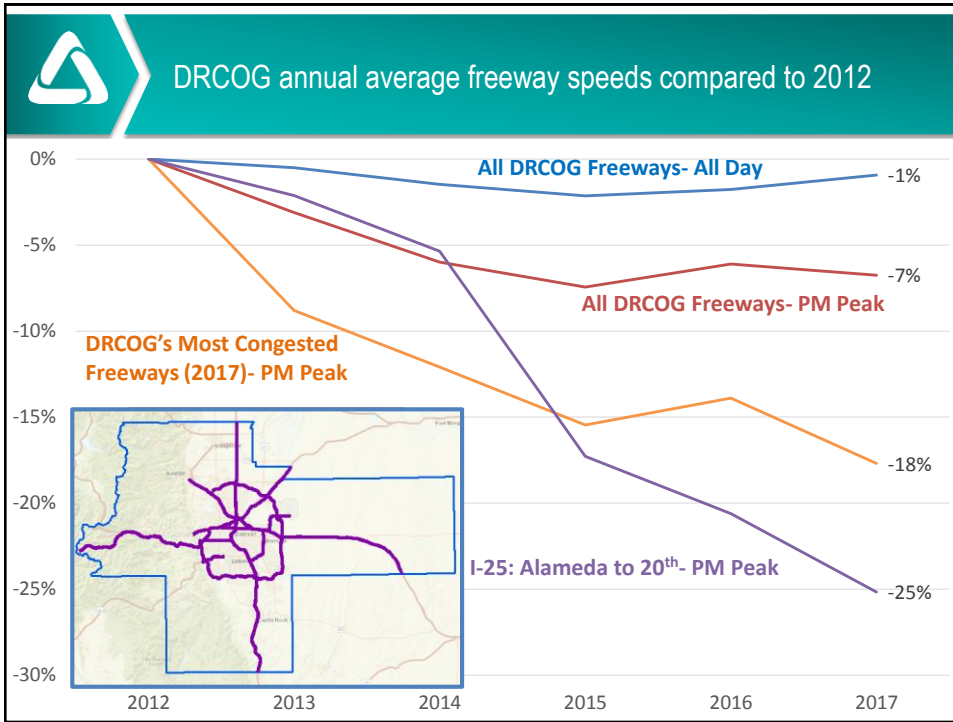




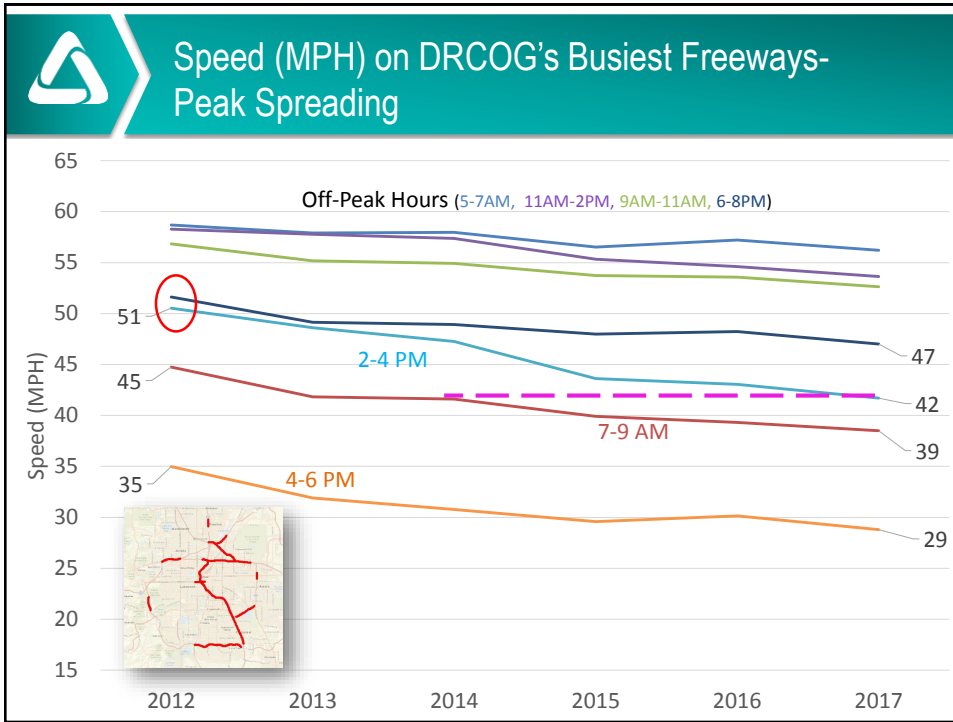
2. TRAFFIC CONGESTION ON MAJOR ROADWAYS



ATTACHMENT 1



ATTACHMENT 1



Congestion Mobility Score

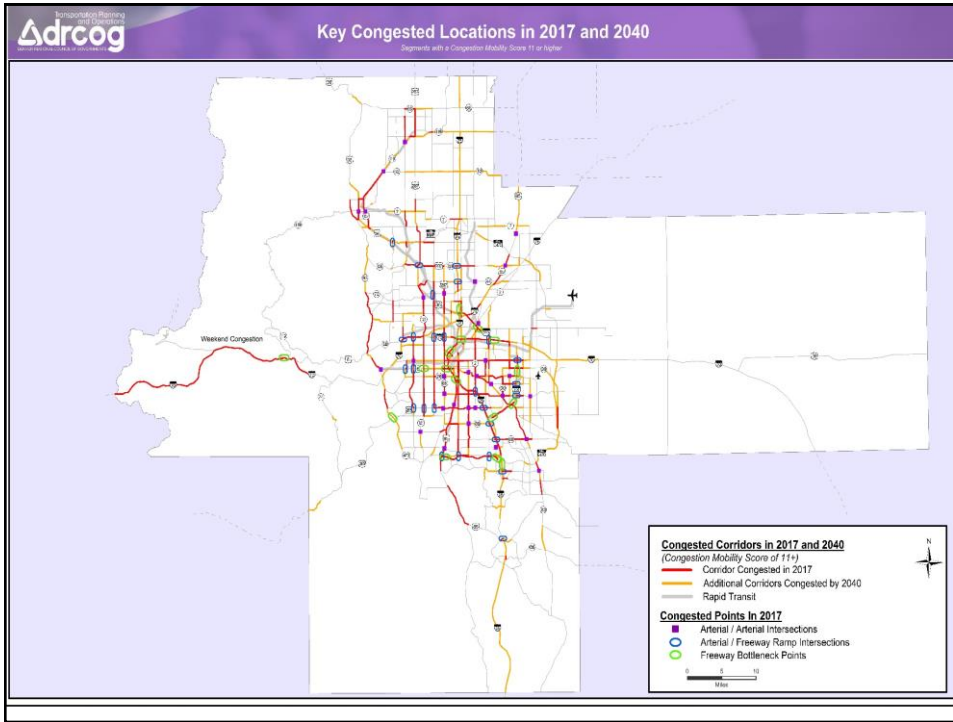
Scores for road segments; four performance measures:

- **severity:**
How bad does congestion get on the roadway during rush hour?
- **duration:**
How many hours per day is the roadway congested?
- **magnitude:**
How many people (traffic volume) are impacted by congestion on the roadway?
- **reliability:**
How often do crashes or incidents occur on the roadway?

METRO TRAFFIC MAKING IT HARD FOR PARAMEDICS

HEAVY TRAFFIC ACROSS THE METRO AREA

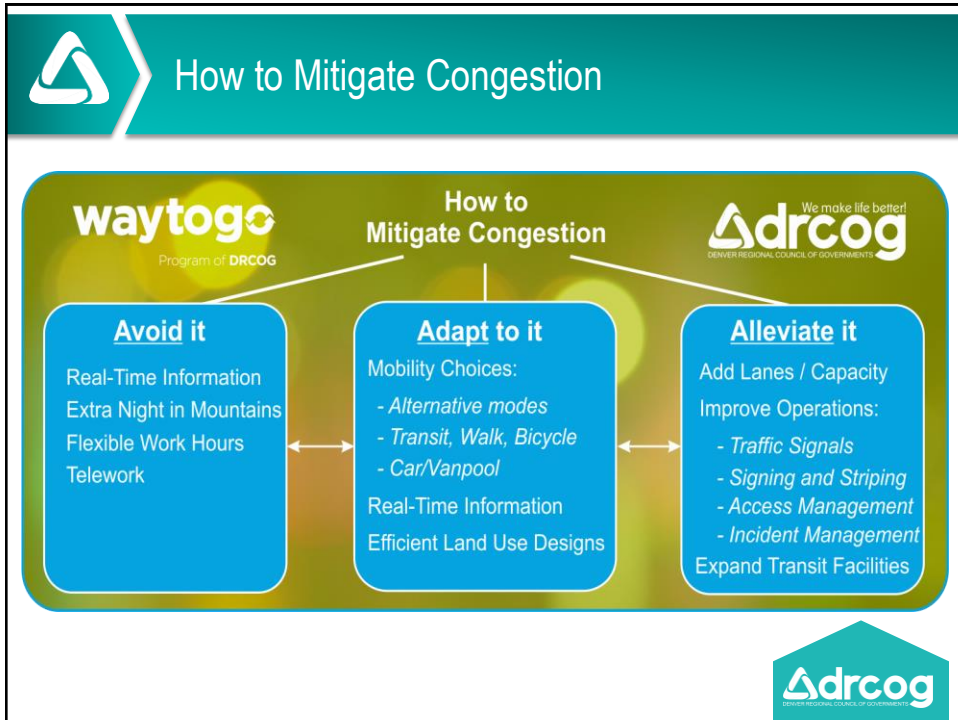
ATTACHMENT 1



Current and future congestion on the Regional Roadway System (freeways and arterials)

| | 2017 | | 2040 (RTP) | | % Change between 2017 and 2040 |
|--|--------------------|---------------------------|--------------------|---------------------------|--------------------------------|
| | Average Weekday | Annual Total Estimate (1) | Average Weekday | Annual Total Estimate (1) | |
| Vehicle Measures: | | | | | |
| Vehicle Miles of Travel | 64,394,000 | 21,765,052,000 | 86,546,000 | 29,252,653,000 | 34% |
| Vehicle Hours of Travel | 1,448,000 | 489,414,000 | 2,084,000 | 704,494,000 | 44% |
| Vehicle Hours of Delay | 236,000 | 79,736,000 | 483,000 | 163,261,000 | 105% |
| Travel Delay Per Driven Registered Vehicle (2) | 7 minutes | 42 hours | 11 minutes | 62 hours | 48% |
| Travel Delay Per Household | 11 minutes | 61 hours | 16 minutes | 89 hours | 45% |
| Person Measures: | | | | | |
| Person Miles of Travel | 88,490,000 | 29,909,740,000 | 119,598,000 | 40,423,963,000 | 35% |
| Person Hours of Travel | 1,994,000 | 673,928,000 | 2,831,000 | 956,815,000 | 42% |
| Person Hours of Delay | 326,000 | 110,053,000 | 663,000 | 224,003,000 | 104% |
| Travel Delay Per Resident | 6 minutes | 34 hours | 9.2 minutes | 52 hours | 54% |
| Other: | | | | | |
| Percent of Travel Time in Delayed Conditions | 16% | n.a. | 23% | n.a. | 43% |
| Travel Time Variation (peak vs. off peak) | 1.22 | n.a. | 1.37 | n.a. | 12% |
| Lane Miles of Roads Congested for 3+ Hours | 1,547 | n.a. | 2,820 | n.a. | 82% |
| (Percent of total Lane Miles) | 22% | n.a. | 38% | n.a. | n.a. |
| Economic Travel Delay Costs: | | | | | |
| Commercial Vehicles (3) | \$1,600,000 | \$541,100,000 | \$2,700,000 | \$909,900,000 | 68% |
| Passenger Vehicle Persons (3) | \$3,300,000 | \$1,099,400,000 | \$5,600,000 | \$1,900,800,000 | 73% |
| Total Cost of Delay | \$4,800,000 | \$1,640,500,000 | \$8,300,000 | \$2,810,700,000 | 71% |
| Transit and Other Regionwide Measures: | | | | | |
| Total RTD Transit Boardings | 337,000 | n.a. | 603,000 | n.a. | 79% |
| Rail Transit Boardings | 101,500 | n.a. | 218,000 | n.a. | 115% |

77% of regional VMT



3. PERFORMANCE OF RECENTLY COMPLETED PROJECTS

Congestion Mitigation Toolkit Summary

1. Active roadway management

- A. Traffic signal timing/coordination/equipment
- B. Ramp meters
- C. Access management
- D. Incident management and response
- E. Traveler information mechanisms
- F. Electronic toll collection (ETC)
- G. Roadway signage
- H. Communication connections and surveillance

2. TDM/non-SOV travel options

- A. Transit service and facility expansion
- B. Transit queue-jump lanes and signal priority
- C. Parking and curbside management
- D. Telework and flexible work schedules
- E. Ridesharing services
- F. Off-street multi-use trails (pedestrian and bicycle)
- G. On-street bicycle treatments
- H. Efficient land use and development practices

3. Physical roadway capacity

- A. Intersection turn lanes
- B. Acceleration/deceleration lanes
- C. Hill-climbing lanes
- D. Grade-separated railroad crossings
- E. Interchange redesigns
- F. Roundabout intersections
- G. Managed lanes (toll express, HOV, etc.)
- H. New travel lanes (widening), new roadways

Congestion Mitigation Toolkit

DRCOG
DENVER REGIONAL COUNCIL OF GOVERNMENTS
June 2008

DRCOG region Transportation Improvement Program projects completed: 2008-2017

- Active roadway management projects (\$50m+)
 - Signal timing
 - Intelligent transportation systems
 - Transportation operations
- Transportation demand management/non-SOV travel choice projects
 - Transit (\$3b+)
 - FasTracks support
 - Bus service expansion
 - Transportation demand management (~\$40m)
 - Way to go
 - Transportation management associations
 - Bicycle and pedestrian (~\$75m)
 - 40+ new facilities
 - 7 over/underpasses

way to go
A program of DRCOG

ATTACHMENT 1

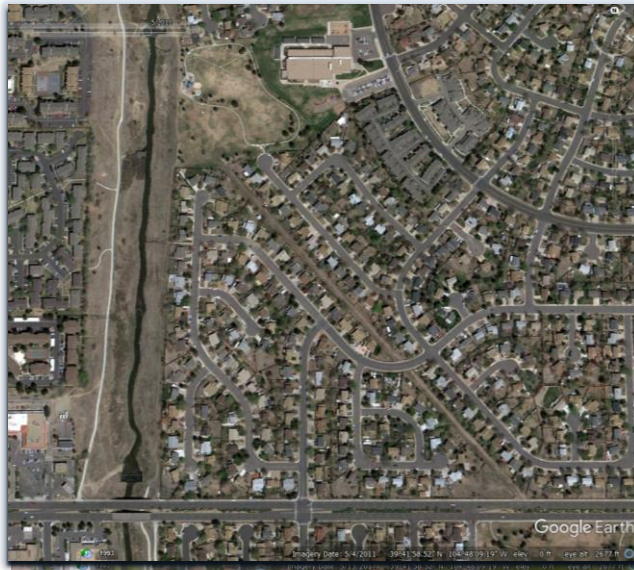


DRCOG region Transportation Improvement Program projects completed: 2008-2017

- Freeways/managed lanes (\$800m+) includes:
 - U.S. Route 36 toll express/bus rapid transit
 - North I-25 interim managed lanes, U.S. Route 36 to 120th Avenue
 - I-25, Ridgeway Parkway to County Line Road
 - I-225, Parker Road to Second Avenue
- Arterial streets (\$200m+) includes:
 - Colfax/17th avenues at I-225
 - Parker Road at Arapahoe Road interchange
 - Foothills Parkway (State Highway 157), Valmont Road to SH 119
- Railroad grade separations (\$120m+):
 - Pecos Street over railroad
 - Peoria Street over railroad/Smith Road
 - Wadsworth Boulevard under railroad/Grandview Ave



Tollgate Creek multi-use trail: before (2011); completed project (2017)



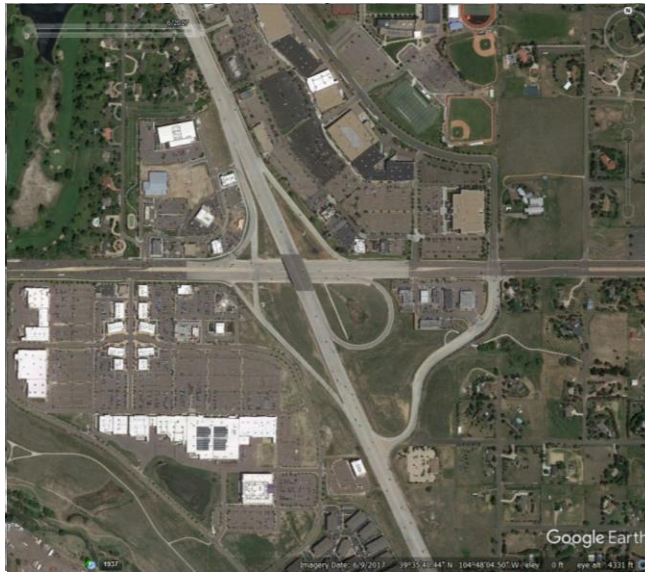
ATTACHMENT 1



**Broadway / Euclid underpass
before (2005); completed project (2014)**

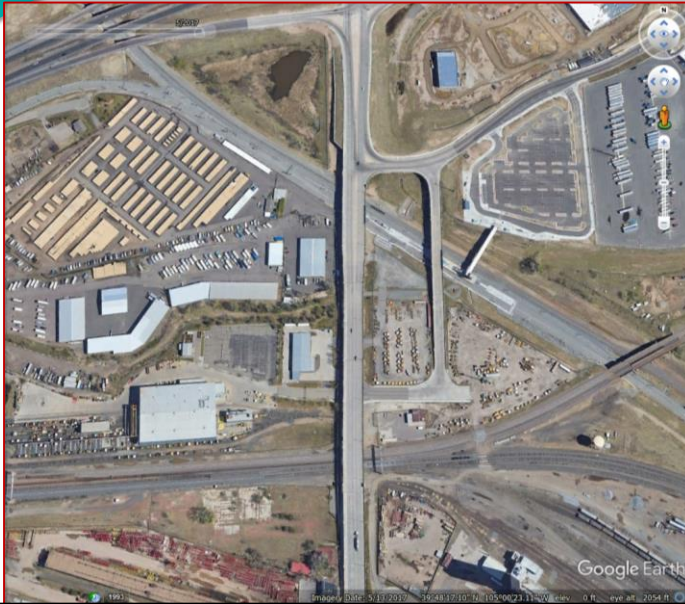


**Parker and Arapahoe- Long ago (1955); before
construction (2005); completed project (2012)**





Pecos St. before (2007); construction (2010);
completed project (2017)



Wadsworth / Grandview RR before (2005);
construction (2008); completed project (2017)



ATTACHMENT 1



Regional benefits of the projects

- Used DRCOG's Focus Regional Travel Demand Model
- 18,500 person hours of delay per day reduced
- 6% less of travel mileage in severely congested conditions

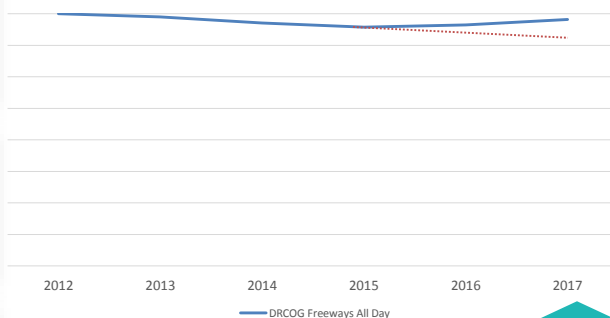


Effects of projects completed in the last decade

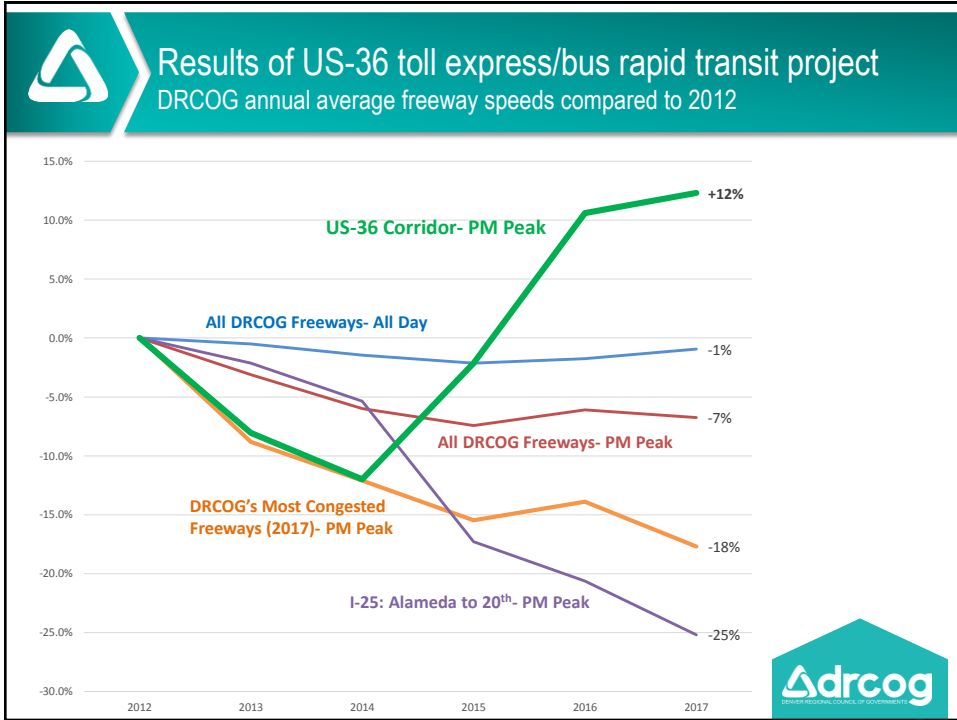
- Regionwide measurements show minor worsening in congestion
- Would be worse today if projects not completed (-----)
- Specific locations with increased congestion



DRCOG Region Average Speed Difference 2012-2017



ATTACHMENT 1



Special Congestion Topic

4. WHAT WILL TRANSPORTATION BE LIKE IN 2040



New technologies and innovation

- New travel modes, mobility services and safety systems
- Travelers and shippers making better decisions using real-time information
- Metro Vision: DRCOG will support and facilitate deployment of technology-related infrastructure and services that benefit the region.



Connected Vehicles (CVs)

- Vehicle to vehicle (V2V) communication
 - Vehicle to infrastructure (V2I) communication
 - Safety benefits – crash & incident reduction/avoidance
 - Travel reliability benefits
- “V2X”



Source: U.S. DOT





Autonomous Vehicles (AVs)

- Various levels of human driver operation: driver control with vehicle assistance (new cars today) --> full automation
- Various location settings: general purpose lanes to fixed guideways
- Various services: private vehicle, fleets, transit
- Collaboration of trucking industry, technology companies and government agencies (FHWA, NHTSA)



Mobility Choice Blueprint (RTD, DRCOG, CDOT, Metro Chamber)

- **Target options for connected mobility**
 - transit, personal vehicles, for-profit mobility services, car-sharing, ride-sharing, bicycling and walking
- **Identify public-private pilot projects**
- **Improve roadway reliability with new technology**
 - Reduce crashes and incidents, support active traffic management, variable speed limits and lane control.
- **Implement public-private pilot projects,.**
- **Hand-off implementation of identified strategies to transportation agencies.**



MOBILITY CHOICE
BLUEPRINT





Considerations With Vehicle Technologies

- How will the capacity for carrying vehicles on the region's roadways change?
 - Increase? (closer vehicle spacing)
 - Decrease? (longer gaps for safety)
- Will VMT increase? (if increased roadway capacity entices more travel)
- Will alertness level of drivers decrease? (if overly dependent on new technology)
- How can multi-passenger HOV travel be increased? (such as shared rides and transit)



QUESTIONS? COMMENTS?

ATTACHE

ATTACHMENT E

To: Chair and Members of the Transportation Advisory Committee
From: Ron Papsdorf, Director, Transportation Planning and Operations
(303) 480-6747 or rpapsdorf@drcoog.org

| Meeting Date | Agenda Category | Agenda Item # |
|------------------|-----------------|---------------|
| October 22, 2018 | Information | 7 |

SUBJECT

Briefing on smart mobility efforts throughout the Denver region.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

Smart (or advanced) mobility has become an increasingly important topic both regionally and nationally. Over the past several months, DRCOG staff have provided briefings to TAC on DRCOG's role in the Mobility Choice Blueprint project, DRCOG's potential role in shared-use mobility data management, and other related topics. This month's TAC agenda also includes briefings on CDOT's I-25 Central PEL study and DRCOG's annual congestion report—both of which are closely related to the topics of smart mobility and technology.

At the October TAC meeting, several entities will present on their current efforts and initiatives related to smart mobility in the Denver region. Presenters include staff from the City of Denver, Smart Cities Alliance, CDOT, and RTD.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

ATTACHMENT

1. Presentations (City of Denver, Smart Cities Alliance, CDOT, RTD)

ADDITIONAL INFORMATION

If you need additional information, please contact Ron Papsdorf, Director, Transportation Planning and Operations at (303) 480-6747 or rpapsdorf@drcoog.org.

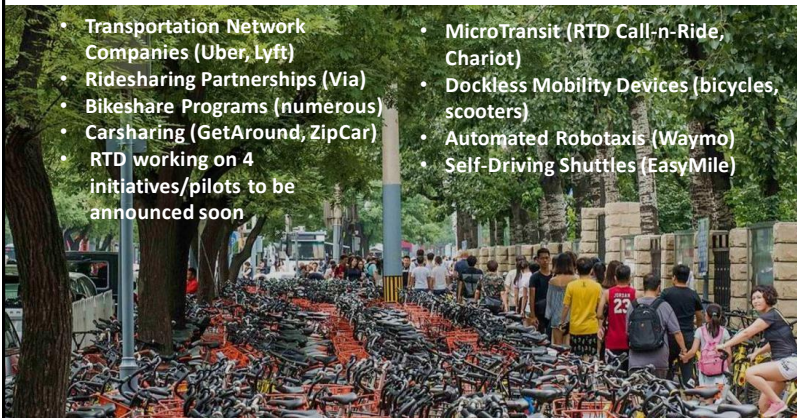


What is the Challenge & What is the RTD Role?

- A multi-faceted challenge that includes both rapidly evolving mobility options, increased congestion and changing transit agency ridership trends

Transportation  Transformation 

Now available or coming soon:



- Transportation Network Companies (Uber, Lyft)
- Ridesharing Partnerships (Via)
- Bikeshare Programs (numerous)
- Carsharing (GetAround, ZipCar)
- RTD working on 4 initiatives/pilots to be announced soon
- MicroTransit (RTD Call-n-Ride, Chariot)
- Dockless Mobility Devices (bicycles, scooters)
- Automated Robotaxis (Waymo)
- Self-Driving Shuttles (EasyMile)

Transportation  Transformation



Future of Call-n-Ride



Transportation  Transformation



The Questions?

- What will be sustainable
- What will contribute to the solution(s) and not contribute to congestion
- How do we address primary barriers around accessibility and equity
 - Physical
 - Technology/banking/credit
 - Affordability

Transit Ridership US and RTD

- National Trends
 - Commuter rail, light rail, metros – typically increasing
 - Fixed route bus – typically decreasing
- RTD Trend
 - Commuter rail – up 10.6% year to date over 2017
 - Light rail – up 4.6% year to date over 2017
 - Fixed route bus – down 3.8% year to date over 2017
- Why bus decrease
 - Accessibility to automobile higher than ever before
 - Congestion and increased auto/bus trip time

RTD as a Mobility Integrator - Lighthouse & Strategic Planner

Each region examined in this research is taking a different approach to addressing shared mobility in the planning process but the white paper provides four general models to conceptualize how this is occurring:

- **Lighthouse Model:** Leadership from an individual or agency to formulate an approach to integrating shared mobility which inspires others to follow a similar path
- **Strategic Model:** Focusing first on a high-level strategic vision intended to drive more specific planning efforts later
- **Operational Partnership Model:** Engaging with shared mobility companies to experiment and pilot innovative approaches to working together to address regional goals
- **Watch and Learn Model:** Focusing on research and thought leadership while seeking more information about how to incorporate shared mobility into planning processes

The National View

- “It is well recognized that the landscape of surface transportation is in a state of transformational change and flux. This new mobility paradigm requires public transit to be inventive, innovative and bold in forging partnerships with new providers, adopting cutting-edge technologies and meeting customers’ evolving desire for more flexible, customized service.”

- Paul Skoutelas, APTA President and CEO

Our Vision

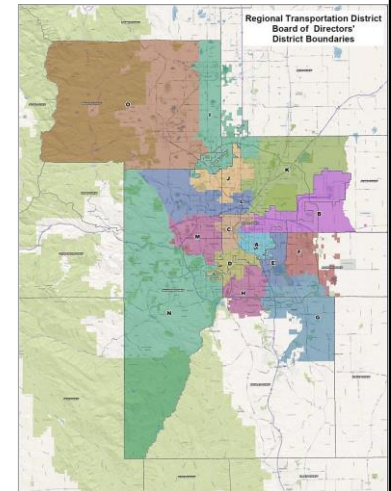
RTD's transit network serves as the backbone for regional shared mobility in metro Denver. We are uniquely positioned to maximize this investment and be the regional mobility integrator for metro Denver.



Our Vision

With RTD as a common denominator, we can build a system in which various service providers work collaboratively to integrate "new mobility" services with traditional public transportation to allow the public to discover, pay for, and use these services for a seamless trip.

The future of mobility depends on public transportation and regional collaboration: practical, sustainable solutions that meet the needs of everyone in the Denver metro area.



RTD Mobility on Demand (MoD) RFI

- RTD released a Request for Information (RFI) in Fall 2017
- RTD received 24 responses under six categories:
 - Service delivery – potential use of dedicated and non-dedicated and vehicles
 - Fixed-route shuttles
 - Trip planning
 - Integrated payment
 - MoD trip exchange
 - Branding



Regional Mobility Working Group

RTD established a group of key staff from local jurisdictions, TMAs and other entities to start a regional dialogue on MaaS. Members include:



Regional Mobility Working Group

- **Exchange** information with regional stakeholders on current and potential projects
- **Facilitate** a regional dialogue to determine public and private partnerships
- **Define** a strategy to implement regional Mobility as a Service pilot projects
- **Convene** local stakeholders and sustaining an ongoing dialogue
- **Explore** partnership opportunities
- **Pursue** demonstration projects
- **Expand** to include private sector & other stakeholders

RTD Uniquely Positioned to Lead Regional Mobility Strategy

- Operates all modes including MicroTransit
- Award a contract for T2 Comprehensive Plan
- Collaborate on and implement pilots
 - First and last mile pilot concept
 - Alternative delivery approach pilot concepts



T2 Comprehensive Plan

An ambitious, two-year project featuring extensive public outreach, engagement, and involvement that will cover:

- Comprehensive Operations Assessment/Systems Optimization
- Financial and Fiscal Sustainability
- Scenario Planning and System Expansion
- Mobility Expansion and Emerging Technologies
- Workforce of the Future

Live Poll Results

What should the public sector's role be in the new era of mobility?

0 8 6

Limited - regulation focused on public health, safety and welfare issues

2 %

Moderate - regulation + limited partnerships with private providers to incentivize behavior to support public goals

34 %

Major - regulation + partnerships + ensuring equity among public and private mobility options

64 %

ATTACHMENT 1 - RTD



ATTACHMENT 2 - Denver

DENVER SMART CITY

Using data to make our city better.

www.denvergov.org/denversmartcity

Denver is Growing- many positives (vitality, jobs) but strains infrastructure, resources and people

Good air quality is necessary for the health of our students

2017 asthma rates at Denver Public Schools

DENVER TRAFFIC FATALITIES OVER TIME

| Year | Fatalities |
|------|------------|
| 2007 | 40 |
| 2008 | 45 |
| 2009 | 40 |
| 2010 | 40 |
| 2011 | 40 |
| 2012 | 40 |
| 2013 | 45 |
| 2014 | 45 |
| 2015 | 50 |
| 2016 | 55 |
| 2017 | 51 |

51 PEOPLE DIED IN 2017

MCKINSEY GLOBAL INSTITUTE

SMART CITIES: DIGITAL SOLUTIONS FOR A MORE LIVABLE FUTURE

JUNE 2018

Smart cities use data and technology to make better decisions.

Smart applications in eight domains affect multiple aspects of the quality of life

The result?
A more efficient, responsive, and sustainable city...

Key Takeaways from Report:

1. Cities could improve some of these quality-of-life dimensions by 10-30 percent with the implementation of smart city technologies and applications.
2. Places with highest number of applications implemented overall have branched out into multiple domains, which gets a city closer to realizing a circle of benefits.
3. Even the most cutting-edge smart cities on the planet are still at the beginning of their journey.

Denver Smart City Implementation Strategy

Thoughtful Application of Technology

| Healthy People & Places | Connected Mobility | IoT Platform & Data Management | Innovative People & Partnerships |
|---|--|---|--|
| <ul style="list-style-type: none"> • Electrification • Sustainability • Decarbonization • Health • Equity <p><i>Happy Denver, Happy Denverites</i></p> | <ul style="list-style-type: none"> • Built environment • Flexibility • Accessibility • Safety • Equity <p><i>Equitable Multi-modal Options for Everyone</i></p> | <ul style="list-style-type: none"> • DSC as a platform • Data Management • Machine Learning • Sensors • Inputs & Outputs <p><i>Learning, Safe, Secure Networks</i></p> | <ul style="list-style-type: none"> • Innovation • Disruption • Paradigm Shift • Experimentation • Equity <p><i>Best & Brightest People, Projects & Partners</i></p> |

ATTACHMENT 2 - Denver

Denver Smart City Implementation Strategy

PASS GAS.
Drive Electric.

Denvergov.org/PassGas

\$1.9M DOE Grant- TNCs

First Mile Last Mile Pilot Shuttle

Denver Smart City ICT Assets: EDM and DAFNE

We are here

Data Aggregation

Data Intelligence

System Interoperability

Denver Area Fiber Network Ecosystem (DAFNE)

Enterprise Data Management (EDM)



Evolution of Analytics

Value

Difficulty

Information

Hindsight

Insight

Optimization

Foresight

Descriptive Analytics

Diagnostic Analytics

Predictive Analytics

Prescriptive Analytics

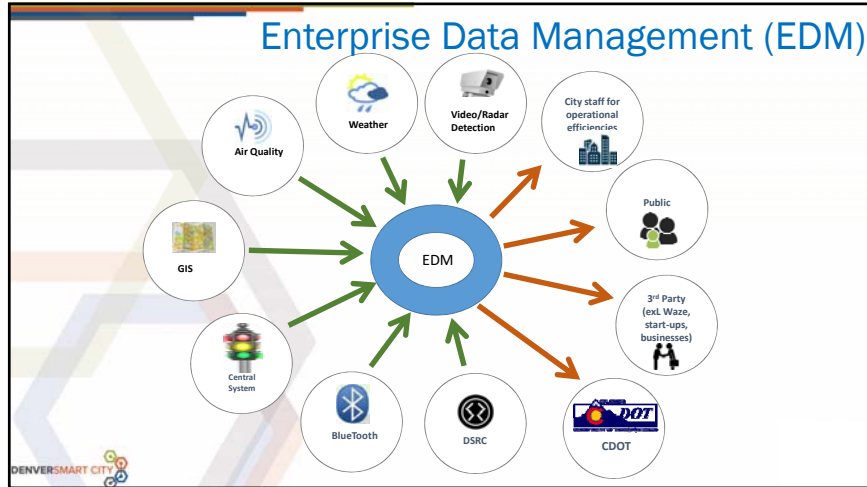
What happened?

Why did it happen?

What will happen?

How can we make it happen?

ATTACHMENT 2 - Denver



Denver Traffic Management Center (TMC)

Core functions of the Denver TMC

- Operational Readiness
- Situational Awareness
- Information Dissemination
- Data Analysis
- Deployment of Operational Strategies
- Traffic Signal Operations
- Identification of Operational Issues

Case Study: TMC & CAD data

- We have enhanced operations through the implementation of a system that provides public safety CAD data, which increases situational awareness
- Result: Denver TMC staff able to deploy operational strategies such as changing traffic signal timing on diversion routes

- The Denver TMC is responsible for real-time monitoring and management of the City's transportation network:
 - Daily operations
 - Unplanned incidents
 - Special events
 - Road work
- To address current and future traffic issues, the City is looking to **enhance the operations** of the Denver TMC to **increase active management** of the transportation network.
- To create a vision for the next generation Denver TMC, it was necessary to develop a Strategic Plan with the objectives to:
 - Develop of Denver TMC core functions**
 - Identify opportunities for increased operational capabilities**
 - Develop a readiness foundation for the absorption of new technologies**

DENVERSMART CITY

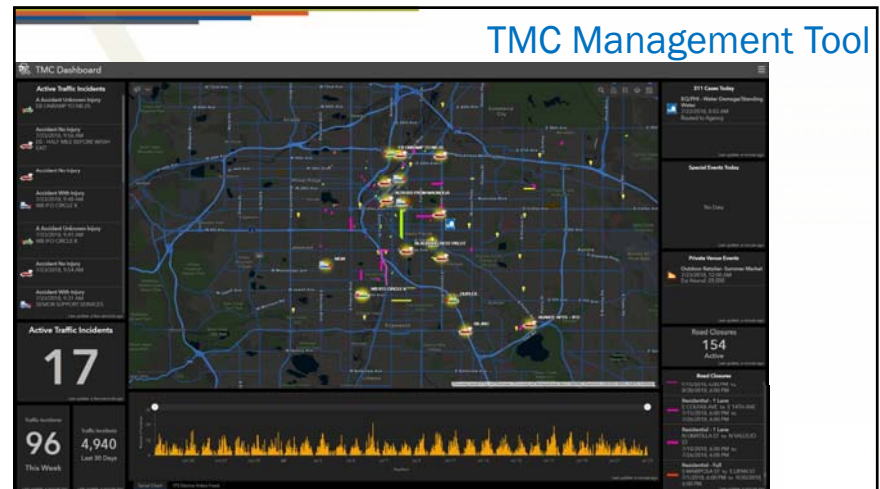
Denver Smart City ICT Ecosystem

- IoT devices= in the field, **sense (listen, hear, see) information**
- DAFNE= nerves, **carry the information**
- EDM= knowledge, **learns** to make better decisions
- TMC= consciousness, **today** will make better decisions

Will look @ historic patterns of
Will help in TMC focus on immediate need

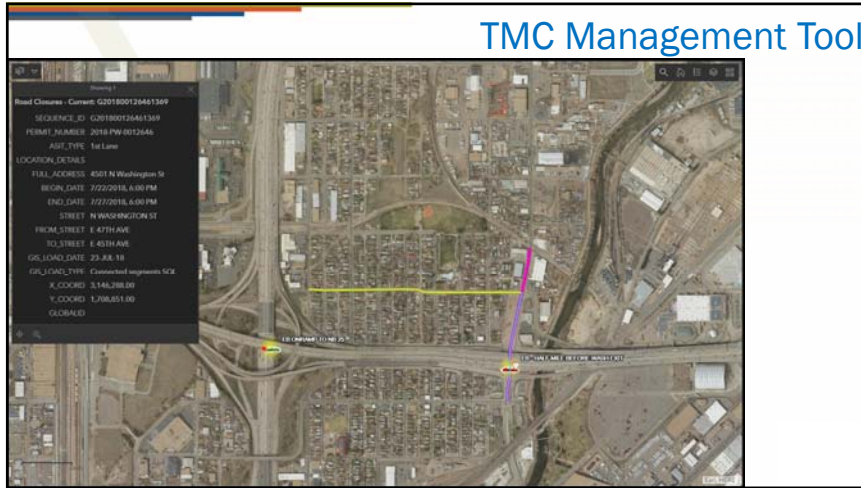
Access to, but I can't see them all; EDM will guide

DENVERSMART CITY



ATTACHMENT 2 - Denver

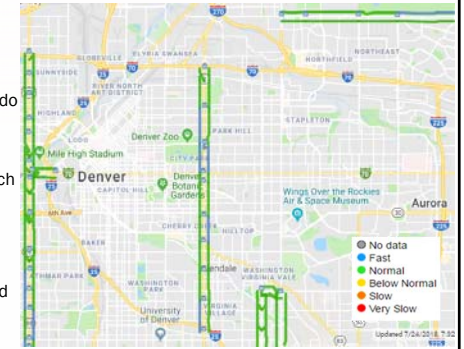
TMC Management Tool



Travel Time Reliability (TTR) via Bluetooth data



- CCD has 41 Bluetooth reader devices along Hampden Ave, Federal Blvd, Colfax Ave, Colorado Blvd, Monaco Pkwy, Quebec St, & 56th Ave
- 18 CDOT owned devices around the Denver Tech Center on CCD signals
- Allows Denver to broadcast travel times to the public on CoTrip, address traffic incidents, and improve signal timing



Traffic Incident Response Summary—Interstate 25

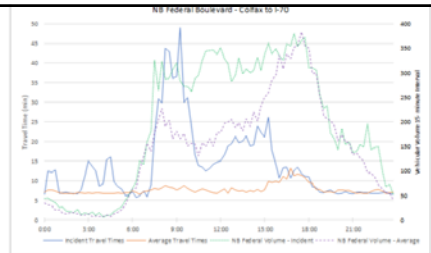
Thursday, June 14, 2018

Incident Background

- Multiple vehicle crash on northbound Interstate 25 just south of Interstate 70
- Crash occurred during the morning rush hour
- Involved a commercial vehicle hauling hazardous materials which had turned onto its side and required extensive recovery efforts
- The northbound lanes of I-25 were **completely closed for 2.5 hours** before the HOV lane was opened for NB traffic
- Allowed for NB traffic to flow; however, vehicles were required to merge into 1 lane
- The Interstate fully opened **approximately 8 hours** after the incident occurred

Traffic Impacts

- Interstate
 - During 2.5 hour full closure of NB Interstate 25 traffic was diverted onto NB Speer Boulevard which is a City of Denver roadway
- City of Denver Roadways
 - Federal Boulevard became a primary diversion route
 - Travel times increased **up to 419%** when compared to normal conditions
 - Traffic volumes increased up to 130% during the incident



- As seen in the diversion route chart above travel times on the Incident day increased significantly along with vehicular volumes when compared to an average day
 - The significant decrease in travel times were seen after changes to traffic signal timing were made by the Denver TMC
- Denver TMC Response**
- Diversion route was identified using situational awareness tools
 - Located bottleneck location
 - **Changes were made to traffic signal timing** from the Denver TMC to locations on Federal Boulevard
 - Activated Interstate closure messages on **Denver variable message signs**

↑ Travel times on Federal Boulevard increased to **over 400%** of average prior to Denver TMC

↑ Travel volumes on Federal Boulevard increased up to **130%** of average

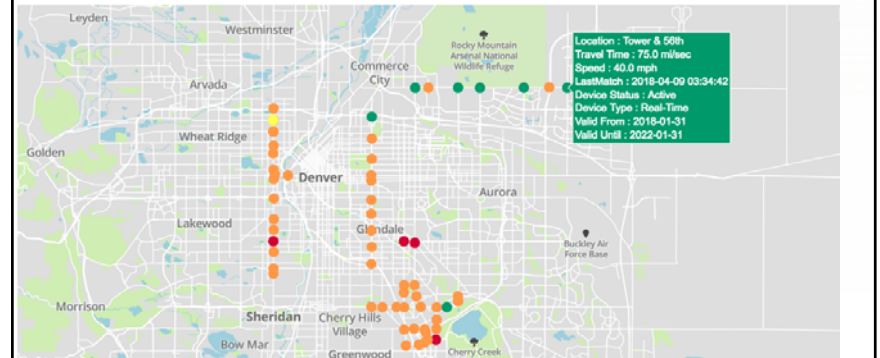
↓ Travel times seen on Federal Boulevard during the incident **decreased by 63%** due to the response of the Denver TMC

On our way: TTR in the EDM

of Routes: 23 # of Pairs: 137 # of Devices: 61 Avg Travel Time: 88.0mi/s Avg Speed: 29.0mph

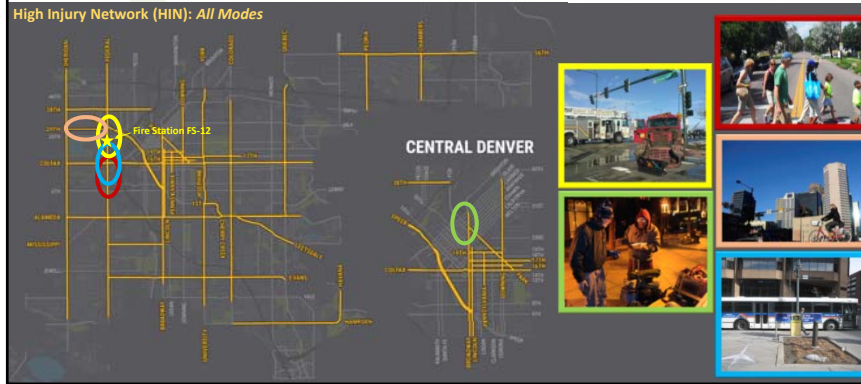
Showing records starting from: 2018-02-12 17:41:01

Showing records till: 2018-04-13 11:43:59



Living Lab Phase 2: Five Use Cases

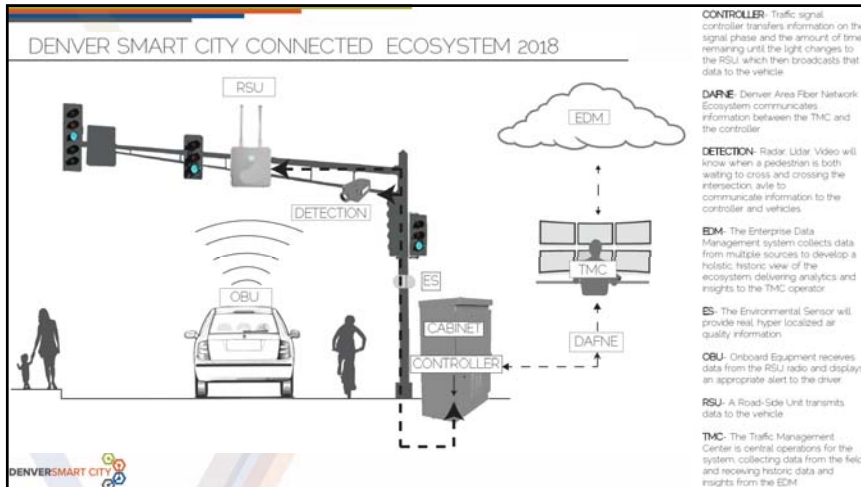
High Injury Network (HIN): All Modes



DENVERSMART CITY
Using data to make our city better.

www.denvergov.org/denversmartcity

DENVER SMART CITY CONNECTED ECOSYSTEM 2018





DRIVE »

— INNOVATION —

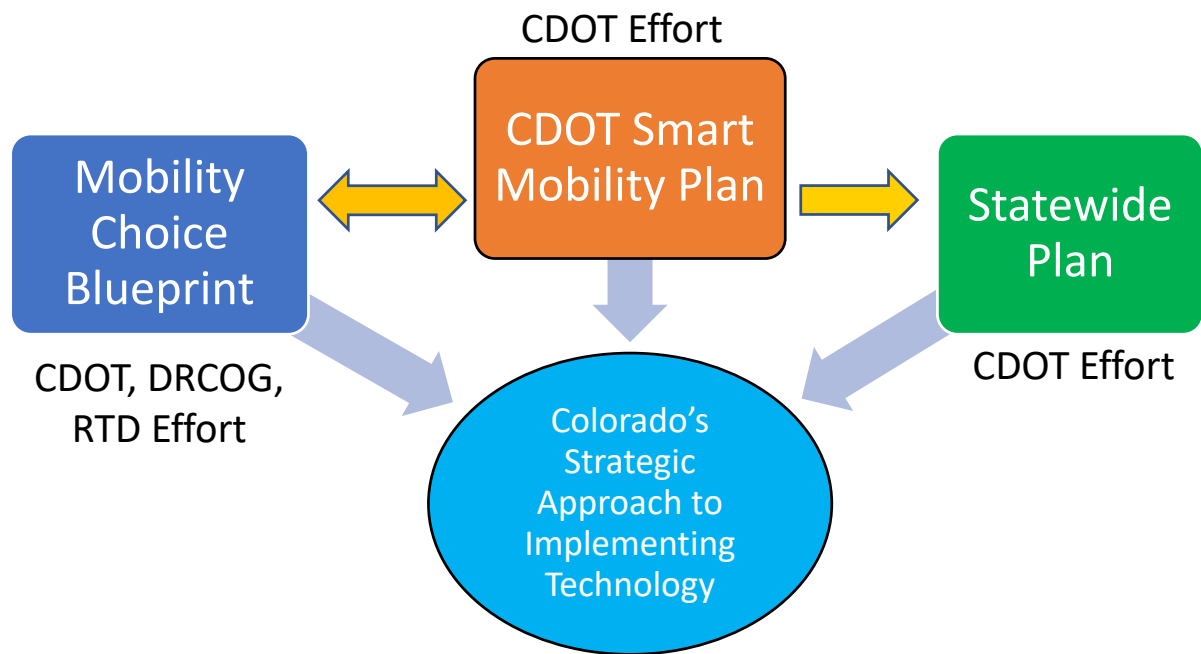
A Vision for Smart Mobility

Ryan Rice
Director of Mobility Operations



COLORADO
Department of
Transportation

SMART MOBILITY



A Vision for Highway Automation

A VISION FOR HIGHWAY AUTOMATION

Problem Statement

- Higher levels of vehicle automation are our best hope to reverse the trend of increasing fatalities and delay.
- Automation of vehicles is not a question of “if”, but rather a question of “when” and “how”.
- To accelerate vehicle automation, Roadway Owner/Operators must prepare their infrastructure.
- Economic competitiveness requires that we continue to innovate in dramatic ways in transportation.



A VISION FOR HIGHWAY AUTOMATION



5 YEAR STRATEGIC GOAL

Make a dramatic leap toward zero deaths by deploying a world class roadway system for connected & autonomous mobility

READINESS FRAMEWORK

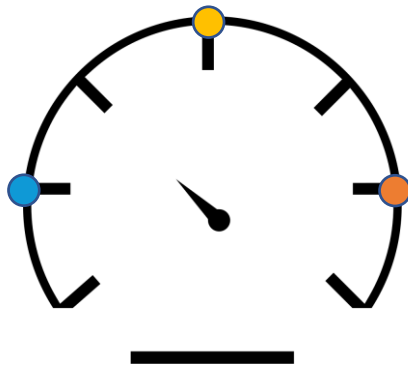


Phase II: Fully Autonomous Network (2022-2025)

Focused on providing a network of roads/lanes for designed for fully autonomous vehicles, connecting freeways to major destination centers

Phase I: Highly Automated Vehicle Network (2019-2021)

Focused on providing a network of high volume roads custom designed to support & advance automated driving systems over the next 5 years



Phase III: System Expansion & Enhancement (2026-2030)

Focused on expanding & enhancing supporting infrastructure, dedicated lanes, & other innovations to the system

PHASE I: Highly Automated Vehicle Network

HIGHLY AUTOMATED VEHICLE NETWORK

Phase I: Focus Areas

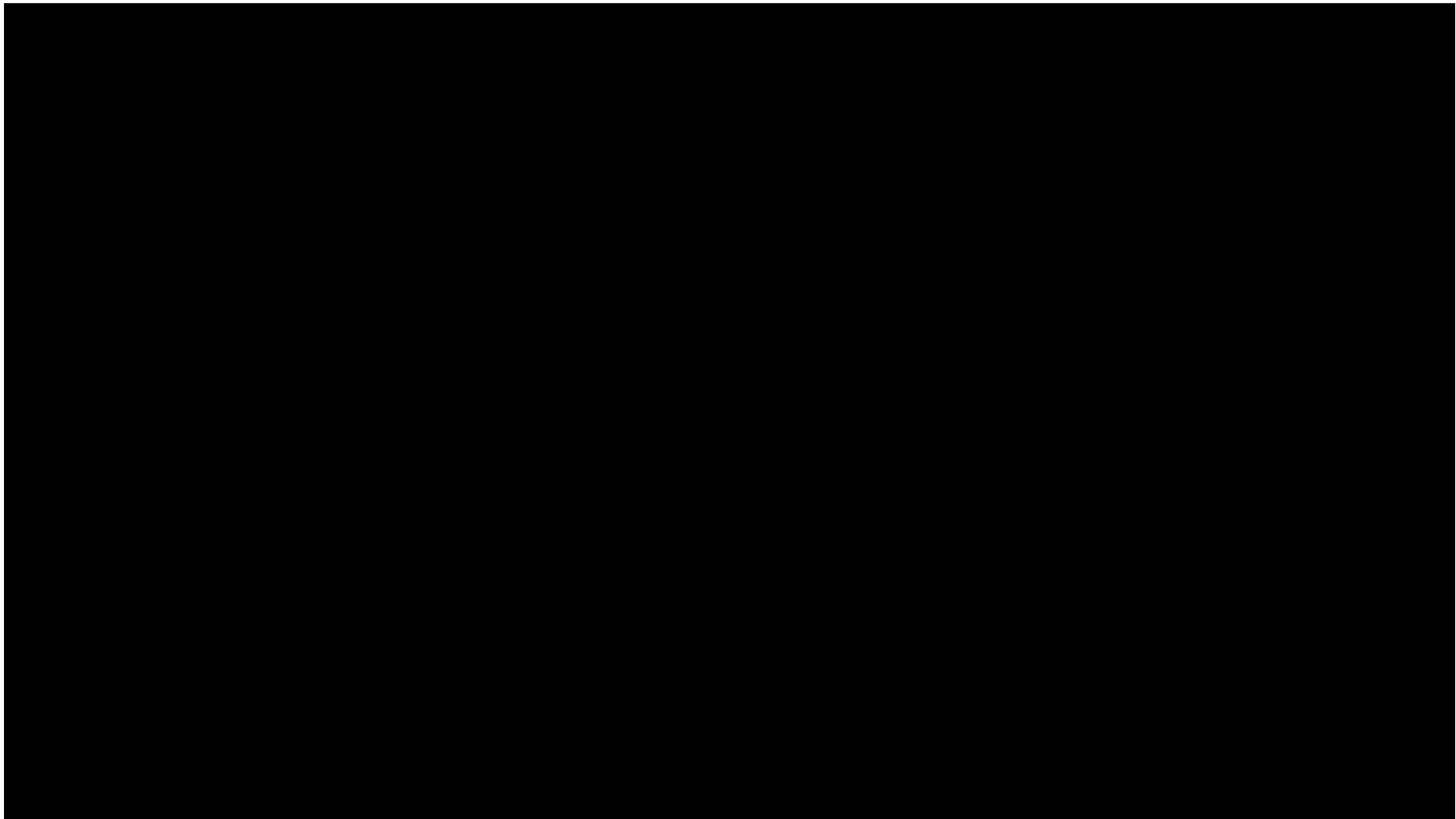
Infrastructure For Navigation & Maneuverability

Helps HAVs know where they are, where the road is, and what's happening on the road

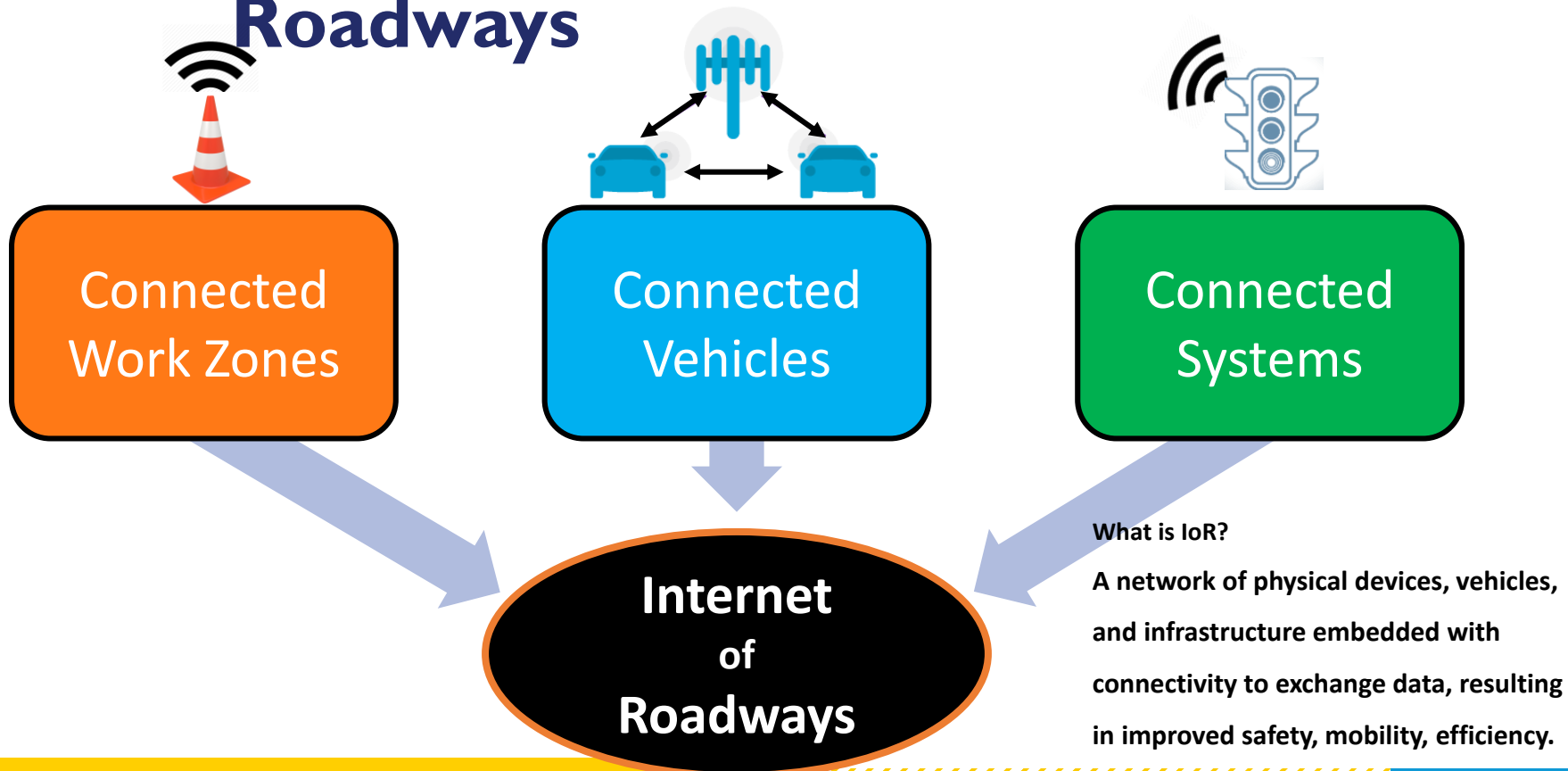
- Striping & Signing Standards
- Interoperable Data
- Work Zone and Lane Closure Data
- Internet of Roads - V2X Infrastructure



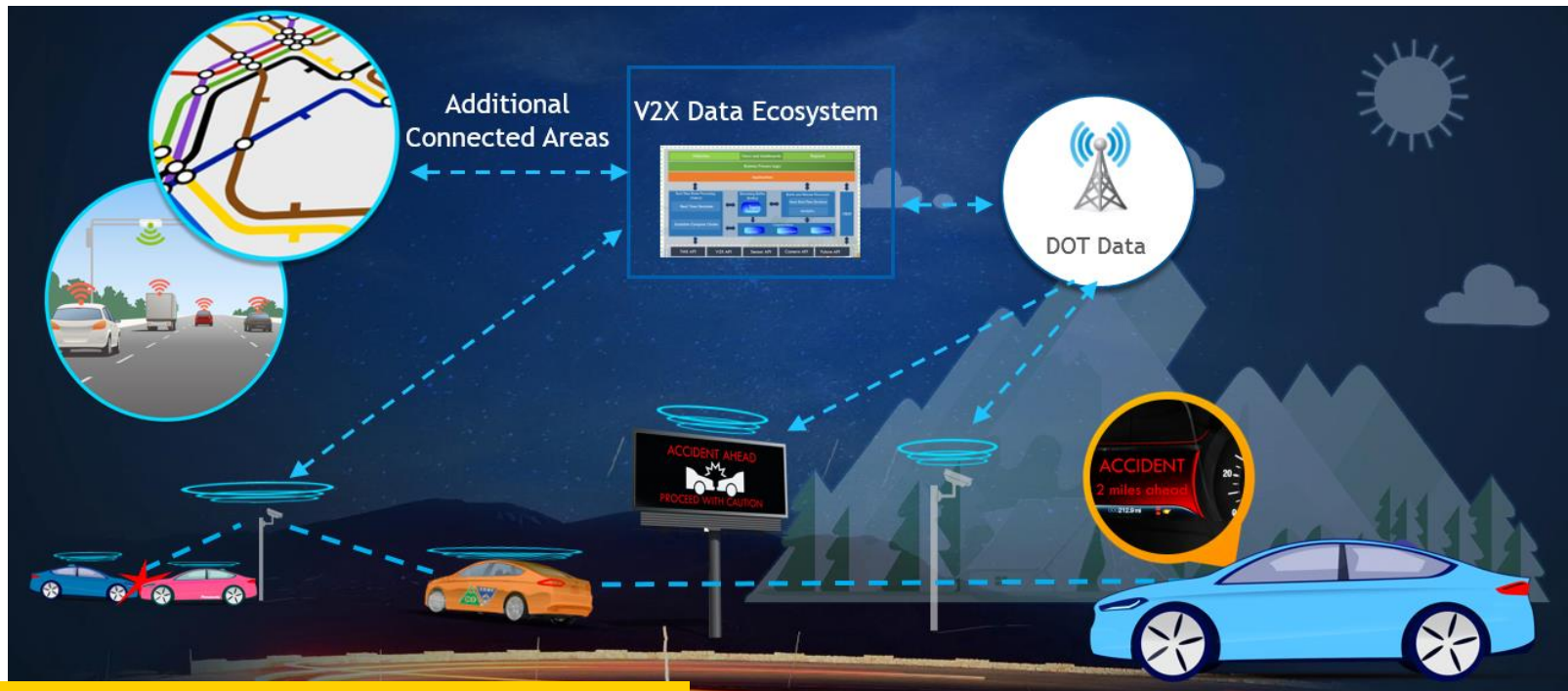
THE INTERNET OF ROADWAYS



The DNA of the Internet of Roadways



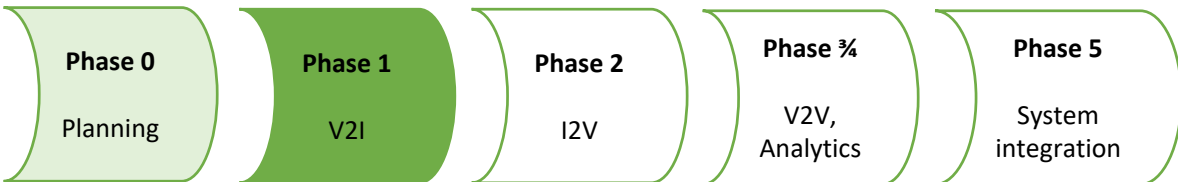
INTERNET OF ROADWAYS



INTERNET OF ROADWAYS

Not a pilot...

- I-70 Deployment in Oct 2018
- 2500 Vehicles equipped
- 100 Road Side Units



Potential I2V Applications

- Crash Notifications
- Road Conditions
- Travel Time
- Queue Detection
- Rerouting
- Dynamic weather alert
- Red light violation
- Variable Speed Limits
- Snowplow priority



INTERNET OF ROADWAYS

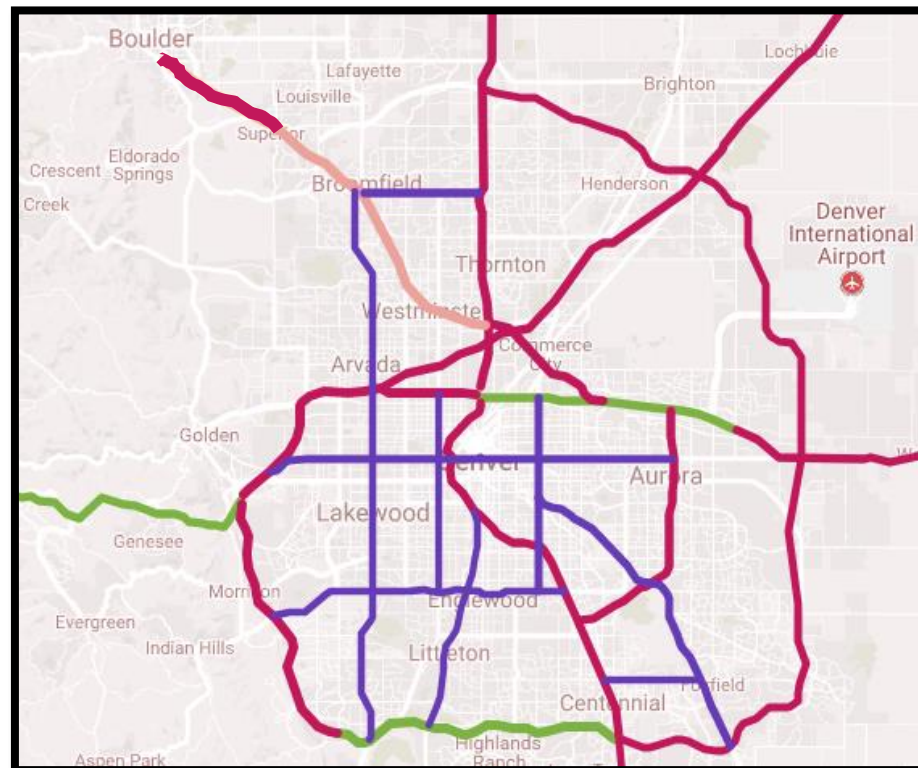
Applications

- Signal Phase and Timing (SPaT) Data Sharing
- Intelligent/Adaptive Signal Timing
- Signal priority/preemption
- Red light running warning
- Pedestrian in crosswalk
- Dynamic speed harmonization

 Arterials

 Freeways

Signalized Corridors



INTERNET OF ROADWAYS

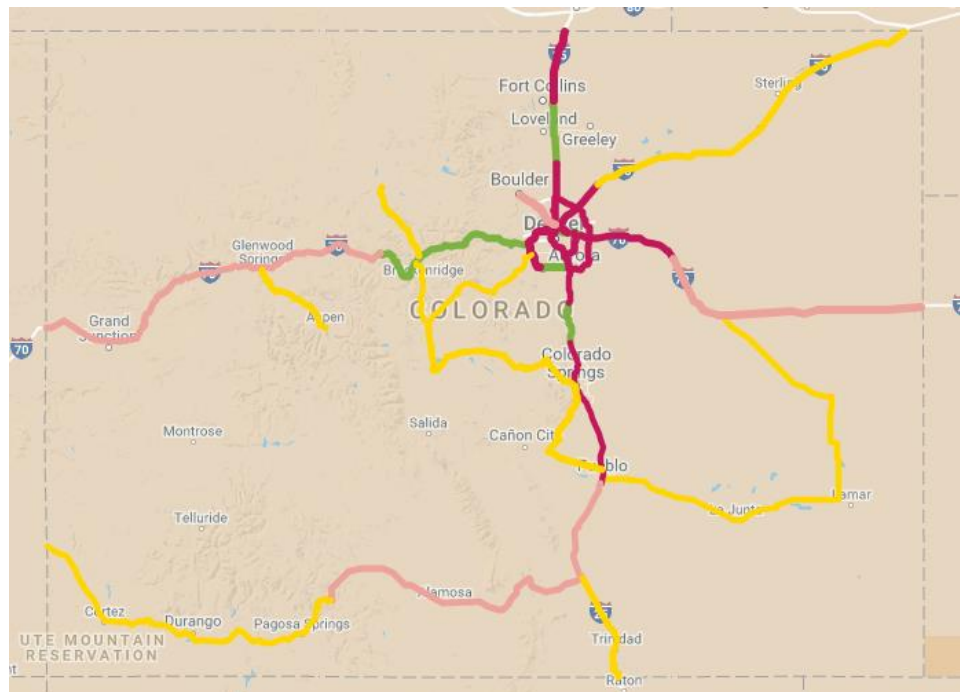
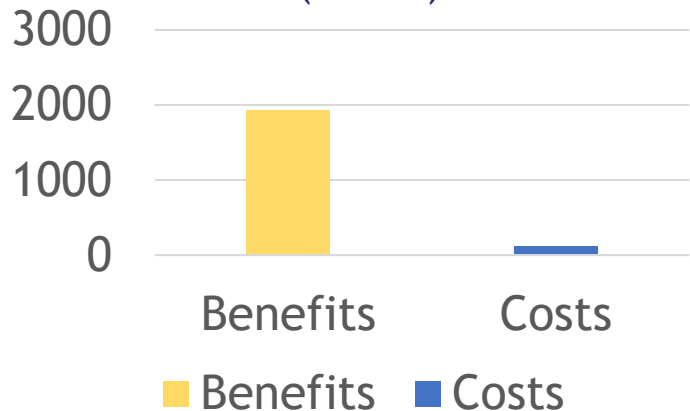
Deployment at Scale

Goal: 2,000+ miles of V2X Connected Vehicle Network by 2025

17 to 1 Benefit/Cost Ratio

(Conservative)

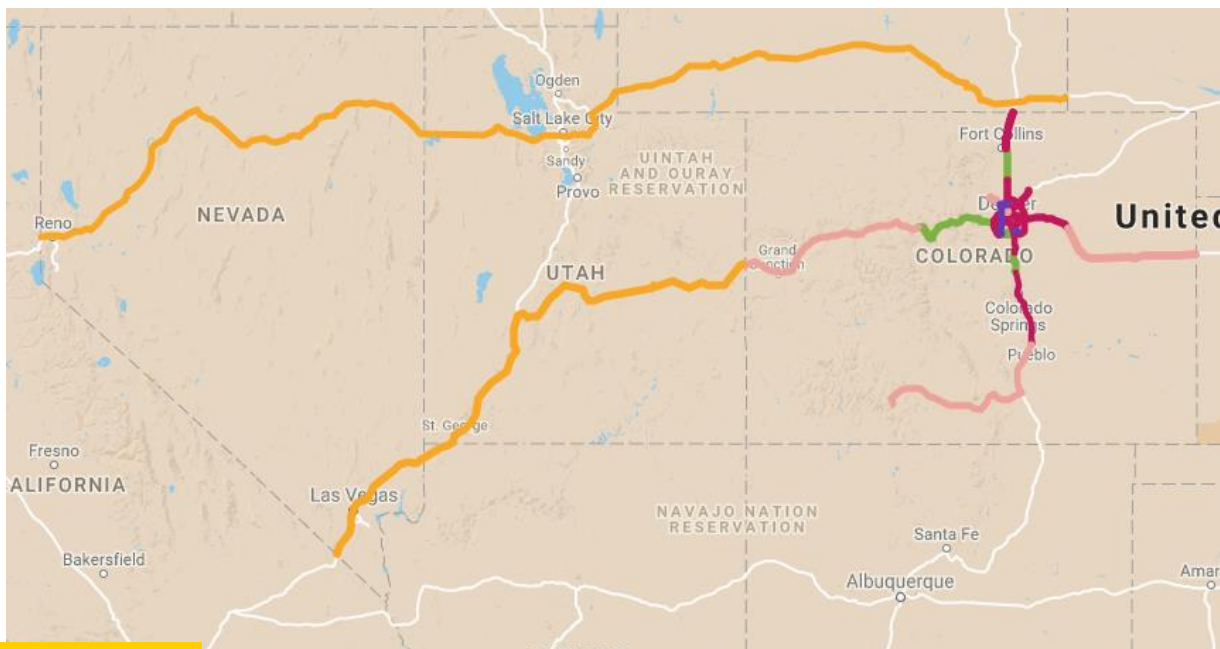
Benefits/Costs-28 Years
(millions)



INTERNET OF ROADWAYS

Interstate Partnership

- Potential for 4 states: CO, WY, UT, NV
- I-70, I-15, I-80
- 1,500 additional miles



SMART WORK ZONES

Current Deployments

- \$500,000 for 2018 Smart Work Zone Deployments
- Devices on work zone equipment to generate data on cone location, lane closures, speeds, queue length



WHAT'S NEXT



National Strategy for Highway Automation

Coast-to-Coast Automated Vehicle Readiness by 2025

- AASHTO Task Force on Highway Automation created - August 2018
- Framework Outline
 - ❑ Vision & Business Case
 - ❑ Road Network Methodology
 - ❑ Implementation Plan
 - ❑ Benefits Analysis
 - ❑ R&D Innovation Roadmap

WHAT'S NEXT



CDOT Smart Mobility Plan

Developing the Highway Automation Readiness Framework

Key Areas

- Internet of Roadways (V2X) Deployment Plan
- Signal Operations
- Work Zone and Incident Data
- Interoperable Data
- Striping and Signing Specifications



Questions?

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