

**AGENDA**  
**REGIONAL TRANSPORTATION COMMITTEE**  
**Tuesday, June 14, 2022, 8:30 a.m.**  
**1001 17<sup>th</sup> Street, Denver, CO**  
**1<sup>st</sup> Floor Aspen & Birch Conference Room**

**\*In-Person Meeting with Virtual Option for Public (via Zoom)**

1. Call to Order
2. Public Comment
  - Members of the public are welcome to comment in person or virtually
3. May 17, 2022, RTC Meeting Summary  
(Attachment A)

**ACTION ITEMS**

4. Federal Performance Targets: traffic congestion and on-road mobile source emissions reduction  
(Attachment B) Alvan-Bidal Sanchez, Transportation Planner

**INFORMATIONAL BRIEFINGS**

5. 2050 Regional Transportation Plan Greenhouse Gas Update  
(Attachment C) Jacob Riger, Manager, Long Range Transportation Planning
6. Regional Complete Streets Network Prioritization Analysis  
(Attachment D) Emily Kleinfelter, Safety/Regional Vision Zero Planner

**ADMINISTRATIVE ITEMS**

7. Member Comment/Other Matters
  - CDOT Report
  - RTD Report
8. Next Meeting – July 19, 2022
9. Adjournment

Attendees can request additional aids or services, such as interpretation or assistive listening devices, by calling 303-480-6701 or emailing [ckennedy@drcog.org](mailto:ckennedy@drcog.org) Please notify DRCOG at least 48 hours in advance so we can coordinate your request.

**ATTACH A**

## ATTACHMENT A

MEETING SUMMARY  
**REGIONAL TRANSPORTATION COMMITTEE**  
Tuesday, May 17, 2022  
Note: Meeting held in-person

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### MEMBERS PRESENT:

Don Stanton	Colorado Department of Transportation
Yessica Holguin	Colorado Department of Transportation
Rebecca White (Alternate)	Colorado Department of Transportation
Eula Adams (Alternate)	Colorado Department of Transportation
Randy Weil (Alternate)	Denver Regional Council of Governments
Doug Rex	Denver Regional Council of Governments
Wynne Shaw	Denver Regional Council of Governments
Kevin Flynn (Chair)	Denver Regional Council of Governments
Steve Conklin (Vice Chair)	Denver Regional Council of Governments
Shelley Cook	Regional Transportation District
Kate Williams	Regional Transportation District
Bill Van Meter (Alternate)	Regional Transportation District
Jeffery Kullman	Michael Baker International
Mike Silverstein	Regional Air Quality Council

### Others Present:

Ron Papsdorf (Alternate)	Denver Regional Council of Governments
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**Public:** Roy Howard, Jan Rowe, Lauren Pulver, Allison Cutting, Rachel Hultin, Cap Kelly, Michael Davis, Nathaniel Minor, Ben Holland

**DRCOG Staff:** Emily Lindsey, Alvan-Bidal Sanchez, Cam Kennedy, Sang Gu Lee, Robert Spotts, Matthew Helfant, Josh Schwenk, Melissa Adamson, Emily Kleinfelter, Steve Cook, Andy Taylor, Greg Mackinnon, Chuck Vigil, Tim Feld

### Call to Order

Chair Kevin Flynn called the meeting to order at 8:30 a.m.

### Public Comment

There was no public comment.

### Summary of April 17, 2022 Meeting

The summary was accepted.

## ACTION ITEMS

### FY 2022-2027 Transportation Improvement Program Air Quality/Multimodal Regional Share Funding Recommendations

Ron Papsdorf, Division Director, Transportation Planning & Operations, informed the committee that on January 24 DRCOG issued the first of four Calls for Projects to program \$463.3 million in available funds from federal fiscal year 2022 through FY 2027. A total of 13 applications totaling \$103,272,000 in funding requests were received from subregional forums and RTD by the March 18 application deadline. From March 23 to April 6, DRCOG conducted a public comment period for the submittals and received 246 comments. The public was able to indicate whether they support, have concern, or are opposed to the proposed project and submit specific written comments.

A dozen DRCOG staff evaluated and scored each application question on a scale of 0 to 5 (5 being the highest) and an average weighted score was calculated for each project and turned

over to a Regional Share TIP Project Review Panel. The panel consists of one technical staff representative from each of the eight subregions, one CDOT representative, one RTD representative, and three regional subject matter experts.

The panel recommends funding six projects. The recommendation considers both the DRCOG technical scores, and the public comments received. Their recommendation was developed through over four hours of deliberations, where they worked to propose funding quality, highly scored submittals from around the region. Aware that four of the top five scoring projects are from two subregions totaling just under 40% of the requested funding, the panel elected to allocate a lower funding amount than requested for some projects in order to fund a larger and more diverse set of project types and locations. The recommended funding amounts ensure that each project can implement meaningful scope elements and deliver improved travel options for residents from throughout the region.

As part of the process to allocate available funds over four calls and two TIPs, no wait lists are being developed as an outcome of the first two calls. Those project sponsors who submitted projects in the first two calls (for the FY 2022-2025 TIP), but were not recommended for funding, may simply resubmit their same or similar application in the later calls if they wish. Wait lists will be developed as an outcome of the final two calls for projects. The suite of projects approved by the Board in May, along with the outcomes of Call #2, will be amended into the current FY 2022-2025 TIP in September.

Commissioner Rebecca White asked where the total sum amount came from, and Mr. Papsdorf responded the total estimated funding for all four calls is \$463.3 million from FY 2022 – FY 2026. Regarding Call #1 specifically, the 13 applications had a total funding request of \$103.272 million.

Director Mike Silverstein inquired about what happens to projects that are not approved. Mr. Papsdorf said the sponsors of projects not recommended for funding are welcome to resubmit in later calls. There will be three more Calls for Projects.

Director Steve Conklin asked about the deadline for applications for Call #2 and Mr. Josh Schwenk stated that the deadline is June 24 and that DRCOG staff will screen projects for eligibility and provide the applications and scoring materials to the subregional forums.

Chair Flynn wondered about the webmaps and how DRCOG communicated with the public. Mr. Papsdorf mentioned that DRCOG will be accepting new public comments with each Call for Projects, as well as after the development of the FY 2024-2027 TIP. Executive Director Doug Rex mentioned that the final comment period will occur on the draft 24-27 TIP prior to Board adoption, so the Board can take the comments into consideration.

Director Kate Williams was curious about coordination with other agencies to promote the public comment opportunities and Mr. Papsdorf mentioned that DRCOG would greatly appreciate other agencies in the region participating in the comment period and sharing comment opportunities through their communication channels.

Kate Williams MOVED to recommend to the DRCOG Board of Directors allocating \$40,323,000 of Air Quality and Multimodal funds to six projects as presented to be included in the current FY 2022-2025 TIP. The motion was seconded and passed unanimously.

## **INFORMATIONAL BRIEFING**

### Regional Transportation Operations and Technology (RTO&T) Strategic Plan

Greg MacKinnon, Program Manager, Transportation Operations, informed the committee that DRCOG, with key regional stakeholders, is developing a Regional Transportation Operations & Technology (RTO&T) Strategic Plan. A key component will be the “operational concept” for regional transportation day-to-day operations. Of particular importance is the data management “service area” because it will serve as the foundation for other service areas. The development of the operational concept builds from planning guidance provided in the DRCOG Metro Vision Plan and the Mobility Choice Blueprint. The completed strategic plan will be brought before this committee later in the year. This plan will provide guidance for the development of the upcoming call-for-projects for the RTO&T Set-Aside Program. The call-for-projects is scheduled for early 2023.

Commissioner Don Stanton inquired about how the RTO&T was weighing the safety factor considerations not just for car crashes but for pedestrians and bicyclists and would like that information to be quantified. Mr. MacKinnon mentioned safety is always the number one priority from the operations perspective and DRCOG is working to ensure safe crossings for pedestrians and bicyclists while also addressing progression for the other modes of transportation.

Director Shelley Cook wanted to know how DRCOG planned to improve transit performance and mentioned how busses in Los Angeles could clear lights ahead of them if the busses are running behind schedule to allow them to catch up. Mr. MacKinnon mentioned that the Mobility Choice Blueprint lists transit signal priority as tactical action. This initiative is a system that gives signal priority to transit vehicles.

Director Jeffery Kullman asked if “minimizing traveler delay due to crashes or other incidents” could be included as an additional objective since greater interconnectivity could solve that problem by rerouting vehicles to avoid those incidents. Mr. MacKinnon mentioned it is possible, but we would need multiple jurisdictions responding and coordinating information on incidents in real-time, for example a car crash or a water line break.

Chair Flynn inquired about if CCTV cameras are static or if they are pan-tilt-zoom cameras and how many agencies contributed to the interconnectivity and if they can see one another’s cameras. Mr. MacKinnon responded that they are pan-tilt-zoom cameras and mentioned while jurisdictions don’t share their cameras currently, they could because there is precedence for it.

### Housing and the Regional Transportation Planning Process

Andy Taylor, Manager, Regional Planning and Analytics, and Alvan-Bidal Sanchez, Transportation Planner informed the committee that DRCOG and other MPOs factor in growth and development when considering projects and strategies for their regional transportation plans and transportation improvement programs. DRCOG’s transportation planning process integrates growth and development in multiple ways. Last year’s Bipartisan Infrastructure Law (BIL) includes provisions that add or clarify the federal transportation planning requirements for MPOs.

Included in these provisions are changes that clarify the role of housing in the regional transportation planning process. Among other factors, the BIL specifies that the process must consider projects and strategies that “promote consistency between transportation improvements and State and local planned growth, housing, and economic development patterns...” Title 23 U.S. Code (USC) § 134(h)(1)(E) (underline reflects addition).

The discussion focused on identifying the top three of the following six objectives for coordinating housing and transportation:

- 1) Improve commutes: Better connect housing and employment
- 2) More transportation-oriented development: Transportation-oriented housing and economic development
- 3) More housing-oriented transportation improvements: Align transportation improvements with housing needs
- 4) Less vehicle miles traveled: Reduce growth in vehicle travel from housing and economic development
- 5) Affordability: Align transportation and housing to improve affordability in relation to income
- 6) Improve access: Increase share of the region's housing with sufficient and affordable access to transportation

Director Cook mentioned she is assisting with setting up an affordable housing area in Arvada and commented on the importance of having more transportation-oriented housing and economic development (TOD) and affordability in suburban and outlying areas.

Director Williams mentioned she is also working on affordable housing and how critical it is that affordable housing developments be near transit. She also inquired about why RTD was not shown in the planning documents. Mr. Papsdorf mentioned that DRCOG didn't list RTD or CDOT in this presentation since they are DRCOG's partners in the MPO and they will be included in the planning work.

Commissioner Yessica Holguin mentioned that it is tough to only select three objectives since there is a lot of overlap between them. For example, options #2 and #5 go together.

Director Rebecca White discussed that in her opinion, option #6 has always been done and belongs more in a category regarding infrastructure rather than housing and transportation.

#### 2050 Regional Transportation Plan Greenhouse Gas Update

Alvan-Bidal Sanchez, Transportation Planner, explained to the committee the next step in the GHG analysis process is to calculate the GHG emissions associated with the 2050 RTP as adopted to establish the baseline. As a reminder, the GHG rule defines the baseline as the modeled emissions associated with the 2050 RTP as adopted in April 2021. DRCOG staff has continued to analyze the potential emission reduction benefits associated with the programmatic investments in the adopted 2050 RTP. These non-modeled, non-project specific investments are a significant portion of the fiscally constrained plan in terms of both financial plan allocations and planned mobility investments in the region's multimodal transportation system through 2050.

DRCOG is testing potential GHG benefits of strategic modifications to the 2050 RTP's fiscally constrained project and program investment mix. These potential concepts consist of:

- Refocusing the scope of some capacity projects to emphasize complete streets/safety retrofits.
- Advancing the implementation of certain BRT corridors to capture their GHG benefits sooner.
- Increasing investments in multimodal improvements to complete more of them and more quickly: regional active transportation network buildout, safety projects, complete streets retrofits, and transit corridors.

DRCOG staff is currently testing the extent to which these strategic 2050 RTP project and program investment modifications help close the gap to achieve the GHG reduction targets.

Based on the work described in this memo, the key modeling analysis steps DRCOG staff is conducting under the GHG Rule include:

- Step 1: Define and model the GHG-reducing categorial funding in the adopted 2050 RTP as described above.
- Step 2: Identify and analyze changes to the 2050 RTP's fiscally constrained investment strategies and projects to further reduce GHG emissions.
- If the GHG reduction targets are still not achieved, DRCOG will consider the GHG rule's Mitigation Action Plan process, which provides for identifying specific mitigation actions to further reduce GHG emissions that are separate from emission reduction strategies included in the Focus model.

Director Williams was curious about marketing as part of the process to meet GHG reduction levels so people who use cars could be motivated to use public transportation. Director Silverstein commended the presentation and mentioned how the GHG reduction strategy will have an enforcement mechanism which is what is needed to solve this issue.

Executive Director Doug Rex thanked the DRCOG staff for their work and commitment to this project. Mr. Papsdorf mentioned changes to the plan alone will likely not get the region to the reduction targets so it appears the region will need to use mitigation measures and it will take a regionwide effort to achieve the goal.

Chair Flynn was curious about congestion and wondered if there is a way to quantify how many vehicle trips can be supplanted by alternate modes of transportation. Mr. Sanchez mentioned project level analysis and regional travel model could look at origin and destination points for vehicle trips. Director Stanton mentioned the Transportation Commission made sure that revisions could be made so TPRs and MPOs have a chance to provide feedback so CDOT can adapt.

Director Randy Weil inquired about how electric vehicles will affect this process. Mr. Sanchez mentioned that while the model factors in the growth of electric vehicles throughout the analysis year, DRCOG will focus on mitigation measures we can adopt and invest in over the next 30 years.

### **ADMINISTRATIVE ITEMS**

#### **Member Comment/Other Matters**

- May 13 2022 Statewide Transportation Advisory Committee Review

Mr. Papsdorf stated RTC should not be viewed solely as a forum for DRCOG topics but a place where regional partners can stay informed on matters occurring at CDOT or RTD as well. This committee should be seen as a transportation planning group not just a DRCOG group. Mr. Papsdorf informed the committee at STAC there was a conversation about GHG policy update in terms of the mitigation measures and once it is adopted it is worth a larger discussion at RTC. Also, during STAC last week there were presentations on the new enterprises created by SB260 with each enterprise dedicated to specific purposes and with dedicated funding streams. Lastly, CDOT discussed expanding Bustang service across the state.

Director White echoed Mr. Papsdorf sentiments that this committee should cover matters ongoing at partner agencies as well and hoped her participation in RTC could help facilitate that connection with STAC. Executive Director Rex mentioned that perhaps it would be beneficial if the committee could also get an update from RTD about some of the upcoming topics being discussed there. Director White also mentioned that STAC will be changing the date for their future meetings and potential new membership was discussed to accommodate the new dates going forward.

Commissioner Stanton asked if the meeting format could be discussed again to see if having RTC as a virtual or hybrid meeting was possible going forward. Chair Flynn stated that the DRCOG Executive Committee will discuss at tomorrow afternoon's meeting.

Next Meeting – June 14, 2022

Adjournment

The meeting adjourned at 10:15 a.m.

**ATTACH B**

## ATTACHMENT B

To: Chair and Members of the Regional Transportation Committee

From: Alvan-Bidal Sanchez, Transportation Planner

Meeting Date	Agenda Category	Agenda Item #
June 14, 2022	Action	4

### SUBJECT

Federal Performance Targets: traffic congestion and on-road mobile source emissions reduction

### PROPOSED ACTION/RECOMMENDATIONS

Staff recommends setting the proposed federal traffic congestion and on-road mobile source emissions reduction targets.

### ACTION BY OTHERS

[May 23, 2022](#) – TAC recommended approval

### SUMMARY

Federal law requires State DOTs and MPOs to set targets and report on progress towards achieving the targets for several performance areas in support of a performance-based approach to transportation planning and programming. These areas include safety, infrastructure condition (pavement and bridge), system performance, transit asset management, and transit safety.

The traffic congestion targets, and on-road mobile source emissions targets are two subparts of the broader PM3: system performance area, and the subject of this memo and presentation item. The two remaining subparts covering travel time reliability and freight reliability will be brought before the RTC at a later date.

#### **PM3: System performance**

##### Traffic congestion reduction

The two performance measures under Traffic Congestion are the annual hours of peak hour excessive delay per capita and the percentage of non-single occupancy vehicles travelling within an applicable urbanized area.

Federal guidance encourages targets to be realistic and achievable. The two targets require joint approval from CDOT and DRCOG and apply to the Denver-Aurora, CO Urbanized Area. The proposed targets are:

Traffic Congestion Reduction	Baseline	2-Year Target	4-Year Target
Percent of non-single occupancy vehicle travel	27.3%	26.7%	27.7%
Annual hours of peak hour excessive delay	11.7	15.8	17.4

DRCOG has established a 2040 performance measure target in Metro Vision of 35% non-single occupant vehicle mode share to work and has a performance measure target addressing daily person delay per capita by 2040. Combined with CDOT modeling work

done through CATCH Intelligence, this was used as the basis for setting the two-year and four-year targets.

On-road mobile source emissions reduction

This measure is the 2-year and 4-year cumulative estimated emissions reductions, for all CMAQ funded projects, of each applicable criteria pollutant and their precursors for which the area is designated nonattainment or maintenance.

Federal guidance encourages targets to be realistic and achievable. DRCOG is required to set targets for the MPO Planning Area for applicable pollutants. The proposed targets are:

On-Road Mobile Source Emissions Reduction	Baseline	2-Year Target	4-Year Target
Total emissions reduction ( <b>VOC</b> ) kg/day	388.191	209.971	423.397
Total emissions reduction ( <b>PM10</b> ) kg/day	41.385	23.900	47.800
Total emissions reduction ( <b>CO</b> ) kg/day	6,006.652	2,583.027	5,213.589
Total emissions reduction ( <b>NOx</b> ) kg/day	707.876	397.012	800.557

DRCOG has built on methodology developed by CDOT to calculate the DRCOG portion of each pollutant and set two-year and four-year targets.

Staff will discuss progress on achieving the previous period's targets, review the methodologies, and explain the proposed targets at the June RTC meeting.

**PREVIOUS DISCUSSIONS/ACTIONS**

N/A

**PROPOSED MOTION**

Move to recommend to the Board of Directors the traffic congestion reduction and on-road mobile source emissions reduction targets for the Denver-Aurora, CO Urbanized Area.

**ATTACHMENT**

1. DRCOG Staff Presentation
2. CDOT Presentation
3. CATCH Intelligence Presentation

**ADDITIONAL INFORMATION**

If you need additional information, please contact Alvan-Bidal Sanchez, Transportation Planner at 720-278-2341 or [ASanchez@drcog.org](mailto:ASanchez@drcog.org)

# Federal Performance Measures and Targets: System Performance, Freight, and CMAAQ

Regional Transportation Committee  
June 14, 2022

**Alvan-Bidal Sanchez, AICP**  
he/him/his

# Federal performance areas



**PM1:** Safety performance



**PM2:** Infrastructure condition



**PM3:** System performance, freight, and CMAQ



**TAM:** Transit Asset Management



**PTASP:** Public Transportation Agency Safety Plan

Federal Highway Administration

Federal Transit Administration

# System performance, freight, and CMAQ



## Traffic congestion reduction

- Annual hours of peak hour excessive delay per capita
- % of non single occupancy vehicle travel



## On-road mobile source emissions

- Total emissions reduction (kg/day)
  - NOx
  - VOC
  - CO
  - PM10



## Travel time reliability

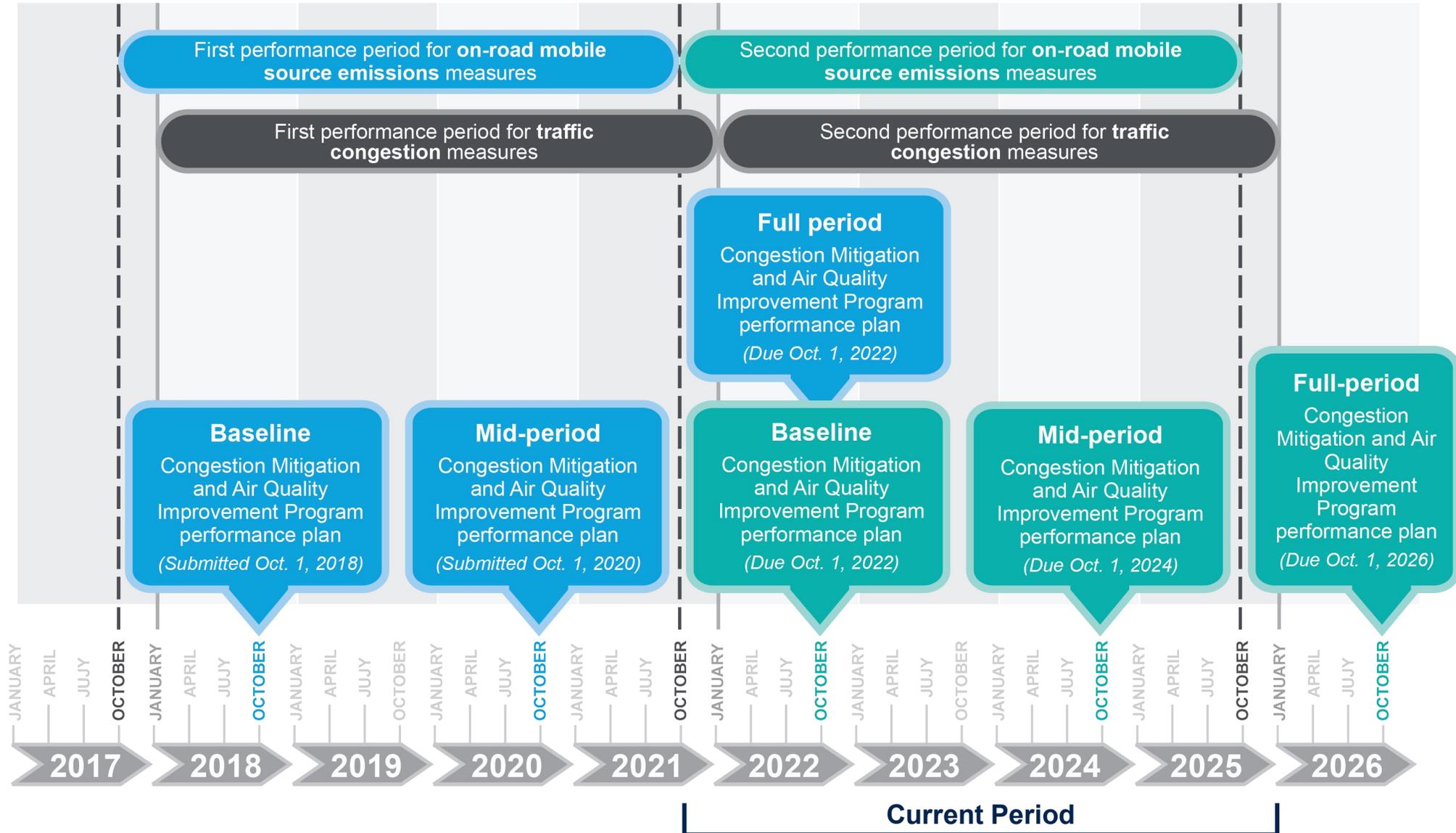
- % of PMT on the interstate that are reliable
- % of PMT on the non-interstate NHS that are reliable



## Freight reliability

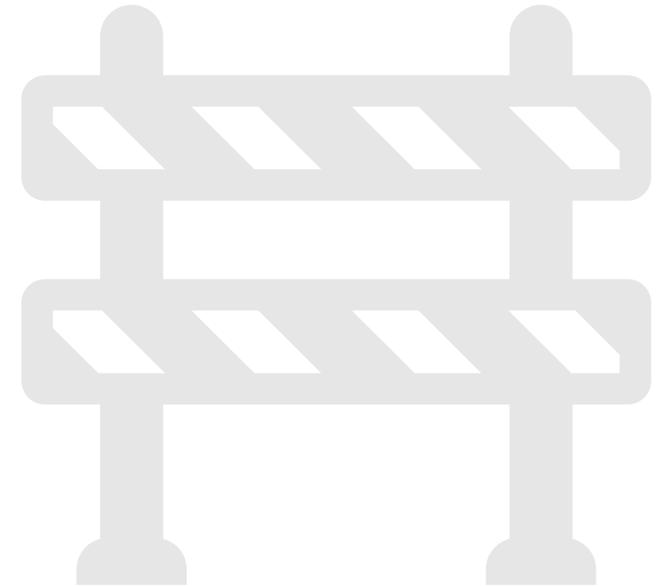
- Truck travel time reliability index

# Performance periods



# Considerations for 2020 data

- 2020 data from the US Census is being called “experimental”
- The census cautions against using the data to inform decisions and cautions against comparing directly to past years.





# Traffic congestion reduction performance measures



- Applies to areas with the following criteria **on October 1, 2021:**

## Area Characteristics

- ✓ Designated urbanized area,
- ✓ Contains NHS mileage **AND**
- ✓ Population over 200,000



## Nonattainment or Maintenance Area

- ✓ Ozone (O<sub>3</sub>)
- ✓ Carbon monoxide (CO) **OR**
- ✓ Particulate matter (PM<sub>10</sub> or PM<sub>2.5</sub>)

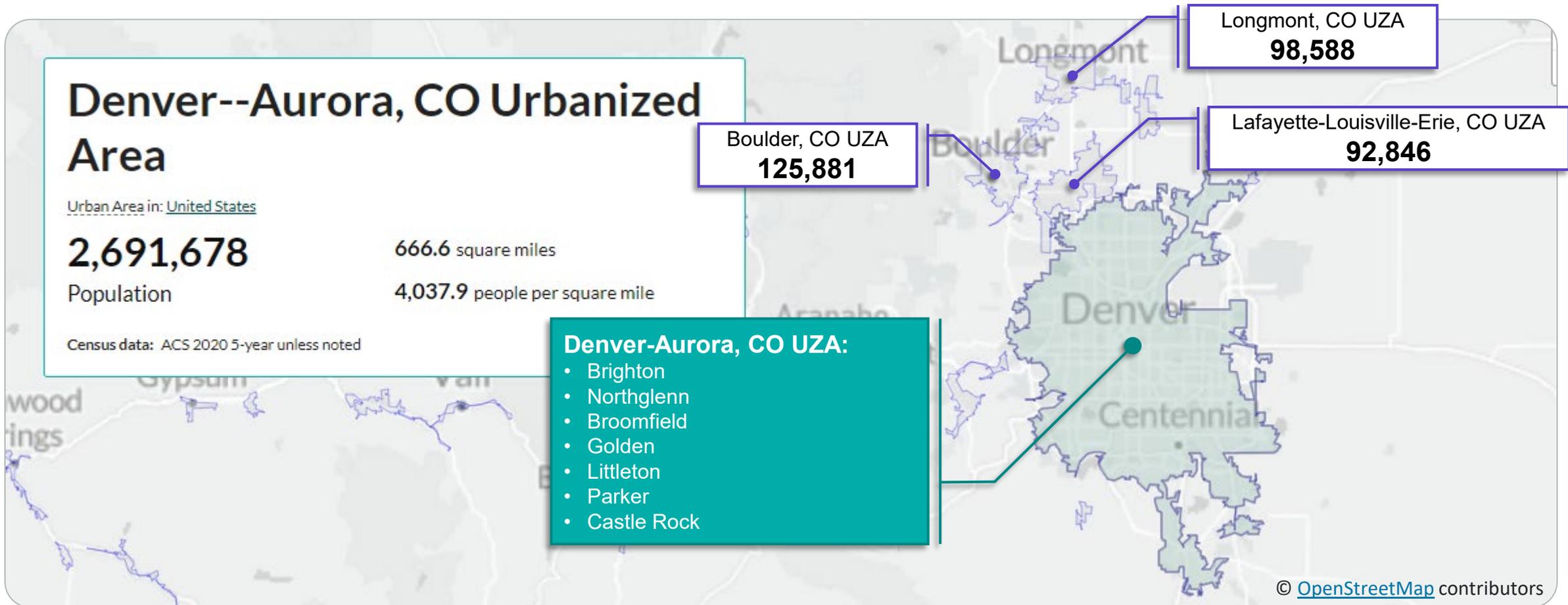
- Coordinate with CDOT on **joint targets** for the region



**COLORADO**

Department of Transportation

# Denver-Aurora, CO Urbanized Area



# Progress meeting previous targets

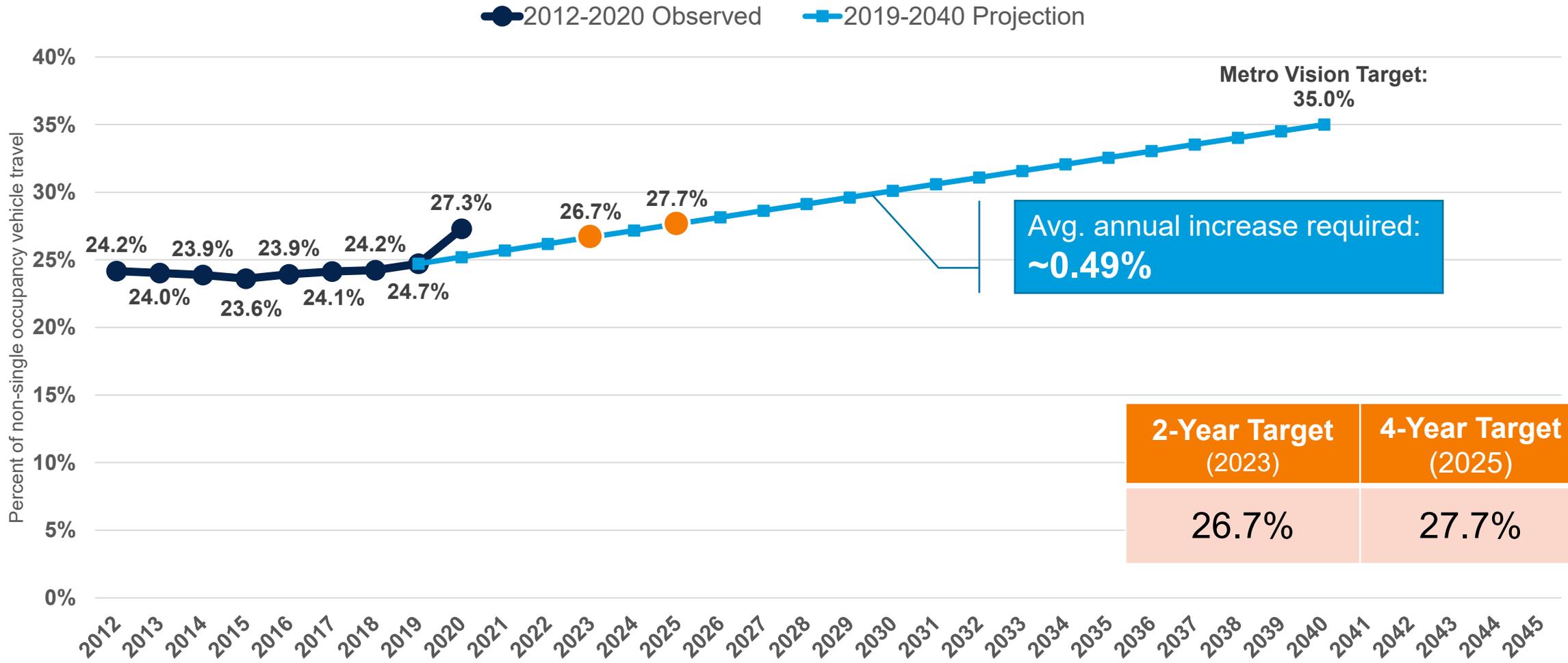
Performance measures	Mid-Performance Period				
	Desired Trend	Baseline	Two-year targets	Two-year observations	Met target or better than baseline?
Percent of non-single occupancy vehicle travel	⬆️	23.8%	24%	<b>24.7%</b>	✔️
Annual hours of peak hour excessive delay	⬇️	47.65	52	<b>16.9</b>	✔️

Performance measures	Full-Performance Period				
	Desired Trend	Baseline	Four-year targets	Four-year observations	Met target or better than baseline?
Percent of non-single occupancy vehicle travel	⬆️	23.8%	25%	<b>27.3%</b>	✔️
Annual hours of peak hour excessive delay	⬇️	47.65	54	<b>11.7</b>	✔️

- **Area** – Denver-Aurora, CO Urbanized Area (2-year and 4-year targets)
- **Data** – American Community Survey **5-Year Data** (“Journey to Work”)
- **Performance Measures** –
  - Percent of non-single occupancy vehicle travel
- **Calculation** –
  - $\% \text{ nonSOV travel} = 100\% - \% \text{SOV travel}$ 
    - May include travel via carpool, van, public transportation, commuter rail, walking, or bicycling as well as telecommuting
- **Federal Guidance** –
  - Targets should be realistic and achievable, not aspirational
  - DRCOG and CDOT **set single unified targets** for the region



# Achieving 35% non-single occupancy vehicle travel by 2040



# Peak hour excessive delay overview

- **Area** – Denver-Aurora, CO Urbanized Area (2-year and 4-year targets)
- **Data** – National Performance Management Research Data Set (NPMRDS)
- **Performance Measures** –
  - Annual hours of peak hour excessive delay per capita
- **Calculation** –
  - *Annual hours of PHED per capita* =  $\frac{\sum_{S=1}^T \text{Total Excessive Delays}_S}{\text{Total Population}}$
  - CATCH Intelligence Model Results
- **Federal Guidance** –
  - Targets should be realistic and achievable, not aspirational
  - DRCOG and CDOT **set single unified targets** for the region



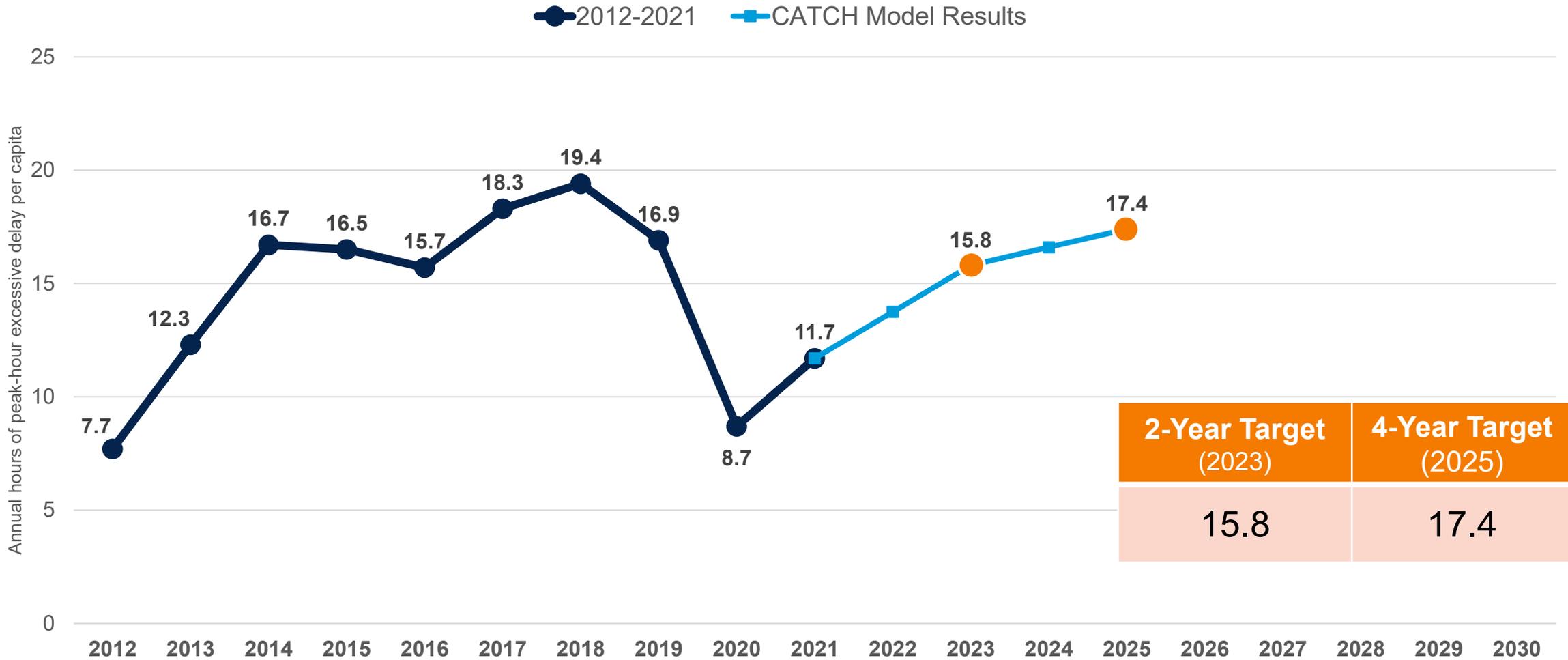


# CATCH Intelligence Model

Colorado Department of Transportation



# CATCH Intelligence Model Results



# Proposed traffic congestion reduction performance targets

Performance Measures	Desired Trend	Baseline	2-Year Target (2023)	4-Year Target (2025)
Percent of non-single occupancy vehicle travel	↑↑↑	27.3%	26.7%	27.7%
Annual hours of peak hour excessive delay	↓↓↓	11.7	15.8	17.4

- DRCOG can reevaluate the 4-year target at the mid-performance period (2-year mark)
  - Staff can evaluate whether the increases in non-SOV trips are stable or increasing, and if delay is returning to pre-pandemic levels



# On-road mobile source emissions reduction performance measures



# Progress meeting previous targets

Performance measures	Mid-Performance Period				
	Desired Trend	Baseline	Two-year targets	Two-year observations	Met target or better than baseline?
Total emissions reduction ( <b>VOC</b> ) kg/day	⋈	88.616	86	<b>131.414</b>	✓
Total emissions reduction ( <b>PM10</b> ) kg/day	⋈	40.714	31	<b>39.743</b>	✓
Total emissions reduction ( <b>CO</b> ) kg/day	⋈	1,682.796	1,152	<b>1,497.037</b>	✓
Total emissions reduction ( <b>NOx</b> ) kg/day	⋈	391.338	86	<b>359.855</b>	✓

Performance measures	Full-Performance Period				
	Desired Trend	Baseline	Four-year targets	Four-year observations	Met target or better than baseline?
Total emissions reduction ( <b>VOC</b> ) kg/day	⋈	88.616	105	<b>388.191</b>	✓
Total emissions reduction ( <b>PM10</b> ) kg/day	⋈	40.714	152	<b>41.385</b>	✓
Total emissions reduction ( <b>CO</b> ) kg/day	⋈	1,682.796	1,426	<b>6,006.652</b>	✓
Total emissions reduction ( <b>NOx</b> ) kg/day	⋈	391.338	105	<b>707.876</b>	✓

- **Area** – State DOTs/MPOs that contain **areas designated as nonattainment or maintenance** (applies to DRCOG & NFRMPO)
- **Data** – FHWA CMAQ Public Access System
- **Performance Measures** –
  - Total emissions reduction for each applicable pollutant in kilograms per day
    - Nitrogen Oxides (NO<sub>x</sub>)
    - Volatile Organic Compounds (VOCs)
    - Carbon Monoxide (CO)
    - Particulate Matter (PM<sub>10</sub>)
- **Calculation** –
  - Summing 2-year and 4-year emissions reductions reported for CMAQ funded projects
- **Federal Guidance** –
  - Targets should be realistic and achievable, not aspirational
  - DRCOG must set our own **targets for the region**

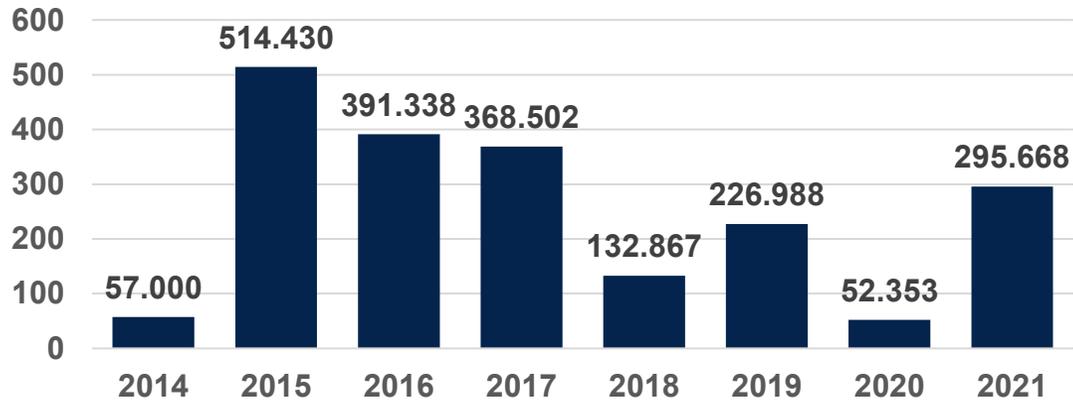


# Considerations for CMAQ target setting

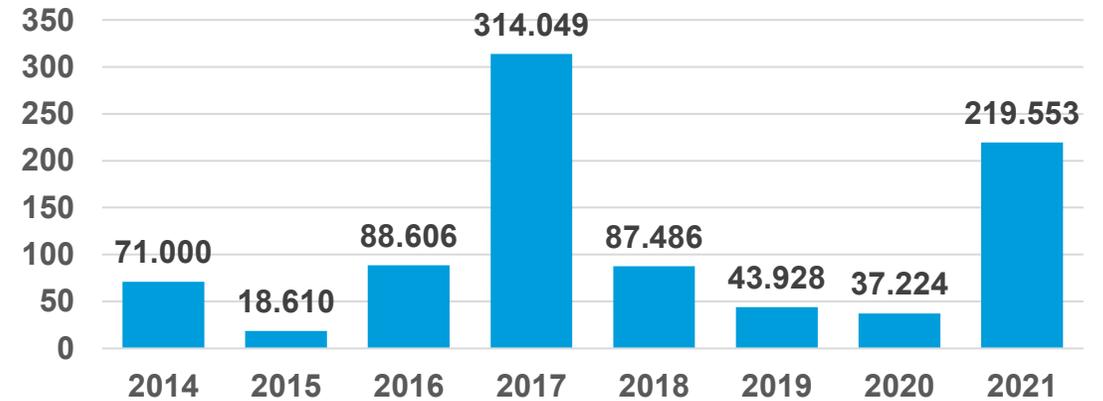
- Emissions reduction benefits are only **recorded from CMAQ funded projects**
  - **Does not include** projects funded with Transportation Alternatives (TA), Multimodal Transportation and Mitigation Options Fund (MMOF) or Carbon Reduction Program (CRP) which likely also have emission reduction benefits, OR Surface Transportation Block Grant (STBG) that may have emission reduction benefits
- Emissions reduction benefits are only **reported when the project is first obligated**, not at project completion/implementation
  - Unexpected delays to a project can change anticipated obligation
  - Emissions reduction benefits for ongoing projects only get recorded with the first obligation
- DRCOG is currently in the middle of multiple Calls for Projects for the 2022-2025 and 2024-2027 TIPs, so staff are **unable to forecast potential emissions reduction benefits**
  - Emission reduction benefits are only one consideration when scoring and evaluating projects
  - Funding type is assigned to account for funding available and project eligibilities and may be combined with other funding
- DRCOG's TIP includes **set-asides that fund projects staff are not aware of until reporting**
- DRCOG's **CO maintenance period has ended** and the **PM10 maintenance period will end this October**, so targets will no longer be required for those pollutants in the future
- Based on CDOT's findings, DRCOG's projects account for **roughly ~74% of the state's CMAQ projects and ~80% of the state's emissions reduction benefits**
- **Metro Vision includes a 2040 target of a 60% decrease** in surface transportation-related GHG emissions per capita from the 2010 baseline

# Historical emissions reduction (FY 2014-2021)

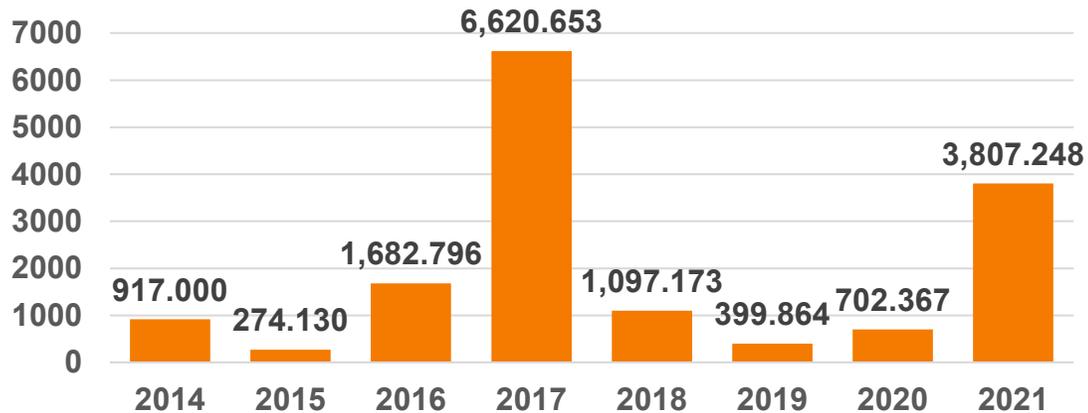
### Nitrogen Oxides (NOx)



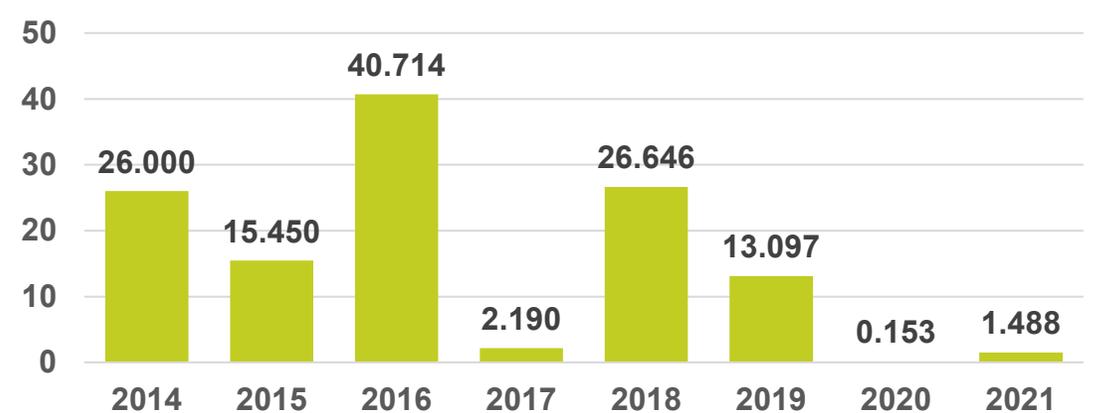
### Volatile Organic Compounds (VOCs)



### Carbon Monoxide (CO)



### Particulate Matter (PM10)

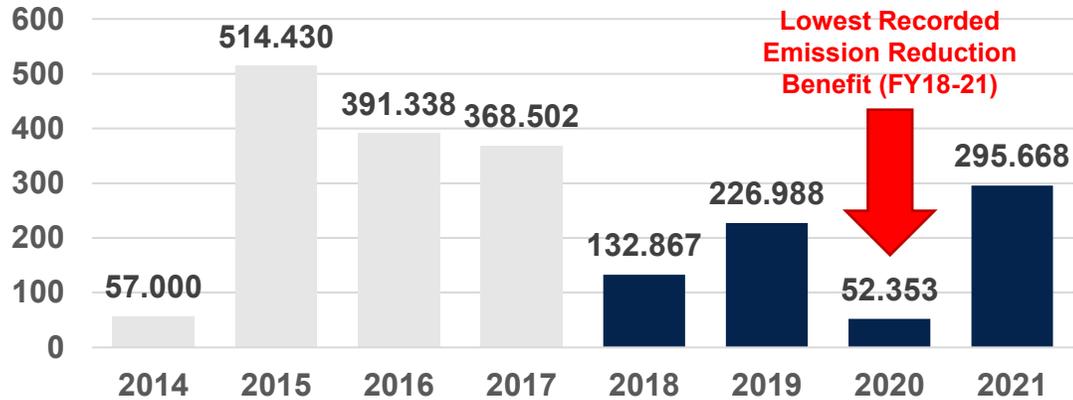


# Calculating future emissions reduction

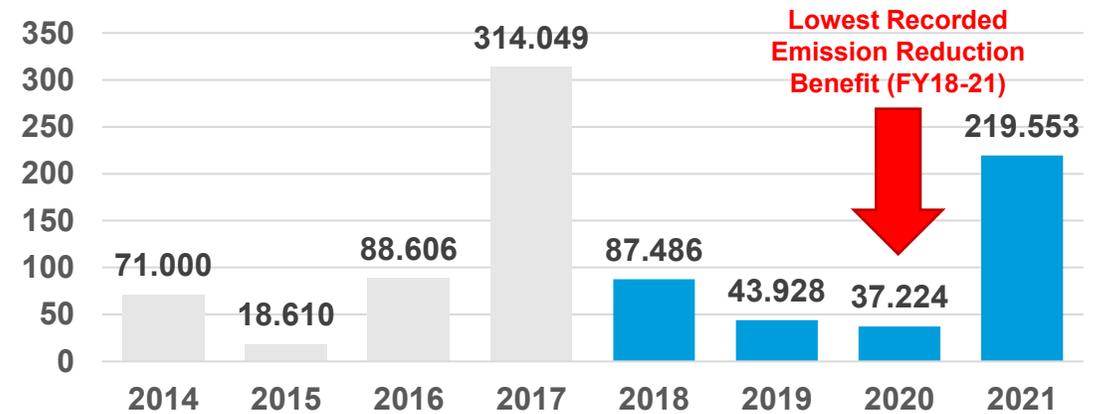
## Looking Back



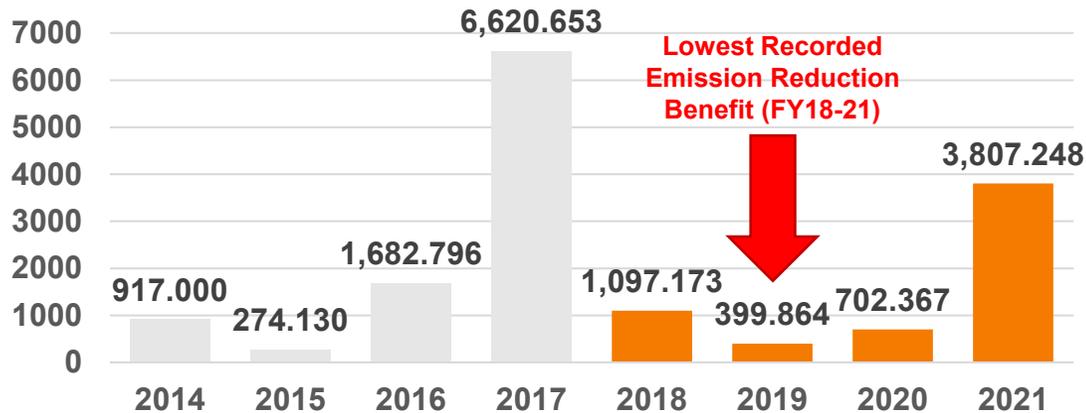
### Nitrogen Oxides (NOx)



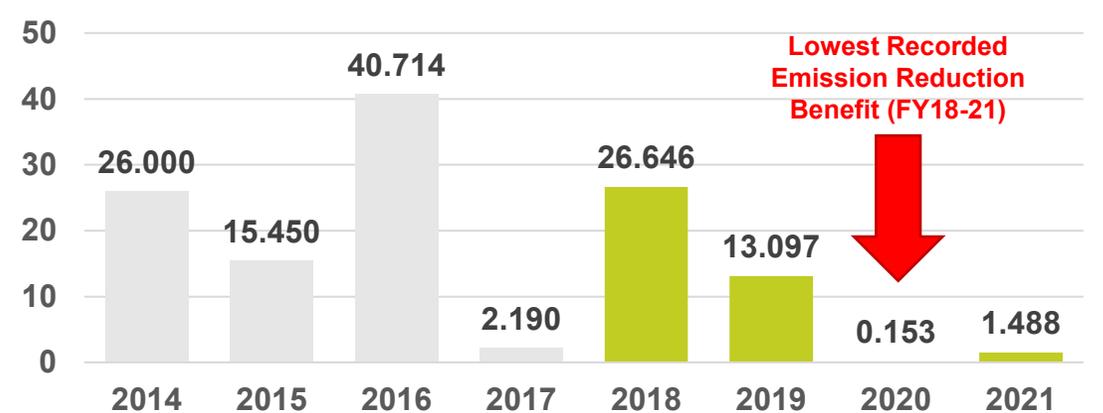
### Volatile Organic Compounds (VOCs)



### Carbon Monoxide (CO)



### Particulate Matter (PM10)

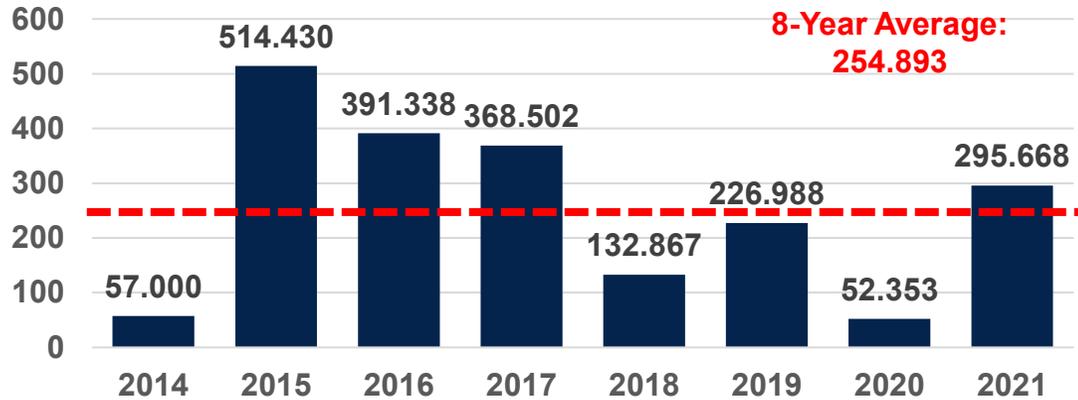


# Calculating future emissions reduction

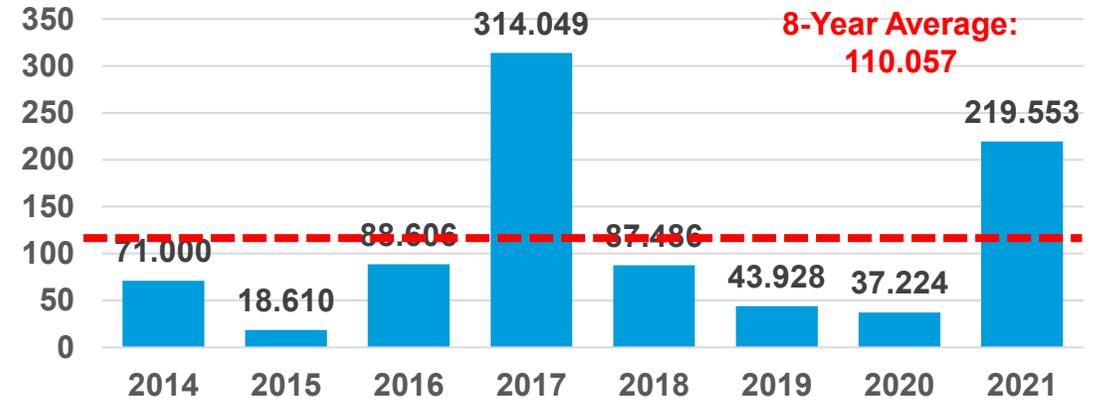
## Taking the Average



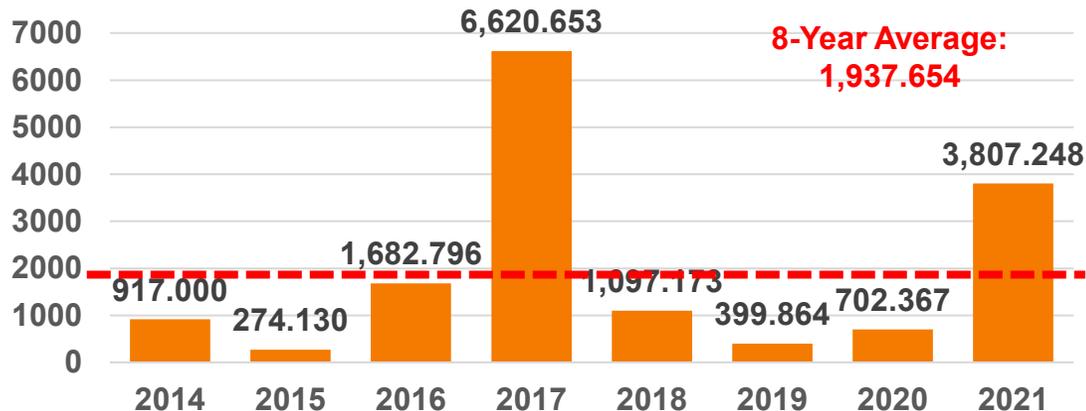
Nitrogen Oxides (NOx)



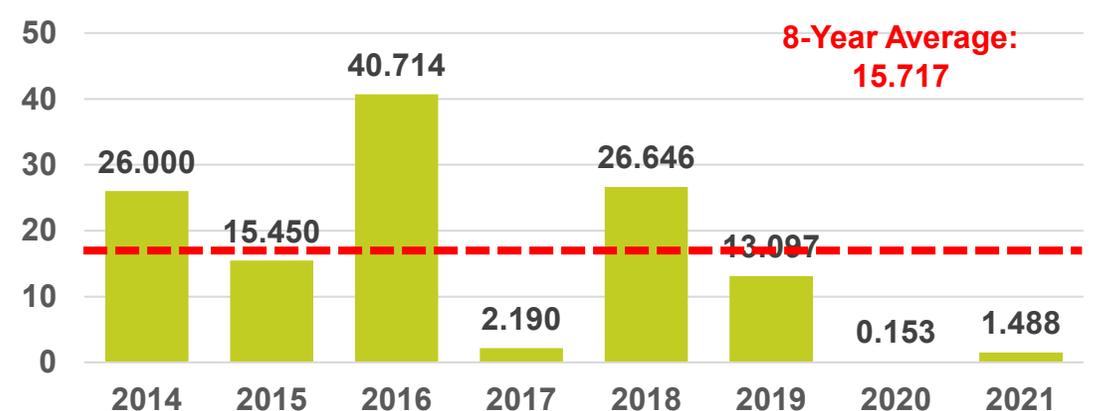
Volatile Organic Compounds (VOCs)



Carbon Monoxide (CO)



Particulate Matter (PM10)

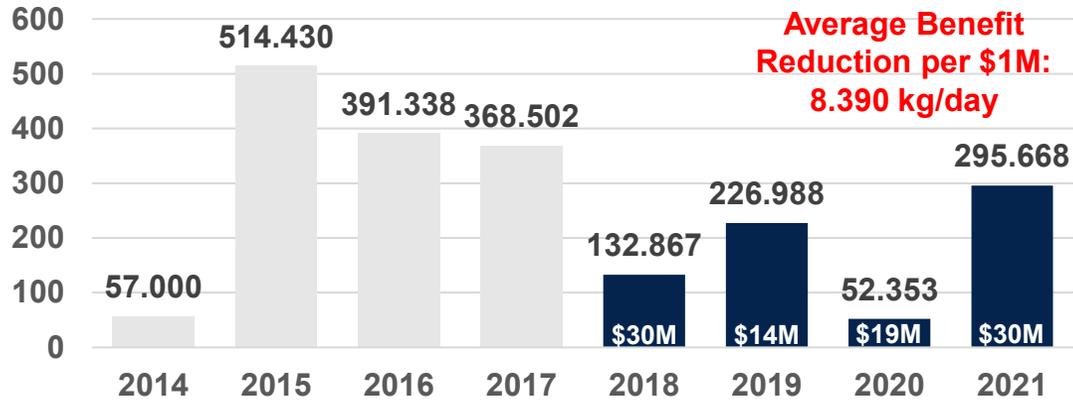


# Calculating future emissions reduction

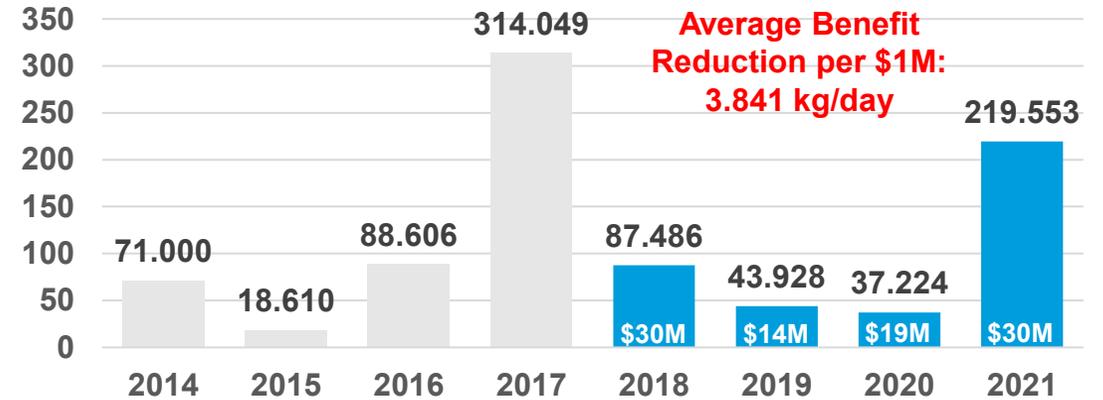
## Benefits per Dollar



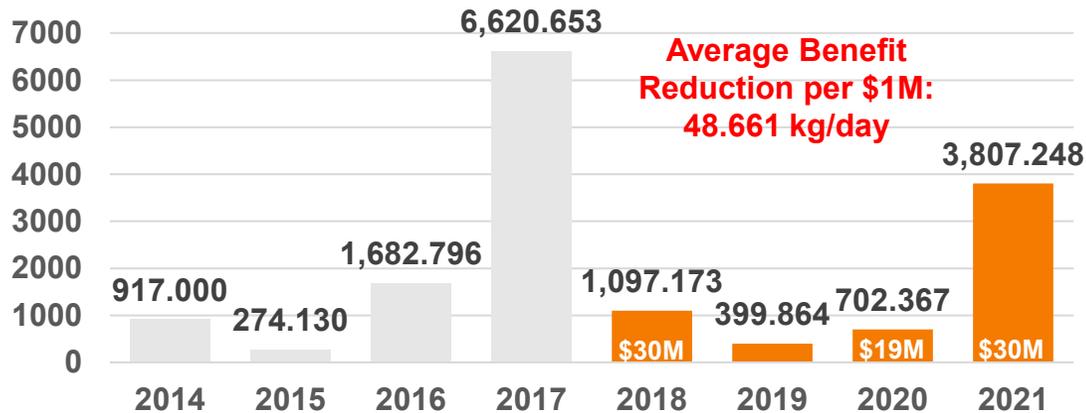
### Nitrogen Oxides (NOx)



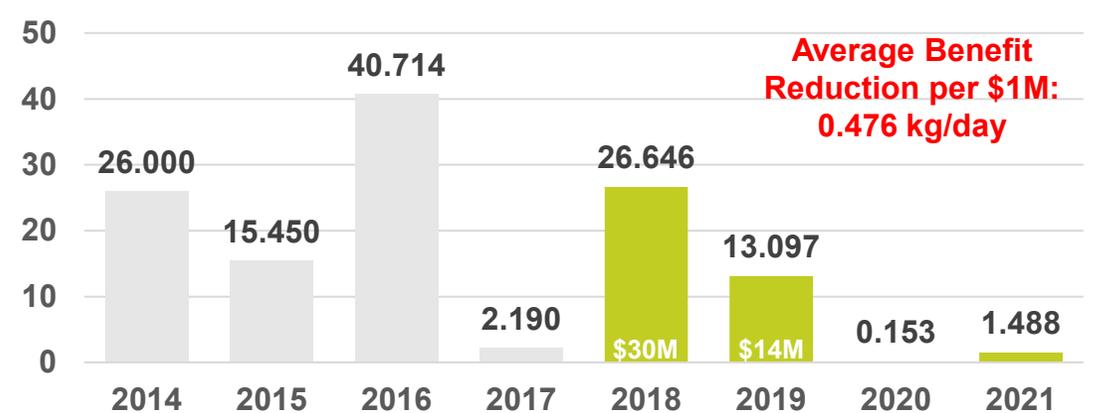
### Volatile Organic Compounds (VOCs)



### Carbon Monoxide (CO)



### Particulate Matter (PM10)



# Emissions reduction 4-year targets comparison

Performance Measures	Baseline (2018-2021)	 Looking Back	 Taking the Average	 Benefits per Dollar
Total emissions reduction ( <b>VOC</b> ) kg/day	388.191	148.896	440.228	636.761
Total emissions reduction ( <b>PM10</b> ) kg/day	41.385	5.953	62.869	78.878
Total emissions reduction ( <b>CO</b> ) kg/day	6,006.652	2,809.468	7,750.616	8,066.434
Total emissions reduction ( <b>NOx</b> ) kg/day	707.876	209.412	1,019.573	1,390.830

- Based on CDOT’s findings, DRCOG’s projects account for **roughly ~74% of the state’s CMAQ projects and ~80% of the state’s emissions reduction benefits**
- **Metro Vision includes a 2040 target of a 60% decrease** in surface transportation-related GHG emissions per capita from the 2010 baseline

# Proposed methodology

On-Road Mobile Source Emissions Reduction Performance Measures	DRCOG Portion	CDOT Forecast (2022-2023)	2-Year Target (2022-2025)
Total emissions reduction ( <b>VOC</b> ) kg/day	~86%	243	209.971
Total emissions reduction ( <b>PM10</b> ) kg/day	~66%	36	23.900
Total emissions reduction ( <b>CO</b> ) kg/day	~95%	2,717	2,583.027
Total emissions reduction ( <b>NOx</b> ) kg/day	~73%	547	397.012

On-Road Mobile Source Emissions Reduction Performance Measures	DRCOG Portion	CDOT Forecast (2022-2025)	4-Year Target (2022-2025)
Total emissions reduction ( <b>VOC</b> ) kg/day	~86%	490	423.397
Total emissions reduction ( <b>PM10</b> ) kg/day	~66%	72	47.800
Total emissions reduction ( <b>CO</b> ) kg/day	~95%	5,484	5,213.589
Total emissions reduction ( <b>NOx</b> ) kg/day	~73%	1,103	800.557

# Proposed emissions reduction performance targets

On-Road Mobile Source Emissions Reduction Performance Measures	Desired Trend	Baseline (2018-2021)	2-Year Target (2022-2023)	4-Year Target (2022-2025)
Total emissions reduction ( <b>VOC</b> ) kg/day	↑↑↑	388.191	209.971	423.397
Total emissions reduction ( <b>PM10</b> ) kg/day	↑↑↑	41.385	23.900	47.800
Total emissions reduction ( <b>CO</b> ) kg/day	↑↑↑	6,006.652	2,583.027	5,213.589
Total emissions reduction ( <b>NOx</b> ) kg/day	↑↑↑	707.876	397.012	800.557

- DRCOG can reevaluate the 4-year target at the mid-performance period (2-year mark)
  - Staff will have a better understanding of the CMAQ-funded projects in the TIP

# Targets and reporting schedule

- Targets adoption:

- Transportation Advisory Committee: **May 23**

- Regional Transportation Committee: **Jun 14** 

- Board of Directors: **Jun 15**

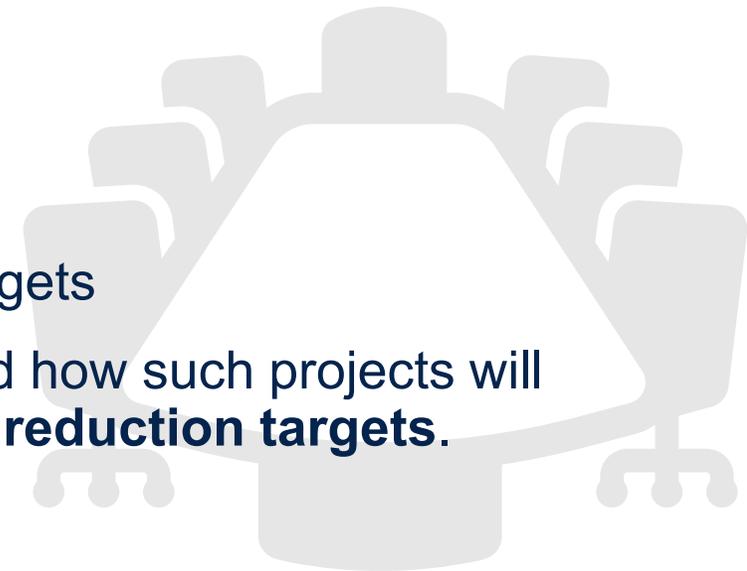
- Reporting requirements:

- CMAQ Performance Plans due: **Sep 1**

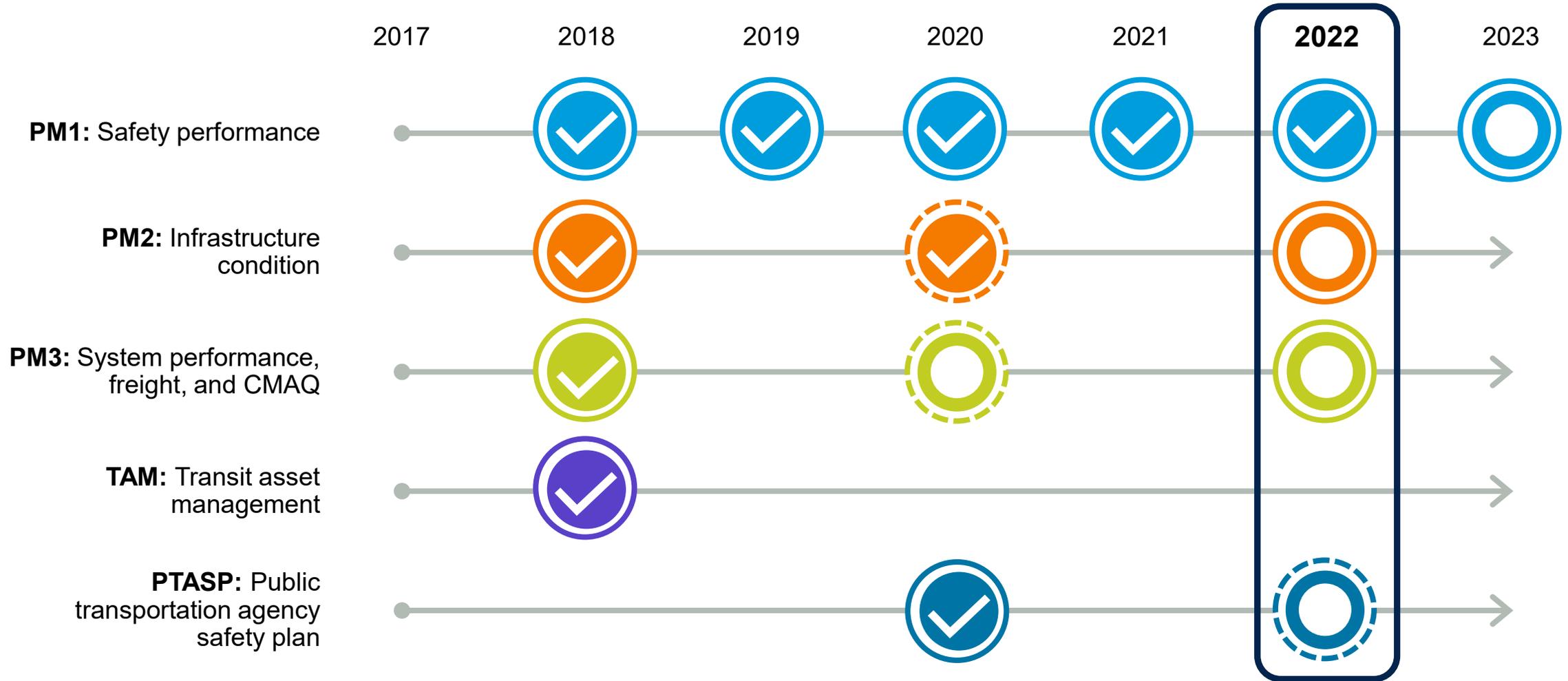
- Includes an **area baseline level**

- Describes **progress made** in achieving the performance targets

- Includes a **description of projects** identified for funding and how such projects will **contribute to achieving emission and traffic congestion reduction targets.**



# Future performance measures



MPO action taken



MPO action required



MPO action possible pending CDOT/RTD action

# Proposed PM3 performance targets

Traffic Congestion Reduction Performance Measures	Desired Trend	Baseline	2-Year Target (2023)	4-Year Target (2025)
Percent of non-single occupancy vehicle travel	↑↑↑	27.3%	26.7%	27.7%
Annual hours of peak hour excessive delay	↓↓↓	11.7	15.8	17.4

On-Road Mobile Source Emissions Reduction Performance Measures	Desired Trend	Baseline (2018-2021)	2-Year Target (2022-2023)	4-Year Target (2022-2025)
Total emissions reduction (VOC) kg/day	↑↑↑	388.191	209.971	423.397
Total emissions reduction (PM10) kg/day	↑↑↑	41.385	23.900	47.800
Total emissions reduction (CO) kg/day	↑↑↑	6,006.652	2,583.027	5,213.589
Total emissions reduction (NOx) kg/day	↑↑↑	707.876	397.012	800.557

# Requested motion

Move to recommend to the Board of Directors the traffic congestion reduction and on-road mobile source emissions reduction targets for the Denver-Aurora, CO Urbanized Area.





**Thank you! ¡Gracias!**  
**Questions? ¿Preguntas?**

**Alvan-Bidal Sanchez, AICP**  
*Transportation Planner*  
direct: (720) 278-2341  
email: [asanchez@drcog.org](mailto:asanchez@drcog.org)



**COLORADO**  
Department of Transportation

**DRCOG PHED  
Model Results**



# PHED Target Setting

- To meet Federal requirements CDOT worked with CATCH Intelligence to forecast future levels of PHED.
- Forecasts were made for:
  - Colorado
  - Denver-Aurora UZA
  - Fort Collins UZA



# Data Used for Calculating PHED

- National Performance Management Research Data Set (NPMRDS)
  - Travel Time Segment Length
  - Epoch (time interval, 15-minute units)
  - Travel Time - All Vehicles
  - Posted Speed Limit
  - Urbanized area designation
- Highway Performance Monitoring System
  - Annual Average Daily Traffic (AADT)
- FHWA provided value
  - Occupancy Factors



# Data Used for PHED Forecasts

- **Point Data**

- Data used in Travel Demand model-2015, 2030 and 2045 files show locations for each establishment, school, and home in the state of CO
- Distances were calculated between each TMC location and each establishment, school and home to find the total number of these entities within 1 and 5 km of each TMC
- Values were weighted (multiplied) by number of employees, students, and residents respectively

- **Population Data**

- County level population estimates from the state demographer's office added to the models

- **Loveland Pass Transit Data**

- Data showing average daily traffic from Loveland pass to each zip code in the state serves as an approximation of the long-distance travel originating or ending in each zip code



# Modeling Approach

- Several different modeling approaches were evaluated and compared before selecting a final model:
- **Classic Linear Model** - A classical approach to modeling where each variable is assigned a coefficient which is used in a final formula to predict a probability of belonging to a certain class
- **Decision tree** - A model that splits data into separate branches based on the value of predictors until data is grouped into highly similar “leaves”
- **Random Forest** - A model that uses many individual decision trees trained on subsets of the data
- **Ridge Regression** - A variation of the linear model in which the algorithm assigns a penalty for large coefficients - this helps reduce “overfitting” a training set
- **Lasso** - Similar in concept to Ridge Regression, however, the way in which the penalty for large coefficients is different and results in variable selection
- **Boosted Linear Regression** - An ensemble method of linear regression where several different linear models are trained, and an average or weighted average of the results are used in the final predictions

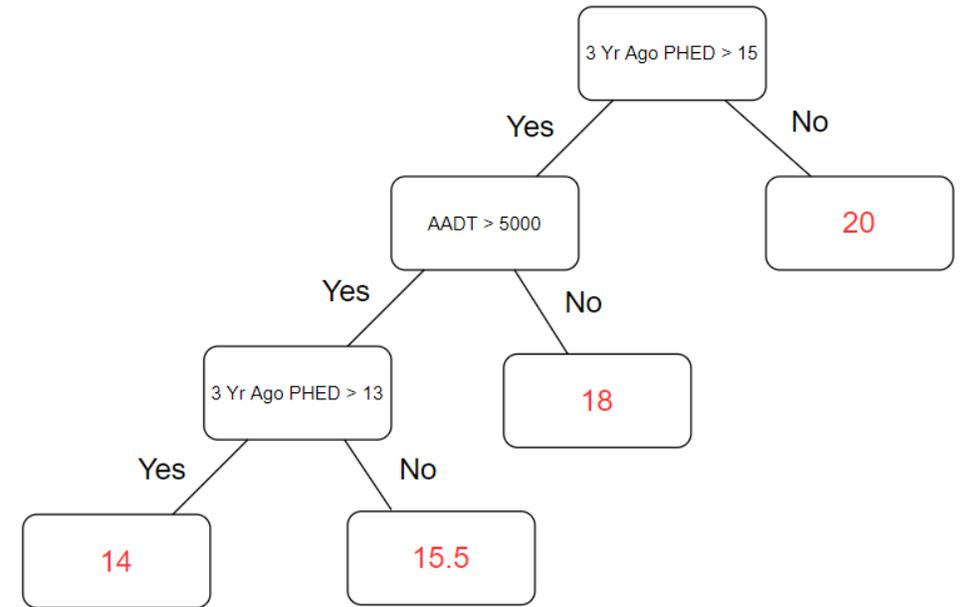


# Decision Tree Example

A decision tree is a predictive model that creates a tree of decisions to arrive at a prediction

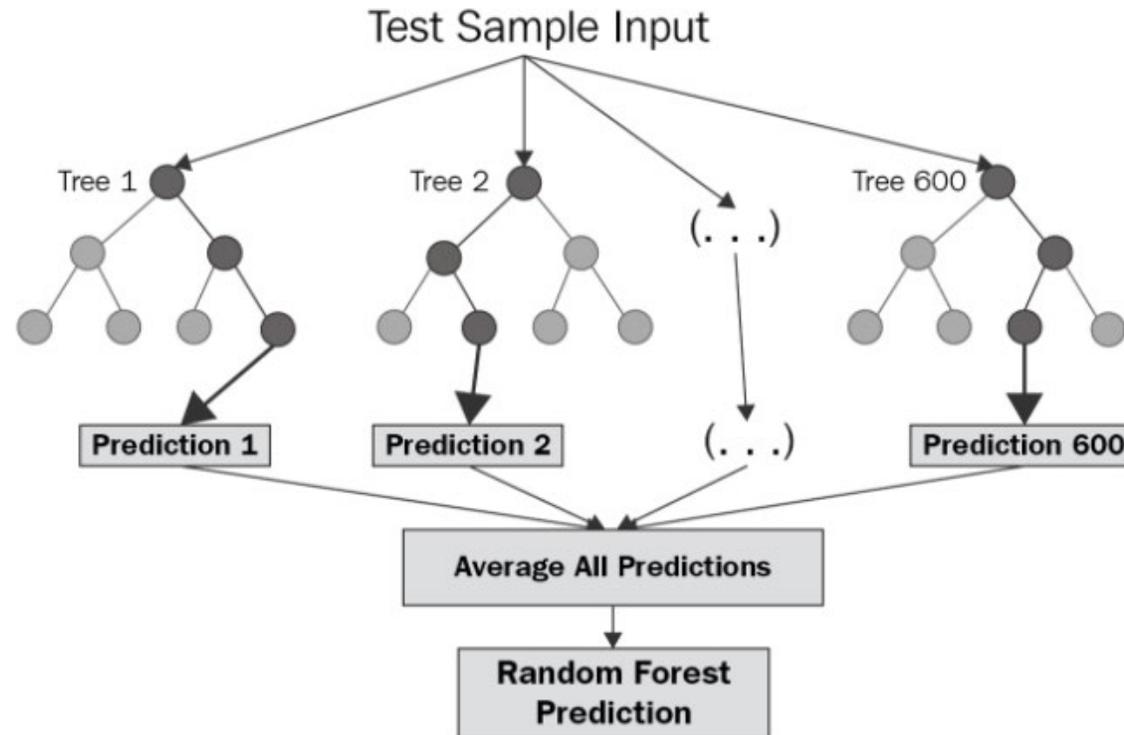
## Prediction Steps

1. Start at the highest node in the tree and check if the current record satisfies the condition
  - TMC 12345 for 2018 has a 3 Yr Ago PHED value that is not greater than 15
2. If the current record does not satisfy the condition, travel to the node to the right, else travel to the left
3. Repeat step 2 until reaching a leaf node or node without any other nodes beneath it
  - In the example, all leaf nodes contain red text
4. Once you have arrived at a leaf, assign the leaf's value as the predicted PHED value
  - TMC 12345 in 2018 would have a predicted PHED value of 20



TMC	Year	3 Yr Ago PHED	AADT	Predicted PHED
12345	2018	14.55	6000	20
12345	2019	16.12	4000	18

# Random Forest Example

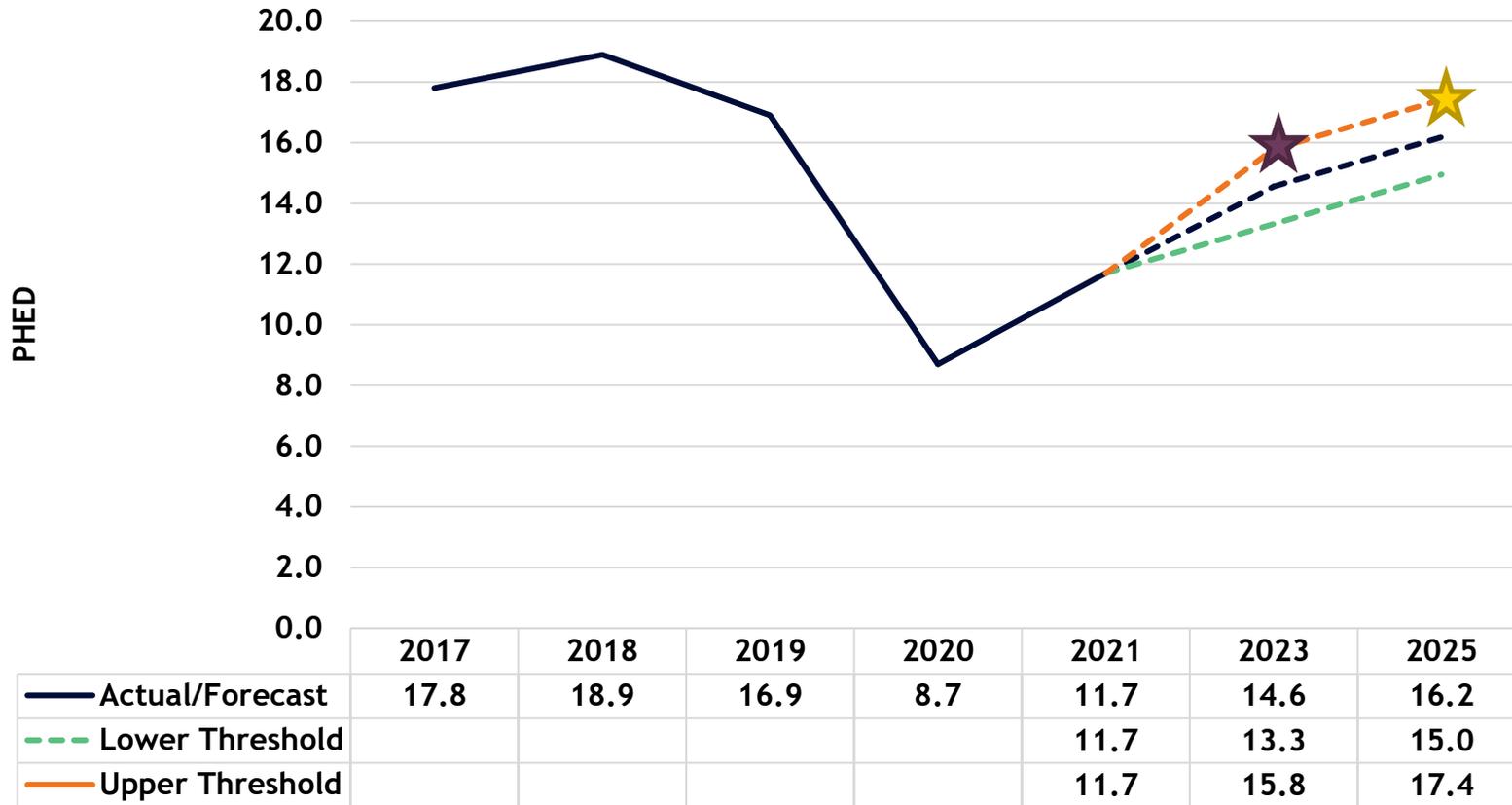


- A Random Forest is a model made up of a group of slightly different decision trees
- Each decision tree is trained on a partial version of the data; the trees are not trained using all predictors or all rows
- Each decision tree, in a random forest model, generates different predictions and the average of all predictions is used as the final predicted value



# DRCOG PHED Target Recommendation

**DRCOG PHED Target Recommendation  
with 95 Confidence Level**



**STAFF RECOMMENDATION:**

Current PHED levels are below pre-pandemic levels. Modeling suggests PHED will continue to slowly rise back to pre-pandemic levels. Staff recommends using the higher threshold level to establish targets for this measure. This aligns with a potential for traffic patterns to return to levels seen before the pandemic and accounts for potential errors in the predictive model.

 **2-YEAR TARGET: 15.8**

 **4-YEAR TARGET: 17.4**

\*2020/2021 data is not used in the predictive model. A 95% confidence interval was applied to 2014-2019 data.



*lead by knowing*

# Model 4 Peak Hours of Excessive Delay: Functional Modification of Model 2

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Presented By: Data Science Team





## Introduction

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### Overarching Objective

- Predict future condition for Peak Hours of Excessive Delay (PHED) for the Denver-Aurora and Ft. Collins Urbanized Areas
- Models were developed for both 2 and 4 year targets (2024 and 2026)
- In total these models will predict 4 targets for system reliability



## Original Data Sources Utilized

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- National Performance Management Research Data Set (NPMRDS)
  - Travel Times
  - Truck Travel Times
  - NHS Travel Segments
  - Interstate Travel Segments
- Highway Performance Monitoring System
  - Annual Average Daily Traffic (AADT)
- FHWA provided value
  - Occupancy Factors



## Additional Data Utilized

---

- Point Data
  - Data used in Travel Demand model–2015, 2030 and 2045 files show locations for each establishment, school, and home in the state of CO
  - Distances were calculated between each TMC location and each establishment, school and home to find the total number of these entities within 1 and 5 km of each TMC
  - Values were weighted (multiplied) by number of employees, students, and residents respectively
- Population Data
  - County level population estimates from the state demographers office added to the models
- Loveland Pass Transit Data
  - Data showing average daily traffic from Loveland pass to each zip code in the state serves as an approximation of the long distance travel originating or ending in each zip code



## Data Staging

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### Original Use Case

- Granular data for the Denver-Aurora Urbanized Area was downloaded from RITIS and staged in the FAST dataset – however, there were some challenges to working with the granular data
  - The calculation for the TMC level PHED metric is fairly complicated, it is a 10 step process for each TMC that includes new calculations at each step
  - CATCH was unable to replicate the exact PHED metrics for the Denver Urbanized area from the granular data provided by RITIS
  - Due to these challenges, we approached the problem using summarized data
- Summarized data was downloaded as a flat file from the RITIS MAP-21 widget
- Flat files were uploaded into SQL Server for each year (2012 – 2021) for Denver-Aurora and (2017 – 2021) for Ft. Collins
- These tables were then aggregated so that a single table now exists that contains all data for each urbanized area

### Enhancement to Use Case 2—Ft. Collins

- Due to challenges with the granular data, CDOT and CATCH agreed to wait until summarized data is available for the Ft. Collins urbanized area
- Depending on remaining hours in the project, CATCH and CDOT agree that it may make sense to revisit the PHED metric calculations and revisit a plan of staging Ft. Collins urbanized area data



## New Data Staging Process

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- Point Data
  - Because the point data is based on distance calculations of the TMCs and there can be new TMCs each year, the point data feature generation code must be run each year targets are forecasted
  - This code has already been included in the GCP implementation; it will not need to be run separately
  - If the point data from the travel demand model changes, the data in GCP should also be updated
- Population Estimates
  - Population estimates from the State Demographer's Office currently extend to 2050
  - If population growth and estimates begin to change significantly from the current estimates, the data should be updated to show revised estimates
- Loveland Pass
  - If Loveland pass data is updated, the data in GCP should also be updated



## Predictive Terminology

- Predictive models require data be in a format of columns and rows, where each row is a unique observation and each column describes something about that particular observation
- In our use case, each row represents a single TMC in a single year
- Columns are either predictors/features or a target
  - Predictors/features describe each observation of the event/process we're modeling
    - E.g. County, number of lanes, AADT, previous year PHED value, etc.
  - Target is the value we are trying to predict
    - E.g. PHED
- Regression – a model with the goal of predicting a numeric value
  - Used to predict PHED values

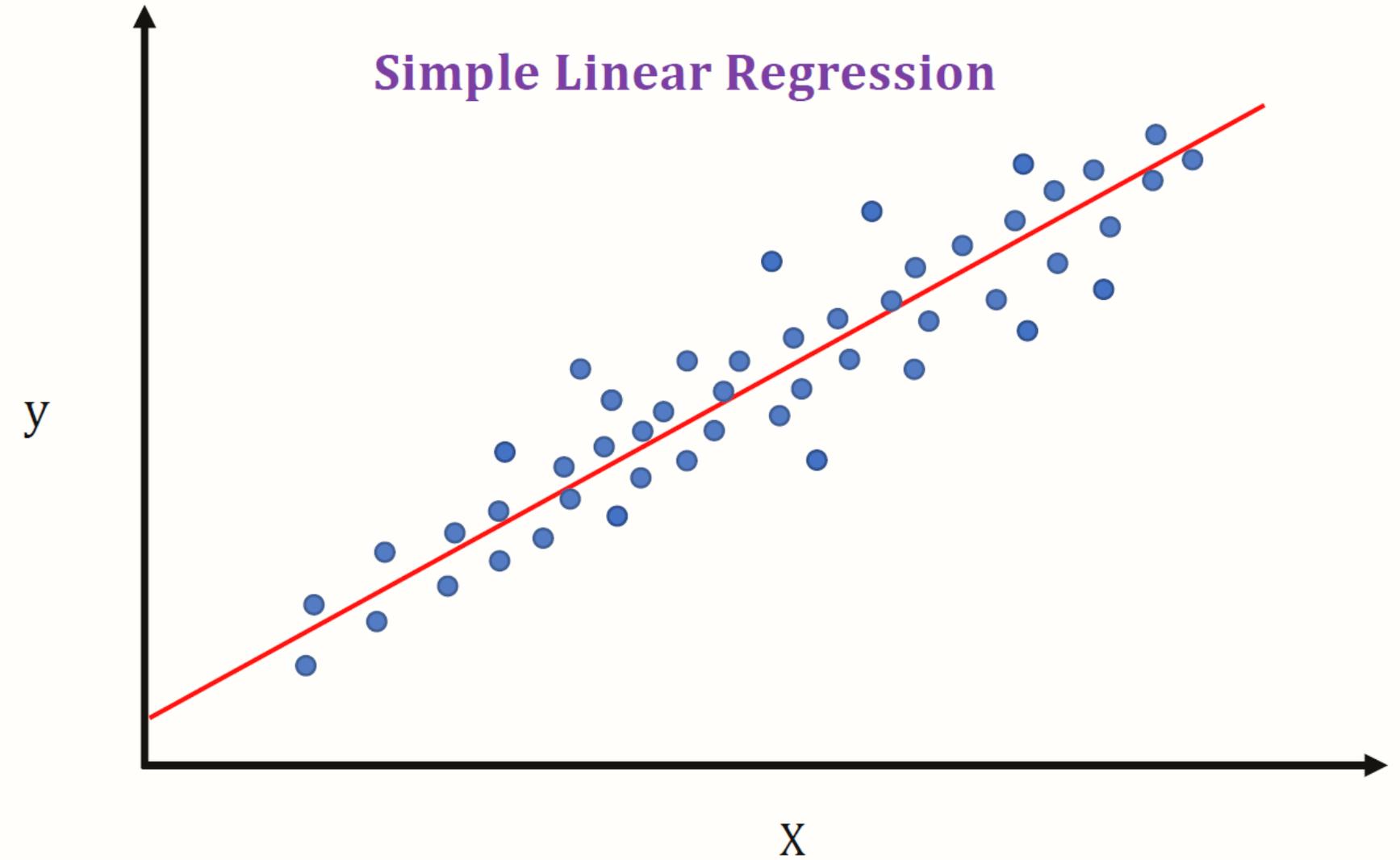
County	3 Yr Ago PHED	4 Yr Ago PHED	Thrulanes	PHED
Denver	3,000	1,500	2	2,000
Denver	5,000	9,000	3	7,000
Arapaho	4,000	5,500	1	4,500



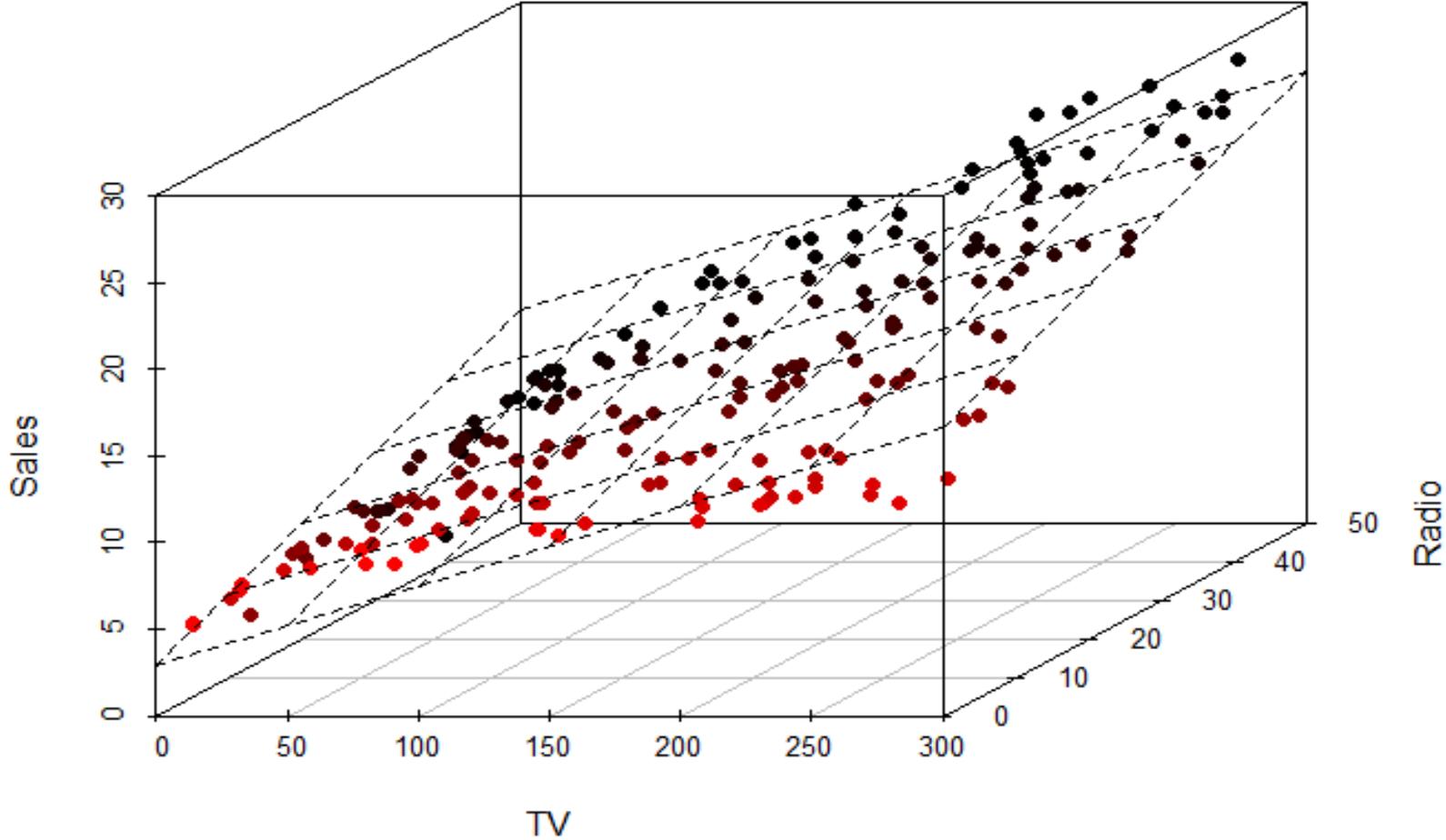
## Predictive Terminology cont.

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- Train/Test Split
  - In order to estimate performance of predictive models, data is split into data sets for training and testing
  - “Noise” is a statistical term that represents the “randomness” of real world events. Essentially, real world activities rarely follow a well defined formula that can be used to predict the outcome. Actual PHED values depend on the behavior of millions of individual drivers using Colorado’s road system, interacting with one another, navigating construction, weather, poor drivers, etc.
  - It’s possible to develop a sufficiently complex model that perfectly explains what occurs in the data it was trained on; however, when we fit models that closely to a training set, we inevitably fit our models to the noise in that training set
  - To avoid this, test sets are withheld from our data when we train a model. We then apply our model to the test set (new data to our model) in order to estimate the actual performance (rather than relying on training set performance)
- Linear Regression
  - A classic linear regression is essentially a “best fit line” that minimizes distance between a line and the actual data points
  - When there is one predictor, a linear regression takes the form of a line, with two predictors a linear regression takes the form of a plane, and with more than two predictors a linear regression takes the form of a hyper-plane
- Decision Tree
  - A Decision tree is a type of predictive model that divides data into smaller and smaller groups.
  - These splits are preformed via a machine learning algorithm based on relationships between predictors and the outcome
  - If we take a single observation and follow it through all its splits, we end up on a “leaf” of the tree with other observations that share common attributes and likely have the same outcome



# Linear Regression with 2 Predictors





# Data Preparation

- The final data step executed in SQL involves creating lag variables for predictive modeling
- Predictive models are trained with data in the format of rows and columns.
  - Each row is one observation of the process/event we are trying to model
  - Columns either represent predictors or targets
    - Predictor – an attribute of the observation that is used to generate a prediction
    - Target – the value we are trying to predict
- The models developed for this use case use previous values of PHED in order to predict future values. Lagging these variables is a data transformation that makes this possible.

TMC	Year	Miles	one_yr_ago_miles	two_yr_ago_miles	three_yr_ago_miles	four_yr_ago_miles	five_yr_ago_miles	six_yr_ago_miles
116+92304	2020	1.150	1.150	1.150	1.145	1.145	1.143	1.143
116+92304	2019	1.150	1.150	1.145	1.145	1.143	1.143	
116+92304	2018	1.150	1.145	1.145	1.143	1.143		
116+92304	2017	1.145	1.145	1.143	1.143			
116+92304	2016	1.145	1.143	1.143				
116+92304	2015	1.143	1.143					
116+92304	2014	1.143						



## Modeling Approach

---

- Several different modeling approaches were evaluated and compared before selecting a final model
- **Classic Linear Model** – A classical approach to modeling where each variable is assigned a coefficient which is used in a final formula to predict a probability of belonging to a certain class
- **Decision tree** - A model that splits data into separate branches based on the value of predictors until data is grouped into highly similar “leaves”
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- **Boosted Linear Regression** – An ensemble method of linear regression where several different linear models are trained and an average or weighted average of the results are used in the final predictions



## Performance Testing Results

- For the “Random Test” strategy, records were randomly held out for a test set
- Because their records may come from any given year, the shown measure is the sum of PHED values for the test set
- Because the actual measure is just a sum of PHED values divided by the population, the % error values are still valid (dividing the real sum and the test sum by the same number results in the same % error)
- Due to lack of data, Ft. Collins was not included in initial testing

### Excludes 2020 and 2021 data due to pandemic anomalies

Region	Strategy	PHED Measure	3 Year Prediction	3 Year Error	5 Year Prediction	5 Year Error
Denver-Aurora	2019 Test	16.9	17.6	3.83%	14.3	24.13%
Denver-Aurora	2018 Test	18.9	19.2	1.83%	20.7	22.5%
Denver-Aurora	Random Test	62639879	61652639	1.57%	66545022	6.23%



## Performance Testing Results cont.

- Additional testing included pandemic data (2020 and 2021)
- Errors for Denver-Aurora are significantly larger when including pandemic data
- The random forest model struggles with 5-year predictions but outperforms all other models in 3-year prediction accuracy

Region	Strategy	PHED Measure	3 Year Prediction	3 Year Error	5 Year Prediction	5 Year Error
Denver-Aurora	2019 Test	16.9	14.3	14.3%	12.3	27.5%
Denver-Aurora	2018 Test	18.9	17.1	9.3%	14.8	21.6%
Denver-Aurora	Random Test	73552561	63237293	14%	63237292	14%
Ft. Collins	2019 Test	4.05	3.72	8%	2.79	31.1%
Ft. Collins	2018 Test	3.66	3.96	8%	3.95	8%
Ft. Collins	Random Test	1086534	971156	10.6%	1146425	5.5%



## 2022 Targets

- A test run using the final modeling script uses data as recent as 2021
- This is done to simulate what our models would have shown had they been used to predict targets for 2024 and 2026
- All targets for Denver-Aurora were generated

Target Year	Urbanized Areas	Target Value
2024	Denver-Aurora	14.55
2024	Ft. Collins	2.90
2026	Denver-Aurora	16.18
2026	Ft. Collins	2.81



## 2022 Steps for Generating 2024 & 2026 Predictions in Production

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- Stage Data
  - Denver-Aurora data for 2020—2021 will need to be staged in the FAST database
  - Ft. Collins data for 2017 – 2021 will need to be staged in the FAST database
- Run R Script
  - There are three R scripts that are part of this process; however, the main R script imports the other two at run time
  - This R Script will...
    - Execute SQL command in database to aggregate and prepare data for analysis
    - Create training data set excluding 2020
    - Train PHED models on statewide data
    - Prepare application data for Denver-Aurora and Ft. Collins
    - Apply models and calculate predicted values for each urbanized area PHED measures
    - Aggregate results into single table displaying target values and save to FAST SQL Database
- Export results from FAST SQL Database into Excel sheet for CDOT



## Conclusion

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### Results

- Random Forest models generally performed the best across all tests and urban areas
- When considering a predictive model, we need to consider both accuracy and robustness—our model needs to perform well with a variety of datasets

### Recommendation

- Utilize random forest models to predict 2024 and 2026 targets for Denver-Aurora and Ft. Collins
- Remove 2020 data from training set





**ATTACH C**

## ATTACHMENT C

To: Chair and Members of the Regional Transportation Committee

From: Jacob Riger, Manager, Long Range Transportation Planning

Meeting Date	Agenda Category	Agenda Item #
June 14, 2022	Informational Briefing	5

### SUBJECT

2050 Regional Transportation Plan (2050 RTP) greenhouse gas (GHG) analysis update.

### PROPOSED ACTION/RECOMMENDATIONS

N/A

### ACTION BY OTHERS

N/A

### SUMMARY

DRCOG staff previously provided an overview of the state GHG emission reduction rule and the emission reduction targets the 2050 RTP must meet for the DRCOG MPO area for each analysis year. Staff also provided initial methods for quantifying the GHG emission reduction benefits associated with the programmatic (non-project specific) investments included in the adopted 2050 RTP and the preliminary baseline GHG emissions calculated for the 2050 RTP as adopted in 2021.

Based on the modeling and technical analysis conducted so far, staff estimates the 2050 RTP will achieve approximately 70%-80% of the emission reduction targets in each analysis year by:

1. Quantifying the programmatic investments included in the adopted 2050 RTP but not previously modeled or estimated at the time of plan adoption.
2. Accounting for increases in telework rates that occurred since the GHG baseline was established.

To achieve further reductions, staff has been testing the potential GHG benefits of strategic modifications to the 2050 RTP's fiscally constrained project and program investment mix. These potential modifications include:

- Refocusing the scope of select roadway capacity projects to emphasize complete streets/safety retrofits.
- Advancing the implementation of select BRT corridors.
- Increasing investments in multimodal improvements to complete more of them and more quickly: regional active transportation network buildout, safety projects, complete streets retrofits, and transit corridors.

However, implementing these important strategies will still leave a GHG reduction gap to close. Accordingly, staff is exploring two additional concepts.

The first concept relates to land use forecasts used in the 2050 RTP planning process. Land use data for the 2020 to 2050 timeframe are forecasted for the 2050 RTP. Staff is currently testing the addition of near-term forecast adjustments based on observed and

anticipated housing construction through 2023 to understand how recent land use decisions may affect the remaining gap in meeting the GHG reduction targets. This will not immediately change the land use forecast assumptions used in DRCOG's official model runs for federal air quality conformity determinations. However, these near-term adjustments are consistent with official model run assumptions and will be evaluated with local government feedback in future RTP amendment cycles.

The second concept relates to CDOT-defined mitigation measures. The GHG rule provides for using mitigation measures to further reduce GHG emissions that are separate from emission reduction strategies reflected in the Focus model. Mitigation measures must be specific, measurable, effective in reducing GHG emissions, and able to be tracked over time. The process of using mitigation measures within the GHG rule, which is codified with the Transportation Commission's adoption of [Policy Directive 1610](#), requires the DRCOG Board to adopt a Mitigation Action Plan committing the region to implementing and annually reporting on the status of the specific mitigation measures chosen.

DRCOG staff are currently analyzing and estimating opportunities available for mitigation measures relating to parking requirements or zoning-related density increases near rapid transit station areas in the region.

Based on the GHG modeling and technical analysis to date, it is possible the other strategies discussed above for the 2050 RTP will not be enough to meet the GHG emission reduction targets without pursuing mitigation measures. The alternative to mitigation measures in this case is accepting restrictions on the use of certain funding sources administered by DRCOG and CDOT 10-Year Plan funds within the DRCOG MPO area to only projects that reduce GHG emissions. This restriction of funds would affect project eligibility for DRCOG's 2024-2027 TIP calls #3 and #4 in late 2022 and early 2023.

PREVIOUS DISCUSSIONS/ACTIONS
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N/A

PROPOSED MOTION
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N/A

ATTACHMENTS
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1. Staff presentation

ADDITIONAL INFORMATION
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If you need additional information, please contact Jacob Riger, Manager, Long Range Transportation Planning, at 303-480-6751 or [jriger@drcog.org](mailto:jriger@drcog.org)

# 2050 MVRTP GHG ANALYSIS

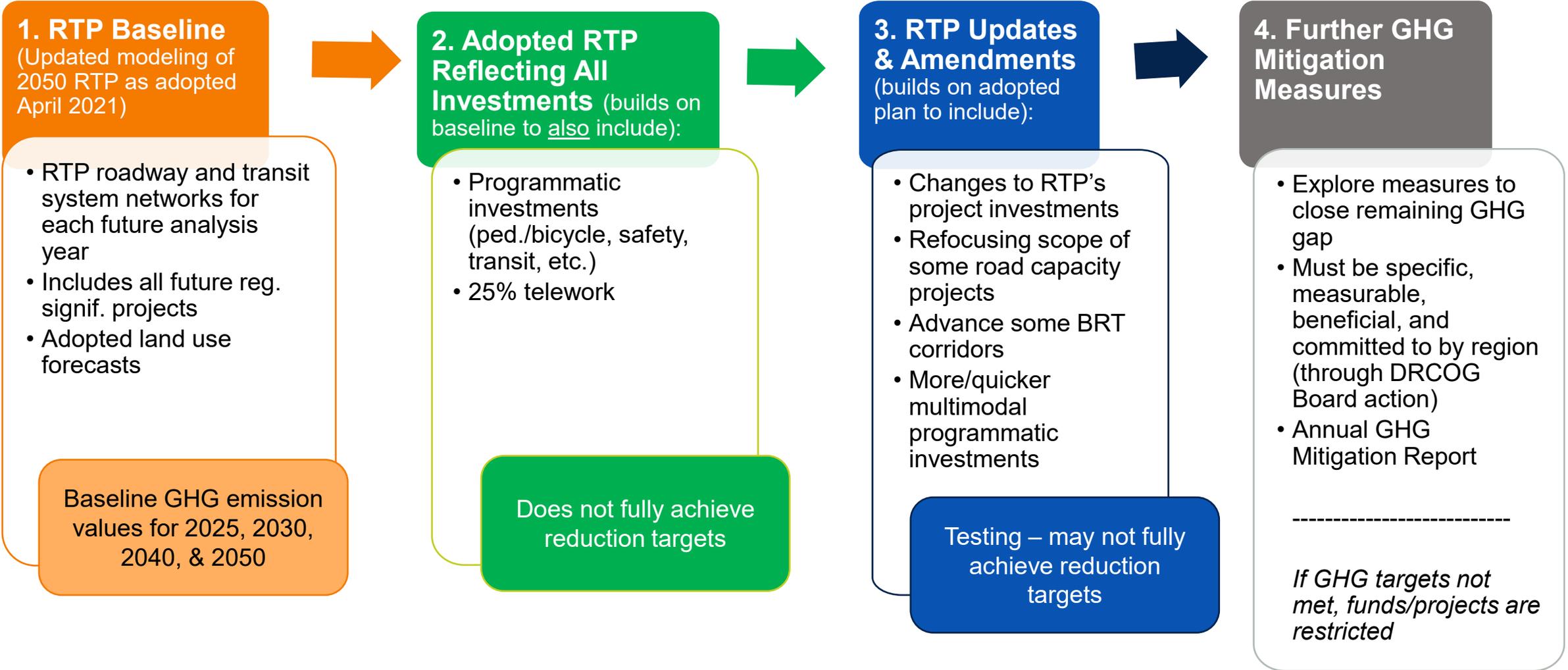
Regional Transportation Committee

June 14, 2022

Jacob Riger, AICP, Long Range Transportation Planning Manager

- Revised 2050 RTP due by October 1, 2022
- GHG rule baseline – modeled 2050 RTP as adopted (April 2021)
- Emission reduction target amounts are from the baseline
- Adopted 2050 RTP can achieve 70%-80% of reduction targets with telework adjustments and quantifying programmatic investments
- Currently testing strategic modifications to 2050 RTP's project investment mix – reduction gap still remains
- Two additional concepts: land use forecast adjustments; mitigation measures

# PROCESS TO MEET GHG REDUCTION LEVELS



# Table 1: GHG Transportation Planning Reduction Levels In Annual Million Metric Tons (MMT)

Regional Areas	2025 Reduction Level (MMT)	2030 Reduction Level (MMT)	2040 Reduction Level (MMT)	2050 Reduction Level (MMT)
DRCOG	0.27	0.82	0.63	0.37
NFRMPO	0.04	0.12	0.11	0.07
PPACG	NA	0.15	0.12	0.07
GVMPO	NA	0.02	0.02	0.01
PACOG	NA	0.03	0.02	0.01
CDOT/Non-MPO	0.12	0.36	0.30	0.17
<b>Total</b>	<b>0.43</b>	<b>1.5</b>	<b>1.2</b>	<b>0.7</b>

# GHG RTP BASELINE AND REDUCTION TARGETS

*Baselines will be rerun every amendment cycle with latest model version and planning assumptions*

	<b>2025</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>
<b>DRCOG GHG Results and Targets</b>				
<b>GHG Baseline (2021 RTP) in Annual MMT</b>	14.64	9.23	6.22	3.70
<b>Reduction Target (Annual MMT) Required by Rule Table 1 for Updated/Amended RTPs</b>	0.27	0.82	0.63	0.37
<b>Percent reduction required from baseline</b>	1.8%	8.9%	10.1%	10.0%



# Programmatic investment categories



## **Operational and safety capacity improvements**

Retiming signals and enhancing equipment to optimize the system



## **Transportation demand management**

Supporting non-single occupancy vehicle options and work from home options



## **Transit enhancements**

Improving transit access and operations



## **Bicycle and pedestrian infrastructure**

Building out a network of facilities for bicyclists and pedestrians



## **Complete streets corridor projects**

Reconstructing and customizing key corridors where streets are balanced for all options



## CIVIC ADVISORY GROUP

“...convened to develop the plan with guidance from **interested residents** who represent the **diversity of communities** and **experiences** in the Denver region and who **may not have participated** in transportation planning previously.”

- Includes representatives from diverse groups historically not given ample voice in transportation planning
- Helped develop the 2050 RTP
- Reconvened for GHG Update (have met twice so far)

# CAG Programmatic Investments exercise

## Voting Session #1



Retiming signals and enhancing equipment to optimize the system.

Support **5**



Supporting non-single occupancy vehicle options and work at home options

Support **5**



Improving transit access and operations

Support **12**



Building out a network of facilities for bicyclists and pedestrians

Support **10**



Reconstructing and customizing key corridors where streets are balanced for all options

Support **8**

## Voting Session #2



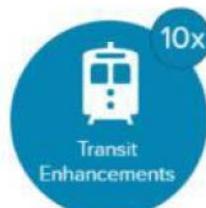
Retiming signals and enhancing equipment to optimize the system.

Support **6**



Supporting non-single occupancy vehicle options and work at home options

Support **4**



Improving transit access and operations

Support **13**



Building out a network of facilities for bicyclists and pedestrians

Support **10**



Reconstructing and customizing key corridors where streets are balanced for all options

Support **7**

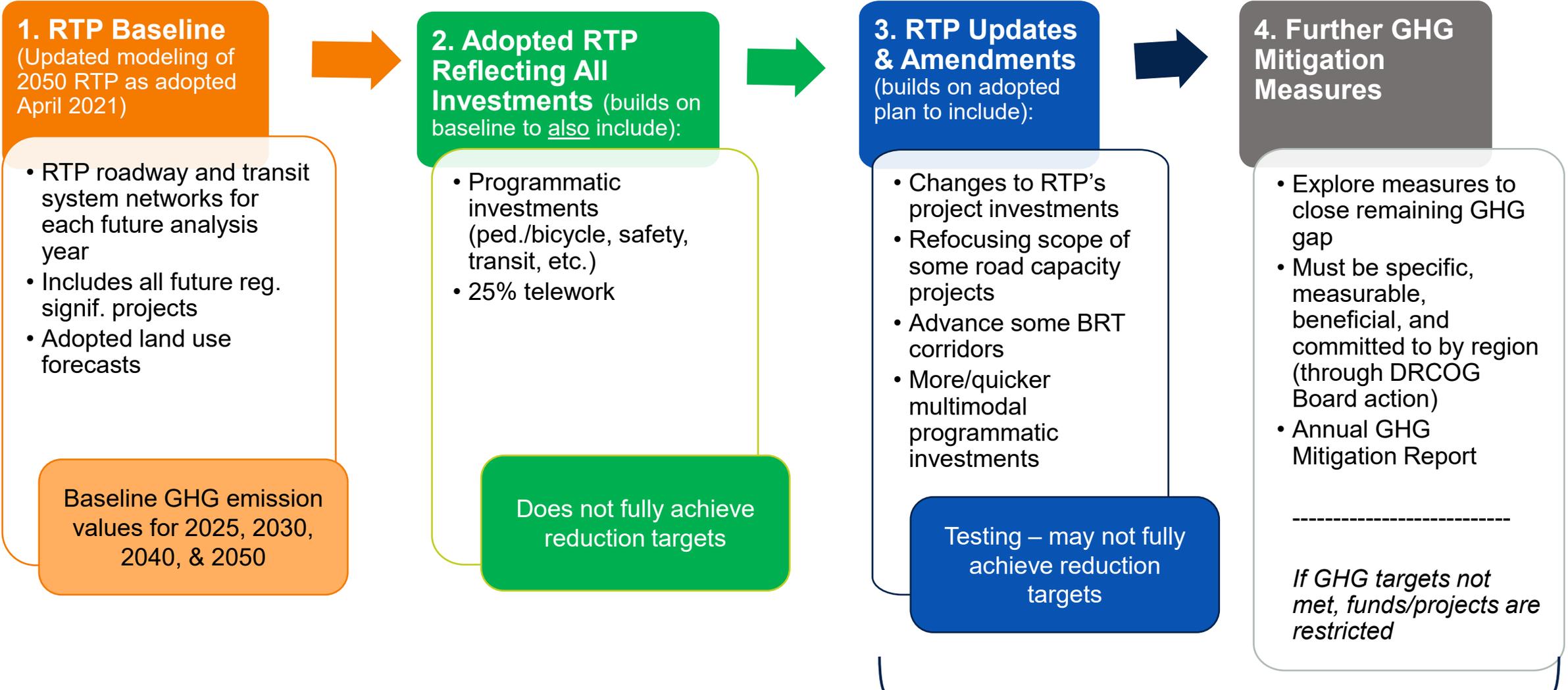
- “Before” and “after” support prioritization exercise
- Priorities did not change significantly between voting exercises
- Primary takeaway: balance between GHG benefit and community investment benefit

- Programmatic strategies alone will not achieve GHG targets
- Testing targeted changes to RTP's projects and investment mix
- Concepts include:
  - Refocusing scope of some capacity projects to emphasize complete streets/safety retrofits
  - Advancing BRT corridors to capture GHG benefits sooner
  - Increasing investments in multimodal improvements to complete more of them and more quickly: regional active transportation network buildout, safety projects, complete streets retrofits, and transit corridors
- These concepts will not completely close the gap

- Near-term land use forecast adjustments
  - Observed/anticipated housing construction through 2023 (higher density than forecast)
  - How will recent land use decisions affect remaining GHG gap?
  - Will not affect federal air quality conformity model runs, but can be incorporated later
- CDOT-defined mitigation measures
  - From GHG rule, defined in pending Policy Directive 1610
  - Separate from Focus model
  - Must be specific, measurable, effective, tracked over time
  - DRCOG Board-adopted Mitigation Action Plan to commit the region
  - Exploring parking requirements and zoning-related density increases near rapid transit stations

- Without mitigation measures, other strategies may not be enough to close the GHG emission reductions gap
- Alternative to mitigation measures – and not meeting GHG reduction targets – is project eligibility restrictions on federal funds within DRCOG MPO area
- This would affect project eligibility for 2024-2027 TIP calls #3 and #4 in late 2022 and early 2023
- Restrictions would also affect CDOT project funding eligibility within DRCOG MPO area

# PROCESS TO MEET GHG REDUCTION LEVELS





**ATTACH D**

## ATTACHMENT D

To: Chair and Members of the Regional Transportation Committee

From: Emily Kleinfelter, Safety/Regional Vision Zero Planner

Meeting Date	Agenda Category	Agenda Item #
June 14, 2022	Informational Briefing	6

### SUBJECT

Regional Complete Streets Network Prioritization Analysis

### PROPOSED ACTION/RECOMMENDATIONS

N/A

### ACTION BY OTHERS

N/A

### SUMMARY

Complete Streets are safe, context sensitive, inclusive, equitable, and flexible. They provide pedestrians, bicyclists, transit riders and other multimodal travelers the same access to safe comfortable streets as motorists.

DRCOG developed a Regional Complete Streets Toolkit for the Denver region that provides guidance for local governments and project sponsors to plan, design, and implement Complete Streets. The Toolkit also includes strategies for decision makers, planners, and designers to ensure that multimodal elements are appropriately and effectively incorporated into transportation projects. DRCOG staff also developed the agency's first ever "story map" to help explain, illustrate, and apply the street typologies. The story map is located here: [Regional Complete Streets Story Map](#).

The recently passed Infrastructure Investment and Jobs Act (IIJA) requires development of a Complete Streets prioritization plan that identifies a specific list of Complete Streets projects to improve the safety, mobility, or accessibility of a street.

To follow the directive of the IIJA, DRCOG extended the contract with Toole Design group to execute a prioritization analysis that identifies segments and locations worthy of investments that address safety, mobility, and accessibility. As the Metropolitan Planning Organization of the Denver region, DRCOG has produced a substantial number of plans that address transportation priorities, challenges, and opportunities in the region. For this analysis process, a single GIS layer was created by gathering data from DRCOG's planning efforts. The data used in this analysis and its corresponding plan are listed below.

Planning Initiative	Data
2050 Metro Vision Regional Transportation Plan	BRT Network; Environmental Justice TAZs
Regional Complete Streets Toolkit	Street Typology
Taking Action on Regional Vision Zero	High Injury Network and Critical Corridors

Active Transportation Plan	Regional Active Transportation Corridors; Pedestrian Focus Areas; Short Trip Opportunity Zones)
Multimodal Freight Plan	Regional Highway Freight Vision Network Tiers 1-3
Congestion Management Process	Key Congested Locations

A core value behind Complete Streets is that they are context sensitive and equitable. Because several datasets from a variety of different plans were used to perform this analysis, each dataset was assigned a weighting based on priority or importance to take equity and context into account and ultimately prioritize locations.

The results of the analysis were mapped to graphically illustrate locations and segments in the DRCOG region that scored the highest for being ideal candidates to take action and invest in projects that addresses multiple planning priorities, including safety, accessibility, and mobility.

The Toolkit is intended to assist project sponsors in developing multimodal projects for the 2024-2027 Transportation Improvement Program (TIP) that help implement the 2050 Regional Transportation Program's (RTP) project and program investment priorities and the Metro Vision Plan's outcomes and objectives. This prioritization analysis is another tool that member governments can use to identify candidate projects for funding programs such as the TIP and the new federal grant program, [Safe Streets and Roads for All](#).

**PREVIOUS DISCUSSIONS/ACTIONS**

RTC – [October 19, 2021](#)  
[August 17, 2021](#)

**PROPOSED MOTION**

**ATTACHMENTS**

1. Staff presentation

**ADDITIONAL INFORMATION**

If you need additional information, please contact Emily Kleinfelter, Safety/Regional Vision Zero Planner, Transportation Planning & Operations Division at (303) 480-5647 or [ekleinfelter@drcog.org](mailto:ekleinfelter@drcog.org).

# Regional Complete Streets Prioritization Analysis

Regional Transportation Committee  
June 14, 2022

Emily Kleinfelter, Safety/Regional Vision Zero Planner

*“The Complete Streets Toolkit provides guidance for local jurisdictions to adopt the Complete Streets approach where streets are balanced for all modes of transportation, including walking, bicycling, taking transit, freight, and driving.”*

The toolkit is intended to:

- 1. Support the implementation** of the 2050 Metro Vision Regional Transportation Plan.
- 2. Provide resources** for Complete Streets implementation.
- 3. Encourage cross-jurisdictional collaboration** to plan design and build Complete Streets throughout the Denver region.

# Regional Complete Streets Story Map

**drcog** Complete Streets for the Denver region
☆ ...

Introducing the toolkit
Developing street typologies
Assigning street types
Defining street types
Designing complete streets
Refining stre
→

## Downtown commercial street

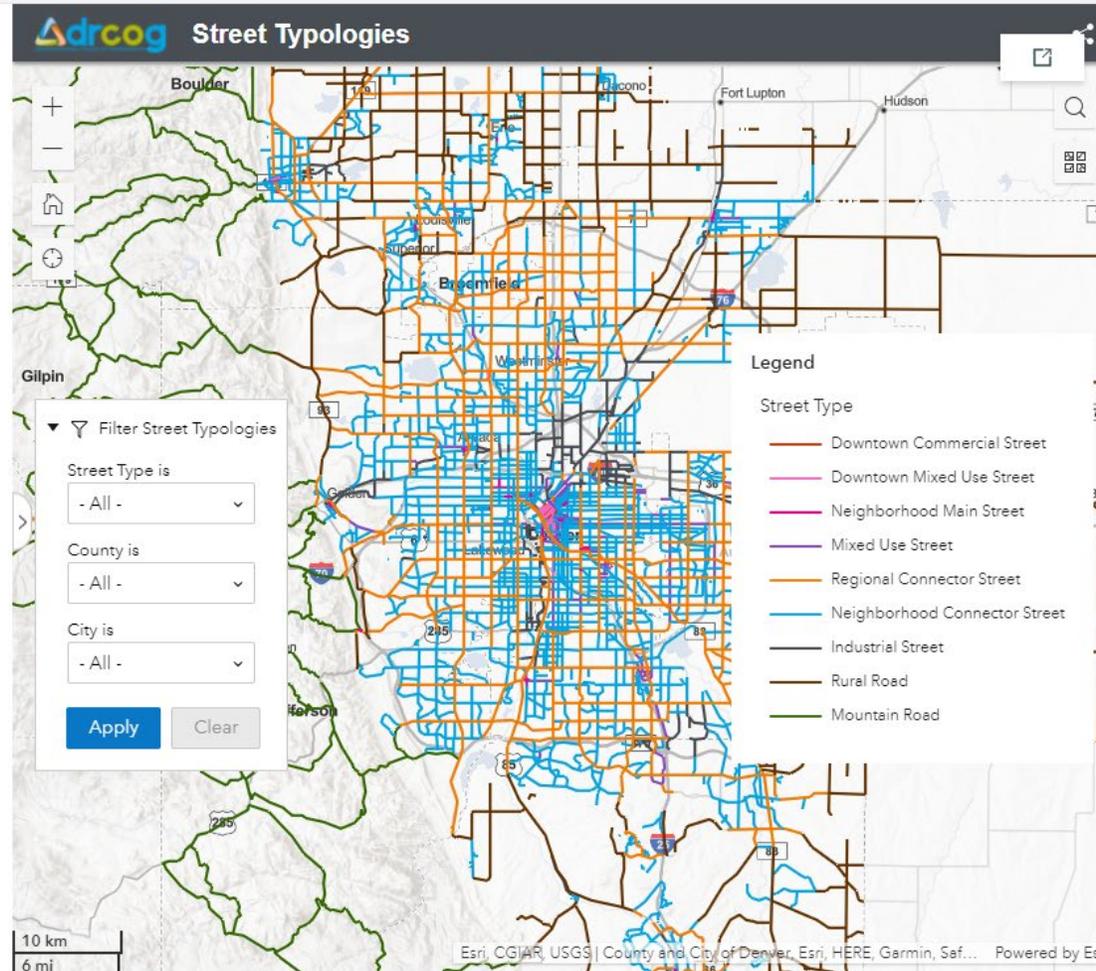


Downtown commercial streets are generally located in central business districts or larger urban cores, support a relatively continuous row of street-facing buildings that encourage street activity, facilitate high user volumes and include short blocks.

**Modal priority**



**drcog** Street Typologies
🗨️



Esri, CGIAR, USGS | County and City of Denver, Esri, HERE, Garmin, Saf... Powered by Esri



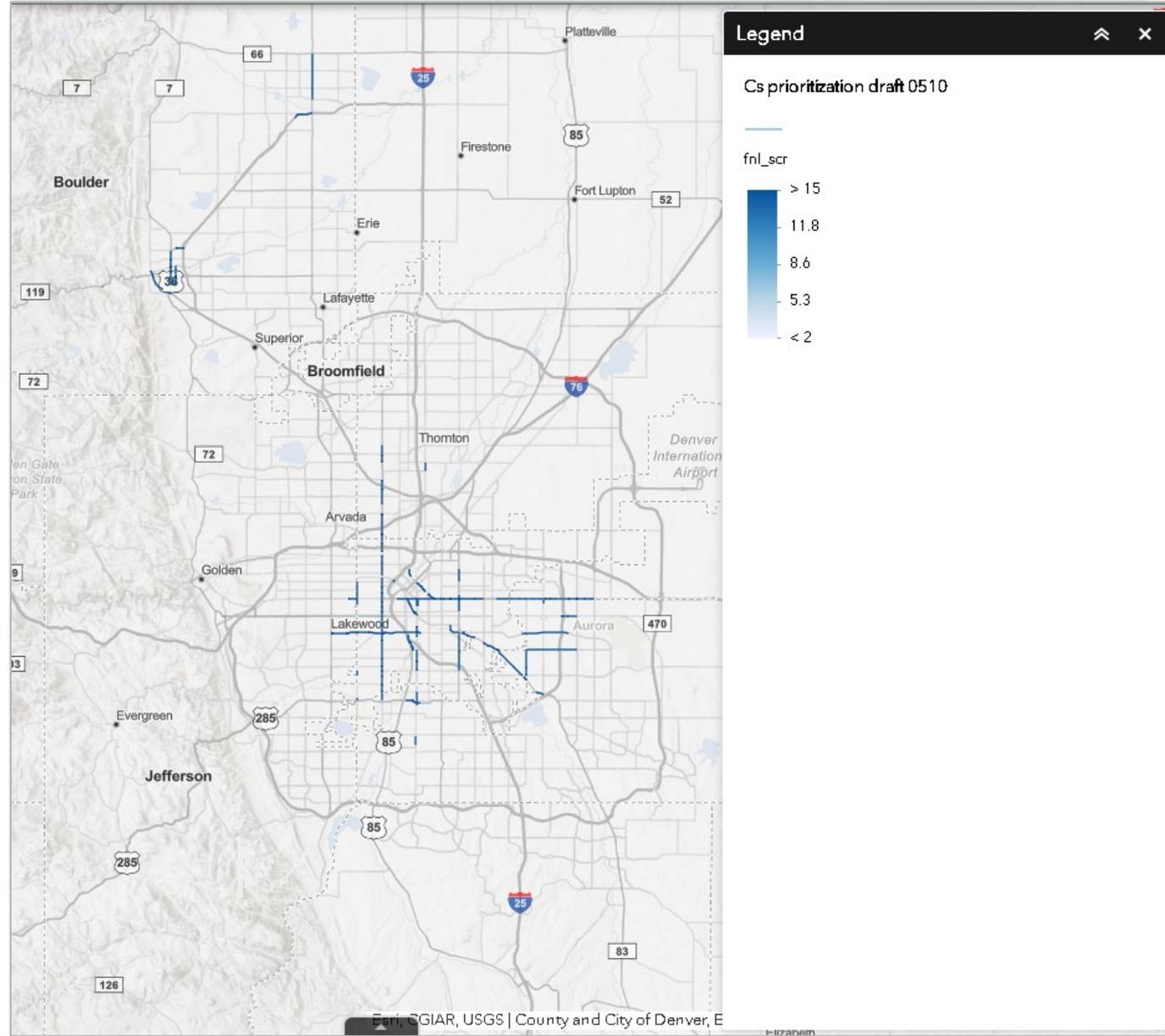
Infrastructure Investments and Jobs Act requires:

- 1) development of a Complete Streets prioritization plan that **identifies a specific list of Complete Streets projects to improve the safety, mobility, or accessibility of a street.**
- The prioritization analysis combined several of DRCOG's planning initiatives to identify segments or locations worthy of investment that address multiple planning priorities to "improve the safety, mobility, or accessibility of a street" as the IJA directs.

## DRCOG Planning Initiatives included in the analysis:

Planning Initiative	Data
2050 Metro Vision Regional Transportation Plan	BRT Network; Environmental Justice TAZs
Regional Complete Streets Toolkit	Street Typology
Taking Action on Regional Vision Zero	High Injury Network and Critical Corridors
Active Transportation Plan	Regional Active Transportation Corridors; Pedestrian Focus Areas; Short Trip Opportunity Zones)
Multimodal Freight Plan	Regional Highway Freight Vision Network Tiers 1-3
Congestion Management Process	Key Congested Locations

# Mapping the Results



## Inform DRCOG's project prioritization process

- This prioritization analysis is another tool intended for member governments to use to identify priority project candidates for funding opportunities such as...
  - Transportation Improvement Program (TIP)
  - New federal grant program: Safe Streets and Roads for All



**THANK YOU!**  
**QUESTIONS?**

Emily Kleinfelter | [ekleinfelter@drcog.org](mailto:ekleinfelter@drcog.org)