

2021 Annual Report on Roadway Traffic Congestion in the Denver Region

November 2022



Introduction

The Denver Regional Council of Governments' annual report on roadway traffic congestion in the Denver region has provided consistent analysis and monitoring of the performance of the region's roadways since 2006. In 2021, travel in the region was meaningfully influenced by the ongoing COVID-19 pandemic and the continued growth in the region. The pandemic, which began significantly affecting travel in the Denver region in March of 2020, disrupted long-standing travel behaviors, as well as how much and when the region's roadways are used.

This report provides a snapshot of regional travel that occurred in 2021, comparing to both 2020 and pre-pandemic 2019 conditions and addresses ongoing telework impacts, time of day of travel and variations of congestion in the region based on geographic area and trip purposes on different roads. It includes regional travel projections for 2050 associated with the network and growth forecasts assumed for the 2050 Metro Vision Regional Transportation Plan adopted in September 2022. The report concludes with thoughts on managing congestion in a growing region through local, regional and state planning efforts.

Vehicle miles traveled

Every year, DRCOG staff estimates the annual change in total vehicle miles traveled on the region's roadways during an average weekday. VMT is a calculated representation of every mile traveled by all cars, trucks, vans and buses on every roadway segment in the region. Total VMT is estimated by using travel demand models that are calibrated to match thousands of roadway traffic counts throughout the region. As an example of how VMT is calculated, if 10,000 vehicles travel along a two-mile-long roadway segment, the VMT would be 20,000 miles.

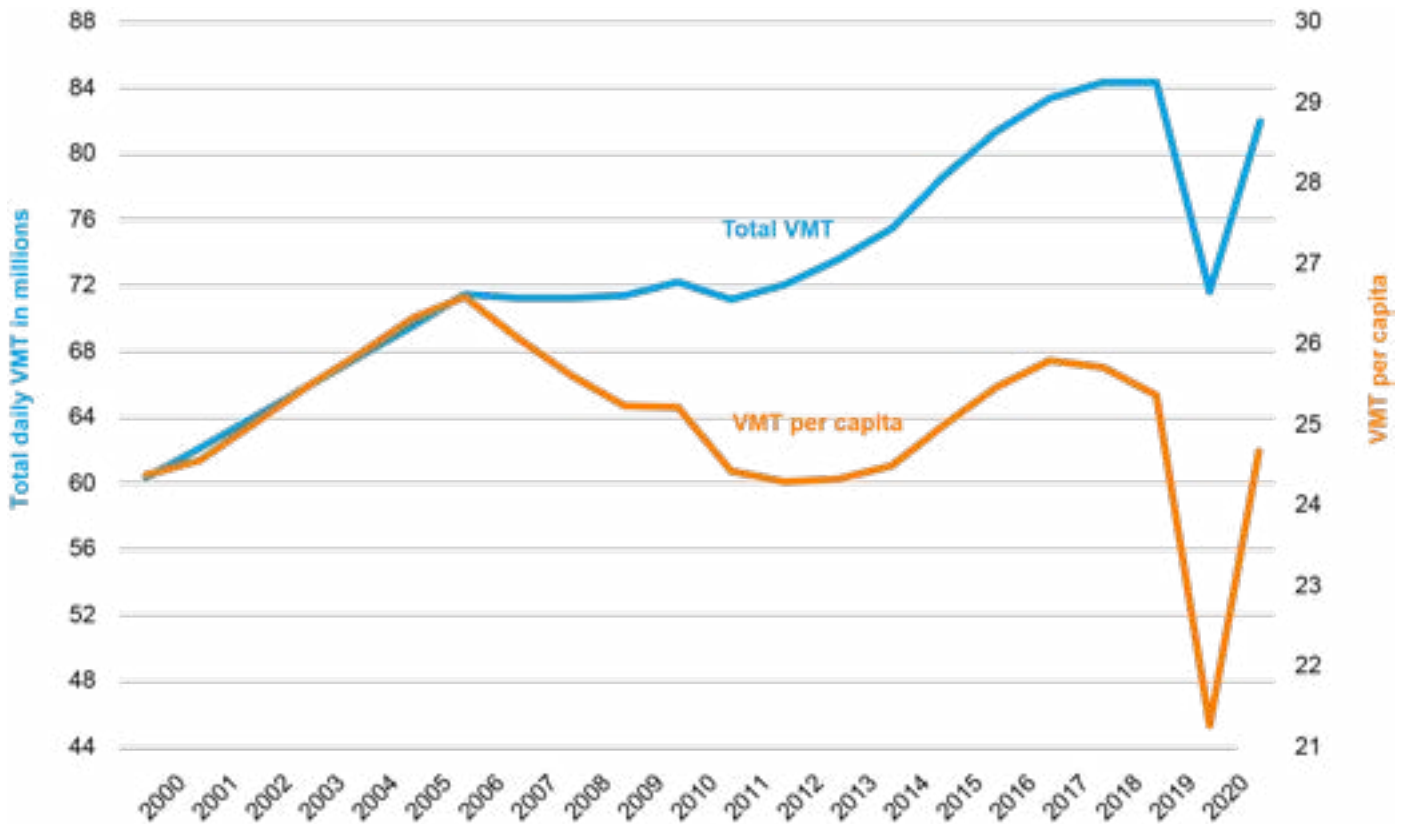
Seasonal variations and other disruptions commonly affect daily VMT throughout the year. Even in a typical year, no two days' VMT are exactly alike. Care is taken to incorporate several factors and sources to come up with the best estimate for the annual average weekday VMT.

For 2021, DRCOG staff estimates 82.5 million average daily VMT for the Denver region, approximately 3% less than in 2019. The 2021 VMT represents a 14% increase over 2020, when lockdowns and changes to travel behavior due to

the COVID-19 pandemic were at their most severe. Some have questioned how VMT could have rebounded so quickly, given the many office workers continue to work at home several days a week. One reason is that office worker commuting represents a relatively a small share of daily VMT. Many jobs are not located in offices amenable to telework options and well over half of daily VMT is not related to commuting at all. It is also important to note the population of the region increased by over 56,000 people between 2019 and 2021.

Figure 1 displays historic annual and per capita daily VMT values. From 2000 to 2018, daily VMT in the region increased approximately 40%. It then flattened just prior to the pandemic in 2020. During 2020, daily VMT dropped to values last seen between 2005 and 2011. In 2021, VMT bounced back to near pre-pandemic conditions while VMT per capita (24.5 miles) was just below the relatively consistent level seen between 2016 and 2019, despite continued population and job growth in the region.

Figure 1. Average daily vehicle miles traveled in the Denver region (2000-2021)



Travel trends in 2021

Differences by location compared to 2019

Traffic volumes on most of the region's roadways increased over the course of 2021 compared to 2020, but only returned to 2019 levels at some locations.

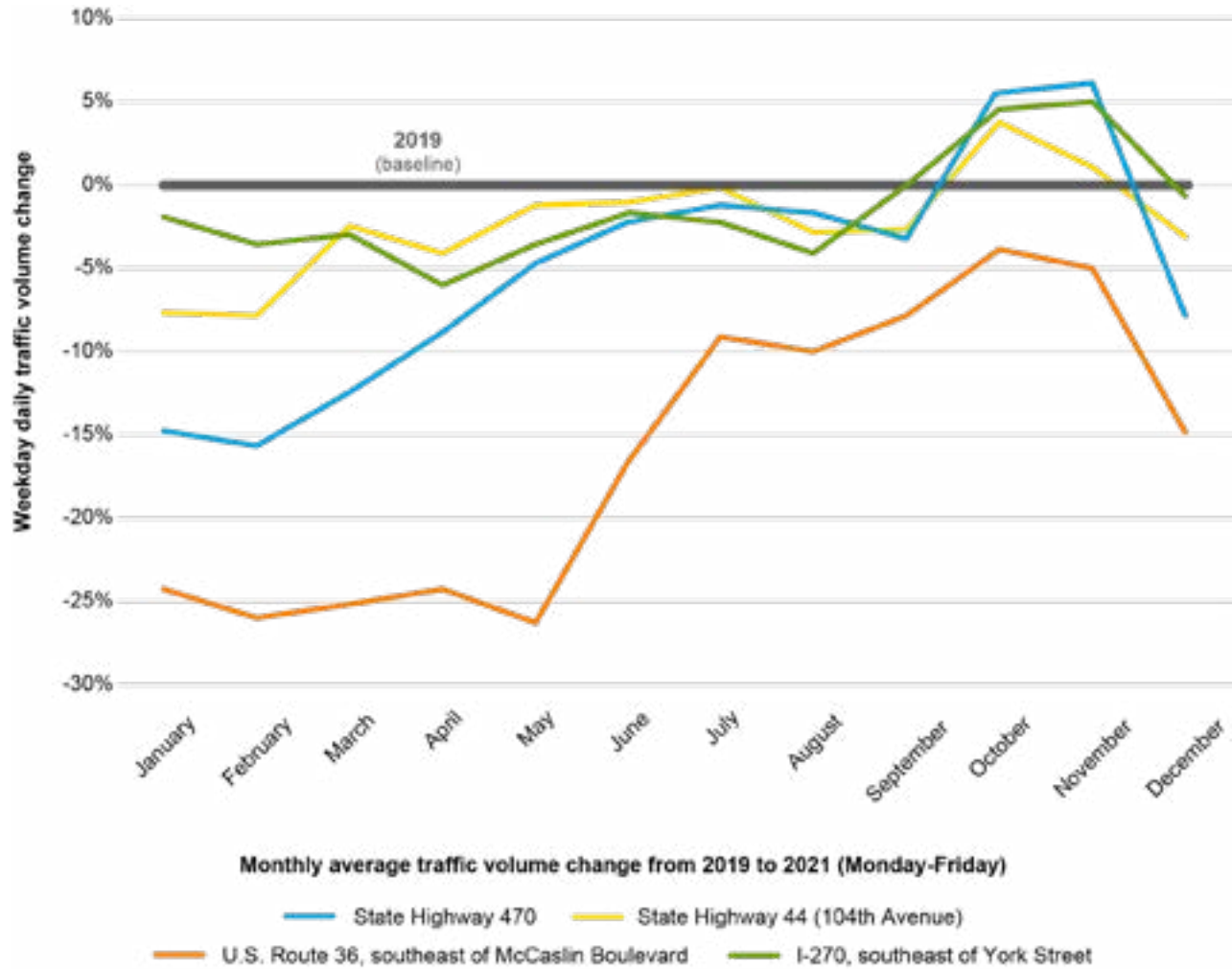
The amount of the change in traffic volumes varied significantly among specific locations across the region, based on common trip purposes on certain roadways and the trip generators and land use mixes that impact travel along different corridors. Figure 2 shows the differences in volumes at four locations with continuous automated traffic recorders across the region, comparing Monday through Friday volumes in 2019 and 2021.

On U.S. Route 36 southeast of McCaslin Boulevard, traffic reductions were much greater than at other locations. The relative decrease in volumes persisted

throughout the year, likely due to the high share of office and university commuters who use U.S. Route 36 and continued to frequently work and study from home throughout 2021. On the other end of the spectrum, traffic did not decrease as significantly on the I-270 location, where there is a higher share of commercial and freight activity. I-270 was the first location during the pandemic to have slightly more average weekday traffic than in 2019, though it leveled off through 2021. In October and November 2021, many locations throughout the region saw an increase in VMT compared to 2019 as many residents returned to more typical travel behavior, however, as the Omicron variant of COVID-19 became more widespread, VMT decreased in the region by December.



Figure 2: Comparing 2021 to 2019 volumes by month on various roadways across the region



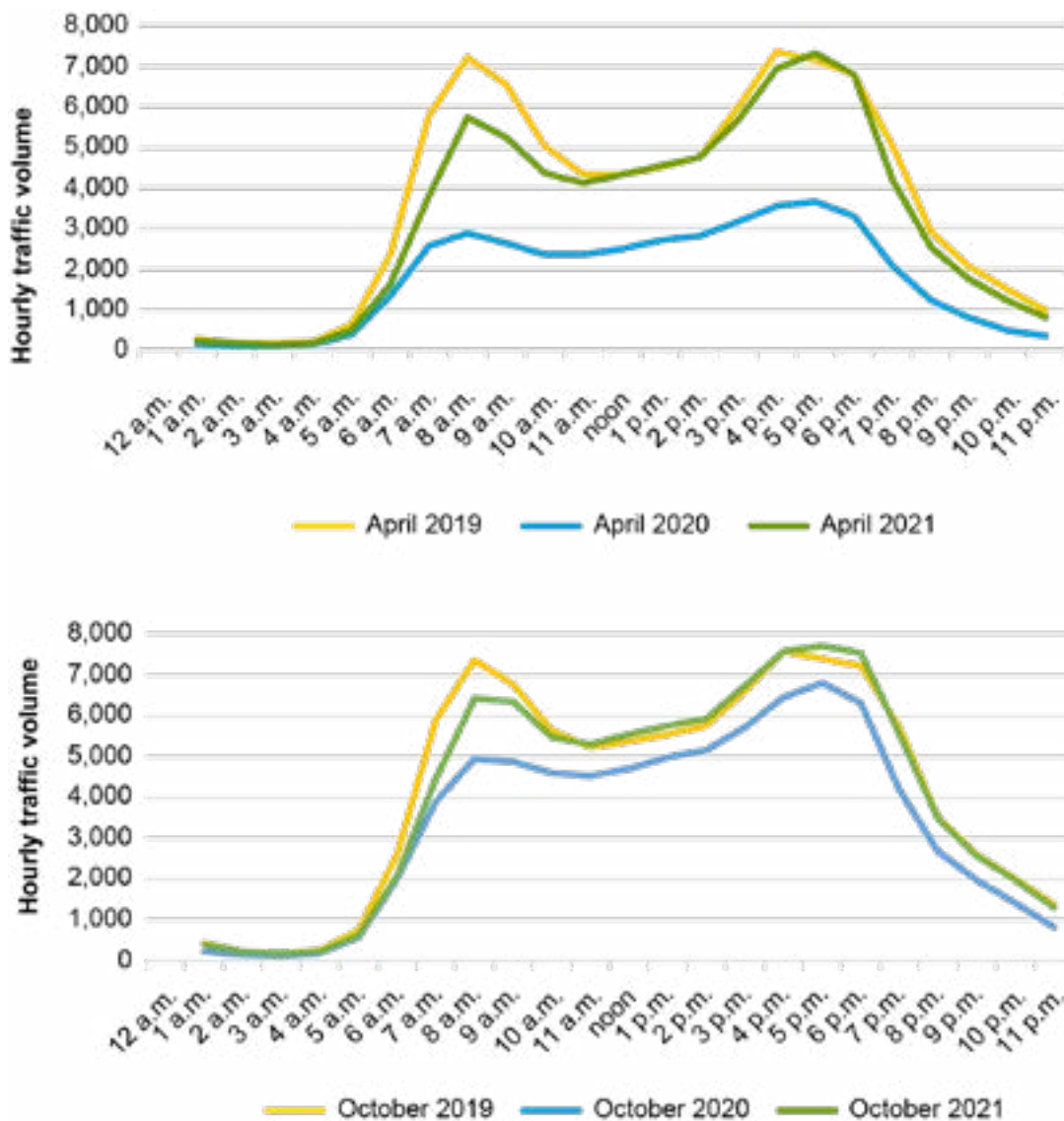
Source: Colorado Department of Transportation Automated Traffic Recorder Data

Differences by time of day

In response to the pandemic, many people changed the time of day they were traveling. Figure 3 shows hourly traffic volumes for State Highway 470 northwest of State Highway 8 (Morrison Road), comparing 2019, 2020 and 2021 for April and October. In 2020, peak hour trips decreased more

than mid-day trips, but the afternoon peak returned to 2019 levels while the morning peak remained consistently lower. By October of 2021, morning peak travel nearly returned to 2019 levels.

Figure 3: Daily traffic volume variation



Source: Colorado Department of Transportation Automated Traffic Recorder Data.

Special case: Denver International Airport

Peña Boulevard is a unique roadway within the region, primarily carrying travelers, employees and freight associated with the airport. From 2019 through early 2020, traffic volumes on Peña Boulevard east of E-470 increased, reflecting the long-term trend of increasing activity at Denver International Airport. Because airline travel is a sector highly impacted by the pandemic, traffic volumes dropped drastically on

Peña Boulevard in 2020. As airline passenger travel rebounded over the course of 2021, so did traffic volumes on Peña Boulevard. Figure 8 shows Peña Boulevard’s average daily traffic volumes along with total Denver International Airport passenger averages month-to-month for 2019, 2020 and 2021. The data reveals the variations of travel before, during, and after the height of the pandemic.

Figure 4: Peña Boulevard and Denver International Airport total passengers by month



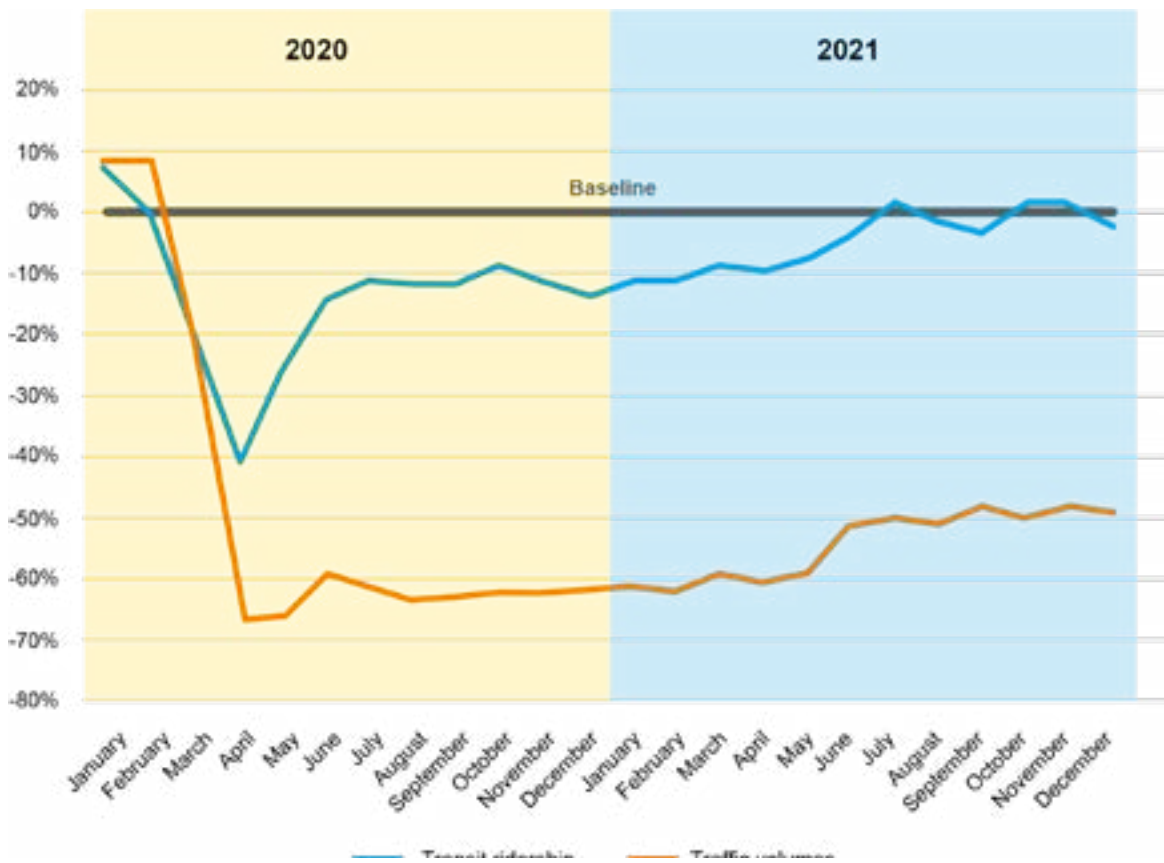
Source: Denver International Airport

2021 Regional Transportation District transit

While traffic volumes rebounded across the region in 2021, transit ridership has not yet returned to 2019 levels. Figure 5 shows that while transit ridership did increase compared to 2020, average daily ridership was still around 50% of 2019 ridership. Fewer daily workers in office buildings, increased telework, reduced transit service levels and ongoing health and safety concerns have all contributed to the sustained reduction in transit ridership. Like many transit agencies across the nation, the Regional Transportation District has also struggled to maintain scheduled transit service levels over the last

two years due primarily to staffing shortages. Despite that, RTD has been working through their “Reimagine RTD” effort to identify comprehensive strategies and service adjustments to better connect people to the places they want and need to go. RTD’s work, along with investments identified in the 2050 RTP, and partnerships with local stakeholders strive to result in significant ridership increase in the coming years.

Figure 5: RTD ridership comparison



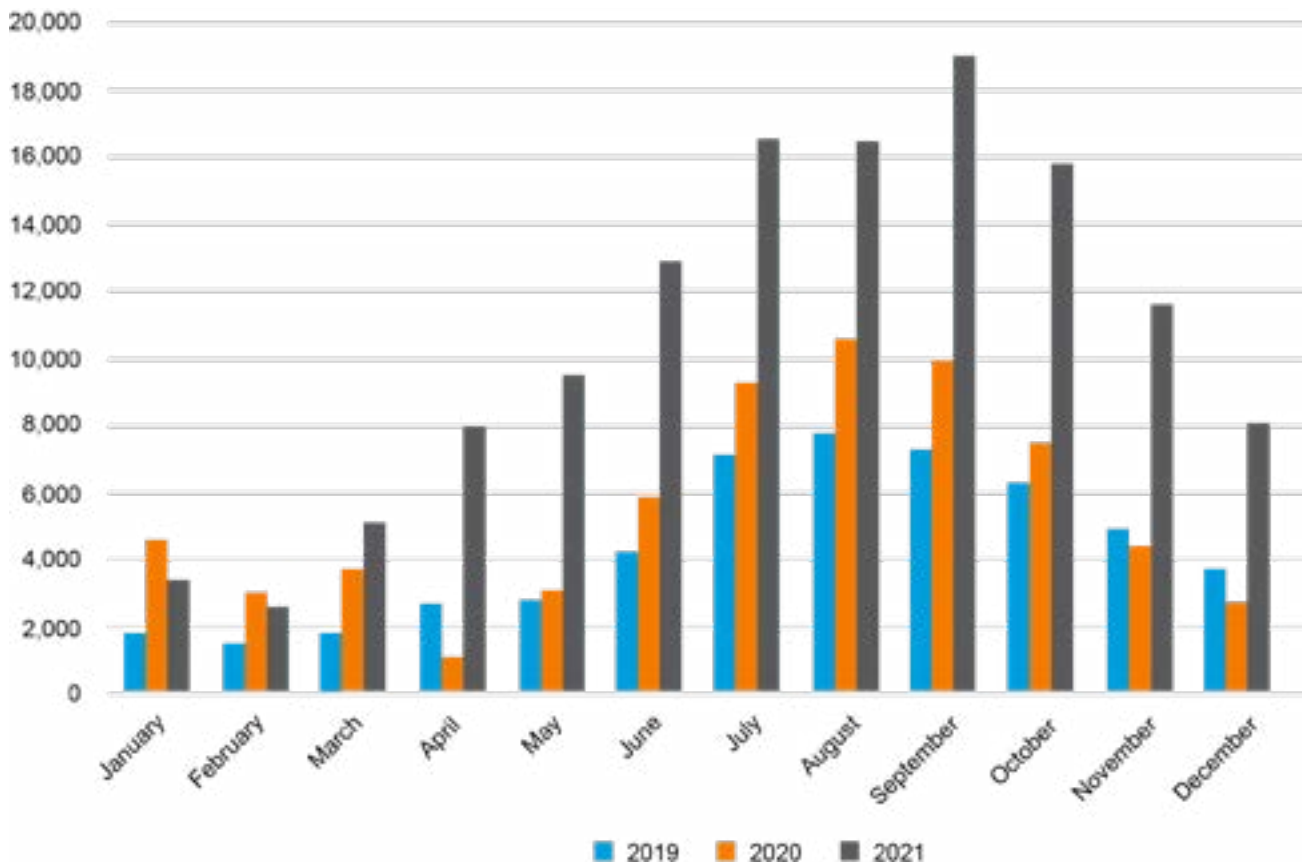
Source: National Transit Database

2021 shared micromobility

Over the last several years, shared micromobility has emerged as an important transportation option in certain areas of the Denver region. Shared micromobility refers to shared, small, human- and electric-powered transportation modes including station-based bikeshare and dockless e-bikes and e-scooters. These devices are typically available for short-term rentals and can be used in designated service areas. In the Denver region, shared micromobility services are primarily operated by private companies, though a few are operated by non-profits and local agencies.

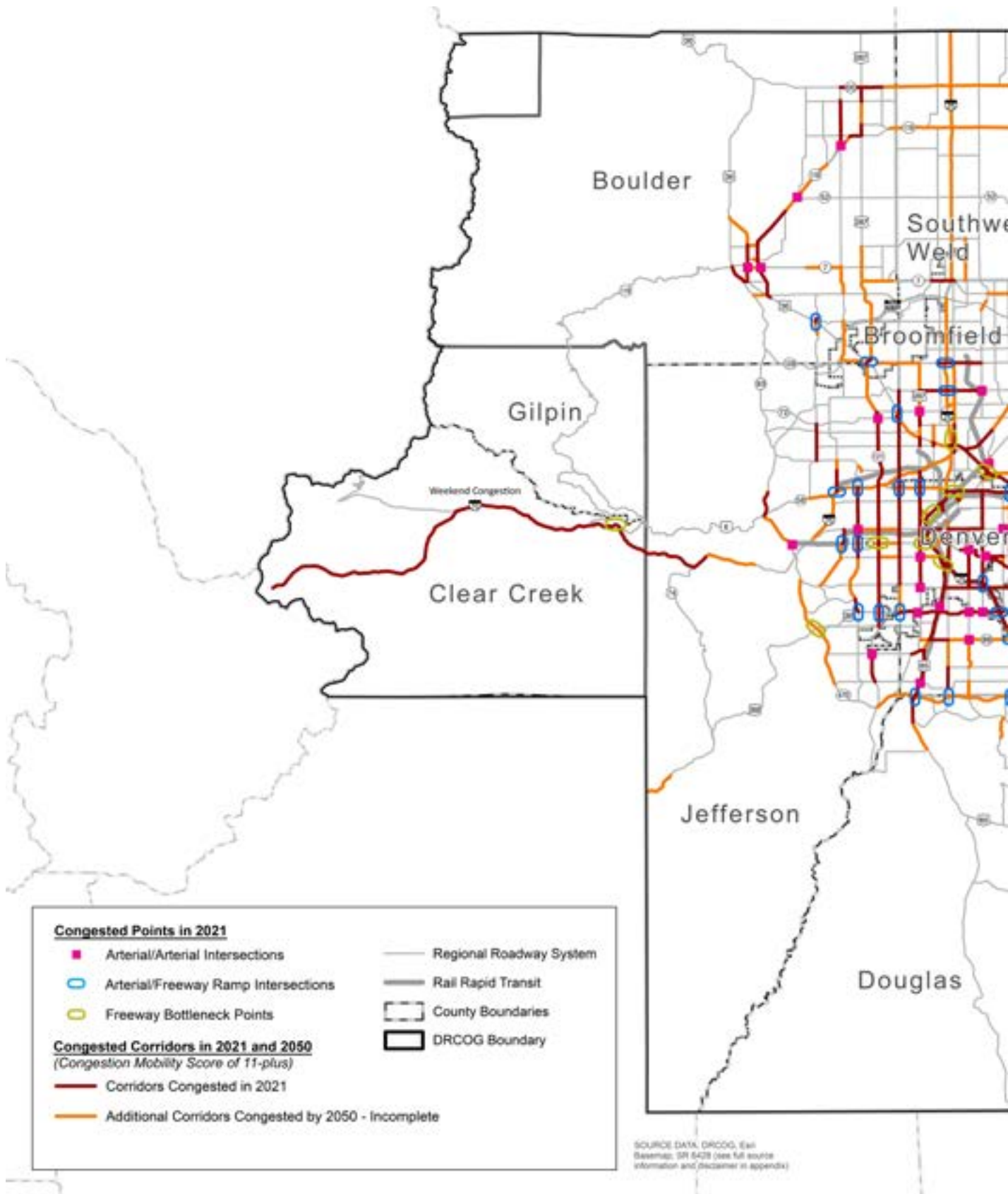
Figure 6 shows the number of shared micromobility trips made in the Denver region in 2019, 2020 and 2021. The number of trips is impacted by multiple factors including seasonality and weather, the pandemic and shutdowns, associated changes in travel behavior and costs, deployment in new areas, the number of total vehicles permitted/available and the social popularity among many demographic groups, especially younger travelers. There has been an increase in the number of vehicles available over the past few years as fleet sizes change and providers expand to new cities in the region. In 2021, there were around four million shared micromobility trips, which averaged eight minutes and just less than one mile.

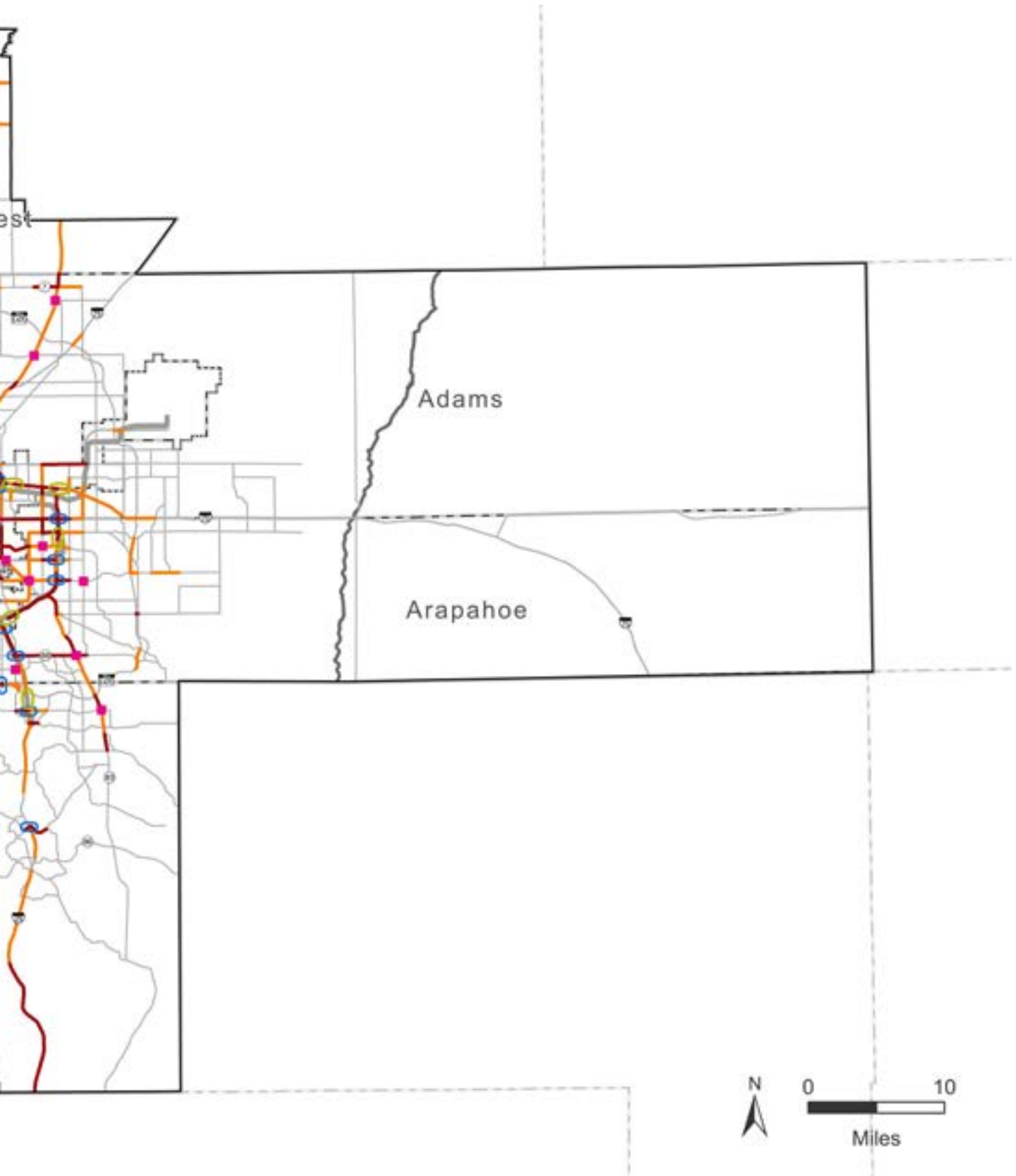
Figure 6: Average daily Denver region micromobility trips



Source: Ride Report

Figure 7: Key congested locations in 2021 and 2050





Congestion in 2050

The Denver region will change over the next thirty years and so will travel patterns and congestion. Based on forecasts from the Colorado Demography Office, DRCOG's staff anticipates the region will grow by more than one million people and add 600,000 new jobs by 2050. The transportation system will change with new facilities serving all travel modes and a significant expansion of transit service. Technological advancements will result in new travel modes, mobility services and safety systems, changing how and when people and freight move around the region.

The 2050 Metro Vision Regional Transportation Plan outlines how the region will continue to improve transportation infrastructure and services as population grows. Based on current estimates, the DRCOG travel model forecasts a 40% increase in daily VMT in the region by 2050. With limited new roadway capacity, the extra travel volume would result

in approximately a near tripling of vehicle hours of delay and over a doubling of lane miles congested for longer than three hours a day. In this scenario, congestion at 2 p.m. in 2050 is worse than it is at 5pm in 2021. Table 1 includes a summary of congestion measures between 2021 and 2050.

The map in Figure 7 compares the most congested segments from 2021 with 2050 and demonstrates how many additional roads will experience high levels of congestion in the future based on four key metrics:

- **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 affected by congestion on the roadway?
- **Reliability:** How often do crashes or incidents occur on the roadway?



Table 1: Current and future congestion measures on Denver freeways and major roads

<i>Note: These measures are only for the designated Regional Roadway System.</i>	2021 Average weekday	2021 Annual total estimate ¹	2050 Average weekday	2050 annual total estimate ¹	Change between 2021 and 2050
Vehicle measures					
Vehicle miles of travel	63,347,000	21,411,251,000	88,447,000	29,895,066,000	40%
Vehicle hours of travel	1,355,000	457,891,000	2,118,000	715,974,000	56%
Vehicle hours of delay	167,000	56,399,000	472,000	159,545,000	183%
Travel delay per driven, registered vehicle (in minutes) ²	3.6	1,232	8.2	2,764	124%
Person measures					
Person miles of travel	86,931,000	29,382,794,000	122,540,000	41,418,394,000	41%
Person hours of travel	1,864,000	630,172,000	2,930,000	990,219,000	57%
Person hours of delay	231,000	77,998,000	650,000	219,817,000	182%
Travel delay per household (minutes per day and hours per year)	10.5	3,547	22.2	7,492	111%
Travel delay per resident (minutes per day and hours per year)	4.1	1,401	9.3	3,132	124%
Other congestion measures					
Percent of travel time in delayed conditions	12%	N/A	22%	N/A	N/A
Extra travel time (5 p.m. peak versus free flow)*	19%	N/A	31%	N/A	N/A
Extra travel time (2 p.m. peak versus free flow)	14%	N/A	23%	N/A	N/A
Lane miles of roads congested for more three-plus hours	1,281	N/A	2,802	N/A	119%
<i>(Percent of total lane miles)</i>	17%		34%		N/A
Economic travel delay costs					
Commercial vehicles ³	\$1,128,000	\$381,311,000	\$2,742,000	\$926,685,000	143%
Passenger vehicle persons ³	\$3,248,000	\$1,097,834,000	\$5,110,000	\$1,727,316,000	57%
Total cost of delay	\$4,376,000	\$1,479,144,000	\$7,852,000	\$2,654,000,000	79%

Technical notes:

1) Annual total estimate is "Average weekday" total multiplied by 338

2) Assumption of 1,850,267 driven registered vehicles in 2021 and 2,429,296 in 2050.

3) Cost calculations incorporate \$12 per hour per adult in car, \$48.30 per hour per light commercial vehicle operator and \$71 per hour for heavy commercial.

Managing congestion in a growing region

The modeled values shown in Table 2 and Figure 7 describe one scenario of how the region's transportation system might function and how severe congestion may be in 2050. However, DRCOG and the region's decision makers have the opportunity to change the trajectory of the region. Through the 2050 Metro Vision Regional Transportation Plan, DRCOG, the Colorado Department of Transportation, RTD and local governments are looking to provide many more travel options to reduce the need for so many miles driven, and the associated unreliable traffic congestion. The opportunity exists to create a better transportation future in the region.

Managing congestion and making progress toward Metro Vision goals depends on DRCOG and its partners helping people avoid and adapt to congestion, while implementing strategies to alleviate congestion. Many mitigation strategies have layered benefits. For example, choosing to bike or take transit instead of drive allows residents to avoid congestion themselves, while alleviating congestion for others by taking one more car off the road.

The 2022 update to the 2050 RTP moves the long-range plan further in this direction, by investing in projects that help people avoid and adapt to

congestion. In the process of updating the RTP to reduce VMT and comply with the state's Greenhouse Gas Transportation Planning Standard, it became clear that the region must invest in a diverse and extensive portfolio of transportation projects and initiatives to effectively reduce emissions and congestion. The following is a highlight of recently completed projects and how they work toward reducing congestion in the region.

Bustang intercity bus service

CDOT's Bustang bus service serves commuters and travelers along the I-25 Front Range and I-70 Mountain Corridors. Special service is also provided to ski areas in the winter (Snowstang) and Estes Park in the summer. By linking major local transit systems together, the Bustang service responds to demand from the traveling public to have a reliable transit alternative along the highest traveled corridors in the state.

By providing a new, long-range service, Bustang provides an opportunity for people travelling long distances throughout the front-range or into the mountains to avoid congestion on long trips while reducing the number of vehicles on the road.



High Line Canal Trail underpass – Colorado Boulevard and Hampden Avenue

Historically, the High Line Canal Trail left pedestrians and people on bikes at Colorado Boulevard and Hampden Avenue, a busy intersection that was intimidating to cross on foot or on a bike. This project, funded in part with DRCOG Transportation Improvement Program project funds, built two underpasses to reroute the trail under the busy arterial street to create a safer, more convenient connection for people walking and riding bikes. In

addition, between the two underpasses, Denver added a new, 10-foot-wide multi-use trail along the north side of Hampden Avenue.

Major improvements such as this remove barriers, decrease travel time, increase comfort and improve safety. They can have a significant impact on people considering switching from driving to bicycling for a trip, decreasing congestion on the roadway.



Photo and map courtesy of the City and County of Denver.

Multi-jurisdictional monitoring and management project

The City and County of Denver, the City of Lakewood and CDOT interconnected their advanced traffic management system software servers to enhance interjurisdictional traffic signal monitoring and management. Specifically, the operators are provided access to a map covering each agency's system. The map illustrates the operating status of select traffic signals and details of current signal timing plans for each jurisdiction. It also produces diagrams illustrating the flow of traffic and quality of traffic signal synchronization across jurisdictional boundaries. Sharing this data improves operator situational awareness of both roadway and traffic signal conditions and creates a common understanding of traffic incident impacts. It also aids

in quickly troubleshooting traffic signal issues across jurisdictional boundaries. The project team estimates this coordinated effort will improve travel times and reduce travel delays by about 5% over the life cycle of the project.

By sharing data and awareness across agencies, vehicles moving through these key regional corridors reduce idling, stop delays and the associated congestion and emissions. By improving incident management, crashes can be cleared from the road more quickly, alternate routes can be prepared for diversions and secondary crashes can be avoided, improving safety.



Other current projects to mitigate congestion

DRCOG supports local governments, CDOT and RTD to complete projects which can mitigate congestion impacts. Table 1 shows a list of example transportation projects addressing congestion and mobility completed or underway in 2020 and 2021. This list is not comprehensive of all efforts but shows several categories of congestion mitigating projects. Interchange and roadway projects address key bottleneck points in the region. Transit, bicycle and pedestrian projects expand and enhance non-roadway facilities that provide additional travel options, allowing people to avoid congestion.

In addition to location specific projects, there are also programmatic investments throughout the region aimed at reducing congestion or helping people avoid or adapt to congestion. This includes the mobility services of DRCOG's Way to Go program and its partnership with transportation management associations throughout the Denver region.

Congestion management co-benefit: Greenhouse gas reductions

As DRCOG staff and partners aim to reduce congestion, the effort is largely aimed at reducing vehicle miles traveled on the region's roadways. The 2020 Annual Report on Traffic Congestion explains how a small reduction in traffic volumes on a road can have a large impact on vehicle delay. Beyond the relationship with congestion, vehicle miles traveled is also closely correlated with fuel use and greenhouse gas emissions. Reducing VMT and the corresponding congestion is critical in efforts to reduce greenhouse gas emissions and ozone precursor pollutants in the region. Many of the strategies adopted in the 2022 updated 2050 RTP have the benefit of reducing congestion.



Table 2: Example recent projects addressing congestion and mobility

Interchange and roadway projects:	Status
C-470 from Wadsworth Boulevard to I-25: new managed lanes	completed
Federal Boulevard from 6th Avenue to Holden Place: widening	completed
I-25 from Crystal Valley Pkwy to the El Paso County Line: new managed lanes	completed
I-70 from I-25 to Chambers Road: new managed lanes	underway
I-70 WB from Twin Tunnels to Empire Junction: new peak period shoulder lanes	completed
Martin Luther King Jr Blvd from Havana St to Peoria St: new road and widening	completed
US-85 from Louviers Ave to Mile marker 192: widening	underway
Rapid transit projects	Status
North Metro Rail Line (Denver Union Station to Eastlake-124th Station) commuter rail	completed
Bicycle/pedestrian projects:	Status
Parker Road overpass for High Plains Trail	underway
C-470 multi-use trail: grade separation at Yosemite St	underway
30th Street and Colorado Avenue bicycle and pedestrian underpasses	underway
High Line Canal Trail underpass at Hampden Ave and Colorado Blvd	completed
State Highway 157 Foothills Pkwy bike/ped underpass	completed
North Metro Rail: 72nd Ave and Colorado Blvd Station sidewalks	completed

Conclusion

The growth in population and jobs in the Denver region requires thoughtful management of transportation system resources. In addition to regional growth, new technologies and the effects of the pandemic will continue to influence travel behaviors. As demand for the limited resources of the transportation system becomes more intense, transportation demand management partners, transit agencies and new mobility technologies will be essential to mitigating congestion. Such mitigations can improve air quality, the economy and residents' quality of life. Providing the region with dynamic, flexible and safe multimodal travel options will be more important than ever. DRCOG takes seriously the responsibility of creating partnerships to monitor performance measure data and mitigate the most severe negative effects of congestion.

As 2050 approaches, congestion in the region is expected to worsen significantly. In a growing region, an increase in congestion is to be expected. To mitigate major increases in congestion, while supporting economic growth and reducing greenhouse gas emissions, agencies throughout the Denver region will need to rely on effective planning, partnerships and innovation. DRCOG is committed to partnering with state, regional and local agencies to keep people, goods and services moving efficiently across all modes.



Visit DRCOG's partner agency websites for more information:

Colorado Department of Transportation | codot.gov

Regional Transportation District | rtd-denver.com

Colorado Department of Transportation Traveler Information | cotrip.org

For ways to avoid or adapt to congestion, visit Way to Go | waytogo.org

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Contact Robert Spotts, program manager, at rspotts@drcog.org for additional information regarding DRCOG's congestion mitigation program.



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