

Regional Multimodal Freight Plan



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Introduction

In today's connected world, the flow of freight is constant, global and often invisible to consumers. When a package arrives on a doorstep the day after placing an online order, or appears on a store shelf, many people aren't aware of the thousands of miles, dozens of borders, handful of transfers and multiple delivery modes involved in that package's travels. Planning for safe, efficient and sustainable freight movement throughout the region is essential to maintaining the multimodal transportation system that keeps the flow of goods moving, enhances communities and quality of life, and strengthens the regional economy.

As the regional economy grows, as new freight technologies emerge, and as new business models take hold, how goods are moved and delivered across the region is an emerging area of interest to local communities. Coordination and collaboration on goods movement issues, including safety, reliability, access, connectivity, economic development and sustainability are critical. Planning and investing in freight infrastructure and technology today is vital to moving the region tomorrow. The region's public and privately operated multimodal freight infrastructure is interconnected and includes local connecting roads, state highways, interstates, national railroads, local short-line railroads, air cargo facilities, interstate pipelines, intermodal terminals and a wide variety of distribution centers, warehouses and delivery hubs.

Plan Contents and Summary

This plan provides a strategic view of significant freight issues, challenges and opportunities that can be addressed by communities within the region. Many other important issues must be addressed at the local level, in concert with regional strategies. This plan is a precursor to more comprehensive regional freight planning and is intended to provide a framework for the region to engage on freight issues through coordination, partnership, integration and investment.

1. Preparing the Regional Multimodal Freight Plan

This chapter introduces how this plan integrates with DRCOG's regional vision and transportation planning processes. It summarizes key themes, issues and needs that arose from conversations with the traveling public, private industry and regional advisory council members.

2. Connecting the Economy

This chapter provides information and indicators of how multimodal goods movement supports the regional economy through jobs and business activity. It includes available data on international exports and significant commodity flows.

3. Delivering the Region

This chapter describes existing conditions, significant needs and emerging issues related to highway, rail, air and pipeline movements. It provides key indicators of current conditions and needs, such as highway and rail safety. This chapter illustrates a future regional vision network of integrated priority highway freight corridors.

4. Planning for the Future

This chapter presents information on future freight forecasts and discusses emerging trends in the freight industry, including technology, safety, modal shifts, and sustainability and efficiency initiatives. It highlights best practices in local and regional freight planning to provide information and examples for future freight planning efforts throughout the region.

5. Focusing on Freight

This chapter highlights key regional strategies and implementation actions that were identified by partners and stakeholders through the planning process. Regional strategies focus on improving regional data, integrating freight considerations into ongoing planning efforts, coordinating with private-industry partners and encouraging the development of local area plans and freight-specific master plans throughout the region.

6. Coordinating Investments

This chapter synthesizes available information on freight-specific existing conditions and needs from statewide data. It provides a starting point for regional and local planning partners to develop area plans that identify solutions and coordinate future projects to compete for limited state and federal freight-specific funding and grant opportunities. This plan does not identify specific priority projects or recommendations. Instead, it identifies potential future investment areas based on needs data and stakeholder input. These areas may guide future project development and local plans.

Summary of Key Regional Coordination Needs and Actions

The Regional Multimodal Freight Plan presents overarching regional strategies focused on greater coordination and collaboration on freight issues at the local level. The strategies reflect the early stage of freight planning and investment across the region and are intended to guide

partners in developing the baseline studies, data and information to better identify regionally significant and locally impactful freight projects. To implement these actions, regional coordination and partnership with industry representatives is critical. This plan provides best practice recommendations, key regional strategies, a vision freight corridor network and potential investment areas to guide further planning and implementation at the regional and local levels.

Best Practices

Communities across the country are planning effectively for freight through local area plans, coordinated land use and development decisions, freight-specific guidelines, and effective public-private partnerships.

Regional Corridors

A network of regionally significant highway and rail corridors serve the region. This plan identifies high-priority highway corridors that form a base for bundling identified freight needs into regionally significant investment opportunities and future project areas.

Regional Strategies

This plan emphasizes action on regional coordination, partnerships and plan integration to better address freight movements and to develop the data, information, priorities and projects to compete for national and state funding sources.

Future Investment Areas

Local areas across the region have unique freight issues that can be addressed through a variety of solutions. Potential future investments are identified through statewide data to highlight highway and rail safety, connectivity, capacity and reliability needs.

1. Preparing the Regional Multimodal Freight Plan

About This Plan

The Denver Regional Council of Governments is an association of over 50 local governments committed to protecting and enhancing the quality of life in the Denver metropolitan area. DRCOG has served as the metropolitan planning organization for the Denver region since 1977, acting as a forum for collaborative transportation planning processes. Today, through DRCOG, local governments are represented in a continuing, cooperative and comprehensive transportation planning process for all modes in the region along with the Colorado Department of Transportation, the Regional Transportation District, the Regional Air Quality Council and other partners. Ongoing planning addresses both short-term needs through the Transportation Improvement Program and the long-term vision for the region presented in the Metro Vision plan and Metro Vision Regional Transportation Plan.

This Regional Multimodal Freight Plan is a supporting element of the Metro Vision Regional Transportation Plan and Metro Vision plan. Like Metro Vision, the Regional Multimodal Freight Plan is aspirational, future-oriented and regional in focus. This plan respects local plans and decisions, while offering ideas and solutions by encouraging communities to plan locally and identifying freight-related corridors, investment needs and solutions for the future. This plan addresses communities across the DRCOG planning region including the counties of Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Gilpin, Jefferson and a portion of southwest Weld.

This Regional Multimodal Freight Plan was coordinated by DRCOG and guided by an advisory committee of local government staff and industry stakeholders. DRCOG appreciates the insights and dedication of advisory committee members who were instrumental in shaping this plan, providing strategic direction, forming strategies and actions, and reviewing critical information. DRCOG is committed to advancing regional freight mobility issues through continued coordination and collaboration with local agency and industry partners.

Goals and Outcomes

Comprehensive regional freight planning is still an emerging practice for many state departments of transportation, metropolitan planning organizations and local communities across the country. With the passage of the latest federal surface transportation authorization – the 2015 Fixing America’s Surface Transportation Act (FAST Act), state departments of transportation are required to develop and update statewide freight plans and to identify priority projects for funding through the National Highway Freight Program. CDOT developed Colorado’s first statewide multimodal freight plan in 2019 and continues to enhance freight-specific data and engage industry stakeholders through the Freight Advisory Council.

DRCOG first developed a freight element of the Metro Vision Regional Transportation Plan in 2015, recognizing the significant role goods movement plays in the regional economy, quality of life and transportation system. This Regional Multimodal Freight Plan is designed as an iterative update to the freight element of the Metro Vision Regional Transportation Plan and demonstrates DRCOG’s commitment to continuing to enhance and improve regional freight planning, integration and investment. Guided by the Regional Multimodal Freight Plan Advisory Committee, the primary goals of this planning effort include to:

- engage industry, stakeholders and local government partners
- document significant regional freight trends and conditions
- provide baseline information, data and best practices to encourage local planning efforts
- develop an inventory of current needs to address freight-related highway and other infrastructure issues
- identify a vision regional freight priority network and illustrate potential future freight focus areas
- craft strategies and actions for continued regional coordination and action



Photo courtesy of David E. Hattan



Photo courtesy of David E. Hattan

Public and Partner Priorities

Business, industry organizations and the traveling public were engaged throughout the plan development process to provide input on regional and local issues and impacts. Local government partners provided robust input and helped link this plan to local plans and priorities. Industry partners, including the Colorado Motor Carriers Association and BNSF Railway, participated in the project advisory committee and weighed in during a series of industry forums to map out specific local challenges and issues. Public participants were asked to provide input on priorities related to freight and invited to pinpoint locally significant issue areas and needs within an online regional map. From these discussions, a set of key themes and regional priorities emerged. The themes reflect the challenges of addressing freight issues and impacts while balancing multimodal interests and accommodating anticipated future growth in truck, train and plane traffic.

- **Safety:** Freight movement presents particular safety challenges including hazardous materials, potential conflicts between users of shared curbsides and streets, railroad crossing risks, older infrastructure accommodating larger vehicles, safe and accessible truck rest areas and parking, and truck turning and merging movements in congested areas. Key issues noted by stakeholders include a need to address areas with dangerous turning movements by large trucks; truck merge areas and lane use on

roadways; pedestrian and bicyclist safety in busy urban delivery areas and along truck routes; railroad crossings and railroad right-of-way trespass; truck driver training and safety procedures; and hazardous materials trucks crossing at-grade rail lines.

- **Connectivity:** Much of the region's existing logistics and distribution centers are clustered along congested interstates or are in areas of older infrastructure in need of upgrade and expansion. Key issues discussed by stakeholders include the potential for truck-only lanes in the region; uniform designation of truck routes across the region; capacity improvements to accommodate future logistics growth around Denver International Airport and emerging logistics-oriented developments along the Interstate 76 and U.S. Route 85 northern corridor; upgrades to low-clearance bridges; grade separations at

busy at-grade rail crossings and in areas of future development; improvements to key local roadway connectors; and addressing freight mobility impediments, such as weight-restricted bridges or congested hot spots along key corridors such as Interstate 70, Interstate 25, Interstate 270, Interstate 76 and U.S. Route 85.

- **Sustainability:** Freight movement contributes to the region's overall levels of congestion, vehicle miles traveled and resulting emissions. Congestion increases costs for businesses in terms of wasted fuel and time and increases negative effects



Photo courtesy of David E. Hattan

on the environment and communities through excess emissions and delay. The freight industry is adopting new initiatives, technologies and vehicles to minimize such effects and recognize efficiencies. Shared initiatives between the public and private sectors have the potential to advance industry sustainability initiatives and alternative delivery programs. Issues raised by stakeholders include the potential for electric or alternative fuel delivery vehicles; new delivery models or consumer awareness programs to address residential freight delivery demands; public-private partnerships and programs to encourage commercial truck fleet and vehicle fuel-efficiency upgrades; coordinated land use and development decisions in areas of future cargo, logistics and distribution-oriented developments; and moving more freight by railroad.

- **Technology:** The business practices and operations of the freight transport industry continue to evolve with advances in technology and emerging delivery options. New delivery methods such as drones, blimps, autonomous vehicles and robots are actively being tested and deployed. New technologies and applications for delivery enable real-time tracking and route optimization for large companies and individual drivers alike. Key issues noted by stakeholders include a need to plan for alternative delivery options to meet increasing demand for residential delivery; preserving the potential of existing freight assets and infrastructure for future applications and technologies; deployment of new freight operations technologies; encouraging data-sharing agreements between private entities and the public sector to better plan for and evaluate freight travel patterns and improvements; and leveraging technology to improve safety, efficiency, and sustainability outcomes across all modes.
- **Delivery:** The rapid rise of online commerce enables consumers to access an ever-expanding variety of goods from around the globe and allows businesses to reach new customers in new markets. As a result, more and more packages are

moving to more and more addresses than ever before through more complex local distribution networks and a greater number of parcel delivery trucks. First- and last-mile connections and curb management are a growing challenge for businesses and a growing concern for all users of the transportation system. Key issues expressed by stakeholders include addressing user conflicts between delivery trucks and cyclists or pedestrians in busy urban and suburban areas; resolving the lack of delivery zones and parking availability in urban centers; balancing transit needs and delivery parking and curb management policies; and the need for alternative delivery options such as off-hours, lockers or store pickup to manage residential delivery demands.

- **Coordination:** Addressing freight-related issues, needs and opportunities requires a close coordination and partnerships at the federal, regional and local levels and between private industry and public partners. Key issues noted by stakeholders include a need for more integrated regional and local freight planning efforts; coordination between land use, building codes and development plans that may affect freight activity zones; exploring potential partnerships between private industry and public agencies to implement alternative delivery programs, share information and coordinate on future investments; and a strong need to more carefully consider freight issues in transportation planning studies and project development.

DRCOG's staff is grateful for the active participation of advisory committee members, industry participants, and members of the public who submitted more than 100

responses as part of the regional multimodal planning effort. These ideas and input significantly shaped the development of the Regional Multimodal Freight Plan and directly guided the identification of regional corridors, future investment areas and recommended regional strategies and actions. DRCOG's visioning efforts through Metro Vision provide an opportunity for continuing engagement on freight and regional transportation issues.



Photo: Denver Regional Council of Governments

2. Connecting the Economy

Regional Commodity Flows and International Exports

The DRCOG region is the trade hub for Colorado. Many of the state’s significant rail terminals, intermodal yards, highways, warehouses, distribution centers and manufacturing centers are located in the region. As a result, more than half of the total tonnage and value of goods moved in Colorado in 2015 was handled primarily within the DRCOG region as a first origin or destination area. For example, newly manufactured vehicles are shipped into Denver’s rail intermodal facilities for sale across the region and the Mountain West. Oil and petroleum products that fuel those vehicles are moved by pipeline, truck and train within the region and to the Western Slope. The consumer items, business supplies, online parcels and mail that residents rely on arrive into the region by truck, plane and train and are distributed through a network of intermodal hubs, distribution centers and warehouses. Major manufacturers in key regional industry clusters rely on the freight system to reach customers and access global markets. Producers of milk, cheese, chocolate, pet food, beef and a range of natural and locally made food products are distributed across the region and shipped out to the rest of the country and world.

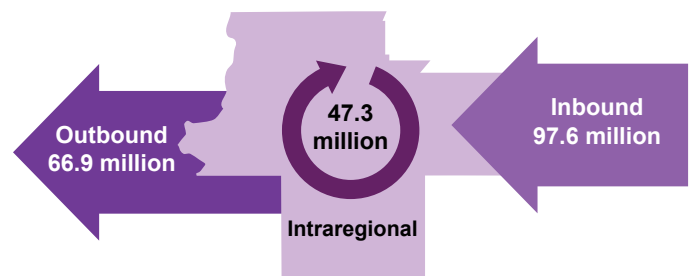
With over 3.2 million residents, 1.7 million workers, 119,000 businesses and 18 million visitors, the DRCOG region relies on the multimodal freight system to move millions of individual packages, products and parcels. In 2015, the total flow of goods into, out of and within the metro area equaled 211.8 million tons valued at \$218.7 billion. The majority of those goods, measured by total tonnage and value, traveled

by truck. Primary commodity flows by mode and direction are shown in the graphics on this page.

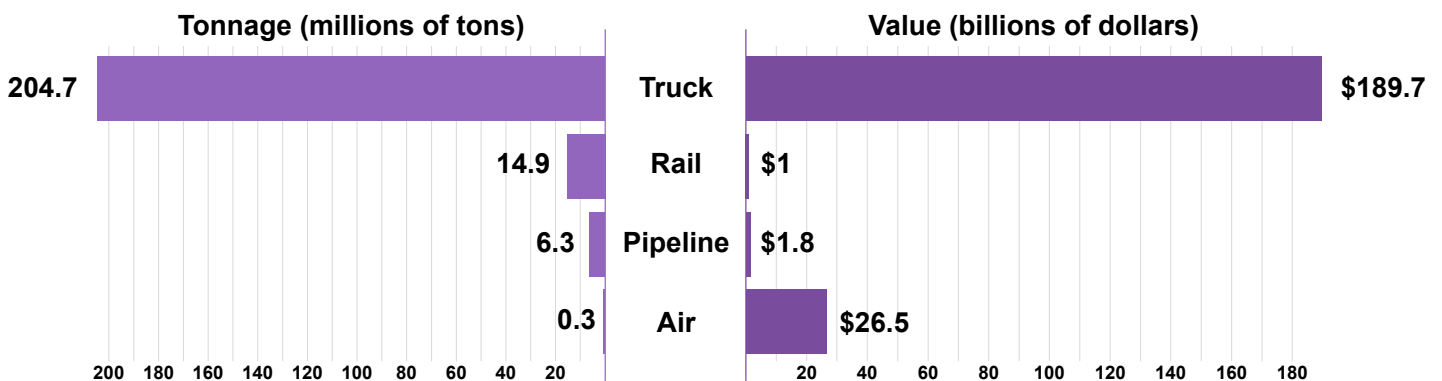
With the Denver region’s growing population and service-based economy, more goods are imported into the region from other parts of Colorado, the U.S. or overseas than are exported from the region. This imbalance can result in trucks, trains and planes bringing goods in and leaving empty. Continuing to support manufacturing, distribution and natural resource industries as a core component of the regional economy can reduce empty vehicle miles traveled and provide value-added economic activity to the region.

Of the millions of tons and billions of dollars in products that move in and out of the DRCOG region, top commodities include retail products moved by rail intermodal or in and out of warehouse and distribution centers by truck to fill consumer demand from a growing population and economy. Goods such as petroleum, motor vehicles, gravel and aggregates, and field crops and grain represent the region’s position as a major distribution hub for the entire state and Mountain West region. Aerospace, pharmaceuticals, electrical and machinery equipment, and food products reflect the region’s manufacturing strengths and business activity. Regional industry clusters, including breweries, generate significant freight activity. A large brewer such as Molson Coors ships out more than 1,500 truckloads and approximately 100 rail carloads of final product each week.

Tonnage of Goods by Directional Flow, 2015



Tonnage and Value of Commodities by Mode, 2015



IHS Markit Economics and Country Risk, Transearch, 2015.

Value of Top Commodities Moved In and Out of DRCOG Region, 2015

Rail Intermodal Drayage from Ramp	\$17,949,415,009
Rail Intermodal Drayage to Ramp	\$14,755,337,098
Warehouse and Distribution Center	\$12,056,629,827
Motor Vehicles	\$10,884,600,066
Petroleum Refining Products	\$8,276,996,128
Drugs	\$7,481,358,790
Missile or Space Vehicle Parts	\$7,028,357,322
Electrical Equipment	\$5,875,794,819
Miscellaneous Manufacturing Products	\$5,296,171,898
Instrument, Photo, Optical Equipment	\$4,795,326,998
Miscellaneous Waste or Scrap	\$4,768,683,819
Transportation Equipment	\$3,686,857,656
Air Freight Drayage from Airport	\$3,481,446,372
Miscellaneous Plastic Products	\$3,216,096,758
Air Freight Drayage to Airport	\$2,259,142,260
Crude Petroleum	\$1,790,736,847
Bread or Other Bakery Products	\$1,676,810,185
Malt Liquors	\$1,341,716,491
Motor Vehicle Parts or Accessories	\$1,261,784,671
Processed Milk	\$1,213,975,118

Tonnage of Top Commodities Moved In and Out of DRCOG Region, 2015

Gravel or Sand	37,727,601
Miscellaneous Waste or Scrap	19,901,609
Broken Stone or Riprap	17,277,726
Petroleum Refining Products	15,545,891
Warehouse and Distribution Center	10,297,132
Crude Petroleum	6,348,334
Ready-Mix Concrete, Wet	5,947,067
Concrete Products	5,282,675
Rail Intermodal Drayage from Ramp	4,057,503
Rail Intermodal Drayage to Ramp	3,335,475
Miscellaneous Field Crops	2,731,628
Grain	2,289,950
Cut Stone or Stone Products	2,047,657
Asphalt Paving Blocks or Mix	1,817,991
Soft Drinks or Mineral Water	1,354,161
Malt Liquors	1,256,905
Motor Vehicles	1,090,996
Miscellaneous Plastic Products	858,362
Metal Scrap or Tailings	824,808
Asphalt Coatings or Felt	773,234

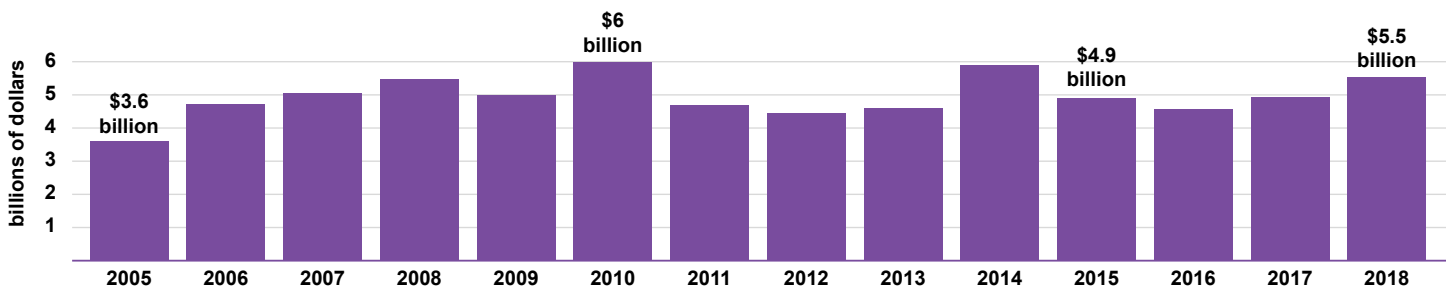
IHS Markit Economics and Country Risk, Transearch, 2015.

The above table highlights the value and tonnage of the top 20 commodities moved in and out of the region in 2015. Commodities are reported consistent with Standard Transportation Commodity Code definitions. Commodities are tracked and reported based on movements and, as a result, first and last connections are reported as commodities. For example, rail intermodal drayage describes the movement of a container or trailer to or from the railroad intermodal terminal to or from the customer’s facility for loading or unloading. Warehouse and distribution center movements can describe a number of secondary movements of general or miscellaneous commodities and goods generated by retail distribution centers.

Heavier weight commodities are primarily moved by the region’s railroad network with intermodal transfer to and from trucks or interstate pipelines. Higher value and time-sensitive products such as electronics, pharmaceuticals, semiconductors and other lightweight consumer products may move by air. Trucks carry the majority of products by weight and value and serve as the primary distribution mode and final link between rail and air intermodal centers. Together, the region’s multimodal freight network is responsible for the daily business of efficiently moving a wide array of critical products, inputs and parcels.

The economic contribution of goods made, grown and mined in the DRCOG region for export throughout the U.S. and world is significant. In 2016, over 5,500 Colorado-

Value of International Exports of Manufactured Goods, 2018



U.S. Department of Commerce, International Trade Administration. Metropolitan Export Series, 2019.

based companies produced goods for export overseas; the majority of which are small and medium-sized enterprises. Export-oriented manufacturing supports significant additional economic activity and employment throughout the region and supports economic diversification and resilience. Data from the Brookings Institution’s Metropolitan Export Monitor suggests that in 2017 the Denver metropolitan statistical area ranked 20th among the top 100 metropolitan areas in the U.S. with approximately 53,630 jobs dependent on direct international exports.

In 2018, the Denver and Boulder metropolitan statistical areas produced goods for international export valued at over \$5.5 billion. This represents 56% of the total international export value produced in Colorado. The region’s largest export markets include countries within the Asia-Pacific Economic Cooperation region, North American Free Trade Agreement countries including Canada and Mexico, and smaller markets with nations in the European Union and Organization of Petroleum Exporting Countries. Top manufactured commodities include electronics, oil and gas, machinery, food, fabricated metals, chemicals and electrical equipment.

Freight moves the region’s economy and connects residents, visitors and businesses to the flow of global commerce. The DRCOG region is a hub for products made and consumed

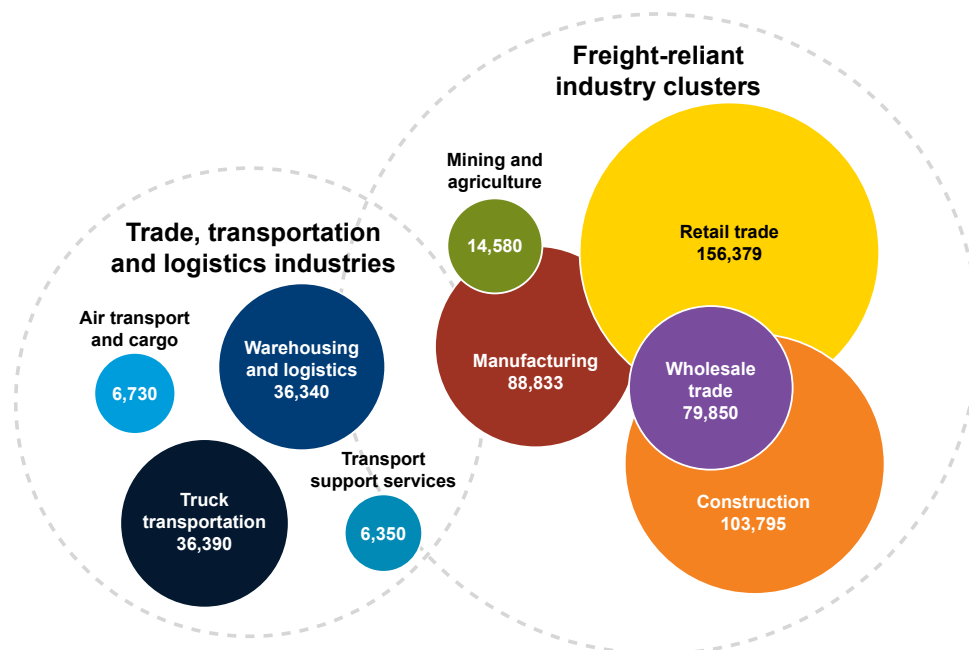
locally, for shipments of essential parcels and packages into the region, for exports of Colorado-made produce and products to global markets, and for networks that distribute goods across the entire Mountain West.

Trade, Transportation and Logistics Workforce

The constant flow of everything from shoes to steel to skis to soap to seeds generates significant economic activity and supports high-wage jobs across the region. In 2018, approximately 88,500 jobs in the region were directly tied to trade, transportation and logistics activity. The DRCOG region is the logistics hub for Colorado with nearly two-thirds of trade, transportation and logistics jobs in the state clustered in the region.

Trade and logistics jobs are as varied as warehouse stockers, forklift and crane operators, truck drivers, cargo handlers, packaging technicians, rail and intermodal yard operators, supply chain managers, logisticians, and international export and customs brokers. Data from the U.S. Bureau of Labor Statistics suggests that average wages in key occupations within the trade, transportation and logistics sector are generally higher than average wages paid in all occupations across Colorado. Trade, transportation and logistics jobs are projected to grow relatively quickly over the coming decades and provide stable opportunities for workers across the region. Employment projections from

Employment in Freight and Freight-Reliant Industries and Clusters, 2018



U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wage, 2018.

the Colorado Department of Local Affairs indicate that by 2028, employment in trade and transportation occupations is expected to reach 123,000 jobs; a growth rate of nearly 40% from 2018.

Additionally, 32,650 businesses employ 449,159 workers across the region in freight-reliant industries. These businesses depend on moving produce, products, packages and inputs as a daily core business function and represent nearly one out of every three jobs in the region. Freight-reliant businesses operate in critical industries that help power homes, farm and raise food, stock store shelves, manufacture goods and supply other businesses. The graphic at right illustrates employment in regional industry clusters that rely on the transportation system to move goods every day.

Regional Freight-Reliant Business Clusters

The DRCOG region's multimodal freight system, including highway, rail, air and intermodal networks, link people and businesses within the region and across the globe, support small businesses and producers, enable consumers access to global markets, and play a vital role in the region's economic competitiveness. Many of the region's freight-reliant businesses are located in traditionally industrial areas with direct access to major road and rail networks. Other businesses are strategically located near workforces or within

urban centers, adjacent to connecting intermodal terminals or with direct access to airports and space facilities.

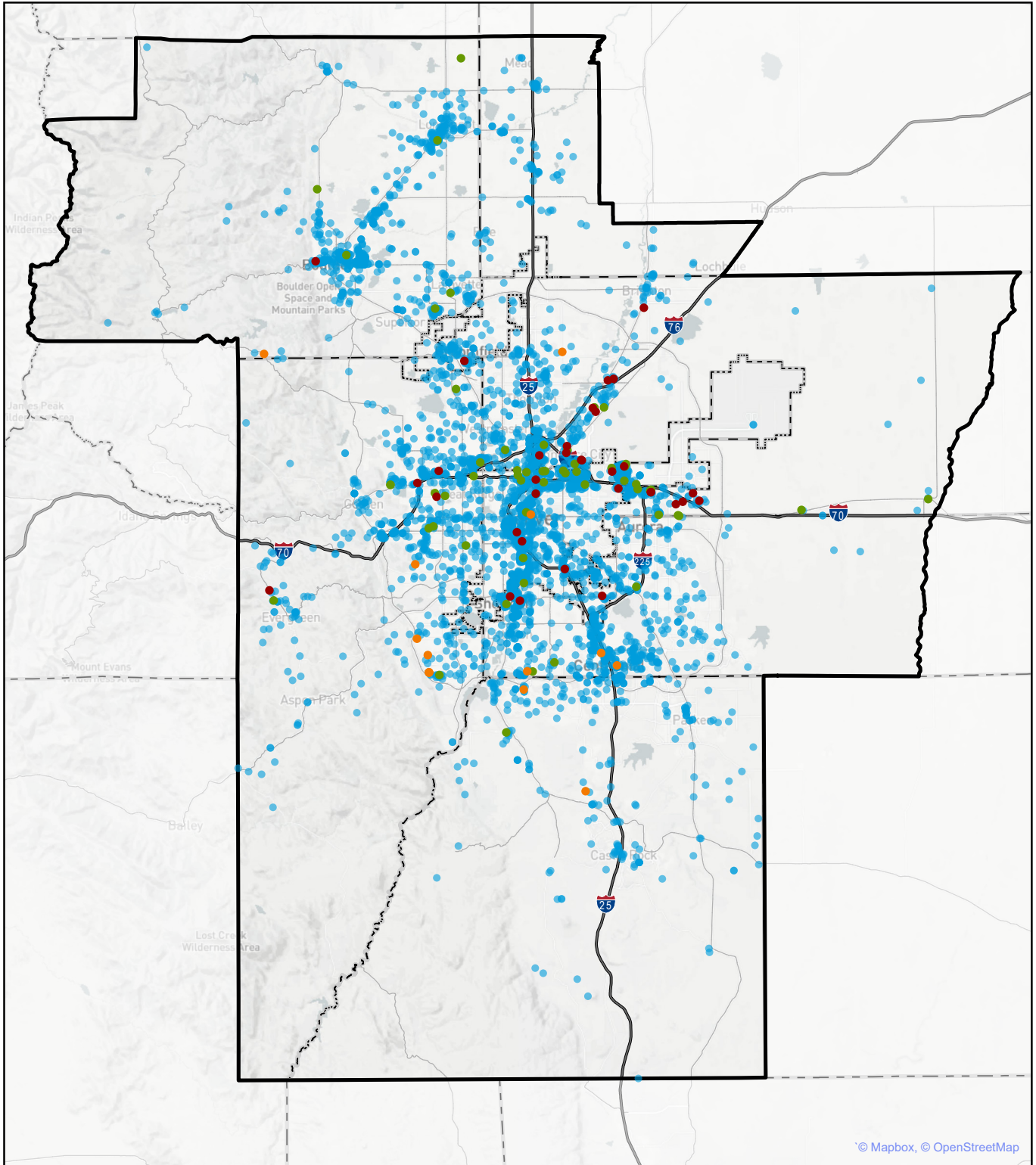
As the region's population and economy continues to grow, demand for moving products and packages will also increase. However, many traditional industrial and distribution-oriented areas are being redeveloped while other areas are affected by increasing congestion on strategic corridors or from adjacent residential development. Accommodating mixed land uses and multimodal transportation needs while preserving the access and connectivity of key industrial areas and distribution corridors will be critical to the future of the region. Hard infrastructure such as rail lines, intermodal terminals, pipelines and refineries, distribution centers and cargo facilities cannot be readily relocated and must be strategically located near consumer markets.

Local governments can plan for the preservation of existing freight facilities, while identifying potential areas suitable for future distribution and logistics-oriented development to supply the region's growing population. For example, the northeast quadrant of the region offers connections to two national rail lines, access to Denver International Airport, and important highways such as I-76 and U.S. Route 85. This area of the region is likely to be the distribution and delivery gateway for the region in the future and would benefit from land use planning, freight-oriented development zoning, connectivity improvements and freight asset preservation.



Photo courtesy of David E. Hattan

Regional Freight-Reliant Business Generators



© Mapbox, © OpenStreetMap

FREIGHT GENERATOR

- Mining
- Wholesale Trade
- Transportation, Communications, Electric, Gas & Sanitary Services
- Manufacturing

DRCOG Planning Boundary

Interstates

Highways

County Boundaries



3. Delivering the Region

Goods movement affects the experience of residents, businesses and visitors, and influences the economic competitiveness, livability and sustainability of the entire region. Planes, trains and trucks operate at airports, on railroad tracks, over highways and through a variety of intermodal terminals and facilities that link modes. The system is essential to delivering products, supplying businesses, creating jobs and supporting communities across the region.

Regional Multimodal Freight Network

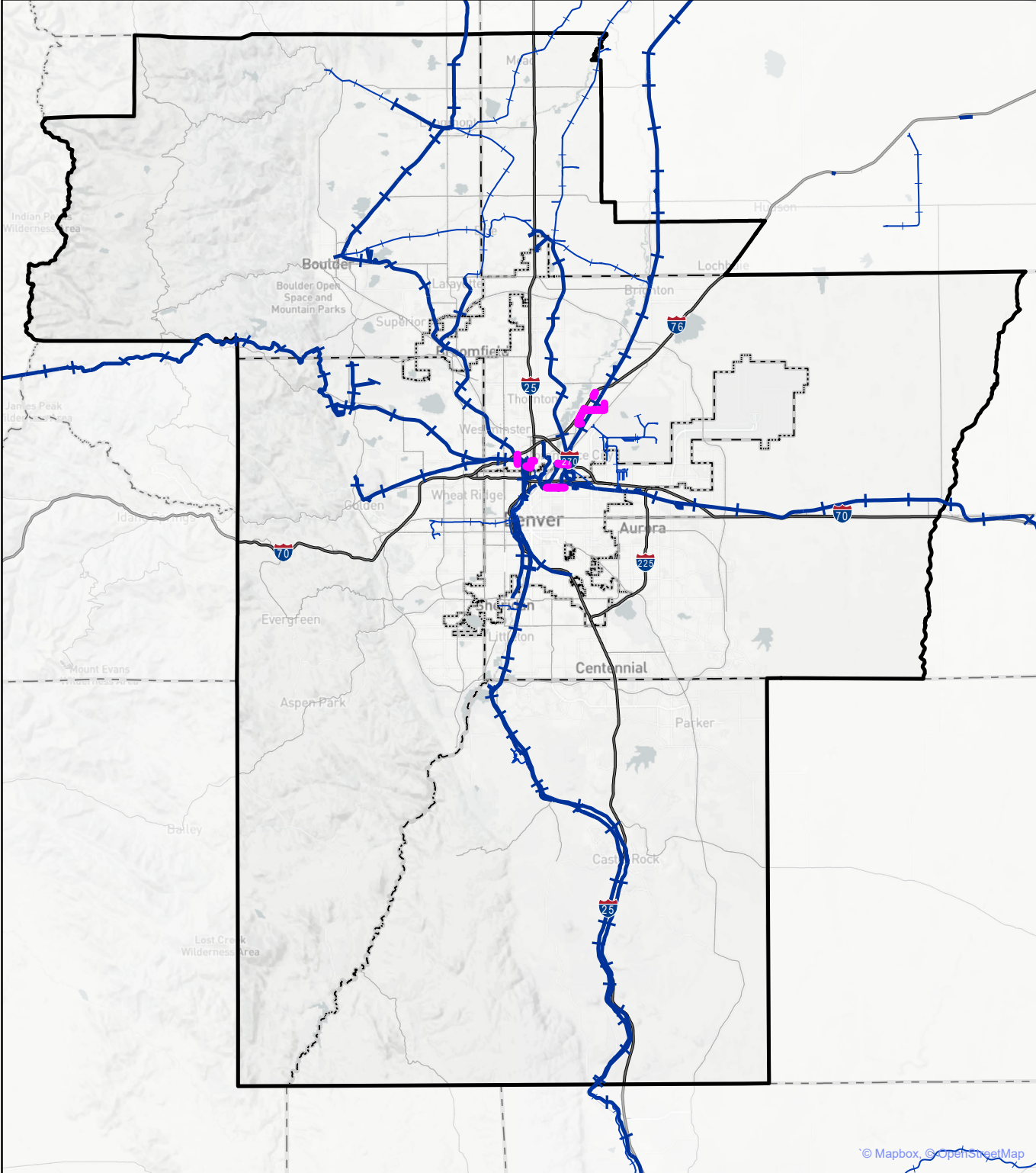
The region’s rail, air and multimodal freight network includes both publicly and privately owned and operated facilities. Private infrastructure includes railroad tracks, terminals, rail yards, most pipelines, and the system of connecting fulfillment, distribution, and warehouse centers. Together, these transportation modes combined with the infrastructure they run on support the multimodal freight system in the DRCOG region.

In addition to primary regional highway and rail corridors, there are eight key intermodal connectors designated by the Federal Highway Administration. These include Denver International Airport, two pipeline terminals and five railroad intermodal terminals.



Photo courtesy of David E. Hattan

Regional Multimodal Freight Network Infrastructure and Facilities



Freight Intermodal Connectors	Interstates
Class I Railroad	Highways
Short Line Railroad	County Boundaries
DRCOG Planning Boundary	

Regional Highway Freight Vision Network

Trucks move the majority of goods — nearly 90% by tonnage — into, out of, and within the region. This includes long-haul interstate semitractor-trailers moving goods from major national seaports and distribution hubs, as well as box trucks and tractor-trailers making daily deliveries to restaurants, grocery stores, construction sites and retail centers, as well as trucks and vans delivering parcels and packages to office buildings and residences across the region.

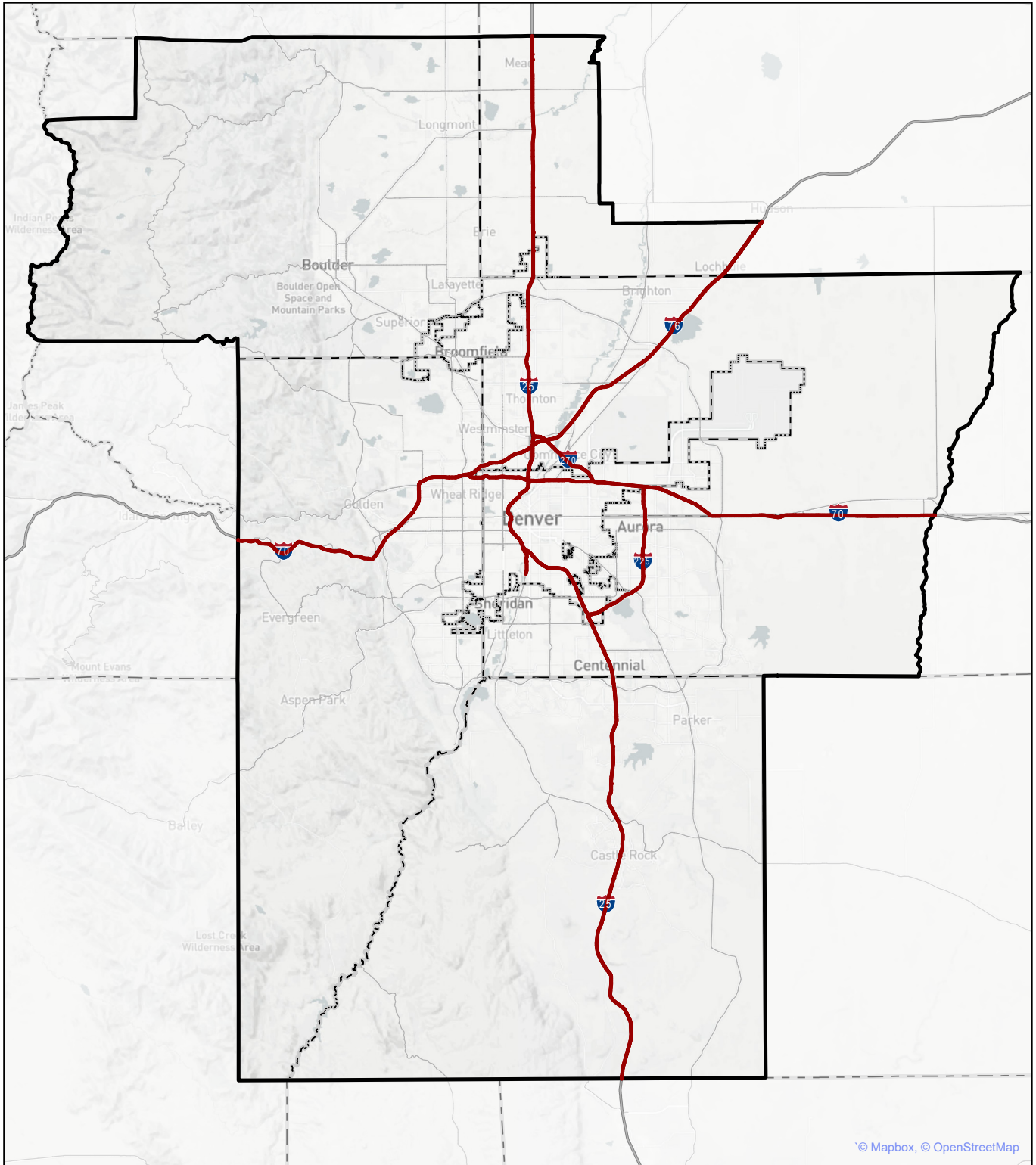
Every commercial alley, neighborhood street, industrial connector, local road, arterial, regional highway and interstate plays a role in moving truck traffic and delivering goods. Interstate corridors such as I-25, I-270, I-70, and I-225 carry significant truck traffic volumes. U.S routes and state highways such as State Highway 58, State Highway 79, State Highway 35, and State Highway 85 and U.S. Route 6 carry relatively high percentages of trucks during peak travel times. Local roads such as 88th Avenue, Smith Road, Tower Road, 104th Avenue and York Street, as well as others throughout the region, carry significant truck tonnage, according to Transearch data. Highway corridors within the region connecting to Denver International Airport, intermodal and rail terminals, private distribution and fulfillment centers, and major manufacturers and producers are critical to efficiently moving goods and supporting industry clusters and existing businesses.

This Regional Multimodal Freight Plan identified a future vision network of high-priority freight roadways throughout the region. The maps on the following page display key corridors and segments based on available truck volume data and travel patterns, intermodal connectivity and local government input. Feedback from advisory committee members was critical in identifying important local roadways that may not be reflected in available datasets and that provide key local connecting or transferring routes between significant origins and destinations.






Corridors were identified based on the following criteria: average annual daily truck traffic greater than 2,500; average percent of peak traffic by trucks of greater than 10%; proximity to key intermodal facilities within half of a mile; local input and engineering judgement. Using this data-driven criteria and incorporating advisory committee input, regional highway freight corridors are illustrated in three tiers. Tier 1 corridors represent nationally strategic roadways that connect DRCOG to the country and international trading partners. These corridors are best identified by existing National Highway Freight Network designations. Tier 2 corridors are regionally significant roadways that link the region with other areas of the state and offer important connections for moving goods within the DRCOG region. These corridors are best represented by the existing National Highway System designation. Tier 3 corridors include local connectors that provide access to intermodal facilities and local roads and connectors identified by advisory committee members as important connectors to major regional freight origins and destinations.

This regional vision network represents the significant highway freight corridors that work together to move hundreds of millions of tons of goods through the DRCOG region. This network provides a basis for future planning and investment so that resources may be focused on building out and improving a robust regional highway freight network. Corridor designations may be refined and considered in future regional and local freight planning efforts and can form a basis for bundling identified freight infrastructure needs into potential future investment areas and regional projects. With regional railroad lines and facilities, air cargo hubs, pipeline networks, intermodal terminals and connectors, and other privately owned distribution and transportation infrastructure, this robust network should work seamlessly to move goods safely and efficiently.

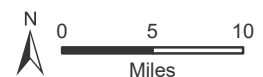
Regional Highway Freight Vision Network: Tier 1



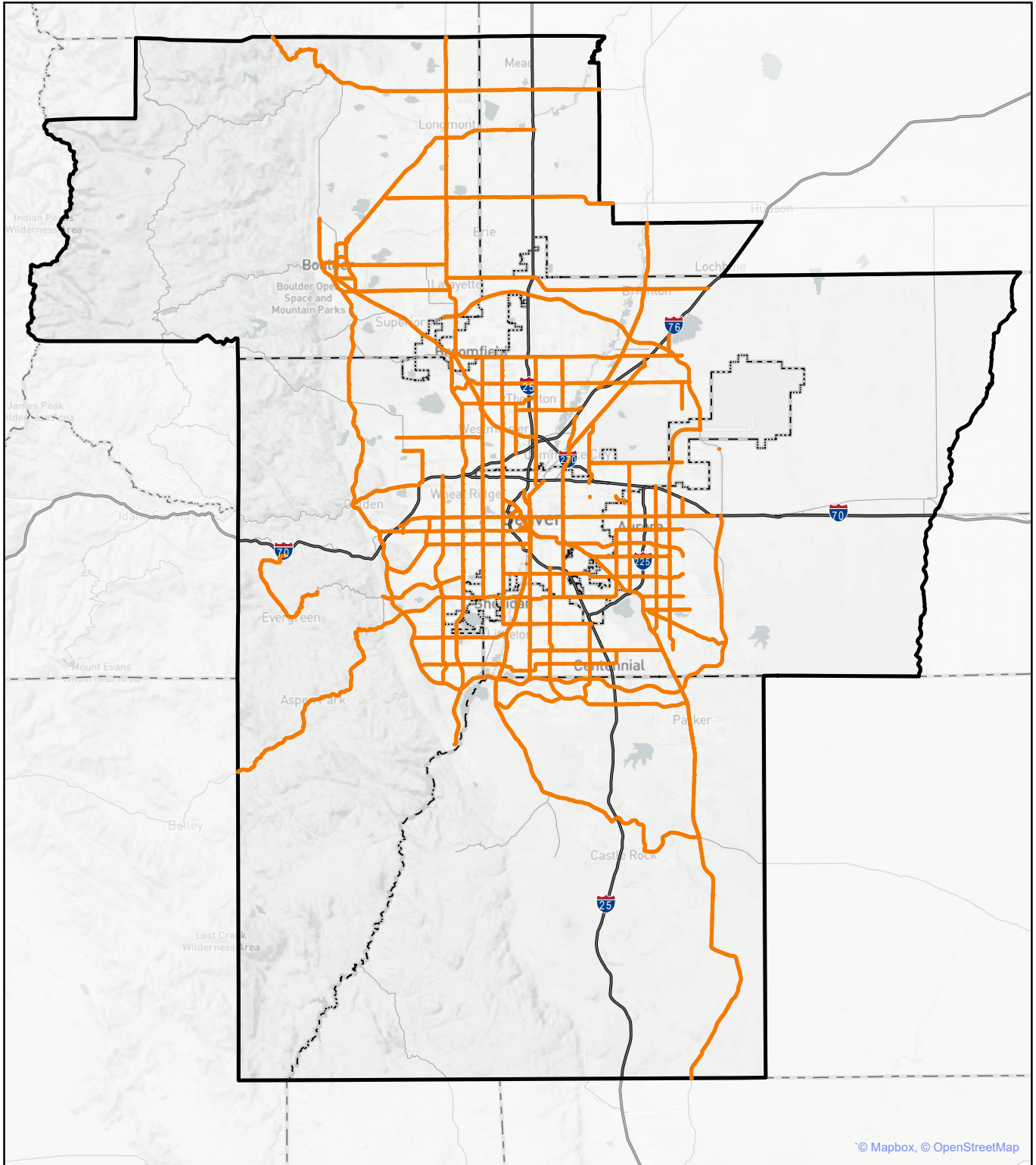
© Mapbox, © OpenStreetMap

-  Tier 1 National Highway Freight Network
-  DRCOG Planning Boundary
-  Interstates
-  Highways
-  County Boundaries

These corridors represent the federally designated National Highway Freight Network. Designated by the U.S. Department of Transportation, the National Highway Freight Network identifies the most critical highway portions of the national freight transportation system as determined by measurable and objective national data. In the DRCOG region, the National Highway Freight Network includes the Primary Highway Freight System covering I-70, I-25, I-225, I-70, I-76, and portions of U.S. Route 6, U.S. Route 85, and State Highway 470.



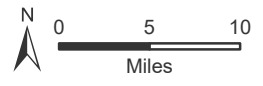
Regional Highway Freight Vision Network: Tier 2



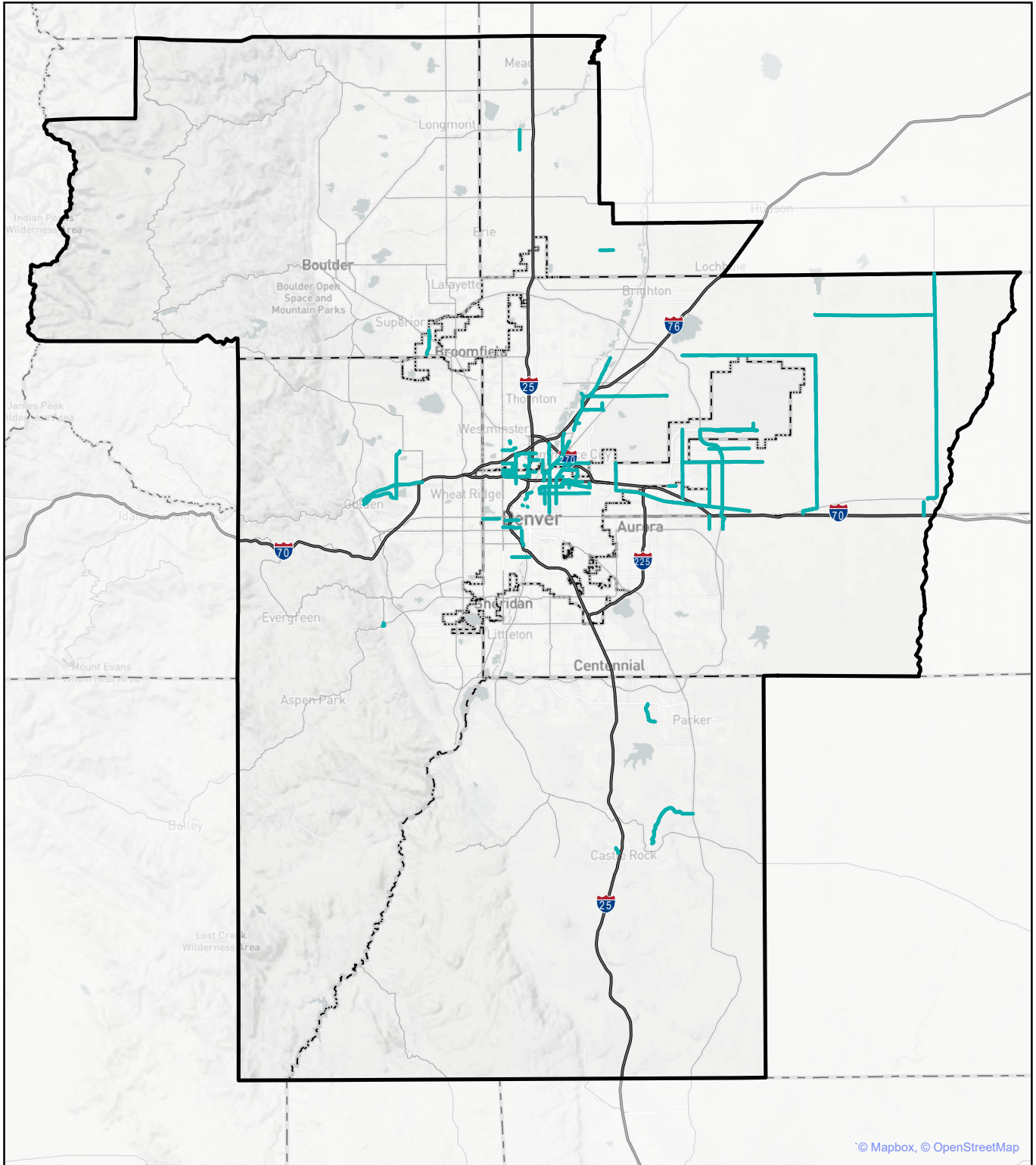
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- Tier 2 National Highway System
- DRCOG Planning Boundary
- Interstates
- Highways
- County Boundaries

These corridors represent the federally designated National Highway System (NHS) routes. National Highway System routes consists mostly of existing two-lane roads. Nationally, the National Highway System includes only 4% of roadways, but carry more than 75% of heavy truck traffic. In the DRCOG region, these include significant U.S. routes such as 36, 40, 85, 287 and 285, as well as many local connectors and state routes such as state highways 2, 31, 44, 85, 83, 93, 121, 128, and others.



Regional Highway Freight Vision Network: Tier 3



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- Tier 3 Intermodal and Local Connectors
- DRCOG Planning Boundary
- Interstates
- Highways
- County Boundaries

These corridors and segments include local roadways recommended by Regional Multimodal Freight Plan Advisory Committee members that are not otherwise designated as part of the National Highway Freight Network or the National Highway System. Local recommendations include segments that provide critical links to major regional manufacturing, warehousing, distribution, and intermodal hubs including 32nd Avenue, 44th Avenue, Smith Road, Chambers Road, Tower Road, and other key links. This tier also includes local roads within a half-mile proximity of federally designated Primary Highway Freight System intermodal connectors which include rail terminals, pipeline to truck transfer facilities, and Denver International Airport.



Truck Traffic and Freight Trends

Truck movements are forecast to grow significantly across the DRCOG region in the future. Total tonnage moved by truck into, out and within the region is estimated to grow from 204 million tons in 2015 to over 311 million tons in 2045, the most recent available forecast horizon from the IHS Markit Economics and Country Risk Transearch dataset. These trends, coupled with increasing levels of congestion and the expectation that vehicle miles traveled and delay will only continue to worsen, mean that costs will rise for shippers that rely on moving goods by truck and the carriers and drivers that provide trucking services. DRCOG estimates that the cost of congestion for commercial vehicles will rise from \$541 million in 2017 to over \$900 million in 2040. Growth in congestion will outpace growth in vehicle miles traveled and reflects increased delay and worsening reliability. Greater fuel consumption and related increases in air quality emissions will affect business, consumers, and communities across the region.

Reliability is a key measure of traffic levels that directly matters to businesses and trucking carriers. Commercial motor carriers must meet high standards for on-time delivery of products and inputs to customers. Delays can mean missing delivery times to businesses, or missing cutoff times for pick-ups or exceeding hours of service regulations which can negatively affect entire supply-chain operations.

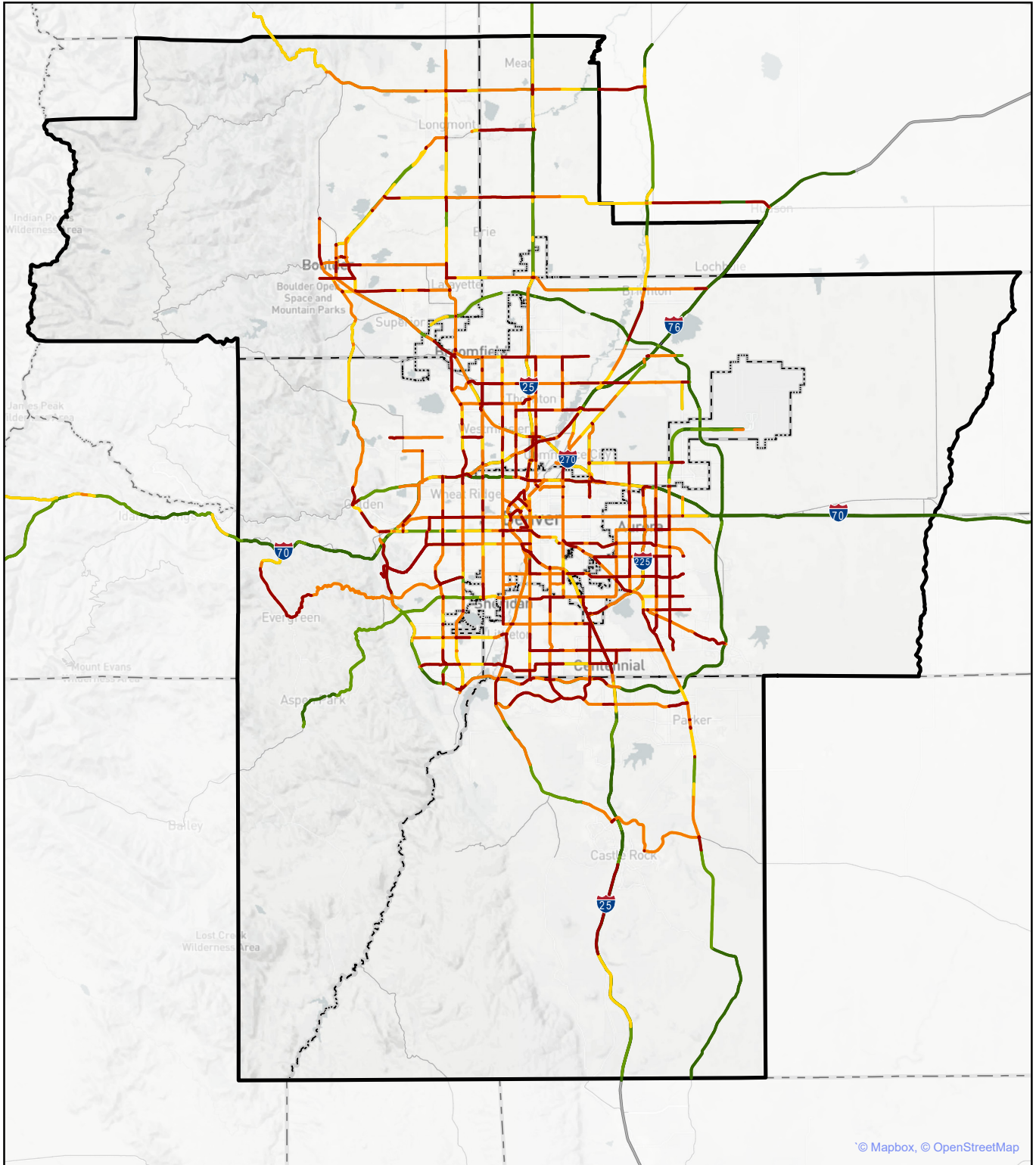
Truck travel time reliability is a key performance measure tracked by DRCOG and reported to the U.S. Department of Transportation on a regular basis. DRCOG has set an interim performance target of achieving truck travel time reliability outcomes of 1.5 or better. A reliability measure of 1.5 indicates that for a trip that usually takes 30 minutes in free-flow traffic conditions, a truck driver should plan on 45 minutes of travel to arrive on time during peak period traffic.

The American Transportation Research Institute reports on the country's most-congested freight bottlenecks. In 2018, the 14th most congested segment in the U.S. was I-70 along the Central Project and the 20th ranked segment was the I-70 interchange with I-25.



Photo courtesy of David E. Hattan

Travel Time Reliability Index Measures by Corridor, 2018



© Mapbox, © OpenStreetMap

Truck Travel Time Reliability Index	1.61-2.0	Interstates
P.M. Peak Period	2.0-3.0	Highways
1.0-1.3	>3.0	County Boundaries
1.31-1.6	DRCOG Planning Boundary	

Truck Safety

Statewide, the number of motor vehicle fatalities in Colorado has climbed in recent years, from 447 in 2011 to more than 632 in 2018. At the same time, vehicle miles traveled have been increasing. More drivers on the roads increases the likelihood of crashes. The same trend is apparent for commercial vehicles. The most recent available data statewide indicates that truck-involved crashes have reached their highest point in recent years. In 2016, there were 2,002 truck-involved crashes resulting in 71 fatalities and 564 serious injuries across the state. While regional data on commercial vehicle safety is not consistently available, recent data from the City and County of Denver suggests that crashes involving vehicles over 10,000 pounds represented just 1% of all fatal and serious injury crashes within the county.

Regional truck-specific safety hot spots are identified as areas where commercial vehicle crash rates consistently exceed overall crash rates. These areas are detailed in Chapter 6 of this plan and identified as future investment needs. These hot spots typically include roadways with significant congestion where short merge lanes with many vehicles can be challenging for trucks to navigate. Other truck safety hot spots locations may include roundabouts, interchanges or roadways with narrow turning radii, as well as roadway design features or weather conditions that can contribute to crashes. Throughout the region, some older interchanges, newer roundabouts or established truck routes may not be designed to accommodate truck movements and can result in sideswipe truck crashes.

Truck parking is a growing concern nationally and an acute issue in Colorado. Lack of real-time information, growing congestion in urban areas and stricter monitoring of hours of service laws under new federal electronic logging device requirements continue to add to the challenge of providing sufficient and safe truck parking in areas where and when drivers need it. Additionally, local municipalities may restrict truck parking in certain areas or at certain times of day. Lack of parking or information about available parking can result in trucks parking on highway shoulders, ramps and interchanges, or in other areas that create safety hazards for both truck drivers and other road users. The lack of safe, lighted parking spaces or the absence of key amenities such as restrooms or trash pickup can deter truckers from using

available spaces or create hazards and concerns for local owners. Insufficient parking can also create inefficiencies and delays in supply chains. Truck drivers may stop well before their allotted driving time runs out to ensure access to a parking spot or detour out of their way to find parking, losing valuable road time and delaying shipments. An analysis of truck parking use by CDOT found that of available private and public parking facilities in the DRCOG region, most facilities were nearing peak capacity and that additional safe parking areas may be necessary. Additional parking facilities may be created by expanding existing rest areas or publicly owned facilities or through partnerships with private landowners, including truck stop owners, to jointly develop new parking areas.



Photo courtesy of David E. Hattan

Regional Freight Rail Network

Freight Rail Infrastructure

Freight rail provides safe and efficient transportation for consumer products and goods produced in the region and throughout Colorado. Rail service provides critical links for communities that depend on farming, ranching, extraction, energy and mining and moves goods such as beer, motor vehicles, lumber and manufactured consumer items.

BNSF Railway and Union Pacific Railroad are the two Class I national railroads operating in the DRCOG region. These national railroads are the primary arteries for rail cargo traveling to and from the region from other states and provide important connections to the national rail networks and international markets. Mainline operations for these railroads carry coal, intermodal goods and agricultural bulk goods through, into and out of the region. BNSF and Union Pacific mainline operations run north-south generally along the I-25 corridor and Union Pacific operates mainline tracks generally along the I-70 corridor east and west of Denver.

BNSF and Union Pacific branch lines and industrial spurs throughout the region serve communities such as Aurora, Boulder, Commerce City, Denver, Golden, Lafayette and Lakewood. These lines serve customers producing and receiving agricultural, lumber, concrete and sand, power generation utilities, manufacturing and beverage production products. In the City and County of Denver, BNSF operates the Rennicks and Globeville switching yards with major terminals and freight transfer facilities to serve trailers on flat cars and auto transport at its Big Lift facility in Littleton. Union Pacific operates major terminals and freight transfer facilities known as the North Yard and 40th Street Yard in Denver and the Rolla Auto Transfer Yard in Henderson, in addition to other regional switching yards.

Two Class III short line railroads also operate within the DRCOG region: Denver Rock Island Railroad and Great Western Railway of Colorado. Denver Rock Island provides first- and last-mile connections between local customers and national rail networks. Denver Rock Island operates two lines at the National Western Complex: the River Spur, which runs along the South Platte River, and the Center Spur, which runs along the west side of the stockyards, both of which date back to the early 1900s. The two lines currently carry two trains per day in each direction and provide switching

movements for local businesses. Denver Rock Island also operates three terminal switching yards at Silver Yard, North Washington Industrial Yard, and Stock Yard Lead in Denver. Great Western operates 80 route-miles of track in northern Colorado, including interchanges with BNSF and Union Pacific. Great Western has an interchange point with BNSF in Longmont which represents the portion of operations within the DRCOG region.

Freight Rail Traffic and Trends

Rail traffic originating, destined and moving within the region totaled approximately 15 million tons valued at over \$1 billion in 2014. More than half of traffic by tonnage was inbound to region, destined for distribution across the region and state. Top commodities moved by rail in and out of the region included coal, aggregates, mixed shipments, nonmetallic minerals, farm products, petroleum products, food items, lumber and wood, waste and scrap, and chemicals. The total tonnage moved by railroad through the DRCOG region without a final destination or origin in the region is not available but likely represents a significant amount of tonnage and rail traffic. For example, more than 154 million tons of product moved through Colorado in 2014, much of which would pass through the DRCOG region on BNSF and Union Pacific mainline tracks.

Railroads move heavy or bulk goods as well as mixed freight in carload units. Intermodal rail traffic includes tractor-trailers on flatbed rail cars and shipping containers. Just 20% of rail traffic by tonnage in and out of the DRCOG region was intermodal. Increasing the amount of intermodal goods shipped by rail directly from West Coast, Texas or Pacific Northwest seaports or distribution centers in the Midwest or Southeastern U.S. can reduce demand for trucks to carry goods and alleviate challenges with roadway congestion. One railcar handles the equivalent weight of three to four trucks, and one intermodal trailer or container handled by rail is generally equivalent to the amount of product that can be hauled by a truck.

Freight rail movements, by tonnage, are forecast to double in the region by 2045 according to available Transearch data. However, coal transport is forecast to decline which may result in railroads with additional track and operational capacity to accommodate additional bulk and intermodal traffic instead. Information on volumes of goods moved by individual railroads or across specific rail lines or track

ownership are not publicly available. However, BNSF and Union Pacific mainline tracks, particularly on north-south routes, are likely to remain the busiest in the region.

Hazardous Material Movements by Rail

Rail transport of products such as crude oil, chemicals, waste and hazardous other goods is generally safer than moving these materials by truck. With growth in the oil and gas industry, Colorado is experiencing an increase in crude oil and petroleum products produced in the state and shipped by rail. Hazardous material movements reached an all-time high in 2014 but have declined since. With increased development in formerly industrial areas, some neighborhoods in the DRCOG region have rail lines, residential development and commercial properties all located in close proximity. Most hazmat loads are flammable liquids, including crude oil, ethanol and oil- and gas-related liquids, that present risk when traveling on rail lines in densely populated areas.

The City and County of Denver monitors movements of flammable liquids, crude oil and related liquids and ethanol. Denver’s Office of Emergency Management reports that hazmat shipments by rail in Denver rose from 23,000 carloads in 2011 to over 70,000 carloads in 2015. In 2011, over 15,000 tank cars of crude oil moved through the city. This declined to 9,000 cars of crude oil in 2015. The City and County of Denver convened a Railroad Safety Working Group, including City and County of Denver agencies and partners from the freight and passenger rail carriers, federal government, and state government, including CDOT representation. This group reviewed the city’s safety and hazard mitigation policies and practices in areas near rail and developed recommendations to improve existing prevention, preparedness, response and recovery practices.

Freight Rail Safety



Photo courtesy of David E. Hattan

Freight rail lines most frequently associated with rail crossing and trespass incidents are typically those running through populated and developed urban areas. Railway-highway crossing safety incidents involving freight railroads in the DRCOG region averaged two fatalities or serious injuries annually between 2015 and 2019 with a high of four incidents in 2018. These incidents generally occur at public at-grade rail crossings when vehicles attempt to circumvent safety devices, when vehicles stall on tracks or when pedestrians or vehicle drivers do not respond to warning signals. Other incidents may occur because of intentional driver behavior. There are approximately 574 freight railroad crossings in the DRCOG region, of which 312 are at-grade crossings along public roadways. Key indicators on existing conditions and safety infrastructure of at-grade public rail crossings across the region are shown in the following table. The top row of the table indicates the total number of at-grade crossings associated with each characteristic or safety infrastructure. The bottom row indicates the proportion of total at-grade crossings associated with the relevant characteristics or infrastructure. For example, while more than 80% of at-grade crossings are marked with recognizable crossbucks, just 33% of at-grade crossings also include warning bells.

Inventory of DRCOG Region Public At-Grade Railroad-Highway Crossing Characteristics

On Federal Aid Highway System	One or More Trains Per Day	Commercial or Industrial Land Use	Residential or Institutional Land Use	Crossbuck Present	Advance Warning Signals Present	Crossing Illuminated	Stop Signs Present	Bells Present	Pavement Markings Present
250	174	188	54	252	213	186	134	103	61
80%	56%	60%	17%	81%	68%	60%	43%	33%	20%

Information on potentially risky railroad crossings is provided in Chapter 6 of this document and highlights at-grade crossings with recent reported safety incidents. However, this information does not capture the need to eliminate hazards or reduce delays at increasingly busy at-grade rail crossings or at crossings near future development sites throughout the region. Upgrading to grade-separated rail crossings requires significant investment but can improve safety and congestion outcomes for roadway users as well as allow railroads to operate at higher speeds with less horn noise and more reliable transit times. Grade separations may be needed throughout the region particularly in areas where new development is planned near Class I railroad mainlines or where risks already exist, such near schools or on roadways traversed by trucks carrying hazardous materials.

The Railway-Highway Crossings (Section 130) Program is one of several federal programs intended to mitigate the frequency and severity of crashes with vehicles and pedestrians at railroad crossings. The program, funded by the Federal Highway Administration, is administered by CDOT. Colorado receives approximately \$3 million annually in federal funding under Section 130 that is directed to projects that improve railway-highway at-grade crossings. Section 130 funds are programmed based on a hazard index which identifies the most critical railway-highway crossings statewide based on train and vehicle movements and other safety considerations. Of Section 130 projects planned by CDOT through fiscal year 2022, most improvements within the DRCOG region are targeted along the U.S. Route 85 corridor in Weld County with several others planned along BNSF tracks in Boulder and Broomfield counties.

Regional Air Cargo

Air Cargo Infrastructure

Denver International Airport (DEN) is the region's primary cargo airport, handling thousands of packages and containers per day. Other airports in the region, including Centennial, Rocky Mountain Metropolitan and Front Range, may handle specialty cargo or mail and parcels carried in the holds of passenger aircraft. DEN is the fifth-busiest passenger airport in the country and the 26th busiest cargo airport in North America. In 2018, 278,272 tons of air freight were moved through DEN. Air cargo operations occur 24 hours a day at DEN and many cargo flights arrive overnight. Freight is transferred from on-site cargo facilities to trucks for delivery to distribution centers in the DRCOG region, around the state and throughout the Mountain West. FedEx and UPS Inc. account for 77% of the total tons moved through DEN in 2015. Top commodities shipped into and out of DEN include electronics and instruments, miscellaneous manufacturing, drugs, and aerospace and transportation equipment worth approximately \$26.5 billion. By value of commodities inbound to and outbound from the DRCOG region, air cargo is second only to trucking in terms of total value of products moved.

Air Cargo Trends

For air cargo, the ability to sort, organize and repackage goods on site or near airport terminals and outside of urban area congestion is critical. While DEN has the capacity and infrastructure to support expanded air cargo operations, national economic factors and relatively low truck transportation prices have resulted in fewer air cargo movements at DEN than initial forecasts suggested. When DEN opened in 1995, growth in air cargo was predicted around 5% per year. Currently, future air cargo growth is expected to hold steady with growth at less than 1% per year through 2040. Limited on-site air cargo process and customs handling may continue to make air cargo uncompetitive compared to trucking in the short-term. For example, inbound FedEx shipments from foreign countries cannot easily clear customs at DEN due to a lack of secure areas and customs facilities, as well as the operational routing and efficiency decisions of carriers. Instead, cargo destined for Colorado is often routed to Memphis or other national air hubs to clear customs before being returned to DEN for distribution and delivery. According to estimates prepared for DEN, an estimated 50% of the region's outgoing air cargo is trucked to

Chicago, Dallas, and West Coast airports for final shipment instead of being flown out of DEN. Air cargo economics are subject to global and national variables including aviation and truck fuel prices, ocean shipping rates and changes in international trade patterns.

The future path for air cargo activity and related airside development in the region may change these dynamics. DEN is the largest airport site in North America and the second-largest in the world. DEN is expanding logistics-based development on or near the airport in concert with the vision for the aerotropolis around Denver International Airport. The aerotropolis is a concentration of airport-oriented development and economic activity planned for nearly 3,000 acres south of DEN. The pending completion of an Amazon fulfillment center south of DEN is one example and development plans for the aerotropolis project include as much as 40 million square feet of new industrial and commercial capacity for the region.

Other national trends may help drive an increase in air cargo to and from the region. Consumers continue to expect goods ordered online to arrive within days. Depending on the location of distribution centers and customers, air cargo is often the only way to provide fast and reliable delivery. Hypothetical increases in trucking costs or driver shortages could also facilitate a switch to air cargo. Growth within the advanced manufacturing industry in the region, including electronics, semiconductors and aerospace equipment could also increase the potential use of DEN air cargo facilities to reach foreign and domestic markets. Colorado's changing demographics and future increase in health care spending may provide a boost to pharmaceuticals and medical supplies that arrive into the region by air.

Space Freight Infrastructure

Located six miles from DEN is the Colorado Air and Space Port which is positioned to serve as one of the country's hubs for commercial space transportation, research and development. In 2018, the facility received a site operator license from the Federal Aviation Administration for space vehicle launch activities. Space may well be the fifth mode in freight transportation in the coming decades and the DRCOG region and Colorado's aerospace manufacturing cluster, public and private research facilities, and defense contractors provide a competitive base for expanding space operations and associated freight and economic activity.

Regional Pipeline Network

Pipeline Infrastructure

The pipeline network in the DRCOG region is primarily used to transport petroleum products such as oil and natural gas. Two pipeline intermodal terminals in the region are identified as critical connectors on the National Highway Freight Network. The Conoco and Kanab pipeline terminals and the state's only oil refinery are located in Commerce City near I-270. Crude oil is processed into usable fuels such as gasoline and delivered by truck to retail gas stations throughout the state. Motor fuel for the Western Slope and parts of New Mexico and Utah are supplied by the refinery in Denver.

Within the DRCOG region there are over 107 miles of crude oil pipelines, 1,124 miles of natural gas and natural gas liquids pipelines, and 271 miles of pipeline carrying refined petroleum products. The region's pipeline network is owned, operated, maintained and protected by 13 companies or public utilities and carried over \$1.8 billion worth of commodities in, out and within the region in 2015. Pipelines are the safest way to transport energy products like natural gas, crude oil and other fuels. The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration regulates pipelines with support from the Colorado Public Utilities Commission. Colorado's legislature and executive branch are calling attention to the safety of pipelines, including the availability of public information and maps of pipelines and monitoring for spills, leaks, and safety and environmental risks.

Pipeline movements are forecast to grow in the future as capacity increases and with continued development and distribution of natural gas and petroleum products.

4. Planning for the Future

Future Freight Trends

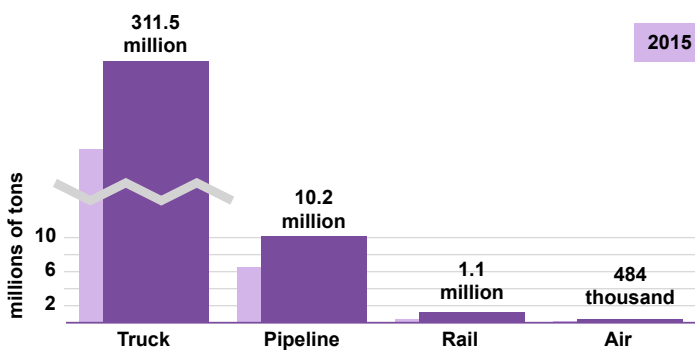
As the DRCOG region’s population and economy grow, so will demand for moving packages and products. By 2040, an additional 1.2 million residents and almost 700,000 jobs will place much greater demands on the region’s transportation system. Those demands include more trips made on the region’s already-congested roadways and more products, packages and inputs to be moved by rail, air and pipeline.

Overall goods movement is forecast to increase by 80% between 2015 and 2045. By 2045, over 323 million tons valued at \$400 billion are expected to be moved within, in and out of the DRCOG region. This increase will be driven by population and economic growth as well as changes in the region’s industry composition, growth in production and manufacturing sectors, demographics, household income and consumer spending patterns, as well as continued growth in e-commerce. Consumers have more and more choices online and can order goods and send products anywhere across the globe with relative ease. Colorado’s aging population will drive growth in the health care industry, while rising income levels among younger residents in

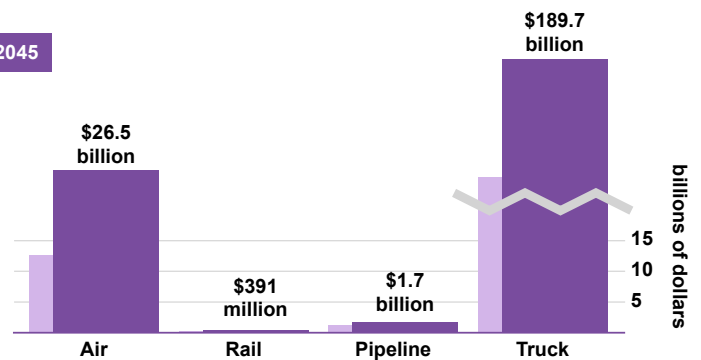
communities across the DRCOG region will continue to generate demand for retail, consumer, construction and manufactured goods. Increases in goods movement by tonnage and value are expected to be the largest for goods moved by truck, including first- and final-mile delivery of goods primarily shipped by rail, air or pipeline. However, rail and air cargo are forecast to grow faster than truck movements in terms of percent change.

By 2040, people living in, working in, and visiting the region will make over 20 million total person-trips per day. Population growth and vehicle trips have already quickly outpaced highway capacity expansion in past decades. The result, as of 2016, is over 390 miles of severe recurring congestion on freeways and arterials in the DRCOG region. The number of congested roadway miles is forecast to increase to 660 miles by 2040. With trucks carrying over 90% of total goods by tonnage, future congestion and reliability challenges on regional roadways will affect the ability of businesses to deliver efficiently to the region’s homes, office buildings, retail and grocery stores, and manufacturers and producers. Shifts from road to rail or alternative delivery options that manage demand during peak delivery times can help address these pressures and meet demand for moving the 300 million tons of goods expected in 2045.

Tonnage of Goods by Primary Mode, 2015-2045



Value of Goods by Primary Mode, 2015-2045



IHS Markit Economics and Country Risk, Transearch, 2015.

Next Generation in Goods Movement

Freight transport technology and business models are changing quickly and potentially dramatically. Technology, including real-time tracking, route optimization, distribution automation and autonomous vehicles are already infused into the first mile, middle mile and, increasingly, the last mile of global supply chains. What the future of freight looks like in the DRCOG region is uncertain, but it is likely to be one of continued incremental change, rather than rapid shifts in how goods are produced, handled and delivered. The region can support next-generation technologies and business practices through industry partnerships, financial incentives, demonstration programs and supportive policies. The following major trends are likely to influence goods movement in the coming decades:

Business practices

The shipping industry operates on relatively small profit margins even though transportation costs represent a significant portion of the final cost of goods and a significant investment by manufacturers, producers and retailers. In 2018, logistics costs at the national level rose to \$1.6 trillion or the equivalent of 8% of U.S. gross domestic product. Costs have increased in recent years, though still remain at historical lows. Tight labor markets for drivers, high inventory costs, retooling to meet e-commerce demands, investments in smaller warehouses and distribution centers, and competitive markets drove supply chain costs and investments higher across the country.

The transport industry is investing in and deploying new practices, vehicles and technology to control costs and find efficiencies. Route optimization technology and real-time tracking and routing can lead to significant fuel savings and help reduce empty loads and trips. Precision scheduling for railroads and recent investments in rail intermodal facilities, including in the metro Denver market, enable rail freight to continue to compete. Electric vehicle technology for light-duty parcel delivery vans and larger tractor-trailers has been slow to reach U.S. markets, but is being used in other parts of the world. Globally, electric or alternative-fuel vehicles represent a small fraction of global vehicle fleets currently used by carriers such as FedEx. Policy incentives, manufacturing capacity and public-private partnerships may help speed adoption of electric delivery vans and light-duty trucks.

The freight trucking industry is also looking to new workforces to help meet delivery demand. Major freight carriers are increasingly outsourcing or using third-party logistics providers to meet demand for drivers and vans. For example, Amazon's delivery service partner program provides leased vehicles, insurance and financing to those interested in starting their own delivery companies. The metro Denver market has seen significant uptake in this program. As reported by CBS4 Denver, in 2018 the owner of Final Mile Fast started a new business as an Amazon delivery service partner. After eight months, the company employed 112 drivers serving over 50 routes. Gig economy drivers, such as for Uber Flex or Walmart Inc. home delivery, may also continue to grow.

Consumer shifts

The exponential growth in e-commerce has dramatically changed the parcel delivery and shipping industry. Even just a decade ago, carriers such as FedEx, UPS Inc., or DHL primarily provided business-to-business services. Today, more than half of FedEx and UPS Inc. business is in residential delivery. New carriers, including Amazon, are entering the market. With the shift to residential delivery, business costs and environmental externalities have also risen as more packages are destined for more addresses. This means more trucks, more drivers, more transit time and more fuel. Coupled with growing congestion on major roadways across the region, the pace and pattern of residential delivery may not be sustainable. Generally, consumers are not charged the full cost of delivery.

As a result, businesses are seeking efficiencies and encouraging changes in consumer behavior. The expectation of next-day or even same-day delivery may not be possible in the near future without significant technological shifts or changes in travel patterns. Instead, consumers may readjust to having packages delivered on a single day of the week – such as the Amazon Day program. Or consumers may get used to picking up parcels at grocery stores, neighborhood drop boxes, or even transit hubs and park-and-rides. Business practices will change to meet to market forces and consumer expectations will adjust to alternative delivery options.

Mode shifts

In the DRCOG region, trucks are likely to continue to carry the majority of goods to, from and within the region. However, market forces and business decisions could shift activity to supporting modes and diversify regional supply chains. Shifting from traditional delivery vans to bicycle cargo delivery may make business sense in increasingly crowded and complex urban centers and downtowns or within new purpose-designed developments that focus less on vehicles and more on other mobility options. UPS Inc. has launched limited fleets of electric cargo bikes in Seattle, Toronto and Pittsburgh, and cargo bikes have been deployed in European cities for more than a decade. The Seattle launch was an outcome of the University of Washington's Urban Freight Lab and a collaboration between UPS Inc. and the City of Seattle. In the DRCOG region, planning for right-of-way, safety technology and other infrastructure considerations may be necessary to make nontraditional delivery modes practical.

The majority of freight rail activity and Class I national rail lines in Colorado have focused on carrying coal and petroleum products from producers on the Western Slope or Wyoming to generating plants in the region and other states. Coal rail traffic is forecast to decline significantly in the near future, continuing recent downward trends. This shift could open up freight rail capacity to carry other goods including intermodal cargo and consumer goods.

With a continued focus on sustainability and emissions reduction from the freight sector, freight rail can serve a critical role in the DRCOG region and throughout the state, by shifting freight traffic from roads to rails. Freight rail infrastructure may need to be improved to serve double-stack containers and access to rail intermodal yards and terminals would need to be preserved.

Air cargo shipping trends at DEN have remained stable. Many goods that could be shipped by air from DEN are instead trucked to major air hubs in Dallas, Memphis, Atlanta or Chicago. Air cargo markets are sensitive to changes in fuel prices and transport costs of other modes. If highway congestion, operational challenges for truck drivers or fuel prices in the DRCOG region were to increase significantly, air cargo activity may expand. Air freight also typically serves lower-weight, higher-value products such as pharmaceuticals, medical supplies, consumer parcels, electronics and semiconductors. Demand for health care

products will increase with Colorado's aging population. Other high-value commodities are produced by growing industry clusters in the DRCOG region. Entirely new air cargo markets could also open, including shipping agricultural products such as live animals, beef or value-added and locally produced food items to growing overseas markets in Asia and Africa.

Automation

The transport industry is adopting automation and autonomous technologies more rapidly than other industry sectors. These advances have the potential to introduce significant, but limited, changes to freight transport. Autonomous trucking technology has already been tested in Colorado and truck platooning is being piloted on roads across the Mountain West by companies such as Peloton Technology. Autonomous trucks could be active on U.S. roads in the coming decades but are more likely to be deployed on interstate routes that could serve new larger automated distribution hubs on the outskirts of regional population centers. Trucking activity to move goods to final destinations within busy metropolitan areas is still likely to be completed with drivers and traditional vehicles. The technology for vehicles operating autonomously in busy downtown environments, within complex loading docks and terminals, or serving suburban residential delivery hub-and-spoke distribution locations remains decades away from deployment. Freight shuttle systems that could use traditional rail lines or entirely new infrastructure such as Hyperloop which remains in development in the Denver region. These fixed-guidance systems are most likely to be pilot-tested and initially used to move goods, rather than people.

Warehouses and distribution centers are rapidly automating, using sophisticated software, robots and drones to pick, package and process shipments. Amazon's sorting facility near DEN currently deploys 400 to 500 robots to pick packages and drop items into loading bins organized by zip code for delivery by van. In the near future, fulfillment centers where consumer items are picked from inventory shelves and packaged may also be automated. Jobs in warehousing and distribution are likely to increasingly demand high-skill occupations such as systems and software engineers and managers responsible for overseeing complex automated systems. Automation of the fulfillment end of the supply chain could advance rapidly, though distribution and final delivery

may be slower to shift away from traditional vehicles. The potential for air drones and ground delivery robots to serve neighborhood markets with final delivery has already been demonstrated in limited capacities such as on university or hospital campuses or in controlled urban environments. Companies such as Amazon, Alphabet, and UPS Inc. are investing in automated delivery options, though full-scale use may be limited until regulatory, air traffic control and reliability issues are addressed.

To support connected and autonomous vehicle technology deployment in the DRCOG region requires significant infrastructure upgrades and maintenance, planning and

coordination among public and private-sector partners. While sensor technology is improving rapidly, the condition of roads, bridges, striping and paint in and around intermodal terminals and distribution centers would need to be significantly improved to enable use by autonomous vehicles. Accommodating future massive automated hub-and-spoke distribution centers would require careful long-term planning and coordination to minimize barriers and avoid conflicts with surrounding land uses and development, much like the process for planning an entirely new airport or inland port facility.



Photo courtesy of David E. Hattan

Future Cargo-Oriented Development Centers

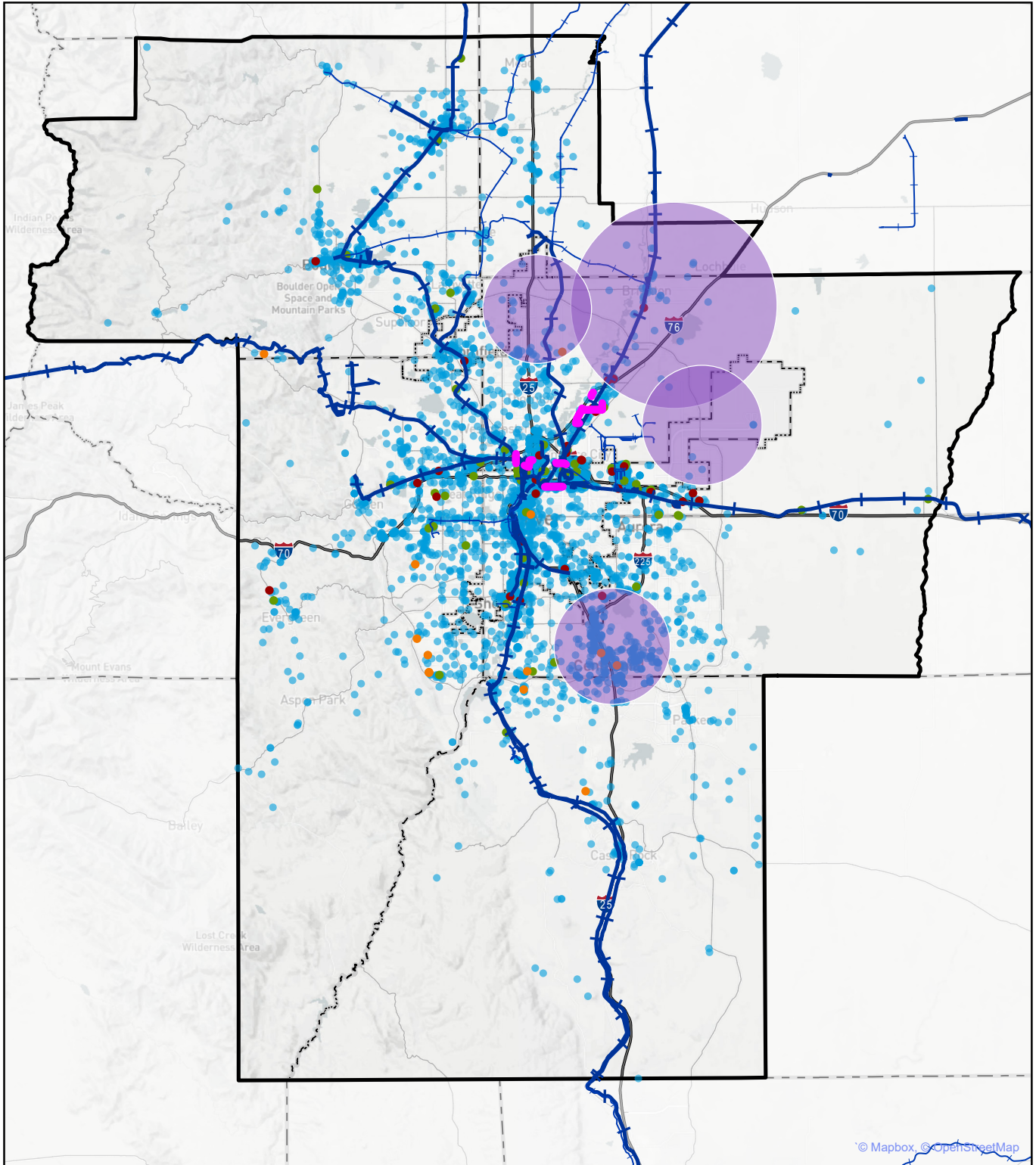
Expected growth in the DRCOG region's population, economy and tourism will drive future increases in the amount and frequency of goods moving into, out of and within the region. Global trade patterns, e-commerce trends, industry diversification, demographic changes and development patterns may shift the type of goods being moved and where those goods are being moved to and from. Technology adoption and new delivery models may help alleviate local challenges and make freight transport safer and more sustainable. However, significant future growth in freight traffic across all modes is expected and the region must plan collaboratively for the future.

Warehouse and distribution activity is currently clustered along I-70 East and I-25 North. Freight rail yards and intermodal terminals are clustered to the northeast of downtown Denver, and Denver International Airport, the Colorado Air and Space Port, and future aerotropolis development are generally located further to the northeast. Critical highway corridors carrying interstate traffic include U.S. Route 85, I-76 and I-25, which connect to major national freight priority corridors such as U.S. Route 287 and I-80. Preserving the future potential for the northeast sector of the

region to provide distribution, logistics, and cargo-oriented development is critical. In particular, the I-76 and U.S. Route 85 intermodal corridor is likely to serve an increasingly important role in the future.

Regional visions and local area plans anticipate significant future cargo-oriented development within the spheres of the aerotropolis and the Colorado Air and Space Port, Centennial Airport, the I-25 North corridor around E-470 and State Highway 7, and the I-76 and U.S. Route 85 corridor to the northeast of Denver. Land use plans and freight visions could be established for these areas to ensure that connectivity and access improvements are made, that local land use and economic development plans support cargo-oriented development and that private sector representative support logistics cluster development opportunities. Communities within the DRCOG region such as Bennett, or those in close proximity to the region such as Hudson, Fort Lupton and even farther out Greeley, Fort Morgan or Limon, will likely see continued growth in fulfillment and distribution center development and could serve key roles in automated warehousing and trucking with the need for connectors into regional and local specialized intermodal hubs within the DRCOG region.

Potential Future Logistics and Cargo-Oriented Development Centers



FREIGHT GENERATOR		Freight Intermodal Connectors	Interstates
Mining	Wholesale Trade	Class I Railroad	Highways
Transportation, Communications, Electric, Gas & Sanitary Services	Manufacturing	Short Line Railroad	County Boundaries
		Future Hub	DRCOG Planning Boundary

Best Practices in Regional and Local Freight Planning

The DRCOG region's multimodal freight system is essential to the everyday lives of residents, visitors and businesses and to the economic competitiveness of regional industry clusters and the broader economy. Planning for and creating communities and corridors that are freight-supportive can improve outcomes for the entire region. Freight-supportive planning, design and operations can mitigate externalities and impacts on quality of life, reduce excess vehicle miles traveled and associated emissions, increase safety for all travelers and focus on making improvements to the efficiency, connectivity and accessibility of the entire freight network.

This section provides a summary of national best practices in freight planning including examples, resources and links for consideration by regional and local agency partners across the DRCOG region. Across the country, regions and communities are increasingly addressing freight issues and seeking to create freight-supportive communities through plans, studies, policies and guidelines. Best practices can be categorized into the following major areas:

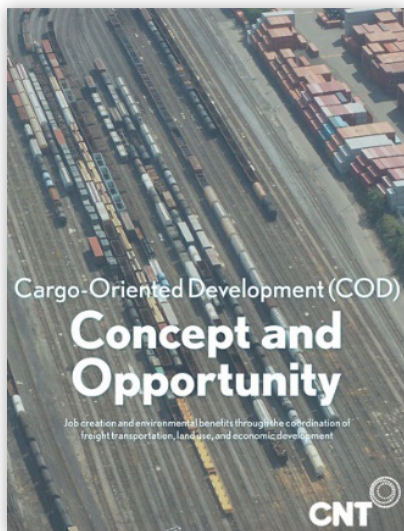
Local or industrial area freight plans and studies

A growing number of regions, counties and cities across the country have developed freight-specific plans and studies. Area freight plans may be components of local comprehensive plans or supporting modal plans that inform local transportation policy. Specific industrial area studies or corridor studies can evaluate transportation and mobility needs from a freight perspective in and around areas with significant freight activity or with planned future logistics-oriented development potential. Local studies are effective at evaluating needs and improvements at a micro level, which can be effective when considering the complexity of trucking, rail, intermodal and airside issues and the general lack of freight-specific data at other planning levels. Studies may also look at the freight movement needs of specific industries, including agriculture, intermodal, air cargo or other target industry clusters. In the DRCOG region, the recent North Metropolitan Industrial Area Connectivity Study was a joint effort between the City of Commerce City, Adams County, and the City and County of Denver to evaluate transportation needs in a traditionally industrial and transport-focused area of the region. This study evaluated needs from

a freight perspective and developed a master list of potential improvements. National examples include the Atlanta Regional Commission, which provides a regional grant program to support the development of local freight cluster plans. The North Metropolitan Industrial Area Connectivity Study is available at capitalprojects.c3gov.com/additional-projects. Additional examples and guidance for developing local plans can be found at atlantaregional.org/transportation-mobility/freight/transportation-mobility-freight-freight-cluster-plans/.



Freight elements in master plans



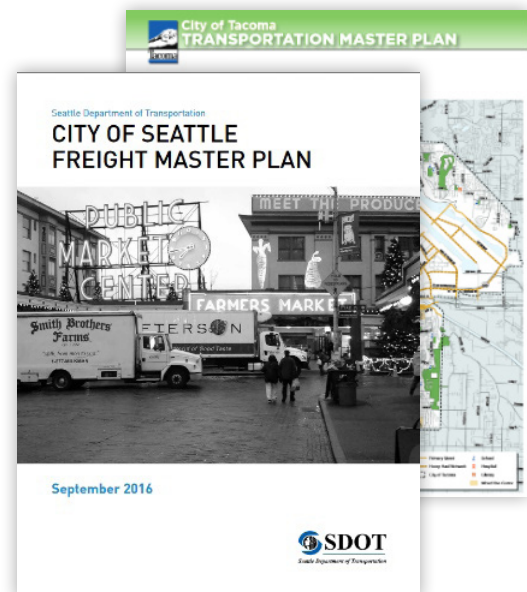
Specific freight transportation or logistics land use elements within county and city comprehensive plans are not common. Colorado guidance on master planning and traditional American Planning Association guidelines do not specifically

reference freight within best practices. The American Planning Association has recently introduced freight policy guidelines for consideration in local plans. Many local plans within the DRCOG region mention or address freight-specific transportation needs at a high level or in the context of freight rail and some subarea plans may consider freight needs in greater detail. Introducing freight and associated economic development, land use and policy needs is a best practice in local plan development and can help inform decision-making, improve truck route identification and designation, and synchronize land use and economic decisions. For example, the Delaware Valley Regional Planning Commission completed county-level freight scans for the nine counties within the MPO region. These scans reviewed freight elements of local comprehensive plans and provided baseline data and findings for local governments to continue freight planning efforts. American Planning Association policy guidelines on freight are available at planning.org/policy/guides/adopted/freight/.

Freight and logistics-oriented development and land use visions

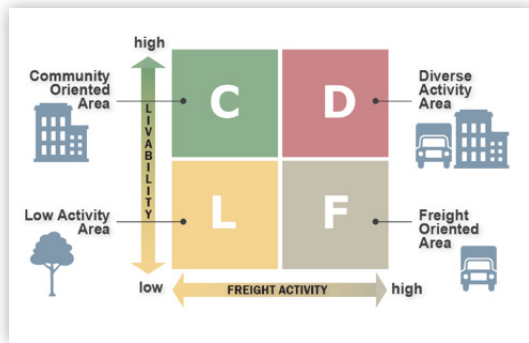
In regions with significant intermodal and maritime cargo activity, some agencies are developing long-term visions for logistics or cargo-oriented development and future land use. Often these plans are centered on specific site development opportunities such as major inland port concepts. In other cases, planning organizations are proactively identifying logistics centers in much the same way as urban centers or transit-oriented development locations are encouraged through policy support and development guidelines. These

initiatives can help reinvigorate urban areas, encourage redevelopment and economic activity, and envision major developments with trade and logistics as their focuses. In Washington, the Puget Sound Regional Council designates manufacturing/industrial centers where manufacturing and industrial uses can be clustered and intermodal access improvements focused. In Fort Worth, the AllianceTexas development was purposefully built around airport and rail facilities and is now supported by cargo-oriented communities. The Center for Neighborhood Technology has advanced cargo-oriented development initiatives in Chicago, Memphis, New Orleans and other communities. Information and resources from the Center for Neighborhood Technology are available at locationefficiency.cnt.org/cargo-oriented-development/.



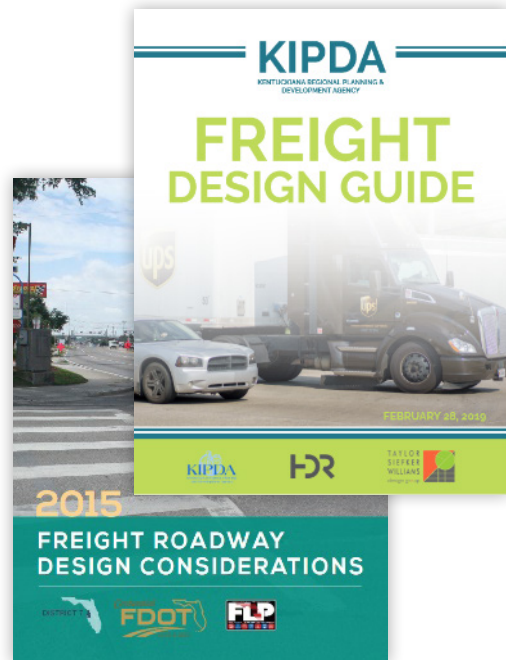
Freight activity center community design standards

Regional planning organizations and freight-oriented cities are establishing best practices for identifying freight activity centers or freight-oriented areas. These designations seek to balance community context with freight activity and can identify a range of freight-oriented areas from industrial access areas to commercial alley systems to urban centers connectors to downtown neighborhood access zones. Planning for various land use and designing urban environments and roadways to purposefully incorporate freight considerations, while accommodating a range of other uses and users, can help mitigate freight delivery and access issues in mixed community types. Examples include the City of Seattle’s Right of Way Manual and Tampa Bay Regional Strategic Freight Plan. Examples are available at streetsillustrated.seattle.gov/ and at tampabayfreight.com/wp-content/uploads/TBRGM_AbbContent_FINAL.pdf.



Truck roadway design standards

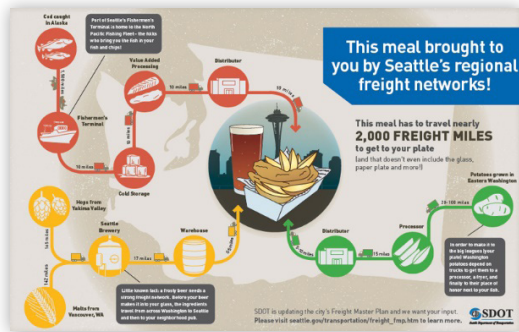
Several state departments of transportation, regional organizations and local governments have developed roadway design standards or manuals specific to truck movements. Examples include the City of Seattle, City of Tampa Bay, City of Portland, Florida Department of Transportation and others. These guidelines tend to go beyond truck specifications included within American Association of State Highway Transportation Officials manuals or state department of transportation design standards and are specific to truck movements. Similar to freight activity center design guidelines, freight-specific roadway design standards should also consider the community type or different environments and functions of streets in different areas for context sensitive design. The Florida Department of Transportation’s District 7 Freight Roadway Design Considerations document includes processes to integrate freight considerations into each aspect of roadway design processes and coordination steps to balance freight facility functionality with community livability. Examples are available at tampabayfreight.com/wp-content/uploads/FRDC_Complete_DRAFT.pdf and at portlandoregon.gov/transportation/article/357099.



Roadway examples

Public information and education

Education, communication and collaboration are significant elements of many freight-related initiatives. Providing information on why goods movement is important, how goods arrive on doorsteps and store shelves, and how the choices consumers make relate to the number of trucks, trains and planes that depend on the transportation system can help inform initiatives and planning efforts. Examples of public information and education campaigns include the Colorado Department of Transportation's Colorado Delivers initiative. Other examples from regional plans include supply-chain infographics and visual representations that illustrate the volume and connections of freight moving through a region or community. Public education around residential delivery is an emerging topic and can play a supporting role in addressing first- and last-mile challenges in urban and suburban areas. Increasing awareness of the impact of e-commerce and providing information on alternative options, such as Amazon Day or pickup lockers, may be a component of broader regional strategies to address delivery impacts.

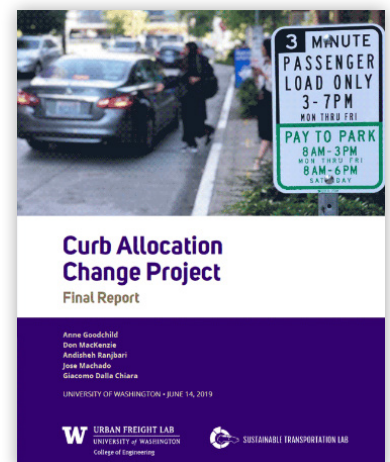


Public-private partnerships

Addressing freight issues requires close communication and collaboration with private-sector representatives and, often, individual businesses. Engaging the private sector in planning can be challenging, but partnerships can be effective means to develop connections, receive input and data, and involve businesses in solutions and actions. Around the country, partnerships around freight have jointly funded studies and plans, advocated for increased investment, pursued grant opportunities and pilot-tested alternative delivery options including off-hours delivery or urban delivery solutions. For example, the Freight Action Strategy for the Everett-Seattle-Tacoma Corridor is a partnership of 26 local cities, counties, ports, federal, state and regional transportation agencies, railroads and trucking interests that advocates for freight issues, secures funding and sets guidelines in the region. Also in Washington State, the Seattle Urban Freight Lab is a consortium led by the University of Washington with public agency and private industry partners that researches, tests and pilots new solutions to urban delivery and freight mobility, in concert with businesses. Information on the Urban Freight Lab is available at: [/depts.washington.edu/sctlctr/urban-freight-lab-0#](http://depts.washington.edu/sctlctr/urban-freight-lab-0#).

Effective freight planning throughout the region can lead to productive outcomes for livability, mobility, efficiency and safety. Local and regional collaborative efforts can support new partnerships to test alternative delivery options and reduce truck trips; synchronize truck and hazardous material routing and permitting; coordinate economic development and logistics or aerotropolis development plans; preserve the functionality or cross-jurisdictional rail lines or freight priority networks; or identify and prioritize improvements that can lead to reductions in emissions, noise factors, rail crossing delays and safety for all travelers.

A comprehensive guide to local freight planning is available from the Ministry of Transportation in Ontario at ceaa-acee.gc.ca/050/documents/p80100/118334E.pdf.



5. Focusing on Freight

Regional Strategies

Planning for the future of freight mobility in an era of rapidly changing consumer expectations, technology, logistics and business operations, and continued growth and expansion across the DRCOG region is challenging. To meet the challenges, regional action, cooperation and collaboration is needed. This Regional Multimodal Freight Plan focuses on regional strategies to better integrate freight considerations in transportation and land use planning, to preserve existing regional freight infrastructure and assets while planning for future freight hubs, and developing the data, information, partnerships and initiatives necessary to identify, prioritize, create and fund regional solutions. The following regional strategies support collaborative action and can be championed by DRCOG and local planning partners.

Develop a comprehensive regional goods movement plan

This Regional Multimodal Freight Plan represents the emerging practice of planning for freight and addressing freight specifically in regional plans, such as the Metro Vision Regional Transportation Plan. A more complete and comprehensive regional freight plan should be developed based on the conditions and needs assessment and strategic framework provided by this plan. Future regional freight planning efforts can focus on gathering and analyzing local and multimodal freight data in order to develop more detailed, prioritized projects by investment category type, with costing, phasing, time frames, implementation partners and potential

funding sources identified. The vision network of highway freight corridors and the identified freight focus areas and potential investment needs within this Regional Multimodal Freight Plan provide a strategic framework for identifying regional priorities and developing project concepts.

Encourage local area, corridor and site-specific freight plans

The DRCOG region encompasses areas of mountains and plains; historic communities, suburban centers and downtown business districts; and, alleys, neighborhood streets, regional arterials, interstate highways and branch and mainline railroads. The local freight issues and challenges in areas across the region are as unique as the potential solutions and investments needed. This regional freight plan provides a broad framework but local, corridor and site-specific freight plans are important to understanding local connectivity, access, safety or planning needs and to identifying potential investments and improvements. Local plans are effective in understanding micro issues and identifying specific freight mobility impediments such as roadway design, rail grade crossing risks, bridge clearances, curbside management policies and access issues for future funding and grant programs. The North Metropolitan Industrial Area Connectivity Study is an example of a local area plan that specifically considers freight movements and identifies investments to improve mobility and connectivity for truck and rail movements. The DRCOG region can encourage local freight plans through planning grants and resources such as technical guidance, tools and data.

Consider goods movement issues in multimodal planning and design

Issues and needs specific to freight are not always considered in multimodal planning and policy development. The region's transportation system must work for a variety of travelers, from bicyclists to pedestrians to transit riders to automobile drivers and to the drivers and operators of parcel delivery vehicles, heavy trucks, hazardous material trucks and trains, railroads and air cargo operations. Roadway or community improvements designed for certain uses may have unintended effects on freight mobility. For example, some roundabout designs pose safety risks for large trucks; walkable communities may not accommodate truck turning movements; limited curb space in downtown centers must be shared by sidewalks, bike lanes and delivery vehicles; and new development and growth may require new railroad crossings. Integrating freight considerations into multimodal planning, design and operations can help mitigate potential community impacts of freight traffic, reduce excess vehicle miles traveled and associated emissions, improve safety for all travelers, and increase the efficiency of the regional multimodal freight network. The DRCOG region's communities and planning partners can integrate freight into planning and design through policies and guidelines, hosting community workshops and by making information on freight issues and needs in planning broadly available.



Photo courtesy of David E. Hattan

Develop coordinated and comprehensive freight land use plans and policies

Transportation and land use decisions are closely connected. Land use, zoning and development guidelines can have significant effects on freight movement and mobility. Freight and logistics-oriented development can range from

traditional heavy industrial areas with significant rail and truck activity as well as light commercial distribution space with smaller and less frequent truck or intermodal activity. As the region continues to grow in population and in its geographic footprint, planning for freight-oriented land uses and identifying future logistics and distribution hubs will be essential to continuing to deliver for the regional economy. Several regions and communities across the country have developed freight-oriented land use designations or overlays that can help inform local plans and policies or provide guidance for roadway and multimodal transportation system design and operation. This broad guidance does not supplant local policies and plans, but provides a framework for preserving access and connectivity for existing freight activity centers and planning for new centers and hubs. Planning to accommodate future freight movements along the northeast I-76 and U.S. Route 85 corridor, around Denver International Airport and spaceport development sites, in proximity to existing major distribution centers along I-70 and I-25, and around key regional freight corridors and intermodal sites is needed. The DRCOG region's member governments and their planning partners can support regional land use planning through resources, technical guidance and planning guidelines.

Preserve regional freight infrastructure and assets for future uses

Historically, the Denver region developed as a trade gateway and railways, roads and industrial areas developed along main corridors, rivers and near emerging town centers. Traces of the past remain in the many railroad main and branch lines that crisscross the region, in the industrial and distribution areas along the South Platte River and in the alleyways, viaducts and local access roadways across the region's communities. As the region has grown in size and population, many of the industrial land uses, warehousing and distribution facilities, and rail and intermodal terminals remain clustered at the north and east of the region. Increasing congestion, infill and redevelopment, new growth and conversion of facilities are hampering the continued functionality and efficiency of key regional freight assets. Preserving the functionality of freight infrastructure for future use is essential to serving the delivery needs of the region today and in the future. What the next generation of goods movement will look like and how goods will be transported is uncertain, but regional rail lines, terminals, distribution

centers and intermodal yards can serve important roles in any future scenario. Preservation of freight assets could include design guidelines so that future use of rail lines for double-stack containers or automated freight shuttles are not precluded by overpasses or at-grade crossings, or roadway design guidelines in industrial and distribution areas that enable access by autonomous trucks and vehicles, or land use overlays that designate freight or logistics-oriented development hubs. The DRCOG region can preserve existing functionality and not preclude future use by identifying regional and local freight assets and developing regional policies and design guidelines specific to goods movements.



Photo courtesy of David E. Hattan

Compile freight specific regional data and information

Planning for freight is an emerging area for many states and regions across the country. Central to effective planning is comprehensive and complete data and information related to freight movements, volumes, patterns, trends, hot spots and needs. At the macro level, information is generally available on major truck movements, safety concerns, barriers and bottlenecks, and basic infrastructure inventory. At the micro level, data is often lacking for local roadways not covered by national highway datasets or regional travel models, for residential parcel delivery and light-duty truck movements, or for privately owned infrastructure such as

railroads and freight terminals. This data is important to help planners and stakeholders better understand the scale and scope of emerging freight challenges, particularly in urban and suburban settings. Collaborative efforts to gather freight-specific regional and local data, leverage real-time or location-based information and to work with private-sector partners to anonymize and use proprietary datasets are critical to effective planning. The DRCOG region's communities and planning partners can support efforts to gather and analyze data by investing in available datasets, gathering and maintaining regional datasets and developing relationships with industry partners.

Target investments and pursue grant opportunities

Few dedicated resources are available for freight investments at the federal and state levels and a pipeline of freight-specific investment needs or projects is still under development at the regional level. Leveraging existing funding opportunities include competitive grant programs such as Infrastructure for Rebuilding America, Consolidated Rail Infrastructure and Safety Improvements, Better Utilizing Investments to Leverage Development and National Highway Freight Program will be essential to completing major freight-specific investments. Federal grant opportunities are competitive and include provisions specifically for freight-related projects, including freight rail and connections to private infrastructure. The Colorado Department of Transportation administers the National Highway Freight Program which provides approximately \$15 million per year in dedicated funding for statewide and regionally significant freight projects. The DRCOG region can position itself for competitive funding programs by identifying priority projects through local plans and studies, advocating for consideration of regional projects under the National Highway Freight Program and encouraging grant applications from local sponsors.

Continued Cooperation and Partnerships

Metro Vision is the region's common platform for collaboration and provides a mechanism for implementing the key strategies and actions of this Regional Multimodal Freight Plan. Implementation requires engaging new partners, building relationships with industry, investing resources, developing a foundation of data and information, and identifying regional and local champions.

Colorado Freight Advisory Council

The Colorado Freight Advisory Council is the state's primary forum for industry to advise CDOT and regional and local planning partners on issues, investments and decisions relating to freight transportation. The Freight Advisory Council includes representatives from across industry sectors and is a resource for participation in local plans or studies, for review and insights into freight decision making or for connections to local stakeholder organizations or industry contacts. The Freight Advisory Council meets on a quarterly basis and is hosted by CDOT.

Local Freight Advisory Committees

Across the country, some regional and local agencies have established freight advisory committees to advise on freight transportation issues at the local level. Committees may be established temporarily to guide plans or studies or on a more regular basis to provide a sounding board and voice for industry. In areas with significant freight-related issues, economic development potential, target industry clusters or future logistics-oriented development plans, ongoing committees can provide valuable partnerships and support.

Industry Partnerships

Regional consortiums, partnerships or joint efforts can be effective tools for advancing regional initiatives or studies. National examples include public-private groups formed to test alternative delivery solutions in urban areas, to jointly fund freight-related studies or to jointly advocate for funding for freight improvements. Potential partners include chambers of commerce, economic development organizations, freight industry representatives, universities or colleges and local or regional agencies.

6. Coordinating Investments

Safety, capacity and connectivity issues across the region's road and rail infrastructure can impose significant additional costs and negative externalities in terms of wasted fuel, excess emissions and additional time and end-costs to consumers and businesses. Inefficiencies in freight transport can affect the DRCOG region's economic competitiveness and attractiveness for major manufacturers and small entrepreneurial producers, as well as affecting the livability of communities and quality of transportation for all travelers across the region. Addressing these needs is critical to supporting the region's economy and livability.

Freight-specific improvement needs across the DRCOG region include:

- **Highway safety** needs include geometric design and merge areas of roadways used by trucks and safety improvements to areas traveled by non-motorized users.
- **Geometric design and access improvements** at key local and regional freight connectors, roundabouts or intersections and interchanges can address truck safety risks.
- **Rail crossing safety** needs include upgrades to public at-grade crossings including signals, equipment and crossing types.

- **Rail grade separation** needs exist in areas of heavy traffic, neighborhoods, connecting to hazardous material intermodal facilities and in areas of expected new development.
- **Rail capacity and maintenance** needs, particularly for short-line railroads, can address degraded infrastructure and enable railroads to carry more products.
- **Low-clearance and weight-restricted bridges** present barriers to double-stack rail movements or require long detours for trucks. Upgrading bridge or rail overpasses can improve safety by reducing strike incidents.
- **Highway maintenance and preservation** in areas used by trucks are needed to maintain drivability life and reduce wear and tear on vehicles.
- **Truck parking** expansion is needed to safely accommodate drivers during mandatory resting periods and address short-term or emergency parking needs during operational closures or for truck staging around terminals, yards and producers. Public-private partnerships and innovative solutions may be needed to address these needs.
- **Highway shoulder** improvements are needed on regional roadways to provide safe emergency pullover spaces and provide buffer space for emergency vehicles and other road users.

Example project type	Railroad Crossing Improvement	Local Freight Connectivity Improvement
Example project	Reconstruction of BNSF railroad bridge overpass over Brighton Boulevard to increase maximum clearance from 11 feet, 5 inches to industry standards.	Extension of 52nd Avenue from Brighton Boulevard to Colorado Boulevard to connect industrial areas, improve truck mobility, improve freight rail access and address safety issues.
Estimated cost	\$45,000,000	\$44,000,000

- **Highway reliability and delay** issues on key freight corridors result in excess travel time and emissions costs. Eliminating freight bottlenecks at rail crossings, merge areas or congested highway segments can improve travel time reliability.
- **Connectivity and capacity** expansions can address delay or safety issues at key access points to terminals or major freight generators. New highway or rail connectivity supports economic development or may be needed to support new intermodal terminals, distribution centers or air cargo-related development.
- **Technology and operations** improvements to signals, interchanges and connected infrastructure can help address reliability, safety and connectivity needs.
- **First- and last-mile delivery**, including technology for reservation systems for parking in congested areas, curb management policies or alternative-mode or off-hours delivery programs could be expanded in the region.

Complete information on regional freight investments is currently underdeveloped and the scale of regional investments is not adequately captured within this Regional Multimodal Freight Plan. Further needs identification at the regional level and additional local and industrial area freight studies are necessary to identify targeted and priority improvement needs.

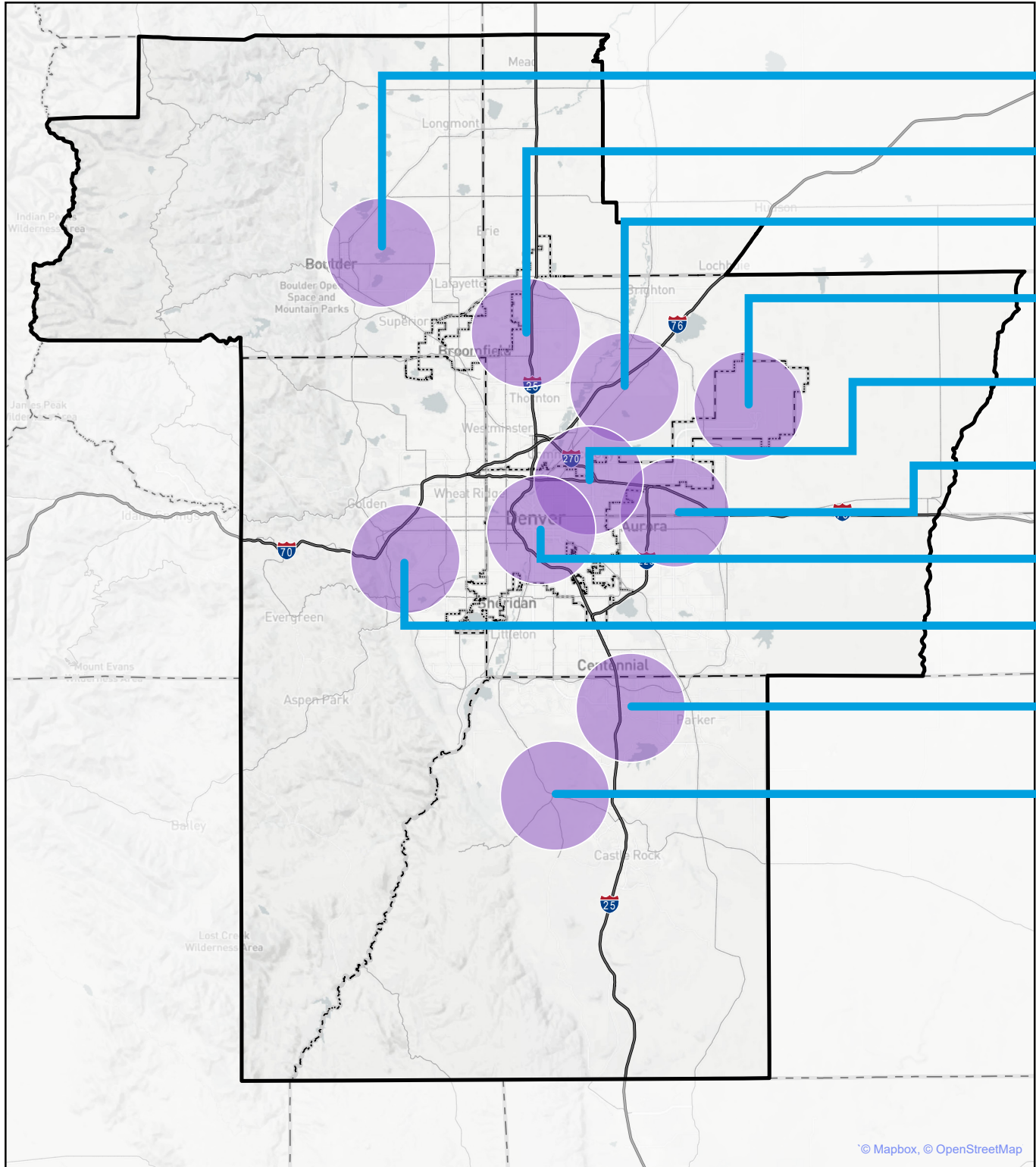
Funding for freight-specific investments is limited at the national, state and regional levels. The CDOT-administered National Highway Freight Program and competitive national grant programs provide funding sources for large-scale projects of statewide and regional significance. However, these funding sources are often inadequate to address significant freight-related improvements. For example, through the National Highway Freight Program, the State of Colorado received \$83 million in federal funding specific to freight investment needs. National Highway Freight Program funding amounted to approximately \$20 million annually over the four fiscal years of the program. This level of funding is far less than is required to address local improvements.

The North Metropolitan Industrial Area Connectivity Study and CDOT’s recent National Highway Freight Program-funded projects provide cost estimates for priority projects that illustrate the magnitude of investment required to address highway, rail and intermodal connectivity needs in the region. Examples of project types and costs from these recent efforts are noted in the following table.

Regional and local improvements must be supported through existing funding sources and coordinated pursuits of federal and state competitive grant opportunities in the absence of significant additional funding dedicated to freight transportation needs.

Highway Freight Connectivity Improvement	Truck Parking Capacity Improvement
Proposed as part of the Vasquez Planning and Environmental Linkage Study, the addition of a ramp from I-270 to Vasquez Boulevard would improve truck connectivity.	Improvements to existing rest area along I-25 at Larkspur to add truck parking spaces, improve lighting and security, and lengthen acceleration and deceleration lanes.
\$8,700,000	\$1,300,000

Regional Freight Focus Areas



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	Freight Focus Areas
	DRCOG Planning Boundary
	Interstates
	Highways
	County Boundaries



Northwest Metro

I-25 North

I-76 / U.S. Route 85 Intermodal Corridor

**Denver International Airport Cargo/
Aerotropolis**

RiNo Industrial District

I-70 East Distribution Corridor

Downtown Denver

I-70 and U.S. Route 6 West

I-25 South and Centennial Airport

U.S. Route 85 South Corridor

Freight Focus Areas

Based on the current highway and rail freight needs identified through this planning effort and coupled with local knowledge and engineering judgement of advisory committee members, this Regional Multimodal Freight Plan highlights ten critical regional freight focus areas. These focus areas are general subregional locations that reflect: 1) clusters of existing trade, transportation and logistics business activity; 2) concentrations of significant current freight-specific safety, mobility, reliability and connectivity issues and needs; and 3) locations that are likely to experience future cargo and logistics-oriented development or that are likely to face significant future freight mobility and connectivity needs. Focus area boundaries are described generally and can be refined through local area plans and additional analysis of data reflecting local truck, rail and intermodal movements. Clusters are highlighted on the map below and key issues, assets and future policy, planning and project needs are identified in the current issues and needs section of this chapter.

This analysis provides a framework for future regional and local freight planning and coordination. Coupled with the vision network of priority highway corridors and the needs and issues identified in this chapter, focus areas are intended to spotlight areas most in need of further study, freight-specific project solutions and investments, and where coordination and collaboration with industry and planning partners may be effective.

Summary of Assets, Issues, and Actions in Freight Focus Areas

Northwest Metro

Context: Includes communities within Broomfield and Boulder counties, generally within the triangle formed by U.S. Route 36, State Highway 119, and U.S. Route 287. This area includes growing, mixed development communities with significant industrial, commercial and agricultural freight generators and existing freight rail infrastructure.

Assets:

- regional and local highway connectivity
- freight rail lines and facilities
- manufacturing clusters and agriculture producers

Needs and Issues:

- safety of local truck movements and residential delivery demand
- multimodal and nonmotorized traveler safety
- rail grade crossing safety
- freight railroad asset and access preservation
- growing consumer base and land use changes

Potential Strategies and Actions:

- initiatives to address residential parcel delivery demand
- coordinated land use planning near existing industrial clusters
- preservation of freight rail assets for future use

I-25 North

Context: The I-25 corridor provides significant interstate connectivity to national markets and trade routes; it is an important intraregional trade corridor with significant truck volumes. These areas are experiencing rapid growth of new distribution and fulfillment facilities in addition to existing freight-reliant retail, wholesale and industrial businesses.

Assets:

- north-south interstate connectivity
- freight rail lines and yards
- major existing industrial and manufacturing clusters
- emerging distribution, warehousing and retail hubs

Needs and Issues:

- truck parking and safety
- truck reliability and delay
- rail crossing safety and future grade-separation
- changing land use and development patterns

Potential Strategies and Actions:

- coordinated land use planning near existing industrial or distribution clusters and around significant freight corridors
- public-private partnerships to use existing facilities for truck parking needs

Denver International Airport Cargo and Aerotropolis

Context: Air cargo facilities at Denver International Airport provide critical links for the region's residents and businesses. Future development plans for the aerotropolis concept include significant cargo and logistics-oriented development.

Assets:

- Denver International Airport cargo facilities
- Colorado Air and Space Port
- freight rail access
- aerotropolis development potential

Needs and Issues:

- future land use and development
- air-to-truck mobility and connectivity
- growing delay and congestion; potential truck bottlenecks
- air cargo capacity and facilities

Potential Strategies and Actions:

- local area studies of key corridors and essential roadways such as Peña Boulevard, Tower Road, Smith Road and Airport Road
- coordinating future cargo-oriented development and land use decisions
- master planning efforts for Denver International Airport and Colorado Air and Space Port potential trade and logistics activity, including rail-to-air and intermodal needs

RiNo Industrial District

Context: One of the region's oldest industrial, freight rail and warehousing clusters, the River North district, is now experiencing significant redevelopment and transforming into a mixed-use activity center.

Assets:

- freight railroad terminals and yards
- National Western Stock Show complex
- existing distribution centers and warehousing facilities
- interstate accessibility and local freight corridors

Needs and Issues:

- future land use and development coordination
- preservation of freight assets and access
- local truck movements
- truck and multimodal roadway safety
- air quality and community livability impacts

Potential Strategies and Actions:

- coordinated land use planning near existing industrial or distribution clusters and around significant freight corridors
- freight-specific local area studies
- integration of freight considerations and perspectives within future corridor and area studies and project development concepts

Summary of Assets, Issues, and Actions in Freight Focus Areas (continued)

I-76 and U.S. Route 85 Intermodal Corridor

Context: A major trade gateway to the region, the I-76 and U.S. Route 85 intermodal corridor is likely to experience significant future logistics-oriented development and rail and truck volume increases.

Assets:

- interstate highway access and critical national trade corridors
- freight railroad lines, terminals and yards
- manufacturing and industrial generators
- access to planned logistics-oriented developments in Hudson and eastern communities

Needs and Issues:

- future land use and development coordination
- preservation of freight assets and access
- truck access and connectivity
- truck parking and safety

Potential Strategies and Actions:

- coordinated land use and development planning to preserve access to existing freight clusters and promote future economic development potential
- safety assessments of future growth near at-grade rail crossings and continued improvements to existing crossings or future grade separation projects
- public-private partnerships to use existing facilities for truck parking needs

I-70 East Distribution Hub

Context: Existing retail, wholesale, warehouse and distribution centers adjacent to I-70 from I-25 to Peña Boulevard make this focus area one of the densest distribution and industrial corridors in the region.

Assets:

- distribution, logistics, industrial and commercial cluster
- interstate access and interregional connectivity
- freight rail lines and connections

Needs and Issues:

- truck mobility, access and connectivity
- truck parking and safety
- future land use and development coordination
- rail grade crossing safety

Potential Strategies and Actions:

- coordinated land use planning near existing industrial or distribution clusters and around significant freight corridors
- safety assessments of future growth near at-grade rail crossings along mainline national railroads
- integration of freight considerations and perspectives within future interchange and local area studies

Downtown Denver

Context: Denver's Central Business District and surrounding mixed-use, residential and commercial neighborhoods generate significant demand for residential and business parcel delivery and commercial deliveries to restaurant and retail businesses.

Assets:

- significant regional economic center and growing mixed-use activity and redevelopment centers
- interstate and intraregional connectivity

Needs and Issues:

- urban parcel delivery demand management
- alternative commercial delivery demand management
- curb management, parking and roadway design
- truck and multimodal roadway user safety

Potential Strategies and Actions:

- initiatives to address residential parcel delivery demand and alternative delivery programs
- collections and analysis of data to assess delivery demand, patterns and needs including parking and curb management
- assessment of local codes for building access and parking
- coordination of truck safety plans and strategies

I-70 and U.S. Route 6 West

Context: A critical east-west interregional corridor, I-70 and U.S. Route 6 provide highway access to major manufacturers, commercial and retail centers. Key local corridors, particularly north-south connectors, experience significant truck volumes and rising delivery demand.

Assets:

- interstate connectivity and local freight access
- commercial, retail and industrial clusters

Needs and Issues:

- truck mobility, reliability and delay
- truck and multimodal roadway user safety
- local business access and freight connectivity

Potential Strategies and Actions:

- coordinated land use planning near existing commercial, retail or distribution clusters
- integration of freight considerations and perspectives within future interchange and local area studies
- safety assessments of recurring truck crash locations

Summary of Assets, Issues, and Actions in Freight Focus Areas (continued)

I-25 South and Centennial Airport

Context: Major interstate and intraregional corridor provides east-west and north-south connectivity for growing commercial clusters, south Central Business District and residential communities. Highway access to key freight corridors including State Highway 470, U.S. Route 83 and along I-25.

Assets:

- commercial and retail clusters and freight generators
- interstate connectivity to I-25, E-470 and C-470
- Centennial Airport

Needs and Issues:

- truck mobility, reliability and delay
- truck and other roadway user safety
- local freight access and connectivity
- future economic development and land use coordination
- growing population and consumer base

Potential Strategies and Actions:

- coordinated land use planning near existing commercial, retail or distribution clusters
- integration of freight considerations and perspectives within future interchange and local area studies
- evaluation of future cargo- and logistics-oriented development potential around Centennial Airport

U.S. Route 85 South Corridor

Context: Major intraregional and interregional corridor providing access to State Highway 470, I-25 and local connectors. Freight rail access and highway connectivity provide potential for future cargo-oriented development.

Assets:

- commercial and retail clusters
- connectivity to U.S. Route 85, State Highway 285, I-25 and E-470

Needs and Issues:

- truck safety hot spots
- truck parking
- truck mobility, reliability and delay
- future economic development and land use coordination

Potential Strategies and Actions:

- coordinated land use planning near existing commercial, retail or distribution clusters
- integration of freight considerations and perspectives within future interchange and local area studies
- study of potential new or expanded truck parking facilities
- evaluation of future cargo and logistics-oriented development potential and rail intermodal facilities



Photo courtesy of David E. Hattan

Inventory of Current Needs by Project Type

The following section provides a summary of freight-related needs and identified issue areas. These potential future project needs are generally limited to roadways on the National Highway System due to data availability. Needs on locally owned roadways or privately owned infrastructure, such as rail overpasses, may not be fully captured.

Existing studies, such as the North Metropolitan Industrial Access Connectivity Study, are important in identifying specific improvements that are locally or regionally significant. CDOT and DRCOG are working to better integrate freight considerations into planning and environmental linkage studies, regional corridor studies and other regional planning processes to support better freight-related project identification moving forward.

As additional freight-specific data and information is developed at the regional and local level, future needs and problem areas can be identified, prioritized and bundled into projects. In areas with significant freight safety, delay, connectivity or access needs, multiple needs may be addressed by bundling into strategic corridor improvements that may be competitive for federal grant programs. The needs and project types illustrated in the following maps and tables provide a base for identifying future freight investments and pursuing federal and state funding sources.

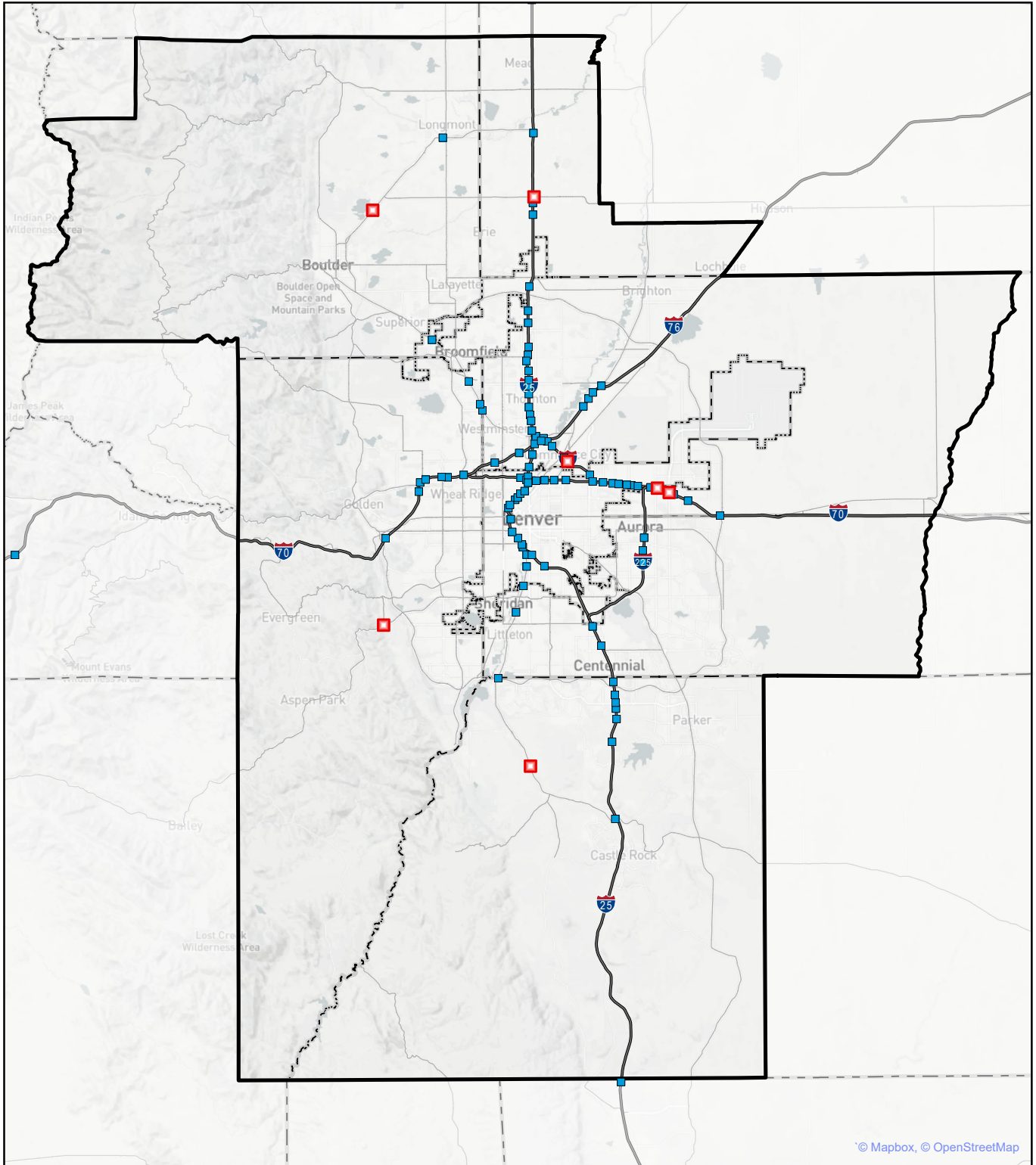
Highway Safety

Highway safety needs and potential investment areas are identified using available CDOT data on statewide commercial vehicle crash patterns. Consistent crash and incident data for commercial vehicles is not readily available at the regional level. Trucks are defined within these datasets as heavy commercial trucks and may not fully capture incidents involving light-duty commercial trucks, including parcel delivery vans. Data is consistent with CDOT's Colorado Freight Plan.

Truck Crash Hot Spots: This analysis identifies locations where the truck crash rate, based on vehicle miles traveled, is higher than the statewide truck crash rate between 2008 and 2014. These locations tend to identify problem areas with recurring crash patterns and causes or where geometric roadway design may be a contributing factor. Top locations are located along interstates and significant U.S. routes and state highways.

Recurring Truck Crash Locations: This analysis identifies locations with greater than 20 commercial vehicle crash locations over a three-year period between 2013 and 2015. These locations indicate problem areas that are likely to have higher truck and general traffic volumes. Top locations are located on interstate highways and significant U.S. routes and state highways.

Truck Crash Hot Spots



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	Recurring Truck Safety Hotspots		Interstates
	High-Frequency Truck Crash Location		Highways
	DRCOG Planning Boundary		County Boundaries

Truck Crash Hot Spots

Route ID	Location	Facility Type	2008-2014 Total Truck Crashes	Truck Vehicle Miles Traveled	Incident Types (and Number of Crashes)
I-70A	I-70E and Airport Blvd	Interchange	42	64.6	Sideswipe (37), Rear End (2), Approach Turn (1), Overtaking Turn (1), Guard Rail (1)
State Hwy 52A	I-25N and State Hwy 52 / County Road 14	Interchange	23	165.9	Sideswipe (17), Rear End (5), Broadside (1)
I-270A	I-270 and U.S. 85N	Interchange	12	538.7	Sideswipe - Same Direction (4), Rear End (3), Overturning (2), Vehicle Debris/Cargo (1), Guard Rail (1), Light/Utility Pole (1)
I-70A	I-70E and Chambers/ Pena	Interchange	6	833.6	Sideswipe (3), Rear End (2), Vehicle Debris/Cargo (1)
U.S. 85B	U.S. 85S and Airport Rd (Louviers)	Highway, Merge	6	661.3	Overturning (1), Rear End (1), Approach Turn (1), Overtaking Turn (1), Guard Rail (1), Other Fixed Object (1)
State Hwy 119B	State Hwy 119 N and 63rd	Intersection	4	116.2	Railroad Crossing Equip (3), Sideswipe (1)
U.S. 285D	U.S. 285 and State Hwy 8	Interchange	4	150.3	Overturning (2), Approach Turn (1), Animal (1)

Recurring Truck Crash Locations

Route ID	Milepost Start	Milepost End	2013 Crashes	2014 Crashes	2015 Crashes	Truck Vehicle Miles Traveled	2013-2015 Total Truck Crashes
I-70A	281	282	20	15	18	768.2	53
I-25A	208	209	13	18	11	436.0	42
I-25A	208	209	8	19	15	949.0	42
I-70A	279	281	6	12	16	1182.4	34
I-70A	282	283	1	18	14	78.7	33
I-76A	12	12	0	19	12	784.0	31
I-70A	285	286	0	20	7	600.1	27
I-70A	276	276	9	8	10	199.8	27
I-76A	10	12	6	15	5	1134.0	26
I-70A	277	277	8	7	11	36.5	26
I-70A	279	279	8	7	10	278.6	25
I-70A	281	282	16	5	3	1012.6	24
I-25A	191	193	10	6	8	98.8	24
I-25A	191	193	6	7	11	224.6	24
I-25A	211	211	8	10	6	502.4	24
I-070A	273	274	7	10	6	339.1	23
I-25A	208	208	2	11	10	281.9	23
I-70A	283	284	3	11	8	602.1	22
I-76A	4	6	2	12	8	426.4	22
I-70A	266	267	4	7	11	427.6	22
I-70A	275	276	3	9	9	455.4	21
I-25A	217	218	8	7	6	814.3	21
I-52A	11	13	10	5	5	34.3	20
I-25A	220	221	5	8	7	789.5	20

Rail Crossing Safety

Railroad safety and security policies help ensure that railroad operations and property remain secure, highway-rail crossings are safe and hazardous material movements protect life and property. Incidents generally occur at public at-grade rail crossings and involve crashes when vehicles attempt to circumvent safety devices, when vehicles stall on tracks or when pedestrians or vehicle drivers do not respond to warning signals. Other incidents may occur because of intentional behavior by a driver. Commercial trucks may be at a greater risk at rail crossings. Trucks stall on railway-highway crossings or fail to completely clear a crossing on a congested roadway. Railroad crossing safety projects

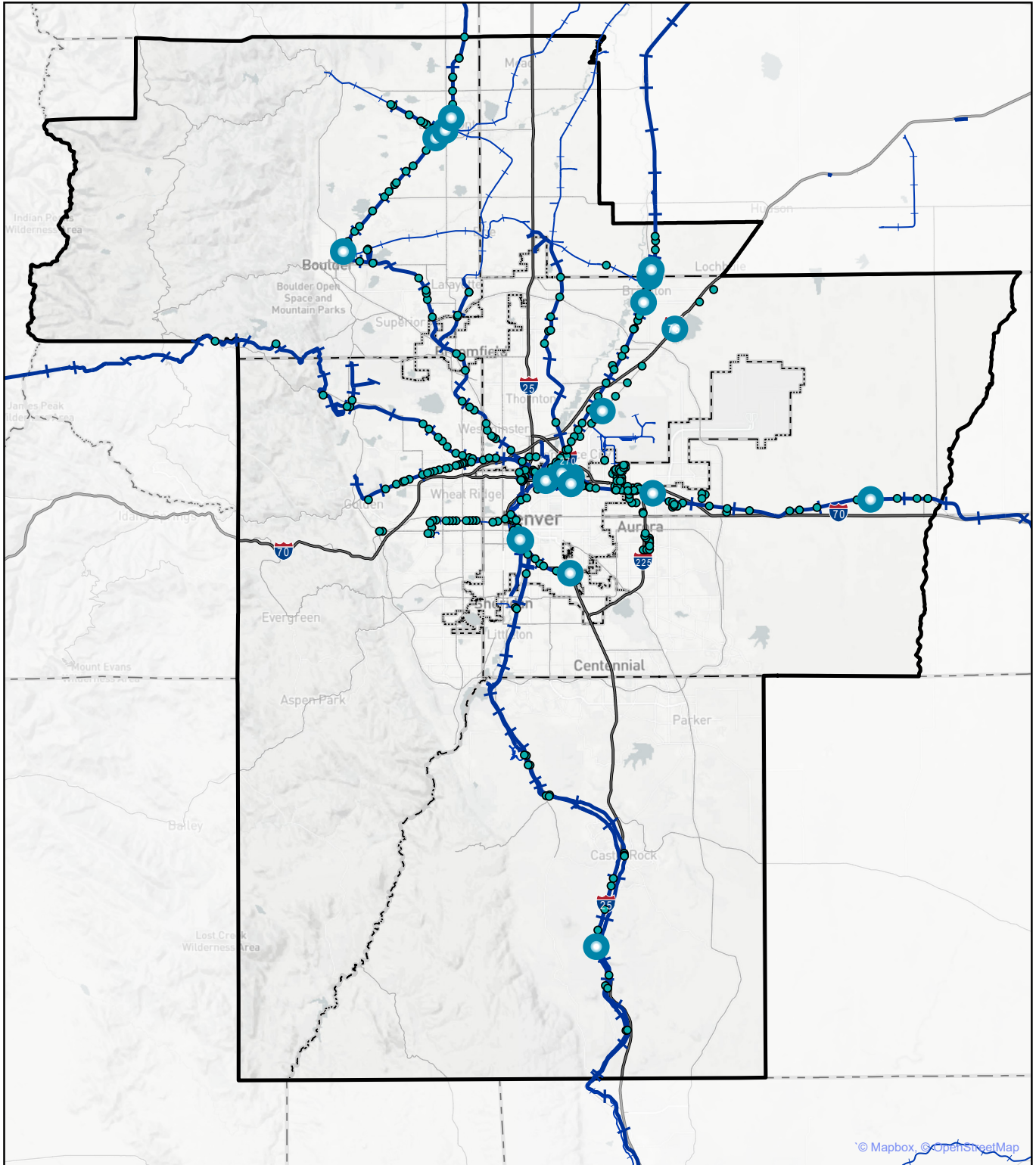
are funded through the Federal Railroad Administration's Section 130 program. This program is administered by CDOT, which evaluates incident history, safety risk, train traffic and highway and pedestrian traffic to prioritize ongoing investments.

Highway-Railroad Crossing Incidents: This dataset highlights highway-rail crossings with incidents including fatalities and serious injuries to highway users and railroad employees, and reported incidents including trespassing or near misses. At-grade crossings with incidents reported for the 2015-2019 calendar years are shown in the following table.

Rail Crossing Safety

FRA Crossing Number	Highway Crossing	Railroad Owner	City, County	Fatality	Injury	Reported Incident
003591R	Sky View Lane	BNSF	Unincorporated, Douglas			4
804480L	County Road 2 1/2	UP	Brighton		2	1
003617R	Private	BNSF	Louviers	2		
804614H	Holly	UP	Denver		1	1
057063P	Dahlia at 47th	BNSF	Denver			1
057064W	East 48th, West of Forest	BNSF	Denver			1
057197N	East 136th Ave	BNSF	Brighton			1
094499P	Yosemite St	BNSF	Commerce City			1
244818W	Valmont Rd	BNSF	Boulder	1		
244845T	Diagonal Hwy	BNSF	Longmont	1		
244847G	Coffman St	BNSF	Longmont			1
245007B	9th Ave	BNSF	Longmont			1
245288M	50th Ave	BNSF	Denver			1
245392G	Santa Fe Ave	BNSF	Denver		1	
245394V	Kalamath Ave	BNSF	Denver			1
253060H	Private	BNSF	Unincorporated, Douglas		1	
253265B	West 56th Ave	UP	Unincorporated, Adams			1
440170H	Yard Crossing	UP	Denver			1
594882K	East 52nd Ave	DRIR	Commerce City		1	
594898G	Holly St	DRIR	Denver			1
804385R	Carman's Crossing	UP	Denver			1
804479S	168th Ave	UP	Brighton			1
804487J	Bromley Ln	UP	Brighton			1
804603V	37th St	UP	Aurora			1
804609L	Monaco St	UP	Denver			1
805515N	County Road 29	UP	Unincorporated, Adams		1	
805532E	Peoria Rd	UP	Deer Trail	1		
906049P	East 33rd Pl	UP	Aurora			1
926715G	Private	BNSF	Denver			1

Highway-Railroad Crossing Incidents



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	At Grade Railroad Crossing with Incidents		DRCOG Planning Boundary
	At Grade Railroad Crossing		Interstates
	Class I Railroad		Highways
	Short Line Railroad		County Boundaries

N
0 5 10
Miles

Highway Delay

Recurring delays on congested corridors and at freight bottlenecks impose direct costs on the freight transport industry in terms of lost time and excess fuel consumption. Additionally, these delays impose greater costs on communities and travelers throughout the region in terms of related safety, air quality emissions, stress and lost time concerns. Congestion on regional roadways is expected to worsen and cannot readily be managed through additional roadway capacity. Potential improvements and investments to address these needs may include demand management

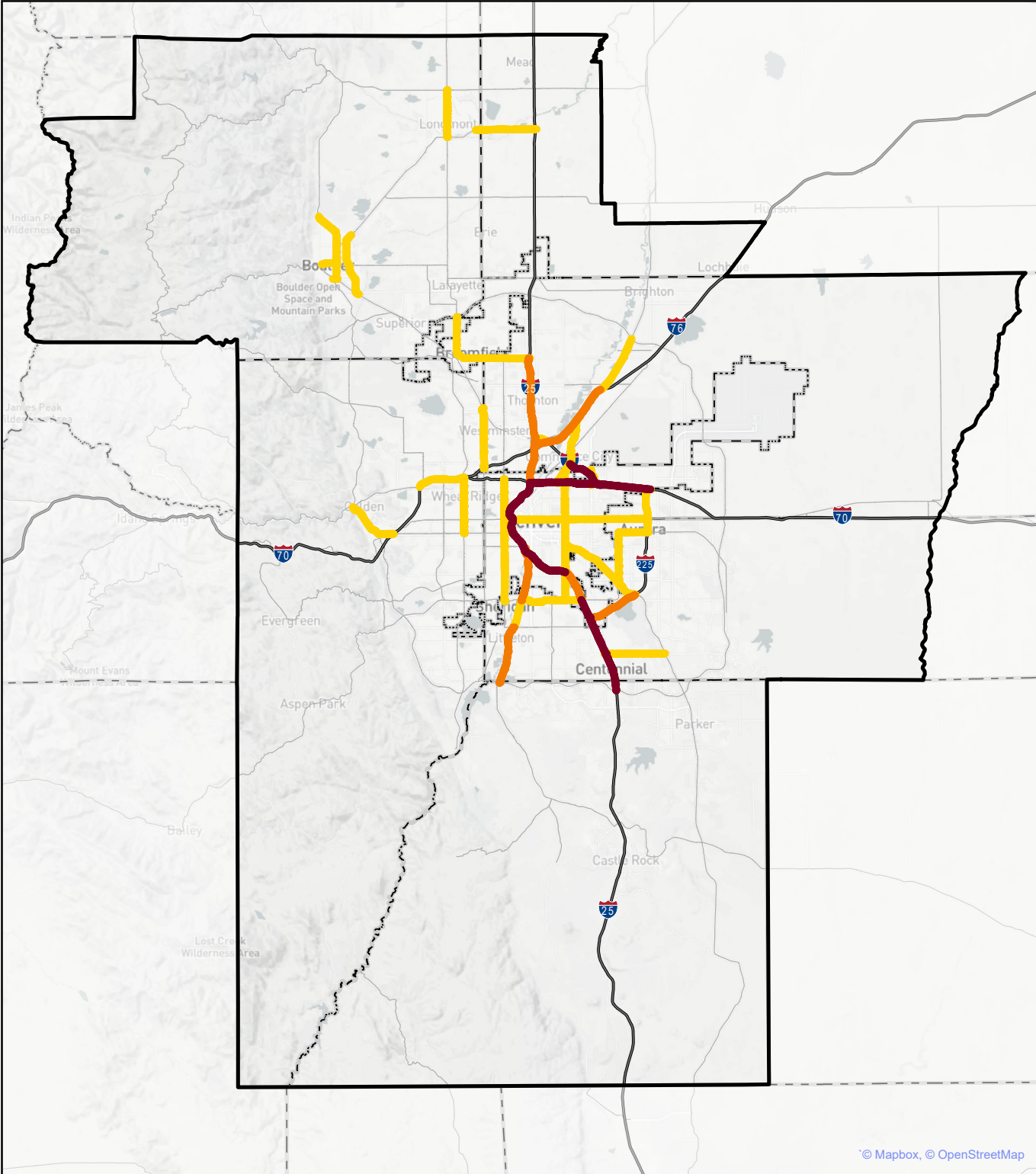
strategies, roadway and geometric improvements to eliminate bottlenecks, managed lanes and other solutions.

Truck Delay: This analysis identifies key corridor segments ranked by average annual truck delay. Using 2016 data from INRIX, the Texas Transportation Institute identified total estimated truck congestion costs and hours of delay for highway segments across the state. Congestion costs are products of time, fuel and associated economic activity. The region's top 20 segments ranked on annual truck delay per mile are shown in the following table.

Truck Delay Ranked by Annual Hours, 2016

Route — Corridor Limits	Annual Truck Delay per Mile (person-hours)	Annual Truck Congestion Cost (dollars)
I-25 – Santa Fe Drive (U.S. 85) to Colfax Ave (U.S. 40)	33,253	\$4,535,101
I-70 – I-25 to I-270	30,939	\$7,725,558
I-25 – Colfax Ave (U.S. 40) to I-70	29,650	\$5,099,139
I-270 – I-70 to CanAm Hwy (U.S. 6)	25,188	\$4,231,402
I-25 – Colorado Blvd (State Hwy 2) to Santa Fe Dr (U.S. 85)	23,128	\$4,097,898
I-70 – I-270 to I-225	21,831	\$4,465,656
I-270 – I-76 to I-25	20,771	\$524,712
U.S. 85 – W Hampden Ave (U.S. 285) to I-25	19,272	\$3,920,474
Quebec St (State Hwy 35) – I-70 to E 53rd Pl	15,680	\$1,039,614
I-225 – I-25 to S Parker Rd (State Hwy 83)	12,926	\$2,563,115
I-25 – Hampden Ave (State Hwy 30/State Hwy 285) to Colorado Blvd (State Hwy 2)	11,675	\$1,412,649
Colorado Blvd (State Hwy 2) – I-25 to Colfax Ave	10,110	\$1,987,171
U.S. 85 – State Hwy 470 to W Belleview Ave (State Hwy 88)	9,783	\$2,149,959
I-25 – I-270/U.S. 36 to 120th Ave (State Hwy 128)	9,025	\$2,722,487
U.S. 85 – I-76 to E-470 (State Hwy 470)	8,263	\$1,908,304
I-225 – E 6th Ave (State Hwy 30) to I-70	7,731	\$387,765
I-70 – State Hwy 58 to Wadsworth Blvd (State Hwy 121)	7,305	\$1,256,337
I-25 – C-470 to Hampden Ave (State Hwy 30/State Hwy 285)	7,033	\$2,505,409
U.S. 85 – W Belleview Ave (State Hwy 88) to W Hampden Ave (U.S. 285)	6,939	\$742,383
Vasquez Blvd (U.S. 6) – I-70 to I-76	6,177	\$1,653,031

Highway Delay



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Top Corridors by Truck Delay	DRCOG Planning Boundary
Delay as AADT	Interstates
500-15,000	Highways
15,001-35,000	County Boundaries
>35,000	



Highway Reliability

Travel time reliability is a key measure of the expected additional time that should be planned to ensure an on-time arrival. For example, a reliability measure of 2.0 for a corridor means that for a 30-minute trip in free flow traffic, a driver should plan on 60 minutes of travel to arrive on time during peak periods. Travel time reliability is affected by recurring congestion during peak travel times and by unexpected events such as crashes or weather. Commercial motor carriers must meet high standards for the on-time delivery of products and inputs to customers. Delays can mean missing delivery times to businesses, missing cutoff times for delivering goods or exceeding hours of service regulations, which can impact entire supply chain operations. Potential

improvements and investments to address these needs may include demand management strategies, roadway and geometric improvements to eliminate bottlenecks, managed lanes and other solutions.

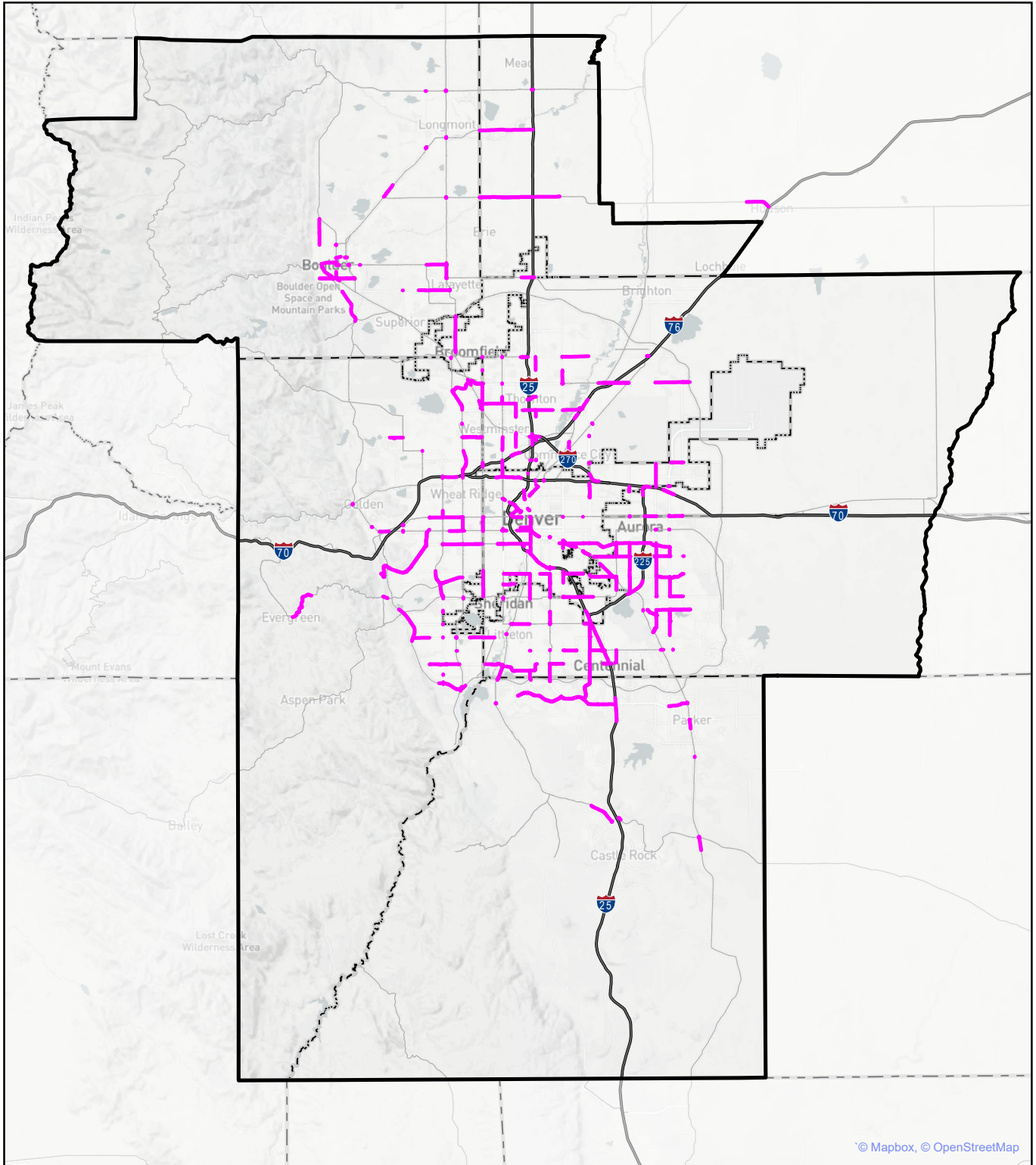
Truck Reliability: This analysis identifies key routes and corridor segments ranked by travel time reliability measures. The Texas Transportation Institute used 2016 INRIX data to develop these estimates for the morning peak period and processed consistent with standards for calculating Truck Travel Time Reliability and Planning Time Index measures as reported by DRCOG and CDOT.

The region's top 20 unreliable segments are shown in the table below.

Truck Travel Reliability, 2016

Route – Corridor Limits	Reliability Truck Travel Time Index	Planning Time Index (95 Percentile)
I-270 – I-76 to I-25	1.98	5.18
I-270 – I-70 to CanAm Hwy (U.S. 6)	1.85	4.04
I-70 – I-25 to I-270	1.76	4.02
I-25 – Colorado Blvd (State Hwy 2) to Santa Fe Dr (U.S. 85)	1.76	4.8
I-25 – Santa Fe Drive (U.S. 85) to Colfax Ave (U.S. 40)	1.72	4
I-225 – I-25 to S Parker Rd (State Hwy 83)	1.54	3.09
Colorado Blvd (State Hwy 2) – I-25 to Colfax Ave	1.5	2.68
I-70 – I-270 to I-225	1.44	2.87
E Hampden Ave (U.S. 285) – CanAm Hwy (U.S. 85) to I-25	1.41	2.57
I-25 – Colfax Ave (U.S. 40) to I-70	1.4	2.92
I-25 – Hampden Ave (State Hwy 30/State Hwy 285) to Colorado Blvd (State Hwy 2)	1.39	2.34
Baseline Rd – Broadway (State Hwy 7) to Denver Boulder Turnpike (U.S. 36)	1.39	2.72
S Santa Fe Dr/ CanAm Hwy (U.S. 85) – W Hampden Ave (U.S. 285) to I-25	1.38	2.58
Quebec St (State Hwy 35) – I-70 to E 53rd Pl	1.38	2.16
Canyon Blvd (U.S. 7) – State Hwy 93 to U.S. 36	1.38	2.04
W Colfax Ave (U.S. 40) – I-25 to Colorado Blvd (State Hwy 2)	1.37	2.62
S Santa Fe Dr/ CanAm Hwy (U.S. 85) – State Hwy 470 to W Belleview Ave (State Hwy 88)	1.36	2.32
E Colfax Ave (U.S. 40) – Colorado Blvd (State Hwy 2) to I-225	1.35	2.2
28th St (U.S. 36) – Broadway (State Hwy 7) to Baseline Rd	1.34	2.18
S Parker Rd (State Hwy 83) – I-225 to Colorado Blvd (State Hwy 2)	1.33	2.19

Highway Reliability



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Truck Travel Time Reliability Index

A.M. Peak Period

— >3.0

DRCOG Planning Boundary

Interstates

Highways

County Boundaries



Highway Bottlenecks

Identifying congested bottlenecks, particularly those located on critical regional freight corridors and important to goods movement, can help inform investment decisions, target operational approaches and examine safety improvements. A traffic jam is typically caused by more vehicles on a roadway at the same time than the road can accommodate. A traffic bottleneck is a specific disruption caused by the physical design of the road (for example, a sharp curve), lane reduction or merge area, traffic signals, weather hazards or temporary situations, such as a traffic crash or a construction work zone. Traffic slowing at the start of the bottleneck can have ripple effects for following traffic, often for many miles over relatively minor incidents or issues. Potential

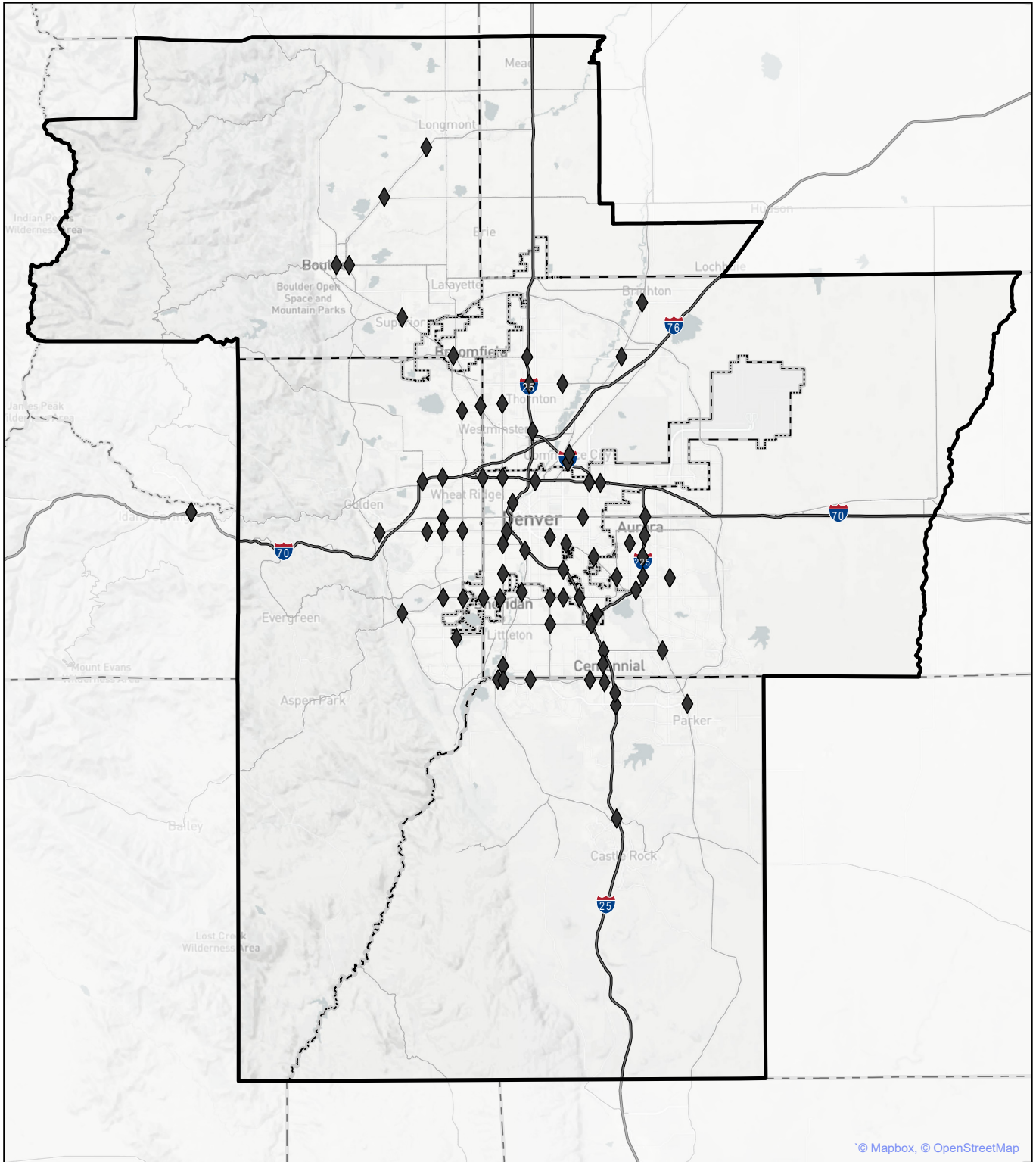
solutions can include geometric or design improvements, additional merge areas to accommodate truck traffic or safety improvements.

Highway Bottlenecks: This analysis was performed by CDOT in 2017 using INRIX data to identify specific locations with a 10% reduction from posted speeds for a period of three consecutive months. Bottleneck segments with high average annual daily truck traffic are located along key urban corridors that are routinely severely congested. Bottlenecks in areas with relatively high percentages of truck traffic may indicate key connectors, specific design or operational features that could be improved. The region's top 25 bottlenecks ranked by percent truck traffic are shown in the following table.

Highway Bottlenecks

Route and Direction	Milepost Begin - End	Average Annual Daily Truck Traffic	Percent of Truck Traffic
I-76 eastbound	12-13	5,190	19.9%
I-70 westbound	288-288	1,723	14.8%
U.S. 85 northbound	227-229	3,622	13.6%
U.S. 85 southbound	227-229	2,211	13.6%
U.S. 85 northbound	229-229	3,528	13.2%
I-76 westbound	12-13	3,102	13.2%
U.S. 85 southbound	229-230	2,124	13.2%
I-76 eastbound	7-8	6,270	13.2%
I-76 westbound	7-8	4,730	13.2%
I-270 westbound	2-3	5,394	13.0%
I-270 eastbound	1-2	6,102	13.0%
I-270 eastbound	0-1	6,102	11.2%
I-270 westbound	1-2	5,198	11.0%
I-70 eastbound	276-276	8,321	11.0%
I-70 westbound	276-276	7,379	10.9%
I-76 westbound	1-2	3,960	10.9%
U.S. 85 northbound	230-230	2,090	10.9%
I-70 westbound	275-276	7,415	10.9%
I-25 northbound	214-215	13,500	10.8%
I-70 westbound	275-275	7,452	10.7%
I-25 southbound	215-216	10,580	9.8%
State Hwy 83 northbound	36-38	198	9.8%
State Hwy 83 northbound	40-42	198	9.8%
I-25 northbound	212-212	12,480	9.7%
I-25 southbound	212-212	11,520	9.7%

Highway Bottlenecks



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-  Highway Bottlenecks
-  DRCOG Planning Boundary
-  Interstates
-  Highways
-  County Boundaries


0 5 10
Miles

Low-Clearance and Weight-Restricted Bridges

The design of bridges, tunnels or overpasses along regional freight corridors and other key routes may restrict truck or rail movements. Older bridges or bridges not designed to handle heavier vehicles may have restrictions on the total gross vehicle weight that may cross. Some bridges may require a permit for heavier loads while others cannot be used by commercial vehicles even with permits. Bridge and tunnel vertical clearances may also restrict truck travel along certain routes or prohibit rail lines from carrying high loads, such as double-stack containers. Weight restricted or low-clearance bridges cannot be used by certain vehicles or may require oversize trucks to detour long distances, which imposes travel time costs and inefficiencies on businesses.

Low Clearance Bridges: CDOT maintains detailed bridge inventories for structures across the state. The statutory requirement for bridges over interstates, U.S. routes and state highways is a vertical clearance of 14 feet, 6 inches. Clearances less than this are considered to be very low clearance and may restrict freight movements. Bridges considered to be low clearance are those less than minimum design requirement of 16 feet, 6 inches. Not captured in this needs analysis are privately owned structures such as rail overpasses or underpasses and some locally owned bridge structures.

Weight-Restricted Bridges: Bridges not adequately designed for heavier truck traffic are identified as either posted for load or with load restriction. All vehicles exceeding specified weights on bridges posted for load are prohibited, including those with overweight permits. Overweight vehicles may use weight-restricted bridges with permits.

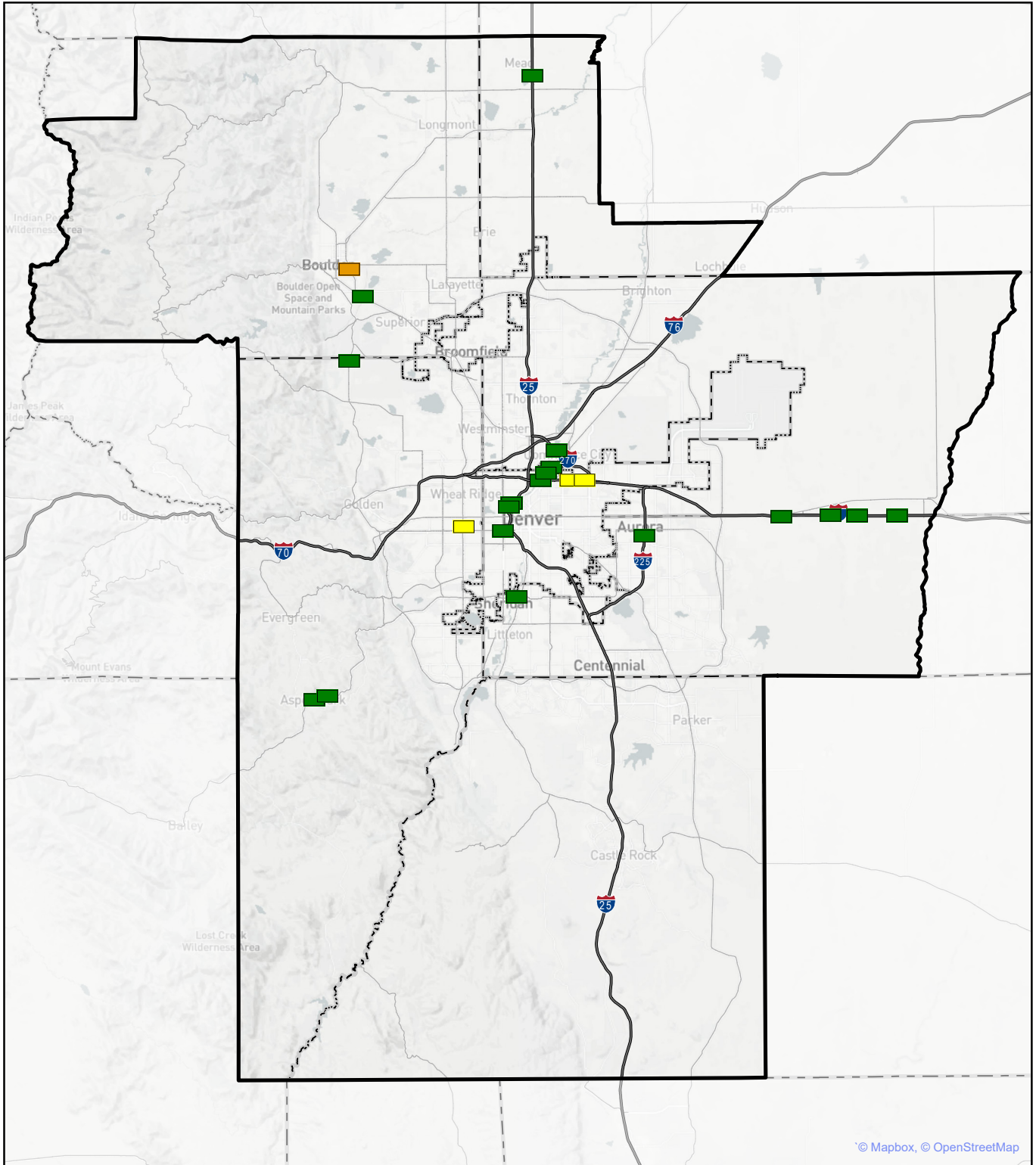
Very Low-Clearance Bridges

Route	Intersecting Facility	Clearance (feet)
State Hwy 265 Mainline	BNSF Railroad	11.3
South Boulder Creek Rd	U.S. 36 Mainline	11.7
County Rd 32	I-25 southbound	12.7
County Rd 32	I-25 northbound	12.8
Ditch Rd, Burlington	I-270 westbound	12.8
I-25 Mainline	Speer Blvd southbound	13.0
I-25 Mainline	Speer Blvd northbound	13.5
South Platte River Roadway	U.S. 285 Mainline	13.7
Aggregate Rd	State Hwy 93 Mainline	13.8
I-25 Mainline	23rd Ave	13.8
I-70 Service Road	Cattle Overpass	14.0
Race St	State Hwy 265 Mainline	14.0
Ditch Rd, Burlington Canal	I-270 eastbound	14.0
North Access Road	U.S. 285 Mainline	14.0
County Rd 31 / 125 (Brick Center Rd)	I-70 eastbound	14.0
County Rd 22 / 89 (Hayesmount Rd)	I-70 eastbound	14.2
Conifer Rd	U.S. 285	14.2
County Rd 26 / 105 (Quail Run Rd)	I-70 eastbound	14.2
U.S. 6 Mainline	State Hwy 88	14.2
County Rd 26 / 105 (Quail Run Rd)	I-70 westbound	14.2
County Rd 31 / 125 (Brick Center Rd)	I-70 westbound	14.2
County Rd 28 / 113 (Manilla Rd)	I-70 eastbound	14.4
Second Ave	I-225 northbound	14.5
County Rd 22 / 89 (Hayesmount Rd)	I-70 westbound	14.5
County Rd 28 / 113 (Manilla Rd)	I-70 westbound	14.6








Weight-Restricted Bridges

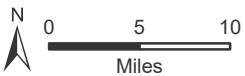
Route (Milepost)	Intersecting Facility	Current Weight Restrictions
State Hwy 7 eastbound (53.2)	Boulder Creek	Orange
U.S. 6 (125.5)	State Hwy 121 Mainline	Yellow
I-70 eastbound (276.9)	Dahlia St	Yellow
I-70 westbound (277.9)	Monaco St	Yellow

Low-Clearance and Weight-Restricted Bridges



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 Low Clearance Bridges	 DRCOG Planning Boundary
Bridges with Weight Restriction	 Interstates
 Orange	 Highways
 Yellow	 County Boundaries









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