steer davies gleave

Regional Trail Connections Study

Final Report
October 2016

Denver South Economic Development Partnership

Our ref: 22772401

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1 Introduction

1.1 Project Goals and Objectives

Steer Davies Gleave was contracted by the Denver South Transportation Management Association (TMA) to initiate the planning process for a regional bicycle trail network connecting the Southeast I-25 Corridor communities, serving as both a commuter connection and recreational amenity to area employers, employees and residents.

The I-25 Corridor is integral to economic activity in the state of Colorado. Businesses and residents choose to locate along the I-25 corridor to take advantage of high quality development, access to major roadways, high capacity transit links, and an educated local work force. The Denver South TMA supports planning for critical infrastructure that enhances the Southeast I-25 Corridor as a top choice for business, employees, and residents.

This Regional Trails Connection Study is a high level corridor plan for a regional bicycle trail network which will allow the Denver South TMA to advance grant applications for further planning, design, and ultimately construction of multimodal (bike and pedestrian) facilities. The Denver South TMA envisions a plan similar to the South Platte River Trail, Clear Creek Bike Path, Cherry Creek Bike Path, and the Sand Creek Regional Greenway – all of which were significant investments that have increased the economic competitiveness of the region.

The purpose of this study was to engage Denver South TMA members and stakeholders in a regional bike planning process, with the following objectives:

- Provide a major north-south transportation link between Southeast I-25 Corridor communities, the City of Denver and surrounding destinations.
- Link to existing and planned urban trail networks.
- Connect major parks and destinations (including transit stations) throughout the region.
- Benefit all member jurisdictions, including Arapahoe County, Douglas County, City of Centennial, City & County of Denver, City of Greenwood Village, City of Lone Tree, Town of Parker, City of Aurora, City of Englewood and the City of Littleton.

In collaboration with the Denver South TMA, the Steer Davies Gleave team worked with stakeholders in corridor communities to develop a long-term vision for the regional trail network. The approach included identifying infrastructure gaps in the existing network, recommending alternative trail corridors to unlock latent demand for bicycling and walking, and developing objective measures to prioritize trail connections with the highest probability of success.

1.2 Schedule

The project involved several components: kickoff meetings, data gathering, technical committee workshops and meetings, and final plan development. Figure 1 identifies key project milestones.

Figure 1. Overall project schedule

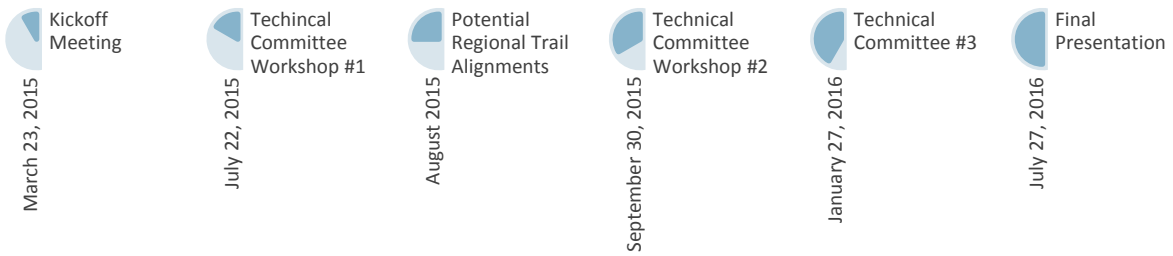


Figure 2. Bike to Work Day event sponsored by the Denver South TMA.

1.3 Relationship to Regional/Local Plans

Several regional and local planning documents overlap with the goals of the Denver South Regional Trail Connections Study. These include regional transportation plans, which encompass an array of transportation-related issues, including active transportation modes. This also includes Bicycle Plans initiated by stakeholder cities to address improvements to bicycle infrastructure. The following is a brief description of related planning documents and how the Denver South Regional Trails Connections Study supports broader planning objectives.

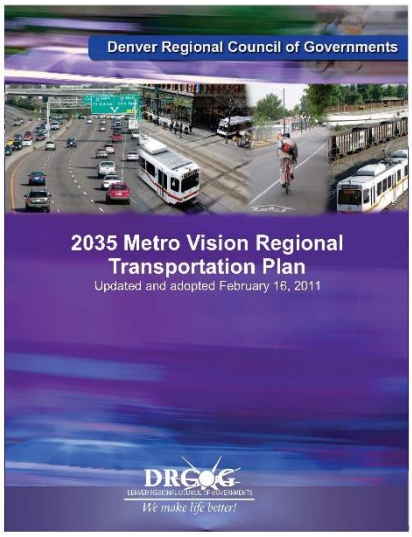
1.3.1 DRCOG Metro Vision 2035 Regional Transportation Plan

https://drcog.org/sites/drcog/files/resources/2035 MVRTP-2010 Update with App 2-9_0.pdf

The Denver Regional Council of Governments Metro Vision 2035 Regional Transportation Plan, updated in February 2011, establishes a 25-year multimodal transportation plan for the region encompassing Boulder, Weld, Broomfield, Adams, Jefferson, Denver, Arapahoe, and Douglas Counties. The plan responds to projected population growth and includes elements to guide sustainable development, preservation of open space, and a well-integrated, multimodal transportation system.

Bicycle accessibility and multimodal connectivity emerge as two important themes in the document. Specifically, the vision for urban centers is that the Denver region "will become an international model for healthy livable communities by developing vibrant urban centers connected by a robust multimodal network throughout the area" (p24).

The plan also calls for an area-wide trails network to link open spaces. The document states several off-street trails should form the backbone of the system when completed. Those highlighted in bold are pertinent to the Regional Trails Connection Study.

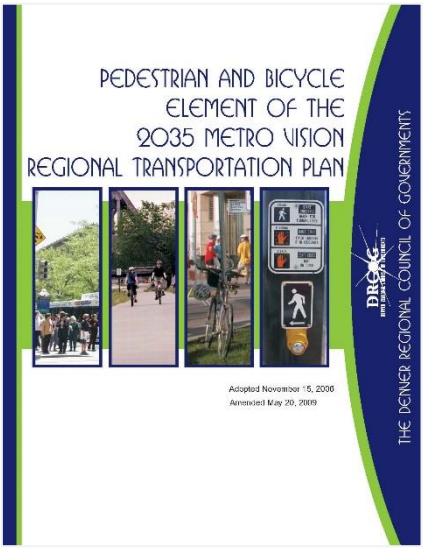


- Bear Creek Trail (Evergreen to Englewood)
- Big Dry Creek Trail (Standley Lake to North Thornton)
- C-470 Trail (Golden to I-25)
- Cherry Creek Trail (downtown Denver to Franktown)
- Clear Creek Trail (Jefferson County Line to South Platte River Trail)
- E-470 Trail (Lone Tree to Thornton)
- InterCounty Non-Motorized Corridor I-70 Mountain Trail (Loveland Ski Area to Jefferson County Line)
- Ralston Creek Trail (SH-93 to Clear Creek Trail)
- Sand Creek/Toll Gate Creek Trail (Commerce City to south Aurora)
- South Platte River Trail (Chatfield Reservoir to Brighton)
- US-36 Bikeway (Boulder to Clear Creek Trail)

The Regional Trail Connections Study is an important step forward in completing the regional network of trails established in the MVP 2035. As explained in this DRCOG document, the precise location of corridor facilities was not known or included in this report. Therefore, the Denver

South Regional Trail Connections Study helps to identify existing facilities, as well as gaps in the system, and establish the best routes for community and regional connectivity.

The Pedestrian and Bicycle Element of the 2035 Metro Vision Regional Transportation Plan (2010) offers further details about walking and biking in the region, including an inventory of local of-street trails.



Several trails fall within the Denver South TMA jurisdiction and have been incorporated into the Regional Trails Connections Study, including:

- Cherry Creek Trail
- C-470 Trail

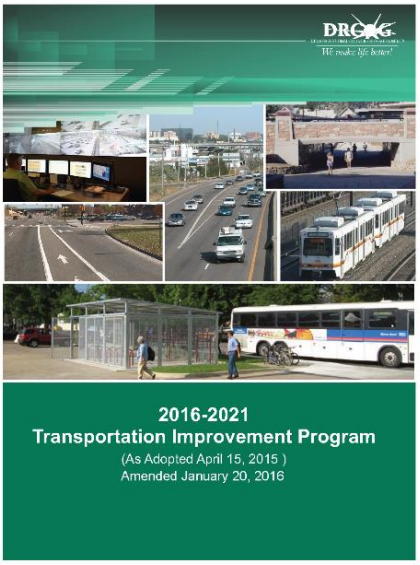
1.3.2 DRCOG Transportation Improvement Plan 2016-2021

https://drcog.org/sites/drcog/files/resources/DRCOG%202016-2021%20TIP-Amended%20January%2027%202016_0.pdf

The fiscally constrained Transportation Improvement Program (TIP) 2016-2021, developed by the DRCOG in cooperation with local governments, outlines the federally funded surface transportation projects to be implemented within the following six years. Where the MVP 2035 represents long-range visioning about the region's transportation system, the TIP 2016-2021 is intended to guide more immediate action.

The TIP identifies bicycle facilities projects, several that fall within stakeholder jurisdictions:

- The Metro Center Station Area Bike/Ped Connector Facility, a multi-use path near the Aurora Municipal Center Complex sponsored by Aurora.
- Toll Gate Creek Trail, a multi-use trail from Chambers Road to Montview Boulevard sponsored by Aurora.
- Westerly Creek Trail to Toll Gate Creek Trail Connector, which provides connections to the Florida light rail station sponsored by Aurora.
- 23rd Ave. Bike/Ped Path at Fitzsimons Station sponsored by Aurora.
- C-470 Multi-use Trail: Grade Separation at Yosemite Street sponsored by Douglas County.
- Parker Rd Sidewalk Connection: Plaza Drive to Sulphur Gulch Trail sponsored by Parker.
- Washington Ave Complete Streets sponsored by Golden.
- I-70/Genesee Bike Path sponsored by CDOT sponsored by Denver.
- Sheridan Blvd Sidewalks: W. 8th Ave to W. 10th Ave and Colfax Ave to W. 17th Ave sponsored by Denver.



1.3.3 Stakeholder Bicycle Plans

Several Denver South TMA stakeholders have already prepared Bicycle and Pedestrian Plans that inventory existing bicycle facilities and outline improvements to local and regional networks. For example, the City and County of Denver updated the Denver Moves: Enhanced Bikeways plan for on-street bikeways in 2016, which includes recommendations for ways to improve the City's facilities downtown and connect to adjacent neighborhood corridors and off-street trails (See Section 6.4 Best Practices for link to design guides). Two new bike lanes, in particular, overlap with the Denver South TMA region:

- On-street bike lane from S. Monaco east to S. Yosemite Street, with sharrows from S. Ulster to DTC Boulevard.
- On-street bike lane from E. Belleview north to the east-bound I-225 on-ramp.

The following table presents the relevant planning documents from stakeholder cities and counties, with links to where they can be found one their agencies websites.

Table 1. Stakeholder bicycle plans

Stakeholder	Plan	Year	Link
City and County of Denver	Denver Moves: Enhanced Bikeways Plan	2016	https://www.denvergov.org/content/denvergov/en/bicycling-in-denver/planning.html
City of Englewood	Walk and Wheel Plan	2015	http://www.englewoodgov.org/home/showdocument?id=12798
City of Aurora	Bicycle and Pedestrian Master Plan	2012	https://www.auroragov.org/UserFiles/Servers/Server_1881137/File/Business%20Services/Economic/Transportation%20Planning/Bicycle%20and%20Pedestrian%20Planning/015491.pdf
City of Littleton	Bicycle and Pedestrian Master Plan	2011	http://www.littletongov.org/home/showdocument?id=743
Douglas County	Bicycle Plan	2009	http://www.douglas.co.us/dcoutdoors/comprehensive-bike-plan/
City of Centennial	Bicycle and Pedestrian Master Plan (Part of Transportation Master Plan)	2007	https://www.centennialco.gov/uploads/FileLinks/b1bd7c35beeb404182da70aa421aa9a5/Transportation_Plan_Final_Approved_Document_12_2013_with_Appendicies_reduced_size.pdf
Town of Parker	Bike Lane Plan (Addendum to Open Space, Trails and Greenways Master Plan)	2005	http://www.parkeronline.org/DocumentCenter/View/14300
Arapahoe County	Bicycle and Pedestrian Master Plan	In development	http://arapahoebikeped.com/

2 Background Review and Analysis

2.1 Existing Conditions

Spatial analysis was conducted using ArcGIS to identify the network of existing and planned bicycle lanes, bicycle routes, and multi-use trails within the region. In addition to local on-street facilities, several off-street multi-use (paved) trails traverse the Southeast I-25 communities. These off-street trails provide recreational opportunities for bicycling, walking and running and also serve an important transportation function by complementing the on-street bicycle and pedestrian system throughout local communities.

In addition, the spatial analysis also considered population density, employment density, number of schools, number of transit stops, and proximity to key destinations along key corridors in the region. This information was particularly useful when stakeholders were discussing prioritization. For example, the initial Route 5, a north-south corridor running the length of the TMA region, was ultimately reconfigured as a segment of Priority Route 2 based on its connections to residents and jobs.

Figures 4-6 show the existing conditions in the TMA region, including: the existing local and regional bicycle routes and multi-use trails, the 2035 DRCOG vision for a regional bike network, and the proximity of existing bicycle facilities to regional employment centers.

Figure 3. Bike to Work Day kiosk for employees.

Figure 4. DRCOG 2013 Bicycle infrastructure (2013 bicycle inventory)

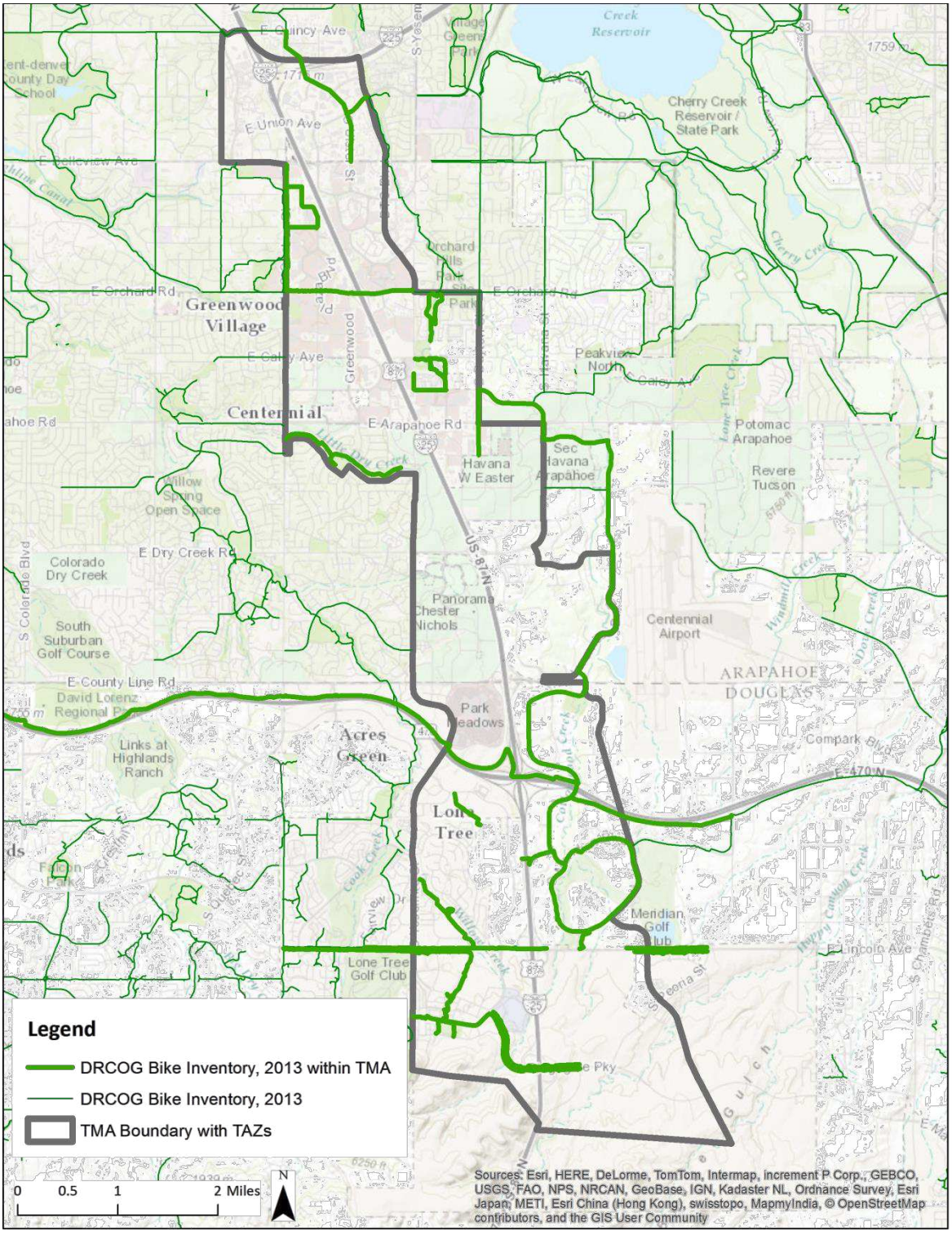


Figure 5. DRCOG 2035 vision (undergoing update) with regional bike corridors

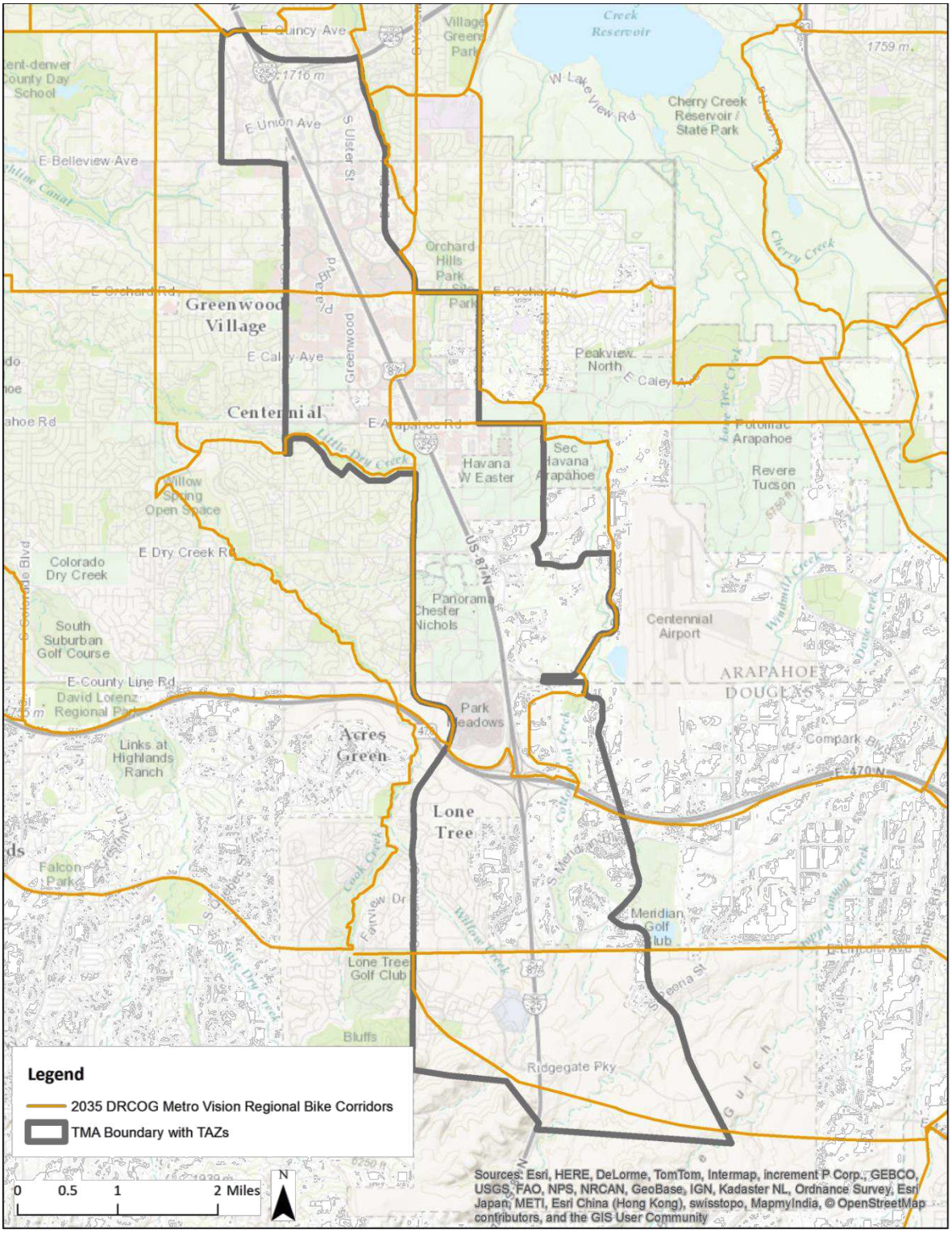
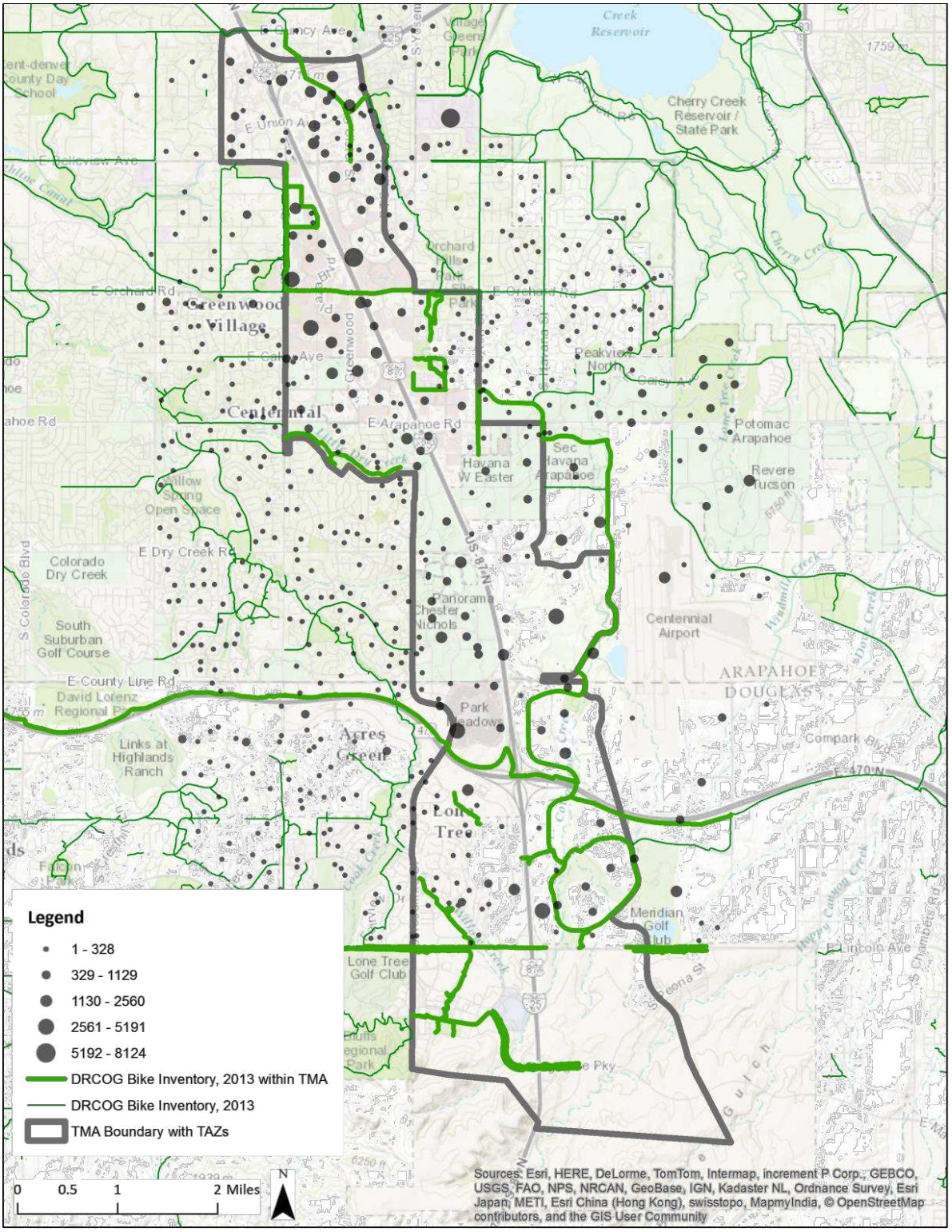


Figure 6. 2011 Employment in the TMA and current DRCOG bicycle facilities



3 Stakeholder Consultation

Stakeholder outreach was conducted in order to establish the South I-25 Urban Corridor Study Technical Committee, a central decision-making body comprising representatives from transportation, economic development, tourism and parks and open space staff within each jurisdiction. During the project initiation phase, the Steer Davies Gleave team met with members of the Denver South TMA to identify key stakeholders to be included in the planning process. The goal of establishing such as committee was to build strong partnerships with member communities and incorporate a variety of planning perspectives, thereby enhancing the vision of the Regional Trails Plan and facilitating its implementation.

3.1 Technical Committee

The Technical Committee consisted of representatives from Denver South TMA and stakeholder jurisdictions, including: Arapahoe County, Douglas County, City of Centennial, City & County of Denver, City of Greenwood Village, City of Lone Tree, Town of Parker, City of Aurora, City of Englewood and the City of Littleton. Bicycle coordinators in local jurisdictions also participated in workshops.

3.2 Workshops

Three workshops were held with the Technical Committee in order to gather information, identify suitable trail corridors, prioritize corridors and develop consensus for a regional trail network.

3.2.1 Workshop 1 Understanding Regional Bicycle Infrastructure and Connections

During the first workshop, stakeholders broke into groups to study regional trail maps and identify missing infrastructure (existing or planned). The groups identified key destinations, outlined potential route alignments, and discussed opportunities and challenges associated with each potential corridor.

Twelve potential bicycle corridors were identified during the first workshop on the basis of ability to: a) provide connectivity across the Denver South sub-region; b) link key destinations, transit stations, and employment centers; and c) link trails to each other to provide additional options. The draft network map is provided in Figure 8Figure 11 in Section 4.

3.2.2 Workshop 2 Finalizing and Prioritizing Routes

During the second workshop, stakeholders participated in two group exercises. First, they discussed the initial network plan developed in Workshop 1 and whether corridors should be combined or amended. Second, the groups discussed prioritization of potential corridors.

As part of discussions during this workshop, the original network was simplified to improve directness and legibility of the network. As a result, several corridors were consolidated and the total number of corridors was reduced from twelve to eleven. Stakeholders also identified two north-south corridors and two east-west corridors that could be potential priorities.

3.2.3 Workshop 3 Completing the Plan

During Workshop 3, stakeholders continued to discuss the revised network and corridors identified in Workshop 2. Further discussion centered around: a) which sections should be prioritized b) which jurisdictions/champions were identified in each location and c) specific types of improvements that could be implemented along each corridor.

The result of the workshop was confirmation of the regional bicycle trail network which consisted of eleven corridors, including four priority corridors (two North-South and two East-West) and seven secondary corridors. The final network plan is provided in Section 5.1.

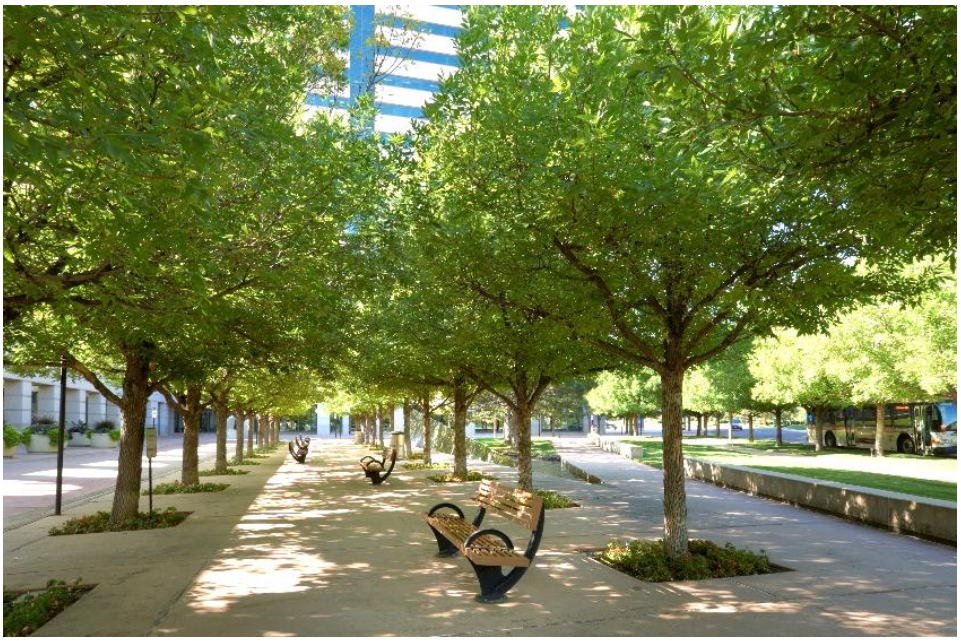


Figure 7. Public spaces in Denver South TMA region.

4 Network Planning Analysis

The Denver South TMA and stakeholders identified several key points related to missing data, key destinations, connectivity, route alignments, and challenges to implementation, which informed the network planning analysis.

4.1 Missing Data

Stakeholder groups compared working maps with regional and local trail maps and plans and determined where data was missing. This process was highly dependent on local knowledge supplied by the TMA's partners. Initially, groups considered excluding existing foot paths 8-feet wide from the network. However, in order to account for the possibility of adding to or improving existing infrastructure, the groups decided to add 8-foot footpaths and sidewalks back into the working maps to allow those connections to be included in the larger discussion. Plans that were found missing were then added to the working map for this project.

4.2 Key Destinations and Intermodal Connectivity

Stakeholder groups also discussed how the final network would provide access to key destinations, such as employment centers, transit stations, parks, schools, and other places of interest. Spatial and demographic analysis conducted previously provided information about where key destinations were located in proximity to existing and proposed trails.

The Denver South TMA caters predominantly to employees commuting into or out of the area, therefore access to transit stations and employment centers was a key focus. Employment centers were categorized on a scale, with 100-500 employees being the smallest and 5,000 or more employees being the largest. Several medium and large employers are located along the proposed corridors, including Comcast, Intuit, Oracle, Dish Network, Skyridge Medical Center and Kaiser Permanente.

In terms of intermodal connectivity, the working maps were updated to include both existing and future (planned) light rail stations. Six existing light rail stations fall within the TMA boundary including Belleview, Orchard, Arapahoe, Dry Creek, County Line and Lincoln Stations. In addition, three proposed light rail stations are located at the southern end of the project area: Skyridge, Lone Tree, and Ridgegate. These stations have been approved by the RTD Board of Directors as part of the Southeast Rail Extension Project, a 2.3-mile extension of the existing light rail scheduled to begin construction in 2016.

Despite the employer focus, stakeholder groups also acknowledged the importance of residents accessing the trail network. Residents, although typically more dispersed than employers, were identified by population and number of households during the demographic analysis. Special consideration was given to households without automobile access.

The working maps were updated to show elementary and middle schools, high schools, and colleges within the vicinity of the proposed network. Several private and public grammar and high schools are located along proposed corridors, including: Cherry Hill High School, Valor Christian High School, Highlands Ranch High School, among others. Columbia College and Regis University are also linked to primary corridors in the final network.

Other key destinations included parks and open spaces, shopping centers and entertainment venues, such as:

- Highland Heritage Regional Park
- Cherry Creek State Park
- Heritage Shopping Station
- Millennium Plaza
- Fiddler's Green

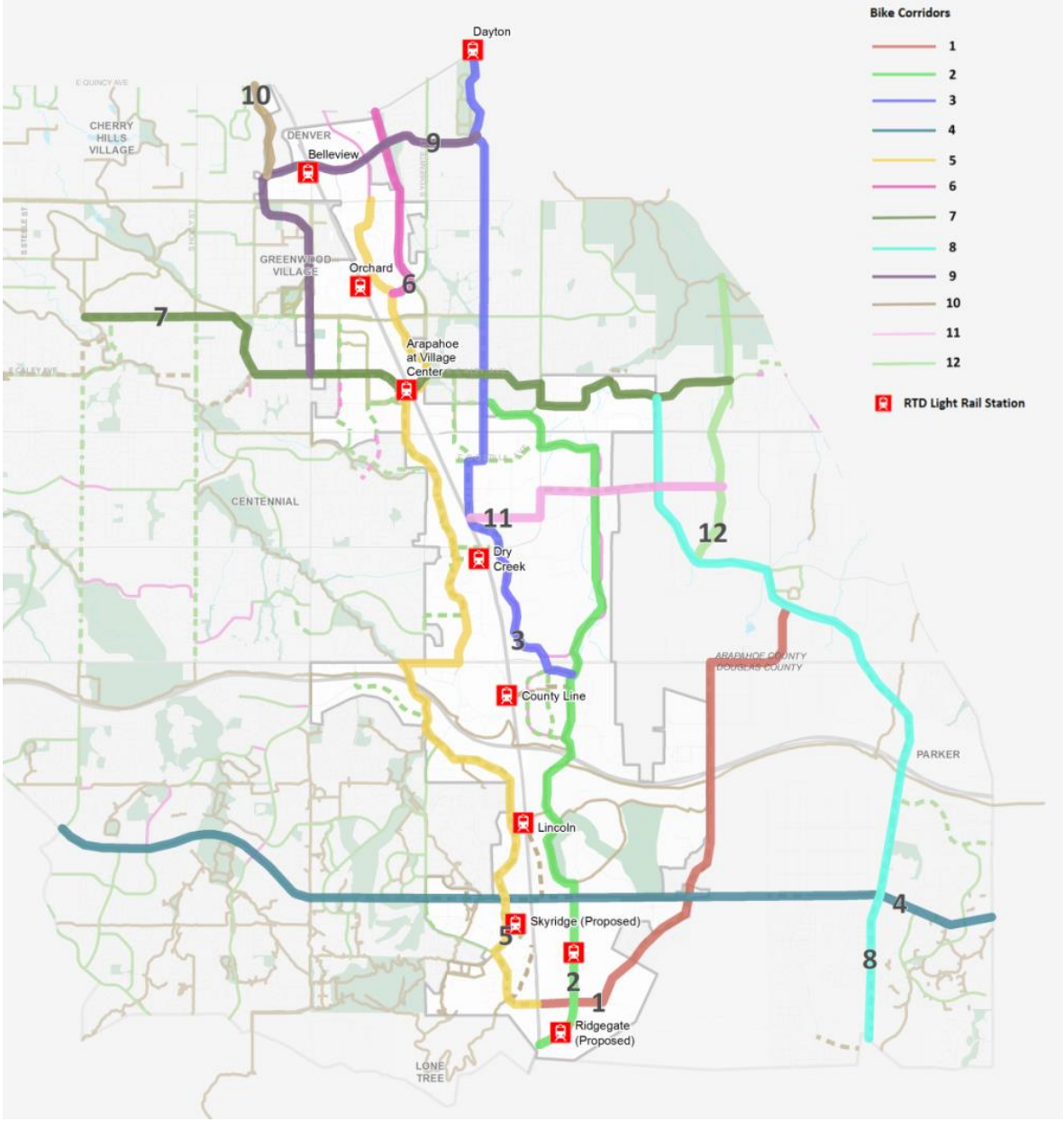
4.3 Potential Route Alignments

Based on the identification of key destinations, twelve initial route alignments traversing the TMA region were identified in both north-south and east-west directions (Figure 8). The proposed corridors emphasized route connectivity among existing bike lanes, bike routes, and multi-use trails.

Through further discussion and analysis, these initial twelve corridors were revised and simplified into the final network of eleven primary and secondary routes. For example, various segments from previous routes 5, 7, 9 and 10 were reconfigured into Final Route 1, which runs north-south parallel to I-25. By doing so, participants eliminated excess highway crossings at Belleview light rail station and provided one seamless route from the City of Denver to Lone Tree. Although the reconfigured alignment eliminated light rail access at Belleview, the final route passes nearby four existing or planned light rail stations.

Similarly, segments of previous routes 2, 5, 6, and 11 were consolidated into final Route 2, another corridor running parallel to I-25 to the east. This route also offers nearby access to existing and proposed light rail stations, but avoids unnecessary highway crossings. It also links to several secondary routes, which expand the networks connectivity to areas in the eastern TMA region.

Figure 8. Initial route network (Workshop 1)



4.4 Issues and Challenges of Routes

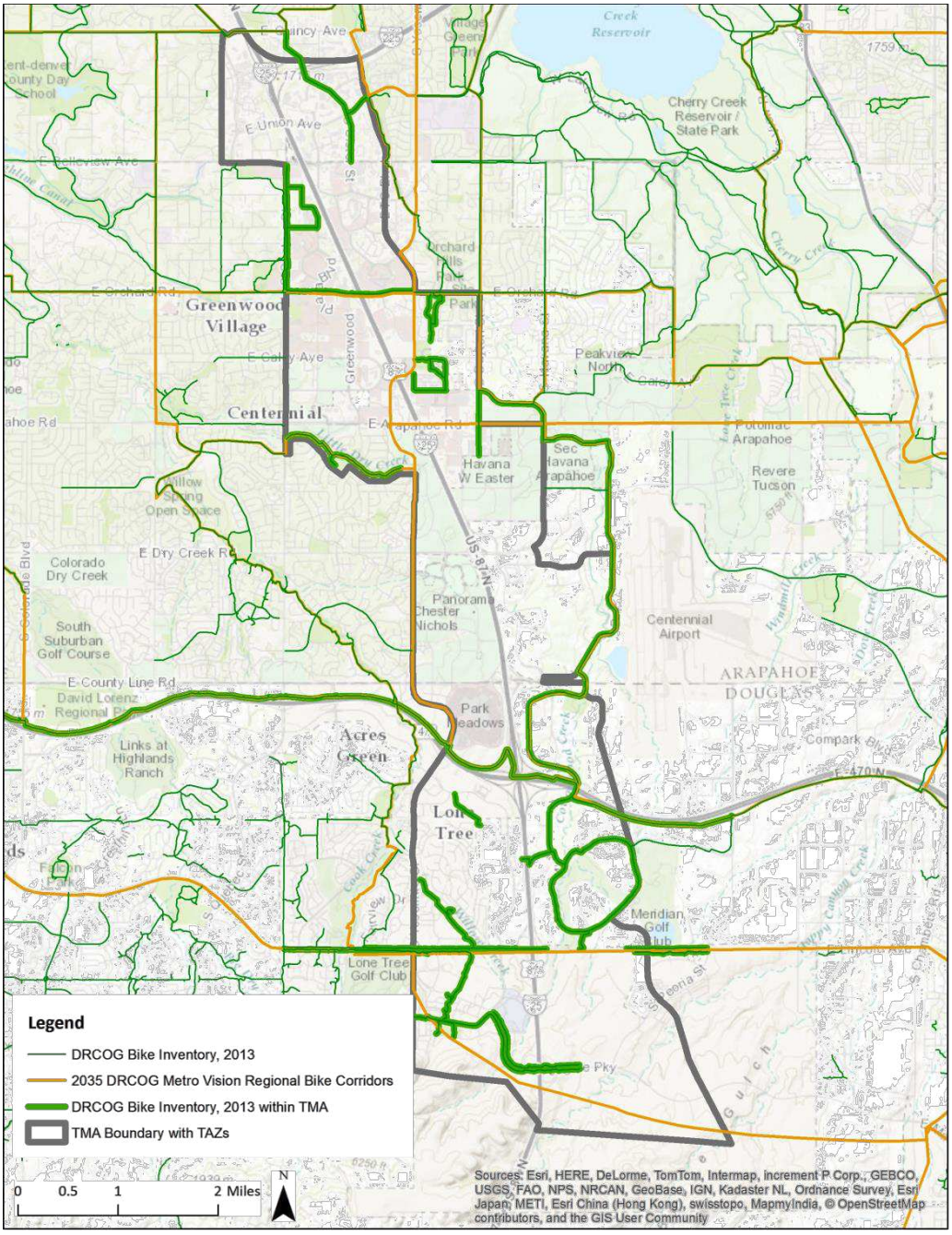
During the discussion of initial and final corridors, stakeholders also addressed major planning obstacles and challenges associated with each of these routes. In terms of geographical barriers, stakeholders expressed concern about safety near highway crossings and on major roadways. The final network eliminated as many I-25 crossing points as possible, restricting them to transit hubs. Arapahoe Road, a major thoroughfare, was another concern. Both the draft and final route network completely avoid this road, and instead, provide a northern and southern east-west alternative for bicyclists. The final Route 3 runs parallel to Arapahoe Road and offers access to Arapahoe at Village Center Station, Fiddler's Green, and the Heritage Shopping Center.

In terms of jurisdictional barriers, participants discussed right-of-way issues, Colorado Department of Transportation (CDOT) and Regional Transportation District (RTD) involvement, and the costs associated with funding these projects.

4.5 Missing Links/Gaps in the Network

The final route network comprises both existing and proposed bike lanes, bike routes and multi-use trails. Figure 9 shows the existing DRCOG bicycle infrastructure and Vision 2035 plan together. There are few north-south and east-west corridors that cross the TMA area and many gaps. The vision of the Regional Trail Connections Study resolves some of these discrepancies.

Figure 9. DRCOG bicycle infrastructure and 2035 vision bike corridors together



4.6 Partner Priorities and Recommended Improvements

Finally, stakeholders identified priorities for the Regional Trail Connections Study, the Denver South TMA and its partners. Partners wanted to see more collaboration and cooperation among stakeholders, inclusive of members of the public. The emphasized the importance of building a shared long term version for the project and mobility in the region as a whole.

4.7 Prioritization Process/Results

Based on the absence of regional north-south corridors, and the original goals for this study, Routes 1 and 2 were reconfigured from the initial plan and elevated to priority status. Routes 3 and 4 were also singled out as priority routes. These routes also satisfied other key goals, such as filling out the network, closing gaps, and connecting to transit, employment centers, and major destinations.

The remaining (secondary) corridors were also reconfigured from a route planning perspective in order to maximize coverage while simplifying the network.

Figure 10. Bicycles lined up outside of Denver South TMA employers on Bike to Work Day.

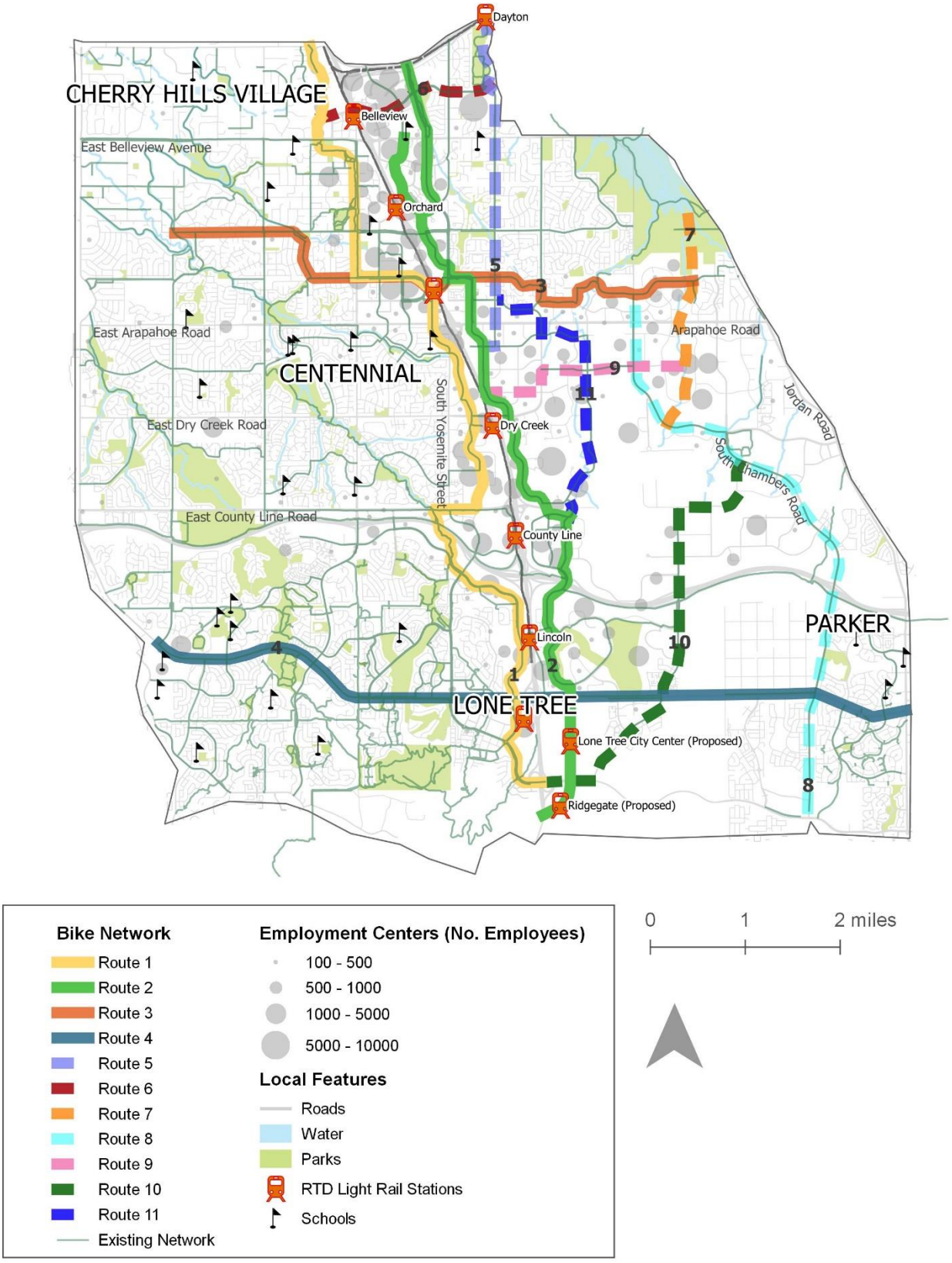
5 Final Trails Plan

5.1 Overview

The final trails plan simplified the network, reducing twelve corridors to eleven. Like the initial plan, it identified four priority corridors and seven secondary corridors. The four priority corridors were identified on the basis of route connectivity and access to transit stations and include two north-south corridors (Routes 1 and 2) and two east-west corridors (Routes 3 and 4). In total, the final network includes five crossing points over the I-25.

The final network consolidated or split some of the previously identified corridors in order to highlight the most important segments and create a clearer, more legible framework. For example, Routes 1 and 2 are continuous from end to end on either side of the I-25, which simplifies the network and responds better to the project's goals. The following section describes each of the final routes in more detail.

Figure 11. Final route network



5.2 Final Routes

5.2.1 Priority Route 1: NS West I-25

Route 1 is a priority north-south corridor west of I-25. The route follows along several major roadways spanning the full length of the TMA boundary from the City of Denver to Lone Tree, including South Quebec Avenue, South Yosemite Street, and Park Meadow Drive.

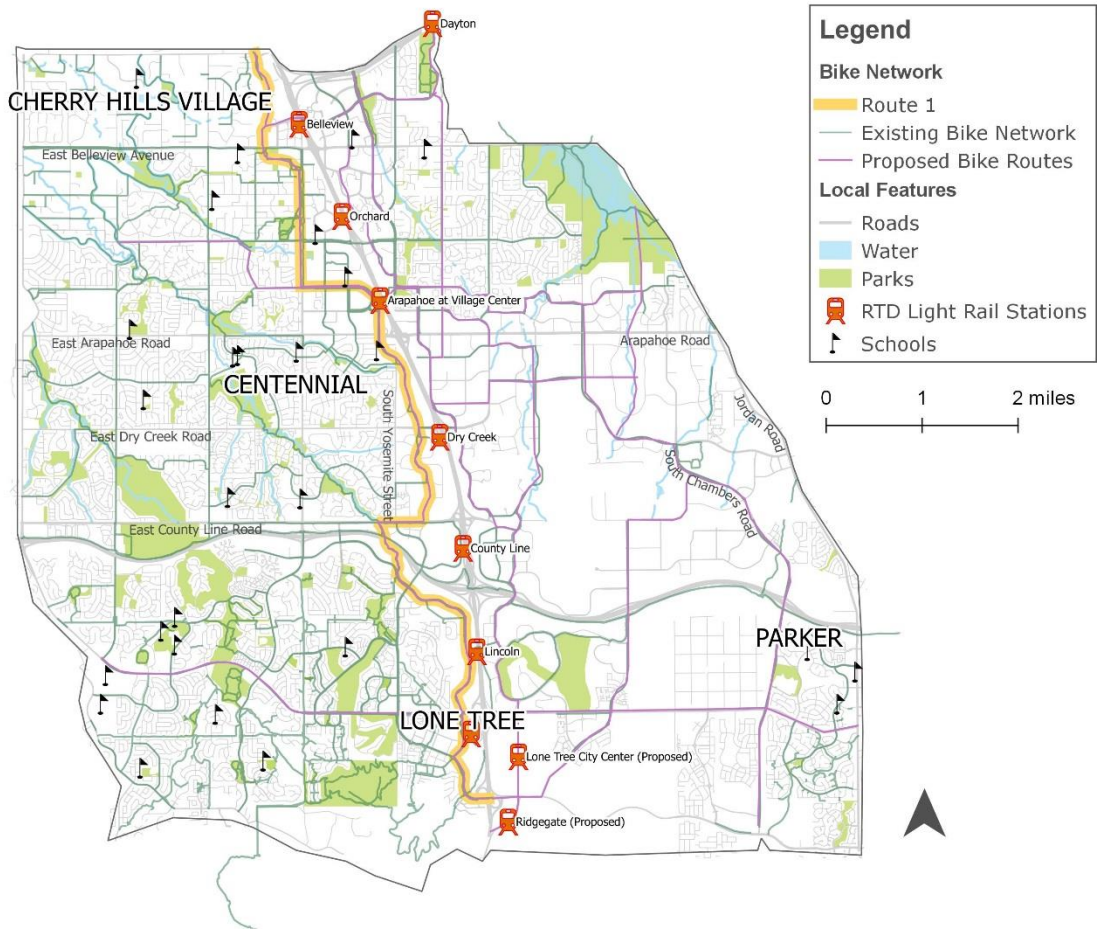
Route 1 connects several major employment centers, including the Arapahoe Village Center, Heritage Shopping Center, the Centennial Promenade, Kaiser Permanente, and Skyridge Medical Center, among others. The route also provides access to Columbia College and Regis University.

This priority route offers light rail connectivity with the existing Arapahoe and Lincoln light rail stations and the proposed Skyridge light rail station. Route 1 crosses major roadways, including the I-25 at the Arapahoe light rail station, the E-470 and Dry Creek Road. The City of Centennial has proposed a Pedestrian Bridge that would offer north-south access over Dry Creek Road along Route 1.

Key Connections

- Priority Route 3
- Priority Route 4
- Arapahoe Village Center
- Columbia College
- Regis University
- Arapahoe and Lincoln Stations
- City of Centennial Pedestrian Bridge

Figure 12. Priority Route 1



5.2.2 Priority Route 2: NS East I-25

Route 2 is a priority north-south corridor to the east of I-25 that runs roughly parallel to Route 1 from the City of Denver to Lone Tree. At the northern end, the route splits in two near Greenwood Village, connecting to the Orchard light rail and Belleview Promenade on the western prong and continuing further north on the eastern prong towards the Denver Tech Center.

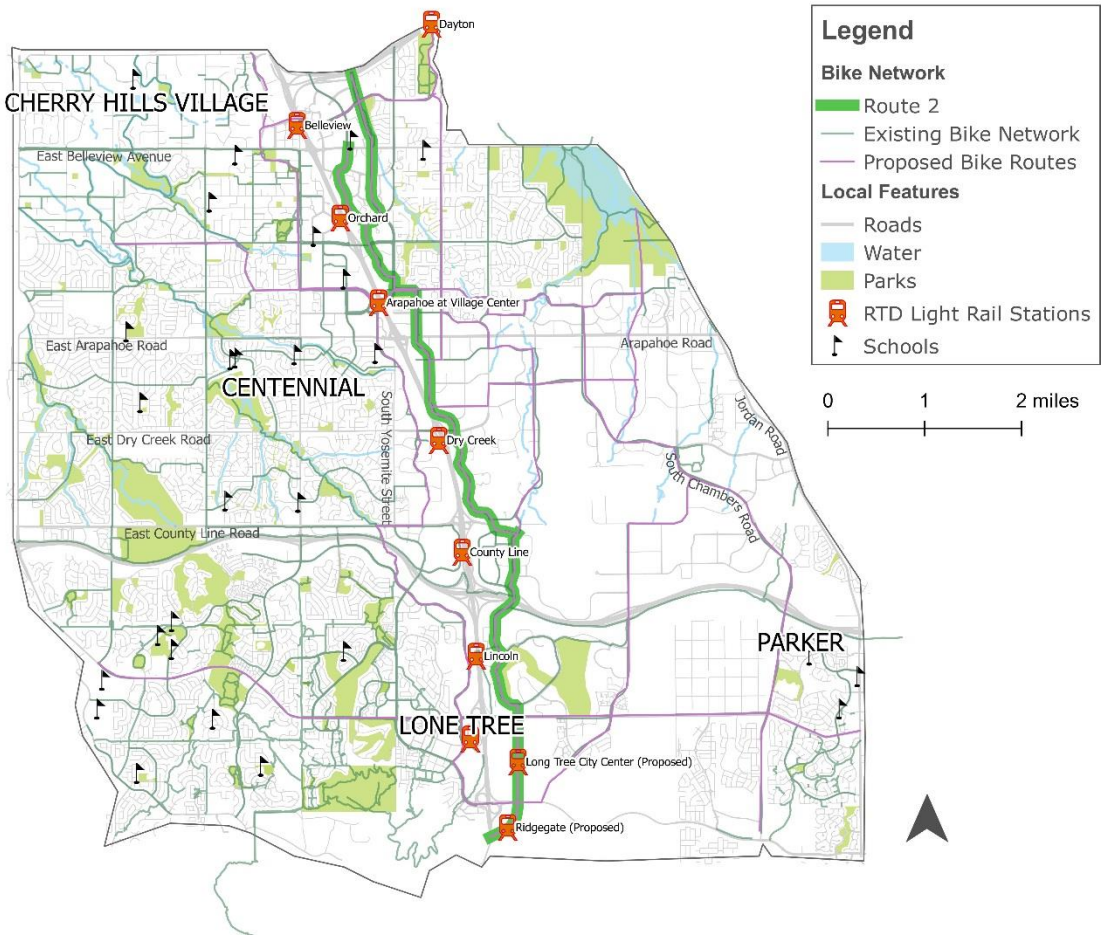
This route was designated as priority on the basis of its ability to serve major employment and residential areas and provide connectivity to future transit stations. Route 2 serves major employers such as Comcast, Intuit, and Oracle among others. It also serves residential areas to the north and areas to the south of E-470 that are planned for future development.

The route crosses the E-470 and links directly to the E-470 trail. The Route offers access to the existing Orchard and Dry Creek light rail stations and will also serve proposed Lone Tree and Ridgegate light rail Stations at the southern end.

Key Connections

- Priority Routes 3 and 4
- Orchard and Dry Creek LRT stations
- Future Lone Tree and Ridgegate LRT stations
- Montessori at the Marina School

Figure 13. Priority Route 2



5.2.3 Priority Route 3: EW via Arapahoe at Village Center

Route 3 is a priority east-west corridor in the norther region of Arapahoe County, beginning near Cherry Creek State Park and ending in Greenwood village. It links several employment areas with residential areas.

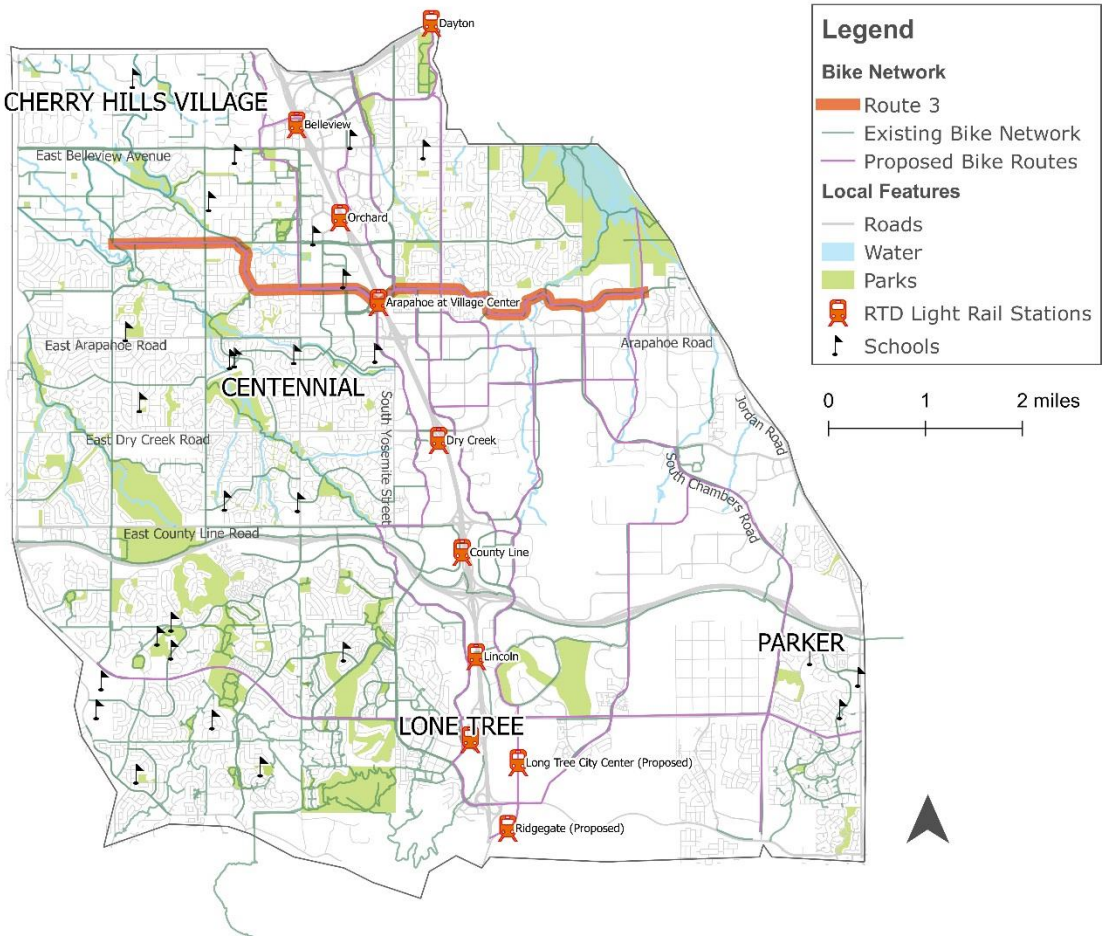
Route 3 runs parallel to the existing Orchard East trail until after it crosses the I-25. Then it directs north and meets the Orchard East Trail. The route also intersects with Routes 1, 2, 5, 8 and 7.

Route 3 crosses the I-25 once at Arapahoe Village Center, where it provides access to the Arapahoe light rail station.

Key Connections

- Priority Routes 1 and 2
- Cherry Creek Park
- Arapahoe light rail Station
- Arapahoe Village Center

Figure 14. Priority Route 3



5.2.4 Priority Route 4: Lincoln Ave

Route 4 is a priority east-west corridor serving the southern portion of the TMA region in Douglas County. It follows Lincoln Avenue from Parker to Highlands Ranch crossing several major barriers, including the I-25. F

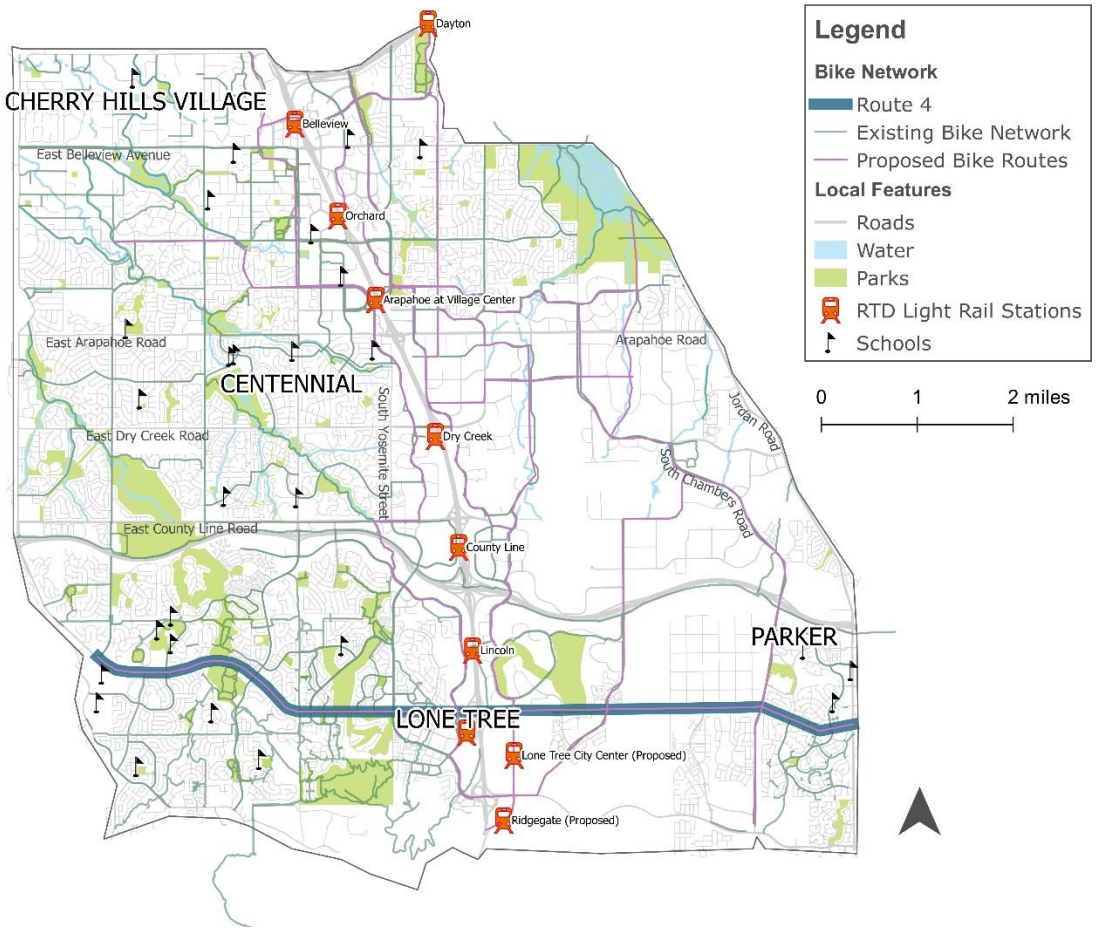
The route connects key residential areas to future developments and existing employment centers. Several elementary and grade schools are located along this route. It also offers access to the Highland Heritage Regional Park, Highlands Ranch Recreation Center, and the Lone Tree Golf Course, among other destinations.

Route 4 follows portions of the Lincoln Avenue trail and adds important connections between existing Willow Creek and Big Dry Creek trails. It also intersects with Routes 1, 2, 10 and 8.

Key Connections

- Priority Routes 1 and 2
- Cherry Creek Park
- Arapahoe light rail Station

Figure 15. Priority Route 4



5.2.5 Secondary Route 5: Dayton St

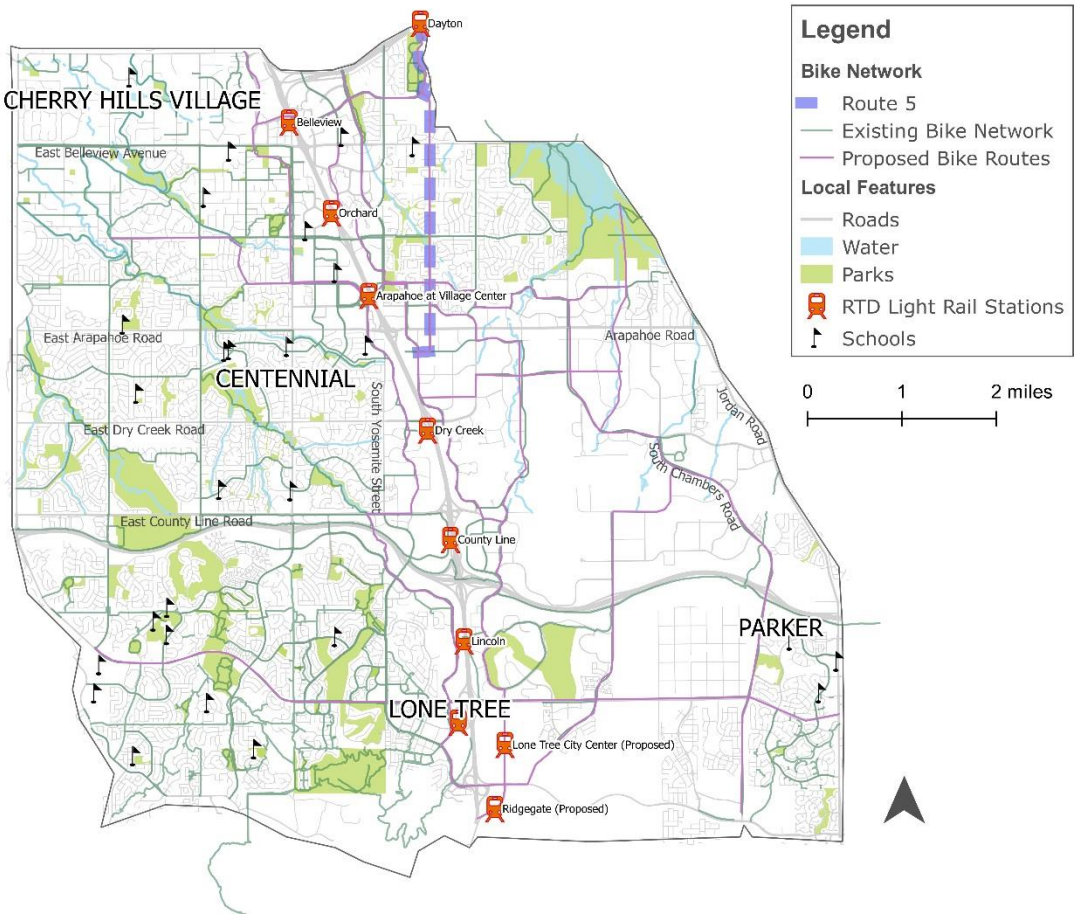
Route 5 is a north-south corridor along S. Dayton Street near the eastern perimeter of the TMA boundary. It begins at Route 2 south of Arapahoe Road and continues north to Dayton light rail station. It also connects with Route 6, 3, and 11.

The route provides access to several elementary and middle schools, Cherry Hill High School, and the Village Greens Park North.

Key Connections

- Connects Route 2 and 6
- Village Greens Park North
- Cherry Hill High School
- Dayton LRT station

Figure 16. Route 5



5.2.6 Secondary Route 6: Temple/Union

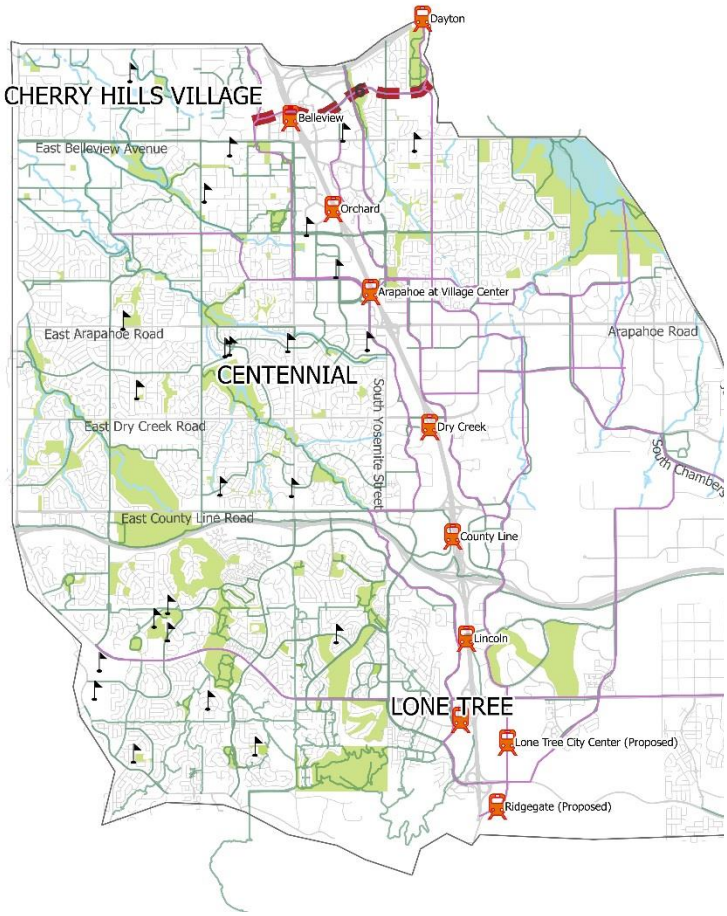
Route 6 is an east-west corridor at the northern end of the TMA region, linking Route 5 to Route 1 via E Temple Drive and E Union Avenue. It crosses Route 2 and I-25.

This route provides access to the Belleview light rail station and the Denver Tech Center.

Key Connections

- Connects Routes 1, 2 and 5
- Belleview LRT station
- Denver Tech Center

Figure 17. Route 6



5.2.7 Secondary Route 7: Airport to Cherry Creek Trail

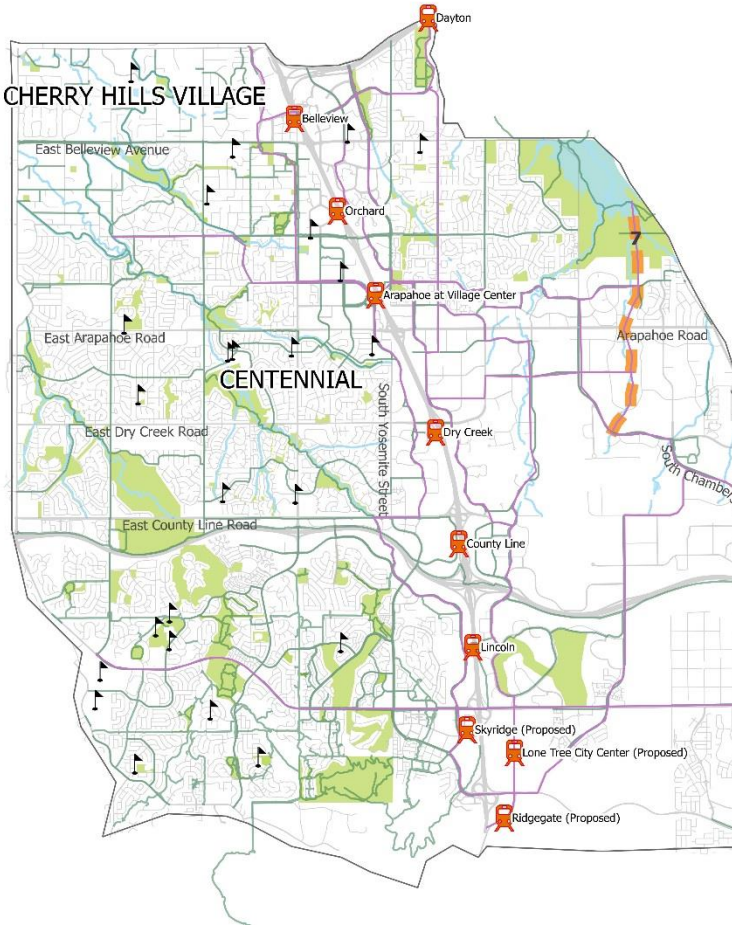
Route 7 is a north-south corridor in the northeast corner of the TMA region, providing a short link from the Centennial Airport to Cherry Creek State Park and Cherry Creek Trail.

It joins employment centers to residential areas. It also intersections with Routes 3, 8 and 9.

Key Connections

- Connects Routes 3, 8 and 9
- Centennial Airport
- Cherry Creek State Park
- Cherry Creek Trail

Figure 18. Route 7



5.2.8 Secondary Route 8: Peoria/Chambers

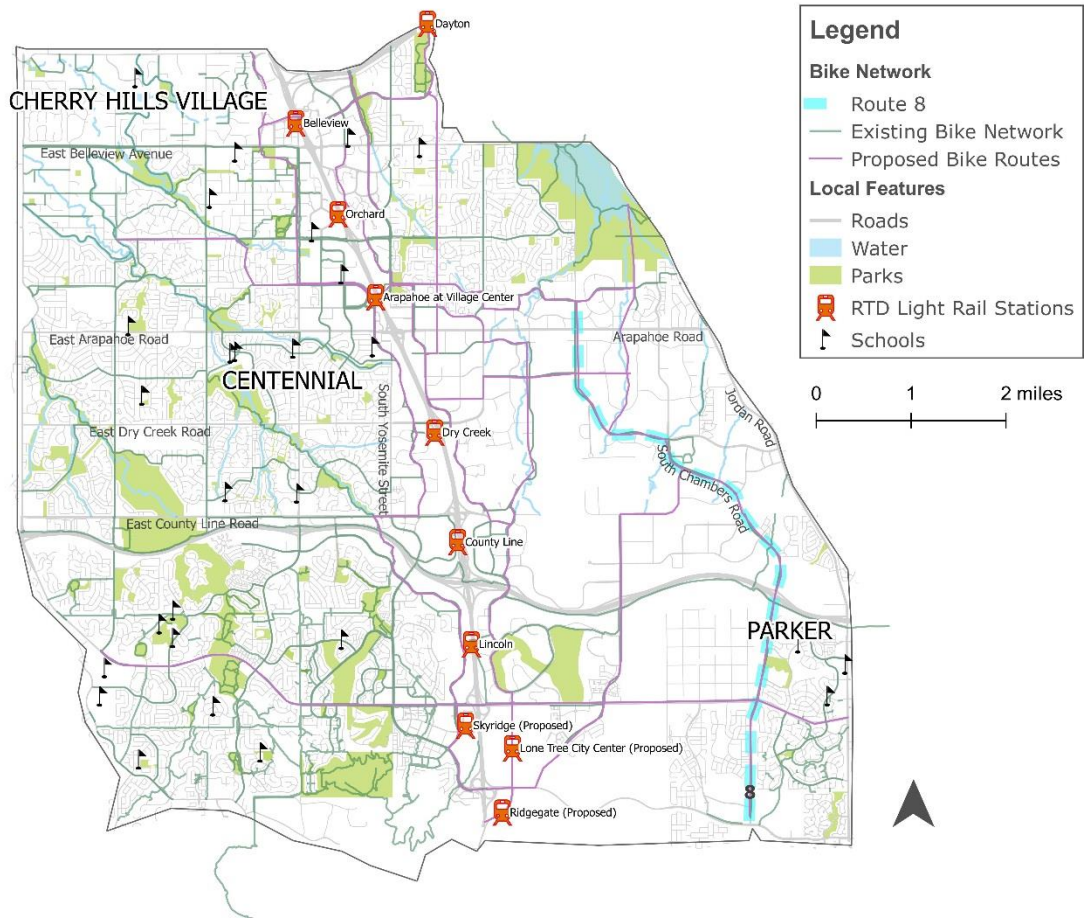
Route 8 is a north-south corridor in the eastern portion of the TMA region. It connects Cherry Creek State Park to the north with Parker to the south via S Peoria Street and S Chambers Road. It offers access to Centennial airport and residential areas.

Route 8 crosses E-470 and connects to the E-470 trail. It also intersects with Routes 3, 4, 7, 9 and 10.

Key Connections

- Connects Routes 3, 4, 7, 0 and 10
- Cherry Creek State Park
- Centennial Airport
- E-470 Trail connection

Figure 19. Route 8



5.2.9 Secondary Corridor 9: Geddes/Easter

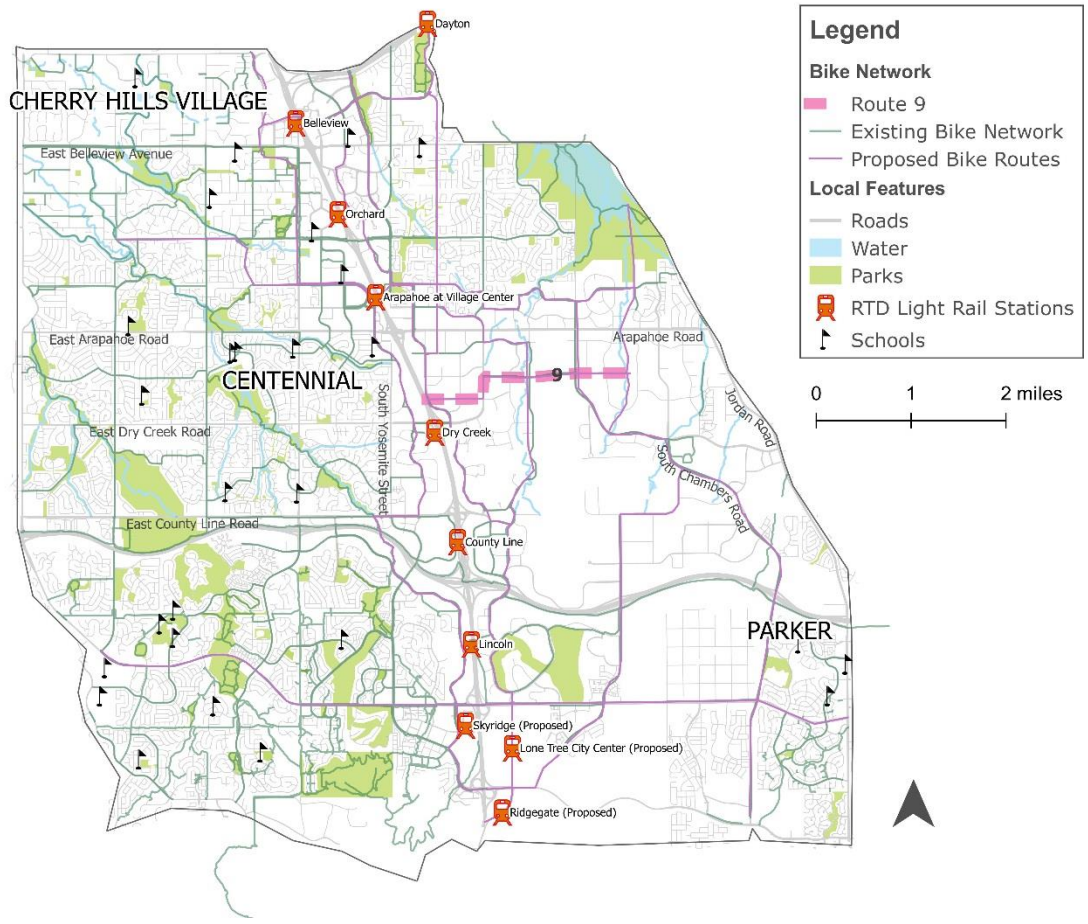
Route 9 is an east-west corridor that joins Route 7 to the east to Route 2 near the Dry Creek light rail station. It follows Easter Ave, S Havana Street, and E Geddes Avenue and stops just before reaching I-25, providing a short link to the Cottonwood Creek trails.

It intersects Corridor 2, 7 and 11.

Key Connections

- Connects Routes 2, 7 and 11
- Cottonwood Creek Trails

Figure 20. Route 9



5.2.10 Secondary Route 10: S Peoria St

Route 10 is a north-south corridor that begins at I-25 between the proposed Lone Tree and Ridgegate light rail stations in Douglas County and runs north-east along S Peoria Street and E County Line Road, terminating at Route 8 in Arapahoe County.

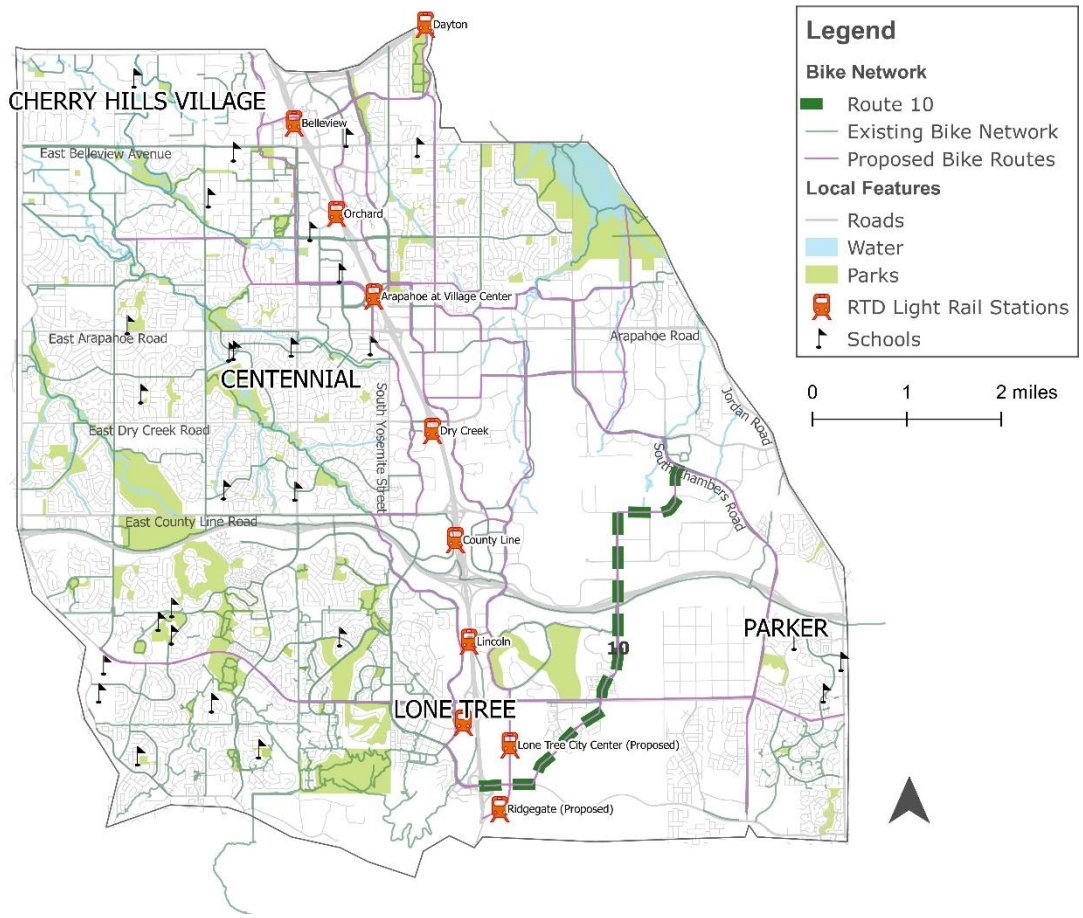
It connects to large employers and Centennial Airport. Although it connects few existing residential areas, the region to the southern end is intended for future development.

Route 10 crosses E-470 and the E-470 trail and links Routes 1, 2 and 4 at its southern end in Douglas County.

Key Connections

- Centennial Airport

Figure 21. Route 10



5.2.11 Secondary Route 11: Lima St

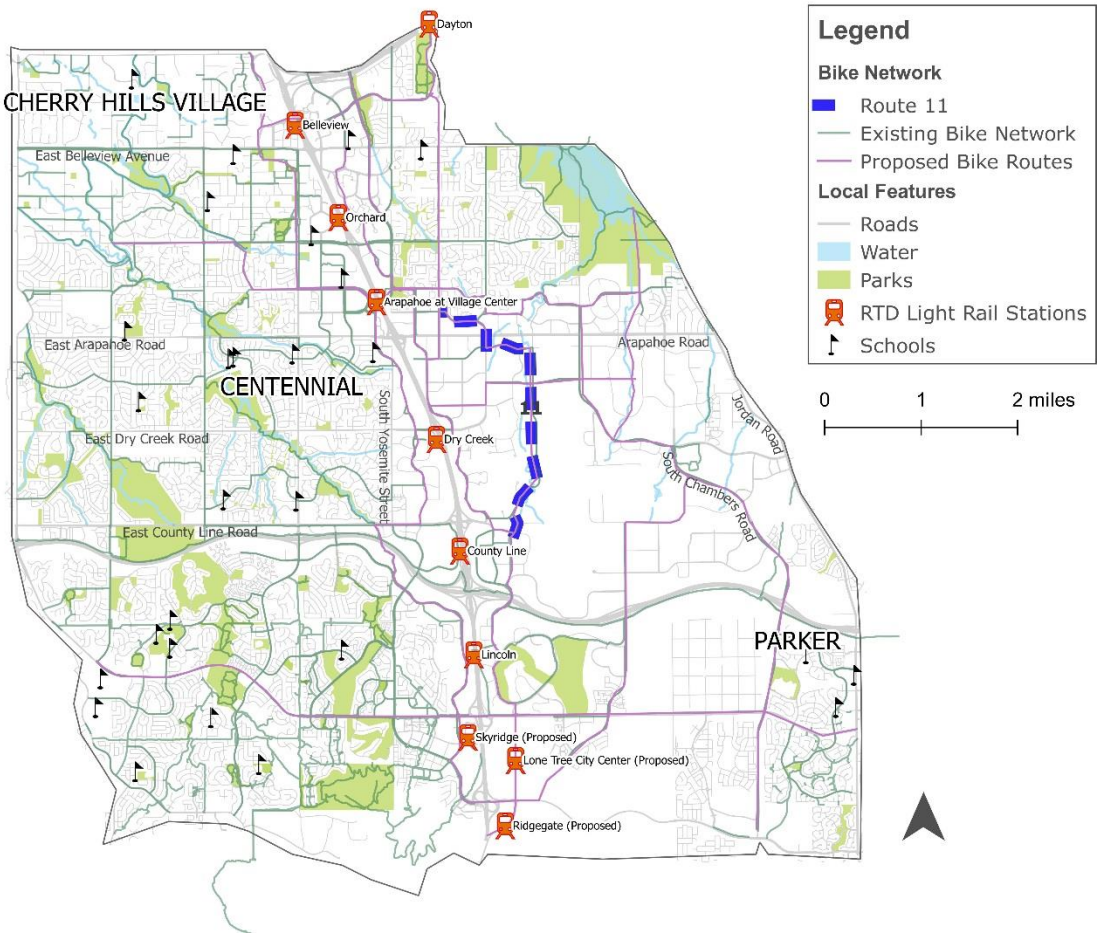
Route 11 is a north-south corridor east of the I-25 in the center of the region that runs predominantly along S Lima St. It provides an easterly alternative to Route 2, serving two major employment centers.

This route also links Routes 2, 5 and 9.

Key Connections

- Connects Routes 2, 5 and 9
- Route 2 Alternative

Figure 22. Route 11



6 Next Steps

The following section is intended to address the actions necessary to advance the Regional Trail Connections Study towards implementation, specifically with respect to funding. Stakeholders can support future funding bids by getting involved now within their jurisdictions to find opportunities and challenges, updating policy documents, and seeking out other "quick wins". There are a few keys steps that local agencies can support to carry on the momentum that has been developed through this initial Study, including:

- Bicycle audits;
- Policy alignment; and
- Development opportunities.

6.1 Bicycle Audits

Partner jurisdictions can improve chances of obtaining funding for the Regional Bicycle Trail Network by taking steps to identify site-specific challenges and opportunities in the short term. The data provided by bicycle or infrastructure audits and inventories is crucial for this step. A bicycle audit involves canvassing an area and assessing the presence and condition of bicycle facilities, with an emphasis on the riding experience. This includes characteristics of roadway infrastructure that may hinder safe riding, such as potholes on roads in poor conditions, low visibility at tunnels and intersections, or poor access to transit stations. Figure 24 shows a snapshot of a bicycle audit prompt published by the Federal Highway Administration (FHWA). The full document is provided in the Appendix of this report. The goal of a bicycle audit is to record detailed information about bicycle accommodations, in particular interactions how bicyclists interact with motorists and pedestrians.

Bicycle audits can be conducted exclusively by city staff or in partnership with community groups, elected officials, and other city leaders. The latter can allow those who may not understand the deficiencies of the existing bicycle network to become better informed and involved in the regional network vision.

Several organizations offer public-access guidance documents and how-to information pertaining to bicycle audits:

- The Pedestrian and Bicycle Information Center provides a comprehensive summary of planning and data collection tools, as well as links to useful auditing resources. **www.bikepedinfo.org**
- The Federal Highway Administration's Road Safety Audit (RSA) Guidelines introduces principles of bicycle safety and provides prompts for a detailed bike audit. **http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/#chap4.0**
- The National Center for Safe Routes to School publishes neighborhood site assessment and school site assessment documents, as well as other resources focused more specifically on safe travel to and from schools.
    - **http://www.saferoutesinfo.org/program-tools/neighborhood-site-assessment**
    - **http://www.saferoutesinfo.org/program-tools/school-site-assessment**

Figure 23. FHWA Bicycle Safety Prompts List

RSA Zones				
A. Street or Path	**B. Structures**	**C. Intersections, Crossings, and Interchanges**	**D. Transitions**	**E. Transit**
1. Presence & Availability				
Are cyclists accommodated?				
2. Design & Placement				
Are design features present that adversely impact the use of the facility by cyclists?	Are bridges/tunnels designed with adequate bicycle accommodations on both sides? Does the gradient of the cycling accommodations impact the use of the facility?	Are intersection/interchange accommodations designed to reduce conflicting movements and communicate proper bicycle positioning through the crossing?	Are transition areas designed with logical termini or do they end abruptly, potentially contributing to sudden and difficult merges, midblock crossings, or behaviors such as wrong-way riding?	Are transit facilities designed and placed to minimize conflicts with other modes?
3. Operations				
Are there suitable provisions for cyclists given the characteristics of the roadway or path (speed, volume, traffic, and functional classification)? Do access management practices detract from cycling safety?		Do traffic operations (especially during peak periods) create a safety concern for cyclists?	Do shared roadway geometrics change substantially or frequently?	Are transit facilities designed and placed to minimize conflicts with other modes?
4. Quality & Conditions				
Is the riding surface smooth, stable, and free of debris and is drainage adequate? Are drainage grates designed for cyclists?	Is the grating/bridge surface designed for cyclists? Is drainage adequate to accommodate bicyclists?	Are there any obstacles at crossings? Are the manhole covers properly designed?	Is there an abrupt change in riding surface?	Are transit stops maintained during periods of inclement weather?

Bicycle audits have other advantages as well:

- They support funding. Bicycle routes do not have to be constructed all at once. The Denver South TMA can bid for funding for either complete individuals segments or packages of segments, which requires that local jurisdictions help identify those piecemeal segments.
- Bicycle audits also demonstrate commitment from the cities and TMA to the funding bodies.
- Bicycle audits provide the data necessary for a research-based approach, which can often help build consensus and momentum within partner agencies.

6.2 Policy Alignment

Policy alignment is another way in which the Denver South TMA and partners can show funding agencies that they are committed to the goals of the Regional Trail Connections Study. Having now identified the new regional bicycle trail network, partner agencies should take advantage of the opportunity to update relevant transportation policies and plans, such as Bicycle Master Plans, Transportation Plans, and circulation elements of General Plans. As noted in Section 1.3.3, several city and county partners have developed Bicycle Master Plans already; therefore, now is the perfect time to align them with the regional vision for a connected network.

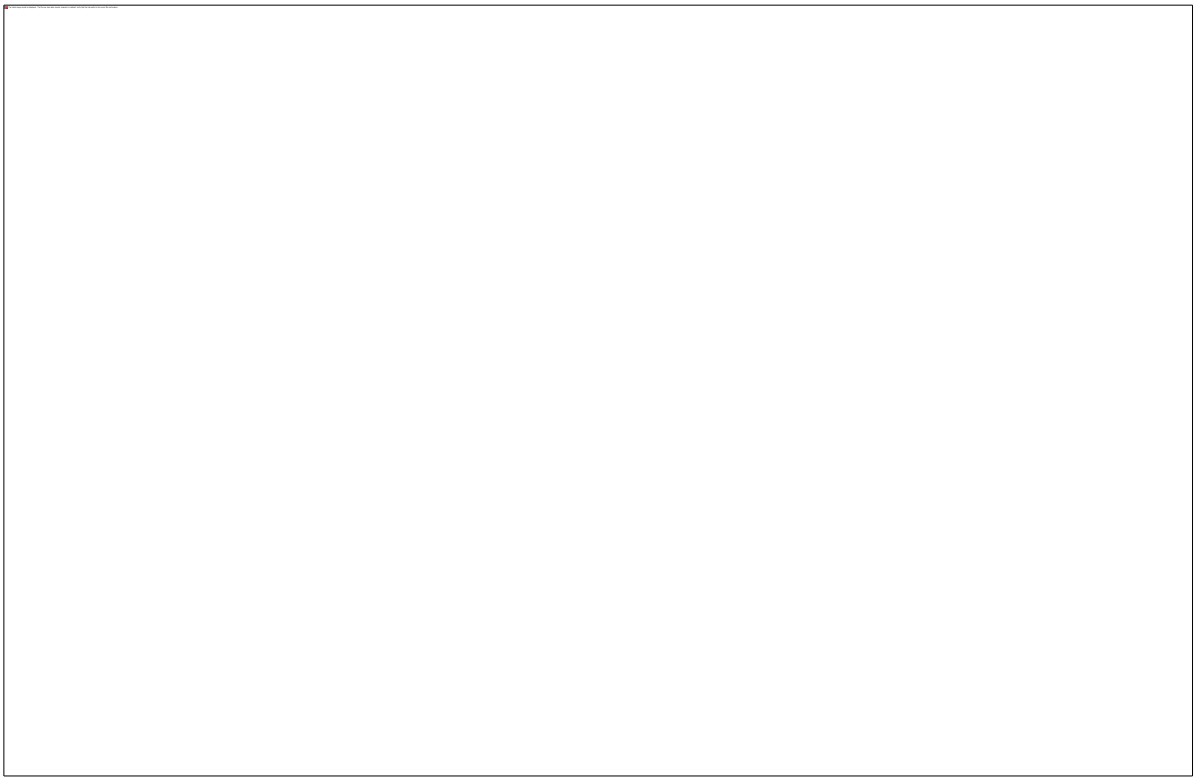
Partners should also work to build regional, local and employer-based support for the bicycle trail network. Outreach to large employers and stakeholders, particularly those located in proximity to priority corridors, can help determine more specific alignments, design considerations, and connections required at the funding stage.

6.3 Development Opportunities

Partners should take advantage of opportunities for *quick wins*, meaning ways to execute parts of the Regional Bicycle Trails Network in the short-term, with less interference. One way to achieve this is by identifying smaller corridor segments or key connection points that can be improved or implemented in line with the regional network plan. Often, there are opportunities that arise in the shorter term through development planning applications, management of City/County land resources, and annual maintenance on City/County owned roads and rights-of-way.

- Cities should mobilize to identify and implement smaller projects on City/County owned land, those which do not require coordination with CDOT or RTD for entitlements and clearances.
- Cities should consider opportunities to partner with RTD to advance projects around transit stations. This includes plans for improvements in the near future to existing Arapahoe and Orchard stations, as well as long-term plans for proposed Skyridge, Lone Tree and Ridgegate stations.
- Finally, cities and counties should identify existing roadway, public works and development opportunities where bike corridor implementation could be integrated at a lower cost during new construction or regular maintenance. One example of this is the City of Centennial's proposed pedestrian bridge, which has been reconfigured on the east side of Chester/Alton (Figure 24, blue) to provide the most direct route possible for existing foot traffic and connection to the existing sidewalk on the east side of S Alton Court. The pedestrian bridge will help people travelling along Route 1 to cross over Dry Creek road, a main thoroughfare.

Figure 24. Proposed pedestrian bridge in the City of Centennial (blue)



Source: City of Centennial.

6.4 Understanding Best Practices

The Denver South TMA and partners should investigate best practices related to bicycle design guidelines, technology, and wayfinding in conjunction with their efforts to inventory existing facilities and increase buy-in from local jurisdictions. Shared standards for each of these features, such as consistent design and wayfinding, will underscore the route network as a *regional* investment. The actual implementation of trail connections, dedicated bicycle facilities or shared-use trails, will depend on the resources, technology and space available to implement improvements. Thankfully, there exists an array of tools and design options for building a better bike network. By becoming well-versed in the latest standards and technology available, the TMA and its partners can present the most actionable plan for the Regional Trail Connections Network to their constituents and key decision makers. This also allows planners to draft more detailed, context-specific scenarios for local projects that will ultimately convey stronger buy-in to agencies awarding grant funding.

6.4.1 Bicycle Infrastructure Design

With regards to bicycle infrastructure, best practices refer to guidelines for the design and implementation of dedicated bicycle facilities, intersection treatments, share-use paths, and bicycle parking. Bicycle facilities are categorized into several classes, distinguished by the degree to which they isolate bicyclists from cars and pedestrians. Figure 25 (Left) shows an image of a cycle track, also known a separated or protected bike lane.

Other bicycle facilities include painted bike lanes, adjacent to regular travel lanes, or shared-lane markings ("sharrows"), which denote that motorists should share the travel lane with bicyclists. The choice of bicycle infrastructure will often vary along the same corridor based on street geometry, operational issues, and costs.

There are also several treatments that can be useful to improve safety and circulation at controlled and uncontrolled intersections. The placement of bicycle boxes and lanes in the intersection can increase bicyclists visibility to motorists and position them to the left of right-turning vehicles.

Bicycle infrastructure also refers to bicycle parking, as shows in Figure 25 (Right). The design, location and number of bike parking installations are all key considerations for the regional network.

Figure 25. Examples of bicycle infrastructure

Cycle Track.

Bicycle Parking

6.4.2 Wayfinding

Wayfinding includes route maps, signs and other media to assist bicyclists in their route planning. Wayfinding can assist with navigation, offering assurance that a traveler is on the right route and how far they have until they reach their destination. Wayfinding can also provide instructions for bicyclists on how best to navigate intersections. In addition, standardized wayfinding offers consistency across city lines. Branding therefore becomes an important component of wayfinding and a useful way build identify around the regional network.

Figure 26. Examples of bicycle wayfinding.

6.4.3 Technology

Technology is becoming increasingly important to all transportation planning, including bicycle planning. Technological advancements in traffic signals, for instance, can enhance safety at intersections. Some examples include bicycle only traffic signals (Figure 7, Right) and bicycle detections sensors that activate green signals. Smart phone technology also now offers bicyclists useful applications for navigation, trip planning, and trip tracking (Figure 27, Left).

Figure 27. Examples of bicycle technology

Bike Signal

Smart phone navigation

6.4.4 Resources

Several agencies and organizations offer guidance for best practices related to bicycle planning inclusive of bicycle infrastructure, wayfinding, technology and other elements.

The Denver Moves: Enhanced Bikeways includes draft design standards for bicycle facilities developed in coordination with the City/County regional bike plan. The Denver Bikeway Design Guidelines are based on standards set by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and others.

- **https://www.denvergov.org/content/dam/denvergov/Portals/708/documents/plans-studies/denver-bikeway-design-guidelines-draft.pdf**

The National Association of City Transportation Officials (NACTO) also produced the 2012 Urban Bikeway Design Guide, which has been widely recognized as an industry resource for implementing bicycle infrastructure. The guide distinguishes between required, recommended and optional design elements for bike lanes, cycle tracks, intersection treatments, signs, and other treatments.

- **http://nacto.org/publication/urban-bikeway-design-guide/**

The US Department of Transportation publishes the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). This 80-year old guide was updated in 2015 and offers detailed descriptions of signs and markings used to communicate with pedestrians, bicyclists and motorists on all US roads and highways.

- **http://mutcd.fhwa.dot.gov/**

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