THORNTON TRANSPORTATION AND MOBILITY MASTER PLAN

ADOPTED
APRIL 26, 2022

THORNTON
TRANSPORTATION MOBILITY

City of
Thornton

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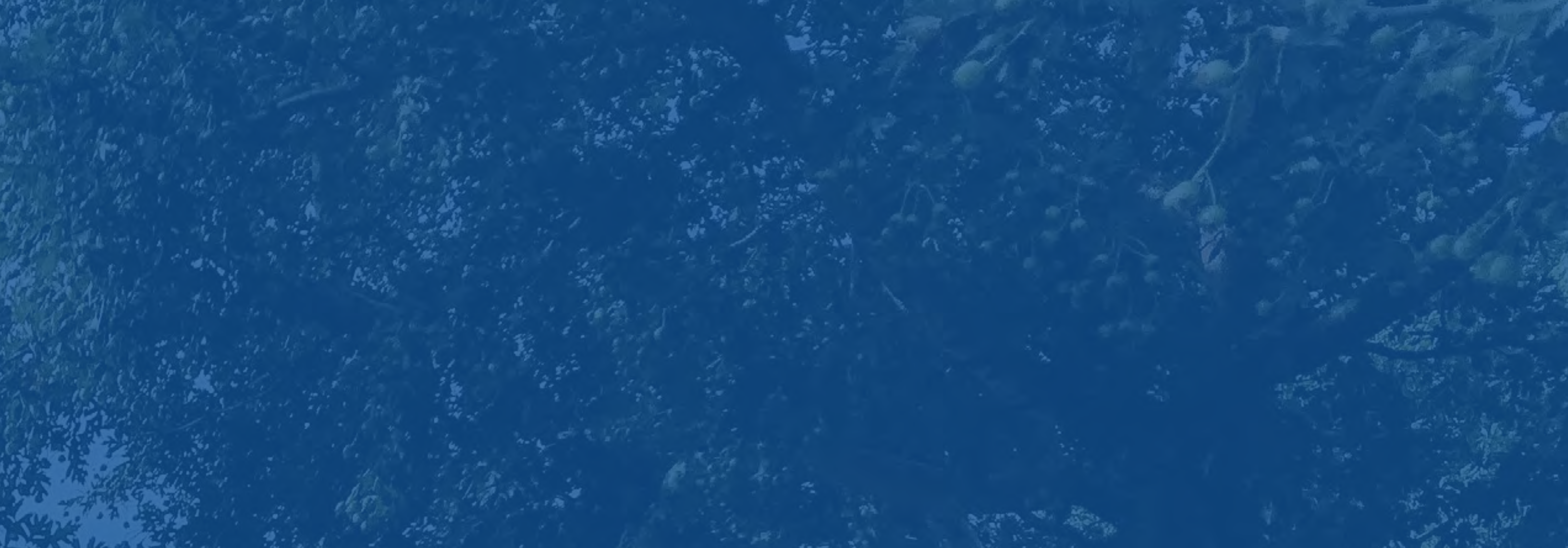

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C.D. No. 2022-070

R E S O L U T I O N

A RESOLUTION ADOPTING THE TRANSPORTATION AND MOBILITY MASTER PLAN AS A SUPPLEMENT TO THE 2020 COMPREHENSIVE PLAN TO SUPERSEDE THE 2009 TRANSPORTATION PLAN WITH 2016 AMENDMENTS.

WHEREAS, the Thornton City Council adopted the 2009 Transportation Plan on September 8, 2009; and

WHEREAS, the Thornton City Council adopted amendments to the 2009 Transportation Plan on March 29, 2016; and

WHEREAS, the Thornton City Council adopted the 2020 Comprehensive Plan on July 15, 2020; and

WHEREAS, the 2020 Comprehensive Plan includes a recommendations to update the Transportation Plan to align with the Comprehensive Plan's Vision Themes and Goals; and

WHEREAS, staff reviewed transportation comments received during the development of the 2020 Comprehensive Plan, gathered more specific detail through focus groups, social media, and other input to create a holistic plan to address automobile, bicycle, pedestrian, and transit needs; and

WHEREAS, the Transportation and Mobility Master Plan incorporates the Vision Themes and Goals of the Comprehensive Plan; and

WHEREAS, City staff will be able to use the Transportation and Mobility Master Plan as a tool in developing and connecting Thornton's multimodal transportation system.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF THORNTON, COLORADO, AS FOLLOWS:

1. The Transportation and Mobility Master Plan in Attachment A is hereby adopted as a supplement to the 2020 Comprehensive Plan.

2. The Transportation and Mobility Master Plan supersedes the 2009 Transportation Plan with 2016 amendments.

PASSED AND ADOPTED at a regular meeting of the City Council of the City of Thornton, Colorado, on April 26, 2022.

C.D. No. 2022-070

CITY OF THORNTON, COLORADO

Jan Kulmann

Jan Kulmann, Mayor

ATTEST:

Kristen N. Rosenbaum, City Clerk

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NO
RTD
PARKING

Executive Summary

The city of Thornton initiated the Transportation and Mobility Master Plan (TMMP) to replace the 2009 *Thornton Transportation Plan*, to incorporate the 2017 Parks and Open Space Plan, and to supplement the Thornton Comprehensive Plan, *Thornton Tomorrow Together*. The Transportation and Mobility Master Plan is a multi-modal transportation plan that details the needs for various transportation modes, impacts of new transportation technology, implementation strategies, and responsibilities.

Since the 2009 Transportation Plan, the city of Thornton has experienced significant growth, the transportation network has changed, and new policies and programs are in place. These changes require a multimodal transportation plan that will move people efficiently and safely in the future.

The Thornton TMMP applied a community-based data-driven process to developing a set of prioritized recommended projects, programs, policies, and studies. Together, as these projects are implemented, they will transition the city towards a more efficient and comfortable transportation network that safely moves people of all ages and abilities.

PROJECT VISION

The overall vision is a transportation network and mobility plan that expands transportation options to enable a resident to access all areas of Thornton in a timely manner without using a private vehicle. Thornton desires a holistic multimodal and mobility view, approach, and evaluation of current and future transportation needs.

PROJECT GOAL

To provide an interconnected multimodal transportation network and mobility plan for all people to access goods, services, residences, and employment and accommodates safely moving people, goods, and services using a variety of modes that includes vehicle, bicycle, pedestrian, bus, shuttle, and passenger rail based on the future land use projections and overall vision for the city.

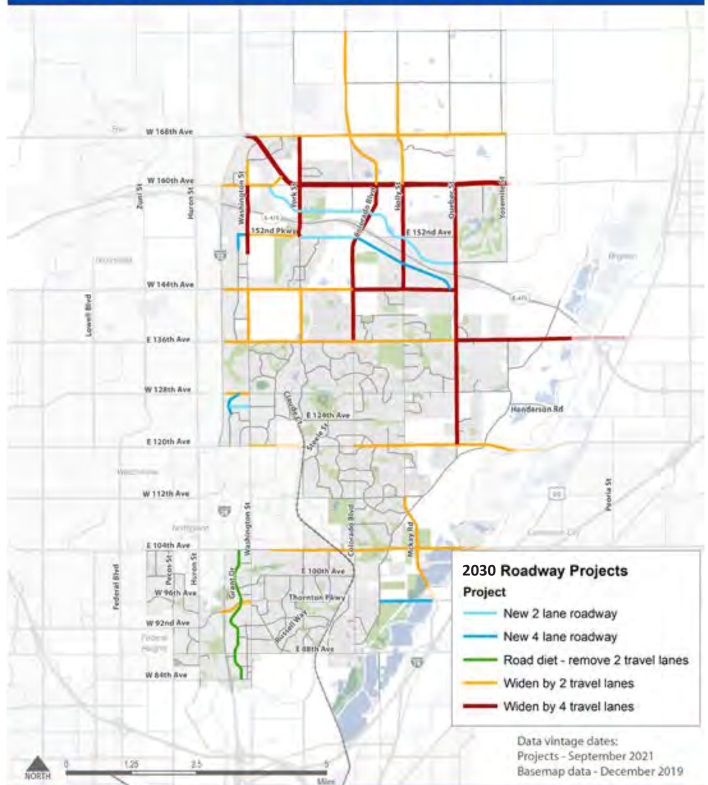
Future Roadway Network

The Roadway Plan provides guidance for the expansion of the vehicular network in both 2030 and 2050. The development of this plan included community input, stakeholder input, City Council direction and data driven information from the DRCOG travel model. This set of recommendations includes new roadways, widening of existing roadways, and reallocation of roadway space for people biking. Implementing these recommendations is in accordance with the vision and goals of TMMP.

Figure ES.1 and **Figure ES.2** show the 2030 Short-term Roadway Plan and the 2050 Long-term Roadway Plan, respectively, for the City of Thornton.

Larger versions of ***Figure ES.1*** *and* ***Figure ES.2*** *can be found on page 5.3 and 5.7.*

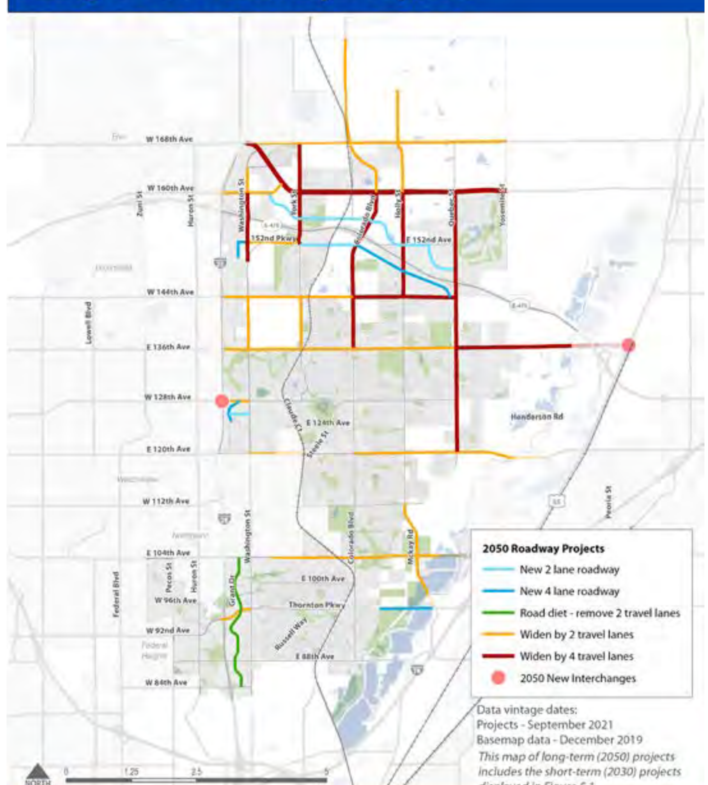
Short-Term (2030) Roadway Projects



City of Thornton

Figure ES.1

Long-Term Roadway Projects



City of Thornton

Figure ES.2

Future Bicycle Network

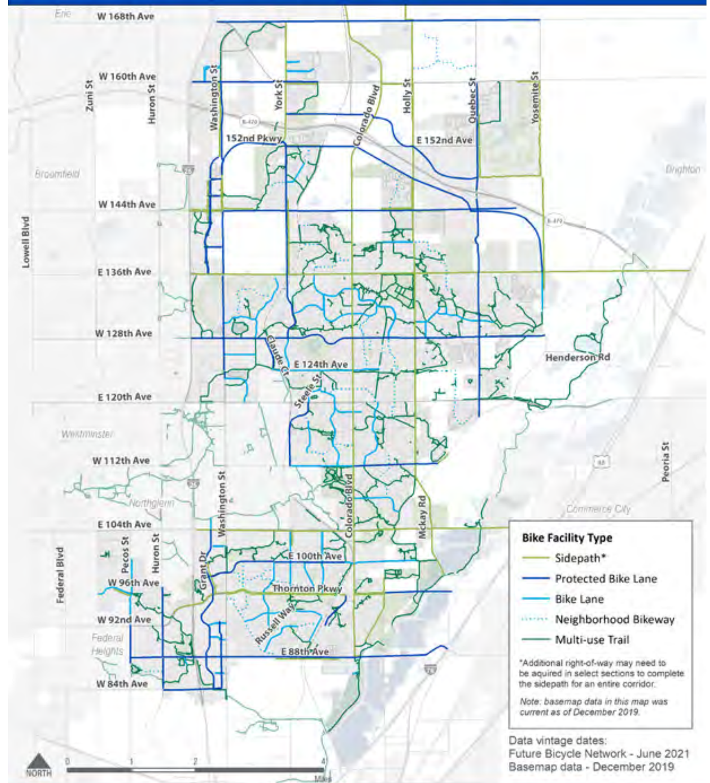
The future bicycle network displays a vision for a low stress and connected bicycle network across the City of Thornton for implementation by 2050. The network was developed by incorporating public input, filling network gaps with low stress connections, and proposing upgrades to the high stress-facilities identified in **Figure ES.3.**

Future Pedestrian Network

Thornton's TMMP creates a tiered system for prioritizing pedestrian improvements across the city. This prioritization does not include safety hazards that need immediate attention such as a raised section of sidewalk causing a trip hazard. **Figure ES.4** displays the different tiers of pedestrian priority areas across the city and highlights gaps in the existing sidewalk network.

*Larger versions of **Figure ES.3** and **Figure ES.4** can be found on page 6.5 and 7.4.*

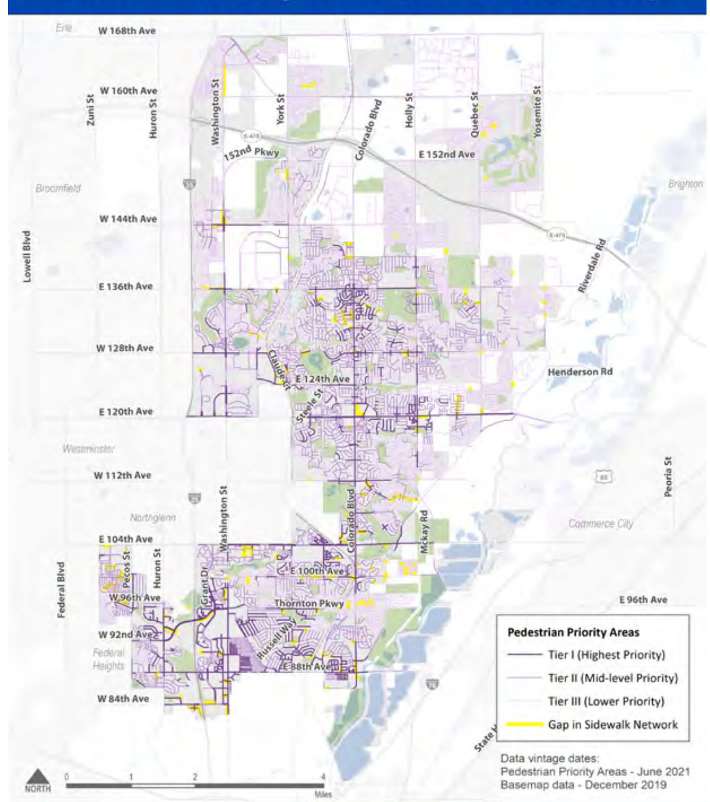
Future Bike Network with Trails



City of Thornton

Figure ES.3

Pedestrian Priority Areas and Sidewalk Gaps



City of Thornton

Figure ES.4

Future Transit Network

Figure ES.5 shows the vision for the 2030 Transit Network in Thornton. Implementation of this vision increases local weekday fixed-route transit service hours in Thornton by about 30-35% from what exists in 2020.

Figure ES.6 illustrates the 2050 transit network vision for Thornton. The proposed future transit network connects most of the city to high quality transit service, improving the utility of transit as a viable option to connect homes, services, and jobs within Thornton and the region. This future network provides more frequent service than exists today, covers more of the city, and through higher frequencies better enables connections between different local bus routes and regional transit service.

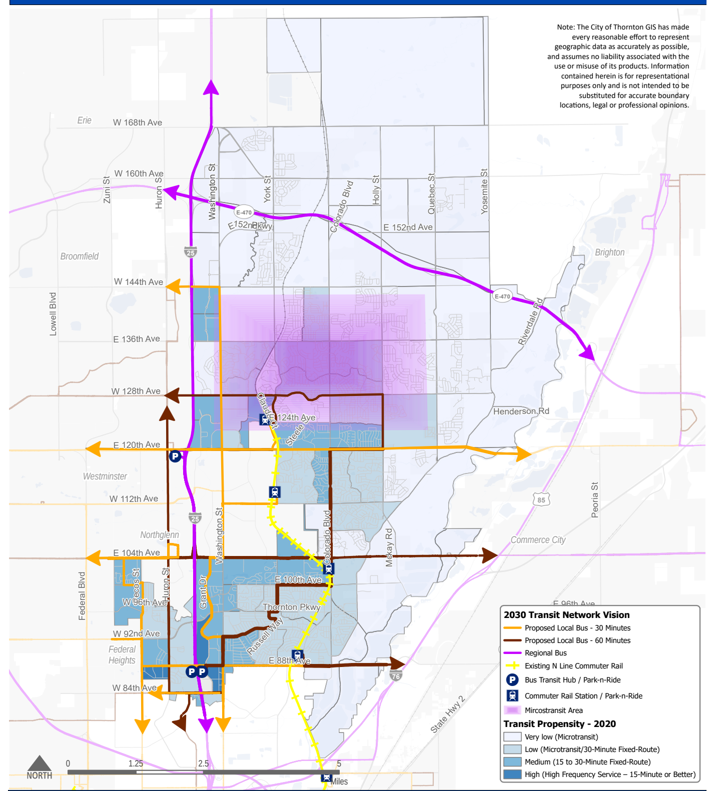
Performance measures

Performance measures are important to evaluate the current success of the city, track the success of the city in the future, and modify the path forward if needed. These performance measures will not only provide a framework to continually assess the performance of the city, but also enable city staff to communicate outcomes as the transportation system changes in the future. The performance measures can be used on a continuous basis for evaluation of the projects recommended in this plan.

The Thornton TMMP is a long-term transportation and mobility plan that will serve as a guide for the city as growth continues to occur. Many projects, programs, policies, and studies are recommended for all modes of transportation (vehicle, transit, bikes, and walking) to help maintain or improve the quality of life for the city's residents. Creating a plan that identifies future improvements provides the city with a blueprint for funding requests to implement any recommendations as well as to work on the preservation of the right-of-way to either provide additional roadway capacity, enough curb space for transit stops and stations, and/or safe pedestrians and bicycle facilities.

*Larger versions of **Figure ES.5** and **Figure ES.6** can be found on page 8.15 and 8.10.*

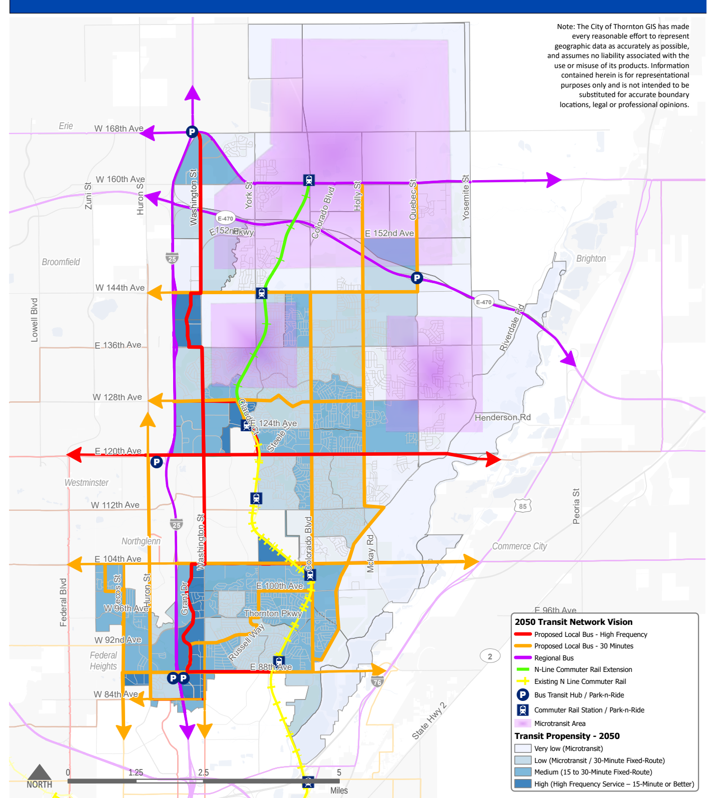
Thornton Transit Vision - 2030



City of Thornton

Figure ES.5

Thornton Transit Vision - 2050



City of Thornton

Figure ES.6

01 Introduction

Prior to the 2021 Transportation and Mobility Master Plan (TMMP), the city of Thornton completed its last transportation plan update in 2009. Since 2009, Thornton and the surrounding region has grown tremendously, in both population and economic activity. Thornton's population has grown 19% (or by about 22,000 people). The regional transit network has expanded significantly, with extension of commuter rail connecting Thornton to downtown Denver. As the community grows and evolves, there has also been an increasing desire for more multimodal infrastructure and programs.

Beyond changes in the local landscape, the transportation industry has also changed since the 2009 Transportation Plan was developed. New trends like app-based transportation services, an increased prevalence of e-commerce, and changes to commute patterns brought on by technology infrastructure that allows more people to work from home have spurred a need to reconsider the role transportation plays in Thornton and the surrounding area. The TMMP builds upon the foundation provided in the 2009 Transportation Plan. As a critical document that supports the 2020 Thornton Comprehensive Plan, the TMMP strives to consider all the transportation-related implications of growth and trends that have emerged since 2009.

1.1 Vision and Goals

This document reflects the community's vision and goals for transportation in Thornton that is:

Vision

A transportation network and mobility plan that **expands transportation options** to enable a resident to access all areas of Thornton in a timely manner **without using a private vehicle**. Thornton desires a holistic **multimodal and mobility** view, approach, and evaluation of current and future transportation needs.

Goals

To provide an interconnected multimodal transportation network and mobility plan for all people to access goods, services, residences, and employment and accommodates safely moving people, goods, and services using a variety of modes that includes vehicle, bicycle, pedestrian, bus, shuttle, and passenger rail based on the future land use projections and overall vision for Thornton.

THORNTON'S
VISION

A transportation network and mobility plan that expands transportation options to enable a resident to access all areas of Thornton in a timely manner without using a private vehicle. Thornton desires a holistic multimodal and mobility view, approach, and evaluation of current and future transportation needs.

1.2 Planning Process

The Thornton TMMP applies a community-based data-driven process to developing a set of prioritized recommended policies, programs, studies, and projects. Together, implementation of these recommendations moves the city towards a more efficient and comfortable transportation network that safely moves people of all ages and abilities.

Since transportation planning involves difficult decisions, trade-offs, and fiscal constraints, the TMMP planning team developed three potential scenarios (Scenario A, B and C) to model prospective transportation networks that may emerge from the Plan. Each scenario – described in **Chapter 4** – envisions varying levels of investment in each transportation mode and diverse approaches to providing a multimodal transportation network by 2050. Scenario C ultimately provided guidance for the recommendations and the plans in the TMMP.

1.3 Recommendations

The outcome of the scenario planning process was a framework for establishing Thornton's investment in infrastructure and programs for people driving, walking, using a wheelchair, biking, and taking transit. The TMMP includes the recommended approach for each mode:

- **People driving (Chapter 5)**- identification and prioritization of roadway projects including new roadways, roadway widenings, and road diets (reallocation of roadway space for people biking)
- **People biking (Chapter 6)**- a prioritized list of low stress facilities that make biking for transportation and recreation accessible to all ages and abilities
- **People walking and in wheelchairs (Chapter 7)**- a prioritization of all roadways within the city to inform sidewalk gap completion, pedestrian crossings, and upgrading of deficient sidewalks
- **People taking transit (Chapter 8)**- a high-level vision for the transit network in 2020 and 2050 and transit-supportive services to make traveling by bus, commuter rail, and on-demand services a convenient and reliable form of transportation

As the transportation industry quickly evolves, tracking future trends and innovations will be important to ensuring that residents, employees, and visitors can travel efficiently and safely. **Chapter 9** explores various future opportunities for transportation that Thornton should consider and preliminary recommendations for future policies and investments that can move Thornton towards its transportation vision and goals.

In addition to infrastructure projects specific to walking, biking, driving or transit, the TMMP identifies a set of programs, policies, and studies (**Chapter 10**) that serve as a necessary supplement to projects to move the city towards its goals. These include safety programs, Transportation Demand Management strategies, and Safe Routes to School.

1.4 Implementation

For the next 5-10 years, until the next update of the transportation plan, the TMMP serves as a guide for the future multimodal transportation network. It provides guidance for each transportation decision and investment as the city implements the transportation and mobility vision and goals of the community.

1.5 Amendment Process

The TMMP may have minor or major amendments. Staff may administratively approve minor amendments. Minor amendments include, but are not limited to, the following: correcting spelling, grammar, and math errors; collector street additions or alignment changes; complete streets designations; program modifications; and technical changes to cross-sections. Major amendments require City Council action. Examples of major amendments include policy changes, incorporating other transportation studies, and major updates.

1.6 Adjustments

Staff may administratively process and approve adjustment requests to the TMMP. Such adjustments are on a case-by-case basis. Examples of adjustments may include cross-section changes to fit existing conditions and bicycle and sidepath locations and routing.

02 Existing Conditions

2.1 Introduction

Thornton's Transportation and Mobility Master Plan (TMMP) is a multifaceted effort to update the city's street network, transit system, and bicycle and pedestrian facilities through infrastructure, policies, and programs. The TMMP addresses all modes operating within the city—driving, walking, biking, transit use, as well as freight. The TMMP must be underpinned by a thorough understanding of the existing transportation network and how it currently serves Thornton and the surrounding region. This chapter provides a snapshot of the multimodal infrastructure and services as well as a review of previous plans, analysis of collision history and patterns, demographic indicators, land use trends, and economic data.

Thornton has grown significantly over the past decade since the *2009 Thornton Transportation Plan*. Thornton's population has increased by 19%, or by about 22,000 people. Along with population growth, the transportation network has evolved to include the Regional Transportation District (RTD) North Metro Commuter Rail Line (N Line), an updated cross-section of 136th Avenue, I-25 managed lanes, and operational service of the Colorado Department of Transportation's (CDOT) Bustang bus route along I-25. The Union Pacific Railroad also stopped running rail freight through Thornton. Thornton also completed a number of plans and studies for future transportation network improvements, including changes to I-25, potential widening of State Highway 7 and State Highway 44, and consideration of Bus Rapid Transit (BRT) along State Highway 7.

New policies and plans since the most recent *Transportation Plan* in 2009 have shaped the transportation network including the implementation of a Complete Streets policy, implementation of the iWatch Speed Awareness Plan, adoptions of *the Denver Regional Council of Governments'* (*DRCOG) Active Transportation Plan,* publication of *Mobility Choice Blueprint*, and partnerships with the North Area Transit Alliance (NATA) and Smart Commute Metro North. Transportation industry and technology changes have rapidly evolved in the past decade with hybrid, electric, and autonomous vehicles becoming more common, while parking and curb space management, shared mobility, and drone usage are continually being evaluated for their impact on transportation.

Thornton's Complete Streets and recent multimodal transportation initiatives align with the Future Land Use changes approved in the 2020 Comprehensive Plan. Thornton's boundary has expanded over time, with the city growing from 1.2 square miles in 1956 to 38 square miles in 2021, with a period of rapid expansion during the 1970s and 1980s. There is future growth opportunity in northern Thornton and historically Thornton's growth has migrated north. Significant opportunities for new or "greenfield" development and infill/redevelopment exist both within the city's existing limits and its Future Growth Boundary. While greenfield development may pose challenges such as expense and expansion of infrastructure, it can also serve as an opportunity to implement a more multimodal transportation system which reduces dependency on single occupancy vehicles. Infill development lends well to "complete neighborhoods" and mixed-use development that serves both transportation and land use goals. The city's Comprehensive Plan identified key development and growth factors including aligning land use and transportation plans and promoting reinvestment in established areas of the community.

This existing conditions assessment builds off of established policies, goals, objectives, and public input from recent plans and identifies the key transportation challenges experienced in Thornton today. The challenges identified in this assessment were used to develop the TMMP's final recommendations.

2.2 Existing Plans and Policies

The TMMP updates and builds off the recommendations, goals, objectives, and vision set by recent plans for all transportation modes. The TMMP identifies accomplishments from previous planning efforts, highlights any actions not yet taken, and provides new opportunities for improving local and regional transportation options in Thornton. These existing plans also included extensive public outreach and stakeholder engagement efforts to establish visions for the community, policies, and goals. In particular, the city engaged the public over the course of nearly two years during the 2020 Comprehensive Plan update process, collecting many comments related to transportation needs in Thornton. It is important that the TMMP considers and is consistent with the community's priorities and values identified in these planning efforts while also performing its own comprehensive outreach effort acknowledging that these values evolve over time. The city has also grown and implemented a number of recommendations since the adoption of these plans. The TMMP incorporates updates that reflect these changes and progression.

The plans summarized in this chapter include: *2009 Transportation Plan, North Metro Rail Line Station Area Master Plans, Parks and Open Space Master Plan, 2020 Comprehensive Plan, DRCOG Active Transportation Plan, DRCOG 2050 Metro Vision Regional Transportation Plan, Mobility Choice Blueprint, RTD Strategic Plan*, and other relevant recent studies. **Figure 2.1** shows geographic focus areas for this set of plans. The summary of each plan identifies applications to the TMMP, major goals, key recommendations, and proposed performance measures.

City of Thornton Transportation Plan (2009)

The *2009 Transportation Plan* replaced the previous *Thornton Thoroughfare Plan* (2000) which only addressed roadways and the needs of private motor vehicle travel. The *2009 Transportation Plan* is a multimodal plan that includes walking, biking, and transit, in addition to the roadway network. The following section describes the elements that are included in the existing 2009 Plan. The 2009 Transportation Plan will be replaced by the TMMP.

GOALS FROM THE 2009 TRANSPORTATION PLAN:

1. Develop a safe, effective, and sustainable multimodal transportation system for people, goods, and services.
2. Locate and design transportation systems in harmony with existing neighborhoods and the natural features of the city while promoting connectivity between neighborhoods.
3. Educate the public about transportation choices and opportunities.
4. Recognize the important relationship between land use and transportation.
   a. Follow the Comprehensive Plan and other long-range plans for future transportation planning
   b. Recognize the transportation ramifications when making decisions on new development
   c. Maximize the location of high intensity uses near multimodal transportation nodes, such as interchanges and transit stations.
5. Enhance existing and encourage new relationships between all agencies impacting and being impacted by transportation decisions i.e. the Federal Government, State Government, Counties, School Districts, RTD and surrounding cities.

ROADWAY PLAN FROM THE 2009 TRANSPORTATION PLAN:

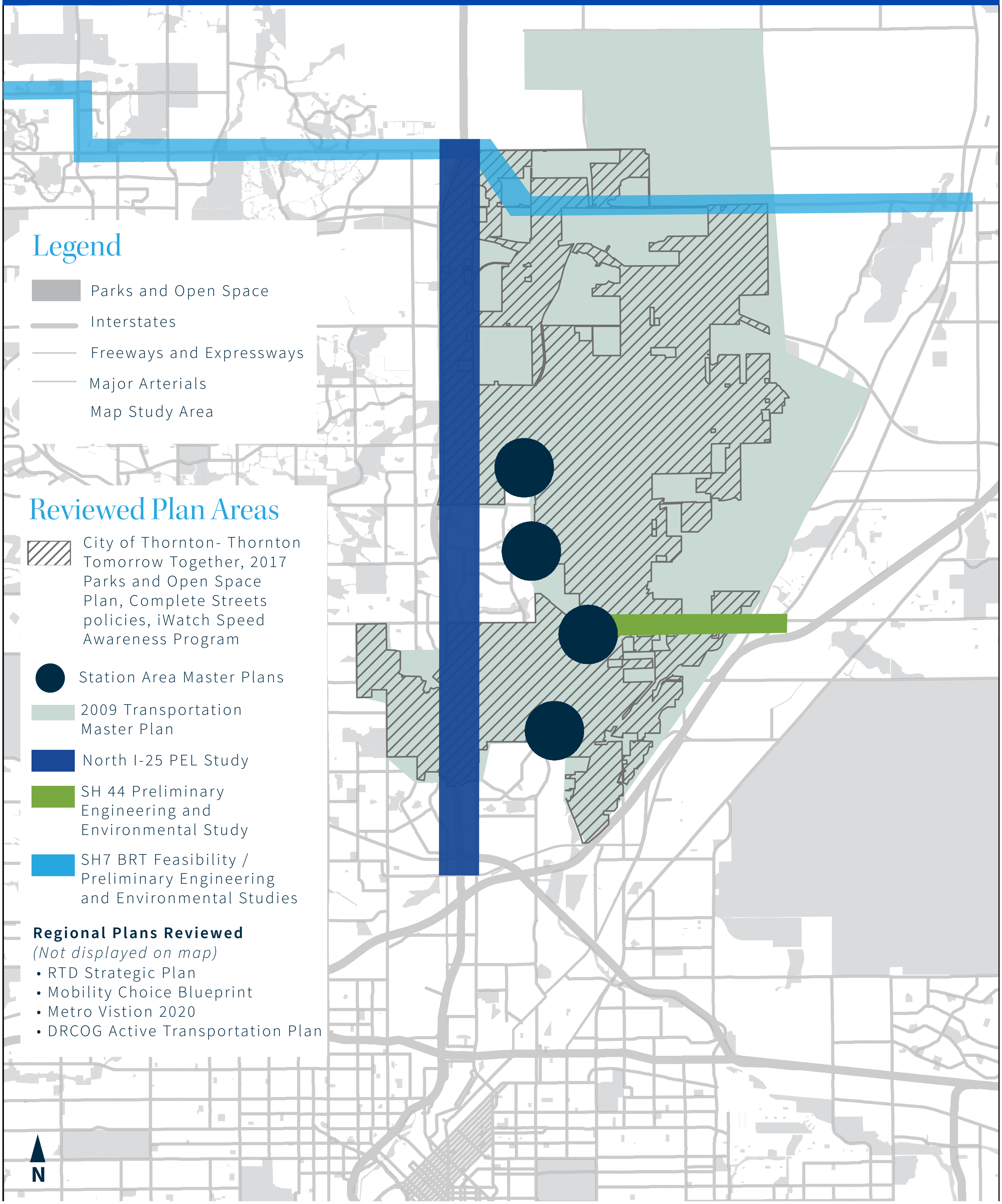
The roadway component of the 2009 Transportation Plan included a number of standards, such as:

- Goal of a minimum "D" level of service for all roadways (see glossary on page GL.1 for explanation of roadway level of service)
- Some arterials were projected to be over-capacity in future growth scenarios and fall below "D" level of service during peak hours
  - » The 2009 plan stated that arterials wider than six lanes are not recommended due to the negative impacts on pedestrians and decreasing effectiveness relative to cost when adding lanes
- Many arterials south of 120th Avenue, including Thornton Parkway and 88th Avenue, are limited to four lanes due to right-of-way restrictions and local character
- Thornton adopted traffic calming standards for new developments in 2005
- The Manual on Uniform Traffic Control Devices serves as the guideline for planning new traffic signals

Appendix E of the 2009 Transportation Plan laid out a comprehensive list of roadway improvements and prioritized them based on time frame of completion. The appendix also included cost estimates for the prioritized projects.

Existing Plans Map

Figure 2.1 Existing Plans Map



MULTIMODAL TRANSPORTATION FROM THE 2009 TRANSPORTATION PLAN

The multimodal section of the 2009 plan included considerations for walking, biking, transit and carpooling as alternatives to single-occupant vehicle (SOV) travel. It also addressed airports, trucking, and freight rail as important pieces of the transportation landscape.

Transit Element from the 2009 Transportation Plan

A summary of the key elements that influenced the transit component of the 2009 plan as they relate to transit include:

- Voters approved FasTracks in 2004
- RTD had planned to have the North Metro Rail Line all the way to Highway 7 completed by 2017
- The 2007 Thornton Comprehensive Plan called out a need to plan efficient transportation links to the future North Metro Line stations
- RTD was working with Union Pacific to formalize agreements to shift freight pick-ups and deliveries to evenings and weekends to accommodate passenger rail
- RTD served Thornton with several regional buses and had two Park-n-Ride locations in the city in 2009

People Biking and People Walking Element from the 2009 Transportation Plan

A summary of the key elements of the 2009 plan as they relate to people walking and biking include:

- The city planned to encourage walking and biking in order to:
    - » Address air quality issues
    - » Reduce congestion
    - » Increase mobility options for all residents
    - » Connect to existing and planned transit
- Coordinated with Parks & Open Space Master Plan to ensure development of a safe and comfortable trail system. In 2009 there were:
    - » 77 miles of paved trails
    - » 3 miles of soft surface trails
    - » 7 miles of on-street bike lanes
- In 2011, Thornton adopted a Complete Streets Policy

AIR QUALITY ELEMENT FROM THE 2009 TRANSPORTATION PLAN

In 2007 the Denver region and parts of the North Front Range were designated as “nonattainment” areas for Federal 8-hour ozone standards. Thornton recognized in 2009 the major role that transportation plays in determining air quality and the 2009 plan took a proactive stance to improve air quality and limit greenhouse gas emissions.

TRANSPORTATION & PUBLIC HEALTH FROM THE 2009 TRANSPORTATION PLAN

Thornton recognized in 2009 the link between biking, walking and public transportation use and public health. Thornton committed in the 2009 plan to encouraging these modes and limiting sprawl to improve the health outcomes of residents.

State Highway 7 BRT Feasibility Study (2018 – Boulder County)

This study considers the existing and future conditions that would contribute to the viability of Bus Rapid Transit (BRT) on State Highway 7 spanning from Boulder to Brighton and passing through northern Thornton. The State Highway 7 BRT Feasibility Study included several important considerations for Thornton:

- There is a considerable amount of vacant land around Highway 7 in northern Thornton that could be developed into dense, transit supportive uses.
- Opportunities exist to connect to the planned North Metro Line at the North Thornton/ Highway 7 Station.
- An additional BRT stop is planned in Thornton at I-25 and Highway 7.
- Hundreds of people currently commute to and from Thornton through this corridor and this number is expected to grow.

The report concludes that a BRT on State Highway 7 is feasible with the right phasing after securing the appropriate funding streams.

State Highway 7 (SH 7) Planning and Environmental Linkages Study (2014)

The *2014 SH 7 PEL Study* examines this corridor's ability to meet current and future travel demands while increasing safety around the corridor. The study is a response to predicted growth likely to increase travel along SH 7.

The PEL establishes existing conditions to identify future transportation challenges (using the year 2035 as a planning horizon) and creates a vision that will serve as a blueprint for future multimodal transportation improvements in this approximately 16-mile corridor. The study considers the roadway capacity for vehicles, as well as looking at right-of-way alternatives that could encourage the use of other modes of travel. For the segment of highway running along Thornton's northern border, the study recommends adding shared use paths on both sides of the highway as well as wide shoulders marked for bicyclists and transit queue jump lanes at signalized intersections. The future of this corridor is an important piece for understanding the future of how people will commute to and from Thornton from the east and west.

State Highway 44 (104th Avenue) Preliminary Engineering and Environmental Plan

In coordination with Adams County and Commerce City, Thornton submitted a Transportation Improvement Plan application to DRCOG for designing 30% plans for the widening of State Highway 44, as well as the creation of pedestrian and bicycle trails along the corridor. Design began in 2021. As of the time of the TMMP adoption, construction is unscheduled. The TMMP considers the possibility of the widening of this road and increased trips through the corridor. Additionally, the TMMP recognizes the opportunity to leverage this project to implement additional bicycle and trail connections through this corridor.


RIGHT LANE
MUST
TURN RIGHT
BANK

North I-25 Planning and Environmental Linkages Study (2014)

This study examines alternative lane configurations for I-25 from US-36 to State Highway 7. This segment of I-25 predominantly runs along the western border of Thornton except in southern Thornton where the city borders both sides, and is the most significant north-south connection to and from the city. Any changes to this segment of the roadway will likely have significant impacts on travel to, from, and through Thornton. The preferred alternative from the study for this segment of I-25 is to add one managed lane in each direction. A temporary, interim solution has been completed from US 36 to just south of E-470. The PEL recommended improvements have yet to be funded by the Colorado Department of Transportation.
A follow-up Road Safety Audit recommended full buildout of the PEL recommended improvements. The interim managed lanes, which do not have standard shoulders or buffer with the general purpose lanes, have improved the movement of buses and carpool vehicles through the region. The completion of the full PEL recommended improvements should improve safety and further enhance transit.

North Metro Rail Line Station Area Master Plans

Thornton has adopted four Station Area Master Plans that outline the existing and projected conditions for each station area accessible to Thornton residents and employees along the North Metro Line (N Line). Each plan includes recommendations for the preferred land use, urban design considerations, and circulation that will support the viability of the N Line.

Eastlake Parking Management Study

As part of the *Eastlake Subarea Plan*, a parking management study was conducted to understand how the new N Line would impact parking within the Eastlake • 124th Station area. Phase I of the parking study recommended the use of "No RTD Parking" signs, time-limited parking, residential parking permits, and the creation of a parking enforcement officer to limit overflow parking from the Eastlake • 124th Station in the surrounding neighborhoods. Phase II calculated existing and future parking demand in the area and made specific recommendations on where future on-street, off-street, and overflow parking should be located and how it should be paid for. While the study was conducted specifically for the Eastlake area, the findings from the parking management study will contribute to how the TMMP examines the first and last mile connections to all the station areas, and how vehicle access to the station areas is considered.

2017 Parks and Open Space Master Plan

The *Parks and Open Space Master Plan* includes Thornton's vision for the trail network. In particular, a few of the plan's goals speak directly to improving transportation and mobility around the city:

- Create and connect recreational opportunities through a well-connected trail system
- Provide long open space trail corridors
- Provide trail connections to other modes of transportation
- Incorporate "Complete Street" projects into the trails network

In addition to these goals, the Trails Element of the plan calls out specific high priority projects along primary corridors. The TMMP integrates these priority trail projects into the planning efforts of the entire network to increase connectivity of the trail network and reduce conflicts between different modes.

2020 Comprehensive Plan

The city's current Comprehensive Plan adopted in 2020, updates the overall community vision for the future of Thornton and will play a key role in informing the TMMP. For the two plans to be successful they must relate to each other, with future land use supporting the planned transportation network, and vice versa. The TMMP looks to the *2020 Comprehensive Plan* to understand:

- Where different land uses will be located and how to effectively connect them
- Where greater density is planned and its influence on the future of transit in Thornton
- How the future transportation network can further community goals identified through the Comprehensive Plan process

Thornton Boomer Bond Assessment

The Thornton Boomer Bond Assessment was created in partnership with DRCOG to evaluate Thornton's infrastructure, programs, and policies for addressing the needs of older adults and allowing residents to age in place. The Mobility and Access section of this assessment identified the need to evaluate and improve sidewalk quality

across Thornton. The assessment recommended that the city engage older adults and people with mobility challenges when assessing the quality of sidewalks and pedestrian paths, and address long crossing distances at intersections.

Thornton Sustainability Action Agenda

In 2020, Thornton developed the *Sustainability Action Agenda* with the objective of creating a pragmatic framework for Thornton to reduce its environmental impacts, give back to the environment in positive ways, and build a more resilient community. Several goals from this plan tie directly to transportation and were considered in the creation of the TMMP recommendations. The following are goals from the *Sustainability Action Agenda* relevant to the TMMP*:*

- Reduce greenhouse gas emissions by 50% by 2030.
- Increase the proportion of electric vehicles in the city's fleet and the community.
- Expand safe and convenient public transit, walking, and bicycling routes.
- Promote sustainable transportation options to reduce car usage.
- Create an age-friendly community.
- Promote active living.

DRCOG Active Transportation Plan

The goal of the *Regional Active Transportation Plan* is to create safe and convenient active transportation options throughout the region in order to increase people's ability to travel both long and short distances using active modes. This plan identifies several regional active transportation corridors, pedestrian focus areas, and short trip opportunity zones throughout Thornton. This plan informed the TMMP by highlighting corridors and opportunity zones for increasing connectivity to, from, and through Thornton. The plan also contains valuable data from resident surveys around the region and national case studies and best practices for active transportation infrastructure.

DRCOG 2050 Metro Vision Regional Transportation Plan (MVRTP)

The 2050 *Metro Vision Regional Transportation Plan* summarizes the current conditions and projections for the future of the region's transportation system including safety, congestion, and air quality. The plan synthesizes this information into a vision of the regional transportation system in 2050. This document informed the Thornton TMMP by orienting Thornton's planning efforts in the greater regional context now and into 2050. The plan also included several specific projects within Thornton which are listed below:

Regionally funded projects:

- Widening of 104th Avenue from Colorado Boulevard to McKay Road
- Vehicle safety and operations improvements along I-25
- Bus Rapid Transit (BRT) service along I-25
- Multimodal corridor improvements along SH-7

Locally derived projects:

- Widening of 104th Avenue from Marion Street to Colorado Boulevard and from McKay Road to US-85

- Widening of 144th Avenue from Washington Street to Colorado Boulevard
- Widening of 152nd from Washington Street to York Street
- Extension and widening of Colorado Blvd from 144th Avenue to 168th Avenue
- Widening of Quebec Street from 120th Avenue to 128th Avenue and from 132nd Avenue to 160th Avenue.
- Widening of Washington Street from 152 Avenue to 16th Avenue
- Widening of York Street from 152nd Avenue to SH-7

Mobility Choice Blueprint

Mobility Choice Blueprint is a coordinated effort between the Colorado Department of Transportation (CDOT), DRCOG, the Regional Transportation District (RTD), and the Denver Metro Chamber of Commerce to take a proactive, rather than reactive, approach to emerging mobility technologies. The Blueprint report summarizes the likely outcomes in cost, travel time, and air quality, of a reactive versus proactive response to emerging technologies and outlines strategies to ensure the region is proactive. In relation to Thornton's TMMP, the Blueprint provides context for the regional strategy being used to work with emerging technologies and can be a starting point to looking at some of the ways Thornton can address the changing transportation landscape.

RTD Strategic Plan (2015-2020)

RTD's five-year strategic plan documents RTD's current progress across seven topic areas and actions the district will take to improve these metrics. The seven topics are customer service, safety, financial sustainability, equity and accessibility, system optimization, technological innovation, and workforce. Three of RTD's strategic planning initiatives are most relevant to Thornton's TMMP:

- *Support and coordinate investments to improve first and last mile connections to transit facilities*
- *Foster livable, equitable, and accessible communities at transit facilities*
- *Partnering with local communities to invest in transit supportive infrastructure*

The TMMP incorporates the RTD Strategic Plan initiatives by recommending opportunities to partner with RTD to create better first and last mile connections to new and existing transit stations and encourage transit supportive development in station areas.

DRCOG Regional Complete Streets Toolkit

Regional Complete Streets Toolkit provides a regional approach and guidance for planning, designing and implementing Complete Streets. The toolkit is intended to help local governments achieve Vision Zero, better define multimodal projects for funding, and implement the long-term vision of the 2050 Metro Vision Regional Transportation Plan. This toolkit can serve as a reference point as Thornton continues to implement complete streets projects.

City of Thornton's Complete Streets Policy

The city's Complete Streets Policy established the importance of developing a safe, accessible, convenient, and comfortable transportation network for all users and abilities. The policy prioritized considering bicycle, pedestrian, and

transit facilities along with private vehicle facilities when considering new infrastructure projects. The policy stated that Thornton will strive to achieve Complete Streets over time, and lays out how the addition of bicycle, pedestrian, and transit facilities should be prioritized as additions to other roadway projects.

This policy provided a strong foundation of priorities for the TMMP. As recommended in Chapter 11, adopting a more detailed Complete Streets policy will help the city achieve the TMMP vision by providing further guidance on transportation strategies that include all modes, persons, and abilities.

iWatch Speed Awareness Program

iWatch is a voluntary neighborhood speed awareness initiative which engages residents in speed reduction through neighbor-to-neighbor education and conversation and a contact where participants can report speeding in their neighborhood. The city's approach to decreasing speeding and increasing safety in neighborhoods is comprised of the four "E's": Educate, Engage, Engineer, and Enforce. The iWatch program assists both engagement and education and can help the city identify places where engineering interventions are needed as well. The iWatch program will continue to play an important role in engaging and educating Thornton residents about transportation networks, and can be an inspiration for additional resident programs. Additionally, the iWatch network may be one effective channel to gather public input and identify current conditions of transportation safety in Thornton.

Current and Previous Planning Efforts in Adjacent Communities

Thornton is bounded by several incorporated cities and by unincorporated Adams and Weld Counties, and users travel seamlessly between them. To create the level of continuous travel across jurisdiction boundaries, it is important to coordinate with neighboring jurisdictions on existing and proposed transportation enhancements. There have been several recent planning efforts in these adjacent communities that are important to consider and build upon. These plans and studies include:

- *Adams County Transportation Master Plan* (In development)
- *Broomfield Transportation Master Plan* (2016)
- *Commerce City Comprehensive Plan* (In development)
- *Northglenn Comprehensive Plan: Transportation & Corridor Plans* (2010) (Update pending)
- *Westminster Transportation & Mobility Plan* (In development)
- *Westminster 2040 Comprehensive Plan Update* (In development)
- *2008 Weld/Adams Crossroads Alignment Study*
- *Weld County 2045 Transportation Plan*

2.3 Existing Conditions Analysis

In addition to the previous plan and study review, an overview of existing conditions by category is included in this document. This section includes a summary of the city of Thornton's land use, demographics and population, employment, roadway network, bicycle and pedestrian network, transit network, and roadway safety.

Land Use

Thornton has expanded over the past 65 years, annexing 37 square miles of land since 1956. The new land incorporated into the city has added open space, residential areas that increased the population, commercial uses, public facilities, miles of road network, and social service areas. Within the current city limits, the three largest land use categories are single-family residential comprising 29% of the city's land area, parks, and open space at 26%, and vacant land at 21%. Most of the vacant land is in the northern portion of Thornton, along I-25, and E-470. Much of the land that is currently vacant has planned development already approved, but not constructed. As illustrated in **Figure 2.2**, Thornton also has many community amenities like recreation centers, parks, schools, and civic services located throughout the city.

The open space land uses are an asset to community members by offering opportunities for recreation and sustainability benefits but can create challenges for accessibility due to poor connectivity of the street grid. Overall, community members desire more and better opportunities for community destinations and gathering locations. Thornton residents would like to see more land uses that provide opportunities

Key Public Facility Locations

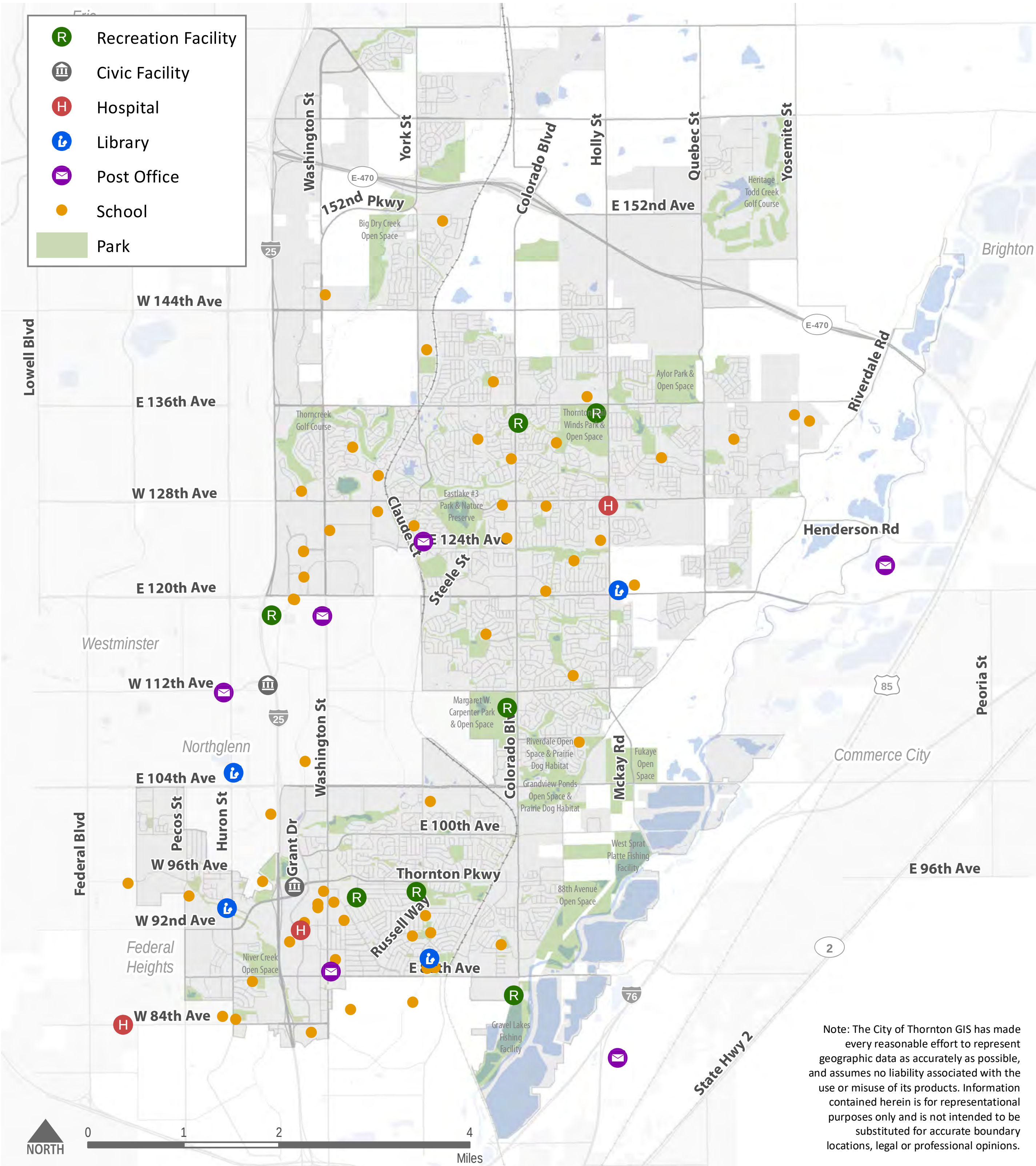


Figure 2.2: Key Public Facility Locations

for shopping, recreating, engaging with natural surroundings and interacting with fellow community members. Existing and future planned amenities include recreation centers, community parks, open land, sports facilities, lakes, cultural centers, and civic centers. These activity centers can be either mixed-use or single use, providing shopping, dining, entertainment, employment, and regional connectivity. The areas in Thornton with the densest land uses are in the southern part of the city and along major corridors. Multifamily housing is located along major corridors and there are manufactured housing neighborhoods located in the southern part of Thornton.

Demographic Conditions and Trends

Thornton's demographics are changing due to land annexation and the general growth of the Denver metro region. In 2020, there were approximately 140,000 Thornton residents, a 19% increase from the 2009 *Transportation Plan* which was based on a 2007 estimate of 117,728 residents. Between Thornton's 1956 founding and 2016, the annual growth rate averaged 4.5%. The high annual growth rate over time is attributed to the increase in the number of residential units in Thornton's relatively short history. More recently, the annual population growth rate from 2007 to 2020 has been consistent, at 1.5% per year.

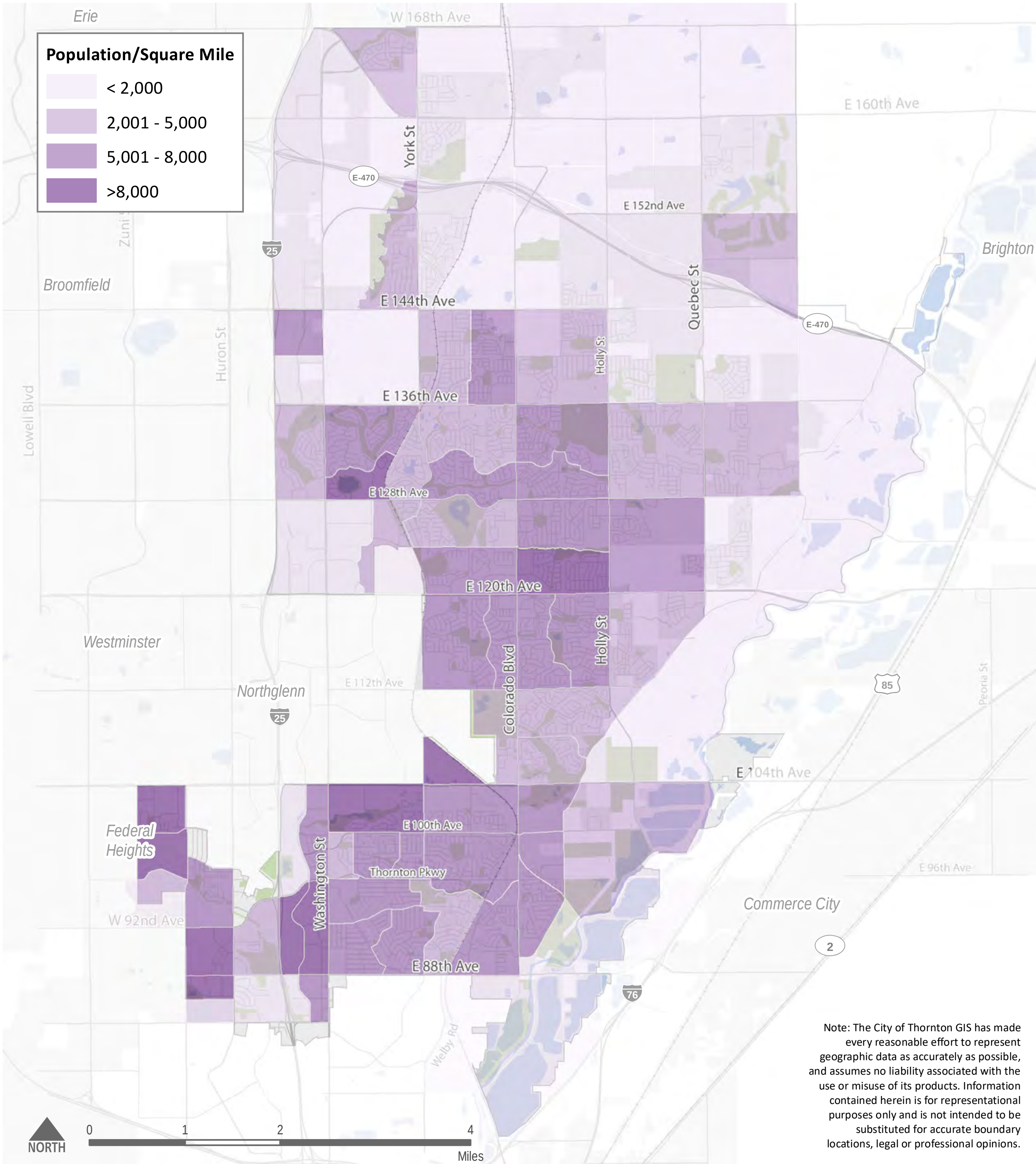
The average household size in Thornton has been increasing since 2016. Despite family and household sizes increasing, home ownership has decreased, and renter-occupied households have increased. The *2009 Transportation Plan* forecasted a population of 152,000 residents and 55,000 households by 2035 based on a low estimated growth rate of 1% annually. In reality, Thornton's average annual growth rate has exceeded 1% and therefore the population size will exceed the 2009 plan estimate. Per the updated population projections of the *2020 Comprehensive Plan*, the city now forecasts a population size between 190,000 and 205,000 by 2040.

Thornton's population is also getting older and more diverse. According to the *2020 Comprehensive Plan,* between 2000 and 2016, the median age has increased from 30.8 to 33.9 and older adults are the fastest growing population group. During that same time, the Latinx population increased from 21.3% to 32.5% of Thornton's total population. The Asian population has the largest annual growth rate (7.9% per year) along with the Latinx population (5.7% per year). The Caucasian population remained the largest ethnic group in 2016 but has the lowest annual growth rate (1.5% per year).

The *2020 Comprehensive Plan* also identified that the southern half of Thornton has a greater density of households with incomes below the poverty line when compared to the northern half of Thornton. To meet the changing needs of the community demographics, outreach from the *2020 Comprehensive Plan* identified that residents would like to focus on housing, services, and inclusion.

Thornton's population is dispersed, and the land use is primarily low density. **Figure 2.3** illustrates population per square mile by Traffic Analysis Zones (TAZs) for Thornton. TAZs are units of geography determined by DRCOG for traffic modeling purposes.

Population Density by TAZ



Note: The City of Thornton GIS has made every reasonable effort to represent geographic data as accurately as possible, and assumes no liability associated with the use or misuse of its products. Information contained herein is for representational purposes only and is not intended to be substituted for accurate boundary locations, legal or professional opinions.

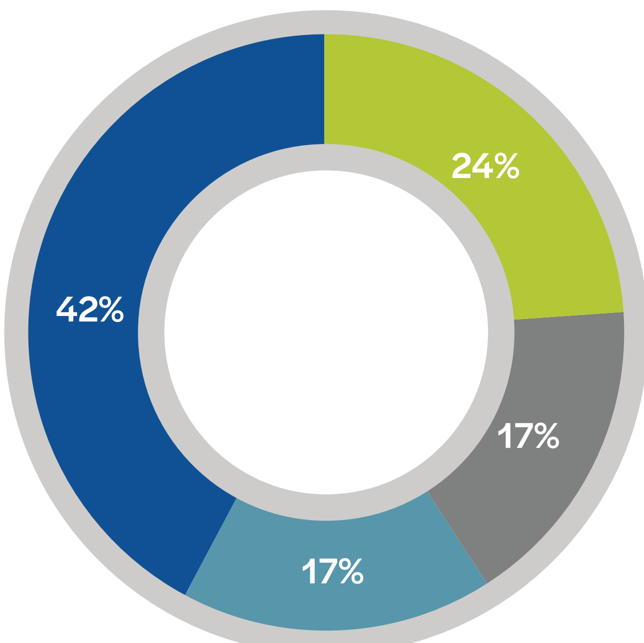
City of Thornton

Figure 2.3: Population Density

Data: DRCOG

Figure 2.4

Share of Jobs in Thornton by Industry



Retail Trade

Accommodations & Food Services

Health Care & Social Assistance

All Other Industries

Data: US Census Bureau – Longitudinal Employer-Household Dynamics (LEHD) Data On the Map (2018 American Communities Survey Five-year Estimates)

Note: This data only reflects trends before the COVID-19 pandemic.

Most of Thornton has fewer than 2,000 people per square mile, aligning with the land use conditions of primarily single-family housing, parks and open space, and vacant land. The average household size in 2016 was 2.99 persons per dwelling unit and is higher than the national average of 2.53 persons per dwelling unit. Areas with less than 2,000 people per square mile translates to roughly 3.1 individuals per acre, or one dwelling unit per acre. TAZs with 5,000-8,000 people per square mile contain about 7.8 people per acre, or 2.6 dwelling units per acre. The highest population category of more than 8,000 people per square mile means these TAZs have about 12.5 individuals per acre, or 4.2 dwelling units per acre.

According to the Census Bureau, Caucasian families more often own their own homes than Latino and Black families across the United States. With the increase in the Latino population, the decrease in home ownership, and increase in renter-occupied dwelling units in Thornton, population density patterns by demographics and socio-economic status could change in the future.

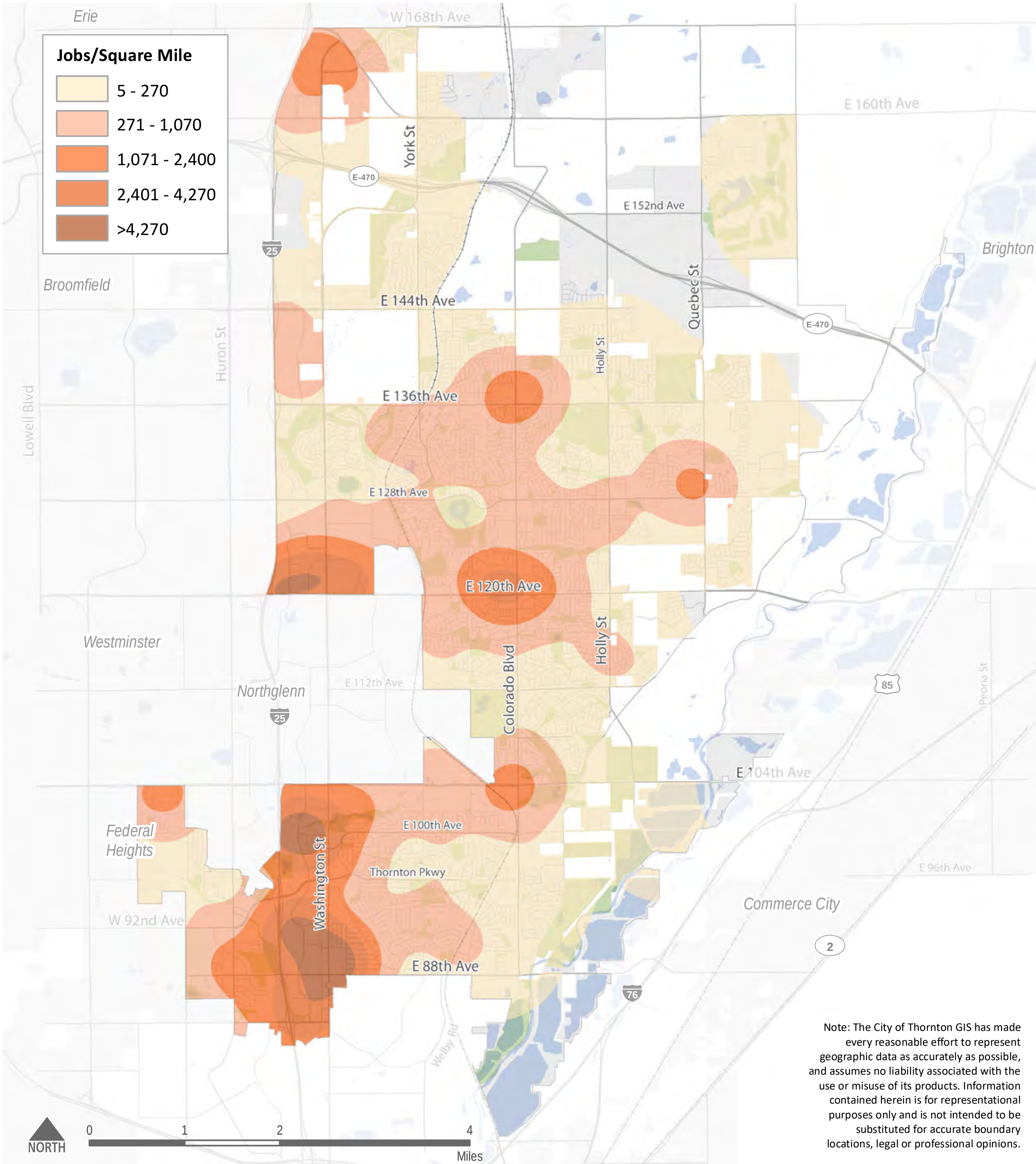
Population density and residential density also inform the level of possible transit service. RTD does not have a specified density within which new transit routes can be built, but routes must be located near sufficient density in order for those routes to meet ridership and cost recovery standards according to RTD's *Transit Service Policies & Standards (2016)*.

Employment Conditions and Trends

In 2018, the City of Thornton had 25,720 jobs. Most jobs in Thornton are in service-based industries. Service jobs like retail, accommodation, or food service, make up 41% of the total jobs in the City of Thornton (displayed in **Figure 2.4**).

Employment density in Thornton is primarily concentrated around shopping centers and hotel locations (see **Figure 2.5**). The greatest employment density is around Washington Street between 88th Avenue and 104th Avenue where there is a concentration of retail and restaurants, two hotels, and the North Suburban Medical Center. Health care and social assistance make up 17% of the jobs in Thornton. Other employment centers in the city include the intersections of Washington Street and 120th Avenue, 120th Avenue and Colorado Boulevard, and 144th Avenue and I-25.

Employment Density



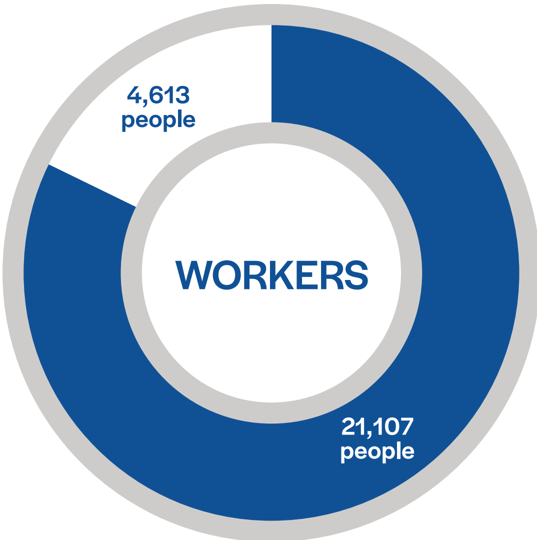
City of Thornton

Figure 2.5: Employment Density Heat Map

Data: US Census Bureau – LEHD Data On the Map (2018 American Communities Survey Five-year Estimates)

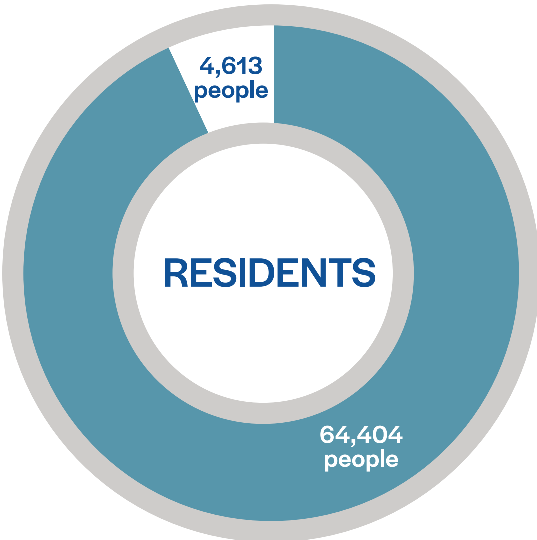
Figure 2.6

Commute of People Who Either Live or Work in Thornton (2014-2018 5-year estimates)



82% Commute Into Thornton

18% Live and Work in Thornton



93% Commute Out of Thornton

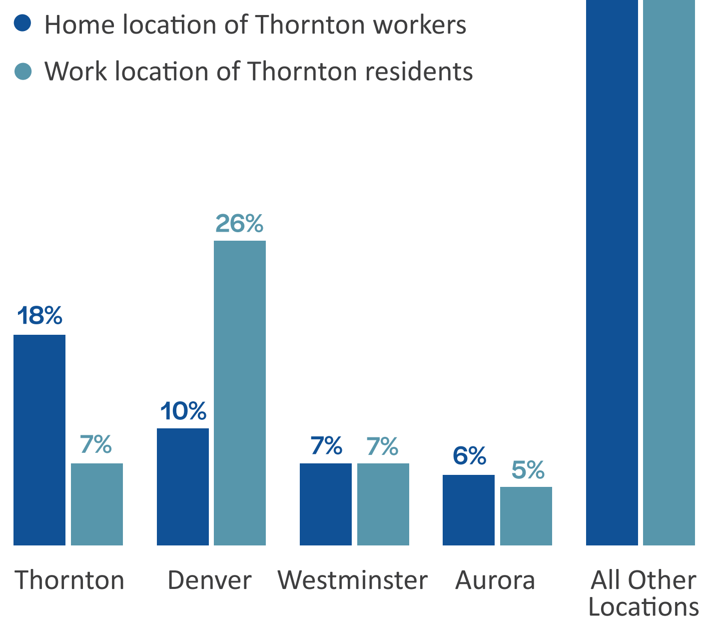
7% Live and Work in Thornton

Figure 2.6 displays the commute trends of people living and working in Thornton. This data is from the US Census Bureaus' 2018 American Communities Survey five-year estimates. This data only reflects trends before the COVID-19 pandemic. Most employed Thornton residents commute out of Thornton to work, and most people who work in Thornton commute in. Only about 4,600 people live and work in Thornton.

For people commuting out of Thornton, the top three origins and destinations are Denver, Westminster, and Aurora. Of working Thornton residents, about a quarter commute to Denver for work. **Figure 2.7** displays the share of residents and workers that commute to or from each of these top locations.

Figure 2.7

Commute Locations for Thornton Workers and Residents (2014-2018 5-year estimates)



Data: US Census Bureau – LEHD Data On the Map (2018 American Communities Survey Five-year Estimates)
Note: This data only reflects trends before the COVID-19 pandemic.

Roadway Network

The City of Thornton has 633 total miles of roadway. I-25 and E-470 provide regional connections to nearby cities while a network of arterials and collector streets serve local mobility needs. The major north-south thoroughfares are Colorado Boulevard, Holly Street, and Washington Street. The major east-west roadways are 104th Avenue, 120th Avenue, and CO 7. The South Platte River along the eastern border of the city limits creates challenges for continuous connectivity eastward out of the city and westward into the city.

Almost 50% of the total roadways within Thornton are residential streets. Residential streets function as access points within neighborhoods to individual dwelling units and other neighborhood amenities such as parks. In addition to residential streets, other street classifications include regional arterial, major arterial, minor arterial, and collector as seen in **Figure 2.8**. However, interconnectivity of residential streets between different neighborhoods is limited in Thornton. Many developments are only accessible by arterial roadways which can present challenges to people walking, using a wheelchair, biking, or making short vehicle trips.

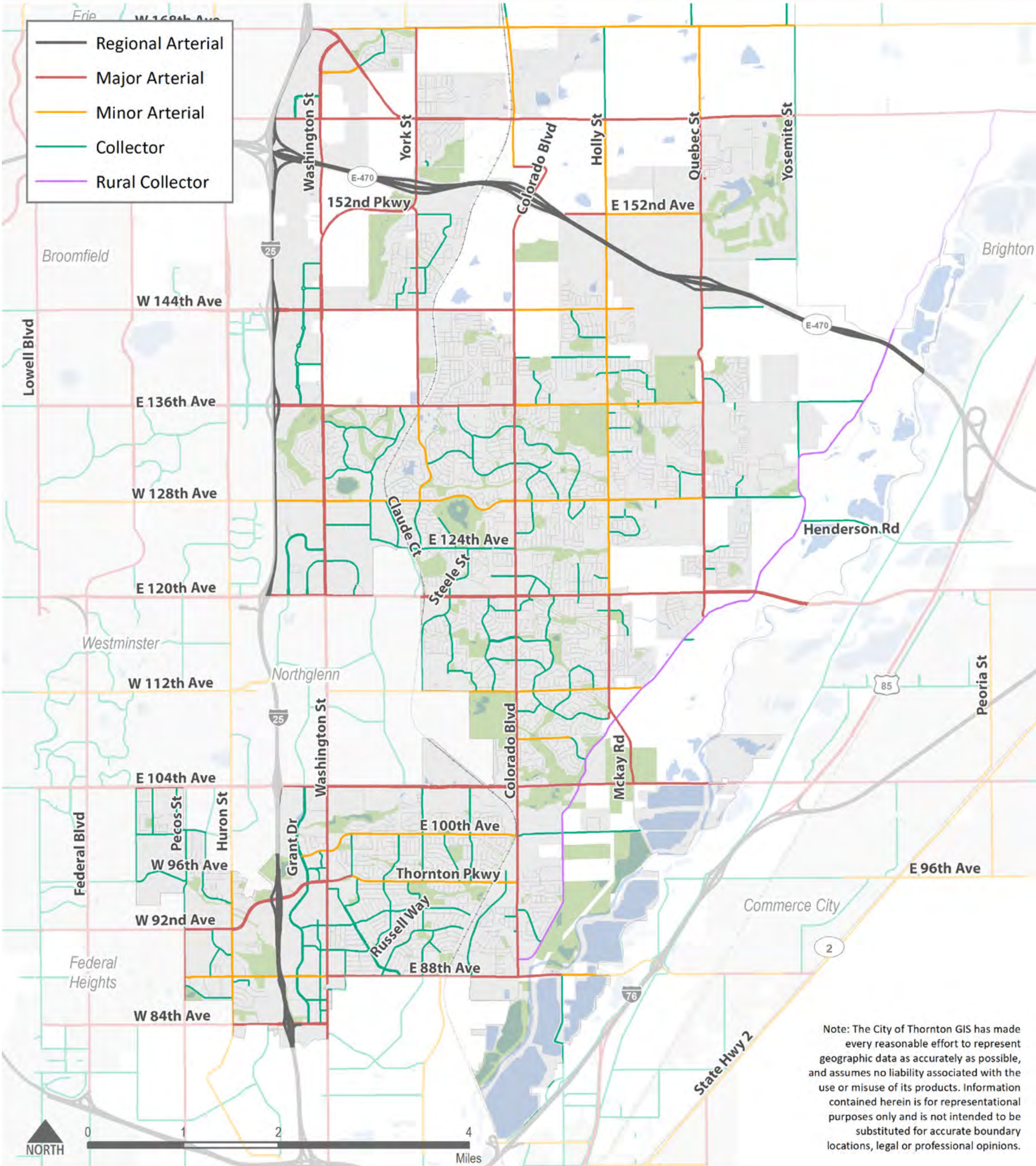
STREET CLASSIFICATIONS

Figure 2.8 displays a map of Thornton's current roadway network symbolized by the existing roadway classification of each roadway. The roadway classification is based on how the road functions currently. **Chapter 5** provides descriptions for each of the roadway types symbolized in **Figure 2.8**.

POSTED SPEED LIMITS

Posted speed limits throughout Thornton vary and are typically tied to the street classification. Regional arterials have posted speed limits greater than 55 MPH. Major arterials usually have posted speed limits between 35 and 50 MPH, while minor arterials are typically 35 to 40 MPH. Collector streets are typically 25 to 30 MPH. Assessing where travel speeds are higher than posted speed limits can inform understandings around crashes, travel times, and other transportation patterns. Higher speeds may facilitate free flowing vehicular and transit mobility. However balancing vehicle speeds with safety needs is a priority for Thornton residents.

Existing Street Classifications



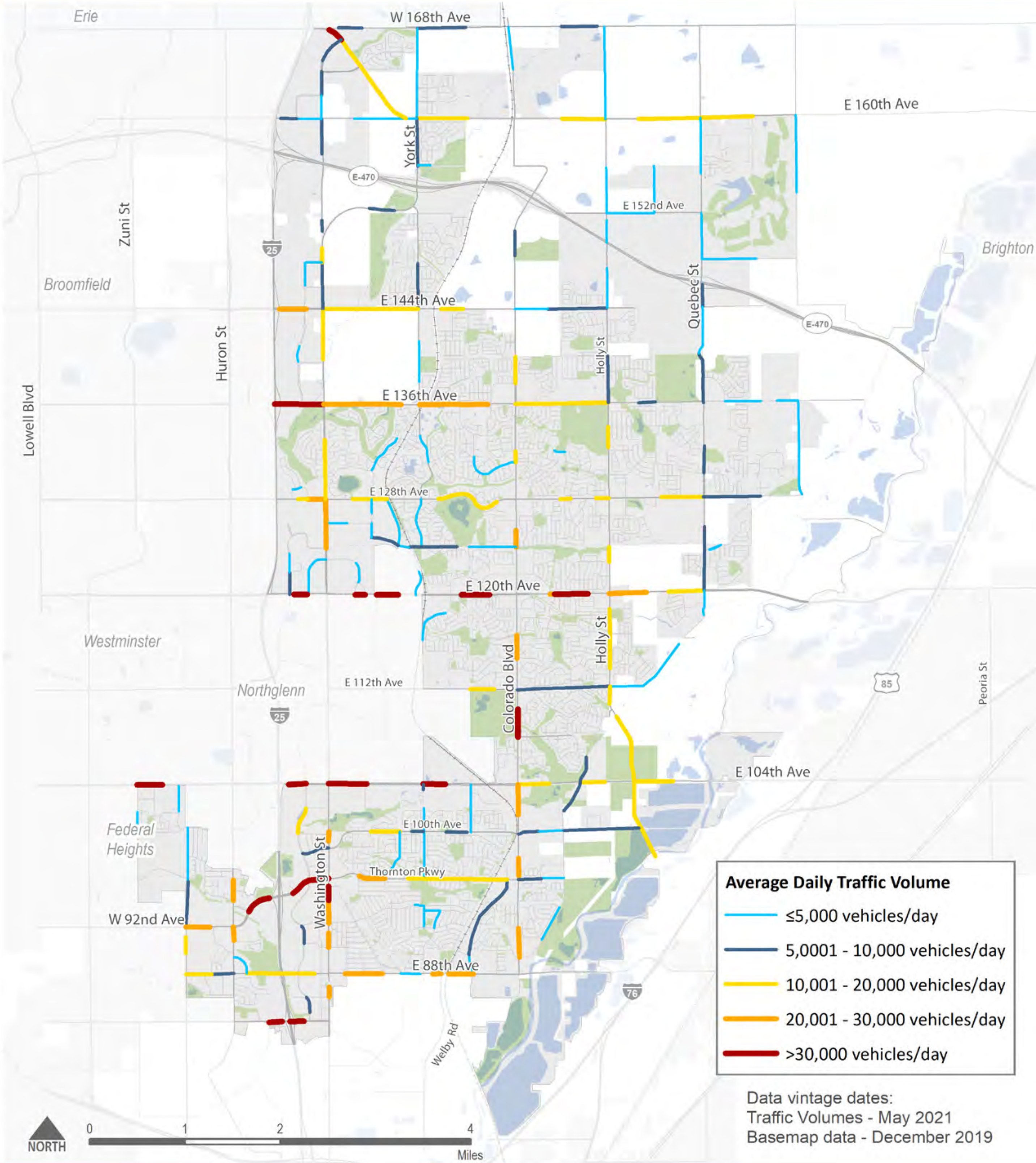
City of Thornton

Figure 2.8: Existing Street Classifications

TRAFFIC VOLUMES

Traffic volumes provide a snapshot of vehicular volumes at specific locations, as shown in **Figure 2.9**. Southern Thornton has the highest concentration of high-volume locations, with multiple locations recording more than 25,000 automobiles per day. Although Colorado Boulevard and Washington Street are the primary north-south connectors, the highest traffic volumes are primarily along east-west roadways, such as 120th Avenue, 104th Avenue, and portions of 136th Avenue. These traffic volumes could be a result of these arterials providing access to I-25. The intersection of CO 7 and Washington Street has more than 25,000 vehicles per day.

Traffic Volumes (2015 - 2019)



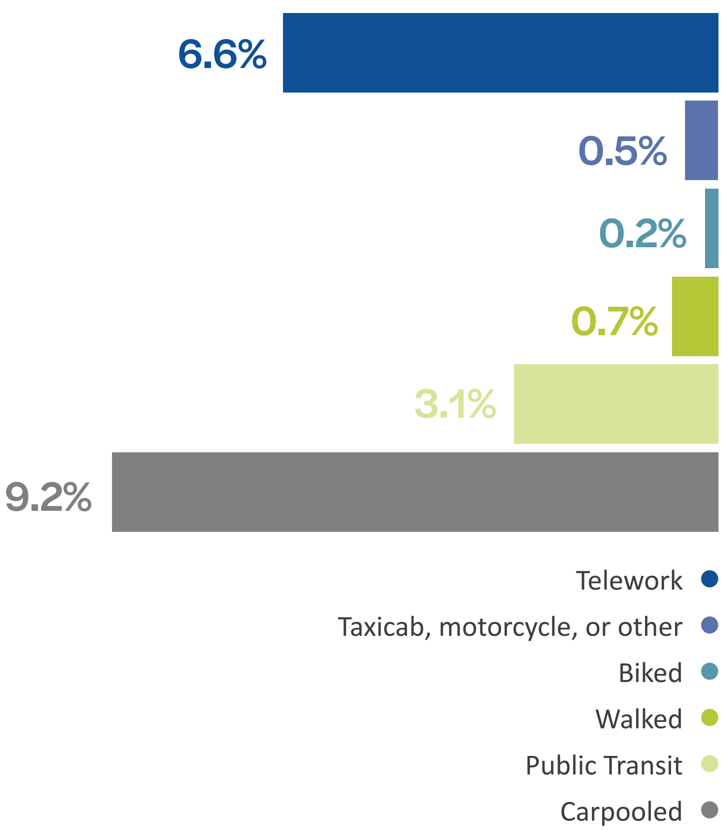
City of Thornton

Figure 2.9: Traffic Volumes (2015-2019)

Data: City of Thornton

Figure 2.10

Non-SOV Commuting Mode Split



Data: US Census Bureau – American Communities Survey (2019 American Communities Survey Five-year Estimates)

COMMUTER TRAVEL PATTERNS

In 2019, there were 71,837 workers over the age of 16 in Thornton according to a five-year estimate by the Census Bureau's American Community Survey (ACS). Of these workers, the majority drive alone to work (79.6%), also known as single occupant vehicles (SOVs). The remaining 20.4% of workers commute to work in non-SOV modes, as shown in **Figure 2.10**. Carpooling, telework, and public transit are the three largest non-SOV modes by eligible Thornton workers in 2019.

Thornton and regional commute pattern data is collected annually as part of the Smart Commute Metro North Commuter Survey. A summary of the 2019 and 2020 surveys provides insight into commute pattern changes among Thornton residents and commuters, and the region as a whole prior to and during the COVID-19 pandemic. Although this survey is localized, the sample sizes are smaller than the ACS 5-year estimate, with an average of 1,389 regional survey participants, and an average of 620 Thornton residents or commuters participating in the surveys.

The North Metro Commuter survey revealed several shifts in travel patterns from 2019 to 2020. In 2019, driving alone was the largest portion of commuting for Thornton (95.2%), seven percent more than the regional average for non-drive-alone modes. In 2020, driving alone dropped significantly for Thornton (72%) and the region (61.7%), with increases in telework making up most of the individual mode changes. Regionally, teleworking increased from 2.5% of respondents in 2019 to 33% in 2020, due primarily to local restrictions associated with COVID-19. Based on the 2019 survey, the average trip distance in Thornton was about 12 miles, fewer miles than the rest of the region. In 2020, the average one-way trip distance remained 12 miles, which was the same for the region. In 2019, Thornton residents

and commuters were most interested in learning about riding transit and teleworking, but in 2020 commuters added biking to that list. 2020 survey respondents indicated that certain improvements would encourage them to bike or take transit more.

For transit, these include transit service near their home, a better transit network, and lower fares. Noted improvements that would encourage more biking focused primarily on having separated bicycle facilities.

Other unique 2020 survey insights include:

- Two out of three survey respondents have a plan to ride the N Line.
- On average, a larger portion of Thornton commuters responded that they desire lower RTD fares than compared to responses from the region.
- Biking and transit commute trips made by Thornton residents are extremely long in comparison to the regional biking and transit commute trips.
- Overall, the COVID-19 pandemic had a smaller impact on Thornton resident and commuter travel patterns compared to the rest of the region.

Bicycle and Pedestrian Network

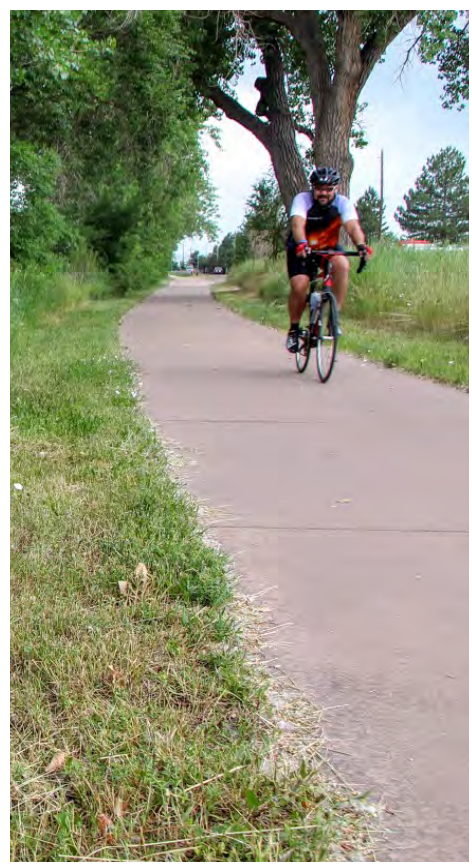
BICYCLE NETWORK

The city has substantially expanded its bicycle infrastructure since the 2009 Transportation Plan. As of March 2020, Thornton's existing bicycle and trail network consists of 29 miles of bike lanes, 159 miles of paved bicycle/pedestrian trails, and 15 miles of soft-surface trails, as shown in **Figure 2.11**. There have been considerable previous planning efforts identifying where to construct future connections to create a comfortable cohesive bicycle network (dashed lines in **Figure 2.11**). With many important connections already identified, emphasis on prioritization and implementation of already proposed projects will fill the existing gaps in Thornton's bicycle network and create a comfortable network across the city. In addition to proposed connections, upgrading existing high-stress bike lanes to more comfortable facilities and creating revised bike lane standards will ensure new bike lanes are low stress and improve bicycle access across Thornton for all ages and abilities.

PEDESTRIAN NETWORK

The city of Thornton currently has a robust sidewalk network that covers almost all the city, while also connecting to regional trails outside of the city's boundaries, as shown in **Figure 2.12**. Sidewalk gaps are primarily in low-density residential neighborhoods where walking or biking occurs on low-speed roadways. However public input indicated that some existing sidewalks on high-speed roadways are insufficient and uncomfortable especially for people using wheelchairs or people with mobility challenges. Concerns included existing sidewalks that are less than five feet wide, obstructed or cracked sidewalks, and pedestrian crossings on major roadways. Public input, pedestrian counts, and crash data can help identify priority areas for widening sidewalks and enhancing crossings to create a more comfortable pedestrian network. Additionally, as of March 2020, Thornton has 15 pedestrian crossings with rectangular rapid flashing beacons and many "marked crosswalks", which are designated with paint markings, throughout the city. However, there is potential for improved pedestrian crossings along Washington Street, Colorado Boulevard, 120th Avenue, Thornton Parkway, and 88th Avenue to increase comfort and improve safety outcomes.

Bicycle Infrastructure Examples



Existing & Previously Proposed Bicycle Network

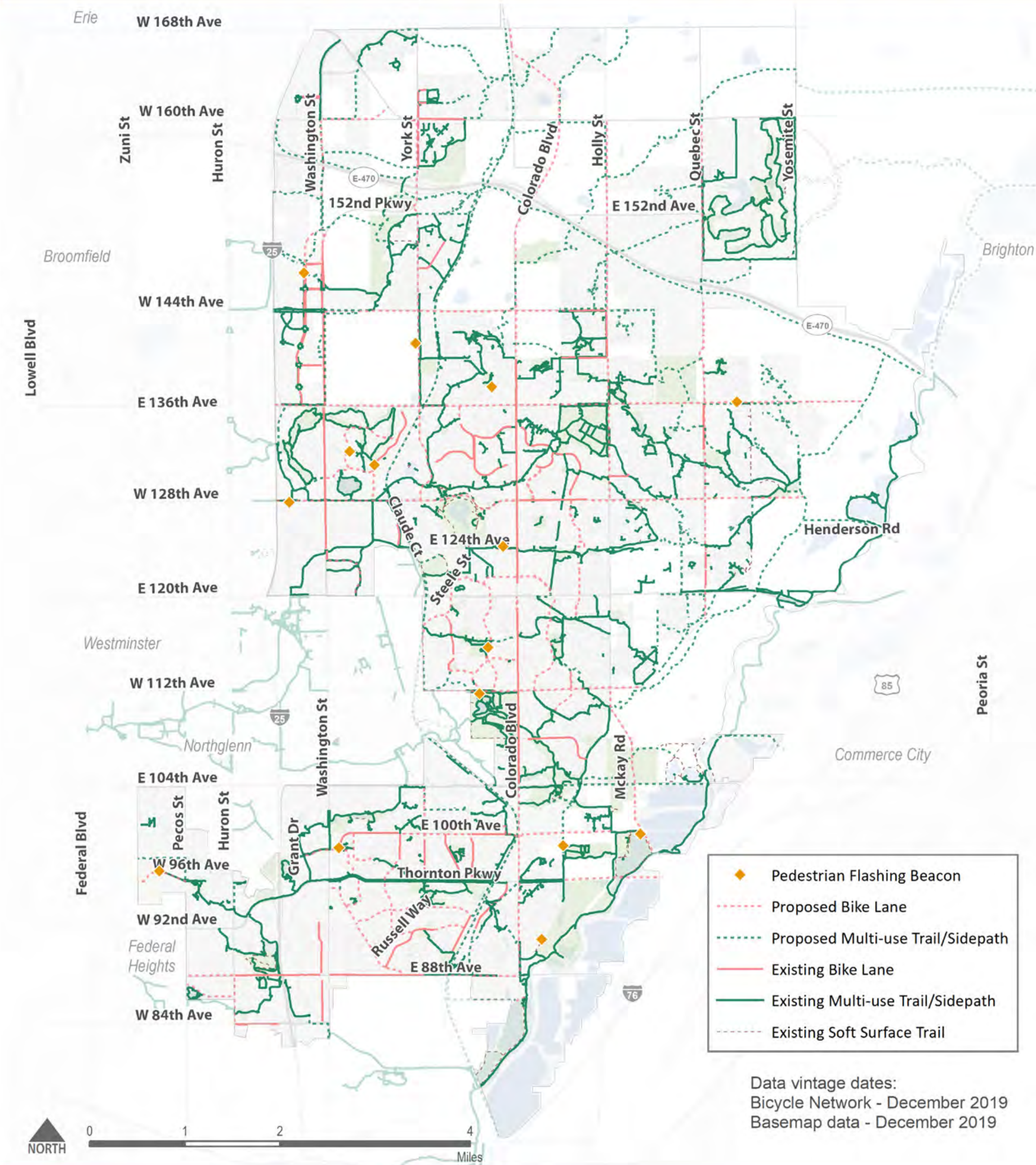


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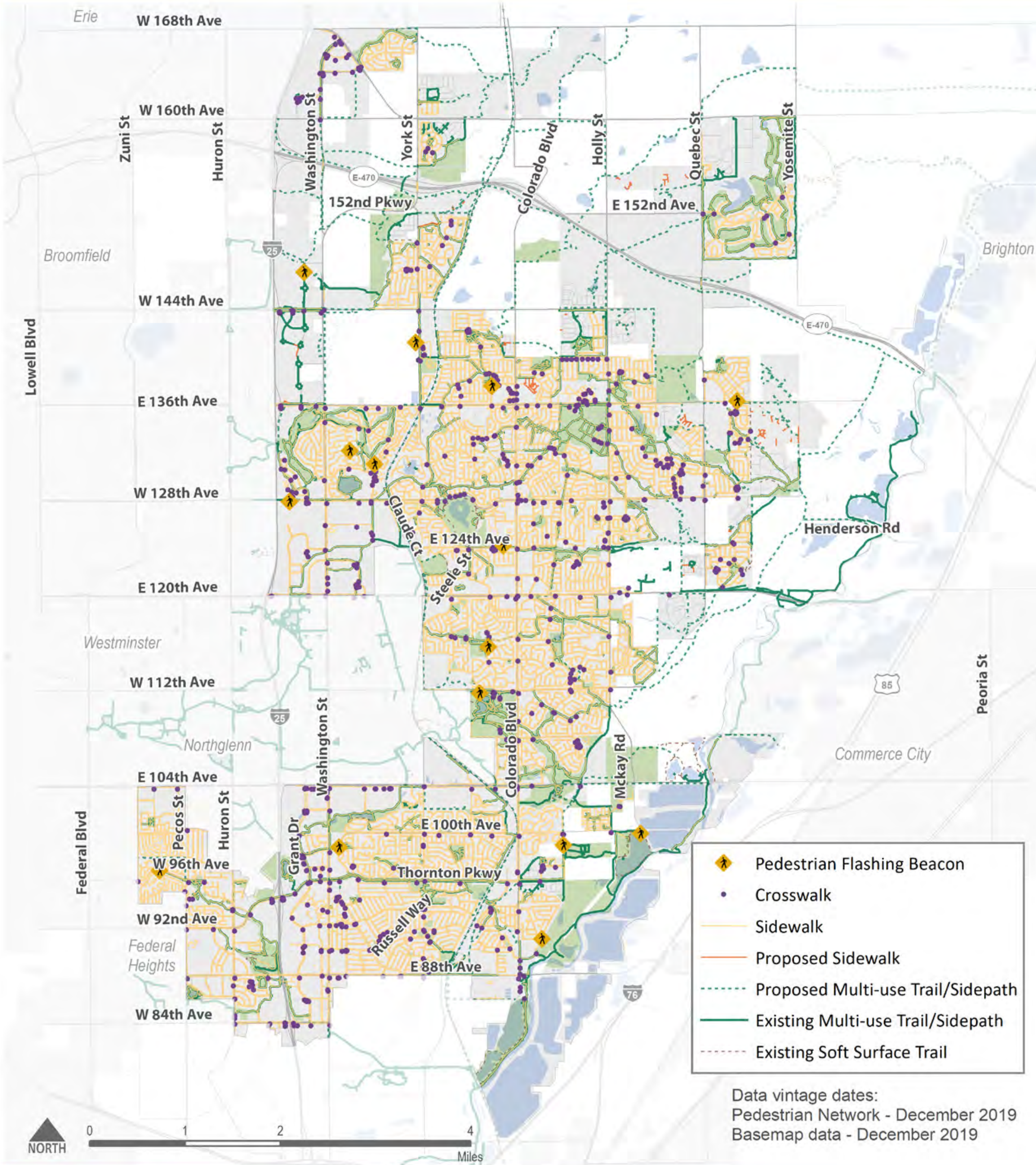
Figure 2.11: Existing and Previously Proposed Bicycle Network

Data: City of Thornton

Existing & Previously Proposed Pedestrian Network



City of Thornton

Figure 2.12: Existing & Previously Proposed Pedestrian Network

Data: City of Thornton

Transit

Thornton's transit network, as shown in **Figure 2.13**, includes commute and local service options, both operated by RTD. Local bus routes serve neighborhoods with stops in closer proximity and provide riders shorter trips between neighborhoods or across town. Local bus route stops are often accessible on foot or by transferring from another mode. Commuter transit services, such as the N Line and regional bus routes, provide longer distance and further spaced stops to move riders farther distances in a shorter amount of time. Thornton has three N Line commuter rail stations within city limits and is also served by Northglenn's station at 112th Avenue and York Street adjacent to Thornton neighborhoods. Commuter service stations are often supported by park-n-ride facilities or transfer from local routes. As noted in the transit network map, regional bus routes along I-25 are supported by park-n-ride facilities along 120th and 88th Avenues. The regional SkyRide bus route transports riders to and from Denver International Airport. The surrounding FlexRide areas in Thornton, Federal Heights, and Wagon Road are first and last mile shuttle services that connect passengers to transit options through a reservation system. The Thornton FlexRide had an average of about 68 boardings per weekday in 2018 and 2019, but a reduction to 43 boardings per weekday in 2020 due to COVID-19.

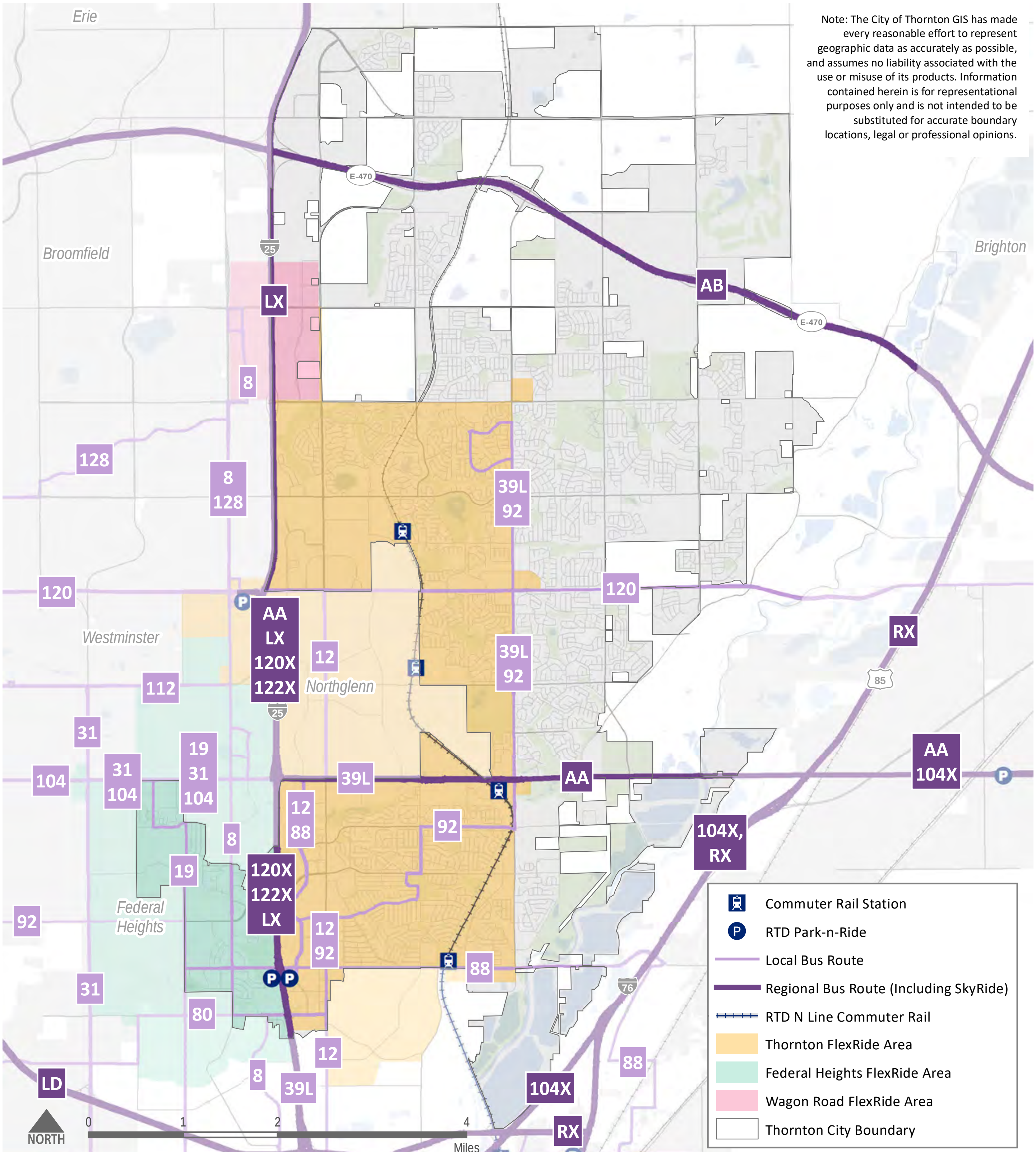
As shown in **Figure 2.14** and **Table 2.1**, the highest ridership stops are at the Thornton Park-n-Ride at I-25 and 88th Avenue, particularly Gates B and C which serve the 120X and 122X (express routes between Thornton and Denver). As of the date of the TMMP adoption, Route 122X was not running due to COVID-19 service changes. Other stops with average daily ridership over 100 riders are Washington Street and 88th Avenue (northbound, southbound, and westbound directions) and Washington Street and Eppinger Boulevard (southbound direction). These stops are all close to retail destinations, restaurants, and hotels which make up the greatest employment density in the city. The N Line had an average of about 215 weekday boardings and alightings at each of the four stations serving Thornton. It is important to note that this data was collected during the COVID-19 pandemic, when transit ridership experienced a significant decrease. Furthermore, the N Line first opened in September 2020, so it has not been operating for a substantial amount of time at the time of data collection.

Table 2.1: Transit Ridership by Stop

Bus Stop Name	Direction	Routes Serving Stop	Average Daily Ridership (Boardings + Alightings)
Thornton Park-n-Ride Gate B	N	120X, 122X*	1,113
Thornton Park-n-Ride Gate C	S	120X, 122X*	991
Thornton Park-n-Ride Gate A	S	80, 88, 92	443
Washington Street & 88th Avenue	N	12, 92	147
Washington Street & Eppinger Boulevard	S	12, 92	126
88th Avenue & Washington Street	W	80, 88, 92	121
Washington Street & 88th Avenue	S	12, 80	109

*122X is not currently running under COVID-19 service changes.

Transit Network

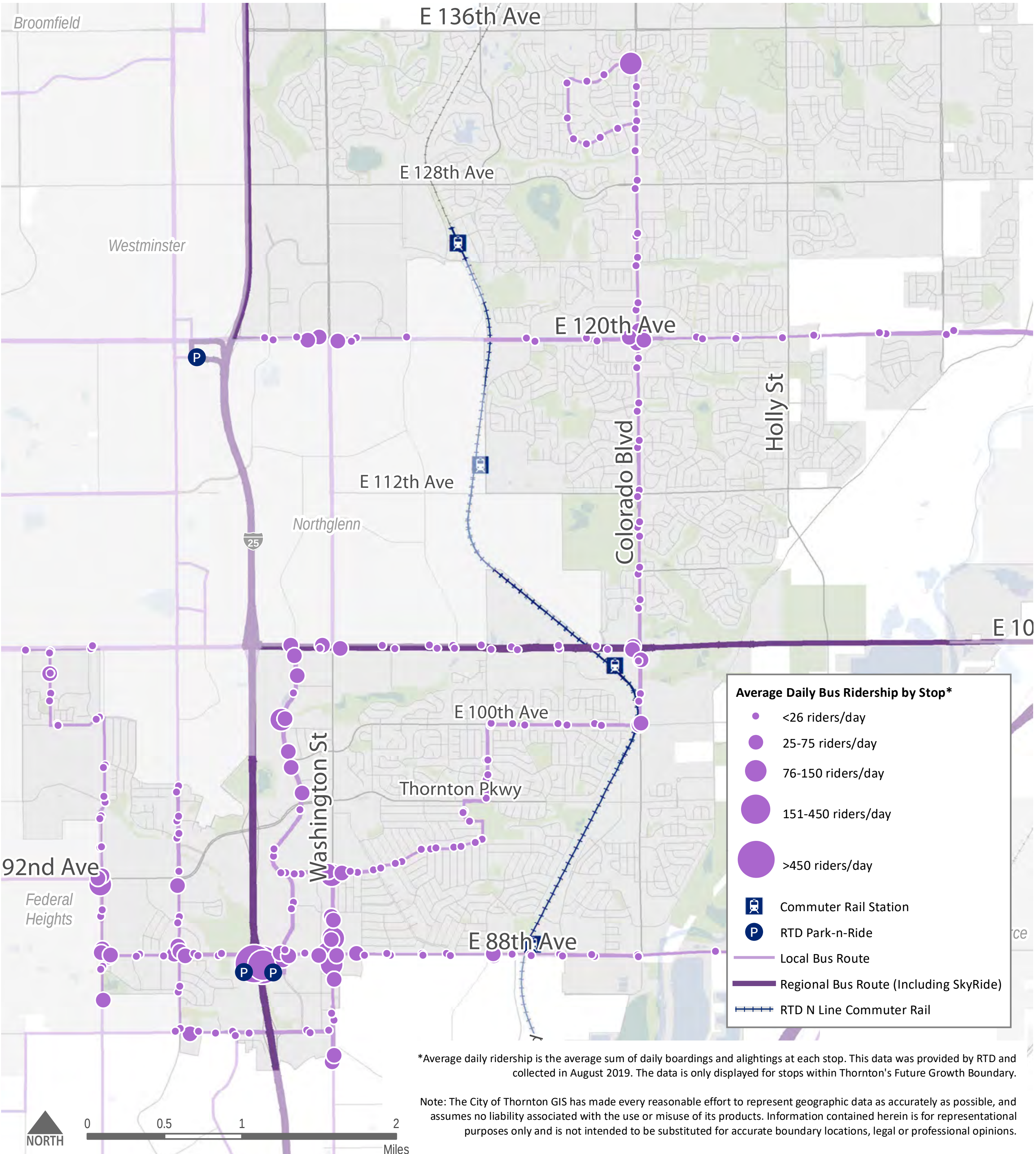


City of Thornton

Figure 2.13: Transit Network

Data: Regional Transportation District (RTD)

Average Daily Bus Ridership by Stop



*Average daily ridership is the average sum of daily boardings and alightings at each stop. This data was provided by RTD and collected in August 2019. The data is only displayed for stops within Thornton's Future Growth Boundary.

Note: The City of Thornton GIS has made every reasonable effort to represent geographic data as accurately as possible, and assumes no liability associated with the use or misuse of its products. Information contained herein is for representational purposes only and is not intended to be substituted for accurate boundary locations, legal or professional opinions.

City of Thornton

Figure 2.14: Average Daily Bus Ridership by Stop

Data: Regional Transportation District (RTD)

Safety

This section covers trends for bicycle and pedestrian-involved crashes (**Figure 2.15 and Figure 2.16)**, crashes that result in severe injuries or fatalities (**Figure 2.17 and Figure 2.18**), the High Injury Network (**Figure 2.19**), and crash types (**Figure 2.20**).

BICYCLE AND PEDESTRIAN CRASHES

Figure 2.15 provides a heat map of crashes that involved a person biking or walking within Thornton between 2015 and 2019. Non-fatal individual crashes are indicated by gray dots, individual fatal crashes are indicated with red dots, and a gradient between yellow and red indicates higher densities of bicycling and pedestrian crashes.

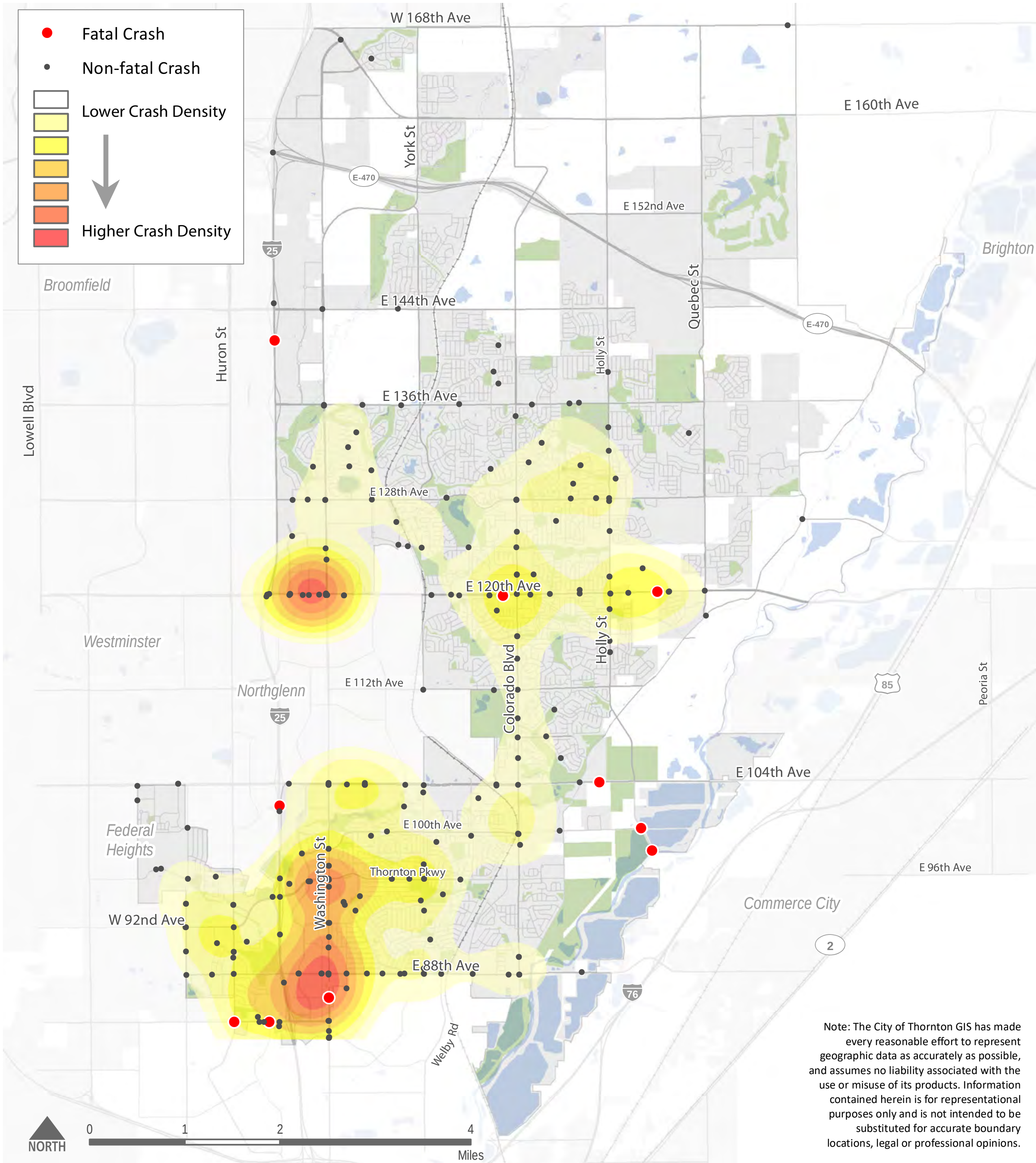
Over the five-year period, a total of 239 bicycle (41%) and pedestrian (59%) crashes occurred, 52 of which resulted in a fatality or severe injury. In general, total bicycle and pedestrian crashes, and severe injury and fatal bicycle and pedestrian crashes were increasing, but then saw a slight dip in 2019 (**Figure 2.16**).

Crashes typically occur on major and minor arterial roads with high volumes and speeds. Areas with the highest crash density are also near intersections, particularly Washington Street at 88th Avenue and along Thornton Parkway, 104th Avenue, and 120th Avenue. The intersection of Washington Street and 88th Avenue and the surrounding commercial area has the highest concentration of crashes in the city. The intersection of Washington Street and Thornton Parkway, and 120th Avenue and Holly Street are also notable for their density of bicycle and pedestrian-involved crashes. Commercial and retail land uses with driveway conflicts, higher activity demand destinations, and a lack of bicycle and pedestrian facilities play a role in the high density of bicycle and pedestrian-involved crashes in this area.

Outside of the core commercial area, the intersection of Washington Street and 120th Avenue has the highest density of bicycle and pedestrian-involved crashes. The intersection of Washington Street and 120th Avenue is a wide intersection with seven to nine lanes per intersection leg to cross, no existing bicycle facilities, and limited pedestrian amenities. These intersection characteristics create an uncomfortable environment for those not in a personal automobile.

The intersection of 120th Avenue and Colorado Boulevard has fewer crashes overall, but one fatal crash near the intersection. Bike lanes were installed on Colorado Boulevard moving traffic away from the sidewalk that is at the back of curb thus enhancing pedestrian safety. However, the vehicle speed on Colorado Boulevard makes these bike lanes high stress for people biking. As noted in the *Bicycle and Pedestrian Network* section, existing bike lanes coupled with crash outcomes could indicate the need for additional countermeasures that may include consideration of protected bike lanes.

Pedestrian or Bicycle Involved Crashes (2015-2019)



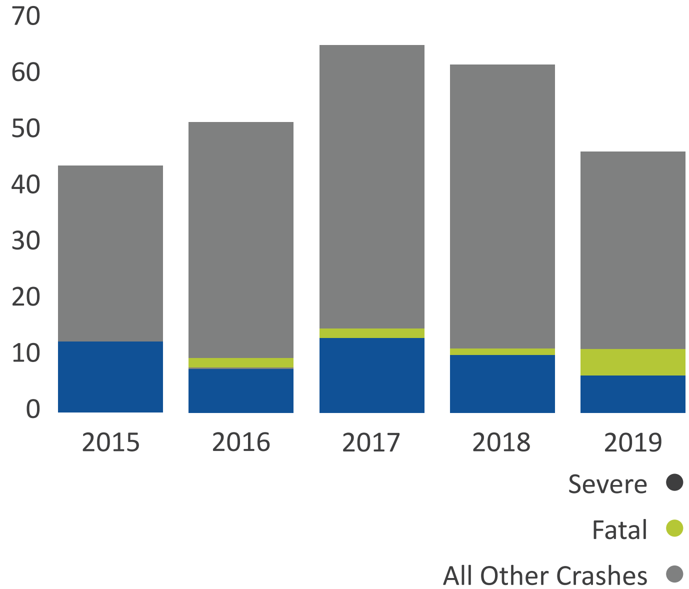
City of Thornton

Figure 2.15: Bicycle or Pedestrian-involved Crashes (2015-2019)

Data: DRCOG Crash Data (2015-2019), from DRCOG Vision Zero Action Plan

Figure 2.16

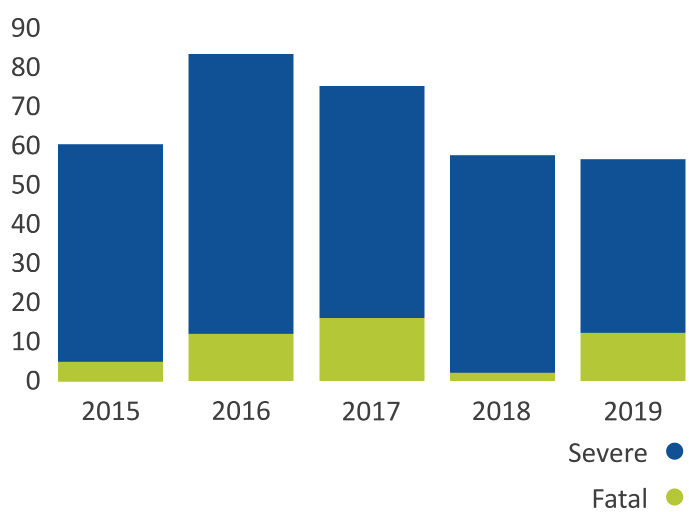
Bicycle and Pedestrian Crashes Per Year by Injury



Data: DRCOG Crash Data (2015-2019)

Figure 2.17

Thornton Fatal and Severe Injury Crashes Over Time (all modes)



Data: DRCOG Crash Data (2015-2019)

FATAL OR SEVERE INJURY CRASHES

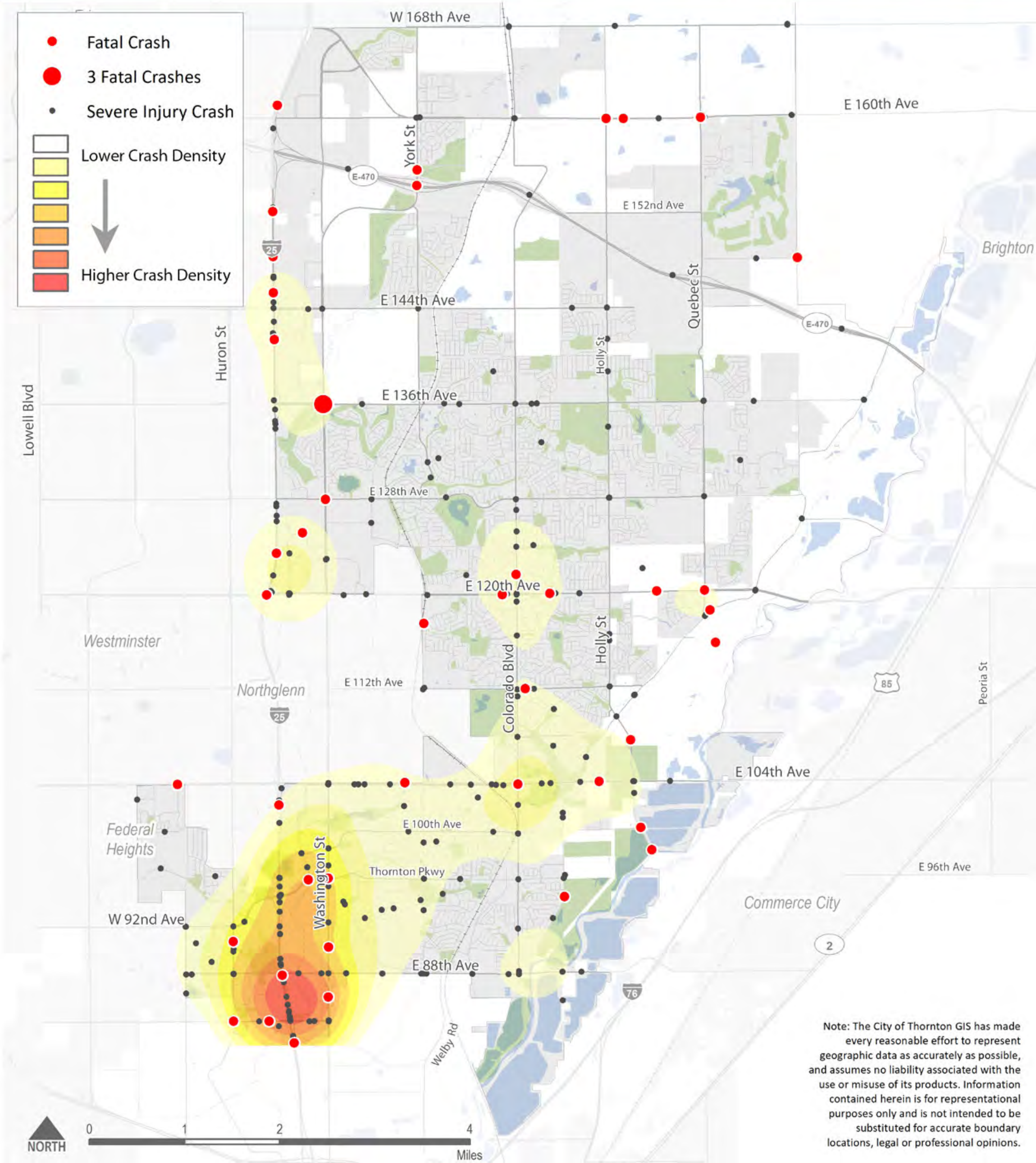
Between 2015 and 2019, a total of 12,833 crashes occurred within the city of Thornton. Of those total crashes, 314 resulted in a fatality or severe injury (shown in **Figure 2.18**). Severe injury and fatal crashes reached a high point in 2016 slightly declining in 2018 and 2019. (**Figure 2.17**).

Injury crashes occur along major and minor arterial roadways with higher volumes and speeds. The commercial area near Washington Street and 88th Avenue has the highest concentration of injury crashes within the city. Washington Street, Colorado Boulevard, 104th Avenue, and 120th Avenue also have a high density of crashes. Despite less activity in north Thornton, 160th Avenue has moderate levels of injury crash density.

HIGH INJURY NETWORK

A High Injury Network (HIN) is the set of roadway segments that have the highest number of fatal and severe crashes. The City of Thornton High Injury Network (**Figure 2.19**) was developed by DRCOG as a part of the regional Taking Action on Regional Vision Zero. This map will be important in informing project identification and prioritization to help the city work towards the region's goal of zero traffic-related fatalities.

Fatal or Severe Injury Crashes (2015-2019)

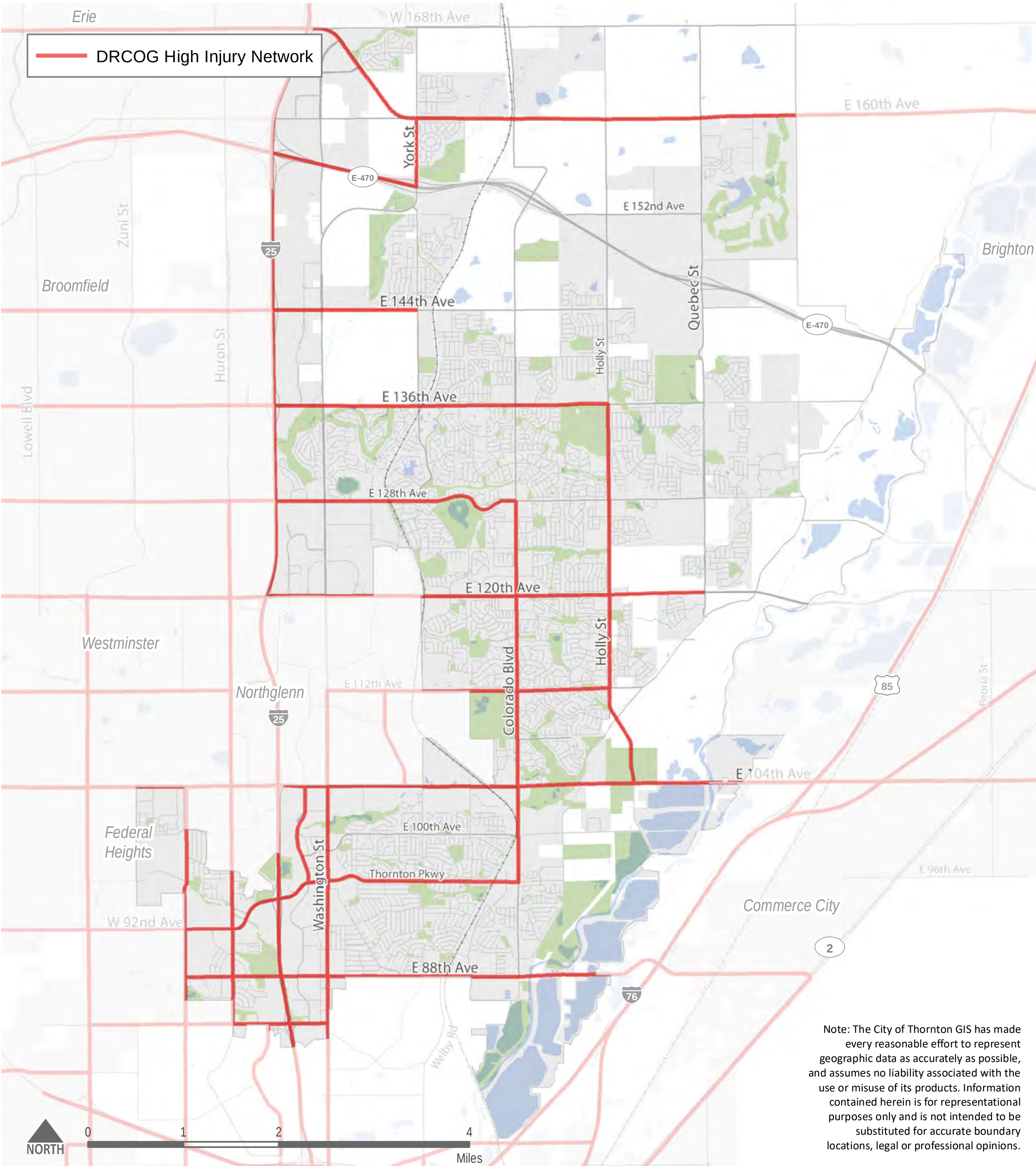


City of Thornton

Figure 2.18: Fatal or Severe Injury Crashes

Data: DRCOG Crash Data (2015-2019)

DRCOG High Injury Network



Note: The City of Thornton GIS has made every reasonable effort to represent geographic data as accurately as possible, and assumes no liability associated with the use or misuse of its products. Information contained herein is for representational purposes only and is not intended to be substituted for accurate boundary locations, legal or professional opinions.

City of Thornton

Figure 2.19: DRCOG High Injury Network

Data: DRCOG

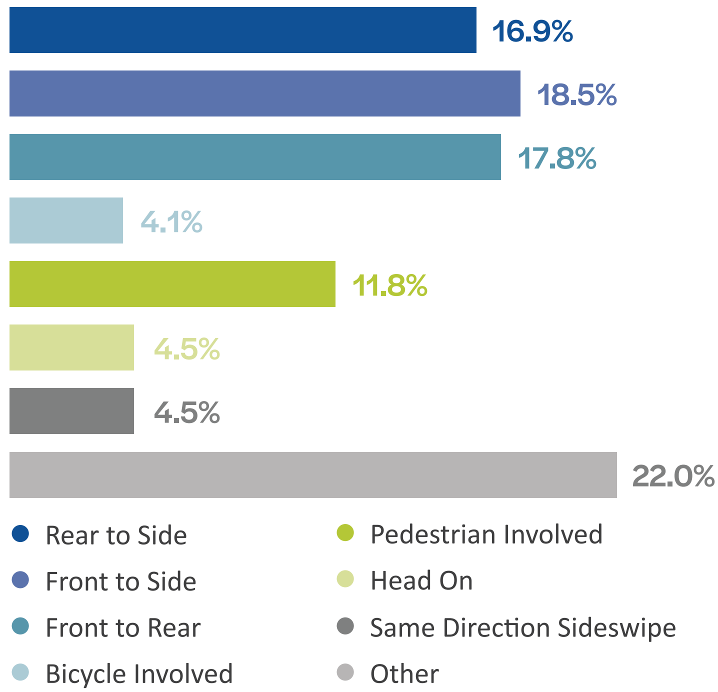
CRASH TYPES

In addition to mapping fatal and severe injury crashes, understanding trends in types of crashes provides insight into how current operations or the environment might influence crashes. As illustrated in **Figure 2.20**, the most common crash types that caused severe injuries or fatalities in the City of Thornton between 2015 and 2019 were front-to-side, front-to-rear, rear-to-side, and crashes involving pedestrians. Front-to-rear crashes are the most common (49%) crash type for all crashes, not just those resulting in a fatality or severe injury.

As shown in **Figure 2.21**, careless and reckless driving are cited as the causes of 45% of fatal or severe injury crashes in Thornton from 2015-2019. Under Colorado Law CRS 42-4-1402 careless driving is defined as "operating a motor vehicle without proper regard for the road and surroundings." Failing to yield at right-of-way and failing to stop at a signal account for 24.6% of fatal and severe injury crashes.

Figure 2.20

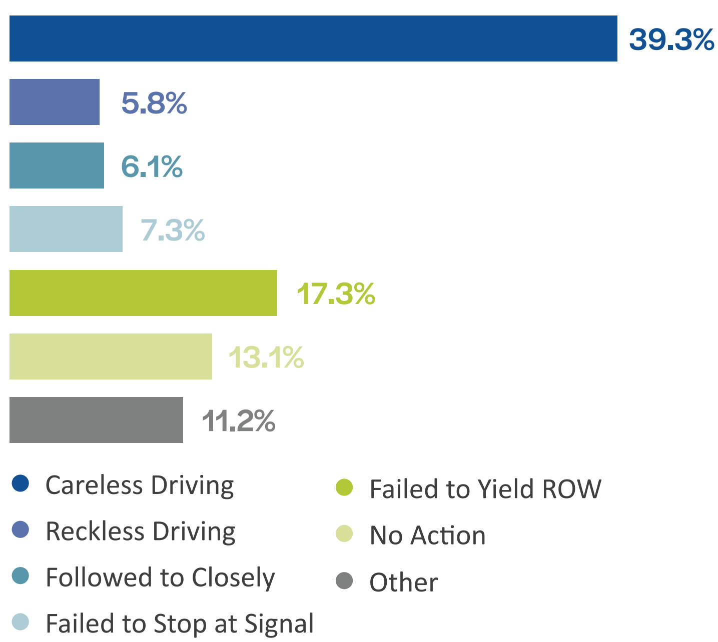
Thornton Severe Injury & Fatal Crash Types



Data: DRCOG Crash Data (2015-2019)

Figure 2.21

Driver Action in Severe Injury and Fatal Crashes



Data: DRCOG Crash Data (2015-2019)

2.4 Conclusion

Overall, the city of Thornton has a growing population with increasing roadway volumes and increasing demand for transit, bicycle, and pedestrian facilities. As the city's population ages, diversifies, and has a growing share of multi-person households, transportation planning considerations must be made to meet the needs of all existing and future transportation network users.

Special attention should be paid to populations in Thornton with the fewest transportation options. As noted, southern Thornton has a higher concentration of manufactured housing, households below the poverty line, and renter-occupied households. Making sure that there are multiple safe options for transportation in southern Thornton can help provide greater access to lower-income Thornton residents.

Southern Thornton also has the highest concentration of severe injury or fatal crashes and bicycle or pedestrian-involved crashes. The N Line, increased employment density, a higher percentage of key destinations, and commercial areas all generate trips to and from southern Thornton, but additional planning efforts (as recommended in **Chapter 11**) should be considered in this area to ensure the safety and economic vitality of all Thornton residents.

Although much of the vacant land in northern Thornton is already permitted for new developments, there are still opportunities for greenfield development, infill development, and redevelopment both within the city's current limits and its Future Growth Boundary. While greenfield development may pose challenges such as expense and expansion of infrastructure, it can also serve as an opportunity to implement a more multimodal transportation system which reduces dependency on single occupancy vehicles. Infill development and some redevelopment can create 'complete neighborhoods' that serve both Thornton's transportation and land use goals. Thornton's 2020 Comprehensive Plan identifies key development and growth factors including aligning land use and transportation plans and promoting reinvestment in established areas of the community.

Thornton's existing conditions establish the foundation for the TMMP to address growing population needs by identifying solutions to improve safety for all roadway users and increasing multimodal access.


BAR & GRILL
2180
HOURS

03 Community Engagement

The Thornton Transportation and Mobility Master Plan (TMMP) was informed by a comprehensive outreach process that gathered input from many residents, employees, stakeholders who were members of various focus groups, and City Council from across the city, representing each of Thornton's four Wards. The project took a multi-pronged approach to seeking feedback to ensure there was a method and available time for all community members to provide meaningful input. Targeted outreach was accomplished through small focus group meetings, special interest meetings, City Council Planning Sessions, and ongoing city staff involvement. Broad outreach occurred in parallel and involved an online survey, an interactive mapping tool, one virtual public event, print and media relations, and detailed information provided on the city website. Outreach related to transportation from the recent Comprehensive Plan was also used to inform the TMMP. The various forms of community feedback are described further in this chapter. The goals of the engagement process are to empower the broader community, create public awareness and interest, provide decision-makers with guidance and continued involvement, and maintain communication through multiple channels.

Most of the TMMP outreach was conducted during a period of restrictions on in-person gatherings associated with COVID-19. In compliance with local guidelines, most of the engagement was completed virtually. A concerted effort was made to overcome barriers to virtual outreach and provide an equitable means to collecting feedback, such as using community champions to reach out to the Latinx community. By applying a variety of different methods in both Spanish and English, the project team was able to integrate feedback from several focus groups and members of the public.

3.1 Engagement Methods

Several methods were used to gather feedback from the public and stakeholders.

Comprehensive Plan

The *Thornton Comprehensive Plan* was adopted in July 2020, overlapping with the TMMP effort. The Comprehensive Plan conducted a robust outreach effort, engaging over 1,500 individuals of all ages, income levels, and ethnic backgrounds from all parts of the city. This was an extensive two-year outreach effort that served as a foundation for more focused outreach through the TMMP.

Events ranged from focus groups and community/neighborhood meetings to more informal events such as Ice Cream Socials, Harvest Fest, and visiting schools and senior centers. Through outreach completed as a part of the Comprehensive Plan, the city received almost 200 comments related to transportation. The transportation themes from the Comprehensive Plan are consistent with the key input heard during the TMMP as well. **Figure 3.1** shows some of the key transportation-related themes that emerged from the Comprehensive Plan. The feedback reflects the community's desire for more multimodal transportation options, to travel more comfortably and conveniently by transit, bicycle, or walking. From a transit perspective, respondents want to see improved connections to the existing N Line commuter rail, expanded coverage, and better bus frequency in the evenings. Feedback on walking and biking reflect a desire for improved connectivity, access to key destinations, and bicycle facilities that are more comfortable for all ages and abilities. Feedback related to roadways included addressing increasing congestion, considering traffic implications of development, safety concerns, and implementing traffic calming to slow vehicle speeds.

Engagement
GOALS

The goals of the engagement process are to empower the broader community, create public awareness and interest, provide decision-makers with guidance and continued involvement, and maintain communication through multiple channels.

Figure 3.1: Thornton Comprehensive Plan Transportation-Related Feedback

Focus Groups

Eight virtual focus group meetings consisting of various mode users were conducted throughout the planning process to gather input. The small group format allowed for more focused, localized ideas and feedback on key themes (**Figure 3.2**) and provided additional community input on the less commented on transportation areas received during the Comprehensive Plan development. The first set of meetings (six meetings during February - March 2021) took place during the existing conditions phase of the project to discuss current challenges and potential opportunities for traveling within and through Thornton. A second set of meetings took place in May 2021 as a part of the scenario development phase, during which the project team presented findings and draft recommendations on potential future roadway, biking, and pedestrian networks, seeking feedback on these initial concepts.

The focus groups included community members representing the following interests:

- Latinx community
- Differently-abled and mobility-challenged individuals
- Active adults/seniors
- Transit riders
- Bicyclists and pedestrians

Feedback from the focus groups was compiled using Jamboards, which is a virtual platform to document and show comments in real time. A Jamboard was created for each of the group interests bulleted above. As an example, **Figure 3.3** shows the "bicycle" Jamboard.

Figure 3.2: Focus Group Meeting

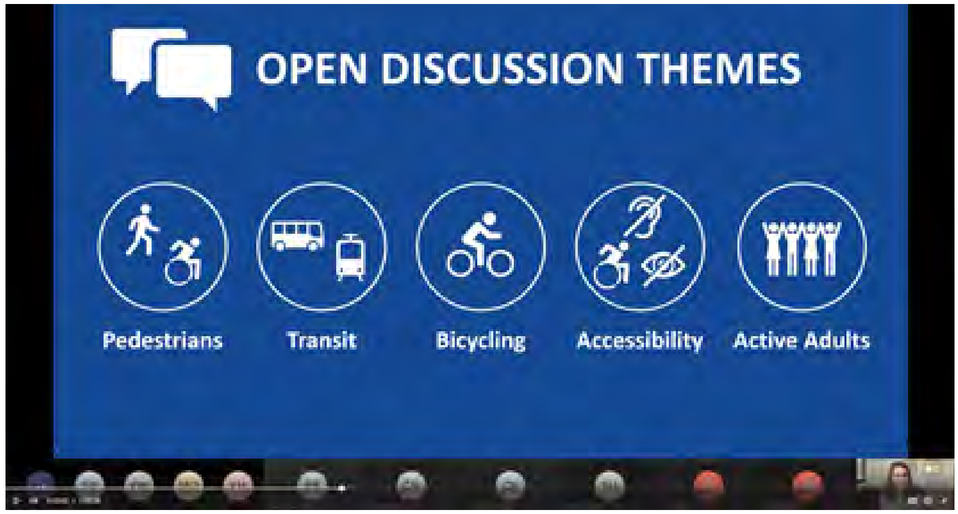
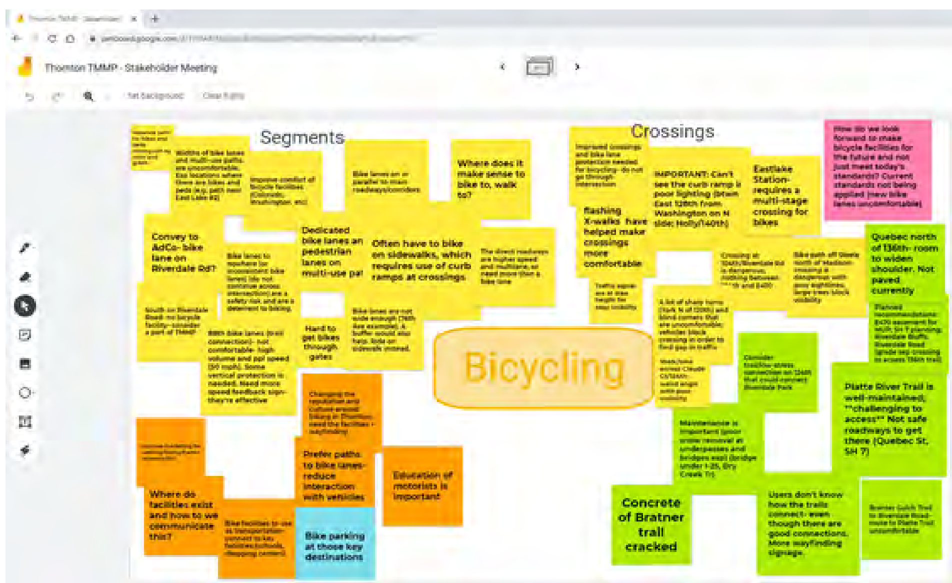


Figure 3.3: Example of Focus Group Jamboard results



Virtual Community Meeting

The virtual community meeting took place on May 20, 2021, and had over 40 attendees. The community meeting included a presentation by the project team and provided an opportunity for attendees to ask questions about the planning process. There were virtual polling questions prompting attendees to identify their preference for a preferred scenario for the city's roadway, biking, and pedestrian transportation network. Attendees were also able to provide other input in the chat to inform the development of the TMMP preferred scenario.

Online Survey

An online survey was made available in English and Spanish on the city's website and through email in February 2021 to gain insight into the challenges and opportunities for people traveling within and through Thornton. Questions asked about: current mode to work; barriers to walking, biking, and taking transit in Thornton; and level of satisfaction with various elements of travel in Thornton such as safety, connectivity, and efficiency. This survey received 76 responses from a broad cross-section of the community. The responses were an important source to inform TMMP recommendations for removing key barriers to comfortable and efficient multimodal travel in Thornton.

Multiple survey questions asked respondents about their travel patterns both before and while still in the COVID-19 pandemic. We also asked respondents to predict how their travel patterns would shift once social distancing guidelines imposed during the pandemic were lifted to derive post-pandemic data and consider how travel behavior has changed in both the short and long-term. **Figure 3.4** shows these changes to travel behavior. These results show a decrease in single occupancy vehicle (SOV) trips during the pandemic, with an increase in SOV trips post-pandemic (based on anticipated travel patterns once social distancing guidelines have been lifted), but still below pre-pandemic levels. This decrease in SOV commute trips is due to increases in telecommuting and walk and bike trips; the percent of respondents commuting by bus also decreased (note: commuter rail did not exist in Thornton until September 2020). Further information on survey responses is located throughout the report, as they apply to relevant topics.

A similar survey was sent to City of Thornton employees to better understand how this cohort travels and their vision for transportation in the city. This survey received 73 responses, which were incorporated into the planning process.

Figure 3.4

Online Survey Responses on Mode Choice

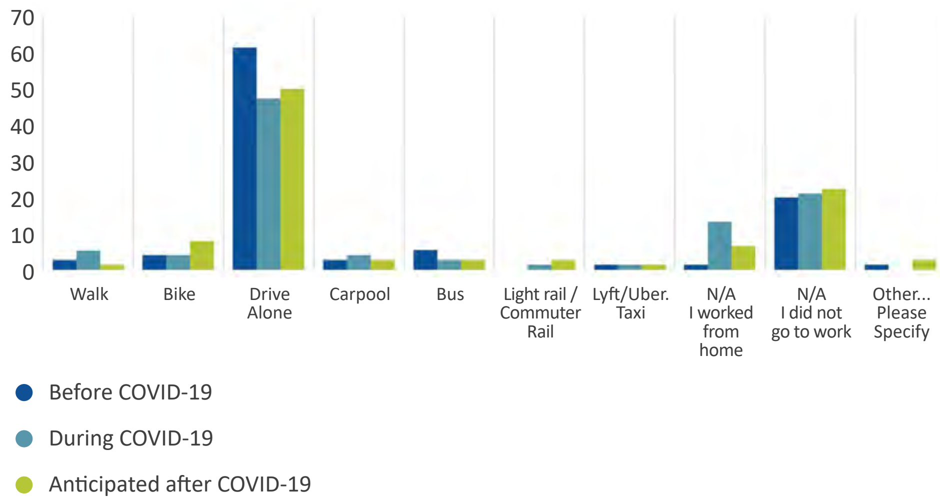


Figure 3.5

City Employee Survey Responses to the Question Of "Do the Following Descriptions Reflect the Transportation System in Thornton?"

Interactive Webmap

The interactive Webmap, as shown in **Figure 3.6**, allowed the public to mark a location with a comment where they experience transportation-related challenges. The Webmap was useful for collecting spatial data and creating a visual dashboard of feedback. Interactive legend items included “Add or improve crosswalk,” “Add a signal or stop sign,” and “Add or Improve Trail or Bike Lane.” The 75 comments in the Webmap formed hot spots that were translated to recommendations as a part of this Plan.

Figure 3.8 shows the results from the interactive Webmap. There is a cluster of feedback around the schools and retail along Washington Street, identifying a need for improved pedestrian facilities and vehicular circulation. Comments are generally focused on arterials and near recreation centers where additional bicycle facilities are desired. These specific recommendations were applied to the roadway and bicycle network, identified in **Chapters 5 and 6**, respectively.

Multimedia

Multimedia updates were pushed out to the community through a project website, as shown in Figure 3.7, and social media including Facebook, Twitter, T-Mail and Nextdoor. These methods described the planning process and solicited opportunities for involvement. The city also set up a dedicated project email and phone number where people could submit transportation comments or questions. This approach reached hundreds of people to keep them apprised of the planning process.

Figure 3.6

Interactive Webmap Interface

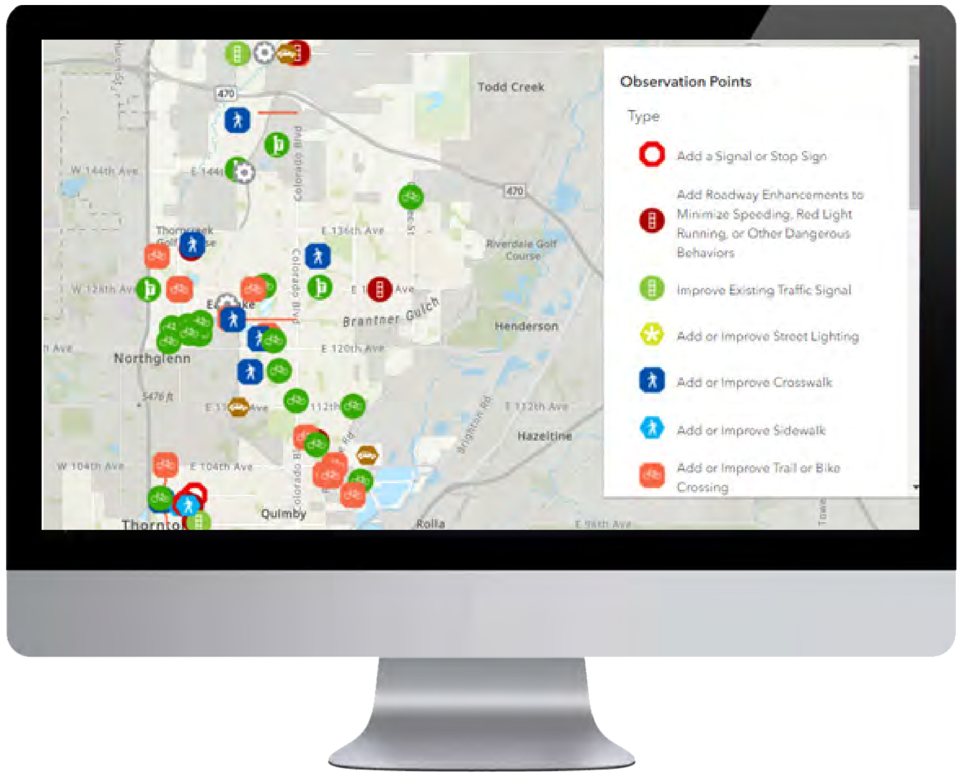
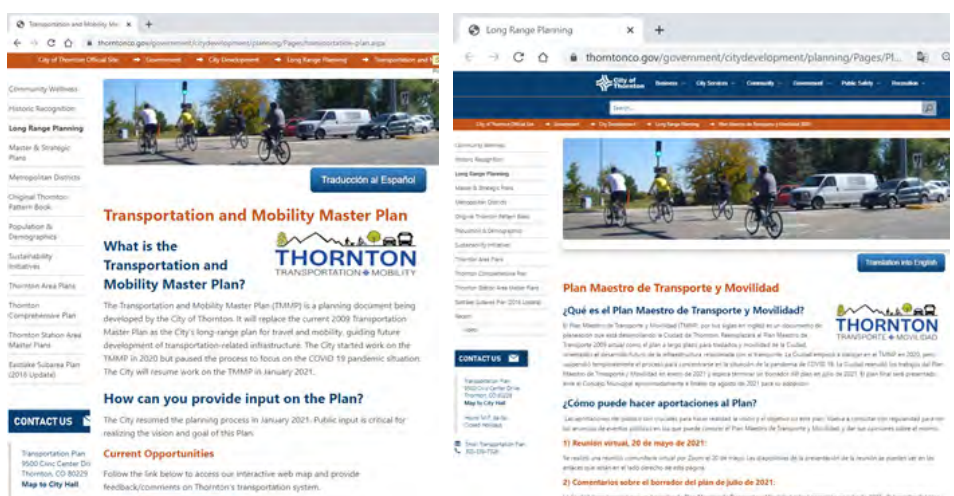
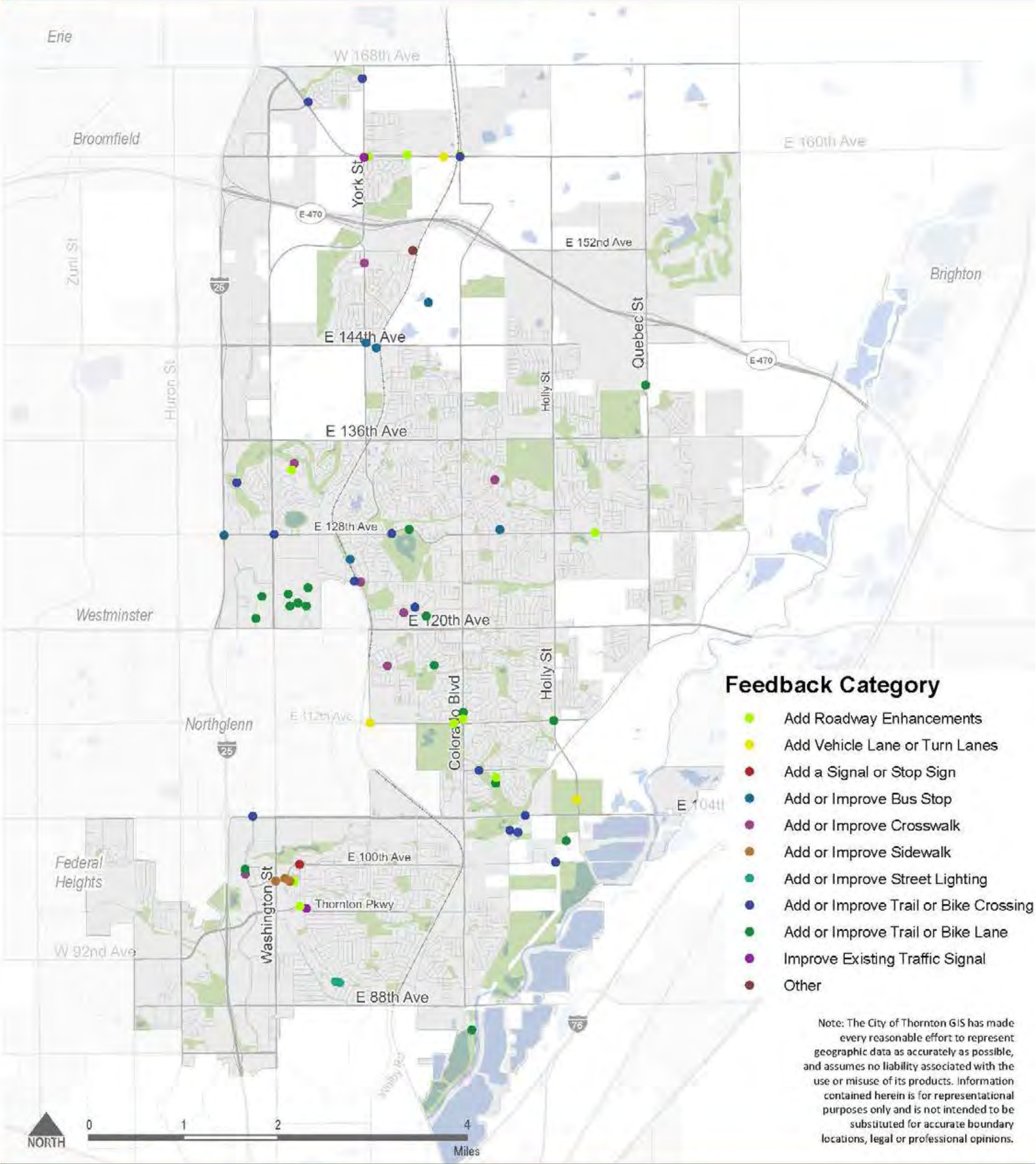


Figure 3.7

TMMP Project Website



Interactive Webmap Results



City of Thornton

Figure 3.8: Interactive Webmap Results

City Council and Ward Meetings

City Council received updates about the planning process and were instrumental in reviewing components at key milestones throughout the planning process. The project team presented to City Council three times—February 2020, March 2021, and April 2022. At the first two meetings, staff solicited feedback, and answered questions after a PowerPoint presentation providing a project update. At the April 26, 2022 City Council meeting, the final Plan was presented for adoption. The project team also discussed the TMMP at four Ward meetings during Spring 2021. These Ward meetings provided an opportunity for attendees to learn about the planning process and to provide feedback as it pertains to transportation challenges in their Ward.

3.2 Key Themes

There were several key findings from this comprehensive outreach process. These findings included both key themes as well as location-specific recommendations. Both types of feedback from the community were incorporated into TMMP recommendations. The key themes are summarized by mode in this section:

Driving

- Congestion is increasing with development
- Need traffic calming
    - » Residential streets are too wide and encourage speeding
- Improve maintenance of roadways
- Need increased enforcement of speeding, consider photo radar
- Reduce the number of large vehicles on residential streets
- Eliminate speed bumps
- Provide more parking for community events
- Poor connectivity regionally

Transit

- Improve first and final mile connections the gap (long distances, lack of infrastructure or services, poor street connectivity) between transit and a user's origin/destination
    - » Improve access between neighborhoods and stations
    - » Provide micromobility (bike share and scooter share) to increase access to transit
- Improve station amenities
    - » Increase covered, secure bike parking at transit stops/stations
    - » Improve lighting at stops/stations
    - » Improve ADA accessibility at stops/stations
    - » Improve personal safety at stations
    - » Provide better protection from wind and elements at station
    - » Provide real time transit information for those without a smartphone
    - » Improve snow removal, especially at new bus stops
- Invest in transit-oriented development with pedestrian-friendly design
- Improve education/marketing
    - » Ensure all information is in both English and Spanish
    - » Promote fare reduction programs
    - » Include maps and schedules (English and Spanish) at all stops/stations
- Improve FlexRide reservation process, provide additional capacity
- Provide more transit connections on weekends and evenings
- Improve transit coverage

Bicycling

- Regarding bicycle facilities along corridors:
    - » Preference for separated bicycle facilities, with horizontal or vertical buffer between the travel lane and bicycle lane
    - » Bike lanes in Thornton are often too narrow
    - » Gap in bicycle facilities, do not connect to trails or key destinations
    - » Preference for trails over on-street bicycle facilities
- Provide better on-street connectivity to regional bike trails
- Improve maintenance: snow and ice removal under bridges on trails
- Carry bicycle facilities through the intersection with signing and striping
- Educate motorists on sharing the road with people bicycling
- Improve bicycle connectivity to key destinations (i.e., shopping centers, schools, grocery stores, transit) to serve as a viable means of transportation
- Increase covered, locked, secure, well-lit bike parking at key destinations

Pedestrian Accessibility

- Missing or inadequate sidewalks
    - » Walking along arterials feels uncomfortable when sidewalks are narrow and there is no buffer
    - » A buffer between the sidewalk and travel lane makes walking more comfortable for children and aging adults especially
    - » There are locations with gaps in the sidewalk network such as on arterials like Colorado Boulevard, Thornton Parkway and 104th Avenue
    - » Improve sidewalk maintenance for those with mobility challenges
- Challenging crossings
    - » Poor visibility of pedestrians by drivers, especially from right-turning vehicles, due to turning radius and vehicle speeds
    - » Right turn lanes encourage fast speeds and low yield compliance
    - » Right turn on red creates safety challenges
    - » Refuge/channelized islands are often too small for pedestrian to wait
    - » Wide roadways result in long crossing distances
    - » Improve ADA-access of ramps and crossings
        - o Tactile pads are poorly maintained and can create additional challenges for those with mobility challenges
    - » Improve at-grade trail crossings
- Parking lots do not have pedestrian facilities
- Lack of pedestrian-scale lighting
- Improve snow removal on pedestrian facilities

Multimodal

- Improve marketing and public awareness for alternative modes in Thornton
- Improve wayfinding signage to increase access to trail network and intuitiveness of the system
- Improve public art and placemaking along trails and transit stations
- Improve east-west connections across the city for all modes
- Increase number of bicycle and pedestrian grade-separated crossings to improve connectivity

3.3 Conclusion

The TMMP built upon the substantial feedback collected during the 2020 Comprehensive Plan outreach process. The TMMP outreach process augmented the Comprehensive Plan information to obtain more focused transportation feedback. Outreach conducted for the TMMP included focus groups, a virtual community meeting, online survey, interactive webmap, multimedia, and meetings with City Council. The key themes that emerged from this outreach included the desire for traffic calming, improved maintenance of the transportation system, more frequent and higher coverage transit services, and a bicycle and pedestrian network that is low-stress and connected. This feedback was an important component to inform the TMMP preferred scenario and multimodal networks for Thornton.

04 Scenario Framing and Recommended Scenario

This chapter describes the process followed to identify a recommended scenario in accordance with the vision of Thornton's Transportation and Mobility Master Plan (TMMP):

A transportation network and mobility plan that expands transportation options to enable a resident to access all areas of Thornton in a timely manner without using a private vehicle. Thornton desires a holistic multimodal and mobility view, approach, and evaluation of current and future transportation needs.

The overall process started by creating two initial planning scenarios that represent two potential futures to manage transportation demand and achieve community goals. The project team analyzed and compared both scenarios through a series of performance measures and public feedback. The results of this analysis and community input informed the creation of a scenario that contains elements of the two initial scenarios and serves as a framework for plan recommendations and priorities ,guidance and continued involvement, and maintain communication through multiple channels.

4.1 Determining Scenario Themes

The *2009 Transportation Plan* proposed a high-capacity roadway system that resulted in recommendations to widen most arterials to six lanes and widen most collectors to four lanes. With the increase in population, the introduction of the North Metro Rail Line, and the impact of emerging technology on travel, the city now desires a more holistic multimodal transportation network. Therefore, this TMMP analyzed scenarios for expanding Thornton's transportation options that could enable residents to access all areas of Thornton in a timely manner without using a private vehicle. The project team for the TMMP developed two initial planning scenarios: one intended to maximize the roadway capacity within the city (Scenario A) and another that prioritized well-connected transit and comfortable biking and walking infrastructure (Scenario B). The goal of this exercise was to analyze the projected impacts and trade-offs to different travel modes of each scenario in order to develop a more balanced scenario (Scenario C) that combined components of each scenario to best meet the city's transportation vision and goals.

4.2 Initial Scenarios

Scenario A was developed to assess the impact on future mode share if the city maximized the roadway capacity while merely maintaining the current planned transit service as reflected by the Denver Regional Council of Governments (DRCOG) in the Focus Model, a regional travel model maintained by DRCOG and used for regional planning in the Denver Metro area. DRCOG works closely with RTD on implementing the model. This scenario does not prioritize a shift towards active transportation modes or include additional investments in transit. Currently, the primary mode of transportation in Thornton is the private automobile so providing the appropriate number of travel lanes is an important priority. However, as some people switch to walking, biking, or taking transit in the future, the appropriate number and type of lanes will also change. Scenario A, which maximizes roadway capacity for vehicles, therefore represents a road network that reinforces current vehicular transportation choices without considering desired mode shifts. To maximize future roadway capacity for private vehicles in Thornton, Scenario A includes:

- Most arterials expanded to six lanes to provide increased roadway system capacity throughout the city
- Two new freeway interchanges at: I-25/128th Avenue and US-85/136th Avenue that provide additional roadway access for Thornton residents

Both items provide additional roadway capacity and options for those using private vehicles, therefore, maximizing the roadway capacity within Thornton.

Scenario B was developed to analyze how mode share is impacted by an increase in the city's investment in frequent, well-connected transit and a low-stress active transportation network. The following key items are present in Scenario B:

- The N line commuter rail extended to CO 7 to provide additional long-distance transit options for those living or working in north Thornton
- Additional bus routes and higher transit frequency within Thornton to provide a higher level of transit service not only for long-distance travel but also within the city
- 88th Avenue as a two-lane road with protected bike lanes to provide vertical separation between vehicles and bikes without increasing the roadway width (or right-of-way)
- CO 7 with two general purpose lanes and one transit-only lane per direction to provide better regional transit service while minimizing the roadway width
- Most arterials as four lanes to minimize the investment in roadway infrastructure and required ongoing maintenance.

All these key items align with the purpose of this scenario, which is to provide a well-connected transit and a low-stress active transportation network, with a decrease emphasis on the private vehicle.

Figure 4.1: Community Feedback on Scenario A

Does Scenario A support your vision for the future of transportation in Thornton?

Number of responses

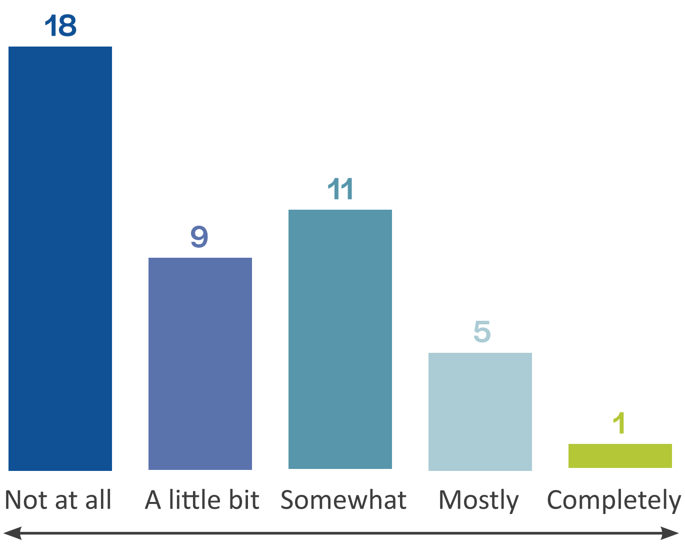
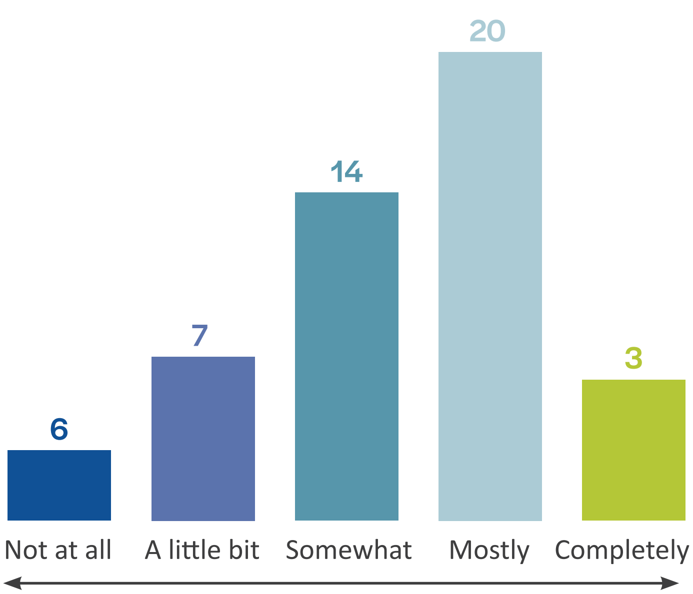


Figure 4.2: Community Feedback on Scenario B

Does Scenario B support your vision for the future of transportation in Thornton?

Number of responses



4.3 Performance Measures

The project team evaluated Scenario A and Scenario B through the following performance measures:

- Mode share – how will people travel in the future (vehicle, transit, walking, biking, etc.)?
- Volume-to-Capacity – what does congestion look like in the future during peak travel times?
- Corridor Travel time – how long does it take to travel key corridors in the city during the AM peak hour?
- Regional Travel Time – hoe long does it take to get to key regional destination by auto and transit in the morning?
- Vehicle Miles Traveled (VMT) per household – an indicator of traffic that calculates how much people travel on a daily basis within the city. VMT consists of two components: number of vehicles on the road and number of miles traveled on the road.

Appendix A: Scenario Framing and Performance Measures includes roadway maps depicting the number of travel lanes included in each scenario as well as details on their performance based on the performance measures. In addition to performance measures, public input was critical to refining the scenarios. At the Community Meeting, attendees were asked which scenario they supported most. They were then asked more specific questions about which elements of each scenario they supported. This information was pivotal in developing Scenario C.

4.4 Public Input

Feedback from the public and focus groups was also important in shaping the recommended scenario. During a series of virtual meetings, the project team asked several polling questions to understand the level of support for each scenario. **Figure 4.1** and **Figure 4.2** show the combined poll results from a community meeting and two focus groups meetings. These results demonstrate a greater level of support for Scenario B than Scenario A.

4.5 Scenario C

The two initial planning scenarios, Scenario A and Scenario B, served as a base to understand the trade-offs between high roadway capacity investments and high transit and active transportation investments. The project team, with input received from the public, selected various components from each scenario to develop Scenario C in accordance with the city's vision Scenario C consists of a short-term and a long-term vision for the plan.

Short-term Vision (2030)

The short-term vision corresponds to the year 2030 and includes roadway capacity projects included in the 5-year Capital Improvement Plan as well as high-ranking projects from the prioritization process explained in Chapter 11. Please refer to Chapter 11 for details about the prioritization process. The key components of the short-term vision for Scenario C are:

- Widening of a few east-west corridors: 136th Avenue, 120th Avenue, and 104th Avenue
- Road diet of southern Grant Street segments
- Widening of 144th Avenue between York Street and Colorado Boulevard modified from 6 lanes to 4 lanes compared to previous plan

Long-term Vision (2050)

The long-term vision corresponds to the year 2050 (same year as Scenario A and Scenario B). The key components of the long-term Scenario C are:

- Most, if not all, arterials are at least four lanes, with some six-lane segments
- Two new freeway interchanges: I-25/128th Avenue and US-85/136th Avenue
- Additional two-lane collectors parallel to E-470 (north side and south side)
- Various collectors to provide additional travel options
- N-line commuter rail extended to CO 7
- Heavy transit investment throughout the city

Appendix A includes roadway maps depicting the number of travel lanes included in both the short-term and the long-term visions, as well as details on their performance based on the performance measures previously outlined.

4.6 Conclusion

The vision of Thornton's TMMP states the desire to expand transportation options for residents, and therefore it is important to account for all transportation modes when determining the transportation future of the city. To accomplish this, the city evaluated two initial scenarios representing different levels of transportation investments (one focused on maximizing roadway capacity for the private vehicle and the other on increasing access to transit and active transportation). The performance of both scenarios was compared and, with input received from the public, the project team selected components from both scenarios to create Scenario C which better aligns with the overall vision for the Plan.

Scenario C consists of a short-term and long-term plan for the city. The short-term plan includes roadway capacity projects included in the 5-year Capital Improvement Plan as well as high-ranking projects from the prioritization process. The long-term plan includes some key elements, such as two additional interchanges that will provide more access to regional destinations, most arterials expanded to four lanes, and the N Line commuter rail extended to CO 7. Scenario C serves as a framework for the plan recommendations and priorities.

05

Roadway Network

5.1 Roadway Plan

The purpose of the Thornton Roadway Plan is to have a clear vision of the roadway system that aligns with the overall vision for Thornton. This plan is a result of analyzing the three planning scenarios previously described in Chapter 4, and this process is described in detail in **Appendix A: Scenario Framing and Performance Measures**. The evaluation of the three planning scenarios considered the anticipated growth in the city, future land use, and future roadway and transit investments (new roads, widening of roads, additional transit service, etc.). The Roadway Plan consists of a short-term and long-term plan—the short-term set of projects are expected to be needed by 2030, with the long-term projects to be needed by 2050.

The set of roadway projects identified to create these future road networks consist of:

- New roadways: new roadways, both 2 and 4-lane, provide increased connectivity for all modes. These new roadways are necessary to provide access to new developments, as it occurs. New roadways also disperse vehicle volumes more evenly throughout the city, thus relieving parallel

roadways that may be experiencing congestion.

- Roadway widenings: Similar to new roadways, roadway widening projects provide increased connectivity, access, and opportunity to distribute traffic. These widening projects are identified on existing roadways with current congestion or anticipated growth based on the travel demand model.
- Road diet: This refers to removing vehicular travel lanes to reallocate space for walking or biking. For example, a four-lane roadway could be reduced to a three-lane roadway with a bike lane in either direction. Road diets are recommended on roadways that have available vehicular capacity and may have a high existing or latent demand for bicycle connectivity.

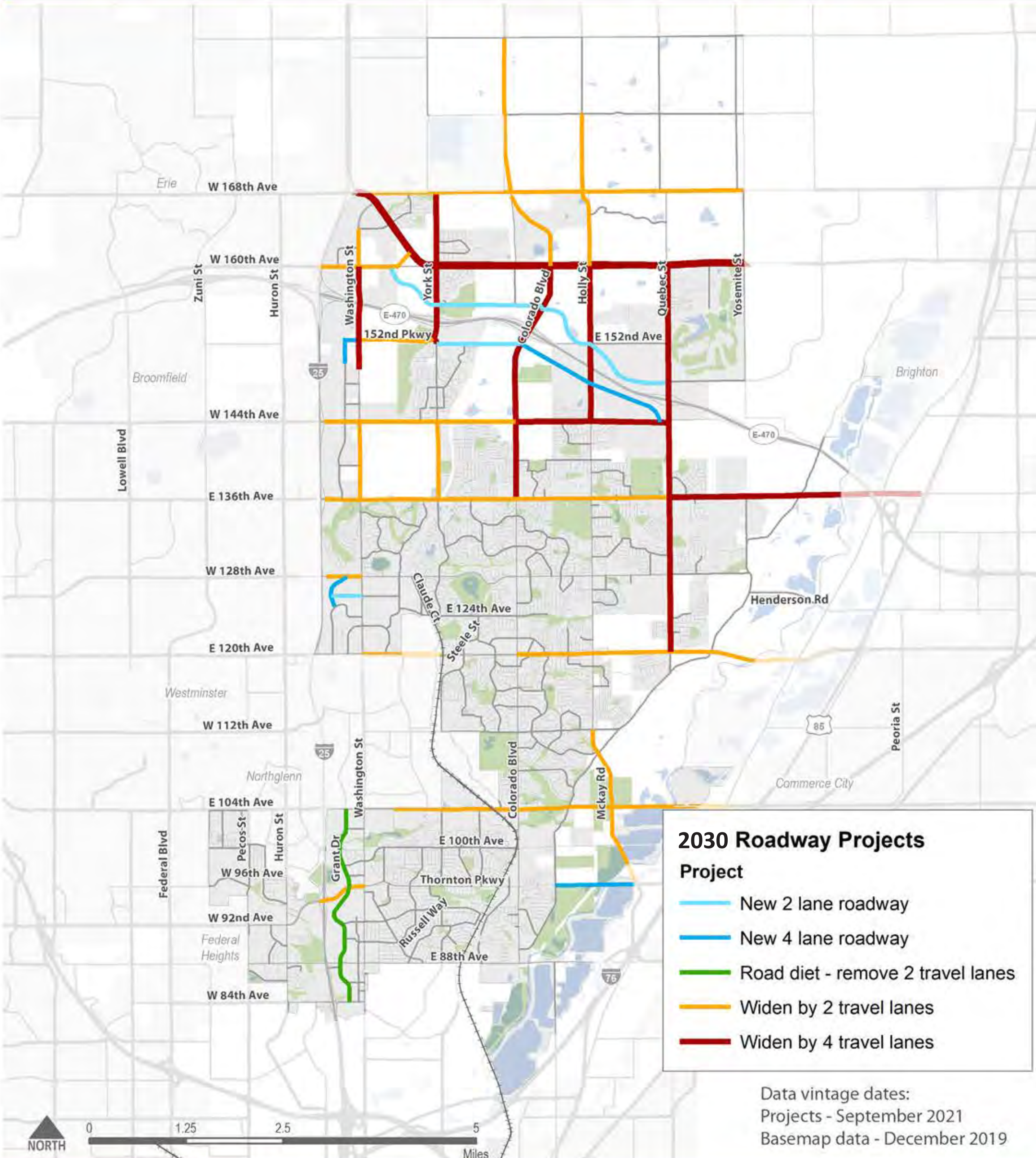
These recommended projects build off recent planning efforts in the region including:

- North I-25, US 36 to SH 7 Planning and Environmental Linkages Study
- State Highway 7 Planning and Environmental Linkages (PEL) Study
- Station Area Master Plans

Short-Term Plan

The short-term plan includes roadway projects from the 5-Year Capital Improvement Plan and the high-ranking projects from the prioritization process described in Chapter 11. Figure **5.1** shows the roadway projects included in the short-term plan and **Figure 5.2** shows the roadway classifications and number of lanes in the short-term plan. The projected 2030 traffic volumes are shown in **Figure 5.3*.***

Short-Term (2030) Roadway Projects



City of Thornton

Figure 5.1: Short-Term (2030) Roadway Projects

Short-Term (2030) Roadway Plan

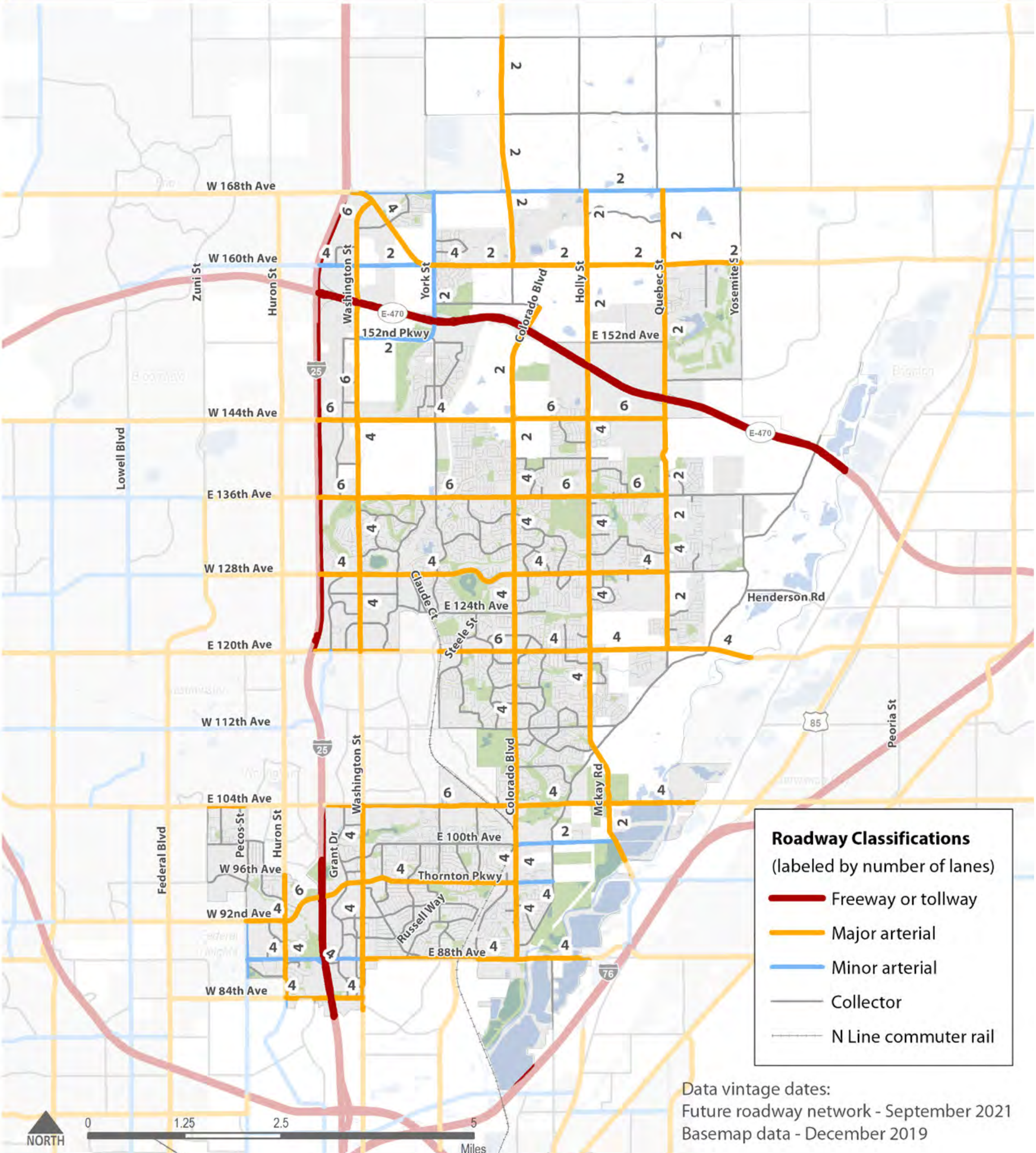
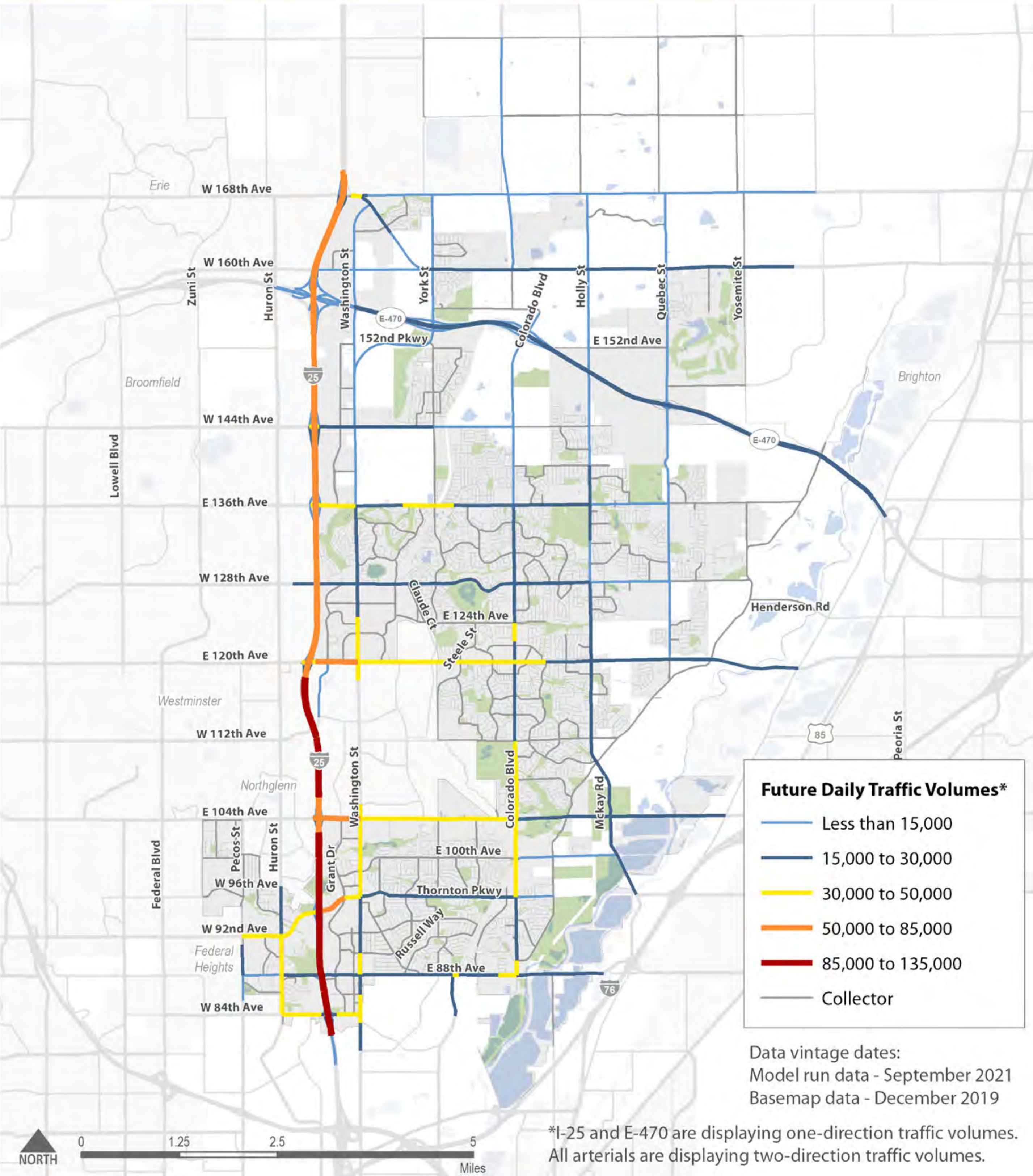


Figure 5.2: Short-term (2030) Roadway Plan

2030 Future Arterial Roadway Volumes



Future Daily Traffic Volumes*

- Less than 15,000
- 15,000 to 30,000
- 30,000 to 50,000
- 50,000 to 85,000
- 85,000 to 135,000
- Collector

Data vintage dates:
Model run data - September 2021
Basemap data - December 2019

*I-25 and E-470 are displaying one-direction traffic volumes.
All arterials are displaying two-direction traffic volumes.

City of Thornton

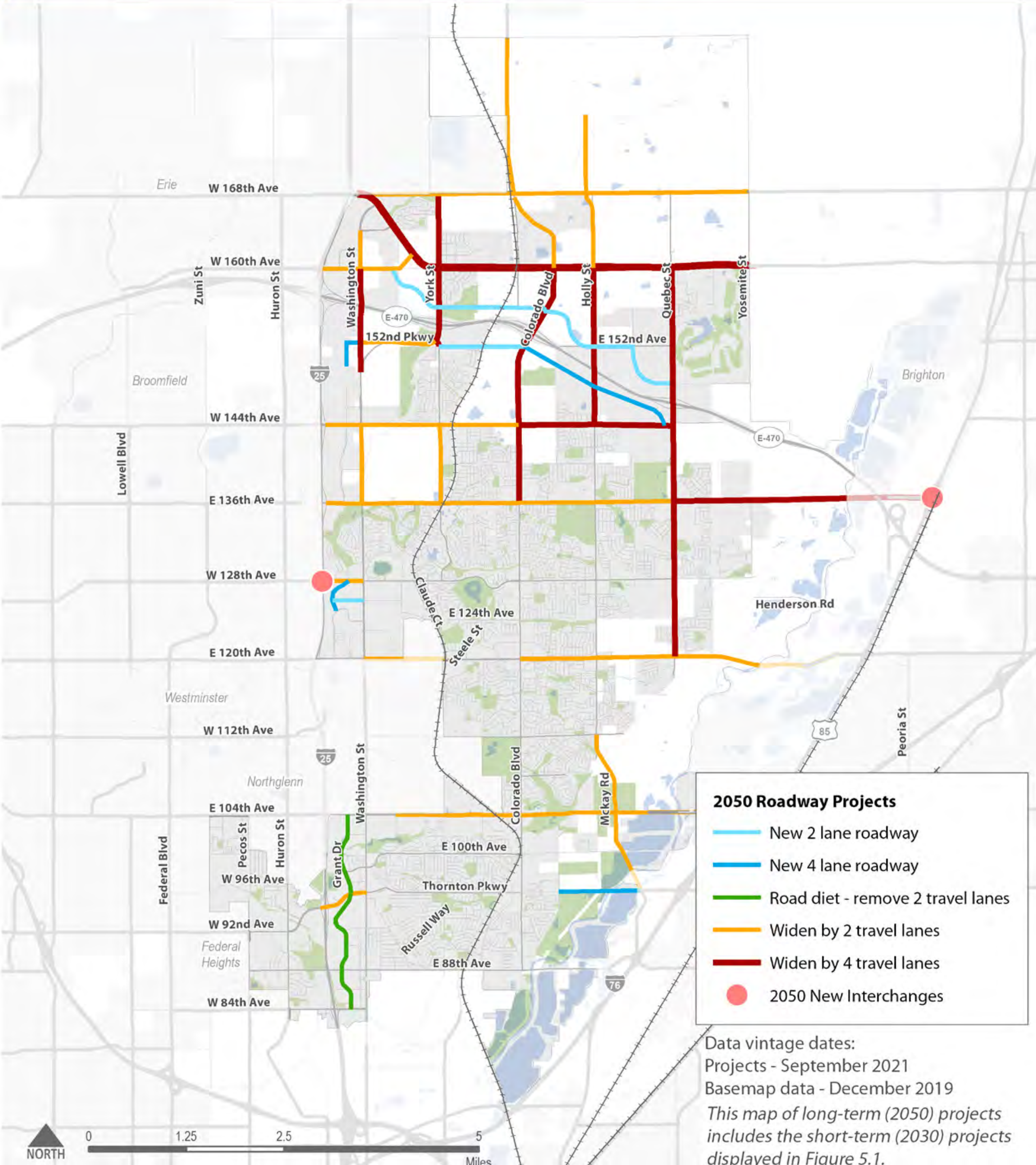
Figure 5.3: Short-term Arterial Traffic Volume

Long-Term Plan

The long-term roadway plan provides the full vision for the roadway network in 2050. To reach this vision, several roadway projects will need to be completed to increase the capacity of existing roadways as well as new roadways. **Figure 5.4** shows the roadway projects included in the long-term plan (including those in the short-term plan).

Figure 5.5 shows the roadway classifications and number lanes for 2050. The implementation of the long-term roadway plan will result in the traffic volumes shown in **Figure 5.6***.*

Long-Term Roadway Projects



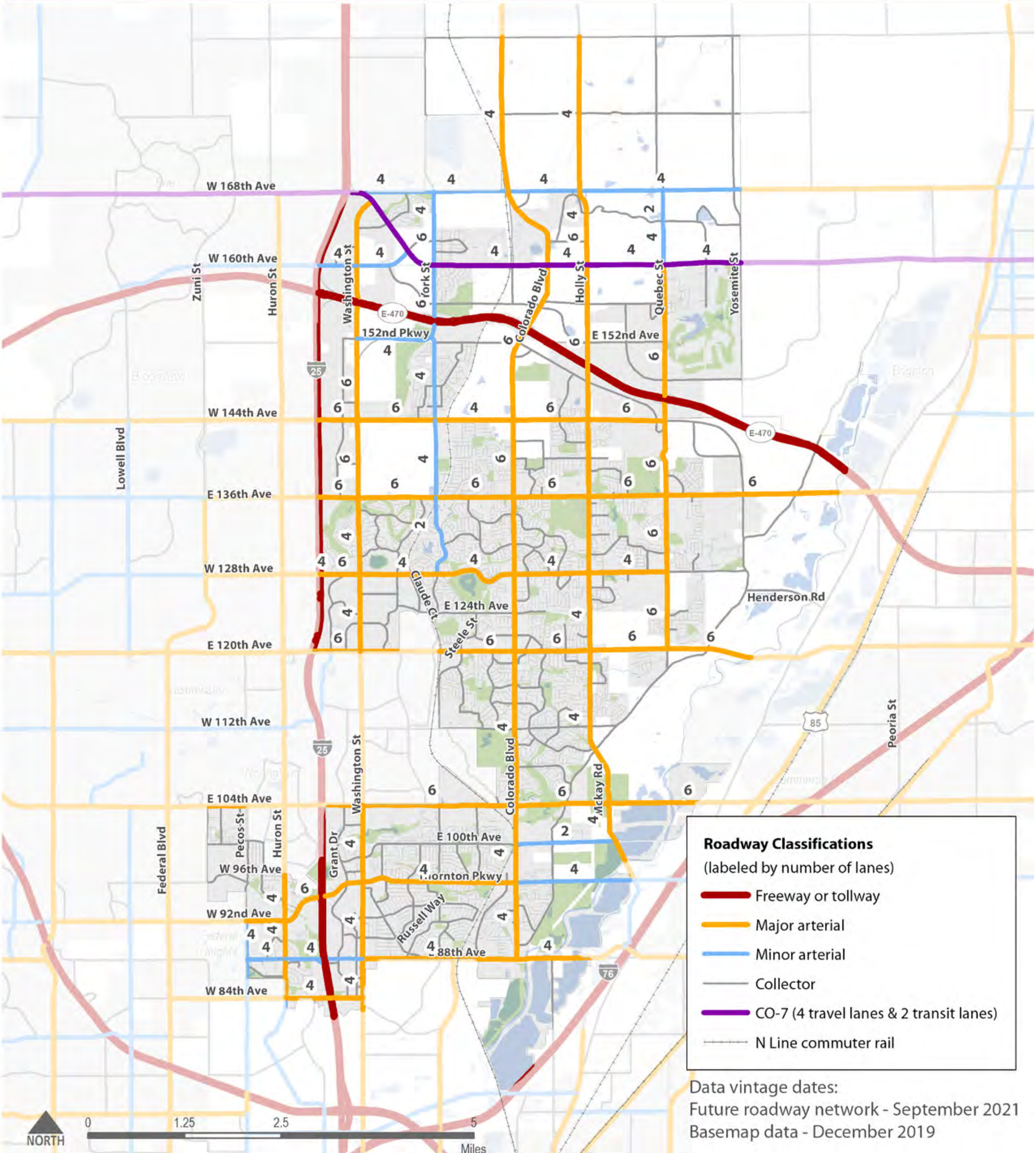
Data vintage dates:
Projects - September 2021
Basemap data - December 2019

This map of long-term (2050) projects includes the short-term (2030) projects displayed in Figure 5.1.

City of Thornton

Figure 5.4: Long-term Roadway Projects

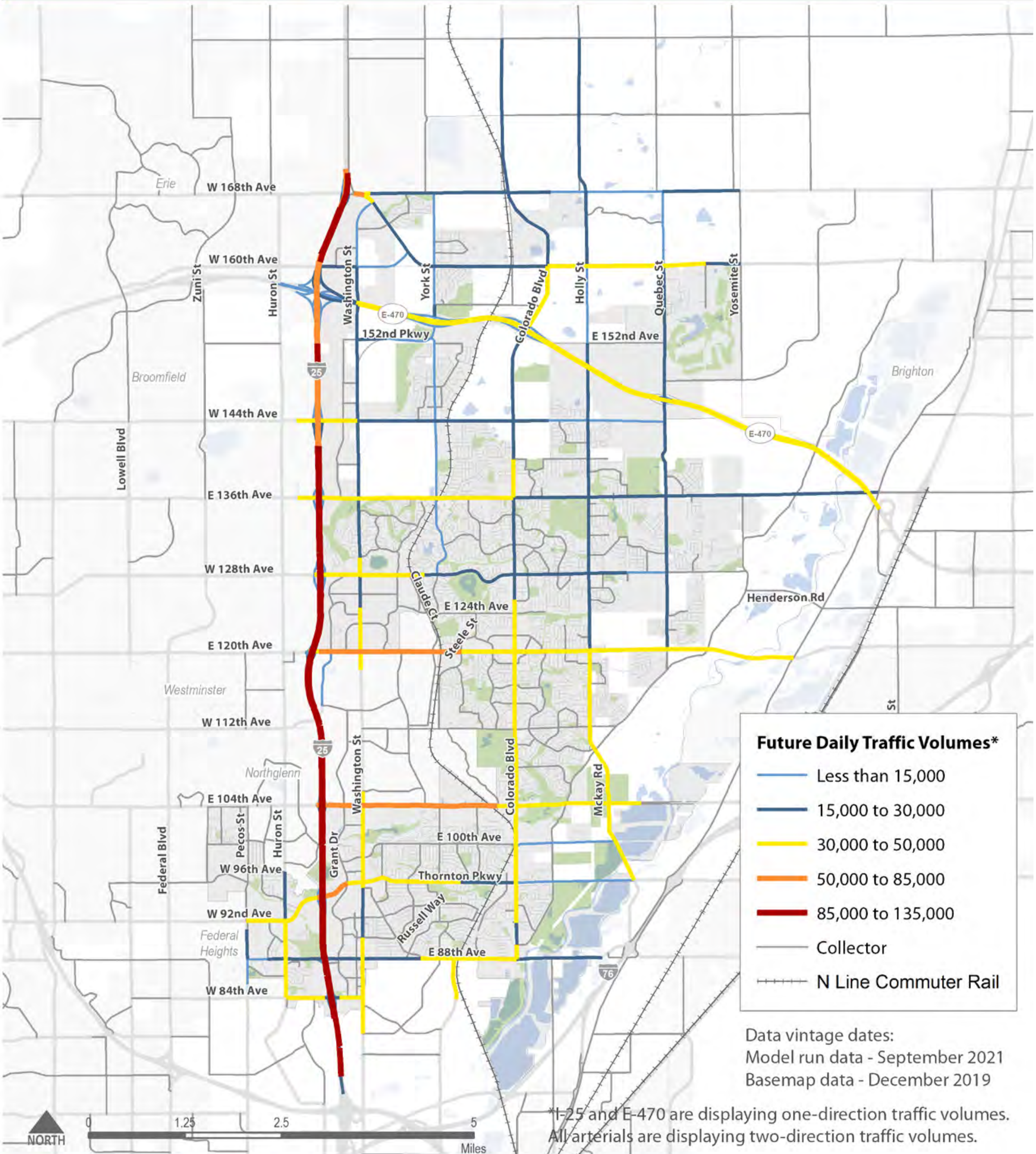
Long-Term Roadway Plan



City of Thornton

Figure 5.5: Long-term Roadway Plan

2050 Future Arterial Roadway Volumes



City of Thornton

Figure 5.6: Long-term Arterial Traffic Volumes

5.2 Roadway Functional Classification and Design Standards

The functional classification of a roadway is dependent on factors such as vehicle volume, access management, speed, and street design. **Figure 5.2** and **Figure 5.5,** on the previous pages, show the street classification of major roadways in Thornton in the short and long-term, respectively.
This section outlines an update to Thornton's roadway design standards for new roadways. For existing roadways, there may be challenges with right-of-way or property that makes implementing these cross sections more challenging.All cross sections in this chapter include a one foot buffer between back of walk and right of way line, and 2.5-foot curb and gutter that is included as a part of the median. For redevelopment and infill roadways, the cross section should be selected that aligns with the proposed bicycle facilities map.

Major Arterial

Major arterial roads are the highest in the roadway hierarchy, currently comprising 11% of Thornton's roadways, and are typically four to six lanes wide. They connect major activity centers and major trip generators and are intended for longer trips. Major arterials typically carry a high proportion of total travel and are usually spaced one mile apart. Some arterials will have a bicycle facility on them. Because of high volumes and speeds, the recommended bicycle facility on arterials is a protected bike lane or sidepath. Major arterial roads should have no more than six lanes as road cost effectiveness decreases for wider roadways.

Shown below are the typical cross sections for major arterial roadways.

Figure 5.7: Major Arterial: 6 Lane Section without bicycle facilities

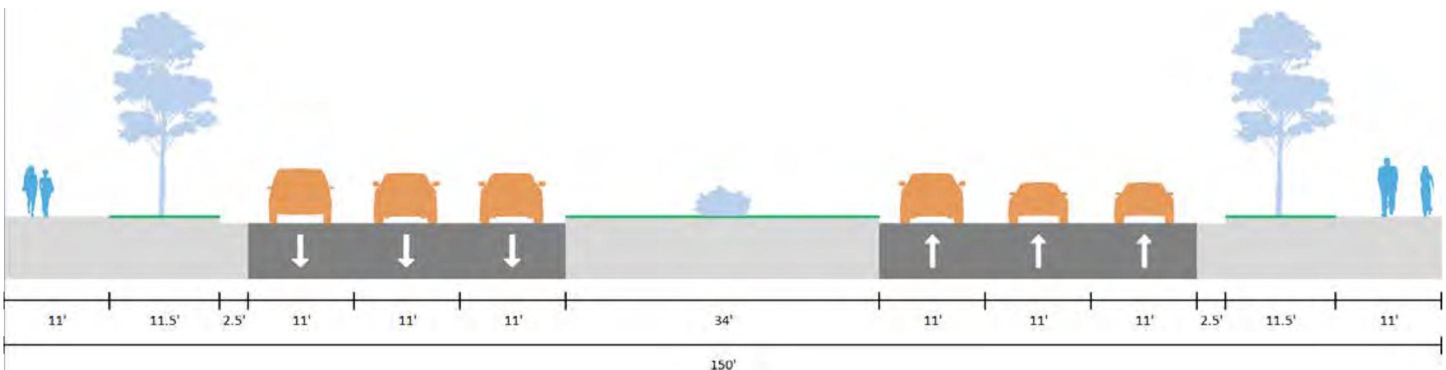


Figure 5.8: Major Arterial: 6 Lane Section with Sidepath

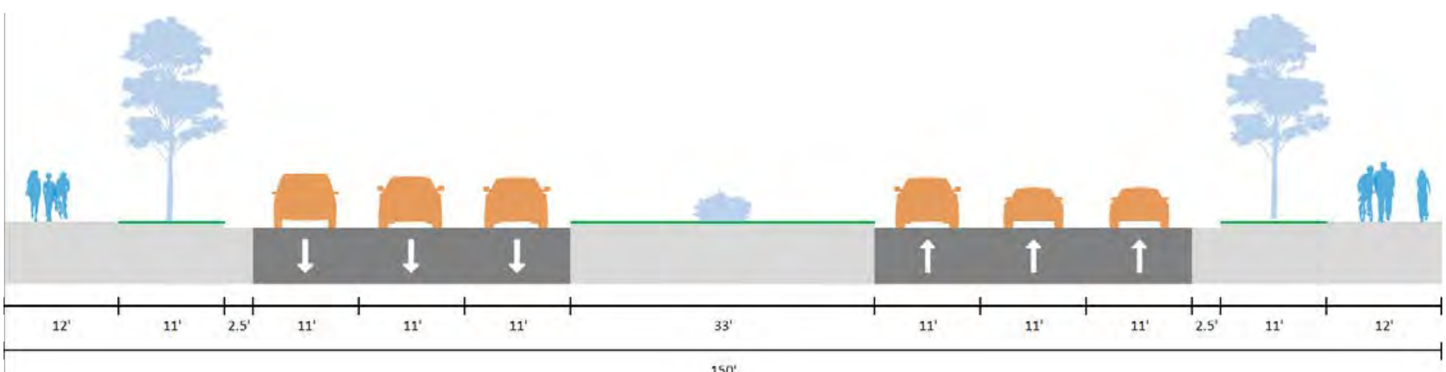
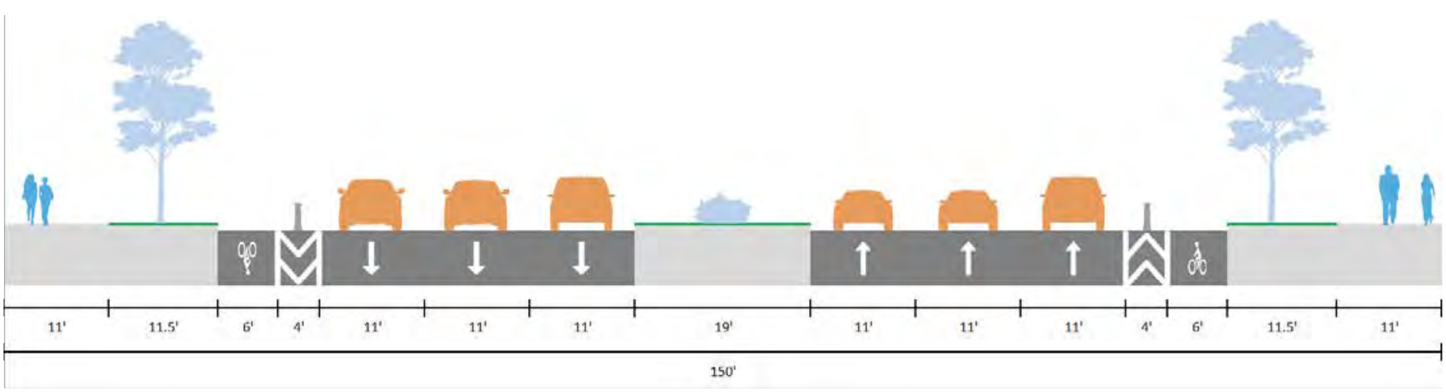


Figure 5.9: Major Arterial: 6 Lane Section with Protected Bike Lanes



Minor Arterial

The second street classification in the roadway hierarchy is minor arterials. Currently, 4% of roads in Thornton are minor arterials which serve to collect and distribute traffic from regional and major arterials to lower street classifications. Minor arterials also primarily support lower tier activity centers such as community business strips and shopping centers or multifamily residential areas. Access to land use is typically permitted but driveways should be limited, consolidated, and shared.

Minor arterials typically have a center two-way left turn lane to separate opposing traffic movements. The recommended bicycle facilities include protected bike lanes and sidepaths.

Shown below are the typical cross sections for minor arterials.

Figure 5.10: Minor Arterial, 4 Lane Section without bicycle facilities

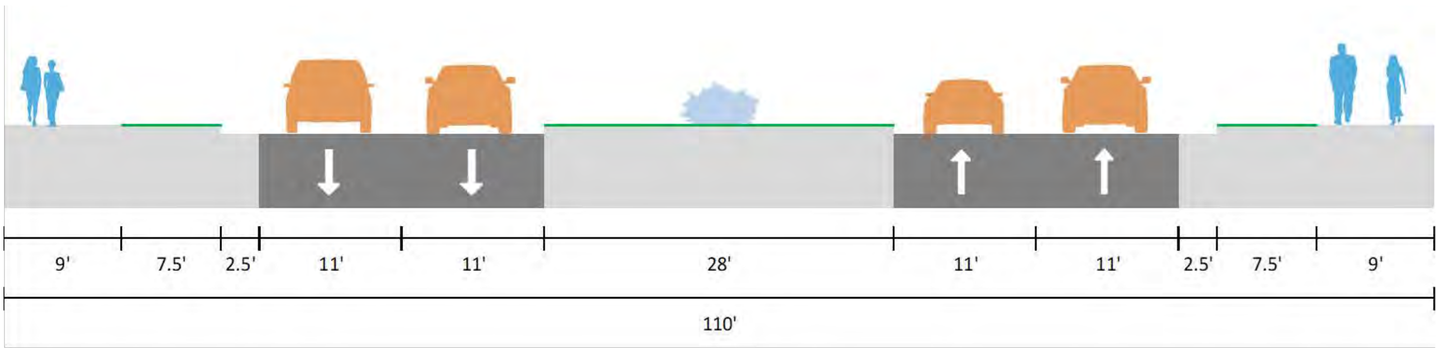


Figure 5.11: Minor Arterial, 4 Lane Section with Sidepath

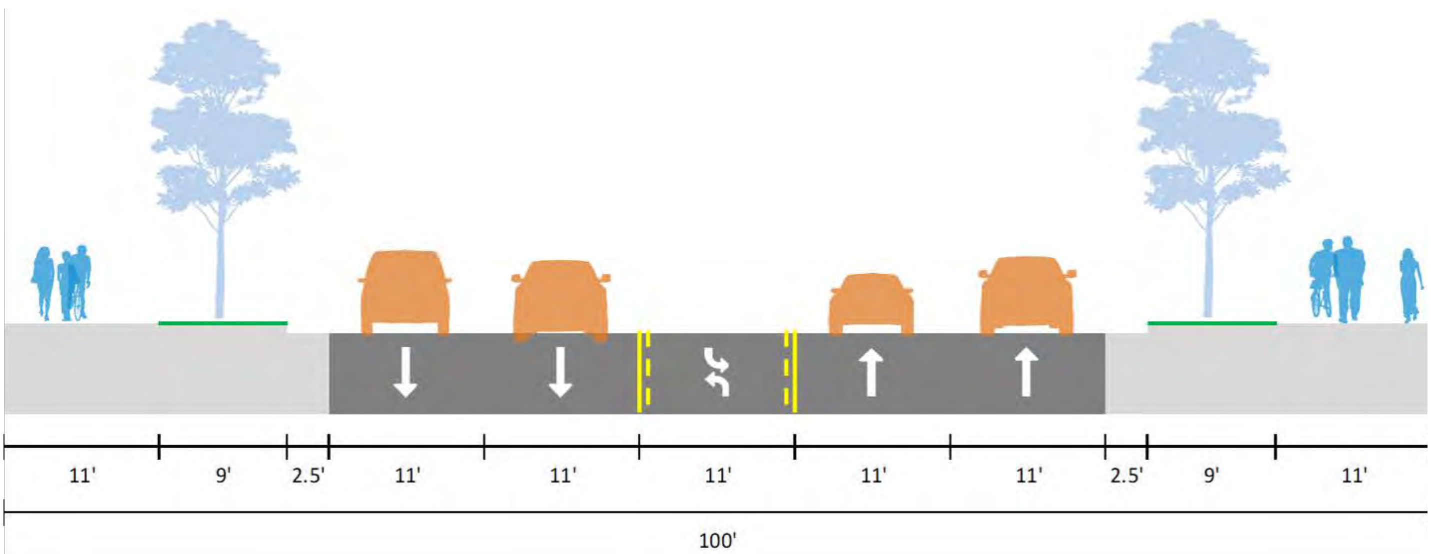
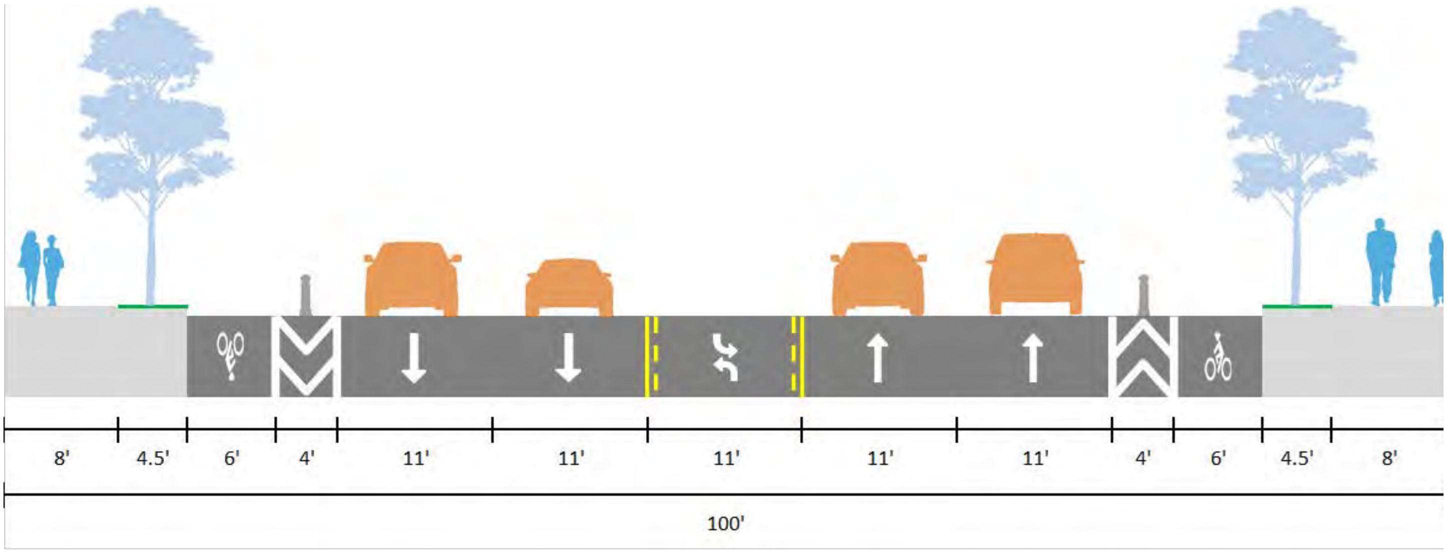


Figure 5.12: Minor Arterial, 4 Lane Section with Protected Bike Lanes



Collector Street

Lastly, collector streets fill the remaining gap between residential streets and local streets. These streets are two or four lanes wide, and serve to distribute traffic from residential, commercial, and industrial areas to both major and minor arterials. Collector streets are not meant for long trips or through travel. However, collectors can be good opportunities for providing low-stress facilities for active modes of travel, like walking or biking, if the collectors are interconnected and not fragmented. Bicycle and pedestrian facilities such as protected bike lanes and sidepaths are strongly recommended for collector streets.

Shown below are the typical cross sections for a 4-lane collector street.

Figure 5.13: Collector, 4 Lane Section without bicycle facilities

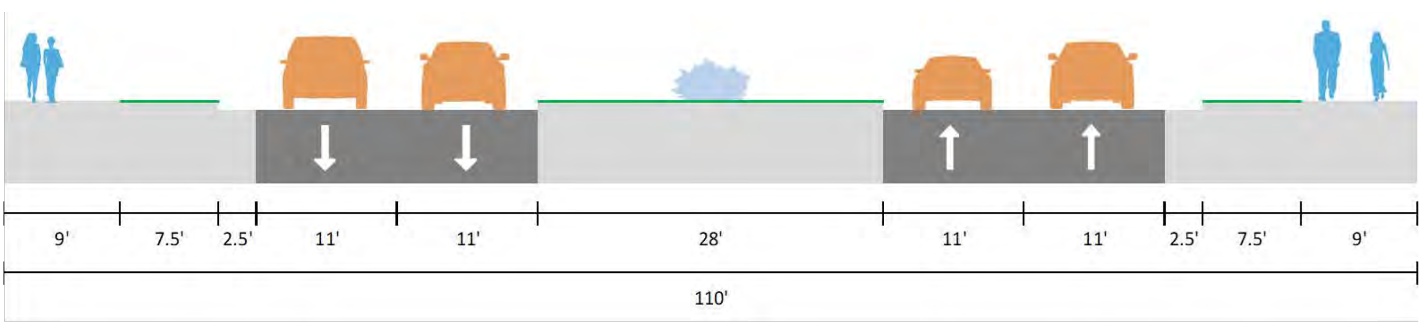


Figure 5.14: Collector, 4 Lane Section with On-Street Bike Lane

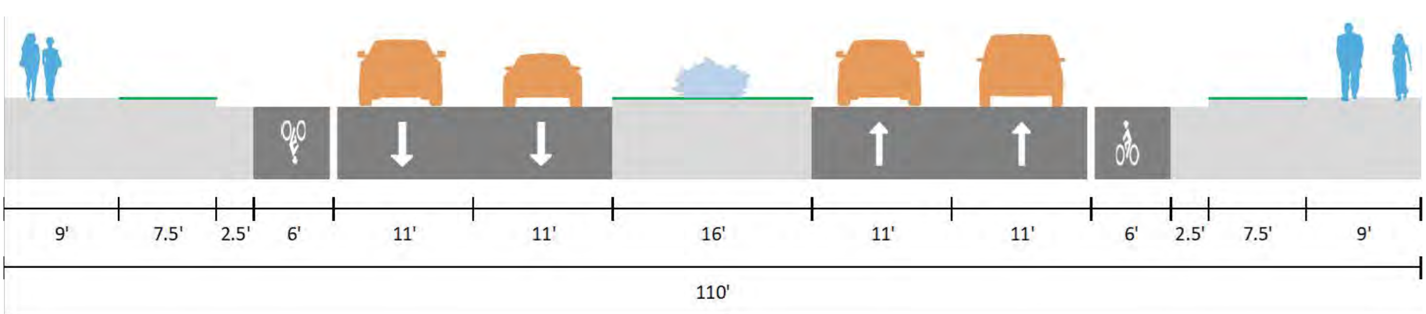
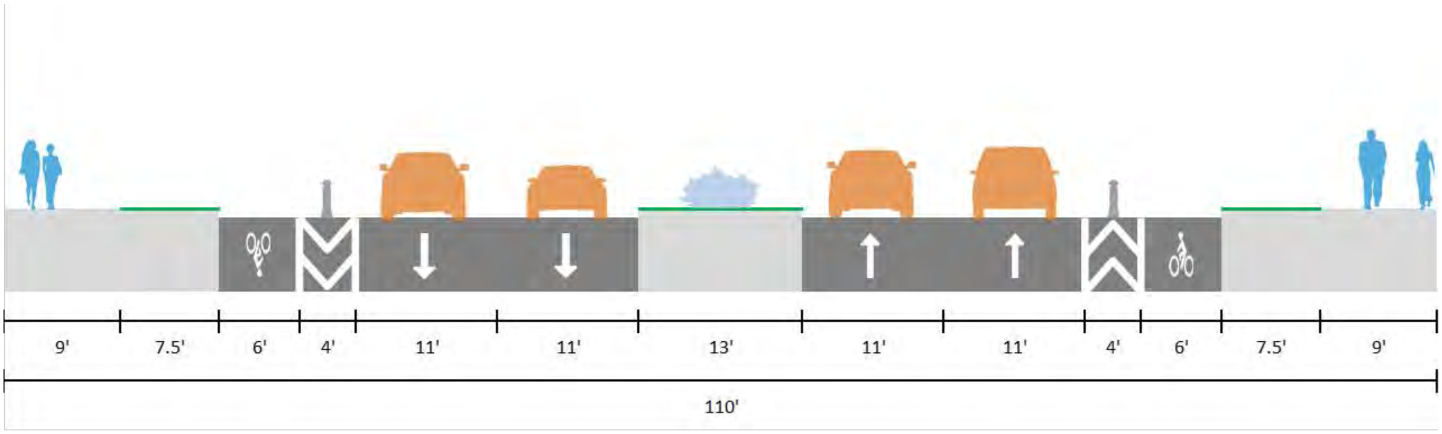


Figure 5.15: Collector, 4 Lane Section with Protected Bike Lanes



Shown below are the typical cross sections for a 2-lane collector street.

Figure 5.16: Collector, 2 Lane Section without bicycle facilities

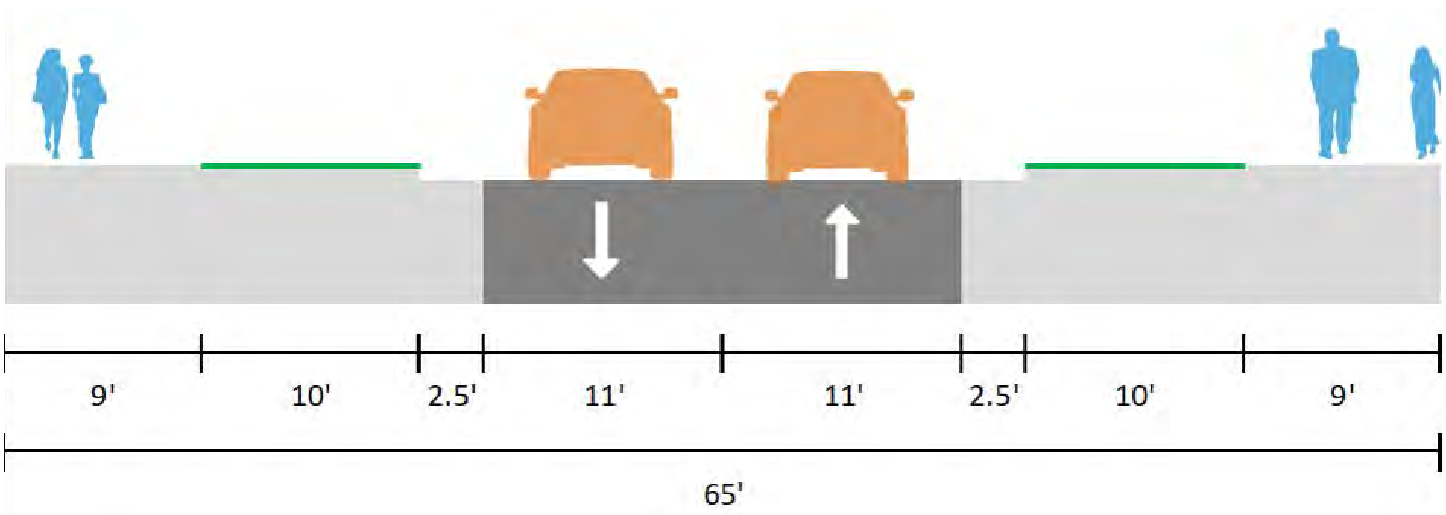


Figure 5.17: Collector, 2 Lane Section with Protected Bike Lane

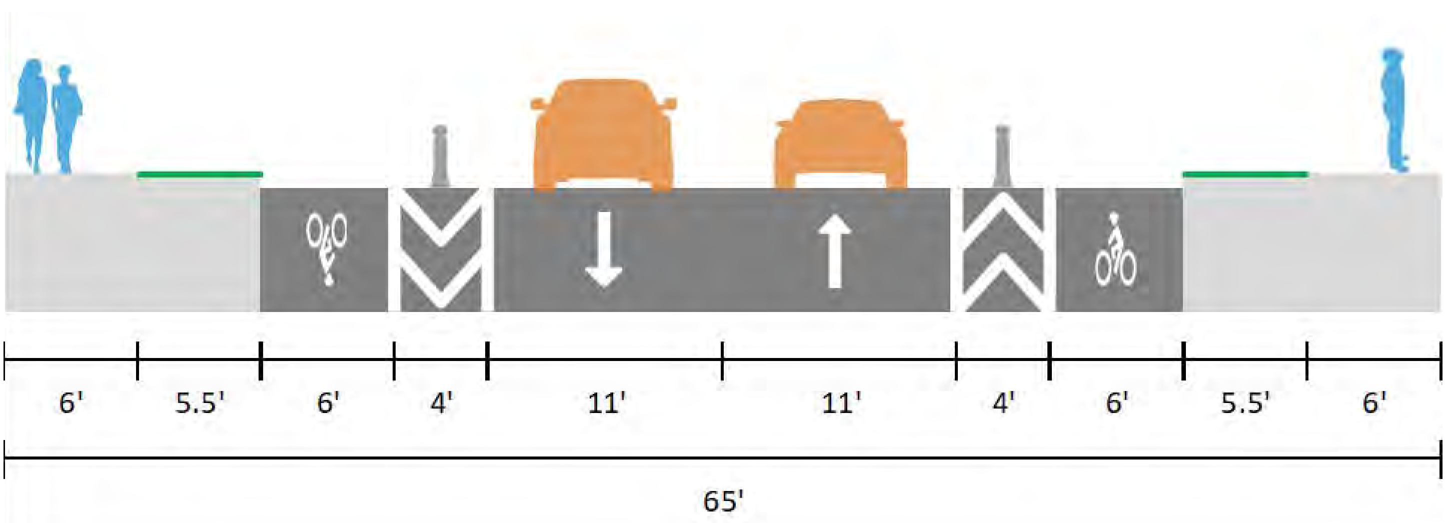


Figure 5.18: Collector, 2 Lane Section with Sidepath

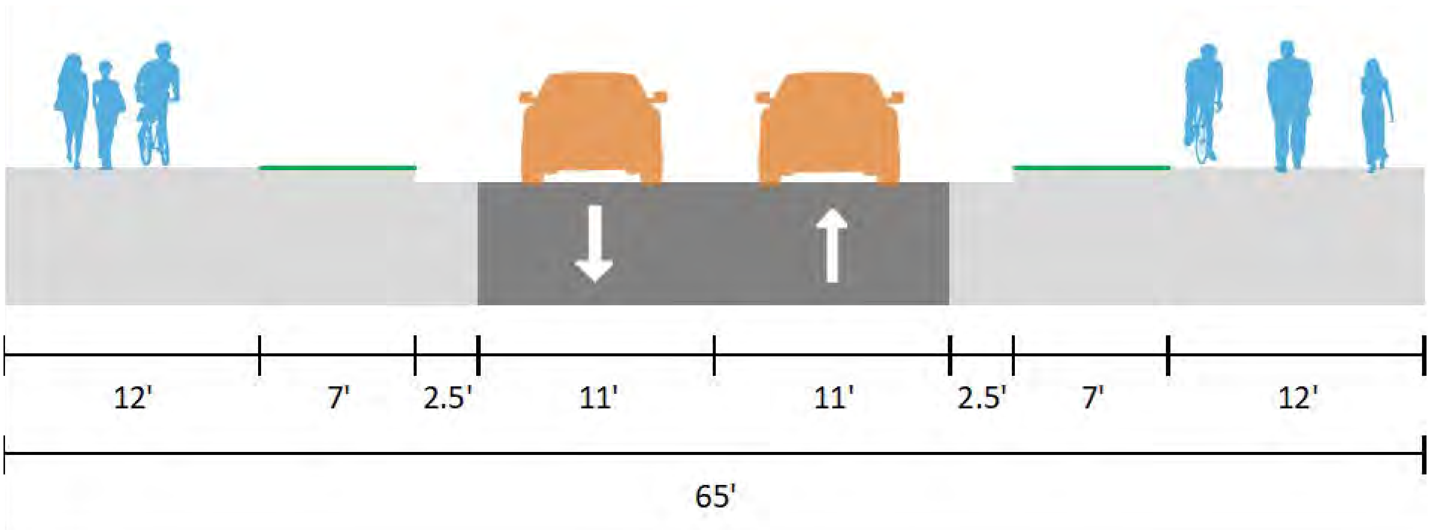


Figure 5.19: Collector, 2 Lane Section with Parking

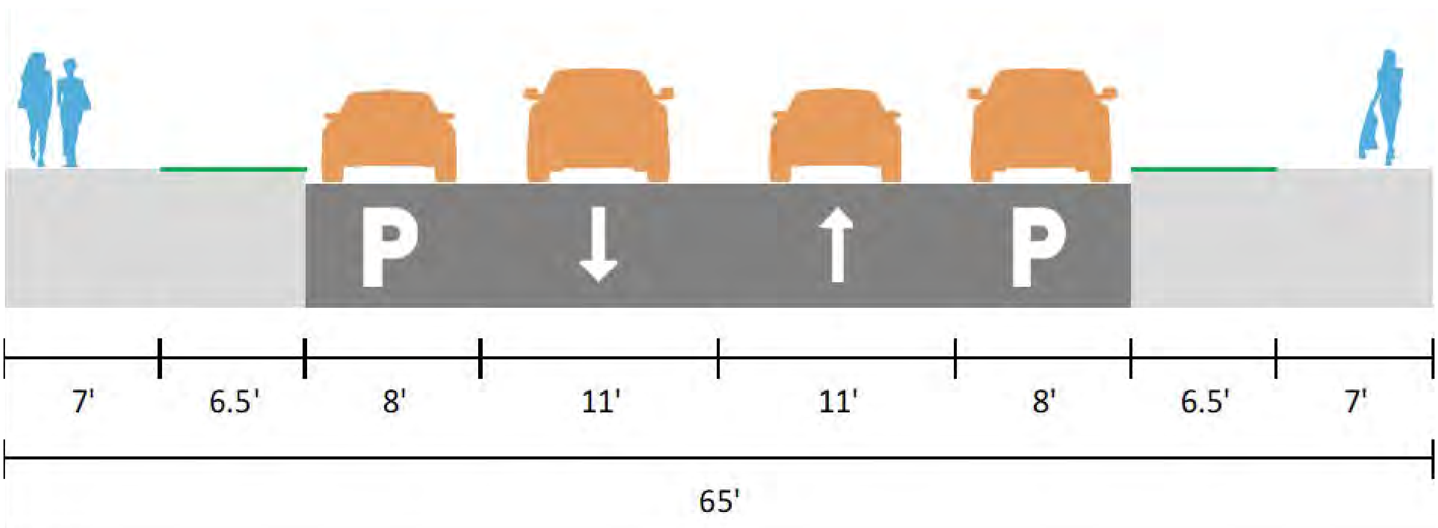
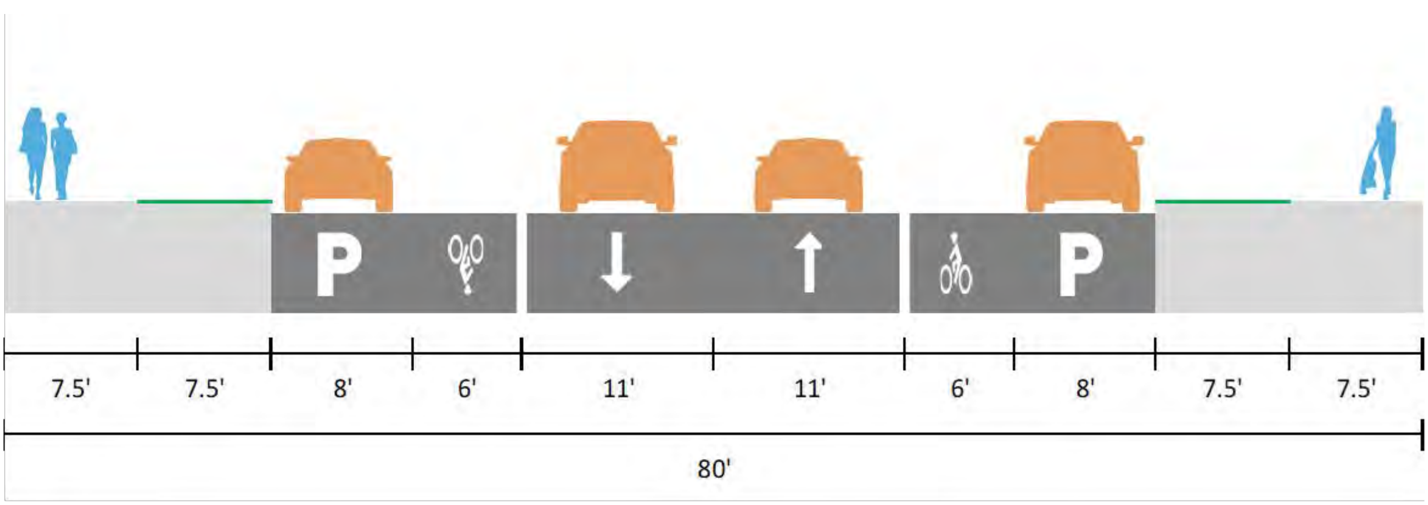


Figure 5.20: Collector, 2 Lane Section with Parking and Bike Lanes



5.3 Roadway Improvement Costs

Planning level cost estimates for the implementation of new roadways of each street classification are shown in **Chapter 11: Implementation**. The implementation chapter also shows the cost estimates for each proposed roadway project.

5.4 Conclusion

The Roadway Plan provides guidance for the expansion of the vehicular network in both 2030 and 2050. The development of this plan included community input, focus group input, City Council direction and data driven information from the DRCOG travel model. This set of recommendations includes new roadways, widening of existing roadways, and reallocation of roadway space for people biking. Implementing these recommendations is in accordance with the vision and goals of TMMP.

06 Bicycle Network

Bicycling is an important piece of Thornton's transportation system, both for commuting and recreation. The Thornton TMMP lays out a vision for bicycling in Thornton that increases the safety, comfort, and connectivity for people biking in the city. Creating a low stress and connected bicycle network is a key component in the overall multimodal transportation network in Thornton. A multimodal transportation network can have a wide range of benefits to the city including:

- Improved physical and mental health outcomes for community members
- Increased equity by providing more transportation choices that are accessible and affordable
- Safe and comfortable routes to transit facilities for those who cannot drive or choose not to drive
- More opportunities for community members to interact and connect, building social capital in the city
- Strengthened environmental sustainability through improved air quality and fewer vehicle miles traveled (VMTs)
- Improved economic benefits through increased spending at local businesses[1]

The TMMP identifies existing challenges to bicycling in Thornton and creates a future bicycle network that addresses these challenges and fills in network gaps. The bicycle facility recommendations put forth in this plan are based on national best practices including standards set by the American Association of State Highway and Transportation Officials (AASHTO) and the National Association of City Transportation Officials (NACTO).

6.1 Bicycle Network

Existing Bicycle Network

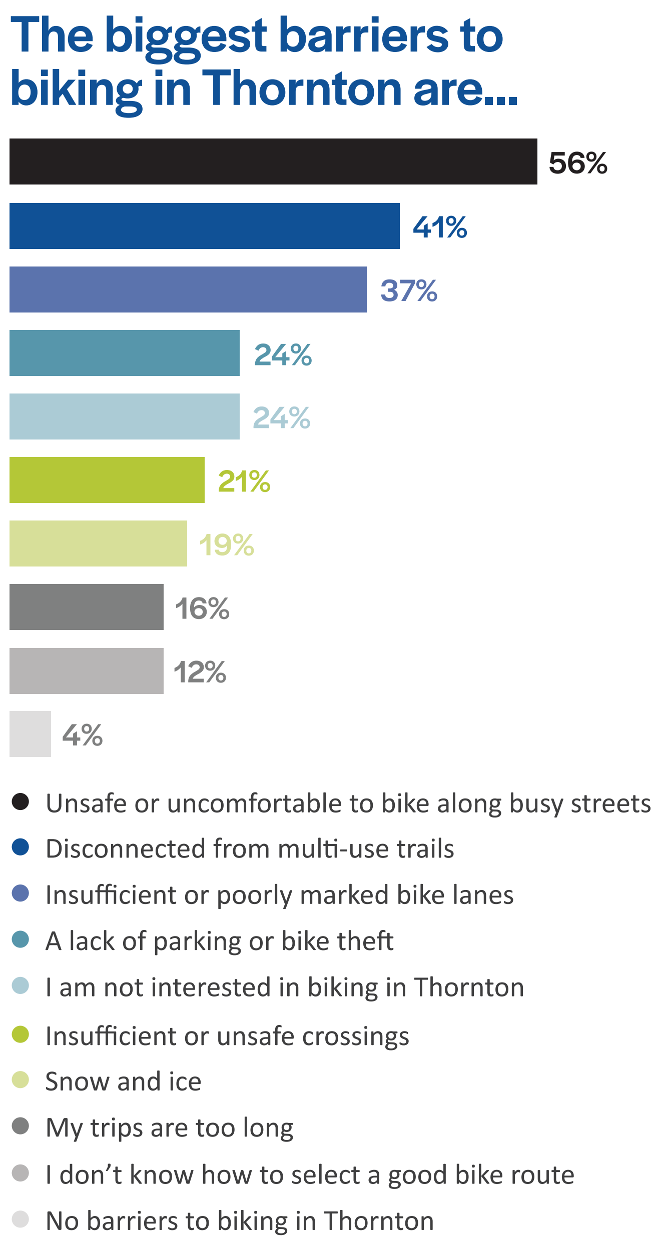
The existing bicycle network consists of bike lanes, buffered bike lanes, protected bike lanes, sidepaths, multi-use trails, and neighborhood bikeways. Implementing a comfortable and connected bike network in Thornton is important for both providing alternatives to car travel for commuting and running errands, as well as ensuring residents have access to biking for recreation. Thornton currently has a robust network of trails and multi-use trails that are low stress for biking. Additionally, Thornton already has almost 30 miles of bike lanes.

There are also opportunities to grow the bicycle network. Challenges within Thornton's existing bike network include bike lanes that are located on high speed, high volume arterial roadways that are considered "high stress" bicycling environments, and not accessible to all ages and abilities. Concerns about bicycling on busy streets was the number one barrier to bicycling identified by respondents to the online survey conducted in February 2021 (42 of the 75 responses) (see **Figure 6.1**). Connectivity of comfortable bicycling facilities is another challenge. Survey respondents identified disconnected trails and insufficient or poorly marked bike lanes as the second and third biggest barriers to bicycling. Ensuring bicycle facilities are direct and efficient, well maintained, and easy to navigate are important to create a comfortable bicycle network.

The future bicycle network (**Figure 6.4** and **Figure 6.5**) in this chapter was developed to address the previously mentioned challenges to bicycling in Thornton. The network was developed by filling network gaps with new comfortable connections and upgrading high stress bicycle facilities to make them comfortable for all ages and abilities.

[1]Consumer Behavior and Travel Choices: A Focus on Cyclists and Pedestrians, Clifton et al

Figure 6.1: Online Survey Results (February 2021)



Level of Traffic Stress Analysis

To develop a future bike network that addresses these challenges, the Level of Traffic Stress (LTS) methodology (Mekuria, Furth, Nixon, 2012) was applied to existing and previously proposed bicycle facilities in Thornton. In 2012, Mekuria, Furth, and Nixon developed the original LTS framework with guidance from NACTO and AASHTO. As a national best practice, LTS is used to inform the appropriate bicycle facility type for a roadway that will be comfortable for all ages and abilities, based on street. The original LTS methodology provided a framework to analyze Thornton's bicycle network.

The LTS analysis uses characteristics of a street (vehicle speed, and number of travel lanes) and the existing or proposed bicycle facility type to determine the comfort level of the facility for people riding bikes. Scoring is from LTS 1 to LTS 4, with LTS 1 being a comfortable, "low stress" bicycle environments for those ages 8 to 80, and LTS 4 being "high stress" bicycle environments where biking is very uncomfortable or even impossible, with limited or no accommodations for people biking. LTS 1 and 2 are considered low stress facilities, while LTS 3 and 4 are considered high stress. **Figure 6.2** describes the types of bicycle riders that feel comfortable at each score.

Figure 6.3 displays a map with the results of the LTS analysis for the existing (solid lines) and proposed (dashed lines) bicycle facilities in Thornton. Most high stress facilities are bike lanes located on arterial roadways.

Future Bicycle Network

The future bicycle network displays a vision for a low stress and connected bicycle network across the City of Thornton for implementation by 2050. The network was developed by incorporating public input, filling network gaps with low stress connections, and proposing upgrades to the high stress-facilities identified in **Figure 6.3.** High stress facilities were chosen for proposed upgrades (for example bike lanes to protected bike lanes) where existing right-of-way allowed and where any trade-offs (such as removing on-street parking) were in line with the city's goals.

Figure 6.2: Bicycle Level of Traffic Stress Score Descriptions

Bicycle Level of Traffic Stress

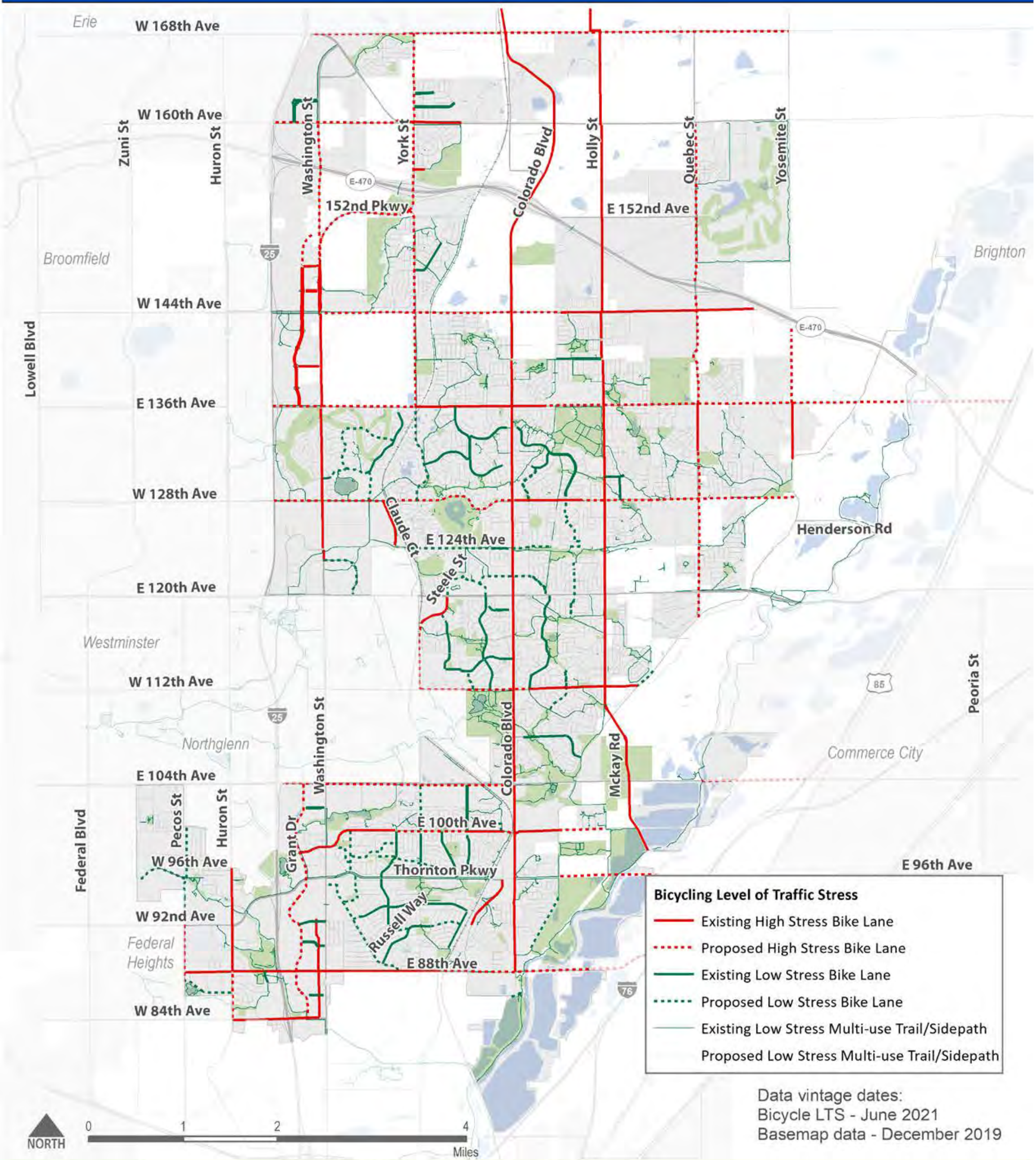


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Figure 6.3: Existing Bicycle Level of Traffic Stress

Future Bike Network with Trails

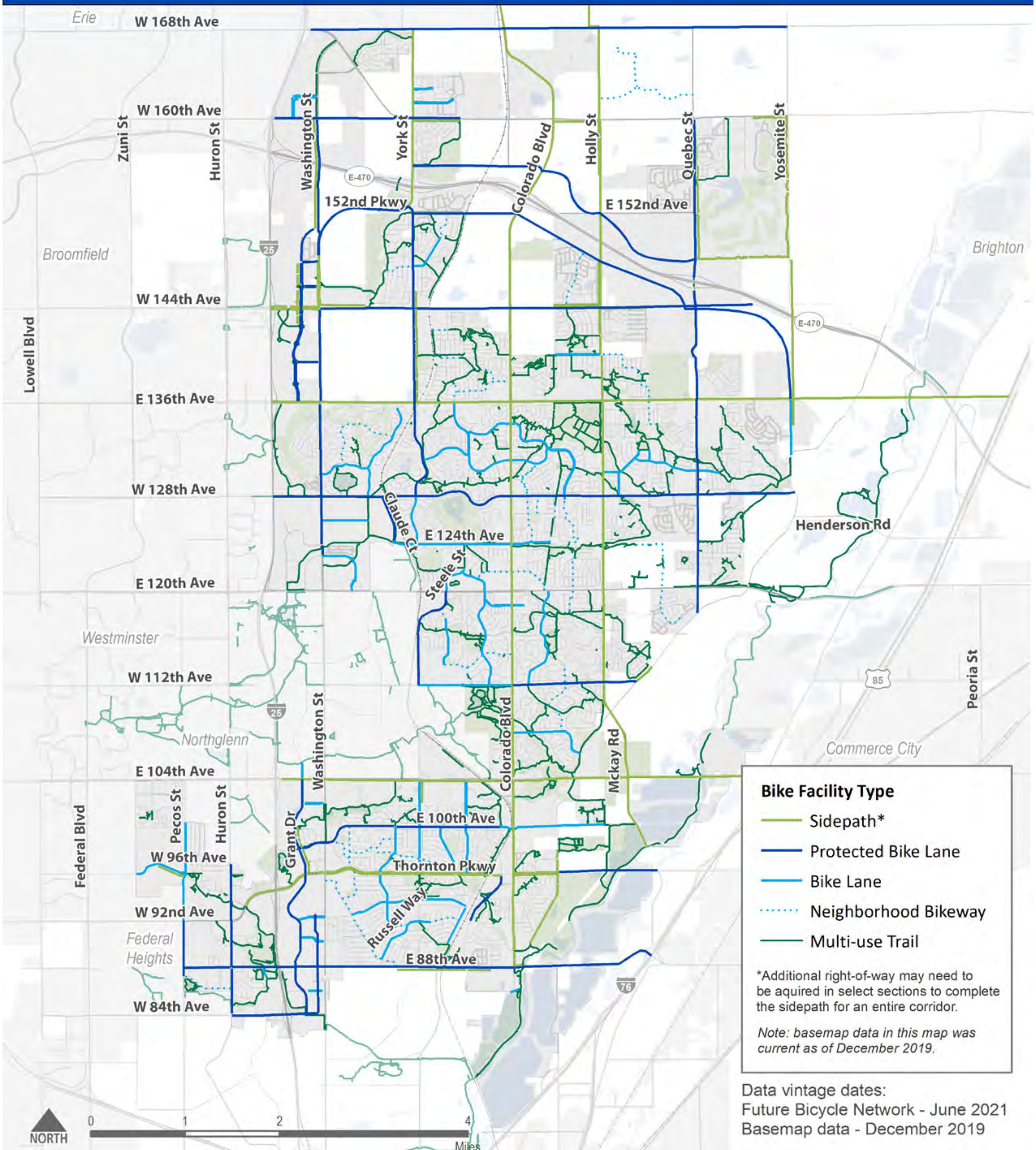

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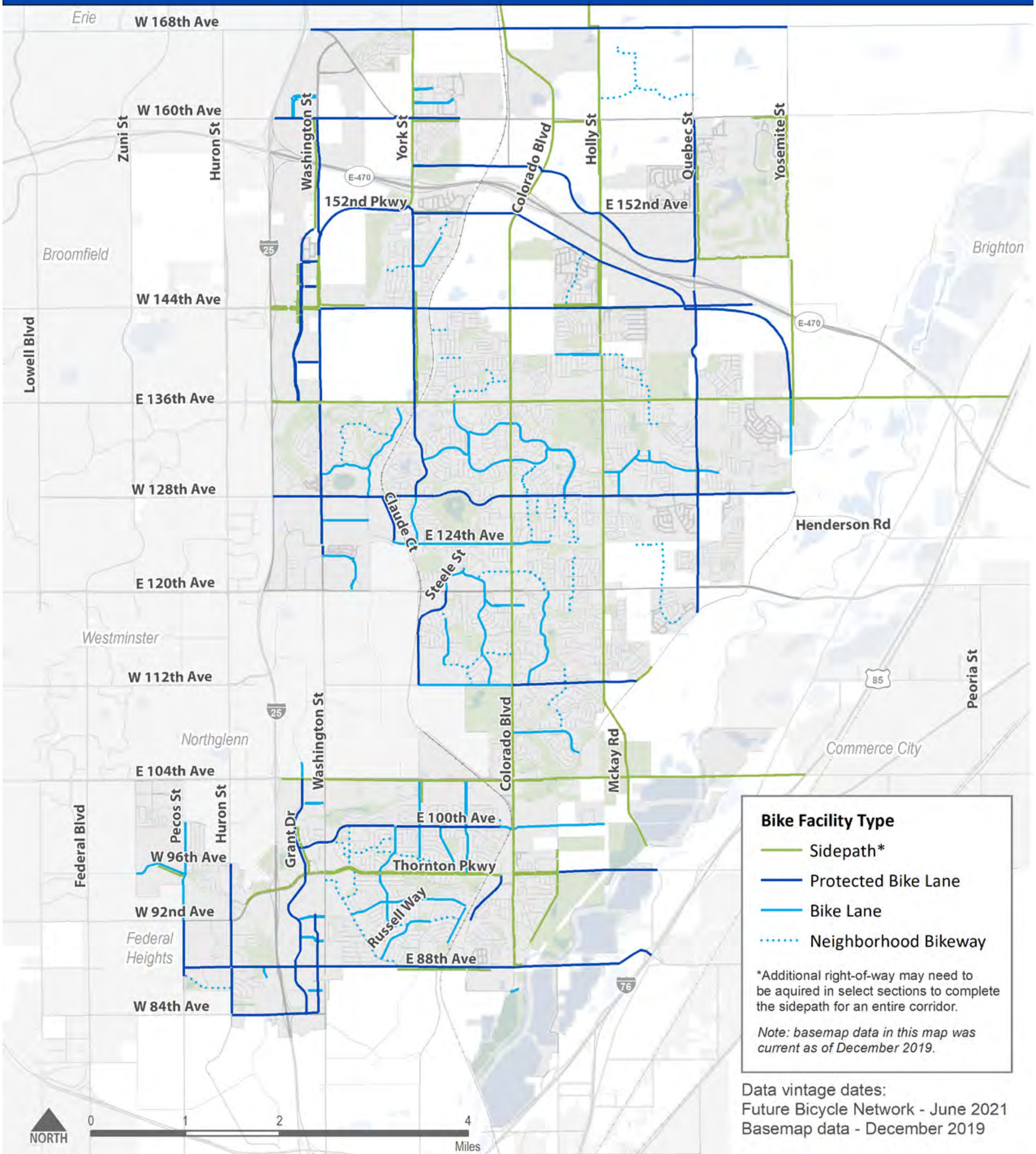
Figure 6.4: Future bicycle network, including trails

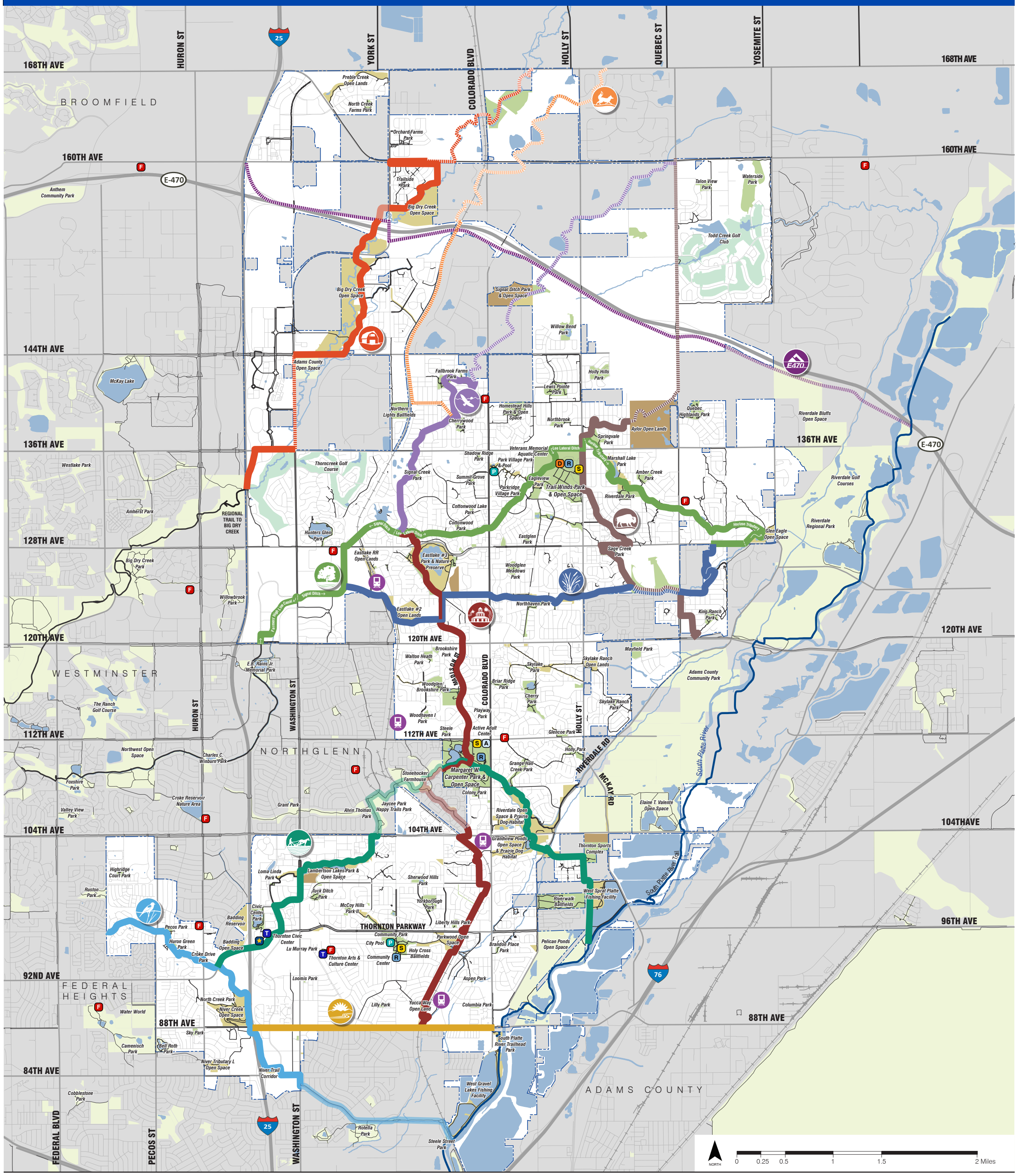
Future Bike Network without Trails



City of Thornton

Figure 6.5: Future bicycle network, without trails

Citywide Trails Map



Primary Trail Names & Icons

- Mid-Town Trail
- Niver Creek Trail
- Ditch Trail
- Big Dry Creek Trail
- Fox Trail
- E-470 Trail
- Grange Hall Creek Trail
- Brantner Gulch Trail
- Signal Ditch Trail
- Plains Tributary Trail
- 88th Trail

Citywide Trails Map Legend:

- RTD N Line Station
- T City of Thornton Building
- P Pool
- R Recreation Center
- A Active Adult Center
- F Fire Station
- D Dog Park
- S Skate Park
- Police Station
- Primary Trails*
- Future Primary Trails*

*All Primary Trail Colors Correspond to Icon Colors Primary Names & Icons Legend

City of Thornton

Figure 6.6: Citywide Trails Map

A list of the bicycle projects recommended for implementation to develop this bike network are identified in **Chapter 11: Implementation**. The bicycle projects have been prioritized based on demand, access to key destinations, safety, and equity. Three tiers have been identified to phase the implementation of the bicycle network as funding becomes available.

Additional Recommendations

In addition to the new and upgraded bicycle facilities recommended in the future bike network, improved wayfinding and implementing new neighborhood connections would help create a more cohesive and connected bicycle network.

BICYCLE WAYFINDING

Figure 6.6 shows citywide trails and the city's recreational wayfinding system. Although these trails are intended for recreation, they provide critical infrastructure for cyclists and pedestrians who use them for transportation as well. However, it is recommended that a similar wayfinding system help integrate on-street bicycle facilities with the off-street trails.

The TMMP recommends that Thornton expand the bicycle wayfinding and signage plan to help people biking for transportation versus just recreation better navigate the existing bicycle network and feel more comfortable riding somewhere new **(Program and Policy Project ID PP.18).** Wayfinding signage should be prioritized anywhere an off-street trail terminates. Signage in these locations should indicate where to go to continue on another low stress bicycle facility or give directions to major destinations nearby.
An effective wayfinding system, especially one that is branded and includes distances or times, can encourage more people to bike because they can feel more confident navigating the system and staying on designated bicycle facilities.

NEIGHBORHOOD CONNECTIONS

Public input and an analysis of the existing transportation network highlighted the lack of connectivity between neighborhoods due to the curvilinear street network, especially for people walking or bicycling. Opportunities for new trail connections between neighborhoods should be considered. Creating a trail at the end of a cul-du-sac or between two unconnected streets can greatly decrease the trip lengths for people walking and bicycling. This can make taking trips by walking or bicycling easier and more feasible. In established neighborhoods these connections can be created by finding existing easements or right-of-way or by acquiring new right-of-way if none currently exists. It is recommended that all new developments be required to provide pedestrian and bicycle connections where there is a lack of connectivity in the roadway network (e.g., cul-de-sac) **(Program and Policy Project ID PP.19).**

COORDINATE WITH CITY OF THORNTON PARKS & OPEN SPACE

Biking infrastructure for transportation and recreation are inextricably tied. Thornton has a comprehensive backbone of local and regional trails that effectively serve users of all types. It is important that the City Development, Street Operations, and Parks and Open Space Management staff collaborate closely to create an on- and off-street bicycle network that is connected and intuitive. The *Parks and Open Space Master Plan* provides an important supplement to the TMMP.

6.2 Glossary of Bicycle Facilities

This section defines and describes characteristics of the future bicycle facility types. Understanding the characteristics of these facilities is critical for successful implementation that applies both best practices and local standards.

Neighborhood Bikeways

Neighborhood bikeways (or bike boulevards or bike routes) are bikeways on streets with low vehicle volumes and speeds where people bicycling share the travel lane with people driving. Neighborhood bikeways use signs, pavement markings, and speed/volume management to communicate the presence and prioritization of people bicycling. Typically, these streets are local, residential roads generally not used for through travel of vehicles. Bicycle routes should include wayfinding signage with distance, direction, and destination information.

The Level of Traffic Stress methodology identifies that the posted speed limit for roadways designated as low stress neighborhood bikeways should generally be 25 mph or less and move fewer than 3,000 vehicles per day. To ensure travel speeds do not exceed 25 mph, neighborhood bikeways may include traffic calming features that control volume or speed through vertical deflection (speed humps) and horizontal deflection (bulb outs, chicanes, medians). The US Traffic Calming Manual (Ewing, Reid, & Steven Brown) can be used to identify the appropriate treatment type for each neighborhood bikeway corridor. A study of each identified neighborhood bikeway should be completed to plan and design the appropriate treatments (i.e., traffic calming, pavement markings, such as bicycle stamps, and wayfinding) for each specific corridor.

Bicycle Lanes and Buffered Bicycle Lanes

A bicycle lane is a designated lane for people bicycling, separated from the general-purpose travel lane or parking lane by a single white line. NACTO recommends that bicycle lanes be five to six-feet wide (but not more than seven-feet wide), not including curb and gutter. When adjacent to on-street parking, a “door zone” between the bicycle lane and parked cars reduces conflicts between people opening car doors and people biking.

A buffered bicycle lane has a painted buffer with limited cross hatching between the bicycle lane and vehicle travel lane. A buffer can increase safety and provide additional comfort for bicyclists, especially on higher speed, higher volume roadways. The identification of future bicycle lane and buffered bicycle lane locations should include the consideration of existing right-of-way, vehicle speeds, vehicle volumes, travel lane requirements, and on-street parking. Bicycle lanes and buffered bicycle lanes should be located on roadways with average vehicle speeds 30 mph or less and less than 7,000 vehicles per day. It is recommended to require bicycle lanes built with new development to have a six-foot bicycle lane accompanied by a three-foot painted buffer with limited cross-hatching between the bicycle lane and travel lane.

Protected Bicycle Lanes

Protected bicycle lanes are buffered bicycle lanes with a vertical barrier (bollards, curb, or raised barricade) between people bicycling and vehicular traffic. Protected bicycle lanes can create low stress bicycling environments on higher volume, higher speed roadways where traditional bike lanes feel uncomfortable or unsafe for many riders. It is recommended that protected bicycle lanes be six-feet wide and have a three-foot buffer with a vertical barrier.

Sidepath or Multi-use Trail (paved and soft surface)

A sidepath or multi-use trail is an off-street low stress facility that supports opportunities for both recreation and transportation. A sidepath more specifically is a wide sidewalk (at least ten feet wide) alongside a roadway, separated by a buffer.A multi-use trail is a separated facility for people walking and biking that does not run immediately adjacent to a roadway. People who walk, bicycle, skate, or use wheelchairs or mobility devices can experience increased comfort and safety on a multi-use trail or sidepath because it is entirely separated from motor vehicles. All multi-use trails serving bicyclists should be a minimum width of ten feet. There should be at least a two-foot vertical buffer (concrete or landscaping) between the path and any roadway.

6.3 Cross Sections and Standards

Cross sections for each roadway classification are defined in **Chapter 5**. In addition to the bicycle facilities shown in the future bicycle network in **Figure 6.4,** the city of Thornton applies Complete Street concepts, including bicycle lanes, on all roadways that are being resurfaced on a case-by-case basis. If bicycle facilities are implemented on arterials, it is recommended that they are protected bike lanes, including a vertical buffer between people biking and driving, or a sidepath.

DRCOG has developed a Regional Complete Streets Toolkit. The toolkit provides guidance for local governments to plan, design, and implement Complete Streets—an approach that gives pedestrians, cyclists, transit riders and other multimodal travelers the same access to safe comfortable streets as motor vehicles. This toolkit provides strategies and give support to decision makers, planners, and designers to ensure that multimodal elements are incorporated into transportation projects. Thornton should reference this toolkit when planning and implementing bicycle facilities.

6.4 Bicycle Crossings

When creating a low stress bicycle network, it is paramount to consider how bicycle facilities will cross roads both at intersections and midblock crossings. A low stress bicycle facility is only as comfortable as the least comfortable component; this component is often the intersection. In Thornton there are currently bike lanes that are not extending through the intersection, creating a gap in the low stress network. Carrying a bike lane through the intersection, along with appropriate signage, striping, and intersection design, can improve both the experience and safety of the bike lane. There are three key elements that make a bicycle crossing facility successful at reducing conflict between vehicles and people bicycling:

1. Reduce vehicle turning speeds
2. Increase the visibility of people bicycling
3. Give people bicycling the right-of-way

The characteristics of both the roadway and the bicycle facility will dictate what type of crossing

treatment is appropriate. There are five main types of bicycle crossing treatments, defined in further detail in this section:

1. Minor street crossings
2. Protected intersections
3. Dedicated intersections
4. Roundabouts
5. Grade separated crossings

Table 6.1 shows the potential crossing treatments to consider depending on the bicycle facility and street type that are intersecting. Crossing treatment types as identified by this table can be evaluated and designed on a case-by-case basis as a part of the bicycle facility future implementation process.

Table 6.1: Bicycle Crossing Type Toolbox

Bicycle Facility Type	Intersection Category: Street Classification of the Perpendicular Street, Being Crossed by Bicyclists				
	Local	Collector	Arterial	Driveway	Roundabout
Neighborhood Bikeway	Minor Street Crossing	Dedicated Intersection	Dedicated Intersection	Minor Street Crossing	Merge with Traffic
Bicycle Lane	Minor Street Crossing	Dedicated Intersection	Dedicated Intersection	Minor Street Crossing	Merge with Traffic
Sidepath	Minor Street Crossing	Dedicated Intersection	Dedicated Intersection	Minor Street Crossing	Provide Ramps to Pedestrian or Otherwise Separated Infrastructure/ Grade Separated Crossing

(Source: modification from NACTO, Don't Give up at the Intersection)

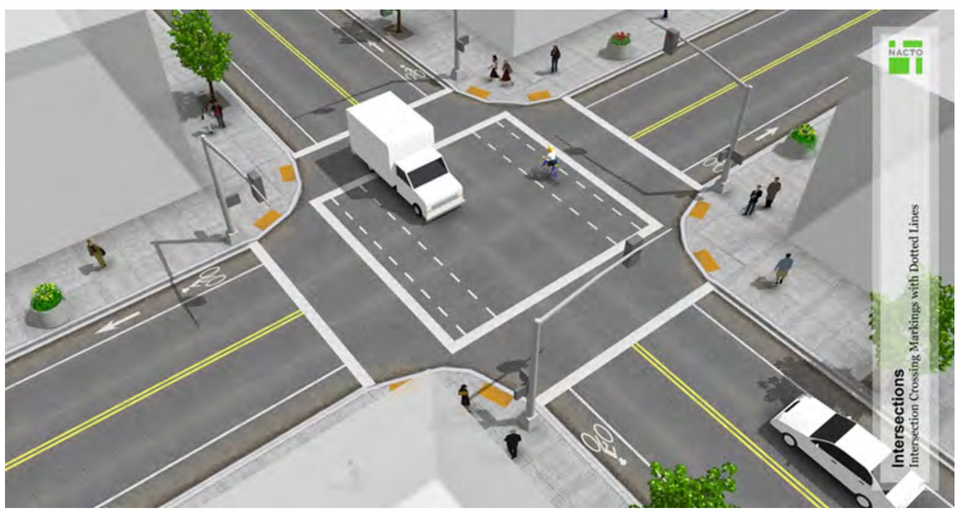
Minor Street Crossings

Minor street crossings are an appropriate treatment type when bicycle routes, bicycle lanes, or sidepaths cross local roads or driveways. Design components of a minor street crossing can create a comfortable experience for people bicycling and may include:

- Curb extensions or bulb outs that slow vehicle turning speeds and increase visibility of bicyclists and pedestrians
- High visibility crosswalks and other markings through the intersection
- Green paint used to highlight bicycle paths through high conflict areas to increase awareness of the presence of people bicycling

In **Figure 6.7**, the white dashed line through the intersection is an example of how a bicycle facility can be continued through an intersection with a local street to form a minor street crossing.

Figure 6.7: Example of a Minor Street Crossing

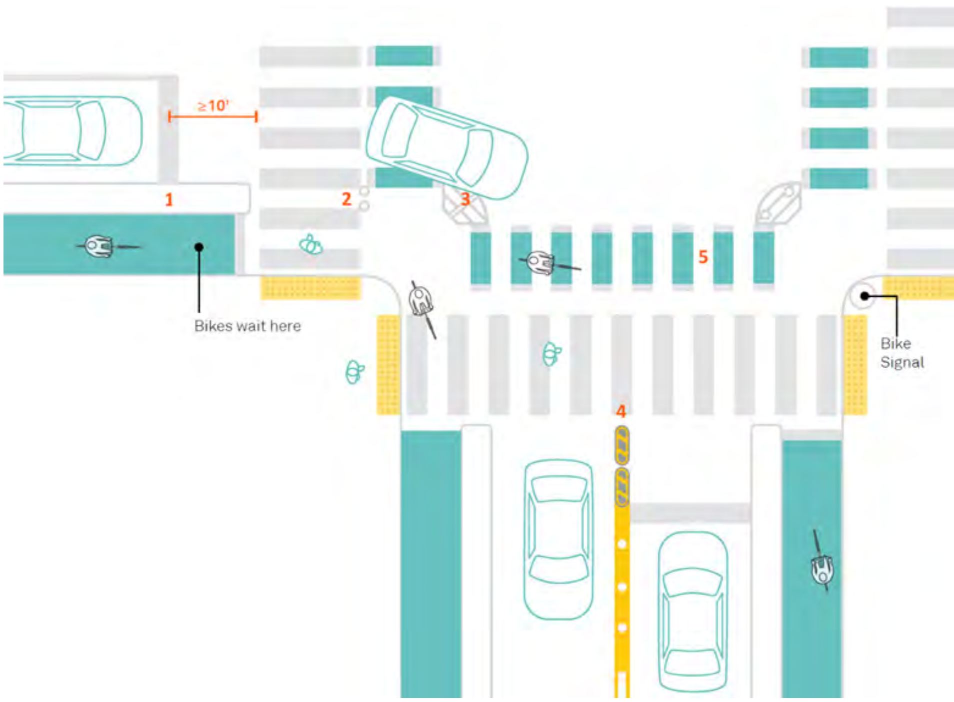


Dedicated Intersections

Dedicated intersections are a potential tool when bicycle routes, bicycle lanes, or sidepaths meet high-volume, high-speed roadways like collectors or arterials. A dedicated intersection can include a variety of improvements to provide more separation between vehicle, pedestrians, and bicyclists, and can improve the safety and comfort of people walking or biking. Improvements in a dedicated intersection can include: painted or raised buffers between bicycle lanes and vehicle travel lanes; crosswalk separators; corner wedges and speed bumps; centerline hardening; traffic control devices like bicycle signals; and bike lane line extensions created with green skip paint denoting bike-lane through the intersection. Dedicated intersections are design options that can be used on an interim or trial basis. Design flexibility is likely necessary at each location to account for the local context and the intricacies of dedicated intersection designs.

An example of a dedicated intersection is shown in **Figure 6.8** (refer to NACTO's *Don't Give Up at the Intersection* for details on dedicated and protected intersections).

Figure 6.8: Example of a Dedicated Crossing

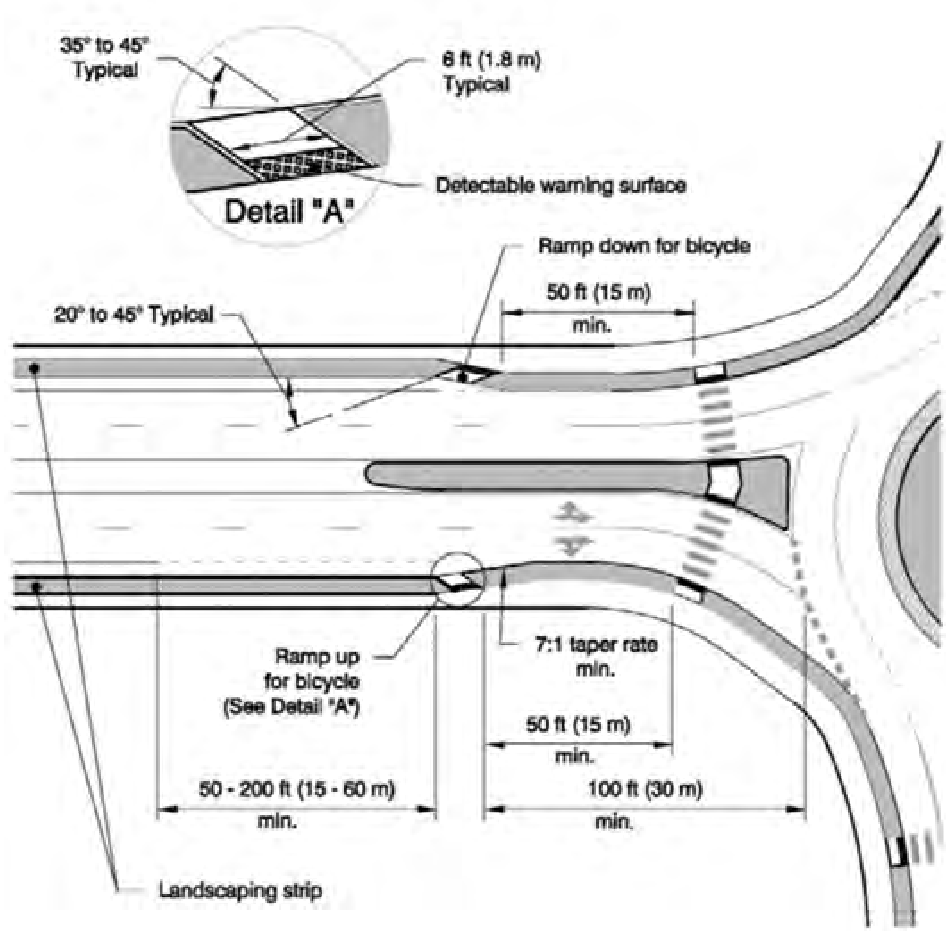


Numbers reference in figure: 1-Buffer or Curb, 2-Crosswalk Separator, 3-Corner Wedge & Speed Bump, 4-Centerline Hardening, 5-Bike Lane Line Extensions

Roundabouts

When bicycle facilities meet a single lane roundabout with a designated speed of <15 mph, bike routes and bike lanes can merge with traffic. Additional signage should be installed, including on-street painted arrows/ shared lane markings through the roundabout. This infrastructure should clearly identify the crossing locations for bicyclists with the use of ramps, pavement markings and/ or signage. When a bicycle facility meets a two-lane roundabout, bicycle facilities are not carried through roundabouts. Instead, separated facilities for bicyclists should be incorporated with the pedestrian facilities and clearly marked as shared use. Additional alternatives exist and are being developed for accommodating bicyclists at roundabouts and should be considered as part of the planning and design for each potential location. **Figure 6.9** illustrates CDOT's standards for a two-lane roundabout where the on-street bike lane becomes a sidepath to separate people biking from vehicular traffic through the roundabout.

Figure 6.9: CDOT Bicycle Roundabout Standards



6.5 Conclusion

Public input about bicycling in Thornton highlighted both the strengths of Thornton's bicycle network, like the city's existing trail network and connections to regional trails, as well as challenges to biking in Thornton such as high stress bike lanes, gaps in the bicycle network, and a lack of bicycle infrastructure through intersections. This chapter leverages the existing bike network and addresses challenges by putting forth the following recommendations for creating a complete low stress bicycle network throughout Thornton:

- New and upgraded low stress bicycle facilities appropriate for the speed and volumes of adjacent roadways
- Additional trail and multi-use trail connections that fill gaps in the bicycle network and increase connectivity between neighborhoods for people walking and biking
- Updated roadway cross sections that include low stress bicycle facilities
- Intersection treatments for improving bicycle infrastructure at roadway crossings

Creating a connected and low stress bicycle network in Thornton will give residents, employees, and visitors more options for getting around the city and make it easier and more comfortable to bike to work, school, errands, and recreation. This chapter serves as a blueprint for implementing the vision of a safe, connected, and enjoyable bicycle network in Thornton by 2050.

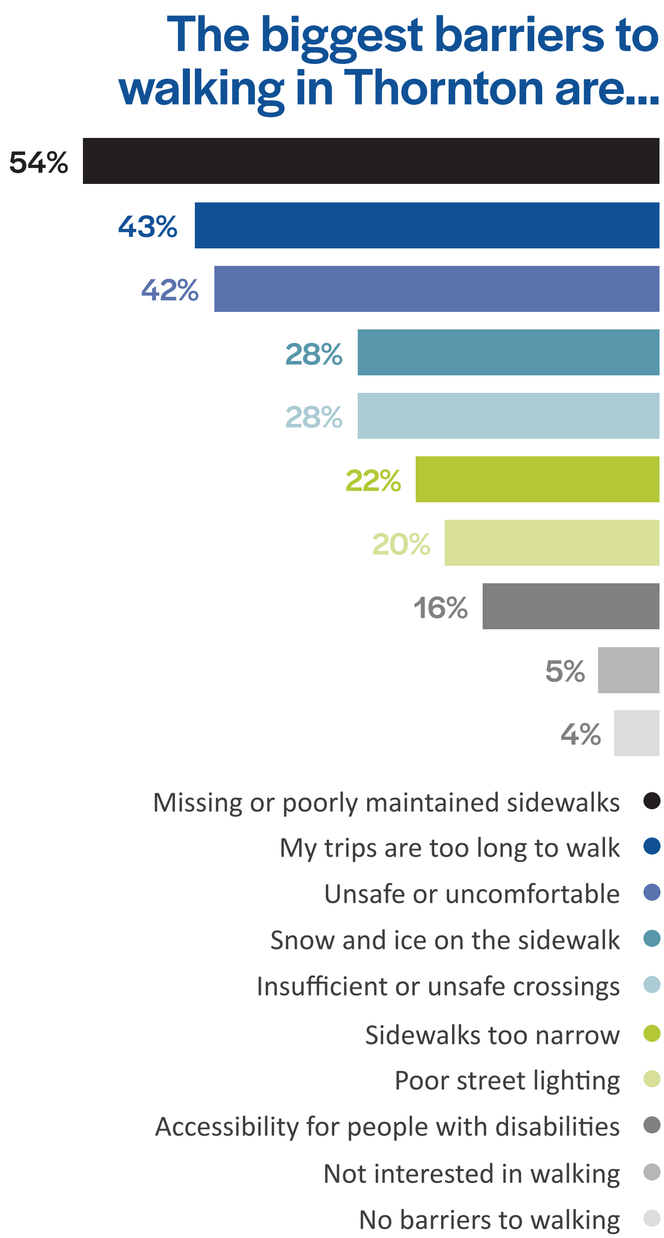
07 Pedestrian Network

7.1 Introduction

Thornton's pedestrian network is made up of multi-use trails, , sidepaths, sidewalks, and roadway crossings. A comfortable, safe, and connected pedestrian network makes walking and using a wheelchair a viable transportation options and improves safety for all modes of travel. Current challenges for pedestrians in Thornton include the lack of connectivity in the overall street grid, missing or insufficient facilities, and many barriers including lakes, rivers, and railroads. **Figure 7.1** displays the online survey responses to the prompt "The biggest barriers to walking in Thornton are…".

This chapter comprises the Pedestrian Plan that helps prioritize pedestrian and wheelchair travel throughout the city.

Figure 7.1: Online survey results (TMMP February 2021 survey)



The Pedestrian Plan has five main objectives:

1. Create a method for prioritizing sidewalk and crossing improvements
2. Fill gaps in the existing pedestrian network
3. Rehabilitate existing sidewalks (widening and adding curb ramps to sidewalks that do not meet ADA standards, fixing maintenance issues, removing obstructions from the sidewalk)
4. Implement new enhanced crossings for pedestrians
5. Identify other amenities needed to create a safe and comfortable pedestrian network

7.2 Pedestrian Network

This section describes the overall proposed infrastructure improvements as well as a prioritization of the proposed pedestrian improvements. This prioritization enables city staff to determine how to implement the improvements as funding becomes available between now and 2050.

Pedestrian Standards

The presence and width of sidewalks and buffers are identified in the cross sections included in **Chapter 5**. The characteristics of the pedestrian network will vary based on street classification, since the speed and volume of the adjacent roadway will impact the widths necessary to create a comfortable experience for people walking. DRCOG developed a Regional Complete Streets Toolkit for the Denver region. The toolkit provides guidance for local governments to plan, design, and implement Complete Streets—an approach that gives pedestrians, cyclists, transit riders and other multimodal travelers the same access to safe comfortable streets as motor vehicles. This toolkit provides strategies and give support to decision makers, planners, and designers to ensure that multimodal elements are incorporated into transportation projects. Thornton should reference this toolkit when planning and implementing pedestrian facilities.

Prioritization

Thornton's TMMP creates a tiered system for prioritizing pedestrian improvements across the city. This prioritization does not include safety hazards that need immediate attention such as a raised section of sidewalk causing a trip hazard. **Figure 7.2** displays the different tiers of pedestrian priority areas across the city and highlights gaps in the existing sidewalk network. Priority areas were determined through a spatial analysis consisting of the factors below. The areas with the highest scores were given the highest priority for pedestrian improvement:

- Number of schools within ½ mile of each corridor
- Number of bike and pedestrian-related crashes within 100 feet of each corridor weighted by crash severity
- Corridors within a ¼ mile radius of a bus stop
- Corridors within a ½ mile radius of a rail station
- Public parks or open spaces within ¼ mile of each corridor
- Presence of a trail access point within ¼ mile of each corridor
- Presence of commercial land uses within 1/4 mile of corridor
- Number of public facilities within ¼ mile of each corridor
- Number of public facilities and community services within ¼ mile of each corridor

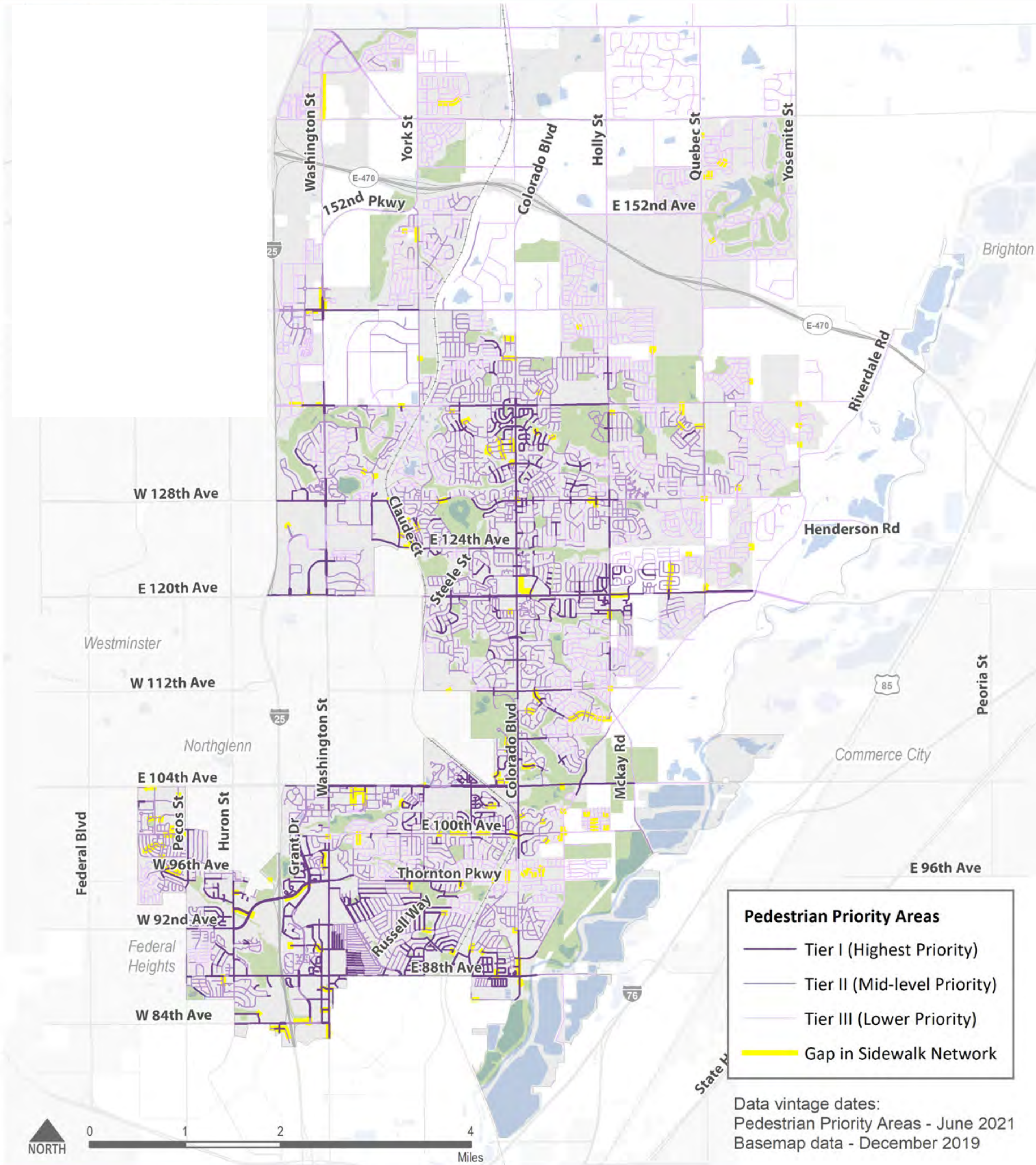
The prioritization of upgrading the pedestrian network has the following components, in the order listed:

1. Filling gaps in the pedestrian network in Tier 1 locations
2. Filling gaps in the pedestrian network in Tier 2 locations
3. Filling gaps in the pedestrian network in Tier 3 locations
4. Sidewalk, trail, or crossing rehabilitation in Tier 1 locations
5. Sidewalk, trail, or crossing rehabilitation in Tier 2 locations
6. Sidewalk, trail, or crossing rehabilitation in Tier 3 locations

Within each of the six categories stated previously, the city reviews and prioritizes specific locations for gap completion or rehabilitation annually and on a case-by-case basis. In addition to the designated tier, consideration should be given to the following qualitative criteria when determining if a sidewalk gap should be completed or upgraded:

- Is there new development and/or a willing property owner adjacent to the sidewalk location?
- How/when does this location tie into the street paving/ rehabilitation schedule?
- Is there a funding source available such as a Safe Routes to School grant?
- Are there potential partnerships with local entities?

Pedestrian Priority Areas and Sidewalk Gaps



City of Thornton

Figure 7.2: Map of pedestrian priority areas and sidewalk gaps

7.3 Pedestrian Crossings

Safe pedestrian crossings are critical to the comfort of the overall pedestrian network. Pedestrian networks are only as comfortable as their least comfortable link which in many cases are roadway crossings. Over one-quarter of respondents to the TMMP survey distributed in February 2021 said that insufficient or unsafe crossings were one of the biggest barriers to walking in Thornton (see **Figure 7.1**). There are two basic categories for pedestrian crossings—controlled crossings and uncontrolled crossings. A controlled crossing is a crosswalk across a roadway that is controlled by a stop sign or traffic signal. Controlled crossings are typically installed on roadways with higher vehicle volumes and vehicle speeds such as arterials or collectors. An uncontrolled crossing is a crosswalk where vehicle traffic is not controlled by a stop sign or traffic signal. Uncontrolled crossings are typically located on local roadways where vehicle volumes and speeds are relatively low. The specific treatments at both controlled and uncontrolled crossings (marked crosswalk, signage, flashing beacons, etc.) should be determined using national best practices.

For example, the National Association of City Transportation Officials' (NACTO) *Urban Street Design Guidelines* include important considerations and recommendations for designing safe and comfortable pedestrian crossings for both controlled and uncontrolled crossings. The FHWA and USDOT developed the *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*. This document details the best practices used across the country for building safe and comfortable uncontrolled crossings. It summarizes criteria for pedestrian uncontrolled crossings and details procedures for evaluating the types of crossing treatments that may be applicable for a particular set of vehicular volumes, speeds, and roadway geometries. Creating safe and appropriately spaced roadway crossings is an important component of a complete pedestrian network. Both proactive and reactive approaches are key to a comprehensive pedestrian crosswalk safety strategy.

Reactively Addressing Pedestrian Crossing Locations

Reactive approaches to improving pedestrian crossing locations include responding to a request or concern expressed by community members about a particular crossing location or identifying needed safety improvements based on a location's history of severe or fatal crashes.

To address these identified concerns, city staff can refer to the *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* provided by the FHWA, or the *Urban Street Design Guidelines* created by the NACTO to determine what treatment type is appropriate at each location. Treatment type is based on vehicular traffic volume, speed limit, and number of travel lanes. Treatments to consider include high visibility crosswalks markings, raised crosswalks, signage, curb extensions, pedestrian refuge islands, beacons such as Rectangular Rapid Flashing Beacon (RRFB) or Pedestrian Hybrid Beacon (PHB), or road reconfigurations (also known as road diets). Additionally, the crash profiles detailed in DRCOG's *Taking Action on Regional Vision Zero* plan can be helpful in linking common crash types to safety improvements.

Responding to these issues is an important part of improving the pedestrian network but must be in balance with proactively addressing unsafe crossing locations before severe or fatal crashes can occur.

Proactively Addressing Pedestrian Crossing Locations

Figure 7.2 prioritizes areas to proactively investigate enhanced pedestrian crossing treatments, first in Tier 1 locations, then Tier 2 locations, followed by Tier 3 locations. Proactive approaches to investigating street crossings could include walking audits, fieldwork, and community outreach to identify pedestrian safety, connectivity, or comfort issues that may not be evident in reported crash records or specific requests from the community. Once crossing locations that are missing or in need of upgrades are identified (starting with Tier 1), each crossing should be assigned a priority score. This score could be based on the peak hour pedestrian crossing volume and the corresponding conflicting vehicular volume, divided by the project's cost. Locations with the highest score should be prioritized for planning and implementation.

Score = (Pedestrian volume x Vehicle volume) / Project cost

Thornton can also identify priority safety projects based on high-risk roadway features that correlate with particularly severe crash types. This systemic safety approach goes beyond spot treatments where previous crashes have occurred to identifying locations across the system that have the highest potential for future severe crashes.

Additionally, Thornton should adopt pedestrian crossing standards to ensure all future intersections or midblock crossings that are built are in line with national best practices for safe and comfortable crossings for all users **(Program and Policy Project ID PP23).**

Pedestrian and Bicycle Grade Separated Crossings

Grade separated crossings are dedicated crossing facilities for people walking and people biking. Grade separated crossings can be designed as over-passes (bridges) or underpasses (tunnels). Grade separated crossings create a low stress connection across roadways allowing people walking and people biking to cross without having to navigate vehicle traffic. These crossing types are an essential component of Safe Systems, which is an evidenced-based approach defined by FHWA to reduce fatal and severe traffic crashes. The Safe System acknowledges that people make mistakes. A Safe System helps communities design transportation networks that ensure inevitable mistakes made by roadway users do not result in fatalities.[2]

[2]https://safety.fhwa.dot.gov/zerodeaths/docs/FHWA_SafeSystem_Brochure_V9_508_200717.pdf

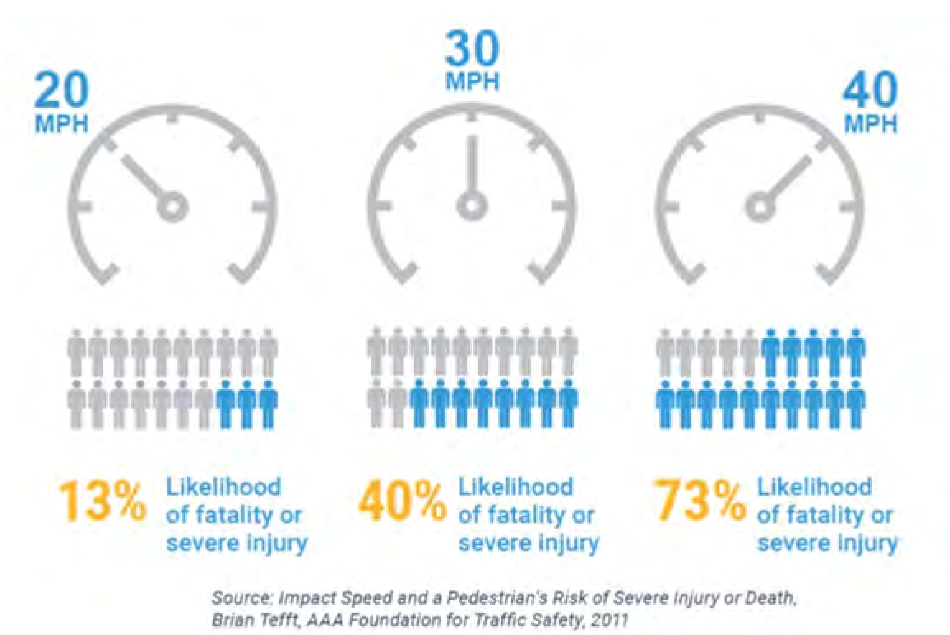
Factors to consider include:

Speed - Candidates for grade separated crossings include streets operating at or above 35 mph. As shown in **Figure 7.3**, fatalities increase significantly as speed increases.

Facility type - The weakest link approach conveys that a walking experience will be negatively altered by the most stressful point in a trip, typically at a roadway crossing. Investing in grade separated crossings where trails and paths cross arterials extends the low stress facility across the roadway.

Users - Grade separated crossings are valuable to people of all ages and abilities. Grade separated crossings can be located where children are present, including at destinations such as schools, parks, and libraries. Grade separated crossings also ensure a safe and low stress crossing opportunity for older adults, those with mobility challenges, and others who may have trouble crossing high-speed, high-volume roadways at grade.

Figure 7.3: Correlation between vehicle speed and fatal or severe crashes



7.4 Additional Considerations for a Comfortable Pedestrian Network

In addition to walkways and crossings, pedestrian amenities play an important role in creating a safe and comfortable experience for people walking or using a wheelchair. In order to accommodate user of all ages and abilities, Thornton should provide a complete network of sidewalks and crossings that are accessible according to the Americans with Disabilities Act (ADA). Public input, particularly during the focus groups, identified the lack of pedestrian amenities in Thornton as an existing barrier to walking or using a wheelchair. Pedestrian amenities can be added as part of other sidewalk or trail rehabilitation projects, in areas with high pedestrian traffic, based on community requests, and required on roadways built for new development. Pedestrian amenities include more shade, landscaping, trash cans, benches, and pedestrian scale lighting.

7.5 Conclusion

In summary, while Thornton's existing trail and sidewalk network are a great asset to build from, there are several key areas in which Thornton could improve the pedestrian network. Both public input and analysis of the existing pedestrian network identified that missing sidewalks, sidewalk maintenance, uncomfortable roadway crossings, and a lack of pedestrian amenities were all barriers to walking and using a wheelchair in Thornton. This chapter details the TMMP's Pedestrian Plan which addresses each of these barriers in the following ways:

Missing sidewalks and sidewalk maintenance:

Missing sidewalks and pedestrian priority areas are identified in the map displayed in **Figure 7.2.** City staff can work to complete sidewalk gaps and rehabilitate existing sidewalks and trails according to their priority tier. Rehabilitation of sidewalks or trails can include widening, replacing or repairing , removing obstructions, and adding curb ramps.

Unsafe or uncomfortable roadway crossings:

This chapter outlines the different types of roadway crossings and the national best practices that can offer guidance in creating safe roadway crossings for people walking. City staff can use a balance of proactive and reactive methodologies to identify priority locations for implementing crossing improvements or redesigns. Thornton can also develop crossing guidelines to ensure all future pedestrian crossings are built as safe and comfortable facilities.

Pedestrian amenities:

Shade, benches, trash cans, and pedestrian scale lighting that are well designed and maintained are important to the comfort and safety for people walking or using a wheelchair in Thornton. Amenities such as these can have a positive impact on people's willingness to walk. Public input collected through focus groups and an online survey highlighted a lack of pedestrian amenities as a barrier to walking. New amenities can be added as part of the rehabilitation of a sidewalk or trail and be a requirement for new developments.

Investing in a safe and comfortable pedestrian network is important for making walking a viable transportation option in Thornton, both for commuting and recreation. This chapter helps lay out a vision for building upon Thornton's existing pedestrian facilities to ensure the pedestrian network serves all users well into the city's future.


Grant

08 Transit Network

This chapter provides a summary of the 2030 and 2050 transit network envisioned in Thornton, including growth strategies and capital investments the city will make to support transit. The future transit vision is based on a combination of the planned regional transit network, forecasted land use density, as well as future transit investments by the city identified in the preferred scenario.

This chapter shows transit propensity and the vision network for 2050 first, followed by 2030. This order demonstrates the ultimate vision for transit, and then conveys how Thornton can work up to that vision in the short-term.

8.1 Existing Transit Service Barriers and Opportunities

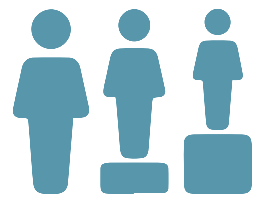
Thornton is part of the Regional Transportation District (RTD), which provides public transit service throughout the Denver metropolitan region. Most existing transit service in Thornton operates at moderate-to-low frequencies, where buses come every 30 or 60 minutes. Three routes in Thornton provide frequencies greater than 30 minutes, all during the morning and evening peak commuter periods. These include the regional express bus service on I-25 (Routes 120X and 122X), the N Line commuter rail, and the Wagon Road FlexRide (also known as the 144th FlexRide), which operates at 20-minute peak period frequencies and may deviate from its route to pick up or drop off passengers.

Given the land use patterns and relatively low service levels, it is not surprising that only about 3% of commute trips originating in Thornton (pre N Line opening in 2020) were made via transit.[3] Under the preferred scenario, transit mode share in Thornton is predicted to double by 2050. This would result in a substantial increase in transit ridership, transit access, and utility of transit for many more trips for employees and residents than is available today.

[3] United States Census Bureau's 2019 American Community Survey 5-year Estimates

BENEFITS OF PUBLIC TRANSIT

There are numerous benefits to investing in public transit in Thornton, including:



EQUITY

Transit is an essential mode of transportation for many of Thornton's most vulnerable population, including youth, older adults, people in low-income households and persons with disabilities, many of whom cannot drive or do not have access to a personal vehicle.

ECONOMIC

A high quality transit system will increase economic opportunity in Thornton as businesses and services can connect to many more employees and customers.

HEALTH & ENVIRONMENT

Transit provides an essential transportation option for many to access healthcare, supports an active lifestyle of walking and biking, and results in lower greenhouse gas emissions and air pollution rates per capita as compared to driving. This results in healthier air and reduced risk of many heart and respiratory diseases.

LAND USE

Transit can support more compact, walkable development patterns.

QUALITY OF LIFE

Transit increases transportation choice and opportunity for residents of Thornton to access more places and connect with more people in the region, which leads to a higher quality of life.

An online survey was made available in English and Spanish on the city's website and through email in February 2021 and 76 people completed the survey.

Figure 8.1 and **Figure 8.2** illustrate the results of two questions with regards to the biggest barriers to taking transit cited by the community. When asked what improvements would make transit service in Thornton more attractive, about 55% of survey respondents identified better connections to their destinations, about 35% wanted transit better connected to their homes, and about 31% identified more frequent service. Safety, cost, and reliability of transit were also cited as barriers. About 85% of survey respondents indicated they would use transit more if improvements were made, indicating an opportunity to grow transit ridership with the right type and level of investment.

Figure 8.1: Online survey results on fixed-route services

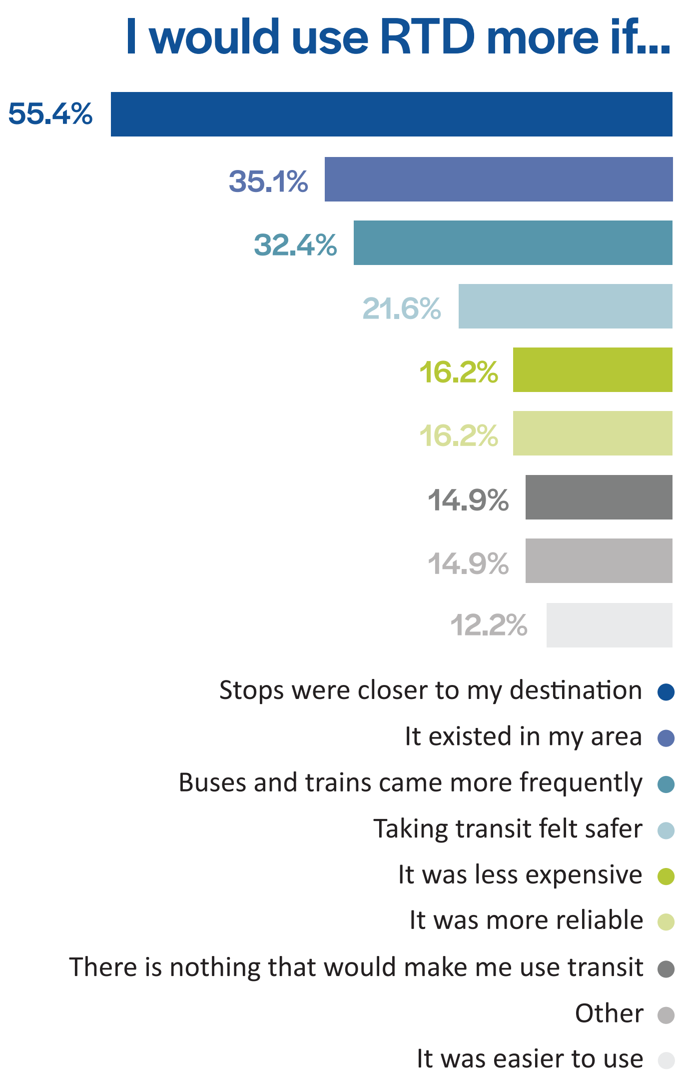
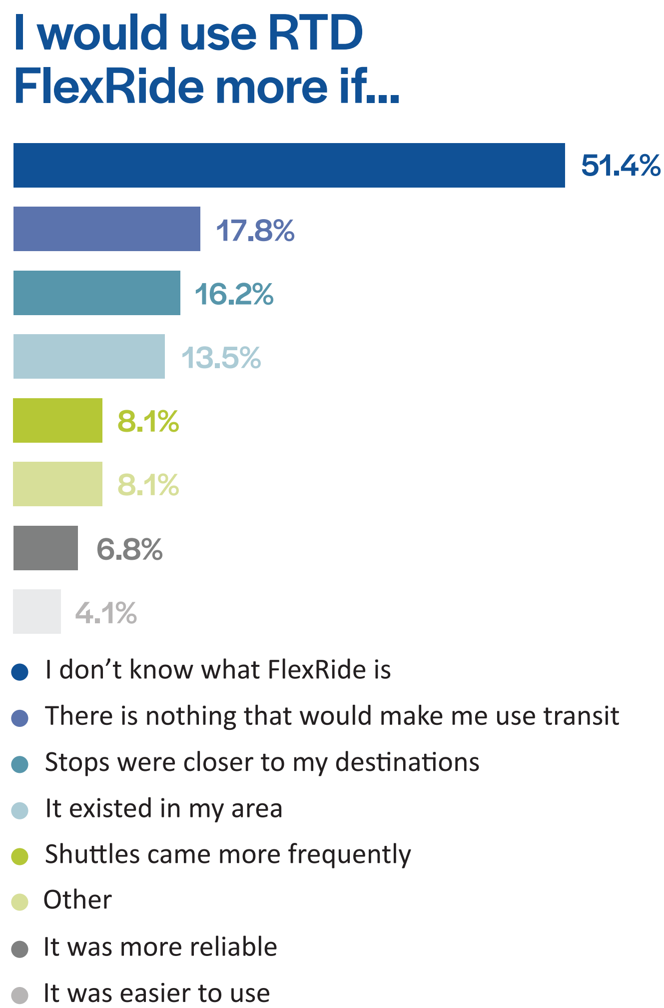


Figure 8.2: Online survey results for FlexRide



Just over 50% of survey respondents were not familiar with RTD's FlexRide, indicating a potential opportunity to better market the service.

8.2 Transit Propensity Analysis

Research over the years has shown that certain groups are more likely to use transit for more trips, and there is a certain subset of the population that relies on transit for critical trips because they cannot use or do not have access to other modes of travel. Identifying the groups that use and/or rely more on transit and understanding their concentration in a community is a useful way to identify existing gaps in transit service and plan for future investments. A transit propensity analysis was performed that combines key factors (population density, job density and demographic/economic factors) to show where demand for transit in Thornton was highest in 2020 and expected to be strongest in 2050. Transit propensity is a measure of the estimated transit demand for a particular geography. The results of this transit propensity analysis can identify areas that are most likely to support transit in Thornton and at what frequency, both now and in 2050. The most important indicator of the likelihood for a location to support transit is the density of residents and jobs.

Methodology

To quantify the transit propensity across Thornton, each transportation analysis zone (TAZ) from the DRCOG Regional Travel Model was assigned a weighted density of residents combined with that TAZ's job density. This method was adapted from similar methods used in Los Angeles County, CA[4] and Fort Collins, CO[5] and based on national research conducted by the Transit Cooperative Research Program.[6] Population, employment, and income data used in this analysis came from the DRCOG Regional Travel Demand Model, while other demographic data came from the United States Census Bureau's 2019 American Community Survey 5-year Estimates.

Population density was weighted by the proportion of each area's population that is more likely to take transit. The following population groups are more likely to take transit at varying rates,[6] thus each were assigned a unique weight (shown in parentheses):

- People without access to a personal vehicle (4.46)
- People of color (2.3)
- People with mobility limitations (1.75)
- People who are foreign-born (1.29)
- People in low-income households (1.25)
- Women (1.19)

The weighted population was added to the number of jobs in each census tract. Jobs were assigned a weight of two times population based on the higher transit mode shares for commute travel compared to other types of travel.[7]

Table 8.1 shows the service type and frequency of transit that would be supported by different land use densities as measured by the weighted number of residents plus jobs per acre. In general, locations with medium and high transit propensity (generally with at least 15 residents per acre or at least eight jobs per acre) are best suited for fixed-route transit.

[4]http://media.metro.net/projects_studies/nextgen/images/Transit_Propensity_writeup_2019-0719.pdf
[5]City of Fort Collins Transit Master Plan (2019)
[6]Rosenbloom, S., & Fielding, G. J. (1998). TCRP Report 28: Transit Markets of the Future: The Challenge of Change. Transit Cooperative Research Program, TRB, National Research Council, Washington, DC, 40
[7]2017 National Household Travel Survey

Table 8.1: Transit Propensity for Different Transit Service Types

Transit Propensity	Typical Corresponding Land Use	Types of Transit	Frequency of Service
High	Urban or mixed-use corridors	• Bus Rapid Transit (BRT) • High frequency bus • Local bus	10-15 minutes
Medium	Suburban or mixed-use nodes	• Local bus	15-30 minutes
Low	Suburban	• Local Bus • Demand response	30 minutes or microtransit
Very Low	Single family residential or rural	• Demand response	Microtransit (i.e., on-demand)

Figure 8.3 illustrates the existing transit propensity in Thornton by TAZ with the existing transit service overlaid. This map shows that existing fixed-route bus service generally aligns with the areas in Thornton with the highest transit propensity, which is generally south of 128th Avenue and west of Colorado Boulevard. The one exception is the area around the Grove Shopping Center and Denver Premium Outlets, located between 136th Avenue and 144th Avenue and just east of I-25, which is served by the Wagon Road FlexRide; this service operates as a deviated fixed-route bus during the morning and evening peak commute periods. The areas with high transit propensity in Thornton that could support high-frequency bus service (15 minutes or less) are all in southwest Thornton around 88th Avenue and I-25. The only local bus routes with 30-minute all day frequency in Thornton pass through this area, including RTD Routes 12 and 92.

Thornton Transit Propensity - 2020

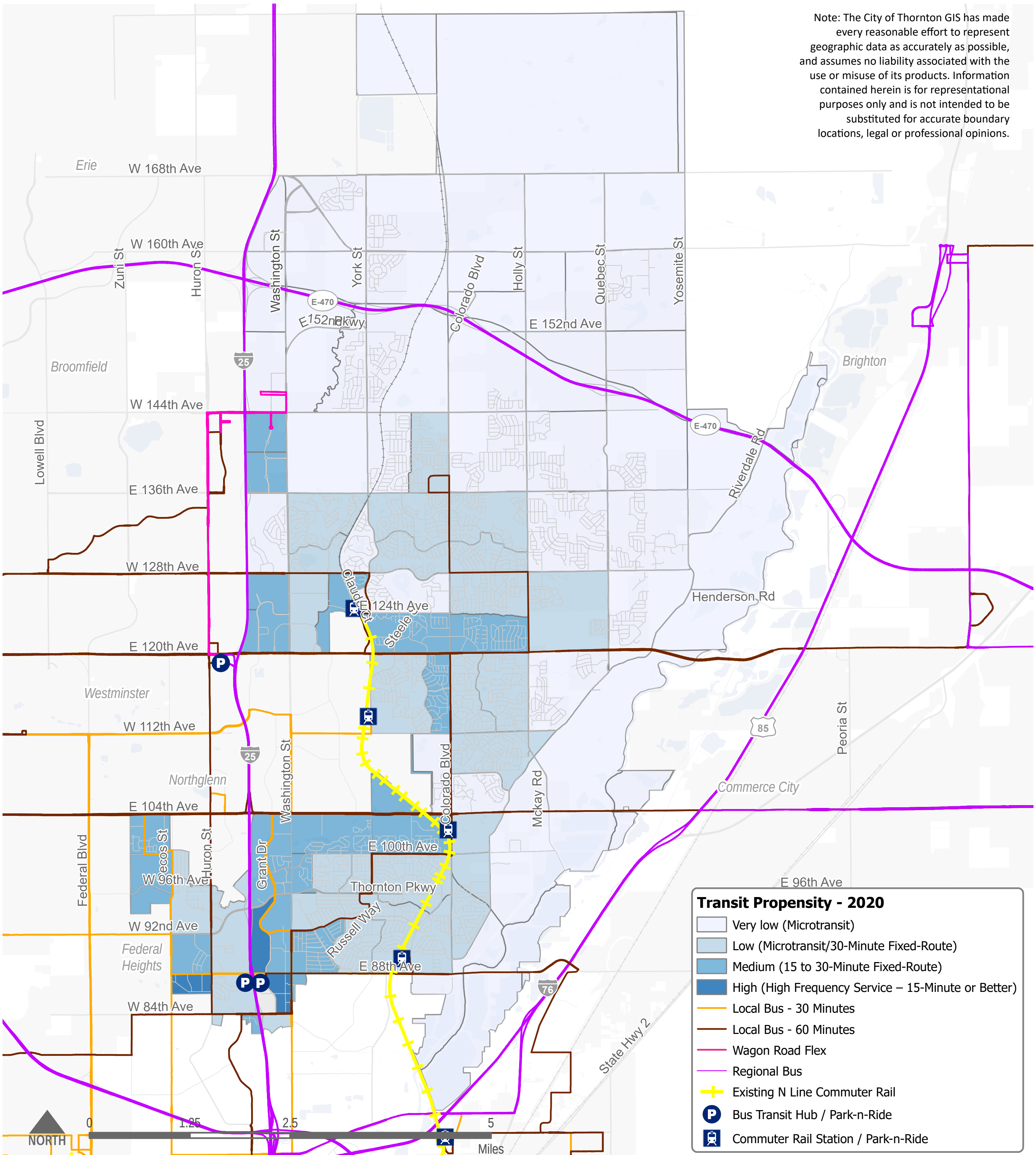


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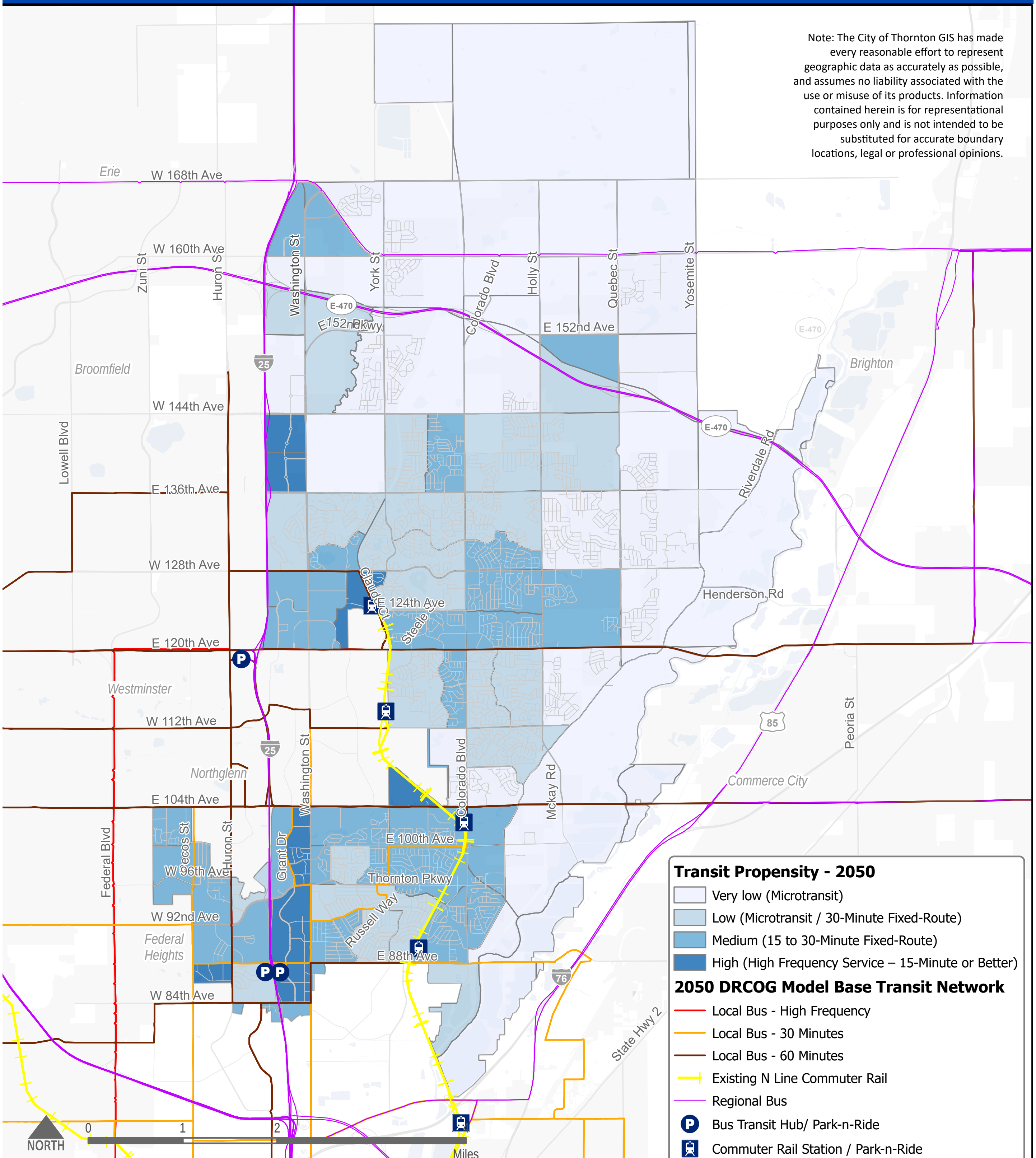
Figure 8.3: Thornton Transit Propensity Map 2020

Figure 8.4 illustrates the transit propensity in 2050 based on forecasted population and employment growth in the 2050 DRCOG Regional Travel Demand Model. The transit network as currently planned in the DRCOG 2050 Regional Travel Demand Model is also shown. This map shows that between now and 2050:

- Most of the areas in south and central Thornton with low transit propensity are expected to change to medium transit propensity (and some locations with medium transit propensity are expected to change to high transit propensity) due to population and employment growth.
- Some TAZs north of 136th Avenue are also expected to increase in transit propensity from very low to low or medium, including around the I-25 and CO-7 interchange.
- Except for the planned Bus Rapid Transit (BRT) route along CO-7, local fixed-route transit service as forecast in the DRCOG 2050 Regional Travel Demand Model is noticeably lacking north of 128th Avenue.
- The highest transit propensity (that could support high-frequency bus) is forecast to occur along Washington Street/Grant Street, 88th Avenue, and around several of the N line commuter rail stations.
- Most of the land on the eastern edge of Thornton and north of E-470 is expected to continue to be low-density and generally not supportive of fixed-route transit.

The 2050 transit propensity in Thornton was used to inform the vision for the 2050 transit network.

Thornton Transit Propensity - 2050



City of Thornton

Figure 8.4: Thornton Transit Propensity Map 2050

8.3 Future Transit Network

Figure 8.5 illustrates the 2050 transit network vision for Thornton. This includes the following key components described in more detail below:

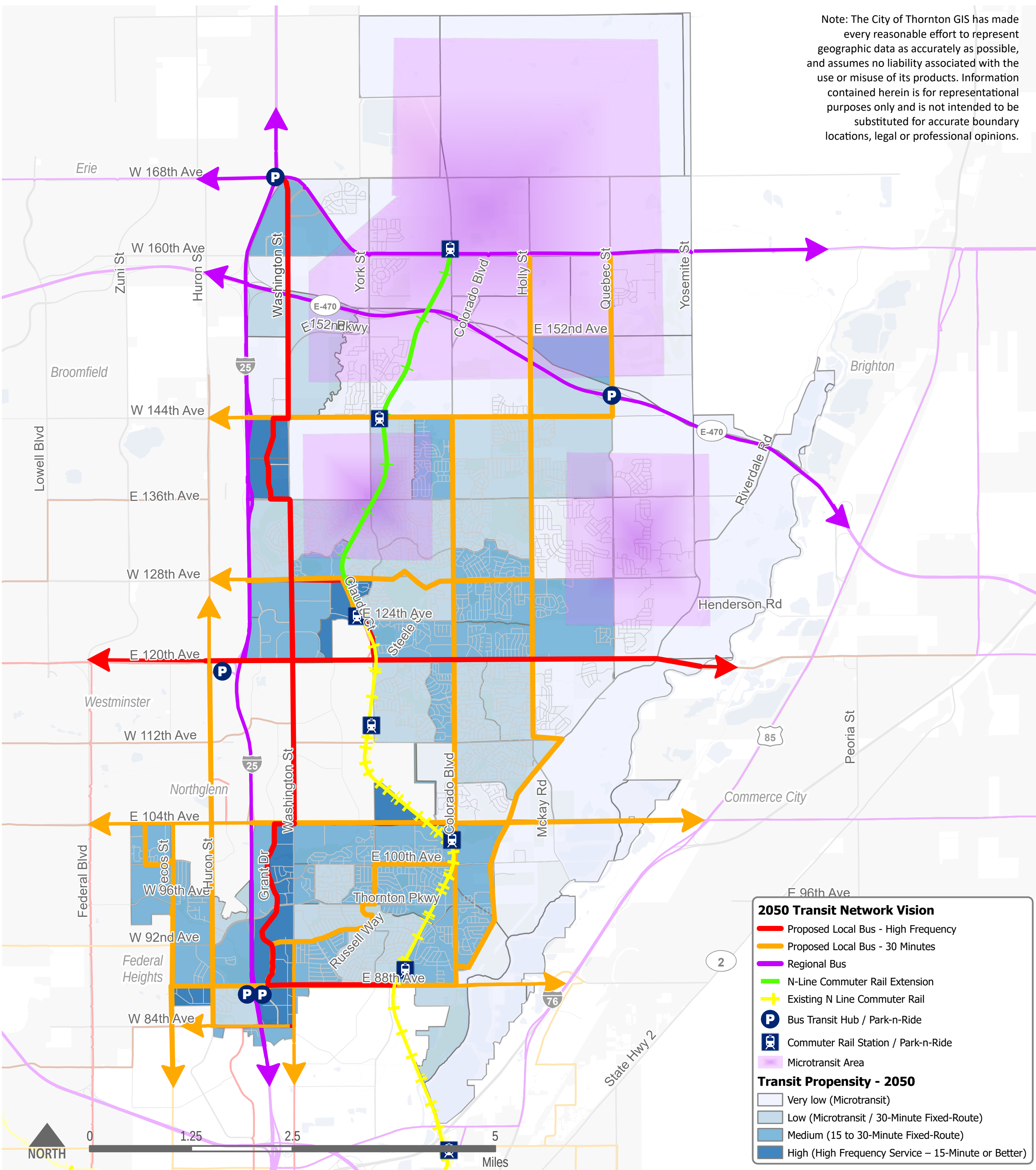
- The extension of the N line to CO-7;
- Four new transit hubs/Park-n-Rides;
- Regional BRT on CO-7 between Boulder and Brighton;
- Expansion of the local fixed-route transit network to most arterial road corridors where densities are expected to be high enough to support sufficient ridership;
- Increase in transit frequency on most corridors including the addition of high-frequency transit service along Washington Street/ Grant Street/88th Avenue and 120th Avenue; and
- Microtransit or on-demand service that will connect the lower-density areas of the city into the fixed-route transit network. This is like today's FlexRide but provides more reliable service with faster time between a ride request and a pickup (typically within 15 minutes) and may utilize different vehicles and technologies in the future, including autonomous shuttles or shared small vehicles.

The proposed future transit network connects most of the city to high quality transit service, improving the utility of transit as a viable option to connect homes, services, and jobs within Thornton and the region. This future network provides more frequent service than exists today, covers more of the city, and through higher frequencies better enables connections between different local bus routes and regional transit service.

Implementation of this network assists Thornton in doubling the 2020 transit mode share by 2050 and supports more walkable, transit-oriented development patterns around core commercial corridors and transit stations. Under the transit vision, transit service hours of the local transit network would increase by over 200% (roughly tripling existing service) in addition to increased regional bus and rail service hours. Given Thornton's population is expected to grow by about 50% between 2020 and 2050, this represents roughly a doubling of local transit service hours per capita by 2050.

It is also important to note that transit is disproportionately used by the most disadvantaged populations, including those who cannot afford or are not physically able to drive, such as people in low-income households, persons with disabilities, youth, and older adults. Investing in the transit system increases equity and provides greater opportunity for businesses and services to connect to employees and customers. This in turn supports economic growth within the city and enhances the quality of life for all residents.

Thornton Transit Vision - 2050



City of Thornton

Figure 8.5: Thornton Transit Vision 2050

N Line Extension

Completion of the final 5.5 miles of the N Line commuter rail from its current terminus at Eastlake•124th Station is part of this plan. The completion includes the addition of two new stops at the planned York•144th Station and North Thornton•Hwy 7 Station. The completion of the N Line is part of the 2004 voter-approved FasTracks project.

Transit Hubs & Park-n-Rides

There are six existing transit hubs serving Thornton, all with Park-n-Rides. These include four stations along the N Line (at 88th Avenue, 104th Avenue, 112th Avenue, and 124th Avenue) and two along I-25, at 120th Avenue (Wagon Road Park-n-Ride) and 88th Avenue (Thornton Park-n-Ride). Like the existing transit stations, future stations will provide connections between local bus routes, on-demand service, and regional bus and rail lines, as well as parking for people driving or biking to transit. The transit vision includes three new transit hubs with Park-n-Rides in Thornton at the following locations:

- York Street•144th Avenue – This station will be added as part of the N Line completion and will include parking and connections to planned local fixed-route bus service and microtransit. This station is included in RTD's FasTracks plan.
- CO-7•Colorado Boulevard - This station will be added as part of the N Line completion and will include parking and connections to the planned BRT on CO-7, local fixed-route bus service, and microtransit. This station is included in RTD's FasTracks plan.
- CO-7•I-25 (Larkridge) - This station will be added as part of a new station along the Bustang North Line (between Denver and Fort Collins) and will include parking and connections to the planned BRT on CO-7, local fixed-route bus service, and microtransit. Planning for this transit hub is part of a larger regional vision for the I-25 corridor and CO-7 BRT project by CDOT, Boulder County, Adams County, and other jurisdictions.
- E-470•Quebec Street – A new station and Park-n-Ride could be added here to provide a connection to RTD's Boulder-to-DIA regional SkyRide route (route AB). This would provide a direct transit connection to the airport (via E-470) for people in North Thornton. The route 104L currently provides a direct airport connection to central Thornton from the Wagon Road Park-n-Ride and stops along 104th Avenue. A more in-depth study is needed to identify if the transit market would support investment in a transit hub at this location. Any future station at this location would likely need to be designed in-line along E-470 to minimize delay to the existing route.

Fixed-Route Bus

The transit vision includes three general types of fixed route service: high-frequency service (15-minute all day frequencies or better), local 30-minute all day service, and regional/BRT service. The conceptual alignments of these services are shown in **Figure 8.5**; these follow the transit service propensity guidelines shown earlier in **Table 8.1**. In general, fixed-route service should be direct, with few deviations to maximize its utility, and with at least one of the termini of each route at a transit hub or activity center to provide a strong anchor. All fixed-route service should operate at 30-minute or better frequencies all day (at least from 6 AM to 7 PM). Anything less frequent is not useful for most trips and is a major barrier for passengers who need to connect between routes, make appointments, or run errands. Areas that cannot support 30-minute frequencies are proposed to be served by microtransit.

- **Regional/BRT** – Regional bus service provides express service along major highways connecting Thornton to major regional destinations. In addition to existing regional service along I-25 to Downtown Denver (existing Routes 120X and 122X), new regional service to Thornton includes the CO-7 BRT connecting Brighton to Boulder and a new Bustang North Line stop at the future transit hub at I-25/CO-7, connecting North Thornton to Loveland, Fort Collins, and Downtown Denver. These regional routes through Thornton are being planned separately from Thornton's transit vision but are tightly integrated with the conceptual service identified in this plan. Additionally, RTD's Route 120X/122X is proposed to extend north to serve the new transit hub at I-25/CO-7.
- **High Frequency Bus** – This service operates with 15-minute or better frequencies all day, along a direct route. The transit vision includes two new high-frequency routes:
  - *Washington Street/Grant Street and 88th Avenue Corridor* – This route would operate between the future I-25/CO-7 transit hub and the Original Thornton•88th Station for the N Line. This proposed route connects to the Thornton Park-n-Ride transit hub at 88th Avenue and I-25. This route provides a direct connection to the highest density nodes in Thornton along the Washington Street, Grant Street, and 88th Avenue corridors, including shopping centers, mixed-use developments, and the Amazon distribution center. This route also connects with all the major regional routes in Thornton, including Bustang North Line, the future CO-7 BRT, the Route 104L to DIA, future 120th Avenue BRT, I-25 express buses, and the N Line commuter rail.
  - *120th Avenue* – This route would extend across Thornton along 120th Avenue and continue beyond the city limits (west to Westminster and east to Brighton). It would also connect to other local and regional transit in Thornton at both the Wagon Road Park-n-Ride and Eastlake•124th Station. Increasing service on this corridor aligns with the vision for a BRT along 120th Avenue identified by Adams County and RTD in the Northwest Area Mobility Study (NAMS).
- **Local 30-Minute Service** - Local bus service operates with at least 30-minute all day frequencies on arterial and collector roads in medium-to-higher density neighborhoods. Some of these routes may operate more frequently during peak times. At least one terminus of each route connects into the regional rail and bus network at transit hubs. Like today's service, many routes extend beyond Thornton to surrounding communities, including Northglenn, Broomfield, Westminster, Commerce City, and Brighton. Future 30-minute local routes are envisioned to operate along the following corridors:
  - Pecos Street (like existing Route 19)
  - Huron Street (like existing Route 8)

- » East Eppinger Boulevard/York Street/100th Avenue between Thornton Park-n-Ride (at 88th Avenue/I-25) and N Line at Thornton Crossroads•104th Station (like existing Route 93L)
- » Colorado Boulevard between future York•144th Station and Original Thornton•88th Station (extension of exiting Route 93L)
- » Holly Street South between the N Line at Eastlake•124th Station and the station at Original Thornton•88th (new route)
- » Holly Street North between future North Thornton•Hwy 7 Station and Eastlake•124th Station (new route)
- » 88th Avenue (like existing Route 92)
- » 104th Avenue (like existing Route 104 and 104L)
- » 120th Avenue with connections to Wagon Road Park-n-Ride and the N Line at Eastlake•124th Station (like existing Routes 120 and 120L)
- » 144th Avenue/Quebec Street from CO-7 BRT at Quebec Street to I-25/144th Avenue including connection to N Line at future York•144th Station (new route)

Microtransit/On-Demand

Areas of Thornton where land use densities are lower and not covered by the fixed-route transit network are proposed to have microtransit or another type of on-demand public transit service. People in these areas will be able to call for a ride using a mobile app or phone, which provides a connection between a location within the microtransit zone and a transit hub or activity center within or nearby the zone. Successful microtransit systems have response times of 15-minutes or less and offer all day service. Service is provided by smaller vehicles and passengers occasionally share a ride with another user. This type of service is not expected to be as productive as fixed-route bus (with a lower number of passengers per hour) but is intended to expand the coverage area of transit in Thornton in a more responsive and cost-effective way. Based on forecasted land use, three areas of the city are envisioned for microtransit as shown in **Figure 8.5:**

- North Thornton - Generally north of 152nd Avenue, connections at the following transit hubs:
  - » CO-7/I-25
  - » Future North Thornton•SH7 Station
  - » Future York-144th Station
- Northeast Thornton – Generally east of Quebec Street and north of 120th Avenue, connections at the following transit hubs:
  - » Future York•144th Station
  - » Eastlake•124th Station
- 136th Avenue – Around 136th Avenue between Washington Street and Colorado Boulevard, connections at the following transit hubs
  - » Future York•144th Station
  - » Eastlake•124th Station

Successful microtransit systems have response times of 15 minutes or less and offer all day service.

Implementation

Since RTD is expected to continue to provide most of the transit service within Thornton, implementation of the transit vision will require close coordination with RTD. One option to increase service beyond the base network provided by RTD is through service-buy ups. A service buy-up is where a local jurisdiction pays RTD to operate a particular route at a higher frequency than RTD would otherwise operate, with the jurisdiction paying for the cost of additional runs. If, over time, ridership on a route with the increased service grows to meet certain thresholds, RTD can begin to cover the cost of the additional frequencies. However, in general, it is expected that transit service will increase to more areas of Thornton as the community grows.

Strategies that support increased transit service as the city grows include: higher-density; pedestrian-oriented land use development along future transit corridors; a well-connected, gridded arterial and collector street network (see Chapter 5); completing a well-connected pedestrian network (see Chapter 7); and enhancing and adopting transportation demand management (TDM) strategies intended to provide travelers with opportunities to choose modes other than a single occupancy vehicle (see Chapter 10). Implementation requires coordination with other regional partners, including CDOT, Boulder County, Adams County, Smart Commute Metro North, and neighboring jurisdictions. Implementing this transit network (including fixed-route service and microtransit) requires a more in-depth study. Therefore, it is recommended that Thornton conduct an in-depth transit study **(Program and Policy ID PP.20)** to refine the transit vision and provide a detailed implementation strategy to complete the future transit network.

Thornton's Role in Implementing the Transit Vision

Thornton does not have direct control over expansion of the transit services provided by RTD, which is the agency that operates the public transit system for the Denver metropolitan region. As such, Thornton cannot, on its own, add a new transit route or increase the frequency of an existing route. However, there are many other aspects of Thornton's transit vision that the city has direct control over, most notably the transportation infrastructure, land use density, and other transit-supportive programs.

Thornton can support transit growth and implement the TMMP transit vision by providing:

1. A well-connected, gridded collector and arterial roadway network that allows for direct transit routes
2. Transit speed and reliability improvements along congested corridors (such as transit signal priority, queue jump lanes, and transit only lanes)
3. A well-connected bicycle and pedestrian network with adequate pedestrian crossings
4. Transit stop amenities
5. Coordination with RTD to locate bus stops near pedestrian crossings
6. Land use policies and zoning that support dense development and pedestrian-oriented design near transit routes and hubs
7. Transportation demand management (TDM) strategies
8. Coordination with regional partners

These strategies and investments are likely to increase demand for transit (beyond just population growth), which will drive RTD to increase transit service in Thornton to meet that demand. Thornton can also more directly increase transit service through service buy-ups, where Thornton pays RTD the cost to operate a particular route at a higher frequency, or by initiating its own microtransit service. Other potential implementation strategies will also be explored as part of a more in-depth transit study.

8.4 2030 Transit Network

Figure 8.6 shows the vision for the 2030 Transit Network in Thornton. Implementation of this vision increases local weekday fixed-route transit service hours in Thornton by about 30-35% from what exists in 2020. The 2030 transit vision includes three key investments in the transit network as well as other transit supportive improvements, described in detail in the following sections:

- Extend Route 12 along Washington Street/Grant Street to 144th Avenue
- Increase frequency of service on 120th Avenue
- Initiate a pilot microtransit service

Thornton Transit Vision - 2030

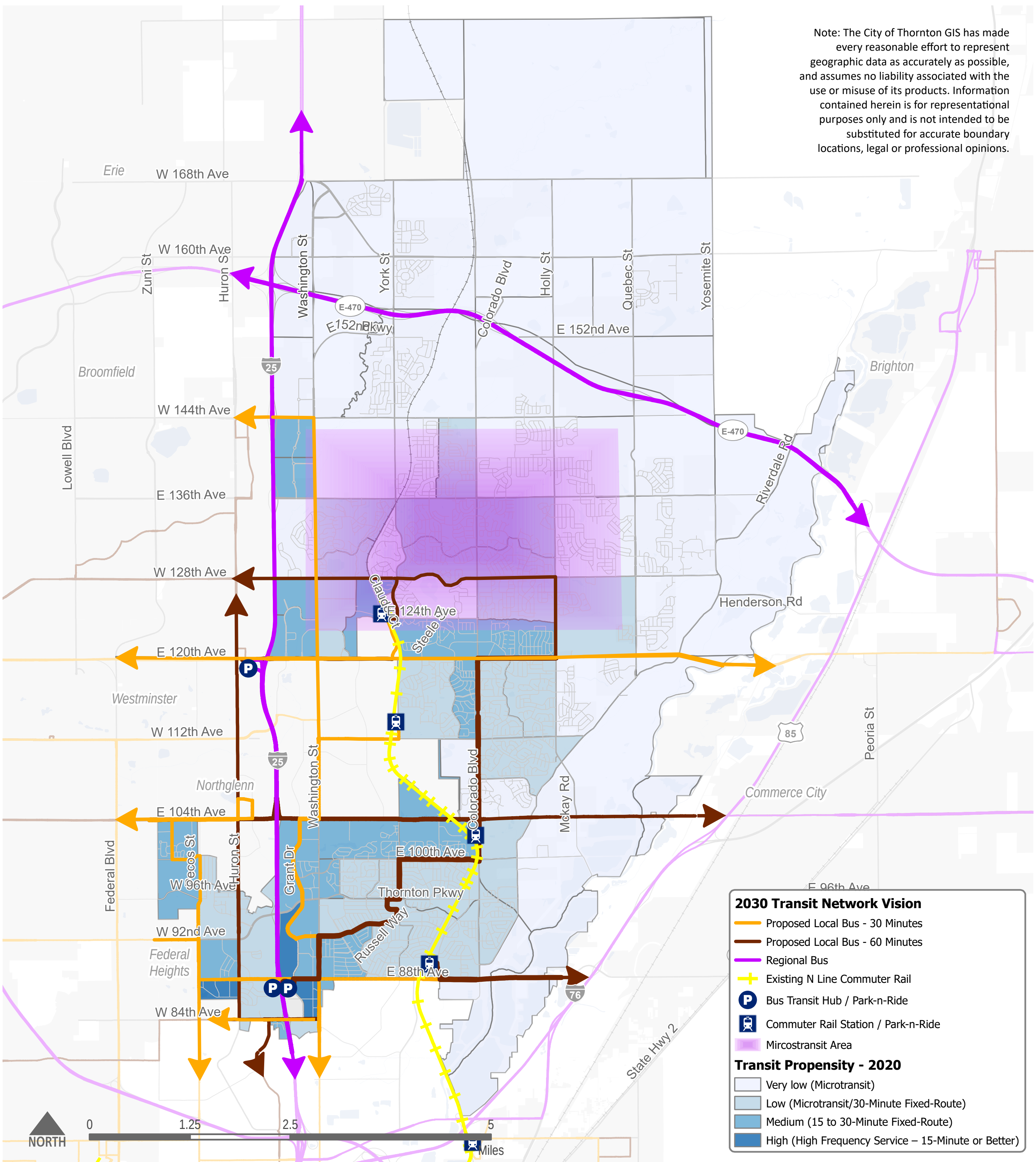


Figure 8.6: Thornton Transit Vision for 2030

Extend Route 12 Along Washington Street/Grant Street to 144th Avenue

New mixed-use development along Grant Street and Washington Street, particularly between 136th Avenue and 144th Avenue has occurred over the last decade and is expected to continue to build out in this area over the next ten years. Extension of the Route 12 north from its current terminus at 112th Avenue to 144th Avenue with 30-minute frequencies provides fixed-route service to this densifying area of Thornton and could possibly replace the Wagon Road FlexRide with an all-day route with similar service levels. This route extension is a first step to eventually upgrading this corridor to high-frequency service. The route should connect to the St. Anthony North Hospital and Orchard Town Center in Westminster on the west side of I-25, as well as the Amazon Distribution Center along 144th Avenue and possibly Route 8 along Huron Street.

Increase Frequency of Service on 120th Avenue

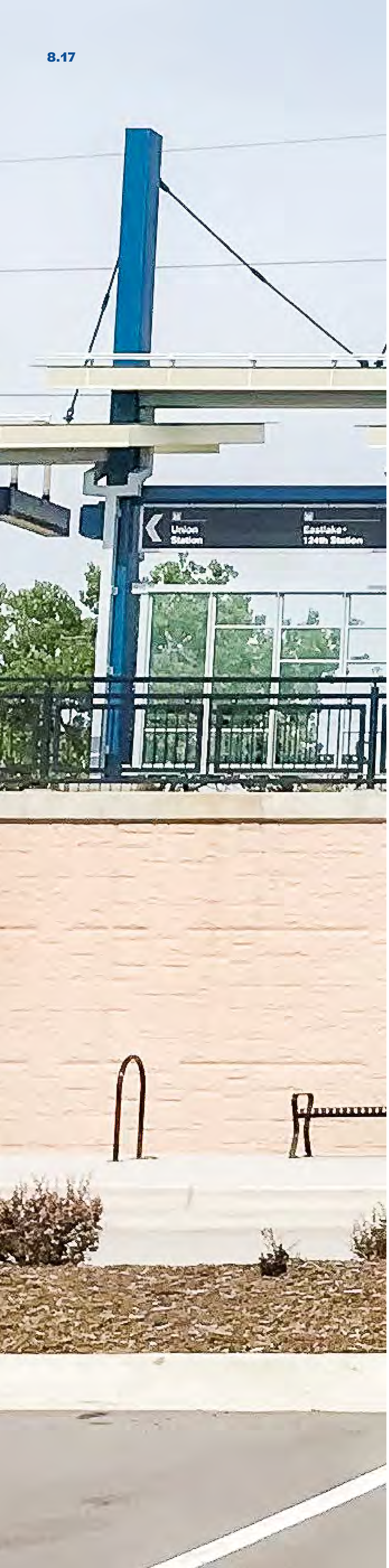
120th Avenue is a key east-west corridor in Thornton that connects adjacent land uses with regional transit service at the Wagon Road Park-n-Ride and Eastlake•124th commuter rail station. This route is identified in the 2050 transit vision as a high-frequency route and is identified by regional agencies (RTD and Adams County) as a future BRT route. An interim step to achieving the long-term transit vision is to increase service along this corridor from 60-minute all day frequencies that exist today to at least 30-minute all day frequencies by 2030. Providing more frequent service along 120th Avenue increases the viability of transit as a transportation option for more people along this corridor and increases connections to the I-25 express buses (routes 120X and 122X) and N line commuter rail.

Initiate a Pilot Microtransit Service

In the 2030 vision, Thornton initiates a pilot microtransit or on-demand service in the north central part of the city serving the growing areas generally between 120th Avenue and 144th Avenue that have less access to the fixed-route transit network. The exact boundaries and service type will be determined through further analysis. Microtransit should serve the recreation center at 136th Avenue and Holly Street, which is currently lacking a connection to the fixed-route network. Microtransit connects people to major destinations within the service area and serves as a first and last mile connection to the N Line commuter rail at the Eastlake•124th Station. The pilot program informs the long-term establishment of microtransit service areas in lower-density parts of the city. There is currently a lot of testing and innovation in the microtransit space with communities partnering with private transportation providers, operating their own services, partnering with paratransit providers, or working with the local transit agency. All these options should be explored when establishing a microtransit service in Thornton and details can be further identified through the upcoming transit study.

Other Transit Supportive Improvements

Between 2020 and 2030, Thornton will gradually make other policy and capital investments to support transit service and ridership. Additional detail on these investments is provided in the following two sections and includes gradually building out the pedestrian and bicycle network, improving bus stops and bus stop



locations, and encouraging transit-supportive land uses in key areas of the city through zoning.

8.5 Capital Improvements

To grow the transit network, Thornton should make capital improvements to leverage transit investments and further support increased transit ridership. These capital improvements make it safer and more convenient to access transit, increase the attractiveness of transit, and use of the transit network as a mode choice.

Align Bus Stop Locations with Pedestrian Crossings

Most of the existing and planned bus routes in Thornton are along arterial roads, typically with four to six travel lanes, and with high traffic volumes and vehicle operating speeds (40+ mph). As part of any round trip on a bus, passengers need to cross the street for one direction of their trip. To improve safety and transit accessibility, Thornton and RTD should collaborate to gradually place or relocate bus stops along arterial roads to be as close as possible to a signalized intersection or enhanced crossing. In some cases where there is a long gap between signalized crossings along a bus route, Thornton may consider adding a new signal or enhanced pedestrian crossing (see **Chapter 7** for guidance on pedestrian crossings).

Bus Stop Improvements

Bus stops are one of the most visible aspects of the transit system. Their condition, quality, accessibility, and perceived safety can make the difference as to whether someone choses to use transit. All bus stops in Thornton should provide a dignified, safe, and accessible waiting area. As such, in the future, all existing and new bus stops should include a minimum standard of design with a concrete waiting area, adequate signage, connection to the sidewalk, and meet Americans with Disabilities Act (ADA) design requirements to ensure access for users of all abilities. Most bus stops should also include a bench and shelter buffered from traffic (behind the sidewalk). Bus stops with higher boardings should have more amenities, which may include pedestrian-scale lighting, route information, a trash receptacle, and bicycle parking. Most bus stops in Thornton meet the minimum level of standard, and many have a bench and shelter. Those that do not are being upgraded over time to at least meet the minimum standard following *RTD's Bus Infrastructure Design Guidelines and Criteria*. One means of implementing improvements is to require large developments to make improvements to adjacent bus stops (existing or planned) when they are constructing their developments or making major renovations.

Transit Speed & Reliability Improvements

The future transit network design includes improvements for transit to be time competitive with motor vehicle travel as reasonably possible. This means routes should be direct (with few deviations) and with adequate stop spacing (at least a quarter mile between stops) to improve overall speed. To further increase direct transit routing, Thornton should continue to work to add key missing gaps in the collector/arterial road network (see Chapter 5), particularly along routes identified in the transit vision. New arterial and collector roads should be built along the established gridded street network, with as few loops or deviations as feasible to allow for direct transit routing.

Additionally, the transit vision includes high-frequency bus routes on the Washington Street/Grant Street corridor, 88th Avenue, and 120th Avenue. Before the high-frequency bus routes occur, it is recommended to analyze those corridors for potential capital improvements to increase transit speed and reliability. Potential improvements may include, but are not limited to, transit signal priority (TSP), queue jump lanes at congested intersections, business access/transit-only (BAT) lanes, bus bulb-outs (allowing buses to stop in the travel lane thereby eliminating the need to re-enter the traffic flow), and removal of bus pullouts (which require the bus to pull out of the travel lane and reenter with a gap in traffic). It is recommended that transit speed and reliability be part of any corridor study including an 88th Avenue corridor study that looks at all modes along 88th Avenue.

8.6 Transit-Oriented Development and First/Last Mile Solutions

As new residential and commercial development occurs, particularly at infill sites along transit corridors and around the commuter rail stations, new markets for capturing transit riders will emerge. There is clear research that shows the linkage between higher densities, increased transit ridership, and lower vehicle miles traveled (VMT). Thornton's 2020 Comprehensive Plan envisions new mixed-use development along several transit-supportive corridors and near existing and future commuter rail stations. Directing new and dense development along transit corridors (such as Washington Street/Grant Street) and around transit hubs (such as near N Line stations) contributes to increased transit ridership, particularly when coupled with new high-frequency reliable service. Thornton can use the following strategies to encourage future development to support the transit vision and increase ridership.

Zone for Higher Densities Near Transit Hubs and High-Frequency Transit Corridor

In alignment with the Future Land Use Map included in the 2020 Comprehensive Plan, the city can encourage higher density and mixed-use developments to locate around transit hubs and along planned high-frequency transit corridors by updating zoning regulations in the Development Code.

Pedestrian-Oriented Site Design

In areas around transit hubs and along transit corridors, updates to the zoning and land use regulations in the Development Code can encourage site designs for future developments to be pedestrian oriented. This includes building locations adjacent to the street that shorten the walking distance to transit, as well as designs that orient pedestrian access points toward the street and connect to pedestrian walkways. Design should avoid large setbacks that require pedestrians to traverse extensive parking areas when walking between transit stations and buildings. Reducing or eliminating minimum parking requirements while managing the potential for adjacent spillover parking should also be considered to reduce the amount of land and capital dedicated to building and maintaining parking.

Pedestrian and Bike Connectivity

The success of transit in the future will heavily depend on the quality, connectivity, and directness of pedestrian walkways and street crossings within existing and future developments. Site plans that include circuitous pedestrian paths and limited pedestrian connectivity to the arterial street network will discourage transit use. Therefore, site plans of future developments should include walkways and bikeways with frequent connections to arterial streets along a direct path. This may include pedestrian cut-throughs on cul-de-sacs or other walkways and bikeways independent of the street network. Buildout of the bicycle and pedestrian networks (see Chapters 6 and 7) greatly expands the reach of transit to include areas beyond the core transit corridors.

Other First/Last Mile Solutions

In addition to creating bicycle and pedestrian connectivity to stations and establishing transit-oriented development, there are other policies, programs, and strategies that Thornton should deploy to improve access to transit. These include:

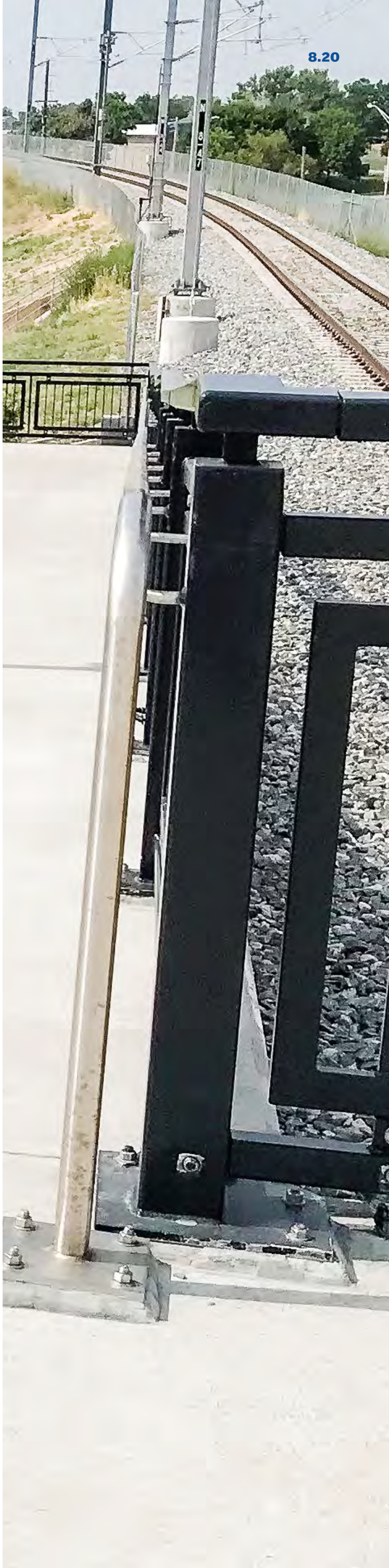
- **Wayfinding**: The purpose of wayfinding is to connect people to places. Wayfinding should specifically be used to provide direction and distance to bus stops and commuter rail stations. Signs should be easy to read and understand, reasonable to maintain, and branded specifically to Thornton.
- **Bicycle parking**: Accessibility, quality, and quantity of bike parking have the potential to increase the number of users biking to transit in Thornton and to improve customer satisfaction and safety for biking customers. A range of bike parking types can be implemented at stations depending on the station typology. Bike parking can be uncovered, covered, and/or secure. Secure bicycle parking can include bike lockers, a secure bicycle room, or a bicycle station on-site. Access should be restricted to only those parking in the facility.
- **Station amenities**: Providing adequate amenities at each commuter rail station and bus stop is essential for creating a comfortable, accessible, and reliable experience for transit users. Station amenities can include shelters and seating, real-time passenger information, maps and schedule, trash and recycling, lighting, landscaping, bike parking and electric vehicle charging infrastructure.
- **Marketing and education**: Marketing and education about the transit service is an important part of promoting these systems to users and increasing the intuitiveness of the service. Marketing campaigns are an effective means to broadly promote RTD services and infrastructure and first and final mile strategies. The goals of these campaigns should be to:
    - » Spread awareness about the benefits of transit to residents, employees, and visitors
    - » Educate and inform users about the logistics of using transit (stop locations, schedules, bikes on buses, first and final mile connections, etc.)
    - » Correct perpetual stigmas around transit
    - » Drive traffic to trip planning applications

8.7 Conclusion

This plan provides a vision for improving and growing the transit network in Thornton by 2050 to meet increased travel demand caused by growth. It aims to increase transit ridership per capita. Approximately 85% of public outreach survey respondents indicated they would use transit in Thornton more if improvements were made to the transit network. Implementation of this vision is expected to leverage this unmet demand, doubling the transit mode share in Thornton by 2050, which results in lower vehicle miles traveled (VMT) per capita. The 2050 Vision for transit includes the following key investments to the transit network in Thornton:

- **Expansion of Regional Transit:** This plan includes completion of the N Line to CO-7, new BRT service on CO-7 (between Boulder and Brighton), extension of I-25 express buses to CO-7, the addition of four new transit hubs/Park-n-Rides in Thornton, and a new stop on the Bustang North Line at the future transit hub at CO-7.
- **Expansion of the Local Transit Network**: The transit vision includes more than tripling revenue hours of local service in Thornton from 2020, including expansion of the local fixed-route transit network to most arterial road corridors (where land use densities are highest), increasing transit frequency on most corridors to a minimum service standard of 30-minute all day service on all routes, and the addition of high-frequency service on Washington Street/Grant Street and 88th Avenue. A more in-depth transit study is recommended to identify a strategy for implementing the transit network vision.
- **Expanded Transit Coverage through Microtransit or On-Demand Service**: This plan includes Microtransit or other on-demand public transit service use to connect the lower-density areas of the city into the fixed-route transit network, providing an additional first-last mile option for residents and businesses not directly connected to the fixed-route transit network.

Thornton's other capital improvements and strategic policy choices to increase safety and access to transit will increase ridership growth. Transit-supportive investments include strategic bus stop improvements, improvements to the pedestrian and bicycle network, TDM programs, and land use and zoning policies. Implementation of the transit network vision assists in bringing Thornton's transportation vision closer to reality.



09 Future Trends

The continued emergence of new technologies is fundamentally changing transportation and how people move around their community. Some of these technologies are already impacting transportation trends, while others are still early on in their development. These new technologies can help move Thornton towards its goal of environmental sustainability and regional goals of reducing single occupancy vehicles. They will likely have more significant impacts to the world, and Thornton, over the next several decades.

This chapter provides an overview of new technologies and their potential impact to future transportation trends. It also identifies potential policies, infrastructure, and plans to leverage these technologies so they support the city's goals and future vision for transportation. The city should continue to monitor these transportation trends to understand and better prepare for future emerging technologies.

9.1 TrendLab+ Workshop Results

Understanding current transportation trends, and forecasting how these trends and emerging technologies may influence travel behavior, is critical to developing appropriate policies and projects to meet future needs.

To understand how those in the Thornton community will travel, Fehr & Peers facilitated a TrendLab+ workshop in May 2021 with members of the city's management and technical staff. TrendLab+ is an analysis tool that forecasts how variable factors will influence future transportation patterns. TrendLab+ was specifically designed to provide additional insight about future transportation trends, and how these could be strongly influenced by demographic, social, and economic forces that are not usually included in transportation analysis. These factors included consumer behavior, teleworking, land use patterns, the regional transit network, and demographics. TrendLab+ measures how each of these factors will impact the vehicle miles traveled (VMT) per person in Thornton.

The results of the TrendLab+ workshop are shown in **Figure 9.1**. The bottom of the image shows how most attendees voted on various inputs. An up arrow means that a variable will grow or increase over time. There was an option for a double up arrow, which was not selected by stakeholders on any of the inputs. A dot means that a variable is not expected to change over time. Land use patterns refers to changes in density and mix of uses. Transportation Demand Management refers to strategies that leverage existing infrastructure to increase non-private automobile transportation options. The magnitude and direction of these inputs that influence transportation trends show that VMT per capita would remain relatively constant over the next 25 years, based on these trend predictions. Given the uncertainty of these and other factors, the shaded areas show the range of how VMT may change. Although VMT per person is anticipated to remain relatively constant, VMT for the region will increase, as Thornton has been continuing to quickly grow.

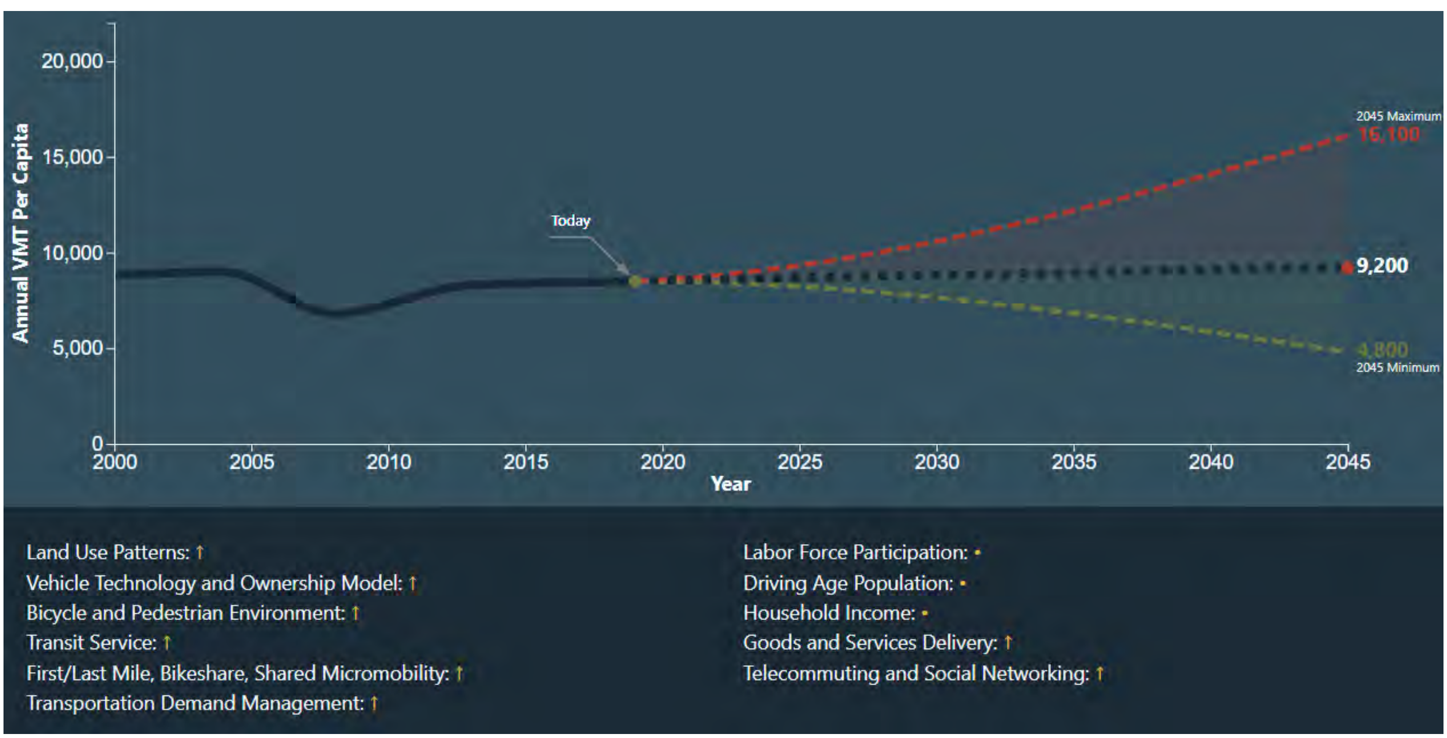
9.2 Autonomous and Connected Vehicles

Autonomous Vehicles (AV) and Connected Vehicles (CV) are two technologies that have been rapidly evolving and have the potential to significantly impact travel patterns and travel behavior in the future. AVs can sense the environment and move through the street network with either little or no human intervention. CVs are vehicles that communicate with one another, as well as connected infrastructure such as traffic signals, to improve roadway safety and efficiency.

There are several potential negative impacts associated with AVs. AVs may increase the demand for travel

Figure 9.1

TrendLab+ workshop results



due to the decreased opportunity costs of driving (e.g., a driver can now sleep or do work in the car), increased pool of users who can independently utilize a vehicle (e.g., children, disabled, elderly, pets), and reduced demand for parking (e.g., vehicles can circle the block empty instead of parking). This could lead to increased VMT and the potential for increased air pollution if fossil-fueled vehicles are used in these vehicles. Battery and fuel-cell electric vehicles would reduce the potential for increased air pollution, but not address increases to VMT.

In addition, research on travel behaviors suggests that AVs may decrease transit usage except for high-quality/high-frequency transit services like trains or bus rapid transit that operate with high frequency such as 7 to 15 minutes between trains or buses. While there is still little research on this topic, AVs may also incentivize more dispersed land uses, particularly for housing, as many users may not view commute times the same way if they are able to do other things rather than attending to the wheel.

Some positive outcomes related to AVs would be providing elderly, youth, and disabled communities with more mobility options than they currently have. Additionally, this technology could create improvements in traffic safety by reducing or removing human intervention to the vehicle as human error is cited as the cause of roughly 94% of crashes.[8]

There are number of strategies to proactively address the potential impacts of AVs and CVs. **Table 9.1** displays a list of potential challenges associated with these technologies and proposals for policies to address these challenges. These policies were adapted from the Autonomous Vehicle Policy Framework Summit as well as research completed by Fehr & Peers. Although AVs are not currently on the market, it is important to implement policies preemptively to lay the groundwork and set user expectations for when AVs are available.

[8]National Highway Traffic Safety Administration, https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

Table 9.1: Potential AV/CV Strategies

Challenge	Potential Strategy
Curbside management – AVs could cause curbside congestion when dropping off/picking up users that impacts other users and modes.	Develop and adopt design standards and fees for curbside drop-off zones. This would ensure that AVs do not dwell at the curb for excessively long periods of time and appropriately price the use of the curb based on demand. Pricing could vary depending on the time of day and day of week. This could apply only to AVs or be expanded to any vehicle using the drop-off zones.
Pedestrian safety – There may be unique concerns about the capability of AVs to adequately respond to pedestrian and bicyclist behavior, especially during inclement weather or if a pedestrian or cyclist is not using designated facilities like marked crosswalks or bike lanes.	Set maximum speeds on AVs that are pedestrian and bicycle friendly and set laws to ensure that AVs pass pedestrians and bicyclists at a safe distance. There may need to be a statewide or federal regulation due to the potential for varying requirements between jurisdictions.
Equity – AVs may be more accessible to those with higher incomes and the added congestion could negatively impact lower income populations by increasing travel times (users not in AVs will not be able to do things other than operate the vehicle, thus be more burdened by this added time).	• Expand efforts to engage and include disadvantaged communities in transportation planning, especially regarding shared mobility. • Look for opportunities and partnerships to make AVs accessible to all individuals, including those without smartphone technology or banking relationships, and support efforts and community partners who provide banking and technology access to those without. • Partner with organizations and entities that work to make mobility options available to those with disabilities.
When people do not have to drive, they might be interested in living further away from work contributing to sprawl and AVs traveling longer distances.	• Support land use policies that restrict sprawl by promoting zoning changes that allow for more compact, walkable, developments. • Research options for opportunities and partnerships to help prevent residential displacement that could result from increased property values associated with AVs. Property values may increase if land is no longer needed for parking and is converted to other uses.

Table 9.1: Potential AV/CV Strategies Continued...

Challenge	Potential Strategy
Transit may be less appealing if AVs are available.	AVs can improve the transit experience if there are programs bridging AVs with transit services through autonomous transit. This can be achieved through formal transit hubs and first/last mile connections. For example, in 2019 Denver tested an autonomous shuttle called the 61AV that connected the 61st and Pena light rail station to an employment area. Other ideas include: • Refine transit governance and procurement processes to allow for different operational models like public/private partnerships. • Explore opportunities for serving as an integrating or centralized resource for fundamental aspects of mobility such as trip planning, trip scheduling, and revenue collection, where a centralized portal offers customers value. • Bundle AV access with non-motorized transportation options and provide education to address AV trips replacing walking, bicycling, and transit trips. This would provide AV users' seamless access to transit options and bike share systems. • Consider taxing zero occupancy vehicles to disincentivize empty vehicles cruising instead of paying for parking. There may need to be a statewide or federal regulation due to the potential for varying requirements between jurisdictions
Design of existing transportation infrastructure may not accommodate AVs.	AVs are likely to use travel lanes more efficiently since they can safely maintain closer following distances with other vehicles. Underutilized lanes can be repurposed to provide additional space for pedestrians and bicyclists while also providing dedicated lanes for AVs, which will ensure safety and comfort for people walking along the curbside and create valuable public spaces in neighborhoods and downtowns.
Existing parking facilities were not intended for AVs.	Site planning and parking design should accommodate AVs and anticipated changes in demand. The city could consider reducing or eliminating minimum parking requirements or developing parking maximums in anticipation that AVs and more robust transit service will reduce the need for people to park at their destination by: • Reducing the amount of parking required as part of new development. • Developing prototypes for adaptable parking garages and infrastructure that could be retrofitted to other land uses such as office space in the future. • Repurposing ground-level space from passive parking to active uses • Require charging stations in parking areas to support electric AVs
On-the-ground technologies are not compatible with AVs and CVs.	Invest in additional smart infrastructure (e.g., dynamic traffic-control signals and multimodal sensor technology). AVs can operate more efficiently, and cities can better manage AV usage if there is connected vehicle infrastructure. This can be accomplished through pricing, trip metering, etc. Other possibilities include: • Create feedback groups to assess/improve user experience. • Install smart sensors to provide a dynamic view of infrastructure conditions. • Streamline online mobility content and make it easier to understand and provide direct feedback
There is a large volume of data that will be available with the roll-out of CVs and AVs. Ensuring the privacy of this data while using it to improve mobility will be important.	• The city can work with the Denver Regional Council of Governments (DRCOG,), state and federal legislators to ensure that they can access relevant and anonymous data from AVs to help inform the understanding of travel patterns and management of the traffic and curb congestion that may come with AVs. Third-party data brokers, such as universities, can facilitate collection and analysis of privately generated data to enable better service planning without compromising intellectual property or competitiveness.

9.3 Electric Vehicles

Electric vehicle (EV) technology continues to advance at a rapid pace with increasing regulatory and financial incentives to encourage production and use at both the state and federal level. The primary advantage at the city-level of this technology is the reduction in vehicle emissions and noise pollution. In planning for future EV integration, Thornton can consider the provision of on-street and off-street EV parking; increasing the number of charing stations on public property; and incentives and requirements for provision of EV charging stations and infrastructure by residential, retail, and commercial office developers. In addition, the I-25 corridor is a federally recognized alternative fuel corridor, where infrastructure upgrades are being made to support the use of electric (battery and hydrogen fuel cell) and other alternative fuel vehicles.

9.4 Shared Mobility

Shared mobility – the shared use of a vehicle, bicycle, or other low-speed travel mode (e.g., scooter) – is an innovative transportation strategy that enables users to have short-term access to a mode of transportation on an as-needed basis. Shared mobility also provides a broader set of transportation options for users that can help reduce reliance on private automobiles and help mitigate congestion and carbon emissions. Shared mobility is often discussed in the context of micromobility – small personal mobility devices including bicycles and scooters. Shared mobility is a key component of Mobility as a Service (MaaS), described later in this chapter.

Bike/Scooter Share

Bike share systems for both traditional and electric bicycles, and more recently electric scooter share, have been a rapidly evolving trend over the last decade, and until the COVID-19 pandemic, had gained traction in communities both large and small worldwide, shifting the way many communities plan for and provide transportation. Bike and scooter share have the potential to increase mobility options available in the city, particularly for access to transit. While bike share and scooter share currently do not exist in Thornton, many nearby communities including Boulder, Denver, Longmont, and Fort Collins have these systems. Sharing services are most successful where there is a higher density of land uses, which may be a challenge in Thornton. If Thornton were to introduce a bike share or scooter share program, it would be important for the city to work closely with potential operators to design a program that supports Thornton's land use and transportation goals, while aiming to mitigate potential issues. For bike share and scooter share to be successful, Thornton can also continue to invest in improved bicycle and pedestrian infrastructure, as well as ensure policies are up-to-date and clear on where and how future users are to operate these types of vehicles within the public right-of-way. Thornton has already developed regulations and permits for bike share programs, but not for scooters.

Car Share

Car sharing is a model for car rental, like bike share or scooter share, which allows a user to pay for access to a vehicle for limited periods of time. Car share systems tend to have vehicles dispersed throughout a service area and can be reserved through a webpage or smartphone app. Thornton can support car share in the future by continuing to permit on-street parking, dedicating parking spaces for car share providers, and providing incentives or requirements for new developments to provide car-share and/or shared parking with neighboring land uses. The market viability of introducing car share depends on the extent to which people can get around the city by foot, bike, and transit, all of which afford the ability to choose not to own a car. Car sharing has the potential to be a viable option in Thornton due to the existing and proposed plans across the other alternative modes. When AVs become available, a company can add them to its car share fleet to incentivize a shared subscription-based model that reduces VMT.

Ride-hailing

Ride-hailing, provided primarily by Transportation Network Companies (TNC),for example, Uber and Lyft, is a newer mobility service that has seen explosive popularity in recent years prior to the COVID-19 pandemic. At its most basic level, it is simply the modern version of a taxi service, using a web-based platform that matches drivers with passengers in a simpler and more intuitive way. Uber and Lyft are currently the only TNCs operating within Thornton and the surrounding region. Another service available in parts of the Denver metropolitan area is called zTrip, which provides an app-based on-demand taxi style service in Northern Colorado using both sedans and wheelchair accessible vehicles. Nationally, TNCs/ride-hailing represents the fastest growing transportation mode. Overall, ride-hailing presents mixed opportunities for Thornton. It provides a niche in the travel market for many trips, especially when transit is more limited or simply does not operate (e.g., evenings and weekends). Ride-hailing can also help to reduce the risk of impaired driving by providing an easy way home for people who should not be driving. Ride-hailing can help overcome the first/last mile gap by providing a connection to commuter and light rail train stations, when walking or biking are not viable options. On the other hand, excessive use of ride-hailing can lead to increased VMT, energy use, greenhouse gas emissions, traffic congestion, and crowded curb spaces and loading zones. Ride-hailing is also not a viable alternative for some low-income households, outside of occasional/emergency use, so TNCs cannot be relied on for providing basic transportation services.

Because most trips in Thornton are made by driving, the risk of increased VMT from ride-hailing is small. However, as the area grows and makes investments in pedestrian, bicycle, and transit networks, the city may need to work more closely with TNCs to ensure that ride-hailing is part of the mobility environment and does not detract from investments in other multimodal networks. Some potential future strategies to balance the pros and cons of ride-hailing are provided later in the document.

9.5 Mobility as a Service (MaaS)

MaaS describes the shift away from privately owned automobiles and towards transportation that is offered as a service. This includes both public and private transportation providers that can work together to provide a holistic landscape of transportation options, either through a subscription or pay-as-you-go service. As described on the Maas Alliance website “MaaS integrates various forms of transport services into a single mobility service accessible on

demand. A MaaS operator facilitates a diverse menu of transport options to meet a customer's request, be they public transport, ride-, car- or bike-sharing, taxi or car rental/ lease, or a combination thereof. For the user, MaaS can offer added value by using a single application to provide access to mobility with a single payment channel instead of multiple ticketing and payment operations. For its users, MaaS should be the best value proposition by helping them meet their mobility needs and solve the inconvenient parts of individual journeys and the entire system of mobility services." Thornton can encourage and facilitate Maas by:

- Requiring open data from private providers to facilitate better trip planning. This includes providing trip planning information and trip costs in a way that can be easily collected and displayed by a third party.
- Creating a platform for payment that integrates all potential providers and that includes public and private providers. Ultimately, Thornton may seek to require third parties to participate in an integrated payment system to operate in the city.
- Creating public-private partnerships that use private providers to complement and supplement public transit. These partnerships can also help improve human service transportation provision.

9.6 Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) are new technologies that are reshaping the traveler experience on roadways. Some examples of ITS include:

- **Adaptive Signal Control:** Traffic signals that can automatically adjust traffic signal timing based on current traffic conditions. These signals help reduce congestion and pedestrian and bicycle crossing wait times.
- **Transit Signal Priority (TSP):** Adaptive signal technology that allows transit vehicles to communicate with a traffic signal to extend green time in their direction of travel. TSP helps transit vehicles run on schedule. Innovative new uses for traffic signal preemption (interruption of a current signal indication) are also emerging. For example, Los Angeles is testing traffic signal preemption to trigger red lights to slow/stop speeding vehicles during peak hours of the day to improve traffic safety.

9.7 Drone Delivery

Delivery drones are remotely piloted vehicles that can deliver lightweight packages and are currently in the development and testing phases. In several examples across the world, drones are being used for delivering time-sensitive items, such as medicine, or deliveries that would be difficult with traditional vehicle-based service. Delivery drones have the potential to change last-mile delivery economics for smaller and lighter packages, as they could replace many of the deliveries being made by traditional delivery trucks. The Federal Aviation Administration (FAA) issued regulations in 2016 that limit but allow the use of commercial aerial drones for deliveries. Current regulations require that: a licensed pilot keep the drone within sight; the flight cannot be conducted from a moving vehicle; and the weight of the drone and package combined must be under 55 pounds. In December 2020, the FAA released new regulations that took even bigger steps to allow the commercial use of drones, requiring drones to broadcast identification or location information; allowing operators of small drones to fly over people and vehicles; and allowing drones to operate at night under certain conditions.

Potential limitations include: limited package weights; constrained operating times due to limited battery capacity; interference with other sidewalk and pathway users (for ground-based drones); difficulty in determining designated drop-off locations in dense urban areas; concerns about privacy, noise, safety, and vandalism; irregular or unpredictable events such as weather, wildlife, or vandalism; and the need for airspace control regulation. In addition, aerial drones are a new source of noise pollution that is currently outside the scope of most city noise ordinances.

The potential limitations and impacts related to drone delivery will need to be evaluated alongside the potential benefits of drone delivery. For example, a benefit is that drones could reduce the impact of "instant delivery" services and more traditional vehicle-based delivery services in neighborhoods, thus reducing vehicle miles traveled. Key actions to consider for both aerial and land-based drones include:

- Size limits for land-based drones to ensure that sidewalk users can navigate around the vehicles.
- Updates to the vehicle code to accommodate the use of land-based drones. This results in a reduction in VMT due to a savings of person power and drones that utilize the sidewalk.
- Noise limits for drones.
- Operating hours to help manage noise impacts.
- Policies to address privacy concerns.

One challenge for local regulation is that delivery services such as UPS and FedEx operate under Department of Transportation regulations. Therefore, cities need to ensure that local regulations do not have the unintended consequence of preventing companies from delivering to the area.

9.8 Mobility Choice Blueprint

The Mobility Choice Initiative consists of DRCOG, RTD, CDOT, and the Denver Metro Chamber of Commerce, a group formed to create a mobility vision for metro Denver. Out of this process the *Mobility Choice Blueprint* was developed, which is now being implemented through the Advanced Mobility Partnership (AMP). The Blueprint acknowledges that advancing technology and internet connectivity are changing the way people travel in the metro area and there is a need for a coordinated strategy for enabling more accessible and effective transportation mobility choices to enhance the quality of social, cultural, and economic life. The Blueprint has seven primary objectives including:

- **Regional Collaboration:** Close institution gaps, update legal and regulatory frameworks, and coordinate with private sector technology implementers.
- **System Optimization:** Connect transportation systems and vehicles with smart technologies to improve safety and operations.
- **Shared Mobility:** Integrate new options of vehicle sharing and ride sharing into the existing multimodal transportation system network.
- **Data Security and Sharing:** Analyze travel data from public and private mobility providers to improve transportation system performance while maintaining security and protecting privacy.

- **Mobility Electrification:** Encourage use of electric powertrains in automobiles and transit vehicles.
- **Driverless Vehicle Preparation:** Prepare for autonomous vehicles to provide safe operations and reduce congestion while retaining a sound human experience.
- **New Transportation Funding:** Establish new funding sources to replace traditional sources that are losing effectiveness.

Out of the *Mobility Choice Blueprint*, 34 policies, programs, and pilot projects were identified as tactical actions for each objective. Cities and counties were identified as initiators, or champions, for two of these tasks including:

- Accelerate testing of bicycle/pedestrian detection at crossings.
- Develop incentives to improve ride-hailing and ridesharing operations.

Cities and counties were also identified as participants in a number of these tasks as well, including:

- Establish a regional smart mobility navigator.
- Implement transit priority on all major bus corridors, including application of such tools as transit signal priority, queue jumps, bypass lanes, bus bulb-outs, and peak hour exclusive bus lanes.
- Implement smart traffic signal control technology on all major regional arterial corridors.
- Pilot integrated corridor management on ten arterial corridors, which are not yet identified.
- Implement “smart corridor” operations on all regional freeways. This includes technologies such as adaptive ramp metering, variable speed limits, and enhanced enforcement that use real-time traffic data to maximize capacity.
- Coordinate traffic management center systems and operations
- Adopt a regional compact defining common standards for micromobility services.
- Develop incentives for improve ride-hailing operations.
- Implement curbside management standards.
- Pilot neighborhood scale mobility hubs.
- Partner with the private sector to provide transportation in mobility-challenged communities.
- Establish a regional mobility data platform.
- Transition government fleets to electric and other zero-emission vehicles.

Thornton should strive to work collaboratively with DRCOG member governments to implement these tasks.

9.9 CDOT Innovative Mobility Program

The Innovative Mobility program within CDOT works to expand mobility options through ridesharing, electrification, and other emerging technologies. The mission of the program is to reduce air pollution and congestion on the roads by expanding multimodal transportation options and using traditional and emerging mobility technologies. Within the Innovative Mobility Program, the Mobility Technology program develops strategy, creates pilot programs for connected and autonomous technologies in Colorado, and develops policy recommendations for emerging transportation technology that can improve safety and expand mobility options.

Mobility Services explores ways to make transportation efficient and more accessible to underserved populations by conducting research, deploying new technologies, analyzing data and piloting new programs.

9.10 Additional Technologies

Some additional technologies that Thornton should implement include:

- Mobility Hubs: Mobility hubs are centers that integrate various transportation modes to allow users to make seamless connections between their origins and destinations. Often centered around transit stations, mobility hubs enable quick transfers from a bus onto a scooter or shared bike, and can also share real-time information on connecting buses, availability of shared-use mobility devices, and walking directions to nearby destinations.
- Connected Infrastructure: New technologies are increasingly connecting vehicles with one another and with the roadway. By "connecting" vehicles and roads through wireless communication technologies, mobility improvements can be made without rebuilding roads or pursuing other costly upgrades.

9.11 Conclusion

New technologies present both an opportunity and a challenge for the future of transportation in Thornton. Leveraging these technologies and understanding and addressing their potential negatives impacts through policies and programs can help move Thornton towards its goal of environmental sustainability and regional goals of reducing single occupancy vehicles.

10 Programs and Policies

This chapter highlights opportunities to meet the TMMP's vision using programs and policies that incentivize alternative travel modes to the private vehicle, implement bicycle and pedestrian infrastructure, and support health and safety outcomes. Beyond simply maintaining and building physical infrastructure, programs and policies ensure that roadways, active transportation facilities, and transit services are efficient, effective, and intuitive. These programs and policies also align the city's transportation system with broader community values and move the city toward its vision for transportation.

Recommended programs and policies are summarized in **Table 11.1** of **Chapter 11: Implementation**. Each recommendation is bolded and numbered (PP.X) in this chapter in order to provide a clear connection to the table in Chapter 11.

Some programs and policies in this table are references and described in other chapters because their primary focus is on another topic. For example, bicycle wayfinding signage is described under the Bicycle chapter.

10.1 Complete Streets Policy

The city currently implements a Complete Streets philosophy based on a past Complete Streets policy that prioritizes the inclusion of bicycle, pedestrian, and transit facilities along with roadway facilities when considering new infrastructure projects. The philosophy helps guide a vision and implementable strategies for the future of transportation in Thornton that includes all modes, persons, and abilities. The policy stated that Thornton will strive to achieve Complete Streets over time, and lays out how the addition of bicycle, pedestrian, and transit facilities should be prioritized as additions to other roadway projects.

PP.1 Consideration should be given to adopt a new Complete Streets policy that strengthens specific recommendations for the type of low stress pedestrian and bicycle facilities for each street classification. This policy should also address aesthetics, landscaping, and lighting to enhance appearance through better looking streets as well as provide safer streets for all modes. The city's upcoming Development Code update should include an expectation for complete streets design. These revisions should be guided by the DRCOG Regional Complete Streets Toolkit.

10.2 Update City Code and Standards and Specifications

For new development, the City Code currently encourages residential street design to eliminate cut-through traffic and specifies the maximum local street length. The City of Thornton Standards and Specifications for the Design and Construction of Public and Private Improvements provide only minimum details on including bike lanes on collector and arterial streets and the installation of traffic calming devices on collector and local streets. These regulations could be updated to enhance multimodal circulation and access. The cross sections identified in **Chapter 5** are to be used until updated in the City Standards and Specifications.

10.3 Transportation Demand Management

Transportation Demand Management (TDM) is a set of strategies and policies for improving the efficiency of a transportation system by providing travelers with opportunities to choose modes other than a single occupancy vehicle and thus, improve air quality. Rather than focusing on meeting travel demand through expanded infrastructure, TDM identifies barriers to using existing, but often underutilized options, as well as generating a mechanism for addressing those barriers. For example, if a company provides subsidized employee vehicle parking and no bicycle racks or secure bicycle storage, then employees are incentivized to drive rather than bike. This barrier to choosing to bike can be addressed through low-cost interventions such as bike parking or financial incentives for bicycle commuters. The city of Thornton is a member of Smart Commute Metro North that works to implement TDM strategies across the north Denver metro region. TDM categories and policies can take on a range of different forms, addressing a variety of modes as well

Thornton's GOALS

To provide an interconnected multimodal transportation network and mobility plan for all people to access goods, services, residences, and employment and accommodates safely moving people, goods, and services using a variety of modes that includes vehicle, bicycle, pedestrian, bus, shuttle, and passenger rail based on the future land use projections and overall vision for Thornton.

Thornton's VISION

A transportation network and mobility plan that **expands transportation options** to enable a resident to access all areas of Thornton in a timely manner **without using a private vehicle.** Thornton desires a holistic **multimodal and mobility** view, approach, and evaluation of current and future transportation needs.

as incentives and disincentives. These categories are outlined in **Table 10.1**.

Table 10.2 shows potential strategies for each category that are relevant to the city, along with high-level cost estimates for implementation and the potential impact of the strategy for changing travel behavior. Some strategies would not fall within the role of the city to implement, but are identified to show what private businesses or community partners could pursue to assist with the TDM efforts. More detailed descriptions of each strategy are included following the table. The vehicle miles traveled (VMT) reductions identified in the 'Potential Impact' column are based on strategies identified in *the California Air Resource Board's* Zero Carbon Buildings Study, which in turn draws from the forthcoming *CAPCOA (California Air Pollution Control Officers Association) 2021 Guide to Mitigating Greenhouse Gas Emissions ("CAPCOA (California Air Pollution Control Officers Association)" Update)*. Impacts are cited based on a broad spectrum of community contexts including urban, suburban, and rural jurisdictions.

Strategies with check marks are already promoted by Smart Commute Metro North, the transportation management organization that covers Thornton.

Table 10.1: TDM Categories

Strategy Category	Example
Biking and Walking	Installing secure bike parking at key destinations. Include sidewalks from the public right-of-way multi-use trails and sidewalks to the main door. Work with homeowners associations or metropolitan districts to include this as needed.
Integrating TDM within Developments	Allowing developers to sponsor a transit stop in lieu of meeting parking minimums
Parking	Working with schools to reduce the availability of student parking and providing improved bus transportation
Programs	On-site daycare offered by major employers
Rideshare	Vanpool programs where participants are eligible for pre-tax commuter benefits
Transit	Transit fare subsidies
Telecommuting	Incentivizing and supporting teleworking for city employees

Table 10.2: Potential TDM Strategies

Strategy Category	Strategy	Description	Cost	Potential Impact
Biking and Walking	Bicycle and Scooter Parking	Racks that are either outdoors or covered and provide secure bicycle storage	$400-$700 / rack	Up to 1% reduction in VMT
	Bicycle Repair Stands	A stand with attached tools that can be located along multi-use trails. Riders can utilize the stands to make emergency repairs	$800-$1,500 / stand	Unknown – the presence of a repair stand makes routine maintenance affordable and provides security to bicycle commuters
	Bike or Scooter Share Program	Public bicycles or scooters that can be accessed either as a walk-up rider or using a subscription service. Thornton has developed preliminary language for a pilot bike share, but bike share companies have not operated in the city.	$20,000 for a bike share dock that can fit 10 bicycles. Cost includes operating the dock and bicycles for one year. Dockless bikes and scooters can be free to the city, with costs incurred by a private provider.	Varies widely, but some jurisdictions (including urban communities) have reported a 10% to 20% vehicle commute trip replacement rate (e.g., one commute trip per week taken by bike share instead of by vehicle)
	✓ Walk Pools/ Walking School Bus	Organized walking groups for commuters and students that encourage replacing driving with walking for short trips	None. There may be some administrative costs involved in organization of walk pools.	Unknown
Integrating TDM with Development	Density bonus in exchange for building less parking	Allowing developers to build more than the maximum allowable units in exchange for providing less parking than required by zoning	Varies	Will reduce or eliminate some vehicle trips due to reduced vehicle ownership; must be part of larger systematic infrastructure improvements for walking and biking
	Access requirements	Require bicycle and pedestrian access to buildings	Varies; funded by developer	Unknown; must be part of larger systematic infrastructure improvements for walking and biking

Table 10.2: Potential TDM Strategies Continued

Strategy Category	Strategy	Description	Cost	Potential Impact
Parking	Unbundled Parking	Leasing parking spaces separately from residences or commercial space to highlight the cost associated with providing parking	None	2.6% - 13% VMT reduction
	Parking Supply Management	Reducing the amount of free parking available	Administrative costs TBD locally	5% - 12.5% reduction in VMT
	Parking Cash-Out	Employers pay employees a monthly stipend in exchange for not utilizing their parking spot.	Cash-out value would be at the discretion of the employer, but generally if an employer pays $100 per employee parking spot vs. $50 per cash-out, the program saves the employer money	3% - 7.7% reduction in VMT
	School Parking Management	Advertising campaigns to promote travel to school by means other than driving. Public education can include information distributed to students about safe bicycling routes or about transit service as alternatives.	Programs have reported costs in the $7.50 to $12.50 per day for student range; RTD youth passes are $.90/day for a local ticket and $1.60/day for a regional ticket	Unknown
	Preferential Parking	Employers and city provide designated parking for carpool, vanpool, and electric vehicles (EVs), with at least Level 2 EV charging stations	$6,000 for average EV charging station; $300 for signage for preferential parking	None
Programs	TDM Coordinators	TDM coordinators are full or part-time staff that are responsible for educating employees about transportation options, organizing encouragement events, and facilitating non-single occupancy vehicle mode options to get to work.	Compensation is at the discretion of the employer.	4% - 5% reduction in commute trips by single occupancy vehicle
	✓ Tailored Commuting Resource Guides	Resources for employers to better understand commute trip options	Programs have reported costs in the $7.50 to $12.50 per employee range.	4% - 5% reduction in commute trips by single occupancy vehicle
	✓ Education, information, and marketing campaigns on transportation options	Resources for employees to better understand commute trip options (how to use transit, safe bike routes, etc.)	Varies but recommended $150,000-	
	On-Site Daycare	Childcare services on-site at office buildings or other commercial developments. Employees who enroll their children in on-site daycare eliminate the need for trips to daycare centers.	No cost to the city – employers would fund the daycare center	Eliminates at least two vehicle trips per day for each participating employee (or shortens trips between home and work and vice-versa)

Table 10.2: Potential TDM Strategies Continued

Strategy Category	Strategy	Description	Cost	Potential Impact
Rideshare	✓ Rideshare Program Parking	Designating parking specifically for employees who carpool and encouraging carpooling	\$300 - \$500 for striping and signage	1% - 15% reduction in commute
	✓ Vanpool	Employer sponsored program for picking up employees from designated locations in a company vehicle and providing rides to work. Promote DRCOG vanpool resources to large employers and residents.	Operating cost can range from \$1,000 to \$1,500 per month for each van. Operating costs include contracting with service for driving the vehicle, maintenance costs, fuel, insurance, and administration	0.3% - 13.4% reduction in commute VMT
Transit	Transit Fare Subsidy	Providing employees and/or students with transit passes	RTD EcoPass price varies based on number of factors	0.3% - 20% reduction in commute VMT
Telecommuting and Remote Work	Flexible schedules and working from home	Providing employees with opportunities to work from home or work longer days and shorter weeks to reduce the number of times employees commute to work	Minimal cost; may include office supplies for home office	.07-5.5% reduction in commute VMT

Thornton should explore, expand, and pursue the following TDM strategies:

- **PP.2 Add bike parking – particularly covered, secure bike storage – on city property and encourage the construction of additional bike parking in new developments and key destinations like RTD stations, major employment centers, and shopping areas.** The city should add secure parking to its own facilities, using the next Parks and Open Space Master Plan update as an opportunity to assess which key public facilities would most benefit from secure parking. City staff should coordinate with RTD to add covered bike storage at the N Line commuter rail stations (Original Thornton/88th Avenue Station, Eastlake -124th Avenue Station, and Thornton Crossroads-104th Avenue Station). While the Development Code requires bike parking with new construction, it could include a requirement or public land dedication (PLD)/ amenity credit for covered, secure, easily accessible bike rooms in multifamily developments and office buildings. Additionally, the city should explore options for incentivizing existing developments to add secure bike parking, such as tax incentives or a grant program. Beyond secure bike parking, the city should also accommodate alternative micromobility such as e-bikes and scooters by constructing micromobility parking in high-demand areas.
- **PP.3 Assess locations for additional bicycle repair stands at transit stations and key destinations and identify funding opportunities for implementation.** An obstacle for bike ownership is the lack of tools to perform routine maintenance and repairs. Public bike stands make it possible for bicycle owners to inflate their tires and make small fixes on their own, without paying for a bike shop to do so. Once installed, city maintenance of stands is generally limited to replacing pump valves since they tend to break with heavy use (a low-cost fix) and occasional cleaning. The city currently has one stand outside the Recreation Center in the Margaret W. Carpenter Park and Open Space. However, this stand is not identified on the city's bike map which may reduce its recognition and utilization. **The city should promote this existing stand and future bike repair stands on the city's bike map and/or trail signage, as well as the city website.**
- **PP.4 Perform a feasibility study for bike/scooter share in Thornton to determine the type of micromobility program that the land use and demand can support. Explore revising Thornton's pilot bike share ordinance to resemble ordinances of regional peers where bike and scooter share companies currently operate.** Scooters and bike share have been successfully deployed in several Front Range communities including Fort Collins,

Boulder, and Longmont. However, sharing services are most successful and financially sustainable where there is a higher density of land uses, which may be a challenge in Thornton. A small bike share program offered to the public, like Golden's "Bike Library" that allows residents and visitors to check out a bike near the visitor center, could be successful in a lower density city like Thornton.

- **PP.5 Continue to work with Smart Commute Metro North to market their resources throughout Thornton.** Education and information campaigns on transportation options will expose Thornton residents to alternatives to driving, making it easier for them to plan trips using transit or bike. By facilitating and supporting the distribution of educational materials through city communication, Thornton can instill interest in active modes and teach residents how to use transit, how to bike safely, and how to connect with other interested community members. **Thornton can also explore integrating bicycle awareness into drivers' education classes and materials.**
- **PP.6 Provide tailored Commuting Resource Guides to employers and employees in conjunction with Smart Commute Metro North.** Provide information to help residents choose alternative modes to work. Inform the public about using the Google Maps route planner to enter any origin and any destination to determine trip times and routes via car, transit, biking, walking, wheelchair and more. The app and website also allow anyone to enter the desired time of arrival or departure to see how that influences route timing.
- **PP.7 Encourage the co-location of daycare providers with major employers.** As part of the upcoming Development Code update, identify and remove any land use impediments to integrating daycare facilities, ensuring that daycare facilities are allowed accessory uses in all appropriate zone districts. The city should assess the feasibility of possible incentives such as designating daycare as an enhancement option or site amenity qualifying for Public Land Dedication (PLD) credit. The city should work with the economic development department to consider additional incentives for employers co-locating with or offering daycare. During the next Comprehensive Plan update, the city could also identify the benefits of locating daycare as a supporting use within employment centers.
- **PP.8 Conduct a study identifying locations for EV charging stations at city facilities.**
- **PP.9 Promote Smart Commute Metro North and DRCOG Way to Go to large employers and residents.**

10.4 Safe Routes to School

Safe Routes to School (SRTS) is a national program to enhance opportunities for students to walk and bike to school safely. Barriers to using active modes for getting to and from school can include a lack of comfortable and safe sidewalks and crosswalks, parent concern about children walking or biking alone, and travel distance. An SRTS program helps to document the concerns regarding travel safety, develop programs that can address some of these concerns, and chart a path for implementing infrastructure improvements and upgrades that address concerns.

Thornton's traffic engineering division currently coordinates with school districts on developing school parking, kiss-n-go lanes, and bus pick up locations. Smart Commute Metro North currently promotes "walking school buses" which are organized walking groups for students who live close enough to school to walk together. Thornton has been successful in the past when competing for SRTS infrastructure grants from the Colorado Department of Transportation (CDOT) to implement both infrastructure and non-infrastructure projects that target safety.

- **PP.10 The city should continue to coordinate with school districts and Smart Commute Metro North, promoting existing programs and seeking outside funding opportunities when possible.**

10.5 Maintenance

The city's Street Rehabilitation Program has been effective in determining priority projects through the Pavement Management System and staff recommendations. When resurfacing streets, the city restripes roadway for vehicles and includes new bike lanes. The city also has an ongoing sidewalk and trail repair program that performs maintenance and replaces facilities at no cost to the adjacent resident or business.

- **PP.11 The rehabilitation program should consider adding to the program buffers between bike lanes and travel lanes to reduce vehicle conflict between drivers and people biking.**

Once the city installs additional multimodal infrastructure, routine roadway maintenance activities should also consider bikeway conditions. For example, the Pavement Management System tracking can extend to bike lanes since uneven pavement, cracks, potholes, and other pavement quality issues impact people biking as well as people driving. Blockages in bike lanes create unsafe conditions for people biking.

- **PP.12 Roadway maintenance should ensure bikeways are clear of detritus and larger objects. Enforcement of illegal parking in bike lanes could extend beyond ticketing drivers to towing vehicles.**

Clearing bicycle facilities following snow or other weather events is also a key component of maintenance for these facilities.

- **PP.13 Thornton's Infrastructure Department and Parks, Recreation, and Community Programs Department should work together to develop a snow removal schedule for multimodal facilities that complements the schedule used for clearing roadways to ensure that facilities can accommodate all users following weather events. This may entail acquisition of specialized plowing equipment for protected or separated bicycle facilities or expanding the fleet of snow removal equipment as the bicycle network grows. Additionally, snow maintenance should factor into the types of bikeways planned on key streets, since bidirectional bike lanes can be easier to clear than bike lanes on either side of a street.**

10.6 Community Health and Safety

Transportation is integrated with community health. Connected and accessible transportation networks, including safe active transportation options, can improve community health by providing opportunities for physical activity. Additionally, programs that address traffic safety can lead to a reduction in crashes.

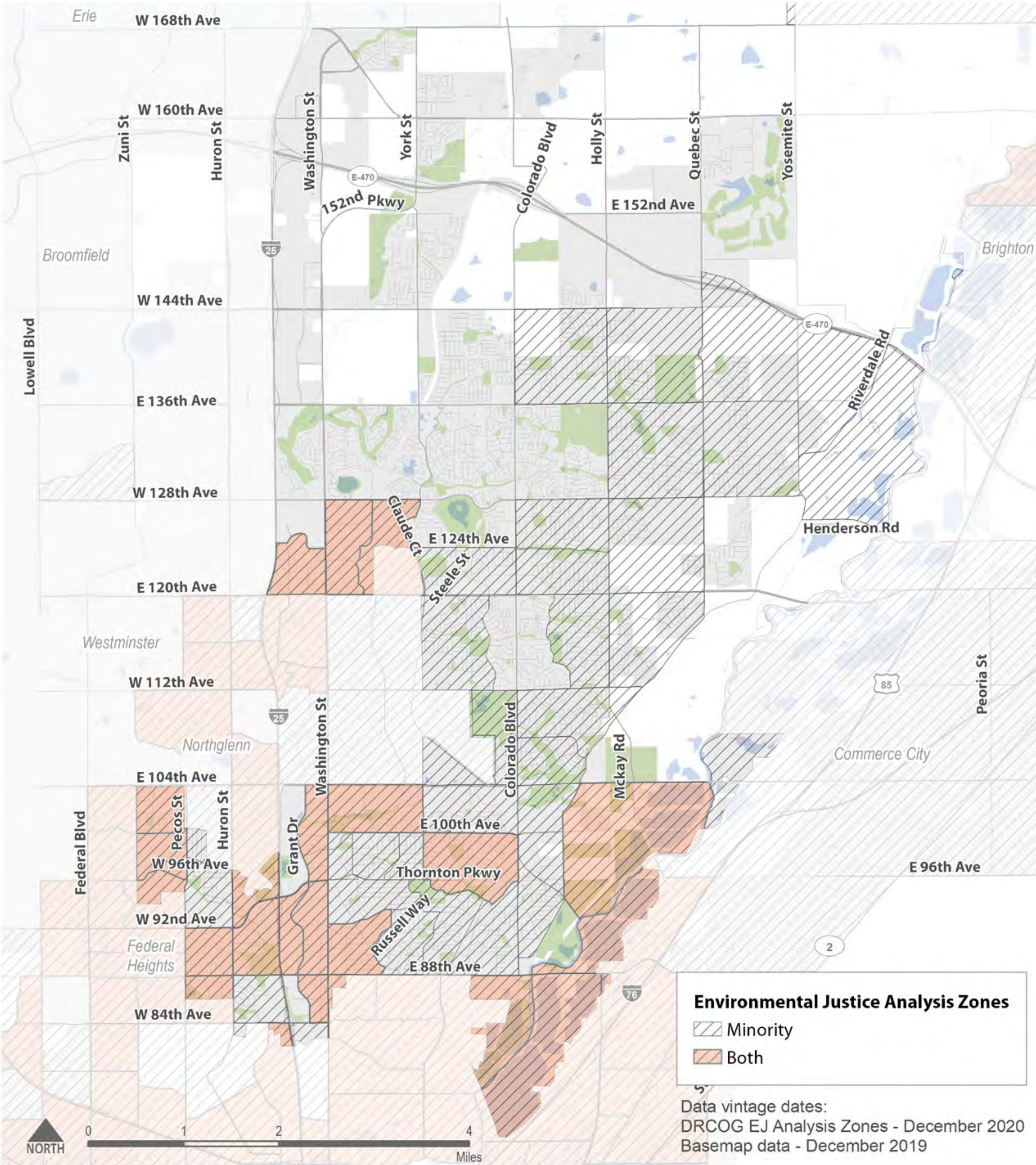
- **PP.14 Thornton should review any health data or reports provided to the city by Tri-County Health Department or the Colorado Department of Public Health and Environment regarding neighborhoods achieving lower health outcomes and identify potential active transportation options and infrastructure improvements in those areas. The city could seek partnerships, grants, developer or capital improvement funding for such improvements.**

10.7 Environmental Justice Analysis Zones

DRCOG provides an Environmental Justice (EJ) dataset by traffic analysis zone (TAZ) for the DRCOG region. Environmental Justice EJ is an effort to identify and address the impacts of disadvantaged and vulnerable populations. EJ areas are classified as "minority" or "low-income" or "both." Many of the TAZs within the Thornton city boundary are classified as minority or both, particularly within the southernmost portion of the city (as seen in **Figure 10.1**).

- **PP.15 Thornton should focus on providing affordable transportation options throughout the city, but especially in the low-income areas where transportation represents a greater cost burden and owning a private vehicle may not be within reach. Thornton should utilize the performance measure monitoring table in Chapter 11: Implementation, to track and ensure the equitable investment of resources into the transportation system.**

DRCOG Environmental Justice Analysis Zones



City of Thornton

Figure 10.1: DRCOG Environmental Justice Analysis Zones

10.8 Safety Trends

Chapter 2 of this report provides a summary of safety patterns in Thornton. As shown in **Figure 10.2**, overall, between 2015 and 2019, a total of 12,833 crashes occurred within the city. Of those total crashes, 314 resulted in a fatality or severe injury. Severe injury and fatal crashes reached a high point in 2016 but have slightly declined between 2016 and 2019.

Vision Zero

Vision Zero programs have been adopted by municipalities around the country at a growing rate. Communities are committing to eliminating traffic crashes that result in fatalities or serious injuries by providing safety training, implementing engineering solutions that are proven to slow vehicle speeds while reducing conflicts with other roadway users, and forming multidisciplinary initiatives for implementing safety programming.

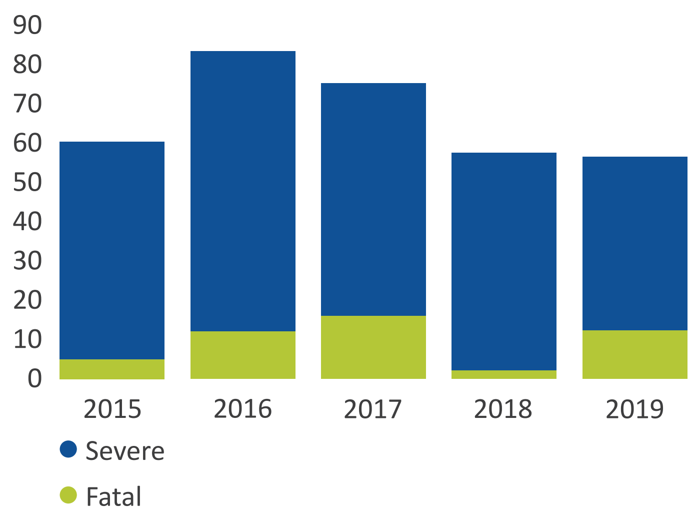
- **PP.16 As a first step, Thornton should develop and adopt a Vision Zero Action Plan. Thornton currently participates in DRCOG's Vision Zero Work Group but should also consider joining Colorado's statewide program – Moving Towards Zero Deaths. The city could also consider having the mayor make a proclamation in support of the state initiative, demonstrating the city's commitment to the vision of zero traffic-related deaths.**

FHWA Local Road Safety Plan

Leveraging opportunities to incorporate safety programming into all city transportation planning efforts is crucial. The Federal Highway Administration's (FHWA) Local Road Safety Plan (LRSP) program is one example of a road safety planning effort the city can undertake. The LRSP program focuses specifically on safety for local (non-highway) roadways, where fatality rates are often higher than on highways, even though traffic volumes are lower. Local roads tend to have more conflict points where crashes occur like intersections. In addition, local roads have less separation between modes, which can increase crash severity when speed limits are not observed. While safety initiatives can often focus on identifying opportunities for improving conditions on major roadways, an LRSP is an opportunity to focus on all streets within the jurisdiction's control.

Figure 10.2

Thornton Fatal and Severe Injury Crashes Over Time (all modes)



Data: DRCOG Crash Data (2015-2019)

- **PP.17 Thornton should develop and implement a FHWA Local Road Safety Plan.**

In 2021, Thornton's City Council provided direction to "Implement a systemic and systematic crash analysis and recommend mitigation efforts." This effort has already begun and could inform an overall local road safety plan. Next steps that Thornton should consider include:

1. Establish leadership through a stakeholder committee or other body of individuals representing all entities involved in roadway safety. Participants can include law enforcement, schools, neighborhood groups, pedestrians, bicyclists, and medical services. This committee is a requirement of an LRSP.
2. Analyze safety data to understand what the largest safety issues are on local streets and apply systemic and systematic crash reduction efforts.
3. Determine emphasis areas, using results from the safety analysis to establish corridors the LRSP should prioritize.
4. Identify strategies. Develop a comprehensive set of strategies for addressing safety issues. These can include programmatic initiatives like stepping up speed enforcement and public awareness campaigns. However, the focus should be on design standards for infrastructure to calm traffic, slow speeds on neighborhood streets, and remove conflict points on high-speed corridors. Roundabouts should be implemented instead of traffic signals whenever feasible to reduce severe intersection related crashes.
5. Prioritize and incorporate strategies. Prioritize the strategies that will be most effective for addressing the priority streets identified in step 3. Develop a plan for implementing the strategies – the plan should include a timeline and performance measures for evaluation.
6. Evaluate and update. Evaluate the LRSP post implementation and update as needed.

iWatch Speed Awareness Program

Thornton currently has an iWatch Speed Awareness Program in place. iWatch is a voluntary neighborhood speed awareness initiative that engages citizens in speed reduction through neighbor-to-neighbor education and conversations, and a contact where participants can report speeding in their neighborhood. The city's approach to decreasing speeding and increasing safety in neighborhoods is comprised of the four "E's": Educate, Engage, Engineer, and Enforce. The iWatch program helps the city identify places where engineering interventions may be needed and are welcomed by most of the residents in the neighborhood. The TMMP recommends continuing the iWatch program.

10.9 Conclusion

Achieving the city's transportation goals will require more than physical infrastructure changes. The suite of programs and policies described in this chapter will be essential to ensure that users are able to use Thornton's network of roadways, active transportation facilities, and transit services effectively and conveniently. While the city already has a set of programs and policies around complete streets, transportation demand management, and maintenance, Thornton can strengthen and expand these existing strategies to make them even more successful.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11 Implementation

This chapter describes the policies, programs, studies and infrastructure projects recommended to implement the transportation networks envisioned in chapters 5 - 8. Implementation recommendations for each of the transportation modes are addressed as follows:

- **Roadway network -** Table 11.1 includes programmatic recommendations related to roadway safety and specific corridor studies. Tables 11.2 - 11.5 identify short-term, mid-term and long-term roadway improvement projects, such as road widenings, needed to achieve the 2030 and 2050 roadway plans.
- **Bicycle network -** Table 11.1 identifies programs and policies aimed at increasing the safety, convenience and ease of cycling. Tables 11.7 - 11.9 identify short-term, mid-term and long-term projects, such as bike lanes and sidepaths, needed to achieve the 2050 low stress and connected bicycle network.
- **Pedestrian network -** Table 11.1 includes recommendations aimed at increasing the safety, convenience and ease of walking or using a wheelchair to travel around the city. Pedestrian projects are not specifically called out in this chapter because the TMMP envisions Complete Streets and as such, the majority

of roadway projects identified in section 11.2 include pedestrian improvements. For example, road widening projects may include sidewalks or pedestrian crossings. The guidance for pedestrian crossings and a comfortable pedestrian network outlined in Chapter 7 will be considered when designing improvements. Implementation of pedestrian improvements will require further vetting based upon the prioritization map (Figure 7.2) in Chapter 7, as well as sidewalk gaps and funding opportunities.

- **Transit network -** Implementation of the transit vision outlined in Chapter 8 will require complex decisions regarding partnerships, funding and infrastructure that are beyond the scope of the TMMP. Therefore, as identified in Table 11.1, the city will conduct a separate Transit Study beginning in 2022 that provides detailed implementation measures to expand the transit network in Thornton.

This chapter also describes the project prioritization methodology, funding sources, and performance measures to evaluate progress.

11.1 Recommended Programs, Policies and Studies

This section contains the compiled set of recommended policies, programs, and studies identified throughout the TMMP. **Table 11.1** summarizes the recommendations. Further detail on each recommendation can be found in Chapter 10.

Table 11.1: Recommended Programs, Policies and Studies

ID	Program /Policy	Description
PP.1	Complete Streets Policy Update	Include specific recommendations for the type of facilities that should be used based on street classification. Include expectation for Complete Streets design in Complete Streets Policy and in Standards and Specifications update.
PP.2	Bike Parking Program	Add bike parking – particularly covered, secure bike storage – on city property and encourage the construction of additional bike parking in new developments and key destinations like RTD stations, major employment centers, and shopping areas, through TDM strategies.
PP.3	Bike Repair Stand Program	Assess locations for additional bicycle repair stands at transit stations and key destinations and identify funding opportunities for implementation.
PP.4	Bike/Scooter Share Feasibility Study and Ordinance Update	Perform a feasibility study for bike/scooter share in Thornton to determine the type of micromobility program that the land use and demand can support. Explore revising Thornton's pilot bike share ordinance to resemble ordinances of regional peers where bike and scooter share companies currently operate.
PP.5	Partnership with Smart Commute Metro North	Continue to work with Smart Commute Metro North to market their resources throughout Thornton and to broaden education to Thornton residents. Information could be provided on the city website.
PP.6	Commuting Resource Guides	Provide tailored Commuting Resource Guides to employers and employees in conjunction with Smart Commute Metro North.
PP.7	Daycare Colocation Incentives	During the next Development Code update, identify any barriers to allowing daycare in appropriate zoning districts and look for options to encourage colocation of daycare with major employers as feasible.
PP.8	Electric Vehicle (EV) Charging Stations Program	Conduct a study identifying locations for EV charging stations at city facilities.
PP.9	Vanpool Support	Promote Smart Commute Metro North and DRCOG Way to Go to large employers and residents though the ETRP (Employee Traffic Reduction Program) TDM Coordinator.
PP.10	Safe Routes to School Program	The city should continue to coordinate with school districts and Smart Commute Metro North, promoting existing programs and seeking outside funding opportunities when possible.
PP.11	Street Rehabilitation Program Expansion	Expand the rehabilitation program to add buffered bike lanes.
PP.12	Pavement Management System Expansion	Roadway maintenance should ensure bikeways are clear of detritus and larger objects. Consider whether enforcement of illegal parking in bike lanes should extend beyond ticketing drivers to towing vehicles.
PP.13	Snow Removal Program	Thornton's Infrastructure Department and Parks, Recreation and Community Programs Department should work together to develop a snow removal schedule for multimodal facilities that complements the schedule used for clearing roadways to ensure that facilities can accommodate all users following weather events.
PP.14	Community Health and Safety Assessment	Thornton should assess neighborhoods achieving lower health outcomes and improve active transportation options and infrastructure in those areas.
PP.15	Environmental Justice Analysis	Thornton should focus on providing affordable transportation options throughout the city, but especially in the low-income areas where transportation represents a greater cost burden and owning a private vehicle may not be within reach.
PP.16	Vision Zero Action Plan	Develop and adopt a Vision Zero Action Plan. Thornton currently participates in DRCOG's Vision Zero Work Group but should also consider joining Colorado's statewide program – Moving Towards Zero Deaths.
PP.17	FHWA Local Road Safety Plan	Thornton should develop and implement a FHWA Local Road Safety Plan to prioritize safety strategies on dangerous streets.

Table 11.1: Recommended Programs, Policies and Studies Continued...

ID	Program /Policy	Description
PP.18	Bicycle Wayfinding and Signage Plan	Expand upon the city's wayfinding system that will assist people walking, using a wheelchair, and biking to intuitively navigate the city. Develop and identify key destinations to include in the signage.
PP.19	Bicycle and Pedestrian Cut-Thrus	Require new developments to provide pedestrian and bicycle connections where there is a lack of connectivity in the roadway network (e.g., cul de sac)
PP.20	Conduct Transit Study	A comprehensive Transit Study would build off the TMMP and provide a more detailed analysis and set of recommendations. Estimated cost of the study is $150,000. See page 8.14 for more information.
PP.21	88th Avenue Corridor Study	Study 88th Avenue from Pecos Street to Dahlia Street in order to determine an appropriate cross section based on forecasted demand. See page 8.18 for more information.
PP.22	96th Avenue Corridor Study	Study 96th Avenue from Pecos Street to Zuni Street in order to consider a road diet—removing a travel lane and implementing a bicycle facility. See page 6.3 for more information.
PP.23	Pedestrian Crossing Standards	Thornton should adopt pedestrian crossing standards to ensure all future intersections or midblock crossings midblock crossings are constructed in accordance with with national best practices for safe and comfortable crossings for all users. See page 7.6 for more information.
PP.24	Update the Monitoring Table (Table 11.10) annually and modify TMMP recommendations accordingly	Each year, the city should consider the set of performance measures included in the Monitoring Table, review the trends of various categories, and identify options for next steps. The city should note progress made on the implementation recommendations.
PP.25	Update the TMMP after next Comprehensive Plan	Update the Transportation Mobility Master Plan (TMMP) after the next Comprehensive Plan update (approximately every 10 years).
PP.26	City Council adopt priorities	Each DRCOG Transportation Improvement Program (TIP) funding cycle, City Council will need to provide direction on what the city should apply for by adopting transportation priorities.

11.2 Recommended Projects

This section identifies recommended infrastructure projects necessary to achieve the vision and goals of the TMMP and outlines the approach for prioritizing these projects. Although the tables in this section categorize projects as “roadway” or “bicycle”, the city strives for Complete Streets. Therefore, many of the identified projects assist the city in improving conditions for all of the transportation modes addressed in this plan. For example, pedestrian improvements such as sidewalks and crosswalks are included components of many of the identified roadway projects. Bicycle projects may help achieve last-mile connections to transit stops, encouraging transit use.

Infrastructure projects were prioritized based on a community-based, data-driven approach. Planning level cost estimates are also included as a part of infrastructure projects. These costs are based on 2020 dollars, so will need to be adjusted for inflation based on the planned year of implementation.

Project Prioritization Methodology

The prioritization methodology for projects identified in the tables in this section was driven by data on access to key destinations, safety, demand, and equity. It enables the city to determine which projects best accomplish plan goals and serves as a guide for the city to make informed choices regarding the order of project implementation. This methodology provides a transparent approach that informs decisions, with the understanding that funding sources and circumstances may alter the order of implementation. It should be noted that during each TIP cycle, the City Council will need to adopt priorities in order to determine which projects the city applies for funding for. For full score tabulations and criteria thresholds, see Appendix C: Prioritization Methodology. The Denver region implements the fiscally constrained short-range transportation plan through DRCOG’s Transportation Improvement Program (TIP). The TIP identifies all current federally funded transportation projects to be completed in the Denver region over a four-year period. Local governments apply to DRCOG for TIP funding for transportation projects.

Each project is scored based on criteria that measures how closely the project addresses the goals of the TMMP. These criteria include:

- **Access to key destinations:** number of bus stops within a quarter mile, number of commuter rail stations within a half mile, number of schools within a half mile, number of parks and open space lands within a quarter mile, number of trail access points within a quarter mile, and number of government and/or civic buildings within a quarter mile
- **Safety:** the total number of crashes along a project segment, with those resulting in a serious injury or fatality weighted more heavily in both roadway and bikeway projects, and bike or pedestrian involved crashes weighted more heavily in bikeway projects
- **Demand:** how many people a project serves, represented by maximum population and employment density along a corridor
- **Equity:** whether a project improves access for underserved populations, represented by the maximum density of low-income households along a corridor
- **Bike access**: roadway projects that include a bicycle facility weighted more heavily

Scores are based on the existing conditions at a project location rather than future outcomes. For example, the safety score reflects the number of crashes near the proposed project as opposed to the project’s capacity for improving safety outcomes. The safety outcomes of a project will be measured as a part of a project’s more detailed scope later in the planning and design process.|

Prioritized Roadway Projects

Tables 11.2 through Table 11.5 describe roadway projects along with a prioritization tier for each project. It is recommended that the city implements projects in the order of the prioritization score, with higher score projects, labeled Tier 1, being implemented in the short range (0-10 years); medium priority projects, labeled Tier 2, being implemented in the 10-20 years range; and lower priority projects labeled Tier 3, being implemented in the long-term (20-30 years). Although projects are prioritized as a part of this plan, this prioritization should maintain a level of flexibility to implement the needs of the community. If funding becomes available that advances the TMMP vision and goals in a certain project type or location, the city should leverage this opportunity.

Table 11.2: Tier 1 Prioritized Roadway Projects - Short-term 2021-2030

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Road diet - remove 2 travel lanes	Grant St	84th Avenue	Thornton Parkway	1.7	Convert to 2-lane with buffered or protected bike lane in each direction.	$175,000
Widen by 2 travel lanes	Thornton Pkwy	I-25	Washington Street	0.6	Widen in some locations to a consistent 6 lane segment.	$1,854,000
Widen by 2 travel lanes	104th Ave	Colorado Blvd	US 85	3.1	2 to 4 lanes with bike lanes.	$9,581,000
Widen by 2 travel lanes	104th Ave	Marion St	Colorado Blvd	1.6	4 to 6 lanes with bike lanes.	$4,945,000
Widen by 2 travel lanes	136th Ave	I-25	Quebec	4.4	4 to 6 lanes with bike lanes in the future.	$13,599,000
Road diet - remove 2 travel lanes	Grant St	Thornton Parkway	104th Avenue	1.1	Convert outside 3rd lane to buffered or protected bike lane in each direction.	$113,000
Widen by 2 travel lanes	120th Ave	Washington Street	Irma Drive	0.5	Construction funded for 6 lanes.	$1,545,000
Widen by 2 travel lanes	144th Ave	I-25	Washington Street	0.5	4 to 6 lanes.	$1,545,000
Widen by 2 travel lanes	120th Ave	Irma Drive	York Street	0.5	4 to 6 lanes.	$1,545,000
Widen by 4 travel lanes	Washington St	152nd Parkway	E-470	0.8	2 to 6 lanes.	$3,750,000
Widen by 2 travel lanes	144th Ave	York Street	Colorado Boulevard	1.0	2 to 4 lanes with bike lanes.	$3,091,000
Widen by 2 travel lanes	160th Ave	I-25	Washington Street	0.5	2 to 4 lanes with bike lanes.	$1,545,000
New 4 lane roadway	Grant St	150th Avenue	152nd Avenue	0.3	Extend from 150th to 152 with connection to Washington Street at 152nd.	$2,970,000
New 4 lane roadway	152nd Ave	Grant St	Washington St	0.2	New collector road with bike lanes.	$1,980,000
Widen by 2 travel lanes	McKay Rd	104th Avenue	112th Avenue	1.1	2 to 4 lanes.	$3,400,000
Widen by 4 travel lanes	Washington St	E-470	160th Avenue	0.5	2 to 6 lanes.	$2,344,000
Widen by 2 travel lanes	144th Ave	Washington Street	York Street	1.0	2 to 4 lanes with bike lanes.	$3,091,000

Table 11.3: Tier 2 Prioritized Roadway Projects – Mid-term 2030-2040

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Widen by 4 travel lanes and new road	136th Ave	Quebec St	US 85	3.3	2 to 6 lanes with bike lanes in the future and new road over the river.	$15,468,000
Widen by 2 travel lanes	104th Ave	Colorado Blvd	US 85	3.1	2 to 4 lanes.	$9,581,000
Widen by 2 travel lanes	120th Ave	Colorado Blvd	US 85	4.4	4 to 6 lanes.	$13,599,000
Widen by 2 travel lanes	Washington St	136th Avenue	144th Avenue	1.0	4 to 6 lanes.	$3,091,000
Widen by 4 travel lanes and realign north of E-470	Colorado Blvd	136th Avenue	CO 7	3.1	0/2 to 6 lanes with bike lanes.	$9,581,000
Widen by 2 travel lanes	Washington St	160th Avenue	164th Avenue	0.5	4 to 6 lanes.	$1,545,000
Widen by 2 travel lanes	York St	136th Avenue	144th Avenue	1.0	2 to 4 lanes with bike lanes.	$3,091,000
Widen by 4 travel lanes	CO 7	I-25	Yosemite St	11.0	2/4 to 4 + 2 transit only lanes. Can convert/ study transit only more in depth in future when there is transit.	$51,561,000
New 4 lane roadway	Thornton Pkwy	Riverdale Road	McKay Road	1.1	New 4 lane roadway.	$10,890,000
Widen by 4 travel lanes	Quebec St	120th Avenue	CO 7	5.0	2/4 to 6 lanes.	$23,437,000
Widen by 2 travel lanes	128th Ave	I-25	Washington Street	0.5	4 to 6 lanes with bike lane.	$1,545,000
Widen by 4 travel lanes	York St	152nd Parkway	168th Avenue	2.0	2 to 6 lanes with bike lanes.	$3,091,000
Widen by 4 travel lanes	144th Ave	Colorado Boulevard	Quebec Street	2.0	Eastern might be new roadway; 2 to 6 lanes with bike lanes.	$9,375,000
Widen by 2 travel lanes and realign	152nd Ave	Washington Street	York Street	1.0	2 to 4 lanes.	$3,091,000

Table 11.4: Tier 3 Prioritized Roadway Projects - Long-term 2040-2050

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Widen by 2 travel lanes	McKay Rd	96th Avenue	104th Avenue	1.1	2 to 4 lanes with 6-lane ROW and bike lanes.	$3,400,000
Widen by 2 travel lanes	168th Ave	CO 7	Yosemite St	4.9	2 to 4 lanes with bike lanes.	$15,144,000
New 2 lane roadway	156th Ave	160th Avenue	Quebec St	4.3	Collector roadway with protected bike lanes.	$28,067,000
Widen by 4 travel lanes	Holly St	144th Avenue	CO 7	2.0	2 to 6 lanes with bike lanes.	$9,375,000
New 2 lane roadway	152nd Ave	York St	Colorado Blvd	1.1	New collector roadway with bike lanes.	$7,180,000
Widen by 2 travel lanes and realign	160th Ave	Washington Street	CO 7	0.9	2 to 4 lanes with bike lanes.	$2,782,000
Widen by 2 travel lanes and realign	Colorado Blvd	CO 7	Weld County Rd 6	3.1	2 to 4 lanes. Preserve 6-lane ROW and bike lanes.	$9,581,000
New 4 lane roadway	152nd Ave	Colorado Blvd	144th Avenue	2.1	New collector roadway with protected bike lanes.	$20,790,000
New 4 lane roadway	Grant St	124th Avenue	128th Avenue	0.4	New collector roadway.	$3,960,000
New 2 lane roadway	126th Avenue	Washington Street	Grant Street	0.4	Extend corridor with 2 lane roadway.	$2,611,000
Widen by 2 travel lanes and realign	Weld CR 15	CO 7	Weld County Rd 6	2.0	2 to 4 lanes with bike lanes	$6,181,000
Realignment	160th Avenue	Washington Street	CO 7	0.6	Realign corridor.	$3,916,000

Table 11.5: Other Projects

Project	Corridor name	Extent	Extent	Notes
Collectors and Local Streets	Multiple roadways	N/A	N/A	Expected to be constructed using developer funds
Multimodal Hub	Interchange at I-25/CO 7	N/A	N/A	Partially outside of the city's boundaries
New Interchange	I-25 / 128th Avenue	N/A	N/A	Partially outside of the city's boundaries
New Interchange	US-85 / 136th Avenue	N/A	N/A	Outside of the city's boundaries
New Interchange	US-85/120th Avenue	N/A	N/A	Outside of the city's boundaries
New Interchange	US-85/104th Avenue	N/A	N/A	Outside of the city's boundaries
Widen by 2 travel lanes	96th Avenue	McKay Road	I-76	2 to 4 lanes; outside of the city's boundaries

Prioritized Bicycle Projects

Tables 11.7 through Table 11.9 describes the recommended bicycle projects. Same as the roadway projects, bicycle projects should be implemented in the order of their prioritization score, with higher score Tier 1 projects implemented in the short range (0- 10 years); Tier 2 projects implemented in the 10-20 years range; and Tier 3 projects implemented in the long-term (20-30 years). However, prioritization should maintain a level of flexibility to implement the needs of the community. If funding becomes available that advances the TMMP vision and goals, the city should leverage this opportunity.

The planning level cost estimates for bicycle projects assume the per unit costs shown in **Table 11.6**, identified in 2020 dollars.

Table 11.6: Bicycle planning level unit cost estimates

Facility Type	Per Mile Cost (2020 dollars)
Neighborhood Bikeway	$170,000
Bike Lane	$91,000
Buffered Bike Lane	$99,000
Protected Bike Lane	$137,000
Sidepath	$1,957,000

Table 11.7: Tier 1 Prioritized Bicycle Projects - Short-term 2021-2030

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Protected Bike Lane	Pearl Street	Eppinger Boulevard	84th Avenue	1.1	Restriping	$151,000
Neighborhood Bikeway	121st Avenue / Northaven Circle	Madison Street	120th Avenue	1.1	None	$187,000
Bike Lane	Washington Center Parkway	Washington Street	120th Avenue	0.7	Widen curb to curb width	$63,000
Protected Bike Lane	128th Avenue	I-25	York Street	1.5	Widen curb to curb width	$206,000
Protected Bike Lane	84th Avenue	Huron Street	Washington Street	0.9	Widen curb to curb width	$123,000
Protected Bike Lane	88th Avenue	Huron Street	Devonshire Boulevard	2.2	Widen curb to curb width	$301,000
Protected Bike Lane	Grant Street	84th Avenue	104th Avenue	2.7	Remove Travel Lane	$370,000
Sidepath	104th Avenue	I-25	US 85	2.5	Additional ROW may be needed	$4,894,000
Protected Bike Lane	Huron Street	Northern City boundary	88th Avenue	0.5	Widen curb to curb width	$69,000

Table 11.7: Tier 1 Prioritized Bicycle Projects - Short-term 2021-2030 Continued...

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Bike Lane	124th Avenue	Claude Court	Dexter Way	1.7	Remove parking	$154,000
Protected Bike Lane	88th Avenue	Pecos Street	Huron Street	0.5	Widen curb to curb width	$69,000
Neighborhood Bikeway	Hoffman Way	Washington Street	88th Avenue	1.3	None	$221,000
Protected Bike Lane	98th Avenue	Grant Street	Washington Street	0.3	Widen curb to curb width	$41,000
Protected Bike Lane	98th Avenue	Washington Street	Corona Street	0.2	Widen curb to curb width	$27,000
Bike Lane	Pecos Street	100th Avenue	Thornton Parkway	1.0	Restriping	$91,000
Sidepath	Colorado Boulevard	WRC 6	91st Drive	11.9	Additional ROW may be needed	$23,293,000
Protected Bike Lane	Grant Street	144th Avenue	136th Avenue	2.1	Restriping	$288,000
Neighborhood Bikeway	Milky Way	Pecos Street	Huron Street	0.5	None	$85,000
Bike Lane	Russell Way	Thornton Parkway	Gail Court	0.5	Restriping	$45,000
Bike Lane	96th Avenue	Zuni Street	Pecos Street	0.6	Restriping	$54,000
Protected Bike Lane	128th Avenue	York Street	Colorado Boulevard	1.1	Widen curb to curb width	$151,000
Sidepath	136th Avenue	I-25	Washington Street	0.5	Additional ROW may be needed; outside city boundary but continuity is important to consider	$979,000
Protected Bike Lane	Pecos Street	Thornton Parkway	Milky Way	0.6	Remove Travel Lane	$82,000
Protected Bike Lane	Huron Street	88th Avenue	84th Avenue	0.6	Widen curb to curb width	$82,000
Bike Lane	Steele Street	Brantner Gulch Trail	120th Avenue	0.4	Restriping	$36,000
Protected Bike Lane	York Street	120th Avenue	Elizabeth Circle	0.4	Widen curb to curb width	$55,000
Bike Lane	York Street	104th Avenue	300ft south of 100th Avenue	0.5	Widen curb to curb width	$45,000
Neighborhood Bikeway	Downing Street	100th Avenue	Thornton Parkway	0.4	None	$68,000
Protected Bike Lane	88th Avenue	Devonshire Boulevard	I-76	2.3	Widen curb to curb width	$315,000
Neighborhood Bikeway	97th Avenue	Community Park Trail	Thornton Parkway	0.9	Restriping	$153,000
Protected Bike Lane	Claude Court	128th Avenue	Eastlake Avenue	0.5	Widen curb to curb width	$69,000
Bike Lane	120th Avenue	Madison Street	Steele Street	0.4	Remove parking	$36,000

Table 11.7: Tier 1 Prioritized Bicycle Projects - Short-term 2021-2030 Continued...

Project	Corridor name	Extent	Extent	Length (mi)	Notes	Planning level cost estimate
Sidepath	104th Avenue	Grange Hall Creek Trail	South Platte Trail	1.5	Trail proposal	$2,936,000
Sidepath	Holly Street	96th Avenue	Weld County Road 6	10.8	Additional ROW may be needed	$21,140,000
Neighborhood Bikeway	Dorothy Boulevard	Thornton Parkway	Hoffman Way	0.4	None	$68,000
Protected Bike Lane	Welby Road	Thornton Parkway	Welby Circle	0.6	Restriping	$82,000
Protected Bike Lane	112th Avenue	Colorado Boulevard	Holly Street	1.0	Restriping	$137,000
Bike Lane	Birch Drive	120th Avenue	112th Avenue	1.1	Remove Parking	$100,000
Protected Bike Lane	100th Avenue	Corona Street	Race Street	0.7	Restriping	$96,000
Bike Lane	Race Street	97th Avenue	Thornton Parkway	0.3	Restriping	$27,000
Neighborhood Bikeway	Fairfax Street	North Haven Park Trail	119th Way	0.4	Restriping	$68,000
Sidepath	124th Avenue	Monroe Drive	Claude Court	.9	Additional ROW may be needed	$1,762,000

Table 11.8: Tier 2 Prioritized Bicycle Projects - Mid-term 2030-2040

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Protected Bike Lane	100th Avenue	Steele Street	Jackson Street	0.4	Restriping	$55,000
Bike Lane	Eppinger Boulevard	Gaylord Street	Yucca Way	0.6	Restriping	$54,000
Protected Bike Lane	128th Avenue	Bellaire Street	Fairfax Street	0.7	Widen curb to curb width	$96,000
Bike Lane	Eppinger Boulevard	Russell Way	Gaylord Street	0.3	Restriping	$27,000
Neighborhood Bikeway	101st Avenue / Jackson Street	Cook Street	100th Avenue	0.3	Restriping	$51,000
Protected Bike Lane	128th Avenue	Monaco Street	Riverdale Road	1.5	Widen curb to curb width	$206,000
Bike Lane	100th Avenue	Jackson Street	Colorado Boulevard	0.1	Widen curb to curb width	$9,000
Bike Lane	Cottonwood Lake Boulevard	Harrison Drive	Bellaire Drive	0.3	Widen curb to curb width	$27,000
Bike Lane	126th Avenue	Existing Bike Lane on 126th Avenue	Farmers Highline Canal Trail	0.3	Restriping	$27,000
Bike Lane	Lafayette Street	128th Avenue	130th Avenue	0.3	Widen curb to curb width	$27,000

Table 11.8: Tier 2 Prioritized Bicycle Projects - Mid-term 2030-2040 Continued...

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Neighborhood Bikeway	Cherry Drive/ Dahlia Drive	115th Court	110th Avenue	0.7	Widen curb to curb width	$119,000
Protected Bike Lane	128th Avenue	Fairfax Street	Monaco Street	0.7	Widen curb to curb width	$96,000
Protected Bike Lane	York Street	Highway 7	136th Avenue	2.1	Widen curb to curb width	$288,000
Sidepath	136th Avenue	York Street	Colorado Boulevard	1.0	Additional ROW may be needed	$1,957,000
Protected Bike Lane	144th Avenue	Washington Street	Fairfax Drive	2.6	Widen curb to curb width	$356,000
Neighborhood Bikeway	96th Place	98th Avenue	Downing Street	0.3	Restriping	$51,000
Protected Bike Lane	Quebec Street	132nd Avenue	124th Avenue	1.8	Widen curb to curb width	$247,000
Protected Bike Lane	York Street	136th Avenue	128th Avenue	1.1	Widen curb to curb width	$151,000
Bike Lane	Eppinger Boulevard	Fir Drive	Russell Way	0.3	Restriping	$27,000
Sidepath	Riverdale Road	Colorado Boulevard	94th Avenue	0.6	Additional ROW may be needed	$1,174,000
Sidepath	136th Avenue	Colorado Boulevard	Quebec Street	2.0	Additional ROW may be needed	$3,915,000
Neighborhood Bikeway	Bellaire Street	128th Avenue	124th Avenue	0.5	None	$85,000
Bike Lane	119th Place	Harrison Street	Eastern End of 119th Place	0.2	Widen curb to curb width	$18,000
Bike Lane	108th Avenue	Margaret Carpenter Trail	Birch Court	0.1	Widen curb to curb width	$9,000
Bike Lane	Steele Street	100th Avenue	99th Way	0.0	Widen curb to curb width	$1,000
Bike Lane	Steele Street	96th Place	Thornton Parkway	0.1	Widen curb to curb width	$9,000
Protected Bike Lane	Washington Street	136th Avenue	124th Avenue	1.5	Widen curb to curb width	$206,000
Protected Bike Lane	Washington Street	Farmers Highline Trail	Washington Center Parkway	0.1	Widen curb to curb width	$14,000
Protected Bike Lane	Huron Street	88th Avenue	84th Avenue	0.5	Widen curb to curb width	$69,000
Neighborhood Bikeway	Bellaire Street	Cottonwood Lake Boulevard	128th Avenue	0.8	None	$136,000
Neighborhood Bikeway	Elm Drive	119th Way	118th Place	0.3	None	$51,000
Neighborhood Bikeway	Gail Court	Russell Way	Pecos Boulevard	0.3	Restriping	$51,000
Bike Lane	130th Avenue	Corona Street	Lafayette Street	0.2	Remove Parking	$18,000

Table 11.8: Tier 2 Prioritized Bicycle Projects - Mid-term 2030-2040 Continued...

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Neighborhood Bikeway	97th Avenue / 98th Avenue	Downing Street	Race Street	0.6	Restriping	$102,000
Bike Lane	Eppinger Boulevard	Hoffman Way	Fir Drive	0.1	Restriping	$9,000
Bike Lane	Conifer Road	88th Avenue	RTD Parking Lot	0.1	Restriping	$9,000
Bike Lane	100th Avenue	Colorado Boulevard	Riverdale Road	0.5	Widen curb to curb width	$45,000
Sidepath	York Street	Highway 7	136th Avenue	1.9	Additional ROW may be needed	$3,719,000
Protected Bike Lane	168th Avenue	CO 7	Yosemite Street	5.1	Widen curb to curb width	$699,000
Neighborhood Bikeway	140th Avenue/ Monaco Street	Holly Street	136th Avenue	1.3	None	$221,000
Protected Bike Lane	Quebec Street	160th Avenue	E-470	1.7	Widen curb to curb width	$233,000
Protected Bike Lane	York Street	Elizabeth Circle	112th Avenue	0.7	Widen curb to curb width	$96,000
Neighborhood Bikeway	Corona Street / 134th Avenue	130th Avenue	High Street	1.0	Restriping	$170,000
Neighborhood Bikeway	115th Avenue	Steele Street	Colorado Boulevard	0.5	Restriping	$85,000
Sidepath	136th Avenue	Quebec Street	Riverdale Road	3.3	Additional ROW may be needed	$6,459,000
Neighborhood Bikeway	Poze Boulevard	Clayton Street	Yucca Way	0.3	Restriping	$51,000
Protected Bike Lane	112th Avenue	Holly Street	Riverdale Road	0.4	Widen curb to curb width	$55,000
Bike Lane	Summit Grove Parkway	Harrison Street	134th Drive	0.1	Widen curb to curb width	$9,000
Bike Lane	131st Avenue	130th Avenue	Brantner Gulch Trail, Horizon Tributary	0.9	Restriping	$82,000
Neighborhood Bikeway	Monaco Way/Niagara Street	Wright Farms Subdivision Trail	Riverdale Road	1.1	None	$187,000
Neighborhood Bikeway	Dahlia Street	110th Avenue	108th Avenue	0.3	None	$51,000

Table 11.9: Tier 3 Prioritized Bicycle Projects - Long-term 2040-2050

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Protected Bike Lane	Grant Street	148th Avenue	144th Avenue	1.0	Widen curb to curb width	$137,000
Protected Bike Lane	144th Avenue	Fairfax Drive	Holly Street	2.0	Restriping	$274,000
Bike Lane	Cottonwood Lake Boulevard	136th Avenue	135th Drive	0.2	Restriping	$18,000
Protected Bike Lane	Quebec Street	136th Avenue	132nd Avenue	0.5	Widen curb to curb width	$69,000
Bike Lane	100th Avenue	Riverdale Road	Fukaye Fields Trail	0.5	Widen curb to curb width	$45,000
Protected Bike Lane	Thornton Parkway	Riverdale Road	McKay Road	1.0	Widen curb to curb width	$137,000
Neighborhood Bikeway	Eudora Drive / Elm Street	128th Avenue	Northaven Park Trail	0.7	Restriping	$119,000
Bike Lane	130th Avenue	Washington Street	Emerson Street	0.1	Remove Parking	$9,000
Sidepath	Yosemite Street	Ehler Parkway	1,000ft South of 136th Avenue	1.8	Additional ROW may be needed	$3,523,000
Neighborhood Bikeway	Milwaukee Street/137th Avenue/138th Avenue	136th Avenue	Colorado Boulevard	0.7	None	$119,000
Neighborhood Bikeway	140th Avenue	Cherry Park Subdivision Trail (West)	Cherry Park Subdivision Trail (East)	0.2	None	$34,000
Neighborhood Bikeway	Garfield Place	Cherrywood Park Trail	138th Avenue	0.2	None	$34,000
Neighborhood Bikeway	Clermont Street	128th Avenue	127th Avenue	0.2	None	$34,000
Neighborhood Bikeway	Dahlia Street	126th Avenue	Meadow Park Subdivision Trail	0.1	None	$17,000
Bike Lane	119th Place	Madison Street	Madison Place	0.01	Widen curb to curb width	$1,000
Protected Bike Lane	Future Roadway South of E-470	York Street	Yosemite Street	5.0	Future Roadway	$685,000
Sidepath	York Street	104th Avenue	Trail	0.2	Trail proposal	$391,000
Protected Bike Lane	160th Avenue	York Street	Big Dry Creek Trail	0.5	Restriping	$69,000
Sidepath	Washington Street	148th Avenue	144th Avenue	1.0	Additional ROW may be needed	$1,957,000
Neighborhood Bikeway	Clayton Street	York Street	118th Circle	0.1	Restriping	$17,000
Bike Lane	130th Avenue	Emerson Street	Corona Street	0.2	Remove Parking	$18,000

Table 11.9: Tier 3 Prioritized Bicycle Projects - Long-term 2040-2050

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Neighborhood Bikeway	115th Avenue	Clayton Street	Steele Street	0.2	Restriping	$34,000
Bike Lane	130th Avenue	Brantner Gulch Trail	Riverdale Park Trail	0.3	Restriping	$27,000
Neighborhood Bikeway	Dexter Way	124th Avenue	125th Avenue	0.1	None	$17,000
Neighborhood Bikeway	123rd Drive	Krameria Street	Wright Farms Subdivision Trail	0.1	None	$17,000
Protected Bike Lane	Quebec Street	E-470	136th Avenue	1.2	Widen curb to curb width	$164,000
Protected Bike Lane	Highway 7	160th Avenue	York Street	0.2	Widen curb to curb width	$27,000
Protected Bike Lane	Grant Street	152nd Parkway	148th Avenue	0.4	Widen curb to curb width	$55,000
Protected Bike Lane	160th Avenue	I-25	Highway 7	1.3	Widen curb to curb width	$178,000
Neighborhood Bikeway	Steele Street	115th Avenue	112th Avenue	0.2	Restriping	$34,000
Bike Lane	Gravel Lakes Fishing Access Road	86th Avenue	South Platte Greenway Trail	0.1	Restriping	$9,000
Bike Lane	126th Avenue	Washington Street	Ogden Street	0.2	Restriping	$18,000
Protected Bike Lane	152nd Parkway	Grant Street	York Street	1.1	Widen curb to curb width	$151,000
Bike Lane	Clayton Street	115th Way	116th Avenue	0.2	Restriping	$1,000
Bike Lane	Jasmine Street	130th Avenue	128th Avenue	0.2	Remove parking	$18,000
Neighborhood Bikeway	148th Avenue	Big Dry Creek Trail	York Street	0.3	None	$51,000
Neighborhood Bikeway	Milwaukee Court	Detroit Street	137th Avenue	0.1	None	$17,000
Neighborhood Bikeway	Signal Ditch Parkway/ Fairfax Drive	Farmers Highline Canal	144th Avenue	0.9	None	$153,000
Protected Bike Lane	Future Roadway North of E-470	York Street	Quebec Street	3.5	Future Roadway	$480,000
Protected Bike Lane	140th Avenue	Grant Street	Washington Street	0.2	Widen curb to curb width	$27,000
Sidepath	136th Avenue	Washington Street	York Street	1.0	Additional ROW may be needed	$1,957,000
Sidepath	Holly Park Connector	Holly Park Trail	Holly Street	0.01	Additional ROW may be needed	$200,000

Table 11.9: Tier 3 Prioritized Bicycle Projects - Long-term 2040-2050

Bicycle facility type	Corridor name	Extent	Extent	Length (mi)	Tradeoff	Planning level cost estimate
Sidepath	Riverdale Road	112th Avenue	120th Avenue	0.2	Additional ROW may be needed	$391,000
Neighborhood Bikeway	142nd Place	Fallbrook Farms Subdivision Trail	Detroit Street	0.2	None	$34,000
Bike Lane	Monaco Street	Riverdale Park Trail	131st Avenue	0.1	None Restriping	$9,000
Sidepath	Washington Street	160th Avenue	152nd Parkway	1.2	Trail proposal	$2,349,000
Sidepath	104th Avenue	South Platte River Greenway Trails	US 85	1.1	Additional ROW may be needed	$2,153,000
Sidepath	152nd Parkway	York Street	RR Tracks	0.5	Trail proposal	$979,000
Protected Bike Lane	Washington Street	166th Avenue	148th Avenue	1.7	Widen curb to curb width	$233,000
Protected Bike Lane	Washington Street	144th Avenue	136th Avenue	1.0	Widen curb to curb width	$137,000
Neighborhood Bikeway	162nd Avenue	Holly Street	Quebec Street	1.1	None	$187,000
Sidepath	Quebec Street	South of 160th Avenue	Quince Circle	0.4	Trail proposal	$783,000
Sidepath	144th Avenue	Holly Street	Krameria Street	0.5	Trail proposal	$979,000
Protected Bike Lane	148th Avenue	Grant Street	Washington Street	0.2	Widen curb to curb width	$27,000
Protected Bike Lane	146th Avenue	Grant Street	Washington Street	0.2	Widen curb to curb width	$27,000
Neighborhood Bikeway	Fillmore Street	Future Roadway South of E-470	Haven Subdivision Trail	0.3	None	$51,000
Neighborhood Bikeway	Eagle Shadow Avenue/ Leyden Street	Ivy Street	162nd Avenue	0.7	None	$119,000
Sidepath	160th Avenue	Colorado Boulevard	Holly Street	0.5	Trail proposal	$979,000
Sidepath	Washington Street	Bull Canal Trail	152nd Parkway	0.3	Trail proposal	$587,000
Sidepath	Holly Street	160th Avenue	Trail	0.6	Trail proposal	$1,174,000
Sidepath	Holly Street	144th Avenue	Road south of E 470	0.5	Trail proposal	$979,000
Sidepath	144th Avenue	City boundary	Holly Street	0.5	Trail proposal	$979,000

11.3 Funding sources

As additional funding becomes available, the city can allocate new funding resources towards implementing currently unfunded projects. The funding landscape is competitive and often requires city departments to enter the planning phase thinking about grant requirements that will set the city up for success in being awarded grants. A critical step in obtaining external grants is having the project priorities identified in the adopted TMMP. Many of the projects in this plan could be funded by grants. It will be critical to have the projects "shovel ready" so that the funding can be used for implementation. In most cases, the list of external funding sources requires local matching funds. Funding sources will continue to change between 2021 and 2050, but this section identifies grant and funding streams available as of September 2021. This section identifies the funding sources that supplement existing funding streams in Thornton.

The descriptions provided for grant opportunities come from federal, state, and regional sources.

Federal

- **Federal Highway Safety Improvement Program (HSIP):** Eligible projects in this category include improvements or corrections to safety issues on any local or regional public roads and trails or paths. Funded activities must be consistent with Colorado's Strategic Highway Safety Plan. Projects are selected competitively through CDOT.
- **USDOT Rebuilding American Infrastructure with Sustainability and Equity (RAISE)** (formerly BUILD and TIGER): Since 2009, USDOT has distributed grants for planning and capital investments in surface transportation infrastructure. Grants are awarded on a competitive basis for projects that will have a significant local or regional impact. RAISE funding can support roads, bridges, transit, rail, ports, or intermodal transportation.
- **FTA (Federal Transit Administration) §5307 Urbanized Area Formula Program:** This program makes federal resources available to urbanized areas for transit capital and operating assistance. Urbanized areas are those areas with a population of 50,000 or more as designated by the U.S. Census Bureau.
- **Infrastructure for Rebuilding America (INFRA):** The FAST (Fixing America's Surface Transportation) Act established the Nationally Significant Freight and Highway Projects (NSFHP) program to provide financial assistance—competitive grants, known as INFRA grants, or credit assistance—to nationally and regionally significant freight and highway projects that align with the program goals to improve safety, efficiency and reliability of freight; improve global competitiveness; reduce highway congestion; improve connectivity; and address growing demand for freight.

State

- **CDOT Funding Advancements for Surface Transportation and Economic Recovery Act (FASTER):** This category includes safety-related projects, such as: asset management, transportation operations, intersection and interchange improvements, and shoulder and safety-related widening, and pedestrian and bicycle facilities. Projects are advanced by local governments and selected based on priority and data within CDOT Region 1.

- **Safe Routes to School (SRTS):** This program was formed to: Enable and encourage children to walk and bike to school; make walking and biking safer and more appealing; facilitate planning development, and implementation of projects that improve safety, reduce traffic, fuel consumption, and air pollution around schools. There is no longer dedicated federal SRTS funding, but the Colorado SRTS program has been continued with state funding and a local agency match requirement. This is a competitive program where projects are screened by a statewide selection advisory committee.
- **Great Outdoors Colorado (GOCO)**: Funding from the Colorado Lottery is awarded to a variety of project types, including trail projects, across the state by the GOCO Board. GOCO Board members are appointed by the Governor and confirmed by the Colorado State Senate.
- **Regional Priorities Program (RPP):** The goal of this program is to implement regionally significant projects identified through the transportation planning process. These funds are flexible in use and are allocated to the regions by the Colorado Transportation Commission on an annual basis. The allocations are based on regional population, CDOT on-system lane miles, and CDOT on-system truck VMT.
- **Highway Users Tax Fund (HUTF):** Revenues generated from the Road Safety Surcharge, Oversize Overweight Surcharge, Rental Car Surcharges, and late vehicle registration fees are credited to the Highway Users Tax Fund (HUTF) and distributed per statute to the Colorado Department of Transportation, counties, and municipalities.

Regional

- **Metropolitan Planning**: Federal funds are allocated to DRCOG to provide for a continuing, comprehensive, and cooperative (3C) transportation planning process in the region.
- **Multimodal Options Fund (MMOF):** The legislation states that the Multimodal Options Fund should promote a "complete and integrated multimodal system" through objectives such as benefitting seniors, providing enhanced mobility for the disabled population, or providing safe routes to school. Local recipients are required to provide a match of project funding equal to the amount of the grant, with exemptions allowed. The current MMOF funding is available through June 30, 2023.
- **DRCOG Congestion Mitigation and Air Quality improvement Program (CMAQ):** The FAST (Fixing America's Surface Transportation) Act continued the CMAQ program to provide a flexible funding source to local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas). Thornton is in an 8-hour ozone non-attainment area.
- **DRCOG Block Grant Program (STBG):** The Surface Transportation

Block Grant program (STBG) provides flexible funding that may be used by localities for projects to preserve and improve the conditions and performance on major regional roadways, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.

- **CDOT/DRCOG Transportation Alternatives (TA):** Eligible projects for TA funding include planning or construction projects for on and off-road pedestrian and bicycle facilities, community enhancement activities, and safe routes to schools. Applications for CDOT TA funds are screened and selected by CDOT Region 1". DRCOG's program is administered as part of our standard TIP calls for projects.
- **DRCOG additional Transportation Improvement Program (TIP) set-asides- DRCOG's TIP also funds set-asides.** Some set-asides hold their own calls for projects at different times during the active TIP lifespan, along with unique scoring criteria. These include Transportation Demand Management (TDM) Services, Regional Transportation Operations and Technology, and Human Service Transportation TIP set-asides. These are offered to local agencies.
- **DRCOG Community Mobility Planning and Implementation (CMPI):** The purpose of the CMPI set-aside is to support small area planning and small infrastructure projects that contribute to the implementation of key outcomes within Metro Vision and the Metro Vision Regional Transportation Plan. The current program goals are to: Support diverse, livable communities; support the development of connected urban centers and multimodal corridors; support a transportation system that is well-connected and serves all modes of travel; support healthy and active choices; expand access to opportunity for residents of all ages, incomes, and abilities; and support a transportation system that is safe, reliable, and well maintained.
- **Colorado Energy Office:** Funding is available through HB21-1253 to local government proposed projects to support the development and construction of renewable and clean energy infrastructure in all areas of the state especially in communities in which renewable and clean energy infrastructure is sparse and with consideration to geographical diversity in these awards.

Local

- **Adams County Road and Bridge Tax Fund**: This fund accounts for the proceeds the City receives from the Adams County Road and Bridge sales tax of 0.50 percent. The Adams County Road and Bridge capital projects are managed by the Infrastructure Department.
- **Local property tax**: Funds generated by sales, use, specific ownership, and property taxes can be transferred to general funds or directed towards capital projects. These can either be permanent or a local option tax that is subject to voter approval.
- **Transportation Utility Fees**: Transportation utility fees are a financing mechanism that treats the transportation system like a utility in which residents and businesses pay fees based on their use of the transportation system rather than taxes based on the value of property they occupy. The fees are not subject to voter approval and are based on the number of trips

generated by different land uses. They are enacted on property owners and renters alike, paid on an ongoing monthly basis.

- **Dedicated Sales Tax**: Additional sales tax could be collected as the result of a city or citizen sponsored ballot initiative to collect sales tax for specific/dedicated transportation-related uses. This can include funding for sustainability and resilience. This additional funding would be collected over a set amount of time and used to fund the included items.
- Other funding options that could be considered with further analysis are parking fees, private sources including developer funding, transportation impact fees, and special assessments.

11.4 Performance Measures

Performance measures are important to evaluate the current success of the city, track the success of the city in the future, and modify the path forward if needed. The TMMP includes a monitoring table, **Table 11.10**, which identifies a set of performance measures that will measure progress towards Thornton's transportation vision and goals. For each performance measure, the monitoring table has three different tracking categories:

1. Existing conditions outputs: the results for performance measures quantified only for existing conditions (for 2019-2021, depending on data availability).
2. Scenario evaluation outputs: the result of performance measures quantified for each of the three scenarios described in Chapter 4.
3. On-going monitoring outputs: every year, the city should report out on this set of performance measures to track the implementation and success of the TMMP.

These performance measures will not only provide a framework to continually assess the performance of the city but also enable city staff to communicate outcomes as the transportation system changes in the future and can be used on a continuous basis for evaluation of the projects.

- **Policy and Program ID PP.24 This monitoring table will be reviewed and updated by the city on an annual basis. The City Development Department will lead this, with coordination from other city departments.**

Table 11.10: Monitoring Table of Performance Measures

Theme	Performance Measure	Metric	Assessment Tool	TMMP Analysis				Ongoing Monitoring: Thornton to Track TMMP Implementation Annually		
				Existing Conditions	Scenario A	Scenario B	Scenario C	2022	2023	...
Transportation Options	Facility Proximity	1. Percent of population within 1/4 mile of low-stress bicycle facility/trail 2. Percent of population within 1/2 mile of bus stop/commuter rail station 3. Percent of population within FlexRide zone	GIS	1. 94% 2. 63% 3. 54% (2019)			1. 94% 2. 50% 3. 67%			
		1. Percent of low-income households within 1/4 mile of low-stress bicycle facility/trail 2. Percent of low-income households within 1/2 mile of bus stop/commuter rail station 3. Percent of low-income households within FlexRide zone 4. Percent of low-income households within 1/2 mile of transportation investment from that year	GIS	1. 91% 2. 82% 3. 79% 4. NA			1. 94% 2. 56% 3. 72% 4. NA			
	Mode Share	Percent of all trips by auto, carpool, transit, bike, and walk modes	Focus Model (mode share can be exported using the DRCOG Focus Model. Updates should be run as the model is updated.)	1. Drive Alone: 43% 2. Carpool: 51% 3. Transit: 1% 4. Walk: 4% 5. Bike: 1%	1. Drive Alone: 45% 2. Carpool: 48% 3. Transit: 2% 4. Walk: 4% 5. Bike: 1%	1. Drive Alone: 44% 2. Carpool: 48% 3. Transit: 3% 4. Walk: 4% 5. Bike: 1%	1. Drive Alone: 44% 2. Carpool: 48% 3. Transit: 3% 4. Walk: 4% 5. Bike: 1%			
		Percent of work trips during the morning peak hour by auto, carpool, transit, bike, and walk modes		6. Drive Alone: 84% 7. Carpool: 10% 8. Transit: 4% 9. Walk: 1% 10. Bike: 1%	11. Drive Alone: 83% 12. Carpool: 10% 13. Transit: 5% 14. Walk: 1% 15. Bike: 1%	16. Drive Alone: 78% 17. Carpool: 9% 18. Transit: 11% 19. Walk: 1% 20. Bike: 1%	21. Drive Alone: 78% 22. Carpool: 9% 23. Transit: 11% 24. Walk: 1% 25. Bike: 1%			
	VMT per Household	Percent change of Vehicle Miles Traveled per Household compared to existing conditions	Focus Model	N/A	-9%	-11%	-10%			
Travel Time	Corridor Travel Times: Vehicle travel times for the selected corridors	Washington Street	Focus Model							
		Colorado Boulevard								
		Holly Street								
		CO 7								
		136th Avenue								
		128th Avenue								
		120th Avenue								
		104th Avenue								
		88th Avenue								
	Regional Travel Times	Vehicle and transit travel times between key O-D pairs, regionally	Focus Model	Thornton to Boulder Vehicle: 50 min Transit: 82 min	Thornton to Boulder Vehicle: 58 min Transit: 74 min	Thornton to Boulder Vehicle: 60 min Transit: 62 min	Thornton to Boulder Vehicle: 59 min Transit: 62 min			
				Thornton to Union Station Vehicle: 39 min Transit: 48 min	Thornton to Union Station Vehicle: 48 min Transit: 31 min	Thornton to Union Station Vehicle: 50 min Transit: 31 min	Thornton to Union Station Vehicle: 49 min Transit: 31 min			
Vehicular Travel	V/C Ratios	Volume-to-capacity ratios on model links	Focus Model	See Ch 4 Figure 8.	See Ch 4 Figure 3.	See Ch 4 Figure 3.	See Ch 4 Figure 8.			
Safety	Crashes	Count of fatality and severe injury crashes	GIS	63 (2019)						
		Count of bike and pedestrian-related crashes		51 (2019) - 42 of these were severe injury or fatal crashes						

Table 11.10: Monitoring Table of Performance Measures Continued

Theme	Performance Measure	Metric	Assessment Tool	TMMP Analysis				Ongoing Monitoring: Thornton to Track TMMP Implementation Annually		
				Existing Conditions	Scenario A	Scenario B	Scenario C	2022	2023	...
Environment	Sustainability-supporting infrastructure	Year-over-year implementation of transportation investments that align with the City's sustainability goals (e.g., number of charging stations, conversion of city fleet, codes, and standards, solar, electrification, check sustainability plan, needs to match state/metro formulas for measuring, TDM expansion)	City staff	NA						
Efficiency	Smart Cities Infrastructure Investments	Year-over-year investments in Smart Cities Infrastructure (transit, solar, electrification, city fleet, codes, and standards, etc.) with key highlights	City staff	NA						
Transportation Options	Sidewalks	Year-over-year miles of sidewalk implemented or widened to meet ADA standards to achieve goal	GIS	NA						
	Paths	Year-over-year miles of sidepaths and multi-use trails implemented to achieve goal		NA						
	Bicycle Facilities	Year-over-year miles of bike lanes implemented to achieve goal		NA						
	Transit	Year-over-year number and frequency of transit routes implemented to achieve goal		NA						
	Mobility Hubs	Year-over-year number of mobility hubs implemented to achieve goal	City Staff	NA						

11.5 Conclusion

The Thornton TMMP is a long-term transportation and mobility plan that will serve as a guide for the city as growth continues to occur. Many projects, programs, policies, and studies are recommended for all modes of transportation (vehicle, transit, bikes, walking, and wheeling could we address wheelchair use as well (per earlier comments)) to help maintain or improve the quality of life for the city's residents.

Creating a plan far in advance provides the city with a blueprint to support funding requests for implementing recommendations, as well as guidance for right-of-way preservation to ensure sufficient roadway capacity as well as curb space for transit stops and stations and safe pedestrian and bicycle facilities.

In the future, new forces and emerging technologies will impact Thornton and most communities around the globe. Examples of these include telecommuting, microtransit, electric vehicles, autonomous vehicles, and many others that will present challenges but also opportunities to better serve communities. As these continue to appear, growth continues to occur, and as projects are implemented, the Monitoring Table included in this chapter will help the city track the success of the plan or make adjustments and modifications if not achieving the goals.

Glossary

Accessibility: The ability of a facility, product, or service to be used by people with disabilities

Active transportation: Self-propelled, human-powered transportation modes like walking or biking

Alightings: Number of exits from a train, bus, or other form of transit

American Association of State Highway and Transportation Officials (AASHTO): Organization which sets standards and policies used in highway construction, air, water, rail, and public transportation

Arterial: A higher capacity roadway that delivers traffic from collectors to freeways and through urban settings

Autonomous and Connected Vehicles (AV/CV): Autonomous vehicles use technology to steer, accelerate, and brake with little to no human input. Connected vehicles use technology to either communicate with each other, connect with traffic signals, signs, and other road items, or obtain data from a cloud.

Bicycle facilities: Amenities created to accommodate people bicycling; these include bicycle routes, bicycle lanes, sidepaths, and multi-use trails

Bicycle routes: Streets with low motorized traffic volumes and speeds that use signs and pavement markings to create comfortable streets for bicyclists to share the road with people driving

Bus rapid transit (BRT): A bus route or system that performs similarly to rail due to dedicated bus lanes, high-capacity transit stations, and design features that reduce delays

Collector: A lower to moderate capacity roadway that serves to connect local street traffic with arterial roadways

Comfortable: Accommodating of and safe for users of all abilities

Complete streets: Streets that are designed to allow for convenient and comfortable travel by users of all transportation modes

Congestion: traffic while driving, including slower speeds, longer trip times, and increased vehicular queueing

Connectivity: The density of the path or road network and the directness of those links to provide travel access with minimal out of direction travel

Constrained funding/fiscal constraints: Transportation projects (vehicular, bicycle, pedestrian, and transit), operations and maintenance are funded at current levels with adjustments for inflation

Curbside management: The reallocation of curbside space for flexible uses other than parking, including bicycle facilities, bus lanes, pick-up and drop-off areas, and delivery vehicle areas

Denver Regional Council of Governments (DRCOG): DRCOG is an association of local governments in the Denver region that works to enhance the regional quality of life. DRCOG is the federally-designated metropolitan planning organization for the region.

Development Code: Chapter 18 of the Thornton City Code

Enhanced transit service: Additional features that make transit more convenient, reliable, and efficient (i.e., more frequent service, expanded hours)

First-last mile: The challenge of connecting passengers between their origin and a transit stop and between a transit stop and their destination

Freight: Commodities moved in large amounts by truck, train, ship, or aircraft

Grade separation: Separation of facilities by elevation, such as a cycletrack a few inches above the roadway, or a pedestrian overpass or underpass

Headways: The average interval of time between vehicles, particularly transit vehicles on the same route

High Injury Network (HIN): The set of roadway segments that have the highest number of fatal and severe crashes

Hybrid beacon: A flashing signal activated by people walking and biking at a crosswalk mid-block or at an intersection

Intelligent Transportation Systems (ITS): Technologies that aim to improve efficiency and safety of roadways in real time

Level of Service (LOS): A measure of vehicle congestion at intersections that grades projects from “A” to “F” based on how much delay drivers experience

Level of Traffic Stress (LTS): An approach that quantifies the level of comfort felt by people walking or biking based on factors such as the speed and volumes of adjacent vehicular traffic and presence of bicycle or pedestrian facilities

Micromobility: Small lightweight vehicles travelling at slower speeds including electric and non-electric bikes, scooters, and skateboards

Microtransit: Privately or publicly operated, technology-enabled transit service that typically uses multi- passenger/pooled shuttles or vans to provide on-demand or fixed-schedule services with either dynamic or fixed routing

Mixed-use: Development or a site or building that contains more than one type of land use, such as residential units above offices

Mobility hubs: Transit stations and the surrounding area seamlessly connecting different modes of transportation (bike share, carshare, etc.)

Mobility as a Service (MaaS): A newer concept in transportation planning that describes the integration of multiple transportation modes into a single application where a user can pay for, reserve, and plan trips

Mode share: Share of people that travel by vehicle, transit, biking, walking, etc.

Multimodal: A transportation system that provides safe and convenient options for getting around by all transportation options, including walking, biking, transit, and driving

National Association of City Transportation Officials (NACTO): A coalition of municipal departments of transportation that publishes research, best practices, and design guidelines for streets and transportation

Paratransit: Transportation services that supplement traditional fixed-route transit, including human services transportation for people with disabilities

Peak volume: Volume of vehicle traffic traveling during the morning and evening/afternoon peak hours (when most people are on the road commuting to and from work)

Pedestrian network: All the components that comprise the facilities used by pedestrians, including sidewalks, mid-block and signalized crossings, and curb ramps

Performance measures: Data metrics that help track progress toward specific goals

Protected bike lanes: On-street bike lanes that have a vertical buffer (such as a curb or plastic bollard) between the bike lane and travel lane

Rapid flashing beacon: A type of pedestrian infrastructure that includes yellow diamond-shaped signage, LED (Light Emitting Diode) flashing lights and a clearly demarcated crosswalk to allow people walking and rolling to cross safely at key points

Road diet: Lane reduction or right-sizing (reduction of the number of general travel lanes) to add improvements for other modes

Ride-Hailing: Point-to-point transportation service provided in a car, van, or bus that can be requested using a phone or web application (i.e., Uber or Lyft)

Safe Systems: An evidenced-based approach defined by FHWA to reduce fatal and severe traffic crashes

Shared mobility: Shared use of a vehicle, bicycle, or other transportation mode that allows users to access transportation services on an as-needed basis; made more common with emerging app-based on demand transportation technologies

Sidepath: A wide sidewalk that will operate like a multi-use trail located along a roadway that may be separated by a wide vegetated buffer

Single occupancy vehicle (SOV) trips: Car trips made by a solo driver

Transit coverage: The amount of area that is covered by a bus or rail route

Transit frequency: The number of transit vehicles that arrive to pick up passengers at a stop during a specified unit of time

Transit propensity: The likelihood of various groups to use or rely on transit

Transit-Oriented Development (TOD): The practice of designing and planning areas where residential and commercial spaces are more conveniently connected with various forms of transportation to make communities more livable, vibrant, and accessible

Traffic or Transportation Analysis Zone (TAZ): The unit of geography commonly used in transportation planning to estimate trip generation

Transportation Infrastructure: the foundational structures and systems for transporting people and goods. Some of the infrastructure required for the transportation networks addressed in this plan include roads, railways, walkways, transit stations, and bicycle infrastructure

Transportation Network Companies (TNCs): Ride-hailing companies like Uber and Lyft

TrendLab+: An analysis tool that forecasts how variable factors will influence future transportation patterns

Trip metering: Measuring the number of miles traveled by a vehicle; can also include the pricing of VMT

Vehicle Miles Traveled (VMT): The sum of all the miles driven by motor vehicles in a specific area (ex: City of Thornton) over a specific period (often daily)

Wayfinding: The information system, usually comprised of signs, that helps users navigate an area

Appendices

APPENDIX A

Scenario Framing & Performance Measures

Appendix A: Scenario Framing and Performance Measures

This appendix provides a detailed description of the planning scenarios evaluated for the Thornton Transportation and Mobility Plan (TMMP) and the performance measures results of each scenario.

Analysis Tool

The project team evaluated three scenarios for the TMMP using the Denver Regional Council of Governments (DRCOG) travel model, Focus. The Focus Model is a regional travel model maintained by DRCOG and used for various regional planning efforts such as the regional transportation plans, transit studies, transportation master plans, etc. The project team modified the model as necessary to evaluate the various scenarios in this plan.

Scenario Descriptions

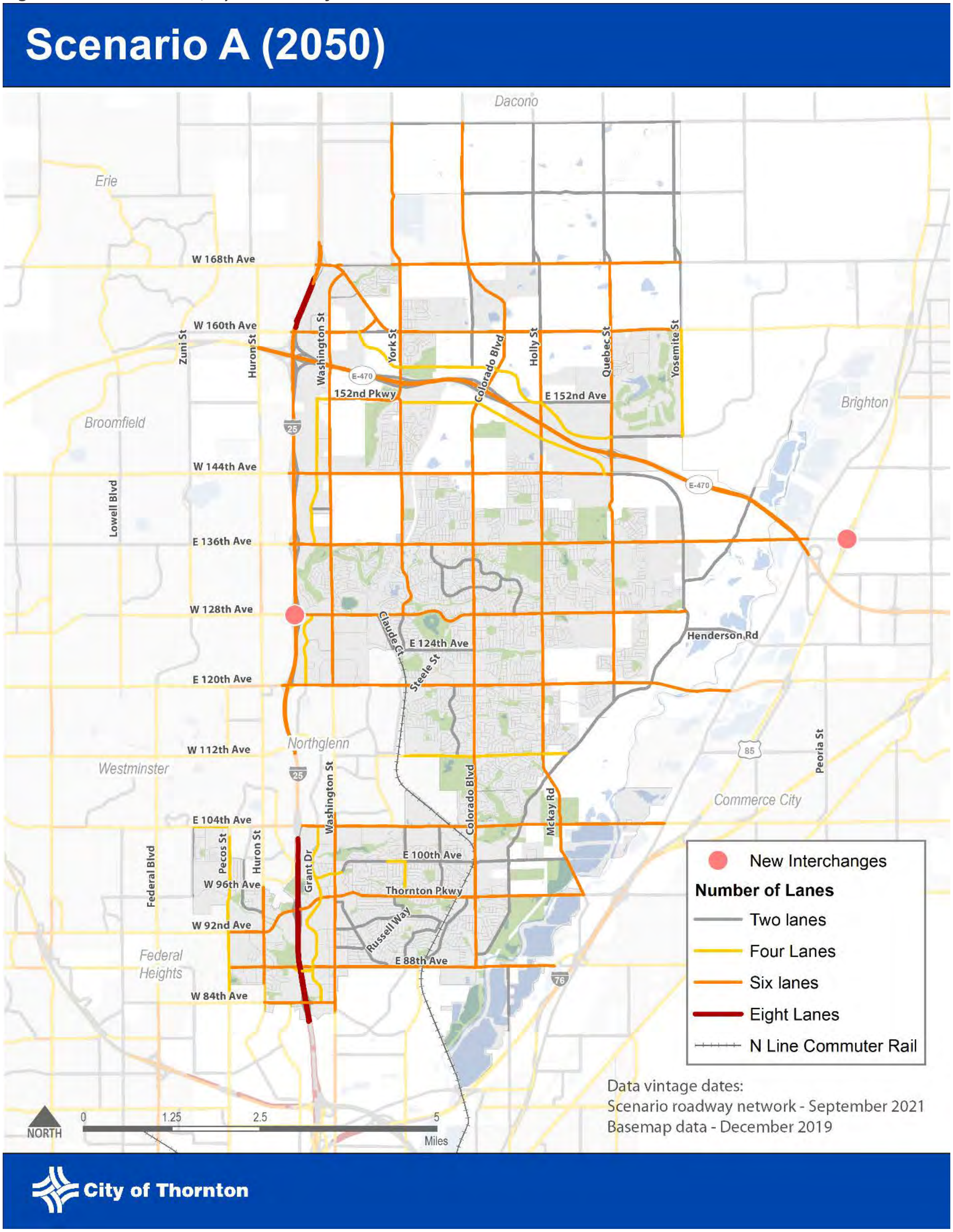
The TMMP evaluated three scenarios: Scenario A, Scenario B, and Scenario C. The project team first compared Scenarios A and B using a series of performance measures to ultimately identify a scenario that aligns with the city's vision, Scenario C.

Scenario A was developed to assess the impact on future mode share if the city maximized the roadway capacity while merely maintaining the current planned transit service as implemented by DRCOG in the Focus Model. DRCOG worked closely with RTD in this implementation. This scenario does not prioritize a shift towards active transportation modes nor include additional investments in transit. Scenario A represents a road network that reinforces current vehicular transportation choices without considering desired mode shifts. To maximize future roadway capacity for private vehicles in Thornton, Scenario A includes:

- Most arterials expanded to six lanes throughout the city (as shown in Figure A.1) to provide increased capacity for the roadway system in the city
- Two new freeway interchanges at: (1) I-25/128th Avenue and (2) US-85/136th Avenue that provide additional roadway access for Thornton residents

Both items provide additional roadway capacity and options for those using private vehicles, therefore, maximizing the roadway capacity within Thornton.

Figure A.1: Scenario A, by number of travel lanes

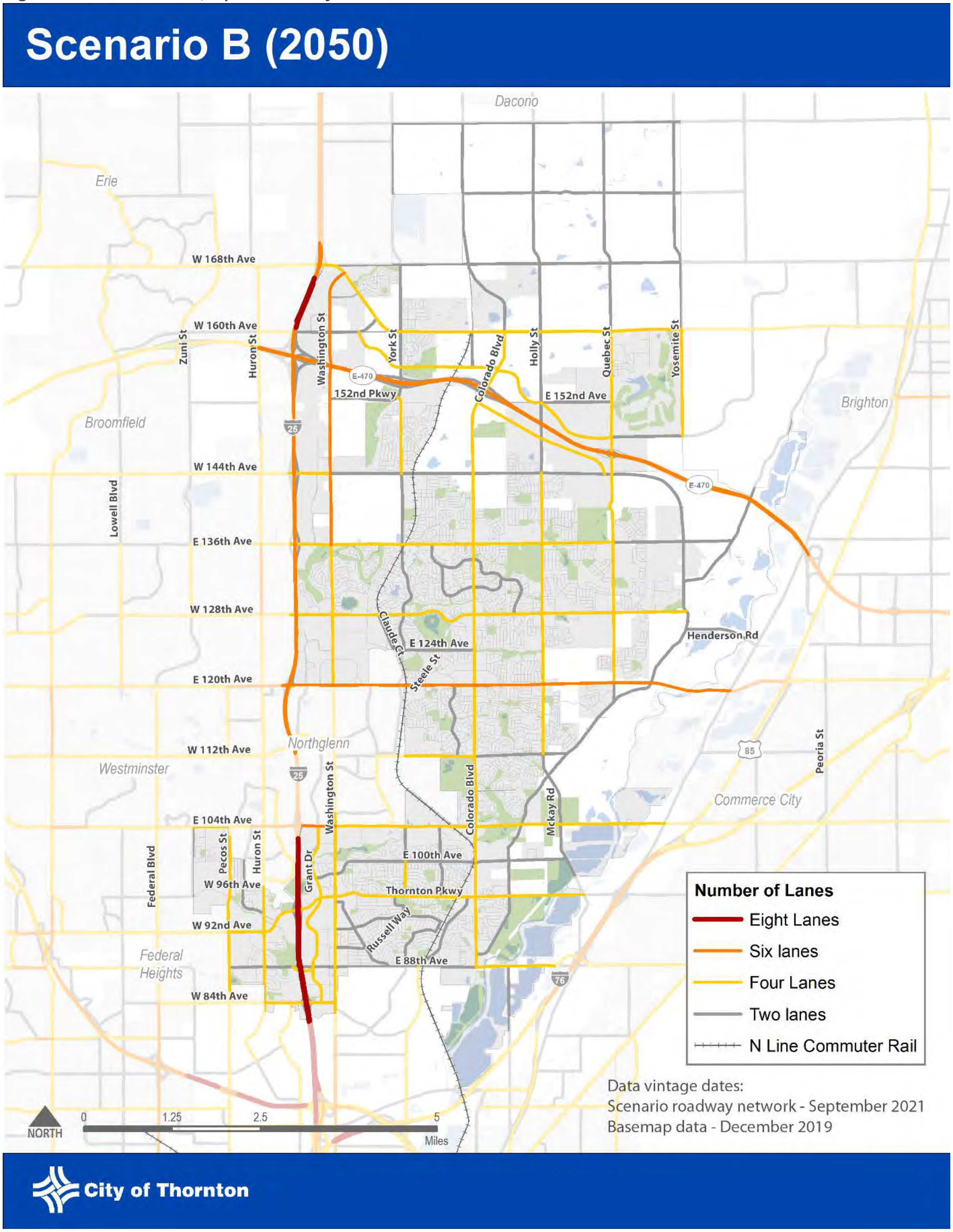


Scenario B was developed to analyze how mode share is impacted by an increase in the city's investment in frequent, well-connected transit and a low-stress active transportation network. The following key items are present in Scenario B:

- The N Line commuter rail extended to CO 7 to provide additional long-distance transit options for those living or working in north Thornton
- Additional bus routes and higher transit frequency within Thornton to provide a higher level of transit service not only for long-distance travel but also within the city
- 88th Avenue as a two-lane road with protected bike lanes to provide vertical separation between vehicles and bikes without increasing the roadway width (or right-of-way)
- CO 7 with two general purpose lanes and one transit-only lane per direction to provide better regional transit service while minimizing the roadway width
- Most arterials have four lanes (as shown in Figure A.2) to minimize the investment in roadway infrastructure and required ongoing maintenance.

All these key items align with the purpose of this scenario, which is to provide a well-connected transit and low-stress active transportation networks, with a decreased emphasis on the private vehicle.

Figure A.2: Scenario B, by number of travel lanes



Scenario C was developed using components from both planning scenarios, Scenario A and Scenario B, with input received from the public. Scenario C is in accordance with the city's vision that reflects a more holistic multimodal transportation network. Scenario C consists of two horizon years: 2030 (short-term) and 2050 (long-term).

The short-term vision corresponds to the year 2030 and includes roadway capacity projects in the 5-year Capital Improvement Plan as well as high-ranking projects from the prioritization process explained in Chapter 11. Please refer to Chapter 11 for details about the prioritization process. The key components of the short-term vision for Scenario C are:

- Widening of east-west corridors: 136th Avenue, 120th Avenue, and 104th Avenue
- Road diet of southern Grant Street segments

The long-term vision corresponds to the year 2050. The key components of the long-term Scenario C are:

- Most arterials are at least four lanes, with some six-lane segments
- Two new freeway interchanges: I-25/128th Avenue and US-85/136th Avenue
- Additional two-lane collectors parallel to E-470 (north and south)
- Various collectors to provide additional travel options
- N Line commuter rail extended to CO 7
- Heavy transit investment throughout the city

Figure A.3 and Figure 4 shows the short-term (2030) and long-term (2050) Scenario C roadway map.

Figure A.3: Number of Travel Lanes in Short-term Scenario C.

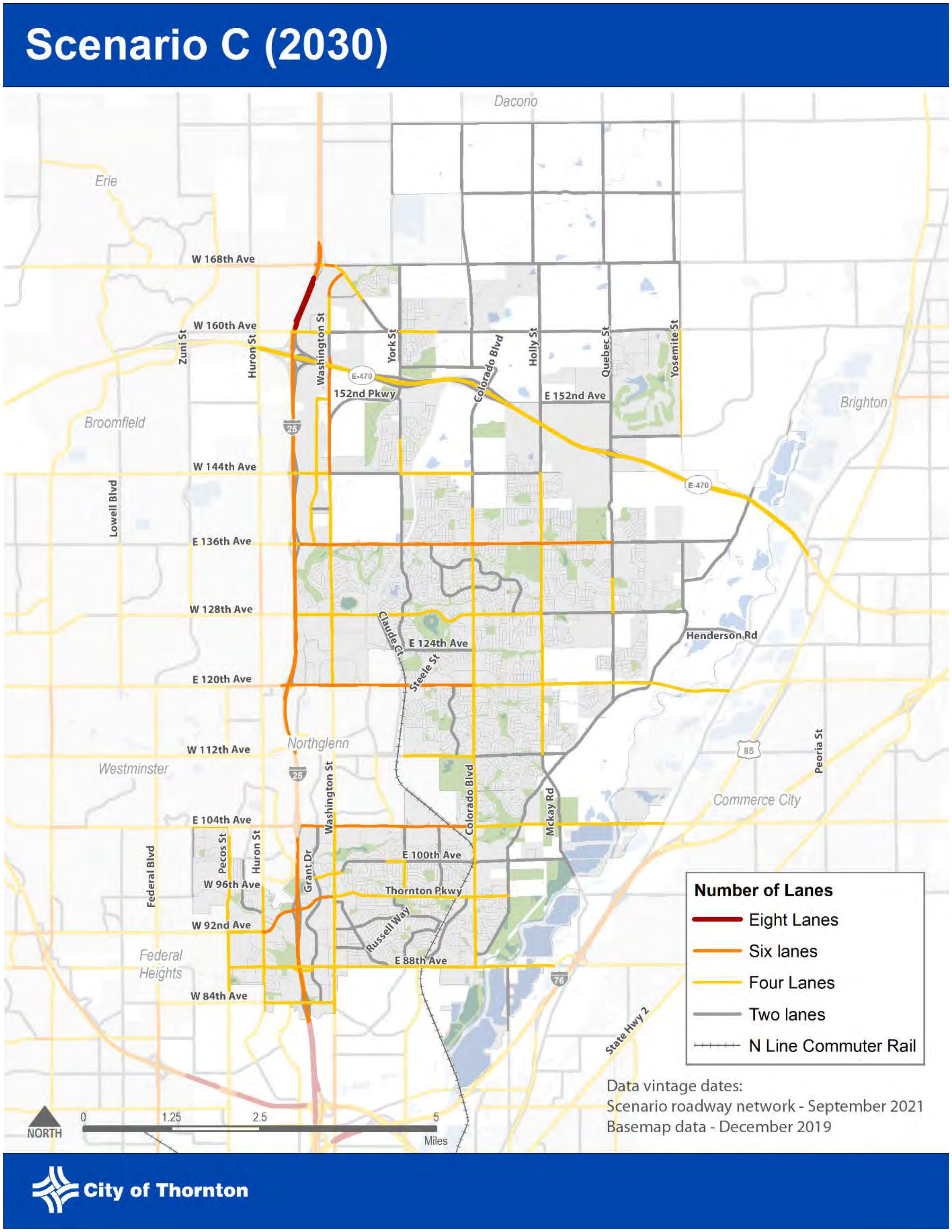
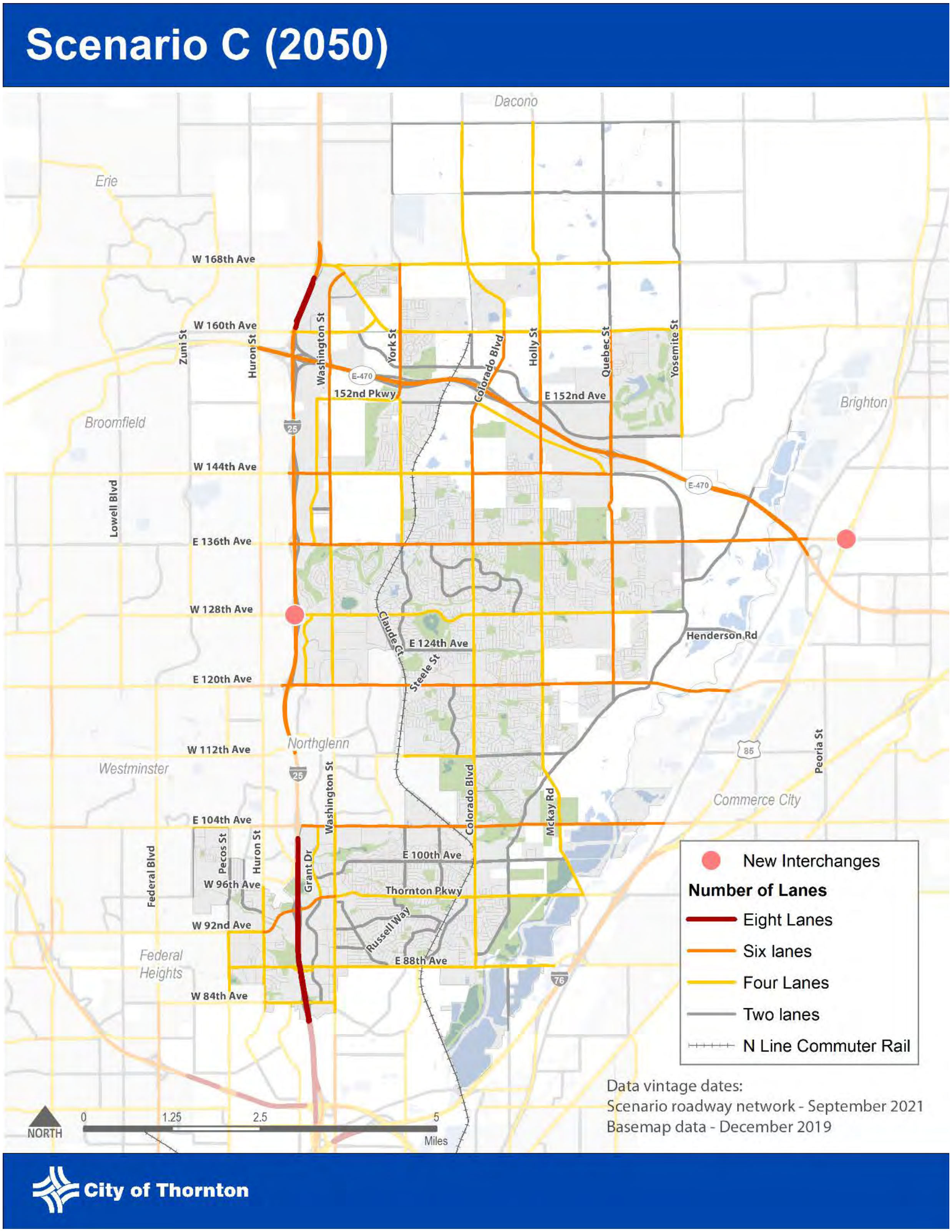


Figure A.4: Number of Travel Lanes in Scenario C



Scenario Testing and Results

The project team used the Denver Regional Council of Governments (DRCOG) travel model, Focus, as the tool to primarily understand how vehicle travel and transit service would shift based on the suggested enhancements. The two planning scenarios, Scenario A and Scenario B, were presented to the public to understand their preferences and concerns and evaluated through performance measures. Through this process, the city staff identified a scenario that aligns with the city's vision, Scenario C. All scenarios were evaluated through the following performance measures:

- Mode share – how will people travel in the future (vehicle, transit, walking, biking, etc.)?
- Volume to Capacity – what does congestion look like in the future during peak travel times?
- Corridor Travel time – how long does it take to travel key corridors in the city?
- Regional Travel Time – how long does it take to get to key regional destinations by auto and transit?
- Vehicle Miles Traveled (VMT) per household – an indicator of traffic that calculates how much people travel on a daily basis within the city. VMT consists of two components: number of vehicles on the road and number of miles traveled on the road.

Performance measures should be considered in combination with each other to form a holistic assessment of how well the transportation system works for all modes. In order to expand transportation options and mobility, performance measures may show a decrease from existing conditions for driving in order to enhance conditions for transit, walking, and biking.

2050 Performance Measures

Scenario A, Scenario B, and Scenario C were evaluated for 2050 conditions. The following sections describe the performance of each scenario based on the previously outlined performance measures.

Mode Share

The mode share performance measure provides an insight on the transportation modes that Thornton residents, employees, and visitors use to travel throughout the city. The vision for the city of Thornton includes a holistic multimodal view. Understanding how the mode share changes under each scenario helps the city accomplish this goal. Figure A.5 shows the daily and work AM peak hour mode share, respectively.

The mode share comparison between scenarios indicates the following:

- Under all scenarios, the private vehicle continues to be the predominant mode of transportation for Thornton while transit, walking, and biking have a smaller share of the trips.
- Transit utilization performs best under Scenario B and Scenario C because of the extension of the N Line commuter rail to CO 7 and the significant improvements in transit.
- In Scenario B and Scenario C, the daily transit mode share is about 1% higher than in Scenario A, which equates to about 20,000 more daily transit trips.

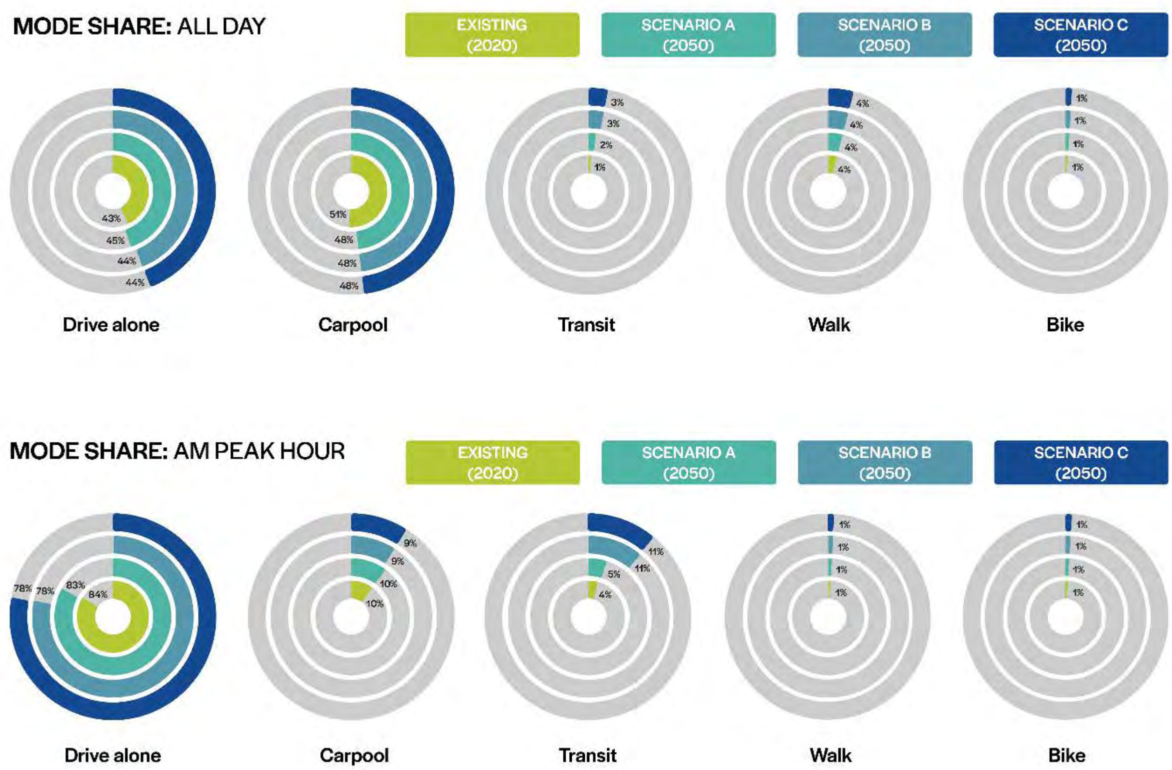


Figure A.5: 2050 Scenarios Mode Share

AM Peak Volume to Capacity Ratios

Volume to capacity (V/C) ratios are one indicator of the level of congestion a vehicular user of the roadway experiences: the higher the V/C ratio, the higher the congestion on the roadway. For this plan, the project team focused on the AM peak hour (7:00-8:00 AM) and Figure A.6 shows the V/C ratio for the existing conditions, Scenario A, Scenario B, and Scenario C. The V/C ratios comparison indicates the following:

- Under all scenarios, congestion increases from existing conditions, particularly on more regional facilities like I-25 and E-470. This can be attributed to the growth expected not only in Thornton but in the overall Denver Metro region.
- Overall, Thornton experiences more vehicular congestion under Scenario B and Scenario C than under Scenario A.
- The comparison between existing and Scenario C indicates the following:
    - Congestion levels are likely to increase due to the growth expected within the city and neighboring areas
    - Key north-south arterials are likely to experience significant congestion, particularly the southern segments of Washington Street, Colorado Boulevard, and Holly Street/McKay Road

- With the widening of several east-west arterials, congestion levels can decrease or stay like today on those facilities, such as 104th Avenue
- Although significant growth occurs in the northeast areas of Thornton, congestion levels along 144th Avenue and 136th Avenue are manageable due to the increased capacity of the roadways (mostly six-lane arterials)

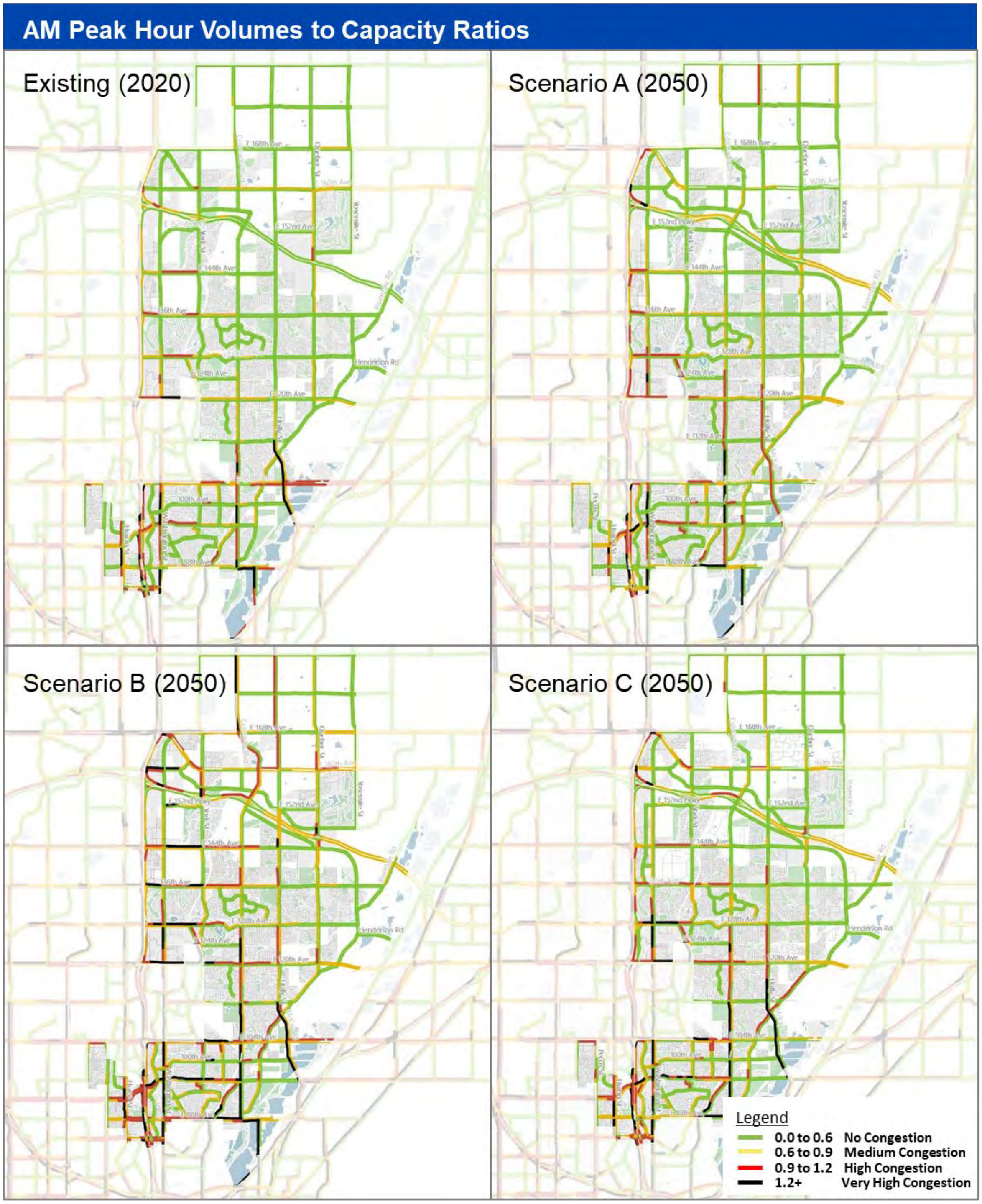


Figure A.6.2050 Scenarios AM Peak Hour Volume to Capacity Ratios.

AM Corridor Travel Times

Corridor travel times are effective indicators to compare the time that vehicles spend on a specific corridor under each scenario. The city of Thornton expects continued growth in the next 20-30 years and if no transportation improvements are made, traffic congestion and time spent on the roadways will increase. Table A.1 shows the corridor travel time comparisons for all scenarios. These results indicate that Scenario B has higher vehicular travel times on the selected corridors than Scenario A since the latter scenario prioritizes private vehicles over other modes. Since Scenario C is a combination of various components of Scenario A and Scenario B, the travel times for the corridors under Scenario C are between Scenario A and Scenario B. For example, it is estimated that it will take vehicles 13 minutes to travel on the four mile stretch of 88th Avenue in Scenario B with two lanes versus 9 minutes in Scenario A with six lanes. Since Scenario C is in between with four lanes, the travel time is also in between, with 10 minutes. The increased driving time is a trade-off for creating roadway conditions that are more conducive to walking and biking. For Scenario C, the comparison also indicates the following:

- The new interchange at US-85 / 136th Avenue with the widening to six lanes allows for a significant number of vehicles using the corridor while maintaining the same travel times as today
- Most corridors will experience an increase in travel times in the future

Table A.1. Scenarios AM Corridor Travel Times

Corridor	From	To	Existing (2020)	Scenario A (2050)	Scenario B (2050)	Scenario C (2050)
Washington Street	CO 7	84th Avenue	21 min	25 min	28 min	27 min
Colorado Boulevard	168th Avenue	88th Avenue	21 min	23 min	27 min	25 min
Holly Street	168th Avenue	96th Avenue	20 min	19 min	25 min	22 min
CO 7	Yosemite Street	Huron Street	11 min	11 min	14 min	13 min
136th Avenue	Yosemite Street	Huron Street	12 min	11 min	14 min	12 min
128th Avenue	Riverdale Road	Huron Street	12 min	11 min	15 min	14 min
120th Avenue	Quebec Street	Huron Street	11 min	11 min	14 min	12 min
104th Avenue	Holly Street	Huron Street	10 min	10 min	13 min	11 min
88th Avenue	Old Brighton Road	Huron Street	9 min	9 min	13 min	10 min

AM Peak Regional Travel Times

Regional travel times are an indicator of how competitive transit can be under each scenario. Travel times via transit are often longer than via private vehicles when traveling short distances; therefore, it is difficult for transit to compete with trips within the city. However, when reaching regional destinations such as Downtown Boulder or Union Station, public transit can provide similar or better travel times than private vehicles, particularly if public transit has its own right-of-way. For this performance measure, two regional connections were selected:

- Thornton (124th Avenue rail station) to Boulder (Downtown transit station)
- Thornton (124th Avenue rail station) to Denver (Union Station)

The regional travel times, as shown in Figure A.7, indicate the following:

- Transit travel time from Thornton to Boulder will be higher than vehicle travel times under all scenarios; however, transit is more competitive to the private vehicle under Scenario B and Scenario C due to the CO 7 Bus Rapid Transit (BRT)
- Transit travel times from Thornton to Union Station under all scenarios are shorter than vehicle travel times because of the recent extension of the N-line to 124th Avenue

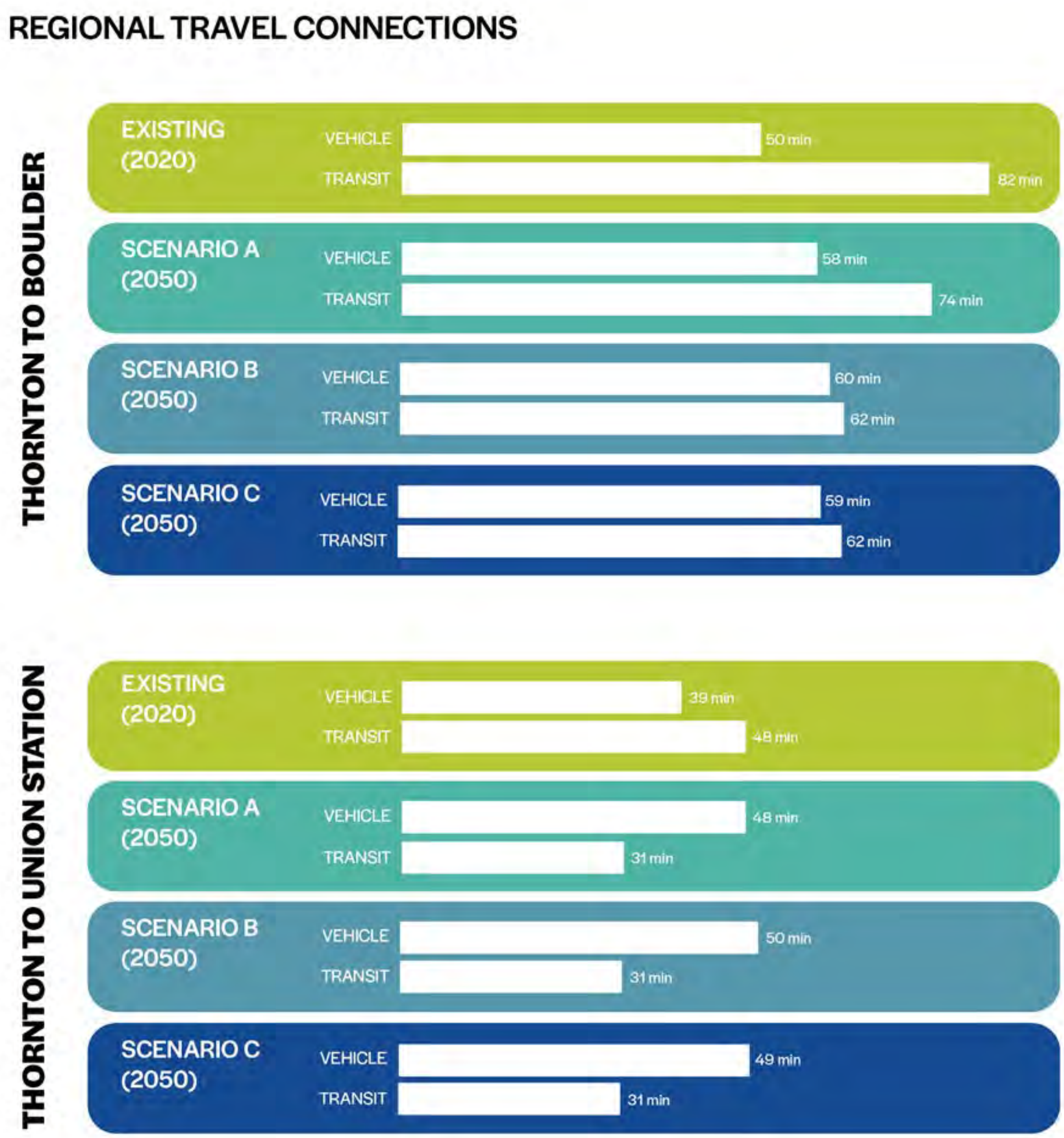


Figure A.7: 2050 Scenario regional travel times.

Vehicle Miles Traveled (VMT) per Household

Weekday vehicle miles traveled (VMT) per household is an indicator of how much people travel daily within the city. VMT consists of two components: number of vehicles on the road and number of miles traveled on the road. Essentially, VMT will be higher if more people use private vehicles or travel longer distances. Generally, a reduction of VMT is desirable to not only reduce traffic congestion but also reduce pollution, ultimately indicating a better quality of life.

The VMT per household was calculated for all scenarios and compared to existing VMT to obtain the VMT per household percent change. Table A.2 shows the projected reduction from existing VMT per household under all scenarios. This percent change results in a reduction of the VMT per household under all scenarios compared to existing primarily due to:

- More compact, mixed-use development in the future which better integrates land uses such as employment and housing, allowing more residents to live, work, and shop within close proximity in Thornton.
- For Scenario B and Scenario C, the higher reductions can be explained by a shift in travel modes due to the additional transit options, reducing the number of vehicles on the streets.

Table A.2: VMT per household percent change.

Scenario A	Scenario B	Scenario C
-9%	-11%	-10%

The performance of Scenario C represents a 2050 horizon year, which reflects the partial buildout of the city. The full buildout of the city includes more development throughout, reflecting more people and jobs within the city and through the region. As a result, full buildout is likely to have more congestion and longer travel times than what is reflected in the Scenario C analysis. However, given the uncertain timeline of when full buildout will occur, how the rest of the region will grow, and how new transportation technologies will affect travel choices, it is not possible to develop precise estimates of full buildout congestion levels or travel times.

2030 Performance Measures

Scenario C is the only scenario with a 2030 horizon year because Scenario C is the scenario that aligns with the vision of the city; Scenario A and Scenario B were only evaluated to develop this scenario.

Mode Share

The short-term Scenario C includes the N Line commuter rail between Union Station and the Eastlake - 124th Avenue Station (which opened in Fall 2020). Other transit investments planned between 2020 and 2030 are relatively small and will not significantly impact mode share, thus the transit mode share in 2030 is expected to be like 2020. Figure A.8 shows the short-term daily and work AM Peak Hour mode share, respectively.

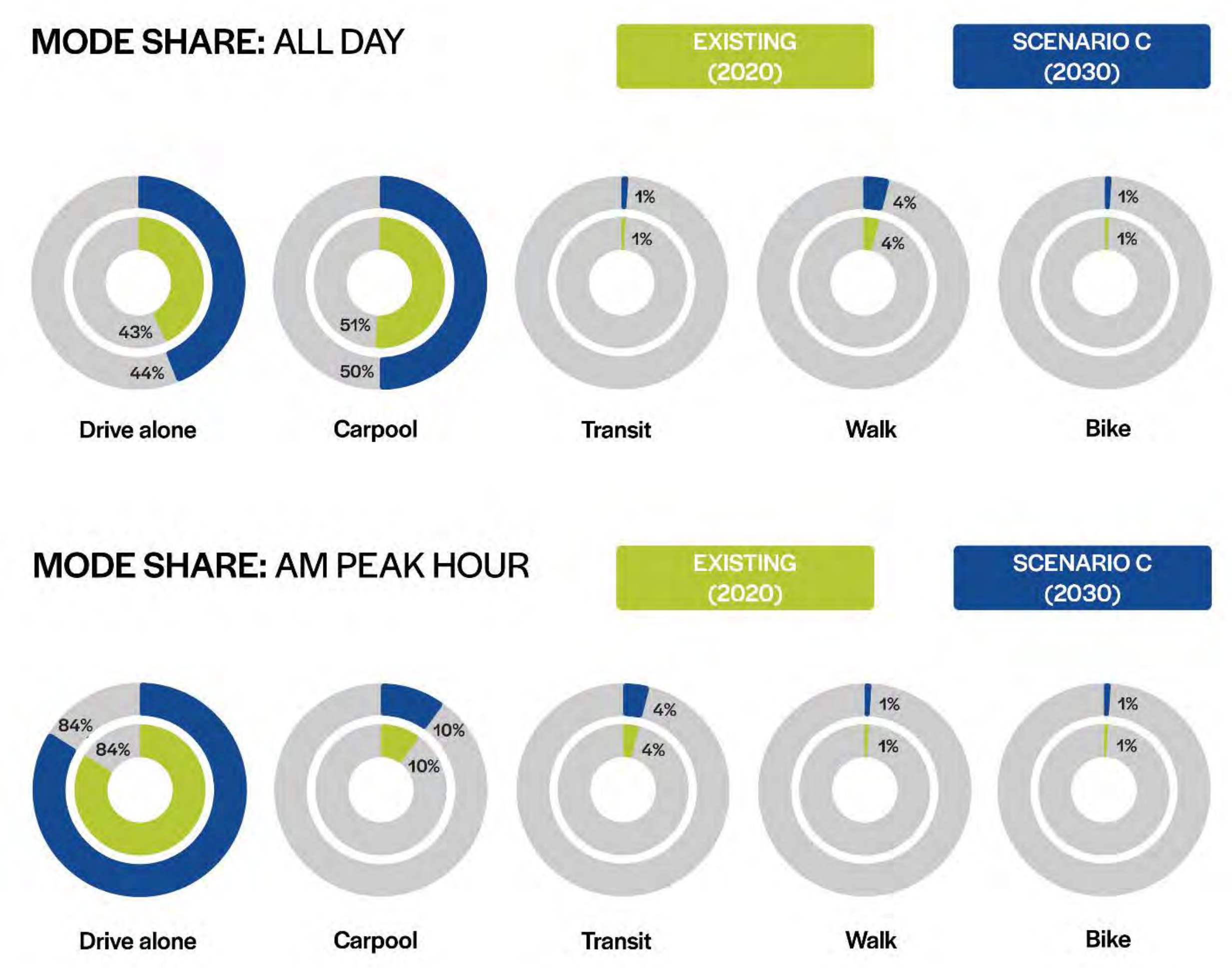


Figure A.8. 2030 Mode Shares

AM Peak Volume to Capacity Ratio

Thornton is expected to continue to grow in the next 10 years, and therefore higher traffic congestion is expected. However, the roadway projects included in the short-term Scenario C help ameliorate the congestion. Figure A.9 shows the V/C ratios for the existing conditions and the short-term Scenario C. The V/C ratio comparison indicates the following:

- Traffic congestion increases primarily on east-west corridors such as CO 7, E-470, and 88th Avenue.
- Colorado Boulevard is expected to increase congestion on the southern sections.
- Some of the projects included help alleviate traffic such as projects on 120th Avenue and 104th Avenue.

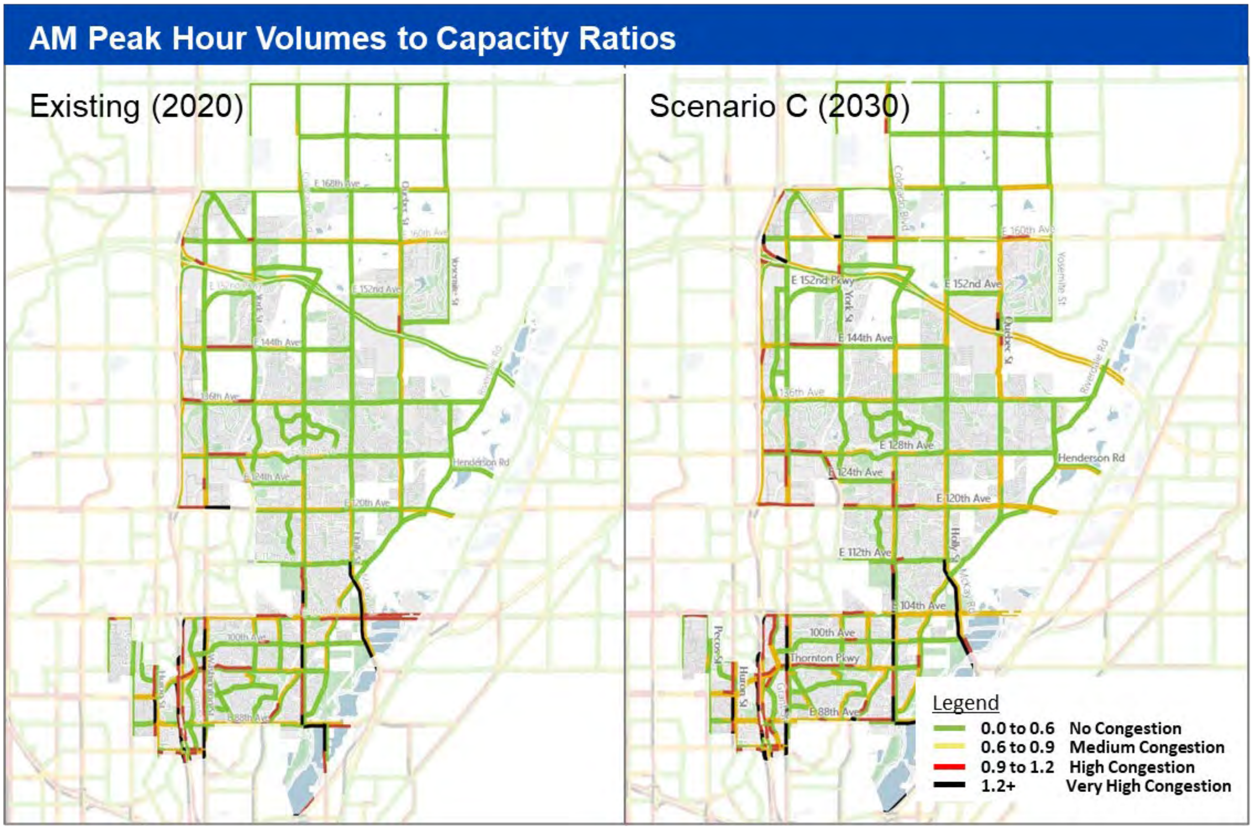


Figure A.9: 2030 Scenario C volume to capacity ratio comparison

AM Peak Corridor Travel Times

The increase in traffic congestion on several corridors also means increased travel times. The transportation improvements in the short-term Scenario C help minimize the travel time increases during the morning. Table A.3 shows the travel time differences between the short-term Scenario C and existing conditions. This comparison indicates the following:

- Roadway improvements on 136th Avenue, 120th Avenue, and 104th Avenue help maintain similar travel times between existing conditions and the short-term Scenario C
- Almost no north-south roadway improvements were included, translating in increased travel times on north-south corridors (Washington Street, Colorado Boulevard, and Holly Street)

Table A.3. Scenarios C AM Corridor Travel Times

Corridor	From	To	Existing (2020)	Scenario C (2030)
Washington Street	CO 7	84th Avenue	21 min	24 min
Colorado Boulevard	168th Avenue	88th Avenue	21 min	24 min
Holly Street	168th Avenue	96th Avenue	20 min	22 min
CO 7	Yosemite Street	Huron Street	11 min	11 min
136th Avenue	Yosemite Street	Huron Street	12 min	12 min
128th Avenue	Riverdale Road	Huron Street	12 min	13 min
120th Avenue	Quebec Street	Huron Street	11 min	11 min
104th Avenue	Holly Street	Huron Street	10 min	10 min
88th Avenue	Old Brighton Road	Huron Street	9 min	9 min

AM Peak Regional Travel Times

Regional travel times are an indicator of how competitive transit can be compared to the private vehicle. As in the previous planning scenarios, the two regional connections that were evaluated were Thornton to Boulder and Thornton to Denver. The regional travel times, as shown in Figure A.11, indicate the following:

- Thornton to Boulder: vehicle and transit travel times increase since few roadway improvements were included, and no significant transit investments were included short term.
- Thornton to Union Station: vehicle travel times increase; however, transit travel times decrease significantly due to the N-line extension to 124th Avenue.

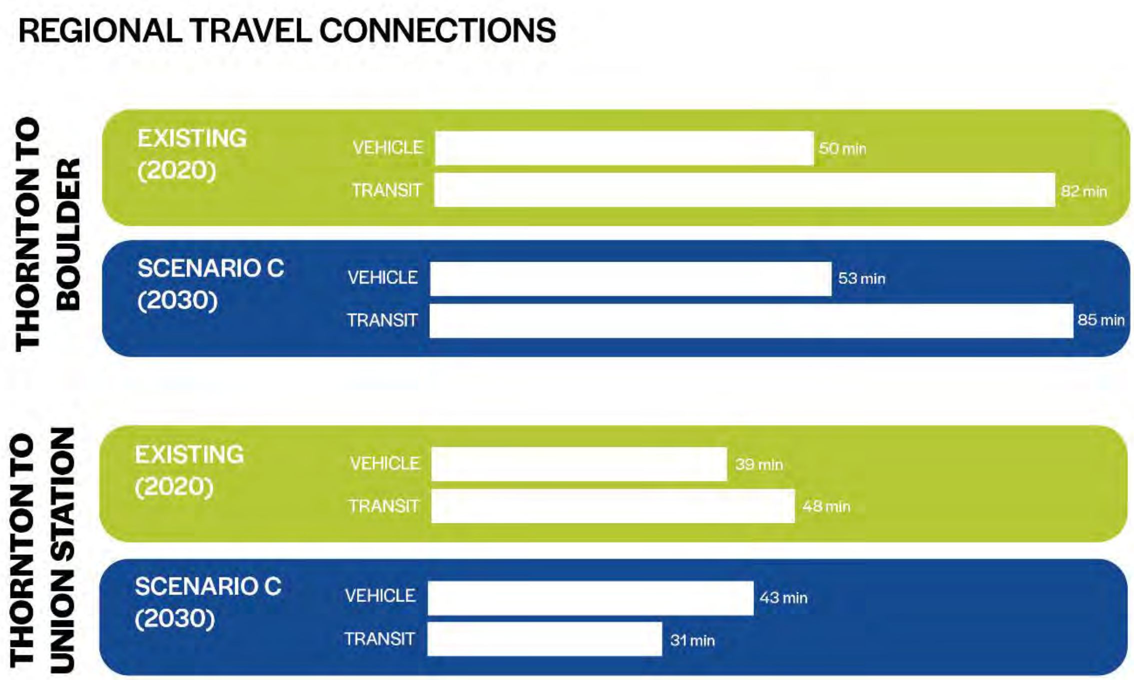


Figure A.10. 2030 Scenario C regional travel times.

VMT per Household

Weekday vehicle miles traveled (VMT) per household is an indicator of how much travel is conducted per household. The project team compared the VMT from the short-term Scenario C with the existing VMT and found that the VMT decreases by 5%. This decrease is primarily a result of the better mix of land use in the future - more jobs and housing in the city, allowing more residents to live, work, and shop within Thornton – but it is not as high as in 2050.

Conclusion

The vision of Thornton's TMMP states the desire to expand transportation options for residents and therefore it is important to account for all modes when determining the future transportation network of the city. To accomplish this, the city evaluated two initial scenarios representing different levels of transportation investments (one focused on the private vehicle and the other on transit). The performance of both scenarios was compared and, with input received from the public, the project team selected components from both scenarios to create a third, Scenario C, that better aligns with the overall vision for the plan.

Scenario C consists of a short-term and long-term plan for the city. The short-term plan indicates that although growth occurs within the city and the region, travel patterns in 2030 within the city will be similar to the existing patterns due to (1) similar transit service within the city and (2) including roadway projects at key corridors, particularly for east-west corridors like 136th Avenue and 104th Avenue.

Complementing the short-term plan, the long-term plan indicates the following key items:

- With greater investment in transit throughout the city, there is a shift in mode share, increasing the transit mode share and decreasing the private vehicle mode share.
- Private vehicle will continue to be the predominant travel mode, but a shift to other modes also occurs.
- Due to increased jobs and population in the city, along with the predominant use of private vehicles, congestion and travel times in key corridors will likely increase throughout the city.
- With the additional transit service in the future, transit can be more competitive with the private vehicle to reach regional destinations such as Union Station and downtown Boulder.
- The full buildout of the city will likely increase congestion and travel times but uncertainties in the future make the estimation of impacts difficult.

APPENDIX B

Technical Analysis Documentation

Appendix B: Technical Analysis Documentation

Introduction

The Thornton Transportation & Mobility Master Plan (TMMP) used the Denver Regional Council of Governments (DRCOG) travel model, Focus, as the tool to evaluate potential future transportation scenarios. The purpose of the modeling documentation is to outline and explain the changes made to the Focus model, the process followed to obtain results, and any assumptions made.

Focus Model

Fehr & Peers used the Focus model as the tool to analyze various transportation investments for the Thornton TMMP. The Focus model is a regional travel demand model used to help with the forecast of future travel patterns in the Denver region. This model is an activity-based model and consists of four key steps:

- Trip generation: estimate number of trips that start and end across the region
- Trip distribution: identify where these trips go
- Mode choice: identify the mode taken for each trip
- Trip assignment: assign the route these trips take

The Focus model works in TransCAD, a travel demand modeling software. This plan has 2030 and 2050 horizon years; therefore, DRCOG provided the Travel Model for years 2020 (base year), 2030, and 2050.

Review 2020 Base Year

Before using the Focus model to analyze transportation investments in Thornton, Fehr & Peers and the city of Thornton staff reviewed and made appropriate revisions to the number of roadway lanes in the 2020 base year highway network received from DRCOG. The Thornton TMMP used this modified version as the 2020 Base Year. No modification to the facility types were made. Table B.1 shows the list of changes needed for the 2020 highway network and Figure B.1 and Figure B.2 shows the number of lanes for both 2020 highway networks: (1) original (from DRCOG) and (2) modified.

The City of Thornton also provided several traffic counts from previous years to validate the 2020 base year. Using these counts and a general visual inspection of congestion patterns, the model was found to reasonably represent existing conditions. Fehr & Peers used the results of the modified 2020 baseline to compare future horizon years.

Table B.1. Changes to 2020 Highway Network

Roadway	Between		Change in Number of Lanes		Comments
	Start	Stop	From	To	
Colorado Blvd (New Alignment)	156th Ave	CO 7	1	0	Not built yet
Colorado Blvd (Existing)	156th Ave	168th Ave (Weld Co 2)	2	1	
156th Avenue	Colorado Blvd (existing)	Colorado Blvd (new)	2	1	
York St	152nd Ave	152nd Parkway	2	1	
York St	124th Ave	144th Ave	2	1	
York St	Thornton Pkwy	100th Ave	1	2	
Holly St	112th Ave	144th Ave	1	2	
McKay Rd	100th Ave	112th Ave	2	1	
Yosemite St	Ehler Pkwy	CO 7	1	2	
I-25	US 36	E-470			3 GP + 1 managed lane pe direction
98th Ave	Grant St	Corona St	1	2	
152nd Ave	RTD RR	RTD RR	1	0	152nd does not yet cross tracks

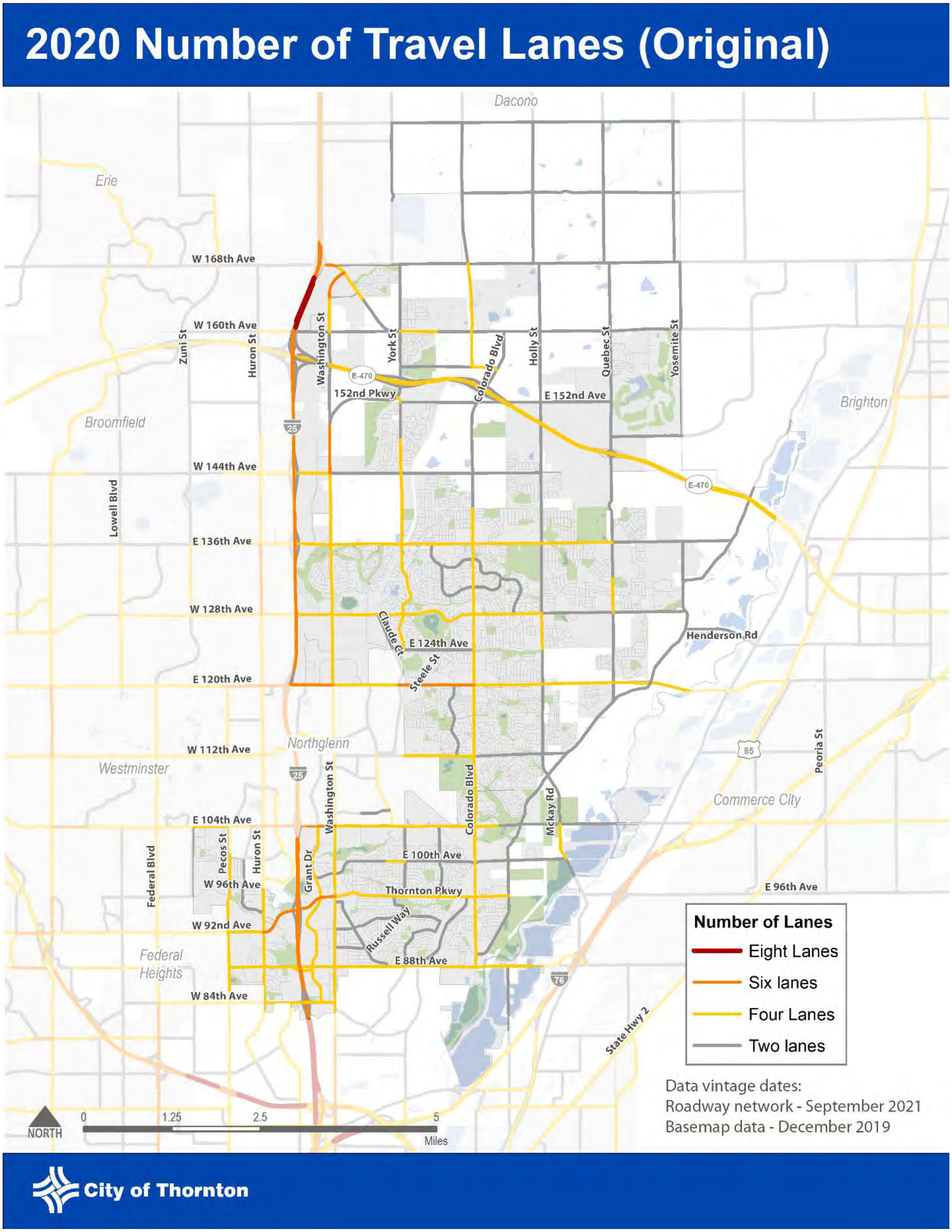


Figure B.1.Original 2020 Base Year Highway Network.

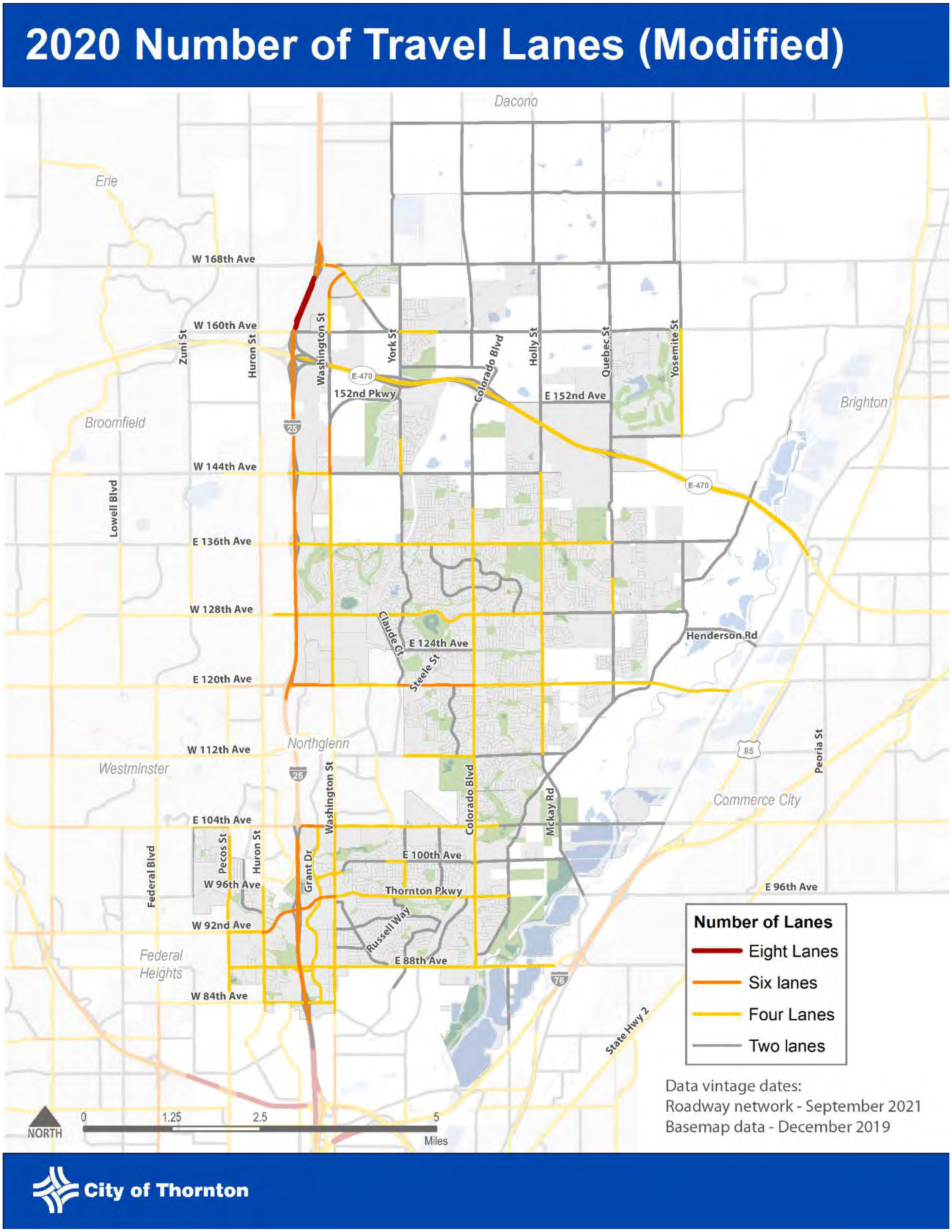


Figure B.2. Modified.2020 Base Year Highway Network.

Scenario Descriptions and Modeling Approach

To determine the optimum level of investment in different transportation modes, the Thornton TMMP project team first developed two contrasting scenarios that intentionally represented extreme levels of transportation investments. One scenario represented a high investment in roadway infrastructure (Scenario A) and the other scenario represented a high investment in transit (Scenario B). The City used the results of these scenarios to reach a more optimum third scenario, Scenario C, that includes components from both scenarios.

Scenario A

Scenario A consists of nearly all arterials converted to six-lane with new interchanges at I-25 / 128th Avenue and US-85 / 136th Avenue. Adding the two interchanges required reviewing other similar interchanges along I-25 and US-85 to follow the same style as other interchanges along these corridors. For example, US-85 is represented in the Focus model as a bi-directional link but at the interchange locations, two separate links represent the northbound and southbound direction. The same style was followed for the US-85 / 136th Avenue interchange. The transit network was similar to the original received from DRCOG which included the N Line extended to just 124th Avenue, a Bus Rapid Transit along CO 7 (which was widened to six general purpose lanes), and several bus routes connecting to the new N Line stations.

Scenario B

Scenario B has a heavier focus on transit investment. In this scenario, the project team included the completion of the N Line to CO 7 as planned in the voter-approved Fastracks rail-expansion program. The extension of the N Line required adding the RTD stations at York/144th Avenue and North Thornton/CO 7 and modifying the Park-n-Ride file to identify the end of line stations and other relevant attributes. Additionally, bus transit service would operate on all arterial roadways in Thornton and frequencies of many existing routes would be improved. Although Scenario B includes service improvements throughout the city, no bus routes/stops or service frequencies were modified. The Mode Share section of this document provides a description of the approach taken for Scenario B. Improvements to the roadway system were minimal.

Scenario C

Scenario C has components from both Scenario A and Scenario B. The key elements from each scenario include:

- Two new freeway interchanges: I-25/128th Avenue and US-85/136th Avenue
- N-line commuter rail extended to CO 7
- Heavy transit investment throughout the City

Scenario C is based on edits to the Scenario B highway and transit model networks including adding the two interchanges, adding/removing lanes to various roadways, and keeping the N Line extension to CO 7. Since Scenario C has the same transit investment levels as Scenario B, Fehr & Peers followed the same methodology explained in the Mode Share section.

Performance Metrics

Performance metrics describe the transportation network at a snapshot in time and inform the selection of a more optimum scenario. They also provide the city with a monitoring table to track the implementation of the TMMP over time. The following performance metrics were estimated for all three scenarios and described in detail in the subsections below:

- Mode share
- Volume-to-Capacity (V/C) ratios
- Local travel times
- Regional travel times
- Vehicle Miles Travelled (VMT) per household

Mode Share

The mode share for Thornton was evaluated using two criteria:

- Daily mode share for all trip purposes (work, shopping, school, etc.)
- AM peak hour work trips

The Focus model generates the *StopsData* file that includes information about all the trips in the DRCOG region (purpose, mode, time of day, etc.). From this file, all the records that have their origin or destination in Thornton were extracted and summarized based on the number of records for each mode. Figure B.3 shows the Traffic Analysis Zones (TAZs) in Thornton used in this analysis. TAZs are geographic units representing areas with common characteristics. TAZ boundaries often relate to roadways.

Fehr & Peers estimated the mode split by adding the total number of records for a mode divided by the total number of records. The Focus model has eight modes in this file that were aggregated as follows:

- Drive alone: drive alone
- Carpool: share ride 2 people, share ride 3+ people, and school bus
- Transit: drive to transit and walk to transit
- Walk: walk
- Bike: bike

Generally, regional models are better suited to evaluate roadway-related performance and not transit-related or active transportation-related performance. This is because the preponderance of trip making is made in private vehicles and more model calibration and validation data are available for these modes.

Fehr & Peers reviewed the AM peak hour work trip transit mode share against the US Census Bureau's commuting mode share from the 5-year American Community Survey (ACS) (2015-2019). It was found that the Focus model results were similar to the ACS data with the model predicting 3.3% of commute trips using transit compared to the ACS estimate of 3.4%. This strong performance under existing conditions gave us confidence that the Scenario A transit mode shares would be reasonable from the Focus model, since under that scenario, future transit service would be similar in nature to existing transit service.

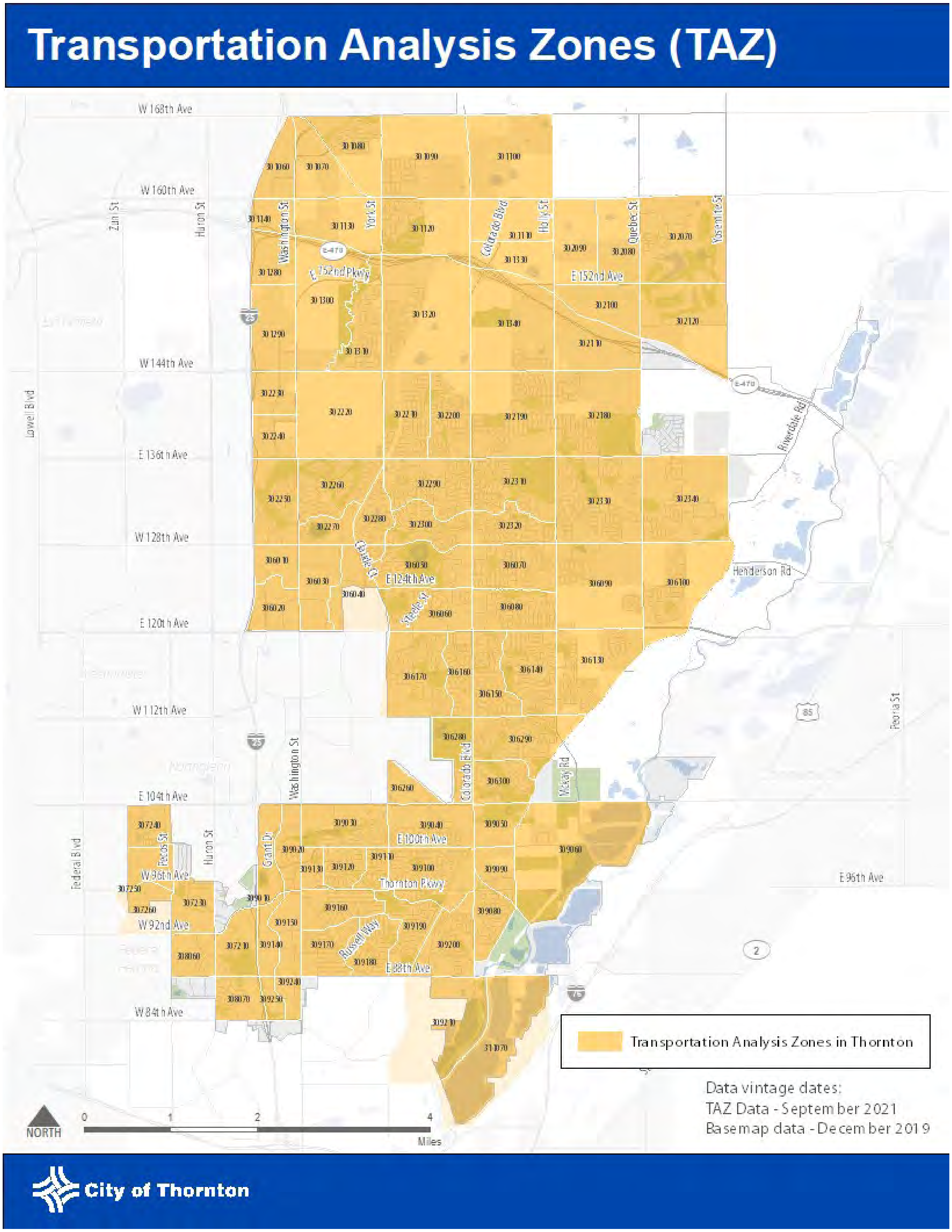


Figure B.3. Thornton TAZs for Mode Share Analysis.

While the existing Focus model showed strong validation to transit mode share, our experience with large regional travel models shows that outlying suburban mode share results often are not responsive to changes in the transit network coding. Given the time it takes to code and run the Focus model, instead of using the laborious method of adding bus routes and stops on all the arterial roadways in Thornton, Fehr & Peers modeled Scenario B using a different approach, with steps outlined below.

- Step 1: Extend the N-Line to CO 7 and add two additional stations (at 144th Avenue and CO 7) in the 2050 Focus model.
- Step 2: Find a peer community that currently has a level of transit service similar to Thornton's transit vision. Fehr & Peers determined that Aurora, west of E-470 and south of I-70, is a good peer community because it has transit on every major arterial, some high frequency transit routes, and centrally located rail line similar to what is envisioned for Thornton.
- Step 3: Obtain the 2020 mode share for Aurora from the Focus model using the same methodology previously outlined for Thornton.
- Step 4: Compare the Thornton and Aurora transit mode share in the 2020 Baseline using the Focus model with Census data. This involved comparing the journey to work transit mode share from the most recent five-year ACS for Thornton with the all-day work trips transit mode share in the Focus model. As noted earlier, this comparison indicates that the mode share estimates from the Focus model are similar to the ACS mode share for Thornton, but also for Aurora. Table B.2 shows the ACS and DRCOG all-day work trip transit mode share for both Thornton and Aurora.

  Table B.2. 2019 ACS and 2020 DRCOG Transit Mode Shares

	Thornton	Aurora
2019 ACS	3.4%	5.6%
2020 DRCOG	3.3%	5.0%

  Given that the 2019 ACS and 2020 DRCOG transit mode shares are similar, Fehr & Peers did not conduct further model calibration of the transit component of the model.
- Step 5: The mode shares reported for the TMMP include all-day all trip and AM peak hour work trips. Fehr & Peers developed a factor to increase the transit mode share and reduce all other modes. Fehr & Peers conducted the following:
  - Obtain all-day all trips transit mode share for Thornton and Aurora, shown in Table B.3
  - Since the future transit vision for Thornton is similar to Aurora's existing level of transit service, the factor to adjust the transit mode share is the Aurora daily transit mode share divided by the Thornton daily transit mode share, which equals 1.95, as shown in Table B.3
  - Apply this factor to Scenario B transit mode share for both all-day all trip and AM peak work trip mode shares
  - Proportionally adjust all other mode shares to add to 100%

Table B.3 shows the mode share adjustment process and final mode share for all-day all trips. Fehr & Peers used the same factor (1.95) to adjust the AM peak hour work trips mode share.

Table B.3. Mode Share Adjustment Process.

2020 Baseline Daily Transit Mode Shares	
Aurora	2.3%
Thornton	1.2%
Factor	1.95
Scenario B – Thornton Daily Mode Shares from Model	
Drive Alone	45.0%
Shared Ride	48.4%
Transit	1.7%
Walk	3.6%
Bike	1.3%
Scenario B – Final Thornton Daily Mode Shares	
Drive Alone	44.2%
Shared Ride	47.6%
Transit	3.4%
Walk	3.5%
Bike	1.3%

The final daily and AM peak hour mode shares for all scenarios are shown in Table B.4 and Table B.5.

Table B.4. Daily Mode Share for All Trips for All Scenarios.

	Existing	Scenario A	Scenario B	Scenario C
Drive Alone	43%	45%	44%	44%
Carpool	51%	48%	48%	48%
Transit	1%	2%	3%	3%
Walk	4%	4%	4%	4%
Bike	1%	1%	1%	1%

Table B.5. AM Peak Hour Work Trips Mode Share for All Scenarios.

	Existing	Scenario A	Scenario B	Scenario C
Drive Alone	84%	83%	78%	78%
Carpool	10%	10%	9%	9%
Transit	4%	5%	11%	11%
Walk	1%	1%	1%	1%
Bike	1%	1%	1%	1%

AM Peak Hour V/C Ratios

A commonly used performance measure to estimate the level of congestion on a roadway is the volume-to-capacity (v/c) ratios on a roadway. If a roadway is approaching capacity, the roadway is likely experiencing high congestion. The Focus model reports the v/c ratios for all the roadways represented in the model for various hours of the day. For the Thornton TMMP, the 2020 AM and PM peak hours were compared visually to determine which hour has more congestion in Thornton. Fehr & Peers determined that the AM peak hour was the most congested, and therefore the AM peak hour was reported for all scenarios.

The 2020 baseline and Scenario A used the v/c ratios as reported from the roadway changes made in the Focus model. However, Scenario B and Scenario C needed further adjustment because the mode share for transit was increased and the mode share for all other modes was decreased to reflect the additional transit service throughout the city. To reflect the benefits of higher transit usage on the roadway conditions, Fehr & Peers adjusted the vehicle origin and destination tables. This adjustment involved determining the adjustment factor to decrease the vehicle trips coming out and going into Thornton's TAZs. The adjustment factor is the adjusted Thornton mode share divided by the original Thornton mode share. Table B.6 shows the calculations for Scenario B and Scenario C.

Table B.6. Adjustment Factor Process for Scenario B and Scenario C.

Scenario B			
Mode	Original Mode Share	Adjusted Mode Share	Adjustment Factor
Drive Alone	45.0%	44.2%	0.983355
Carpool	48.4%	47.6%	0.983355
Scenario C			
Mode	Original Mode Share	Adjusted Mode Share	Adjustment Factor
Drive Alone	45.2%	44.4%	0.983394
Carpool	48.3%	47.5%	0.983394

Fehr & Peers applied these adjustment factors to the trips by drive alone, shared ride with 2 people, and share ride with 3+ people that have their origins or destinations in a Thornton TAZ (Figure B.3 shows the TAZs identified as Thornton). After applying these adjustment factors, Fehr & Peers executed the assignment step of the model. This step involves assigning the vehicle trips in the region to the highway network; because the vehicle trips from Scenario B and Scenario C were reduced to account for the additional transit availability, these reduced trips were assigned to the network by only executing the assignment step of the Focus model. The v/c ratio for Scenario B and Scenario C came from the results of only executing the assignment step of the Focus model with the adjustments made.

AM Peak Hour Corridor Travel Times

Similar to the v/c ratios, corridor travel times for 2020 and Scenario A came directly from the roadway changes made in Focus Model. Since the corridor travel times are dependent on the traffic volumes on the roads, the corridor travel times for Scenario B and Scenario C are a result of the assignment-only model explained earlier. Fehr & Peers used the Shortest Path tool to obtain the AM peak hour travel times for all corridors listed in Chapter 4. The Shorthest Path tool is a built-in tool within TransCAD to identify the shortest path between two points.

AM Peak Regional Travel Times

The regional travel times for the plan reflect the vehicle and transit travel times from Thornton to Boulder and from Thornton to Union Station. The Thornton origin location was the rail station at 124th Avenue. For the vehicle travel times, Fehr & Peers reported the travel time in the single occupancy vehicle skim matrix for all scenarios. For transit travel time, Fehr & Peers followed the methodology outlined in Table B.7. The in-vehicle travel times (travel time in the bus or train) were informed by the current Regional Transportation District schedule.

Table B.7. Regional Transit Travel Time Methodology.

	2020 Baseline	Scenario A	Scenario B & C
Thornton to Boulder	• 12-minute walk to 120th Ave • 30-minute ride on Route 120 to Broomfield Station • 3-minute walk • 8-minute wait to transfer • 29-minute ride on Route FF1 to Downtown Boulder	• 3-minute walk to 120th Ave[1] • 31-minute ride on Route 120 to Broomfield Station • 3-minute walk • 8-minute wait to transfer • 29-minute ride on Route FF1 to Downtown Boulder	• 3-minute walk • 8-minute ride on the N-line to North Thornton – Hwy 7 Station • 3-minute walk • 8-minute wait to transfer • 40-minute ride on SH7 BRT to Downtown Boulder
Thornton to Union Station	• 12-minute walk to 120th Ave • 6-minute ride on Route 120 to Wagon Road Park-n-Ride • 8-minute wait for transfer • 22-minute ride on 120X to Union Station	• 3 minutes to walk • 28-minute ride on the N-line	• 12-minute walk to 120th Ave • 6-minute ride on Route 120 to Wagon Road Park-n-Ride • 8-minute wait for transfer • 22-minute ride on 120X to Union Station

1. *Walk time different from 2020 due to routing change of Route 120 to N-line and travel time on Route 120 is 1 minute more due to increased congestion despite more direct route alignment.*

Vehicle Miles Travelled (VMT) Per Household

The Focus model reports the VMT for every roadway link in the model. However, to report the VMT generated only by Thornton TAZs, a “select link” or “select zone” analysis is needed. A select link (or select zone) analysis tracks either the trips that use the selected link(s) or the trips generated by the selected zone(s). The Focus model has the capability to do a select link analysis and requires a query file with a list of the TAZs. For this analysis, Fehr & Peers included the TAZs highlighted in Figure B.3 in the query file and executed the assignment step of the Focus model.

The Focus model has 10 time periods that represent the 24 hours of the day: three AM periods, three PM periods, and four off-peak (OP) periods. The select zone analysis results in 20 files, 10 for passenger cars (one for each time period), and 10 for commercial vehicles[1] (one for each time period). These 20 files contain a list of all the roadway links included in the model with the vehicle flow of the Thornton TAZs passing though each roadway link. To estimate the VMT generated by Thornton on each roadway link, Fehr & Peers multiplied the Thornton vehicle flow on the link by the distance of the link. However, these 20 files represent only one hour of the time period, therefore Fehr & Peers multiplied the VMT on

[1] Commercial vehicle is a vehicle designation within the DRCOG Travel Model, Focus.

each file by the number of hours in the time period. Table B.8 shows the number of hours in each time period.

Table B.8. Number of Hours in DRCOG's Time Periods.

Time Period	Time of the Day	Number of Hours
AM1	6:00AM – 7:00AM	1
AM2	7:00AM - 8:00AM	1
AM3	8:00AM - 9:00AM	1
OP1	11:00PM – 6:00AM	7
OP2	9:00AM - 11:00AM	2
OP3	11:00AM - 3:00PM	4
OP4	7:00PM - 11:00PM	4
PM1	3:00PM - 5:00PM	2
PM2	5:00PM - 6:00PM	1
PM3	6:00PM - 7:00PM	1

To calculate the daily VMT generated by Thornton, Fehr & Peers aggregated the VMT for all the roadway links for all time periods. Table B.9 shows the calculations for one roadway link representing a portion of 128th Avenue. In this example, the total VMT on the roadway segment is higher than the VMT on that segment generated by Thornton, which means vehicles from outside of Thornton are also using that roadway segment.

Table B.9. VMT Sample Calculations for one Roadway Link.

Time Period	Number of Hours	Commercial Vehicles	Passenger Vehicles	Total Vehicle Flow per Hour	Number of Hours	Period Total Vehicle Flow
AM1	1	11	370	381	1	381
AM2	1	18	1,000	1,018	1	1,018
AM3	1	13	845	858	1	858
OP1	7	1	48	49	7	343
OP2	2	12	517	529	2	1,058
OP3	4	16	566	582	4	2,328
OP4	4	4	325	329	4	1,316
PM1	2	10	813	823	2	1,646
PM2	1	12	955	967	1	967
PM3	1	8	760	768	1	768
Daily VMT generated by Thornton on the roadway link						10,683
Daily VMT on the roadway link						11,084

After the estimation of the daily VMT generated by Thornton, the daily VMT was divided by the number of households in Thornton TAZs. The total number of households for 2020 and 2050 is 53,184 and 90,248, respectively.

Conclusion

The TMMP used the Focus model, a regional travel demand model maintained by DRCOG, as the tool to evaluate the performance of potential future scenarios for Thornton. The project team developed three planning scenarios for this evaluation:

- Scenario A: high investment in roadway infrastructure
- Scenario B: heavier focus on transit investment
- Scenario C: recommended scenario with components from Scenario A and Scenario B

The purpose of this appendix is to outline and explain the changes made to the Focus model, the process followed to obtain results, and any assumptions made for the evaluation of all three scenarios. The performance measures evaluated using the Focus model were:

- Mode share
- V/C ratios
- Local travel times
- Regional travel times
- Vehicle Miles Travelled (VMT) per household

Fehr & Peers developed methodologies to evaluate these performance measures and documented the process for future reference.

APPENDIX C

Prioritization Methodology

Appendix C: Prioritization Methodology

The following inputs will be used to prioritize proposed bicycle and roadway projects and organize into tiers. Tables C.1 to C.5 illustrate the scoring system used for each of the listed inputs.

1. **Access to key destinations**- number of facilities within set distance of bus stops, commuter rail stations, schools, parks, key destinations, and trail access points
2. **Safety-** weighted number of crashes for a project segment, based on severity
3. **Demand**- number of people served, including population and employment density factors
4. **Equity**- improved access for underserved, based on number/proximity of low income households
5. **Bicycle facility-** presence of bike lane evaluated for roadway projects only

1. **Access to key destinations** – *Does the proposed project provide access to key destinations?* Equally weighted; Projects within a buffer of the following key destinations:

- Bus Stops – ¼ mile
- Commuter Rail Stations – ½ mile
- Parks and Open Lands – ¼ mile
- Schools – ½ mile
- Trail Access Points – ¼ mile
- Government/Civic Buildings – ¼ mile

Table C.1: Key Destinations Scoring

Score	**Roadway projects** Number of Key Destinations	**Bikeway projects** Number of Key Destinations
1	*0*	*0*
2	*1-9*	*1-7*
3	*10-35*	*8-15*
4	*36-84*	*16-25*
5	*85+*	*26+*

2. **Safety** – *Does the proposed project address roadway safety concerns in the City?* Number of crashes on a proposed project segment. Crashes resulting in death or severe injury will be weighted as two crashes for roadway projects. For the bikeway projects, each crash involving a cyclist or pedestrian will be weighted as four crashes. Bicycle and pedestrian-involved crashes are less prevalent nominally but tend to be more severe in nature. Weighting bicycle and pedestrian-involved crashes more heavily helps to normalize crash data during the prioritization process.

Table C.2: Corridor Safety Scoring

Score	**Roadway projects** Total number of crashes, with those resulting in serious injury or fatality counting as 2	**Bikeway projects** Total number of crashes, with those resulting in injury or fatality counted as 2, and bike or pedestrian involved crashes counted as 4
1	*0*	*0*
2	*1-55*	*1-8*
3	*56-201*	*9-19*
4	*202-556*	*20-50*
5	*557+*	*51+*

3. **Demand** – *How many people does the proposed project serve?*
   Based on a transportation demand index that was developed using two factors:

   - Max Population density (pop/mi^2) + Max Employment Density (Job/mi^2)

Table C.3: Demand Scoring

Score	**Roadway projects** (Max Population + Employment Density/Mi)	**Bikeway projects** (Max Population + Employment Density/Mi)
1	*<2170*	*<2645*
2	*2170-5525*	*2645-6065*
3	*5526-9240*	*6066-7825*
4	*9241-13940*	*7826-9055*
5	*>13940*	*>9055*

4. **Equity** – *Does this project improve access for underserved (i.e. low income) populations?*

Table C.4: Equity Scoring

Score	**Roadway projects** (Max Low Income Households/SqMi)	**Bikeway projects** (Max Low Income Households/SqMi)
1	*<8*	*<8*
2	*9-27*	*8-41*
3	*28-150*	*42-99*
4	*151-320*	*100-274*
5	*>320*	*>274*

5. **Bicycle facility** – *Is there a bike lane included?*
   Evaluated for roadway projects only.

Table C.5: Bike Scoring

Score	Roadway projects
0	*Not included*
2	*Bike facility included*

Final project scores: Roadway

Name	Project	Extent 1	Extent 2	Count bus stops	Count light rail stations	Count schools	Count parks	Count key destinations	Count trail access points	Sum key destinations	Key destination score	Count crashes	KSI crashes	Crash weight	Crash score	Max pop and jobs	Demand score	Max low income households	Equity score	Bike facility	Bike score	Final score	Tier
Grant St	Road diet - remove 2 travel lanes	84th Avenue	Thornton Parkway	30	0	12	5	2	21	70	4	1797	25	1822	5	16711	5	733	5	Yes	2	21	1
Thornton Pkwy	Widen by 2 travel lanes	I-25	Washington Street	10	0	8	8	2	78	106	5	1188	16	1204	5	16711	5	921	5	No	0	20	1
104th Ave	Widen by 2 travel lanes	Colorado Blvd	US 85	18	1	4	9	0	71	103	5	1217	29	1246	5	10797	4	320	4	Yes	2	20	1
104th Ave	Widen by 2 travel lanes	Marion St	Colorado Blvd	18	1	4	9	0	71	103	5	1217	29	1246	5	10797	4	320	4	Yes	2	20	1
136th Ave	Widen by 2 travel lanes	I-25	Quebec	1	0	8	14	2	111	136	5	906	14	920	5	7690	3	89	3	Yes	2	18	1
Grant St	Road diet - remove 2 travel lanes	Thornton Parkway	104th Avenue	10	0	8	3	1	45	67	4	551	5	556	4	10797	4	320	4	Yes	2	18	1
120th Ave	Widen by 2 travel lanes	Washington Street	Irma Drive	4	0	5	0	2	24	35	3	998	11	1009	5	1039101	5	1400	5	No	0	18	1
144th Ave	Widen by 2 travel lanes	I-25	Washington Street	0	0	1	0	0	82	83	4	333	8	341	4	7986	3	150	4	Yes	2	17	1
120th Ave	Widen by 2 travel lanes	Irma Drive	Railroad	12	0	2	6	0	26	46	4	269	5	274	4	9239	3	319	4	No	0	15	1
Washington St	Widen by 4 travel lanes	152nd Parkway	E-470	0	0	1	2	0	81	84	4	178	6	184	3	7690	3	89	3	Yes	2	15	1
144th Ave	Widen by 2 travel lanes	York Street	Colorado Boulevard	0	1	2	2	0	23	28	3	22	0	22	2	7344	3	38	3	Yes	2	13	1
160th Ave	Widen by 2 travel lanes	I-25	Washington Street	0	0	0	0	0	5	5	2	199	2	201	3	2647	2	0	1	Yes	2	10	1
Grant St	New 4 lane roadway	150th Avenue	152nd Avenue	0	0	1	0	0	13	14	3	76	3	79	3	2169	1	0	1	Yes	2	10	1
152nd Ave	New 4 lane roadway	Grant St	Washington St	0	0	0	0	0	0	0	1	35	1	36	2	2169	1	0	1	Yes	2	7	1
136th Ave	Widen by 4 travel lanes and new road	Quebec St	US 85	1	0	8	14	2	111	136	5	906	14	920	5	7690	3	89	3	Yes	2	18	2
120th Ave	Widen by 2 travel lanes	Colorado Blvd	US 85	18	0	3	10	1	38	70	4	437	7	444	4	9742	4	128	3	No	0	15	2
Washington St	Widen by 2 travel lanes	136th Avenue	144th Avenue	0	0	1	2	0	81	84	4	178	6	184	3	7690	3	89	3	Yes	2	15	2
Colorado Blvd	Widen by 2 travel lanes and realign north of E-470	136th Avenue	CO 7	1	1	1	5	1	75	84	4	100	2	102	3	7344	3	38	3	Yes	2	15	2
Washington St	Widen by 2 travel lanes	160th Avenue	164th Avenue	0	0	1	2	0	81	84	4	178	6	184	3	7690	3	89	3	Yes	2	15	2
Washington St	Widen by 4 travel lanes	E-470	160th Avenue	0	0	1	2	0	81	84	4	178	6	184	3	7690	3	89	3	Yes	2	15	2
York St	Widen by 2 travel lanes	136th Avenue	144th Avenue	0	1	1	2	0	61	65	4	10	0	10	2	6637	3	55	3	Yes	2	14	2
CO 7	Widen by 4 travel lanes	I-25	Yosemite St	0	1	0	4	0	25	30	3	244	17	261	4	95592	5	8	2	No	0	14	2
Thornton Pkwy	New 4 lane roadway	Riverdale Road	McKay Road	0	0	0	5	0	0	5	2	21	1	22	2	6523	3	254	4	Yes	2	13	2
Quebec St	Widen by 4 travel lanes	120th Avenue	CO 7	0	0	2	4	0	55	61	4	149	7	156	3	2113	1	27	3	Yes	2	13	2
144th Ave	Widen by 2 travel lanes	Washington Street	York Street	0	1	2	2	0	23	28	3	22	0	22	2	7344	3	38	3	Yes	2	13	2
128th Ave	Widen by 2 travel lanes	I-25	Washington Street	0	0	2	2	0	24	28	3	197	2	199	3	5525	3	0	1	Yes	2	12	2
York St	Widen by 4 travel lanes	152nd Parkway	168th Avenue	0	0	1	4	0	75	80	4	29	2	31	2	3271	2	17	2	Yes	2	12	2

144th Ave	Widen by 4 travel lanes	Colorado Boulevard	Quebec Street	0	0	0	0	0	38	38	4	44	1	45	2	2808	2	11	2	Yes	2	12	2
McKay Rd	Widen by 2 travel lanes	104th Avenue	112th Avenue	0	0	2	6	0	11	19	3	47	2	49	2	5524	2	40	3	Yes	2	12	2
McKay Rd	Widen by 2 travel lanes	96th Avenue	104th Avenue	0	0	0	4	0	22	26	3	78	5	83	3	1580	1	24	2	Yes	2	11	3
168th Ave	Widen by 2 travel lanes	CO 7	Yosemite St	0	0	0	1	0	2	3	2	80	7	87	3	2862	2	8	2	Yes	2	11	3
156th Ave	New 2 lane roadway	160th Avenue	Quebec St	0	0	0	2	0	8	10	3	31	0	31	2	2480	2	17	2	Yes	2	11	3
Holly St	Widen by 4 travel lanes	144th Avenue	CO 7	0	0	0	0	0	5	5	2	49	4	53	2	2808	2	11	2	Yes	2	10	3
152nd Ave	New 2 lane roadway	York St	Colorado Blvd	0	0	1	1	0	7	9	2	2	0	2	2	3271	2	8	2	Yes	2	10	3
152nd Ave	Widen by 2 travel lanes and realign	Washington Street	York Street	0	0	1	1	0	5	7	2	5	0	5	2	3271	2	8	2	Yes	2	10	3
160th Ave	Widen by 2 travel lanes	Washington Street	CO 7	0	0	0	0	0	5	5	2	199	2	201	3	2647	2	0	1	Yes	2	10	3
Colorado Blvd	Widen by 2 travel lanes	CO 7	Weld County Rd 6	0	1	0	0	0	0	1	2	31	3	34	2	643	1	8	2	Yes	2	9	3
152nd Ave	New 4 lane roadway	Colorado Blvd	144th Avenue	0	0	0	2	0	0	2	2	17	1	18	2	1905	1	9	2	Yes	2	9	3
Grant St	New 4 lane roadway	124th Avenue	128th Avenue	0	0	5	1	0	0	6	2	45	3	48	2	5525	3	0	1	No	0	8	3
Weld CR 15	Widen by 2 travel lanes	CO 7	Weld County Rd 6	0	0	0	0	0	0	0	1	20	0	20	2	31	1	0	1	Yes	2	7	3

Final project scores: Bikeway

Name	Extent 1	Extent 2	Proposed facility	Count bus stops	Count light rail stations	Count schools	Count parks	Count key destinations	Count trail access points	Sum key destinations	Key destination score	Count crashes	Bike ped crashes	KSI crashes	Crash weight	Crash score	Max pop and jobs	Demand score	Max low income households	Equity score	Final score	Tier
Pearl Street	Eppinger Boulevard	84th Avenue	Protected Bike Lane	30	0	10	4	2	11	57	5	283	8	6	313	5	14874	5	656	5	20	1
121st Avenue / Northaven Circle	Madison Street	120th Avenue	Neighborhood Bikeway	10	0	3	9	0	16	38	5	50	2	3	59	5	9742	5	319	5	20	1
Washington Center Parkway	Washington Street	120th Avenue	Bike Lane	1	0	4	0	0	47	52	5	1183	20	14	1257	5	9239	5	287	5	20	1
128th Avenue	I-25	York Street	Protected Bike Lane	0	1	5	10	0	71	87	5	267	3	5	281	5	67279	5	287	5	20	1
84th Avenue	Hudson Street	Washington Street	Protected Bike Lane	12	0	5	3	0	22	42	5	1465	6	29	1512	5	27945	5	509	5	20	1
88th Avenue	Hudson Street	Devonshire Boulevard	Protected Bike Lane	42	1	14	9	2	31	99	5	658	12	18	712	5	16711	5	733	5	20	1
Grant Street	84th Avenue	104th Avenue	Protected Bike Lane	36	0	14	8	2	123	183	5	2248	9	26	2301	5	16711	5	733	5	20	1
104th Avenue	I-25	US 85	Multi-use Trail	18	1	3	6	0	40	68	5	1034	15	22	1101	5	10797	5	320	5	20	1
Huron Street			Protected Bike Lane	13	0	3	4	1	6	27	5	148	5	6	169	5	9069	5	355	5	20	1
124th Avenue	Claude Court	Dexter Way	Bike Lane	4	1	8	13	1	82	109	5	44	3	2	55	5	9742	5	319	5	20	1
88th Avenue	Pecos Street	Huron Street	Protected Bike Lane	17	0	3	3	0	0	23	4	63	1	2	68	5	13943	5	921	5	19	1
Hoffman Way	Washington Street	88th Avenue	Neighborhood Bikeway	15	0	14	5	1	23	58	5	192	6	7	217	5	9071	5	216	4	19	1
98th Avenue	Grant Street	Washington Street	Protected Bike Lane	3	0	2	7	0	8	20	4	80	3	3	92	5	10797	5	320	5	19	1
98th Avenue	Washington Street	Corona Street	Protected Bike Lane	0	0	1	6	0	12	19	4	50	1	1	54	5	10797	5	320	5	19	1
Pecos Street	100th Avenue	Thornton Parkway	Bike Lane	11	0	1	4	0	6	22	4	377	3	3	389	5	11603	5	565	5	19	1
Colorado Boulevard	County Road 6	91st Drive	Multi-use Trail	46	1	10	38	2	96	193	5	1039	25	29	1143	5	9742	5	254	4	19	1
Grant Street	144th Avenue	136th Avenue	Protected Bike Lane	0	0	1	1	0	143	145	5	317	0	8	325	5	7986	4	150	4	18	1

Milky Way	Pecos Street	Huron Street	Neighborhood Bikeway	12	0	3	2	0	1	18	4	25	0	1	26	4	1039296	5	1034	5	18	1
Russell Way	Thornton Parkway	Gall Court	Bike Lane	9	0	4	5	0	0	18	4	111	3	0	120	5	9071	5	216	4	18	1
96th Avenue	Zuni Street	Pecos Street	Bike Lane	6	0	2	4	0	4	16	4	30	0	1	31	4	11036	5	565	5	18	1
128th Avenue	York Street	Colorado Boulevard	Protected Bike Lane	4	1	6	18	0	24	53	5	127	3	1	137	5	8351	4	132	4	18	1
138th Avenue	I-25	Washington Street	Multi-use Trail	0	0	0	1	0	50	51	5	509	1	9	521	5	186774	5	89	3	18	1
Pecos Street	Thornton Parkway	Milky Way	Protected Bike Lane	9	0	1	1	0	0	11	3	162	4	5	179	5	1221731	5	1034	5	18	1
Huron Street			Protected Bike Lane	9	0	2	7	1	19	38	5	294	2	3	303	5	9069	5	96	3	18	1
Steele Street	Brantner Gulch Trail	120th Avenue	Bike Lane	2	0	0	4	0	16	22	4	20	0	1	21	4	9056	5	319	5	18	1
York Street	120th Avenue	Elizabeth Circle	Protected Bike Lane	2	0	1	6	0	1	10	3	118	2	1	125	5	9056	5	319	5	18	1
York Street	104th Avenue	300ft south of 100th Avenue	Bike Lane	10	0	1	4	0	3	18	4	42	1	1	46	4	10066	5	274	4	17	1
Downing Street	100th Avenue	Thornton Parkway	Neighborhood Bikeway	0	0	5	10	1	12	28	5	17	0	0	17	3	9348	5	101	4	17	1
88th Avenue	Devonshire Boulevard	I-76	Protected Bike Lane	8	1	8	7	2	37	63	5	335	7	12	368	5	6787	3	179	4	17	1
97th Avenue	Community Park Trail	Thornton Parkway	Neighborhood Bikeway	7	0	1	9	0	24	41	5	34	2	1	41	4	8387	4	274	4	17	1
Claude Court	128th Avenue	Eastlake Avenue	Protected Bike Lane	0	1	3	5	0	5	14	3	33	0	0	33	4	9239	5	287	5	17	1
120th Avenue	Madison Street	Steele Street	Bike Lane	3	0	1	3	0	1	8	3	30	0	0	30	4	9056	5	319	5	17	1
104th Avenue	Grange Hall Creek Trail	South Platte Trail	Multi-use Trail	0	0	1	6	0	19	26	5	175	2	6	187	5	7107	3	204	4	17	1
100th Avenue	Race Street	Steele Street	Protected Bike Lane	10	0	1	10	0	10	31	5	18	0	1	19	3	8387	4	274	4	16	1
Holly Street	96th Avenue	Weld County Road 6	Multi-use Trail	4	0	6	23	3	134	170	5	510	17	22	583	5	6852	3	41	3	16	1
Dorothy Boulevard	Thornton Parkway	Hoffman Way	Neighborhood Bikeway	7	0	6	3	1	21	38	5	23	0	0	23	4	6730	3	171	4	16	1

Welby Road	Thornton Parkway	Welby Circle	Protected Bike Lane	0	1	2	4	0	18	25	4	36	0	0	36	4	8387	4	274	4	16	1
112th Avenue	Colorado Boulevard	Holly Street	Protected Bike Lane	4	0	1	6	1	26	38	5	36	0	2	38	4	7618	3	128	4	16	1
Birch Drive	120th Avenue	112th Avenue	Bike Lane	7	0	3	12	0	18	40	5	19	0	1	20	4	7618	3	128	4	16	1
100th Avenue	Corona Street	Race Street	Protected Bike Lane	0	0	1	10	0	8	19	4	18	0	0	18	3	10066	5	257	4	16	1
Race Street	97th Avenue	Thornton Parkway	Bike Lane	0	0	0	6	0	27	33	5	24	0	0	24	4	8315	4	55	3	16	1
Fairfax Street	North Haven Park Trail	119th Way	Neighborhood Bikeway	3	0	3	7	0	4	17	4	39	1	1	43	4	9742	5	85	3	16	1
100th Avenue	Steele Street	Jackson Street	Protected Bike Lane	8	1	0	8	0	0	17	4	14	0	1	15	3	8387	4	274	4	15	2
Eppinger Boulevard	Gaylord Street	Yucca Way	Bike Lane	8	0	4	5	1	14	32	5	13	0	3	16	3	6730	3	171	4	15	2
128th Avenue	Belaire Street	Fairfax Street	Protected Bike Lane	4	0	5	10	1	1	21	4	24	0	0	24	4	8351	4	84	3	15	2
Eppinger Boulevard	Russell Way	Gaylord Street	Bike Lane	12	0	3	3	1	0	19	4	21	0	1	22	4	6730	3	171	4	15	2
101st Avenue / Jackson Street	Cook Street	100th Avenue	Neighborhood Bikeway	8	1	0	7	0	18	34	5	2	0	0	2	2	8921	4	183	4	15	2
128th Avenue	Monaco Street	Riverdale Road	Protected Bike Lane	0	0	1	3	0	38	42	5	49	1	2	54	5	6852	3	28	2	15	2
100th Avenue	Jackson Street	Colorado Boulevard	Bike Lane	6	1	0	4	0	5	16	4	16	1	0	19	3	8387	4	274	4	15	2
Cottonwood Lake Boulevard	Harrison Drive	Bellaire Drive	Bike Lane	8	0	5	9	0	5	27	5	14	0	0	14	3	8351	4	84	3	15	2
126th Avenue	Existing Bike Lane on 126th Avenue	Farmers Highline Canal Trail	Bike Lane	0	1	3	1	0	8	13	3	5	0	1	6	2	9239	5	287	5	15	2
Lafayette Street	128th Avenue	130th Avenue	Bike Lane	0	0	3	5	0	0	8	3	4	0	0	4	2	8527	4	286	5	14	2
Cherry Drive/Dahlia Drive	115th Court	110th Avenue	Neighborhood Bikeway	0	0	2	5	0	9	16	4	9	0	1	10	3	7618	3	128	4	14	2
128th Avenue	Fairfax Street	Monaco Street	Protected Bike Lane	0	0	3	3	1	29	36	5	13	2	0	19	3	7823	3	99	3	14	2
York Street	Highway 7	136th Avenue	Protected Bike Lane	0	1	2	4	0	54	61	5	53	0	1	54	5	3271	2	8	2	14	2

136th Avenue	York Street	Colorado Boulevard	Multi-use Trail	1	0	2	5	1	21	30	5	24	0	1	25	4	7344	3	38	2	14	2
144th Avenue	Washington Street	Fairfax Drive	Protected Bike Lane	0	1	2	2	0	18	23	4	59	1	0	62	5	7344	3	38	2	14	2
96th Place	98th Avenue	Downing Street	Neighborhood Bikeway	0	0	2	9	0	2	13	3	4	0	0	4	2	9348	5	101	4	14	2
Quebec Street	132nd Avenue	124th Avenue	Protected Bike Lane	0	0	2	1	0	22	25	4	105	2	9	120	5	6852	3	28	2	14	2
Fork Street	136th Avenue	128th Avenue	Protected Bike Lane	0	1	3	9	0	3	16	4	46	0	1	47	4	6637	3	55	3	14	2
Eppinger Boulevard	Fir Drive	Russell Way	Bike Lane	10	0	5	2	0	0	17	4	12	0	1	13	3	6730	3	171	4	14	2
Riverdale Road	Colorado Boulevard	94th Avenue	Multi-use Trail	0	0	1	4	0	14	19	4	15	0	2	17	3	7440	3	182	4	14	2
136th Avenue	Colorado Boulevard	Quebec Street	Multi-use Trail	1	0	3	10	2	22	38	5	160	3	2	171	5	2808	2	11	2	14	2
Bellaire Street	128th Avenue	124th Avenue	Neighborhood Bikeway	6	0	6	6	0	1	19	4	9	0	0	9	3	8351	4	99	3	14	2
119th Place	Harrison Street	Eastern End of 119th Place	Bike Lane	6	0	2	6	0	1	15	3	16	0	0	16	3	7887	4	128	4	14	2
108th Avenue	Margaret Carpenter Trail	Birch Court	Bike Lane	5	0	0	5	0	24	34	5	13	1	1	17	3	4713	2	116	4	14	2
Steele Street	100th Avenue	99th Way	Bike Lane	4	0	0	6	0	0	10	3	10	0	0	10	3	8921	4	274	4	14	2
Steele Street	96th Place	Thornton Parkway	Bike Lane	0	0	0	3	0	9	12	3	9	0	0	9	3	8387	4	274	4	14	2
Washington Street	136th Avenue	124th Avenue	Protected Bike Lane	0	0	6	2	0	0	8	3	468	5	6	489	5	5525	2	52	3	13	2
Washington Street	Farmers Highline Trail	Washington Center Parkway	Protected Bike Lane	0	0	4	0	0	8	12	3	51	1	0	54	5	3667	2	53	3	13	2
Huron Street	88th Avenue	84th Avenue	Protected Bike Lane	15	0	3	3	0	2	23	4	24	0	1	25	4	3910	2	43	3	13	2
Bellaire Street	Cottonwood Lake Boulevard	128th Avenue	Neighborhood Bikeway	6	0	5	10	0	1	22	4	5	0	0	5	2	8351	4	84	3	13	2
Elm Drive	119th Way	118th Place	Neighborhood Bikeway	4	0	2	6	0	8	20	4	10	0	0	10	3	7282	3	57	3	13	2

Gail Court	Russell Way	Pecos Boulevard	Neighborhood Bikeway	6	0	9	4	0	0	19	4	1	0	0	1	2	7484	3	197	4	13	2
130th Avenue	Corona Street	Lafayette Street	Bike Lane	0	0	3	3	0	0	6	2	4	0	0	4	2	8527	4	286	5	13	2
97th Avenue / 98th Avenue	Downing Street	Race Street	Neighborhood Bikeway	0	0	2	9	0	1	12	3	9	0	0	9	3	8315	4	55	3	13	2
Eppinger Boulevard	Hoffman Way	Fir Drive	Bike Lane	8	0	6	3	1	0	18	4	7	0	1	8	2	6730	3	171	4	13	2
Conifer Road	88th Avenue	RTD Parking Lot	Bike Lane	7	0	3	4	0	9	23	4	7	0	0	7	2	5064	2	355	5	13	2
100th Avenue	Colorado Boulevard	Riverdale Road	Bike Lane	4	1	0	3	0	0	8	3	17	0	1	18	3	6523	3	254	4	13	2
York Street	Highway 7	136th Avenue	Multi-use Trail	0	0	1	4	0	25	30	5	40	0	4	44	4	3271	2	8	2	13	2
168th Street	CO 7	Yosemite Street	Protected Bike Lane	0	0	0	1	0	18	19	4	189	2	8	203	5	2862	2	8	2	13	2
140th Avenue/Monaco Street	Holly Street	136th Avenue	Neighborhood Bikeway	0	0	2	9	0	37	48	5	13	0	0	13	3	4738	2	41	3	13	2
Quebec Street	160th Avenue	E-470	Protected Bike Lane	0	0	0	1	0	18	19	4	91	0	6	97	5	2113	1	27	2	12	2
York Street	Elizabeth Circle	112th Avenue	Protected Bike Lane	0	1	0	1	0	2	4	2	23	1	2	28	4	6066	3	80	3	12	2
Corona Street / 134th Avenue	130th Avenue	High Street	Neighborhood Bikeway	0	0	2	2	0	0	4	2	24	0	0	24	4	6637	3	55	3	12	2
			Existing Bike/Parking Lane	2	0	3	11	0	6	22	4	7	0	0	7	2	6096	3	48	3	12	2
115th Avenue	Steele Street	Colorado Boulevard	Neighborhood Bikeway	3	0	1	7	0	0	11	3	1	0	0	1	2	7887	4	80	3	12	2
136th Avenue	Quebec Street	Riverdale Road	Multi-use Trail	0	0	3	1	0	17	21	4	57	0	3	60	5	945	1	11	2	12	2
Poze Boulevard	Clayton Street	Yucca Way	Neighborhood Bikeway	0	1	9	5	0	0	15	3	7	0	0	7	2	7484	3	197	4	12	2
112th Avenue	Holly Street	Riverdale Road	Protected Bike Lane	0	0	1	2	0	3	6	2	36	0	2	38	4	7282	3	57	3	12	2
Summit Grove Parkway	Harrison Street	134th Drive	Bike Lane	3	0	3	5	1	3	15	3	12	0	0	12	3	6371	3	58	3	12	2
131st Avenue	130th Avenue	Brantner Gulch Trail,	Bike Lane	0	0	2	3	0	13	18	4	12	0	1	13	3	4738	2	41	3	12	2

		Horizon Tributary																				
Monaco Way/Niagara Street	Wright Farms Subdivision Trail	Riverdale Road	Neighborhood Bikeway	2	0	1	0	0	2	5	2	263	7	3	287	5	6852	3	28	2	12	2
Dahlia Street	110th Avenue	108th Avenue	Neighborhood Bikeway	0	0	2	4	0	20	26	5	9	0	0	9	3	5524	2	40	2	12	2
Grant Street	148th Avenue	144th Avenue	Protected Bike Lane	0	0	1	0	0	23	24	4	112	0	4	116	5	1644	1	0	1	11	3
144th Avenue	Fairfax Drive	Holly Street	Protected Bike Lane	0	0	0	0	0	8	8	3	33	0	0	33	4	2808	2	11	2	11	3
Cottonwood Lake Boulevard	136th Avenue	135th Drive	Bike Lane	1	0	2	2	0	0	5	2	14	1	1	18	3	6371	3	58	3	11	3
Quebec Street	136th Avenue	132nd Avenue	Protected Bike Lane	0	0	2	3	0	1	6	2	31	0	3	34	4	4738	2	41	3	11	3
100th Avenue	Riverdale Road	Fukay Fields Trail	Bike Lane	0	0	0	3	0	32	35	5	12	0	1	13	3	1580	1	24	2	11	3
Thornton Parkway	Riverdale Road	McKay Road	Protected Bike Lane	0	0	0	5	0	17	22	4	31	0	2	33	4	1580	1	24	2	11	3
Eudora Drive / Elm Street	128th Avenue	Northaven Park Trail	Neighborhood Bikeway	0	0	3	4	0	0	7	2	15	0	0	15	3	7823	3	99	3	11	3
130th Avenue	Washington Street	Emerson Street	Bike Lane	0	0	3	2	0	5	10	3	5	0	0	5	2	6637	3	55	3	11	3
Yosemite Street	Ehler Parkway	1,000ft South of 136th Avenue	Multi-use Trail	0	0	2	1	0	14	17	4	33	0	3	36	4	2113	1	27	2	11	3
Milwaukee Street/137th Avenue/138th Avenue	136th Avenue	Colorado Boulevard	Neighborhood Bikeway	0	0	2	4	0	1	7	2	32	0	0	32	4	7344	3	38	2	11	3
140th Avenue	Cherry Park Subdivision Trail (West)	Cherry Park Subdivision Trail (East)	Neighborhood Bikeway	0	1	2	3	0	30	36	5	5	0	0	5	2	5513	2	32	2	11	3
Garfield Place	Cherrywood Park Trail	138th Avenue	Neighborhood Bikeway	0	0	1	2	0	21	24	4	6	0	1	7	2	7344	3	38	2	11	3
Clermont Street	128th Avenue	127th Avenue	Neighborhood Bikeway	0	0	3	3	0	2	8	3	1	0	0	1	2	7823	3	99	3	11	3
Dahlia Street	126th Avenue	Meadow Park Subdivision Trail	Neighborhood Bikeway	0	0	3	2	0	6	11	3	4	0	0	4	2	7823	3	99	3	11	3

119th Place	Madison Street	Madison Place	Bike Lane	3	0	1	1	0	0	5	2	1	0	0	1	2	7887	4	80	3	11	3
Future Roadway South of E-470	York Street	Yosemite Street	Protected Bike Lane	0	0	3	3	0	5	11	3	21	0	1	22	4	3271	2	11	2	11	3
York Street	104th Avenue	Trail	Multi-use Trail	5	0	1	1	0	0	7	2	0	0	0	0	1	8921	4	183	4	11	3
160th Avenue	York Street	Big Dry Creek Trail	Protected Bike Lane	0	0	0	2	0	7	9	3	47	0	3	50	4	643	1	8	2	10	3
Washington Street	148th Avenue	144th Avenue	Multi-use Trail	0	0	1	0	0	15	16	4	28	0	0	28	4	1644	1	0	1	10	3
Clayton Street	York Street	118th Circle	Neighborhood Bikeway	2	0	1	4	0	0	7	2	1	0	0	1	2	6066	3	80	3	10	3
130th Avenue	Emerson Street	Corona Street	Bike Lane	0	0	3	2	0	0	5	2	1	0	0	1	2	6637	3	55	3	10	3
115th Avenue	Clayton Street	Steele Street	Neighborhood Bikeway	0	1	1	4	0	0	6	2	1	0	0	1	2	6066	3	80	3	10	3
130th Avenue	Brantner Gulch Trail	Riverdale Park Trail	Bike Lane	0	0	1	4	0	6	11	3	1	0	0	1	2	4738	2	41	3	10	3
Dexter Way	124th Avenue	125th Avenue	Neighborhood Bikeway	0	0	4	4	0	4	12	3	0	0	0	0	1	7823	3	99	3	10	3
123rd Drive	Krameria Street	Wright Farms Subdivision Trail	Neighborhood Bikeway	0	0	2	0	0	3	5	2	9	0	1	10	3	6852	3	28	2	10	3
Quebec Street	E-470	136th Avenue	Protected Bike Lane	0	0	0	2	0	7	9	3	11	0	0	11	3	945	1	11	2	9	3
Highway 7	160th Avenue	York Street	Protected Bike Lane	0	0	0	0	0	5	5	2	12	0	0	12	3	2862	2	8	2	9	3
Grant Street	152nd Parkway	148th Avenue	Protected Bike Lane	0	0	1	0	0	0	1	2	67	0	3	70	5	1644	1	0	1	9	3
160th Avenue	I-25	Highway 7	Protected Bike Lane	0	0	0	0	0	5	5	2	196	0	2	198	5	2647	1	0	1	9	3
Steele Street	115th Avenue	112th Avenue	Neighborhood Bikeway	0	0	1	4	0	0	5	2	0	0	0	0	1	6066	3	80	3	9	3
Gravel Lakes Fishing Access Road	86th Avenue	South Platte Greenway Trail	Bike Lane	2	0	0	2	1	0	5	2	4	0	0	4	2	3915	2	63	3	9	3
126th Avenue	Washington Street	Ogden Street	Bike Lane	0	0	5	0	0	0	5	2	4	0	0	4	2	5525	2	53	3	9	3

52nd Parkway	Grant Street	York Street	Protected Bike Lane	0	0	1	1	0	5	7	2	17	0	0	17	3	3271	2	8	2	9	3
Clayton Street	115th Way	116th Avenue	Bike Lane	0	1	1	3	0	0	5	2	0	0	0	0	1	6066	3	80	3	9	3
Jasmine Street	130th Avenue	128th Avenue	Bike Lane	0	0	1	2	1	1	5	2	5	0	0	5	2	4738	2	41	3	9	3
148th Avenue	Big Dry Creek Trail	York Street	Neighborhood Bikeway	0	0	0	2	0	6	8	3	2	0	0	2	2	3271	2	8	2	9	3
Milwaukee Court	Detroit Street	137th Avenue	Neighborhood Bikeway	0	0	2	2	0	6	10	3	1	0	0	1	2	5513	2	32	2	9	3
Signal Ditch Parkway/Fairfax Drive	Farmers Highline Canal	144th Avenue	Neighborhood Bikeway	0	0	0	2	0	8	10	3	2	0	1	3	2	2808	2	11	2	9	3
Future Roadway North of E-470	York Street	Quebec Street	Protected Bike Lane	0	0	0	2	0	1	3	2	27	0	0	27	4	1809	1	17	2	9	3
140th Avenue	Grant Street	Washington Street	Protected Bike Lane	0	0	0	0	0	0	0	1	0	0	0	0	1	7690	3	89	3	8	3
136th Avenue	Washington Street	York Street	Multi-use Trail	0	0	1	2	0	0	3	2	26	2	1	33	4	477	1	2	1	8	3
Holly Park Connector	Holly Park Trail	Holly Street	Multi-use Trail	0	0	2	1	0	4	7	2	3	0	0	3	2	5524	2	40	2	8	3
Riverdale Road	112th Avenue	120th Avenue	Multi-use Trail	0	0	0	1	0	5	6	2	3	0	0	3	2	2740	2	16	2	8	3
142nd Place	Fallbrook Farms Subdivision Trail	Detroit Street	Neighborhood Bikeway	0	1	1	1	0	10	13	3	0	0	0	0	1	5513	2	32	2	8	3
Monaco Street	Riverdale Park Trail	131st Avenue	Bike Lane	0	0	1	3	0	2	6	2	0	0	0	0	1	4738	2	41	3	8	3
Washington Street	160th Avenue	152nd Parkway	Multi-use Trail	0	0	0	0	0	6	6	2	30	0	0	30	4	2647	1	0	1	8	3
104th Avenue	South Platte River Greenway Trails	US 85	Multi-use Trail	0	0	0	0	0	0	0	1	13	0	0	13	3	1580	1	24	2	7	3
152nd Parkway	York Street	RR Tracks	Multi-use Trail	0	0	1	1	0	3	5	2	0	0	0	0	1	3271	2	8	2	7	3
Washington Street	166th Avenue	148th Avenue	Protected Bike Lane	0	0	1	0	0	0	1	2	6	0	1	7	2	2169	1	0	1	6	3
Washington Street	144th Avenue	136th Avenue	Protected Bike Lane	0	0	1	1	0	0	2	2	3	1	1	7	2	477	1	2	1	6	3

162nd Avenue	Holly Street	Quebec Street	Neighborhood Bikeway	0	0	0	0	0	0	0	1	10	0	1	11	3	1128	1	4	1	6	3
Quebec Street	South of 160th Avenue	Quince Circle	Multi-use Trail	0	0	0	0	0	4	4	2	5	0	0	5	2	480	1	7	1	6	3
144th Avenue	Holly Street	Krameria Street	Multi-use Trail	0	0	0	0	0	0	0	1	1	0	0	1	2	1905	1	9	2	6	3
148th Avenue	Grant Street	Washington Street	Protected Bike Lane	0	0	1	0	0	0	1	2	0	0	0	0	1	1644	1	0	1	5	3
146th Avenue	Grant Street	Washington Street	Protected Bike Lane	0	0	1	0	0	0	1	2	0	0	0	0	1	1644	1	0	1	5	3
Fillmore Street	Future Roadway South of E-470	Haven Subdivision Trail	Neighborhood Bikeway	0	0	1	0	0	2	3	2	0	0	0	0	1	1686	1	4	1	5	3
Eagle Shadow Avenue/Leyden Street	Ivy Street	162nd Avenue	Neighborhood Bikeway	0	0	0	0	0	0	0	1	3	0	0	3	2	1128	1	4	1	5	3
160th Avenue	Colorado Boulevard	Holly Street	Multi-use Trail	0	0	0	0	0	0	0	1	2	0	1	3	2	121	1	0	1	5	3
Washington Street	Bull Canal Trail	152nd Parkway	Multi-use Trail	0	0	0	0	0	0	0	1	1	0	0	1	2	96	1	0	1	5	3
Holly Street	160th Avenue	Trail	Multi-use Trail	0	0	0	0	0	0	0	1	0	0	0	0	1	121	1	0	1	4	3
Holly Street	144th Avenue	Road south of E 470	Multi-use Trail	0	0	0	0	0	0	0	1	0	0	0	0	1	177	1	1	1	4	3
144th Avenue	City boundary	Holly Street	Multi-use Trail	0	0	0	0	0	0	0	1	0	0	0	0	1	177	1	1	1	4	3

APPENDIX D

Transit Study

THORNTON TRANSIT STUDY

Final Plan

March 29, 2024

Prepared for

THORNTON

Prepared by

FEHR & PEERS

ACKNOWLEDGEMENTS

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And all other city and regional agency staff that were involved in this study.

Consultant

Fehr & Peers

RESOLUTION

A RESOLUTION AMENDING THE TRANSPORTATION AND MOBILITY MASTER PLAN TO INCLUDE THE THORNTON TRANSIT STUDY AS AN APPENDIX.

WHEREAS, the Thornton City Council adopted the Transportation and Mobility Master Plan on April 26, 2022; and

WHEREAS, the Transportation and Mobility Master Plan recommends an implementation plan to achieve its vision and goal that includes a transit study; and

WHEREAS, the Thornton Transit Study fulfils the recommendation of the Transportation and Mobility Master Plan; and

WHEREAS, the Thornton Transit Study provides a phased 10-year implementation plan for expanded and new transit services throughout Thornton; and

WHEREAS, the Thornton Transit Study further expands the information in Chapter 8: Transit Network of the Transportation and Mobility Master Plan; and

WHEREAS, the City of Thornton acknowledges the importance of transit as part of the overall transportation network.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF THORNTON, COLORADO, AS FOLLOWS:

The Thornton Transit Study in Attachment A is hereby acknowledged and adopted as Appendix D: Thornton Transit Study into the Transportation and Mobility Master Plan adopted on April 26, 2022.

PASSED AND ADOPTED at a regular meeting of the City Council of the City of Thornton, Colorado on May 14, 2024.

CITY OF THORNTON, COLORADO

Karen Bigelow

Karen Bigelow, Mayor Pro Tem

ATTEST:

Kristen N. Rosenbaum, City Clerk

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Executive Summary

The Thornton Transit Study builds off the vision set by the Transportation and Mobility Master Plan (TMMP) with the following goals:

- Bring Thornton closer to implementing the TMMP's vision.
- Provide clear guidance to implement transit improvements over the next 10 years.
- Make transit a more viable mode choice for residents that do not currently have access to transit.
- Better serve those who are mobility challenged, but not served by RTD's Access-A-Ride.

Expanding public transit helps meet the mobility needs of the community, particularly for the most vulnerable community members that have limited mobility options, and is a crucial element of achieving the vision identified in the TMMP to enable residents to access all areas of Thornton in a timely manner without using a private vehicle.

Phased Transit Operating Plan

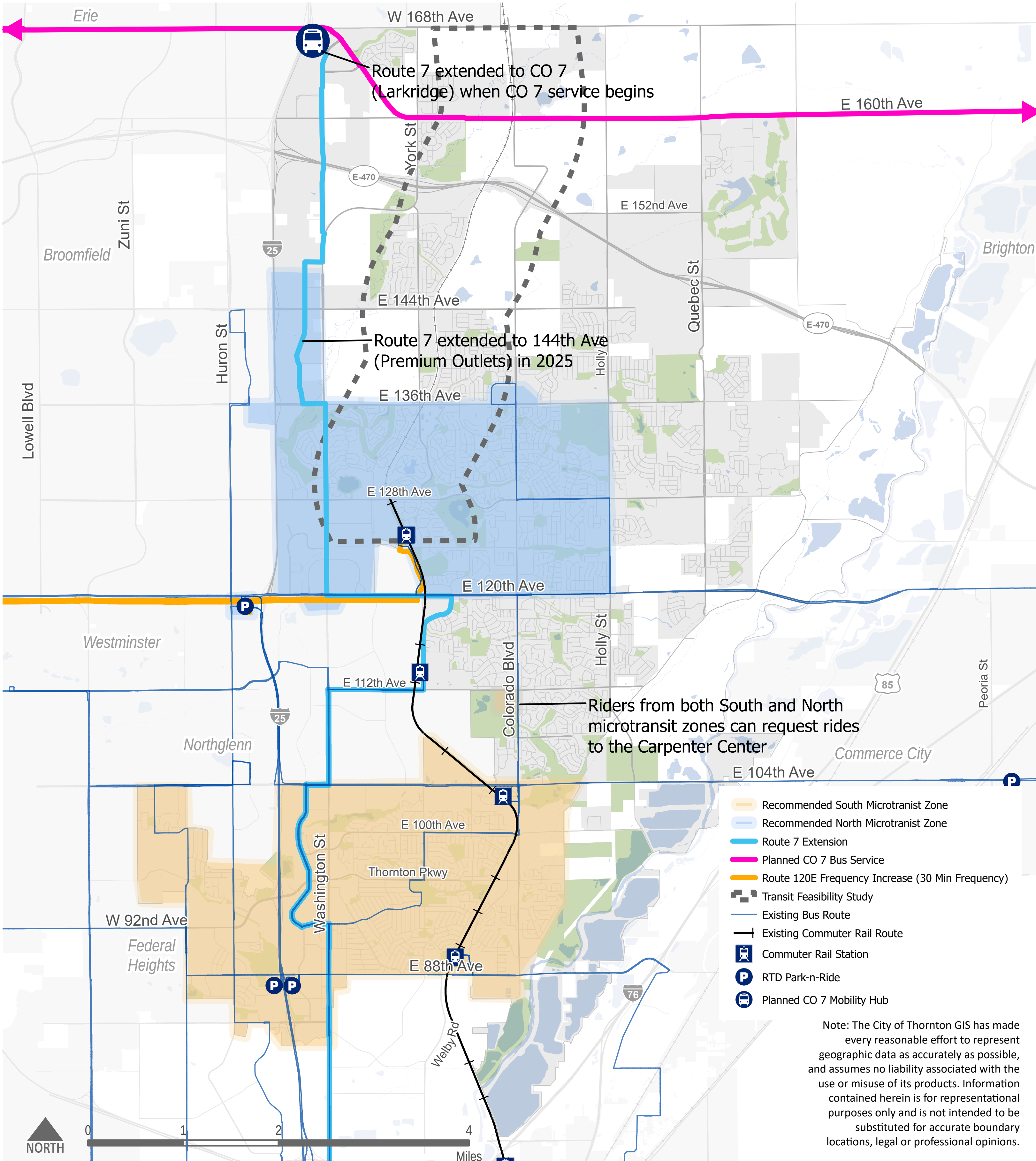
This study demonstrates that transit, and the expansion of public transit service, is a viable transportation solution within the City of Thornton. Many areas of Thornton are well suited for short-term implementation of on-demand transit service, and some corridors can support expansion of fixed-route transit service. As the city grows, additional areas will become more viable for transit expansion. This Study provides a phased-approach for gradually expanding transit service, prioritizing expansion to locations were transit is likely to be most successful first.

The preferred alternative includes three phases of transit improvements over a ten-year period between 2025 and 2034 which are shown in **Figure ES**. and **Figure ES**..

1. **Short-term: 2025 to 2027** - In the first three years the city will focus on implementing two microtransit zones, one in south Thornton and one in north Thornton, extending the Route 7 north to Larkridge along the Washington Street/Grant Street corridor, increasing service frequency on 120th Avenue west of the N Line to 30 minutes, and studying feasibility of an interim bus service between the end of the N Line and CO 7.
2. **Mid-term: 2028 to 2031** - Mid-term recommendations include making adjustments to the microtransit services to expand and improve service, increasing frequency on three bus routes to 30-minutes: the Route 7 extension, Route 93L, and Route 120L, reinstating Route 104 along 104th Avenue, extending the Route 120X along I-25 to Larkridge, and implementing an interim bus service between the end of the N Line and CO 7.
3. **Long-term: 2032 to 2034** - Long-term improvements include adjusting the services implemented in the previous phases, increasing core routes to 15-minute peak period frequencies, and evaluating additional north/south routes in North Thornton based on future development.

Short-Term Implementation (2025-2027)

ES.1



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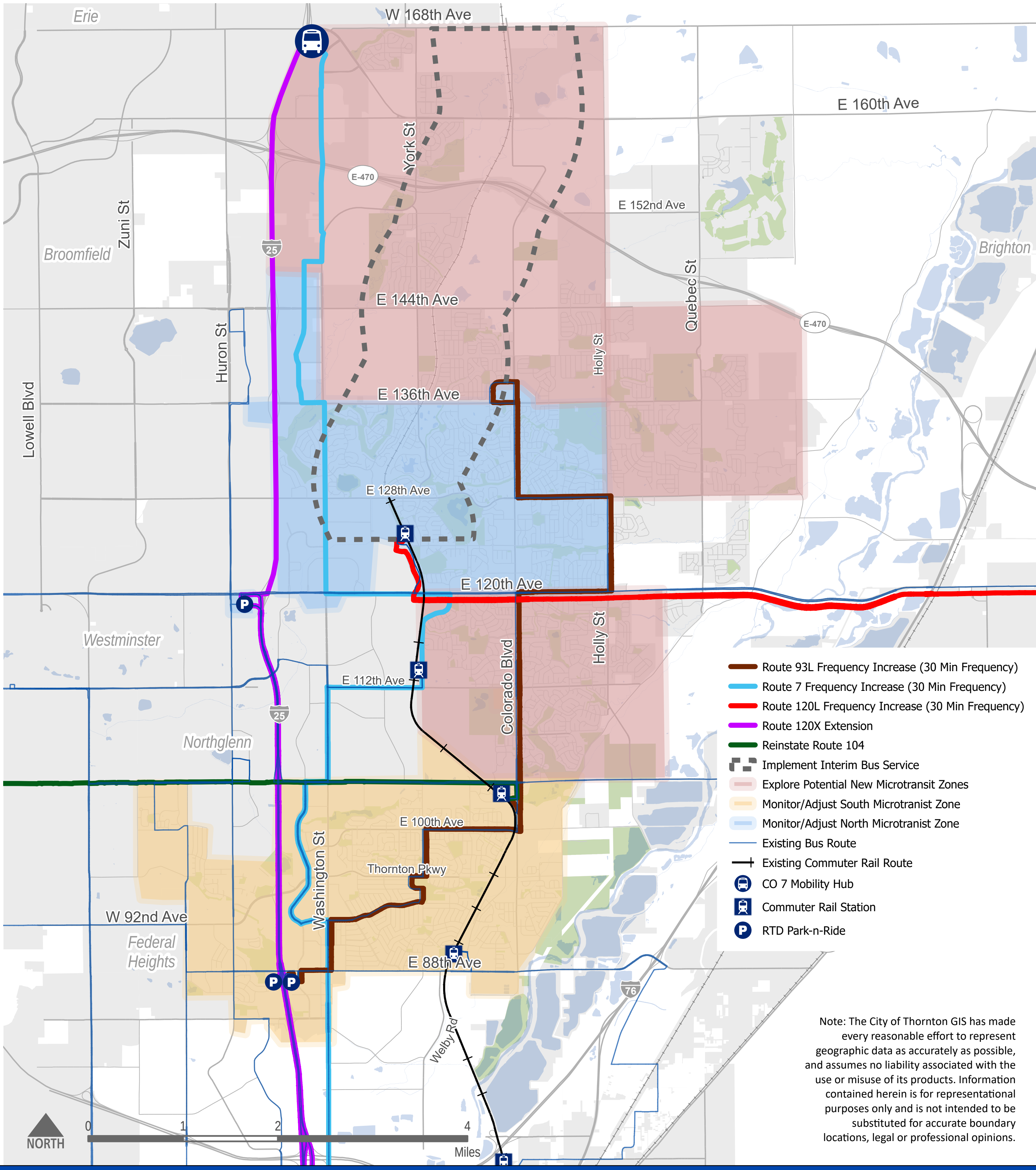
City of Thornton

Basemap Data: June 2023

Mid-Term Implementation (2028-2031)

*These improvements are in addition to the short-term improvements

ES.2



City of Thornton

Basemap Data: June 2023

Chapter 1 – Introduction

Purpose of the project

The Thornton Transit Study builds off the vision set by the Transportation and Mobility Master Plan (TMMP) with the following goals:

- Bring Thornton closer to implementing the TMMP's vision.
- Provide clear guidance on how to implement transit improvements throughout Thornton over the next 10 years.
- Make transit a more viable mode choice for residents that do not currently have access to transit.
- Better serve those who are mobility challenged, but not served by RTD's Access-A-Ride.

The transit study includes the following elements:

- **Transit Market Analysis.** This analysis, described in Chapter 2, includes a comprehensive demographic analysis, an evaluation of the existing transit service, an analysis of travel patterns, community input, and a review of peer communities. Chapter 2 highlights the key conclusions of the transit market analysis, while the complete transit market analysis is available in Appendix A.
- **Alternatives Analysis and Community Input.** This analysis, described in Chapter 3, includes an evaluation of five potential "bookend" alternatives for transit improvements in Thornton, including new on-demand service, improvements to existing fixed-route service, and new fixed-route service. The alternatives and evaluation criteria were created based on input from the first round of community engagement and the transit market analysis. The alternatives analysis was used to present benefits and challenges of several potential transit improvements in Thornton. Alternatives were presented to the public, and a preferred alternative for phasing and implementation was developed based on input from the public, stakeholders, and project team.
- **Preferred Alternative and Implementation Phases.** This phasing plan, described in Chapter 4, details the implementation of each transit recommendation over the next ten years. The phasing includes action items for the short-term (first three years), mid-term (three to seven years), and long-term (seven to ten years).
- **Financial Plan.** This plan, described in Chapter 5, details the estimated costs by year to implement each element of the operating plan. This chapter also includes details on funding strategies for these costs.
- **Implementation Plan.** This plan, described in Chapter 6, provides details of implementing on-demand transit and fixed-route transit options. These details include service adjustments, roles and responsibilities, strategies for managing hurdles, and other key factors to implementation.

Chapter 2 – Transit Market Analysis

This chapter highlights the key conclusions of the transit market analysis, which included a comprehensive demographic analysis, an evaluation of the existing transit service, an analysis of travel patterns, community input, and a review of peer communities. The complete transit market analysis is available in Appendix A.

Demographic Analysis

Thornton's residents are diverse in age, income, and travel characteristics. Those who are most likely to rely on transit service for transportation are youth, older adults, people with low and moderate income, people with disabilities, and households with limited access to vehicles. While there are higher concentrations of people with these characteristics in the southern portion of Thornton (generally south of 104th Avenue), there are other areas of the city with higher concentrations of these demographics as well, including:

- A high youth and older adult population north of 136th Avenue.
- Residents living under the poverty line north of 136th Avenue.
- Residents with no or limited access to vehicles in communities between 112th Avenue and 128th Avenue, and in the Todd Creek Area.

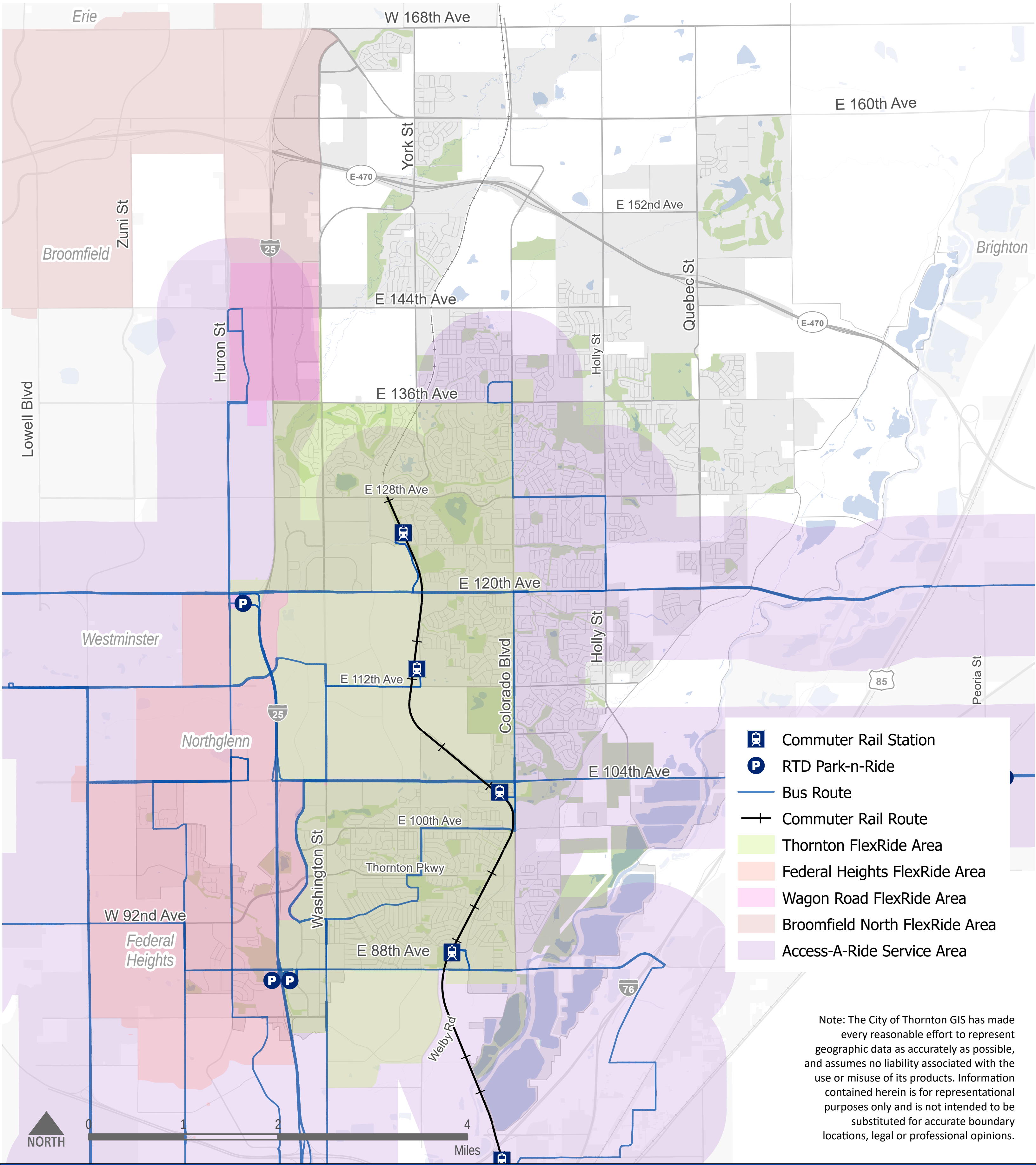
Existing Transit Service

Existing transit service in Thornton is operated by RTD and was found to be:

- **Regionally Focused** – The system is predominantly designed for regional travel, particularly to downtown Denver and the Denver International Airport, and less useful for local travel within Thornton and for east-west regional travel.
- **Limited in Geographic Coverage** – While the southwest part of Thornton (generally south of 120th Avenue and west of Colorado Boulevard) which has the highest transit propensity and is generally covered by transit there are large sections of north and eastern Thornton without any transit. This also leaves parts of these areas in north Thornton devoid of Access-a-Ride service (**Figure 1**). Additionally, many areas of southern Thornton are more than a quarter-mile walk from transit and/or have areas with missing or narrow sidewalks that add additional barriers to accessing transit (**Figure 2**).

Thornton Transit Coverage

Figure 1

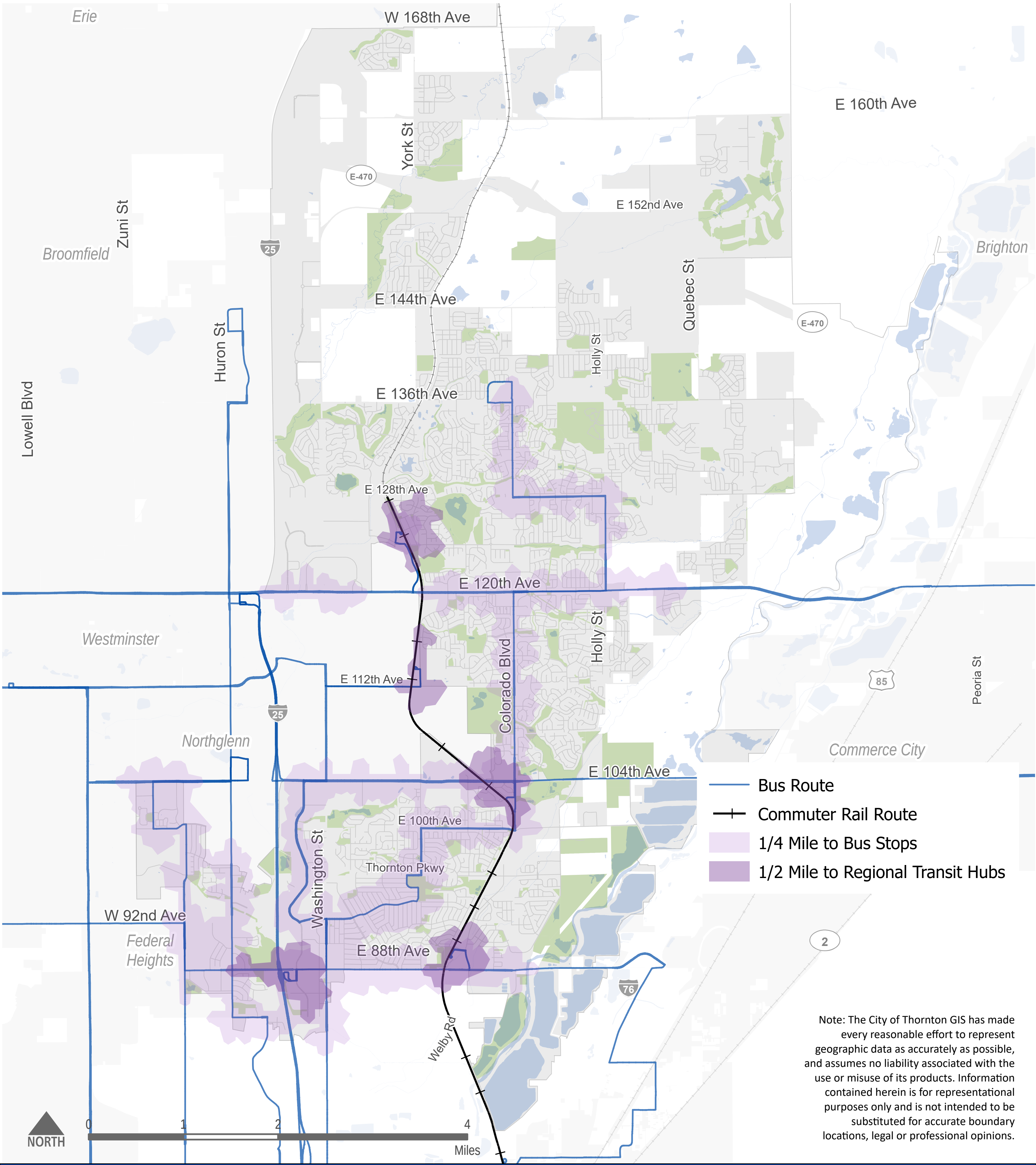


City of Thornton

Sources: RTD, 2023
Basemap Data: June 2023

Thornton Transit Access

Figure 2



Bus Route

Commuter Rail Route

1/4 Mile to Bus Stops

1/2 Mile to Regional Transit Hubs

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City of Thornton

Sources: RTD, 2023
Basemap Data: June 2023

- **Low Frequencies** – Most bus service in Thornton operates at 60-minute frequencies, with just three local routes (Route 7, Route 19, and Route 92) plus the N Line and 120X providing 30-minute all-day frequencies. The low frequency is one of the biggest barriers to using transit in Thornton, making it an impractical option for many trips (even where transit exists), especially for short trips and trips that require a transfer.
- **Limited Demand Response Service** – The three FlexRide services that operate in Thornton are designed to fill those gaps in local travel demand, but can be unreliable, difficult to coordinate transfers, and exclude many areas of Thornton. The service also suffers from lack of efficiency typically averaging less than 3 riders per hour. Additionally, because the Thornton FlexRide does not operate after 6 PM, it does not serve evening commuters/service workers.
- **Limited Connectivity Across I-25** – While service is provided on both sides of I-25, service on 104th Avenue does not connect across, and the FlexRide boundaries generally fall along I-25 making connections across I-25 via FlexRide generally impractical.

Existing Travel Patterns

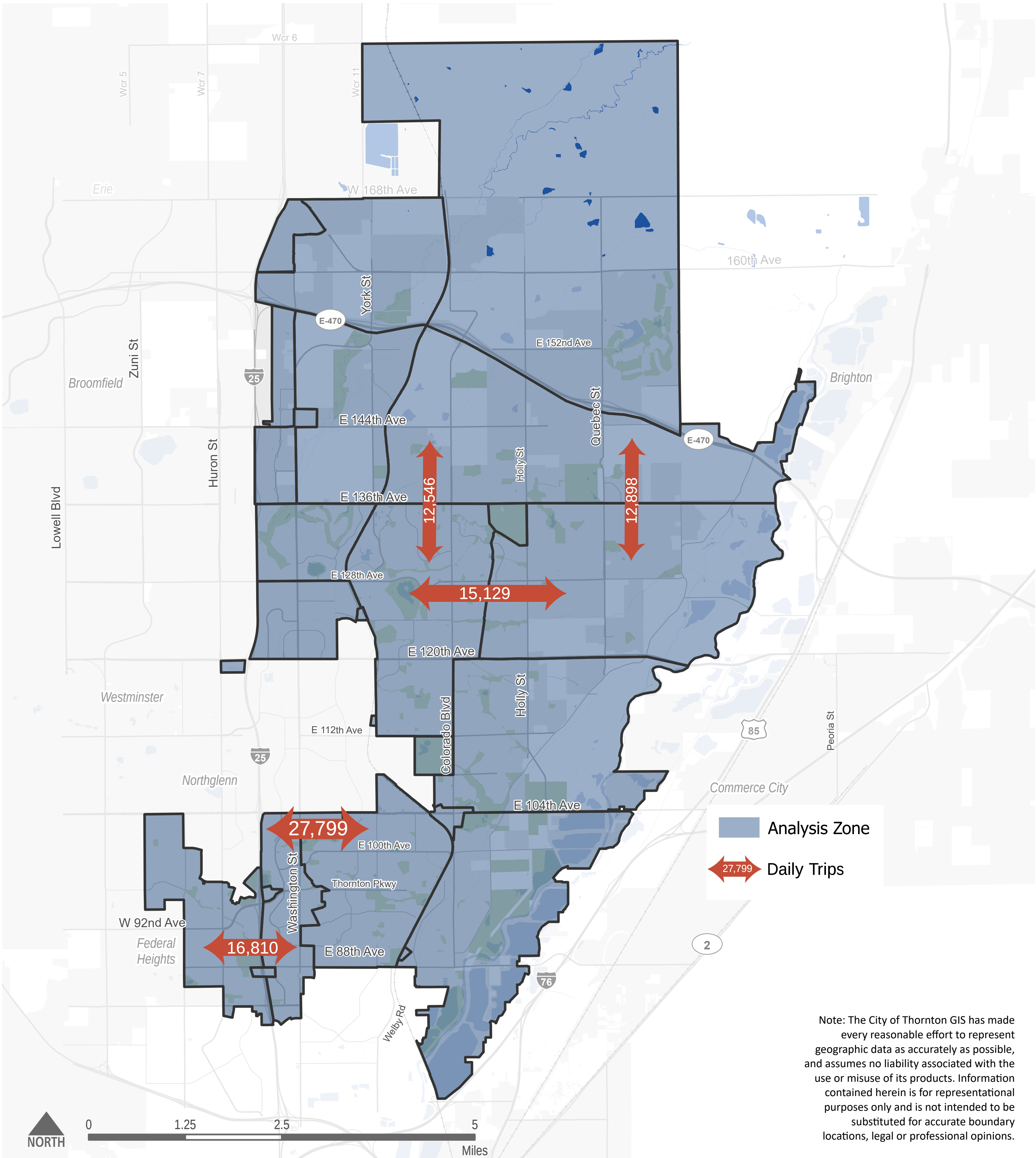
Both Longitudinal Employer-Household Dynamics (LEHD) and StreetLight (origin-destination data) analyses show that there is considerable demand for local destinations in Thornton, and nearly 50% of local trips are two to five miles. More specific takeaways include:

- Non-commute trips make up 82% of trips on weekdays.
- Nearly half of all trips in Thornton have an average speed of 10 to 20 mph from origin to destination.
- The most common trip length is two to five miles.
- The top local trip pairings occur in the southwestern part of the city going to/from the Washington Street corridor from zones directly east or west (**Figure 3**).

Top Trip Pairs within Thornton

March - April 2022

Figure 3



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- Most regional trips are destined for Commerce City and Broomfield, but there are also many trips headed to Brighton, Westminster, and to communities along the north I-25 corridor.
- In 2019, the highest concentration of work locations for Thornton residents was along the north I-25 corridor and Downtown Denver. There were also notable nodes in Boulder, Brighton, Broomfield, and at the Anschutz Medical Campus in Aurora.
- Of trips that originate in Thornton's top transit propensity zones, most are destined to adjacent neighborhoods, so trips are predominantly short and close.
- Most people traveling from Thornton to one of the six regional transit hubs in (or near) Thornton originate in the zones immediately around a station. The two exceptions are the Wagon Road park-n-ride and the Crossroads at 104th Station, both of which have much larger travel sheds than the other transit hubs.
- The Carpenter Recreation Center and Thornton Active Adult Center draw people from all areas of Thornton in a fairly evenly distributed manner, while the Trail Winds Recreation Center has a much higher share of trips originating from northern Thornton, with fewer people coming from south Thornton.
- While the Amazon facility (specifically the employee lot) draws trips from across Thornton, there are particularly higher concentrations of trips originating in south Thornton.

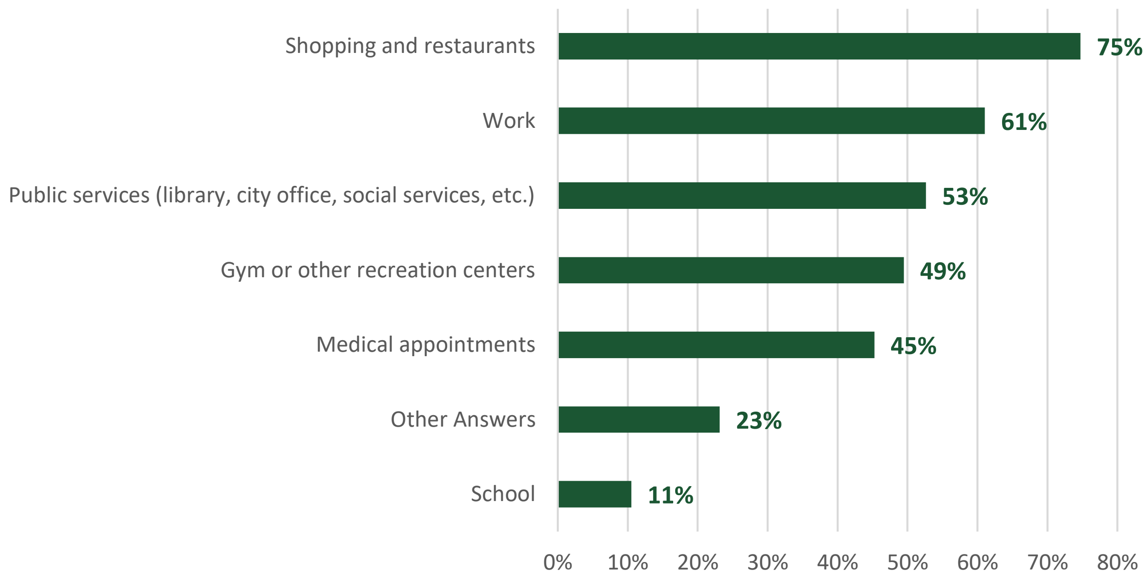
Community Input

Community input was provided through public outreach and a dedicated stakeholder working group throughout the project. This stakeholder group was made up of local and regional partners, including staff from various City of Thornton departments, DRCOG, RTD, and CDOT, who met three times throughout the project and guided the process. Public input was sought multiple times throughout the project, including during the market analysis phase to gain input on existing experiences and desired improvements, a survey to react to draft alternatives, and a final survey to provide input on the final draft. The following are key takeaways from the community input gathered during the initial survey on existing experiences and desired improvements:

- A disproportionately high percentage of survey respondents live in north Thornton (as compared to the actual population distribution) meaning respondents from south Thornton, which has a higher percentage of transit-reliant population, may be underrepresented in the survey.

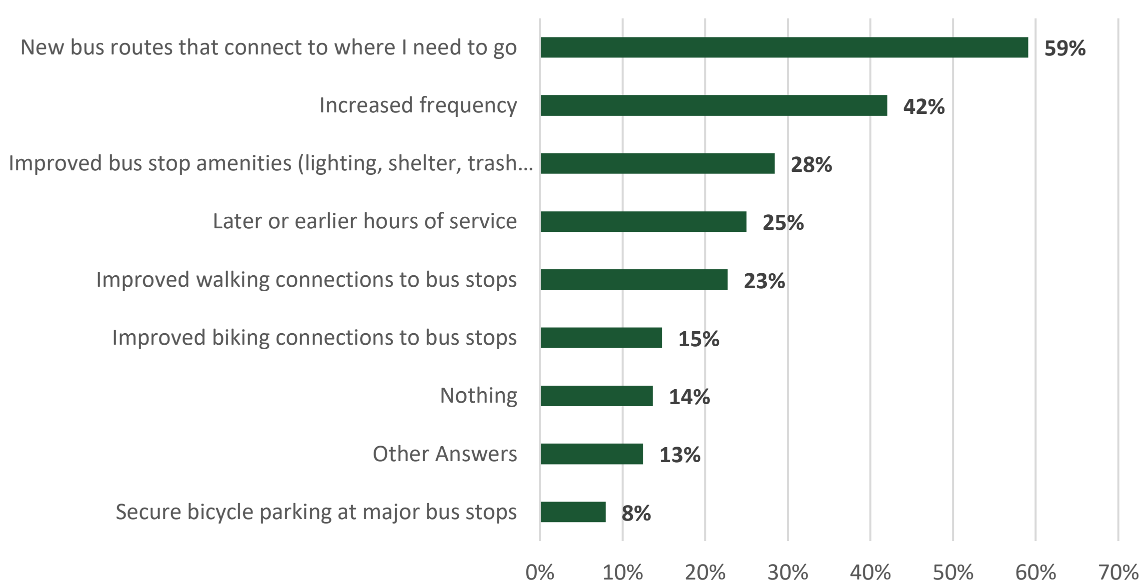
- The top desired destinations for transit include shopping and restaurants, work, and public services (**Figure 4**).

Figure 4: Desired Destinations Using Public Transit



- The top desired transit improvements include increased frequency (particularly along the N-Line), earlier and later hours of service, and additional first/last mile transit service within Thornton to connect to the rail stations (**Figure 5**).

Figure 5: Desired Bus Service Improvements



- For both existing FlexRide and with any new on-demand service, residents' top priority is being able to be guaranteed a ride within 15 to 30 minutes of a request, followed by a convenient booking platform and consistent, professional drivers.
- Other characteristics that impact first/last mile connections like bicycle and pedestrian facilities are important to consider when planning new services.
- Desired destinations are dispersed throughout the community.
- The FlexRide can be challenging to use as it's not always available and difficult to make transfers.
- Traveling from one side of I-25 to the other and making most local trips in general in Thornton is very difficult due to the low frequency of existing transit service, lack of transit service in some areas, and need to transfer.

Peer Community Analysis

When looking at communities that are like Thornton, such as Lafayette, CO; Kent, WA; and Tracy, CA; local transit service is supplemental and complimentary to regional service. Further, the local services in these communities focus on ensuring access to a wide variety of areas throughout the community by providing a mix of fixed-route services and on-demand services.

Potential Transit Travel Markets

Primary transit travel markets (groups with common demographic characteristics) are important to identify to inform the service alternatives, the service plan, and associated marketing strategies. Through the transit market analysis, including analysis of demographics, existing transit service, community input, and existing travel patterns, the following potential key transit travel markets were identified.

Young Users and School Trips

Youth between the ages of 10 and 17 make up 13% of Thornton's population. These riders may not have a driver's license or access to a vehicle and may be a market for increased ridership. These young users may be more open to app-based on-demand services than other user groups. Typically, the largest demand of trips for this travel market is to get to and from school and to after school activity centers and jobs. This population group is distributed across most of Thornton.

Older Adults

People aged 65 and over make up 10% of Thornton's population. Older adults may be more interested in a new service that picks up and drops them off closer to where they need to go, and areas with missing or uncomfortable sidewalks are going to be a significant barrier to using fixed-route transit. The most desired trip types by this group are to grocery stores, medical facilities and services, and community centers (including the Active Adults Center). Through the active adults focus group, it was made clear that transit improvements are highly supported among this group. While there are several areas of Thornton with higher concentrations of older adults, these areas are distributed across the city, with a notable population in the 55+ community of Todd Creek that is far from any existing transit service.

Individuals and Families with Lower Incomes

Census data showed that people with low and moderate income are mostly in the southern portion of Thornton, but there are other areas to the north where a large portion of the population is living under the poverty line. A low cost, reliable transit service that connects low-income families and individuals with shopping options, local services, and jobs could be an important mobility option for these riders.

People with Limited Access to a Vehicle

About 3% of Thornton households do not own a vehicle, and 14% only have one vehicle. Even in households with one vehicle, there may be people who need to get around but don't have the option to drive, particularly youth and older adults, either because they cannot drive, someone else in the house is using the vehicle, or they choose not to have a vehicle. Transportation for these populations is often challenging, due to the limitations in driving a personal automobile or consistent access to a personal automobile. In some census tracts in Thornton over 5% of households do not have a vehicle, particularly in the southwest, southeast, and in the Todd Creek 55+ neighborhood. By expanding transit options and connections, a new transit service could improve mobility for those who would otherwise have a difficult time accessing the places that they need to go.

People with Limited Mobility or Mobility Assistance Devices

Given that 9% of Thornton residents households have a disability, and those community members may have mobility needs, there is an opportunity to provide a more convenient option using an on-demand solution, especially for those residents that do not meet eligibility requirements for paratransit but may not be able to easily use existing bus services.

Commuters and Service Workers

While RTD does provide some service to regional destinations, particularly to Downton Denver and Denver International Airport, there are many service-oriented jobs within and near Thornton with varying schedules that are not well served by existing transit service. People working service jobs often do not have access to a vehicle and depend on transit or a friend or family member to get to work.

First/Last Mile Access

There are six regional transit hubs in or adjacent to Thornton that provide bus and/or rail service to destinations throughout the Denver region. While many people use these regional services (or would like to), these hubs are difficult to access without a vehicle from most of Thornton. Improving access via transit to these regional hubs was one of the most desirable transit improvements identified by the community and a potential travel market that is not well served today.

Short, Community-Based Trips

The most common trip type in Thornton are short community-based trips of two to five miles. This market is not currently well-served by RTD and there may be an opportunity for Thornton to fill this gap as the existing transit service is designed largely to serve longer regional and commuter trips. While these trips occur across the city there are particularly high concentrations in south Thornton where densities are higher and there are numerous commercial destinations (particularly around the Washington Street corridor).

Chapter 3 – Alternatives Analysis and Community Input

Five alternatives were evaluated as opportunities for transit improvements in Thornton. The alternatives included variations of new on-demand service, improvements to existing fixed-route service, and new fixed-route service. The alternatives were created based on input from the first round of community engagement and the transit market analysis. The alternatives were intended to be bookends to demonstrate the different benefits and challenges of several transit improvement options in Thornton, with the preferred alternative likely to be a subset or variation of the alternatives.

Description of Alternatives

The project team developed five potential improvements to public transit in Thornton, including two microtransit (on-demand shuttle) options and three options for improving standard bus service.

Microtransit Alternatives

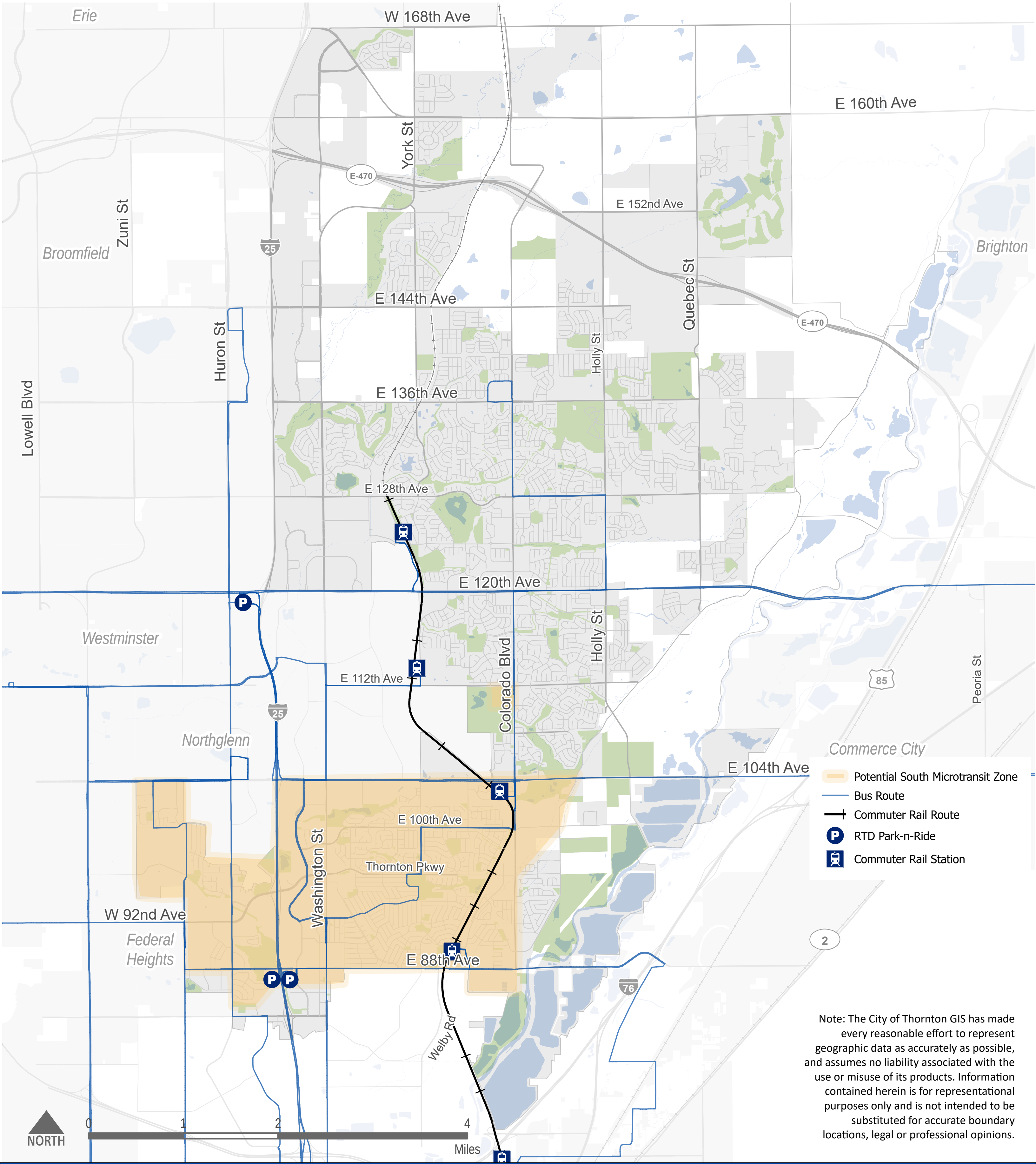
Microtransit is an on-demand transportation service where a ride can be requested from any origin to any destination within a fixed zone. Rides are requested through a smartphone app or phone call and response times are about 15 to 30 minutes after a request is made. A new microtransit service would use either SUVs, minivans, passenger vans, or minibuses (like FlexRide). With any option there will always be at least one vehicle available that is wheelchair/mobility device accessible (ADA compliant). Microtransit alternatives were assumed to be fare free and for purposes of the analysis were assumed to operate 14 hours a day, six days per week.

Alternative 1: South Microtransit Zone

Alternative 1 would provide microtransit service to the southern region of Thornton, generally between 88th Avenue and 104th Avenue, and from Zuni Street to Colorado Boulevard (**Figure 6**). The zone would also provide access to the Margaret W. Carpenter Recreation Center and Thornton Active Adult Center at 112th Avenue and Colorado Boulevard. The zone was slightly modified after community input, as described later in this chapter.

Alternative 1: South Microtransit Zone

Figure 6



City of Thornton

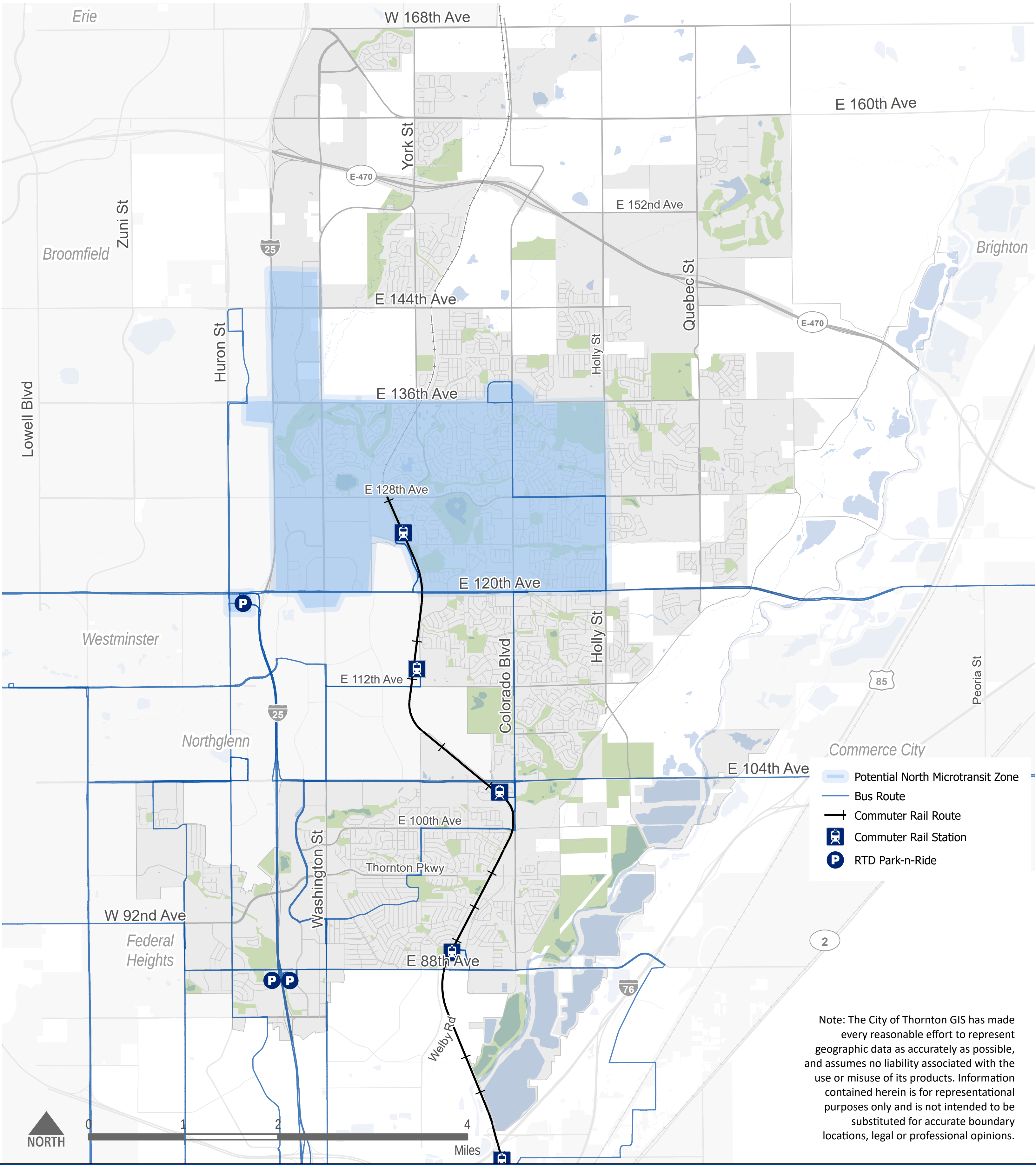
Basemap Data: June 2023

Alternative 2: North Microtransit Zone

Alternative 2 would provide microtransit service to the northern region of Thornton, generally between 120th Avenue and 136th Avenue, and from I-25 to Holly Street (**Figure 7**). The zone would also provide access to the Denver Premium Outlets and the Wagon Road Park-n-Ride in Westminster. The zone was slightly modified after community input, as described later in this chapter.

Alternative 2: North Microtransit Zone

Figure 7



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Fixed-Route Buses

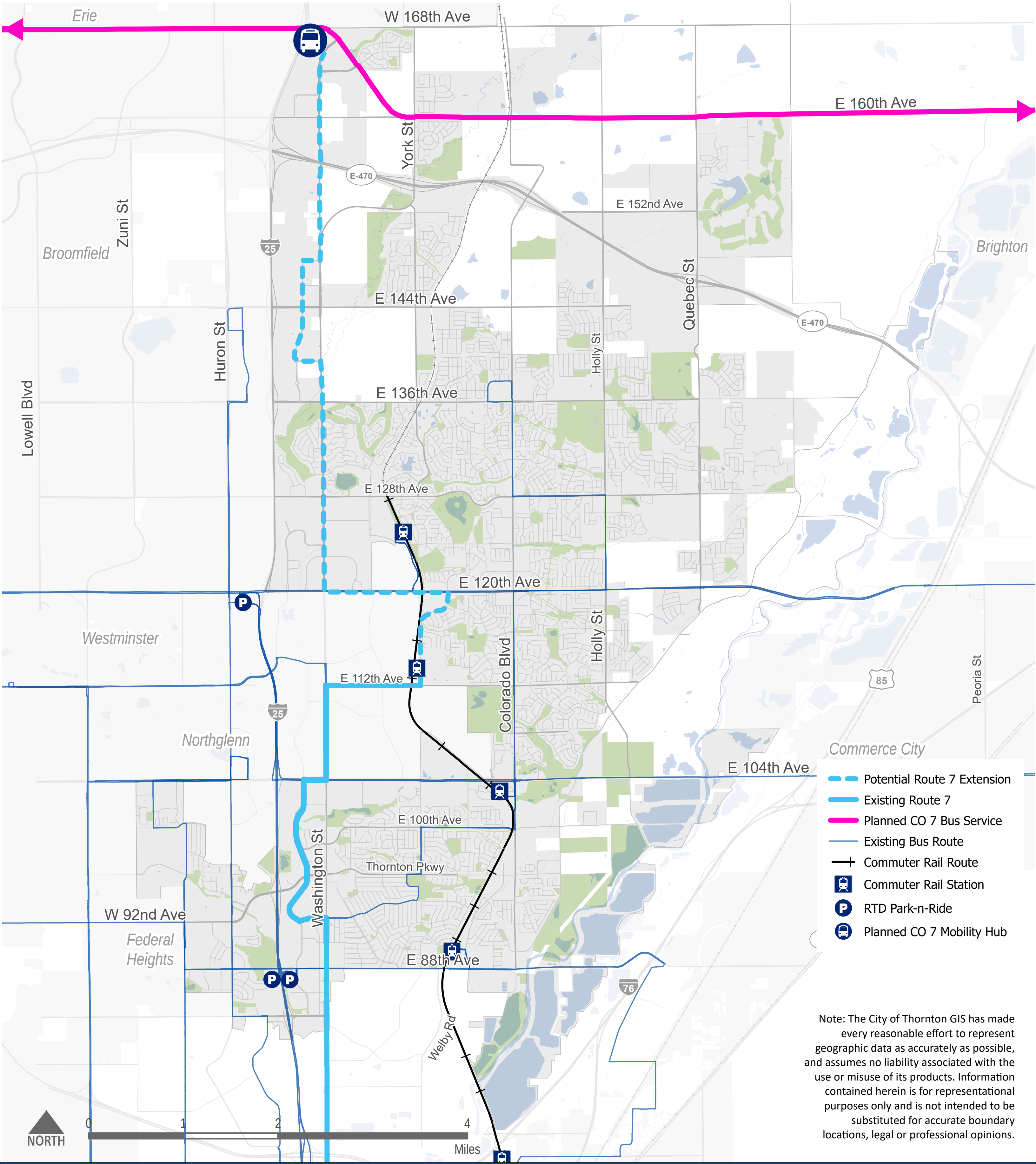
Eleven traditional bus routes (known as “fixed-route” buses) operated by RTD currently serve Thornton in some capacity. These are bus routes that run between set stops on set schedules. Based on input from the first round of community engagement, extending the existing Route 7 (Alternative 3), increasing frequency of existing routes on 120th Avenue (Alternative 4), and increasing frequency on the existing Route 93L (Alternative 5) were identified as opportunities for potential service improvements. Any changes to RTD routes will require interagency coordination between the City of Thornton, RTD, and neighboring communities. The evaluation conducted for this study only analyzed the impacts of these improvements within Thornton. Additional recommendations to fixed-route service were made after community input, as described in Chapter 4.

Alternative 3: Extend Route 7

Alternative 3 would extend the existing Route 7 from its current terminus at the Northglenn – 112th Station to the Larkridge Shopping Center near I-25 and CO 7 where it would connect with the planned Bus Rapid Transit (BRT) line along CO 7 and future Bustang stop on I-25 (**Figure 8**). The current route provides service between the 38th & Blake Rail Station in Denver and the Northglenn & 112th Rail Station at 30-minute frequencies throughout the day. The extension would also operate at 30-minute frequencies.

Alternative 3: Extend Route 7

Figure 8



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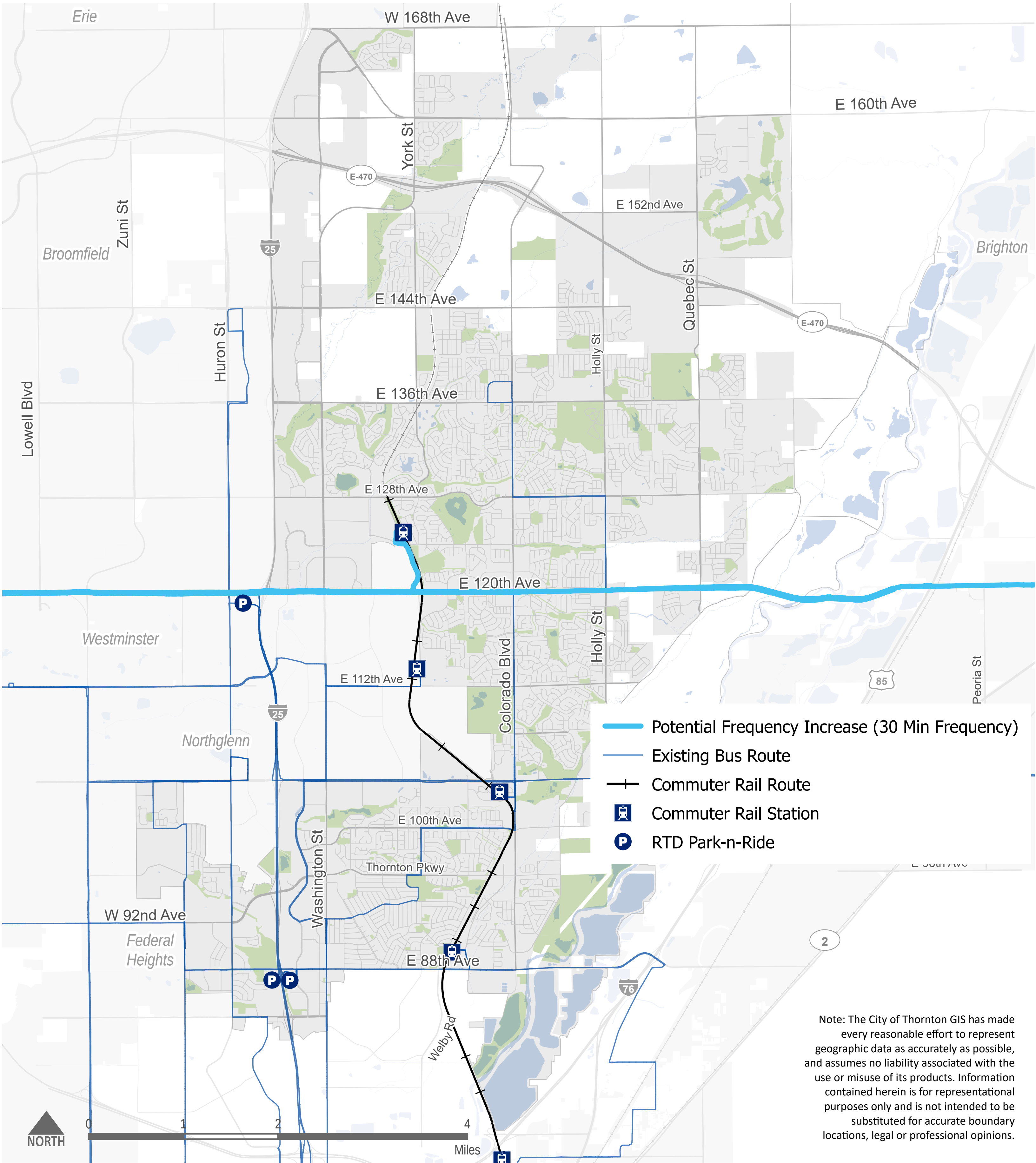
Alternative 4: Increase Frequency on 120th Avenue

Alternative 4 would increase bus frequency (how often the bus comes) on 120th Avenue within Thornton (**Figure 9**) from 60-minutes to 30-minutes throughout the day. Currently, 120th Avenue is served by the Route 120E between the US 36 & Broomfield Station in Broomfield and the Eastlake & 124th Station, and the Route 120L between the Eastlake & 124th Station and the US 85 & Bridge St Park-n-Ride in Brighton. Both routes currently travel at 60-minute frequencies.

Alternative 4: Increase Frequency on 120th Avenue

Figure 9



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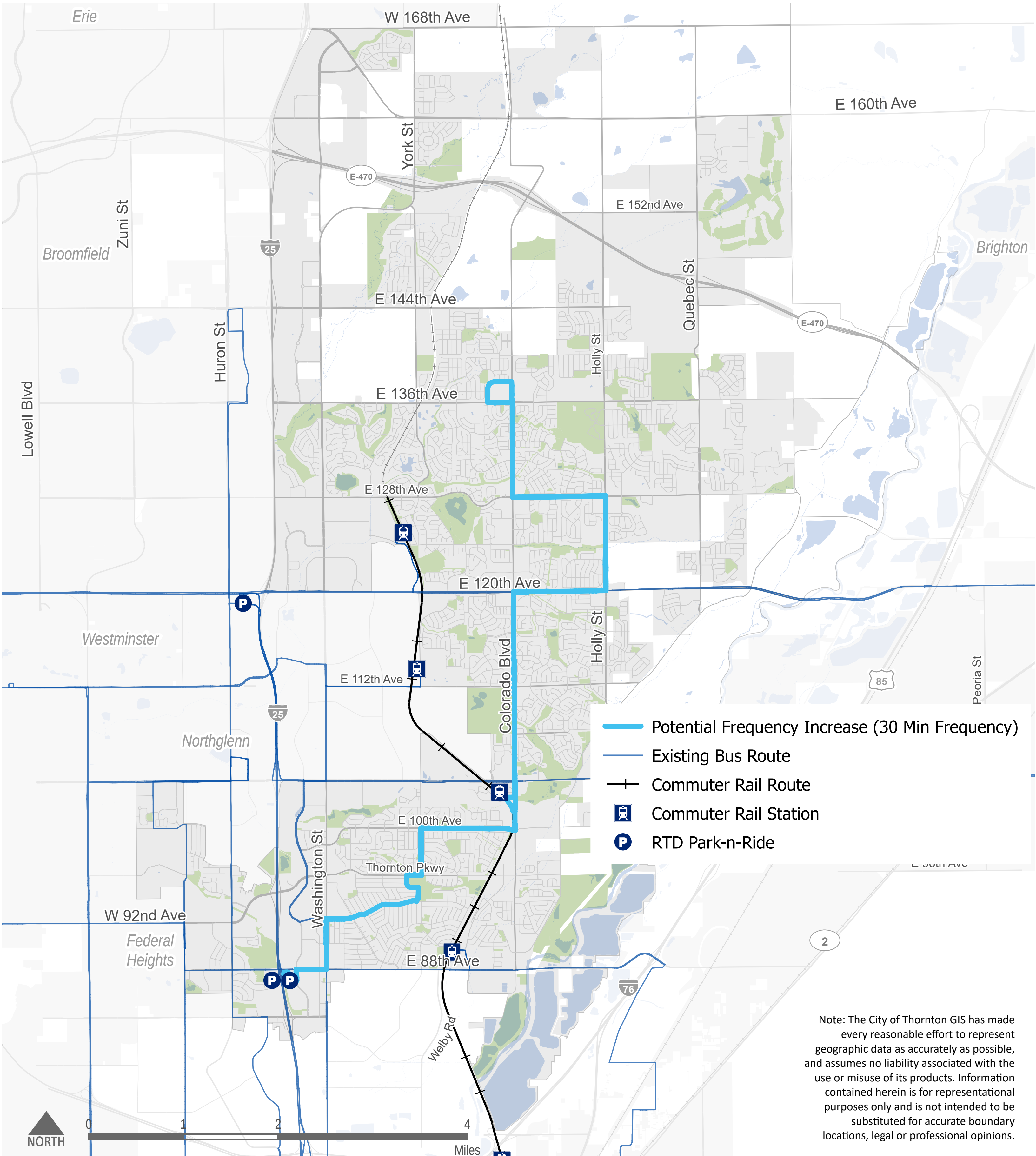
Alternative 5: Increase Frequency on Route 93L

Alternative 5 would increase the frequency of the existing Route 93L (**Figure 10**) from 60-minutes to 30-minutes throughout the day. The 93L currently provides service between the Thornton Park-n-Ride (near 88th Avenue and I-25) and 138th & Cherrywood Park Road at 60-minute frequencies throughout the day.

Alternative 5: Increase Route 93L Frequency

Figure 10



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Evaluation Criteria

Each alternative was evaluated based on a set of criteria that was informed by the first round of public engagement, such as how each alternative serves different demographic groups and destinations across Thornton. Each evaluation criteria are displayed in **Table 1**, along with what was measured, and the methodology used to measure each evaluation criteria. For microtransit alternatives, the analysis was performed for the area of the proposed zone. For fixed-route alternatives, the analysis was performed for the area within a quarter mile of the proposed route alignment.

Table 1: Evaluation Criteria

Evaluation Criteria	Metric	Methodology	Data Source(s)
Ridership Potential	Average Weekday Riders	Estimates of transit ridership at full build-out of each alternative based on peer communities, population and employment forecasts, and research.	Denver Area On-Demand Services, DRCOG Small-Area Forecasts, Transit Cooperative Research Program (TCRP)
Cost	Annual Operating Cost	Estimates of annual operating cost at full build-out of each alternative based on peer communities and RTD cost per revenue estimates	Denver Area On-Demand Services, RTD
Ease of Implementation	Qualitative Ability to Implement	Qualitative assessment of logistical needs for implementing each alternative, including need for vehicles, bus stops, drivers, coordination with partner agencies, etc.	Peer Communities
Equity Index	Number of Census Tracts with High and Medium Equity Scores Served	Using DRCOG's equity index tool, classified Thornton's census tracts by natural breaks of the final equity index score. Alternatives that serve census tracts classified in the top two classes (more likely to be historically disadvantaged) were counted.	DRCOG Equity Index
Connect to Active Transportation Network	Number of Trailheads Served	Using Thornton's trails and trailheads data, calculated number of trailheads served by alternatives.	City of Thornton
Connection to Future Transit Lines	Connection to Future CO 7 BRT	Assessed if the alternative provided access to the future CO 7 Bus Rapid Transit line.	N/A

Area Not Served by Existing 30-Minute Transit Frequencies	Percent of Area Not Currently Served by 30-Minute Transit Frequencies or Better	For microtransit, calculated the percentage of the proposed microtransit zone area that is farther than a quarter mile from an existing bus route that operates at 30-minute frequency or better and farther than a half mile from a transit hub (park-n-ride). For fixed-route alternatives, the same calculation was performed for the area within a quarter mile of the proposed route.	RTD
Area Not Served by Existing Transit	Percent of Area Not Currently Served by FlexRide or 60-Minute Transit Frequencies	For microtransit alternatives, calculated the portion of the proposed zone area not currently within one of the following: a quarter mile of an existing fixed route bus, a half mile from a transit hub, or within an existing FlexRide zone. For fixed-route alternatives, the same calculation was completed for the area within a quarter mile buffer around the proposed route.	RTD
Travel Markets Served			
Schools	Number of Middle/High Schools Served	Number of Thornton middle and high schools directly served by alternatives.	City of Thornton
Student Trips	Number of Middle/High School Students Served	Number of students attending Thornton middle and high schools directly served by alternatives.	City of Thornton
Older Adults (Quantitative)	Percent of Thornton's Older Adults Served	Percent of older adults directly served by alternatives compared to the total of older adults in Thornton.	U.S Census
Older Adults (Qualitative)	Ease of Access for Older Adults	Qualitative Assessment of average distance a user would need to walk to access on-demand service vs. fixed-route transit service.	N/A
Low-Income Families (Quantitative)	Percent of Thornton's Low-Moderate Income Population Served	Number of low-income families directly served by alternatives compared to the total number of low-income families in Thornton.	U.S Census

Low-Income Families (Qualitative)	Ease of Access (likely fare) for Low-Moderate Income Population	Qualitative Assessment of fare required for on-demand vs. fixed-route transit options.	N/A
People with Limited Access to Vehicles	Percent of Thornton's Households with One or Fewer Vehicles Served	Number of households with limited access to vehicles directly served by alternatives compared to the total number of households with limited access to vehicles in Thornton.	U.S Census
People with Disabilities	Percent of Thornton's Disability Population Served	Number of individuals with disabilities directly served by alternatives compared to the number of individuals with disabilities in Thornton.	CDPHE
Access to Service Jobs	Percent of Thornton's High and Medium Employment Concentrations Served	Total area of high and medium employment concentrations as designated by DRCOG directly served by alternatives compared to the total area of high and medium employment concentrations in Thornton.	DRCOG Employment Concentrations
First/Final Mile Access	Number of Regional Transit Hubs Served	Count of regional transit hubs (rail stations or park-and-ride stops) directly served by alternatives.	N/A
Short Community-Based Trips	Number of Key Destinations Served	Number of key destinations within Thornton (including schools, medical centers and hospitals, grocery stores, community and recreation centers, libraries, social services, and other desired destinations from public input) directly served by alternatives.	City of Thornton, First Round of Community Input

Alternatives Analysis Findings

The alternatives were scored relative to each other on a qualitative scale of high-medium-low for each evaluation criteria based on the resulting metrics. Both the quantitative and qualitative results are displayed in **Figure 11**.

Figure 11: Alternatives Analysis Results

Legend:	***Higher Feasibility***	***Medium Feasibility***	***Lower Feasibility***	

Evaluation Criteria	Metric	South Thornton Microtransit Zone	North Thornton Microtransit Zone	Extend Route 7	Increase 120th Frequency	Increase 93L Frequency
Ridership Potential	***Average Weekday Riders***	200-300	125-225	300-425	125-200	125-175
Cost	***Annual Operating Cost***	\$975k-\$1.2M	\$800k-\$1M	\$2M-\$3.3M	\$675K-\$1.1M	\$1.2M-\$1.9M
Ease of Implementation	***Qualitative Ability to Implement***	High	High	Low	Medium	Medium
Equity Index	***Number of Census Tracts with High and Medium Equity Scores Served***	8	2	1	1	3
Connect to Active Transportation Network	***Number of Trailheads Served***	3	1	0	0	1
Connection to Future Transit Lines	***Connection to Future CO-7 BRT***	No	No	Yes	No	No
Area Not Served by Existing 30-Minute Transit Frequencies	***Percent of Area Not Currently Served by 30-Minute Transit Frequencies or Better***	47%	91%	95%	83%	76%
Area Not Served by Existing Transit	***Percent of Area Not Currently Served by Flex Ride or 60-Minute Transit Frequencies***	2%	12%	20%	0%	0%
Travel Markets Served						
Schools	***Number of Middle/High Schools Served***	12	8	4	0	5
Student Trips	***Number of Middle/High School Students Served***	7,390	6,555	1,589	0	4,891
Older Adults (Quantitative)	***Percent of Thornton's Older Adults Served***	33%	29%	9%	11%	23%
Older Adults (Qualitative)	***Ease of Access for Older Adults***	+	+	-	-	-
Low-Income Families (Quantitative)	***Percent of Thornton's Low-Moderate Income Population Served***	54%	17%	7%	11%	24%
Low-Income Families (Qualitative)	***Ease of Access (likely fare) for Low-Moderate Income Population***	+	+	-	-	-
People with Limited Access to Vehicles	***Percent of Thornton's Households with One or Fewer Vehicles Served***	55%	19%	8%	12%	23%
People with Disabilities	***Percent of Thornton's Disability Population Served***	43%	21%	9%	12%	24%
Access to Service Jobs	***Percent of Thornton's High and Medium Employment Concentrations Served***	42%	34%	21%	12%	24%
First/Final Mile Access	***Number of Regional Transit Hubs Served***	3	2	1	2	1
Short Community-Based Trips	***Number of Key Destinations Served***	76	33	17	12	39

Key findings of the alternatives analysis are summarized below by alternative:

- **Alternative 1: South Microtransit Zone.** This alternative had more "high" scores across the different evaluation criteria than any of the other alternatives. Specifically, this alternative scored the best for serving the travel markets identified in the travel market analysis. It also scores well in cost and ease of implementation. It was middle-of-the road in terms of ridership potential as compared to the other alternatives. This alternative does not score as well as the others in serving areas that are not currently being served by transit, as the south microtransit zone would overlap with the areas in Thornton with some of the best existing transit services. Overall Alternative 1 scored the best among the criteria evaluated, but it would also be in an area with the most existing transit coverage in Thornton.
- **Alternative 2: North Microtransit Zone.** Alternative 2 had the second highest number of high and medium scores among the alternatives. Alternative 2 scores relatively high among travel markets served, but not as high as Alternative 1. In particular, this zone does not serve as many schools, low-income families, people with limited access to vehicles, or people with a disability as Alternative 1 does. Similar to Alternative 1, Alternative 2 scores high in terms of minimizing cost and ease of implementation, but ridership is not expected to be as high as Alternative 1. Alternative 2 also scored the highest among all alternatives in serving areas that are currently underserved/unserved by transit, as this zone is in an area of Thornton that has minimal existing transit options today.
- **Alternative 3: Extend Route 7.** This alternative performed the lowest among all alternatives in terms of travel markets served. However, Alternative 3 has the highest ridership potential among all of the alternatives, scored the best at connecting to future transit lines and serving areas that are currently underserved by transit. This alternative may also be the most challenging to implement due to both the need to coordinate with RTD (similar to the other fixed-route alternatives) and the additional need to construct bus stops and access to the bus stops along the route.
- **Alternative 4: Increase Frequency on 120th Avenue.** Compared to all the other alternatives, this alternative scored the lowest when comparing all evaluation criteria. It should be reiterated that scoring lower than the other alternatives does not mean that this alternative does not accomplish the desired goals of new transit services in Thornton. Rather, it means that other alternatives might be better suited to serve transportation needs. The area in which Alternative 4 scores highest is in minimizing cost. Ease of implementation, its ability to serve areas that are currently underserved by transit, and providing first/final mile access were all medium scores, while the alternative scored lower in all other metrics as compared to the others.
- **Alternative 5: Increase Frequency on Route 93L.** This alternative scores in the middle compared to the other alternatives. Alternative 5 serves the identified travel markets better than the other two fixed-route alternatives, but not as well as the microtransit alternatives. Cost is in the middle compared to the other alternatives and ridership potential is on the low end compared to other alternatives. Because of the travel markets served this alternative scored better on the equity index than compared to Alternatives 2, 3, and 4.

Community Input on Alternatives

Through a virtual open house and an online survey, all five alternatives and their scoring from the alternatives analysis were presented to the public. In both the open house and the online survey, it was made clear that the alternative improvements shown were still in draft phase and intended to represent bookends for purposes of comparison analysis. The public was made aware that final recommendations may be a subset, combination, or variation of one or all the five improvements and will be refined based on community feedback and further analysis.

Participants of these community engagement efforts were asked to provide input on the evaluation criteria used in the alternatives analysis, preference of alternatives, and preferred service characteristics (days of the week and times of day). Between the virtual open house and the online survey, the project received input from 57 people. For this round of the online survey (there was another one completed during the transit market analysis phase of the project), the largest portion of respondents (31%) indicated they live in Ward 2, which covers the southeast portion of the City **(Figure 12)**. A map of the ward geographies at the moment of this survey is provided in **Figure 13**. There was also a significant portion of respondents who do not live within the city boundaries of Thornton, and the survey received the least number of responses from Ward 1. These are important to note when understanding how respondents' residences impact their choices to answers throughout the survey.

Figure 12: Which City of Thornton Ward do you live in?

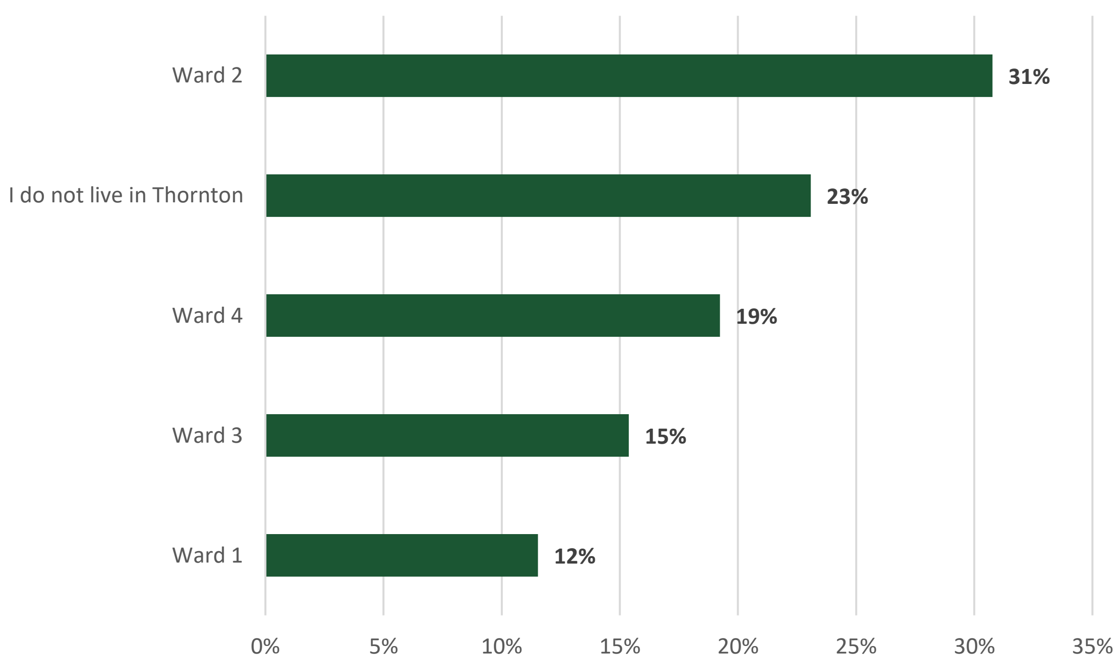
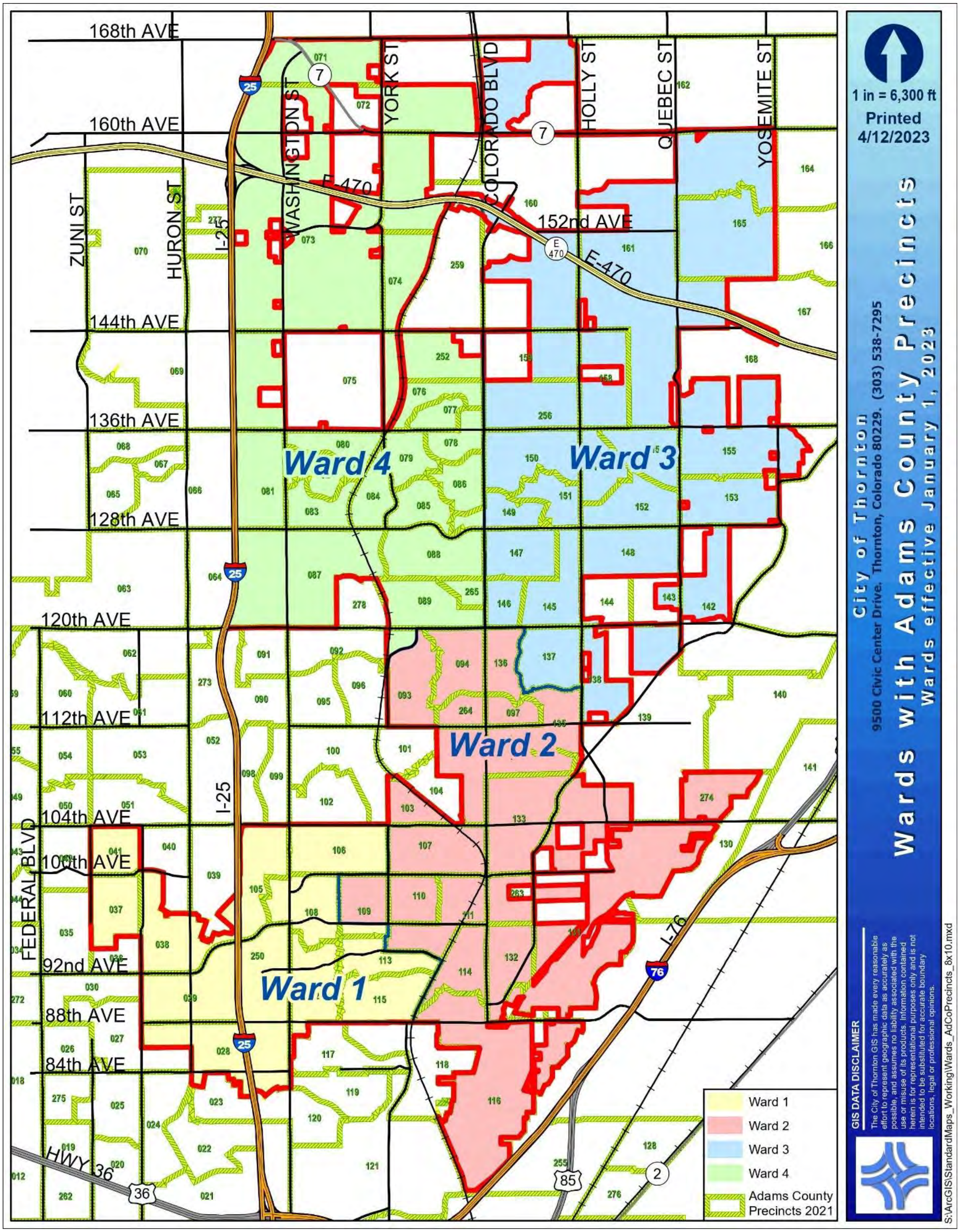


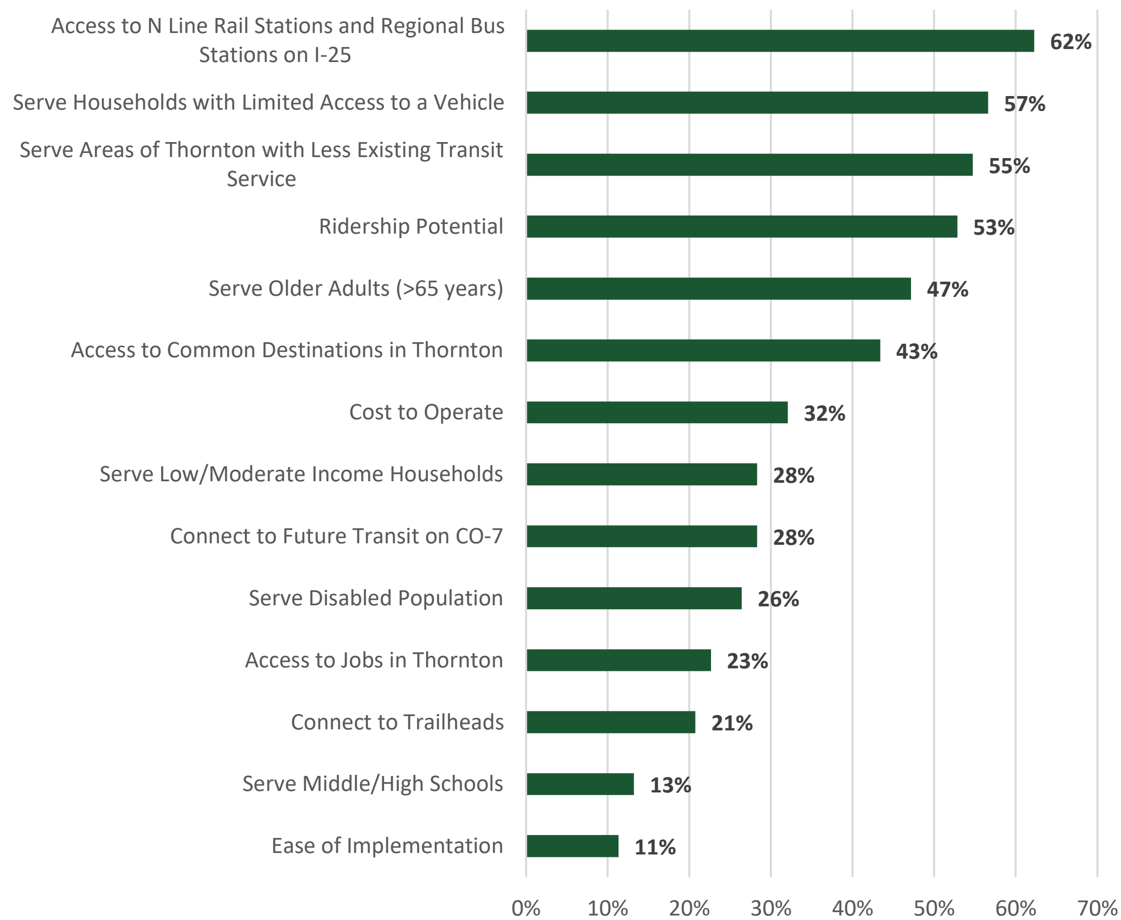
Figure 13: City of Thornton Ward Map, January 2023



Alternatives Survey Results

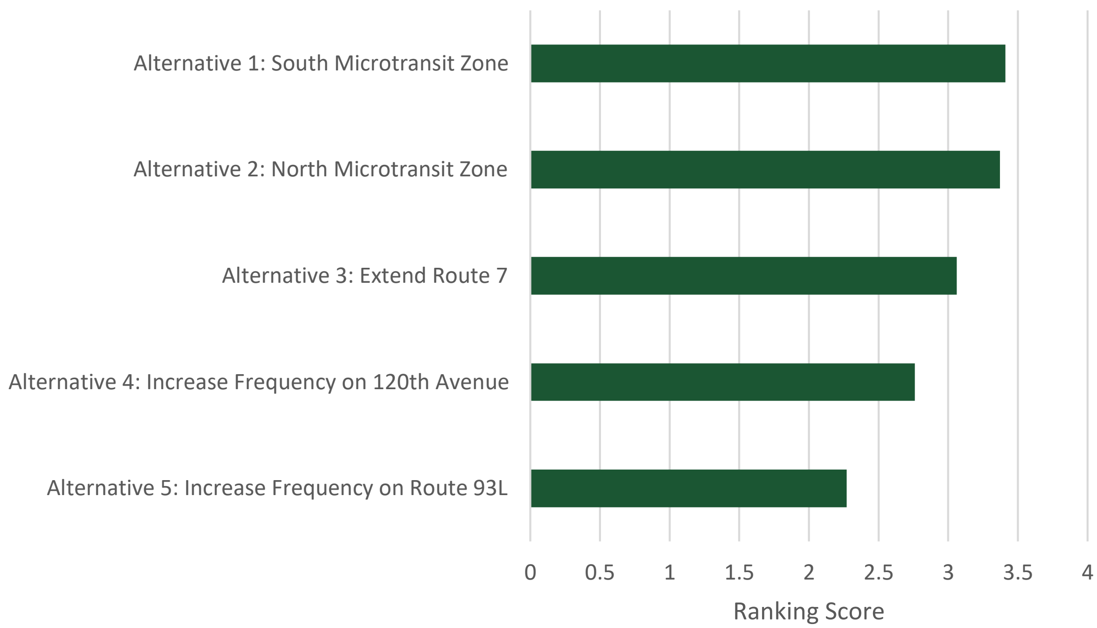
The community was asked to pick the five most important evaluation criteria when it comes to evaluating each alternative. **Figure 14** displays which criteria were the most important to survey respondents. The top factors were access to N Line rail stations and regional bus stations, serving households with limited access to a vehicle, serving areas of Thornton with less existing transit service, ridership potential, serving older adults, and access to common destinations in Thornton.

Figure 14: Of the Evaluation Criteria used to compare the improvement alternatives, please indicate the five most important to you.



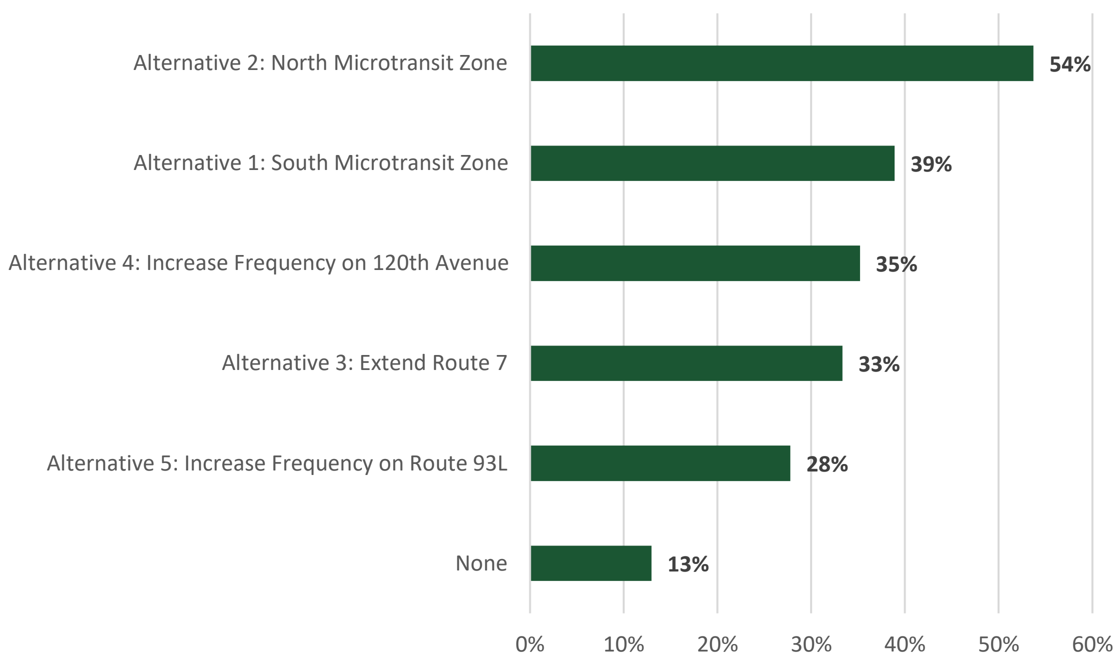
Survey respondents were asked to provide input on the draft alternatives in two ways. The first way was by ranking the alternatives from most preferred to least preferred. For this question the two microtransit zones were ranked highest, followed by Alternative 3 - to extend Route 7 **(Figure 15)**.

Figure 15: Based on the comparison between all five alternatives for improving public transit in Thornton, please rank the alternatives from most preferred to least preferred.



The second way in which respondents were asked to provide input on the draft alternatives was by selecting which alternative(s) they would use. **Figure 16** displays that the North Microtransit Zone would be used most, followed by the South Microtransit Zone. It is notable that although the survey respondents ranked the microtransit zones similarly, there is a larger portion of people who said they would use the North one. Further, although the Route 7 extension alternative ranked third, the public input shows that people would more likely use the increased frequency on 120th Avenue. It is important to consider that there were more Ward 2 and Ward 4 residents who responded to the survey than Ward 1 or 3 residents, which corresponds to the transit alternatives that rose to the top by likelihood to use.

Figure 16: If all of these alternatives were implemented, which would you use? (select all that apply)



Input on Service Characteristics

The online survey also asked respondents to rank the days of the week and times of day that they would most likely use transit services in Thornton. **Figure 17** displays the preference of days, with weekdays (Monday through Friday) ranking at the top, followed by Saturday and then Sunday.

Figure 17: Please rank the days of the week you would likely use transit service in Thornton from most likely to least likely. Do not select days you would not use the service.

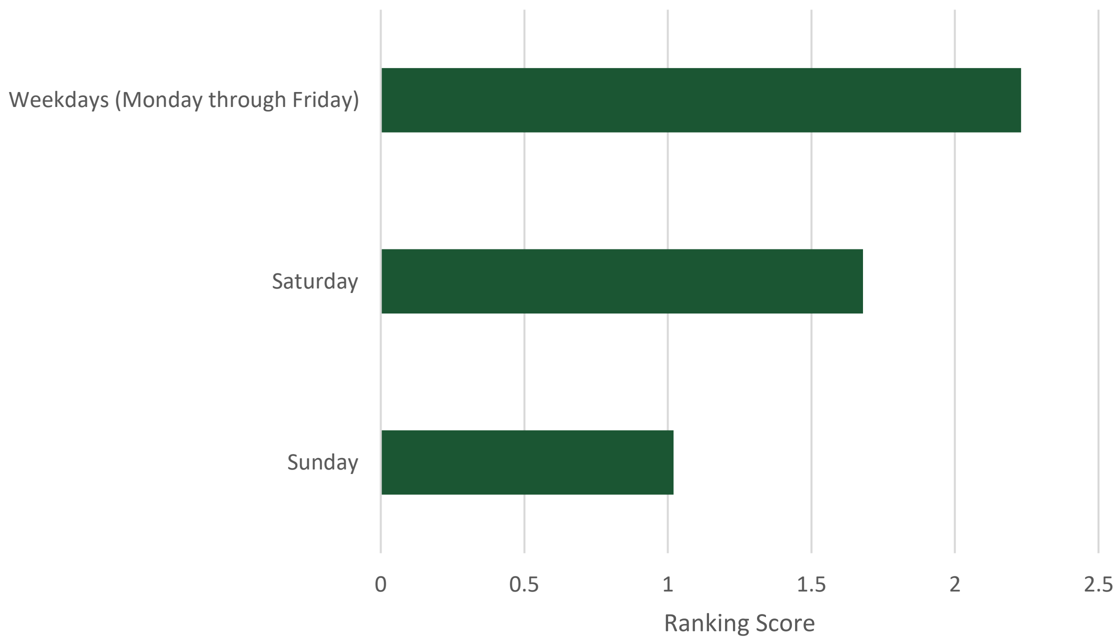
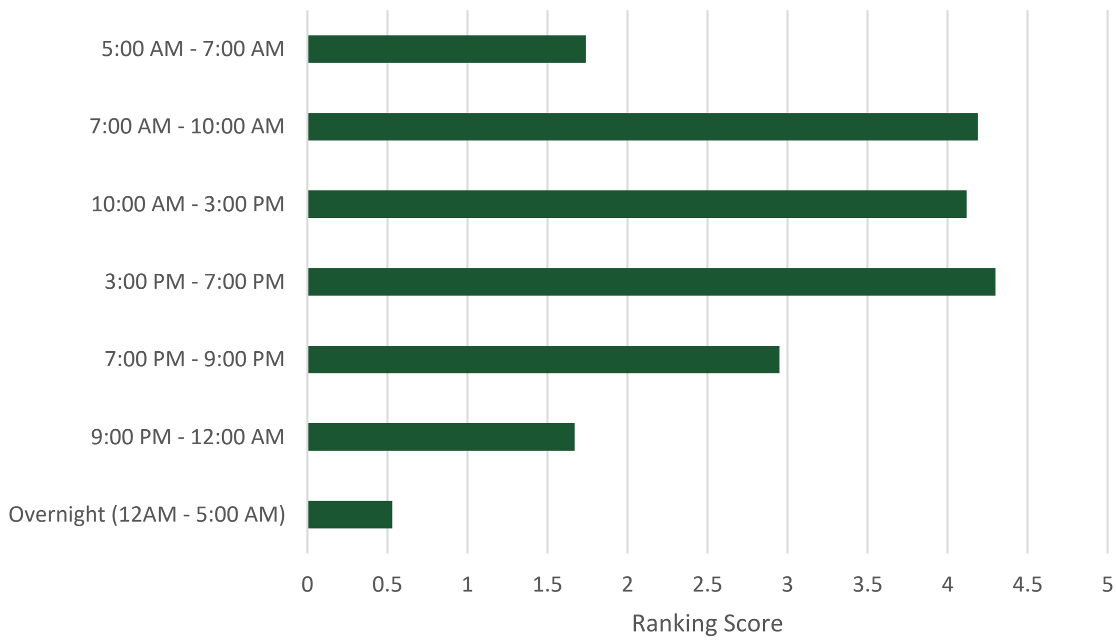


Figure 18 displays the preference for times of the day, with the top desired times of day being 7:00 AM to 7:00 PM. There is also a larger preference for service going toward 9:00 PM than service going earlier from 5:00 AM.

Figure 18: Please rank the times of the day you would likely use transit service in Thornton from most likely to least likely. Do not select times of day you would not use the service.



Other Comments

During the open house and through the survey, the public had opportunities to provide open-ended responses related to changes to the presented alternatives, additional improvements to public transit, and other comments. In general, the open-ended responses were more focused on similar themes seen in the first phase of public outreach, where the public expressed a desire for increased frequency of existing transit services and easier connections to regional transit at the N Line stations and the regional bus stations. The comments directly related to the presented alternatives expressed a desire to connect to nearby areas outside of the Thornton city boundary, and a desire for the microtransit zones to overlap more to provide north-south connections throughout the city. There were also numerous comments about improvements to the existing RTD FlexRide service and improvements to the RTD website.

Selection of a Preferred Alternative

Based on the evaluation criteria, input from the public, and guidance from the project's stakeholder group, the project team determined that implementation of all alternatives over time would advance the city toward its transit mobility goals. Based on feedback from the public and stakeholders some modifications were made to the microtransit zone boundaries to cover more area. Community and stakeholder input along with anticipated performance metrics also informed a phasing plan to prioritize implementation of certain improvements first. Several additional future transit projects emerged from the evaluation process that were also included as medium and long-term improvements in the plan. The preferred alternative and phasing of each action is described in Chapter 4.

Chapter 4 – Preferred Alternative and Implementation Phases

This chapter describes the preferred alternative and provides guidance on how to phase the transit improvements over a ten-year period between 2025 and 2034. The operating plan is split into three implementation phases:

4. Short-term: 2025 to 2027
5. Mid-term: 2028 to 2031, and
6. Long-term: 2032 to 2034.

Note: All cost estimates are in 2023 dollars and will need to be adjusted for inflation according to year they are implemented. Additionally, the proposed responsible party was identified for each improvement in **Table 2**, **Table 3**, and **Table 4**. The responsible party includes City of Thornton, RTD, or RTD and City of Thornton and potentially other jurisdictions. For improvements where City of Thornton is listed, Thornton will need to initiate this improvement, but funding could come from multiple sources, including both internal and external. For improvements where only RTD is identified as the responsible party, RTD has expressed their intent to make that improvement. For improvements to the RTD fixed-route network where both City of Thornton and RTD are listed, it is assumed that either RTD will need to make this improvement or Thornton (and potentially other jurisdictions) will need to “buy up” service from RTD. However, it should be noted that RTD is not currently allowing buy-ups largely because of the driver shortage, but RTD has indicated a desire to allow buy-ups again in the future. More is described on this risk at the end of Chapter 6 – Implementation Plan.

Short-Term Implementation (2025-2027)

The short-term transit improvements are displayed in **Table 2**, along with service characteristics, cost estimates, and implementation timeline. In the first three years the city will focus on implementing the two microtransit zones and extending the Route 7 north to Larkridge in two phases.

Figure 19 illustrates these short-term improvements in a map. Descriptions of each transit improvement are also provided below.

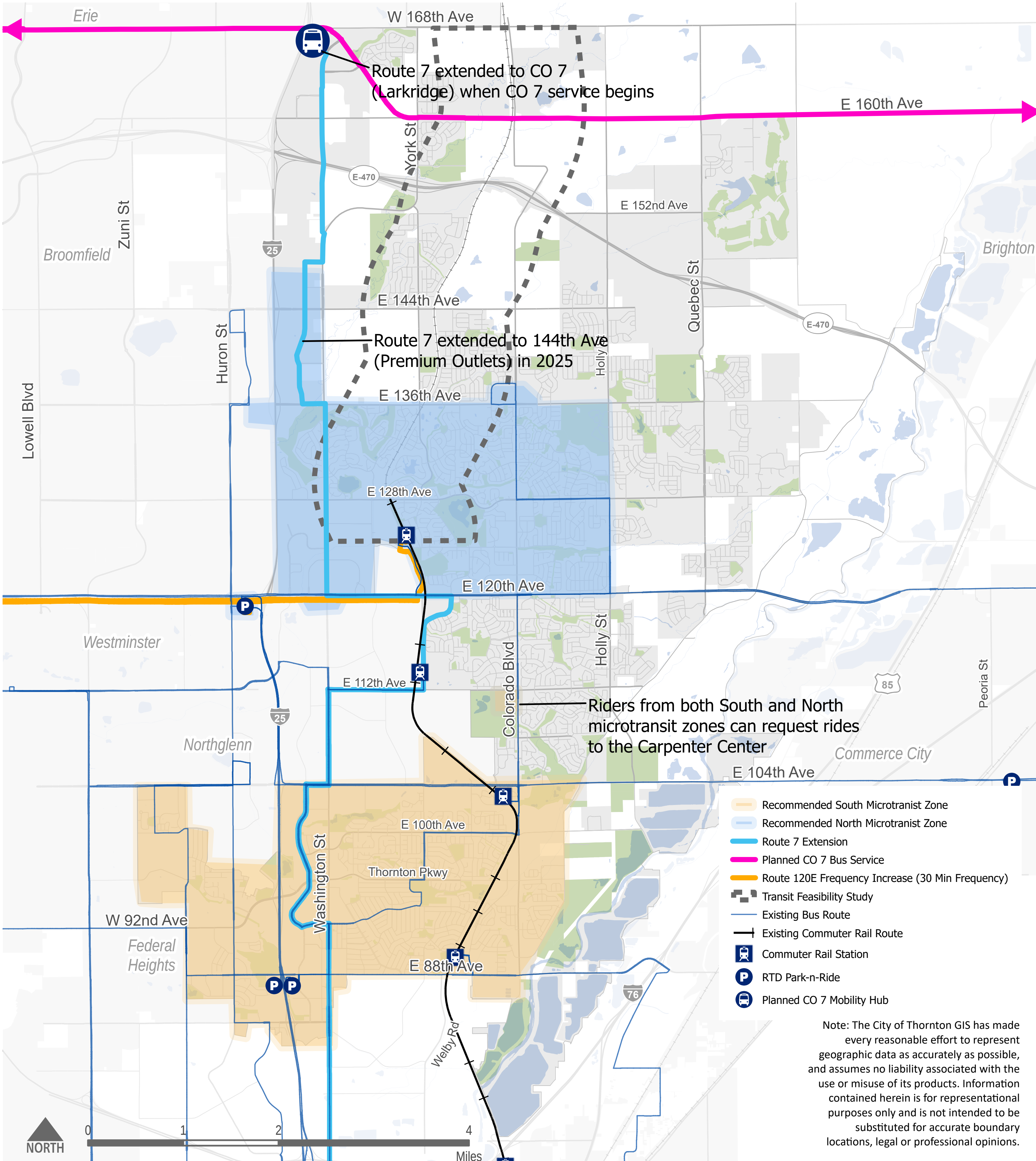
Table 2: Short-Term Implementation Details

Transit Improvement	General Extent Description	Service Hours	Response Time or Frequency	Estimated Annual Operating Cost*	Implementation Year	Responsible Party
South Microtransit Zone	Between southern city limits and 104th Ave, and from Zuni St to Riverdale Rd. Rides can also be requested to/from the Carpenter/Active Adult Center.	Monday – Saturday 7:00 AM to 9:00 PM	30 minutes	\$1M - \$1.5M	2025	City of Thornton
Route 7 Extension (Northglenn/112th to 144th Avenue)	RTD SOP indicates an extension to 144th Avenue (Denver Premium Outlets).	Daily 5:00 AM to 12:00 AM	60 minutes	\$600K - \$1.2M	2025	RTD
Route 7 Extension to CO 7 (144th Ave to CO 7)	Extension to the future CO 7 mobility hub (Larkridge Shopping Center).	Daily 5:00 AM to 12:00 AM	60 minutes	\$350K - \$450K	When CO 7 Bus Service Begins (2025/2026)	City of Thornton and RTD
North Microtransit Zone	Between 120th Ave and 136th Ave, and from I-25 to Holly St. Rides can also be requested to/from the Carpenter/Active Adult Center and the Wagon Rd Park-n-Ride.	Monday – Saturday 7:00 AM to 9:00 PM	30 minutes	\$800K - \$1.2M	2026-2027	City of Thornton
Transit Feasibility Study for Interim Connections to CO 7	Study for bus service and supporting infrastructure to connect Eastlake & 124th Station to CO 7 through planned station areas.	TBD	TBD	\$200K - \$300K	2026-2027	City of Thornton
Route 120E Frequency Increase	Routing stays the same as existing between US 36 & Broomfield Station and Eastlake & 124th Station.	Daily 6:00 AM to 11:30 PM	30 minutes	\$300K - \$500K	2026-2027	RTD

*Cost estimates are in 2023 dollars and will need to be adjusted for inflation.

Short-Term Implementation (2025-2027)

Figure 19



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City of Thornton

Basemap Data: June 2023

South Microtransit Zone

The area of the south microtransit zone should generally extend from the southern city limits to 104th Avenue and from Zuni Street to Riverdale Road and include a connection point to/from the Carpenter Recreation Center and Thornton Active Adult Center. Riders may request rides from any origin to any destination within the zone boundary. In addition, riders may request rides from the south zone to and from the Carpenter Recreation Center and Thornton Active Adult Center. This zone boundary will allow transfers at three regional transit hubs to the N Line and regional service along I-25: Thornton Crossroads & 104th, Original Thornton & 88th, and Thornton Park-n-Ride. The annual operating cost estimate of $1M to $1.5M assumes 14 hours of service six days per week, three vehicles operating throughout the day, and any necessary start-up, administrative, and marketing costs. The alternatives analysis public survey results indicate the highest demand for the service to be between 7:00 AM and 9:00 PM. As will be described in the implementation plan in Chapter 6, the City of Thornton should work with the selected microtransit operator to refine the service area, service days and hours, and required vehicles to best support the community needs over time.

Route 7 Extension to 144th Avenue

RTD's Strategic Operating Plan (SOP) indicates that Route 7 (which currently terminates at the Northglenn & 112th Station) will be extended to the Denver Premium Outlets at 144th Avenue by 2028. The alignment of the route may change over time to best accommodate the travel demand, but the SOP would have every other trip travel to the Denver Premium Outlets, meaning that there would be 30-minute frequency to the Northglenn & 112th Station, and 60-minute frequency between the current terminus and the Denver Premium Outlets. It is recommended that this be completed in 2025 since the demand for this extension already exists. Due to RTD planning to implement this extension, the assumption is that the City of Thornton would not need to fund it. To still understand the rough magnitude of cost, the project team estimates that this route extension with 60-minute frequencies would cost an additional $600K to $1.2M to the existing annual operating cost. This cost assumes a standard operating rate provided by RTD, with proportional route distance added.

Route 7 Extension to CO 7

Between the anticipated commercial and mixed-use development north of 144th Avenue, the mobility hub to be constructed at I-25 and CO 7, and new transit service to run between Brighton and Boulder on CO 7, it is recommended to extend Route 7 to this mobility hub along a Grant Street/Washington Street alignment. It is currently uncertain who would fund this extension. It may be RTD, the city, or a combination. The annual operating cost estimate of this extension from 144th Avenue to CO 7 is $350K - $450K at 60-minute frequencies. The cost assumes a standard RTD operating rate proportionally applied to route distance.

North Microtransit Zone

The general area of the north microtransit zone is recommended to initially extend from 120th Avenue to 136th Avenue, and from I-25 to Holly Street. The zone also extends to 148th Avenue between I-25 and

Washington Street. Riders may request rides from any origin to any destination within the zone boundary. In addition, riders may request rides from the north zone to and from the Carpenter Recreation/Active Adult Center and/or the Wagon Road Park-and-Ride. The annual operating cost estimate of $800K to $1.2M assumes 14 hours of service six days per week and three full-time vehicles and one part-time vehicle (three vehicles during peak hours). Like the south microtransit zone, the City of Thornton should work with the selected microtransit operator to modify the service area, service days and hours, and required vehicles to best support the community needs over time.

Transit Feasibility Study for Interim Connections to CO 7

According to the RTD FasTracks program, the N Line (which currently has a temporary end of line station at the Eastlake & 124th Station) is to be completed to CO 7 with stops at York & 144th and CO 7. As of 2023, funding the completion to CO 7 is not available, and RTD states the completion of the final 5.5 miles will be complete when funds become available, which may not happen for another 20 or 30 years – or more. As this area of Thornton is expected to grow significantly in the next decade, the City of Thornton should study the feasibility of providing an interim bus service between the Eastlake & 124th Station and CO 7, including to the planned N Line station that would be at 144th Avenue. This study should consider the transit service type (fixed-route, deviated, vehicle type, etc.), the alignment, stations, land acquisition, ridership demand, and implementation timing given development and other bus connections along CO 7; the initial CO 7 service plan includes stations in Thornton at the CO 7/I-25 Mobility Hub, Holly Street, and Quebec Street. Furthermore, the study should consider locations for the future N Line station areas and other infrastructure needed to support both the interim service and the N Line extension (such as park-n-rides and bicycle/pedestrian connections).

Route 120E Frequency Increase

To increase frequency of service on 120th Avenue within Thornton, modifications to frequency will need to occur to both the Route 120E and Route 120L. Route 120E, which runs between the US 36 & Broomfield Station and the Eastlake & 124th Station, currently operates at 60-minute frequencies east of Wagon Road Park-n-Ride. RTD has indicated they are likely to increase frequencies of the Route 120E to operate at 30-minute frequencies during the peak periods at some point in the next year or two. The recommendation in this plan is to increase to 30-minute frequencies in the midday as well. The estimated additional annual operating cost for increasing frequency on the segment between Wagon Road Park-n-Ride and the Eastlake & 124th Station all day is $300K to $500K, assuming a standard RTD operating rate.

Mid-Term Implementation (2028-2031)

The mid-term implementation transit improvements are displayed in **Table 3**, along with service characteristics, cost estimates, and implementation timeline. Mid-term recommendations include making adjustments to the existing microtransit services and providing enhancements to fixed-route transit through frequency increases, new routes, and route extensions. Recommended mid-term improvements are illustrated in a map **(Figure 20)** and descriptions of each transit improvement are provided below.

Table 3: Mid-Term Implementation Details

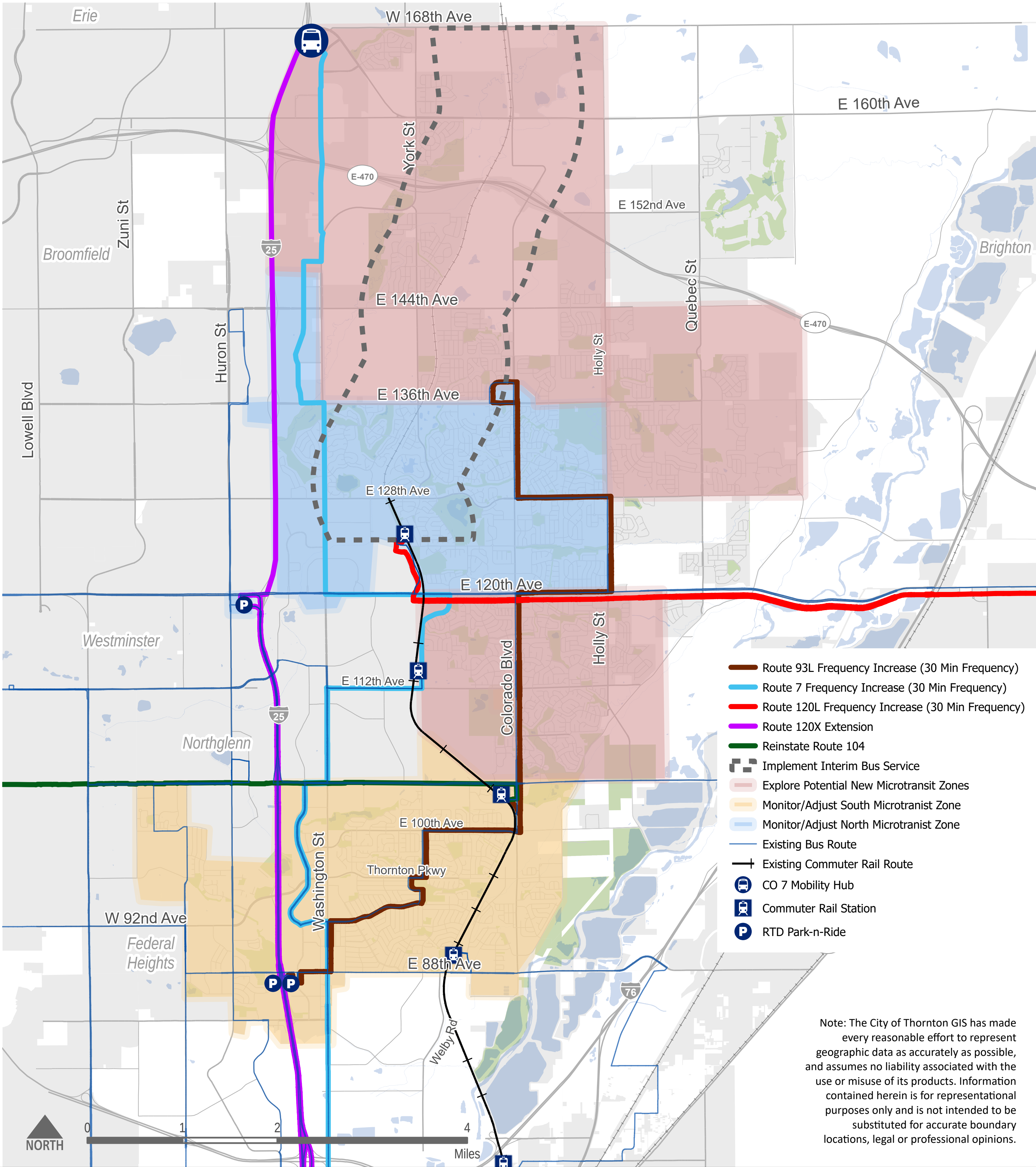
Transit Improvement	General Extent Description	Service Hours	Response Time or Frequency	Estimated Annual Operating Cost*	Implementation Year	Responsible Party
Adjustments to South and North Microtransit Zones and Potential New Zone(s)	Consider adjusting service areas or creating new service areas to accommodate any travel gaps identified in initial implementation.	TBD	30 minutes	Approx. $200K - $300K for improvements, and $800K - $1.2M per new zone	2028-2031	City of Thornton
Route 93L Frequency Increase	Routing stays the same as existing between Thornton Park-and-Ride and 138th & Cherrywood Pk Rd.	Daily 7:00 AM to 9:00 PM	30 minutes	$1.2M - $1.9M	2028-2029	City of Thornton and RTD
Route 7 Frequency Increase	Along entire route, including extension; from Northglenn & 112th Station to CO 7.	Daily 5:00 AM to 12:00 AM	30 minutes	$1M - $1.6M	2028-2029	City of Thornton and RTD
Route 120L Frequency Increase	Routing stays the same between Eastlake & 124th Station and US 85 & Bridge St Park-and-Ride.	Monday – Saturday 5:30 AM to 12:00 AM	30 minutes	$400K - $600K	2028-2029	City of Thornton, RTD, Westminster, Broomfield
Extend 120X to CO 7	Extension to the future CO 7 mobility hub (Larkridge Shopping Center).	Monday – Saturday 5:00 AM to 12:00 AM	15 minutes during peak times; 30 minutes during off-peak times	$800K - $1.5M	2029-2031	City of Thornton, RTD, Adams County, Brighton
Reinstate Route 104	Per RTD North Metro Corridor Bus Operations Service Plan, reinstate a route along 104th Ave between US 36 & Church Ranch Station and Thornton Crossroads & 104th Station.	Daily 5:00 AM to 12:00 AM	30 minutes	$1.1M - $1.4M	2029-2031	City of Thornton, RTD, Northglenn, Westminster
Implement Interim Bus Service per Transit Feasibility Study	Bus service and infrastructure to connect Eastlake & 124th Station to CO 7 through planned stations areas.	TBD	TBD	TBD	2029-2031	City of Thornton and RTD

*Cost estimates are in 2023 dollars and will need to be adjusted for inflation.

Mid-Term Implementation (2028-2031)

*These improvements are in addition to the short-term improvements

Figure 20



City of Thornton

Basemap Data: June 2023

Adjustments to South and North Microtransit Zones and Potential New Zone(s)

The city should evaluate the performance of the microtransit systems on at least a monthly basis, including tracking ridership per service hour, response times, top destinations, unfulfilled ride requests, customer service, demand by time of day, and feedback from the public. Based on the performance the city may need to make periodic adjustments within the first few years to improve the service and match available funding. Adjustments may be needed to the service boundaries, times of day, days of week, number of vehicles, types of vehicles, minimum trip distances, etc. to maintain the utility of the service to the community.

Based on performance, community feedback, and available resources it may also be appropriate to explore additional areas within the city to add new service, such as filling the gap between the North and South microtransit zones between 104th Avenue and 120th Avenue and north of 136th Avenue. The city should also periodically engage with other jurisdictions (such as Northglenn, Westminster, Federal Heights, and Adams County) to see if there are opportunities to jointly provide service to meet the travel demand to destinations in adjacent communities. Given the uncertainty of future modifications and expansions, mid-term cost estimates for these adjustments cannot be determined, but would be directly linked to service area size, population density, population demographics, and number of service hours.

Route 93L Frequency Increase

The 93L currently provides service between the Thornton Park-n-Ride and 138th & Cherrywood Pk Rd at 60-minute frequencies during peak times. It is recommended to increase the frequency on this route to 30 minutes. The estimated annual operating cost of increasing service is $1.2M to $1.9M. Like the other route extensions or frequency increases of existing RTD routes, the City of Thornton will need to work with RTD to make this improvement. If RTD does not consider this service change to be justified by its own metrics, the City of Thornton may need to finance the “buy-up” of the service to provide the desired frequency.

Route 7 Frequency Increase

In the mid-term, it is recommended to increase the frequency of Route 7 between the Northglenn & 112th Station and CO 7 to 30 minutes. This will cost an estimated $1M - $1.6M in annual operations in addition to the operating cost of the Route 7 extension at 60-minute frequencies recommended as part of the short-term implementation. The City of Thornton will need to collaborate with RTD to determine financing and service delivery for this transit improvement.

Route 120L Frequency Increase

It is recommended to increase the frequency of the 120L in the mid-term between the Eastlake & 124th Station and the US 85 & Bridge St Park-n-Ride in Brighton from 60 minutes to 30 minutes. The annual operating cost to do so within the portion of the route that is within Thornton is $400K to $600K. Additional funding from RTD or other jurisdictions this route passes through, including Adams County and Brighton, will be needed to increase frequency in the portion of the route outside Thornton.

Extend 120X to CO 7

Input from the public and the study's stakeholder group recommended the extension of Route 120X to the future mobility hub at I-25 and CO 7. The route currently runs between Denver's Union Station and the Wagon Road Park-n-Ride at 15-minute peak-direction frequencies and 30-minute off-peak frequencies. The estimated annual operating cost to extend the route to CO 7 assuming the same frequency is $800K to $1.5M in addition to the current cost of operating the route. However, as this route extension moves toward implementation, the specific routing, frequency, and scheduling will need to be determined and may impact operating cost. Because this route travels along I-25 there are multiple jurisdictions on the west side of I-25 (Westminster and Broomfield) in addition to Thornton on the east side that would benefit from this service. Therefore, funding should be coordinated with RTD in conjunction with the surrounding jurisdictions.

Reinstate Route 104

Prior to the COVID-19 pandemic, RTD operated Route 104 at 60-minute frequencies, connecting Thornton communities to the US 36 & Sheridan Station along 104th Avenue. In preparation for the opening of the N Line in 2020, RTD prepared the North Metro Corridor Bus Operations Service Plan, which detailed the bus routes that would support the operation of the N Line. One of the proposed routes was to modify Route 104 to connect the US 36 & Church Ranch Station and the Thornton Crossroads & 104th Station along 104th Avenue. Route 104 was discontinued starting in April 2020. A key concern expressed throughout the Thornton Transit Study is the lack of transit connections across I-25, so reinstating Route 104 was raised repeatedly by the community. It is recommended that RTD reinstate this route to provide this critical connection with 30-minute frequencies. The estimated annual operating cost for the portion of the route within Thornton is $1.1M to $1.4M. Given this route crosses multiple jurisdictions (including Northglenn and Westminster) funding should be a collaborative effort between RTD, the City of Thornton, and surrounding jurisdictions.

Implement Interim Bus Service per Transit Feasibility Study

Pending the completion of the **Transit Feasibility Study for Interim Connections to CO 7** that will be completed in the near-term phase, the city should consider implementing recommendations that come out of the study in the mid-term. Bus service would provide an interim transit connection between the Eastlake & 124th Station and CO 7, including service to 144th Avenue, until RTD is able to extend the N-Line north to CO 7 as planned as part of FasTracks.

Long-Term Implementation (2032-2034)

The long-term implementation transit improvements are displayed in **Table 4**. These improvements are less detailed due to the uncertainty of the transit landscape in 2032 through 2034. Most of the improvements are targeted toward adjusting and improving the services that would have been implemented in the previous phases.

Table 4: Long-Term Implementation Details

Transit Improvement	General Extent Description	Service Hours	Response Time or Frequency	Estimated Annual Operating Cost	Implementation Year	Responsible Party
Adjustments to South and North Microtransit Zones and Potential New Zone(s)	Consider adjusting service areas, creating new service areas where gaps exist, or scaling back where new fixed-route service may be sufficient.	TBD	30 minutes	TBD	2032-2034	City of Thornton
Frequency Increases Across Fixed Routes	Consider increasing frequencies of fixed-route buses across Thornton in demand areas.	TBD	15-minute peak hours, 30-minute off-peak hours	TBD	2032-2034	City of Thornton and RTD
Route Extensions Across Fixed Routes	Consider extending other routes to connect to growing areas, such as along York St, Colorado Blvd, Holly St, and Quebec St.	TBD	30 minutes	TBD	2032-2034	City of Thornton and RTD

Adjustments to South and North Microtransit Zones and Potential New Zone(s)

The city will continue to monitor and adjust microtransit service zones and operations as needed to maintain efficient service within available funding, in particular riders per hour and adequate response times. In addition to expanding to new areas to fill gaps in the network, adjustments may also include scaling back service in locations that may be getting more robust and complete fixed-route service that would more efficiently fill the transit service demand for a particular area.

Frequency Increases Across Fixed Routes

The city will monitor ridership and potential demand along existing transit corridors in the community and work with RTD to explore increasing the frequency of fixed routes with the highest demand. Assuming that all recommendations to short-term and mid-term implementation on fixed-route service will be successful, all transit services in Thornton will have a frequency of 30-minutes or better. During the long-term phase of implementation, the City of Thornton should work with the public and RTD to identify any routes where improving frequency to 15 minutes during peak hours can provide a beneficial impact to riders and community members. These will typically be routes with relatively high existing ridership, that connect into key destinations, and provide key connections throughout the city and region. Core routes identified for higher frequency service in the future by the TMMP are those that operate along Washington/Grant Street (currently Route 7), 88^{th} Avenue (Route 92), and 120th Avenue (120/120L).

Route Extensions Across Fixed Routes

In the long-term implementation phase, the city will evaluate the need and feasibility of extending fixed route service to increase transit coverage to areas that are continuing to grow. Over the next decade additional development is expected across Thornton, particularly north of 144th Avenue. Providing transit coverage to these areas will become increasingly important as more and more people begin living and working in the area. Potential extensions or new routes to explore include along York Street (in conjunction with the interim bus service connections to CO 7), Colorado Boulevard, Holly Street, and Quebec Street. These route extensions would connect with other transit services, with the aim being to increase transit access and overall connectivity.

Chapter 5 – Financial Plan

Short/Mid-Term Financial Plan

The financial plan detailed in **Table 5** describes the estimated financial commitment (in 2023 dollars) to deliver each transit improvement identified in the Transit Operating Plan described in Chapter 4 in the short-term and mid-term implementation phases from 2025 to 2031. Costs are summarized by year and organized by the assumed agency that would be responsible for the given improvement, including Thornton, RTD, or undetermined as RTD, Thornton, and/or other jurisdictions.

City of Thornton Financial Responsibility

It is assumed that Thornton would be responsible for assembling funding for:

1. Microtransit service, including start-up and adjustments over time, and
2. Infrastructure costs (e.g., bus stop improvements) to extend RTD Route 7 to CO 7/Larkridge
3. Conducting a transit feasibility study for interim connections to CO 7.

It is assumed that the microtransit services would be turn-key operated through a third-party vendor, as detailed in Chapter 6.

RTD Financial Responsibility

Operations costs for the following transit improvements are assumed to be fully financed by RTD as they are either slated as action items in the RTD System Optimization Plan or RTD has verbally communicated an intent to improve service:

4. Extend RTD Route 7 to 144th Avenue at 60-minute frequency
5. Increase peak period frequencies of RTD Route 120E to 30-minute

RTD, City of Thornton, and/or other Jurisdiction Financial Responsibility

Finally, the responsible party for the following transit improvements is unknown at the moment. These improvements will require coordination between the City of Thornton, RTD, and/or other jurisdictions, and may be funded by any or all of these agencies through internal and/or external sources:

6. Operations cost to extend RTD Route 7 from 144th Avenue to CO 7/Larkridge
7. Increase midday frequency of RTD Route 120E to 30-minutes
8. Increase midday and peak period frequency of RTD Route 93L to 30-minutes
9. Increase midday and peak period frequency of RTD Route 7 extension to 30-minutes
10. Increase midday and peak period frequency of RTD Route 120L to 30-minutes
11. Extend RTD Route 120X to CO 7/Larkridge

12. Reinstate RTD Route 104 along 104th Avenue between US 36 & Church Ranch Station and the Thornton Crossroads & 104th Station

It should be noted that all operations costs shown in the plan are service costs for the portion of routes operating only within Thornton. For example, the costs shown to increase the frequency of Route 120L are just the cost of the small portion within Thornton, based on the proportional route distance within Thornton, and do not include the cost of operations for the portion that operates in unincorporated Adams County or Brighton. Given the regional nature of the transit system there are some transit improvements that are dependent on the cooperation of RTD and other jurisdictions to bear the cost of improvements outside of the city boundaries.

Furthermore, for the improvements to RTD routes (which include the majority of recommendations) if RTD is unwilling or unable to finance the improvements on their own, a potential financing strategy would be for Thornton to explore "buying-up" service to fund the frequency increase or route extension. If after a period of time the service buy-up results in ridership performance metrics that meet RTD's minimum standards, RTD may take over cost of financing the route. This model has been implemented historically in places like Boulder and Commerce City (Route 104L). It should be noted that RTD has temporarily suspended service buy-ups largely due to an ongoing driver shortage but hopes to allow them again in the future.

Table 5: Short/Mid-Term Financial Plan

	Short-Term			Mid-Term			
Transit Improvement	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Thornton Costs*							
South Microtransit Zone (including start-up costs and future adjustments)	$1M - $1.5M	$1M - $1.5M	$1M - $1.5M	$1.2M - $1.7M	$1.2M - $1.7M	$1.4M - $1.8M	$1.4M - $1.8M
North Microtransit Zone (including start-up costs and future adjustments)	-	$800K - $1.2M	$800K - $1.2M	$1M - $1.4M	$1M - $1.4M	$1.2M - $1.6M	$1.2M - $1.6M
Potential New Microtransit Zone	-	-	-	-	-	$800K - $1.2M	$800K - $1.2M
Transit Feasibility Study	-	-	$200K - $300K	-	-	-	-
Thornton Costs Subtotals	$1M - $1.5M	$1.8M - $2.7M	$2M - $3M	$2.2M - $3.1M	$2.2M - $3.1M	$3.4M - $4.6M	$3.4M - $4.6M
RTD Costs							
Route 7 Extension (Northglenn/112th to 144th Ave at 60-minutes)	$600K - $1.2M	$600K - $1.2M	$600K - $1.2M	$600K - $1.2M	$600K - $1.2M	$600K - $1.2M	$600K - $1.2M
Route 120E Frequency Increase	-	-	$300K - $500K	$300K - $500K	$300K - $500K	$300K - $500K	$300K - $500K
RTD Costs Subtotals	$600K - $1.2M	$600K - $1.2M	$900K - $1.7M	$900K - $1.7M	$900K - $1.7M	$900K - $1.7M	$900K - $1.7M
Thornton, RTD, and/or other Jurisdictions							
Route 7 Extension (144th Ave to CO 7 at 60-minutes)	-	$350K - $450K	$350K - $450K	$350K - $450K	$350K - $450K	$350K - $450K	$350K - $450K
Bus Stop Improvements/ New Bus Stops for Route 7	$600K - $1.2M	$600K - $1.2M	-	-	-	-	-
Route 93L Frequency Increase	-	-	-	-	$1.2M - $1.9M	$1.2M - $1.9M	$1.2M - $1.9M
Route 7 Frequency Increase (Northglenn/112th to CO 7 at 30-minutes)	-	-	-	$1M - $1.6M	$1M - $1.6M	$1M - $1.6M	$1M - $1.6M

Route 120L Frequency Increase	-	-	-	-	$400K - $600K	$400K - $600K	$400K - $600K
Route 120X Extension to CO 7	-	-	-	-	-	$800K - $1.5M	$800K - $1.5M
Reinstate Route 104	-	-	-	-	-	$1.1M - $1.4M	$1.1M - $1.4M
Thornton, RTD, and/or other Jurisdictions Costs Subtotals	$600K - $1.2M	$1M - $1.7M	$350K - $450K	$1.4M - $2M	$3M - $4.6M	$4.9M - $7.5M	$4.9M - $7.5M

*Cost estimates are in 2023 dollars and will need to be adjusted for inflation.

Long-Term Financial Plan

The actions that are currently undetermined in terms of cost and responsibility include the following three improvements:

1. Implement interim bus service along future N-Line extension between 124th & Eastlake Station and CO 7
2. Increase frequency of high-ridership RTD routes in Thornton to 15-minutes (e.g., Route 7, Route 120, and/or Route 92)
3. Add or extend additional RTD routes along future north-south corridors to CO 7 (e.g., along York Street, Colorado Boulevard, and/or Quebec Street)

These three improvements would be implemented either toward the end of the mid-term phase or throughout the long-term phase and would depend on a variety of factors. The interim bus service and associated cost is dependent on the recommendations of the Transit Feasibility Study completed during the short-term implementation phase. Similarly, costs for the frequency increases on high-ridership RTD routes and additional routes or extensions of routes to CO 7 will be directly related to the number of service hours the bus routes will provide, and the human and infrastructure support the routes will require.

Furthermore, it is assumed that all of the improvements mentioned throughout Chapter 4 will continue into the long-term phase, meaning that the financial commitments will remain constant, only changing due to service enhancements, changes to the responsible party, and/or inflation.

Potential Funding Mechanism

The following is a list of potential funding mechanisms Thornton can explore to finance Thornton's share of microtransit or fixed-route transit improvements identified in this plan. This list is not exhaustive and should be considered a starting point.

DRCOG TIP Funding

DRCOG has provided matching funding through the Transportation Improvement Program (TIP) for microtransit services that fill a local transportation need in other areas of the Denver Region. Thornton could explore this option and submit a TIP application to partially fund transit improvements in Thornton.

RTD Partnership Program

RTD launched their Partnership Program in 2023, which made available $2 million dollars per year for up to three years to transit and mobility projects operated by local governments or Transportation Management Associations/Organizations (TMAs/TMOs) within the district. Thornton could consider applying for funds during a future Call for Projects through this program to support funding for local transit improvement projects.

Federal Funds

Federal funds for transit service improvements are likely to flow through RTD, DRCOG, or CDOT. In general, Thornton should work with these regional agencies to secure federal funding. Federal funds for transit projects typically come in the form of formula funding, competitive grants, or earmarks. There are occasionally one-time federal funding programs that could potentially fund microtransit services. Federal funding opportunities for microtransit and fixed-route transit can change from year to year and Thornton should keep updated on those potential options over time.

Local Funds

It is recommended that the local contribution for start-up pilot microtransit service be funded through the general fund initially to build public awareness and make sure the service is performing well and meeting mobility goals. Long-term local transit funding options may include funding through the general fund, or establishing a dedicated transportation/transit funding stream, such as through sales tax, property tax, transportation utility fees, or other fee programs.

Chapter 6 – Implementation Plan

On-Demand Transit

Service Delivery

The South and North microtransit zones are recommended for implementation in the first three years. Microtransit can be operated either through a turn-key contract (third-party service provider) or agency-operated, whereby the City of Thornton would fully manage and operate the service. Turn-key contracts involve delivering a service plan directly to a service provider and relying on that provider to implement the service. The vendor is typically experienced in delivering fixed-route, flex-route, and on-demand transit service and would manage all aspects of the service. Based on the logistical advantages and disadvantages displayed in **Table 6**, it is recommended that the two microtransit zones be operated through a turn-key contract.

Table 6: Advantages and Disadvantages to Turn-Key Contracts for Microtransit Services

Advantages	Disadvantages
Quick deployment	Requires oversight by City of Thornton
Does not require City of Thornton to have experience operating a transit service	Flexibility, responsiveness, and adaptability are constrained to the terms of the contract and to the capacity of the vendor
Does not require hiring of additional City of Thornton personnel (e.g. vehicle operators, administrative staff, maintenance teams)	Less control of service quality, customer experience, and operational procedures
Vendor is responsible for service quality and compliance	
Vehicle capital costs are included in the contract – minimizes the capital assets that City of Thornton must acquire	
Allows City of Thornton to take advantage of the vendor's existing scale	

Potential Vendors

There are several national vendors providing turn-key microtransit service today. These include Downtowner, RideCo, Spare Labs, Transloc, and Via, among others. These vendors provide service in a variety of Colorado communities, such as Denver, Lafayette, Lone Tree, Golden, Steamboat Springs, and Aspen. There are also many local, regional, and national contract transit service providers who may be interested in participating in an RFP for microtransit service provision within Thornton. The turn-key contractor should be selected based on experience, project/area understanding, project approach, capabilities, ability to deliver, qualifications of the team, references, and overall value.

Hybrid and Electric Vehicle Infrastructure

If the City of Thornton determines that it is in its best interest to pursue hybrid and/or electric vehicles for its preferred vehicle fleet for the microtransit service, it will need to work with the selected vendor to do so. In general, many vendors are experienced with providing microtransit services with a variety of vehicle types. Although these details will be determined through the turn-key contracting process, the more that the city is able to offer in terms of vehicle storage, charging, maintenance, washing, etc., the less costly the turn-key contract with the operator will be. It should also be noted that opting for a fully electric microtransit fleet will require a feasibility analysis on daily vehicle miles. This analysis will help determine the necessary vehicle range and the number of vehicles needed to meet the service's daily demand.

Service Adjustments and Monitoring Plan

Throughout the implementation of the new microtransit services, the service may need to be adjusted periodically to better serve local needs. This section describes elements of a monitoring plan that should be implemented early in the life of the on-demand transit services and used to determine whether and when service changes are needed. In essence, this monitoring plan sets the expectations for when changes should be made.

Tracking Ridership

The number of daily riders using the new transit service is a basic metric that the contract vendor will be able to provide to Thornton on a regular basis. Ridership can be reported both as the total number of passenger trips per day and the average number of passengers per vehicle service hour. As discussed in the alternatives analysis of Chapter 3, the South microtransit service is projected to have 200-300 passenger trips per day and the North microtransit service is projected to have 125-225 passenger trips per day. These estimates are based on five to seven passengers per vehicle service hour on the South microtransit service, and four to six passengers per vehicle service hour on the North microtransit service. Over the first one to two years, the ridership may be lower while the city and its partners build awareness about the service and community understanding of this new transportation resource grows. As seen in

Table 7, the goal for the first year of service should be an average of 150-200 passenger trips per day on the South microtransit service and 75-125 passenger trips per day on the North microtransit service, growing over the course of the following two years.

Table 7: Average Daily Passenger Expectations by Year of Service Implementation

Service Area	Year 1 of Implementation	Year 2 of Implementation	Year 3 of Implementation
South Microtransit Zone	150-200 Daily Passengers	200-250 Daily Passengers	200-300 Daily Passengers
North Microtransit Zone	75-125 Daily Passengers	125-175 Daily Passengers	125-225 Daily Passengers

If the service is not meeting the ridership targets, then some additional analysis may be needed to pinpoint whether there are times of day when the service is utilized at a higher rate. If so, a determination can be made on whether a service span adjustment is needed. While ridership is a key metric, it should not be the single metric for measuring whether the initial service is performing successfully. When Thornton is determining whether to extend the service, metrics like response time, rider satisfaction, and the rate at which the service completes the intended trip types should be among the factors considered.

Tracking Ride Times

The number of passengers that can be served within a daily service span is dictated, in part, by the amount of time vehicles spend completing trips and the amount of time vehicles spend traveling between trips, also known as deadhead. It is assumed that single passenger trips will take, on average, 10 minutes from origin to destination. It is also assumed that a 50% buffer should be added into trip time estimates for deadhead or for passengers sharing their trip with others making an unrelated trip, which will likely extend the ride time for both individuals. Factoring in the buffer time, it is assumed each passenger will experience a 15-minute average trip fulfillment time (time between when a passenger requests the trip using the app or calling and when they are picked up). If, after the first three months, the actual per passenger trip time exceeds 15 to 20 minutes, the service plan should be adjusted to better reflect local travel conditions.

It is also projected that the average trip fulfillment time should be 15 to 20 minutes and ideally no longer than 30 minutes. The selected vendor will be able to provide a response time by passenger trip. If it is found that the average response time is longer than 15 to 20 minutes, then changes may be needed in order to provide riders with a more accurate sense of potential response time.

Tracking User Experience

While metrics like ridership can convey system productivity, more qualitative indicators are also important. The experiences of early riders should be captured to learn of any unanticipated issues with service provision. Rider feedback can be captured through post-trip surveys distributed either electronically via the smartphone app or using paper copies that are distributed by the vehicle operator. In order to ensure the highest response rate possible, it is recommended the survey be brief with two to three key questions. Paper surveys should also include a pre-paid postage envelope, so respondents face minimal barriers to returning their surveys.

Since the contract vendor will track the quantitative aspects of each trip, like response time and time in vehicle, the survey can be used to assess ease of use of the reservation system, whether riders find the vehicles comfortable, whether riders have positive interactions with vehicle operators, and whether the rider overall travel experience has improved because of the new service.

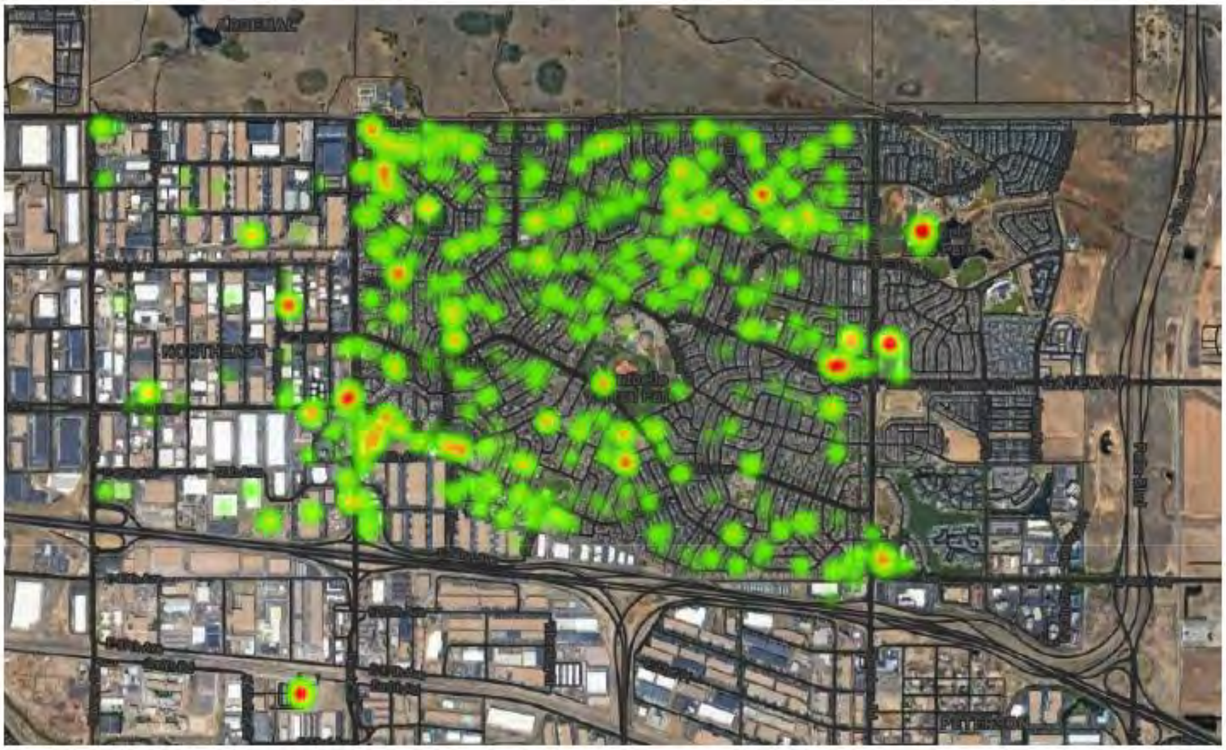
The surveys should be offered to each rider during the first six months of service in English and Spanish. Following a survey response evaluation period, surveying should then be conducted at regular intervals to be determined by the City of Thornton and for passenger samples instead of all riders.

Beyond the qualitative factors that the survey will provide, the city can track overall rider satisfaction, aiming for a 90% or more satisfaction rate. Furthermore, the city should aim for a 1% complaint rate based on customer complaints that are registered and regularly reviewed.

Evaluating Service Area Scope

The initial service zone has been drawn based on the travel market assessment and stakeholder input. It is possible that some portions of the service area may be disproportionately heavy trip generators or popular destinations. Monitoring the origin and destinations patterns by trip will allow Thornton to understand whether the service area needs to be modified or if there are particular origin-destination pairs and routes that are utilized at a high rate. The selected vendor will likely be able to provide visualizations of trip patterns like the example shown in **Figure 21** to help Thornton evaluate service utilization and potentially make adjustments such as narrowing the service area or establishing fixed pick-up/drop-off locations that serve popular destinations. This data will also inform the envisioned mid-term and long-term adjustments and potential new microtransit zones after 2027.

Figure 21: Example of pickup heat map (courtesy of City & County of Denver and Downtowner)



Determining Service Changes

While this service plan seeks to meet the needs of the Thornton travel market, it is possible that in practice the performance outcomes may differ from the service goals outlined here. Thornton should be prepared to collaborate with the selected vendor on making service adjustments on an as-needed basis to ensure the microtransit service is providing efficient service and filling the desired mobility needs. It is recommended that Thornton complete a thorough review of the performance metrics described in this service monitoring plan along with initial responses to the rider surveys after the first year of service. If any goals are unmet or if initial rider satisfaction is low, then targeted service adjustments may be required.

Regular Updates to Elected Officials

As microtransit will be a significant investment in Thornton's intracommunity mobility, it is recommended that staff schedule monthly updates to elected officials through the City Manager's notes to the Thornton City Council for the first year of service. After the first year of service, these updates can be made quarterly. These updates should include summaries of the above metrics to best inform City Council of the progress that the microtransit service is making and if any changes or adjustments are expected. These updates should also include the status of community marketing and outreach efforts. Staff can also encourage the elected officials to ride the new service, leverage their networks to spread the word, and educate constituents about the new service.

Long-Term Goals and Priorities

The service model for microtransit services described in the preferred alternative and the implementation plan is a step towards enhanced mobility within Thornton, and it should be considered as the start to longer-term improvements. The operating and implementation plans detail the initial services. In conjunction with the service adjustment metrics detailed previously, Thornton should strive for having long-term microtransit services that might include:

- Service seven days per week with weekday hours of 5:00 AM to 10:00 PM and weekend hours of 7:00 AM to 9:00 PM.
- Service that can connect Thornton residents, employees, and visitors with destinations that may be outside of the Thornton boundaries (such as in Northglenn, Westminster, and Broomfield).
- Average trip fulfillment time of 15 minutes or less with a mixed fleet of low- or zero-emission vehicles.

To work toward accomplishing the above goals, future improvements to individual zones should be prioritized in the following manner:

1. Expand weekday hours of service to 5:00 AM to 10:00 PM.
2. Add weekend service.
3. Expand service area.

Roles and Responsibilities

It is important to establish and understand the roles and responsibilities of implementing microtransit service in Thornton. **Table 8** displays the different responsibilities of the City of Thornton staff and the microtransit vendor when operating the on-demand service. In general, a turn-key contract allows the City of Thornton to have minimal staff managing the microtransit service as discussed previously. Especially with the initial South microtransit zone, the staff resource need will be approximately 0.25 FTE (full-time equivalent) and can be incorporated into an existing role. As the service grows and as Thornton adds the North microtransit zone, the staff commitment will rise. In its full development stage, overseeing transit services that are funded directly by the City can potentially be a role for one full time employee.

Table 8: Microtransit Roles and Responsibilities

City of Thornton Staff	Microtransit Vendor
Oversee vendor contract	Operate the service day-to-day according to the service plan and per the contract
Manage marketing, branding, and community outreach	Ensure quality of service and compliance with contract
Interpret performance metrics	Be accountable to specific performance metrics and provide excellent customer service; Report on performance metrics
Update City Council on service performance and anticipated service adjustments	Resolve minor customer complaints

Coordinate with surrounding jurisdictions for partnerships on potential cross-jurisdictional services	Provide necessary vehicles, drivers, insurance, dispatch, supervisors, vehicle storage, fuel, maintenance, and microtransit ride-matching technology
Develop community partnerships to support awareness and build ridership	Make suggestions on service improvements, based on operations knowledge
Develop local funding for long-term sustainability	
Review and resolve serious customer complaints	

Strategies for Managing Implementation Hurdles

The implementation plan described in this chapter is an ideal situation for new microtransit services in Thornton. However, the city should be prepared for implementation hurdles to arise (in the case of political, economic, or other unknowns). This section describes a couple of ways in which Thornton can be flexible and adaptable in implementing the new microtransit services.

Delaying Implementation

Although it is anticipated that the two microtransit services will be implemented within the designated timeline, this timeline may change. Delaying implementation, specifically for the second microtransit zone (North microtransit zone), might prove to be an effective measure if Thornton feels like it would be beneficial to continue to improve and garner support for the South microtransit zone. In deciding to delay implementation, it is critical to be ahead on any public marketing and outreach. It is recommended that the City of Thornton announce the upcoming plans for microtransit service to begin the educational component, but to delay announcing service launch dates until they are solidified. This is especially applicable when the South microtransit service will already be operational and the North microtransit zone will still be anticipated.

Adjusting Service Levels

Another option in the case that implementation of the service(s) is deemed difficult is to scale service appropriately to meet capacity. The city can work with the service vendor to reduce service hours or reduce the number of vehicles being deployed to maximize the given resources. It is important to note that these adjustments that result in less convenience for the user may be difficult to communicate to the public. For this reason, the initial service levels should be closely coordinated between the city and the vendor to ensure that any adjustments are made to improve user convenience.

Marketing, Branding, Outreach

A critical aspect of program success is robust marketing and outreach effort. An awareness building campaign should be paired with the service rollout to ensure community members and visitors learn of the new service, understand how to request trips, and are aware of the service area. While traditional avenues, like visually compelling advertisements, will be important, additional community-specific outreach strategies should also be pursued. These can include engaging local stakeholders who have existing community ties to serve as ambassadors for the new service and establishing educational messaging that the new Thornton microtransit service is a public service that is open to all and highlighting the benefits of using the service (e.g., low cost and shorter travel times relative to existing fixed route bus service).

Overall Marketing Strategy

In order for the microtransit service to be successful, Thornton should place an emphasis on maintaining as broad an outreach approach as possible in order to reach existing and potential transit riders. The city can partner with local businesses, schools, community centers, and other key destinations to post information about the new service. Beyond physical advertisements, the social media networks of these community partners can also be leveraged to broaden awareness. All marketing efforts should focus on educating community members about the service itself and conveying three key messages:

1. Thornton microtransit is a new service that has been designed to help address the mobility challenges residents are facing today.
2. The microtransit service will be both free and offer a comparable travel time to driving for certain trips.
3. The city will continuously seek rider feedback to learn how the new service can be optimized to best meet local travel needs.

In order to effectively disseminate these messages, Thornton should work with the selected vendor to develop a robust brand identity for the service and pursue a broad advertising and outreach campaign, as described below. To ensure the marketing campaign has an effective reach, Thornton can monitor who is utilizing the service through the rider surveys and then target marketing efforts to any groups within the community who have not yet tried the new service. Having a dynamic marketing campaign that tailors messaging to the various audiences within Thornton will help ensure that all efforts to raise awareness target both people who are likely to ride, like existing transit users, and those who are not currently transit users but may benefit from the new service.

Branding

Applying a logo and uniform color scheme on vehicles and on all collateral related to the service will help establish a uniform brand. Brand awareness is critical to developing an understanding that the new Thornton microtransit service is distinctive from existing RTD service that is a new mobility resource. The selected vendor will likely have prior experience with service branding and will be able to advise the city on the parameters for applying new logos and paint to their fleet. **Figure 22** shows examples of branding from various microtransit systems. Developing a distinctive visual style for the system will help community members readily identify the microtransit vehicles.

Figure 22: Microtransit Vehicle Branding Examples

Signage

Signage describing the new service and featuring the branding should be posted in all locations where it is likely community members will start or end rides. Although the current microtransit operations would be zonal, where riders could make trips between any two points within the zone boundaries, these signs can serve to designate pick-up and drop-off locations, which would make the system easier to use. Furthermore, having a signed, dedicated curb space at the N Line stations and Thornton Park-n-Ride could also help identify the new service and educate potential riders on how to use it. High quality, visually compelling signs can be targeted to key market groups such as active adults, youth, and commuters.

Advertising

Signage can also be adapted into flyers that are posted in popular locations – having system information at local community centers, medical centers, social services locations, and businesses will be important and could take the form of a tabletop rack card with information on how to use the system and where it serves. In addition, the city can partner with local print media along with radio and tv stations to promote the service, such as through the Thornton City Voice paper. While traditional media platforms have a wide reach, social media promotion is also a useful avenue to explore. Social media is particularly effective at reaching younger and commuter audiences, which should be a key consideration in Thornton. The city can use its existing social media presence and also partner with RTD and other community partners who may be willing to promote the service.

Outreach

The city should leverage the existing network of community groups to raise awareness and promote the new service. Key stakeholders, such as the Active Adults Center and Smart Commute, should be invited to serve as ambassadors for the new service. This role can be as simple as committing to including the microtransit service as a discussion topic in community events or promoting the service on an organization’s website, social media pages and community boards. The city can also collaborate with ambassadors to periodically visit popular destinations throughout the community and informally discuss the new service with residents.

Employer Partnerships

Partnerships with local employers are another tool the city can utilize. Local businesses with employees who may not have reliable transportation should see the benefit of the new public transit service. Employees who need to travel to Amazon, the medical centers, or the retail centers will find it easy to use the new service to get to employment destinations.

Active Adults Partnerships

As part of this transit study, a distinct group that has voiced their desire for dedicated outreach on transit in general is Thornton’s active adult population. In partnership with the Active Adult’s Center, the City of Thornton can ensure that this population is engaged and understands how the new service works, emphasizing that technology is not a limitation to this service. This outreach could include flyers and dedicated learning sessions at the Active Adult's center.

School Partnerships

Local schools can also advertise the new service. While some parents may not be comfortable allowing their child to walk or bike to school, microtransit could be perceived as a safe and efficient travel option, especially when the school supports and advertises the service as a mode for getting to school.

Business Partnerships

The city should work with Thornton's businesses to promote the new transit service. Having printed flyers in local retail establishments and restaurants that announce the new service and how to use it could be an effective way to gain awareness of the service. Businesses could also distribute information to employees and allow local ambassadors to present at staff meetings.

Special Events

The city should consider having a presence at all local events such as markets, visitor events, expos, kids' events, and neighborhood parties. Setting a table with brochures and a friendly community ambassador is a relatively low-cost way to build awareness of the new service.

Microtransit Implementation Timeline

Although it is typical for a pilot microtransit project to take 12 to 18 months to launch once a final service plan is complete, the City of Thornton has been thoroughly and strategically working on this transit study since November 2022. As such, it is possible to accelerate implementation and condense into six to nine months, assuming that contracting with a microtransit vendor could be done efficiently and that Thornton and its community partners can move effectively through the various service preparation steps, shown in **Figure 23**. According to this timeline, it may be possible to have this new service operating by late 2024 or early 2025.

Figure 23: Microtransit Implementation Timeline

6 months before launch	Finalize program management and oversight Select turn-key service operator and associated vehicle fleet Finalize budget and associated operating hours Select program name, logo, and brand
3 months before launch	Develop marketing materials and advertising plan Formalize promotional partnerships with community groups Work with microtransit vendor on service plan adjustments Install any permanent infrastructure such as signage
1 month before launch	Install vehicle brand graphics (vinyl wraps) Begin intensive advertising and promotion of program launch Coordinate with program partners and electeds about launch Test microtransit technology and dry-run service
Launch of operations	Final planning, promotion, and coordination for launch event Determine performance monitoring program Launch event Intensive advertising and promotion of service
Month 1	Daily service quality monitoring Responsiveness to passenger complaints or input Weekly evaulation of performance metrics Intensive advertising and promotion of service
Month 2	Review lessons learned in first month with vendor Intensive advertising and promotion of service Ongoing evaluation/monitoring/customer responsiveness
Months 3-6	Implementation of possible service adjustments Ongoing advertising and promotion of service Ongoing evaluation/monitoring/customer responsiveness Report to electeds and community partners on early results
Months 7+	Plan for Year 2 of service and added fixed route phase Ongoing advertising and promotion of service Ongoing evaluation/monitoring/customer responsiveness Review and report on first year results

Fixed Route Transit

Provide Supporting Bus Infrastructure

Bus service extensions require appropriate infrastructure to support service, including ADA accessible locations for bus stops, layover locations at the end of the route with bathroom facilities available to drivers, and direct convenient route alignments that can accommodate a 40-foot transit bus. The city should work to provide this infrastructure supportive of bus service along planned future bus route extensions.

Of particular importance in supporting bus service are planning new streets and developments with bus stops, which allow bus circulation, and with convenient pedestrian infrastructure in place. Bus stops should be anticipated in locations along arterial and collector streets to meet RTD design standards (near-side, far-side, etc.), adjacent to pedestrian crossings, where they allow for convenient transfers to crossing transit routes, and as close to high trip generating destinations as reasonably possible. Bus stops and pedestrian access to bus stops should be incorporated into the design of future development. Bus stop location should be considered when designing auxiliary lanes, utility infrastructure, landscaping, drainages, pedestrian crossings, and bikeways. Arterial and collector streets where future bus routes are planned should be designed to accommodate bus circulation and pedestrian access to stops and avoid an overly circuitous design. Lastly, new development along planned bus routes should be designed to be pedestrian oriented, with direct pedestrian connections to land uses and adjacent streets and trails that avoids large parking lots and other setbacks from the street that pedestrians would need to traverse to connect between a building and the street.

Mitigating Unknown Factors (Specific to RTD)

To implement many of the fixed-route transit improvements recommended in the preferred alternative, the City of Thornton will need to strategically partner with RTD and other surrounding jurisdictions. Due to this required relationship, there are number of factors that may pose challenges to the implementation timeline for these fixed-route recommendations. Some factors are routine and can surface at any time while others, like a global pandemic, are unpredictable. When assessing the factors that may pose a challenge to the City of Thornton as it seeks to implement transit improvements to the existing fixed-route network, the following issues are most likely to impede the process:

Inflation

Throughout the COVID-19 pandemic and in the post-pandemic era, inflation has increased and remained high. As noted in the operating and financial plans, the displayed estimated costs are based on 2023 prices. Should inflation rates continue to increase, the cost estimates may soon be too low.

Driver Shortages

RTD, along with other transit providers across the nation, has struggled to hire and retain transit operators for existing service. This challenge is typically more difficult to overcome with fixed-route transit due to a variety of factors, including federal employment requirements, commercial vehicle training requirements, and workload. Enhancing the existing services to run more frequently or cover more distance requires a larger workforce. The ongoing driver shortage is likely to be a significant barrier to increasing RTD fixed-route service levels in Thornton near-term. It is the primary reason that RTD is not currently allowing service buy-ups.

One strategy some agencies are experimenting with to overcome this barrier is operating transit service at time intervals that are more attractive to drivers, such as eliminating split shifts during daytime hours. The city should continue to maintain close relationships and regular communication with RTD to advocate for improvements and collaborate on strategies to make improvements to the fixed-route network identified in this plan acknowledging that driver shortages are likely to be a near-term barrier.

Strategies for Managing Implementation Hurdles

There are a few strategies to manage potential implementation hurdles related to fixed-route transit. For example, delaying implementation and adjusting service levels to ease the stress on human and capital resources may be a strategy that RTD employs. Some other strategies that the City of Thornton can employ include:

Contract Fixed-Route Service Through a Third-Party Vendor

Although the ideal scenario includes RTD funding and operating fixed-route transit services in Thornton, the city may determine that it is a worthy investment to contract supplemental fixed-route service using a third-party vendor. New fixed-route services that operate fully within the city boundaries (such as the Route 93L) could be contracted through a turn-key contract, similar to microtransit. This may require careful conversations and coordination with RTD, but it could ensure that the city is responsible for meeting its mobility needs and goals, rather than relying on the regional provider.

Organize Regular Meetings between Thornton's Elected Officials and RTD's Elected/Appointed Officials

To keep Thornton and its unique mobility needs part of RTD's priorities, it is important that Thornton's elected officials hold quarterly conversations with RTD's elected officials. Parts of Thornton fall into the I, J, and K RTD districts, so engaging in conversations with those elected district directors can ensure that RTD is making changes that align with Thornton's transit plans.

Conclusion

The 2022 Transportation and Mobility Master Plan (TMMP) established a long-term vision for Transit within Thornton. This Transit Study further analyzed the viability of enhancing public transit in different parts of the city and provides guidance on how to implement transit service improvements in Thornton over the next ten years (through 2034). This study demonstrates that transit, and the expansion of public transit service, is a viable transportation solution within the City of Thornton. Many areas of Thornton are well suited for short-term implementation of on-demand transit service, and some corridors can support expansion of fixed-route transit service. As the city continues to grow, additional areas of the city, particularly in north Thornton, will become more viable for additional transit expansion. This Study provides a phased-approach for gradually expanding transit service in Thornton as the city grows and more resources become available to fund service, prioritizing expansion of service to the locations were transit is likely to be most successful first.

Through a robust transit market analysis, including input from the community, five alternatives were initially developed and refined into a preferred alternative to be implemented over a course of short, mid, and long-term phases between 2025 and 2034. The preferred alternative includes introducing two new on-demand (microtransit) service zones within the city, increasing the frequency of several existing local bus routes, and the extension or creation of other routes. The study also includes a financial plan (with potential funding mechanisms) along with an implementation plan for both the on-demand transit services and the fixed-route transit services. It is emphasized that in order to accomplish the entirety of the preferred alternative, close collaboration between the City of Thornton, RTD, neighboring jurisdictions, and other regional agencies will be crucial.

Expanding public transit will help meet the mobility needs of the community, particularly for the most vulnerable community members that have limited mobility options, and will be a crucial element of achieving the vision identified in the TMMP to enable residents to access all areas of Thornton in a timely manner without using a private vehicle. This study provides an implementation framework to achieve core goals identified early on in the project, including bringing Thornton closer to implementing the TMMP’s vision, making transit a more viable choice for residents that do not currently have access to transit, and better serving those who are mobility challenged, but not served by RTD’s Access-A-Ride.

Appendix A: Transit Market Analysis

Thornton Transit Study: Travel Market Analysis

Prepared for:
City of Thornton, CO

June 12, 2023

DN23-0752

FEHR PEERS

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Background

Purpose of the project

The Thornton Transit Study builds off the vision set by the Transportation and Mobility Master Plan (TMMP) with the following goals:

- Bring Thornton closer to implementing the TMMP's vision.
- Provide clear direction on how to implement transit improvements throughout Thornton over the next 10 years.
- Make transit a more viable mode choice for residents that do not currently have access to transit.
- Better serve those who are mobility challenged, but not served by RTD's Access-A-Ride.

Ultimately, the study will evaluate how to serve more of Thornton with transit, and it will determine the best type of service. This evaluation will include the following criteria:

- Integrating with Thornton's active transportation system
- Ridership projections
- Impact of trip frequency
- Cost magnitudes
- Environmental justice and geographical equity

As a result of the study, the outcomes will be the following:

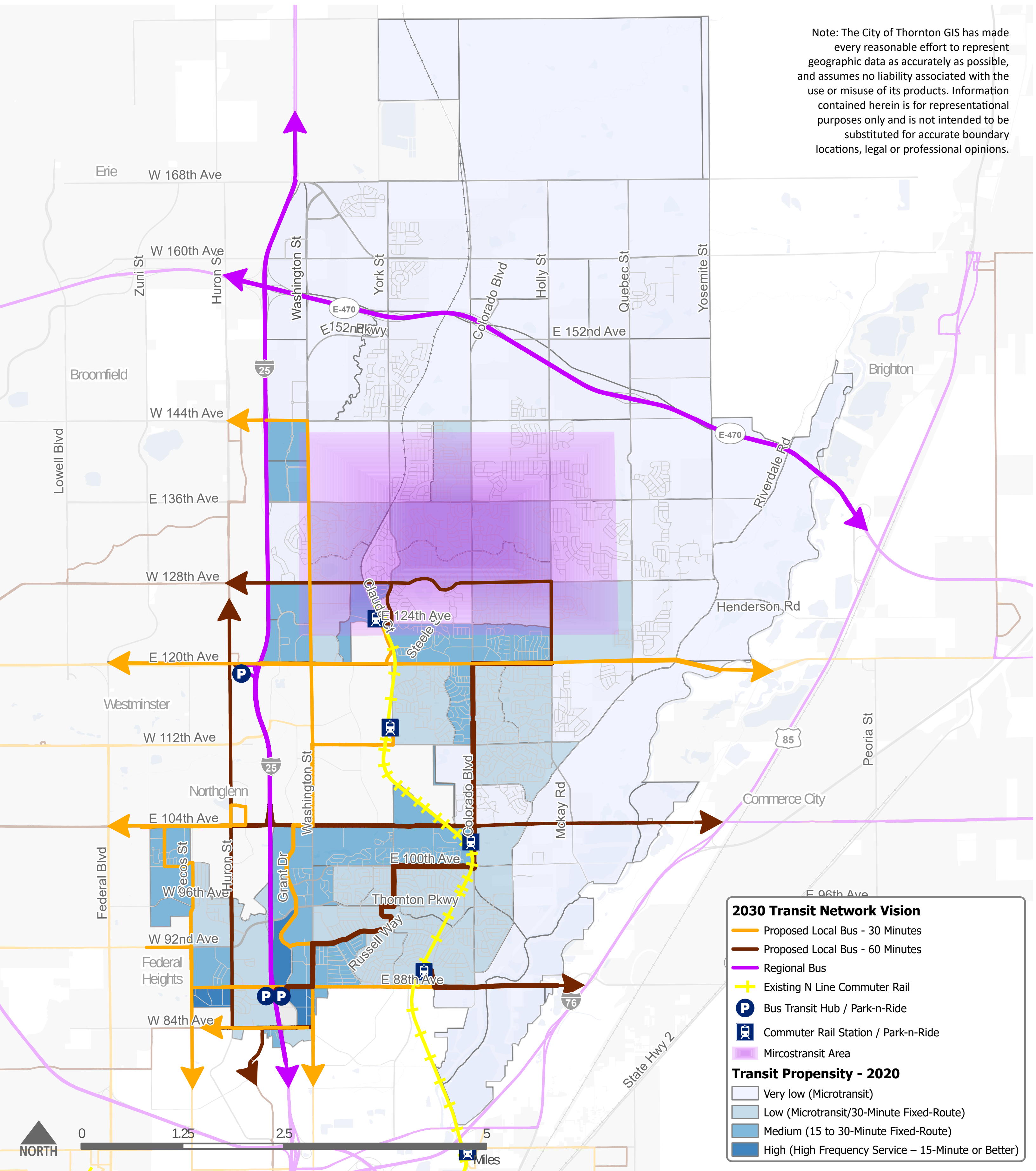
- A transit operating plan
- A financial plan for implementing transit
- A 10-year phasing plan
- Service delivery strategies
- Supporting infrastructure
- Performance measures

TMMP vision

Thornton's 2022 TMMP envisioned the overall transportation network that expands transportation options to enable a resident to access all areas of Thornton in a timely manner without the use of a private vehicle. The plan developed transit visions for 2030 and 2050 based on a transit propensity analysis, as shown in **Figure 1** and **Figure 2**, respectively. The vision includes proposed fixed routes, regional routes, transit hubs, and potential microtransit areas.

Thornton Transit Vision - 2030

Figure 1

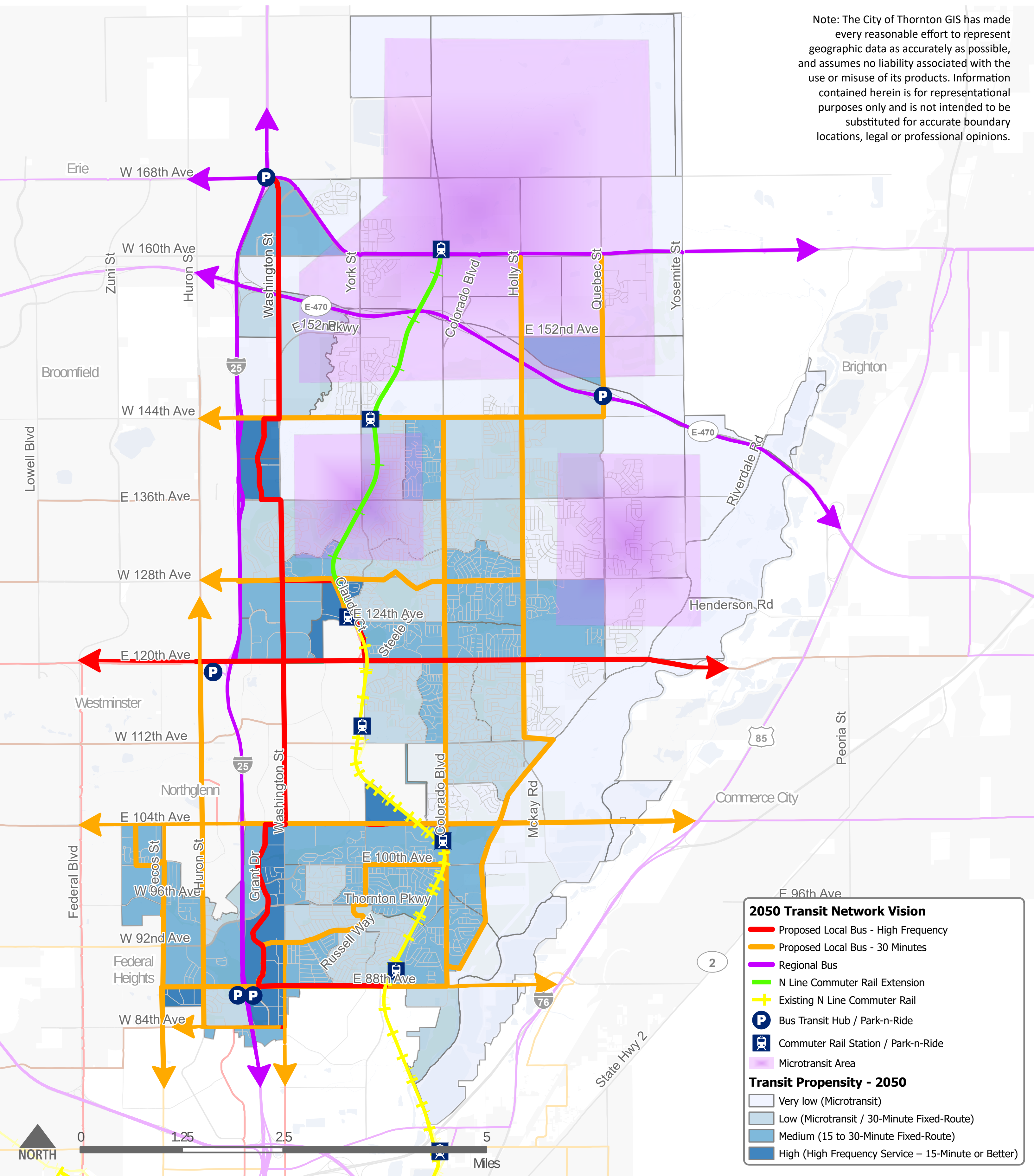


City of Thornton

Source: Thornton TMMP 2022

Thornton Transit Vision - 2050

Figure 2



City of Thornton

Source: Thornton TMMP 2022

Other Relevant Plans

This study is also considering how other municipalities and agencies are planning transit in this area.

RTD System Optimization Plan (July 2022)

The *Reimagine RTD System Optimization Plan* (SOP) includes the following route improvements relevant to Thornton:

- Route 7 extended north of 112th Ave to Denver Premium Outlets at 60-minute frequencies.
- Reinstate Route 80 at 60-minute frequencies (Olde Town Arvada to Original Thornton/88th).
- Reinstate Route 104 at 60-minute frequencies (Church Ranch Blvd/Westcliff Pkwy to Thornton Crossroads/104th).
- Reinstate Route 122X at 30-minute peak direction frequencies (Wagon Rd to Civic Center).

The SOP also mentions that RTD is exploring the integration of the following opportunities:

- Demand-response expansion
- Micro-mobility
- Rideshare
- Active transportation

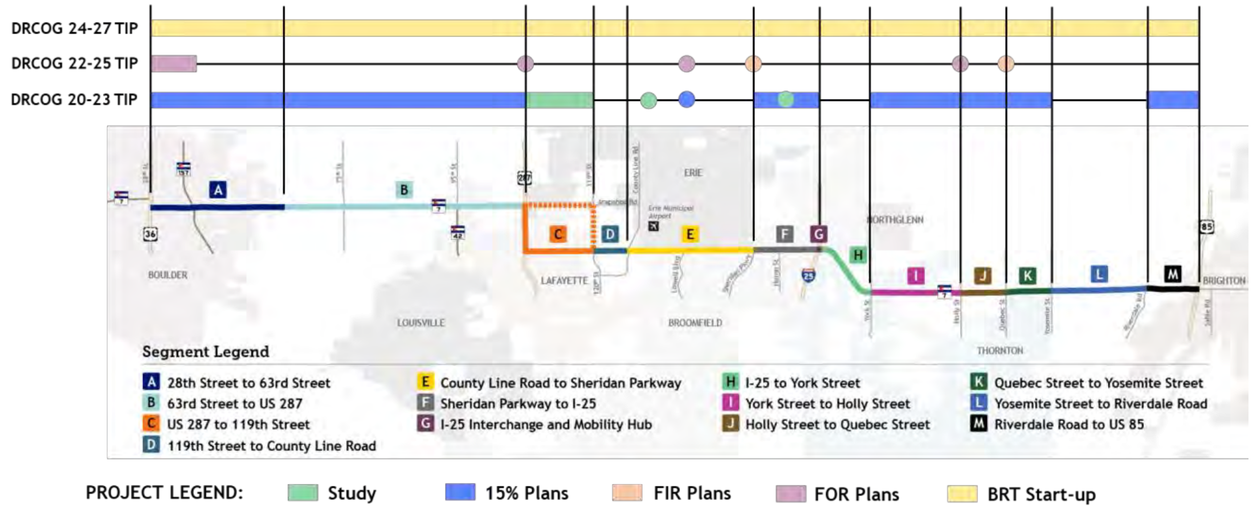
DRCOG 2050 Metro Vision Regional Transportation Plan DRAFT (September 2022)

This plan identifies specific projects and programs that the Denver Regional Council of Governments can help implement to improve mobility across the Denver region. The plan's priorities are multimodal mobility, safety, air quality, regional transit, active transportation, and freight. There are minimal mentions of transit improvements related to Thornton, but there is acknowledgement of the coordinated efforts to develop the CO 7 corridor between Brighton and Boulder as well as mobility along I-25 North and the CO 7 interchange.

CDOT CO 7 Corridor Development Plan (February 2021)

The CO 7 corridor is being developed for mobility improvements between Brighton and Boulder, including the northern portions of Thornton (**Figure 3**). Tentatively, a bus rapid transit (BRT) system will operate on the corridor beginning in 2025, Monday through Friday with 30-minute frequencies. The plan is to increase this to daily operations in 2026.

Figure 3: CO 7 Corridor Development and Funding



An aspect of the project is the mobility hub at the CO 7 and I-25 interchange. An interim interchange design is in progress with construction set for 2024-2025 with hopes to start the operation of CDOT's Bustang service in 2025 or 2026. The ultimate mobility hub, currently at 30% design, will serve the CO 7 BRT, Bustang, and future RTD service, and the hub would be a key transit hub for regional trips. This includes residents of Thornton who would need to travel north toward Fort Collins, south toward Denver, and west toward Boulder.

Advancing Adams: Adams County Transportation Master Plan (April 2022)

Advancing Adams guides Adams County through changes to the mobility network through 2040. A key factor of the plan is ensuring first/last mile connections, including on-demand, door-to-door services that connect users to key destinations or RTD transit stations within the denser parts of the county. Further, the plan emphasizes the ideas of mobility as a service and other transportation services that make it easier to live, work, play, and age in place in Adams County.

Active Adults Center Transportation Services

Thornton's Active Adult Advisory Board promotes and facilitates communications with Thornton City Council, specifically on issues relating to 55+ citizens. A current effort the Board is working on is the investigation of existing transportation services. The Board is collecting an inventory of transportation vendors and services, and how Thornton residents can access these services. This research also includes how the existing city transportation resources can be leveraged for increased transportation access. Further, an important characteristic of the Board's efforts is the understanding of the intersection of access to affordable housing with transportation.

Demographic Analysis

Key aspects of this study include making transit a more viable mode choice for residents that do not currently have access to transit and better serving those who are mobility challenged. A demographic analysis helps identify the communities that are more likely to benefit from improved transit service in Thornton.

Transit Propensity from TMMP

The TMMP included a transit propensity analysis based on the density of residents and jobs weighted by demographic factors that are proven to increase the likelihood of people using transit (such as zero car households) to identify areas with the highest need for transit. The results of this transit propensity analysis identified areas that are most likely to support transit in Thornton and at what frequency. **Table 1** shows the service type and frequency of transit that would be supported by different land use densities as measured by the weighted number of residents plus jobs per acre. In general, locations with medium and high transit propensity (generally with at least 15 residents per acre or at least eight jobs per acre) are best suited for fixed-route transit. As seen in

Figure 4, the area south of 128th Avenue and west of Colorado Boulevard is the area generally with the highest transit propensity.

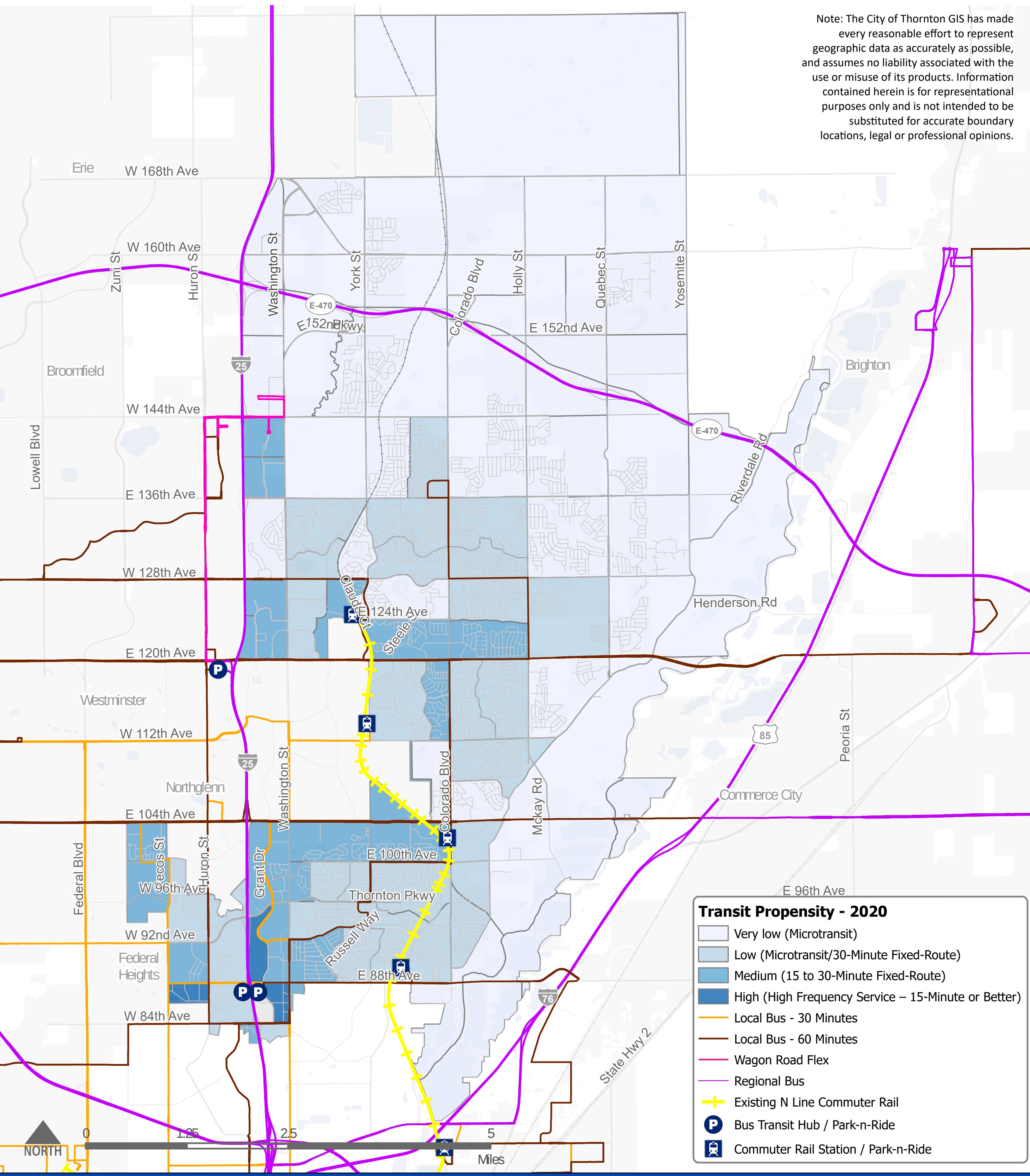
Table 1: Transit Propensity for Different Transit Service Types

Transit Propensity	Typical Corresponding Land Use	Types of Transit	Frequency of Service
High	Urban or mixed-use corridors	• Bus Rapid Transit (BRT) • High frequency bus • Local bus	10-15 minutes
Medium	Suburban or mixed-use nodes	• Local bus	15-30 minutes
Low	Suburban	• Local Bus • Demand response	30 minutes or microtransit
Very Low	Single family residential or rural	• Demand response	Microtransit (i.e., on-demand)

Source: Thornton TMMP, 2022

Thornton Transit Propensity - 2020

Figure 4



Source: Thornton TMMP 2022

Geographic Patterns

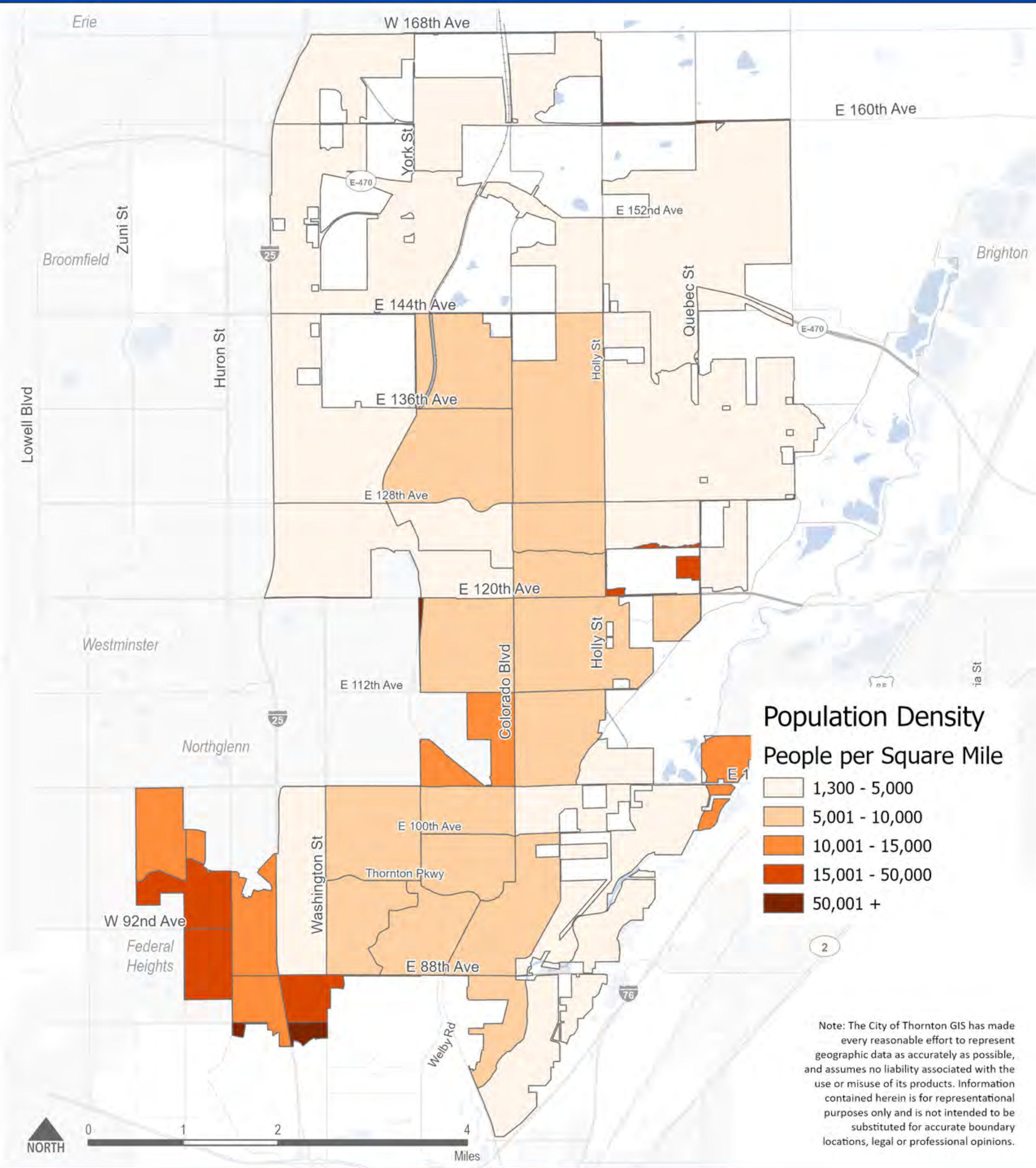
The TMMP's transit propensity analysis provided insightful focus for areas in Thornton that could have a higher demand for transit. Building off the TMMP and to get a better understanding of the potential transit markets in Thornton, a demographic analysis was performed by geography within Thornton.

Population Density

Figure 5 displays population density within each census tract in Thornton. The densest areas are in the southwestern part of Thornton and along Colorado Boulevard. Areas with higher densities are more likely to be areas where frequent transit services can be the most successful.

Population Density

Figure 5



City of Thornton

Sources: Thornton TMMP 2022
Basemap Data: June 2023

Age

Age is a notable factor in the likelihood of transit usage. Younger people, including teenagers and college-aged residents tend to rely more heavily on transit as they are less likely to have access to a car. For a similar reason older adults also tend to rely on transit more than other age groups.

Youth Population

There are many census tracts where a large portion of residents are between the ages of 10 and 17, and these are fairly dispersed across the city (**Figure 6**). Some locations in Thornton with the highest concentration of teenagers are not in areas that the TMMP identified as having high transit propensity, but youth populations tend to use transit service at higher rates due to either not yet having a driver's license or not having access to a personal vehicle. Further, with multiple schools, recreation centers, and other key destinations for youth, improving transit in Thornton can positively impact the city's youth populations.

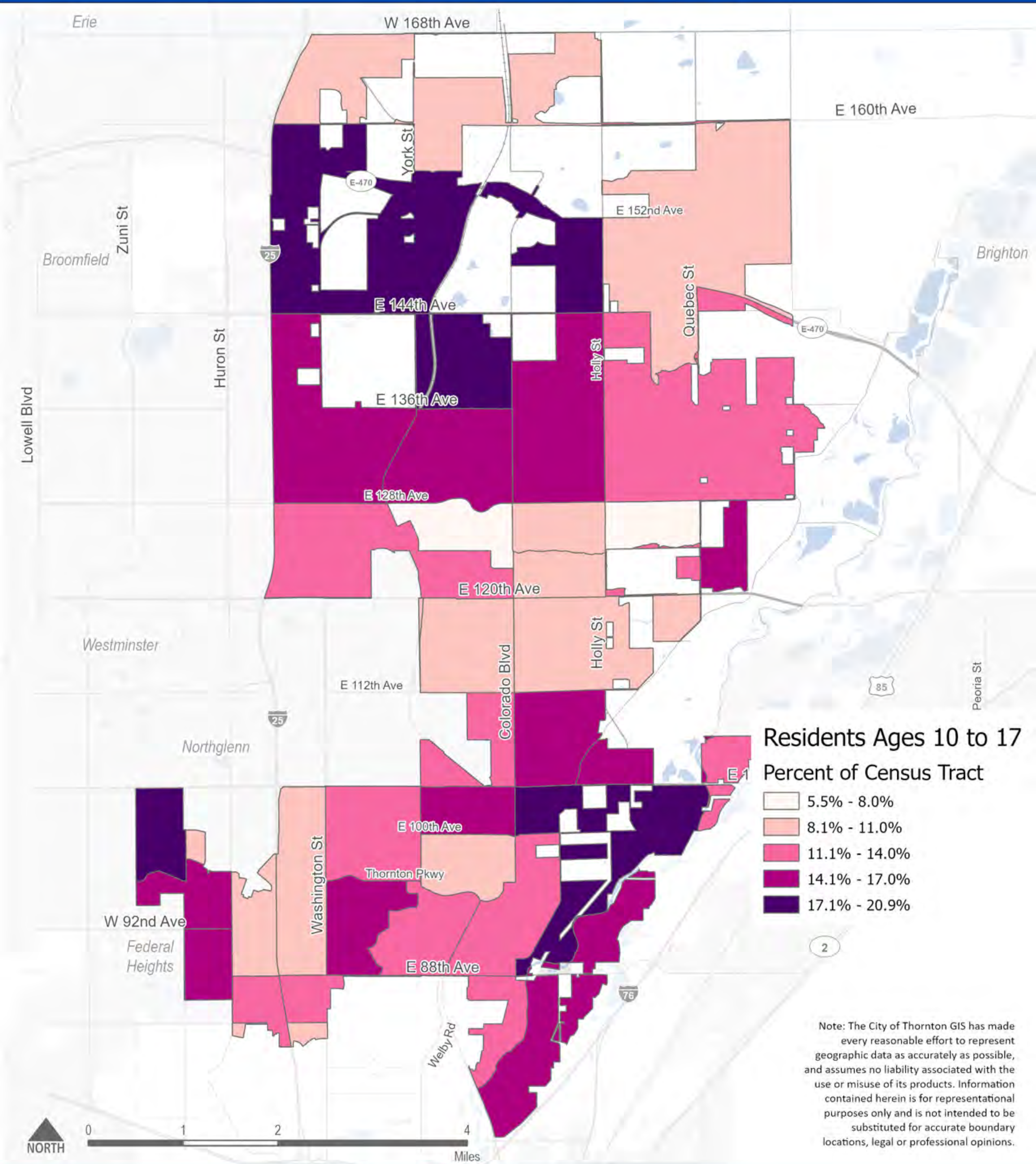
Older Adult Population

Like youth, older adults use transit 10% more than the average rate of ridership.[1] This can be for several reasons, including increased prevalence of health issues that may limit the ability to drive or a desire to limit the risk of experience traffic safety issues. In Thornton, unlike the youth population, there are distinct census tracts with high portions of resident 65 years of age and older (**Figure 7**). One of these areas is between 112th Avenue and 144th Avenue, west of Colorado Boulevard. The other area with a high portion of residents 65 years of age and older is in the most northeastern part of the city, which is the location of a large 55+ living community called Todd Creek. Like the areas with high populations of youth residents, the Todd Creek area was not identified as having high transit propensity in the TMMP, but having transit in this area can connect the senior population to key destinations such as grocery stores, medical appointments, and the active adults center.

[1] TCRP Report 28: Transit Markets of the Future

Youth Residents (Ages 10 to 17)

Figure 6



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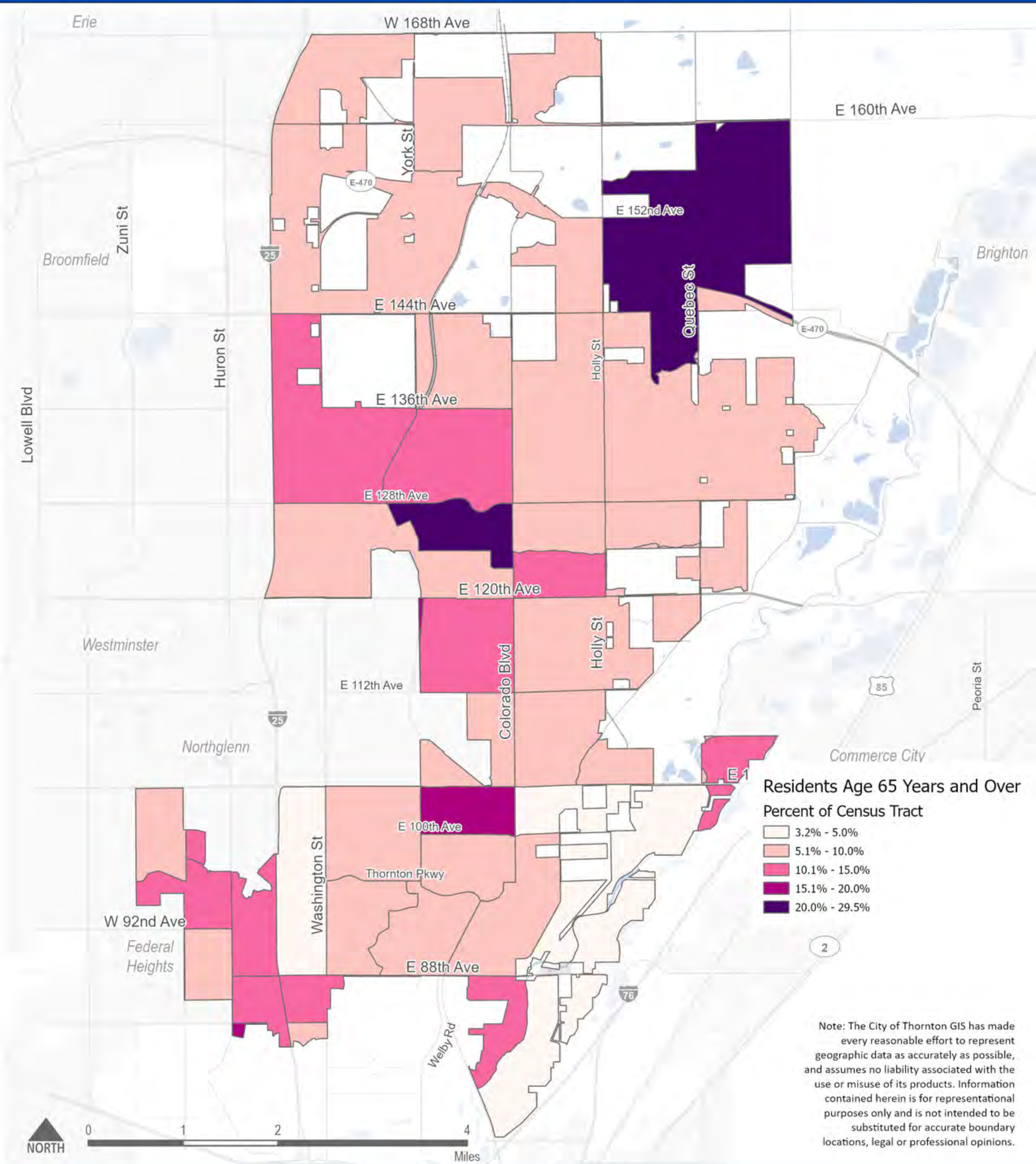
City of Thornton

Sources: American Community Survey, 2020
Basemap Data: June 2023

Residents 65 Years of Age and Older

Figure 7



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City of Thornton

Sources: American Community Survey 2020
Basemap Data: June 2023

Income

Transportation and housing are the two main expenses of each household, so income plays a critical role in impacting the use of transit.[2] Further, access to transit can be a large motivator for low-income individuals when choosing where to live.

Residents Living in Poverty

To determine poverty, the U.S. Census Bureau uses income thresholds based on family size. If the family's total income is less than the threshold determined for that size of a family, the family and every individual in it is considered to be in poverty. **Figure 8** displays the percent of residents in each census tract who live under the poverty line. South of 104th Avenue is an area where up to 20% of residents living within a census tract are living under the poverty line. Further, between 136th Avenue and 160th Avenue, west of Holly Street is another area where a significant portion of residents experience poverty.

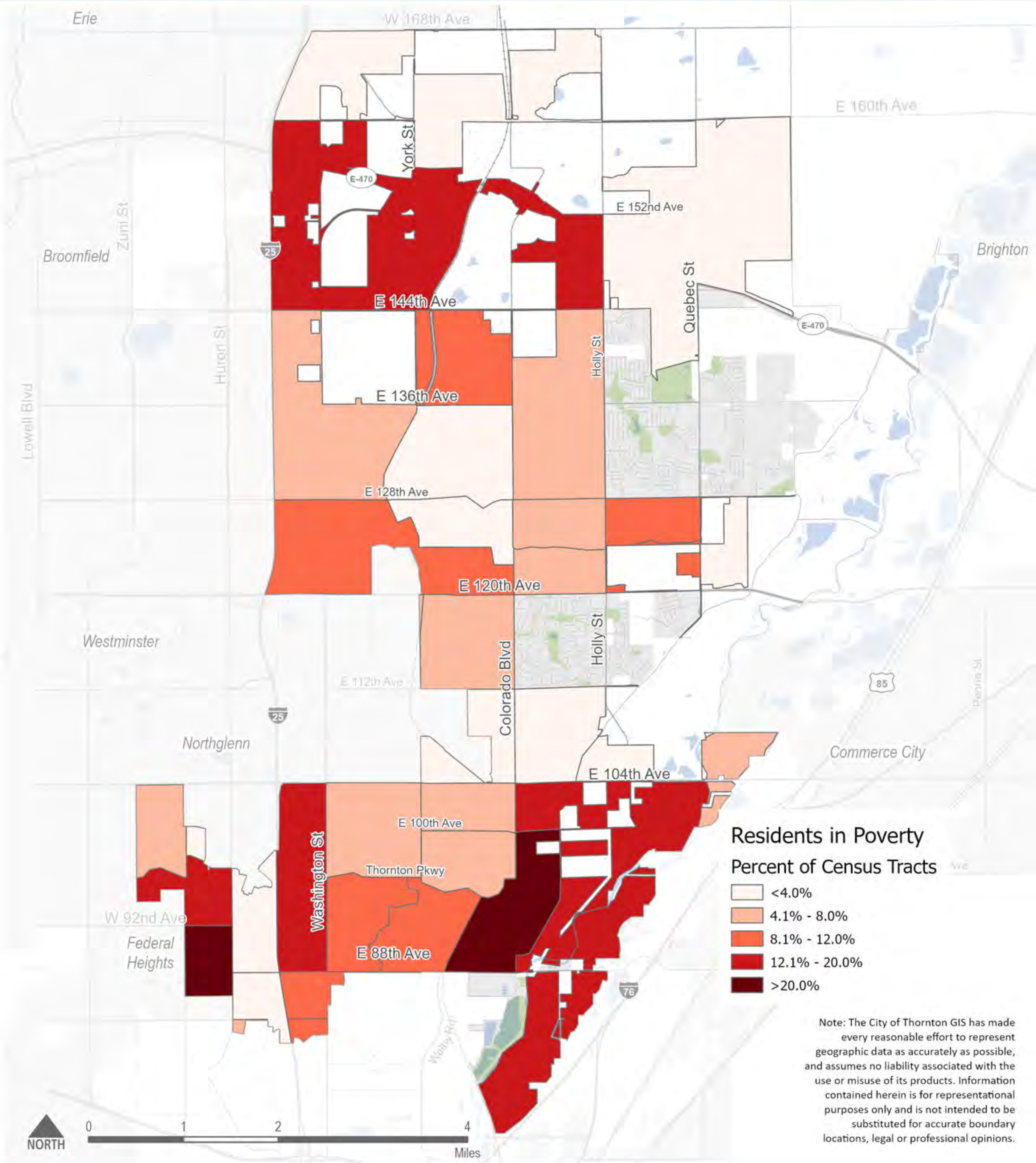
Residents of Low and Moderate Income

The U.S. Department of Housing and Urban Development defines low-income populations as those earning 50 percent or less of the Area Median Income (AMI), and moderate-income populations as those earning between 50 percent and 80 percent of the AMI. Although some people with low and moderate income earn more than those living under the poverty line, they are still vulnerable to the burden of transportation costs. Census tracts located south of 104th Avenue have up to 82% of residents who earn low and moderate income, as displayed in **Figure 9**. The data shows a clear segmentation of the population by income in Thornton, with lower incomes to the south, gradually increasing to higher incomes to the north. Whether people are living with low and moderate income, or they are living under the poverty line, transportation is a burdensome cost; focusing transit access in these areas can meet the demand for transportation options and significantly improve the quality of life for these residents.

[2] Housing and Transportation Affordability Index

Residents Living Under the Poverty Line

Figure 8



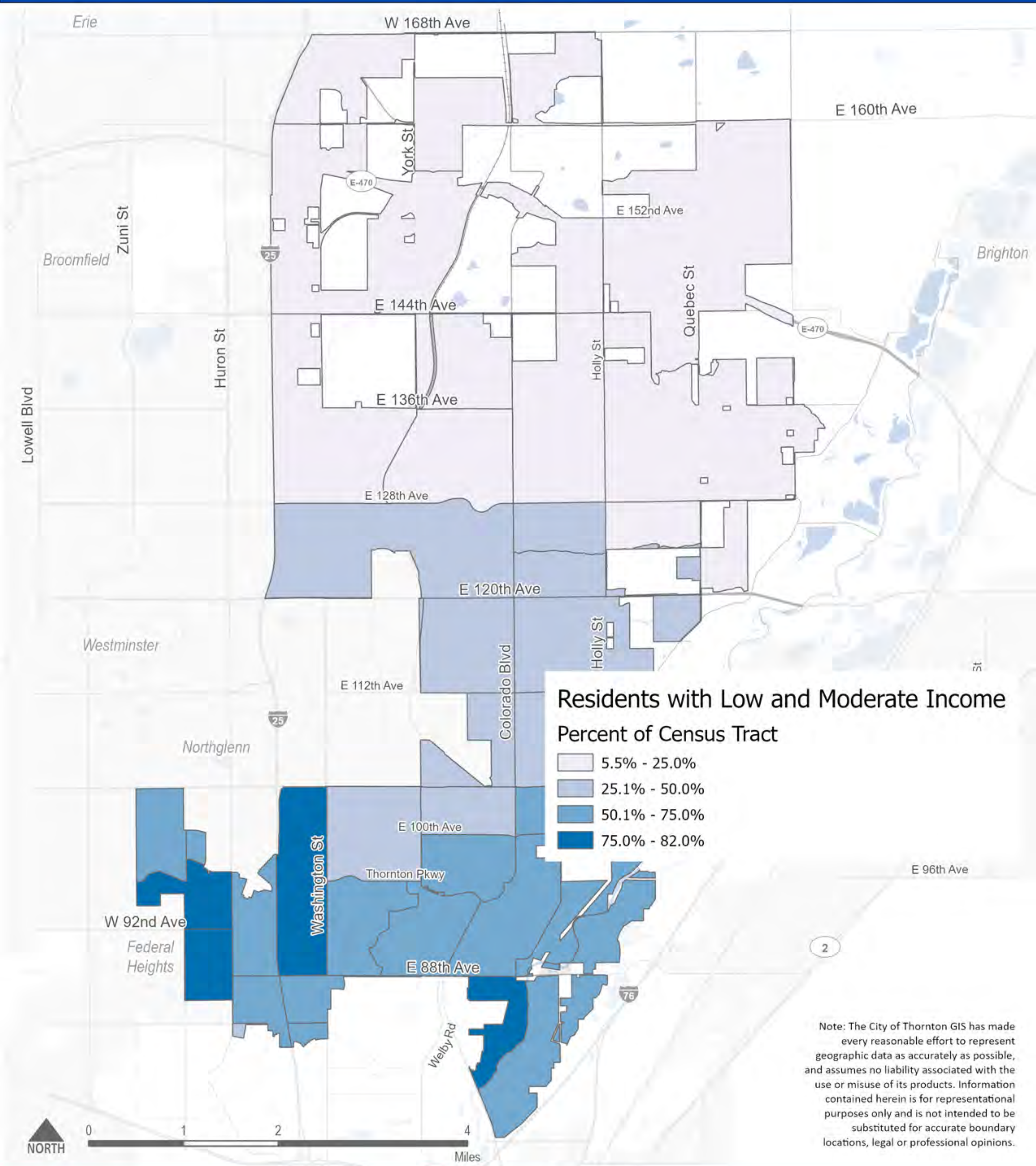
City of Thornton

Sources: American Community Survey 2020

Basemap Data: June 2023

Low and Moderate Income

Figure 9



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City of Thornton

Sources: CO DOLA, Department od Housing, 2020
Basemap Data: June 2023

Travel Characteristics

Vehicle availability and commute mode are insightful factors to understand existing demand for public transportation.

Zero Vehicle Households

Residents without access to vehicles are much more likely to use transit than those with a vehicle, particularly in areas where land uses are more dispersed and parking is free, such as in Thornton. **Figure 10** displays the percent of households in each census tract that do not own a vehicle. The highest concentration of residents without a vehicle live south of 128th Avenue, which reflects the income trends shown in **Figure 9**. This data reinforces the notion that these areas are likely to have the highest demand for transit. Interestingly, there is also a large census tract in northeast Thornton where up to 13% of residents have no vehicle available despite this being in an area of Thornton with higher average incomes. This location coincides with the same census tract with a large portion of residents 65 years and older, which is located in the 55+ community of Todd Creek. Given these demographic characteristics, this area of Thornton may also have a higher demand for public transportation.

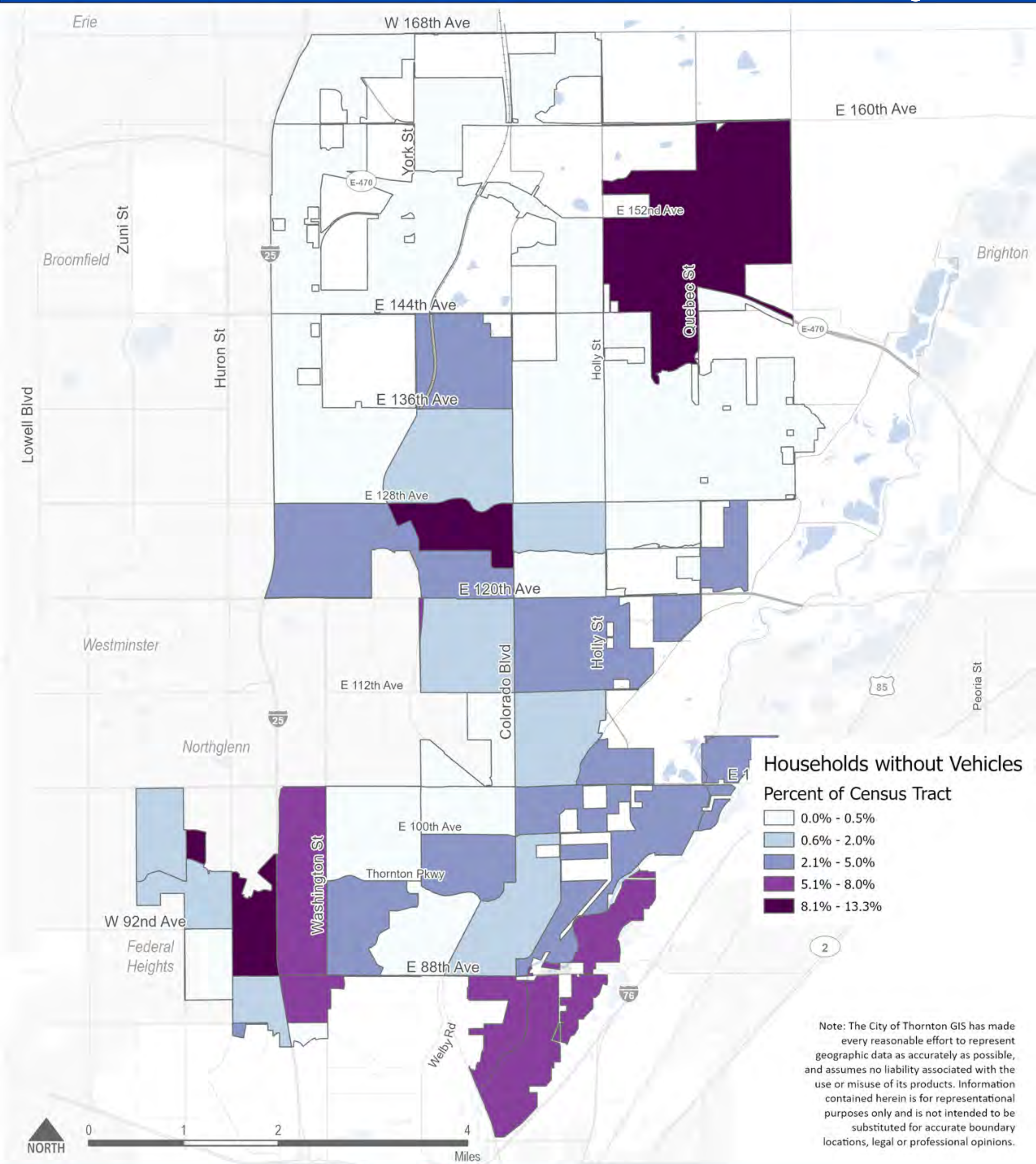
Transit Commute Mode Share

Beyond vehicle availability, understanding where in Thornton people are currently using transit can help reveal areas with high transit demand. As seen in **Figure 11**, most residents who use public transportation live south of 104th Avenue. There is also a concentration of residents commuting using public transportation between 120th Avenue and 144th Avenue west of Colorado Boulevard. This pattern generally correlates with the areas of the city where higher transit use would be expected given these areas generally have higher densities, lower incomes, and lower levels of car ownership. However, to some extent this data also reflects where public transit operates today within Thornton and this data also only reflects transit use for people commuting, which is less than half of transit trips.[3] Older adults tend to use transit for non-commuting purposes and this data would not reflect those trip types. Thus, demand for transit for non-commute trips and in areas of the city with little or no transit service would not be reflected.

[3] According to the 2017 National Household Travel Survey, approximately 37% of transit trips are by people commuting to work.

Households with No Vehicles Available

Figure 10



Households without Vehicles

Percent of Census Tract

- 0.0% - 0.5%
- 0.6% - 2.0%
- 2.1% - 5.0%
- 5.1% - 8.0%
- 8.1% - 13.3%

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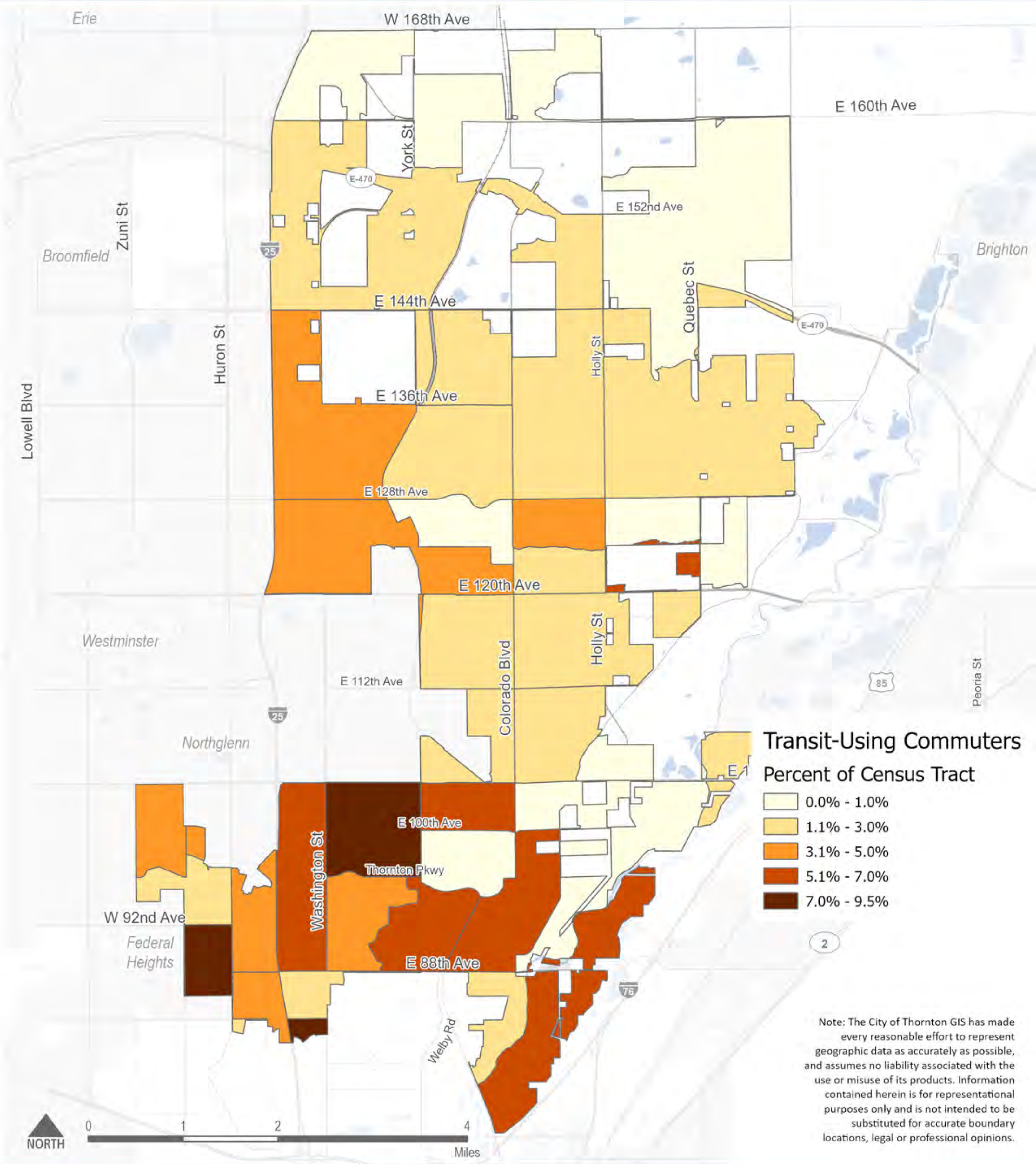
City of Thornton

Sources: American Community Survey 2020
Basemap Data: June 2023

Residents Commuting Using Public Transportation

Figure 11



City of Thornton

Sources: American Community Survey 2020

Basemap Data: June 2023

Smart Commute

Smart Commute Metro North is the transportation management organization serving northern Colorado. The organization annually surveys residents across the north area of the Denver metropolitan area on their commute patterns. The organization also focuses on connecting with and educating different municipalities on how to interpret the results and apply them to actionable recommendations. The takeaways from the 2022 survey are described in **Table 2**.

Table 2: Smart Commute Metro North Survey Highlights

	North Denver Metro Area	City of Thornton
Single-Occupancy Vehicle Commuters (Considering days off)	54.2%	61.5%
Transit Commuters	0.9%	0.9%
Bike Commuters	1.5%	1.0%
Average Commute Distance	12.4 miles	9.9 miles
Average Commute Distance using Transit	15 miles	15 miles
Percent of people who do not know who to ask about different commuting options	64%	72%
Percent of people who are responsible for a child during their commute	27%	31%

Source: 2022 Smart Commute Metro North Commuter Survey

Thornton is similar to the rest of the region in its commute patterns, especially when comparing regional and local transit use for commuting purposes. When measuring mode split, Smart Commute calculates the contribution of peoples off days to represent an average day more accurately. This means that although 87% of Thornton commuters use a single-occupancy vehicle as their commute mode, only about 62% of commuters use a single-occupancy vehicle on any given day due to the consideration for a day off. In other words, because people work varying schedules with differing days off, a more accurate percentage of people commuting in single-occupancy vehicles is closer to 62% on any given day.

The average commute distance is smaller in Thornton (9.9 miles) than across the region (12.4 miles), which also aligns with the fact that 21% of survey respondents indicated they work and live within Thornton. Although the average commute distance using transit is the same as the regional average, the larger difference between the average commute distance for all modes and for transit indicates a mismatch in the desired destinations and the transit service provided.

Beyond the average commute distance using transit, the sentiment of the mismatch in desired destinations and the transit service provided is reiterated in responses to desired transit improvements for errands outside of commuting. Smart Commute asks what type of transit improvements would make people more likely to ride transit instead of driving for an errand; 65% of respondents indicated a desire for service-related improvements, 16% safety improvements, 13% equity improvements, and 6% educational improvements. More specifically, people indicated a desire for service near homes and destinations, a better transit network, and more direct transit services between origins and destinations, improved safety in and around the train/bus, lower fares, and education about how to use transit.

For the City of Thornton, Smart Commute Metro North recommends exploring the following next steps in 2023:

- Coordinating more with residents and employers to increase educational opportunity for commuting and travel options.
- Working with community members and stakeholders to identify gaps in the non-motorized transportation system, starting with areas with lower access to opportunity.

Existing Transit Service

RTD provides public transportation in Thornton through three main services: fixed-route bus, commuter rail, and FlexRide.

Fixed-Route Bus Service

Eleven fixed-route bus routes currently serve Thornton in some capacity, listed in **Table 3** and illustrated in **Figure 12**. Most routes have 30-to-60-minute frequencies throughout the day and predominantly connect to the southern portion of Thornton. With the limited frequencies and limited geographic reach, fixed-route transit is hard to rely on as a mode of transportation. The majority of bus routes in Thornton operate at hourly frequencies, which are impractical for most people, particularly if a transfer is required. Further, this limits the transit-dependent population on how many travel choices they can make, negatively impacting their quality of life.

Only three local bus routes in Thornton operate at 30-minute frequencies during the day, all of which operate in the very south and western parts of the city:

- Route 7 – Along Washington Street south of 112th Avenue
- Route 19 – Along Pecos Street and Ura Lane south of 104th Avenue
- Route 92 – Along 88th Avenue from Pecos Street to the Original Thornton N Line Station

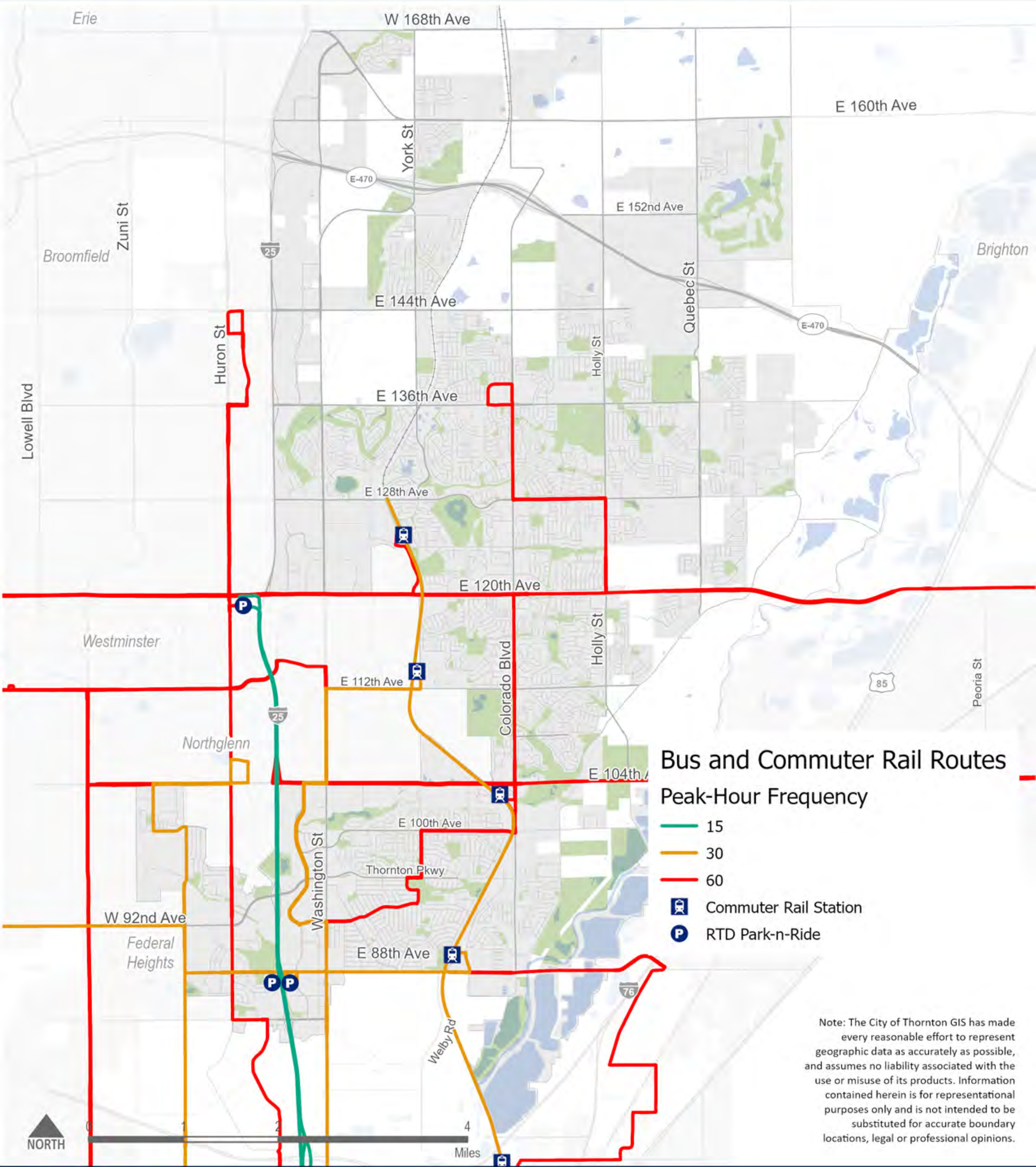
Table 3: Existing Bus Routes and Frequency (in minutes) in Thornton

Route #	Route Name	Weekday Day (Eve)	Weekend Day (Eve)
7	North Washington	30 (30)	60 (60)
8	North Broadway / Huron	60 (60)	60 (60)
19	North Pecos	30 (60)	60 (60)
31	Federal Blvd	- (60)	- (60)
88L	Thornton / Commerce City Limited	60 (60)	60 (60)
92	92nd Avenue	30 (60)	30 (60)
93L	N Colorado Blvd Limited	60 (60)	60 (60)
104L	Wagon Road / Denver Airport Limited	60 (60)	60 (60)
120E	120th Avenue	60 (60)	60 (60)
120L	120th Avenue Limited	60 (60)	60 (60)
120X	Wagon Road / Thornton Express	15 (30)	30 (30)

Source: RTD, 2023

Frequency by Route (January 2023)

Figure 12



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City of Thornton

Sources: RTD 2023
Basemap Data: June 2023

Rail Service

The N Line is a commuter rail running between Denver's Union Station and the Eastlake & 124th Station in Thornton. It runs at 30-minute frequencies all day, daily, making four stops in Thornton:

- Eastlake & 124th
- Northglenn & 112th
- Thornton Crossroads & 104th
- Original Thornton & 88th

In a similar pattern to the fixed-route buses, the most northern station is geographically only halfway into Thornton. With the intense growth expected in northern Thornton, a rail extension will positively impact transit availability. Eventually, the N Line is planned to go up to Colorado Boulevard & CO 7 once funding becomes available.

FlexRide

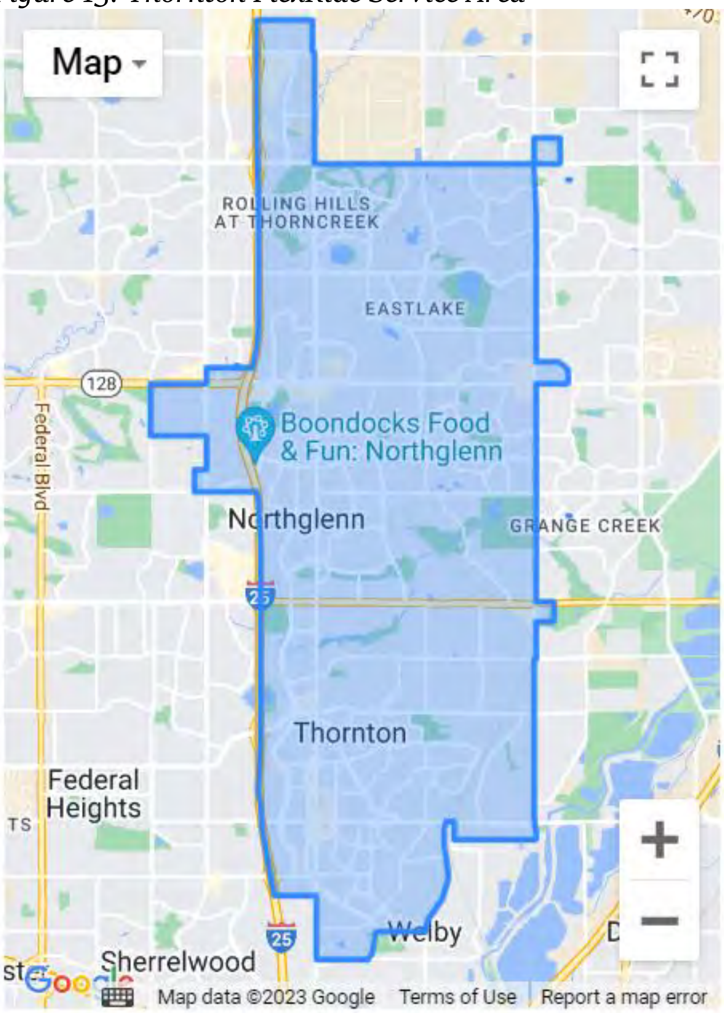
FlexRide is RTD's extended bus service intended to help with first- and last-mile connections. In general, riders can reserve a ride anywhere within the FlexRide service area, and RTD offers a subscription service for people that regularly need a ride at a set time on certain days. Thornton has four FlexRide service areas: Thornton, Federal Heights, Wagon Road/144th, and Broomfield North with some overlap between the service areas in the case of a needed transfer.

Per conversations with RTD, the Thornton FlexRides generally serve a community-based need; this means that the FlexRide is used more by residents who need to get to shopping opportunities, appointments, and recreational services, and is less used by commuters. Service for the Thornton and Federal Heights FlexRide are each provided by two buses. Because they each serve a large geographic area, it can sometimes be impossible to reserve a ride when needed. Additionally, while transfers are technically feasible at the Thornton Park-n-Ride, Wagon Road Park-n-Ride or the area around St. Anthony's Hospital, they are often challenging to coordinate may require significant out-of-direction travel making connections from either side of I-25 via FlexRide impractical.

Thornton FlexRide

The Thornton FlexRide mostly covers a large area generally from 70th Avenue to 144th Avenue east of I-25 and west of Colorado Boulevard, as depicted in **Figure 13**. It operates Monday through Friday between 5:30 AM and 7:00 PM, and the service is mostly available by reservation, but it will also depart from the Wagon Road Park-n-Ride every 60 minutes between 6:00 AM and 6:00 PM without a required reservation.

Figure 13: Thornton FlexRide Service Area

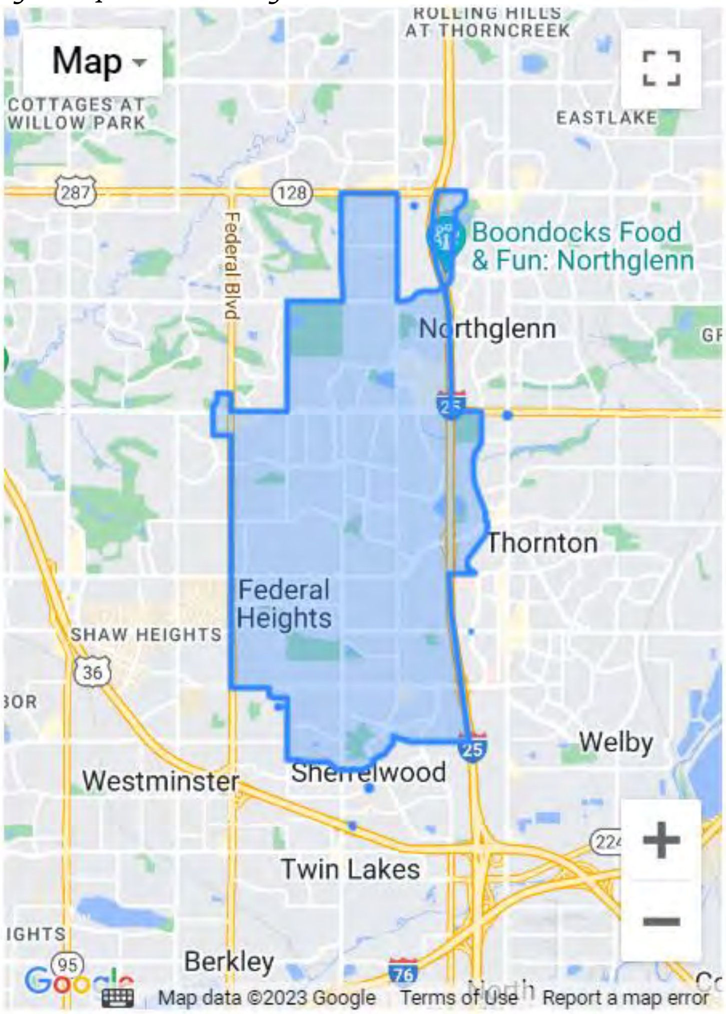


Source: RTD, 2023

Federal Heights FlexRide

The Federal Heights FlexRide mostly covers an area from 76th Avenue to 120th Avenue east of Federal Boulevard and west of I-25, as depicted in **Figure 14**. It operates Monday through Friday between 5:30 AM and 7:00 PM, and the service is available by reservation only.

Figure 14: Federal Heights FlexRide Service Area

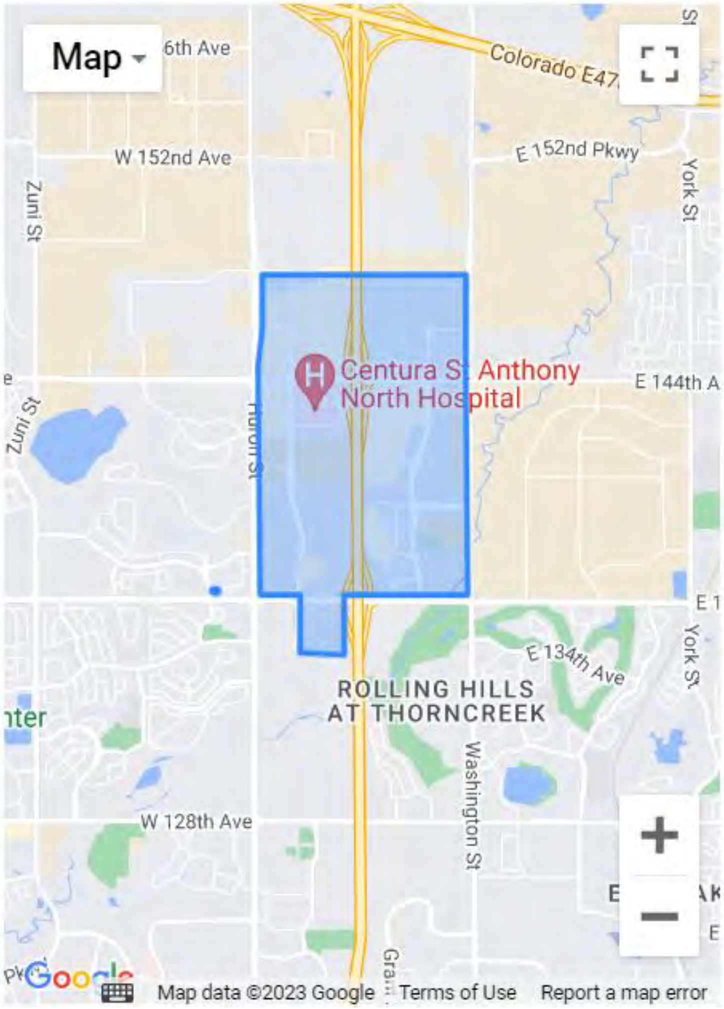


Source: RTD, 2023

Wagon Road FlexRide

The Wagon Road FlexRide covers a small area between 136th Avenue and 148th Avenue east of Huron Street and west of Washington Street, as depicted in **Figure 15**. It operates Monday through Sunday between 4:50 AM and 9:45 PM; between 8:45 AM and 5:30 PM, it is an on-demand service requiring reservations, and in the other times it is a fixed-route departing every 20 minutes from the Wagon Road Park-n-Ride and making stops at the St. Anthony's employee entrance, the Dollar Tree at The Orchard, the Amazon main door, the Grove at Burlington, Grant at 141st Street, and the Premium Outlet Group Check. The fixed-route service portion of service is oriented primarily during shift changes at the St. Anthony's hospital and Amazon distribution center. The service is funded by a grant that is set to expire in September 2023 and the city, Smart Commute, and RTD are working on solutions to keep the service operating in the future.

Figure 15: Wagon Road FlexRide Service Area

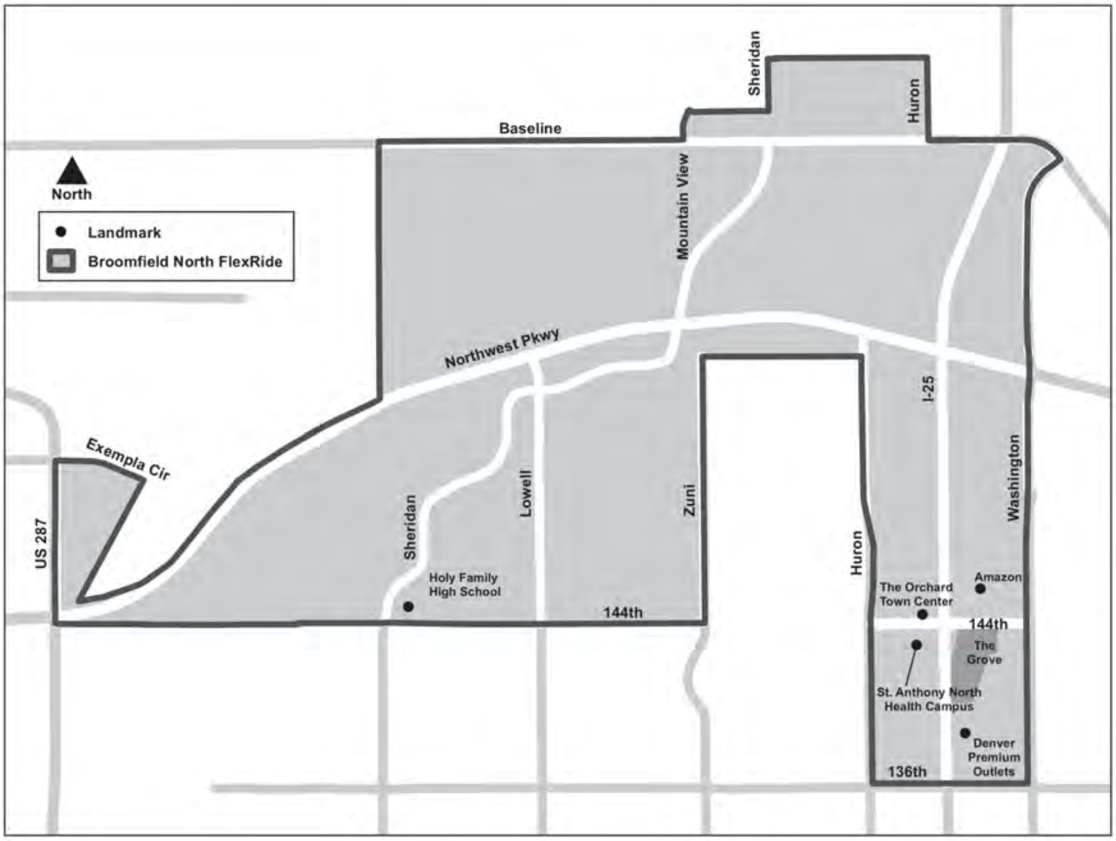


Source: RTD, 2023

Broomfield North FlexRide

The Broomfield North FlexRide service started on May 29, 2023 and Broomfield serves an area between 136th Avenue and CO 7 east of US 287 and west of Washington Street, as seen in **Figure 16**. The service operates Monday through Friday between 9:00 AM and 4:00 PM. Unlike the other FlexRide services in Thornton, the Broomfield North FlexRide has very little overlap with RTD's existing fixed-route service. The only connections points into the rest of RTD's transit network are with the LD regional bus (which operates hourly between Broomfield and Longmont) along US 287 and the Wagon Road FlexRide around 144th Street & I-25.

Figure 16: Broomfield North FlexRide Service Area



Source: City and County of Broomfield, 2023

Access-a-Ride

RTD also provides an ADA paratransit service, Access-a-Ride, which serves people who cannot use regular fixed-route services due to a disability. To qualify, a rider must be unable to independently get to and from a bus stop or on and off a lift-equipped fixed-route bus; and the rider must have a disability that prohibits them from independently riding fixed-route bus services. The service has a fare and is available anywhere throughout the RTD service area, as long as the origin and destination are within ¾ mile of the local fixed-route transit system. **Figure 17** shows that because of the lack of fixed-route service to most of north Thornton, there are gaps in that part of the city where Access-a-Ride does not serve.

Transit Hubs

There are six transit hubs in or near Thornton that provide access to the N Line or regional express bus service on I-25. These hubs are park-n-rides and major transfer points in the regional transit system. The locations of transit hubs are mapped in **Figure 17** (see Commuter Rail Stations and Park-n-Rides) and summarized in **Table 4**.

Table 4 Transit Hubs in/near Thornton

Station	Regional Bus/Rail Routes	Local/Limited Bus Routes	FlexRide
Eastlake & 124th	N Line	120E, 120L	Thornton
Northglenn & 112th	N Line	7, 112	Thornton
Thornton Crossroads & 104th	N Line	93L, 104L	Thornton
Original Thornton & 88th	N Line	92, 88L	Thornton
Wagon Road Park-n-Ride	120X	8, 104L, 120W	Federal Heights, Thornton, Wagon Road
Thornton Park-n-Ride	120X	92, 93L	Federal Heights, Thornton

System Coverage & Gaps

RTD provides fixed-route bus service, commuter rail service, and FlexRide service to the Thornton area. **Figure 17** displays this coverage. In terms of coverage, the services cover a significant land area of Thornton, especially in the western and southern parts of the City. However, there are notable gaps in this coverage especially when combined with frequency as explained below.

Geographic Coverage Gaps

As seen in **Figure 17**, there is minimal to no transit east of Colorado Boulevard and north of 120th Avenue, leaving no practical option for transit access within most of these neighborhoods. Some of these areas are also more than three quarters of a mile from the nearest fixed-route transit, meaning Access-a-Ride is not available for people who would otherwise qualify for the service.

Further, **Figure 18** displays the areas of Thornton within a quarter-mile to nearest bus stops and a half-mile distance to the nearest regional transit hubs via the roadway network. These are the distances most people are willing to walk to access local bus (a quarter mile) and regional express service (a half a mile). This map shows many areas of the city that are not within a convenient walk to transit, even in the areas south of 104th Avenue where transit coverage is higher. Additionally, the analysis does not account for the existence (or condition) of the sidewalk network, which is generally poorer in the southern part of Thornton as expressed by stakeholders and members of the public. Narrow or missing sidewalks can make it more difficult to access transit stops, even when one’s origin or destination is within walking distance to a stop.

While the areas with existing service roughly align with the areas of Thornton with the highest population density (**Figure 5**) and highest transit propensity, much of the service in this area is too infrequent to be practical, especially when making connections, as described below.

Frequency Gaps

Frequency is another gap that limits residents from being able to access transit in a flexible and accommodating way. As discussed with **Table 3**, none of the local fixed-route transit services run more frequently than every 30 minutes in Thornton. The only services that run more frequently than 30 minutes are the 120X along I-25 that operates at 15-minute headways in the peak direction and the Wagon Road Flexride that operates at 20-minute frequencies during peak commuting times. The TMMP emphasizes being able to access all areas of Thornton in a timely manner without using a private vehicle, which would be difficult with the current frequency of service provided.

Service Span Gaps

How early or late in the evening transit service operates impacts its utility, particularly for service workers who often have non-traditional schedules. While most fixed-route transit in Thornton operates in the evening, the Thornton FlexRide stops running at 6 PM which limits the ability of many evening commuters and service workers to use the service.

Connectivity Gaps

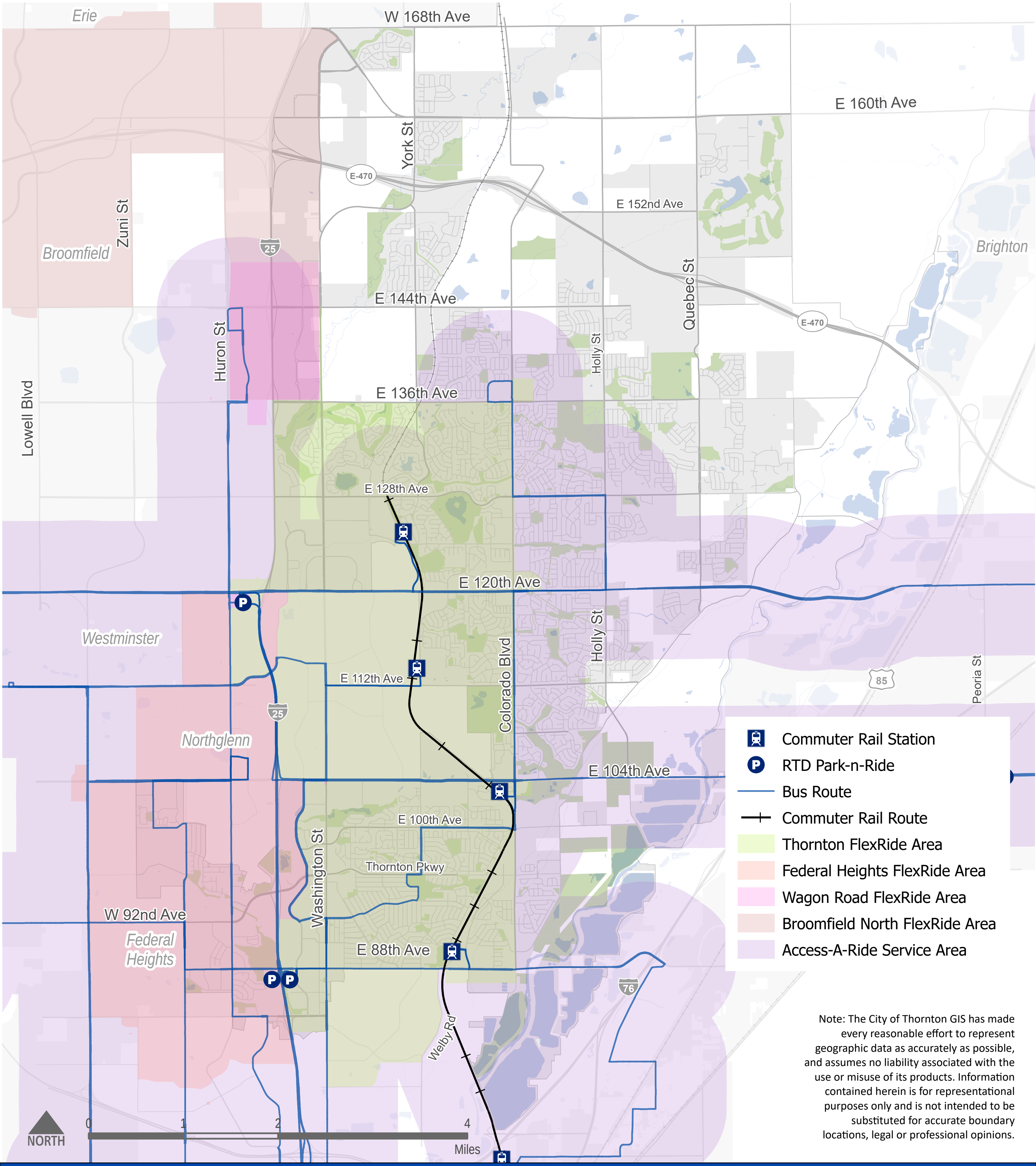
In much of Thornton there is good connectivity of services to the N Line and I-25 transit hubs. However, there are noticeable gaps. In addition to the challenges of transferring between routes that is caused by the low frequency of most routes, there is also a lack of transit connectivity across I-25 in some areas. This includes 104th Avenue (despite fixed-route service on both sides of I-25), and the FlexRide boundaries are split generally along I-25 making this FlexRide extremely inconvenient to use for trips that cross I-25.

Trip Purpose Gaps

Another gap in transit service in Thornton is the mismatch between the services offered and the desired trip purposes. The routes in Thornton are mostly oriented to serve regional trips, particularly to downtown Denver, which is helpful to commuters who work outside Thornton or are traveling longer distance in the region. However, the existing transit service is not well set up for shorter community-based trips, other than the FlexRide is not always an option due to capacity constraints. Thus, this market is largely unserved by transit in Thornton. Additionally, the travel market for east-west regional trips is not well served by transit today.

Thornton Transit Coverage

Figure 17

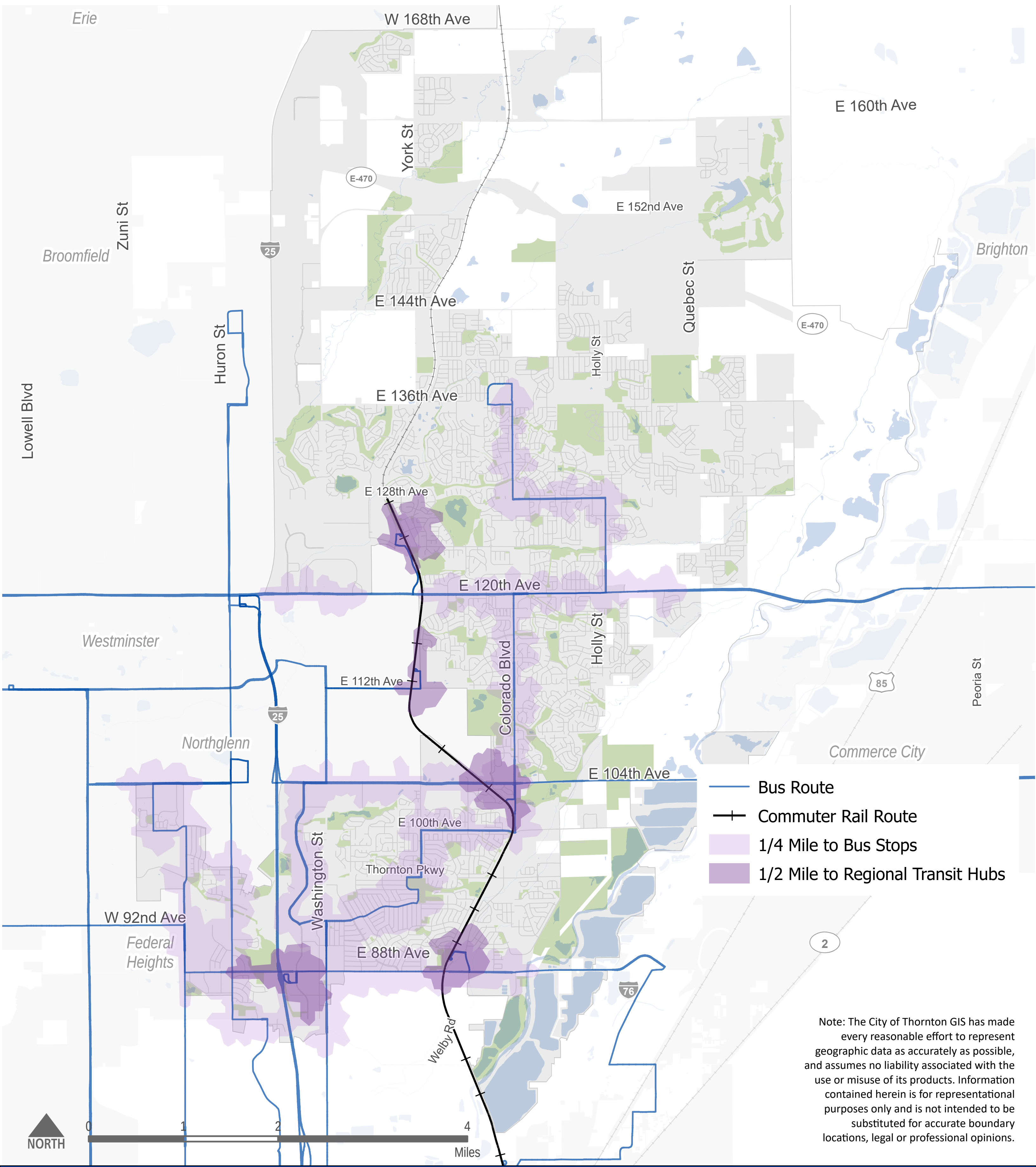


City of Thornton

Sources: RTD 2023

Thornton Transit Access

Figure 18



City of Thornton

Sources: RTD 2023
Basemap Data: June 2023

Ridership by Stop

The success of existing transit is heavily based in ridership, and the ridership for the bus stops in Thornton is displayed in **Figure 19**. In the map, ridership is calculated as the average daily boardings and alightings throughout the May to August 2022 runboard. This runboard was used since previous runboards were still disrupted by the COVID-19 pandemic.

The stops with the highest daily ridership align with the rail stops and park-n-rides and major transfer points in the system, as seen in **Table 5**. The Thornton Park-n-Ride and the stops at 88th Avenue & Washington Street also have substantial ridership. This pattern may be indicative of how the existing transit services are used for more regional connections rather than local connections.

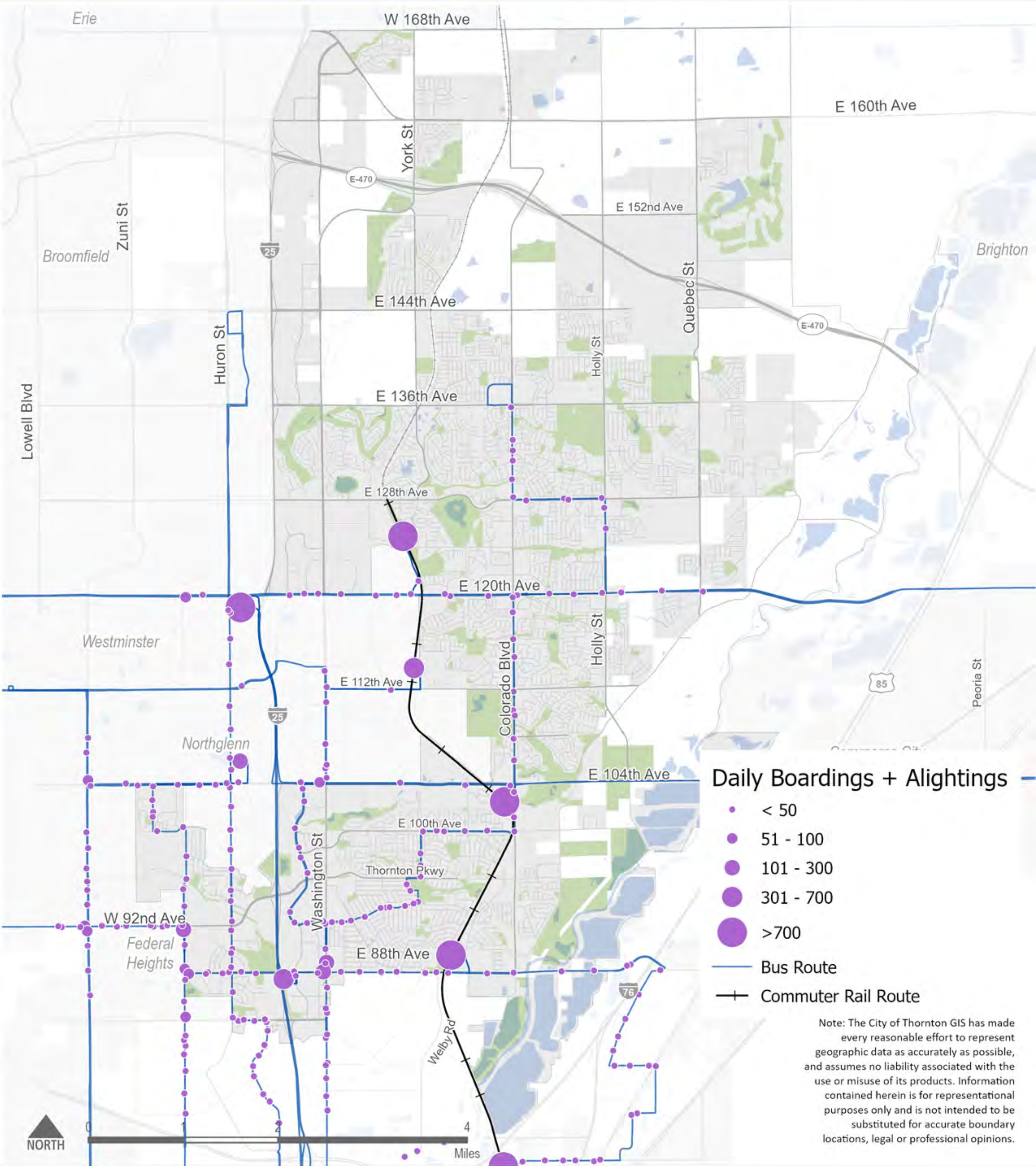
Table 5: Highest Ridership Stops

Transit Stop	Average Daily Boardings	Transit Routes Available
Eastlake & 124th	1,665	N Line, 120E, 120L, Thornton FlexRide
Thornton Crossroads & 104th	940	N Line, 93L, 104L, Thornton FlexRide
Wagon Road Park-n-Ride	905	8, 104L, 120W, 120X, Federal Heights, Thornton, & Wagon Road FlexRides
Original Thornton & 88th	746	N Line, 88L, 92, Thornton FlexRide
Northglenn & 112th Ave	700	N Line, 7, 112, Thornton FlexRide

Source: RTD, 2022

Ridership by Stop (May 2022)

Figure 19

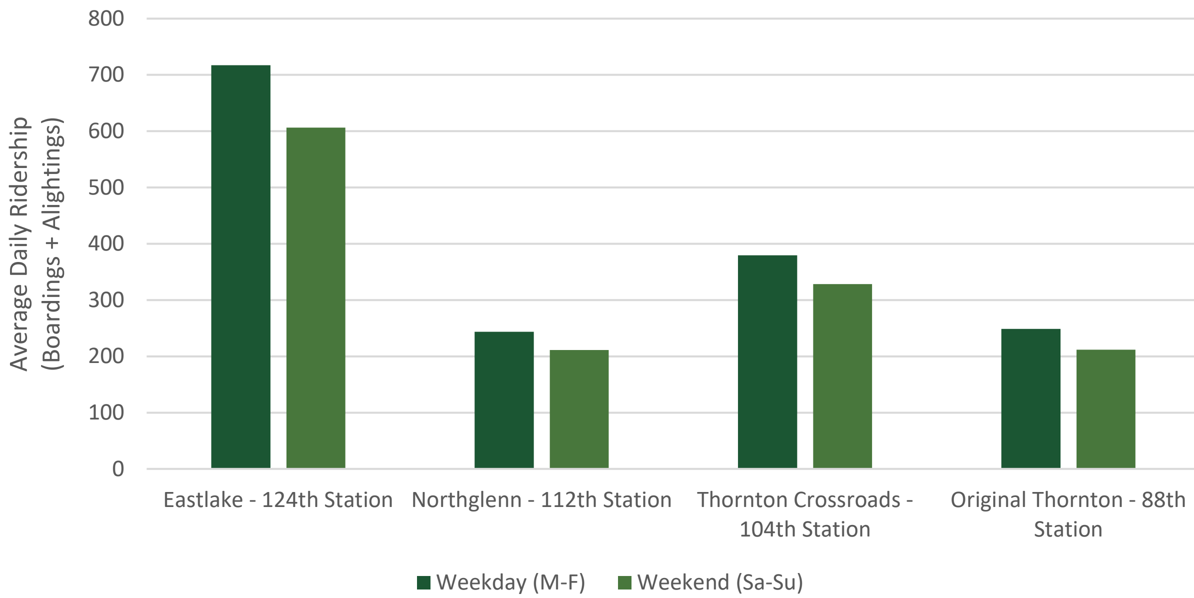


City of Thornton

Sources: RTD 2023
Basemap Data: June 2023

Further, with the N Line stops being significant origins and destinations for transit trips, **Figure 20** displays the difference in ridership on the weekdays and the weekends. There are about 16% more trips on the weekdays than on the weekends, indicating a relatively consistent demand for the N Line throughout the week.

Figure 20. Average N Line Ridership, May 2022 (Weekdays vs Weekends)

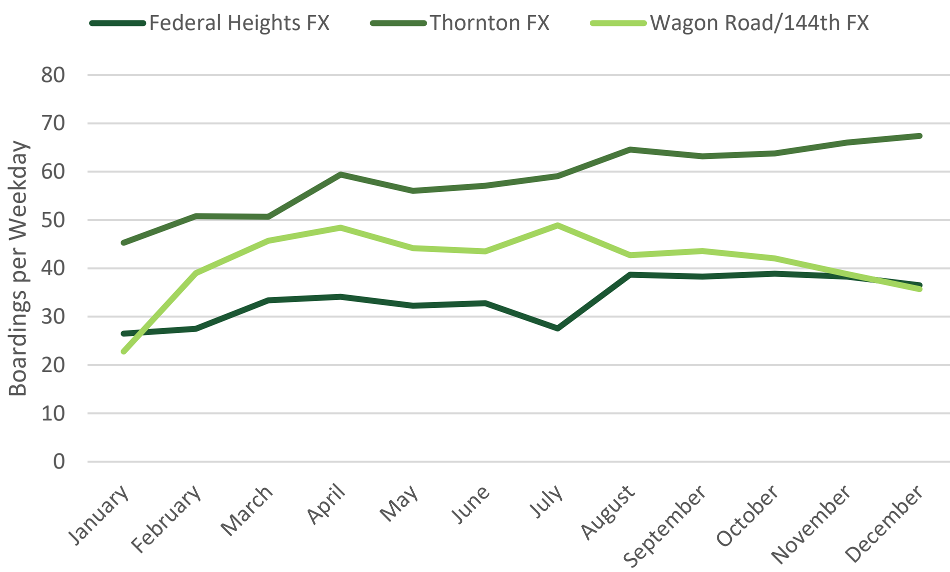


Source: RTD, 2022

FlexRide Ridership Patterns

RTD also tracks ridership patterns for the FlexRide services. **Figure 21** displays the average boardings per weekday on all three FlexRide services in 2022. It should be noted that the new Broomfield North FlexRide is not displayed due to starting service in May 2023. Overall, the Thornton FlexRide had the largest ridership, and it grew over the course of the year, from 45 riders per day in January to almost 70 riders per day in December. It is also noteworthy that this FlexRide has the largest service area. The other two FlexRide services grew more modestly in 2022 and were averaging about half as many riders per day (just under 40) by December, 2022, with ridership on the Wagon Road FlexRide declining since its peak in the summer.

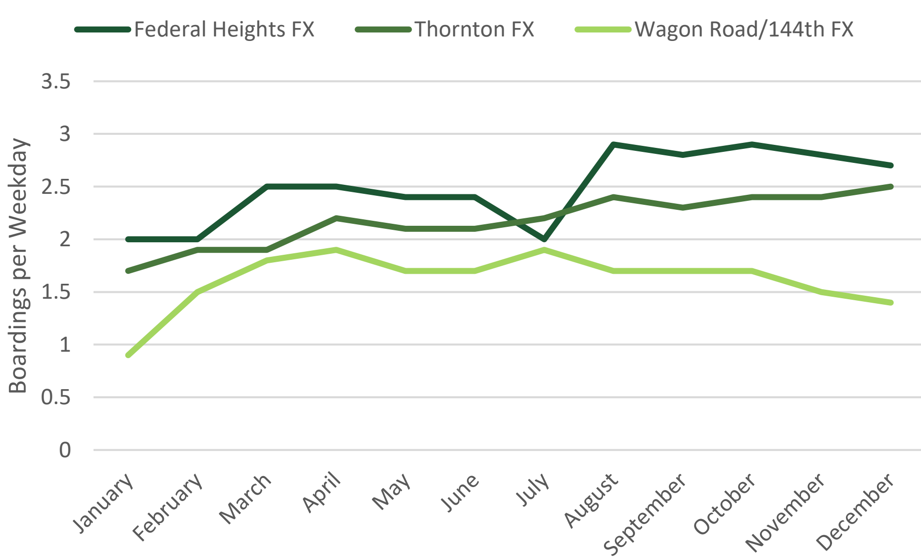
Figure 21: 2022 Boardings per Weekday on Thornton Flex Rides



Source: RTD, 2022

Figure 22 and **Table 6** display the boardings per hour for each FlexRide service, which in 2022 ranged from an average of 1.6 boardings per hour on the Wagon Road FlexRide to 2.5 boardings per hour on the Federal Heights FlexRide. RTD aims to have an average of three boardings per hour, and the closest one to that level of service is the Federal Heights FlexRide.

Figure 22: 2022 Boardings per Hour on Thornton Flex Rides



Source: RTD, 2022

Further, it is important to compare the FlexRide ridership patterns over time. **Table 6** also displays how ridership on the Thornton area FlexRide services has changed between 2021 and 2022, and both the Federal Heights FlexRide and the Thornton FlexRide increased in overall ridership. Despite the growth in ridership, the relatively low numbers reflect the inefficiency of operating an on-demand service over a large area and challenges in meeting demand. The Wagon Road FlexRide had a decrease in ridership between 2021 and 2022. The latter service is largely dependent on patterns at Amazon and may be reflective of changes in shift schedule and number of employees.

Table 6: FlexRide Ridership Over Time

Service	2021	2022	Percent Change
	Average Boardings per Weekday		
Federal Heights FlexRide	30.2	33.7	+11.7%
Thornton FlexRide	45.4	58.6	+29.1%
Wagon Road FlexRide	47.7	41.3	-13.5%
	Average Boardings per Hour (Weekdays)		
Federal Heights FlexRide	2.5	2.5	0%
Thornton FlexRide	1.9	2.2	+14.5%
Wagon Road FlexRide	1.9	1.6	-14.9%

Source: RTD, 2022

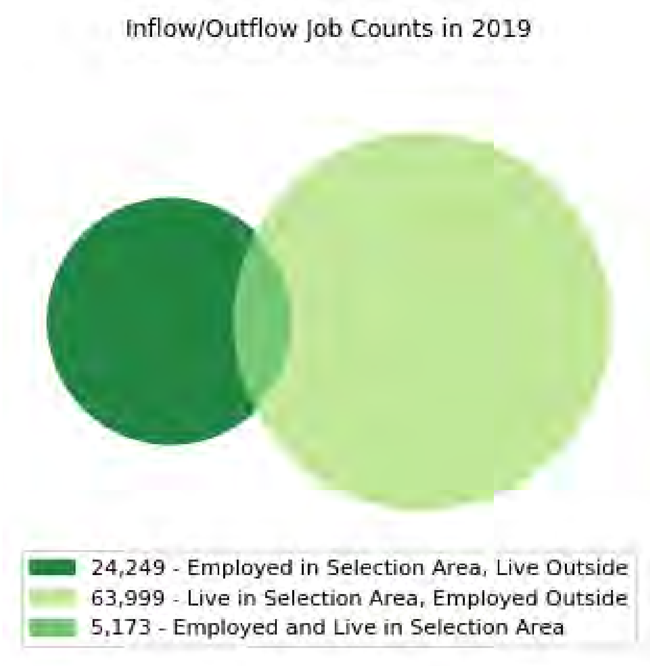
Travel Patterns & Demand

Existing travel patterns and demand are insightful to how people currently move around and in relation to Thornton. Studying where people are currently making trips by all modes can help reveal potential markets for transit service.

LEHD Commute Patterns

The Longitudinal Employer-Household Dynamics (LEHD) from the U.S Census collect survey data on travel and commute patterns. As seen in **Figure 23**, the majority of Thornton residents work outside of Thornton, although there is also a good amount of people who work in Thornton but live elsewhere. A small portion of Thornton's residents work and live within Thornton. It should be noted that the LEHD data is from 2019 and patterns may have shifted significantly following the COVID-19 pandemic and a higher prevalence of working from home.

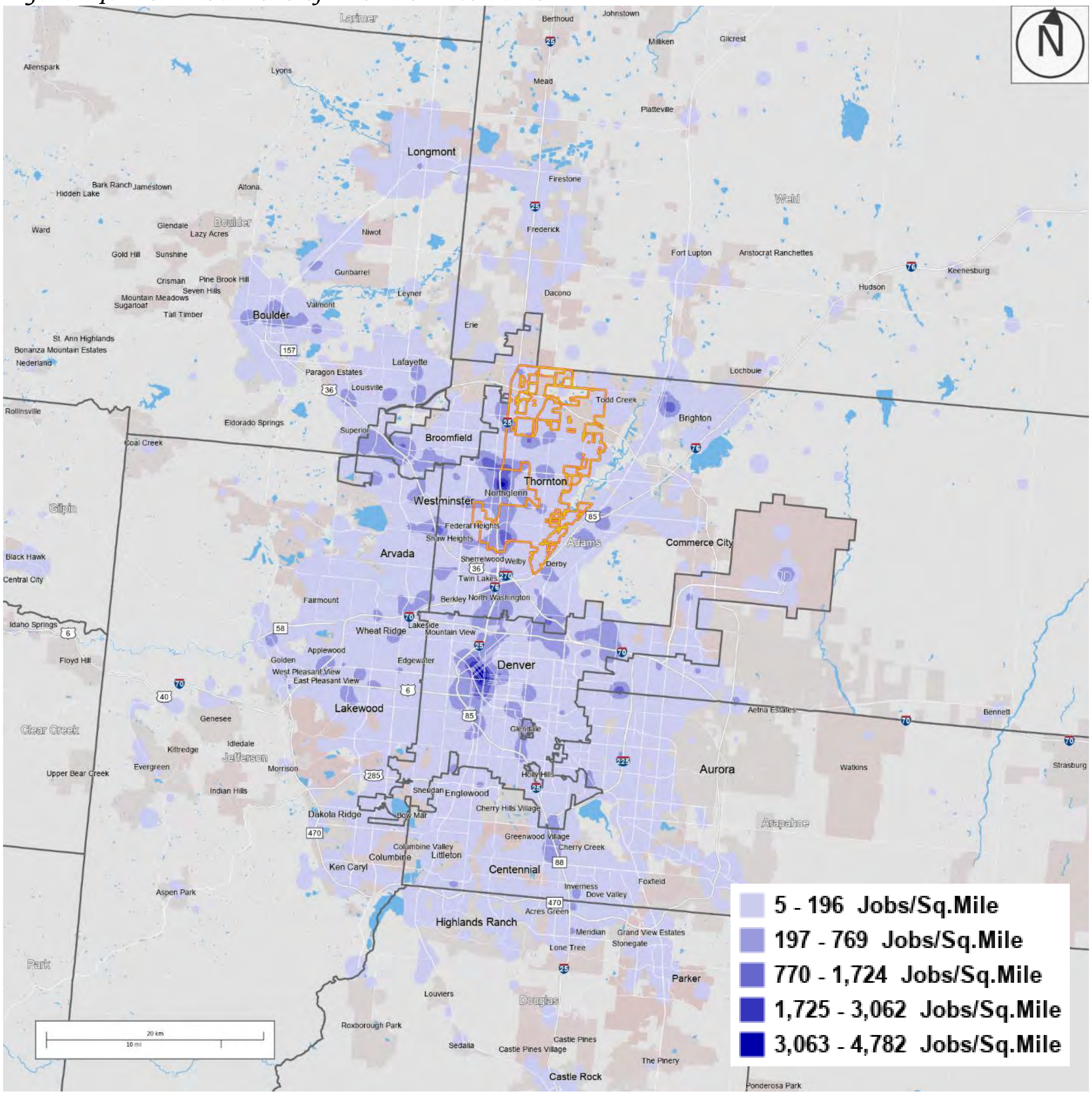
Figure 23: Inflow/Outflow of Commuters



Source: LEHD, 2019

Figure 24 shows where people who live in Thornton were working in 2019. Geographically, two primary areas are evident as work locations for Thornton residents: Northglenn and Downtown Denver. However, the data also shows that commute trips from Thornton are highly dispersed throughout the region, spreading from Boulder to Brighton to Greenwood Village.

Figure 24: Work Locations of Thornton Residents



Source: LEHD, 2019

StreetLight Data Analysis

Origin-destination trip data for Thornton and the surrounding area were collected using StreetLight Data. StreetLight Data is an on-demand mobility analytics platform and a "Big Data" provider that compiles origin-destination trip data from global positioning system (GPS) tracking technology provided through location-based services (LBS) data or connected vehicle data (CVD). LBS data is collected through mobile devices when a user enables a location-based services application on their smartphone, and CVD is collected from vehicles equipped with advanced communication technology.

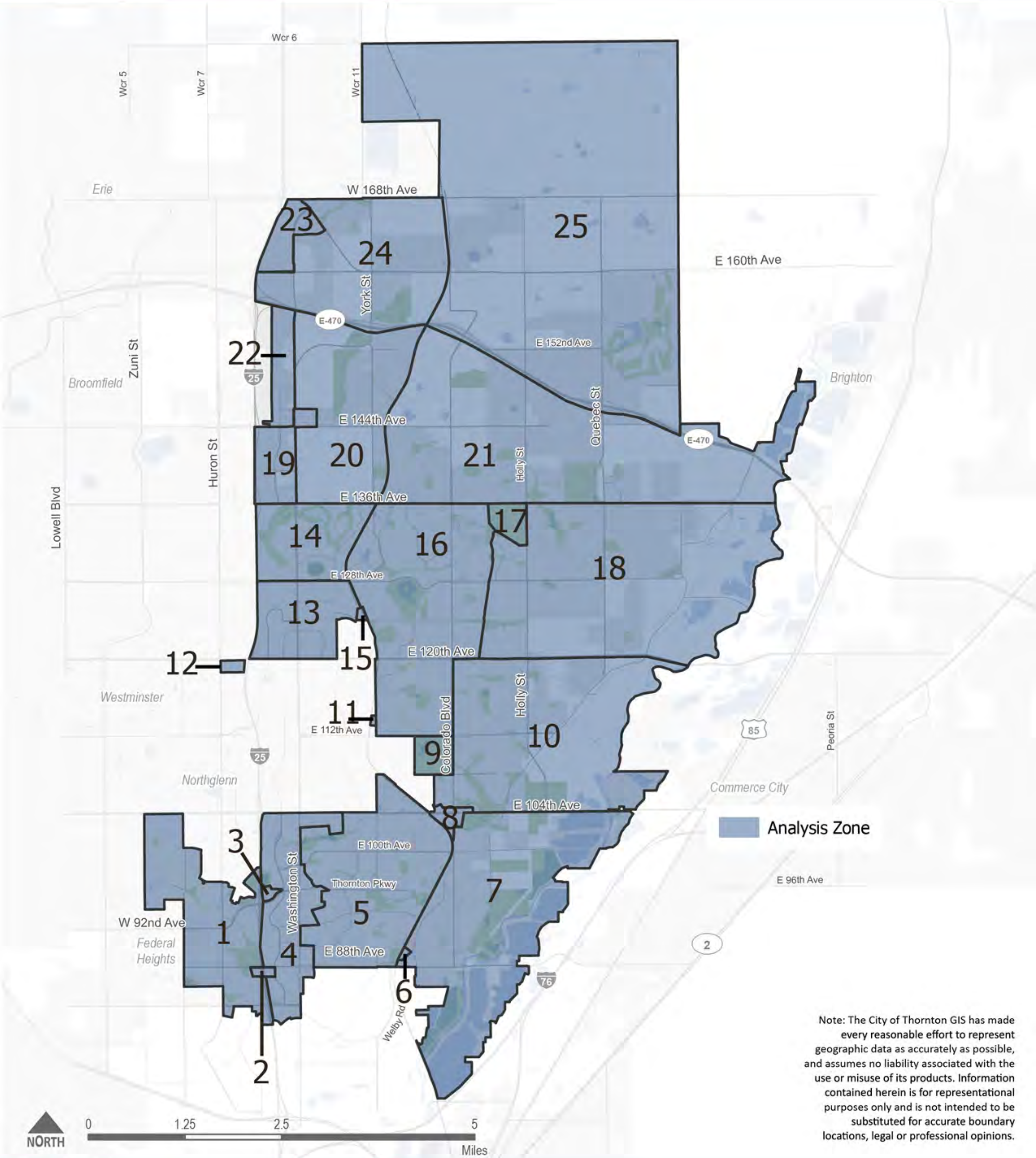
The primary output used in this analysis is the StreetLight Index, which is a relative estimate of device trips (including trips taken by automobile, truck, motorcycle, and bus). StreetLight allows for analysis over different time periods depending on the type of data collected; LBS is available for analysis dates between January 2016 and April 2022, and CVD is only available between May 2022 and December 2022. For this analysis, LBS data was collected for March – April 2022 and CVD data was collected for September – October 2022. To capture peak flows and analysis at various times of the day and days of the week, data was collected for a typical weekday (Tuesday – Thursday), a typical weekend (Saturday – Sunday) on an hourly basis.

Zones

Transportation zones are the building blocks for running analyses on the StreetLight platform. Zones can be used to analyze traffic that stops and starts within an area. To capture all the critical origin and destination spots in and around Thornton, 25 zones were developed for this analysis. The zones developed for this analysis were based on the land use patterns, including separate zones for major commercial areas and recreational facilities, separate zones for the major transit stations and Park-n-Rides, and separate zones for residential zones separated by highways, railroads, or other built-environment features. **Figure 25** shows a map of the zones analyzed and **Table 7** shows the zone descriptions, with numbers corresponding to the map. To understand certain questions of the analysis, specifically regional trips to or from Thornton, an additional analysis with pre-set ZIP code geographies was run.

Analysis Zones

Figure 25



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City of Thornton

Sources: RTD 2023
Basemap Data: June 2023

Table 7. StreetLight Analysis Zone Descriptions

Zone Name	Zone Number
Huron Street Area	1
Thornton Park-n-Ride	2
Thornton Civic Center/City Hall	3
Washington Street Commercial Corridor, South of 104th	4
Residential Zone East of Washington Street, West of Railroad	5
Original Thornton/88th Station	6
Eastern Residential Zone South of 104th	7
Thornton Crossroad104th Station	8
Carpenter Recreation Complex	9
Residential Zone between 104th Avenue and 120th Avenue, East of Colorado	10
Northglenn/112th Station	11
Wagon Road Park-n-Ride	12
Western Commercial Zone between 120th Avenue and 128th Avenue	13
Western Residential Zone between 128th and 136th Avenue	14
Eastlake/124th Station	15
Residential Area surrounding Eastlake	16
Trail Winds Recreation Complex	17
Eastern Residential Zone between 120th Avenue and 136th Avenue	18
Denver Premium Outlets	19
Residential Zone between 136th Avenue and E470, West of Railroad	20
Residential Zone between 136th Avenue and E470, East of Railroad	21
Amazon Employee Parking	22
Larkridge Employee Center	23
Residential Zone between E470 and 168th Avenue, West of Railroad	24
Northern Zone North of E470, East of Railroad	25

Analysis Results

To best inform the study of the existing travel patterns, and how transit can assist in these patterns, the Streetlight analysis aimed to answer the following questions:

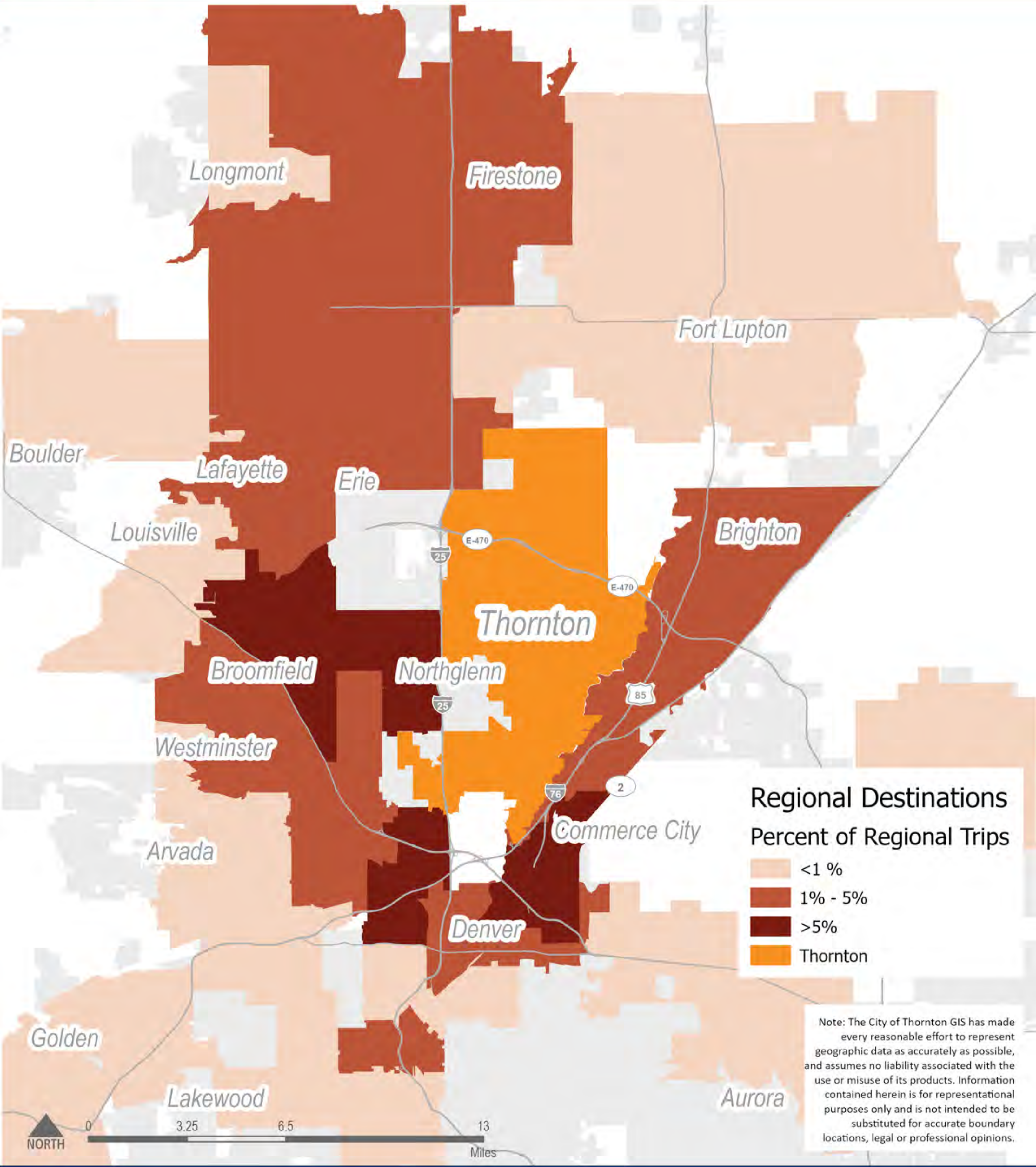
- What regional destinations are people from Thornton going to?
- Where are people in the high transit propensity zones (from TMMP) going in Thornton?
- What are the origins of trips to the transit hubs?
- What are the origins of trips to some key destinations in Thornton?
- What are the general travel patterns within Thornton?

Top Regional Destinations

To understand where people are travelling to outside of Thornton, an origin-destination analysis with pre-set geographies was run. This is an analysis type where the origins are set as the 25 custom zones in Thornton, and the destinations are set as ZIP code boundaries. **Figure 26** displays the distribution of destinations from Thornton on weekdays between March and April 2022. Out of all trips destined to areas outside of Thornton, a large portion of trips are travelling to Commerce City and Broomfield. There are also a significant portion of trips travelling to Brighton, Westminster, and to communities along the Northern I-25 corridor (Erie, Lafayette, Firestone). In general, this pattern shows that trips destined outside of Thornton do not travel far; most trips are within a radius of 15 miles. This is consistent with the Smart Commute survey, which showed that the average commute distance of Thornton residents in 2022 was 9.9 miles.

Regional Destinations

Figure 26



City of Thornton

Sources: StreetLight Data, March to April 2022, Fehr & Peers
Basemap Data: June 2023

Where are Trips from High Transit Propensity Zones Going within Thornton?

As described in **Figure 4**, the TMMP identified transit propensity zones where residents are more likely to rely on and use transit. These transit propensity zones were given special attention in the StreetLight analysis to understand the specific travel patterns to and from these areas of Thornton. The zones with high transit propensity include the following:

- Huron Street Area
- Washington Street Commercial Corridor
- Residential Zone East of Washington Street
- Western Commercial Zone (North of Northglenn)
- Eastlake Area

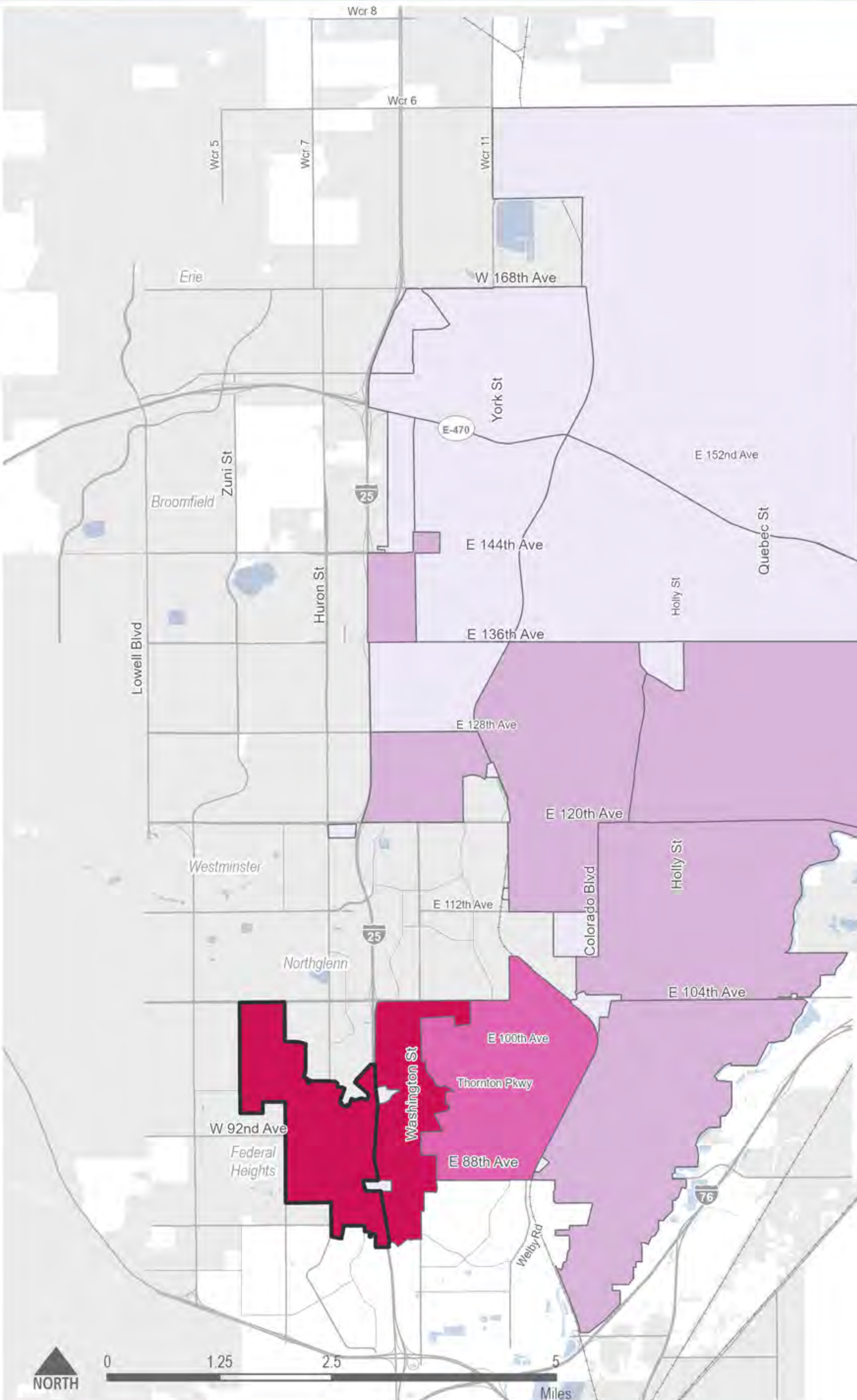
An analysis of top destinations within Thornton from these high transit propensity zones was conducted to understand potential transit market demand from these areas of Thornton.

Huron Street Area

Compared to other areas of Thornton, the Huron Street area has a higher portion of its population living under the poverty line, under the age of 18 and over the age of 64, with limited access to vehicles, and commuting using public transportation. The StreetLight analysis showed that most destinations of trips originating in this area and going to other areas of Thornton are to the surrounding zones directly east, but there are still some trips heading northeast towards 136th Avenue (**Figure 27**).

Destinations from Huron Street

Figure 27



Percent of Trips from Huron Street

- <1%
- 1% - 5%
- 6% - 15%
- >15%
- Huron Street

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City of Thornton

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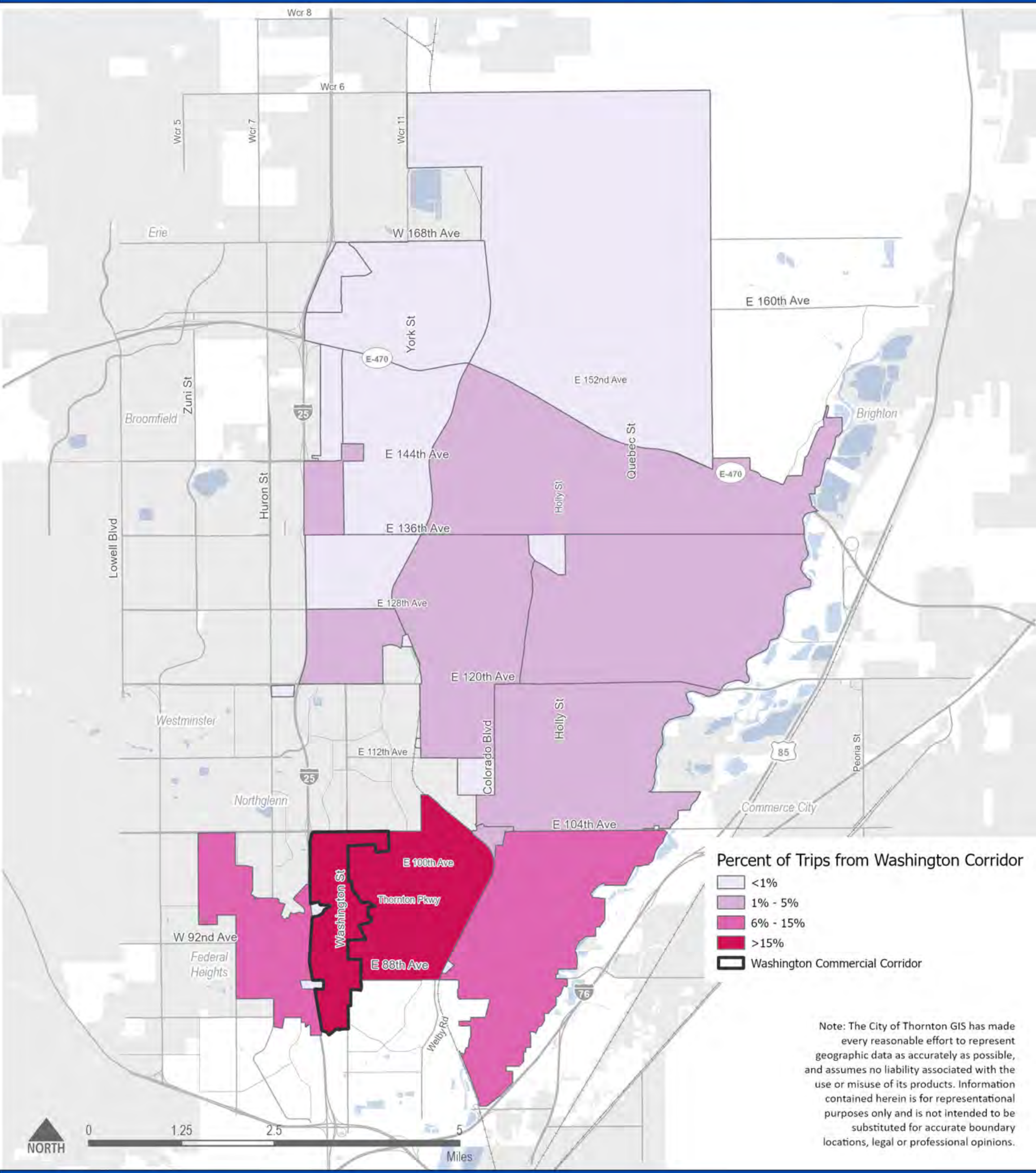
Basemap Data: June 2023

Washington Street Commercial Corridor

The commercial corridor located along Washington Street is bounded by 84th Street to the south and 104th Avenue to the north. The zone's demographic characteristics are similar to the Huron Street area, except there are not as many people under 18 years of age or older than 64 years of age. Destinations from this zone are also similar to the Huron Street area with most people going to areas directly east and west of the zone (**Figure 28**). However, there are people travelling to more northern areas of Thornton. This suggests that besides residents travelling to and from this zone, the commercial corridor is a destination for many people in Thornton. In fact, as seen in later maps (**Figure 29, Figure 30, Figure 31**), the data shows that the Washington Street Commercial Corridor is a consistent destination of trips from other areas of Thornton as well, especially other transit propensity zones.

Destinations from Washington Corridor

Figure 28



City of Thornton

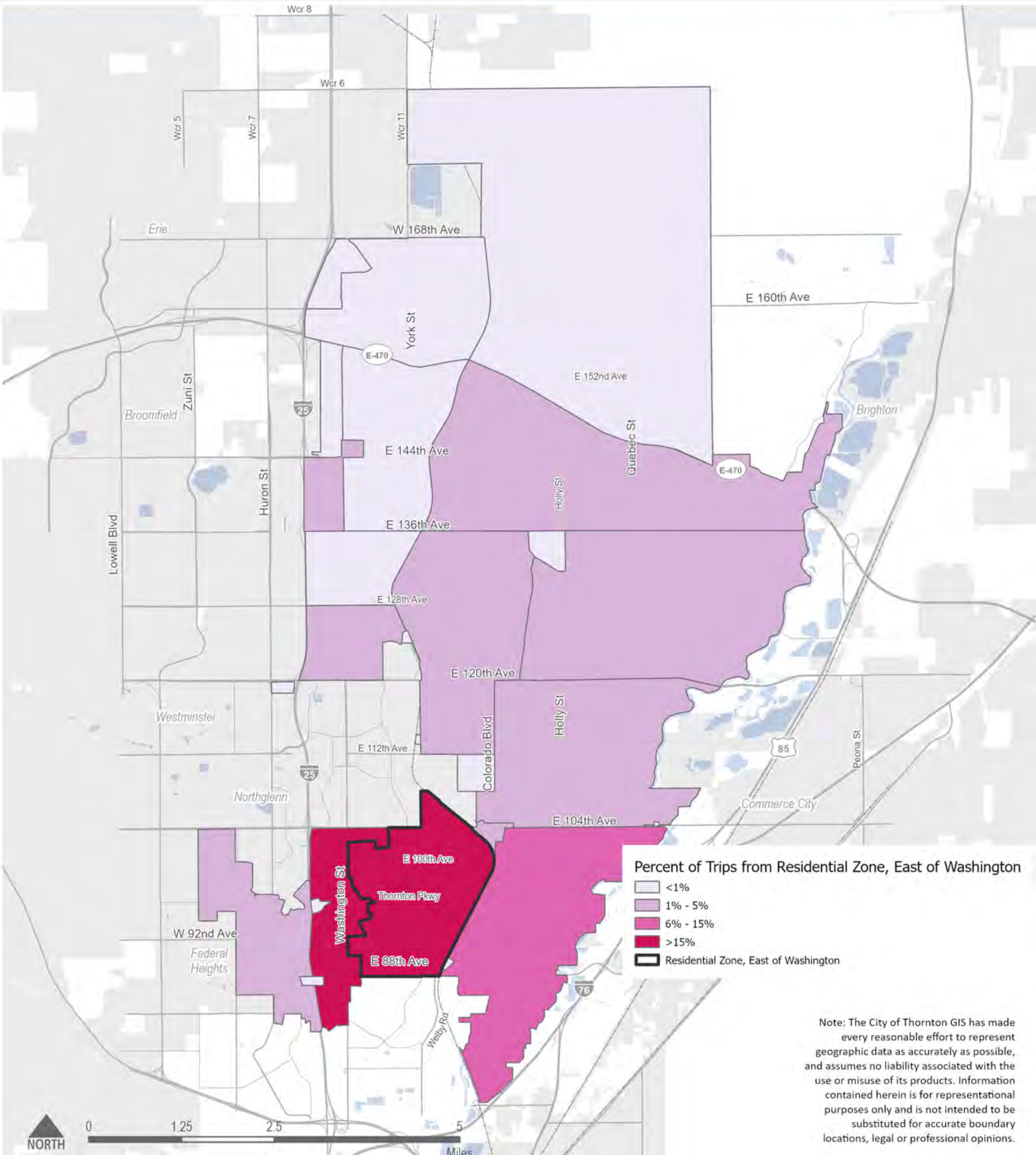
Sources: StreetLight Data, March to April 2022, Fehr & Peers
Basemap Data: June 2023

Residential Zone East of Washington Street

The residential zone east of Washington Street and west of the railroad is bounded by 88th Avenue to the south and 104th Avenue to the north. Not as many residents in this area experience poverty or limited access to a vehicle as in the Huron Street area or the Washington Street Corridor, there is still a relatively higher portion of residents living with low and moderate income and using public transportation as their commute mode as compared to the rest of the city. There is also a significant portion of the population who is under 18 years of age. The travel patterns for this area are almost identical to those of the commercial corridor on Washington Street (**Figure 29**). The slight difference is that there are less people travelling between the Huron Street area and this area than from the Washington Street Corridor.

Destinations from East of Washington

Figure 29



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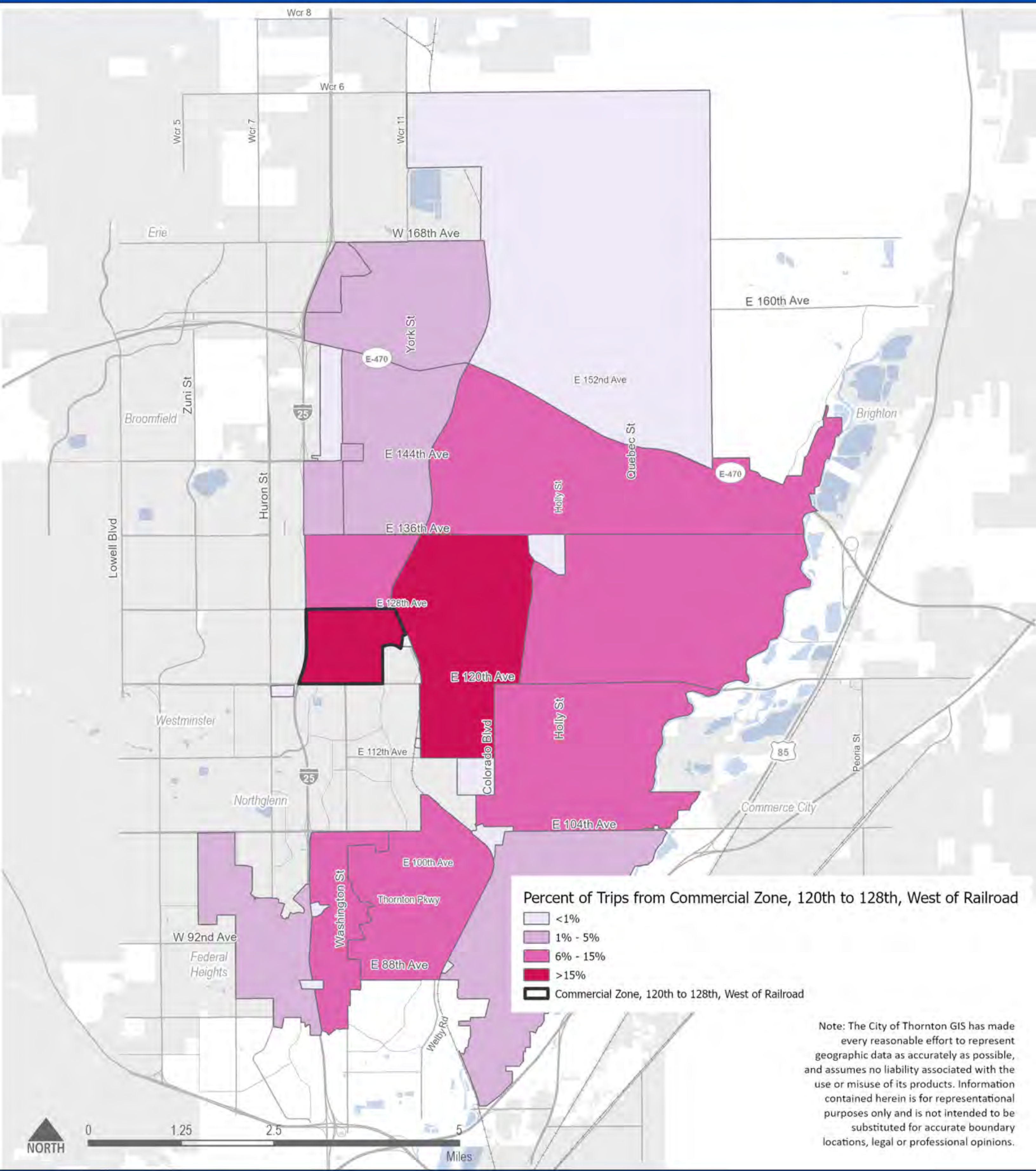
Western Commercial Zone (North of Northglenn)

The commercial area directly north of Northglenn between I-25 and the railroad is bounded by 120th Avenue and 128th Avenue. Like the other transit propensity areas, most people travel to and from the nearby zones (**Figure 30**). However, there is an equal distribution of trips coming from all over Thornton, potentially due to the commercial nature of this zone.

Destinations from Western Commercial Zone

Figure 30



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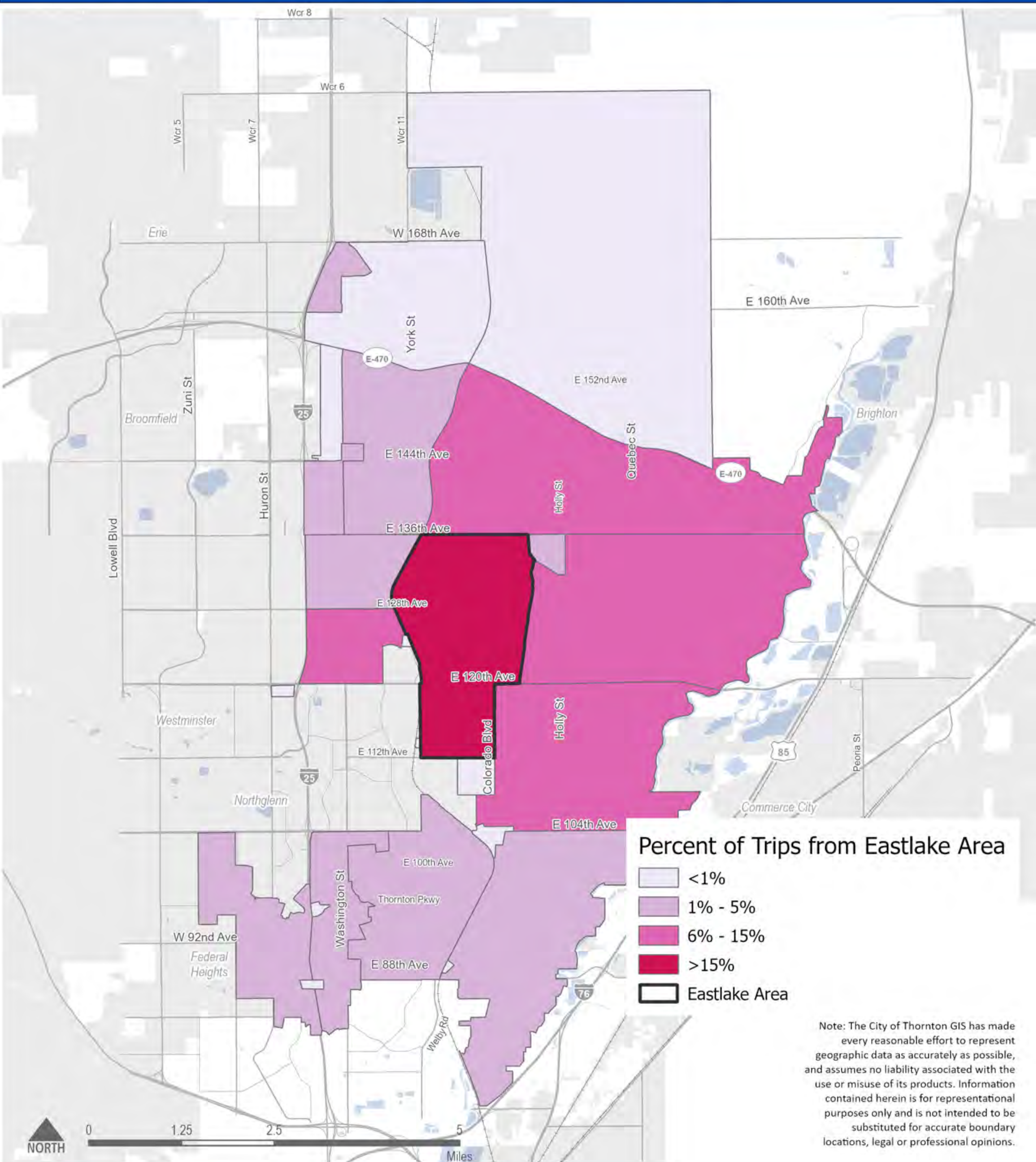
Eastlake Area

The TMMP also identified the area surrounding Eastlake/124th Station as a transit propense area, so the analysis zone is bounded by the railroad to the west and a trail leading to the Trail Winds complex to the east. The area stretches from 112th Avenue to the south to 136th Avenue to the north. Most of the travel is internal within the zone, although there is also significant travel to the areas between 104th Avenue and E-470 (**Figure 31**).

Destinations from Eastlake Area

Figure 31



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Basemap Data: June 2023

Origins of Trips to Transit Hubs

There are six transit hubs in or near Thornton that provide access to the N Line or regional express bus service on I-25 and are major transfer points in the regional transit system:

1. Original Thornton & 88th Station
2. Thornton Crossroads & 104th
3. Northglenn & 112th
4. Eastlake & 124th
5. Thornton Park-n-Ride
6. Wagon Road Park-n-Ride

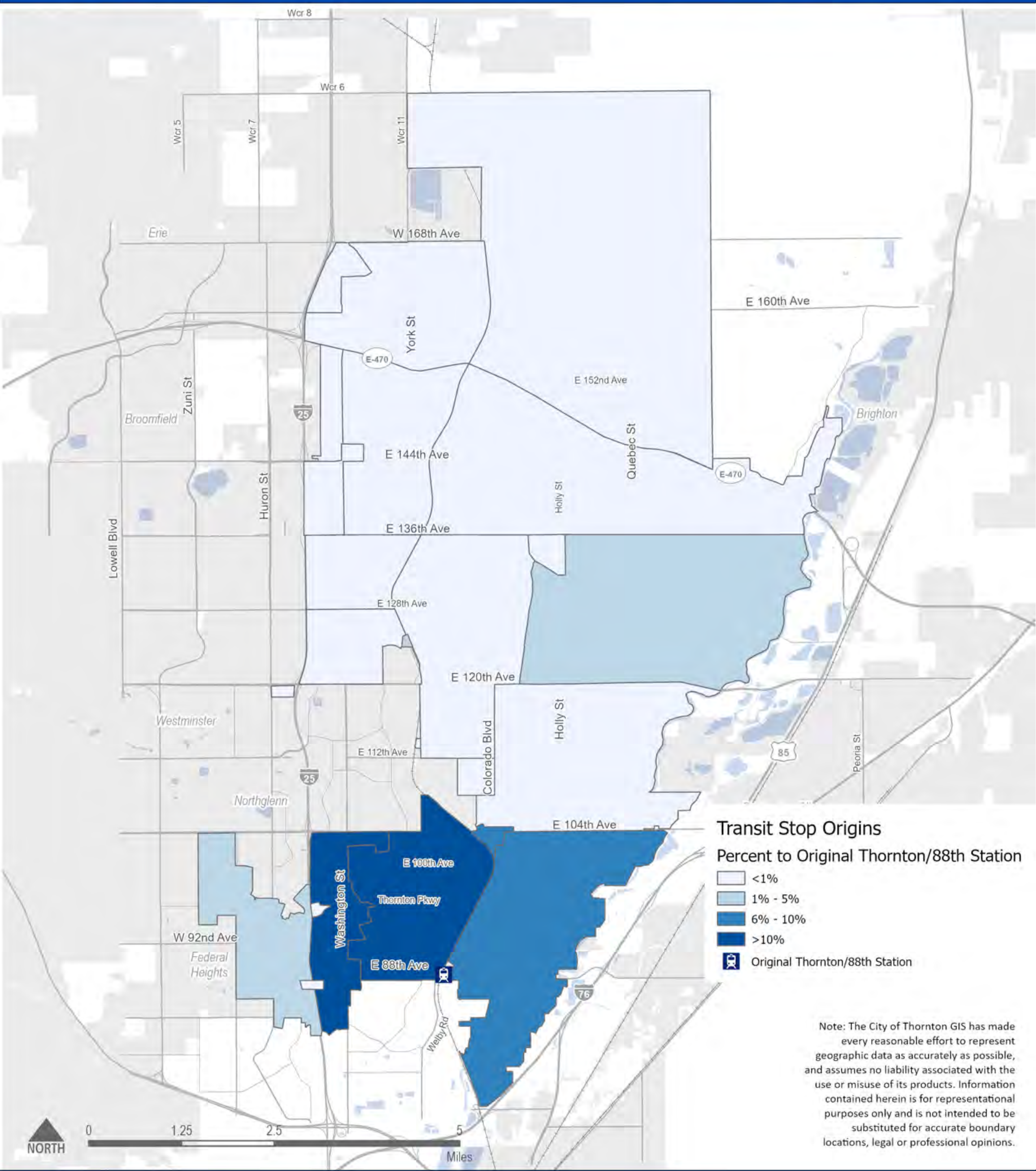
An analysis was performed to understand where people come from in Thornton who travel to these transit hubs. Improving access to these transit hubs is a potential transit market for people making longer regional trips on the transit network.

Original Thornton & 88th Station

The Original Thornton & 88th Station is located at 88th Avenue and Welby Road, and most of the origins to this transit station from Thornton are from the areas directly adjacent to the station (**Figure 32**). There is also a slightly higher travel pattern between the eastern residential area between 120th Avenue and 136th Avenue, which is interesting considering there are other transit stops closer to the area. This potentially indicates a travel time preference where residents see a benefit to getting to this station before getting on transit.

Origins to Original Thornton/88th Station

Figure 32



City of Thornton

Sources: StreetLight Data, March to April 2022, Fehr & Peers
Basemap Data: June 2023

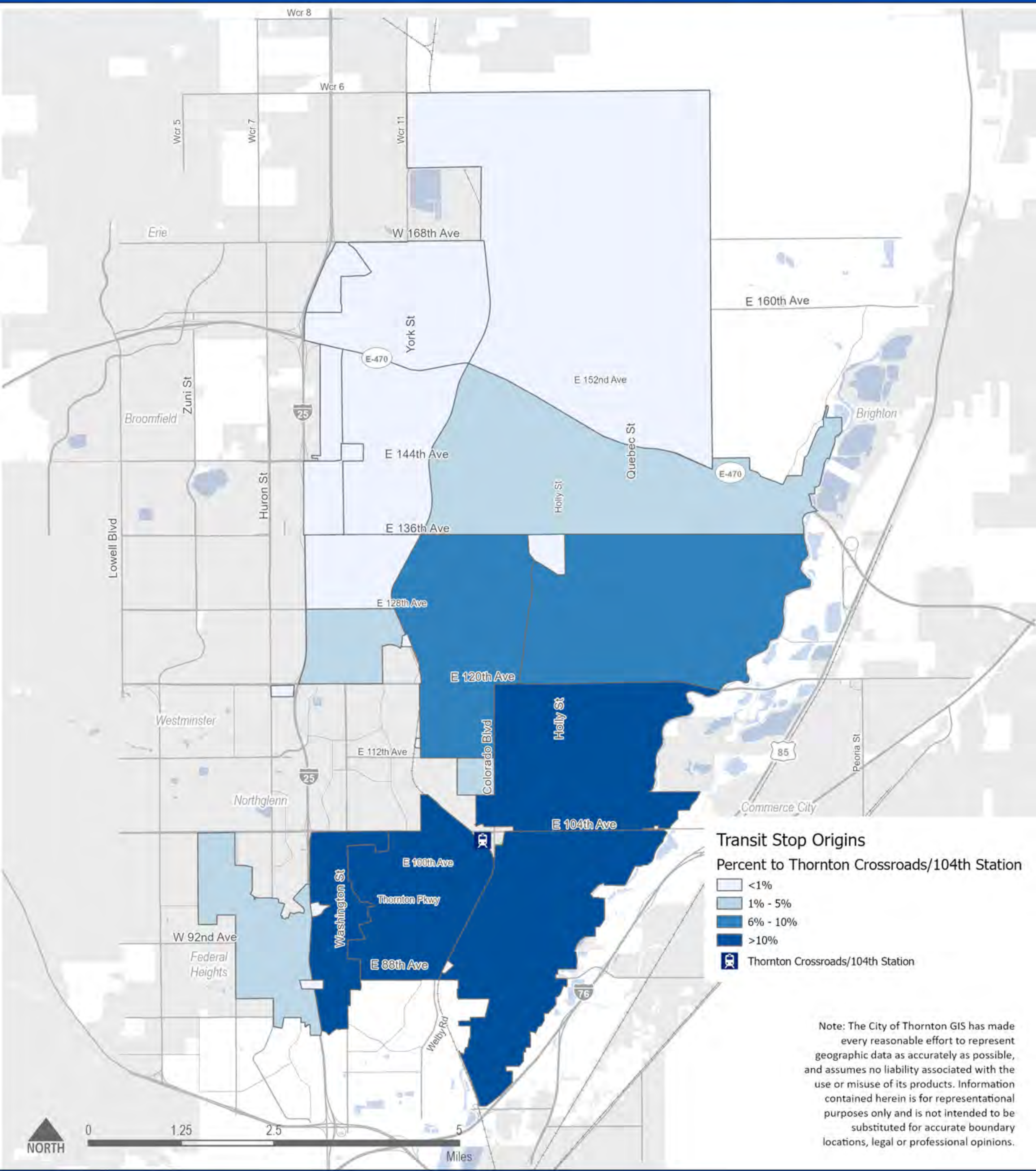
Thornton Crossroads/ 104th Station

The Thornton Crossroads/104th Station is located near the shopping center at Colorado Boulevard and 104th Avenue, and the 93L, 104L and N Line transit routes serve the station. The analysis zone includes the commercial properties nearby as these would be just as much of a destination as the rail station from a transit market perspective. Data shows that trips to this zone are coming from many areas of Thornton well beyond the immediate station area travel shed and from a larger area than most of the other transit hubs (**Figure 33**). There are several potential reasons for this:

- This station is the only station on the N Line in Thornton with a parking garage, which provides shelter for one's vehicle.
- This is the furthest north N Line station where a local fare can be used to ride the train into Union Station.
- Unlike the other stations, this station is surrounded by a commercial area that may attract trips from farther away.
- The geographic location of the station, being the furthest east station and along Colorado Boulevard, may make it a more convenient location for people coming from the north as it would avoid out of direction travel to the west.

Origins to Thornton Crossroads/104th Station

Figure 33



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City of Thornton

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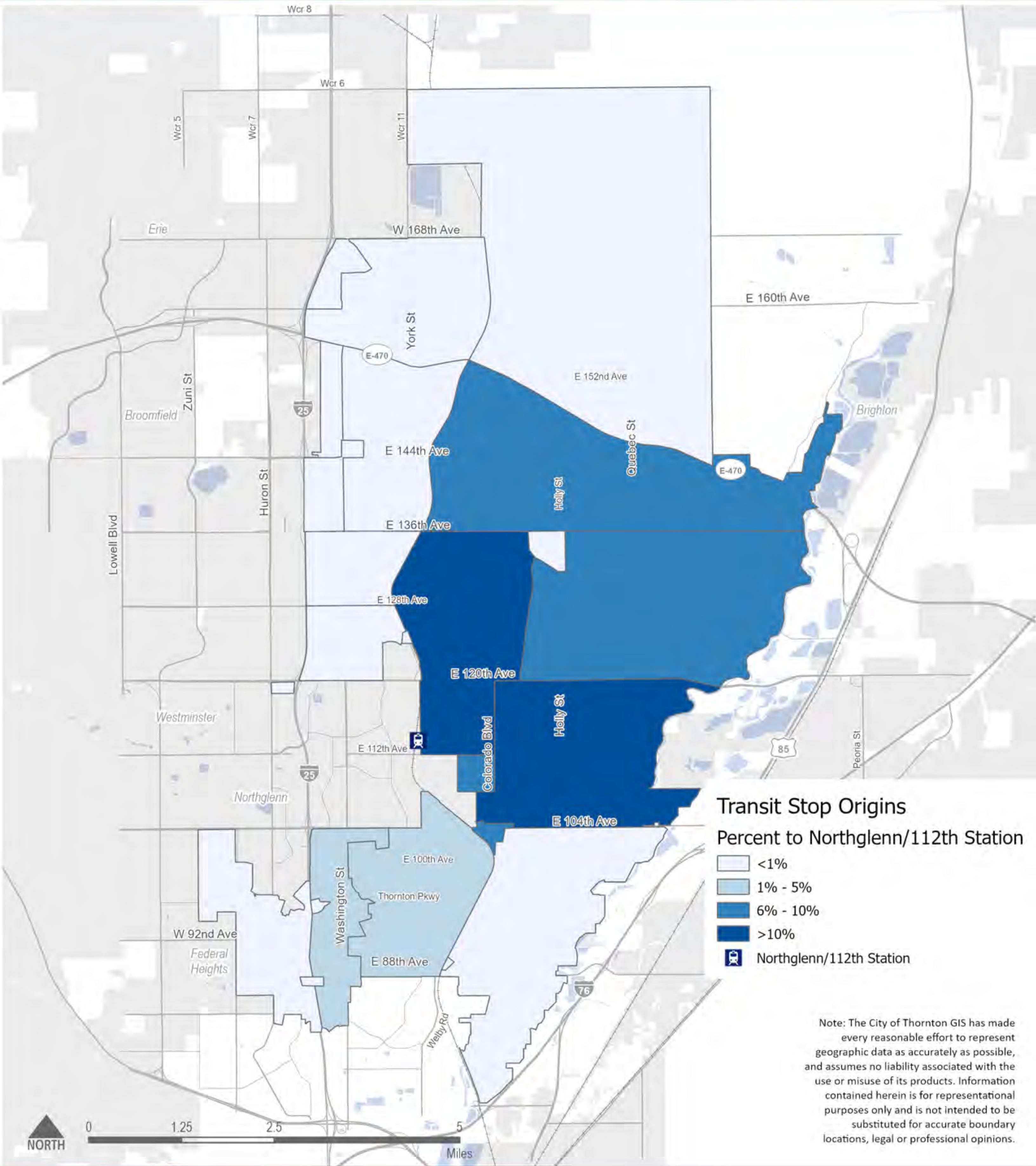
Basemap Data: June 2023

Northglenn/112th Station

The Northglenn/112th Station is located at 112th Avenue and York St, and it is served by the 12, 112, and N Line transit routes. Many people travel from the residential areas directly east of the station, although there are some people coming from the southern zones too (**Figure 34**).

Origins to Northglenn/112th Station

Figure 34



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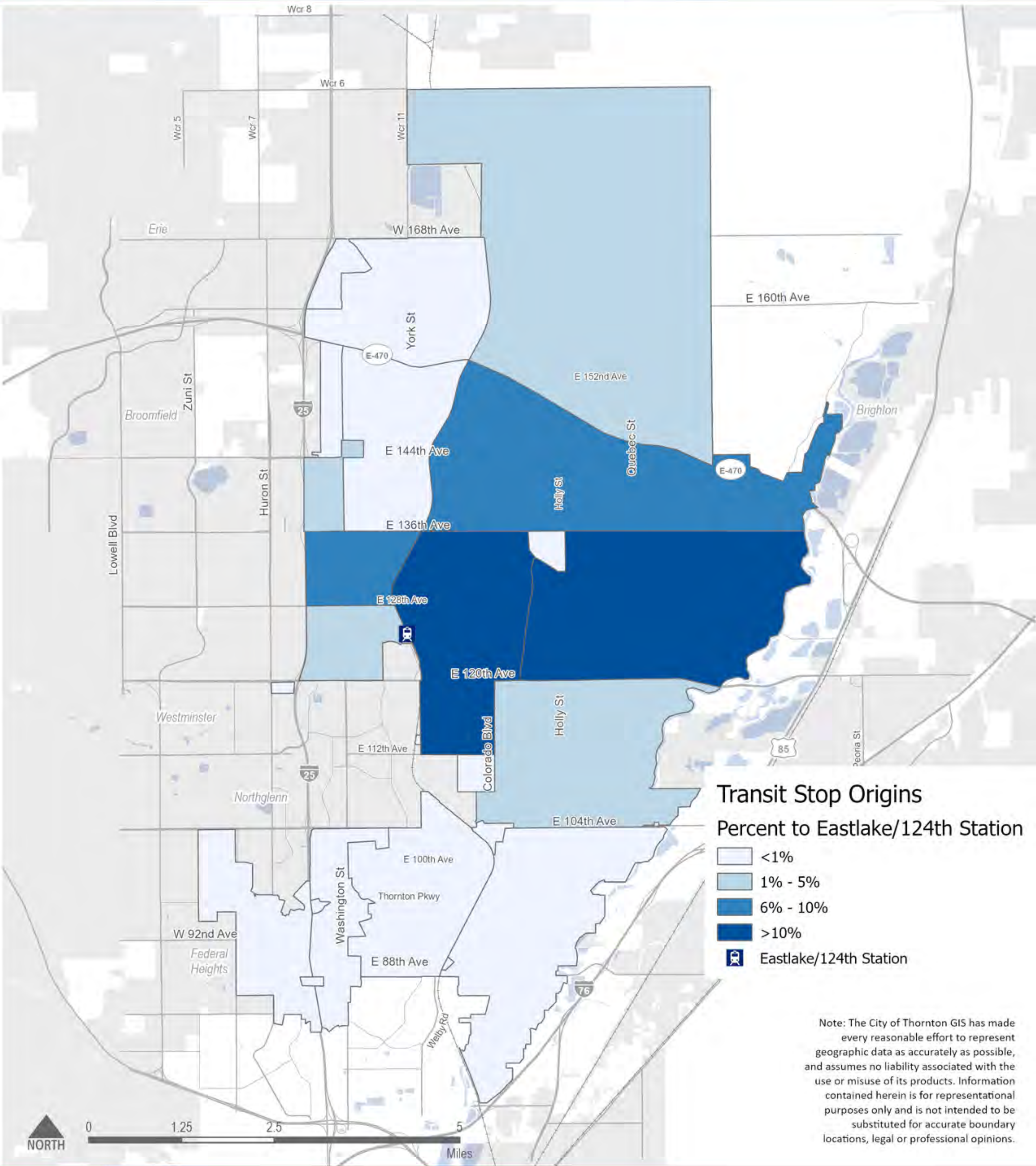
Basemap Data: June 2023

Eastlake/124th Station

The Eastlake/124th Station is located at Eastlake Avenue and Claude Court, and it is served by the 120E, 120L and the N Line transit routes. Most trips to the station originate in the zone directly to the east of the station, with less people traveling from other areas (**Figure 35**).

Origins to Eastlake/124th Station

Figure 35



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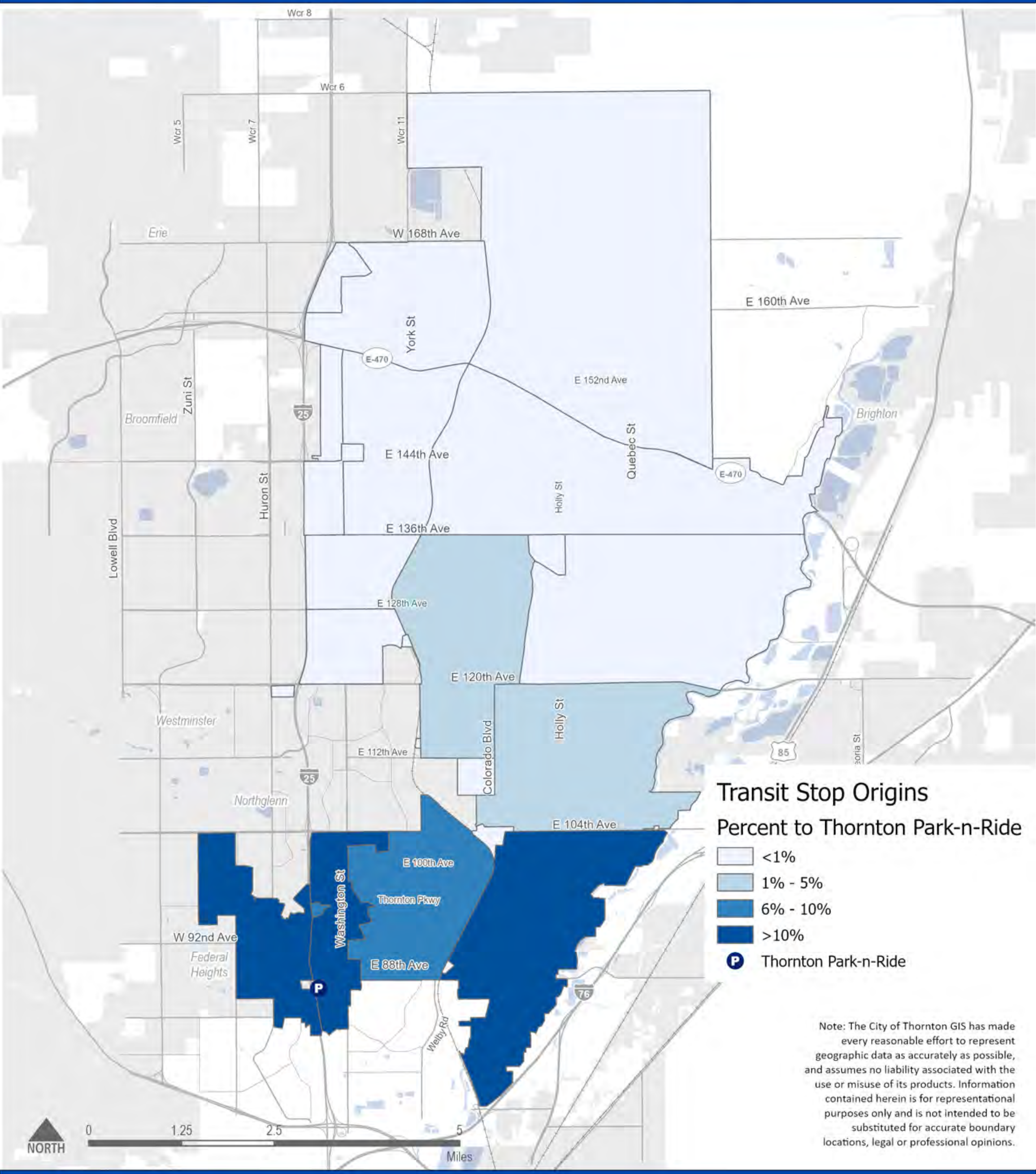
Thornton Park-n-Ride

The Thornton Park-n-Ride has two large parking lots on both sides of I-25 at 88th Avenue. The east side serves the 92, 93L, and 120X bus routes, while the west side just serves the 120X bus route. People who travel to this park-n-ride mostly come from areas south of 104th Avenue (**Figure 36**). Like the Eastlake/124th Station, this concentration of origins for this park-n-ride might be due to the convenience of the transit stop for people directly surrounding it, and other transit stops or modes of transportation might be more convenient for others across Thornton.

Origins to Thornton Park-n-Ride

Figure 36



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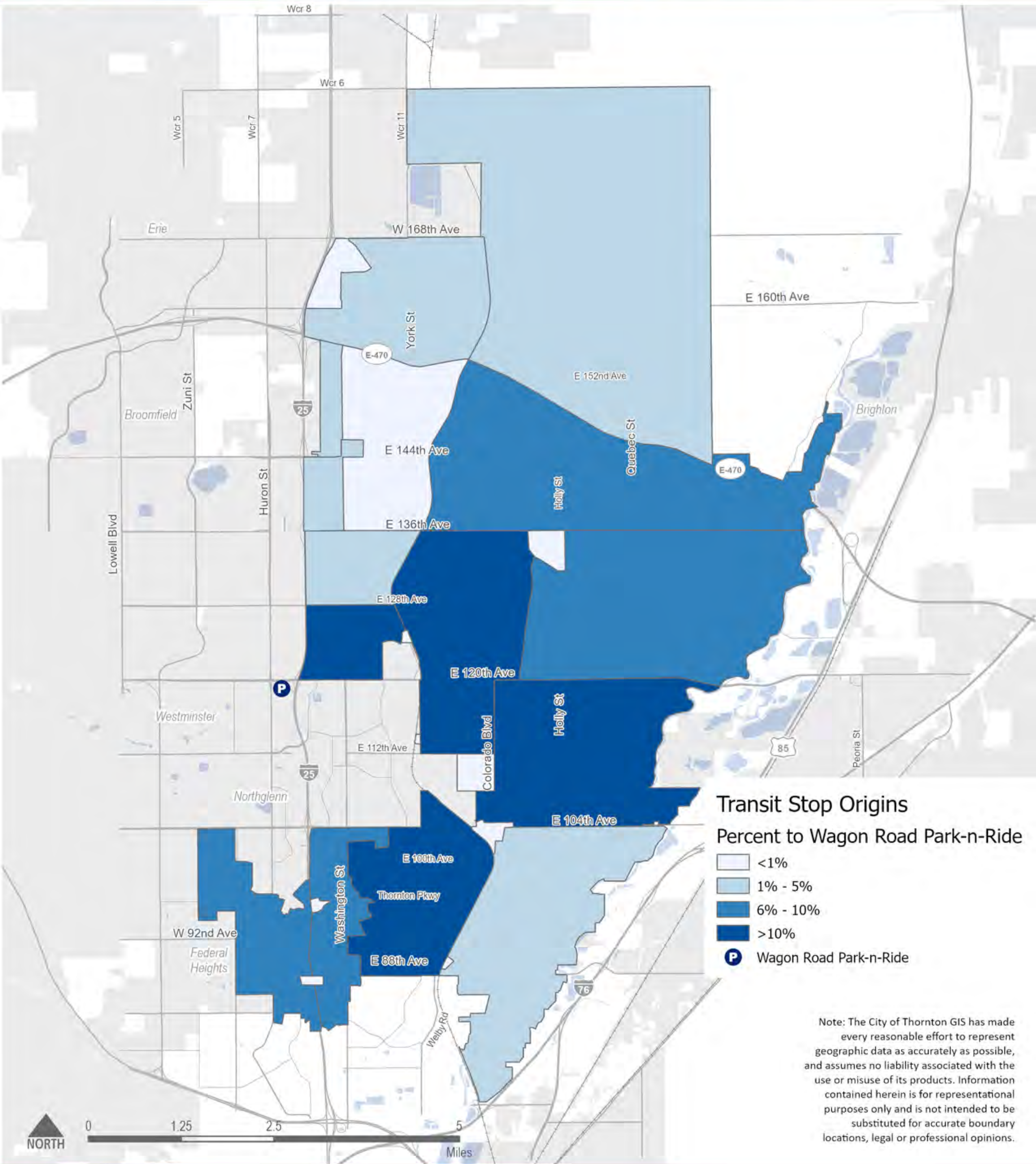
Wagon Road Park-n-Ride

The Wagon Road Park-n-Ride is located west of I-25 on 120th Avenue, and it is served by the 8, 104L, 120W, 120X bus routes as well as all three Flex Ride services. Although the transit stop is not directly within Thornton, the variety of routes and destinations from the stop is a large motivator for using transit. As seen in **Figure 37**, people travel to the Wagon Road Park-n-Ride from nearly all areas of Thornton. Thus, similar to the Crossroads & 104th Station, the Wagon Road Park-n-Ride serves a larger travel shed than most of the other transit hubs in the area.

Origins to Wagon Road Park-n-Ride

Figure 37



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Origins of Trips to Key Destinations

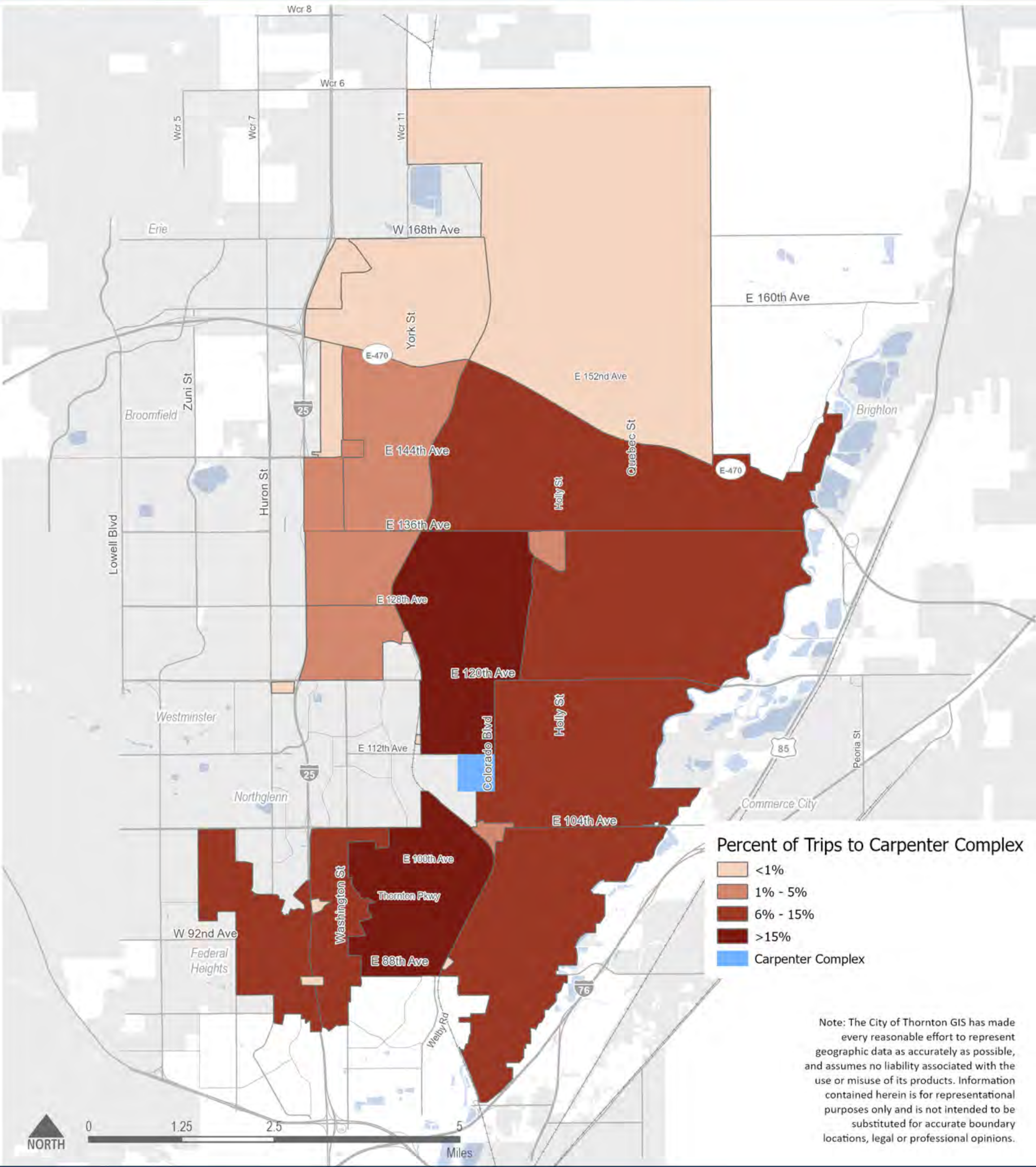
The Trail Winds recreational complex, the Margaret Carpenter recreational complex, and the Amazon facility are three key destinations in Thornton identified as part of the outreach process. Understanding where people come from when travelling to these locations may be helpful in assessment transit markets and potential for improved transit service.

Carpenter Complex

The Margaret Carpenter Recreation Center opened in 1994 and was Thornton's main recreation center until 2019 when the Trail Winds Recreation Center was built. The Carpenter Complex is located at 112th Avenue and Colorado Boulevard, and includes the recreation center, an amphitheater, boathouse, sports courts and fields, pavilion, playground, skatepark, active adults center and other amenities. **Figure 38** shows that people are traveling to the Carpenter Complex from all areas of Thornton, and the distribution of those trips is fairly evenly spread across the city.

Origins to Carpenter Complex

Figure 38



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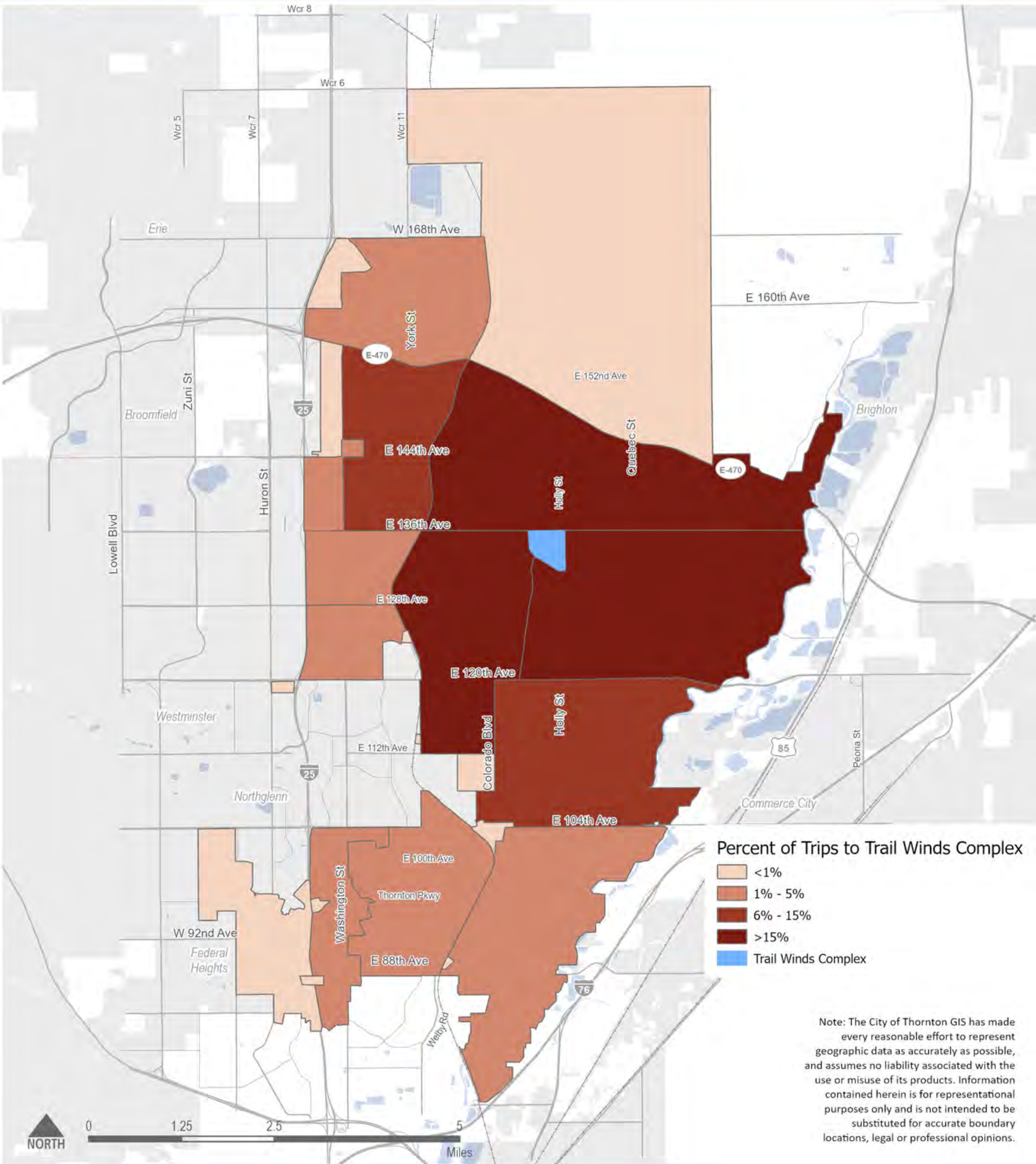
Basemap Data: June 2023

Trail Winds Complex

The Trail Winds Recreation Center was opened in 2019 in Trail Winds Park at 136th Avenue and Holly Street, which also includes sports fields, a water park, dog park, skate park, community lawn, trails and open space, and other amenities. **Figure 39** shows that most people who visit the complex come from the immediate surrounding areas, and there are fewer trips from southern Thornton. Unlike the Carpenter Complex, there is no existing transit service to the Trail Winds Complex which may impact who is able to get to the Carpenter Complex.

Origins to Trail Winds Complex

Figure 39



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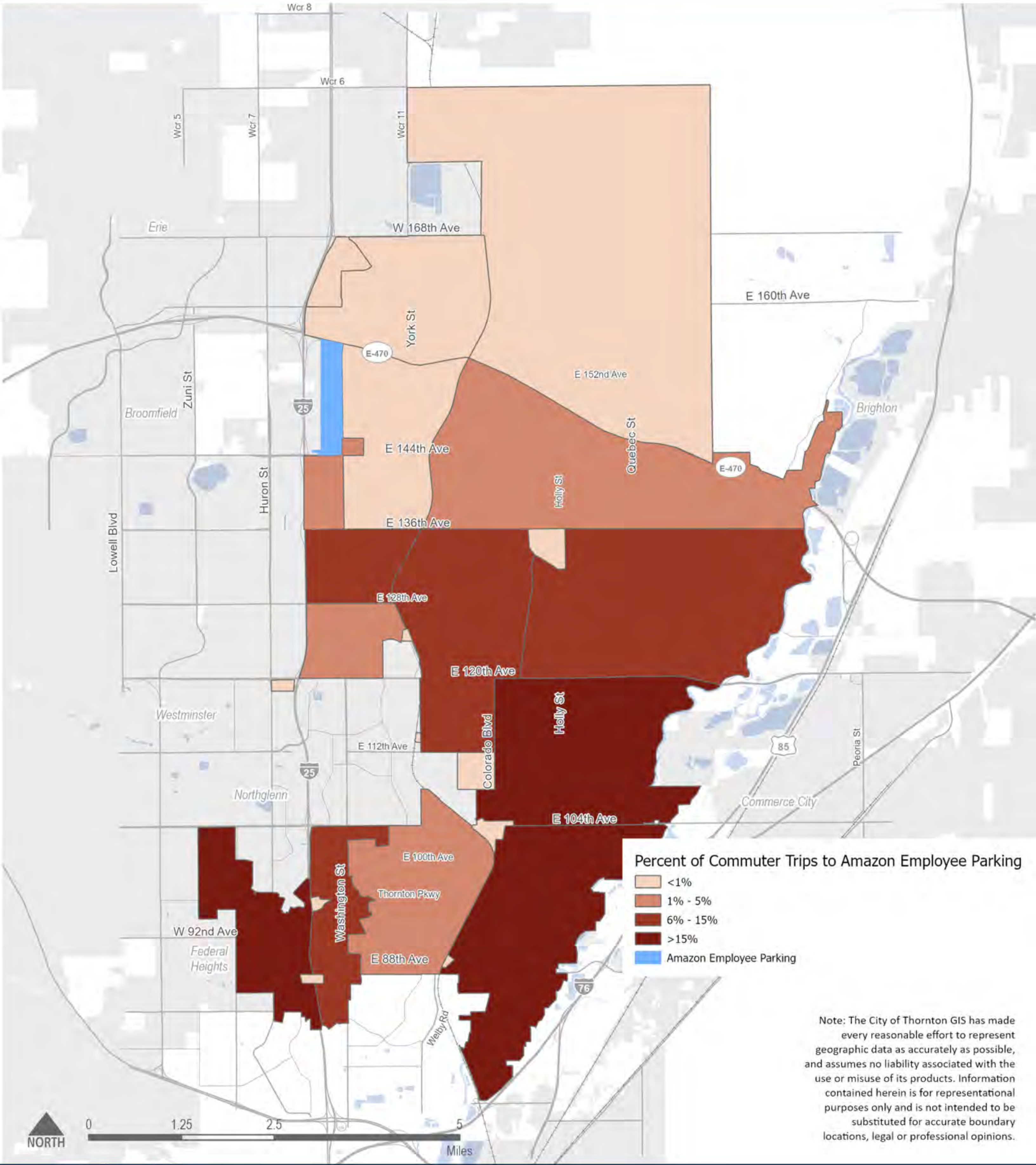
Basemap Data: June 2023

Amazon Distribution Center

The Amazon Distribution Center is located at 144th Avenue and Washington Street, and it is a major employer for Thornton residents and the surrounding community. The StreetLight analysis zone for Amazon included the employee parking and entrance area and excluded the freight and delivery areas to isolate travel patterns of employees. Further, the analysis specifically looked at commuter trips. **Figure 40** shows that a high percentage of commute trips to the Amazon facility travel from southwestern Thornton (around Huron and Washington Street) and from southeastern Thornton (east of Colorado Boulevard). These areas correlate with areas with the areas of the city with the highest portion of residents are living with low and moderate incomes (see **Figure 9**).

Commuter Origins to Amazon

Figure 40



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City of Thornton

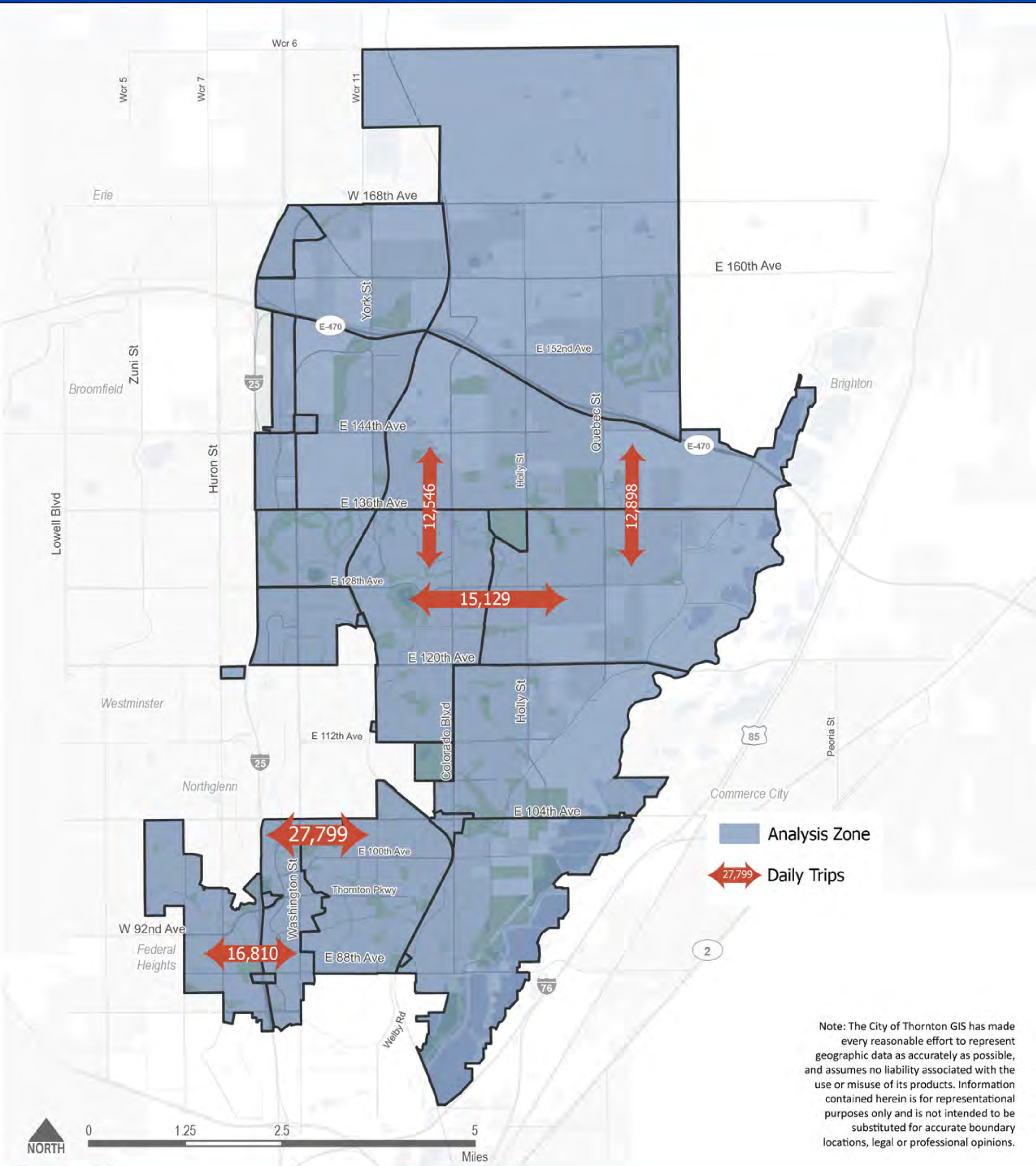
Sources: StreetLight Data, March to April 2022, Fehr & Peers
Basemap Data: June 2023

General Travel Patterns

An analysis of the highest volume trip pairs in Thornton shows that most trips are relatively short. **Figure 41** shows the top five highest trip pairs of the zones analyzed in the city, with the two highest between the Washington Street Corridor south of 104th Avenue and the two adjacent zones east and west. Given the geography of the area it's also likely that there are high trip pairings between this area of the city and the adjacent communities in Federal Heights and Northglenn. However, those trips were not analyzed in this part of the study given the focus of this Transit Study is on transit market potential within Thornton.

Top Trip Pairs Within Thornton

Figure 41



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City of Thornton

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Basemap Data: June 2023

Other notable general trip patterns are shown in **Table 8**:

- Only 18% of trips on weekdays are people travelling between home and work.
- The largest share of trips is between ten and twenty minutes and two and five miles.
- Almost half of all trips have an average speed of between 10 and 20 miles per hour,

These existing travel patterns show that for transit to competitively serve this market, service will need to provide fairly direct connections over short-to-medium distances to key destinations within the city, including non-employment destinations such as groceries, medical providers, commercial centers, recreation/community centers, schools, etc.

Table 8: General Trip Characteristics

Trip Characteristics	All Days	Weekdays	Weekends
Percent Commuters	14%	18%	6%
Largest Share of Travel Time (Percent of All Trips)	10-20 minutes (38%)	10-20 minutes (38%)	10-20 minutes (38%)
Largest Share of Trip Length (Percent of All Trips)	2-5 miles (50%)	2-5 miles (51%)	2-5 miles (49%)
Largest Share of Trip Speed (Percent of All Trips)	10-20 miles per hour (44%)	10-20 miles per hour (45%)	10-20 miles per hour (43%)

Source: StreetLight Data March-April 2022

Travel Pattern & Demand Summary

The existing transit system is designed to serve regional, long-distance travel, particularly for commuters, and is not well-designed for short, community-focused trips, which is the predominant trip type in Thornton. Thus, there may be an untapped market potential for transit to better serve these types of trips in the future.

To be competitive with existing travel speeds of 10-20 mph transit would need to provide more frequent and direct connections than exist today. While most local transit services operate at an average speed of 10 – 20 mph, when wait times and walking distances are long, overall travel speeds for short trips significantly decrease, decreasing the utility of transit. Thus, to best serve this market pattern via transit, transit should be design in one of two ways:

- In the form of frequent fixed-route service along high demand corridors (such as Washington Street), or

- In situations where origins and destination are more dispersed (as in much of Thornton), microtransit that is designed to provide door-to-door on-demand service with relatively short response times.

Although the regional trips serve a critical need, data shows there is also a need to provide local and frequent transit service that can connect people with local destinations in addition to local and regional workplaces. Especially because half of the trips in Thornton are within five miles, additional transit services may help diversify the mode share and the available mobility options.

Community Input

Community input is a key aspect of understanding the gaps in the existing transit system and transit market potential in Thornton. Initial community input to inform this market analysis was gathered through several means, including:

- A public online survey;
- An in-person and virtual community open house;
- An online mapping exercise;
- A stakeholder group of local and regional partners;
- A project website; and
- Several focus groups.

Online Survey and Community Open House

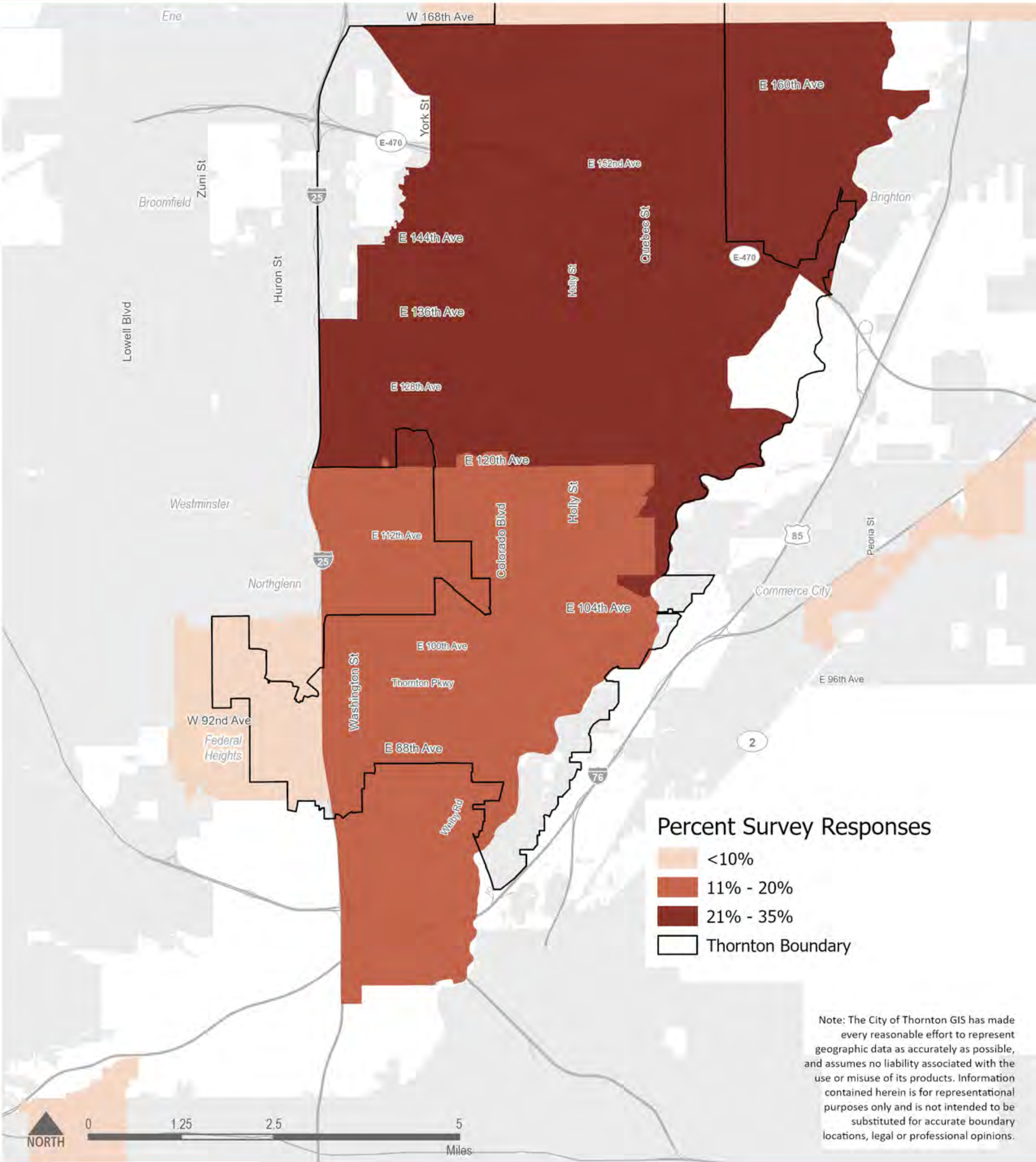
One online survey and one community open house were conducted throughout the Transit Market Analysis period, in conjunction with other engagement mediums. The survey accepted responses in English and Spanish between February 10th, 2023, and April 17th, 2023, and the community open house was held in an in-person and hybrid manner in early March 2023. The survey received 93 total responses and 10 people in total attended the open houses. Both the survey and the open house offered participants an opportunity to learn more about the goals of the study and to voice their current transit and travel patterns, as well as aspirations for transit in Thornton. The combined input from the survey and open house are described below.

Respondent Demographics

Respondents to the online survey were presented with optional questions to describe their residence location, age, vehicle availability, and personal mobility. These questions were asked to ensure that the survey reached a representative population. 91% of the respondents identified as Thornton residents, and most respondents reside in ZIP codes 80602 (Northern Thornton) and 80241 (Eastlake Area), as seen in **Figure 42**. Knowing that the location of survey respondents is skewed to the north, where there are higher average incomes, and less dependency on the transit system, and less overall existing transit service, as compared to south Thornton is important to interpreting the survey results.

Survey Respondent Home Locations

Figure 42



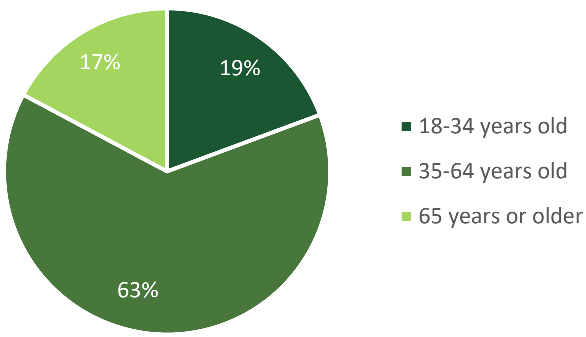
Note: The City of Thornton GIS has made every reasonable effort to represent geographic data as accurately as possible, and assumes no liability associated with the use or misuse of its products. Information contained herein is for representational purposes only and is not intended to be substituted for accurate boundary locations, legal or professional opinions.

City of Thornton

Sources: Fehr & Peers
Basemap Data: June 2023

Most respondents were between the ages of 35 and 64, and 17% of respondents were 65 years or older (**Figure 43**). The survey did not receive a single response from anyone under the age of 18.

Figure 43: Survey Respondent Age



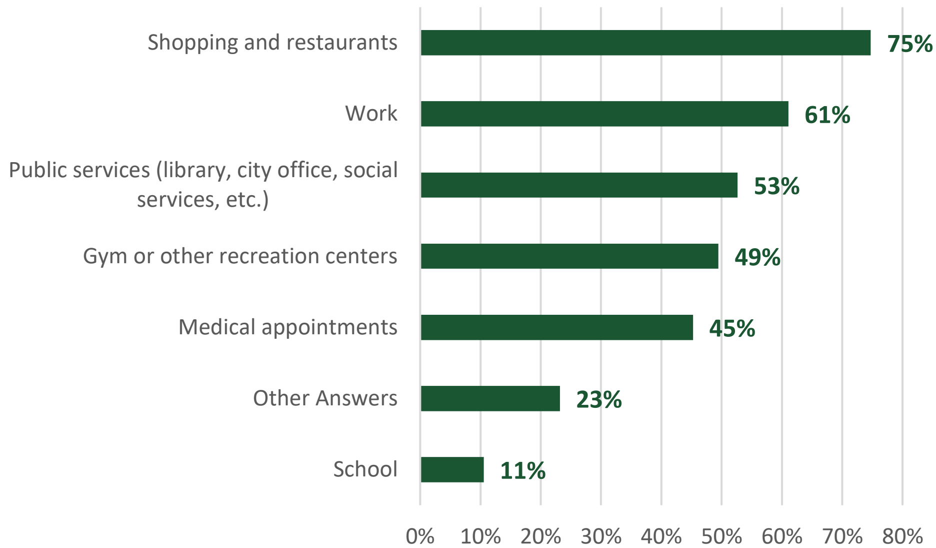
Further, 12% of respondents indicated that they do not have regular, dependable access to a car either as a driver or passenger. Lastly, 4% of respondents indicated they have personal mobility challenges that impact their ability to get around.

Understanding the needs of older adults, people with limited vehicle availability, and people with personal mobility challenges are critical to considered in this study.

Trip Type

When asked what destinations people would like to take public transit to, more than half of the respondents indicated that shopping and restaurants, work, and public services as desirable destinations (see **Figure 44**).

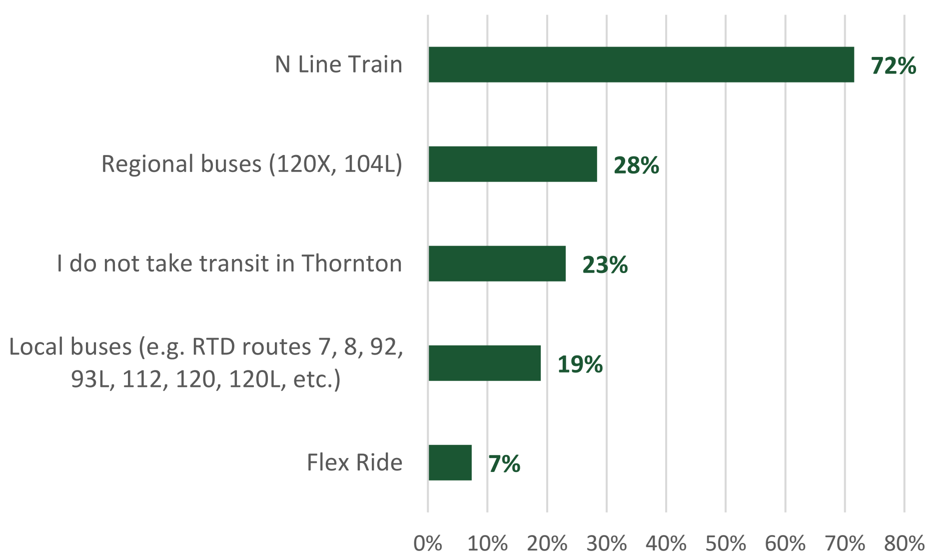
Figure 44: Desired Destinations Using Public Transit



Transit Use

When asked which public transit services people currently use in Thornton, over 70% of survey and open house respondents said they use the N Line train, followed by 28% who use regional buses, and 19% who use local bus (**Figure 45**). Only 7% of respondents also said they utilize FlexRide, almost a quarter of respondents indicated they do currently take transit in Thornton.

Figure 45: Current Public Transit Use



Desired Improvements

Survey respondents were also asked about their desire for more frequent public transit routes and more extended hours of public transit routes. For both types of improvement, overwhelmingly the respondents believe that the N Line train should run more frequently and at earlier/later hours of the day (**Figure 46** and **Figure 47**). The other top transit routes to which frequency improvements would be desired are Route 104L, Route 93L, and Route 120. The other transit routes to which more extended hours of service would be desired are Route 104L, Route 120X, and Route 93L. Some comments related to frequency improvements related to providing more frequent access to shopping centers and to the major transit stations and stops. The strong desire for increased frequency on the N Line as compared to other routes in the city may, in part, be attributable to the home location of many of the respondents, which was skewed to the north where there are few (if any) bus routes and less dependency on transit as compared to areas to the south.

Figure 46: Desired Frequency Improvements

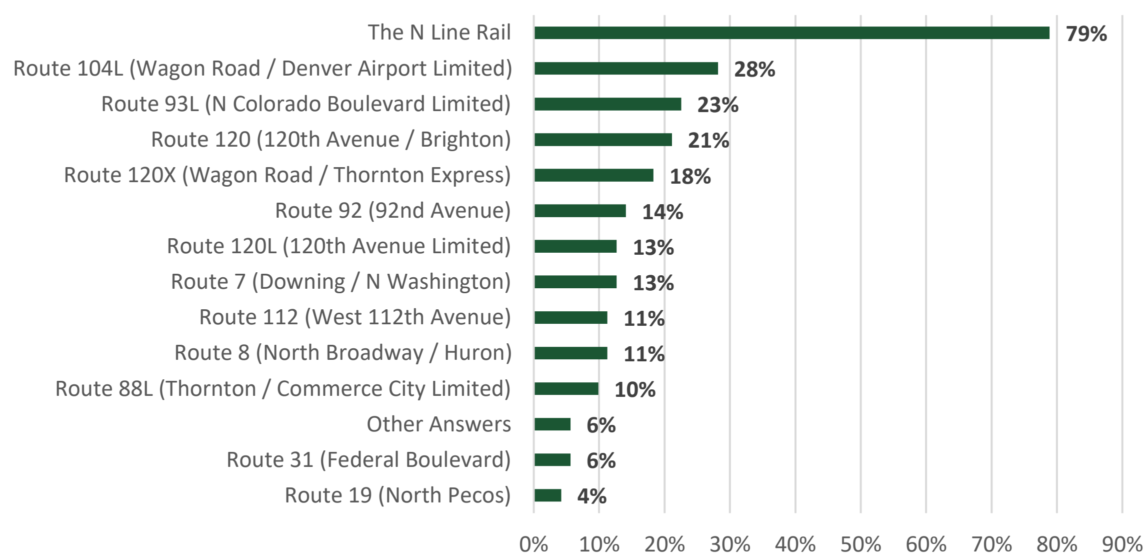
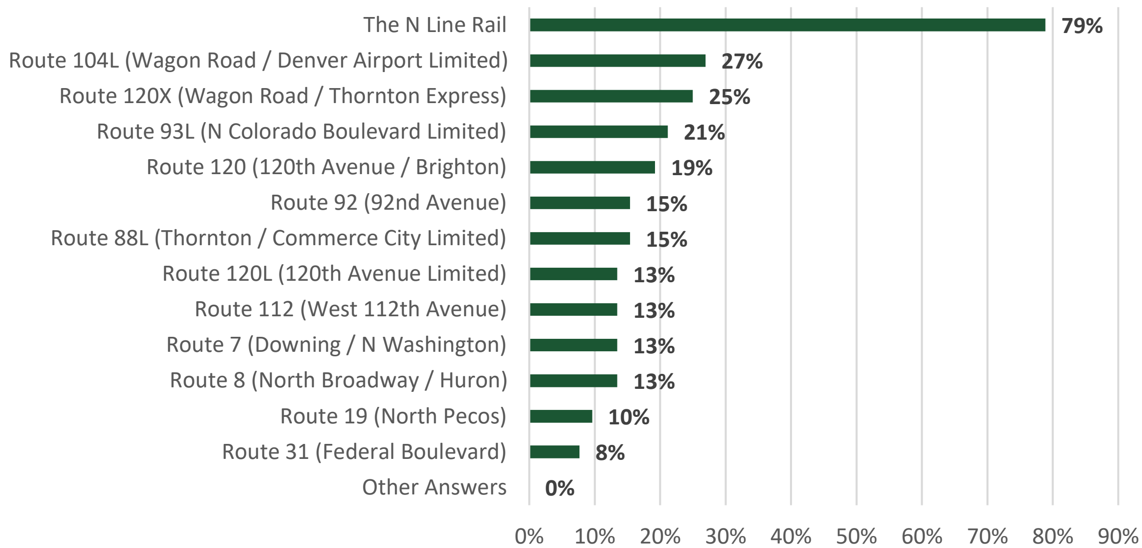


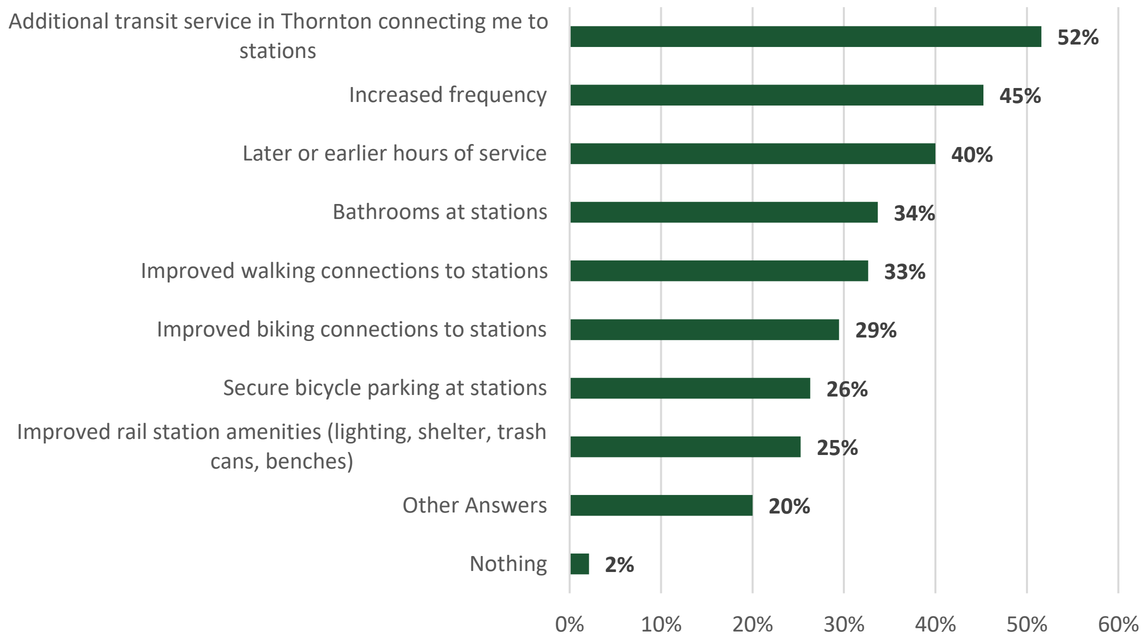
Figure 47: Desired Hour Extensions (Earlier or Later Transit Operations)



N Line Improvements

When specifically asked which improvements to the existing N Line service would make it more useful, people expressed that additional transit service within Thornton to connect to the stations in addition to frequency and service hour expansion (**Figure 48**). Many of the comments specifically related to N Line improvements included the extension of the route further north and connections to transit that would connect to other communities like Boulder and Erie. Further, people commented on the lack of safety they feel at the stations and on the trains.

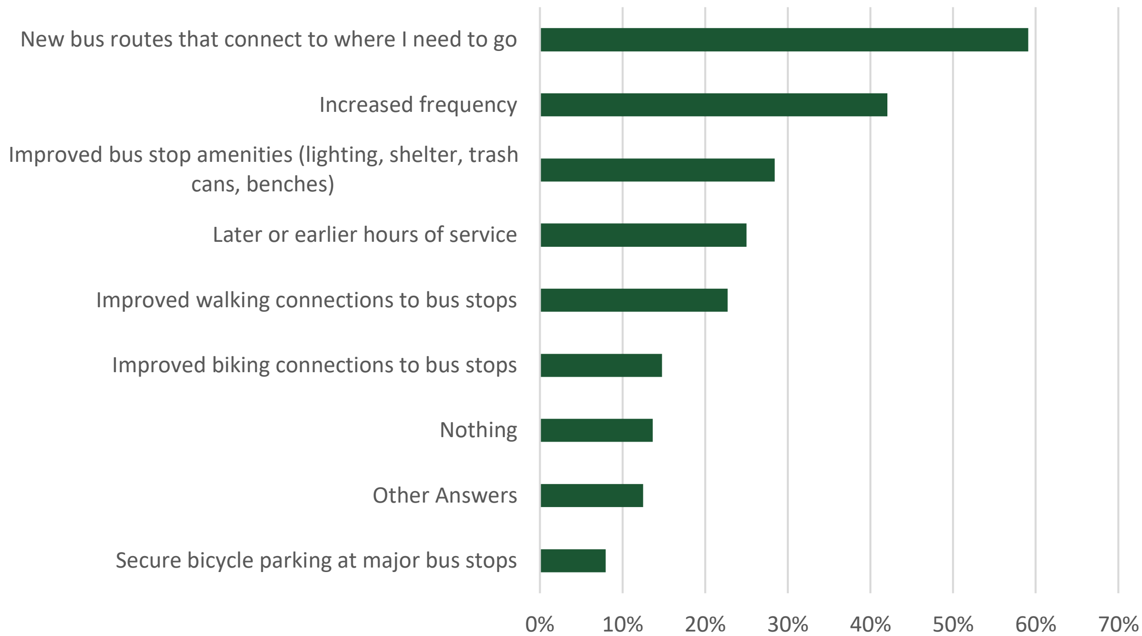
Figure 48: Desired N Line Improvements



Bus Service Improvements

When specifically asked which improvements to the existing N Line service would make it more useful, people expressed that new bus routes connecting to desired destinations and improved bus stop amenities were top priorities in addition to increased frequency (**Figure 49**). The comments expressed for this question were like the responses, indicating that there are not enough local routes to connect from desired origins to desired destinations. Multiple comments stated that FlexRide also does not help solve this issue due to its limited service area.

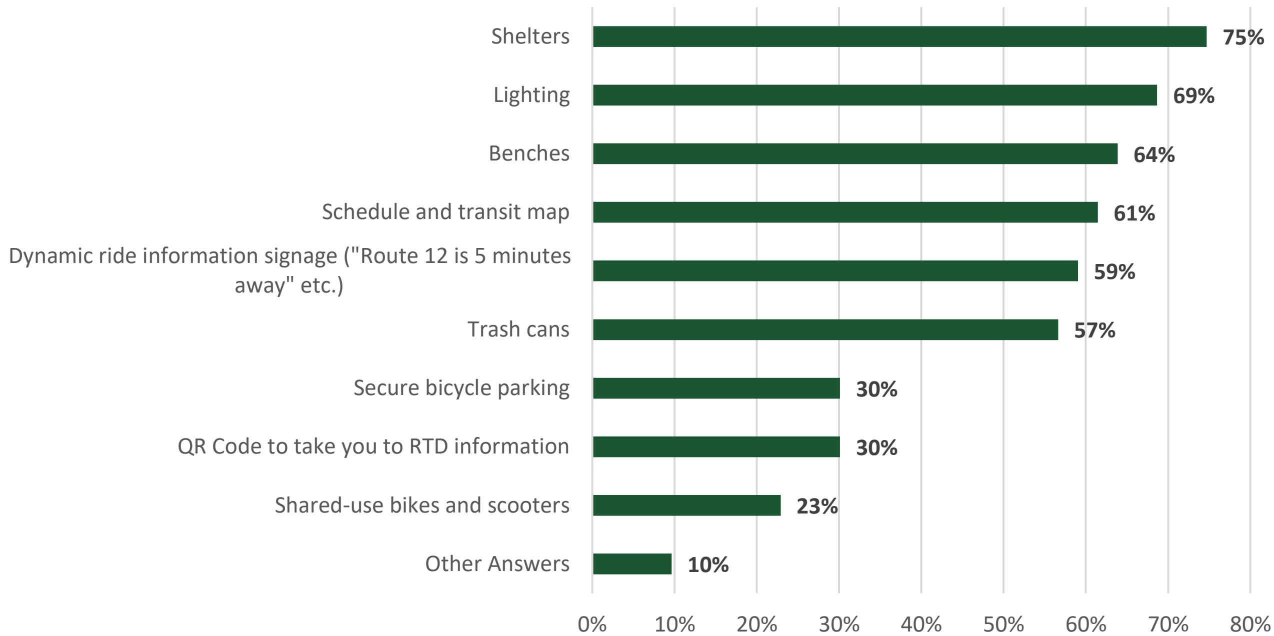
Figure 49: Desired Bus Service Improvements



Transit Stop Amenity Improvements

Respondents were asked for input on the amenities they would like to see at bus stops and rail stations. Many respondents indicated that shelters, lighting, benches, schedules and transit maps, dynamic signage, and trash cans are all desired amenities (**Figure 50**). The comments on this question mostly focused on safety and concerns that both the stops and park-n-rides do not feel secure.

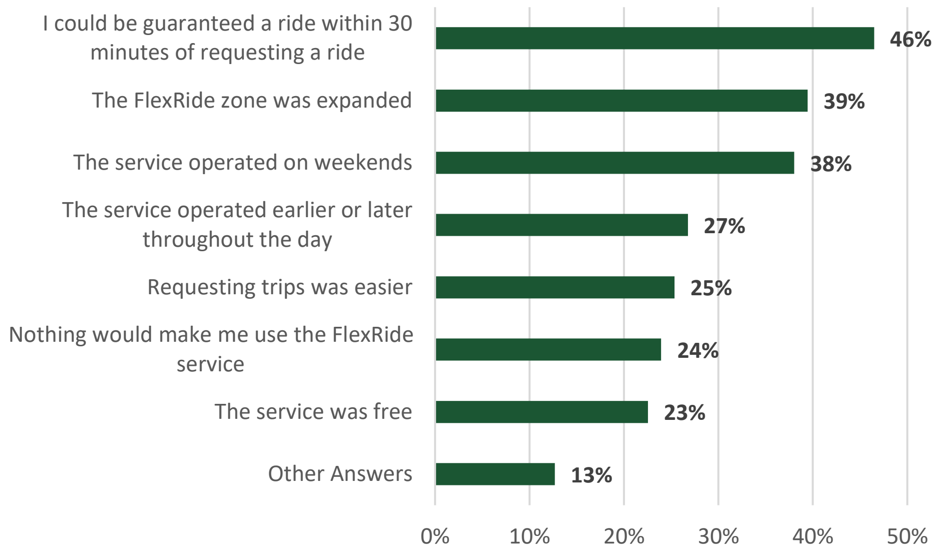
Figure 50: Desired Transit Stop Amenities



FlexRide Improvements

Although there are three FlexRide services in Thornton, residents had previously expressed a lack of understanding of the service. The survey informed the respondents of FlexRide characteristics, and it asked what would encourage them to use the service more. The most popular response was the guarantee of a ride within 30 minutes of requesting a ride, and the other top responses included service zone expansion and operation on weekends (**Figure 51**). The comments related to this question included a desire for more information about FlexRide, and concerns about the current lack of reliability and service area coverage.

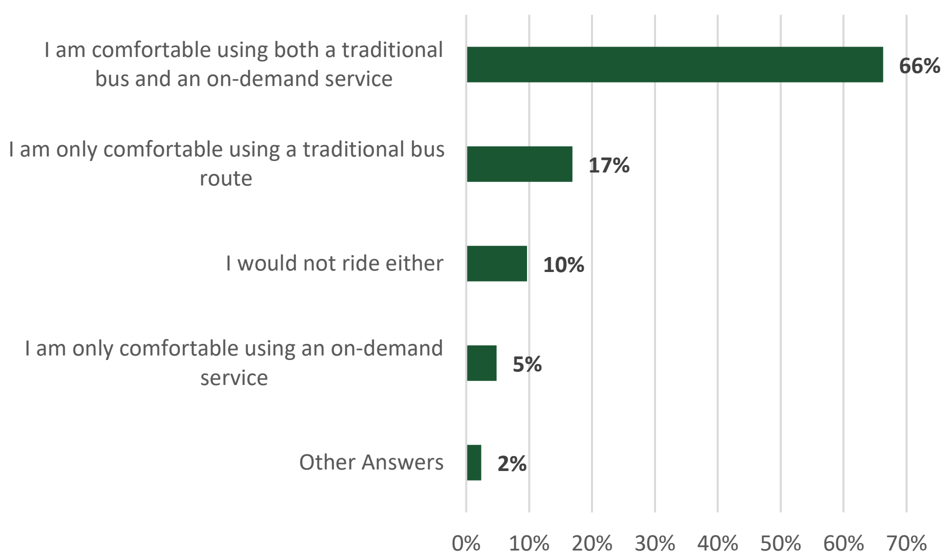
Figure 51: Desired FlexRide Improvements



New Transit Services

When asked about which types of transit service people would be most supportive of, most people are comfortable using both traditional buses and on-demand services (**Figure 52**). A few people said they would only be comfortable using a traditional bus route, while some people said they would not ride either type of transit service.

Figure 52: Transit Service Type Preferences

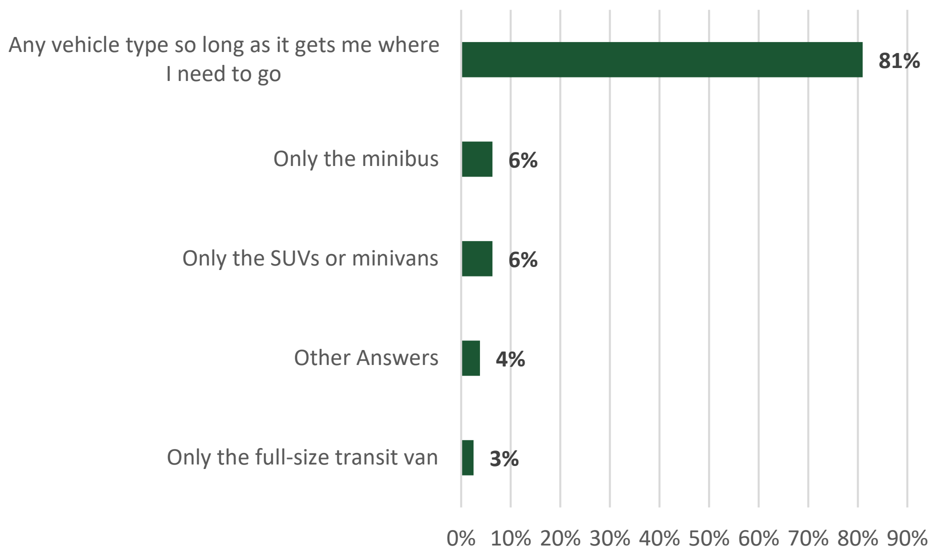


FEHR PEERS

On-Demand Service

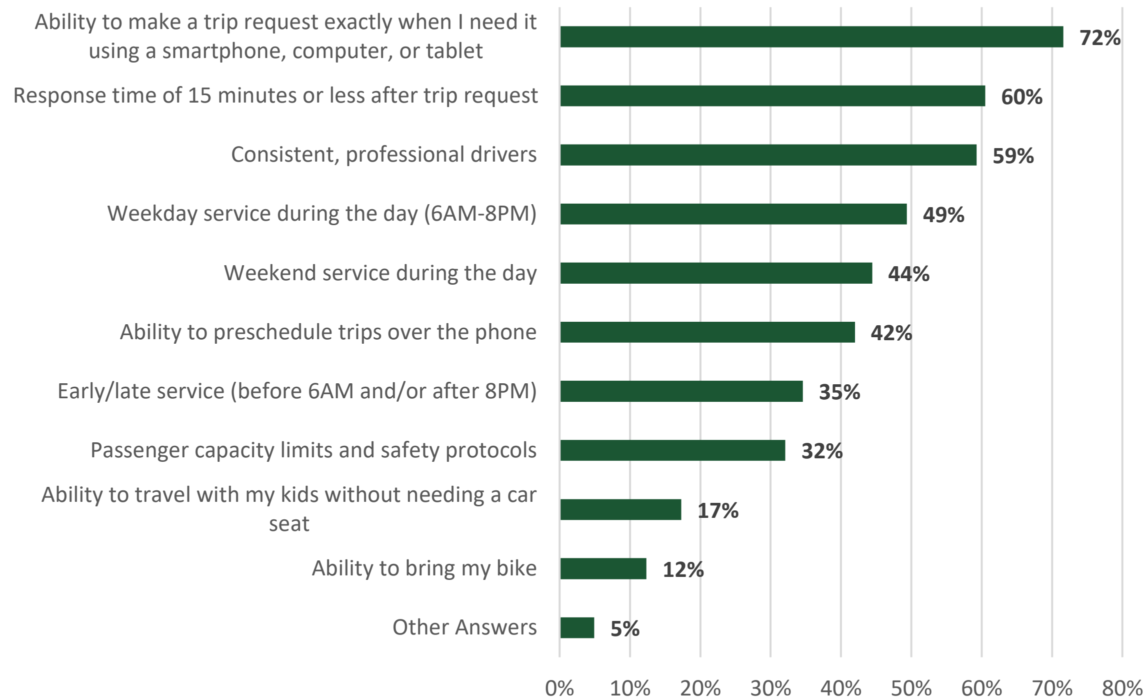
Survey and open house participants were introduced to the idea of on-demand public transit service. They were then asked about the type of vehicle they would be most comfortable using for on-demand service, and overwhelmingly people responded that the type of vehicle is not as important as being able to connect to the desired destination. Comments to this question also indicated a desire for a marketed vehicle that is easy to spot and recognize.

Figure 53: On-Demand Vehicle Type Preference



When asked about the specific characteristics of a potential on-demand service, the top answer was the ability to make a trip request when needed using a smartphone, computer, or tablet (**Figure 54**). The other top answers included a response time of 15 minutes or less after the trip request and consistent/professional drivers. Nearly 60% of respondents also preferred a consistent, professional driver.

Figure 54: Important Characteristics of an On-Demand Service



Based on how respondents were supportive of new services and vehicles if the service can be requested easily, efficiently, with consistent drivers, and it will connect them with desired destinations, the community would support a new on-demand service.

Anticipated CO 7 Park-n-Ride

This outreach process also informed the public about the new park-n-ride bus station that is planned to open at the intersection of CO 7 and I-25 in 2025 or 2026. People were asked if the park-n-ride will be beneficial to them, and how they anticipate using the park-n-ride. 43% of respondents said the park-n-ride would be beneficial to them and 22% were uncertain (**Figure 55**). Those who said they would find it beneficial would use it to either get to Denver's Union Station or destinations from the new CO 7 regional bus (**Figure 56).** Additional comments about this park-n-ride indicated a desire for expanded service to Boulder and the extension of the N-Line train.

Figure 55: CO 7 Park-n-Ride Benefit

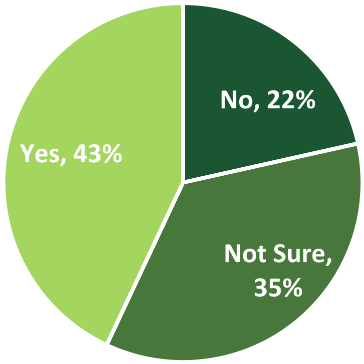
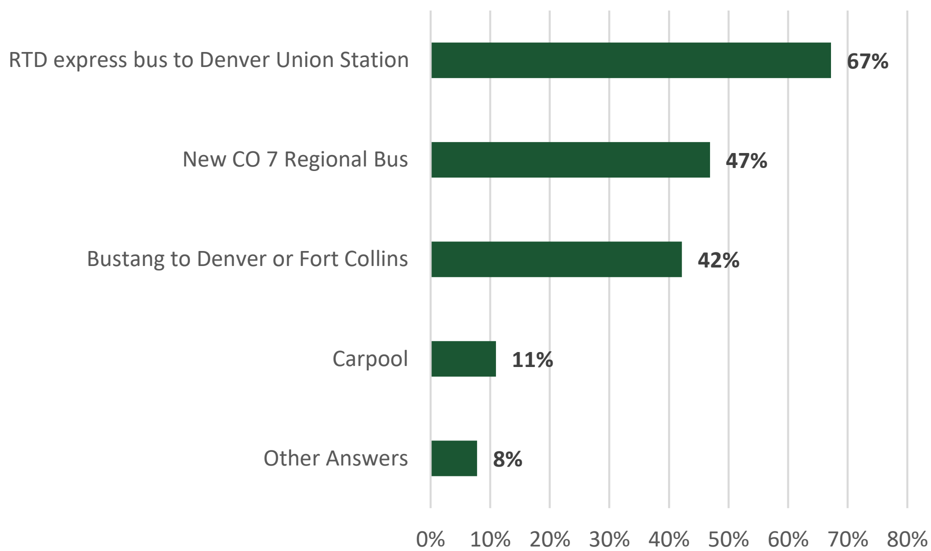


Figure 56: Anticipated Use of CO 7 Park-n-Ride



Other Comments

Both survey respondents and open house participants also had an opportunity to express other comments that were not addressed. Overall, there were 54 comments on a variety of topics. The top three categories of comments were related to a desire for route expansion, increased bicycle facilities, and a concern for inconvenient connections to desired destinations.

The comments related to route expansion expressed interest in and support for the N Line expansion. Other similar comments emphasized the need for the bus route 104, more service in Ward 1, and more service in the 136th Avenue and Quebec Street area.

Comments relating to increased bicycle facilities expressed the concern that without adequate bicycle connections, using transit is not as supportive of the suburban nature of Thornton. Respondents want to be able to connect to transit on bike, but the lack of facilities does not allow them to do so. A few comments also mentioned the need for more bike racks at stops and stations.

The third most popular comment theme was about inconvenient transit connections to desired destinations. People specifically mentioned that traveling from one side of I-25 to the other is difficult to do on the existing transit services, and that the mismatch in scheduling and frequency does not make the existing transit conducive to productive use. One person said to go a couple of miles in Thornton on the existing transit system would take them over two hours because of the 60-minute frequency and need for transfers.

Other comments included a desire for later/earlier service on the N Line, connections that are focused on the mobility of older adults, and safety improvements at transit stops and along pedestrian facilities. There were also a few people between the overall comment section and comments throughout the survey that indicated an interest in bringing back the Broncos Ride.

Some key comments representative of common themes are displayed here:

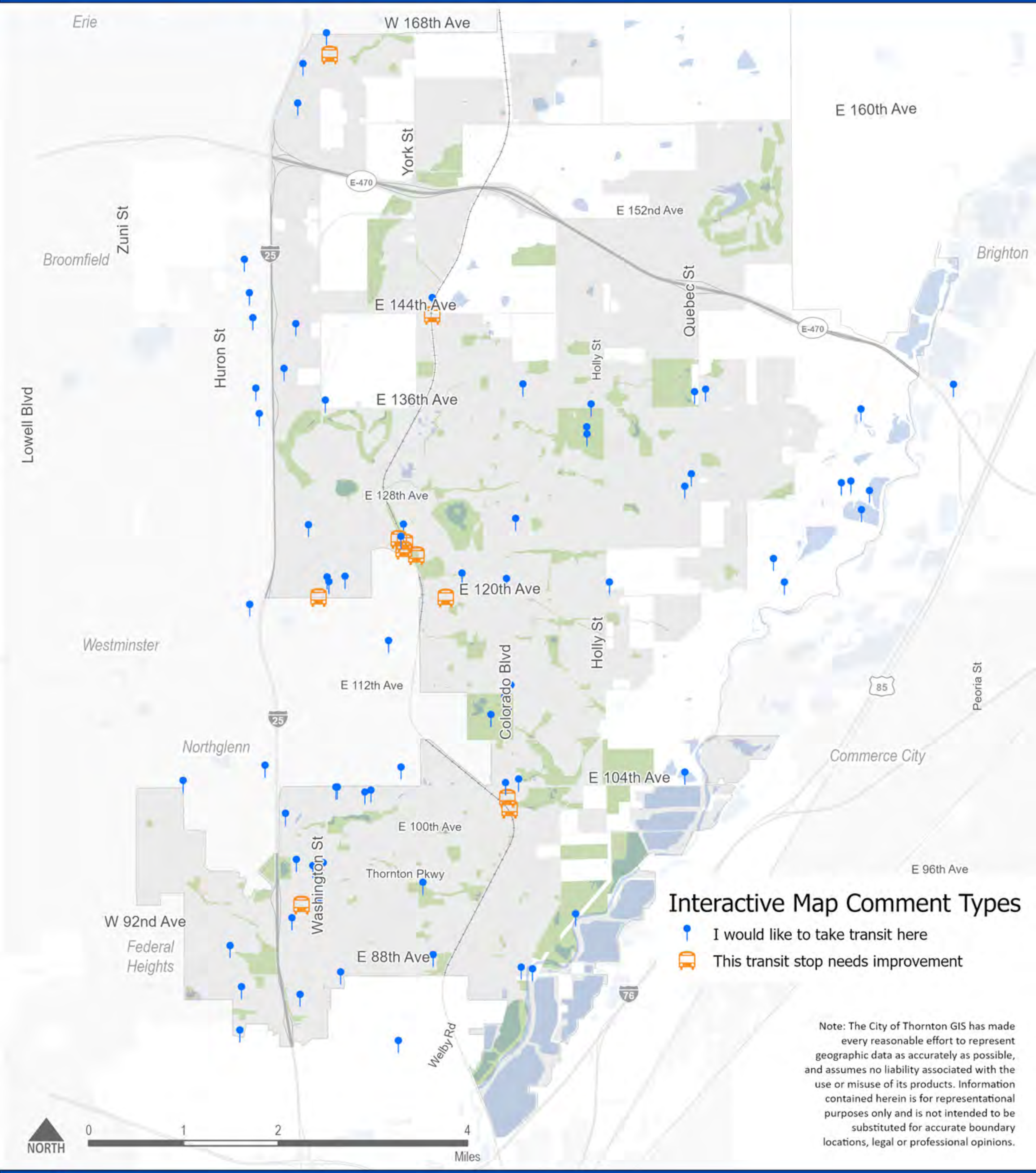
- "Bike lane are only available directly around the stations, but getting to those bike lanes are not always easy."
- "I would like to see flexride have weekend service. I use flexride multiple times a week and weekends would be very beneficial."
- "I use the bus every day and I have to walk 30 minutes to the Eastlake and 124th station to get the train to Union Station. It is very inconvenient for me."
- "There seems to be a lot of transit routes that take you from parking lot to parking lot. Instead they should pick up and drop off closer to where people are. The transit should be closer to where people live. Have stops closer to neighborhoods so people can get there without using a car which would induce people to use them."

Destinations Mapping

As part of the survey and open house process, community members had an opportunity to interact with a map of Thornton to give input on where people live, where they would like to take transit, where they believe a transit stop needs improvement, and any other comments they have. Thirteen respondents shared their home location, and **Figure 57** shows the combined responses from the survey and the open house, representing locations where people would like to take transit to, and which transit stops need improvements.

Interactive Map Comments

Figure 57



City of Thornton

Sources: Fehr & Peers
Basemap Data: June 2023

The residents who shared their home location all live south of 128th Avenue, which is representative of the population density, but it does not necessarily display all desired origins for trips.

Comments relating to improvements needed at transit stops included concerns of the unnecessarily large size of the Eastlake/124th Station parking lot and the lack of transit connections to the station. The Thornton Crossroads/104th Station, among others, was also identified as a transit stop where people desire more destinations to which transit could be taken. There were multiple comments like this that mentioned the need for more transit-oriented development across the city.

As for the desired destinations, they are spread out throughout Thornton, ranging from grocery stores to restaurants to recreational facilities to doctor's offices. A few of these pins were dropped outside of the Thornton city boundary, which indicates a need for Thornton residents to travel outside of the city for certain reasons, mostly for recreation. Many comments on desired destinations discussed how large commercial areas, specifically the Larkridge Shopping Center and the Denver Premium Outlets, do not have any transit access. In fact, many other comments expressed a desire for more transit service in the areas where it does not exist at all right now, specifically in the northern parts of the City.

Focus Groups

Like the community open house and the online survey, focus groups were formed to provide input on how people currently use transit, advantages and disadvantages of the current system, where people would like to go, and what improvements they would like to see. The purpose of these focus groups, however, was to ensure the perspective of particular groups was captured in the planning process.

Active Adults Focus Group

The Active Adults focus group was held on April 4th, 2023, at the Active Adults Center in the Carpenter Recreation Complex. There were nine community members in attendance, two of which do not have regular access to a vehicle. The discussion with this group was focused on desired destinations, challenges with transit, and thoughts on a new on-demand service.

In general, this group expressed a need to travel to grocery stores, medical centers, and public services (libraries, recreation centers, and community centers). They also expressed that there are certain destinations just outside of Thornton (particularly west of I-25) to which they consistently travel.

There were multiple challenges the group expressed with the current state of transit. Active adults are most interested in door-to-door services like FlexRide, but they believe that FlexRide is not meeting their needs. Specifically, the service areas do not cover the desired origins and destinations, and although transfers are possible between one FlexRide service area and another, these are inconvenient and difficult to make. Further, they expressed frustration with the difficulty of booking the service, especially with a technological gap for some residents.

Beyond FlexRide, the active adults suggested that more information on existing and new transit services be widely publicized and easily conveyed. They feel as though there are plenty of existing services, specifically those which serve senior or disabled citizens, but not many fully understand how the services operate.

When asked about where a potential on-demand or microtransit service should be prioritized, the group had a few key points. Whatever the on-demand service looks like, the active adults believe that it should connect to:

- Existing food deserts in southeastern Thornton
- 104th and 120th Avenues due to the presence of key destinations
- Community centers like the Carpenter recreation complex to ensure a community purpose beyond just access to basic necessities.

Latinx Focus Group (From TMMP)

During the TMMP process in 2020, there was a successful focus group made up of Spanish-speaking individuals. Although the TMMP was a holistic process evaluating and planning all elements of transportation, this focus group mostly provided input on the topic of transit. For this reason, this study incorporates this feedback from the TMMP to ensure the feedback for transit is heard and considered.

In particular, this focus group indicated that increased public transportation options across the city would help mitigate vehicular traffic, and they believe that investment in public transit should be significantly increased. Further, an important piece of feedback received through this group is the lack of translated materials available about transit; schedules, fare payment methods, using the park-and-ride lots, etc. are not displayed in Spanish or other languages. This discourages and makes it much more difficult to use public transit when English is not the primary language.

A final point of concern expressed across the entire focus group is the lack of first and last mile connections to transit and other destinations due to poor pedestrian and bicycle infrastructure.

There are either no sidewalks or too narrow sidewalks, especially in the southern part of Thornton, which discourage safely getting to and from transit stops.

Peer Community Analysis

As Thornton looks ahead to transit improvements, it is important to understand what peer communities have done to address transit gaps.

Lafayette, Colorado

Lafayette, CO is located within ten miles of Thornton to the northwest, between Thornton and Boulder. Although Lafayette's population is significantly smaller than Thornton's, its distribution of age is like Thornton. Lafayette also has a larger portion of its population who commute using public transportation than in Thornton.

RTD provides a regional route between Denver and Longmont which goes through Lafayette. There is also an on-demand, door-to-door bus service that connects people throughout the city and to the Kestrel community in Louisville. The service is called Ride Free Lafayette, operating seven days a week from 7:00 AM to 8:00 PM for free, and it is operated by Boulder County.

Kent, Washington

Kent, WA is located twenty miles southeast of Seattle and it also has about 140,000 residents. Kent has a similar share of its population as Thornton who are either under 18 years of age or 65 years of age and older. Also, Kent has a larger portion of its population who is racially and ethnically diverse, and the household income is smaller than in Thornton. Further, Kent has a larger population than Thornton who commute using public transportation.

Kent is served by King County Metro Transit and Sound Transit buses and trains. In addition, King County Metro Transit operates the DART shuttle, which is a free shuttle travelling in multiple loops to shopping areas, banks, medical facilities, and senior housing. The shuttle arrives each half-hour in the downtown Kent area and each hour in the East Hill area from 9AM to 5PM Monday through Saturday. Every bus is equipped to serve wheelchairs and bikes. The DART shuttle is a joint effort between King County Metro Transit, the City of Kent, and Hopelink (which prioritizes serving homeless, low-income, children, seniors, and people with disability).

Tracy, California

Tracy, CA is located east of the intersection of I-205 and I-580 in California, between San Jose and Sacramento. It is a bit smaller than Thornton with 93,000 residents. Although Tracy has a smaller portion of its population who are 65 years of age and older, they have a large portion of their residents who are under 18 years of age. Tracy has a similar portion of its population who are Hispanic or Latino, but compared to Thornton, the portion of the racially diverse population is much higher in Tracy. Although the median household income is higher in Tracy, the portion of the population living in poverty is almost identical to that of Thornton. Further, a similar but larger portion of residents commute using public transportation in Thornton than Tracy.

Tracy, unlike Thornton, is served almost solely by a local transit system. In fact, the regional transit system in San Joaquin County, where Tracy is, operates one route to Stockton, CA and one to the Dublin BART station in Pleasanton, CA. The local transit system in Tracy includes local routes across the city operating all week long, commuter routes across the city operating on weekdays, on-demand bus service operating when the other services are not, and paratransit door-to-door service for ADA/Medicare passengers.

Conclusion

This transit market analysis report includes the project's background, a comprehensive demographic analysis, an evaluation of the existing transit service, an analysis of travel patterns, community input, and a review of peer communities.

Key Findings

Key findings from the analyses within this report are summarized as follows:

Demographic Analysis

Thornton's residents are diverse in age, income, and travel characteristics, and those who are most likely to rely on transit service are youth, older adults, people with low and moderate income, people with disabilities, and households with limited access to vehicles. While there are higher concentrations of many of these key demographic groups in the southern portion of Thornton as well as high population densities, there are other areas of the city with higher concentrations of these demographics as well, including:

- A high youth and older adult population north of 136th Avenue
- Residents living under the poverty line north of 136th Avenue
- Residents with no or limited access to vehicles in communities between 112th Avenue and 128th Avenue, and in the Todd Creek Area

Existing Transit Service

Overall, existing transit service in Thornton exhibits the following key themes:

- **Regionally Focused** – The system is predominantly designed for regional travel, particularly to downtown, and less useful for local travel within Thornton and east-west regional travel.
- **Limited in Geographic Coverage** – While the southwest part of Thornton (generally south of 120th Avenue and east of Colorado Boulevard) which has the highest transit propensity is generally covered by transit there are large sections of north and eastern Thornton without any transit, which also leaves parts of these areas in north Thornton devoid of Access-a-Ride service. Additionally, many areas of southern Thornton are more than a quarter-mile walk from transit and/or have areas with missing or narrow sidewalks that add additional barriers to accessing transit.

- **Low Frequencies** – Most bus service in Thornton operates at 60-minute frequencies, with just three routes plus the N-Line and 120X providing 30-minute all day frequencies. The low frequency is one of the biggest barriers to using transit in Thornton, making it an impractical option for many trips (even where transit exists), especially for short trips and trips that require a transfer.
- **Limited Demand Response Service** – The three FlexRide services that operate in Thornton are designed to fill those gaps in local travel demand, but can be unreliable, difficult to coordinate transfers, and exclude many areas of Thornton. The service also suffers from lack of efficiency typically averaging less than 3 riders per hour. Additionally, because the Thornton FlexRide does not operate after 6 PM, it does not serve evening commuters/service workers.
- **Limited Connectivity Across I-25** – While service is provided on both sides of I-25, service on 104th Avenue does not connect across, and the FlexRide boundaries generally fall along I-25 making connections across I-25 via FlexRide generally impractical.

Existing Travel Patterns

Both LEHD and StreetLight analyses show that desired destinations for Thornton residents are mostly local, most commonly within five miles. More specific takeaways include:

- Non-commute trips make up only 82% of trips on weekdays.
- Nearly half of all trips in Thornton have an average speed of 10 to 20 mph from origin to destination.
- The most common trip length is two to five miles.
- The top local trip pairings occur in the southwestern part of the city going to/from the Washington Street corridor from zones directly east or west.
- Most regional trips are destined for Commerce City and Broomfield, but there are also many trips headed to Brighton, Westminster, and to communities along the Northern I-25 corridor.
- In 2019, the highest concentration of work locations for Thornton residents was along the north I-25 corridor and Downtown Denver. There were also notable nodes in Boulder, Brighton, Broomfield, and the Anschutz Medical Campus in Aurora.
- Of trips that originate in Thornton's top transit propensity zones most are destined to areas directly surrounding the zones, so trips are predominantly short and close.
- Most people traveling from Thornton to one of the six regional transit hubs in (or near) Thornton originate in the zones immediately around the station. The two exceptions are the Wagon Road park-n-ride and Crossroads & 104th Station which have much larger travel sheds than the other transit hubs.

- The Carpenter Recreation Center draws people from all areas of Thornton in a fairly evenly distributed manner, while the Trail Winds Recreation Center has a much higher share of trips originating around the recreation center in north Thornton, with fewer people coming from south Thornton.
- While the Amazon facility (specifically the employ lot) draws trips from across Thornton, there are particularly higher concentrations of trips originating in south Thornton.

Community Input

The following are key takeaways from the community input process:

- A disproportionately high percentage of survey respondents live in north Thornton (as compared to the actual population distribution) meaning respondents from south Thornton which has a higher percentage of transit-reliant population may be underrepresented in the survey.
- The top desired destinations for transit include shopping and restaurants, work, and public services.
- The top desired transit improvements include increased frequency (particularly along the N-line), earlier and later hours of service, and additional first/last mile transit service within Thornton to connect to the rail stations.
- For both existing FlexRide and with any new on-demand service, residents' top priority is being able to be guaranteed a ride within 15 to 30 minutes of a request, followed by a convenient booking platform and consistent, professional drivers.
- Other characteristics that impact first/last mile connections like bicycle and pedestrian facilities are important to consider when planning new services.
- Desired destinations are dispersed throughout the community.
- The FlexRide can be challenging to use as it's not always available and difficult to make transfers.
- Traveling from one side of I-25 to the other and making most local trips in general in Thornton is very difficult due to the low frequency of existing transit service, lack of transit service in some areas, and need to transfer.

Peer Community Analysis

When looking at communities that are similar to Thornton, such as Lafayette, Kent, and Tracy, local transit service is supplemental and complimentary to regional service. Further, the local services in these communities focus on ensuring access to a wide variety of areas throughout the community by providing a mix of fixed-route services and on-demand services.

Potential Transit Travel Markets

Primary transit travel markets (groups with common demographic characteristics) are important to identify to inform the service alternatives, final service plan, and associated marketing strategies. Through the transit market analysis, including analysis of demographics, existing transit service, community input, and existing travel patterns, the following potential transit travel markets have been identified.

Young Users and School Trips

Youth between the ages of ten and seventeen make up 13% of Thornton's population. These riders may not have a driver's license or access to a vehicle and may be a market for increased ridership. These young users may be more open to app-based on-demand services than other user groups. Typically, the largest demand of trips for this travel market is to get to and from school and to after school activity centers and jobs. This population group is distributed across most of Thornton.

Older Adults

People aged 65 and over make up 10% of Thornton's population. Older adults may be more interested in a new service that picks up and drops them off closer to where they need to go, and areas with missing or uncomfortable sidewalks are going to be a significant barrier to using fixed-route transit. The most desired trip types by this group are to grocery stores, medical facilities and services, and community centers (including the Active Adults Center). Through the active adults focus group, it was made clear that transit improvements are highly supported among this group. While there are several areas of Thornton with higher concentrations of older adults, these areas are distributed across the city, with a notable population in the 55+ community of Todd creek that is far from any existing transit service.

Individuals and Families with Lower Incomes

Census data showed that people with low and moderate income are mostly in the southern portion of Thornton, but there are other areas to the north where a large portion of the population is living under the poverty line. A low cost, reliable transit service that connects low-income families and individuals with shopping options, local services, and jobs could be an important mobility option for these riders.

People with Limited Access to a Vehicle

About 3% of Thornton households do not own a vehicle, and 14% only have one vehicle. Even in households with one vehicle there may be people who need to get around but don't have the option to drive, particularly youth and older adults, either because they cannot drive or someone else in the house is using the vehicle. Transportation for these populations is often challenging, due to the limitations in driving a personal automobile or consistent access to a personal automobile. In some census tracts in Thornton over 5% of households do not have a vehicle, particularly in the southwest, southeast, and in the Todd Creek 55+ neighborhood. By expanding transit options and connections, a new transit service could improve mobility for those who would otherwise have a difficult time accessing the places that they need to go.

People with Limited Mobility or Mobility Assistance Devices

Given that 9% of Thornton residents households have a disability, and those community members may have mobility needs, there is an opportunity to provide a more convenient option using an on-demand solution, especially for those residents that do not meet eligibility requirements for paratransit but may not be able to easily use existing bus services.

Commuters and Service Workers

While RTD does provide some service to regional destinations, particularly to Downton Denver, there are many service-oriented jobs within and near Thornton with varying schedules that are not well served by existing transit service. People working service jobs often do not have access to a vehicle and depend on transit or a friend or family member to get to work.

First/Last Mile Access

There are six regional transit hubs in or adjacent to Thornton that provide bus and/or rail service to destinations throughout the Denver region. While many people use these regional services (or would like to), these hubs are difficult to access without a vehicle from most of Thornton. Improving access via transit to these regional hubs was one of the top desired transit improvements identified by the community and a potential travel market that is not well served today.

Short, Community-Based Trips

The most common trip type in Thornton are short community-based trips of two to five miles. This market is not currently well-served by RTD and there may be an opportunity for Thornton to fill this gap as the existing transit service is designed largely to serve longer regional and commuter trips. While these trips occur across the city there are particularly high concentrations in south Thornton where densities are higher and there are numerous commercial destinations (particularly around the Washington Street corridor).

Next Steps

Based on findings from this Transit Market Analysis, the project team will work with the project Stakeholder group to compile a list of potential transit alternatives to serve the potential transit travel markets in Thornton. This process will include identifying evaluation criteria to assess the performance of different alternatives within these travel market opportunities. Following the alternatives analysis, the public will get an opportunity to provide input in selecting a preferred alternative to advance forward and develop into a final transit service plan.