287 Bus Rapid Transit Feasibility Study

Participating Partners:

RTD · City of Fort Collins · Commuting Solutions · Federal Transit Administration · Colorado Department of Transportation · Town of Berthoud · City and County of Broomfield · City of Lafayette · City of Longmont · City of Loveland · Boulder County · AECOM

APRIL 2022

Flatiron Flyer on US 36 between Broomfield and Westminster

Acknowledgments

Stakeholder Working Group

- Jeff Butts, Boulder County – Project Manager
- Kathleen Bracke, Boulder County – Project Director
- Alex Hyde-Wright, Boulder County
- Scott McCarey, Boulder County
- Sarah Grant, City and County of Broomfield
- Sam Taylor, Broomfield Chamber of Commerce
- Jeff Arthur, City of Lafayette
- Joliette Woodson, City of Lafayette
- David Pasic, Town of Erie
- Phil Greenwald, City of Longmont
- Scott Cook, Longmont Chamber of Commerce
- Seth Lorson, City of Fort Collins
- Chris Quinn, RTD
- Nataly Handlos, RTD
- Sage Thornbrugh, RTD
- Dan Marcucci, CDOT Region 4
- Emma Belmont, FTA Region 8
- Tracey MacDonald, FTA Region 8
- Jason Igo, CDOT Region 1
- Adam Parks, CDOT Region 1
- Matthew Helfant, DRCOG
- Jacob Riger, DRCOG
- Carson Priest, Smart Commute Metro North
- Audrey DeBarros, Commuting Solutions

Elected Officials

- Marta Loachamin, Boulder County –Board of County Commissioners
- Laurie Anderson, City -County of Broomfield – Councilmember
- Jennifer Carroll, Town of Erie – Mayor
- Jamie Harkins, City of Lafayette – Mayor
- Joan Peck, City of Longmont – Mayor
- William Karspeck, Town of Berthoud – Mayor
- Jacki Marsh, City of Loveland – Mayor

Consultant Team

- AECOM, Nick VanderKwaak – Project Manager
- Fox Tuttle
- NHN Consulting

Special Thanks

- Todd Fessenden, Town of Erie – Public Works
- Mark Jackson, City of Loveland – Public Works
- Candice Folkers, City of Loveland – Public Works
- Chris Kirk, Town of Berthoud – Town Manager

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People within Broomfield and Boulder County

1. EXECUTIVE SUMMARY

1.1 PROJECT INTRODUCTION AND DESCRIPTION

In conjunction with local and regional partners, Boulder County led this study to analyze the feasibility of developing a Bus Rapid Transit (BRT) corridor with a core study area from CO 66 in north Longmont to US 36 in Broomfield and plans for future transit extensions along US 287 from Fort Collins and Denver. A Stations Area Toolkit was developed to help inspire a more comfortable and improved operational experience for people utilizing transit and the traveling public as a whole..

US 287 BRT is central in building a network of transit solutions to allow residents and visitors to get from anywhere to anywhere without the need of a personal vehicle. US 287 serves the northwest Denver region by providing north-south connectivity between many communities and connecting transit along the front range. As a US highway, it carries a large volume of automobile traffic but is also an important freight corridor and is the spine of regional transit. People also walk and bike along the corridor, largely within the communities.

This feasibility study aims to address several of the regional travel needs that were identified in the Northwest Area Mobility Study (NAMS), Boulder County's Transportation Master Plan (TMP), and municipal transportation and corridor plans. NAMS identified BRT on US 287 as a priority for future investment and opportunity. The TMP studied the existing and projected travel patterns of the region and identified several growing transportation needs that need to be addressed within the region. One of the key travel trends that was identified in the TMP is the increase of regional trips. The TMP projected a 74 percent increase in trips between Boulder and Broomfield counties, a 38 percent increase in trips between Boulder and Denver counties, and a 39 percent increase in trips between Boulder and Larimer counties.

Transit improvements on US 287 are one of the transportation investments that Boulder County is exploring to address these growing needs. BRT is premium bus service that is designed to improve capacity and travel time reliability over traditional local and regional bus service by offering more frequent and reliable service, transit priority, additional passenger amenities at stations, and specific branding.

This study explores how a BRT route along US 287 can help the region address the growing transportation needs and opportunities to make the stations more inviting and comfortable for people. As one of the main north-south regional corridors, US 287 has the potential to provide a convenient regional transit connection to several of the communities along the corridor. This process also identified other corridor needs for transit to work, such as pedestrian and bicycle comfort.

The objective of this US 287 BRT Feasibility Study is to define and understand the north-south mobility needs along US 287 and recommend specific capital and transit service enhancements for the corridor.

A comprehensive understanding of multimodal needs and desires along the corridor is critical before making specific modal transportation investments. The primary goal of this study is to understand the feasibility of BRT on US 287, but the study also considers other transportation investments.

Public, municipal, agency and elected official engagement were a guiding part of the planning process. To create a plan that reflects the perspectives of people in the study area, Boulder County and partners conducted a robust outreach effort throughout the course of the study in both English and Spanish. The outreach efforts included meeting with agency partners, hosting virtual public meetings, meeting with the community via Community Conversations, conducting public surveys, keeping an up to date website, sending timely email updates, and coalition building among elected officials.

The following four goals were developed with the technical team and public for the US 287 BRT Feasibility Study:

GOAL 1: **INCREASE THE EFFICIENCY, ATTRACTIVENESS, AND UTILIZATION OF TRANSIT THAT BENEFITS ALL USERS**

GOAL 2: **PROVIDE COMPETITIVE TRANSIT TRAVEL TO SERVE INTERCITY AND REGIONAL TRAVEL DEMAND**

GOAL 3: **CONTRIBUTE TO AN EQUITABLE, SOCIALLY, ECONOMICALLY, AND ENVIRONMENTALLY SUSTAINABLE NETWORK**

GOAL 4: **DEVELOP AND SELECT AN IMPLEMENTABLE AND COMMUNITY-SUPPORTED PROJECT**

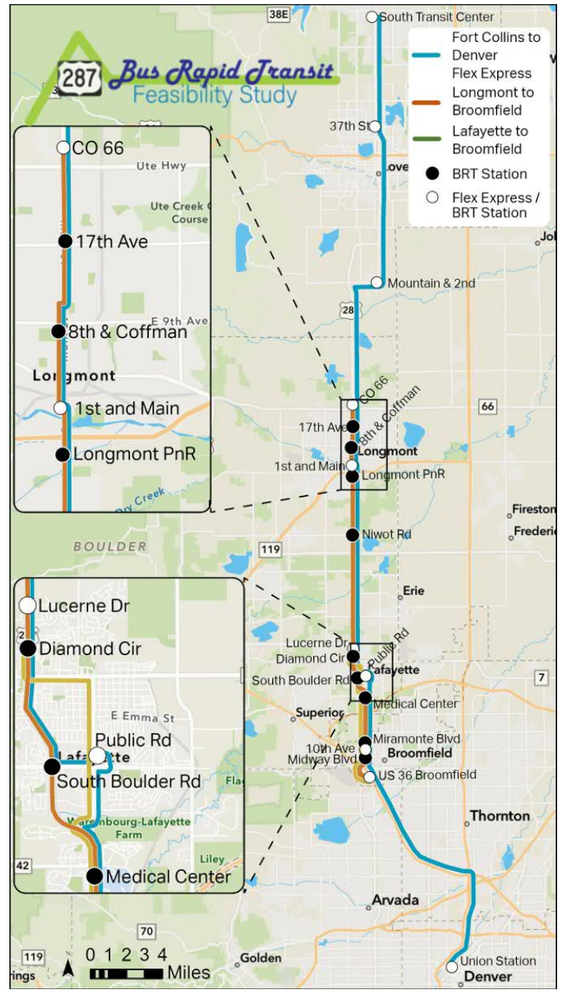
1.2 ALTERNATIVES AND SCREENING

To select a recommended alternative, Boulder County and project partners identified several alignment, station, and guideway alternatives for BRT on US 287. The study looked at existing conditions and public preferences to develop a set of BRT service and alignment alternatives. The study identified a set of alternatives and conducted a detailed evaluation to compare potential benefits and impacts of treatments and recommended solutions. The following sections summarize the two-tier evaluation process.

1.2.1 TIER 1 EVALUATION SUMMARY

The first tier of the alternatives analysis defined alignment and station alternatives for the corridor. As a more than 20-mile corridor (Broomfield to Longmont), US 287 runs through a variety of roadway and land use contexts. For each community segment in Longmont, rural Boulder County, Lafayette, and Broomfield, the project team developed alignment and station alternatives. The results of this initial screening resulted in three service patterns including a long express route from Fort Collins to Denver, a medium length core route from Longmont to Broomfield, and a shorter route to serve Lafayette to Broomfield. There are 19 total stations, as shown in Figure 1.

Figure 1: Tier 2 Alternatives Analysis



1.3 TIER 2 EVALUATION SUMMARY

The Tier 2 evaluation formed the recommended alignments from the Tier 1 evaluation into end-to-end alternatives. Key metrics that were calculated during this evaluation included capital costs, operations and maintenance (O&M) costs, ridership, and travel times, which are often the factors that are used by communities to select an alignment. Additional factors were considered, including potential impacts to the transportation network, demographics, and land use. The information and results of this evaluation are intended to provide decision makers and the public with information that will help them balance costs and benefits to select an alignment that is financially feasible, aligns with the project goals and has strong local support.

A series of scenarios were developed using varying levels of service and investment along three service patterns. As shown in Table 1, three end-to-end service patterns were identified. For the purposes of this feasibility analysis, it was assumed that existing Transfort Flex service to Boulder would remain, and a determination of which agency or agencies would operate this new service has not yet been determined. Further analysis, collaboration and implementation planning is needed.

Using combinations of these three service patterns and levels of transit investment between Broomfield and Longmont, three scenarios were generated using combinations of capital investments for evaluation in the Tier 2 screening process.

Table 1: End-to-end Service Patterns

Pattern 1: Fort Collins to Denver Flex Express	Provides limited stop service between Fort Collins and Denver Union Station (assumes no capital improvements north of Longmont	10 Stations
Pattern 2: Longmont to Broomfield	Core BRT service connecting Longmont to Broomfield	14 Stations
Pattern 3: Lafayette to Broomfield	Provides additional service between Lafayette Public PnR and Broomfield/US 36	6 Stations

Table 2: Scenarios

	Scenario	Description
	Baseline	The baseline maintains the same level of transit infrastructure as existing conditions while assuming some expansion of existing transit services for future ridership growth. Existing RTD and Flex ride service is maintained.
1	Operational Improvements Only	No capital investments on US 287, but the number of bus stops is reduced, service patterns are updated, and frequency is increased.
2	Mixed Flow BRT + Intersection Improvements	Substantial changes to stations and technology but operate in mixed traffic in majority of corridor. Transit Signal Priority (TSP) and queue jumps implemented at congested intersections. Queue jumps are a type of roadway geometry used to provide preference to buses at intersections by adding an additional travel lane.
3	Mixed Flow BRT + Intersection Improvements + BAT Lanes	Same as Scenario 2 with addition of continuous BAT lanes where feasible in Broomfield, Lafayette, and Longmont

The Tier 2 evaluation modeled ridership and travel times for each of the end-to-end alternatives to determine which scenario would provide the most efficient service for the region and also evaluated capital costs and operations and maintenance (O&M) costs for each scenario.

The planning-level cost estimate for intersection improvements with queue jumps at key intersections ranges from $167 Million to $182 Million. This total reflects improvements at 27 intersections (12 high, 6 medium, 9 low). The planning-level cost estimate for these same intersection improvements with the addition of BAT lanes in high impact areas ranges from $198 Million to $215 Million. Operations and Maintenance costs for each alternative is similar ranging from $19.6 million to $21.4 million annually for all three service patterns.

LONGMONT TO DENVER: ONE-SEAT-RIDE

- **Priority for the community**
- **Reduces travel time into Denver by eliminating the need for a transfer**
- **The Fort Collins to Denver route may first start in Longmont to provide express service into Denver, later expanding to Fort Collins.**
- **A complementary route on I-25 may be a viable option given the right operating conditions**

Figure 2: Longmont to Broomfield Travel Time in 2045 (minutes)

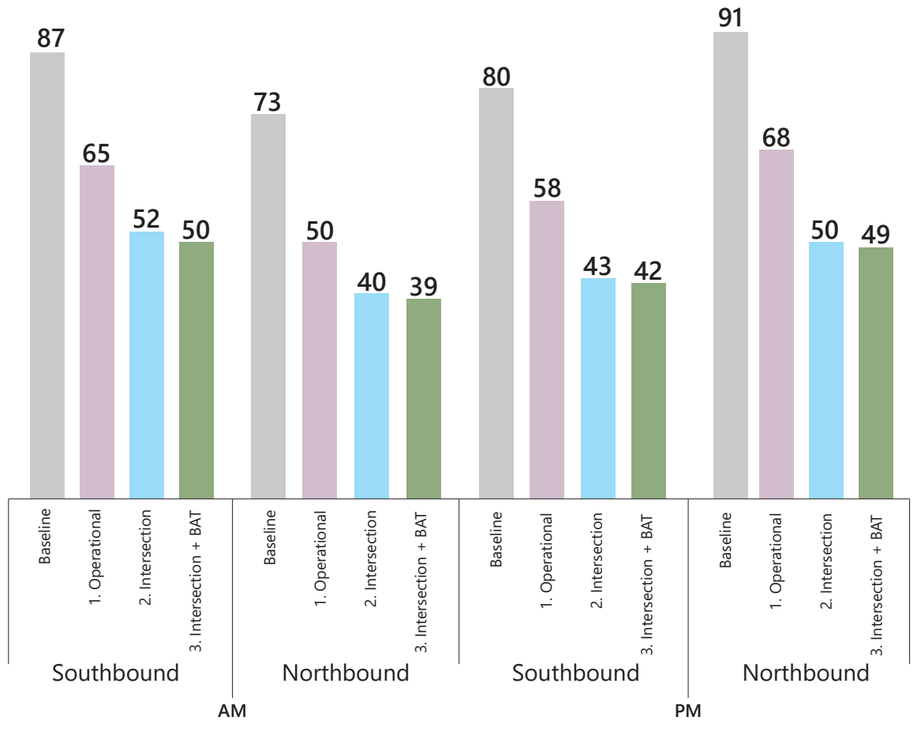
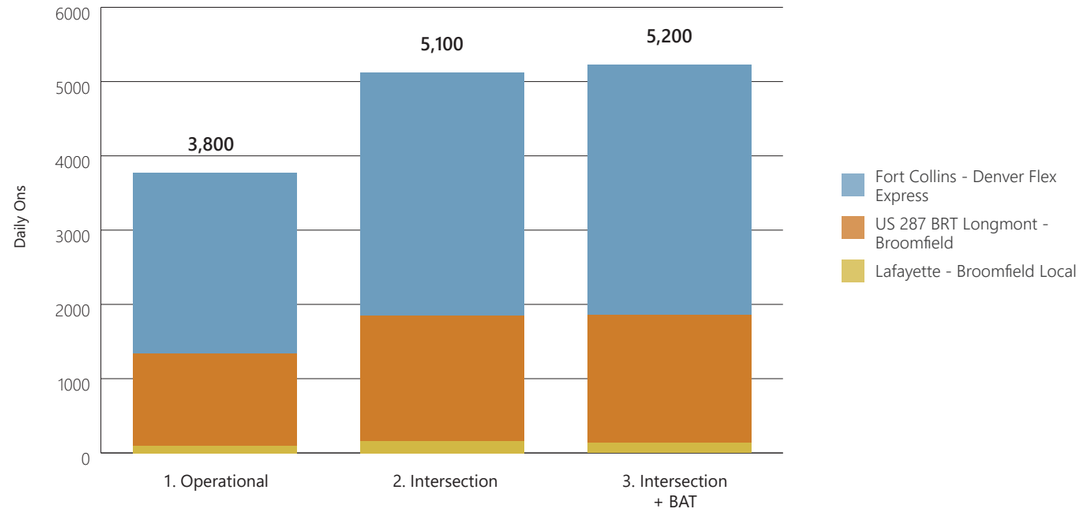


Figure 3: Forecasted Daily Boardings (2045)



1.4 BRT RECOMMENDATIONS

The core evaluation of this study was to understand the feasibility of BRT and premium transit on US 287. Through a robust technical analysis and working with stakeholders and the public, a series of investments have been identified that will improve bus travel times and improve stations along the corridor between Broomfield and Longmont. Each of the evaluated scenarios shows that a better bus system and transit network will result from increased transit capital investments at intersections and congested areas of the corridor. A dedicated bus guideway along the full stretch of the corridor is not a recommendation of this study as traffic on much of the corridor does not suffer from high levels of congestion, but future evaluation by individual communities may determine specific sections of roadway would benefit from additional investment. A summary of the improvements evaluated as part of the process is shown in Figure 4.

1.5 NEXT STEPS

In future phases of planning, Boulder County will develop implementation plans for individual projects. This may include smaller investments at intersections, investment in station locations, or other parts of the system to improve bus speed, reliability, and provide new service connections.

Boulder County will look at safety, connectivity, and multimodal mobility in a Phase II project planned to start shortly after this feasibility study that will include a high-level environmental review. The county and partners will also investigate funding opportunities, advance to the Preliminary Engineering and NEPA Phase, and continue integrating project development with technical, public, and elected official support.

Figure 4: Intersection Improvements and Park and Ride Locations

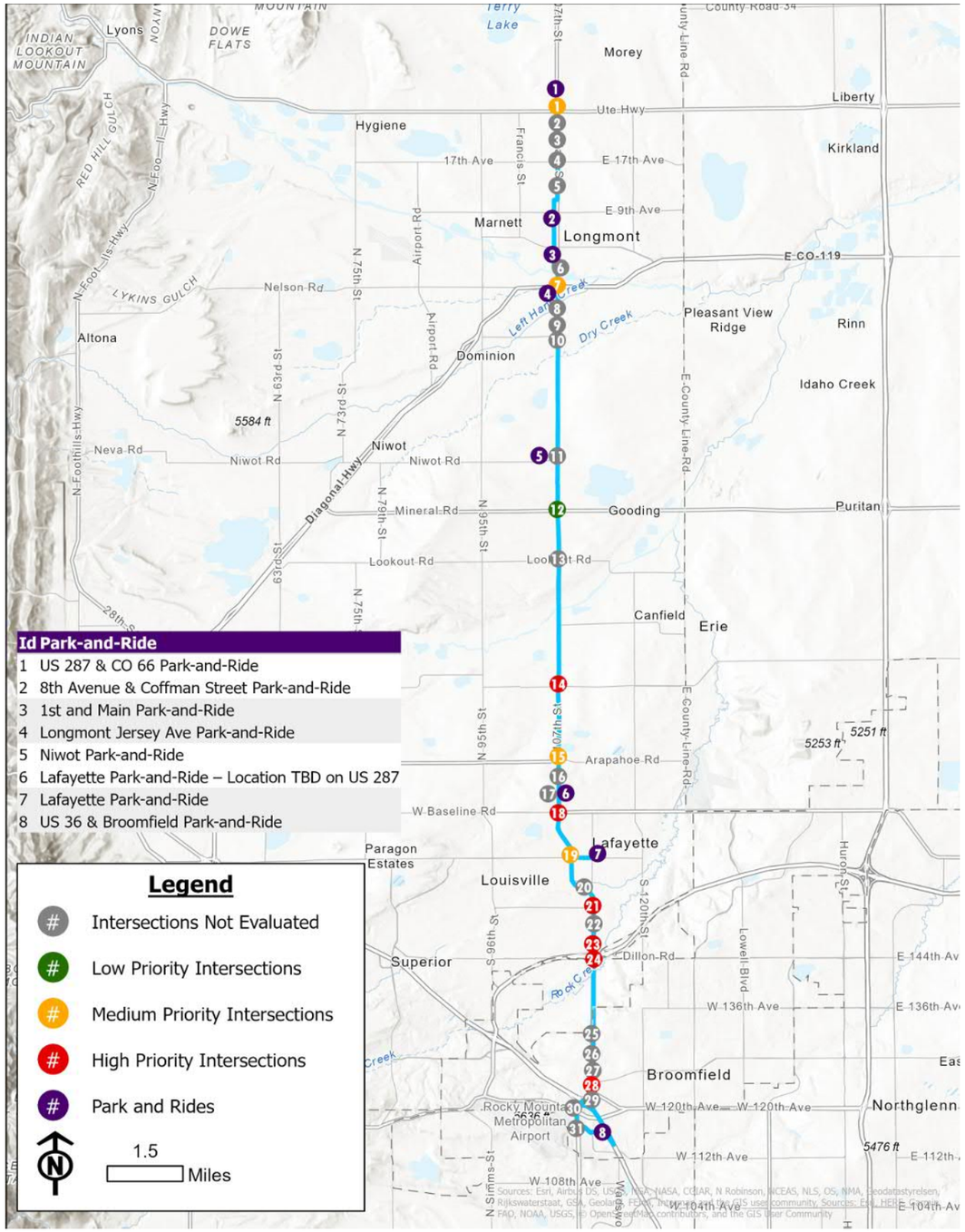


Table 3: US 287 Prioritized Treatments

ID	Intersection	Station Location	Intersection Treatment**	Overall Relative Priority***
1	CO 66	YES	Signal and queue jump - high cost	Medium
2	23rd Ave		Signal and queue jump - medium cost (NB only)	Not Evaluated
3	21st Ave		Signal and queue jump - high cost	Not Evaluated
4	17th Ave	YES	Signal and queue jump - high cost	Not Evaluated
5	Mountain View Ave		Signal and queue jump - high cost	Not Evaluated
6	Boston Ave		Signal and queue jump - low cost (NB left only)	Not Evaluated
7	Ken Pratt Blvd (CO 119)	YES	Signal and queue jump - high cost	Medium
8	Quail Rd		Signal and queue jump - medium cost	Not Evaluated
9	Quebec Ave		Signal and queue jump - medium cost	Not Evaluated
10	Pike Rd		Signal and queue jump - high cost	Not Evaluated
11	Niowt Rd	YES	Signal and queue jump - low cost	Not Evaluated
12	Mineral Rd (CO 52)		Signal and queue jump - low cost	Low
13	Lookout Rd		Signal and queue jump - low cost	Not Evaluated
14	Isabelle Rd		Signal and queue jump - medium cost	High
15	Arapahoe Rd		Signal and queue jump - medium cost	Medium
16	Lucerne Dr	YES	Signal and queue jump	Not Evaluated
17	Diamond Cir	YES	Signal and queue jump - low cost	Not Evaluated
18	Baseline Rd		Signal and queue jump - high cost	High
19	W South Boulder Rd	YES	Signal and queue jump - high cost	Medium
20	Public Rd		Signal and queue jump - high cost	Not Evaluated
21	Exempla Cir (CO 42)	YES	Signal and queue jump - high cost	High
22	Campus DR		Signal and queue jump - medium cost	Not Evaluated
23	Dillon Rd (NW Pkwy WB)		Signal and queue jump - high cost (SB)	High
24	Dillon Rd (NW Pkwy EB)		Signal and queue jump - high cost (NB)	High
25	Miramonte Blvd	YES	Signal and queue jump - low cost	Not Evaluated
26	10th Ave	YES	Signal and queue jump - low cost	Not Evaluated
27	6th Ave		Signal and queue jump - low cost	Not Evaluated
28	Midway Blvd	YES	Signal and queue jump - low cost	High
29	US 36 Off Ramp		Maintain existing - no cost	Not Evaluated
30	Wadsworth & CO 128		Intersection Improvement - cost not evaluated	Not Evaluated
31	Wadsworth & Uptown		Intersection Improvement - cost not evaluated	Not Evaluated

**Intersections located on Coffman or on alternate alignment not on US 287 are not shown.*
*** Cost categories estimated at feasibility level (includes contingency). Low=$1.4M, Medium=$2.1M, High=$2.8M*
**** Relative priority is worst ranking of LOS or Travel Time in Existing and 2045. Intersections not evaluated at station*

When queue jumps are implemented, consider continuing the bus lane past the intersection with BAT Lanes at the following locations to create continuous bus lanes:

1	**Longmont:** North of SH66 to 17th Ave; Boston Ave to Pike Rd
2	**Lafayette:** North of Baseline to South of Public; North of Exempla to South of Campus
3	**Broomfield:** North of Miramonte to South of Midway

US 36 and Broomfield Station

2. INTRODUCTION

In conjunction with local and regional partners, Boulder County led a study to analyze the feasibility of developing a Bus Rapid Transit (BRT) corridor and subsequent service enhancements along US 287 between Longmont and Broomfield. US 287 BRT is central in building a network of transit solutions to allow residents and visitors to get from anywhere to anywhere without the need of a personal vehicle. US 287 serves the northwest Denver region by providing north-south connectivity between many communities and connecting routes along the front range. As a US highway, it carries a large volume of automobile traffic but is also an important freight corridor and is the spine of regional transit. People also walk and bike along the corridor, largely within the communities.

This feasibility study aims to address several of the regional travel needs that were identified in the Northwest Area Mobility Study (NAMS), Boulder County's Transportation Master Plan (TMP), and municipal transportation plans. NAMS identified BRT on US 287 as a priority for future investment and opportunity. The TMP studied the existing and projected travel patterns of the region and identified several growing transportation needs that need to be addressed within the region. One of the key travel needs that was identified in the TMP is the increase of regional trips. The TMP projected a 74 percent increase in trips between Boulder and Broomfield counties, a 38 percent increase in trips between Boulder and Denver counties, and a 39 percent increase in trips between Boulder and Larimer counties.

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This study explores how a BRT route along US 287 can help the region address the growing transportation needs and opportunities to make the stations more inviting and comfortable for people. As one of the main north-south regional corridors, US 287 has the potential to provide a convenient regional transit connection to several of the communities along the corridor.

Boulder County

AECOM

2.1 STUDY OBJECTIVE

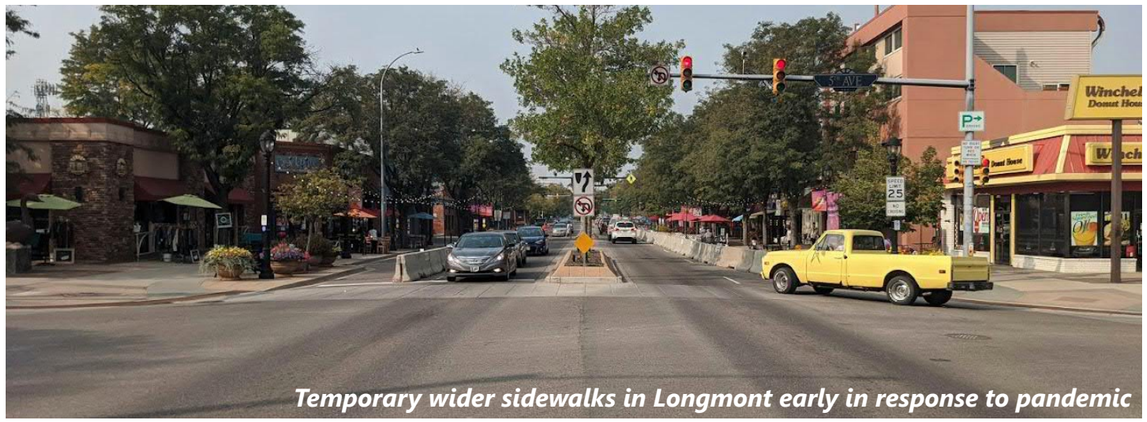
The objective of this US 287 BRT Feasibility Study is to define and understand the north-south mobility needs along US 287 and recommend specific capital and transit service enhancements for the corridor. A comprehensive understanding of multimodal needs and desires along the corridor is critical before making specific modal transportation investments. The primary goal of this study is to understand the degree of feasibility for BRT on US 287, but the study also considers other transportation investments.

2.2 STUDY AREA

Boulder County and the City and County of Broomfield, in partnership with local and regional organizations, undertook this feasibility study to understand and prepare for future capital investments on US 287 within various jurisdictions; however, understanding the regional transit network and travel demand south to Denver and north to Fort Collins created the need for a larger study area. Capital recommendations are focused on US 287 between Broomfield at US 36 and Longmont at CO 66. Due to the regional travel shed, extended service patterns cover the greater region between Denver Union Station and Fort Collins South Transit Center. The project study area is shown in Figure 5.

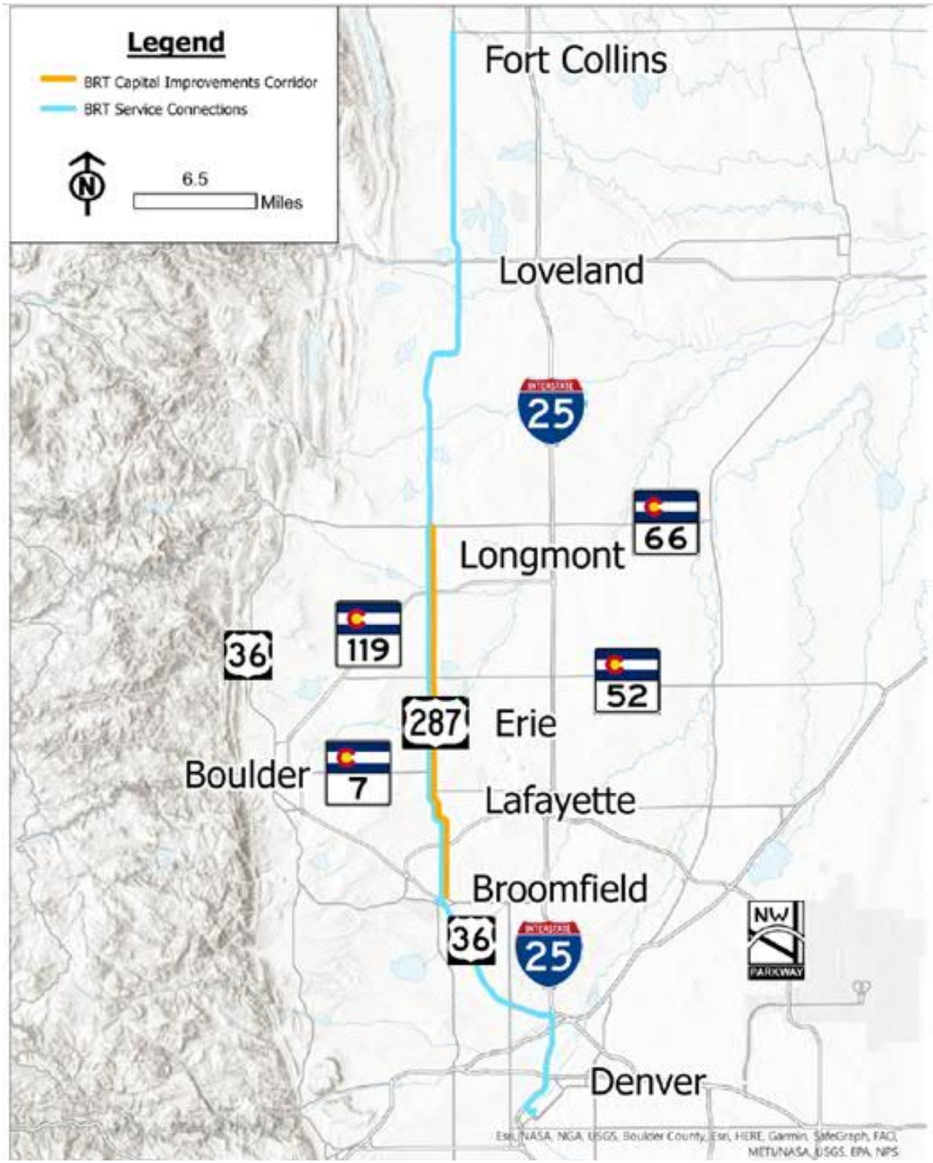
2.3 COVID-19 IMPLICATIONS

This study was conducted in 2020 and 2021 during the COVID-19 pandemic. The pandemic led to changes in traditional travel behaviors. As a result, the project team took extra care to differentiate between pre-COVID transit and travel data and post-COVID projections. On future phases of study and design, it may be necessary to revisit traffic assumptions depending on how travel behavior evolves. As of now, travel patterns have changed and it remains to be seen to what degree these transportation habits are lasting or temporary.



Temporary wider sidewalks in Longmont early in response to pandemic

Figure 5: Project Study Area

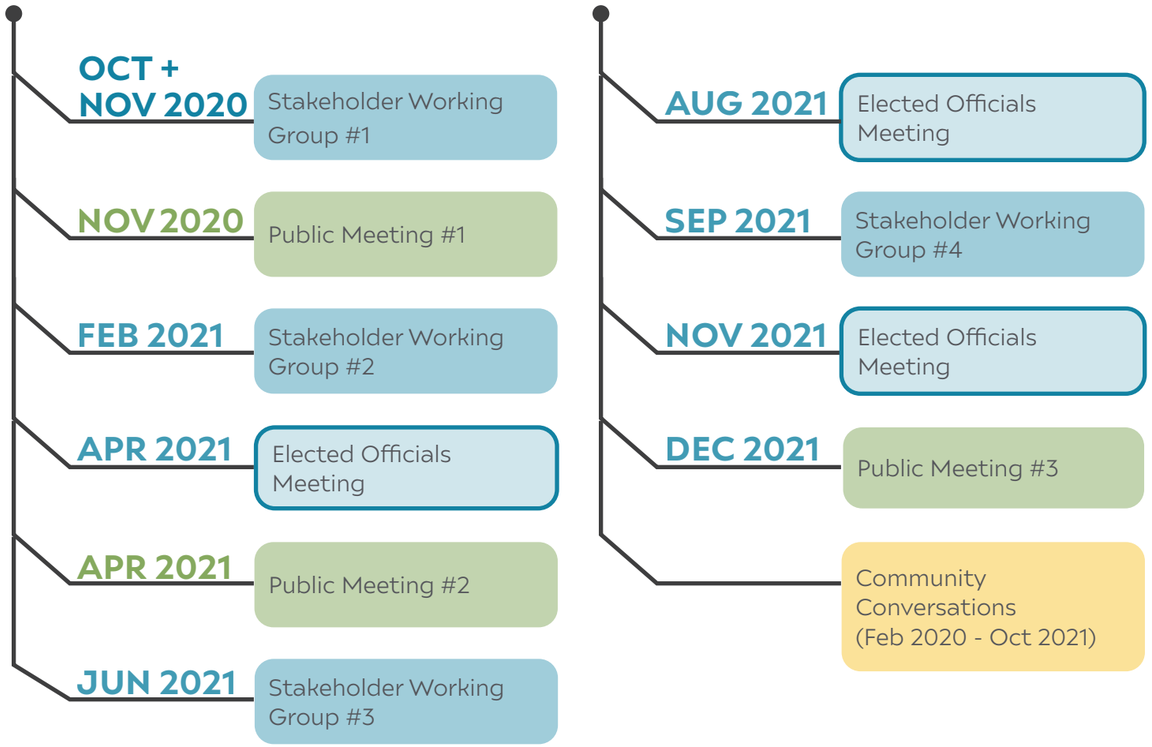


2.4 ENGAGEMENT

Public, municipal, agency and elected official engagement guided part of the planning process for the US 287 BRT Feasibility Study. To create a plan that reflects the perspectives of stakeholders and members of the public in the study area, Boulder County conducted a proactive outreach effort throughout the study. The outreach efforts included meeting with agency partners, hosting virtual public meetings, meeting with the community using Community Conversations, and conducting public surveys.

Boulder County has and will continue to seek feedback from community leaders, partner agencies, and the public throughout the development process of the US 287 BRT corridor. Early on, Boulder County developed a public engagement framework to keep the public informed and solicit participation in the development of the US 287 BRT Feasibility Study. A timeline of engagement activities is shown in Figure 6.

Figure 6: Engagement Timeline



2.4.1 STAKEHOLDER WORKING GROUP (SWG)

To build consensus on the project among technical and organizational partners, Boulder County formed a Stakeholder Working Group (SWG) that was consulted throughout the course of the feasibility study. The SWG was comprised of representatives from the City-County of Broomfield, City of Lafayette, City of Longmont, Town of Erie, Fort Collins (Transfort), City of Loveland, Regional Transportation District (RTD), Colorado Department of Transportation (CDOT), Federal Transit Administration (FTA), Denver Regional Council of Governments (DRCOG), Commuting Solutions, Longmont Chamber of Commerce, and Broomfield Chamber of Commerce.

Boulder County held four SWG meetings over the course of the planning process. At each meeting, members of the SWG provided feedback on different aspects of the project, including the vision, goals, alignment alternatives, station alternatives, and recommendations. Feedback from the SWG guided the development of the project and was taken into consideration during each key decision point of the planning process. In addition to these formal meetings, the county had one-on-one meetings with the members of the group to hear ideas, concerns, and feedback outside of the group setting.

2.4.2 PUBLIC MEETINGS

Input from the public played a critical role in the planning process. Boulder County held three virtual public meetings (two English and Spanish) and provided two public surveys to get input on the project. At the public meetings, the attendees were informed on the progress of the study and encouraged to provide feedback to help them make informed decisions. Members of the public were encouraged to give input on several different aspects of the project, including the goals, alignment alternatives, station alternatives and recommendations. Input provided by the public informed key decision points throughout the planning process.

Figure 7: Virtual Public Meeting

2.4.3 COMMUNITY CONVERSATIONS

Boulder County made a special effort to meet with people in a series of community conversations to get more direct feedback from members of the community. To identify community groups to reach out to, Boulder County collaborated with stakeholders to create a list of councils, committees, and advocacy groups. Boulder County facilitated conversations with the following groups:

- Lafayette Senior Advisory Board
- Latino Coalition
- Longmont Bicycle Issues Committee
- Lafayette Waste Reduction Advisory Committee
- Mobility and Access Coalition (former LCC)
- Lafayette Energy Sustainability Advisory Committee (LESAC)
- Longmont Transportation Advisory Board
- Broomfield ACES – Transportation Subcommittee

Themes from these conversations are found in the graphic below:

Figure 8: Themes from Public Engagement

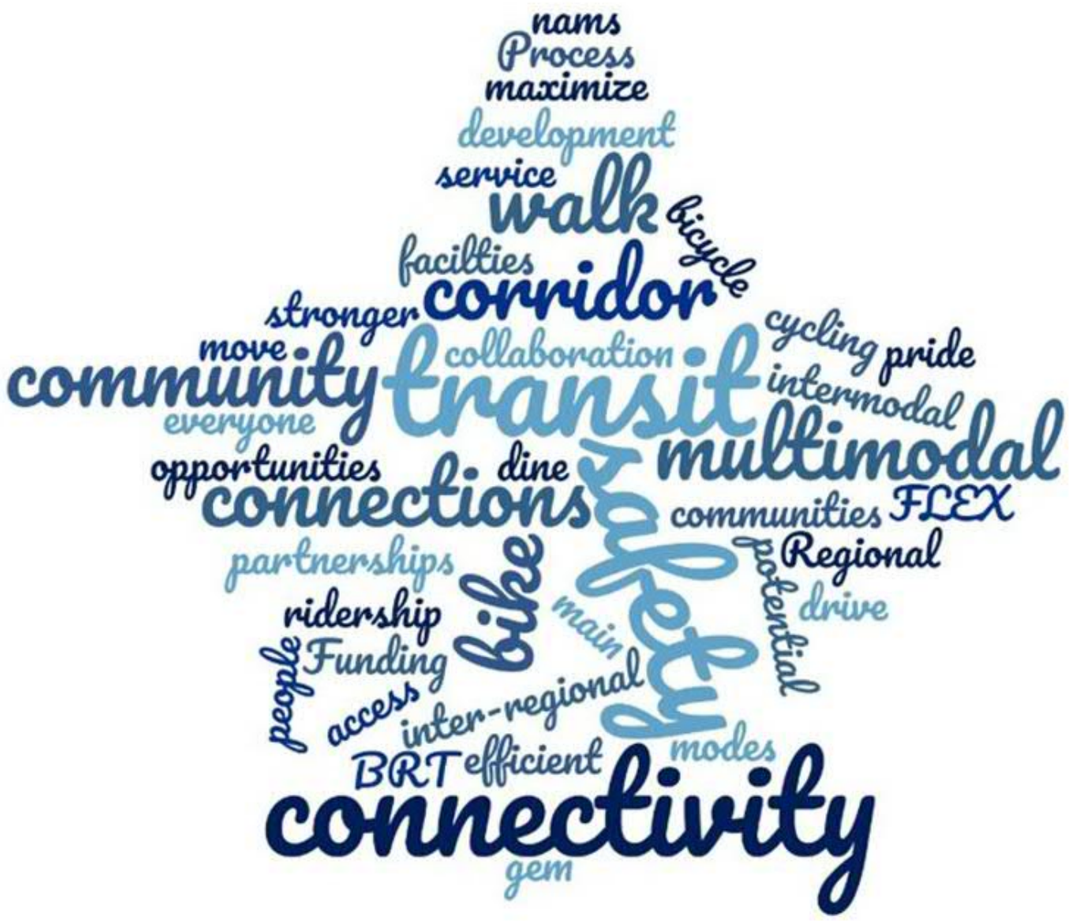
A summary of the conversations is located in Appendix B. These community conversations will be continued beyond this feasibility study as Boulder County and project partners continue to advance the goals of this project.

Figure 9: Virtual Interview with the Latino Chamber of Commerce of Boulder County

2.5 VISION AND GOALS

Boulder County went through an extensive visioning process to define the vision and the goals for the US 287 corridor that guided decisions throughout the course of the project. Input and ideas from an early SWG session are shown in Figure 10.

Figure 10: Ideas and Priorities for US 287 from Stakeholder Working Group



The SWG also evaluated the Strengths, Weaknesses, Opportunities, and Challenges (SWOC) along US 287. Figure 11 summarizes the major themes the participants identified.

Figure 11: SWOT Analysis

Strengths

- Connections to other transit routes
- Diverse land uses
- Wide right-of-way
- Stakeholder support for multimodal improvements
- NAMS identified high ridership potential

Weaknesses

- Auto-centric design
- Safety concerns
- Lack of bicycle facilities
- Lack of safe crossings and quality pedestrian facilities
- High speed corridor

Opportunities

- Regional connections
- Future development
- Encourage and enhance cycling
- Connections to existing park and rides

Challenges

- Qualifying for federal funding
- Growing traffic and congestion
- Community perception
- Potential to alter sense of place

Input from Boulder County staff, community, and partners helped to develop the following project objective statement to reflect the priorities for the corridor.

The US 287 Bus Rapid Transit Feasibility Study intends to study and understand north/south mobility needs along US 287 and recommend specific capital improvements and transit service enhancements for the corridor.

Value statements for the corridor were also discussed and refined with municipal, agency, and public partners. These value statements were used to develop four goals, each with specific objectives. The project team presented the goals and objectives to the stakeholders at a second SWG meeting in February 2021. Based on the input from the stakeholders, the project team refined the goals and objectives for the project as follows:

GOAL 1: INCREASE THE EFFICIENCY, ATTRACTIVENESS, AND UTILIZATION OF TRANSIT THAT BENEFIT ALL USERS

OBJECTIVES:

- Provide reliable, frequent service matched with demand that improves the experience of existing bus users and attracts new riders
- Provide increased transit capacity
- Provide enhanced stop amenities and infrastructure
- Prioritize moving number of people over number of vehicles
- Prioritize one seat rides when high origin and destinations warrant it
- Provide comfortable walking and biking connections to transit stops
- Provide bus service that competes with car travel times

GOAL 2: PROVIDE COMPETITIVE TRANSIT TRAVEL TO SERVE INTERCITY AND REGIONAL TRAVEL DEMAND

OBJECTIVES:

- Improve north/south transit on US 287 in Boulder County and Broomfield
- Provide option for one-seat transit connections from Boulder County/Broomfield to Downtown Denver and Fort Collins during peak periods with enough transit demand to warrant service
- Balance with acceptable levels of traffic operations in the corridor
- Improve pedestrian and bicycle access to stations along the corridor
- Focus on peak hour bus frequency versus all day service
- Coordinate with existing bus service and planned BRT service (RTD, Transfort, Bustang)
- Improve transit passenger comfort

GOAL 3: CONTRIBUTE TO AN EQUITABLE, SOCIALLY, ECONOMICALLY, AND ENVIRONMENTALLY SUSTAINABLE NETWORK

OBJECTIVES:

- Promote an efficient and sustainable transportation system that reduces Vehicle Miles Traveled (VMT) and greenhouse gas emissions
- Provide equitable mobility and accessibility improvements for transit dependent populations and existing users
- Integrate with regional transit to develop a complete and efficient network with maximum transfer opportunities
- Support local goals for development along the corridor
- Support institutional and key stakeholder planning efforts
- Providing affordable transit options for lower income users
- Coordinate with regional boards/groups for diversity and equity

GOAL 4: DEVELOP AND SELECT AN IMPLEMENTABLE AND COMMUNITY-SUPPORTED PROJECT

OBJECTIVES:

- Identify and select transit improvements with strong public, stakeholder, and agency support
- Define a cost-effective phased approach for transit improvements that meet existing needs and plan for long term success
- Define and select transit improvements that are competitive for Federal Transit Administration funding

Bus Stop at US 287 and 10th Avenue in Broomfield

3. EXISTING CONDITIONS

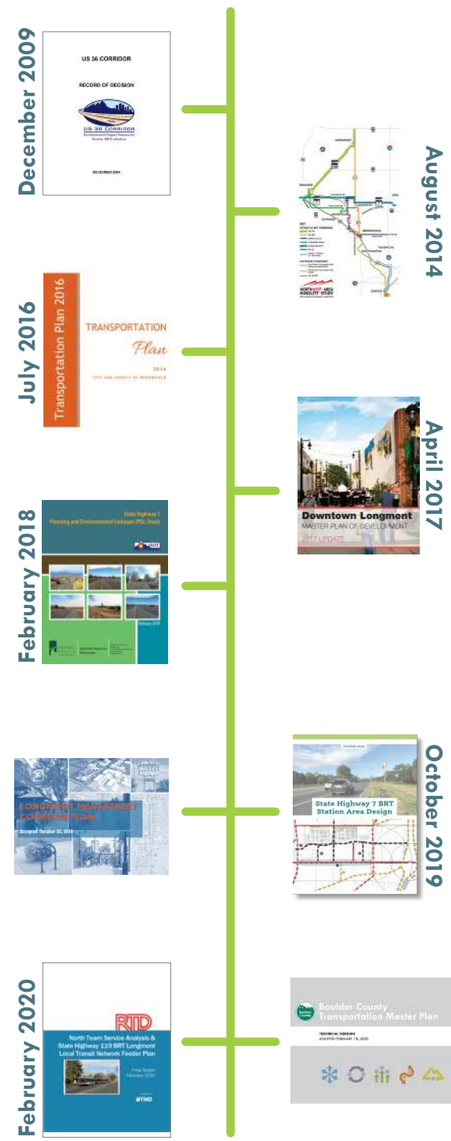
3.1 REVIEW OF PREVIOUS PLANS AND STUDIES

Over the years, several published plans and studies have set the context and framework for the US 287 BRT. These guiding plans and studies have set a solid foundation for the vision of transportation on the US 287 corridor, including the potential for BRT. The reviewed plans and studies included documents from Boulder County, local municipalities along the corridor, and the Regional Transportation District (RTD):

- Northwest Area Mobility Study (NAMS)
- City and County of Broomfield Transportation Plan
- US 36 Environmental Impact Statement
- Downtown Longmont Master Plan of Development
- State Highway (SH) 7 Planning and Environmental Linkages (PEL) Study
- Longmont Main Street Corridor Plan
- Boulder County Transportation Master Plan
- State Highway 7 BRT Station Area Design including potential stations at Arapahoe and Lucerne, as shown on **Page 21** in the accompanying Stations Area Toolkit
- RTD North Team Service Analysis & State Highway 119 BRT Feeder Plan

The following sections outline the information from each of these plans that is relevant to the US 287 BRT Feasibility Study.

Timeline of Previous Studies



Northwest Area Mobility Study (NAMS)

Adopted: August 2014
Agency: RTD

In 2014, RTD and its partners completed the NAMS which evaluated several different corridors for the implementation of BRT. For each of the potential corridors, the report outlined service details, including headways, routes, potential station locations, Transit Signal Priority (TSP) locations, projected ridership, and capital cost estimates. Tables 4 and 5 summarize the key recommendations from the NAMS that pertain to implementation of BRT along US 287.

US 287 was one of the potential BRT corridors that was identified and evaluated in the NAMS. Of the potential BRT routes that were evaluated in the study, the US 287 BRT was projected to have the highest boardings per revenue hour while maintaining the lowest subsidy per boarding. Based on these promising findings, NAMS recommended that the US 287 BRT be implemented in the short-term and be prioritized over other BRT corridors in the region.

Table 4: US 287 BRT Key Characteristics Identified by NAMS

Statistic	Description
Starts/Ends:	US 287/ Wal-Mart PnR in Longmont to Transit Way and Uptown Avenue
Length:	• 21.8 miles • 58% bus on shoulder (On US 287 from Ken Pratt Blvd to Arapahoe Rd and from S. Public Rd to Midway Blvd.)
Travel Time (Start to End):	39 minutes from 21st PnR to Broomfield PnR
Number of Stations:	34
Projected 2035 Boardings:	8,000-9,000
Estimated Capital Cost:	$56,300,000
Key Characteristics:	• Direct connection from Longmont to US 36 BRT service corridor • Opportunities for bus on shoulder application • Limited stop service • Connects Louisville and Lafayette to the north and south • Connects to two other potential arterial BRT routes at the Broomfield US 36 BRT station

Source: RTD, 2014, NAMS

Table 5: US 287 BRT Station Locations, Transit Signal Priority, and Park and Ride Locations Identified by NAMS

	Station and TSP Locations	Queue/TSP	Station	PnR Location	# of Stations
1	Main Street at Wal-Mart PnR	Yes	Yes - Minor	Yes	1
2	Main Street at 21st Ave	Yes	Yes - Major	Yes	2
3	Main at 17th Ave	Yes	Yes	No	2
4	Main St at Mountain View Ave	No	Yes	No	2
5	*Coffman at 8th Street	No	Yes - Major	Yes	2
6	Coffman St at 6th Ave	No	Yes	No	2
7	*Coffman and 3rd Ave	Yes	Yes	No	2
8	*Main and 1st Ave	Yes	Yes - Major	Yes	1
9	US 287 and Delaware Ave	No	Yes	No	2
10	**US 287 and Pike	No	Yes	No	2
11	**US 287 and Niwot Rd	Yes	Yes	Yes	2
12	**US 287 and CO 52 (Mineral)	Yes	No	No	0
13	**US 287 and Jasper Rd	Yes	Yes	Yes	2
14	**US 287 and Arapahoe Rd	Yes	Yes	No	2
15	***S Boulder Road and S Public Rd	Yes	Yes - Major	Yes	2
16	S Public Rd and Empire Rd	Yes	Yes	No	2
17	**Miramonte Blvd and US 287	Yes	Yes	No	2
18	**Midway Blvd and US 287	Yes	Yes	No	2
19	Interlocken Loop at US 36 WB Ramp	Yes	No	No	0
20	Interlocken Loop at US 36 EB Ramp	Yes	No	No	0
21	Transit Way and Uptown Avenue	No	Yes	Yes	1

**BRT will use Coffman from 8th to 1st Ave*
***Shoulder running from Ken Pratt to Arapahoe and Empire Rd to Midway Blvd*
****New alignment: US 287 to S Boulder Rd to S Public Rd*
Source: RTD, 2014, NAMS

City and County of Broomfield Transportation Master Plan

Adopted: July 2016
Agency: City and County of Broomfield

Published in 2016, the City and County of Broomfield's Transportation Master Plan outlines the vision, goals, policies, and actions to guide the implementation of transportation infrastructure in the community. The plan identifies several transportation needs within the community, including along US 287. In the plan, US 287 is identified as one of the major roadways that is operating above capacity conditions. The high demand on US 287 creates an opportunity to BRT on the corridor as a potential solution to increase person capacity. Additionally, the plan references the NAMS and cites US 287 as a potential BRT corridor within Broomfield.

Table 6: Broomfield Potential BRT Corridors

Potential BRT Corridor	Description	Length (miles)	Number of Stations
120th Avenue	East-west connection from Broomfield to I-25/Adams County Government Center	16.3	18
US 287	Direct Connection from Longmont to US 36 - Lafayette and Broomfield from S. Public Rd to Midway Blvd.)	21.8	34
CO 7	East-west connection from Boulder to northern areas of Lafayette and Broomfield Broomfield PnR	17.9	44

Source: City and County of Broomfield, 2016, Transportation Master Plan

US 36 Environmental Impact Statement

Adopted: December 2009
Agency: CDOT, RTD, FHWA and FTA

The US 36 Environmental Impact Statement (EIS) published in 2009 studied multi-modal improvements for the US 36 corridor between Denver and Boulder including modifications at the US 287 interchange. Some of the improvements have been completed, but several remain including the eastbound on and off-ramp configurations, the bridge widening, and the Alter Street Connection.

Downtown Longmont Master Plan of Development

Adopted: April 2019
Agency: City of Longmont

The Downtown Longmont Master Plan of Development outlines the community's vision, goals, and strategies for guiding development within Longmont's downtown. Since US 287 is Longmont's Main Street through its downtown, the corridor plays a critical role in the character and development of the area. One of the goals that is identified by the plan is to "improve and expand the infrastructure that ensures Downtown is well-connected and easily accessible by multiple transportation modes." The plan goes on to outline several strategies to achieve the vision and goals for Downtown Longmont, including several strategies to improve pedestrian comfort, enhance bicycle safety, encourage the use of alternative modes of transportation to access downtown, and align transportation and land use planning efforts to achieve a well-connected downtown. These multi-modal improvements along with the coordinated land use planning efforts could support the implementation of the BRT within Downtown Longmont by creating first mile/last mile connections as well as generating ridership.

State Highway 7 Planning and Environmental Linkages (PEL) Study

Adopted: February 2018
Agency: Boulder County

The CO 7 PEL studies the existing transportation problems on CO 7 between 7th Street and US 287. The CO 7 PEL identifies several multimodal needs along CO 7, including opportunities to improve safety, access to transit facilities, bicycle infrastructure, pedestrian facilities, and traffic operations. The PEL recommended three possible cross-sections to be evaluated further. These were shoulder running transit, a reversible center-running lane and keeping just two general purpose (GP) lanes. There was no scenario in the PEL that widened this section of CO 7 to four lanes. The recommendations on CO 7 from the PEL would support the potential for a BRT to be implemented on CO 7 which would be an important regional connection for the US 287 BRT.

Longmont Main Street Corridor Plan

Adopted: October 2019
Agency: City of Longmont

The City of Longmont adopted the Longmont Main Street Corridor Plan to provide recommendations for multimodal enhancements along the corridor. The plan was done concurrently with the 1st and Main Station Transit and Revitalization Plan which promotes multi-modal transportation and supporting land uses for future BRT and commuter rail services. The 1st and Main Station plan identified Coffman Street was the potential BRT corridor within downtown as opposed to the Main Street (US 287). As a result, Coffman Street was considered as the primary transit corridor as part of the US 287 study to allow for potential connections to other transit services. The Longmont Main Street Corridor Plan also identifies several opportunities for infill and mixed-use development along Main Street. These opportunities for supporting land uses along the corridor could generate ridership for the US 287 BRT and provide opportunities for Transit Oriented Development (TOD).

Boulder County Transportation Master Plan

Adopted: February 2020
Agency: Boulder County

The Boulder County Transportation Master Plan (TMP) was adopted in February 2020. The plan is intended to identify transportation improvements that will be needed to meet future transportation needs within the county.

In the plan, US 287 was identified as one of the key north-south travel corridors in the county. As a key travel corridor US 287 was identified as one of the best opportunities to develop a multimodal corridor to serve internal travel between county communities and regional travel that begins or ends outside the county.

The plan also classified US 287 as a major regional corridor that is anticipated to experience moderate population and employment growth, especially in the northern section of Boulder County. It is noted that US 287 serves as the local Main Street through Longmont and that the City of Longmont is in the process of completing a Main Street Corridor Plan which will set the vision for the future of this corridor.

Additionally, the Boulder County TMP also identifies several improvements that are recommended for implementation along US 287, including:

- Local transit connections
- New Park-n-Ride facilities
- Park-n-Ride capacity improvements
- Bus stop enhancements and first mile/last mile amenities
- Queue jump lanes
- Bike storage
- Transit Signal Priority (TSP)
- Bikeable shoulders
- Multi-use paths
- Grade-separated crossings for bicyclists and pedestrians
- Intersection improvements for multimodal safety and operations
- Signal detection
- Crossing improvements

RTD North Team Service Analysis & State Highway 119 BRT Feeder Plan

Adopted: December 2019
Agency: RTD

In 2020, RTD performed an analysis to take a broad network based approach to identify areas for optimizing local bus service and creating a system in Longmont to connect with proposed BRT. The local changes presented would occur simultaneously with the opening of CO 119 BRT system.

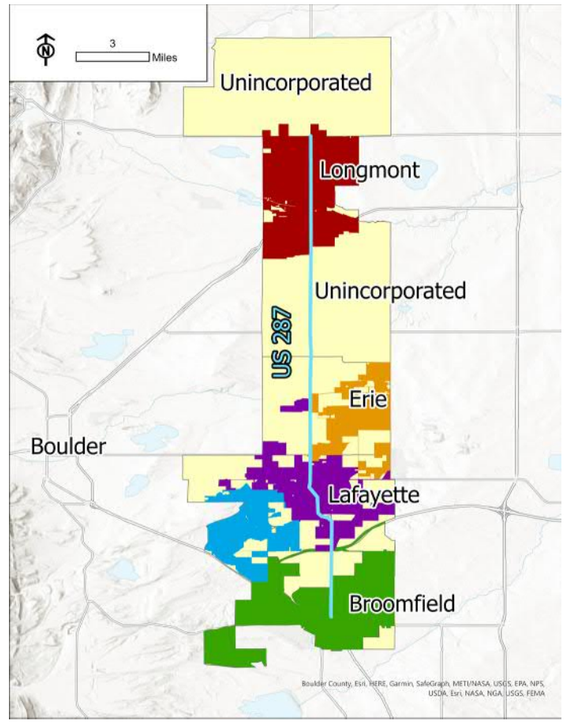
3.2 EXISTING CONDITIONS

As a 20-mile corridor, the study area for the US 287 BRT contains a diverse representation of demographics and transportation needs. The purpose of this section of the report is to analyze the existing conditions of the study area and summarize key findings that will inform later stages of the study.

The study area that is used throughout the Existing Conditions report is based on Census Tracts that are within two miles from the US 287 corridor. There are four municipalities that are located within the boundary of the study area: Longmont, Erie, Lafayette, and Broomfield. Figure 12 depicts the study area boundary as well as the areas within the boundary that are incorporated into the municipalities.

The following analysis uses this study area as the basis for determining the characteristics of the demographics that the US 287 corridor would serve. Additionally, this report includes documentation of the existing transportation conditions and infrastructure on the US 287 corridor, including information on the existing transit routes, pedestrian facilities, existing bicycle facilities, and traffic conditions within the study area.

Figure 12: Municipalities within Project Study Area



3.2.1 POPULATION DENSITY

The population within the study area is primarily concentrated within the municipal boundaries of the cities and towns along the corridor. As shown in Figure 13, the Downtown Longmont area has the highest population density within the study area. The rest of the population on the corridor is primarily concentrated around the south section of the study area where Broomfield and Lafayette are located, with a smaller concentration in Erie near the center of the study area. The unincorporated area between Erie and Longmont has the lowest population density within the study area.

Figure 13 also includes statistics on projected growth for each of the areas along the corridor. Erie is forecasted to have the highest percentage of growth, with its population expected to grow 213 percent between 2015 and 2045. The unincorporated area is also forecasted to have a high amount of population growth, with its population expected to grow 79 percent between 2015 and 2045.

Figure 13: Study Area Population Density

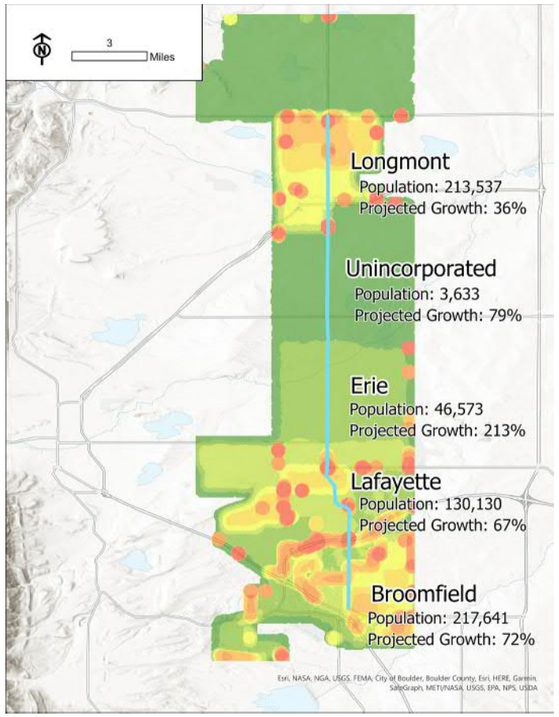
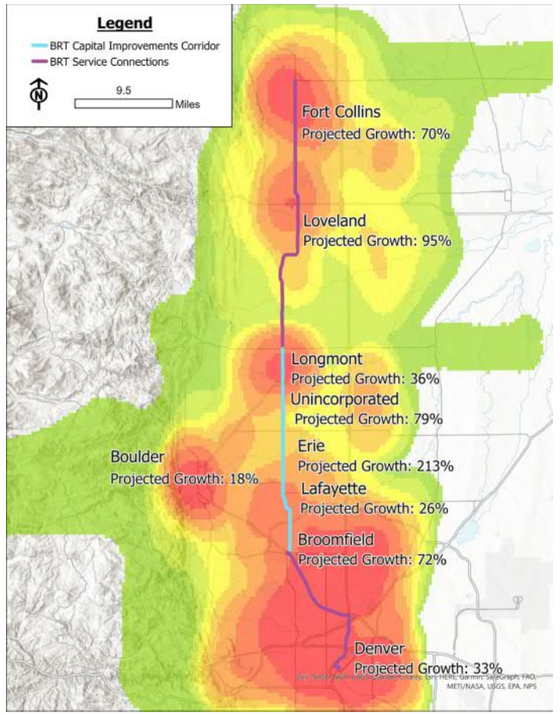


Figure 14: Regional Population Density



Projected growth rates are based on the 2015 and 2045 Statewide Model Traffic Analysis Zone land use data

As explained in Section 1, the US 287 BRT feasibility analysis includes service connections to Fort Collins and Denver. As a result, Figure 14 shows the population density for the larger region to demonstrate the potential demand for the service improvements. Figure 14 also includes statistics on the projected growth for the larger municipalities in the region.

Quick Facts about Population within the Study Area

147,897
people in study area (Longmont to Broomfield)

59,399
households in study area (Longmont to Broomfield)

Projected regional growth: **47%**

Projected study area growth: **75%**

3.2.2 MINORITY POPULATION AND LANGUAGES SPOKEN

Of the population within the study area, 24 percent of the population identifies as non-white. As shown in Figure 15, approximately 16 percent of the population within the study area identifies as Hispanic, making it the second most predominant race ethnicity within the study area after Caucasian.

5%
of the corridor population speaks English **"Less than Very Well"**

Figure 15: Racial Breakdown of Study Area

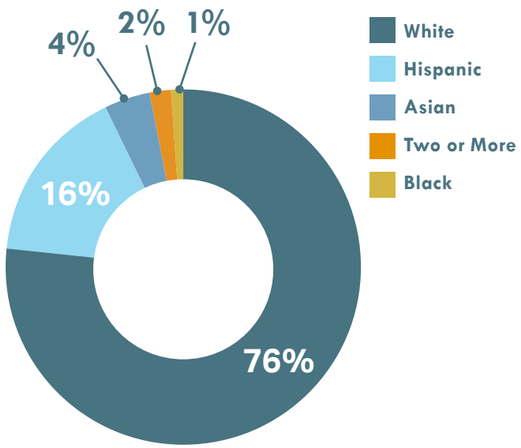
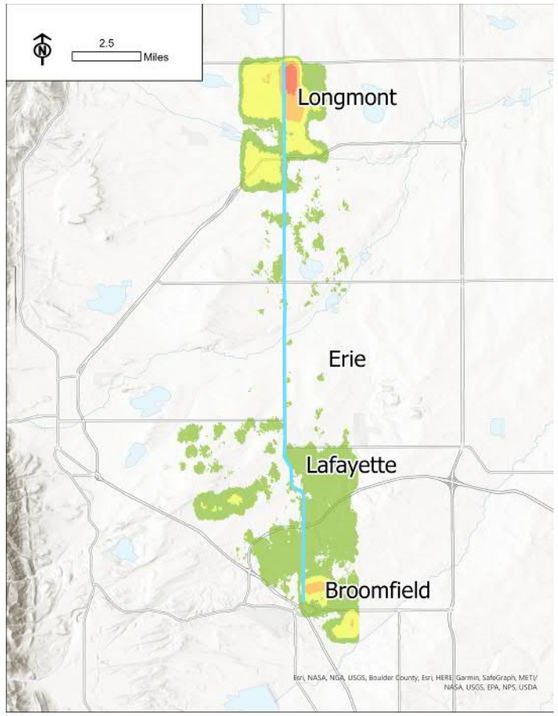


Figure 16: Concentrations of Populations that Speak English "Less Than Very Well" in the Study Area



In terms of English proficiency within the study area, approximately five percent of the population is categorized as speaking English "less than very well." As shown in Figure 16, the majority of the population people that speaks English "less than very well" are concentrated in Longmont. Most households on the corridor primarily speak English; however, there is also a prevalent Spanish-speaking community accounting for approximately ten percent, making Spanish the second most common language spoken within the study area after English.

3.2.3 AGE

There is a diversity of age groups that live within the study area. Of the population in the study area, approximately 23 percent are in an age group that puts them at higher risk for having mobility limitations.

Aging populations are defined as populations that are 65 years old or older. Approximately 14 percent of the population in the study area are in the aging population age group. As shown in Figure 17, most of the population that is 65 or older is concentrated in Longmont and Broomfield. There are also several senior facilities that are located within the study area that are shown as purple stars in Figure 17.

Approximately 9 percent of the population within the study area are enrolled in either high school or an undergraduate program. As shown in Figure 18, there are students in all four of the municipalities within the study area. There are also numerous high school (blue triangles) and colleges (purple stars) within the study area.

Additionally, the median age of the study area is 38.2. Figure 19 demonstrates the overall age group distribution within the study area.

Figure 17: Aging Population within Study Area

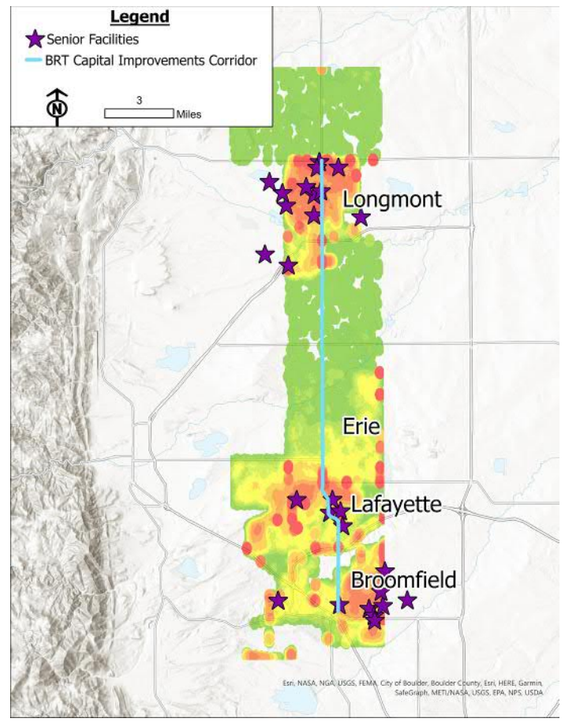


Figure 18: Populations Enrolled in High School or College Within Study Area

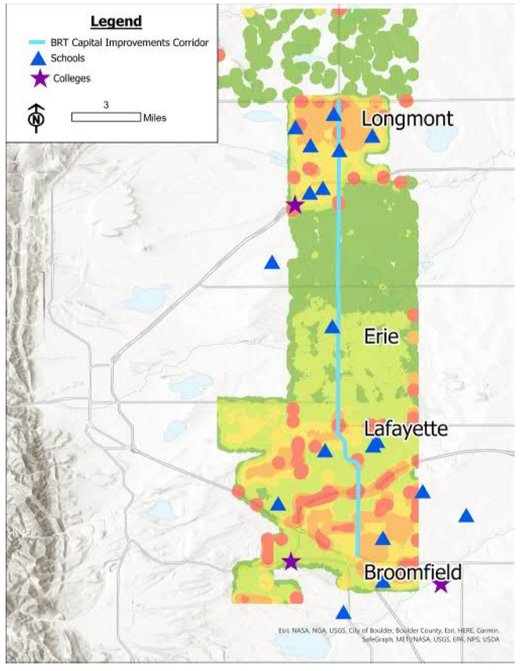
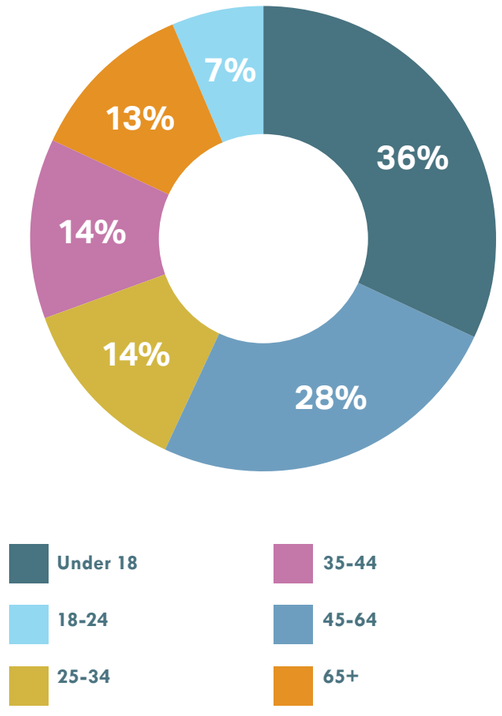


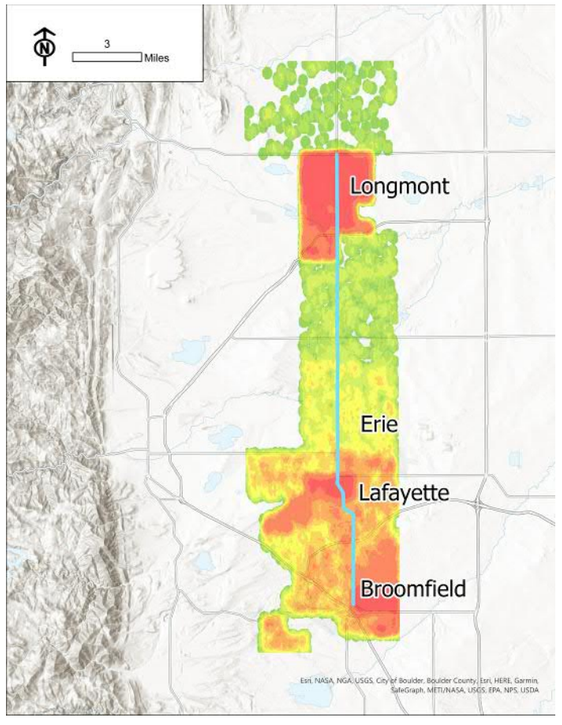
Figure 19: Age Group Distribution within Study Area



38.2
Median Age

32%
Population in a Mobility Challenged Age Group

Figure 20: Concentrations of People with Disabilities within Study Area



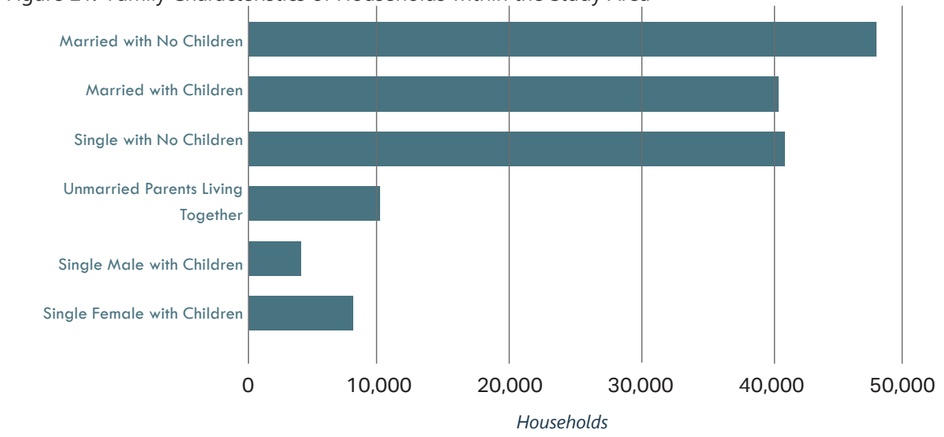
3.2.4 PEOPLE WITH DISABILITIES

Some disabilities prevent people from operating a motor vehicle, and people with unique mobility needs may benefit from high-quality public transit. Within the study area, there are a reported 14,800 people who have a documented disability, accounting for approximately 9.8 percent of the population. Most of the populations that have a documented disability are concentrated in Longmont, Lafayette, and Broomfield, as shown in Figure 20.

3.2.5 SINGLE PARENT FAMILIES

Of the households within the study area, approximately seven percent are single parent households. The single parent households are scattered throughout the corridor, with most of them being located within the incorporated areas on the corridor. The majority of the single parent households (approximately 70 percent) are single mothers. Figure 21 summarizes the family characteristics of households in the study area.

Figure 21: Family Characteristics of Households within the Study Area



3.2.6 EMPLOYMENT DENSITY AND COMMUTING PATTERNS

The jobs that are within the study area are primarily located within Longmont, Broomfield, and Lafayette. As shown in Figure 22, Longmont has the highest employment density near its downtown. Broomfield also has high densities of jobs west of US 287.

As explained in Section 1, the US 287 BRT feasibility study includes service connections to Fort Collins and Denver. Figure 23 shows the employment density for the larger region to demonstrate the potential demand for the potential service improvements. Figure 24 also includes statistics on the projected growth for the larger municipalities in the region.

Based on an analysis of commuting patterns within the study area, most commuters who live in the study area tend to travel south, southwest, and southeast for work. This indicates that many people who live in the study area work in the Denver metropolitan area. Figure 25 demonstrates the direction workers traveled to get to their job from the study area. Figure 25 shows the employment centers people are traveling to within the region.

Figure 22: Concentrations of Jobs within Study Area

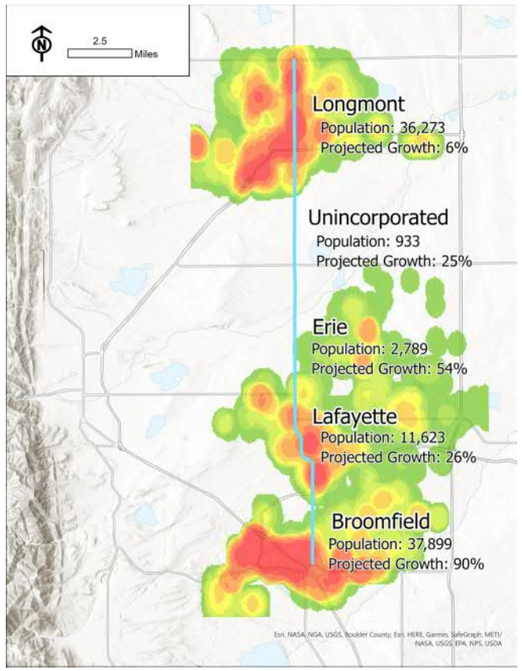
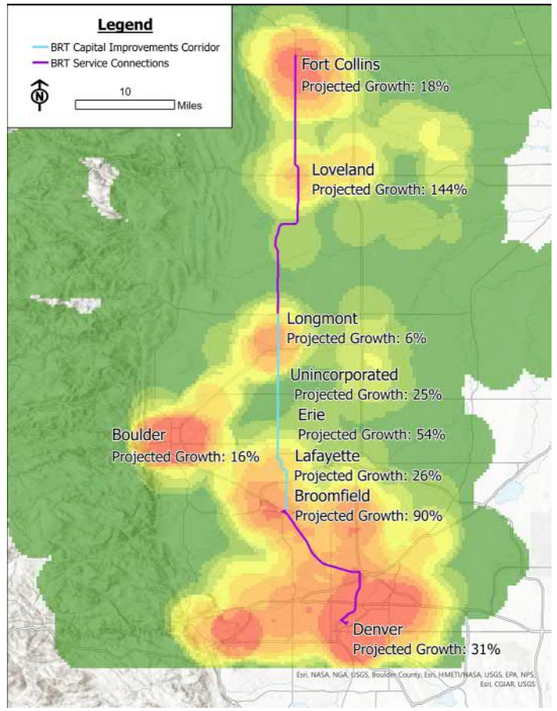


Figure 23: Concentrations of Jobs within Region



Projected growth rates are based on the 2015 and 2045 Statewide Model Traffic Analysis Zone land use data

Figure 24: Concentrations of Jobs within Region

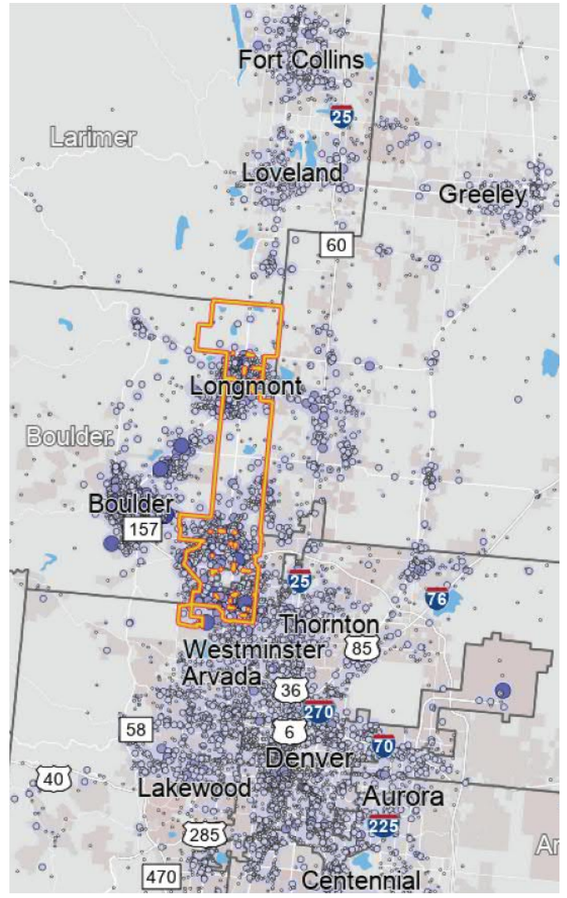
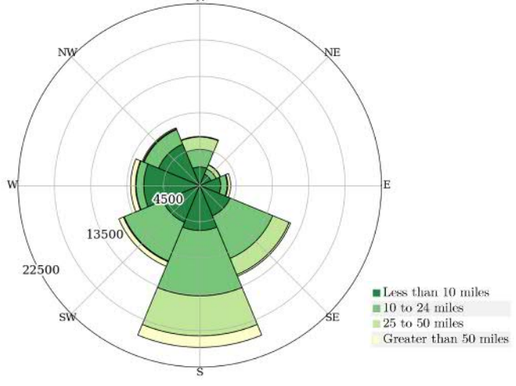


Figure 25: Distance/Direction of Jobs for People who Live Within the Study Area



3.2.7 INCOME

The median household income for the study area is $86,576. Of the municipalities within the study area, Erie has the highest median income of $103,558. Lafayette had the lowest median income of $62,985, as shown in Figure 26. While the median income of the corridor is above the state average, approximately 8.5 percent of the households within the study area are below the poverty line. Longmont has the highest concentration of populations below the poverty line of the municipalities within the study area.

3.2.8 VEHICLE OWNERSHIP

Most households in the study area own two vehicles, with approximately 41 percent of households owning two vehicles. While most households own at least one vehicle, there are 2,858 households in the study area that do not own a vehicle. Longmont has the highest concentration of car-free households, with 718 households that do not own a vehicle. Figure 27 summarizes the household vehicle ownership within the study area.

Figure 26: Median Income within Study Area

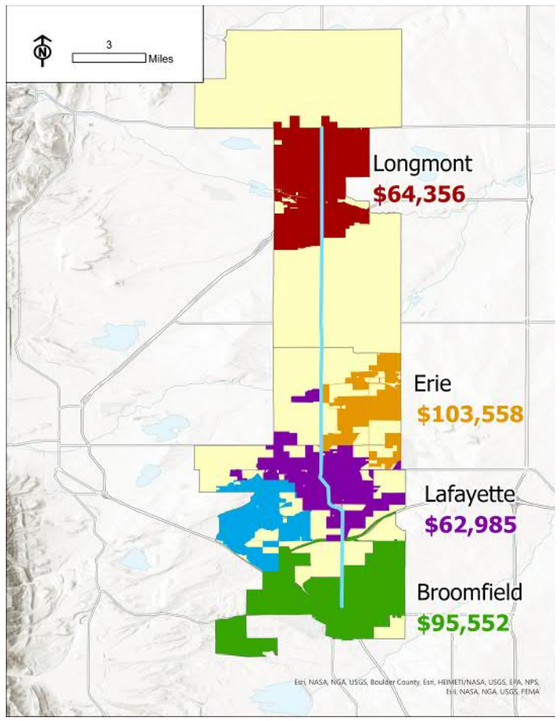
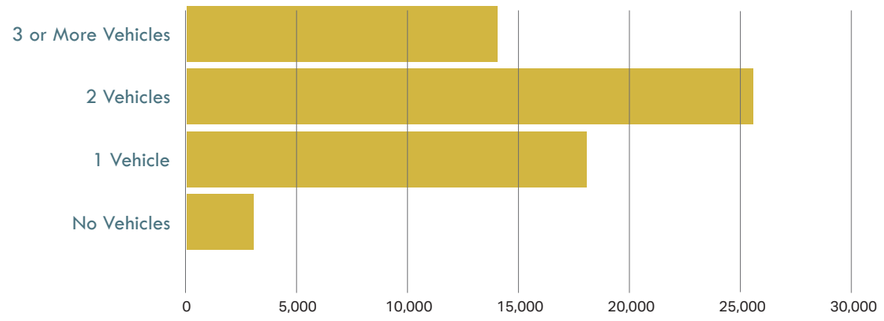


Figure 27: Household Vehicle Ownership within Study Area



3.2.9 TRAVEL PATTERNS

Understanding travel patterns provides important insights about the existing transportation needs of the region. Boulder County worked with Teralytics data which uses anonymous information from cell phone towers to provide valuable information on where, when and why people are traveling. Teralytics provides a comprehensive data set that includes all trips within the region, regardless of mode. This gives a holistic view of the origin-destination patterns in the region and allowed Boulder County to identify the trip patterns of potential riders. The following sections summarize the key findings from the origin-destination analysis.

Regional Travel Patterns

As shown in Figure 28 and Table 7, there are thousands of people traveling each weekday both within the study area and to regional destinations. The most common type of travel was trips that both started and ended within the study area. This indicates that there is a high demand for trips between Broomfield, Lafayette, Erie, and Longmont. Additionally, there were a significant number of trips that started within the study area and ended at other destinations. As highlighted on Figure 28, there were more than 20,000 daily trips that started within the study area and ended in Fort Collins, Loveland, or Denver. These trips demonstrate that there is a need for north-south connectivity throughout the region.

Figure 28: Regional Travel from the Study Area

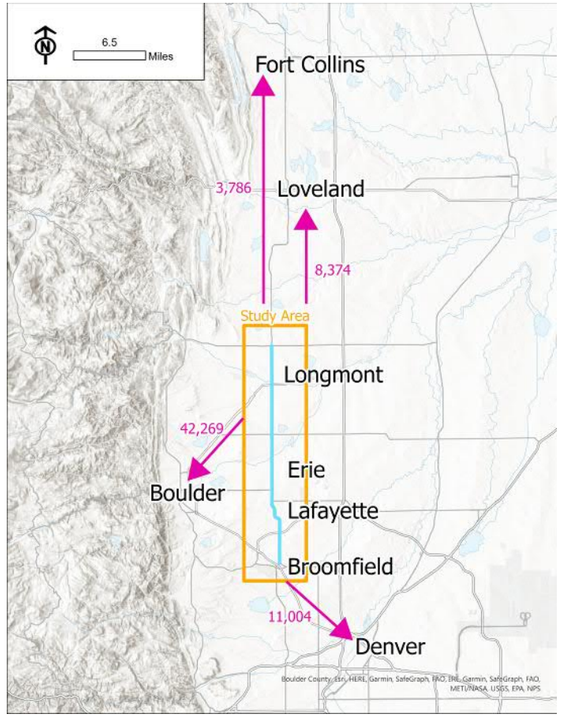


Table 7: Top Destinations from the Study Area

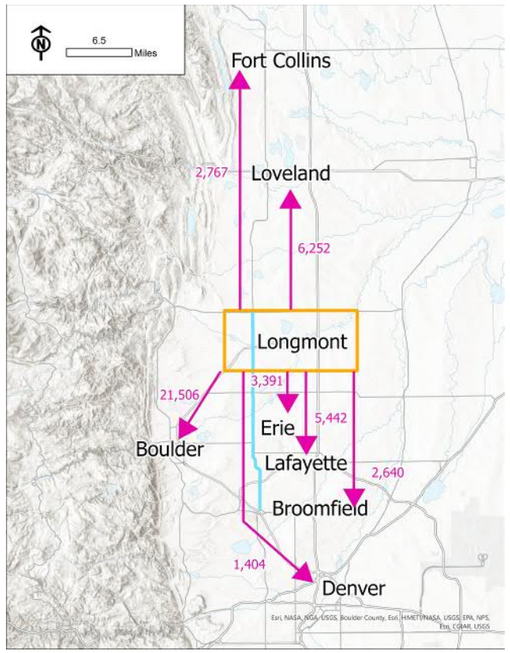
Rank	Destination	2019 Average Weekday Trips
1	On Corridor	133,895
2	Other Destinations	118,441
3	Boulder	42,269
4	Downtown Denver	11,004
5	Loveland	8,374
6	Fort Collins	3,786

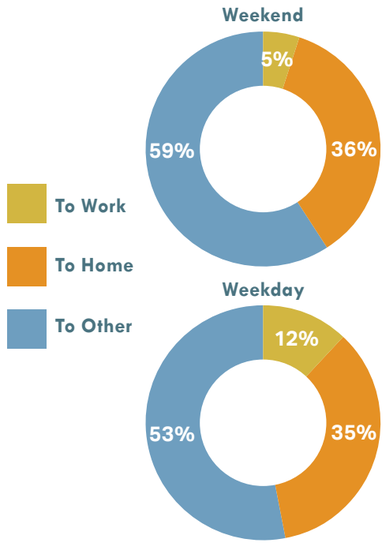
Longmont Travel Patterns

On a typical weekday, there are nearly 120,000 trips that originate in Longmont. Of those trips, approximately 59,000 trips end in the study area. As shown in Figure 29, over 11,000 trips that originate in Longmont end in Erie, Lafayette, or Broomfield. An additional 10,000 trips that originate in Longmont end in Fort Collins, Loveland, or Denver. This indicates that there is significant demand on weekdays for north-south travel destinations.

The average trip length of trips originating in Longmont is 10.8 miles. This indicates that most destinations are not within walking distance from their origin. Of the weekday trips, 12 percent of trips were to a work destination, 35 percent of trips were to a home destination, and 53 percent of trips were to other destinations.

Figure 29: Regional Travel from Longmont





How far are people traveling?

10.8 miles

Average Trip Length

Potential Transit Trips

1,197

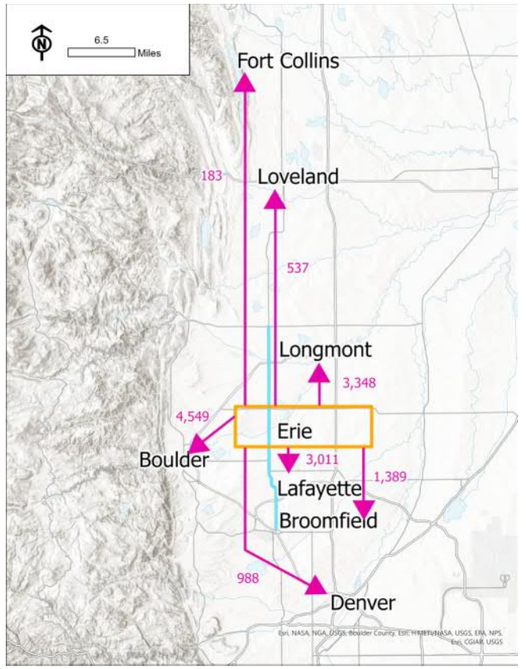
Potential Weekday Trips if 1% of trips were completed via transit

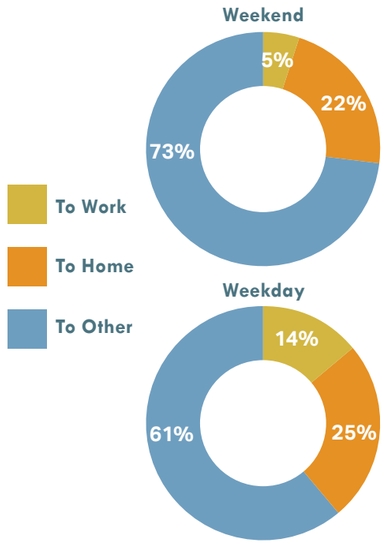
Erie Travel Patterns

On a typical weekday, there are nearly 26,000 trips that originate in Erie. Of those trips, approximately 14,000 trips end at a location outside of Erie. As shown in Figure 30, over 7,700 trips that originate in Erie end in Longmont, Lafayette, or Broomfield. An additional 1,700 trips that originate in Erie end in Fort Collins, Loveland, or Denver.

The average trip length of trips originating in Erie is 11 miles. This indicates that most destinations are not within walking distance from their origin. Of the weekday trips, 14 percent of trips were to a work destination, 25 percent of trips were to a home destination, and 61 percent of trips were to other destinations.

Figure 30: Regional Travel from Erie





How far are people traveling?

11.0 miles

Average Trip Length

Potential Transit Trips

261

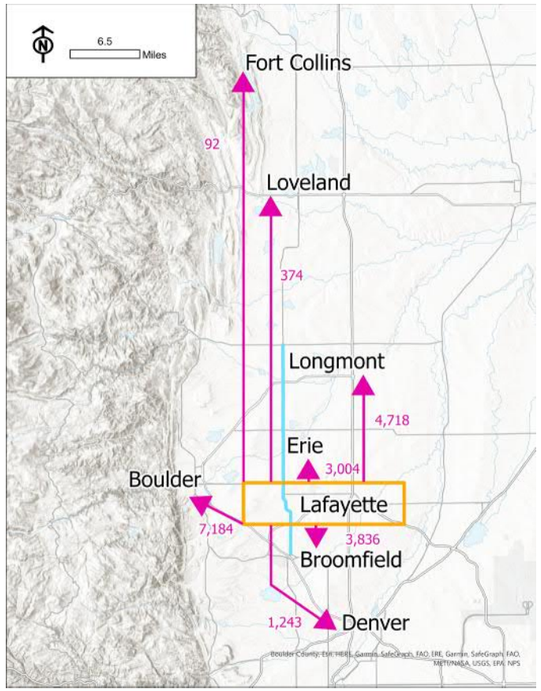
Potential Weekday Trips if 1% of trips were completed via transit

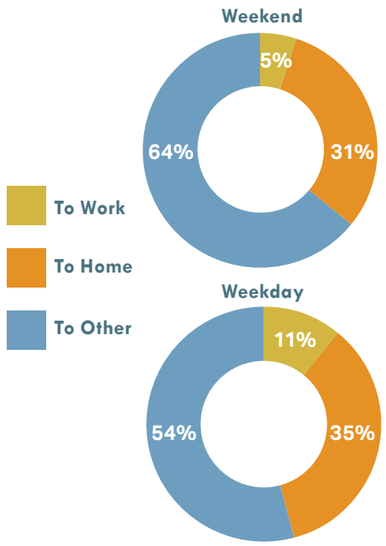
Lafayette Travel Patterns

On a typical weekday, there are nearly 34,000 trips that originate in Lafayette. Of those trips, approximately 55,000 trips end in the study area. As shown in Figure 30, over 11,000 trips that originate in Lafayette end in Erie, Longmont, or Broomfield. An additional 1,700 trips that originate in Lafayette end in Fort Collins, Loveland, or Denver.

The average trip length of trips originating in Lafayette is 9.8 miles. This indicates that most destinations are not within walking distance from their origin. Of the weekday trips, 11 percent of trips were to a work destination, 35 percent of trips were to a home destination, and 54 percent of trips were to other destinations.

Figure 31: Regional Travel from Lafayette





How far are people traveling?

9.8 miles

Average Trip Length

Potential Transit Trips

344

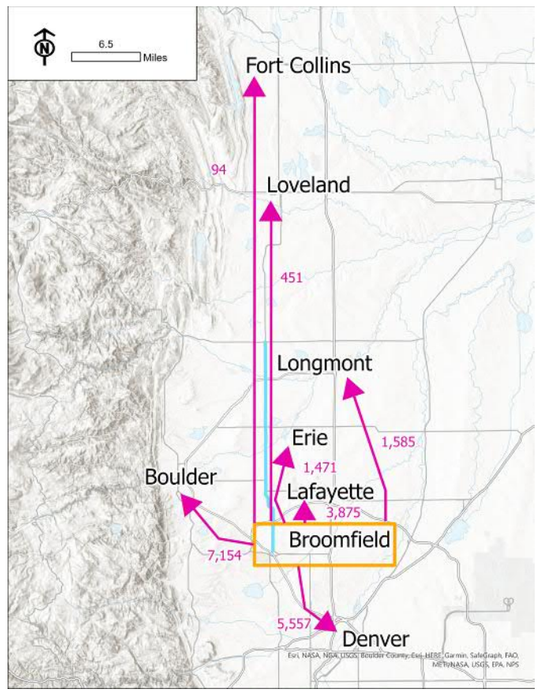
Potential Weekday Trips if 1% of trips were completed via transit

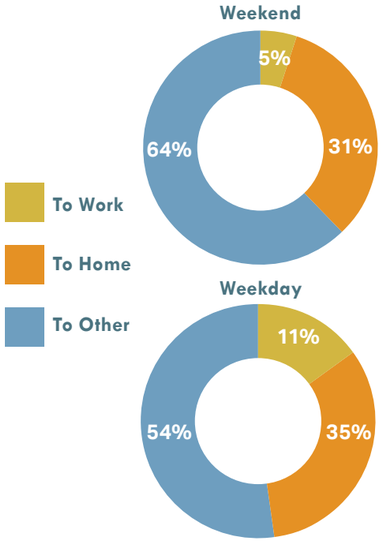
Broomfield Travel Patterns

On a typical weekday, there are nearly 60,000 trips that originate in Broomfield. Of those trips, approximately 54,000 trips end in the study area. As shown in Figure 31, nearly 7,000 trips that originate in Broomfield end in Erie, Longmont, or Lafayette. An additional 6,000 trips that originate in Broomfield end in Fort Collins, Loveland, or Denver.

The average trip length of trips originating in Broomfield is 8.7 miles. This indicates that most destinations are not within walking distance from their origin. Of the weekday trips, 15 percent of trips were to a work destination, 33 percent of trips were to a home destination, and 52 percent of trips were to other destinations.

Figure 32: Regional Travel from Broomfield





How far are people traveling?

9.8 miles

Average Trip Length

Potential Transit Trips

344

Potential Weekday Trips if 1% of trips were completed via transit

3.2.10 TRANSIT

There are several existing transit routes that serve the study area and provide a variety of services. Understanding the performance and operations of these existing routes is a critical step in the planning a successful BRT route on US 287 as several of these existing routes will be important transfer points for the BRT. The performance of the existing routes is a strong indicator of what is working well in the area as well as where they may be areas to improve transit operations. Table 8 summarizes the existing transit routes in the study area and their relationship to the US 287 corridor as well as their average 2019 weekday ridership.

Table 8: Existing Transit Routes within Study Area*

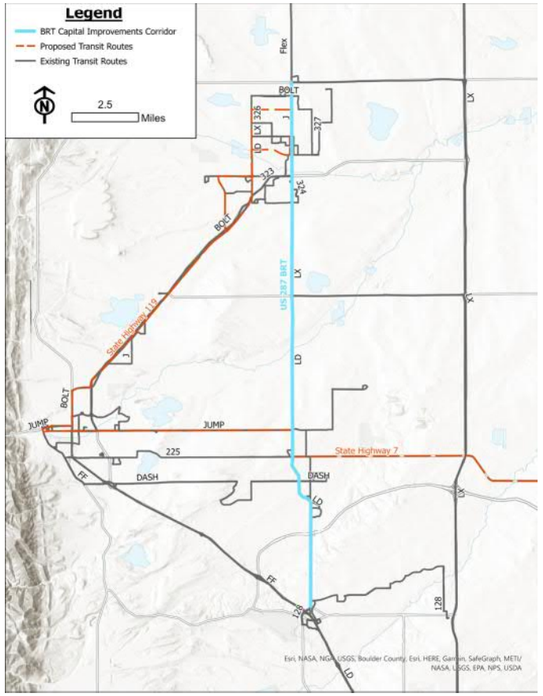
Route	Description	Service Type	Relationship to US 287 Corridor	Daily Weekday Ridership
76	Wadsworth Blvd	Suburban Local	Transfer Opportunity	3,530
112	Broomfield 112th Avenue	Suburban Local	Transfer Opportunity	262
120	Broomfield 120th Avenue	Suburban Local	Transfer Opportunity	691
128	Broomfield/ Wagon Road	Suburban Local	Transfer Opportunity	278
225	Boulder/ Lafayette via Baseline	Suburban Local	Transfer Opportunity	1,459
323	Skyline Crosstown	Suburban Local	Transfer Opportunity	423
324	Main Street	Suburban Local	Transfer Opportunity, aligned with US 287 for a portion of the route	1,216
326	Westside Crosstown	Suburban Local	Transfer Opportunity	355
327	Eastside Crosstown	Suburban Local	Transfer Opportunity	266
BOLT	Boulder/ Longmont	Regional	Transfer Opportunity, aligned with US 287 for a portion of the route	1,439
DASH	Boulder/ Lafayette via Louisville	Suburban Local	Transfer Opportunity	2,361
FlexRide	Interlocken FlexRide		Transfer Opportunity	Not Evaluated
J	Longmont/East Boulder/CU	Regional (Peak Only)	Transfer Opportunity	254
JUMP	Boulder/Lafayette via Arapahoe	Suburban Local	Transfer Opportunity	1,802
LD	Longmont/Denver	Regional	Transfer Opportunity, aligned with US 287 for a portion of the route	945
LX	Longmont I-25 Express	Regional	Parallel to US 287	461
Flatiron Flyer	Denver/Boulder BRT (all route patterns)	Regional BRT	Transfer opportunity	14,428

**Source: RTD August 2019*

In addition to the existing transit routes in the study area, there are also other planned BRT routes that could be critical transfer points in the future when they get implemented. The two proposed BRT routes that could connect to the US 287 BRT are the State Highway 7 BRT and the State Highway 119 BRT. Figure 33 shows where these planned routes would be located as well as the service routes of the existing transit services.

There are 75 existing bus stops located on US 287. Most of these bus stops are concentrated in the Longmont area, with 44 of the bus stops being located within the Longmont municipal boundary. The rest of the stops are scattered throughout the US 287 corridor with higher concentrations in Lafayette and Broomfield.

Figure 33: Existing and Planned Transit Routes within Study Area



Quick Pre-pandemic Facts about Transit Service within the Study Area

11
Suburban Local Routes

4
Regional Routes

1
Regional BRT Route on US 36

Several BRT Routes under study including CO 7 and CO 119

30,169
Existing transit riders who travel on US 287 or through a connecting US 287 bus stop on an average weekday

75
Existing bus stops on US 287

Source: RTD August 2019

In terms of ridership, all five of the highest performing stops are located in Longmont, as shown in Table 9 and Figure 34. While Longmont has the highest performing stops, Broomfield and Lafayette both have high performing stops that are within the top 10 high-performing stops on the corridor. These high performing stops include short trips on local service as well as regional trips between locations. A combination of local and regional transit demand at these stops demonstrates a high existing transit market in these locations.

Figure 34: 2019 Weekday Transit Ridership by Stop within Study Area

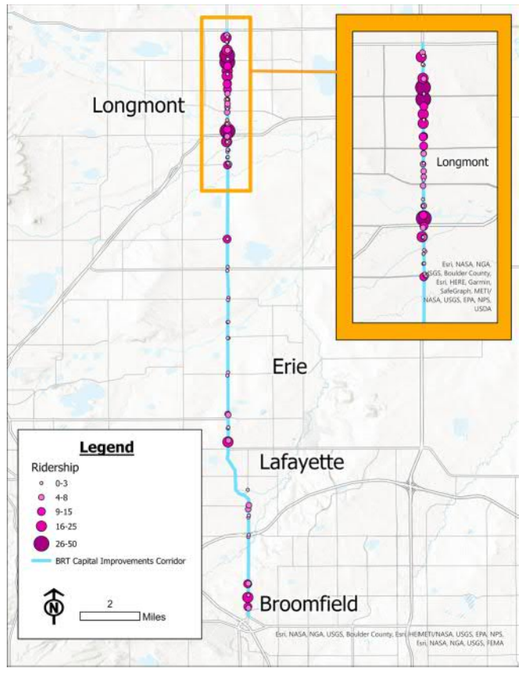


Table 9: 2019 Top 10 Highest Ridership Stop on US 287

Stop	Location	Service Type	2019 Weekday Ridership
Main St/17th Ave	Longmont	Regional	50
S Main St/Delaware Ave	Longmont	Regional	35
Main St/19th Ave	Longmont	Regional	25
Main St/20th Ave	Longmont	Regional	24
Longmont PnR	Longmont	Regional	21
Main St/15th Ave	Longmont	Regional	19
US 287/W 10th Ave	Broomfield	Regional	18
23rd Ave/Main St	Longmont	Local	17
US 287/Diamond Cir	Lafayette	Regional	15
Main St/Mountain View Ave	Longmont	Local	15

Source: RTD August 2019

Of the existing transit routes on the corridor, there are two routes that currently provide regional north-south connectivity between Denver and Longmont: the LD series and the LX. Since these two routes serve similar markets to the planned US 287 BRT, understanding the operational characteristics of these routes and their performance can highlight the existing market for regional service on US 287 as well as provide valuable insights on where there are currently reliability issues that can be addressed by infrastructure and technologies that will be evaluated at later stages of the feasibility study. The following sections analyze the operational characteristics and performance of the LD and LX routes.

LD and LX Operational Characteristics

The LD and LX both provide north-south regional connectivity between Denver and Longmont; however, there are distinct operational differences between the two routes. The LD runs along US 287 and provides transit services to Broomfield, Lafayette, and Erie in three different patterns. The LX, on the other hand, typically runs parallel to US 287 on I-25 and only makes stops in Denver and Longmont, providing express service. Some pre-pandemic LX service stopped at the Niwot/US 287 PnR as well before traversing to I-25.The service has yet to be restored.

3.2.11 EXISTING ROADWAY CONDITIONS

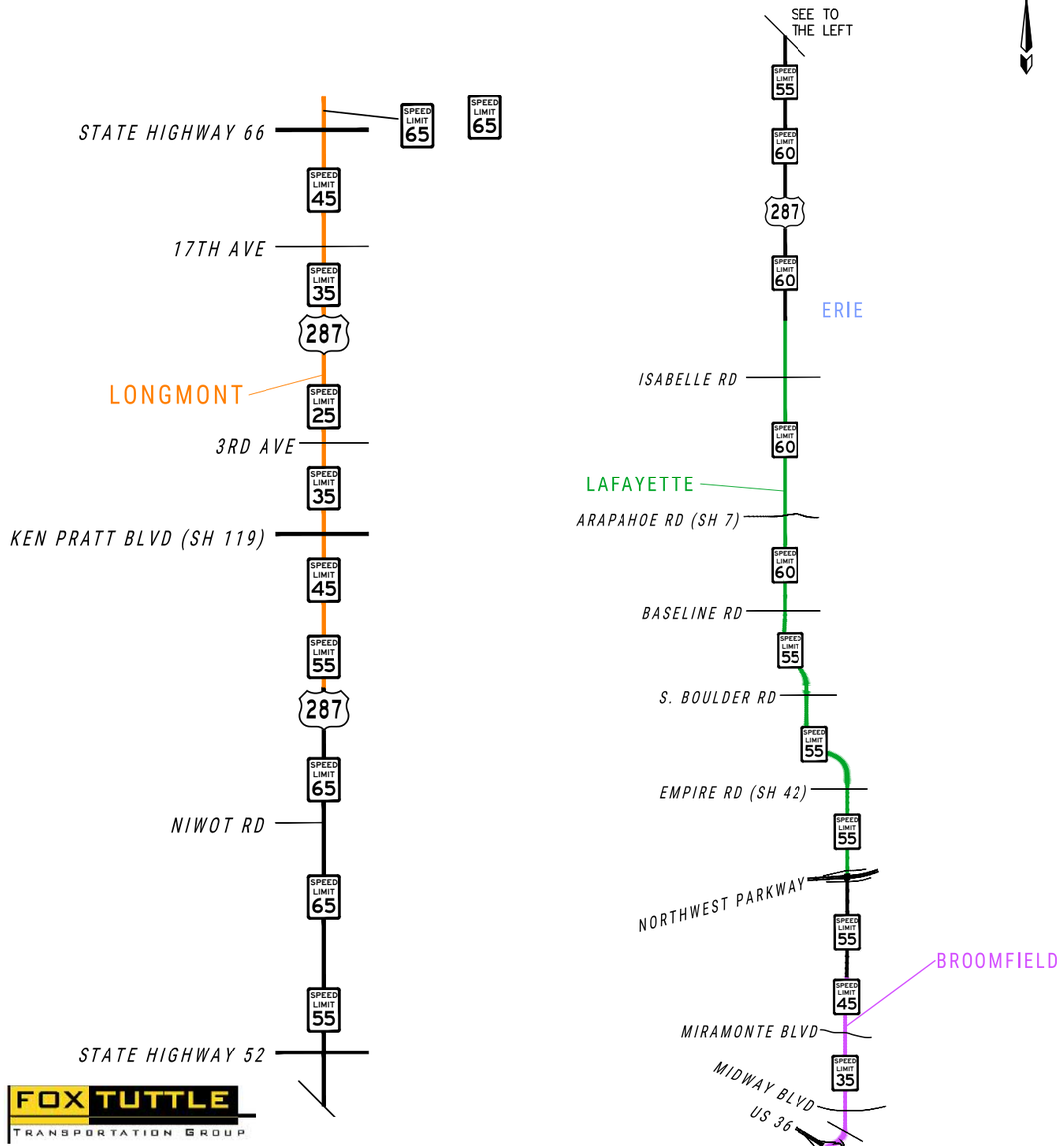
US 287 is a north-south highway that extends from Montana to Texas and serves as a major arterial route through the Front Range of Colorado, linking the communities of Longmont, Boulder County, Erie, Lafayette, and Broomfield through the 20-mile corridor study area. The Colorado Department of Transportation (CDOT) categorizes US 287 as a Rural Highway (R-A), Non-Rural Highway (NR-A), and Non-Rural Arterial Roadway (NR-B at various segments within the project corridor. The R-A category is largely characterized by a priority on regional access with higher speeds and more limited direct access, with the NR-B section (downtown Longmont more applicable to roadway segments with developed sections that allows more direct access to occur, with the NR-A category falling between these two in terms of throughput vs. access.

US 287 is predominantly a four-lane roadway (two through lanes in each direction along the project corridor, with some short six-lane segments within the City of Longmont. Left-turn and right-turn deceleration lanes are provided at major intersections and accesses throughout the corridor. There are 38 signalized intersections within the corridor and one signalized at-grade rail crossing (located just north of Broomfield):

- 20 signalized intersections located within the City of Longmont
- 6 signalized intersections in unincorporated Boulder County, including the signalized railroad crossing
- 9 signalized intersections in the City of Lafayette
- 4 signalized intersections in the City-County of Broomfield

The posted speed limit ranges from 25 miles per hour (mph) within downtown Longmont to 65 mph along more rural segments within unincorporated Boulder County. The existing speed limits are summarized on Figure 35.

Figure 35: Existing Speed Limits



3.2.12 EXISTING TRAFFIC VOLUMES

Daily vehicular roadway volumes and peak hour intersection turning movement volumes were compiled from available data sources and/or collected specifically for this project. The data includes both pre-COVID-19 and COVID-19-impacted Average Annual Daily Traffic (AADT) data from the CDOT Transportation Data Management System (TDMS) website, historic counts (2017 to 2019) from other projects along the corridor, and data made available by local agencies along the corridor. New counts were collected at several roadway segments and intersections along the corridor in November 2020 to compare to locations where pre-COVID-19 data was also available, to assess the impact that the COVID 19 pandemic has on traffic patterns and volumes within the study area.

Based on the CDOT TDMS data, daily traffic volumes range from 25,000 vehicles per day (vpd) in parts of unincorporated Boulder County and at the north end near State Highway 66 to nearly 48,000 vpd at the far south end of the corridor just north of US 36. The corridor services between 2.4% and 5.4% heavy trucks (as a percentage of the total daily traffic volume), with the higher truck percentages at the southern end of the corridor.

Comparisons of CDOT 2019 AADT volumes to November 2020 daily roadway counts at two locations (just north of CO 52 and just north of South Boulder Road) showed a 19% to 26% reduction in daily volume due to COVID-19 impacts and seasonal variation. However, a comparison of CDOT peak hour volumes at the same locations showed a reduction of 23% to 39% in peak hour volumes at South Boulder Road and a 42% to 43% reduction at CO 52, with the highest reductions in the AM peak hour. This is indicative of typical commuting peak hour commuting patterns being altered by the closure of many schools and businesses at the time of the November 2020 counts.

In order to provide a conservative estimate of "existing" traffic conditions in the corridor, and since the major of traffic data compiled was prior to the COVID-19 pandemic, pre-COVID-19 traffic data was utilized for this report (or new data was factored up to represent pre-COVID-19 conditions). The traffic data is summarized in Figure 36. This figure also shows the existing intersection lane geometry at 10 of the 38 signalized intersections along the corridor.

CDOT data projects traffic growth along the corridor at between 0.7% and 1.8% annually. In comparison, the Denver Regional Council of Governments (DRCOG) regional travel model forecasts between 0.2% and 1.0% annual growth in daily traffic volumes along the corridor, depending upon location.

3.2.13 EXISTING OPERATIONAL ASSESSMENT

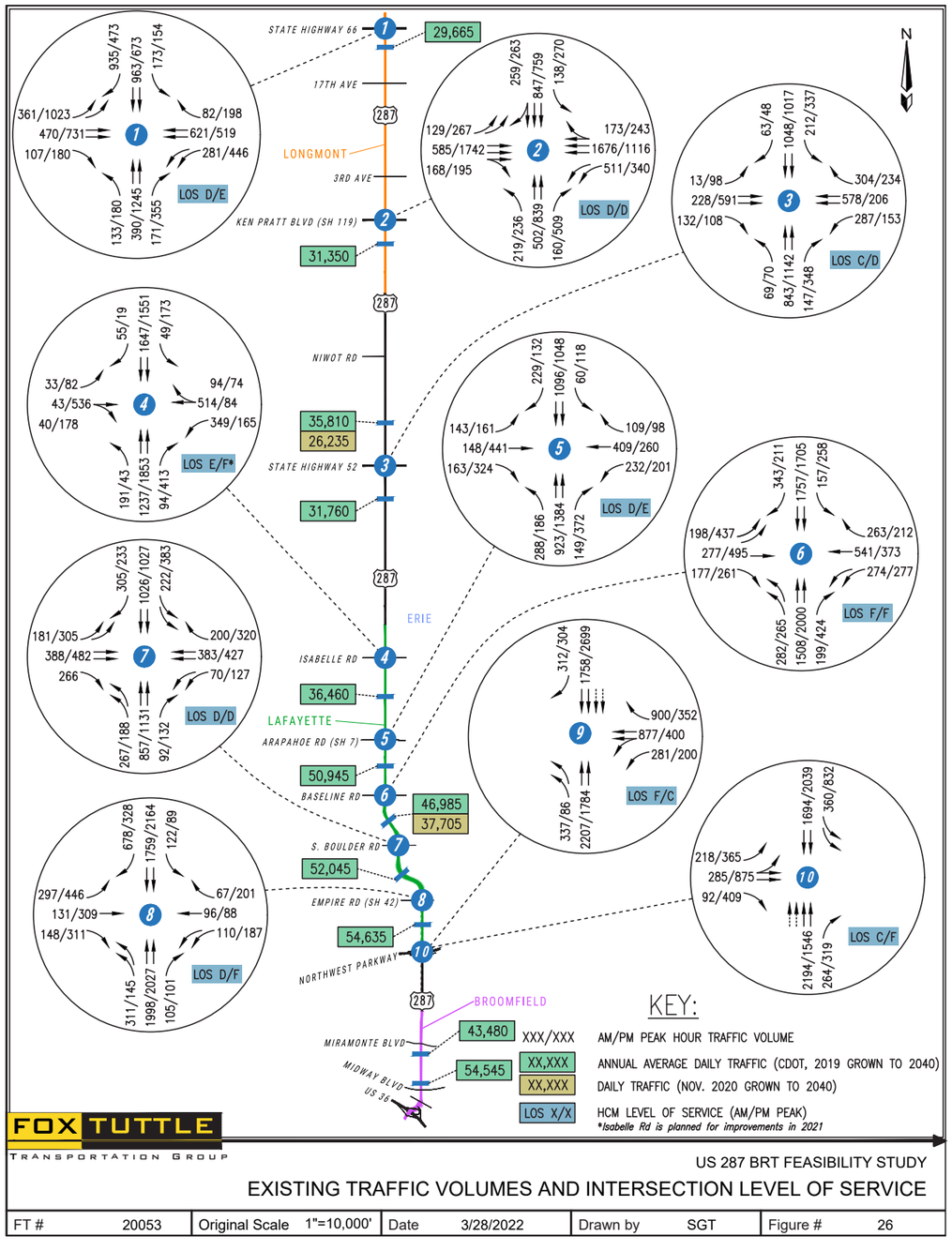
In determining the operational characteristics of a roadway segment or intersection, "Levels of Service" (LOS) A through F are applied, with LOS A indicating very good operations and LOS F indicating congested operations. Criteria contained in the Highway Capacity Manual (HCM) was applied to the existing intersection volumes to identify areas in the corridor that may be operating at or near theoretical capacity.

Overall AM and PM peak hour intersection LOS are summarized on Figure 36 for each of the ten intersections analyzed for this study. As shown, all intersections are operating at LOS D or better overall in the AM and PM peak hours, with the following exceptions:

US 287 & Isabelle Road is calculated to operate at LOS E in the PM peak hour with existing volumes. However, a multimodal improvement project has been recently completed that added additional accessory lanes on the eastbound and westbound approaches, bike lanes on Isabelle Road, traffic signal improvements, and pedestrian crossing improvements.

- US 287 & Baseline Road is calculated to operate at LOS F in the PM peak hour with existing volumes.
- US 287 & CO 42 is calculated to operate at LOS E in the PM peak hour with existing volumes.
- US 287 & Northwest Parkway/Dillon Road (North Ramps) is calculated to operate at LOS E in the AM peak hour with existing volumes. This intersection experiences a heavy westbound directional volume in the morning peak hour.
- US 287 & Northwest Parkway/Dillon Road (South Ramps) is calculated to operate at LOS F in the PM peak hour with existing volumes. This intersection experiences a heavy eastbound directional volume in the evening peak hour.

Figure 36: Existing Traffic Volumes and Intersection Level of Service



3.2.14 CHARACTER ZONES

The US 287 project corridor connects Broomfield and Longmont and in doing so, it crosses through urban, suburban and rural areas within Boulder County and City-County of Broomfield. One-size fits all recommendations are not appropriate for a corridor this long and diverse. Therefore, BRT recommendations will need to be tailored to the surrounding areas to make sure they are appropriate. Character Zones were developed based on the existing roadway layout, existing excess right-of-way and land use typologies. Existing Roadway Layouts were defined by the infrastructure elements that are currently within the roadway such as center medians, parking, shoulders and sidewalks. Existing right-of-way characteristics are defined as the amount of available space within the roadway corridor that is currently owned by the County and does not have existing infrastructure or other features within it. Lastly, Land Use characteristics are defined by the surrounding areas and whether those are predominantly rural (agricultural/open space); suburban (single-family homes and shopping centers); and urban (town centers and multifamily housing).

Boulder County has combined the different elements across the main categories to develop the 5 different Character Zones as seen in Table 10. The development of Character Zones enables Boulder County to make transportation service and infrastructure recommendations that best fit that area of the corridor.

Figure 37 demonstrates the segments of the corridor that fall into each of the existing roadway layout categories that are defined in Table 10. While the 9.6-mile rural segment of the corridor has a consistent roadway layout, the areas that are located within the cities on the corridor have more variation in their roadway layouts.

Figure 38 shows the right-of-way availability throughout the corridor estimated using GIS parcel data. Most of the corridor has moderate to wide right-of-way which could create opportunities for infrastructure improvements as part of the US 287 BRT project. Segments of the corridor that are in more urban contexts have narrower right-of-way and may be more limited in the improvements that could fit in the existing right-of-way.

Figure 39 demonstrates the variety of land use patterns along the US 287 corridor. While most of the corridor has rural or suburban land use patterns, there are segments in Longmont, Lafayette, and Broomfield that are urban.

Table 10: Character Zone Elements

Existing Roadway Layout	Right-of-Way	Land Use
TYPE 1: Town Streets	Narrow, Moderate	Urban
Physical median, on-street parking, and sidewalks		
TYPE 2: Suburban Streets	Moderate, Wide	Suburban
Physical median and sidewalks		
TYPE 3: Rural Highway	Moderate, Wide	Rural
Two-way turn lane and shoulder		
TYPE 4: Suburban Highway	Wide	Suburban
Physical median and shoulder		
TYPE 5: Suburban Arterial	Narrow, Moderate	Suburban
Two-way turn lane and sidewalks		

1 Physical Median, Sidewalks; 1.4 Miles
2 Two-Way Turn Lane, Sidewalks; 3.5 Miles
3 Physical Median, Sidewalks, On-Street Parking; 0.8 Miles
4 Two-Way Turn Lane, Shoulder; 9.6 Miles
5 Physical Median, Shoulder; 4.6 Miles

Figure 37: Existing Roadway Layout Categories

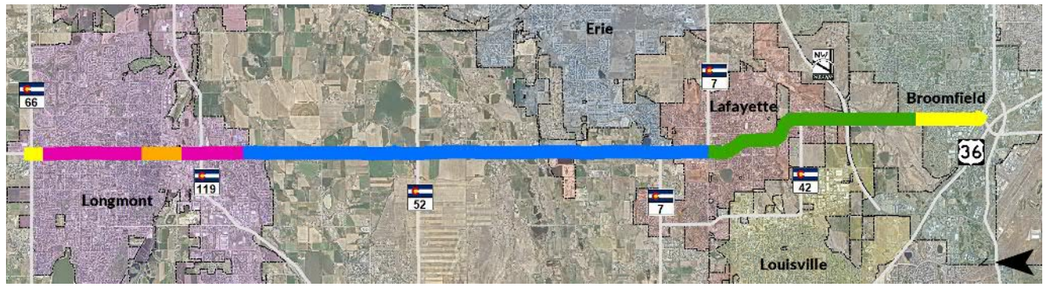


Figure 38: Right-of-way Availability

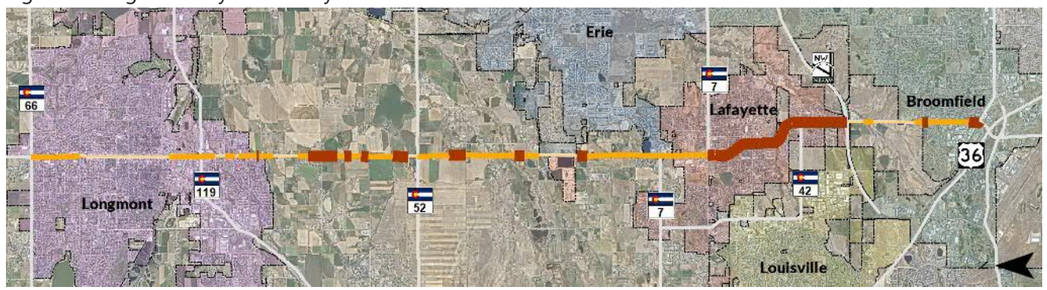
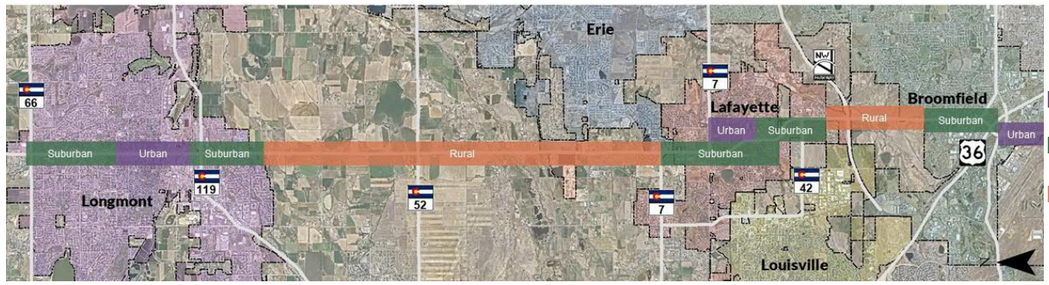


Figure 39: Land Use Patterns



RTD Customer Checking Time While Loading Bicycle

4. ALTERNATIVES DEVELOPMENT & EVALUATION

To select a recommended alternative, Boulder County and project partners identified several alignment, station, and guideway alternatives for BRT on US 287. The study looked at existing conditions and public preferences to develop a set of BRT service and alignment alternatives and associated benefits and impacts of treatments.

The following sections describe the methodology that was used to select a recommended alternative. The evaluation criteria identified for each step of the process relates to the goals and objectives identified for US 287 BRT Feasibility Analysis.

4.1 METHODOLOGY

The NAMS was the precursor to this BRT Feasibility study. Based on the recommendations from the NAMS, the assumed transit mode most appropriate for the corridor is BRT. Using this assumption as a starting point, a two-tier evaluation process was used to define and evaluate alternatives, treatments, and service as shown in Table 11.

Table 11: Two Tier Evaluation Process

1 - Alignment Screening

- Potential alignments defined and evaluated for each geographic section of the corridor
- Stakeholder driven selection process based on local plans, interviews, and evaluation
- Results in a recommended alignment to be evaluated in Tier 2, but does not eliminate alignments from further consideration later in the process

2 - Treatments and Service

- Focused on one recommended alignment as a result of Tier 1 screening
- Service patterns and specific capital investments evaluated
- Ridership modeling conducted on limited number of alternatives
- Capital and O&M cost considerations evaluated

This tiered screening process defines and organizes in the following categories:

- **Segments:** Subsections of study corridor focused on the individual streets within a community.
- **Alignment:** The path a bus could use to reach the same start and end point (ex. Using Coffman versus Main Street in Longmont).
- **Patterns:** These define bus stop service patterns for scheduled trips. Multiple service patterns can run on a single alignment.
- **Scenarios:** Unique combinations of one or more service patterns and level of capital investments at intersections and along the corridor.

4.2 TIER 1 EVALUATION

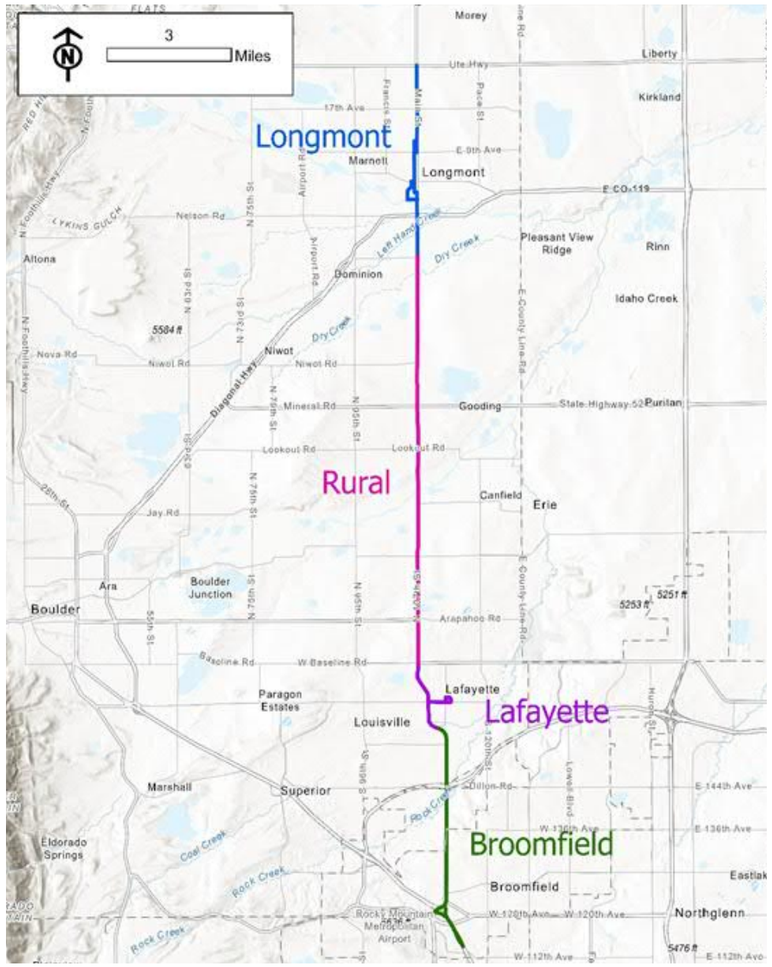
The first tier of the alternatives analysis defined alignment and stations for the corridor. As a more than 20-mile corridor, US 287 runs through a variety of roadway and land use contexts. For the purposes of this study, the corridor was segmented into four subareas based on existing roadway cross sections, land use density, and other characteristics as shown in Figure 40.

For each subarea, the project team developed alignment and station options. The following sections summarize the evaluation for each of the four segments of the corridor.

4.2.1 ALIGNMENTS

The alignments provide different corridor options of where the US 287 BRT could operate and provide service. At the Tier 1 level, alignment alternatives were developed for each of the four segments shown in Figure 40. The following sections describe the different alignment alternatives for each segment of the corridor and summarize the Tier 1 evaluation and results.

Figure 40: Tier 1 Evaluation Segments



4.2.1.1 Longmont

The Longmont segment of the corridor extends from Prospect Road to CO 66. As shown in Figure 41, the project team identified four potential alignments for the Longmont segment of the corridor.

Alignment 1 along US 287 between Prospect Road and CO 66 serves as Longmont's main street which means the bus would provide direct service to many of the businesses located in downtown Longmont; however, this alignment was ruled out because it does not align with the community's plan to utilize Coffman Street as the bus corridor through downtown.

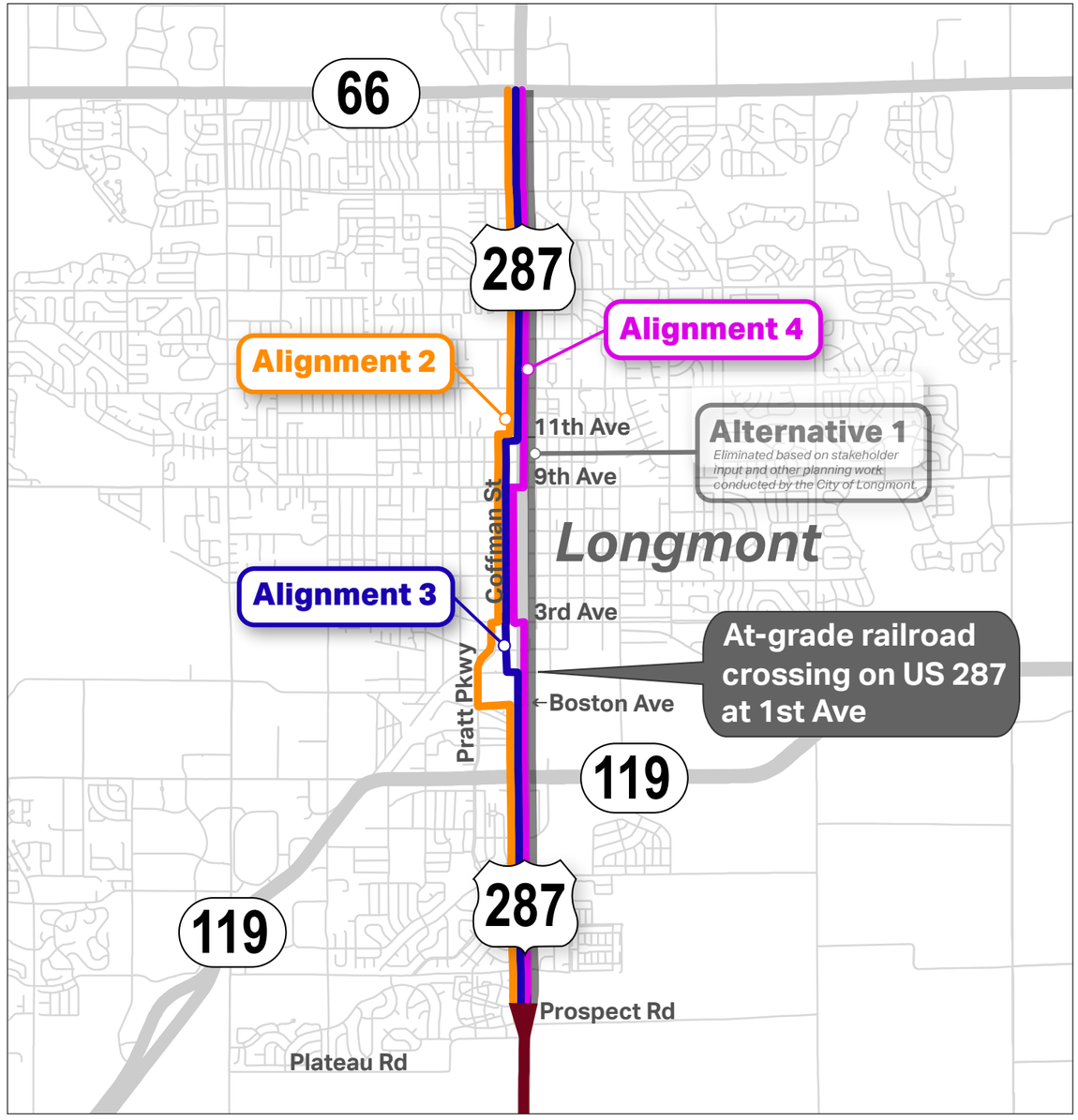
Alignment 2 would be along US 287 between Prospect Road and Boston Avenue. The bus would then use Boston Avenue, Pratt Parkway, and 3rd Avenue to get to Coffman Street. The bus would utilize the planned dedicated bus lanes and remain on Coffman Street until 11th Avenue. Then, the bus would use 11th Avenue to access US 287. The bus would remain on US 287 until CO 66. Using Pratt Parkway would allow the bus to use the existing grade-separated railroad crossing on Pratt Parkway which could help the bus avoid unexpected delays caused by the railroad. Having the alignment on Coffman between 3rd Avenue and 11th Avenue would be consistent with the city's planned transportation improvements. This could be used for detours during train delays.

Alignment 3 would be along US 287 between Prospect Road and 1st Avenue. The bus would then use 1st Avenue to access Coffman Street. The bus would utilize the planned dedicated bus lanes and remain on Coffman Street until 11th Avenue. Then, the bus would use 11th Avenue to access US 287. The bus would remain on US 287 until CO 66. Using 1st Avenue to access Coffman Street would make the bus cross the railroad tracks at-grade. This at-grade crossing could cause unexpected delays when trains pass through. The Coffman Street alignment would be consistent with the city's planned transportation improvements.

Alignment 4 would be along US 287 between Prospect Road and 3rd Avenue. The bus would then use 3rd Avenue to access Coffman Street. The bus would utilize the planned dedicated bus lanes and remain on Coffman Street until 9th Avenue. Then, the bus would use 9th Avenue to access US 287. The bus would remain on US 287 until CO 66. Using 3rd Avenue to access Coffman Street would avoid the at-grade rail crossing on Coffman Street and is just north of 1st Avenue. The Coffman Street portion would be partially consistent with the city's planned transportation improvements.

Prior to the Covid-19 pandemic, RTD operated an "LX" series that traveled from Longmont to Denver by way of I-25. This route was not thoroughly analyzed during this study because of uncertainty about how the planned mobility hubs on at I-25 and CO 119 and CO 7 will impact travel behavior. Transfers may be desired at these locations and RTD would need statutory changes to stop and provide transfers. This service option will require partnership and should continue to be examined.

Figure 41: Tier 1 Longmont Alignment



To evaluate which of the alignments should be carried forward to the Tier 2 screening, the project team developed evaluation criteria based on direction from the SWG. Table 12 summarizes how the Tier 1 Longmont segment alignments aligned with the selection criteria.

To determine the recommended alignment in Longmont, Boulder County interviewed Longmont staff, elected officials, and solicited feedback from the public on the alignments. Alignment 1 rwas emoved from consideration because it was inconsistent with other local plans for transit investment on Coffman Street. A common theme from public feedback was the importance of connecting the BRT alignment to development. Generally, the public preferred the BRT close to Main Street but not directly on it. The mixed use building between 1st and 2nd on Main and future planned rail station near 1st and Main were important considerations.

Table 12: Longmont Tier 1 Evaluation

	Alignment 1	Alignment 2	Alignment 3	Alignment 4
Description	**US 287/Main Street**	**US 287/Main Street - Boston Avenue - S Pratt Parkway - 3rd Avenue - Coffman Street - 11th Avenue - US 287/Main Street**	**US 287/Main Street - 1st Avenue - Coffman Street - 9th Avenue or 11th Avenue - US 287/ Main Street**	**US 287/Main Street - 3rd Avenue or 2nd Avenue - Coffman Street - 9th Avenue or 11th Avenue - US 287/Main Street**
Residents within 1/2 mile	13,183	13,405	13,322	13,335
Jobs within 1/2 mile	10,318	10,731	10,419	10,395
Character and ROW suited for dedicated lanes	Low	High	High	High
Travel time advantage	Medium	Medium	High	High
Ability to accommodate pedestrians	High	High	High	High
Ability to accommodate bicyclists	Medium	Medium	Medium	Medium
Economic Development Potential	Medium	High	High	High
Consistency with other local plans	Low	Medium	High	Medium
Stakeholder preference/opinion	Low	Medium	High	Medium
Other Fatal Flaw	No, but includes at-grade railroad crossing	No	No, but includes at-grade railroad crossing. Detour available on Pratt Pkwy	No, but includes at-grade railroad crossing
Existing transit activity	93	458	458	458
Tier 1 Screening Recommendation	**Eliminate**	**Recommended as detour route when trains block at-grade crossing**	**Recommended as primary route with southern extension of Coffman Street to Boston Avenue**	**Potential**

Based on the analysis summarized in Table 12 and the stakeholder and public input, it was recommended that Alignments 2 and 3 be carried forward to the Tier 2 evaluation. This evaluation resulted in the following:

- Alignments 1 was removed from consideration because it was not consistent with other local plans and did not have strong support from stakeholders.
- Alignments 2 with the modification that the bus would turn off US 287 on Boston Avenue instead of 1st Avenue would allow the bus to serve the planned transit station at 1st Avenue and Main Street.
- Alignments 3 would be the recommended alternative for the Longmont segment of the corridor and would be used most of the time; however, in the event that a train is blocking the at-grade crossing, the bus would use the Alignment 2 alignment.
- Alignment 4 could be a viable option if something changes with the local plans and context. It could be revisited during future planning studies should the need arise.

  A scroll plot was developed that demonstrated the recommended Longmont alignment that advanced to the Tier 2 evaluation. See Appendix D to review the scroll plot.

4.2.1.2 Rural

The rural segment of the corridor extends from the Longmont city boundary to the Lafayette city boundary. Due to the limited options of north-south corridors in the rural section of the corridor, only one alignment was identified for the rural segment, as shown in Figure 42. This alignment would be along US 287 between Lafayette and Longmont.

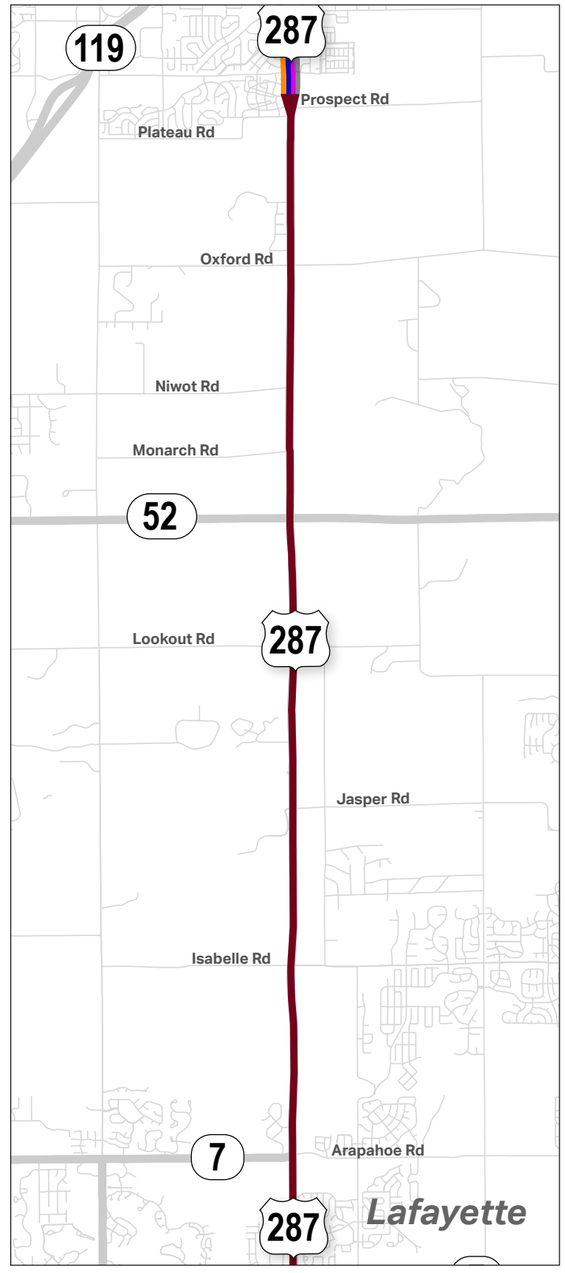
While there was only one alignment for the rural segment, the project team did evaluate the alignment based on the same Tier 1 evaluation criteria that was used to evaluate the other alignments for the other segments of the corridor. Table 13 summarizes the Tier 1 evaluation of the rural segment of the corridor.

Based on the Tier 1 evaluation, the rural segment alignment should be carried forward to the Tier 2 evaluation.

Table 13: Rural Segment Tier 1 Evaluation

Description	Alignment 1
	US 287
Residents within 1/2 mile	5,977
Jobs within 1/2 mile	1,398
Character and ROW suited for dedicated lanes	Medium
Travel time advantage	Medium
Ability to accommodate pedestrians	Low
Ability to accommodate bicyclists	Low
Economic Development Potential	High
Consistency with other local plans	Medium
Stakeholder preference/opinion	High
Other Fatal Flaw	No
Existing transit activity	56
Tier 1 Screening Recommendation	**Recommended**

Figure 42: Tier 1 Rural Alignment



4.2.1.3 Lafayette

The Lafayette segment of the corridor extends from CO 7 to Northwest Parkway. As shown in Figure 43, the project team identified three potential alignments for the Lafayette segment of the corridor.

Alignment 1 would be along US 287 between CO 7 and Northwest Parkway. As a highway, US 287 allows faster speeds than alignments that deviate onto the local roadway network. However, staying on US 287 would not connect passengers with downtown Lafayette and the many businesses that are located on Public Road nor would it serve the Lafayette Park-n-Ride that is located near the Public Road and South Boulder Road intersection.

Alignment 2 would be along US 287 before turning north onto Public Road. The bus would remain on Public Road which would connect passengers with the many businesses along the corridor. The bus would then use Baseline Road to return to US 287, and a southbound bus would follow the same alignment in reverse. This alignment would serve the many businesses on Public Road as well as the Lafayette Park-n-Ride. However, Public Road has numerous four-way stops that would significantly impact the efficiency of the service and increase travel times.

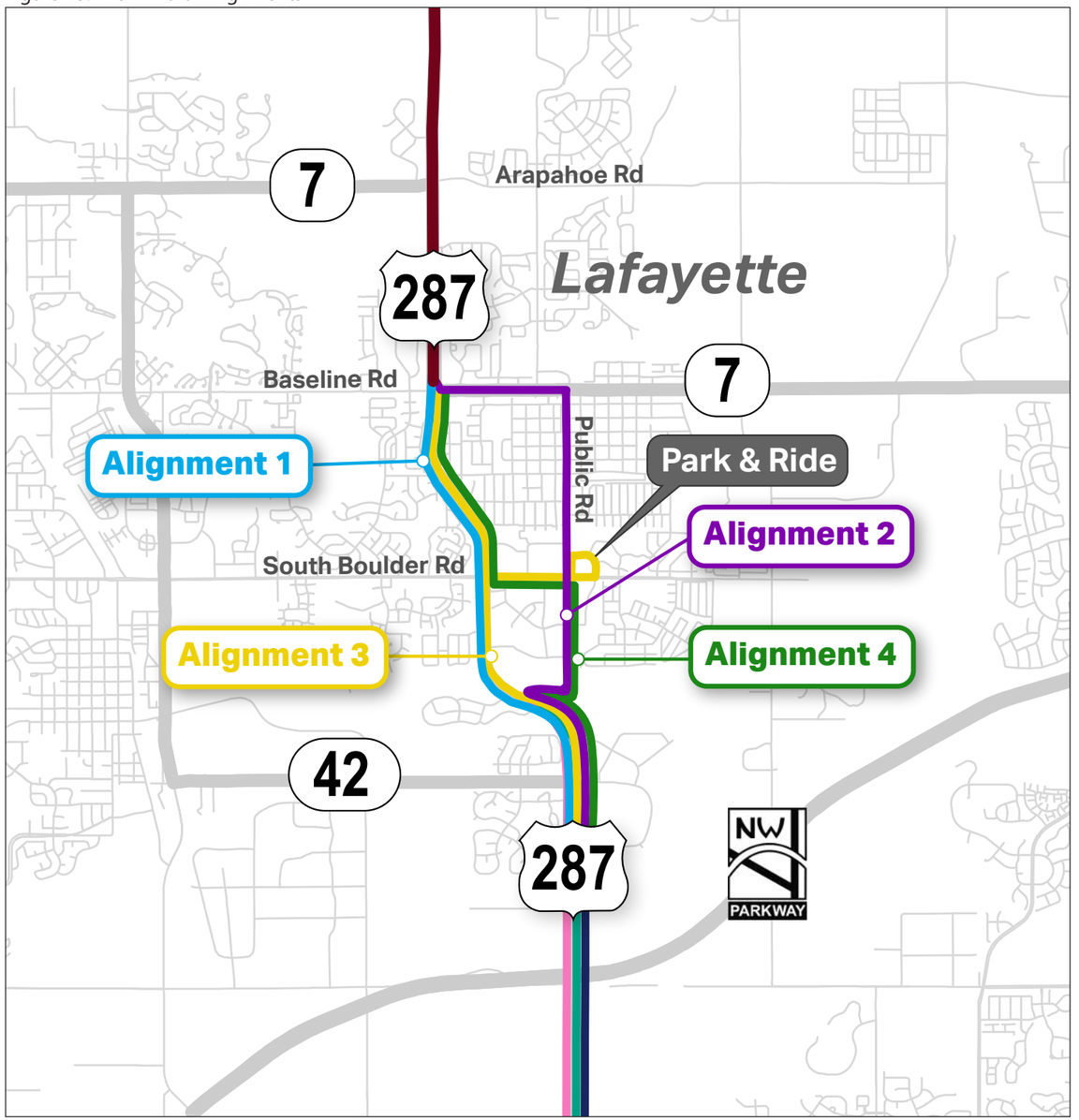
Alignment 3 would be along US 287 between CO 7 and Northwest Parkway, but it would also include the option to turn onto South Boulder Road and serve the Lafayette Park-n-Ride before returning to US 287 to continue the north-south service. This alignment would provide better access to destinations along Public Road; however, the bus service would be less efficient because of the additional traffic signals on South Boulder Road that would slow the bus down. The deviation to the Lafayette Park-n-Ride would also be a less direct service pattern for passengers who are traveling north and south. Modifications to the signals and roadway between South Boulder Rd and Public Rd could help decrease transit delay.

To evaluate which of the alternatives should be carried forward to the Tier 2 screening, the project team developed evaluation criteria based on direction from the SWG. Table 14 summarizes how the Tier 1 Lafayette segment alignments aligned with the selection criteria.

To determine the recommended alignment for the Lafayette area, Boulder County interviewed City staff and talked with members of the public to get feedback on the alignments. Stakeholders preferred for the BRT to remain on US 287 as opposed to using Public Road through downtown; however, stakeholders did emphasize the importance of serving the Lafayette Park-n-Ride or developing a new Park-n-Ride location directly on US 287. The public had mixed opinions on which alignment would be the best for the community, but the public did emphasize that they wanted the fastest service to Denver.

Based on the analysis summarized in Table 14, it was recommended that Alignment 3 (with some layered service patterns) be carried forward as the primary BRT routing to the Tier 2 evaluation. Alignments 1 and 2 are both viable options and could be revisited during future planning studies. A combination of service patterns could be implemented to meet the goals of improving travel time while also serving the Lafayette Park-n-Ride on Public Road. This was evaluated in the Tier 2 screening to best understand the most efficient route patterns to meet this need.

Figure 43: Tier 1 Rural Alignments



Public engagement also brought to the surface the need for improved pedestrian access and safety crossing US 287 – calling it "The Great Wall of 287". Figure 44 was sent to the project management team by a member of the public who had previously created this image of improved pedestrian crossing on US 287 at South Boulder Rd. This type of treatment could be explored further and may be in conflict with other goals; however, it may help to address concerns from members of the public about how US 287 divides the community. Further exploration of center running BRT could meet both objectives, but would need to come at the bequest of the City of Lafayette.

More work is needed in Lafayette to better understand travel demands and future vision for the community. Questions arose around people driving to the Park-n-Ride from surrounding neighborhoods and whether another use would be better for the area. The idea of using the existing parking lots as Park-n-Rides around the shopping areas and medical complex at the edges of Lafayette would better serve the residents. A scroll plot was developed that demonstrated the recommended Lafayette alignment that advanced to the Tier 2 evaluation. See Appendix D to review the scroll plot.

Figure 44: Concept for Pedestrian Refuge on US 287 within Lafayette

Image Source: Aiden Johan, CU Student

Table 14: Lafayette Tier 1 Evaluation

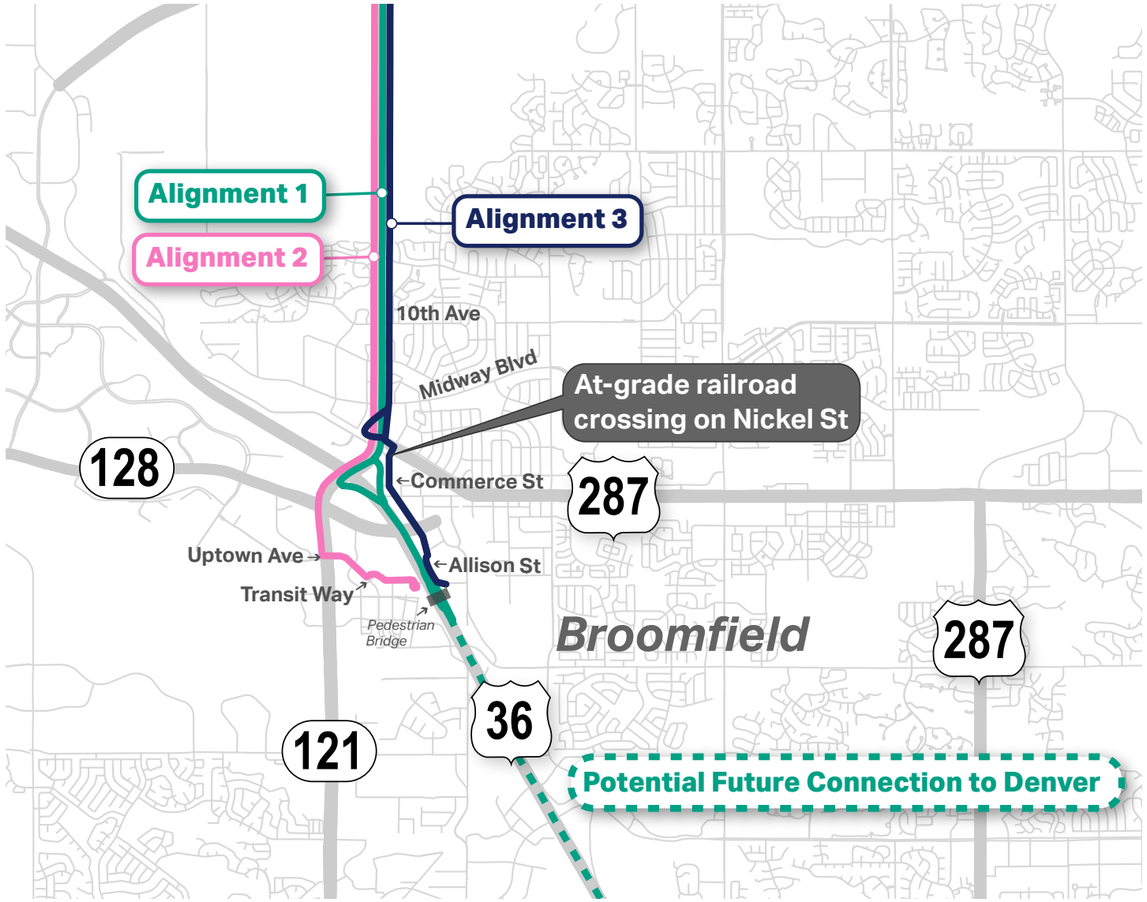
Description	Alignment 1 US 287	Alignment 2 US 287 - Public Road - Baseline Road - US 287	Alignment 3 US 287 - South Boulder Road - City Center Circle - Public Road - South Boulder Rd - US 287
Residents within 1/2 mile	5,558	6,301	6,855
Jobs within 1/2 mile	4,377	4,724	4,789
Character and ROW suited for dedicated lanes	Medium	Low	Medium
Travel time advantage	High	Low	Medium
Ability to accommodate pedestrians	Low	High	Medium
Ability to accommodate bicyclists	Low	Medium	Medium
Economic Development Potential	High	Medium	Medium
Consistency with other local plans	Medium	Medium	Medium
Stakeholder preference/opinion	Medium	Medium	High
Other Fatal Flaw	No	No	No
Existing transit activity	96	357	306
Tier 1 Screening Recommendation	**Potential**	**Potential**	**Recommended**

4.2.1.4 Broomfield

The Broomfield segment of the corridor extends from Northwest Parkway to US 36. As shown in Figure 45, the project team identified three potential alignments for the Broomfield segment of the corridor.

Alignment 1 would be along US 287 between Northwest Parkway and the US 36 interchange. The bus would then use the interchange to go onto US 36 and would use the existing slip ramps to stop at the existing US 36 Station. This alignment option would be most suitable for service patterns that would continue to Denver since there is not a turnaround option for the transit vehicle. There may be opportunity for future evaluation of off-ramp queue jumps.

Figure 45: Tier 1 Broomfield Alignments



Alignment 2 would be along US 287 between Northwest Parkway and the US 36 interchange. At the interchange, the bus would continue straight onto State Highway 121 before using Uptown Avenue and Transit Way to access the US 36 Station. This alignment would be most suitable for service patterns that terminate at the US 36 Station and would turn around to make northbound run to Longmont.

Alignment 3 would be US 287 between Northwest Parkway and the US 36 interchange. Just before the interchange, the bus would exit US 287 and turn onto Nickel Street and use Commerce Street and Allison Street to connect to the US 36 Station. On Nickel Street, the bus would cross a railroad at-grade which would cause unexpected service delays when trains pass through. This alignment could be suitable for service patterns that terminate at the US 36 Station but would require patrons to cross the bridge to get to the Southbound Flatiron Flyer. The bus would then turn around to make the northbound run to Longmont.

To evaluate which of the alternatives should be carried forward to the Tier 2 screening, the project team developed evaluation criteria based on direction from the SWG. Table 15 summarizes how the Tier 1 Broomfield segment alignments aligned with the selection criteria.

To determine the recommended alignment for the Broomfield area, the project team conducted stakeholder and public engagement to get feedback on the alignments. The public had mixed opinions on which alignment would be the best for the community, but there was a stronger preference for Alignments 1 and 2. The public emphasized that they want fast and efficient service to Denver.

Based on the analysis summarized in Table 15, it was recommended that Alignments 1 and 2 be carried forward to the Tier 2 evaluation. Alignment 1 is the recommendation for service patterns that continue to Denver while Alignment 2 is the recommendation for service patterns that terminate in Broomfield. It is recommended that Alignment 3 be removed from consideration at this time. The at-grade railroad crossing for Alignment 3 would cause unexpected delays to the BRT system and would negatively impact passenger experience.

A scroll plot was developed that demonstrated the recommended Broomfield alignment to the Tier 2 evaluation. See Appendix D to review the scroll plot.

Table 15: Broomfield Tier 1 Evaluation

Description	Alignment 1 US 36 - US 36 & Broomfield Station Slip Ramps - US 287	Alignment 2 US 36 & Broomfield Station - Uptown Ave - US 287	Alignment 3 US 36 & Broomfield Station - Allison Street - Commerce Street - Nickle Street
Residents within 1/2 mile	6,856	5,876	6,478
Jobs within 1/2 mile	7,416	6,533	6,616
Character and ROW suited for dedicated lanes	Medium	Medium	Low
Travel time advantage	Medium	Medium	Low
Ability to accommodate pedestrians	Medium	Medium	Low
Ability to accommodate bicyclists	Medium	Medium	Low
Economic Development Potential	Medium	Medium	Medium
Consistency with other local plans	Medium	Medium	Medium
Stakeholder preference/opinion	Medium	Medium	Medium
Other Fatal Flaw	No	No	Yes, at-grade railroad crossing
Existing transit activity	438	438	438
Tier 1 Screening Recommendation	**Recommended**	**Recommended**	**Eliminate**

4.2.2 PROPOSED STATION LOCATIONS

A large advantage of BRT over standard bus transit service is faster travel times. Existing and local bus stop spacing on US 287 varies throughout the context of the corridor, but they are typically spaced close together which is a primary factor contributing to slower travel times. To decrease travel time, BRT seeks to reduce delays caused by frequent stopping by optimizing the stations and locations.

To identify potential station locations for the US 287 BRT, the project team conducted an assessment of existing bus stops on the corridor. The assessment began with all the existing bus stops that are located on US 287 or one of the alignments discussed in Section 4.2.1. The station options were then refined based on several factors:

- Total transit activity (boardings and alightings)
- Recommendations from NAMS
- Opportunities to transfer to other transit routes
- Presence of an existing or planned Park-and-Ride

Based on these four criteria, each station was evaluated and only stops that met at least one of the criteria were considered as a station option. Additional considerations were made to potentially combine and/or relocate some stop locations to improve transit operations and provide optimum spacing for BRT service.

As part of the US 287 BRT Feasibility Study, a Stations Area Toolkit [that is applicable elsewhere] was developed to help with specific investments and amenities at BRT stations to create a more comfortable and inviting environment for people at and accessing them. That document can be used as an inspirational reference for what could be built at stations. This feasibility assessment focuses on what station locations could work out best for the corridor.

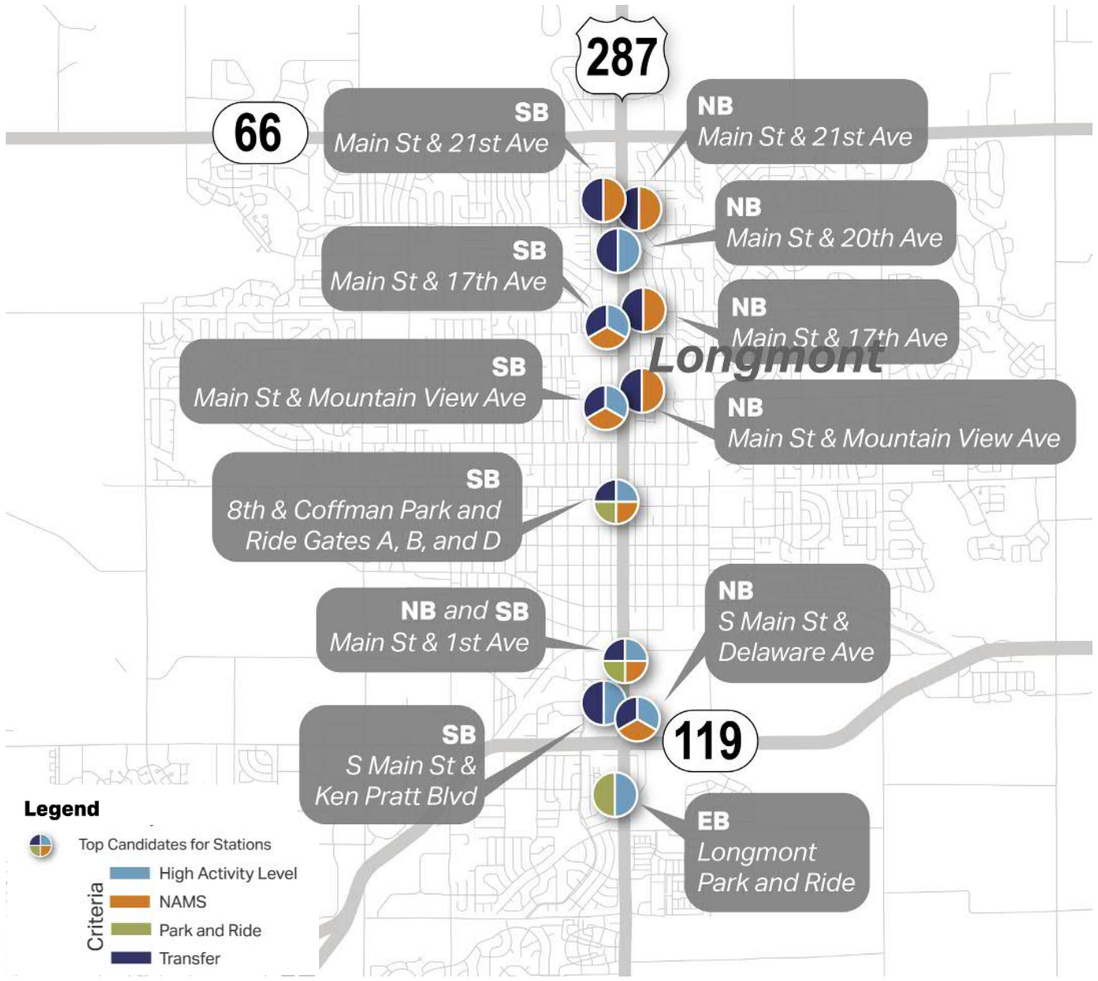
Image Source: Boulder County

4.2.2.1 Longmont

In Longmont, nine stops were identified that met at least one of the criteria. Figure 46 shows the nine potential station locations that were identified during the first round of screening.

To get input on the station locations, the project team put out a public survey to ask participants which stations they are most likely to use. There were mixed responses on station preferences in Longmont, but the stations that people selected the most were Main Street and 1st Avenue, Coffman and 8th Avenue, and Main Street and CO 66. Additional intermediate stops on Coffman Street are being studied and planned by the City of Longmont.

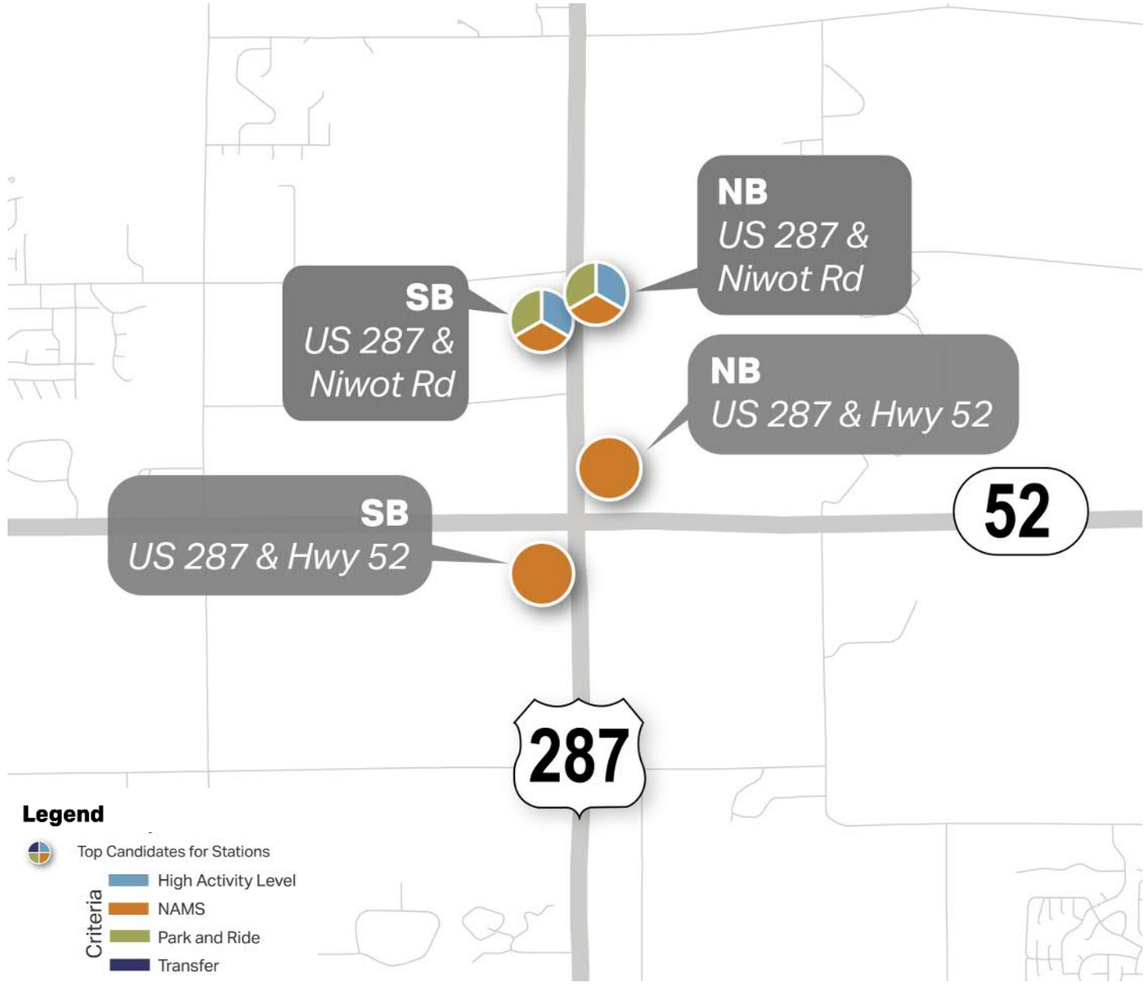
Figure 46: Potential Station Locations in Longmont



4.2.2.2 Rural and Erie

In the rural segment of the corridor, three stops were identified that met at least one of the criteria. Figure 47 shows the three potential station locations that were identified during the first round of screening. Almost all station activity in rural areas is driven by Park-n-Ride or passenger drop off, so locating stations in this area of the corridor should be prioritized to efficiently serve a large catchment area for vehicular or bicycle access to stations.

Figure 47: Potential Station Locations in Rural Segment

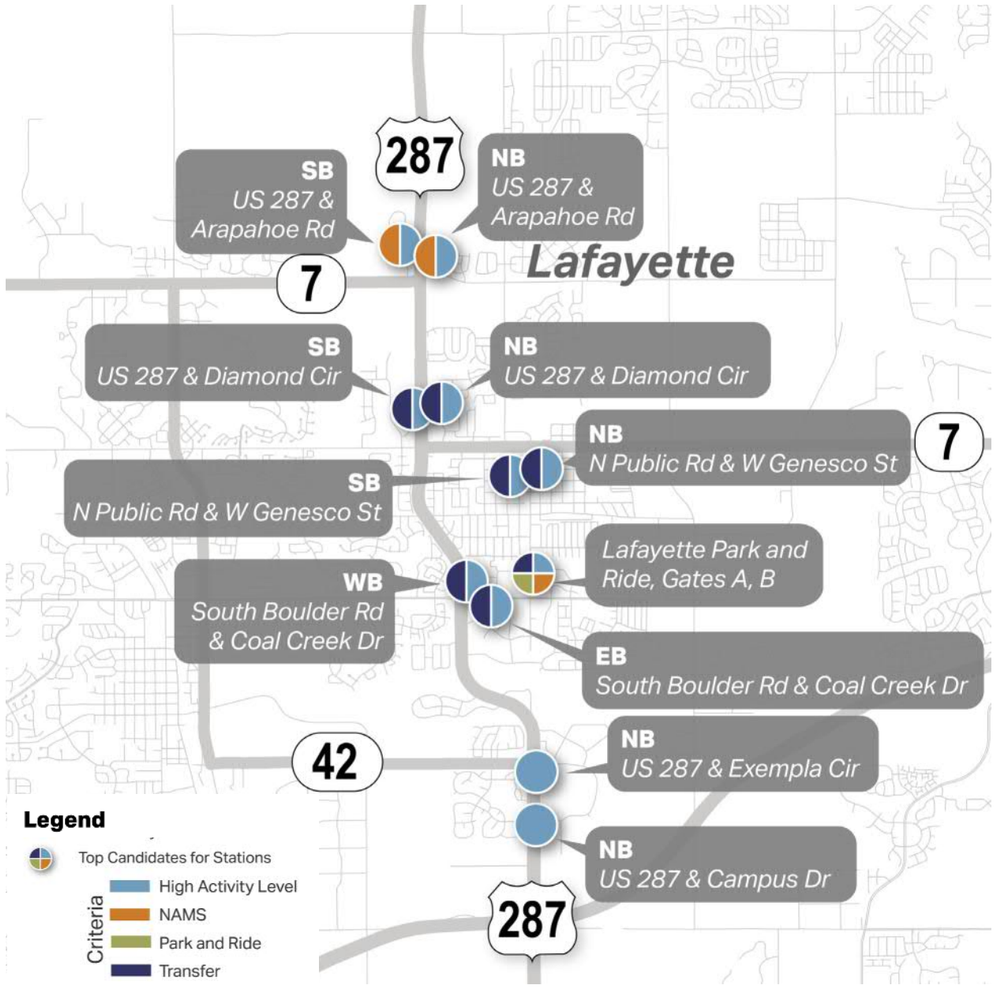


4.2.2.3 Lafayette

In Lafayette, seven stops were identified that met at least one of the criteria. Figure 48 shows the seven potential station locations that were identified during the first round of screening.

To get input on the station locations, the project team put out a public survey. The survey asked participants which stations they are most likely to use. There were mixed responses on station preferences in Lafayette, but the stations that people selected the most were the Lafayette Park-n-Ride, N public Road & W Genesco Street, and South Boulder Road & Coal Creek Drive.

Figure 48: Potential Station Locations in Lafayette

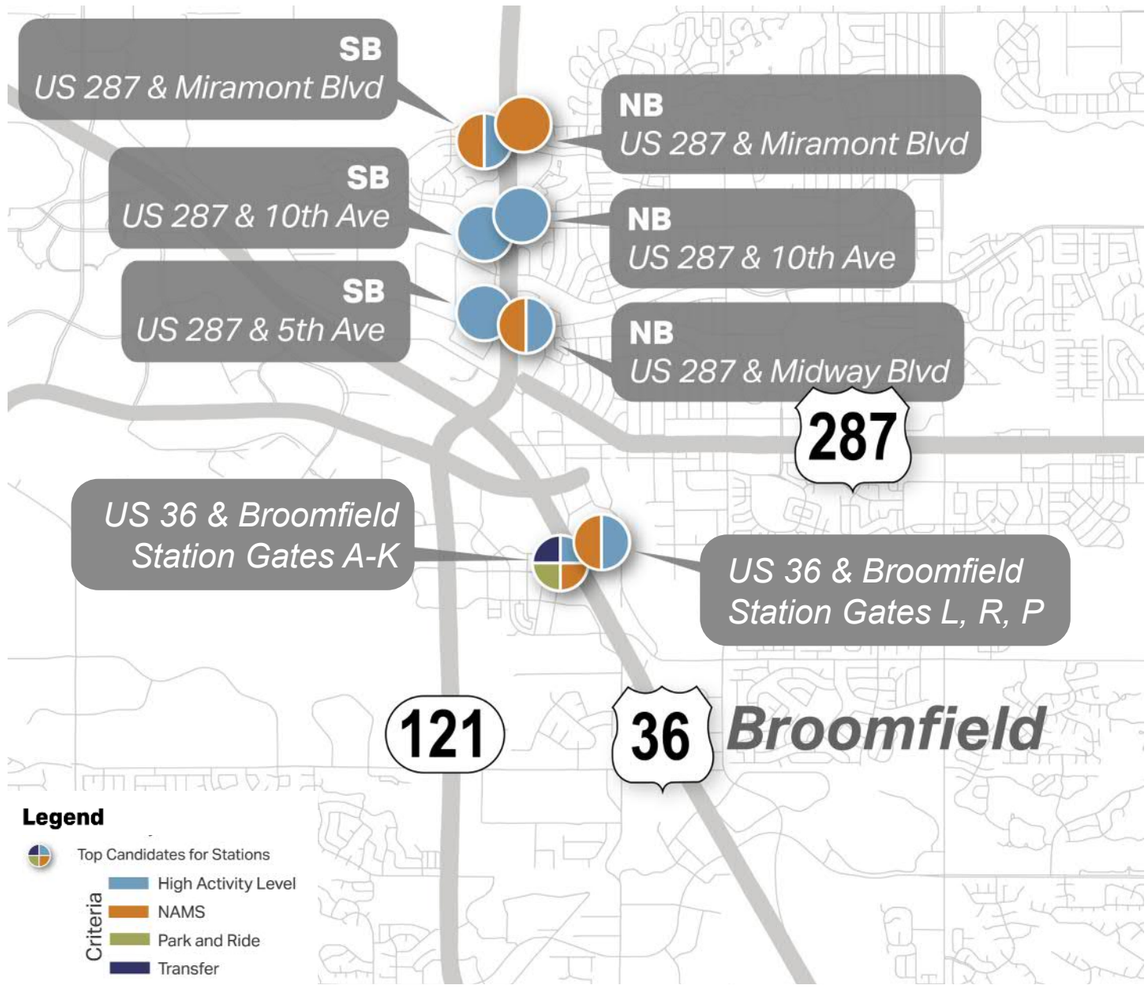


4.2.2.4 Broomfield

In Broomfield, four stops were identified that met at least one of the criteria. Figure 49 shows the four potential station locations that were identified during the first round of screening.

To get input on the station locations, the project team put out a public survey to get input on the project. The survey asked participants which stations they are most likely to use. There were mixed responses on station preferences in Broomfield, but the stations that people selected the most were the US 36 & Broomfield and a mix between Miramonte, 10th, and Midway Blvd.

Figure 49: Potential Station Locations in Broomfield



4.2.2.5 Stations outside of Boulder County and City and County of Broomfield

Project goals included assessing the feasibility of transit connections that continued outside of Boulder County and City-County of Broomfield. To assess and analyze the impact of specific connections, certain assumptions were made for routes and station areas. These assumptions were defined for the purposes of understanding the potential connections, but future studies and evaluation is recommended to gain a larger consensus and understanding. To the north of Longmont, minimal stations were selected to provide faster express service for longer trips, and the existing Flex Express stops were assumed with a few tweaks for US 287 BRT Service. Through Larimer County, the following stations are assumed:

- Berthoud – 4th/5th/Main
- Loveland – 37th (planned Transit hub)
- Fort Collins – South Transit Station

For service evaluation extending south of Broomfield, it was assumed that service would extend to Denver Union Station with no additional stops in between. The Flatiron Flyer stops remain and would provide local and regional connections with a transfer along US 36.

One-seat-rides from Longmont to Denver eliminate transfers and reduce travel times. One option, as RTD restores service, could be starting the Fort Collins to Denver express route at Longmont and working with partners to later add services to Fort Collins. Routing from Longmont to Denver via I-25 requires additional analysis to determine if it would be advantageous for a person traveling to stop at future mobility hubs planned for I-25 at CO-119 and CO-7. Stopping at mobility hubs would require changes to the RTD boundaries.

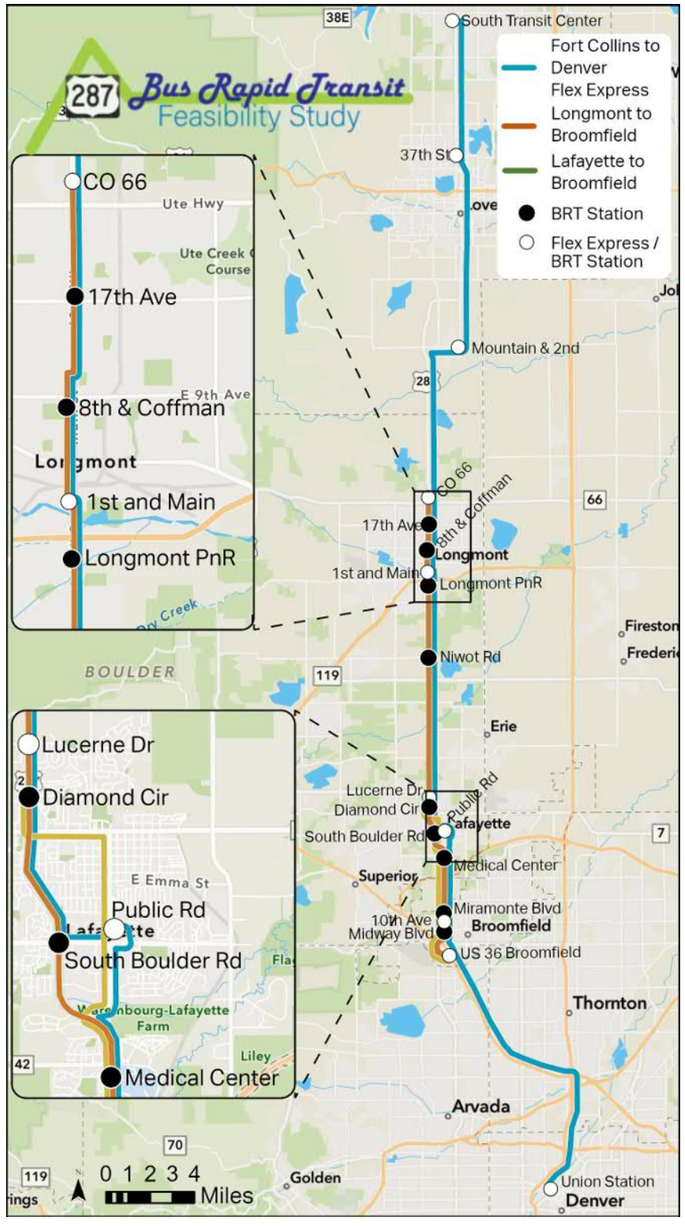
4.2.2.6 Corridor-Wide Station Summary

The candidate stations were presented to the SWG and the public for additional feedback. Additional potential stations were added to be consistent with existing local plans and other stations were eliminated based on stakeholder and public feedback. Any stations that did not align with the recommended alignments were eliminated. The stations that advanced to the Tier 2 alternatives analysis are shown in Figure 50.

At this stage of the planning process, the project team identified the general locations of stations; however, these locations may be revisited in future stages of planning and design. Additionally, this study does not recommend specific amenities to individual stations.

The Stations Area Toolkit [that is applicable elsewhere] was developed to accompany this report which provides examples of amenities that may be implemented at stations. Future stages of planning and design will determine which amenities are appropriate at specific station locations.

Figure 50: Tier 2 Alternatives Analysis



4.3 TIER 2 EVALUATION

The Tier 2 evaluation formed the recommended segment alignments from the Tier 1 evaluation into end-to-end alternatives with varying levels of capital investment and service. Key metrics that were calculated during this evaluation included capital costs, operations and maintenance (O&M) costs, ridership, and travel times, which are often the factors that are used by communities to select a preferred alternative. Additional factors were considered including potential impacts to the transportation network, demographics, and land use. The information and results of this evaluation are intended to provide decision makers and the public with information that will help them balance costs and benefits of each alternative to select an alternative that is financially feasible, aligns with the project goals and has strong local support.

A series of end-to-end service patterns were developed, as shown in Table 16, to provide varying levels of transit service throughout the corridor. The Fort Collins to Denver Flex Express pattern was evaluated to understand ridership of an express bus that provides continuous limited stop service the entire length between Fort Collins and Denver along US 287. For the purposes of the analysis, it was assumed that existing Transfort Flex service to Boulder would remain, and a determination of which agency or agencies would operate this new service has not yet been determined. Further analysis, collaboration and implementation planning is needed. A layered level of service using these patterns can provide limited stop express service, a core BRT route, and the opportunity to serve multiple alignments in places like Lafayette. Additional service patterns such as a future express Lafayette to Denver Flatiron Flyer pattern were not evaluated in detail as part of the feasibility study but could be viable service enhancements in the future. Each of the three service patterns would benefit from capital investments on US 287 including shared stations. These patterns help to provide varying service and stop locations, shown in Table 17, to meet the diverse travel needs.

Table 16: End-to-end Service Patterns*

Pattern 1: Fort Collins to Denver Flex Express	Provides limited stop service between Fort Collins and Denver Union Station (assumes no capital improvements north of Longmont	10 Stations
Pattern 2: Longmont to Broomfield	Core BRT service connecting Longmont to Broomfield	14 Stations
Pattern 3: Lafayette to Broomfield	Provides additional service between Lafayette Public PnR and Broomfield/US 36	6 Stations

** Additional service patterns such as a future express Lafayette to Denver Flatiron Flyer pattern were not evaluated in detail as part of the feasibility study but could be viable service enhancements in the future.*

Table 17: Service Pattern Stops

Fort Collins to Denver Flex Express	Longmont to Broomfield	Lafayette to Broomfield		
			Fort Collins	South Transit Center
			Loveland	37th St (Planned Transit Center)
			Berthoud	Mountain & 2nd
			Longmont	US 287 & CO 66
			Longmont	Main St & 17th Ave
			Longmont	8th & Coffman
			Longmont	1st & Main (Transit Center)
			Longmont	Longmont PnR (S of Ken Pratt)
			Boulder County	US 287 & Niwot Rd
			Erie	US 287 & Lucern
			Lafayette	US 287 & Diamond Cir
			Lafayette	US 287 & South Boulder Rd
			Lafayette	Downtown Lafayette PnR
			Lafayette	US 287 & Medical Center
			Broomfield	US 287 & Miramonte Blvd
			Broomfield	US 287 & W. 10th Ave
			Broomfield	US 287 & Midway Blvd
			Broomfield	US 36 & Broomfield Station
			Denver	Denver Union Station

4.3.1 BUS HEADWAYS

Increased frequency is one of the best ways to increase ridership on existing bus routes. Increasing bus frequencies alone would boost ridership in the corridor with no additional capital roadway investments but would also have an increased operating cost. The analysis conducted in Tier 2 screening assumed increased service frequencies in all scenarios. To evaluate the feasibility of capital improvements, a high level of bus service with frequent headways was assumed to capture potential ridership demand. A more detailed service planning oriented series of travel demand scenarios could help to define a more limited level of service that would increase ridership but still be an acceptable level of operating cost increase. Depending on the combination of route patterns serving stops along the corridor, bus headways at stations between Denver and Fort Collins range from 7.5 to 30 minutes. Individual route patterns operate at either 15 or 30 minute headways.

4.3.2 IMPROVEMENTS DEFINITION

In forming the scenarios, various levels of capital investment on the corridor were defined to evaluate the impacts. The following types of BRT improvements were evaluated.

- Station Improvements
- Intersection Improvements
- Business and Transit (BAT) Lanes
- Dedicated Lanes
- Multimodal Access

Table 18: Scenarios

	Scenario	Description
	Baseline	The baseline maintains the same level of transit infrastructure as existing conditions while assuming some expansion of existing transit services for future ridership growth. Existing RTD and Flex ride service is maintained.
1	Operational Improvements Only	No capital investments on US 287, but the number of bus stops is reduced, service patterns are updated, and frequency is increased.
2	Mixed Flow BRT + Intersection Improvements	Substantial changes to stations and technology but operate in mixed traffic in majority of corridor. Transit Signal Priority (TSP) and queue jumps implemented at congested intersections. Queue jumps are a type of roadway geometry used to provide preference to buses at intersections by adding an additional travel lane.
3	Mixed Flow BRT + Intersection Improvements + BAT Lanes	Same as Scenario 2 with addition of continuous BAT lanes where feasible in Broomfield, Lafayette, and Longmont

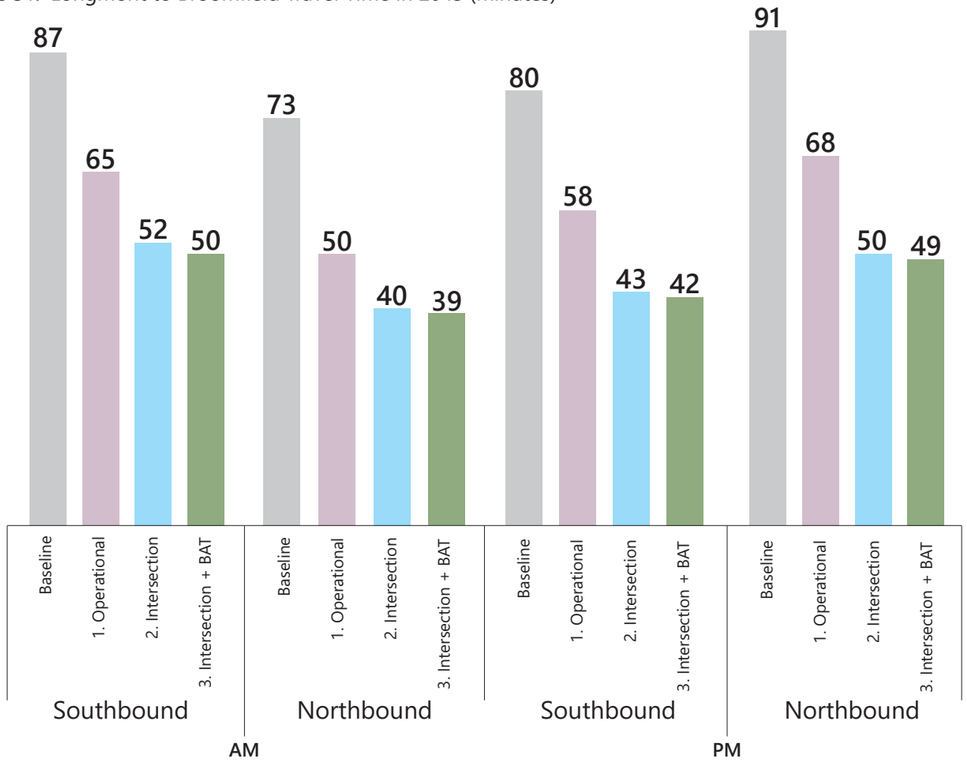
Using combinations of these three service patterns and levels of transit investment between Broomfield and Longmont, three scenarios were generated using combinations of capital investments for evaluation in the Tier 2 screening process.

Each of the Tier 2 scenarios were evaluated to answer key questions that will guide the recommendations of the US 287 BRT Feasibility Study. These key questions include:

- Should the US 287 BRT provide focused service between Broomfield and Longmont or should the US 287 BRT provide one seat ride service between Denver and Fort Collins?
- What level of capital investment will result in increased ridership or other benefits?
- What service patterns would maximize convenience and usage of the BRT services?
- How much would expanded service to Fort Collins and Denver increase ridership?

To answer these questions, the Tier 2 evaluation modeled ridership and travel times for each of the end-to-end alternatives to determine which alternative would provide the most efficient service for the region and also evaluated capital costs and O&M costs for each scenario. A summary of the process and results of each are included below, and additional technical documentation is located in Appendix E.

Figure 51: Longmont to Broomfield Travel Time in 2045 (minutes)



4.3.3 TRANSIT TRAVEL TIMES

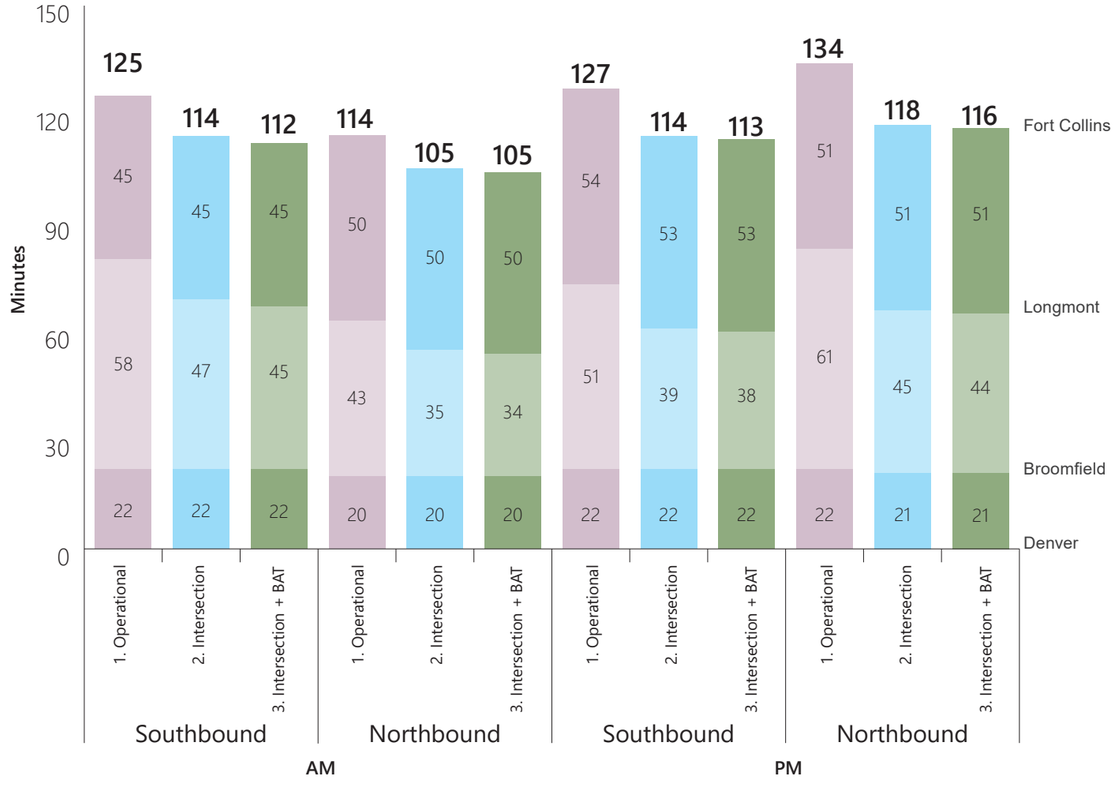
Capital investment on US 287 between Broomfield and Longmont will influence the travel times of all bus transit that operates along the corridor. Queue jumps and intersection investments reduce the impact of congestion on buses at major intersections, and investment in dedicated bus lanes in specific areas along the corridor reduces travel time even more. As investment increases, travel times improve.

For each of the scenarios, AM peak and PM peak transit travel times were calculated for the year 2045 using travel demand model outputs as well as estimated travel times for a combination of intersection improvements and BAT lanes in Boulder County and Broomfield. All service combinations benefit from these investments including patterns that extend to Fort Collins and Denver. Travel times for service improvements between Broomfield and Longmont are shown in Figure 53 and travel times on the express service between Denver and Fort Collins are shown in Figure 52. A baseline travel time is shown for Longmont to Broomfield as other existing transit services currently serve that route; however, no baseline is shown for Fort Collins to Denver as a single service on US 287 does not yet exist.

Significant benefit is gained by investing at intersections, and additional travel time benefit is gained by adding in BAT lanes. These are used for scenarios only and implementation may not progress with the same succession.

Image Source: Commuting Solutions

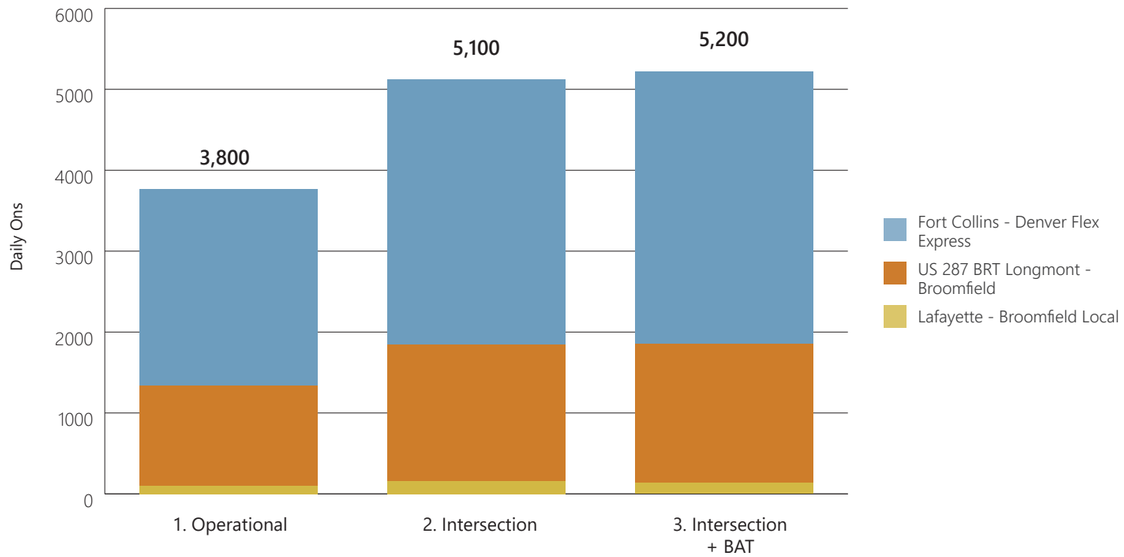
Figure 52: Flex Express Fort Collins - Denver Travel Time in 2045 (minutes)



4.3.4 BRT RIDERSHIP

Ridership forecasts are an indication of potential demand for transit service. Ridership was estimated for the three scenarios using the 2045 CDOT Statewide Travel Demand Model. Daily ridership in the scenarios evaluated ranges from 3,800 daily riders in Scenario 1 with operational improvements and 5,200 riders in Scenario 3 with BRT related capital investments at stations, intersections, and BAT lanes along the corridor.

Figure 53: Daily Ridership



The access mode to stations trends fairly similar throughout the scenarios with:

- Drive access accounting for 13%-15% of trips
- Transfers from other transit routes accounting for 54% to 56% of trips
- Walk access accounting for 30% to 33% of trips

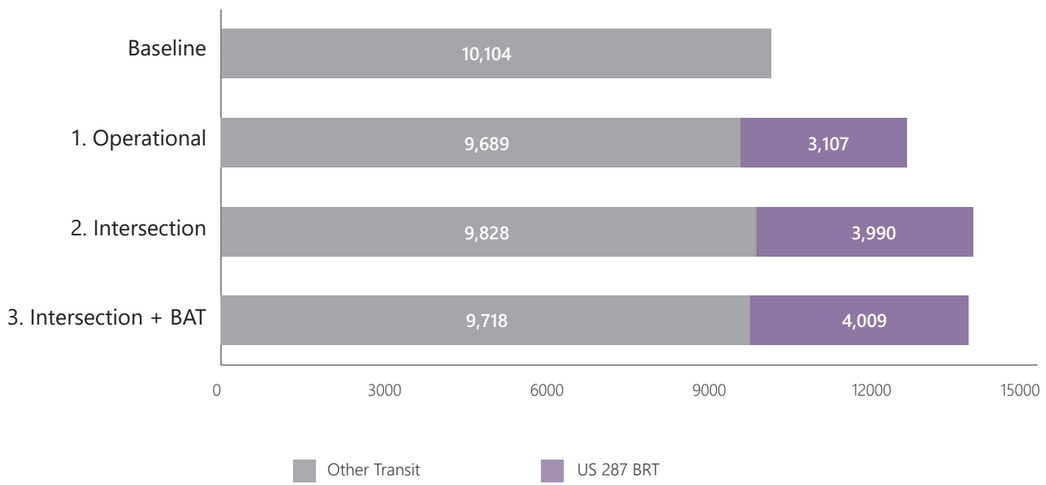
The points above highlight how important the transit network and walking are for success of BRT on the corridor. During implementation, evaluating cost-per-rider could help analyze where and how to make investments that have the highest return on investment.

The operational enhancements including additional service to Fort Collins and Denver result in a premium service that is attractive at the system level and more than triples ridership from existing to 2045. The scenario with intersection improvements and BAT lanes provides the highest ridership results due to faster running times achieved through separation from traffic congestion.

Regardless of which investments are made, any investment that improves travel time is showing a significant increase in ridership along the corridor.

When looking at all transit ridership along US 287 including local routes and transfers, BRT investment increases transit activity for all routes in the corridor by 36 percent. Some of these riders using the upgraded BRT service shift from Flex Boulder services or RTD routes to other transit routes operating in the corridor. This transit activity increase is shown in Figure 54. The baseline and operational only improvements did not include US 287 BRT route and stop adjustments, so all ridership is combined into other transit.

Figure 54: All Transit Ridership along US 287: Fort Collins to Broomfield, 2045

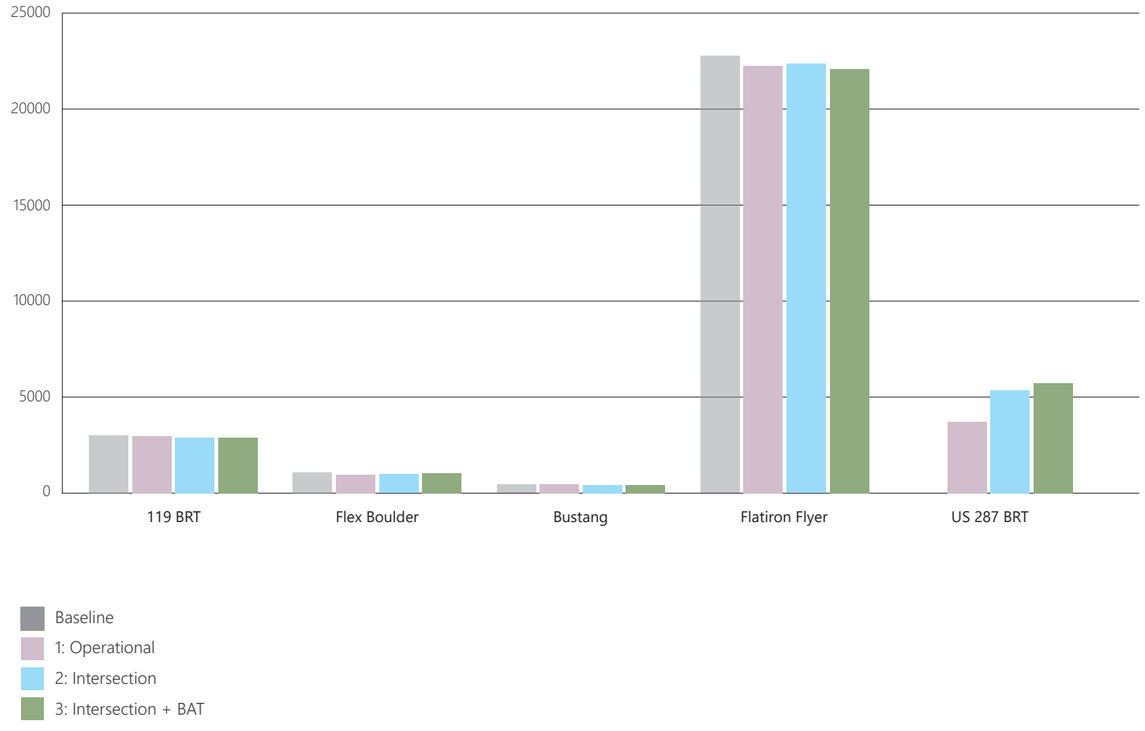


4.3.5 COMPLEMENTING TRANSIT ROUTES

For each BRT scenario that was evaluated, the forecasted ridership for complementing Transit Routes was reviewed to understand the ridership impact of BRT investment on other routes such as planned CO 119 BRT, Flex service between Fort Collins and Boulder, and CDOT Bustang. Understanding the impacts of ridership on these other routes helps to determine if new riders on the 287 BRT routes are just transferring routes or if the improved transit service is attracting new riders. The ridership of 119 BRT, Flex service, and CDOT Bustang service on I-25 is shown in Figure 55.

The various transit routes compliment each other rather than compete with each other and overall are attracting new transit riders with transit improvements along US 287.

Figure 55: Complementing Transit Routes Ridership 2045



4.3.6 PERSON THROUGHPUT AND TRANSIT MODE SHARE

Investing in transit on US 287 increases the total person throughput on the corridor. The travel demand model estimated that in 2045, each scenario of transit investment also increases the number of transit riders but also increases the number of people traveling in passenger cars. The transit mode share of person throughput ranges from 0.75 percent in the baseline to almost 2 percent in the top level investment alternative.

Figure 56: Corridor Person Throughput

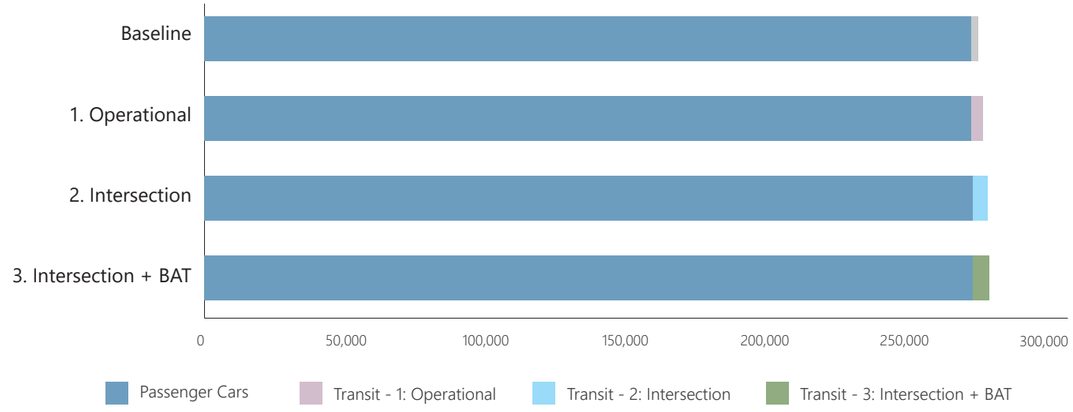


Figure 57: Transit Share: US 287 Broomfield to Fort Collins

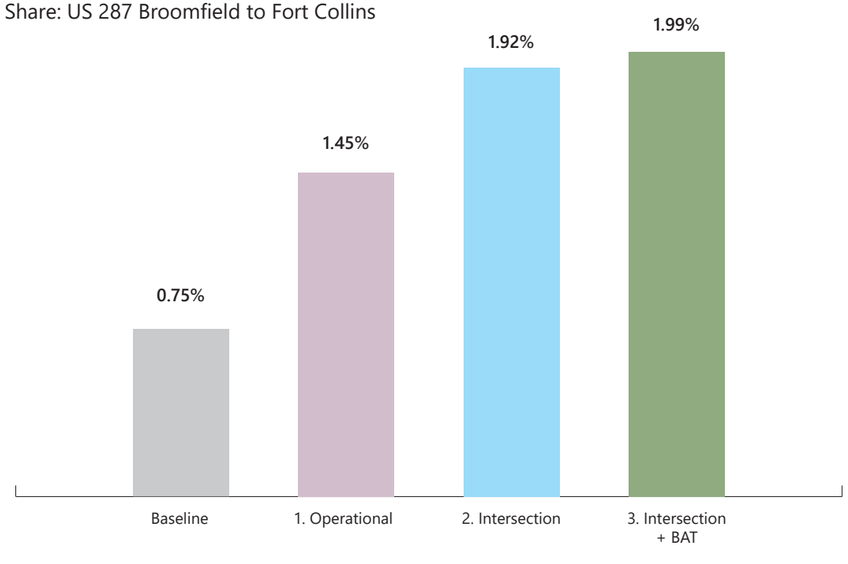


Table 19: Capital Cost Estimate Details

		Scenario - Operational Improvements (2021$)		Scenario 2 - Intersection Improvements (2021$)		Scenario 3 - Intersection Improvements + BAT Lanes (2021$)		
Federal Railroad Administration Standard Cost Categories	Description	% of Total Project Cost	Total Cost	% of Total Project Cost	Total Cost	% of Total Project Cost	Total Cost	Notes
10	Guideway & Track Elements	0%	$0	30%	$55M	34%	$73M	Includes Queue Jump widening improvements at 27 intersections Tier 2 includes ~$4.8M for Longmont BAT Lanes and $14.1M for Broomfield BAT Lanes.
20	Stations	0%	$0	6%	$12M	5%	$12M	Includes 12 two-way BRT stations
30	Support Facilities	0%	$0	0%	$0M	0%	$0M	No maintenance facility improvements included in the estimate
40	Sitework & Special Conditions	0%	$0	8%	$16M	9%	$18M	Includes two new pedestrian underpasses
50	Systems	0%	$0	7%	$13M	6%	$13M	Includes signal improvements for queue jumps as well as TSP, communications improvements, and station fare collection equipment.
51	**Construction Subtotal (10 - 50)**	0%	$0	**52%**	**$95M**	**55%**	**$117M**	
60	ROW, Land, Existing Improvements	0%	$0	2%	$4M	2%	$5M	ROW allowance assumption only
70	Vehicles	90%	$36M	15%	$28M	13%	$28M	Assumed 34 60' articulated buses for Scenario 1 and 27 60' articulated buses for scenario 2 and 3.
80	Professional Services	0%	$0	13%	$24M	14%	$29M	
81	**Subtotal (10 - 80)**	0%	$0	**90%**	**$152M**	**91%**	**$180M**	
90	Unallocated Contingency	10%	$3M	10-20%	$15M to $30M	10-20%	$18M to $35M	
91	**2021$ Total Project Cost (10 - 90)**	**100%**	**$39M**	**100%**	**$167M to $182M**	**100%**	**$198M to $215M**	Coffman segment improvements not included as they are accounted for in a separate project.

4.3.7 VEHICLE MILES TRAVELED AND EMISSIONS

BRT investment on US 287 changes the travel patterns in Boulder County and reduces automobile generated Vehicle Miles Traveled (VMT. However, with transit service, there is an increase to bus miles traveled which can vary depending on diesel versus low or no emission buses. Additional study regarding VMT and emissions impact from transit investment is recommended at the Boulder County scale including an evaluation of the impact of low or no emissions buses.

4.3.8 CAPITAL COST ESTIMATES

Capital costs are an upfront investment that would be required to implement the project. Capital costs can include reconfiguring roadways, constructing stations, installing amenities, and purchasing vehicles. Capital cost estimates were prepared for each of the US 287 BRT alternatives using Standard Cost Categories (SCC which represent FTA's format for the reporting, estimating, and managing of transit capital projects. Financing costs (SCC 100 were not included as the development of the financial plan and would not be completed until later in the planning process. Unit costs used to develop the capital cost estimates were developed using standard CDOT cost estimating tools to be consistent with local market conditions. All costs are reported in 2021 dollars, but as a project timeline is more defined the costs would be escalated to a midpoint in the construction timeline.

To understand the costs of incremental investments, two tiers of capital investments were estimated that align with Scenarios 2 and 3 (Scenario 1 included operational improvements and thus does not have a significant capital cost other than additional buses to accommodate increased service. Each of these investment Tiers contained a combination of investments including:

- Queue Jumps – estimated according to existing intersection configuration and traffic congestion as High (2000'), Medium (1500'), Low (1000') Cost
- Widening for BAT Lanes by length
- Pedestrian underpass investments at identified stations to cross US 287. Assumes 150' long 20'x10' box culvert underpass with connecting sidewalks, retaining walls, and pedestrian ramps
- Station platforms assume prepayment and real time bus arrival per platform
- Standard one-way stations have a single platform; standard two-way stations have two platforms
- Advanced Mobility Technology (TSP, Communications) assumed to be a corridor wide investment
- Price of new buses

CO 66 PnR is not included in these costs as this cost was assumed to already be included in other projects.

The planning-level cost estimate for Alternative 2 improvements with queue jumps at key ranges from $167 million to $182 million. This total reflects improvements at 27 intersections (12 high, 6 medium, 9 low). The planning-level cost estimate for Alternative 3 improvements which add BAT lanes in high impact areas in addition to the intersection improvements from Alternative 2 ranges from $198 million to $215 million.

Key Assumptions used for the US 287 BRT capital costs include:

- Unit prices for the various standard cost elements are based on unit prices for other completed US transit projects and tempered for the Colorado market.
- Quantity estimates are based on the conceptual designs developed for each alternative.
- Capital costs are escalated by 3.5 percent per year inflation
- BRT guideway is concrete throughout the alignment
- Signals
  - At grade crossings of the guideway will be limited to signalized intersections
  - Signals in arterial sections will be modified
  - Assume mid-block crossings only for center platforms

4.3.9 Operations and Maintenance (O&M COSTS

O&M costs are the reoccurring costs of operating transit service. O&M costs can include driver wages, vehicle maintenance, agency overhead costs, and fuel. To estimate the O&M costs for each Tier 2 alternative, a high-level service planning analysis was conducted to determine the number of buses that would be needed to provide frequent service to the alternative as well as the end-to-end travel times.

For each of the three scenarios that were evaluated, a combination of three service patterns used including 15-minute weekday and 30-minute evening/weekend headways between Longmont and Broomfield, 15-minute weekday and 30-minute evening/weekend service between Lafayette and Broomfield, and 30-minute weekday and 60-minute evening/weekend service on the Flex Express between Fort Collins and Denver. Scheduling assumptions also included a 20 percent minimum layover/recovery, 18-hour spans Monday to Saturday, and 16-hour Sunday span.

Unit costs were developed using a multi-variable model based on BRT national averages, and no cost increment for facility maintenance was included in the cost estimates. Costs utilized include:

- $103.26 per vehicle revenue hour for operating costs
- $2.86 per vehicle revenue mile for vehicle maintenance
- $108,208 per peak vehicle for general administration costs

As one time capital investments increase, ongoing operations expenses decrease as fewer buses and time is needed to provide the same level of service. In an operations-only scenario, the number of buses needed is 34, but when capital investments are made that decrease bus travel time the number drops to 27 as buses deliver service levels more efficiently. The correlating operations expenses decrease by an estimated $1.8 million, or 8.4 percent annually.

Table 20: Annual Operations and Maintenance (O&M) Costs

	Scenario 1 - Operational Improvements			Scenario 2 - Intersection Improvements			Scenario 3 - Intersection Improvements +BAT Lanes		
	Fort Collins to Denver Flex Express	Longmont to Broomfield	Lafayette to Broomfield	Ft. Collins to Denver Flex Express	Longmont to Broomfield	Lafayette to Broomfield	Ft. Collins to Denver Flex Express	Longmont to Broomfield	Lafayette to Broomfield
Headways	30 minutes	15 minutes	15 minutes	30 minutes	15 minutes	15 minutes	30 minutes	15 minutes	15 minutes
Vehicle Revenue Hours	41,692	40,180	16,688	40,180	31,458	15,176	40,180	31,458	15,176
Vehicle Revenue Miles	1,535,224	1,095,751	314,132	1,535,224	1,089,782	307,990	1,535,224	1,089,782	307,990
Peak Vehicles in Service	11	11	5	10	8	4	10	8	4
Line O&M Estimate (2021)	$9.8 million	$8.4 million	$3.1 million	$9.6 million	$7.2 million	$2.9 million	$9.6 million	$7.2 million	$2.9 million
Total O&M Estimate (2021)	**$21.4 million**			**$19.6 million**			**$19.6 million**		
Total Fleet (20% spare)	**34**			**27**			**27**		

4.4 OVERALL TIER 1 AND TIER 2 EVALUATION RESULTS

Selection of an alternative to advance in future planning and design is a balance between tradeoffs made at key decision points – such as the cost of implementing improved bus priority intersections versus the travel time benefits received and cost per rider from investments. This process has provided information to technical staff, decision makers, and members of the public. A multi-tiered evaluation allowed for determination of preferred alignment, stations, operations, and level of capital investment that are financially feasible and have strong local support.

The Tier 1 evaluation helped to narrow alignments, stations, and service patterns along the US 287 corridor through Longmont, rural Boulder County, Lafayette, and Broomfield. Based on the screening process and community input, the primary alignment recommendation for US 287 BRT is along US 287 with the following deviations:

- In Longmont, the alignment follows Longmont's planned transitway on Coffman Street between Boston Ave and 11th Ave.
- In Lafayette, service to the existing Public Park-n-Ride is not adjacent to US 287 and is an important connection. Therefore, multiple service patterns allow for faster connections that bypass this location and other service patterns that stop at this location. Additional evaluation by Lafayette including locating future Park-n-Ride locations directly on US 287 will refine these recommendations.
- Service to Fort Collins and Denver (with no additional capital investment) will create additional one seat rides and provide improved and more frequent service to transit riders.

The Tier 2 evaluation used the results of the Tier 1 evaluation and tested the impact of service changes and capital investments in the future. A number of indicators evaluated generally resulted in the following conclusions:

- Increasing service levels and streamlining transit operations results in faster transit service, increased ridership and minimal capital investment.
- Layered service patterns provide increased frequency at highly utilized stations, express patterns that benefit longer trips, and increased number of stations to service local connections.
- As levels of capital investment increase, travel time decreases, ridership increases, and annual operational costs decrease.
- The top level of investment evaluated that included intersection investments, BAT lanes, and station improvements will create a desired transit route that operates efficiently and serves the greatest number of people. This transit service could be classified as BRT in some locations, but many locations along the corridor do not have high enough levels of congestion to warrant an increased level of investment such as dedicated bus lanes. Mixed flow buses in these areas will provide a similar operational benefit as a dedicated lane would provide.

The overall recommendation from the evaluation is to move forward with the strategy of implementing operational and capital improvements (intersection, BAT lanes and station improvements) along the identified route to increase transit ridership and improve multimodal access. Additional fully dedicated bus only facilities within communities would create additional benefit but are not a primary recommendation from this feasibility study. Each intersection improvement or BAT lane improvement that contributes towards a more desirable transit route can iteratively transform the corridor, and these improvements can be phased over time as opportunities arise. Additional evaluation on the competitiveness of CIG funding will help to refine strategy on implementing many of these improvements within a larger federally funded project.

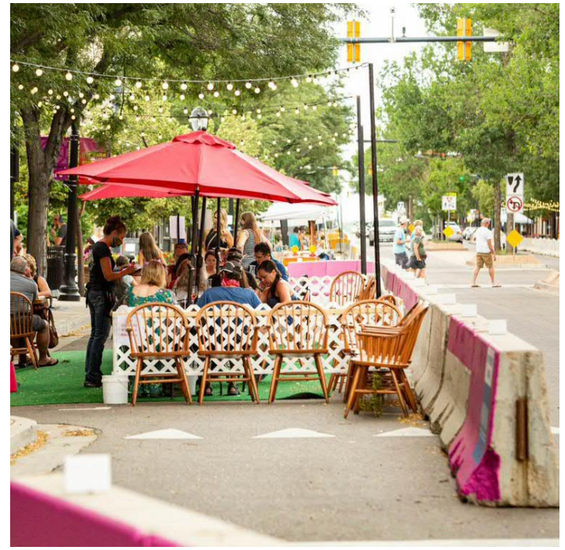


Image Source:
Longmont Downtown Development Authority

Image Source: Boulder County

5. RECOMMENDATIONS AND NEXT STEPS

This Feasibility Study has shown that investing in transit and multimodal improvements on US 287 will increase transit ridership, reduce transit travel times, and create an improved transit and multimodal network. As levels of investment increase, the ridership benefits to the corridor increase and operational expenses decrease. Boulder County and its partners plan to advance the evaluation completed in this feasibility analysis into the next phase of study to further develop projects that advance the vision of improved transit on US 287, while taking other factors into consideration such as access and safety. These steps will include designing conceptual intersections, improving station amenities, seeking funding, completing the federal environmental review process, conducting preliminary and final design, and eventually implementing the projects. Pro-active English and Spanish community engagement will be vital throughout this process as the US 287 BRT project advances. While exclusive bus lanes are not specifically advanced in this feasibility study, they are not eliminated from future consideration. Lafayette and Longmont or other communities along this corridor may decide to investigate more specific sections of the corridor and determine that exclusive lanes make sense in some congested locations.

The following detailed recommendations are broken down into BRT recommendations and multimodal recommendations.

Family Waiting at Lafayette Park-n-Ride

Image Source: Boulder County

5.1 RECOMMENDATIONS

The core evaluation of this study was to understand the feasibility of transit on US 287. Through a robust technical analysis and working with stakeholders and the public, it was determined that implementing a 22-mile long fully dedicated transitway for BRT is not feasible due to cost and other constraints, but investing in queue jumps and intersection improvements, stations, and BAT lanes that create continuous bus prioritized access are feasible and will create an improved and attractive bus rapid transit route that improves travel times, increases passenger amenities, and greatly increases ridership. Each of the scenarios evaluated in the process shows that the bus system and transit network will benefit as additional capital investment is implemented at intersections and congested areas of the corridor.

The following overall transit improvements are recommended:

Stations

- **Stations Area Toolkit** This accompanying document is a reference for stations on this corridor and other regional BRT corridors. Small stations will likely have fewer elements and large stations 10 or more.

Operational

- **Increase Transit Frequencies**. Increased frequencies will have the highest return on investment to increase ridership – both in this corridor and on transferring routes.
- **Optimize Routing and Station Spacing**. Eliminating out of direction travel and optimizing station spacing will decrease transit travel time making it more convenient and attractive to existing and potential bus riders.

Transit Capital

- **Implement Transit Priority Lanes**. There are high, medium, and low priority intersections for implementing various levels of transit priority lane geometry. They include transit signal priority.
- **Prioritize Near Term BAT Lane Implementation That Does Not Require Any Roadway Widening.** BAT lanes requiring widening or ROW acquisition should be evaluated further in the next planning and design process.
- **Implement Transit Signal Priority (TSP)**. Implementing at signals along the entire length of the corridor is a relatively inexpensive option and important to reduce transit travel times.
- **Plan for new Park-n-Rides**. Advance the CO 66 Park-n-Ride and evaluate one to two additional facilities in Lafayette directly adjacent to US 287.
- **Implement a Super Stop at US 287 and CO 7**. This location serves two planned BRT corridors and provides a transfer point to Boulder and I-25.
- **Consider Pedestrian Connections at Stations**. A pedestrian underpass at Lucerne and at a new station that would serve the medical complex more efficiently in Lafayette are recommended.

Multimodal Capital

- **Invest in bike and pedestrian infrastructure**. Investment in bike and pedestrian infrastructure on US 287 and adjacent intersections will improve overall safety, multimodal accessibility, and station access.

287 Bus Rapid Transit Feasibility Study AT A GLANCE

Proposed Recommendations

27 **Intersection Investments** on US-287 between CO-66 & US-36

10 **Flex Express Stations** between Fort Collins and Denver

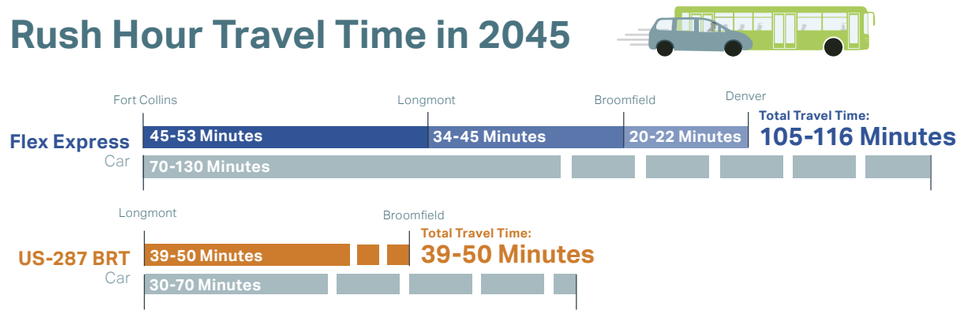
14 **US-287 BRT Stations** between CO-66 and Broomfield US-36

02 **Connections to Planned BRT Routes** (CO 7 and CO 119)

10 **Transfers to Local Bus Routes**

03 **3 Regional Connections** (Flex, Flatiron Flyer, LX)

Rush Hour Travel Time in 2045



Cost

Capital Investment: $167-$215 Million

Operations & Maintenance: $19.6-$21.4 Million

Vehicular Emissions

Personal car vehicle miles traveled reduction: 17,000 Miles

Increased service increases bus VMT, but Low and No Emissions buses would lead to reduced Greenhouse Gases

Demographics

Percentage of people within study area that identify as a minority: 24%

Percentage of households in the study area that do not own a car: 4.7%

Forecasted Household Growth by 2045 between Broomfield and Fort Collins: 1.2% annual

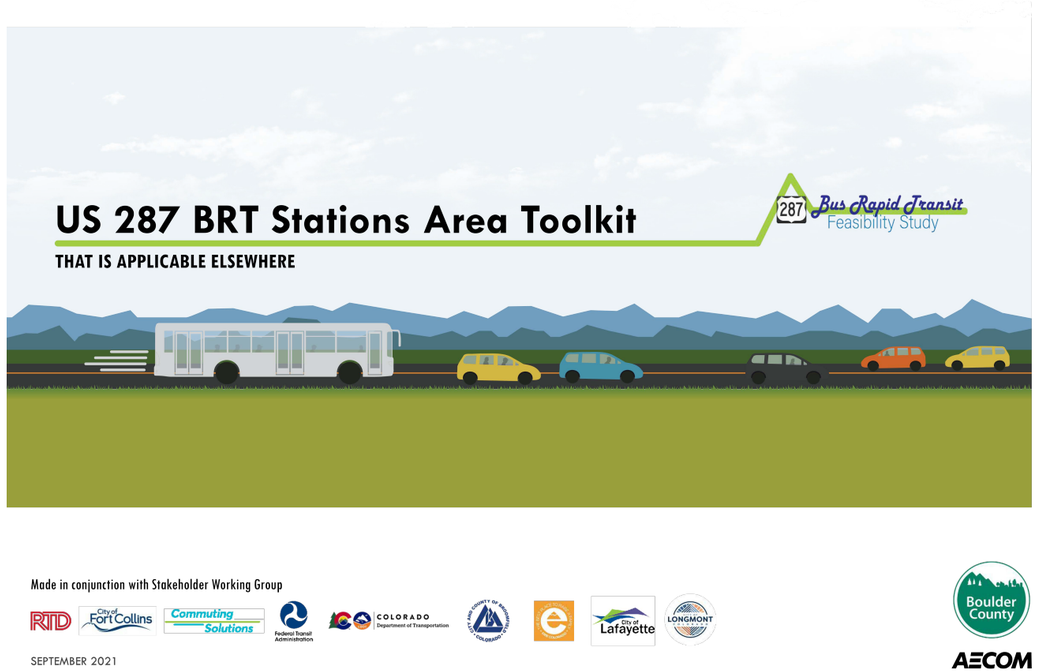
Ridership

Weekday Ridership (2045): 3,700-5,200

Existing US 287 Regional Bus Ridership: 945

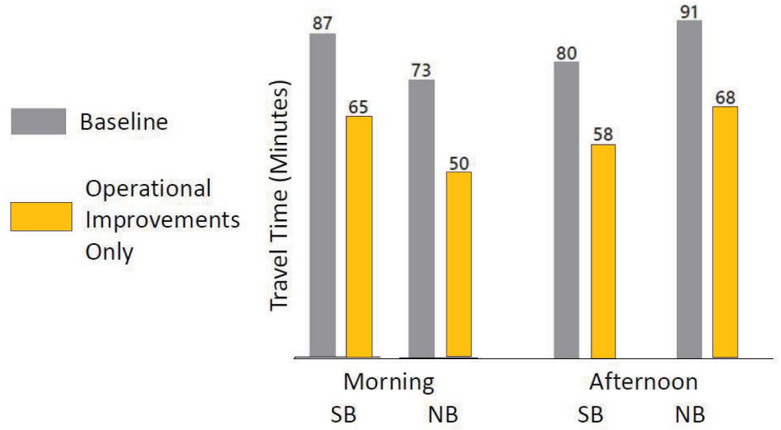
5.1.1 STATIONS AREA TOOLKIT

Creating more comfortable and inviting stations improves the user experience in addition to both real and perceived safety. The Stations Area Toolkit was developed as a reference document to help provide ideas for how to improve stations. It includes opportunities for lane configurations leading up to stations, such as a queue jump or bypass lane. It also includes connecting transit with other modes, such as bike parking and pedestrian refuges. The toolkit also provides multiple concepts for enhancing the stations from leaning rails and lighting to prepayment and station enclosure. Finally, the document builds to placemaking with Transit Oriented Development and a concept from Project for Public Spaces known as the "power of 10." Utilizing this concept, smaller stations are likely to have fewer elements from the toolkit and larger stations could aim for 10 features or more.



5.1.2 OPERATIONAL RECOMMENDATIONS

Optimizing the number of stops on the route and limiting out of direction travel on routes will greatly reduce travel times. Reduced travel times combined with increased bus frequencies throughout the day will make the route more convenient and attractive to existing and potential bus riders.



5.1.3 TRANSIT CAPITAL RECOMMENDATIONS

Implementing capital improvements at intersections and congested areas along the corridor will benefit buses by reducing transit travel time. This study evaluated traffic at several major intersections along the corridor and prioritized them based on existing and future traffic level of service and potential travel time reductions with the addition of queue jump lanes at intersections (calculations are shown in Appendix C). Only major intersections were evaluated with these metrics, but minor signalized intersections that were not evaluated could also offer some transit travel time reduction with improvements. Intersections close to stations would have a transit travel time and safety benefit from improvements. Additional traffic evaluation at locations not included in this analysis could result in additional investment recommendations. Intersections that include stations are assumed to be higher priority than those without stations as buses would be given priority before and after stopping at station locations. Additional traffic evaluation at locations not included in this analysis could result in additional investment recommendations.

Figure 58: Intersection Improvements and Park and Ride Locations

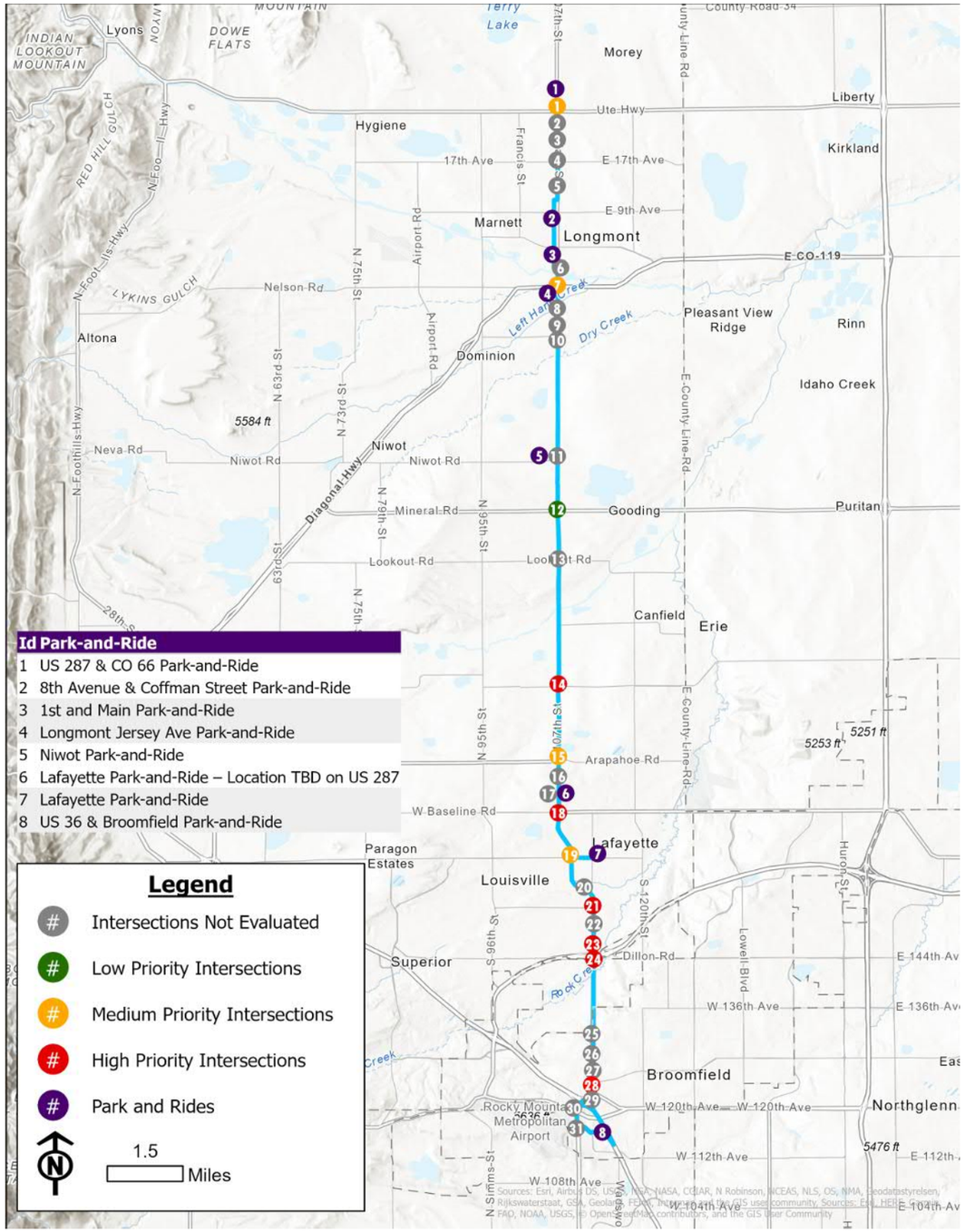


Table 21: US 287 Priority Improvements

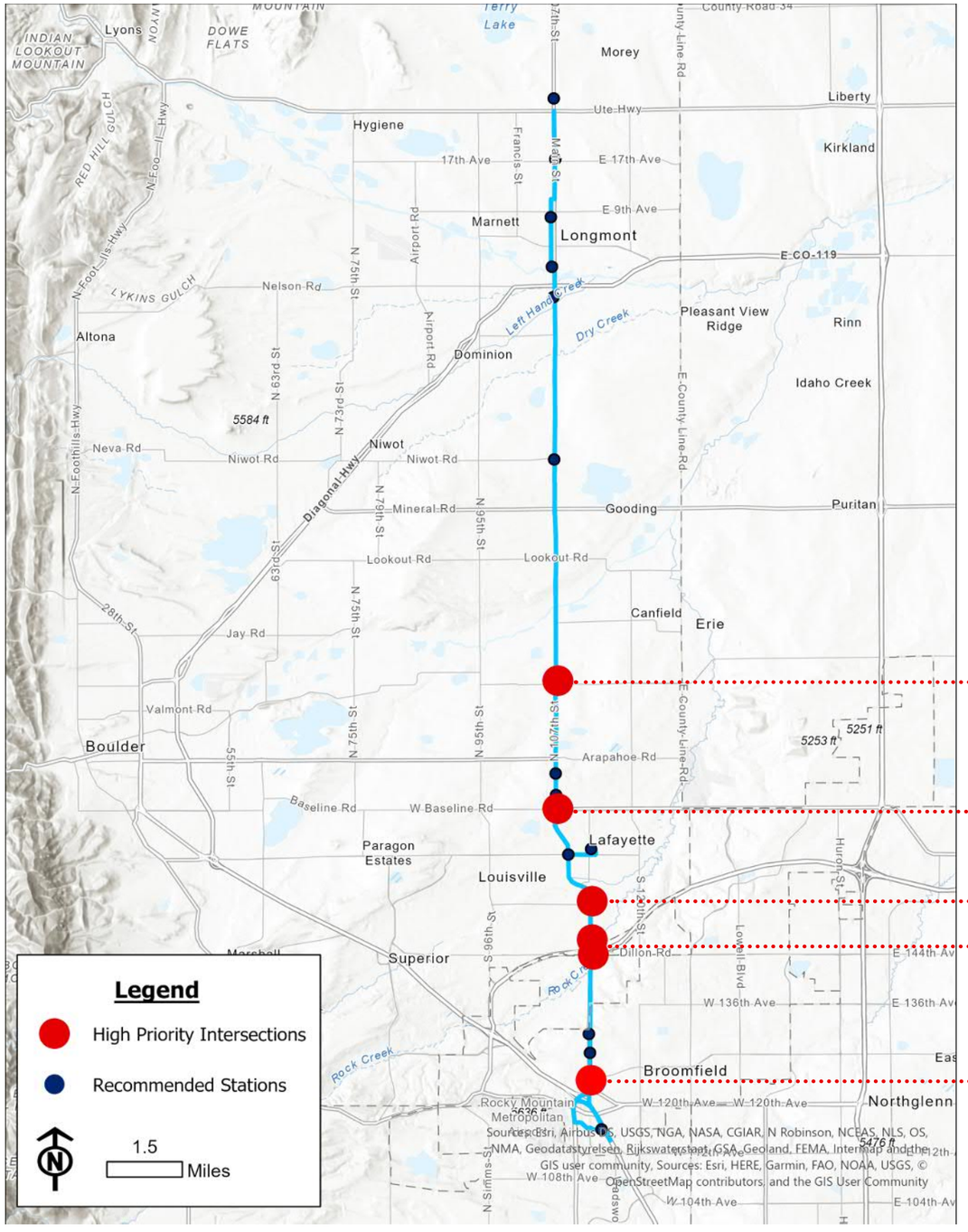
ID	Intersection	Station Location	Intersection Treatment**	Overall Relative Priority***
1	CO 66	YES	Signal and queue jump - high cost	Medium
2	23rd Ave		Signal and queue jump - medium cost (NB only)	Not Evaluated
3	21st Ave		Signal and queue jump - high cost	Not Evaluated
4	17th Ave	YES	Signal and queue jump - high cost	Not Evaluated
5	Mountain View Ave		Signal and queue jump - high cost	Not Evaluated
6	Boston Ave		Signal and queue jump - low cost (NB left only)	Not Evaluated
7	Ken Pratt Blvd (CO 119)	YES	Signal and queue jump - high cost	Medium
8	Quail Rd		Signal and queue jump - medium cost	Not Evaluated
9	Quebec Ave		Signal and queue jump - medium cost	Not Evaluated
10	Pike Rd		Signal and queue jump - high cost	Not Evaluated
11	Niowt Rd	YES	Signal and queue jump - low cost	Not Evaluated
12	Mineral Rd (CO 52)		Signal and queue jump - low cost	Low
13	Lookout Rd		Signal and queue jump - low cost	Not Evaluated
14	Isabelle Rd		Signal and queue jump - medium cost	High
15	Arapahoe Rd		Signal and queue jump - medium cost	Medium
16	Lucerne Dr	YES	Signal and queue jump	Not Evaluated
17	Diamond Cir	YES	Signal and queue jump - low cost	Not Evaluated
18	Baseline Rd		Signal and queue jump - high cost	High
19	W South Boulder Rd	YES	Signal and queue jump - high cost	Medium
20	Public Rd		Signal and queue jump - high cost	Not Evaluated
21	Exempla Cir (CO 42)	YES	Signal and queue jump - high cost	High
22	Campus DR		Signal and queue jump - medium cost	Not Evaluated
23	Dillon Rd (NW Pkwy WB)		Signal and queue jump - high cost (SB)	High
24	Dillon Rd (NW Pkwy EB)		Signal and queue jump - high cost (NB)	High
25	Miramonte Blvd	YES	Signal and queue jump - low cost	Not Evaluated
26	10th Ave	YES	Signal and queue jump - low cost	Not Evaluated
27	6th Ave		Signal and queue jump - low cost	Not Evaluated
28	Midway Blvd	YES	Signal and queue jump - low cost	High
29	US 36 Off Ramp		Maintain existing - no cost	Not Evaluated
30	Wadsworth & CO 128		Intersection Improvement - cost not evaluated	Not Evaluated
31	Wadsworth & Uptown		Intersection Improvement - cost not evaluated	Not Evaluated

**Intersections located on Coffman or on alternate alignment not on US 287 are not shown.*
*** Cost categories estimated at feasibility level (includes contingency). Low=$1.4M, Medium=$2.1M, High=$2.8M*
**** Relative priority is worst ranking of LOS or Travel Time in Existing and 2045. Intersections not evaluated at station locations received a Medium, and others not evaluated received a low.*

When queue jumps are implemented, consider continuing the bus lane past the intersection with BAT Lanes at the following locations to create continuous bus lanes:

1	**Longmont:** North of CO 66 to 17th Ave; Boston Ave to Pike Rd
2	**Lafayette:** North of Baseline to South of Public; North of Exempla to South of Campus
3	**Broomfield:** North of Miramonte to South of Midway

Figure 59: High Priority Capital Projects



High Capital Projects

These high priority capital projects have been selected due to the high level of benefits for 1) transit travel time reductions and 2) vehicular level of service. These are the capital projects that should be done first. Proposed station locations are shown for reference.

Baseline Road: Transit Signal Priority and Transit Only Lane Priority

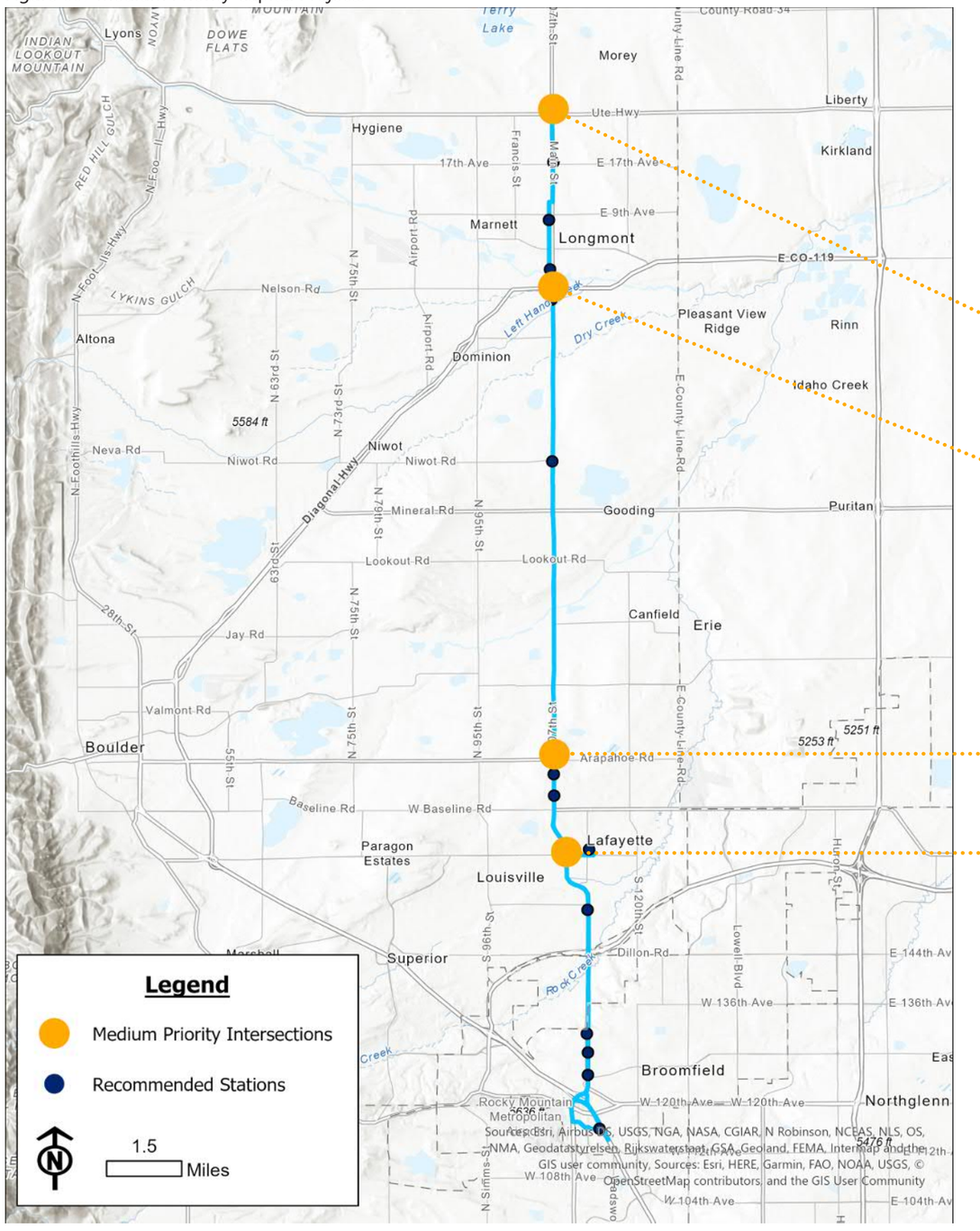
Exempla Circle: Transit Signal Priority and Transit Only Lane Priority

Isabelle Road: Transit Signal Priority and Transit Only Lane Priority for Future Condition

Dillon Road (WB & EB): Transit Signal Priority and Transit Only Lane Priority

Midway Boulevard: Transit Signal Priority and Transit Only Lane Priority

Figure 60: Medium Priority Capital Projects



Medium Capital Projects

These medium priority capital projects are still important for the corridor but have less transit travel time and LOS benefits. These are the projects that should be done after the high priority projects have been completed. Proposed station locations are shown for reference.

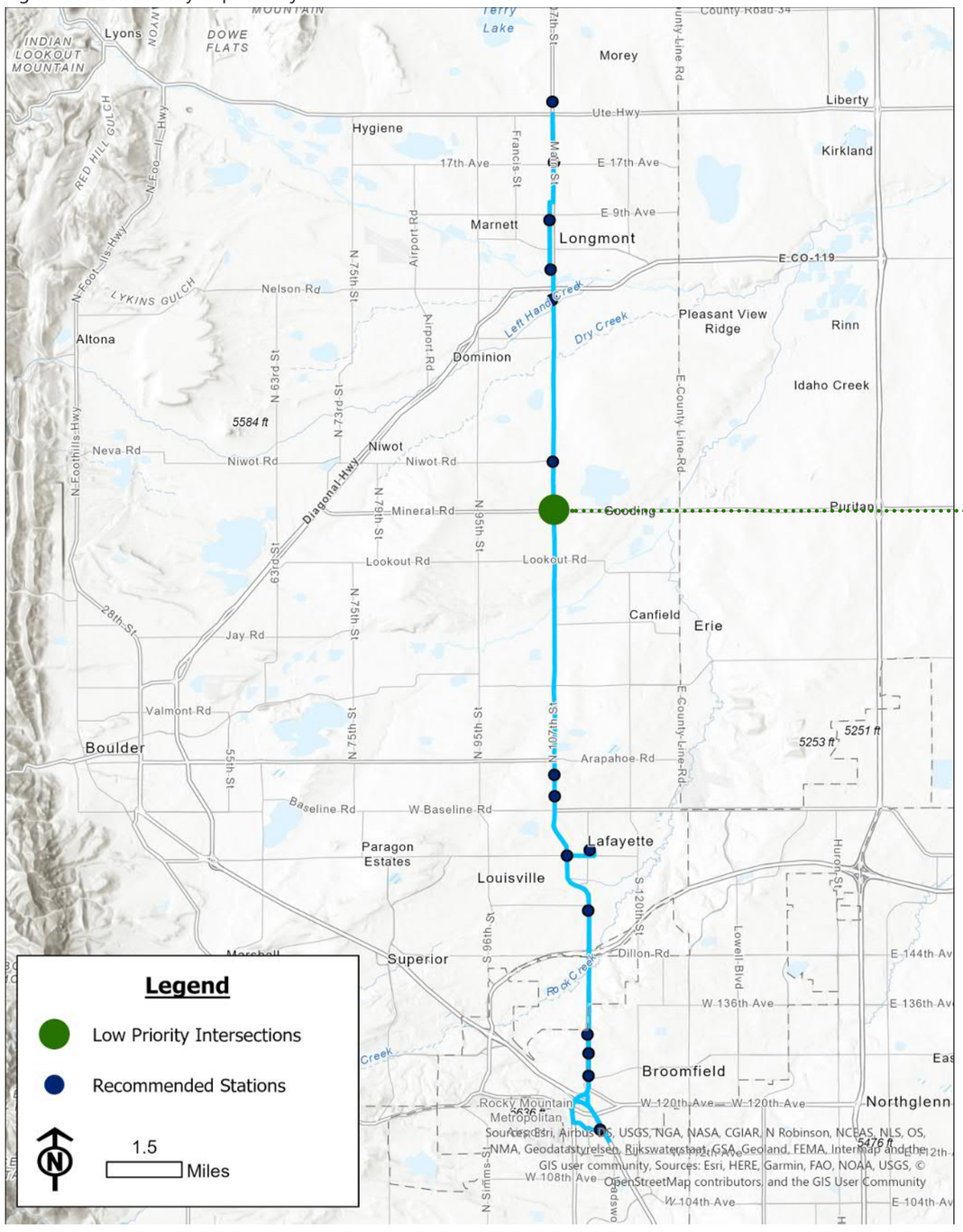
CO 66: Transit Signal Priority and Transit Only Lane Priority

Ken Pratt Boulevard: Transit Signal Priority and Transit Only Lane Priority

Arapahoe Road: Transit Signal Priority and Transit Only Lane Priority

South Boulder Road: Transit Signal Priority and Transit Only Lane Priority

Figure 61: Low Priority Capital Projects



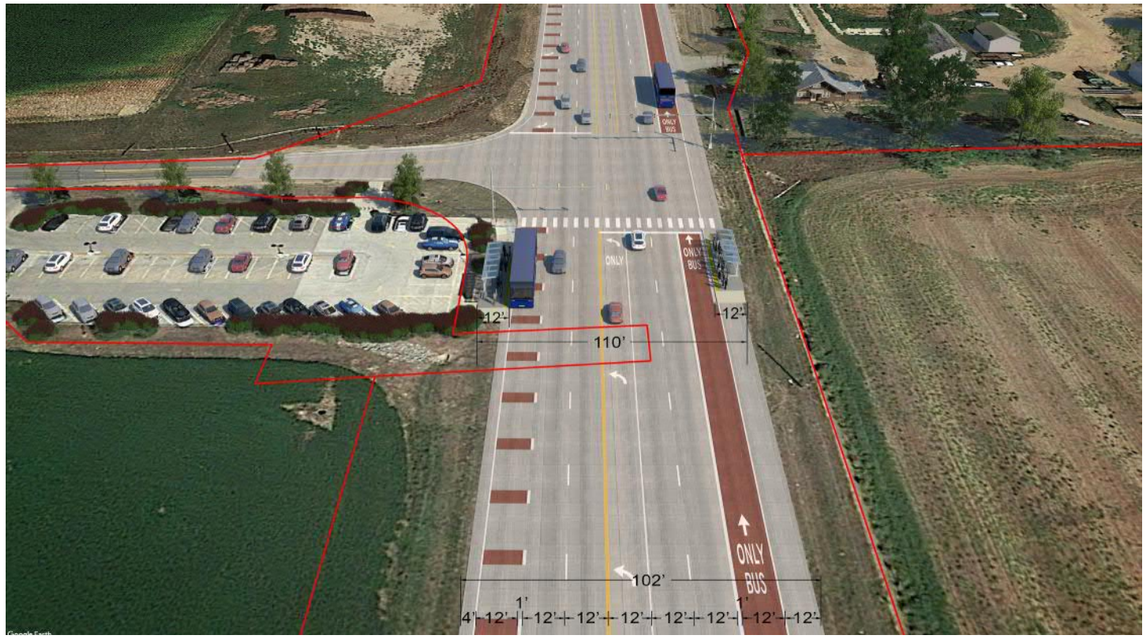
Low Capital Projects

These low priority capital projects have the lowest relative benefits in terms of transit travel time and LOS benefits. These are the capital projects that should be done after the high and medium priority projects have been completed. Proposed station locations are shown for reference.

CO 52: Transit Signal Priority and Transit Only Lane Priority

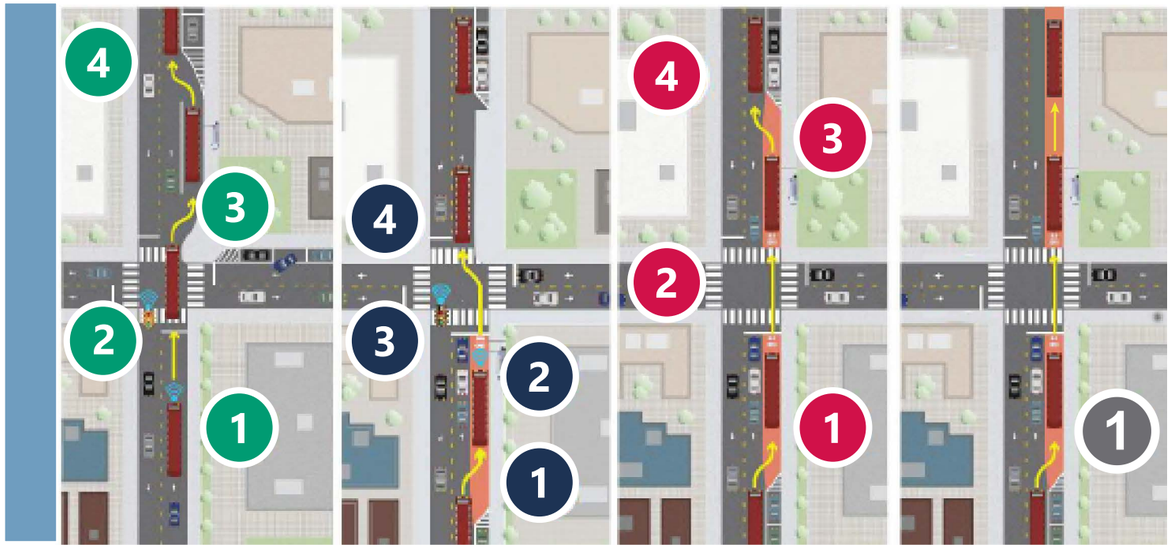
5.1.4 TRANSIT PRIORITY TREATMENTS

There are several types of transit priority lane geometry that can be designed and implemented. More analysis is needed to determine the best treatment at each intersection.



Visualization of a bus lane treatment at the Niwot Park-n-Ride that was shared with technical staff and during public meetings to demonstrate the concept. Specific improvements at this location and others will be defined in later stages of planning and design.

Figure 62: Intersection Improvement Types



	Transit Signal Priority	Queue Jump - No Receiving Lane	Bypass Lane	BAT Lane
	1. Bus approaches intersection and communicates with upcoming signal. 2. Green light extends, bus proceeds through intersection. 3. Signal resumes normal timing once bus clears intersection. Bus dwells at station. 4. Bus merges back into travel lane when appropriate.	1. Bus enters queue jump lane. 2. Bus dwells in right turn lane at station. 3. Bus communicates with priority signal. A few seconds before green bus travels through intersection ahead of vehicles alleviating the right turn lane. 4. Bus merges back into travel lane.	1. Bus enters bypass lane (shared right turn lane) 2. Bus travels through intersection. 3. Bus dwells at station. 4. Bus merges back into travel lane.	1. Bus travels in outside turn lane restricted to bus and right turns only.
Function	• Improved efficiency at congested intersections or intersections with long signal cycles using technology enhancements	• Improved safety and transit efficiency at non-congested intersections by dedicating transit facilities before signal with bus station and providing a green before other vehicles.	• Improved safety and transit efficiency at congested intersections that uses dedicated bus facilities • Preserves general vehicles right turning ability	• Improved bus operations in congested corridors between intersections • Can be combined with queue jump improvements to create a full transit bypass lane
Benefits	• Reduces transit delay at intersections • Improves system reliability	• Reduces transit delay at intersections • Provides dedicated land before signal for transit station	• Reduces transit delay at intersections • Provides dedicated lane for transit to bypass congestion	• Reduces transit delay between intersections and provides a continuous transit lane to bypass congestion

5.1.4 MULTIMODAL CAPITAL RECOMMENDATIONS

The following sections provide an overview of the existing multimodal conditions along the US 287 project corridor from US 36 to State Highway (CO) 66 and potential improvement recommendations, broken out by segments corresponding to each jurisdiction.

City of Longmont Segment (CO 66 to Pike Road)

Existing multimodal facilities through the City of Longmont include sidewalks (some attached, some detached) of varying widths, with narrow on-street bike lanes on the southern section from Grand Avenue to Quebec Avenue. South of Quebec Avenue no dedicated bicycle facilities exist, and on-street bicyclists either ride in general purpose lanes or segments of shoulders varying in width from 3'-10'.

For this segment, it is recommended that the next phase of design for the US 287 BRT project:

- Coordinate with and incorporate proposed design elements with the Coffman Street Busway design project underway with the City of Longmont. This corridor runs parallel to Main Street north of Boston Avenue. The multimodal vision for the Coffman Street corridor includes wider sidewalks, tree lawns, protected bike lanes, and on-street parking, in additional to the general-purpose travel and BRT lanes. Construction is anticipated in 2023.
- Coordinate with CDOT and the City of Longmont on potential multimodal safety improvements north of 11th Street (to CO 66). Potential improvements for this segment should follow the recommendations in Longmont's Main Street Corridor Plan.
- Look for opportunities to improve pedestrian crossings with CDOT.

Boulder County & Town of Erie (Pike Road to CO 7)

Existing multimodal facilities through unincorporated Boulder County and the Town of Erie are limited to bikeable shoulders except at intersections where right-turn lanes exist, and bicyclists must travel in the turn lane through the intersection area. There are no pedestrian facilities adjacent to the roadway within this segment. Consider a combination of an at-grade crossing of US-287 at Lucerne near the station and a pedestrian underpass and signal work near US 287 and Arapahoe Road to provide convenient bicycle and pedestrian connections for US 287 and CO 7 bus routes.

For this segment, it is recommended that the next phase of design for the US 287 BRT project:

- Coordinate with CDOT, Boulder County and the Town of Erie to design a continuous off-street multi-use path, potentially on one side of the roadway. This should include intersection and crossing improvements to facilitate multimodal access to this facility from intersecting roadways and trails.
- Carefully assess intersection design that predictably and safely gets people bicycling through the intersection in a manner intuitive to people using all modes of travel.
- Look for opportunities to improve pedestrian crossings with CDOT.

City of Lafayette Segment (CO 7 to Northwest Parkway)

Existing multimodal facilities from CO 7 to the Northwest Parkway vary from no sidewalks, attached and detached sidewalk segments, some shared-use path segments with limited connectivity, limited sections of bikeable shoulders that become discontinuous where turn lanes are added, and no designated on-street bicycle facilities.

For this segment, it is recommended that the next phase of design for the US 287 BRT project:

- Coordinate with CDOT and the Town of Lafayette to design improvements to widen narrow path segments and create/connect parallel off-street multi-use paths, to include intersection and crossing improvements to facilitate multimodal access to these paths.
- Look for opportunities to improve pedestrian crossings with CDOT including a potential grade separated crossing of US 287 near the Medical Center.

Boulder County and City & County of Broomfield (Northwest Parkway to US 36)

Existing multimodal facilities from the Northwest Parkway to US 36 include: no sidewalks and only bikeable shoulders from NW Parkway to Miramonte Blvd. (except where turn lanes exist); attached and detached sidewalk segments (many 8' wide) from Miramonte Blvd. to just south of Midway Blvd., with the exception of no sidewalks on the east side of US 287 between 6th Avenue & the commercial driveway just north of Midway Blvd.

For this segment, it is recommended that the next phase of design for the US 287 BRT project:

- Coordinate with CDOT and Boulder County to design a continuous off-street multi-use path, potentially on one side of the roadway. This should include intersection and crossing improvements to facilitate multimodal access to this facility from intersecting roadways and trails.
- Coordinate with CDOT and the City & County of Broomfield to widen narrow sidewalks and provide missing link segments to have continuous 8' sidewalk sections on both sides of US 287.
- Look for opportunities to improve pedestrian crossings with CDOT.

Image Source: Longmont Downtown Development Authority

5.2 NEXT STEPS

This study found that BRT can and will work on US 287 given the right operational and capital investments. These investments are included in the above recommendations. This section outlines the next steps that should be taken.

5.2.1 IMPLEMENTATION PLAN

This Transit Feasibility Study is not intended to serve as a project implementation plan. The next step is to develop an implementation plan that will provide additional detail on:

- Cost and sequencing of additional bus frequency in the corridor,
- Sequencing of stop consolidation and route streamlining (with close coordination with RTD)
- Refinement of transit priority treatments including an evaluation of: Right-of-way, environmental constraints, and timing with adjacent projects.
- Prioritizing one-seat-ride service between Longmont and Denver.

5.2.2 PROJECT FUNDING OPPORTUNITIES

The implementation plan should include a funding strategy to implement the proposed projects. In moving forward with a recommended alternative, the project may be eligible for federal funding of up to 80 percent of a project's capital cost. Federal Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grants could also be an option to help fund transit projects. Other funding will primarily come from local sources.

FTA's Section 5309 CIG program is a multi-step, multi-year process to become eligible for federal funding. For Small Starts projects, within the CIG program, is for projects with a total capital cost of less than $400 million and seeking less than $150 million in Section 5309 CIG funding. The first phase of FTA process for Small Starts projects is Project Development, following Project Development the project would receive a grant agreement.

For the CIG program, projects must be evaluated and rated by FTA in accordance with the defined criteria at various milestones in the development process and receive at least a "Medium" rating for both the project justification criteria and local financial commitment in addition to other requirements.

Project justification is based on six equally weighted categories for rating:

- Mobility Improvements
- Environmental benefits
- Congestion reliefEconomic Development
- Land use
- Cost effectiveness (annualized federal share of capital cost per trip)

Local Financial Commitment categories for rating:

- Capital Improvement Grant (CIG) share of capital costs
- Current financial conditions of project sponsor (and or project funding partners), for both capital and operating.
- Commitment of funds for both capital and operational expenses
- Reasonableness of financial plan; including planning assumptions, cost estimates, and capacity to withstand shortfalls and cost overruns

A preliminary assessment of the cost effectiveness measure indicates that the US 287 BRT project would likely receive a Low rating for cost effectiveness from the FTA and may not qualify for a CIG award. During later phases of corridor planning a more detailed calculation all project justification criteria could be investigated for the project.

There is also RAISE competitive program that could be used to fund transit projects. For example, the Section 5339 Bus and Bus Facilities grant program could fund the construction of stations and park-and-rides along the corridor. This program could also provide funding for any additional transit vehicles that would be needed to operate the service.

The US 287 BRT may also be funded through local sources. Local funding can be used as a 20 percent match for federal programs, or it could be the predominant funding source for the recommended improvements depending on if the US 287 BRT is competitive for federal funding.

Since local funding sources usually have a lower dollar value available, Boulder County and its partners could submit several applications for specific improvements that would be needed along the corridor, such as intersection improvements, multimodal safety projects, and bus stop improvements. Breaking up the project into specific components could help the project be more competitive for certain local funding opportunities that are geared toward specific types of transportation improvements.

Other funding sources may include funding from DRCOG and CDOT's Safer Main Streets program. The state also administers several federally funded programs, such as the Highway Safety Improvement Program (HSIP), which may also be viable options.

5.2.3 CONCLUSION

This study found that BRT can and will work on US 287 given the right operational and capital investments. The corridor partners are excited to take the next steps to make BRT on US 287 a reality!

CONTINUED COMMUNITY ENGAGEMENT

US 287 and 5th Avenue, Longmont

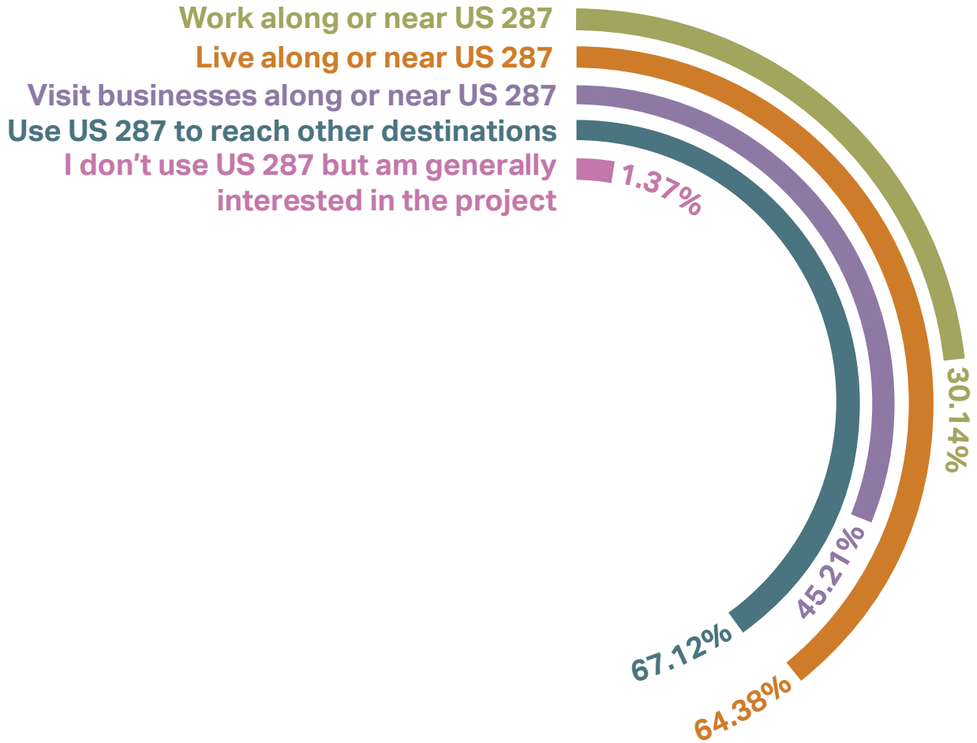
APPENDIX A:
PUBLIC SURVEY RESULTS

Community Feedback

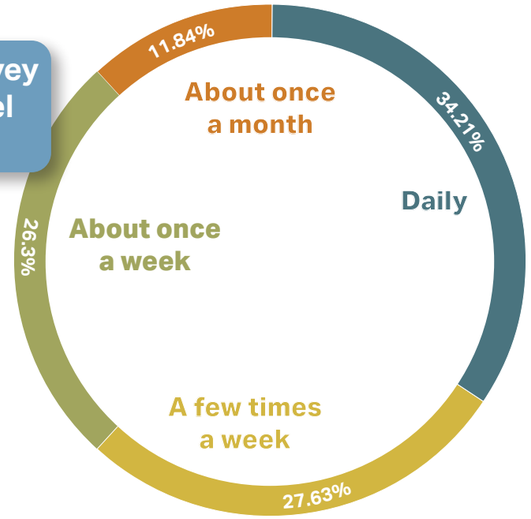
This survey was posted during the COVID-19 pandemic. Therefore, the survey may be missing responses from individuals who could not access the survey and may reflect altered preferences based on a change in routines.

287 Bus Rapid Transit Feasibility Study

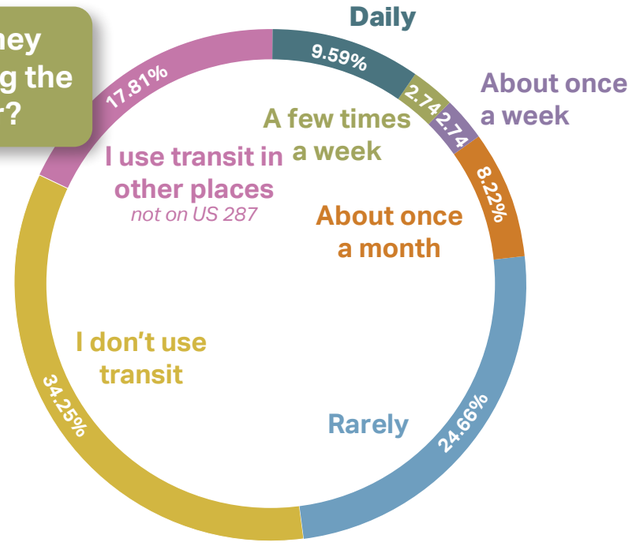
Why are survey takers interested in this study?

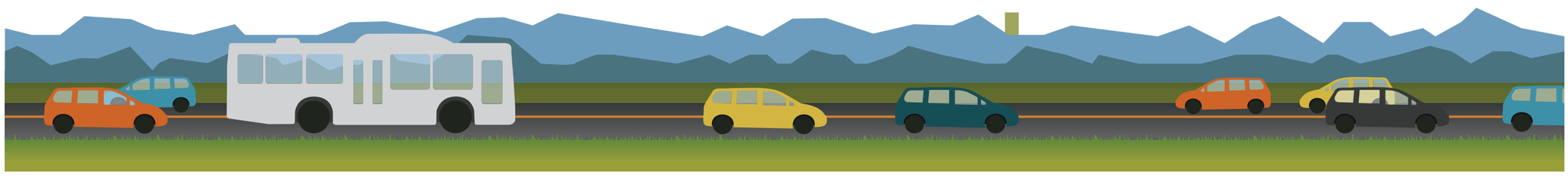


How often do survey respondents travel on US 287?

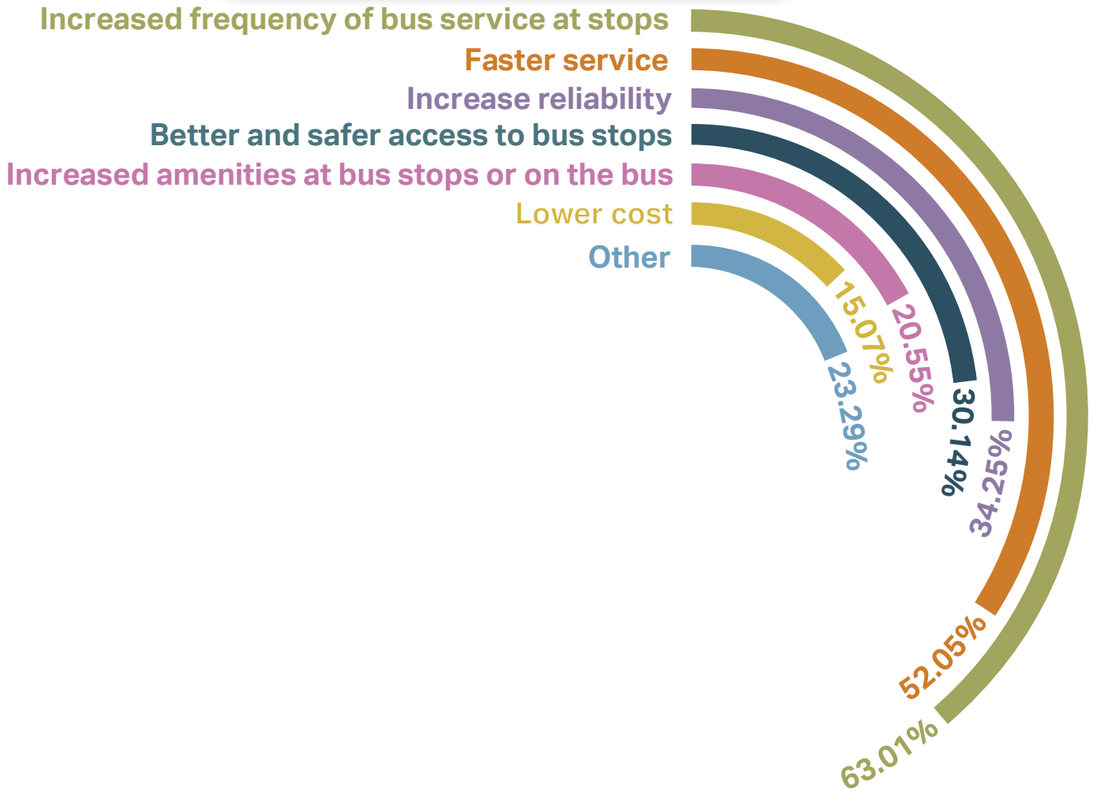


How often do they use transit along the US 287 corridor?





What would encourage survey takers to take transit more often?



Survey respondents indicated safety issues at these intersections

Plateau
Change stoplights to roundabouts

Jasper Rd

Oxford
Campus Dr
Dillon Rd

Baseline Rd
Isabelle Rd

Arapahoe

3rd Ave
4th Ave
5th Ave
6th Ave
8th Ave
9th Ave

Lookout Rd
Mineral Rd

Hwy 52

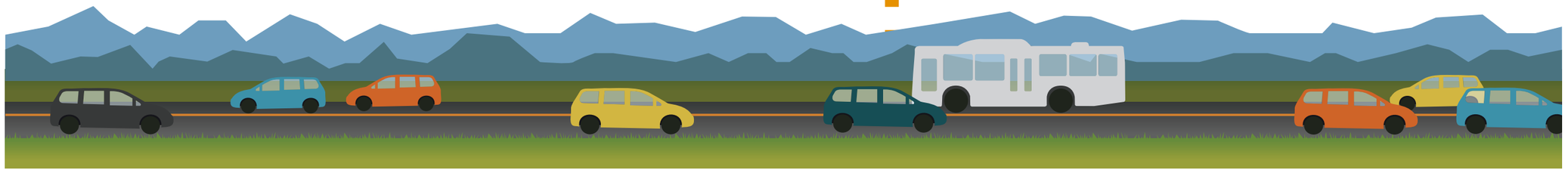
South Boulder

None of the intersections are pedestrian friendly

Explema Dr
Not accessible
Longs Peak Ave

Niwot Rd

Quail
Hwy 66

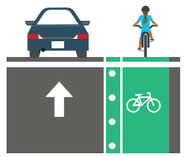


Bus Rapid Transit Feasibility Study

Desired bike improvements for US 287 were ranked by survey respondents.

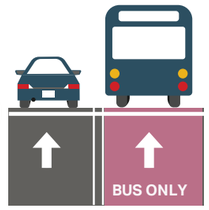
1. 
Off street multiuse path

2. 
Bicycle improvements on nearby parallel roadways

3. 
On street bicycle lane

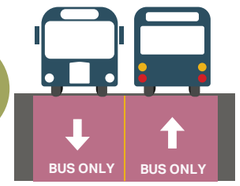
Desired transit improvements for US 287 were ranked by survey respondents.

1. 
Bus stop improvements

2. 

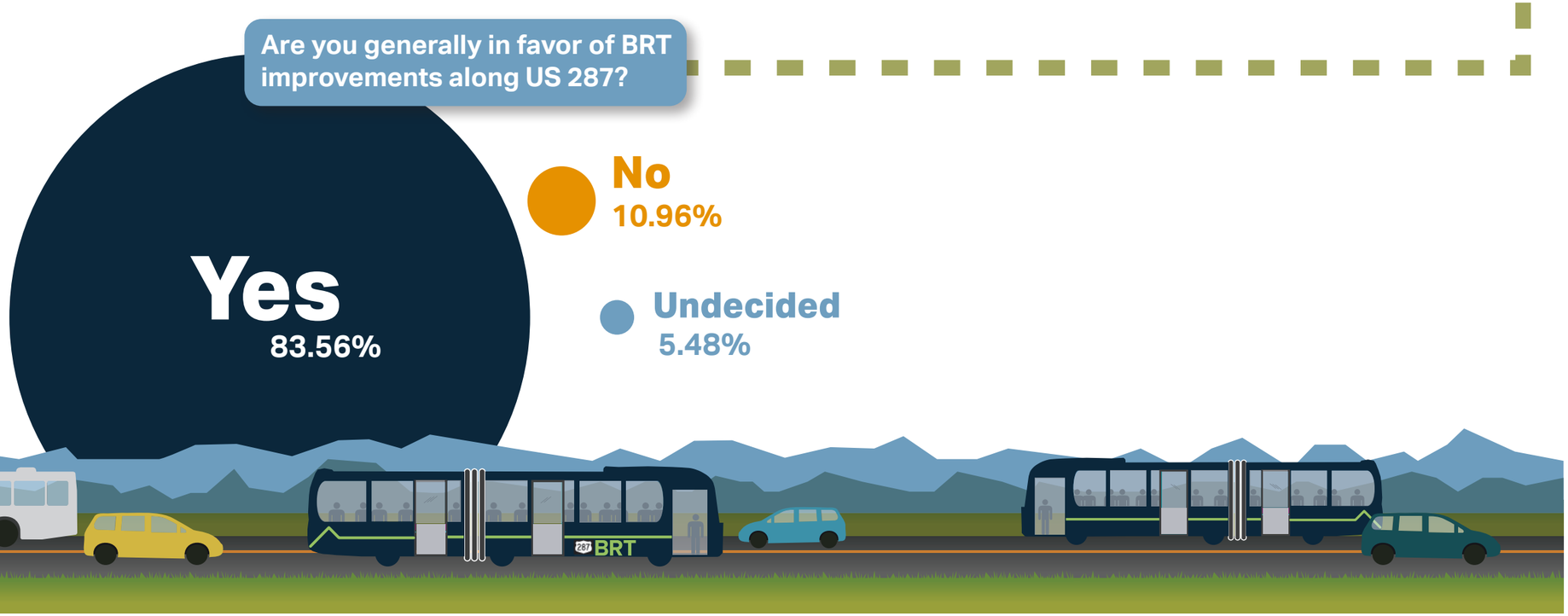
Dedicated shoulders for buses

3. 
Prioritization of buses at intersections

4. 

Dedicated center running bus lanes

Are you generally in favor of BRT improvements along US 287?



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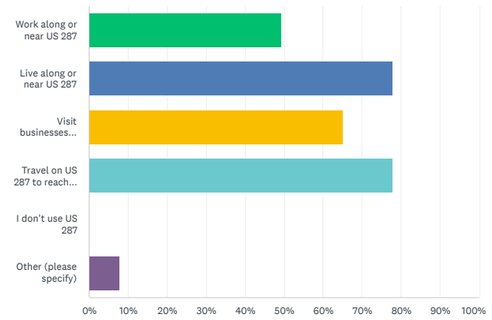
US 287 Bus Rapid Transit Feasibility Study Survey #2

QUESTION SUMMARIES | DATA TRENDS | INDIVIDUAL RESPONSES

Q1

Why are you interested in the US 287 BRT Feasibility Study? (Select all that apply)

Answered: 63 Skipped: 0

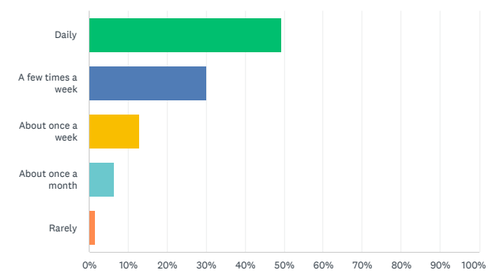


ANSWER CHOICES		RESPONSES	
Work along or near US 287		49.21%	31
Live along or near US 287		77.78%	49
Visit businesses along or near US 287		65.08%	41
Travel on US 287 to reach other destinations		77.78%	49
I don't use US 287		0.00%	0
Other (please specify)	Responses	7.94%	5
Total Respondents: 63			

Q2

How often do you travel on US 287? If you are currently taking precautions for COVID-19, how often did you travel on US 287 pre-pandemic? (Select top response)

Answered: 63 Skipped: 0



ANSWER CHOICES	RESPONSES	
Daily	49.21%	31
A few times a week	30.16%	19

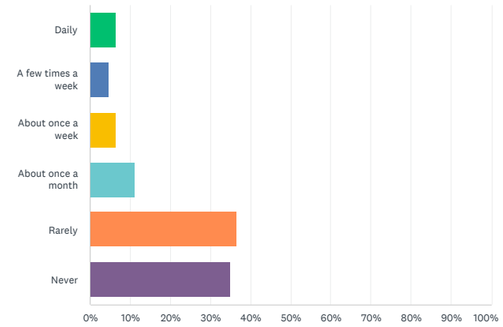
Add a co

TOTAL 63

Q3

How often do you use transit on the US 287 corridor? If you are currently taking precautions for COVID-19, how often did you use transit on the US 287 pre-pandemic? (Select top response)

Answered: 63 Skipped: 0

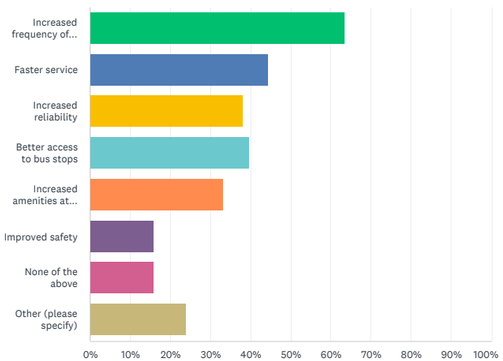


ANSWER CHOICES	RESPONSES	
Daily	6.35%	4
A few times a week	4.76%	3
About once a week	6.35%	4
About once a month	11.11%	7
Rarely	36.51%	23
Never	34.92%	22
TOTAL		**63**

Q4

What would encourage you to take transit more often? (select all that apply)

Answered: 63 Skipped: 0



ANSWER CHOICES	RESPONSES	
Increased frequency of bus service at stops	63.49%	40

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63 responses

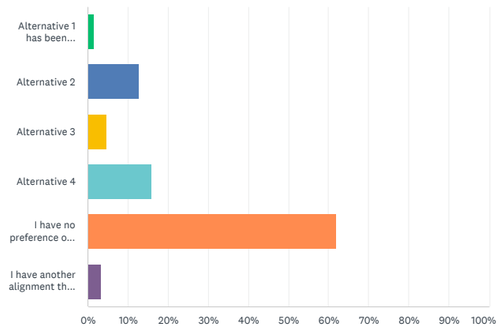
SIGN UP FREE

Improved safety		15.87%	10
None of the above		15.87%	10
Other (please specify)	Responses	23.81%	15
Total Respondents: 63			

Q5

Out of the options shown on the map below, which alignment would you prefer the US 287 BRT to use in the Longmont area?

Answered: 63 Skipped: 0



ANSWER CHOICES		RESPONSES	
Alternative 1 has been eliminated		1.59%	1
Alternative 2		12.70%	8
Alternative 3		4.76%	3
Alternative 4		15.87%	10
I have no preference on the US 287 BRT alignment in the Longmont area		61.90%	39
I have another alignment that I would prefer in the Longmont area (please specify)	Responses	3.17%	2
TOTAL			**63**

Q6

Based on your response to the question above, please explain why your selection is your preferred alignment and provide any other feedback you have regarding the US 287 BRT's alignment in the Longmont area.

Answered: 49 Skipped: 14

no delays to wait for train

5/10/2021 5:29 PM

I'd love to skip the train but I also think the access to the housing along Main Street is important

5/10/2021 4:18 PM

close to the apartments along Coffman Street and I think that it is a designated route for the bus to take instead of using Main Street.

5/10/2021 4:16 PM

Although I used to work and live in Longmont, it's been a while. I'm not familiar now with the area now to have a valid opinion.

5/7/2021 9:40 AM

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63 responses

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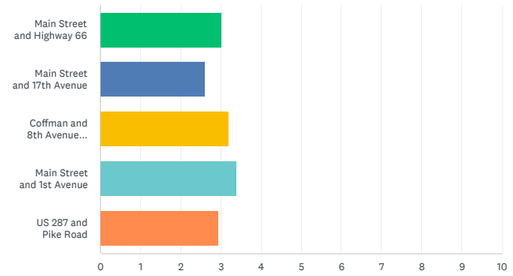
Q7

Based on stakeholder feedback and an initial analysis, the project team has identified several potential station locations for the US 287 BRT. Please rank the following potential station locations for the Longmont area from the stations you are most likely to use to the stations you are least likely to use.

Answered: 44 Skipped: 19

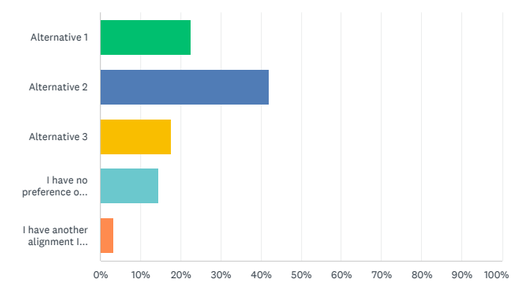


	1	2	3	4	5	TOTAL	SCORE
Main Street and Highway 66	35.00% 14	12.50% 5	12.50% 5	0.00% 0	40.00% 16	40	3.02
Main Street and 17th Avenue	2.44% 1	19.51% 8	19.51% 8	53.66% 22	4.88% 2	41	2.61
Coffman and 8th Avenue Park-and-Ride	25.00% 10	20.00% 8	25.00% 10	10.00% 4	20.00% 8	40	3.20
Main Street and 1st Avenue	26.19% 11	28.57% 12	14.29% 6	21.43% 9	9.52% 4	42	3.40
US 287 and Pike Road	16.67% 7	21.43% 9	26.19% 11	11.90% 5	23.81% 10	42	2.95

Q8

Out of the options shown on the map below, which alignment would you prefer the US 287 BRT to use in the Lafayette area?

Answered: 62 Skipped: 1



ANSWER CHOICES	RESPONSES	
Alternative 1	22.58%	14
Alternative 2	41.94%	26
Alternative 3	17.74%	11

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63 responses

Q9

Based on your response to the question above, please explain why your selection is your preferred alignment and provide any other feedback you have regarding the US 287 BRT's alignment in the Lafayette area.

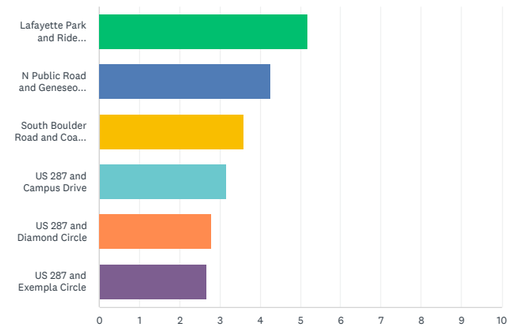
Answered: 49 Skipped: 14

I would like to see quicker service as I live in Niwot. a ten minute delay is not consistent with BRT 5/10/2021 4:18 PM
Bus stop needs to be closer to residential areas 5/10/2021 4:17 PM
I imagine that if I am using rapid transit, I am headed for Denver and I would like to get there as quickly as possible. However, maybe I was going to Lafayette for my final destination, I would want to end up downtown, so I would want the bus to take me there. 5/10/2021 4:16 PM
Access to the Public Rd business area 5/7/2021 9:40 AM

Q10

Based on stakeholder feedback and an initial analysis, the project team has identified several potential station locations for the US 287 BRT. Please rank the following potential station locations for the Lafayette area from the stations you are most likely to use to the stations you are least likely to use.

Answered: 50 Skipped: 13

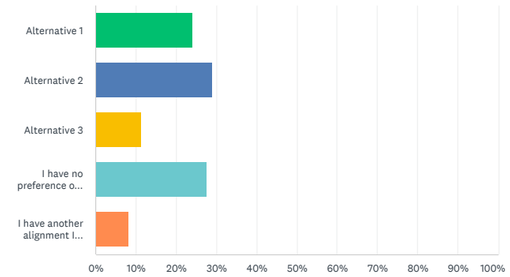


	1	2	3	4	5	6	TOTAL	SCORE
Lafayette Park and Ride (Public Road and South Boulder Road)	57.45% 27	25.53% 12	6.38% 3	4.26% 2	2.13% 1	4.26% 2	47	5.19
N Public Road and Geneseo Street	25.58% 11	37.21% 16	6.98% 3	11.63% 5	4.65% 2	13.95% 6	43	4.26
US 287 and Campus Drive	4.65% 2	6.98% 3	16.28% 7	44.19% 19	27.91% 12	0.00% 0	43	3.16
US 287 and Diamond Circle	6.82% 3	11.36% 5	9.09% 4	20.45% 9	31.82% 14	20.45% 9	44	2.80
US 287 and Exempla Circle	6.52% 3	15.22% 7	15.22% 7	6.52% 3	15.22% 7	41.30% 19	46	2.67

Q11

Out of the options shown on the map below, which alignment would you prefer the US 287 BRT to use in the Broomfield area?

Answered: 62 Skipped: 1



ANSWER CHOICES		RESPONSES
Alternative 1	24.19%	15
Alternative 2	29.03%	18
Alternative 3	11.29%	7
I have no preference on the US 287 BRT alignment for the Broomfield area	27.42%	17
I have another alignment I would prefer in the Broomfield area (please specify) Responses	8.06%	5
TOTAL		62

Q12

Based on your response to the question above, please explain why your selection is your preferred alignment and provide any other feedback you have regarding the US 287 BRT's alignment in the Broomfield area.

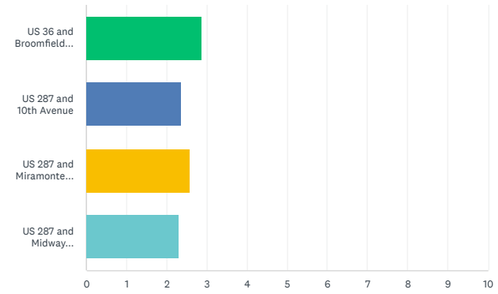
Answered: 48 Skipped: 15

something fast and efficient that gets people to and from where they are going 5/10/2021 4:18 PM
I live in Boulder 5/10/2021 4:17 PM
If I am on this bus I am headed for Denver and I would want to get there as quickly as possible. I think this is the quickest route you are offering 5/10/2021 4:16 PM
It's near my house 5/7/2021 9:40 AM

Q13

Based on stakeholder feedback and an initial analysis, the project team has identified several potential station locations for the US 287 BRT. Please rank the following potential station locations for the Broomfield area from the stations you are most likely to use to the stations you are least likely to use.

Answered: 51 Skipped: 12

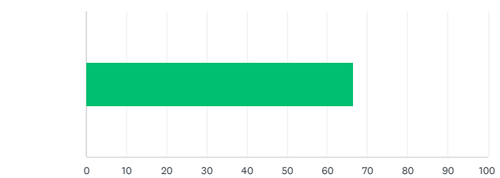


	1	2	3	4	TOTAL	SCORE
US 36 and Broomfield Station	46.81% 22	17.02% 8	12.77% 6	23.40% 11	47	2.87
US 287 and 10th Avenue	14.89% 7	25.53% 12	40.43% 19	19.15% 9	47	2.36
US 287 and Miramonte Boulevard	27.66% 13	29.79% 14	14.89% 7	27.66% 13	47	2.57
US 287 and Midway Boulevard	14.58% 7	29.17% 14	29.17% 14	27.08% 13	48	2.31

Q14

Using the slider below, please indicate your level of preference between the following scenarios.

Answered: 50 Skipped: 13



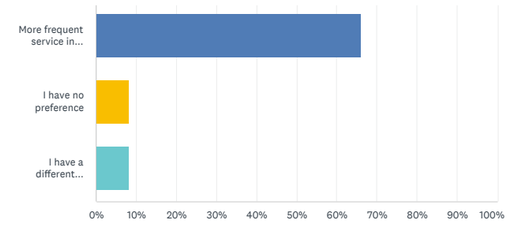
ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
Responses	67	3,328	50

Total Respondents: 50

Q15

With available funding, there are tradeoffs between service frequency and coverage. Which of the following scenarios would you prefer?

Answered: 62 Skipped: 1

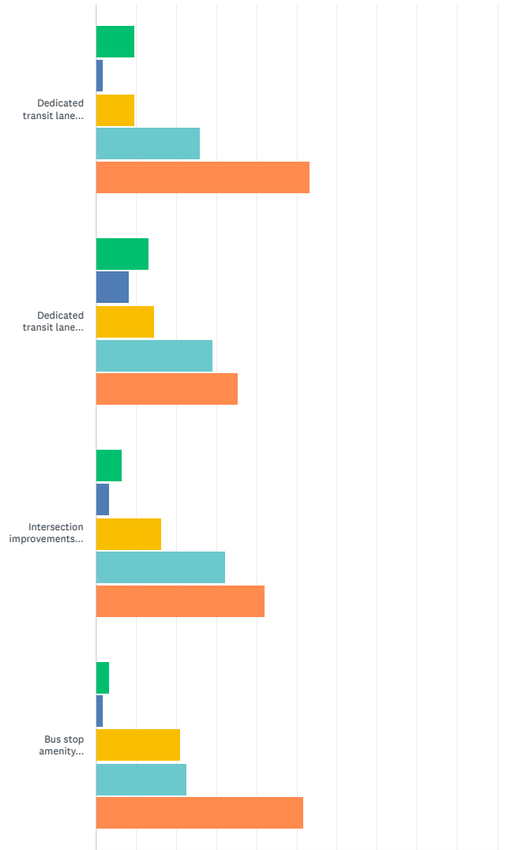


ANSWER CHOICES		RESPONSES	
A one-seat ride to Denver and Fort Collins, but less frequent service		17.74%	11
More frequent service in Boulder and Broomfield counties, with a transfer to other high-frequency routes to get to Fort Collins and Denver		66.13%	41
I have no preference		8.06%	5
I have a different preference for how I would want to make connections to regional destinations (please specify)	Responses	8.06%	5
TOTAL			62

Q16

Which types of transit improvements would you support on US 287?

Answered: 62 Skipped: 1



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63 responses

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63 responses

	STRONGLY DO NOT SUPPORT	SOMEWHAT DO NOT SUPPORT	NEUTRAL/NO PREFERENCE	SOMEWHAT SUPPORT	STRONGLY SUPPORT	TOTAL	WEIGHTED AVERAGE
Dedicated transit lanes in congested areas	9.68% 6	1.61% 1	9.68% 6	25.81% 16	53.23% 33	62	4.11
Dedicated transit lanes throughout the corridor	12.90% 8	8.06% 5	14.52% 9	29.03% 18	35.48% 22	62	3.66
Intersection improvements, including transit signal priority and queue jumps	6.45% 4	3.23% 2	16.13% 10	32.26% 20	41.94% 26	62	4.00
Bus stop amenity improvements, such as shelters and benches	3.23% 2	1.61% 1	20.97% 13	22.58% 14	51.61% 32	62	4.18

Q17

Do you have any other general comments about this project that you'd like to share?

Answered: 32 Skipped: 31

Based on the above image, at least once a day a person would have to cross the entire highway by foot or wheelchair to get to or from the bus with an outside dedicated transit lane. That's not good service nor safe for users. These stops will need lots of safety improvements including painted crossings and pedestrian priority signals to be comfortable. They probably could use something like Eisenhower Tunnel has where if a pedestrian has activated a signal and a car is detected running a red light a siren goes off to warn the person. And need colored paint on the ground to indicate people use that zone!

5/10/2021 4:18 PM

None

5/7/2021 9:26 AM

Give us bike lanes

5/7/2021 9:18 AM

US 287 in Broomfield

APPENDIX B:
COMMUNITY CONVERSATIONS

Appendix B : Community Conversations

This document provides an overview of the Community Conversations as part of a pro-active community engagement approach by reaching people where they are. All meetings were held virtually over Teams or Zoom. Some of the meetings have extensive notes and others have results from Mentimeter.com, depending on the preference of the group.

These conversations were fluid and changed with each entity, but centered around the goals, routes, stations and ways this project can help meet that group's goals.

Key take-a-ways:

- Need place for bikes
- Need safer way to cross 287
- Enclosed stations \ protection from elements popular
- Knowing when bus will arrive, predictable

Interesting facts:

- 287 was built as a bypass to get cars off Public Rd.

<u>Lafayette Senior Advisory Board</u> – April 13, 2021

- Overall trip times would be a key statistic that should serve as a deciding factor, in understanding how and why people may choose to use Bus Rapid Transit and should be factored into the decision
  - To make BRT enticing the county has to look at how to speed up the bus
  - Location Considerations
    - Stop spacing
    - Land use
    - Major Trip Generators
    - Equity
  - Number of stops has slowed transit and has made transit options cumbersome
    - Stop consolidation to reduce overall trip time
  - <u>Baseline is a key mobility point for seniors living at Affinity Living Communities and residents cannot necessarily walk to a further stop</u>
    - Walmart and the Hospital are all key stops for many residents in Lafayette
    - Some of the former 225 route stops could be considered for consolidation
    - Could a two-tier system work? One for major stops that an express bus stops at and a second bus that connects the smaller or less frequently used stops to the express route
    - 80% of population lives along the Front Range, any future BRT needs to compliment a possible future rail system

    - Josephine Commons and Mobile home parks are key locations that need to be on feeder routes allowing for an integrated transit system
    - Interconnected system most include stops at senior sites including planned Willoughby Corner
  - System needs to be integrated to prevent the system from being too cumbersome

- Routing where the boss would go
  - 287 would be the fastest route, with 12min added if the bus where to go down Public Rd. But Public Rd would result in a ore walkable system
    - If two-tiered approach is used it should include a tie into the park and ride where people could switch from local bus to BRT
  - If sticking with HWY 287 a station at ether Walmart or Exempla Hospital could help to balance the express nature of BRT with riders needs
    - Limited evening without trips after 7pm makes less usable for residents.
      - For evening service need to drive to a regional PnR
    - HWY 287 BRT could tie into Flatiron Flyer
    - The medical complex on the East side of HWY 287 could benefit from more local bus service beyond what the current Free Ride Lafayette service offers
    - Free Ride Lafayette is a key service for residents because of the flexible nature of the service
  -
- Station Areas
  - Crossings at Baseline and Hwy 287 to go from King Soopers to Walmart is very wide and congested making it unsafe and hazardous for seniors to cross which could make BRT less usable
    - Pedestrian island could help provide safer crossing
  - Great Wall of 287:
    - Lafayette is sliced in two by 287; east and west
    - Isolates people who do not drive with unsafe crossing experience
      - Lafayette feels like two cities unless you drive
      - Drivers become frustrated and take risks to beat the lights; they do not want to wait for pedestrians
    - People driving don't pay attention to people crossing at S. Boulder Rd.
    - Extra walking to reach pedestrian bridges, unusable for many.
    - The county being at SAB meeting provides a meaningful opportunity for senior residents to provide input
- Treatment options
    - The county is looking at options of where to locate stations, both roadside as well as center running stations are being explored
      - Walmart, Affinity Living Communities and Exempla Health are key stops for BRT
        - The BRT should tie into the Public road Park and Ride
        - Local service from BRT to Josephine Commons is very important
      - Will busses be full size or smaller?

        - Decision hasn't been made as of yet but a standard sized bus maybe best
    - It is important to remember that RTD works for the people of the district, so the service need the ridders needs first
    - Eastern side of Lafayette has a concentration of seniors who would need transportation from both Josephine Commons and Willoughby Corner to the centrally located BRT
    - Center loading stations allows for safe drop off of passengers in both direction while serving as a pedestrian shelter for people trying to cross at HWY 287 by Walmart
    - A pedestrian tunnel could be an option but there are safety concerns for riders and concerns about them flooding
    - Bridge or tunnel?
        - Bridges can be hard for those using a mobility device, there is no perfect solution
        - Some RTD Park ad Rides include an elevator which could be a good option for seniors

Latino Coalition – April 15, 2021

- Need to consider senior citizens
- RTD = being in areas where seniors can get
    - Go to Keiser
    - Stop in different location
- Hispanic seniors
    - NE Longmont
        - Should look into that
        - Seniors have a TOD style apartment opportunity
- Future of all of this depends on money, planning and building
- Long term plans should include electric, self-driving, FFM, metrobus … 10 years
- Lafayette created 287 as a bypass
    - Minimize traffic on public
    - Now it's congested
        - People going from Longmont to Broomfield
    - Public needs transit with a stop at every-other block
        - Good for boarding
        - How it was in the past
    - S. Boulder Rd and 287 could be a good spot for a PnR
- Broomfield has essential workers
    - Live and work regionally
        - What is the ridership?
        - Look at demographics
    - King Soopers and Flatiron Mall
- Do not think it should go to Denver, but transfer to Flatiron Flyer
    - Seniors, essential workers and service industry

- Need discussion on fare structure
- Need WiFi … digital divide

Longmont Bicycle Issues Committee – April 26, 2021

- Need a bicycle trail adjacent to BRT
    - Alongside the road
    - Accessibility, not on a parallel route
        - On and off parallel routes
    - If a storm comes, would be nice to be able to get on the bus
- Why was Main Street eliminated?
    - City and County have done a lot of work
        - Coffman busway
        - 100% on Coffman
        - Will come back to Main street further south
- Timeline
    - Coffman will start in 2 years (2022-2023)
    - Boulder is already doing things
    - Pieces come together a little at a time
- Rural sections:
    - Bikes need safer intersections
        - Porkchop goes all the way into the travel lane
        - Have to get off and walk
        - No ramps
        - Pull median back; improve bicycle movements
    - Move signals to the edge to provide more opportunity to work within roadway
- Stations:
    - Need to have bike parking
    - Hard to get the bike on and off the front of the bus
        - A place to lean the bicycle when you are taking it off
    - Stations are in the middle of where trail would go
        - Trail should be pulled back behind station
            - Avoid dodging
            - Behind is better
            - Broomfield events center
        - Plan trail and station to work together
- Will Longmont have TSP?
    - That's a Longmont Issue:
        - 1st and Coffman
        - 17th and Main
        - 66 and Main
        - Pike Road and Main
- Include bike signals

Lafayette Waste Reduction Advisory Committee – June 3, 2021

- Routing
  - Bus should go on Coffman and Longs Peak in Longmont
  - On 287 could cause problems
  - Take bus to Lafayette and back home
    - Use as a local service like SKIP
  - Stations
    - Emma could be a good spot
    - Bridges
    - Pull out for buses
    - Parking arrangement for areas
  - Bike Share, scooters and rental device help with FFM
  - Would be great to have a "HOP"
    - Baseline, 95th, Public Rd.
      - Housing and 95th and Baseline
      - Fixed route, connectivity
  - Headache is local stops when going to Denver
  - 128 to Flatiron Mall
    - Business Park
      - Does RTD provide service over there?
  - Difficult to get between Lafayette and Longmont quickly
    - Go to Niwot PnR

- Safety
  - Underground or Overpass
    - High speeds on 287
    - Feels unsafe to cross
  - Center concept is good for Lafayette
    - Acts like a median to break up street
    - But would not want to feel like a "sitting duck" when bus is not there
    - Cars may use the center lane … would need barrier
  - Fully enclosed stations good idea
    - Clear vision zones w/ center
    - What will be least burdensome and reduce waste?
  - Need bicycling improvements, including connections to like Niwot and Arapahoe
  - Want it to be easy to look up arrivals
    - 5 digit stop ID
  - Commuting but also placemaking
    - Create a pedestrian friendly environment
    - Protection from weather and security

Mobility and Access Coalition (former LCC)

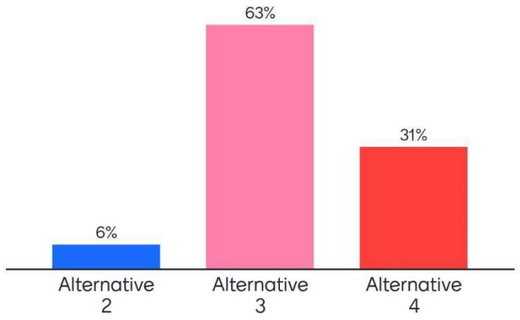
This was our first time using Mentimeter and we had time for a fully engaged and long conversation with up to 19 participants responding to the slides.

What are the top things we should consider when planning transit enhancements on 287?

Mentimeter

Which route do you prefer for Longmont?

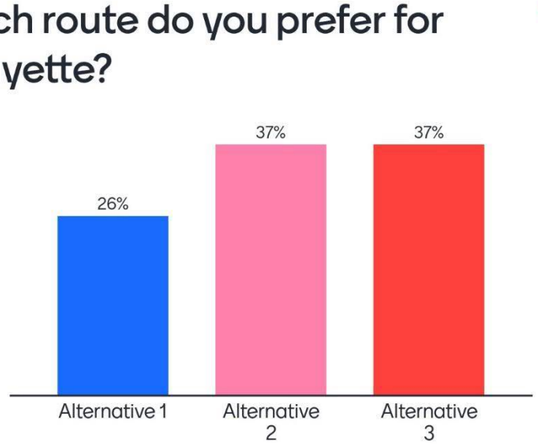
Mentimeter



16

Which route do you prefer for Lafayette?

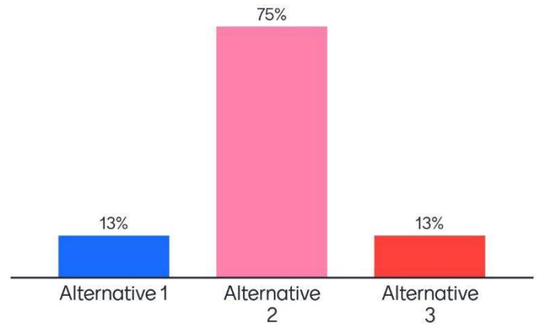
Mentimeter



19

Which route do you prefer for Broomfield?

Mentimeter



16

Lafayette Energy Sustainability Advisory Committee (LESAC) – June 11, 2021

Goals should be:

- Usability by the people
  - DC / LA
  - Favored, convenient, carpool lane
  - Useful
    - More difficult to drive
  - Places where people live to where they work
    - At times when convenient
  - How will people behave post-Covid?
    - Could be significant changes
- Convenience
  - Only way to airport is PnR
  - Bus saves money
  - Now PnR, two transfers and shuttle
    - From Boulder is easy
  - Lafayette to Boulder

        - Bus schedule!
        - Figure out when it's going
        - Frequent and on-time
            - 10 minutes, next one will come
        - Don't want to look up schedule
- Apps and Technology
    - Need to accept coins and bills in the bus
    - And use technology
    - More direct routes
    - Takes work to use
    - Different expectations
- What's good for Lafayette, may not be good for everyone else (going down Public)
- Walking bridge connects two sides
    - "Great Wall of 287"
- #3 is the best solution
- Electric scooters and bikes can help with distance (FFM)
- Circulation route would be helpful
    - Like 16th St in Denver
    - PnR on Public to the north
- Make waiting better!
    - -25 in January and 100 in July
    - Need shelter from elements
    - Inside could provide more protection
        - But there is a cost consideration

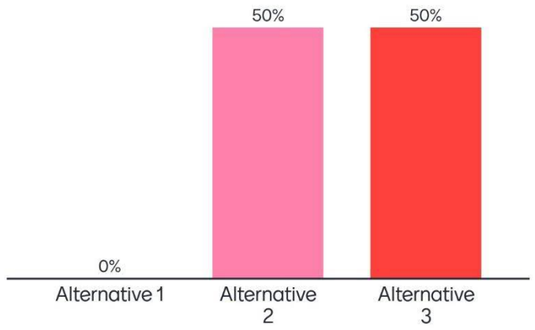
Longmont Transportation Advisory Board – June 14, 2021

- **On routing:**
    - Needs to work with the transit network, including future train
    - Technology is important to consider
        - Potential for future automation
    - Transit centers; need maintenance facility
- **Stations**
    - Enclosure, places to drink and sit
    - 1880s transit was better
        - Even better in 1972
            - Tied to funding and financing
    - Food trucks next to the station
        - Make it safer and not so lonely, plus provide food
        - Activity will bring more people
    - Accessibility with bikes – store them on the bus and along the routes
- Pedestrian safety is extremely important!
    - Especially at the intersections
    - Also need better design for bicycles
- Frequency needs to be more than every hour!

    - Depends on number of stops, service patterns
        - Perhaps one-seat ride at peak and 2-seat ride off peak
        - Commuting can be one-seat ride to major destinations
        - Need well-timed connections to use the network
- Regional bus also acts local and slows it down
    - Having to go through town and make stops, slows it down
- Also should think of connections to Weld County
    - Latino workers and other connections
- Kiosks would be great for buying tickets in advance
    - Should both accept cards and give exact change back
    - Ecopass is great
    - Perhaps can have passes that can be purchased at an ATM or gas-station
    - Cash is very important for buying tickets, seniors + digital divide
- Bay Area Rapid Transit as and example and DC
    - Easy to use
- Main Street station will be accessible to housing
- **Stops**
    - Does it include local routes?
    - Super fast only a few times
        - Perhaps an express and a slower option

Which route do you prefer for Lafayette?

Mentimeter



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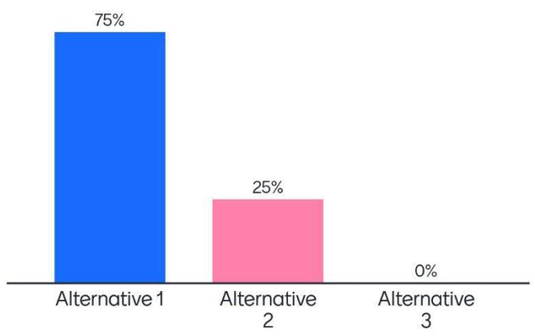
Which route do you prefer for Broomfield?

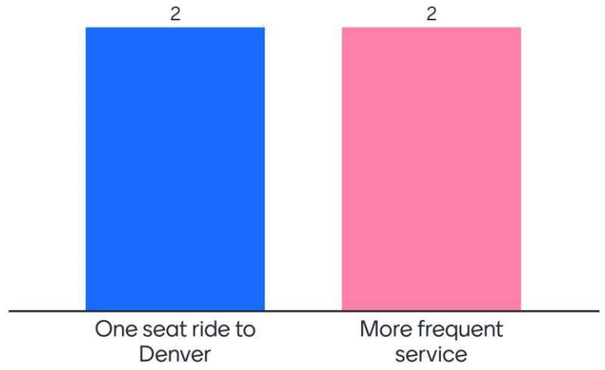
Mentimeter



4

Which is more important?

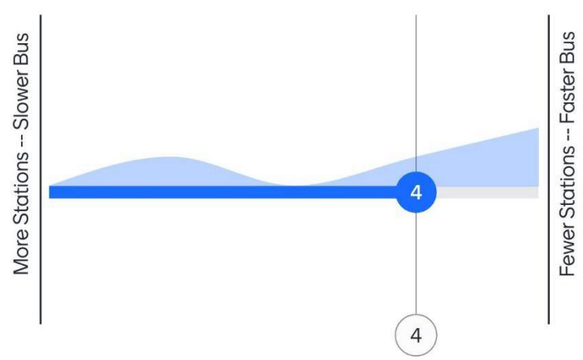
Mentimeter



4

Where is the balance between speed and station access?

Mentimeter



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Broomfield ACES – Transportation Subcommittee; June 16, 2021

In this group, we had only a short time and used Mentimeter to help bring the top issues to the front in a short time. There were 8 participants (n=8). Here are the notes from that meeting and the results from Mentimeter:

- Flatiron Flyer is center running
    - But needs to merge across lanes after leaving the lane
- How will this work after the traffic signals?
- People also need to feel comfortable riding bicycles on the corridor
- Coordination and timing could offset the need for a one-seat ride
- Local routes are not too frequent in Broomfield
    - Need to look at the entire network
    - Flatiron Flyer is great, but sometimes full
- Frequency is important; if you miss a bus the next one is 30 minutes
    - That could cause issues with people missing work or other important
    - Sometimes issues with the drivers

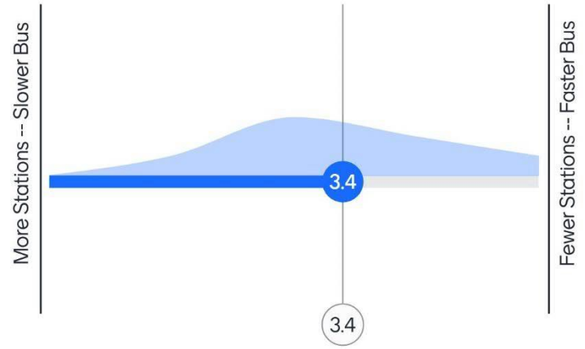
What are the top things we should consider when planning transit enhancements on 287?

Mentimeter

8

Where is the balance between speed and station access?

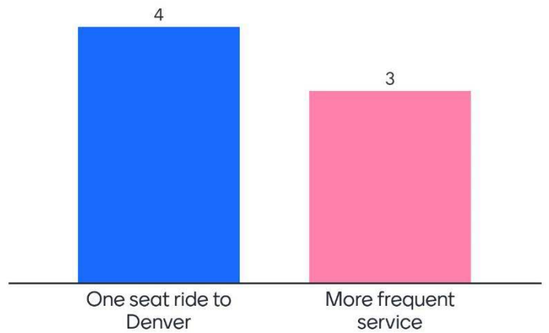
Mentimeter



7

Which is more important?

Mentimeter



7

US 287 and Lucerne Drive

APPENDIX C:
CAPITAL COST ESTIMATES AND INTERSECTION PRIORITY CALCULATIONS

Scenario 1 - Queue Jumps

FTA SCC	Description	Unit	Unit Cost (2021$)	Segment:	Longmont North	Longmont/ CO119 Coffman St	Longmont South	Boulder CO Rural	Lafayette North	Lafayette South	Broomfield	Broomfield South	Subtotal			Total
				From - To	North of CO66 to 11th Ave		Boston Ave to Pike Road	Longmont City Limits to South of Lucerne	North of Diamond Lane to South of Public	South of Public to NE Expressway	South of NE Expressway to Midway	South of Midway BLVD to RTD Connection	North of CO66 to US36 RTD Station			
				Length (mi)	1.8	1.51	1.4	8.8	2.4	1.5	2.4	2.5	22.3			
					Quantity / Total Segment Cost		Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Subtotal Cost	Allocated Contingency %	Allocated Contingency	Total Cost
10	**GUIDEWAY & TRACK ELEMENTS**			**0.0 / $9,500,000**		**$8,000,000**	**$6,000,000**	**$7,000,000**	**$7,500,000**	**$4,000,000**	**0.0 / $0**	**0.0 / $42,000,000**		**$12,600,000**	**$54,600,000**
10.02	New Center Running BRT Lanes	Route Mile	$7,500,000	0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
10.03	New BAT Lane Widening	SY	$275	0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
10.03	New Signal Queue Jump - High Cost	EACH	$2,000,000	4.0 / $8,000,000		2.0 / $4,000,000	0.0 / $0	3.0 / $6,000,000	3.0 / $6,000,000	0.0 / $0	0.0 / $0	12.0 / $24,000,000	30%	$7,200,000	$31,200,000
10.03	New Signal Queue Jump - Medium Cost	EACH	$1,500,000	1.0 / $1,500,000		2.0 / $3,000,000	2.0 / $3,000,000	0.0 / $0	1.0 / $1,500,000	0.0 / $0	0.0 / $0	6.0 / $9,000,000	30%	$2,700,000	$11,700,000
10.03	New Signal Queue Jump - Low Cost	EACH	$1,000,000	0.0 / $0		1.0 / $1,000,000	3.0 / $3,000,000	1.0 / $1,000,000	0.0 / $0	4.0 / $4,000,000	0.0 / $0	9.0 / $9,000,000	30%	$2,700,000	$11,700,000
20	**STATIONS**			**1.0 / $750,000**		**1.0 / $750,000**	**3.0 / $2,250,000**	**2.0 / $1,500,000**	**1.0 / $750,000**	**3.0 / $2,250,000**	**1.0 / $750,000**	**12.0 / $9,000,000**		**$2,700,000**	**$11,700,000**
20.01	Standard One-Way BRT Station	Stations	$350,000	0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
20.01	Standard Two-Way BRT Station	Stations	$750,000	1.0 / $750,000		1.0 / $750,000	3.0 / $2,250,000	2.0 / $1,500,000	1.0 / $750,000	3.0 / $2,250,000	1.0 / $750,000	12.0 / $9,000,000	30%	$2,700,000	$11,700,000
30	**SUPPORT FACILITIES**			**0.0 / $0**		**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**			
30.02	Light Maintenance Facility (Layover)	Each		0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
30.03	Heavy Maintenance Facility	Each		/ $0		/ $0	0.0 / $0	/ $0	/ $0	/ $0	/ $0	0.0 / $0	30%	$0	$0
40	**SITEWORK & SPECIAL CONDITIONS**			**/ $1,481,125**			**/ $1,264,375**	**/ $3,392,125**	**/ $1,228,250**	**/ $3,392,125**	**/ $903,125**	**/ $108,375**	**0.0 / $11,769,500**		**$3,771,825**	**$15,541,325**
40.01	Demolition, Clearing, Earthwork	% of Const. Subtotal	2.0%	/ $205,000			/ $175,000	/ $165,000	/ $170,000	/ $165,000	/ $125,000	/ $15,000	0.0 / $1,020,000	35%	$357,000	$1,377,000
40.02	Site Utilities, Utility Relocation		6.0%	/ $615,000			/ $525,000	/ $495,000	/ $510,000	/ $495,000	/ $375,000	/ $45,000	0.0 / $3,060,000	35%	$1,071,000	$4,131,000
40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0.7%	/ $71,750			/ $61,250	/ $57,750	/ $59,500	/ $57,750	/ $43,750	/ $5,250	0.0 / $357,000	35%	$124,950	$481,950
40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0.5%	/ $51,250			/ $43,750	/ $41,250	/ $42,500	/ $41,250	/ $31,250	/ $3,750	0.0 / $255,000	35%	$89,250	$344,250
40.05	Site structures including retaining walls, sound walls		0.3%	/ $25,625			/ $21,875	/ $20,625	/ $21,250	/ $20,625	/ $15,625	/ $1,875	0.0 / $127,500	35%	$44,625	$172,125
40.06	New Pedestrian Underpass	EACH	$ 2,200,000.00					1.00 / $2,200,000		1.00 / $2,200,000			2.0 / $4,400,000	30%	$1,320,000	$5,720,000
40.07	New Park-N-Ride Off System Facility	EACH	$ 3,750,000.00					/ $0					0.0 / $0	30%	$0	$0
40.08	Temporary Facilities and other indirect costs during construction	% of Const. Subtotal	5.0%	/ $512,500			/ $437,500	/ $412,500	/ $425,000	/ $412,500	/ $312,500	/ $37,500	0.0 / $2,550,000	30%	$765,000	$3,315,000
50	**SYSTEMS**			**/ $1,556,900**			**/ $1,517,000**	**/ $2,534,000**	**/ $1,493,050**	**/ $1,274,350**	**/ $1,616,200**	**/ $382,500**	**0.0 / $10,374,000**		**$3,112,200**	**$13,486,200**
50.02	Transit Signal Priority	Route Mile	$ 50,000	1.8 / $89,000		1.4 / $70,000	8.8 / $440,000	2.4 / $120,500	1.5 / $73,500	2.4 / $122,000	2.5 / $125,000	20.8 / $1,040,000	30%	$312,000	$1,352,000
50.02	Queue Jump signal	EACH	$ 250,000	5.0 / $1,250,000		5.0 / $1,250,000	4.0 / $1,000,000	4.0 / $1,000,000	4.0 / $1,000,000	0.0 / $0	27.0 / $6,750,000	30%	$2,025,000	$8,775,000
50.05	Communications	Route Mile	$ 55,000	1.8 / $97,900		1.4 / $77,000	8.8 / $484,000	2.4 / $132,550	1.5 / $80,850	2.4 / $134,200	2.5 / $137,500	20.8 / $1,144,000	30%	$343,200	$1,487,200
50.06	Fare collection system and equipment	EACH	$ 120,000	1.0 / $120,000		1.0 / $120,000	3.0 / $360,000	2.0 / $240,000	1.0 / $120,000	3.0 / $360,000	1.0 / $120,000	12.0 / $1,440,000	30%	$432,000	$1,872,000
51	**Construction Subtotal (10 - 50)**			**/ $13,288,025**			**/ $11,531,375**	**/ $14,176,125**	**/ $11,221,300**	**/ $12,916,475**	**/ $8,769,325**	**/ $1,240,875**	**0% / $73,143,500**		**$22,184,025**	**$95,327,525**
60	**ROW, LAND, EXISTING IMPROVEMENTS**			**0 / $372,065**		**0**	**/ $322,879**	**0 / $396,932**	**0 / $314,196**	**0 / $361,661**	**0 / $245,541**	**0 / $34,745**	**0 / $2,048,018**		**$2,048,018**	**$4,096,036**
60.01	Land Acquisition Allowance	% of Const. Subtotal	2.8%	/ $372,065			/ $322,879	/ $396,932	/ $314,196	/ $361,661	/ $245,541	/ $34,745	/ $2,048,018	100%	$2,048,018	$4,096,036
70	**VEHICLES (number)**			**0 / $0**		**0**	**/ $0**	**0 / $0**	**0 / $0**	**0 / $0**	**0 / $0**	**0 / $0**	**27.0 / $27,000,000**		**$1,350,000**	**$28,350,000**
70.01	60' BRT Bus	EACH	$ 1,000,000	0 / $0		0	/ $0	0 / $0	0 / $0	/ $0	0 / $0	0 / $0	27.0 / $27,000,000	5%	$1,350,000	$28,350,000
70.01	40' BRT Bus	EACH	$ 550,000	/ $0		0	/ $0	/ $0	/ $0	/ $0	/ $0	/ $0	/ $0	5%	$0	$0
80	**PROFESSIONAL SERVICES (applies to Cats. 10-50)**		32.0%	**/ $4,252,168**			**/ $3,690,040**	**/ $4,536,360**	**/ $3,590,816**	**/ $4,133,272**	**/ $2,806,184**	**/ $397,080**	**0.0 / $23,405,920**		**$585,148**	**$23,991,068**
80.01	Project Development		13.0%	/ $1,727,443			/ $1,499,079	/ $1,842,896	/ $1,458,769	/ $1,679,142	/ $1,140,012	/ $161,314	/ $9,508,655	2.5%	$237,716	$9,746,371
80.02	Engineering			/ $0			/ $0	/ $0	/ $0	/ $0	/ $0	/ $0	/ $0	2.5%	$0	$0
80.03	Project Management for Design and Construction	% of Const. Subtotal	4.0%	/ $531,521			/ $461,255	/ $567,045	/ $448,852	/ $516,659	/ $350,773	/ $49,635	/ $2,925,740	2.5%	$73,144	$2,998,884
80.04	Construction Administration & Management		10.0%	/ $1,328,803			/ $1,153,138	/ $1,417,613	/ $1,122,130	/ $1,291,648	/ $876,933	/ $124,088	/ $7,314,350	2.5%	$182,859	$7,497,209
80.05	Professional Liability and other Non-Construction Insurance		2.0%	/ $265,761			/ $230,628	/ $283,523	/ $224,426	/ $258,330	/ $175,387	/ $24,818	/ $1,462,870	2.5%	$36,572	$1,499,442
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.		1.0%	/ $132,880			/ $115,314	/ $141,761	/ $112,213	/ $129,165	/ $87,693	/ $12,409	/ $731,435	2.5%	$18,286	$749,721
80.07	Surveys, Testing, Investigation, Inspection		1.0%	/ $132,880			/ $115,314	/ $141,761	/ $112,213	/ $129,165	/ $87,693	/ $12,409	/ $731,435	2.5%	$18,286	$749,721
80.08	Start up		1.0%	/ $132,880			/ $115,314	/ $141,761	/ $112,213	/ $129,165	/ $87,693	/ $12,409	/ $731,435	2.5%	$18,286	$749,721
81	**Subtotal (10 - 80)**			**/ $17,912,258**	**$0**		**/ $15,544,294**	**/ $19,109,417**	**/ $15,126,312**	**/ $17,411,408**	**/ $11,821,050**	**/ $1,672,700**	**/ $125,597,438**		**$26,167,191**	**$151,764,629**
90	**UNALLOCATED CONTINGENCY**	% of Subtotal (10 - 80)	10.0%	**/ $1,791,226**	**$0**		**/ $1,554,429**	**/ $1,910,942**	**/ $1,512,631**	**/ $1,741,141**	**/ $1,182,105**	**/ $167,270**	**/ $12,559,744**		**$2,616,719**	$15,176,463
91	**2021$ Total Project Cost (10 - 90)**			**/ $19,703,483**	**$0**		**/ $17,098,723**	**/ $21,020,358**	**/ $16,638,944**	**/ $19,152,549**	**/ $13,003,155**	**/ $1,839,969**	**/ $138,157,182**		**$28,783,910**	**$166,941,092**
	Escalation Cost	% of Const. Subtotal	0.0%	**$0**	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**			**$0**
	2021$ Total Project Cost (10 - 90)			**/ $19,703,483**	**$0**		**/ $17,098,723**	**/ $21,020,358**	**/ $16,638,944**	**/ $19,152,549**	**/ $13,003,155**	**/ $1,839,969**	**/ $138,157,182**			**$166,941,092**

Based on CO119 BRT Preliminary Engineering Cost Estimate including Longmont Coffman St Blue Route ($7,909,099 for Longmont Blue Route + $6,280,000 Coffman St Corridor Improvements)- 6/19/2018 (Escalated to 2021$ at the project estimate value of 3% per year) Rounded up to the next $100,000 = $15.6 Million

Value includes professional services and 25% Contingency already.

This segment excluded from total US 287 BRT costs as the project is already funded and assumed to be completed prior to US 287 BRT project.

Ranges are rounded with the lower end of range is based on a 10% unallocated contingency rather than a 20%.

$166.9 M

Low end of range (10% unallocated contingency)

FRA SCC	Description	% of Total Project Cost	2021$ Total Cost	2022$ Total Cost	2023$ Total Cost	2024$ Total Cost	2025$ Total Cost
10	**GUIDEWAY & TRACK ELEMENTS**	**33%**	**$55 M**	**$57 M**	**$58 M**	**$61 M**	**$63 M**
20	**STATIONS**	**7%**	**$12 M**	**$12 M**	**$13 M**	**$13 M**	**$13 M**
30	**SUPPORT FACILITIES**	**0%**	**$0 M**	**$0 M**	**$0 M**	**$0 M**	**$0 M**
40	**SITEWORK & SPECIAL CONDITIONS**	**9%**	**$16 M**	**$16 M**	**$17 M**	**$17 M**	**$18 M**
50	**SYSTEMS**	**8%**	**$13 M**	**$14 M**	**$14 M**	**$15 M**	**$15 M**
51	**Construction Subtotal (10 - 50)**	**57%**	**$95 M**	**$99 M**	**$102 M**	**$106 M**	**$109 M**
60	**ROW, LAND, EXISTING IMPROVEMENTS**	**2%**	**$4 M**	**$4 M**	**$4 M**	**$5 M**	**$5 M**
70	**VEHICLES**	**17%**	**$28 M**	**$29 M**	**$30 M**	**$31 M**	**$33 M**
80	**PROFESSIONAL SERVICES**	**14%**	**$24 M**	**$25 M**	**$26 M**	**$27 M**	**$28 M**
81	**Subtotal (10 - 80)**	**91%**	**$152 M**	**$157 M**	**$163 M**	**$168 M**	**$174 M**
90	**UNALLOCATED CONTINGENCY**	**9%**	**$15 M**	**$16 M**	**$16 M**	**$17 M**	**$17 M**
91	**YOE Total Project Cost (10 - 90)**	**100%**	**$167 M**	**$173 M**	**$179 M**	**$185 M**	**$192 M**

RANGE: **$167M to $182M**

Assumed annual escalation rate	3.50%
2021	1.000000
2022	1.035000
2023	1.071225
2024	1.108718
2025	**1.147523**

287 Bus Rapid Transit Feasibility Study

Scenario 2 - Queue Jumps + BAT Lanes

			Segment:	Longmont North	Longmont/ CO119 Coffman St	Longmont South	Boulder CO Rural	Lafayette North	Lafayette South	Broomfield	Broomfield South	Subtotal			Total
			From - To	North of CO66 to 11th Ave		Boston Ave to Pike Road	Longmont City Limits to South of Lucerne	North of Diamond Lane to South of Public	South of Public to NE Expressway	South of NE Expressway to Midway	South of Midway BLVD to RTD Connection	North of CO66 to US36 RTD Station			
			Length (mi)	1.8	1.51	1.4	8.8	2.4	1.5	2.4	2.5	22.3			
FTA SCC	Description	Unit	Unit Cost (2021$)	Quantity / Total Segment Cost		Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Segment Cost	Quantity / Total Cost	Allocated Contingency %	Allocated Contingency	Total Cost
10	**GUIDEWAY & TRACK ELEMENTS**			$10,572,500		$8,302,500	$6,000,000	$14,012,500	$9,975,000	$7,643,750	$0 / $0	52777.0 / $56,506,250		$16,951,875	$73,458,125
10.02	New Center Running BRT Lanes	Route Mile	$7,500,000	0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
10.03	New BAT Lane	SY	$275	3900.0 / $1,072,500		1100.0 / $302,500	0.0 / $0	25500.0 / $7,012,500	9000.0 / $2,475,000	13250.0 / $3,643,750	0.0 / $0	52750.0 / $14,506,250	30%	$4,351,875	$18,858,125
10.03	New Signal Queue Jump - High Cost	EACH	$2,000,000	4.0 / $8,000,000		2.0 / $4,000,000	0.0 / $0	3.0 / $6,000,000	3.0 / $6,000,000	0.0 / $0	0.0 / $0	12.0 / $24,000,000	30%	$7,200,000	$31,200,000
10.03	New Signal Queue Jump - Medium Cost	EACH	$1,500,000	1.0 / $1,500,000		2.0 / $3,000,000	2.0 / $3,000,000	0.0 / $0	1.0 / $1,500,000	0.0 / $0	0.0 / $0	6.0 / $9,000,000	30%	$2,700,000	$11,700,000
10.03	New Signal Queue Jump - Low Cost	EACH	$1,000,000	0.0 / $0		1.0 / $1,000,000	3.0 / $3,000,000	1.0 / $1,000,000	0.0 / $0	4.0 / $4,000,000	0.0 / $0	9.0 / $9,000,000	30%	$2,700,000	$11,700,000
20	**STATIONS**			**1.0 / $750,000**		**1.0 / $750,000**	**3.0 / $2,250,000**	**2.0 / $1,500,000**	**1.0 / $750,000**	**3.0 / $2,250,000**	**1.0 / $750,000**	**12.0 / $9,000,000**		**$2,700,000**	**$11,700,000**
20.01	Standard One-Way BRT Station	Stations	$350,000	0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
20.01	Standard Two-Way BRT Station (Includes Both Platforms)	Stations	$750,000	1.0 / $750,000		1.0 / $750,000	3.0 / $2,250,000	2.0 / $1,500,000	1.0 / $750,000	3.0 / $2,250,000	1.0 / $750,000	12.0 / $9,000,000	30%	$2,700,000	$11,700,000
30	**SUPPORT FACILITIES**			**0.0 / $0**		**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**	**0.0 / $0**			
30.02	Light Maintenance Facility (Layover)	Each		0.0 / $0		0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	0.0 / $0	30%	$0	$0
30.03	Heavy Maintenance Facility	Each		/ $0		0.0 / $0	/ $0	/ $0	/ $0	/ $0	/ $0	0.0 / $0	30%	$0	$0
40	**SITEWORK & SPECIAL CONDITIONS**			**$1,636,101**		**$1,308,086**	**$3,392,125**	**$2,241,556**	**$3,749,763**	**$1,429,647**	**$108,375**	**0.0 / $13,865,653**		**$4,469,213**	**$18,334,866**
40.01	Demolition, Clearing, Earthwork	% of Const. Subtotal	2.0%	$226,450		$181,050	$165,000	$310,250	$214,500	$197,875	$15,000	0.0 / $1,310,125	35%	$458,544	$1,768,669
40.02	Site Utilities, Utility Relocation		6.0%	$679,350		$543,150	$495,000	$930,750	$643,500	$593,625	$45,000	0.0 / $3,930,375	35%	$1,375,631	$5,306,006
40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0.7%	$79,258		$63,368	$57,750	$108,588	$75,075	$69,256	$5,250	0.0 / $458,544	35%	$160,490	$619,034
40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0.5%	$56,613		$45,263	$41,250	$77,563	$53,625	$49,469	$3,750	0.0 / $327,531	35%	$114,636	$442,167
40.05	Site structures including retaining walls, sound walls		0.3%	$28,306		$22,631	$20,625	$38,781	$26,813	$24,734	$1,875	0.0 / $163,766	35%	$57,318	$221,084
40.06	New Pedestrian Underpass	EACH	$ 2,200,000.00				1.00 / $2,200,000		1.00 / $2,200,000			2.0 / $4,400,000	30%	$1,320,000	$5,720,000
40.07	New Park-N-Ride Off System Facility	EACH	$ 3,750,000.00					$0				0.0 / $0	30%	$0	$0
40.08	Temporary Facilities and other indirect costs during construction	% of Const. Subtotal	5.0%	$566,125		$452,625	$412,500	$775,625	$536,250	$494,688	$37,500	0.0 / $3,275,313	30%	$982,594	$4,257,906
50	**SYSTEMS**			**$1,556,900**		**$1,517,000**	**$2,534,000**	**$1,493,050**	**$1,274,350**	**$1,616,200**	**$382,500**	**0.0 / $10,374,000**		**$3,112,200**	**$13,486,200**
50.02	Transit Signal Priority	Route Mile	$ 50,000	1.8 / $89,000		1.4 / $70,000	8.8 / $440,000	2.4 / $120,500	1.5 / $73,500	2.4 / $122,000	2.5 / $125,000	20.8 / $1,040,000	30%	$312,000	$1,352,000
50.02	Queue Jump signal	EACH	$ 250,000	5.0 / $1,250,000		5.0 / $1,250,000	5.0 / $1,250,000	4.0 / $1,000,000	4.0 / $1,000,000	4.0 / $1,000,000	0.0 / $0	27.0 / $6,750,000	30%	$2,025,000	$8,775,000
50.05	Communications	Route Mile	$ 55,000	1.8 / $97,900		1.4 / $77,000	8.8 / $484,000	2.4 / $132,550	1.5 / $80,850	2.4 / $134,200	2.5 / $137,500	20.8 / $1,144,000	30%	$343,200	$1,487,200
50.06	Fare collection system and equipment	EACH	$ 120,000	1.0 / $120,000		1.0 / $120,000	3.0 / $360,000	2.0 / $240,000	1.0 / $120,000	3.0 / $360,000	1.0 / $120,000	12.0 / $1,440,000	30%	$432,000	$1,872,000
51	**Construction Subtotal (10 - 50)**			**$14,515,501**		**$11,877,586**	**$14,176,125**	**$19,247,106**	**$15,749,113**	**$12,939,597**	**$1,240,875**	**0% / $89,745,903**		**$27,233,288**	**$116,979,191**
60	**ROW, LAND, EXISTING IMPROVEMENTS**			**0 / $406,434**		**0 / $332,572**	**0 / $396,932**	**0 / $538,919**	**0 / $440,975**	**0 / $362,309**	**0 / $34,745**	0.0 / $2,512,885		**$2,512,885**	**$5,025,771**
60.01	Land Acquisition Allowance	% of Const. Subtotal	2.8%	$406,434		$332,572	$396,932	$538,919	$440,975	$362,309	$34,745	$2,512,885	100%	$2,512,885	$5,025,771
70	**VEHICLES (number)***			**0 / $0**		**0 / $0**	**0 / $0**	**0 / $0**	**0 / $0**	**0 / $0**	**0 / $0**	**27 / $27,000,000**		**$1,350,000**	**$28,350,000**
70.01	60' BRT Bus	Each	$ 1,000,000	$0		$0	$0	$0	$0	$0	$0	27.0 / $27,000,000	5%	$1,350,000	$28,350,000
70.01	40' BRT Bus	EACH	$ 550,000									$0	5%	$0	$0
80	**PROFESSIONAL SERVICES (applies to Cats. 10-50)**		32.0%	**$4,644,960**		**$3,800,828**	**$4,536,360**	**$6,159,074**	**$5,039,716**	**$4,140,671**	**$397,080**	**0.0 / $28,718,689**		**$717,967**	**$29,436,656**
80.01	Project Development		3.0%	$435,465		$356,328	$425,284	$577,413	$472,473	$388,188	$37,226	$2,692,377	2.5%	$67,309	$2,759,687
80.02	Engineering		10.0%	$1,451,550		$1,187,759	$1,417,613	$1,924,711	$1,574,911	$1,293,960	$124,088	$8,974,590	2.5%	$224,365	$9,198,955
80.03	Project Management for Design and Construction		4.0%	$580,620		$475,103	$567,045	$769,884	$629,965	$517,584	$49,635	$3,589,836	2.5%	$89,746	$3,679,582
80.04	Construction Administration & Management	% of Const. Subtotal	10.0%	$1,451,550		$1,187,759	$1,417,613	$1,924,711	$1,574,911	$1,293,960	$124,088	$8,974,590	2.5%	$224,365	$9,198,955
80.05	Professional Liability and other Non-Construction Insurance		2.0%	$290,310		$237,552	$283,523	$384,942	$314,982	$258,792	$24,818	$1,794,918	2.5%	$44,873	$1,839,791
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.		1.0%	$145,155		$118,776	$141,761	$192,471	$157,491	$129,396	$12,409	$897,459	2.5%	$22,436	$919,896
80.07	Surveys, Testing, Investigation, Inspection		1.0%	$145,155		$118,776	$141,761	$192,471	$157,491	$129,396	$12,409	$897,459	2.5%	$22,436	$919,896
80.08	Start up		1.0%	$145,155		$118,776	$141,761	$192,471	$157,491	$129,396	$12,409	$897,459	2.5%	$22,436	$919,896
81	**Subtotal (10 - 80)**			**$19,566,896**	**$0**	**$16,010,986**	**$19,109,417**	**$25,945,099**	**$21,229,804**	**$17,442,577**	**$1,672,700**	**$147,977,477**		**$31,814,140**	**$179,791,618**
90	**UNALLOCATED CONTINGENCY**	% of Subtotal (10 - 80)	10.0%	**$1,956,690**	**$0**	**$1,601,099**	**$1,910,942**	**$2,594,510**	**$2,122,980**	**$1,744,258**	**$167,270**	**$14,797,748**		**$3,181,414**	$17,979,162
91	**2021$ Total Project Cost (10 - 90)**			**$21,523,585**	**$0**	**$17,612,085**	**$21,020,358**	**$28,539,609**	**$23,352,784**	**$19,186,834**	**$1,839,969**	**$162,775,225**		**$34,995,555**	**$197,770,780**
	Escalation Cost	% of Const. Subtotal	0.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0			$0
	2021$ Total Project Cost (10 - 90)			**$21,523,585**	**$0**	**$17,612,085**	**$21,020,358**	**$28,539,609**	**$23,352,784**	**$19,186,834**	**$1,839,969**	**$162,775,225**			**$197,770,780**

Based on CO119 BRT Preliminary Engineering Cost Estimate including Longmont Coffman St Blue Route ($7,909,099 for Longmont Blue Route + $6,280,000 Coffman St Corridor Improvements)- 6/19/2018 (Escalated to 2021$ at the project estimate value of 3% per year) Rounded up to the next $100,000 = $15.6 Million

Value includes professional services and 25% Contingency already.

This segment excluded from total US 287 BRT costs as the project is already funded and assumed to be completed prior to US 287 BRT project.

Ranges are rounded with the lower end of range is based on a 10% unallocated contingency rather than a 20%.

$197.8 M

Low end of range (10% unallocated contingency)

FRA SCC	Description	% of Total Project Cost	2021$ Total Cost	2022$ Total Cost	2023$ Total Cost	2024$ Total Cost	2025$ Total Cost
10	**GUIDEWAY & TRACK ELEMENTS**	**37%**	**$73 M**	**$76 M**	**$79 M**	**$81 M**	**$84 M**
20	**STATIONS**	**6%**	**$12 M**	**$12 M**	**$13 M**	**$13 M**	**$13 M**
30	**SUPPORT FACILITIES**	**0%**	**$0 M**	**$0 M**	**$0 M**	**$0 M**	**$0 M**
40	**SITEWORK & SPECIAL CONDITIONS**	**9%**	**$18 M**	**$19 M**	**$20 M**	**$20 M**	**$21 M**
50	**SYSTEMS**	**7%**	**$13 M**	**$14 M**	**$14 M**	**$15 M**	**$15 M**
51	**Construction Subtotal (10 - 50)**	**59%**	**$117 M**	**$121 M**	**$125 M**	**$130 M**	**$134 M**
60	**ROW, LAND, EXISTING IMPROVEMENTS**	**3%**	**$5 M**	**$5 M**	**$5 M**	**$6 M**	**$6 M**
70	**VEHICLES**	**14%**	**$28 M**	**$29 M**	**$30 M**	**$31 M**	**$33 M**
80	**PROFESSIONAL SERVICES**	**15%**	**$29 M**	**$30 M**	**$32 M**	**$33 M**	**$34 M**
81	**Subtotal (10 - 80)**	**91%**	**$180 M**	**$186 M**	**$193 M**	**$199 M**	**$206 M**
90	**UNALLOCATED CONTINGENCY**	**9%**	**$18 M**	**$19 M**	**$19 M**	**$20 M**	**$21 M**
91	**YOE Total Project Cost (10 - 90)**	**100%**	**$198 M**	**$205 M**	**$212 M**	**$219 M**	**$227 M**

RANGE: $198M to $215M

Assumed annual escalation rate	3.50%
2021	1.000000
2022	1.035000
2023	1.071225
2024	1.108718
2025	**1.147523**

ID	Intersection*	Station Location	Existing LOS, Queue Jumps, Travel Times								2045 LOS, Queue Jumps, Travel Times								Intersection Treatment**	Overall Relative Priority***
			AM LOS	PM LOS	SB 95Q	NB 95Q	AM Time Savings (seconds)	PM Time Savings (seconds)	LOS Relative Need	Travel Time Savings Relative Need	AM LOS	PM LOS	SB 95Q	NB 95Q	AM Time Savings (seconds)	PM Time Savings (seconds)	LOS Relative Need	Travel Time Savings Relative Need		
1	US 287 & CO 66	YES	C	D	284'	564'	7	40	Low	Medium	C	E	447'	730'	9	61	Medium	Medium	Signal and queue jump - high cost	Medium
2	US 287 & 23rd Ave		Not Evaluted in Feasibility Study																Signal and queue jump - medium cost (NB only)	Not evaluated
3	US 287 & 21st Ave																		Signal and queue jump - high cost	Not evaluated
4	US 287 & 17th Ave	YES																	Signal and queue jump - high cost	Not evaluated - station
5	US 287 & Mountain View Ave																		Signal and queue jump - high cost	Not evaluated
6	US 287 & Boston Ave																		Signal and queue jump - low cost (NB left turn only)	Not evaluated
7	US 287 & Ken Pratt Blvd (CO 119)	YES	D	D	320'	477'	12	35	Low	Medium	D	E	418'	575'	12	64	Medium	Medium	Signal and queue jump - high cost	Medium
8	US 287 & Quail Rd		Not Evaluted in Feasibility Study																Signal and queue jump - medium cost	Not evaluated
9	US 287 & Quebec Ave																		Signal and queue jump - medium cost	Not evaluated
10	US 287 & Pike Rd																		Signal and queue jump - high cost	Not evaluated
11	US 287 & Niowt Rd	YES																	Signal and queue jump - low cost	Not evaluated - station
12	US 287 & Mineral Rd (CO 52)		C	C	336'	392'	0	18	Low	Low	C	D	505'	604'	13	25	Low	Low	Signal and queue jump - low cost	Low
13	US 287 & Lookout Rd		Not Evaluted in Feasibility Study																Signal and queue jump - low cost	Not evaluated
14	US 287 & Isabelle Rd		Under construction						Medium		E	F	924'	1087'	43	154	Medium	High	Signal and queue jump - medium cost	High
15	US 287 & Arapahoe Rd		C	D	466'	648'	18	24	Low	Low	D	E	620'	795'	30	37	Medium	Medium	Signal and queue jump - medium cost	Medium
16	US 287 & Lucerne Dr	YES	Not Evaluted in Feasibility Study																Signal and queue jump	Not evaluated - station
17	US 287 & Diamond Cir	YES																	Signal and queue jump - low cost	Not evaluated - station
18	US 287 & Baseline Rd		D	F	856'	1185'	38	86	High	High	F	F	1031'	1535'	98	163	High	High	Signal and queue jump - high cost	High
19	US 287 & W South Boulder Rd	YES	C	D	547'	521'	0	0	Low	Low	C	D	578'	566'	4	3	Low	Low	Signal and queue jump - high cost	Medium
20	US 287 & Public Rd		Not Evaluted in Feasibility Study																Signal and queue jump - high cost	Not evaluated
21	US 287 & Exempla Cir (CO 42)	YES	D	E	1144'	1006'	27	47	Medium	Medium	D	F	1497'	1338'	38	80	Medium	High	Signal and queue jump - high cost	High
22	US 287 & Campus DR		Not Evaluted in Feasibility Study																Signal and queue jump - medium cost	Not evaluated
23	US 287 & Dillon Rd (NW Pkwy WB)		E	C	673'	1031'	13	0	Medium	Low	F	C	741'	1333'	11	7	High	Low	Signal and queue jump - high cost (SB)	High
24	US 287 & Dillon Rd (NW Pkwy EB)		C	F	1158'	611'	15	60	High	Medium	C	F	1428'	716'	9	84	High	High	Signal and queue jump - high cost (NB)	High
25	US 287 & Miramonte Blvd	YES	Not Evaluted in Feasibility Study																Signal and queue jump - low cost	Not evaluated - station
26	US 287 & 10th Ave	YES																	Signal and queue jump - low cost	Not evaluated - station
27	US 287 & 6th Ave																		Signal and queue jump - low cost	Not evaluated
28	US 287 & Midway Blvd	YES	E	F	1108'	1226'	48	48	High	Medium	F	F	1484'	1663'	Planned Improvements		High	High	Signal and queue jump - low cost	High
29	US 36 Off Ramp		Not Evaluted in Feasibility Study																Maintain existing - no cost	Not evaluated
30	Wadsworth & CO 128																		Intersection Improvement - cost not evaluated	Not evaluated
31	Wadsworth & Uptown																		Intersection Improvement - cost not evaluated	Not evaluated

*Intersections located on Coffman or on alternate alignment not on US 287 are not shown.

** Cost categories estimated at feasibility level (includes contingency). Low=$1.4M, Medium=$2.1M, High=$2.8M

*** Relative priority is worst ranking of LOS or Travel Time in Existing and 2045. Intersections not evaluated at station locations received a Medium, and others not evaluated received a low.

When queue jumps are implemented, consider continuing the bus lane past the intersections with BAT lanes at the following locations to create continous bus lanes

1	**Longmont**: North of SH66 to 17th Ave; Boston Ave to Pike Rd
2	**Lafayette**: North of Baseline to South of Public; North of Exempla to South of Campus
3	**Broomfield**: North of Miramonte to South of Midway

Bus Stop at US 287 and 10th Avenue

APPENDIX D: SCROLL PLOTS

[Provided in separate PDF]

APPENDIX E:
TRAVEL DEMAND MODEL

Appendix E :Travel Demand Model

Introduction

In support of US 287 BRT feasibility study, the Colorado Statewide Focus travel demand model was selected to forecast the 2045 ridership for one baseline and three alternative scenarios as described in the study report and shown in Table 1.

Table 1. Scenarios Analyzed

Name	Description
Baseline	No change to physical or service elements. Includes 2045 land use forecasts and transportation investments included in RTP + CO 7 BRT
Alternative 1	Operational Improvements Only: No capital investments on US 287, but number of bus stops reduced, service Mixed Flow BRT + Intersection Improvements: patterns updated, and frequency increased.
Alternative 2	Mixed Flow BRT + Intersection Improvements: Substantial changes to stations and technology but operate in mixed traffic in majority of corridor. TSP and queue jumps implemented at congested intersections
Alternative 3	Mixed Flow BRT + Intersection Improvements + BAT Lanes: Same as Alternative 2 with the addition of continuous BAT lanes where feasible in Broomfield, Lafayette, and Longmont

A general joined validation review of the statewide model and Regional Transportation District's (RTD) four-step travel model suggested both models produce similar transit ridership forecast for the US 287 corridor, while the statewide model also provides the benefit of capturing regional travel market between Fort-Collins, Loveland, Longmont, Lafayette, Broomfield and Denver.

CO 7 BRT

CO 7 BRT service (Boulder – Brighton) recommended from the recently completed CO 7 Bus Rapid Transit Study was added in the 2045 transit network used by the statewide model for the analysis of all four scenarios.

Figure 1. CO 7 BRT, Source: CO 7 Corridor – Corridor Development Plan Final Report

US 285 BRT Fare

The statewide model uses a zonal fare system for all transit routes, in which transit users pay transit fare based on the fare zones where the origin and destination stops are located. The fare structure for the US 287 BRT route was designed to match the other regional transit routes operating on US 287, including Flex Boulder and LD services, as shown in Table 2 and Figure 2.

Table 2. US 287 BRT Zonal Fares

FZS/Fare (2010$)	1	40	41	42	45	46	48	50	71	79	82	83
1	0.94	0.94	0.94	2.53	3.28	3.28	3.28	0.94	3.28	3.28	3.28	3.28
40	0.94	0.94	0.94	0.94	2.53	2.53	2.53	0.94	3.28	3.28	3.28	3.28
41	0.94	0.94	0.94	0.94	2.53	2.53	2.53	0.94	3.28	3.28	3.28	3.28
42	2.53	0.94	0.94	0.94	0.94	0.94	0.94	2.53	3.28	3.28	3.28	3.28
45	3.28	2.53	2.53	0.94	0.94	0.94	0.94	3.28	2.53	3.28	3.28	3.28
46	3.28	2.53	2.53	0.94	0.94	0.94	0.94	3.28	2.53	3.28	3.28	3.28
48	3.28	2.53	2.53	0.94	0.94	0.94	0.94	3.28	2.53	3.28	3.28	3.28
50	0.94	0.94	0.94	2.53	3.28	3.28	3.28	0.94	3.28	3.28	3.28	3.28
71	3.28	3.28	3.28	3.28	2.53	2.53	2.53	3.28	1.08	3.28	3.28	3.28
79	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	0.25	0.25	0.25
82	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	0.25	0.25	0.25
83	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	0.25	0.25	0.25

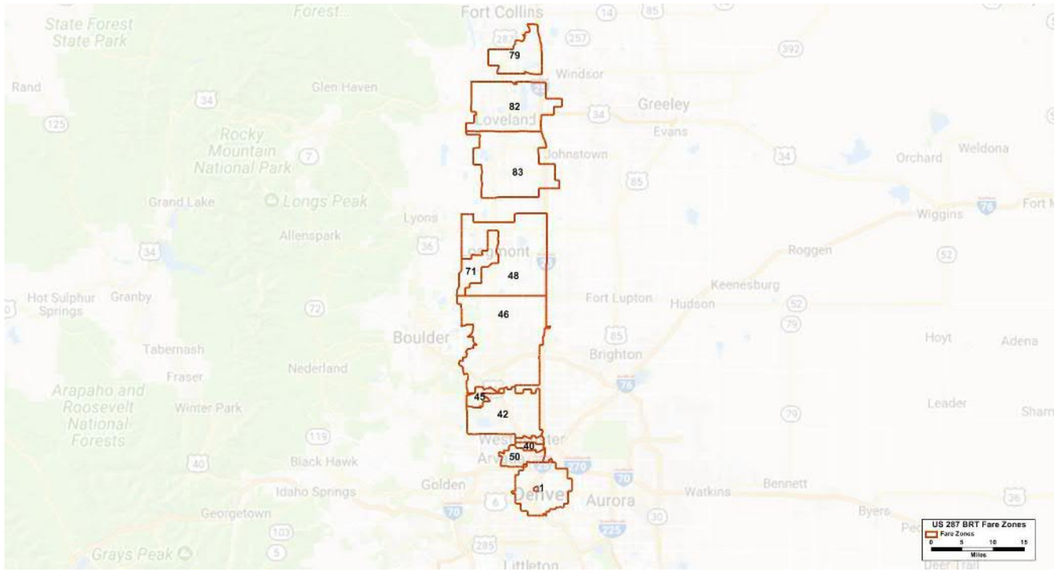


Figure 2. US 287 BRT Fare Zones

US 287 BRT Operation Parameters

- **Operation Headway**

The planned US 287 BRT route operates in three service patterns as shown in Figure 3. The operation headway of US 287 BRT specified in the statewide model for each service pattern is shown in Table 3.

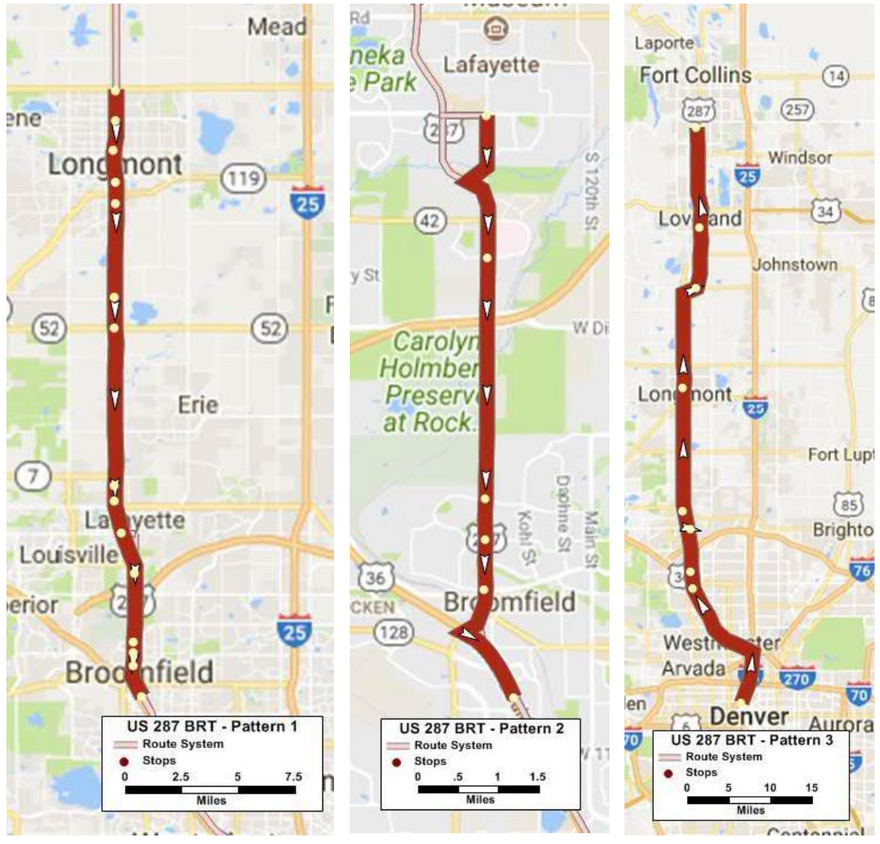


Figure 3. US BRT Service Patterns

Table 3. US 287 BRT Operation Headways

Service Pattern	Description	Headway (Min)	Operation Period
1	Longmont-Broomfield	15	Throughout service period
2	Lafayette-Broomfield	30	Throughout service period
3	Fort Collins-Denver Union Station	30	Throughout service period

- **Bus Travel Time**

The statewide model estimates congested travel times for vehicular traffic and transit buses running in mixed traffic. Alternative 2 and 3 assumes infrastructure and facility investments to improve bus operations at intersections through transit signal priority and queue-jumping lanes. The US 287 BRT bus travel time changes through these intersection improvements were analyzed by the Synchro traffic model and are shown as the percent reductions of travel times for both AM and PM time periods in Table 4.

Table 4. % Travel Time Reductions for US 287 BRT from Intersection Improvements

Segments (Station - Station)	SB				NB			
	AM	PM	MD	NT	AM	PM	MD	NT
US 287 & CO 66 - Main St & 17th Ave	21.7 %	27.6 %	10.8 %	5.6 %	21.7 %	27.6 %	10.8 %	5.6 %
Main St & 17th Ave - 8th & Coffman	5.8%	7.7%	3.0%	1.5 %	6.9%	7.1%	3.1%	1.6 %
8th & Coffman - Boston & Coffman	0.0%	0.0%	0.0%	0.0 %	0.0%	0.0%	0.0%	0.0 %
Boston & Coffman - Longmont PnR (s of Ken Pratt)	13.6 %	16.7 %	6.6%	3.4 %	13.6 %	16.7 %	6.6%	3.4 %
Longmont PnR (s of Ken Pratt) - US 287 & Niwot Rd	24.6 %	31.9 %	12.4 %	6.4 %	24.6 %	31.9 %	12.4 %	6.4 %
US 287 & Niwot Rd - US 287 & Hwy 52	12.5 %	21.1 %	7.3%	3.8 %	12.5 %	21.1 %	7.3%	3.8 %
US 287 & Hwy 52 - US 287 & Lucern	17.9 %	25.0 %	9.4%	4.8 %	17.9 %	25.0 %	9.4%	4.8 %
US 287 & Lucern - US 287 & Diamond Cir	25.0 %	40.0 %	14.2 %	7.3 %	25.0 %	40.0 %	14.2 %	7.3 %
US 287 & Diamond Cir - US 287 & South Boulder Rd	22.2 %	28.1 %	11.0 %	5.7 %	22.2 %	28.1 %	11.0 %	5.7 %
US 287 & South Boulder Rd - US 287 & Medical Center	25.0 %	30.3 %	12.1 %	6.2 %	21.9 %	27.0 %	10.7 %	5.5 %
US 287 & Medical Center - US 287 & Miramonte Blvd	21.1 %	28.4 %	10.8 %	5.6 %	22.6 %	30.2 %	11.6 %	6.0 %
US 287 & Miramonte Blvd - US 287 & W. 10th Ave	25.0 %	28.6 %	11.7 %	6.1 %	25.0 %	28.6 %	11.7 %	6.1 %
US 287 & W. 10th Ave - US 287 & Midway Blvd	33.3 %	38.5 %	15.7 %	8.1 %	33.3 %	38.5 %	15.7 %	8.1 %
US 287 & Midway Blvd - US 36 & Broomfield Station	4.1%	4.3%	1.8%	0.9 %	15.0 %	19.7 %	7.6%	3.9 %

Review of the studies from AECOM[1] and TCRP[2] suggested the travel time reductions from intersection improvements for less congested time periods, e.g. middle-day and night, are less significant than AM and PM. These studies also indicated the travel time benefits vary with roadway congestion level. Based on the reviewed

study results and analysis of the V/C ratios along US 287 corridor estimated by the statewide model, it was determined the middle-day travel time reduction is 43.5% of that from AM/PM peak periods and 22.6% for night period. The estimated middle-day and night travel time reduction percentages are also included in Table 4.

Alternative 3 also assumes that Business Access and Transit (BAT) lanes are available at the following locations.

- Broomfield: Midway Blvd to Miramonte
- Lafayette: S. Public Rd to Baseline Rd
- Longmont: Pike Rd to Boston Ave, 17th Ave to CO 66

Although BAT lanes provide additional BRT bus travel time benefits, some of them are already captured by intersection improvements as BAT lanes also serve as the queue-jumping lanes at intersections. This consideration, along with the reviewed study results from DVRPC[3], suggested it is reasonable to assume additional 10% bus travel time reduction from BAT lanes for peak periods. Likewise, the benefits decline for middle-day and night periods due to reduced congestion, with 5% reduction assumed for middle-day and no reduction for nighttime operations, as all shown in Table 5.

Table 5. % Travel Time Reduction for US 287 BRT from Intersection Improvements and BAT lanes

Segments (Station - Station)	SB				NB			
	AM	PM	MD	NT	AM	PM	MD	NT
US 287 & CO 66 - Main St & 17th Ave	31.7%	37.6%	15.8%	5.6%	31.7%	37.6%	15.8%	5.6%
Main St & 17th Ave - 8th & Coffman	5.8%	7.7%	3.0%	1.5%	6.9%	7.1%	3.1%	1.6%
8th & Coffman - Boston & Coffman	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Boston & Coffman - Longmont PnR (s of Ken Pratt)	23.6%	26.7%	11.6%	3.4%	23.6%	26.7%	11.6%	3.4%
Longmont PnR (s of Ken Pratt) - US 287 & Niwot Rd	27.6%	34.9%	13.9%	6.4%	27.6%	34.9%	13.9%	6.4%
US 287 & Niwot Rd - US 287 & Hwy 52	12.5%	21.1%	7.3%	3.8%	12.5%	21.1%	7.3%	3.8%
US 287 & Hwy 52 - US 287 & Lucern	17.9%	25.0%	9.4%	4.8%	17.9%	25.0%	9.4%	4.8%
US 287 & Lucern - US 287 & Diamond Cir	25.0%	40.0%	14.2%	7.3%	25.0%	40.0%	14.2%	7.3%
US 287 & Diamond Cir - US 287 & South Boulder Rd	32.2%	38.1%	16.0%	5.7%	32.2%	38.1%	16.0%	5.7%
US 287 & South Boulder Rd - US 287 & Medical Center	29.5%	34.8%	14.4%	6.2%	26.4%	31.5%	13.0%	5.5%
US 287 & Medical Center - US 287 & Miramonte Blvd	21.1%	28.4%	10.8%	5.6%	22.6%	30.2%	11.6%	6.0%
US 287 & Miramonte Blvd - US 287 & W. 10th Ave	35.0%	38.6%	16.7%	6.1%	35.0%	38.6%	16.7%	6.1%
US 287 & W. 10th Ave - US 287 & Midway Blvd	43.3%	48.5%	20.7%	8.1%	43.3%	48.5%	20.7%	8.1%
US 287 & Midway Blvd - US 36 & Broomfield Station	4.1%	4.3%	1.8%	0.9%	15.0%	19.7%	7.6%	3.9%

BRT bus travel time reductions percentages included in Table 4 and 5 were applied directly to the bus travel times estimated by the statewide model to account for the impact of the investments for intersection improvements and BAT lanes on transit bus operations.

- **Transfer**

Passenger transfer options between US 287 BRT and other regional and local transit routes were reviewed and adjusted to ensure proper passenger transfers. However, no new 'feeder' bus routes were added and no major adjustment to existing transit routes were made either.

Forecasted Ridership

The ridership forecasted by the statewide model is shown in Table 6, which presents a clear trend of the investment in bus vehicle technology, stop/station amenities, operation right of way and intersection improvements improves the usage of transit system in ridership, transit person-miles-traveled (PMT) and average riding distance.

Table 6. US 287 BRT ridership and Person-Miles-Traveled (PMT)

Service Metrics	Alternative-1	Alternative-2	Alternative-3
Ridership	3,767	5,119	5,220
PMT	53,828	78,714	81,839
Average_Riding_Distance	14.3	15.4	15.7

Estimated BRT Bus Travel Time

The statewide model estimated bus travel time between route terminals for each service pattern of each alternative is shown in Table 7 - 9.

Table 7. US 287 BRT bus travel time between terminals – Alternative 1

Service Pattern	Service Direction	Bus Travel Time (Mins, Layover and Non-Revenue Time Excluded)			
		AM	Mid-Day	PM	NT
Pattern 1 (Longmont-Broomfield)	SB	65	42	58	38
	NB	50	42	68	39
Pattern 2 (Lafayette-Broomfield)	SB	28	15	24	12
	NB	20	15	31	12
Pattern 3 (Fort Collins-DUS)	SB	125	93	127	87
	NB	114	93	134	86

Table 8. US 287 BRT bus travel time between terminals – Alternative 2

Service Pattern	Service Direction	Bus Travel Time (Mins, Layover and Non-Revenue Time Excluded)			
		AM	Mid-Day	PM	NT
Pattern 1 (Longmont-Broomfield)	SB	52	37	43	34
	NB	40	37	50	35
Pattern 2 (Lafayette-Broomfield)	SB	22	13	18	10
	NB	15	13	22	11
Pattern 3 (Fort Collins-DUS)	SB	114	88	114	84
	NB	105	88	118	84

Table 9. US 287 BRT bus travel time between terminals – Alternative 3

Service Pattern	Service Direction	Bus Travel Time (Mins, Layover and Non-Revenue Time Excluded)			
		AM	Mid-Day	PM	NT
Pattern 1 (Longmont-Broomfield)	SB	50	36	42	34
	NB	39	36	49	35
Pattern 2 (Lafayette-Broomfield)	SB	22	13	18	10
	NB	15	13	21	11
Pattern 3 (Fort Collins-DUS)	SB	112	88	113	84
	NB	105	88	116	84

Table 7-9 demonstrate significant bus travel time improvements from the investments in facilities and infrastructures.

Air Quality

The CMAQ Emissions Calculator Toolkit – 'Transit Bus Service and Fleet Expansion' from the FHWA Office of Natural Environment was used to evaluate the air quality and energy consumption impact of implementing the US 287 BRT project. It is worth noting that the tool is Excel spreadsheet based and offered only as an additional resource to assist in project justification process. The tool requires two sets of data that can be developed by the statewide model:

- Before-and-after-project bus VMTs, along with the bus fleet model year, fuel type and road type distributions, to determine the change of vehicle emissions from buses.
- Before-and-after-project passenger vehicle VMTs or number of trips, and average passenger vehicle trip length to estimate the change of vehicle emissions from passenger vehicles. Whether the passenger vehicle trips are linked with bus trips as a result of the bus service or fleet expansion is also a factor used in estimating the emission from passenger vehicles

The data required by the tool was prepared accordingly using the following assumptions and setting parameters:

- Bus and passenger vehicle VMTs were summarized for Boulder County only.
- Project evaluation year was set to 2030.
- Before-project bus model year, fuel type and road type distribution were set to national default values included in the tool.
- After-project BRT buses were assumed new and hybrid electric (HEV).
- None of the reduced passenger vehicle trips are linked with bus trips.

The estimated vehicle emission changes are shown in Table 10.

Table 10. Vehicle Emission Reduction in Boulder County

County Metrics		Alternative-1	Alternative-2	Alternative-3
Change of VMT/Day	Passenger Vehicle	14	-3,275	-17,231
	Bus	6,785	6,785	6,785
	Total	6,799	3,510	-10,446
Reduction of Vehicle Emission (kg/day)	Carbon Monoxide (CO)	-9	4	25
	Particulate Matter <2.5 µm (PM2.5)	0	0	0
	Particulate Matter <10 µm (PM10)	-1	-1	0
	Nitrogen Oxide (NOx)	-12	-6	-5
	Volatile Organic Compounds (VOC)	-1	0	1
	Carbon Dioxide Equivalents (CO2e)	-117	11	58
Reduction of Total Energy Consumption (MMBTU)		-8,909	843	4,434

Although the noise from the travel demand model results, blended with the reduction of passenger vehicle VMT being offset by the increased bus VMT due to expanded services, makes the trend in vehicle emission not very obvious, it can be concluded the vehicle emission impact from the US 287 BRT project is negligibly small.

References

1. B. Cesme, etc. 2014, Queue Jump Lane, Transit Signal Priority, and Stop Location: Evaluation of Transit Preferential Treatments using Microsimulation
2. TCRP Report 118 – Bus Rapid Transit Practitioner's Guide, 2007
3. DVRPC - Enhance Bus Service Operations Analysis, 2017