

Appendix C

Alternatives

Analysis Report

NORTH COLLEGE MAX BRT

ALTERNATIVES ANALYSIS REPORT

SEPTEMBER 2022



NORTH COLLEGE

FEHR & PEERS



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Appendix A - Summary of North College Avenue Onboard Questionnaire

OVERVIEW

This report outlines the alternatives that were developed for operating MAX style bus rapid transit (BRT) service on North College Avenue including route and stop alignment, bus turnaround options, and roadway cross-sections. In addition to transit service, this report includes recommendations and considerations for other types of improvements that are complimentary to the transit service such as mobility hubs, pedestrian and bicycle access, and open space. Alternatives were developed using available transportation data, community input from Phase 1 of the project, and collaboration with city staff.

MAX ROUTE ALTERNATIVES

POTENTIAL ROUTE ALTERNATIVES ANALYSIS

Four route alignment/turnaround alternatives were analyzed in depth and are detailed in this section. All four alternatives include MAX service on the North College Corridor, and one alternative includes MAX service on Blue Spruce Drive, where there is a collection of social services as well as potential sites for future development. An alternative for MAX service turning around in the entrance to the Poudre Valley Mobile Home Park was not considered in this analysis because that scenario would cause at least twice as many buses, and larger articulated buses, to enter the mobile home park than currently do today. Public outreach indicated increasing the number of buses turning around in the mobile home park was not desirable for residents.

For all of these alternatives, local service could continue to serve Blue Spruce Drive and Linden Street as it does today, or a new alignment could be created to provide new local bus connections to and from the North College Avenue area. These potential future connections will be detailed at the end of this section following the different MAX route alignment alternatives.

SERVICE CHARACTERISTICS SHARED BY ALL FOUR ALTERNATIVES

MAX service in all four scenarios would operate at 15-minute headways during the day and 30-minute headways during evenings and Sundays. The local route (route 8) would operate at 30-minute headways. Larger 60-foot articulated buses are envisioned for MAX on North College Avenue route and standard 40-foot buses would be operated on the realigned Route 8.

These service characteristics are shown in **Table 1**.

Table 1: MAX Service Characteristics Shared by All Route Alternatives

Service Characteristics	MAX on North College
<i>Days of Service</i>	7 days per week, 365 days/year
<i>Span of Service</i>	6:15 AM – 11:00 PM, Monday – Saturday 6:15 AM – 7:00 PM, Sundays
<i>Frequency</i>	Every 15 minutes: M-Sa 6:15 AM – 7:00 PM Every 30 minutes: Evenings and Sundays
<i>Vehicle Requirements</i>	1-2 MAX 60' BRT buses
<i>Operating Costs (compared to existing Routes 8 and 81)</i>	50 – 100% more

There are currently two reverse circulator routes on North College Avenue and Blue Spruce Drive: Route 8 (counterclockwise) and Route 81 (clockwise). Each route runs at 30-minute frequency, creating 15-minute effective frequency on each corridor. However, this 15-minute effective frequency can be

misleading because it can require some passengers to travel significantly out of direction to take advantage of this frequency.

The proposed service characteristics take two routes running at 30-minute frequency and turn them into one route running at 15-minute frequency (MAX on North College Avenue) and a second route running at 30-minute frequency (Route 8); Route 81 would be eliminated. On North College Avenue the vehicle requirements would be up to 100 percent of what is required under today’s operations and the operating costs would be 50 to 100 percent of today’s operating costs, depending on the alternative and the turnaround location.

All potential route alignments would have the following advantages and disadvantages over the existing local Routes 8 and 81:

Advantages	Disadvantages
<ul style="list-style-type: none"> • Creates frequent (15-minute) BRT service level on North College Avenue. • Supports North College Avenue land use development. • Allows MAX on Mason Street buses to be interchangeable with North College Avenue MAX route, creating opportunity for MAX on Mason Street to be extended with a single seat ride to North College Avenue. • Potential for a realignment of Route 8 to serve different destinations like the Walmart and Home Depot on Lemay Avenue. 	<ul style="list-style-type: none"> • Requires up to two 60’ MAX BRT-style buses on North College, and 1-2 standard 40’ buses for Blue Spruce Drive. • May take existing riders time to understand and feel comfortable with the new service and route alignment.

Bus Stop and Infrastructure Considerations

For Route 8 the existing bus stops and associated passenger amenities would be utilized. Bus stops and shelters served by Route 8 could be improved incrementally over time.

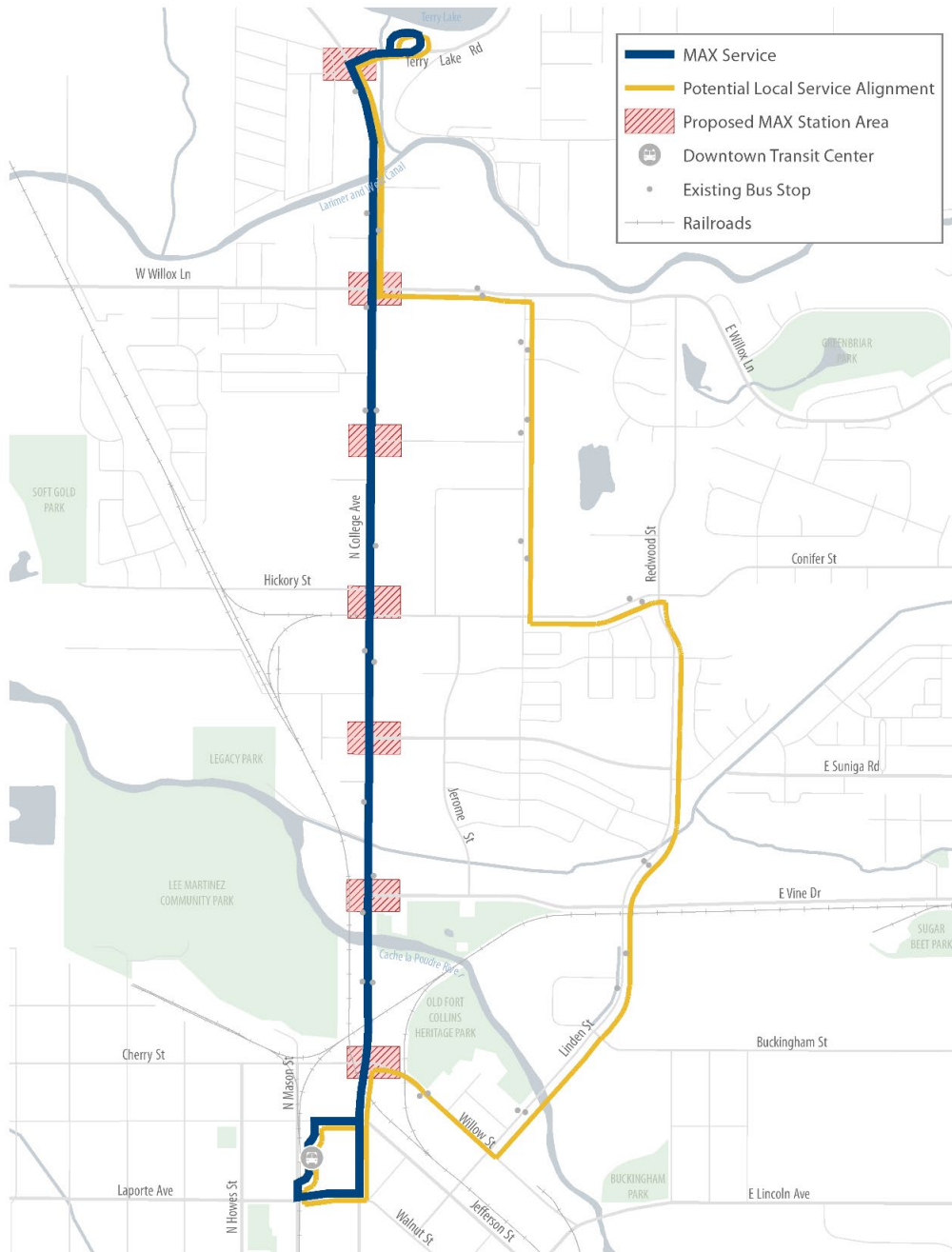
For MAX on North College the existing bus stops and associated passenger amenities could initially be used but should be improved over time to include:

- Reduce number of overall stops by combining stops into single bus stop pairs in a few locations. (See route alternative maps for proposed locations of consolidated bus stops for MAX service.)
- Develop bus shelters with transit kiosks with real-time bus location digital signage for all stops.
- Add additional facilities to MAX stops to create mobility hubs at each stop to improve first and last mile options.

MAX ALTERNATIVE 1 – MAX ON NORTH COLLEGE ONLY WITH TURNAROUND SOUTH OF TERRY LAKE

Under this alternative MAX BRT would operate on a linear route along North College Avenue only from the DTC to a new turnaround south of Terry Lake as shown in **Figure 1**. This route alignment would have a likely runtime of about 16 minutes per round trip for MAX. Under this alternative the local Route 8 would also turn around at Terry Lake Dam and would continue to serve Blue Spruce Drive similar to current conditions.

Figure 1: Map of Alternative 1 - MAX on North College with Turnaround at Terry Lake Dam



Assessment

A high-level assessment of this alternative is shown below.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Allows for a transit stop to be located close to the Poudre Valley Mobile Home Park. • Straightforward route makes it easier for passengers to use. 	<ul style="list-style-type: none"> • More expensive than other feasible alternatives. • Requires partnership with Larimer County and private landowners. • Prioritizes serving demand on North College rather than transit ridership who ride the bus to access the service providers on Blue Spruce. • May require signalization of turnaround access point which may not be feasible.

MAX ALTERNATIVE 2 – MAX ON NORTH COLLEGE WITH TURNAROUND ON INTERNAL KING SOOPERS ROADWAYS

Under this alternative, MAX BRT would operate on a linear route along North College Avenue from the DTC to a new turnaround on King Soopers’ internal roadways (which are currently used for trucks accessing the store), as shown in **Figure 2**. Route 8 would connect to the Poudre Valley Mobile Home Park, while the MAX route would not.

This alternative would likely have a run time of about 15 minutes per round trip for MAX.

Figure 2: Map of Alternative 2 - MAX on North College with Turnaround on King Soopers Internal Roadway



Assessment

A high-level assessment of this alternative is shown below.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Allows for a transit stop to be located just south (within a ¼ mile) of the Poudre Valley Mobile Home Park. • Does not require the construction of a separate turnaround facility. • Would allow for an opportunity for a shared parking agreement with King Soopers or old Albertson’s lot. 	<ul style="list-style-type: none"> • Requires partnership with King Soopers. • May require City of Fort Collins taking over ownership or at least maintenance of internal King Soopers streets. • Prioritizes serving demand on North College rather than transit ridership who ride the bus to access the service providers on Blue Spruce. • Loop around King Soopers may make riding transit less intuitive or appealing for riders.

MAX ALTERNATIVE 3 – MAX ON NORTH COLLEGE WITH TURNAROUND AT EXISTING ROUNDABOUT ON WILLOX LANE

Under this alternative, MAX BRT would operate on a linear route along North College Avenue only from the DTC to the existing Willox Street roundabout which buses would use to turn around (which are currently used for trucks accessing the store) as shown in **Figure 3**. Route 8 would connect to the Poudre Valley Mobile Home Park, while the MAX route would not. This analysis confirmed that the roundabout has a sufficient turning radius for the articulated MAX buses to use it as a turnaround. Since Routes 8 and 81 already use the roundabout, as well as heavy vehicles accessing the adjacent businesses, the roundabout is already designed to accommodate frequent heavy vehicle traffic.

This alternative would likely have a run time of about 12 minutes per round trip for MAX.

Figure 3: Map of Alternative 3 – MAX on North College with Turnaround at the Roundabout on Willox Lane



Assessment

A high-level assessment of this alternative is shown below.

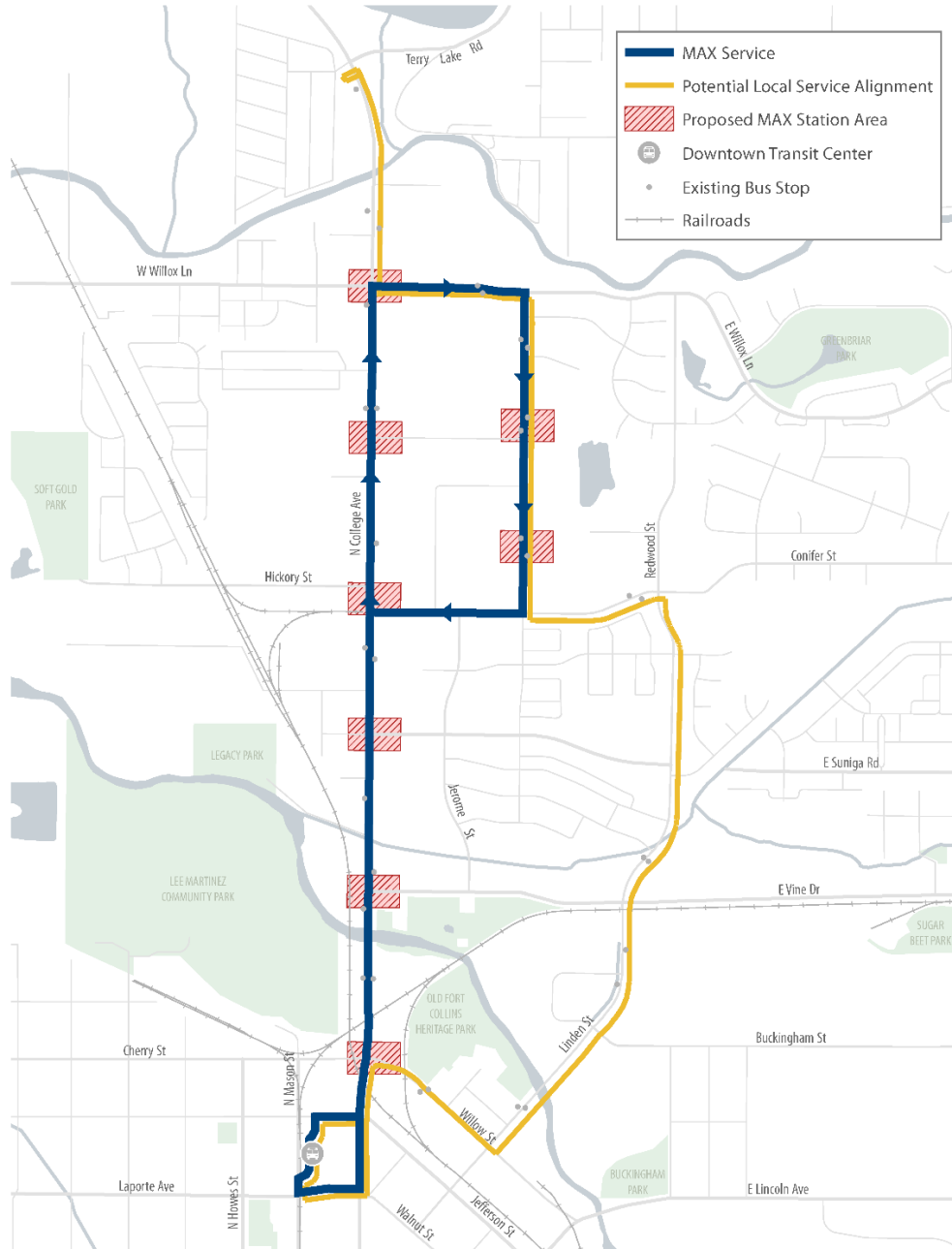
Advantages	Disadvantages
<ul style="list-style-type: none"> • Straightforward route makes it easier for passengers to use. • Does not require the construction of a separate turnaround facility. • Would allow for an opportunity for a shared parking agreement with King Soopers or old Albertson’s lot. • Existing turning radius of roundabout can accommodate articulated buses. 	<ul style="list-style-type: none"> • Closest MAX stop would be about ½ mile away from Poudre Valley Mobile Home Park. • Prioritizes serving demand on North College rather than transit ridership who ride the bus to access the service providers on Blue Spruce.

MAX ALTERNATIVE 4 – MAX ON NORTH COLLEGE AND BLUE SPRUCE DRIVE

Under this alternative, MAX BRT would operate up North College Avenue from the DTC and then would follow a loop around Willow, Blue Spruce Drive, and Conifer Street, as shown in **Figure 4**. The loop section of the MAX BRT route could be operated either direction or could be bidirectional with buses alternating directions on the loop with every other trip. Route 8 would connect to the Poudre Valley Mobile Home Park, while the MAX route would not.

This alternative would likely have a run time of about 16 minutes per round trip for MAX.

Figure 4: Map of Alternative 3 for MAX on North College and Blue Spruce



Assessment

A high-level assessment of this alternative is shown below.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Does not require the construction of a separate turnaround facility. • Would allow for an opportunity for a shared parking agreement with King Soopers or old Albertson’s lot. • Balances support for North College Avenue land use development while improving Blue Spruce Avenue connectivity to downtown. 	<ul style="list-style-type: none"> • Closest MAX stop would be about ½ mile away from Poudre Valley Mobile Home Park. • Is duplicative and inefficient to provide both a MAX BRT route and a local route on Blue Spruce Drive. • Likely would require bus stop improvements along Blue Spruce Drive. • May result in much lower ridership for Route 8 since high ridership on Blue Spruce Drive may switch to MAX.

ROUTE ALIGNMENT ALTERNATIVES SUMMARY

Table 2 displays a summary matrix of the different route alignment alternatives comparing their ranking in relative favorability for different criteria. Green squares indicate favorable, yellow squares indicate somewhat favorable, and red squares indicate unfavorable. The criteria are:

- Benefits existing ridership – describes the extent to which an alternative prioritizes service frequency on Blue Spruce Avenue, proximate to existing social service providers.
- Benefits future demand – describes the extent to which an alternative prioritizes service frequency on North College Avenue, where future growth in population and employment is expected.
- Serves extent of North College corridor – describes whether an alternative serves the Poudre Valley Mobile Home park or not.
- Requires external partnerships – green squares indicate that no external partnerships are required; red squares indicate that partnerships with Larimer County, other agencies, or private property/business owners are required.
- Additional infrastructure requirements and associated costs – describes whether the route alternative can be operated on existing city street infrastructure, or if additional off-street infrastructure is necessary.
- Ease of use and convenience to riders – describes how intuitive a service is; point-to-point services fare better than services with loops.

Table 2: Evaluation Criteria Rubric for Route Alignment Alternatives

Route Alternatives	Benefits Existing Ridership	Benefits Future Demand	Serves Extent of North College Corridor	Requires External Partnerships	Additional Infrastructure Requirements and Associated Costs	Ease of Use and Convenience to Riders
Terry Lake Turnaround	Yellow	Green	Green	Red	Red	Green
King Soopers Turnaround	Yellow	Green	Yellow	Red	Yellow	Yellow
Willox Street Roundabout Turnaround	Yellow	Green	Yellow	Green	Green	Green
Blue Spruce Turnaround	Green	Red	Red	Green	Green	Red

ELIMINATED ALTERNATIVES

Several MAX service route alignments were considered in the alternatives analysis. Through further investigation and conversations with staff some of the alternatives were eliminated earlier on in the evaluation process. The following sections lists the alternatives that were eliminated and the reasons why they were determined to be undesirable or unfeasible.

MAX SERVICE ON EXISTING ALIGNMENT OF LOCAL ROUTES 8 & 81

Reasons for elimination of alternative:

- Requires up to four 60' MAX BRT-style buses to serve both routes with 15-minute peak frequency.
- Does not expand access to new destinations.
- Same circuitous routing as today to access destinations on Blue Spruce Drive.
- Duplicative and inefficient to provide BRT service on two adjacent and parallel corridors connecting same major points.
- Introduces 60-foot buses to streets, intersections, and turns that may be operationally challenging.
- Puts more, larger buses into the Poudre Valley Mobile Home Park, unless land south of Terry Lake is made available for a turnaround.
- For certain segments of existing routes, represents unnecessarily high level of service

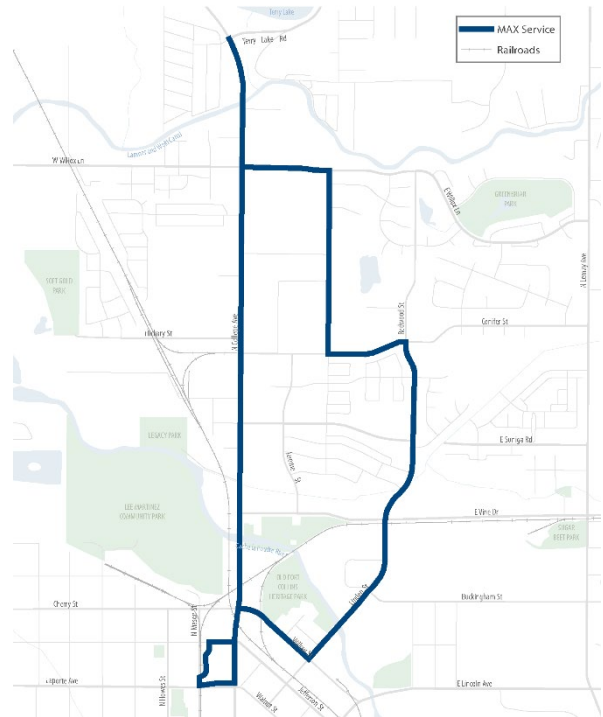


Figure 5: Map of MAX Service on Existing Route 8 & 81 Alignment

MAX TURNAROUND AT CANAL CROSSING & SPAULDING LANE

Reasons for elimination of alternative:

- Very expensive to build a new crossing over the canal.
- Would likely require a signal at Spaulding Lane and Terry Lake Road which would be expensive and may not align with CDOT’s vision for State Highway 1 (Terry Lake Road).
- Would likely require right-of-way acquisition.



Figure 6: Map of MAX Turnaround at Canal Crossing & Spaulding Lane

MAX TURNAROUND AT A NEW TERRY LAKE ROAD & NORTH COLLEGE ROUNDABOUT

Reasons for elimination:

- Building a new roundabout is expensive and may not be favorable to the public.
- Would require acquisition of additional right-of-way.
- This intersection was recently rebuilt and would require a full rebuild to create a roundabout for a turnaround point.

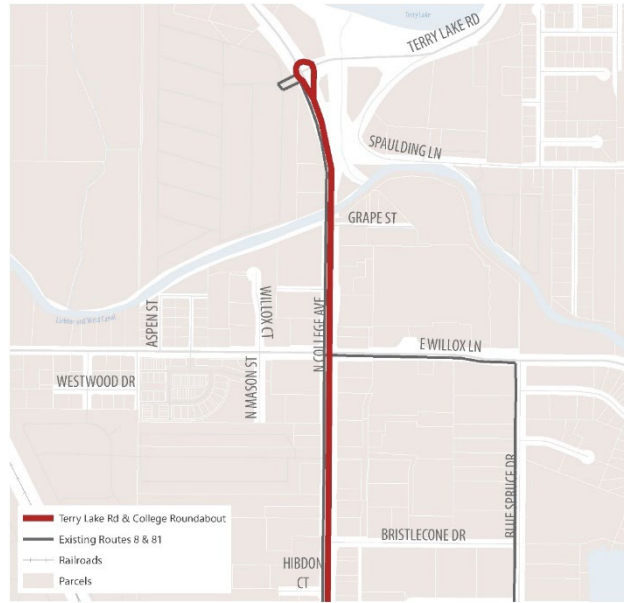


Figure 7: Map of MAX Turnaround at a New North College & Terry Lake Road Roundabout

MAX TURNAROUND AT US 287 & US 287 BYPASS ROUNDABOUT

Reason for elimination:

Would add almost four miles to the round trip of the bus with very little ridership gain for the additional miles.

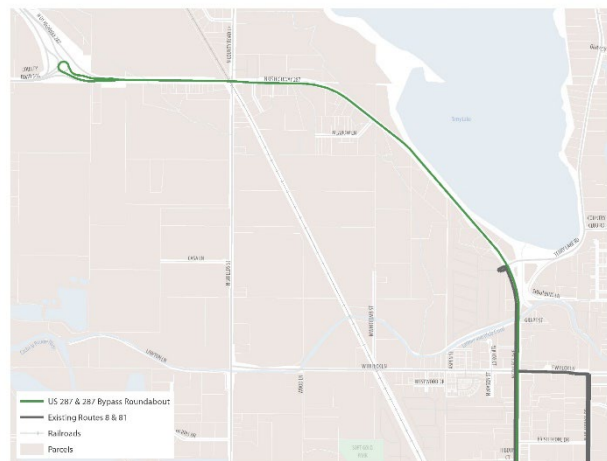


Figure 8: Map of MAX Turnaround at US 287 & 287 Bypass Roundabout

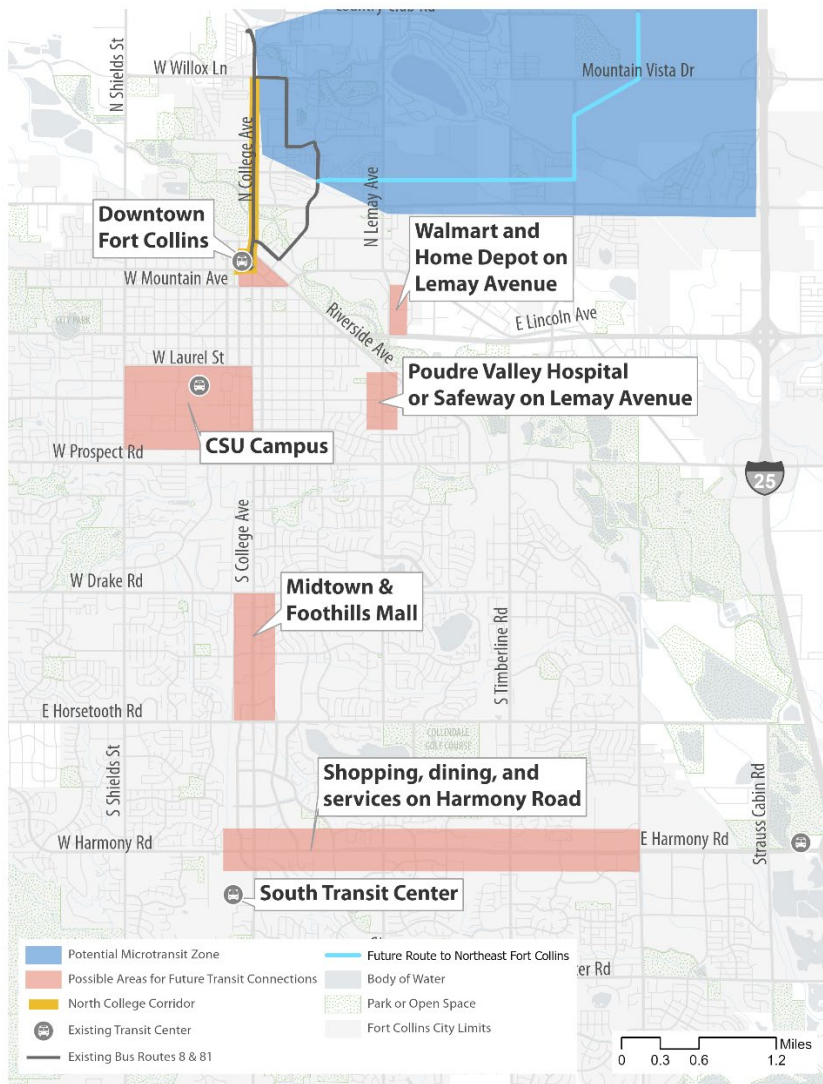
POSSIBLE FUTURE CONNECTIONS

Independent of which MAX alternative is chosen for the North College Corridor, there is an opportunity to create new and improved transit connections to the area from other parts of the city. Below is a list of possible future connections that could be made with any of the MAX alternative alignments mentioned above:

- Microtransit connection from North College Avenue to northeast Fort Collins
- Local bus connection to Walmart and Home Depot on Lemay Avenue
- Single seat MAX ride (no transfer required) from North College Avenue to to:
 - CSU Campus
 - Midtown & Foothills Mall
 - Shopping, dining, and services on Harmony Road

Figure 9 displays a map of the locations of these potential connections.

Figure 9: Map of Potential Future Transit Connections to the North College Corridor



PREFERRED ROUTE ALIGNMENT

NEAR TERM ALIGNMENT

The preferred MAX service route alignment for North College Avenue is for the Willox Street roundabout to be used in the short-term as the turnaround for a new MAX service. This alternative was chosen because it could be implemented immediately with no additional infrastructure or external partnerships needed for the turnaround location. This alternative also still allows local service to directly connect to the Poudre Valley Mobile Home Park and provides MAX service within a half mile of the vehicle entrance to the mobile home park, and within a quarter mile of the south end of the mobile home park which has an unofficial pedestrian entrance used by residents to access the neighborhood.

Additionally, this alternative creates a straightforward and intuitive route that goes both north and south on North College and does not make any additional loops. This configuration of the route can help with route efficiency as well as rider comfort and confidence using the service.

The drawbacks of this alternative are that they do not provide MAX level service directly to the Poudre Valley Mobile Home Park or the social services on Blue Spruce Drive and Redwood Street. However, local service can still be provided to these locations and the efficiency of a local route on that corridor will be improved because it will not need to make a loop on North College Avenue. Local service could even be extended to new connections like the Home Depot and Walmart on Lemay Avenue. This alternative allows for both MAX and local bus service to operate without being redundant.

POTENTIAL FUTURE PHASE OF ROUTE ALIGNMENT

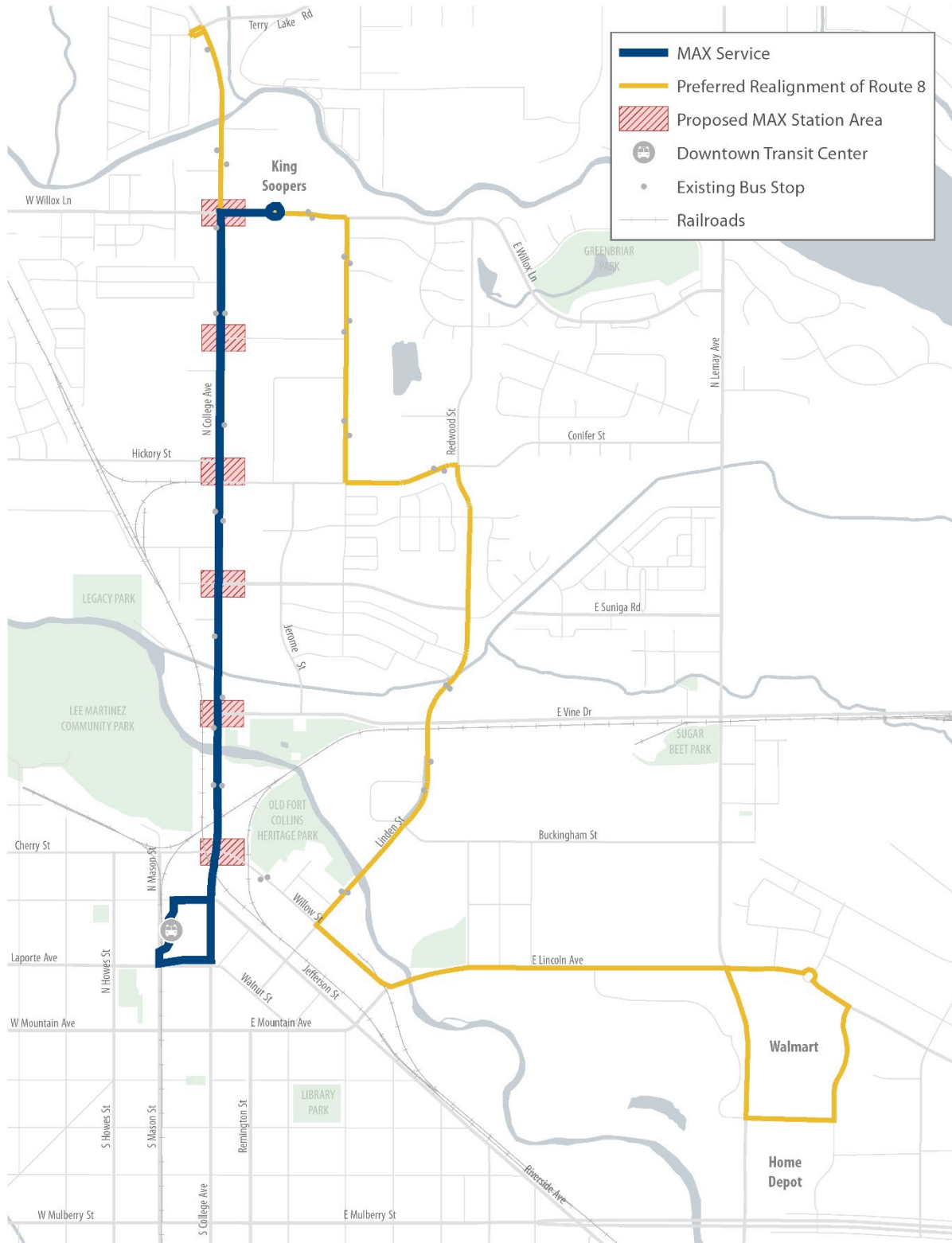
It is recommended that the turnaround south of Terry Lake continue to be investigated as an option for a future phase of MAX service on North College Avenue. There will be a considerable cost to the study and construction of this turnaround, as well as partnership with the landowner, which makes it a less desirable alternative in the short-term. However, as a long-term goal, this turn around would be able to provide MAX service closer to the Poudre Valley Mobile Home Park and other residences in the area north of Willox Street. This turnaround would also be available for use by local buses to eliminate buses turning around inside of the mobile home park, as they currently do today.

PUBLIC INPUT ON REALIGNMENT OF ROUTE 8

Public input, including responses from an on-board questionnaire of existing riders (see **Appendix A**), indicated a support for a realigned Route 8 to connect to the Walmart and Home Depot shopping centers on Lemay Avenue north of Mulberry Street. This realignment would allow riders to move between destinations like the Kings Soopers, social service providers on Blue Spruce Drive and Linden Street, and the Home Depot and Walmart without needing to transfer. This new Route 8 would also allow people to connect to Route 5 easily and access Lemay Avenue south of Riverside Avenue. MAX service on North College Avenue would continue to provide a connection from the corridor into Downtown Fort Collins.

Figure 10 displays a map of the preferred alignment for MAX service and Route 8 local service.

Figure 10: Preferred Alternative Route Alignments for MAX and Route 8



CORRIDOR CROSS SECTION ALTERNATIVES

In addition to the alignment of future MAX and local bus service in the study area, this alternatives analysis also considered potential cross sections for North College Avenue and their effects on transit efficiency, bicycle and pedestrian comfort, and vehicle operations. This section describes different cross section alternatives and compares them across a series of evaluation criteria. The cross sections considered in this analysis compared different options for BRT travel lanes and bicycle and pedestrian infrastructure. This section includes illustrations of the following cross section types:

- **Existing Typical Cross Section**

Although the cross section varies throughout the corridor, this typical cross section is one that is common throughout the corridor.

- **Corridor Based BRT**

In all of the corridor-based BRT cross sections, buses use general purpose travel lanes (sharing lanes with other vehicles) along the midblock sections of the corridor.

At intersections the following options exist:

- Buses continue to use general purpose travel lanes through the intersection.
- Buses are able to use queue jump lanes to get ahead of private vehicle traffic queueing at intersections.

Both of the above options allow for either:

- Raised curb-protected bike lanes separate from an 8-foot sidewalk.
- A multi-use path.

- **Business Access Transit Lanes**

Business Access Transit (BAT) lanes are exclusive lanes for buses which vehicles can use only for making right turns at intersections or turning into driveways. With the inclusion of BAT lanes there is not enough right-of-way to include a separate bike lane, but there are a few ways the existing sidewalk could be widened to accommodate a multiuse path.

EXISTING TYPICAL CROSS SECTION

The potential cross sections evaluated in this section are compared to a typical cross section of the North College Avenue corridor (**Figure 11** and **Figure 12**). The actual cross section of the corridor varies and alterations to the proposed cross sections or additional right-of-way may be necessary to implement a preferred future cross section.

Figure 11: Typical Existing Cross Section at Intersections

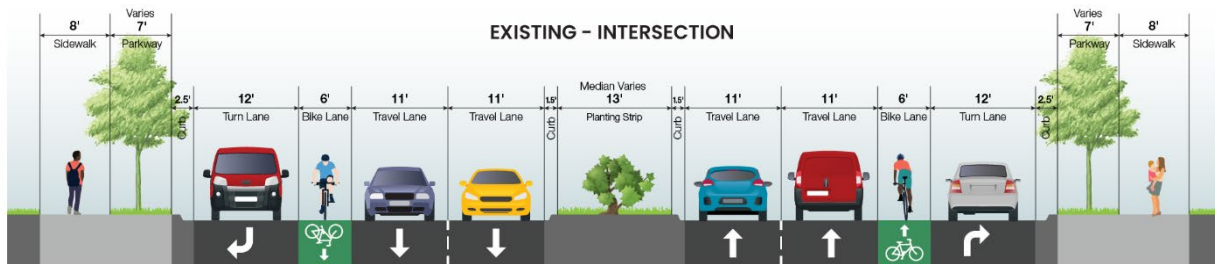
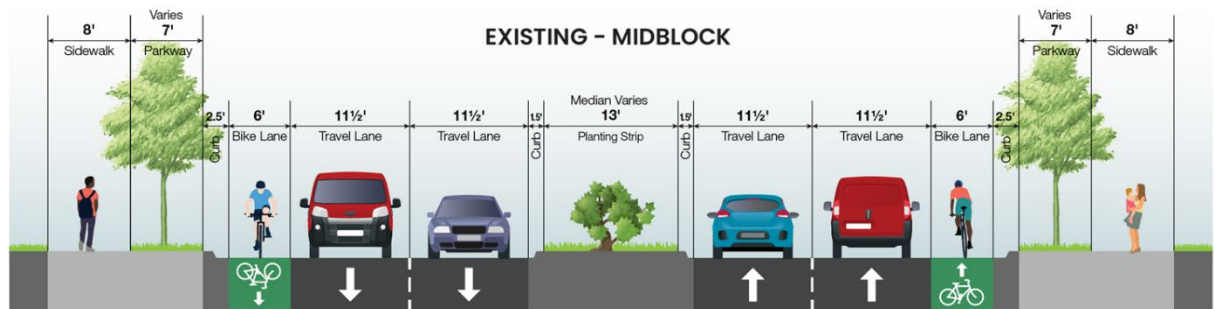


Figure 12: Typical Existing Cross Section Midblock



CORRIDOR BASED BRT

In all of the corridor-based BRT cross-sections buses use the general purpose travel lanes along the corridor. **Figure 13 - Figure 16** display illustrations of the various cross sections that could be achieved with a corridor-based BRT.

INTERSECTIONS

The corridor-based BRT cross section can either include, or not include, queue jump lanes at intersections. **Figure 13** displays the cross section without queue jump lane and **Figure 14** displays a cross section with queue jump lanes. The creation of queue jump lanes would require the widening of receiving legs of the intersection to accommodate the receiving lane for the buses.

Figure 13: Corridor-based BRT at Intersections (No Queue Jump Lanes)

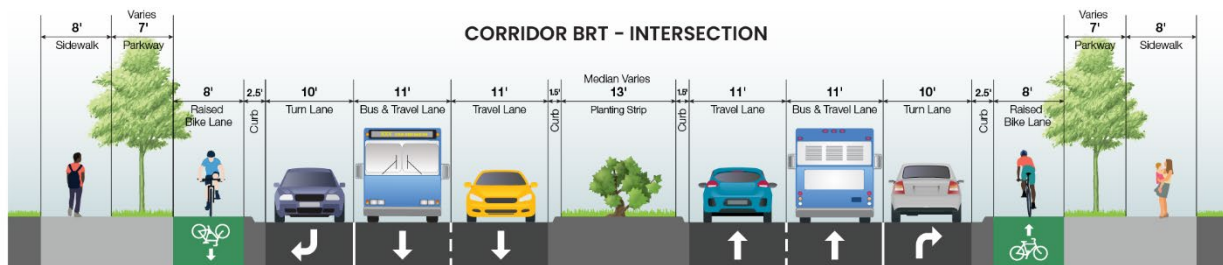
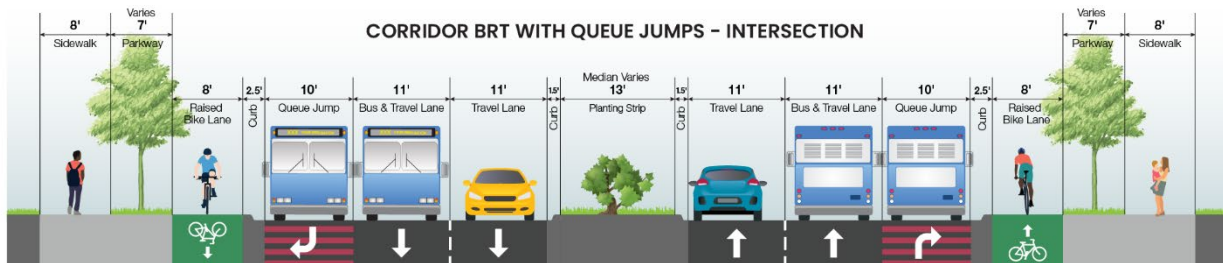


Figure 14: Corridor-based BRT at Intersections (with Queue Jump Lanes)



MIDBLOCK

The corridor based BRT cross section can either accommodate people biking with a curb protected bike lane adjacent to the vehicle travel lanes (**Figure 15**) or a shared-use path separated from the travel lanes by a landscaped buffer (**Figure 16**). Both of these options for accommodating people biking would require moving the existing curb and gutter. Both of these cross sections could be implemented with or without queue jump lanes at intersections.

Figure 15: Corridor-based BRT Midblock (with Bike Lanes)

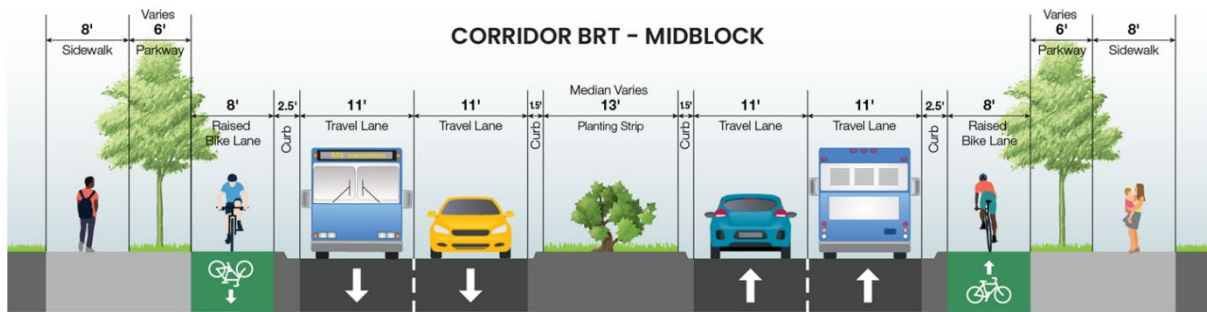
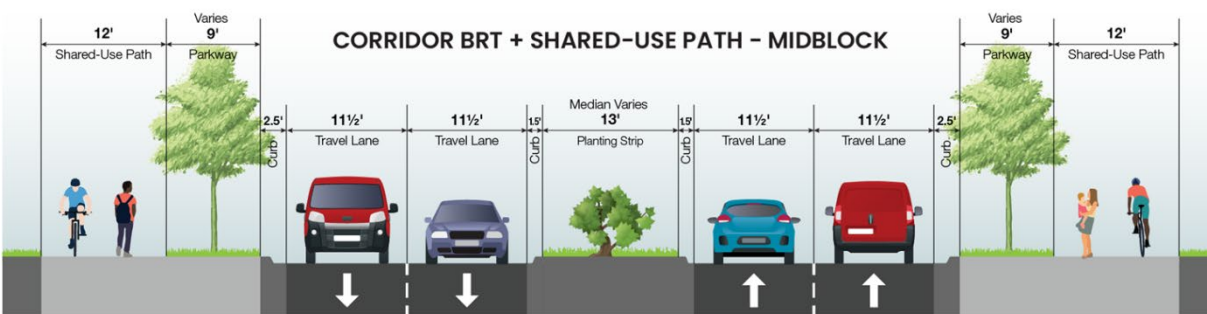


Figure 16: Corridor-based BRT Midblock (with a Shared-use Path)



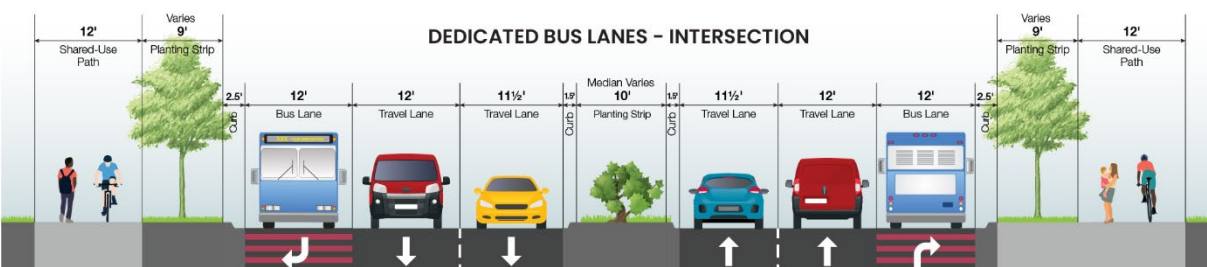
BUSINESS ACCESS TRANSIT (BAT) LANES

Business Access Transit (BAT) lanes are lanes which buses travel in and vehicles can use only for making right turns at intersections or turning into business access midblock. The creation of these BAT lanes can use the existing curb-to-curb width of the street (with the existing median width reduced).

INTERSECTIONS

The BAT lanes cross section at intersections is displayed in **Figure 17**.

Figure 17: Business Access Transit Lanes Cross Section at Intersections



MIDBLOCK

The construction of BRT lanes would not allow for a raised bicycle lane. Instead, a multi-use path (at least 10-foot wide) would be constructed along the length of the corridor to provide a high-comfort

facility for people walking and riding bicycles. There are two options for accommodating this multi-use path, either the existing landscaped buffer can be reduced allowing for a 10-foot shared use path (

Figure 18) or the existing sidewalk could be widened behind the back of walk to allow for both a shared-use path and the existing width of landscaped buffer (**Figure 19**). The first option could be achieved in existing right-of-way while the second would require acquiring additional right-of-way from adjacent properties.

Figure 18: BAT Lanes Midblock (Reduced Landscaped Buffer)

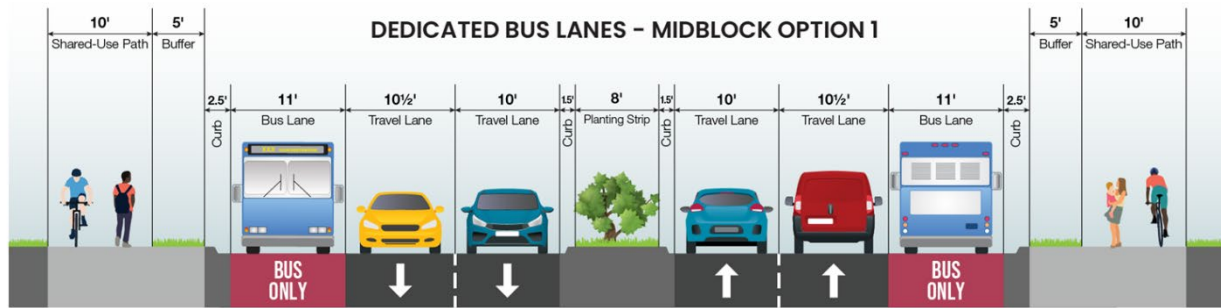
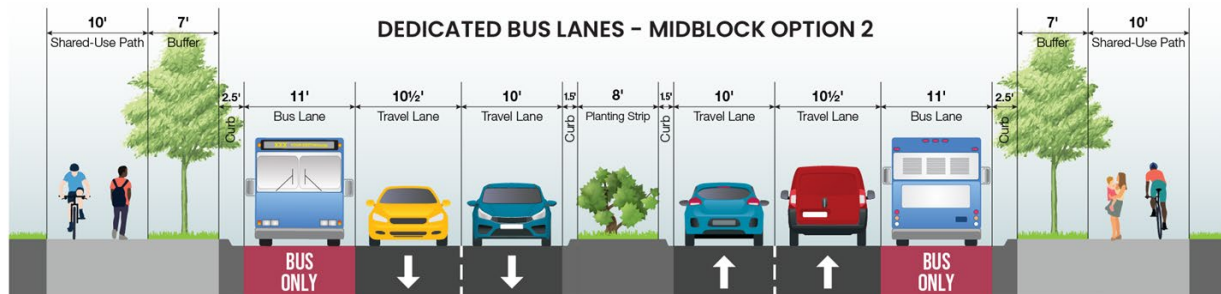


Figure 19: BAT Lanes Midblock (Sidewalk Widened Behind Back-of-Walk)



CROSS SECTION EVALUATION AND COMPARISON

All the potential cross section elements detailed above were evaluated and compared to each other based on the following criteria:

- Capital Costs
- Additional Right-of-way Needs
- Potential Maintenance Costs and Considerations
- Bus Travel Time Efficiency
- Safety and Comfort of People Walking
- Safety and Comfort of People Bicycling
- Vehicle Travel Time Efficiency

CAPITAL COSTS

The North College corridor from Terry Lake Road to Cherry Street/Willow Street is about 1.6 miles long. One option is for cross section improvements to be applied along the length of the corridor all at once. Alternatively, bicycle and pedestrian improvements could be focused on improving parallel corridors on Mason Street and Blue Spruce Drive (see **Figure 20**) and prioritizing improvements to select pieces of North College Avenue where there are gaps in the parallel corridors. The remainder of the corridor could be reconstructed to the recommended cross section as redevelopment occurs.

Figure 20: Parallel Bicycle & Pedestrian Corridors with Priority Segments of North College for Improvement

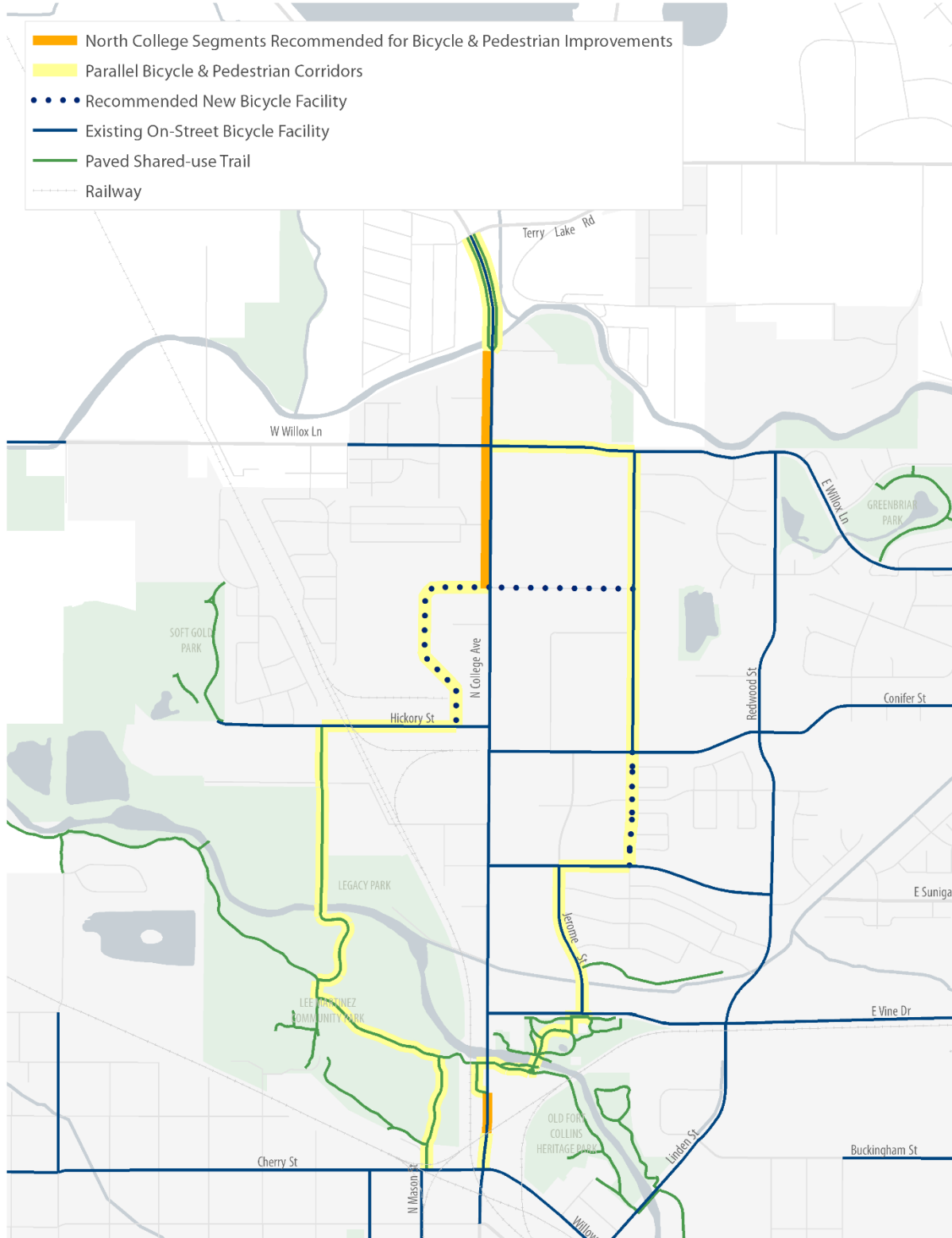


Table 3 displays high level cost elements for the construction of the major infrastructure elements in the possible cross sections, one column displays the cost of applying a treatment to the length of the corridor, and the last column displays the cost of improving only the select segments of North College identified in **Figure 20**.

Table 3: High Level Cost Estimates for Construction of Cross Section Elements

Cross Sections where Improvement Applies	Infrastructure Improvement	Cost for Treatment on Entire Corridor (1.6 miles)	Cost for Select Sections of Corridor (0.5 mile, on one side of the street for the northern section)
Corridor-based BRT	Construction of Curb-protected Bike Lane.	\$5.0 Million (Treatment excludes possibility of BAT lanes)	\$900,000 (Treatment excludes possibility of BAT lanes)
Corridor-based BRT or BAT Lanes	Widening shared-use path into existing landscape buffer/tree lawn.	\$4.5 Million	\$800,000
	Shifting curb to edge of outside travel lane and widening of sidewalks and landscaped buffer.	\$8.2 Million (Treatment excludes possibility of BAT lanes)	\$1.5 Million (Treatment excludes possibility of BAT lanes)
	Widening shared-use path beyond outside edge of existing sidewalks.	\$6.4 Million	\$1.2 Million
BAT Lanes	Narrowing of landscaped medians to increase pavement width on either side.	\$2.7 Million	N/A (Treatment would need to be corridor-wide)

ADDITIONAL RIGHT-OF-WAY NEEDS

Only the BAT lane cross section where the multi-use path is expanded past the existing back of walk requires additional right-of-way. This cross section would require the acquisition of a few feet of right-of-way of roughly 60 properties along the corridor. A high-level cost estimate of this right-of-way acquisition was made at \$600,000/mile, but the actual costs could be much higher.

POTENTIAL MAINTENANCE COSTS AND CONSIDERATIONS

All of the above-described cross sections would have ongoing costs associated with maintenance like street sweeping and snow removal. The proposed dimensions of the protected bike lane and multi-use path are supportable per the city's current street maintenance equipment. Additionally, the landscaped median and buffers will require irrigation and other maintenance of vegetation but these elements already exist on the corridor with the existing cross section. Therefore, there is no significant benefit of one cross section over another due to maintenance concerns and the selection of a future cross section can be made based on other criteria.

BUS TRAVEL TIME EFFICIENCY

Queue Jump Lanes/BAT Lanes vs. Buses in Through Lanes

An analysis was conducted to understand the time savings for buses if either queue jump lanes or BAT lanes were implemented on the corridor. This analysis was conducted by subtracting the right turn lane delay (seconds/vehicle) from the through lane delay (to represent situations where right turn lane queues are shorter than through lane queues) to understand the reduction in delay buses would experience if the existing right turn lanes were converted into shared right turn/queue jump or BAT lanes. This reduction in delay was added up for the entire corridor (in both the north and south direction) to find the maximum time savings per round trip at the most congested time of day (PM peak hour). This analysis was conducted both for existing conditions (2020) and future conditions (2045). Overall, the time savings expected from queue jump lanes or BAT lanes is minimal with a maximum of 11 seconds per roundtrip saved under existing conditions and 26 seconds per roundtrip under future conditions. These results are displayed in **Table 4**.

Table 4: Travel Time Savings per Run with Queue Jump Lanes or BAT Lanes

Analysis Year	Maximum Travel Time Savings [PM Peak] (for queue jump or BAT lanes alternatives)
Existing Conditions (2020)	11 seconds/run
Future Conditions (2045)	26 seconds/run

Queue Jumps Lanes vs. BAT Lanes

In addition to the time savings analysis, a queuing analysis was conducted under both existing and future conditions. The goal of the queuing analysis was to understand how long existing and future queues are at each intersection to help inform whether queue jump lanes or exclusive bus only lanes are most appropriate. If the queues of the through lanes of the northbound and southbound approaches are shorter than the right turn lanes, buses would be able to enter the right turn/queue jump lane to effectively get around the vehicle traffic at the intersection. However, if the through lanes exceed the right turn lanes the buses will be unable to use these right turn lanes as queue jump lanes. In this case extending the turn lanes may be needed to make them effective queue jump lanes, or if the queues are significant, exclusive BAT lanes may be more appropriate.

Table 5 displays the results of the queuing analysis. Overall, under existing conditions the right turn lanes could adequately serve as queue jump lanes with the exception of at North College/Cherry Street and Willow Street.

Table 5: Results of Queueing Analysis

Does the through lane queue exceed the right turn lane queue? (If yes, by how many feet?)		
Intersection	Existing Conditions (2020)	Future Conditions (2045)
N College Avenue/Wilcox Street	No	Yes (by 60ft)
N College Avenue/Hickory Street	No	Yes (by 25ft)
N College Avenue/Conifer Street	No	No
N College Avenue/Vine Drive	No	Yes (by 65ft)
N College Avenue/Cherry Street & Willow Street	Yes (by 60ft)	Yes (by >400ft)

SAFETY AND COMFORT OF PEOPLE WALKING & BICYCLING

The safety and comfort of people walking and biking on the north college corridor is a critical component in identifying the preferred cross section for the North College Corridor. This section compares the different pedestrian and bicycle facilities for their relative comfort. **Table 6** compares the sidewalk and multi-use path for the comfort of people walking and **Table 7** compares the curb-protected bicycle lane and shared-use path for the comfort of people bicycling.

Figure 21: City of Fort Collins Level of Traffic Stress Criteria

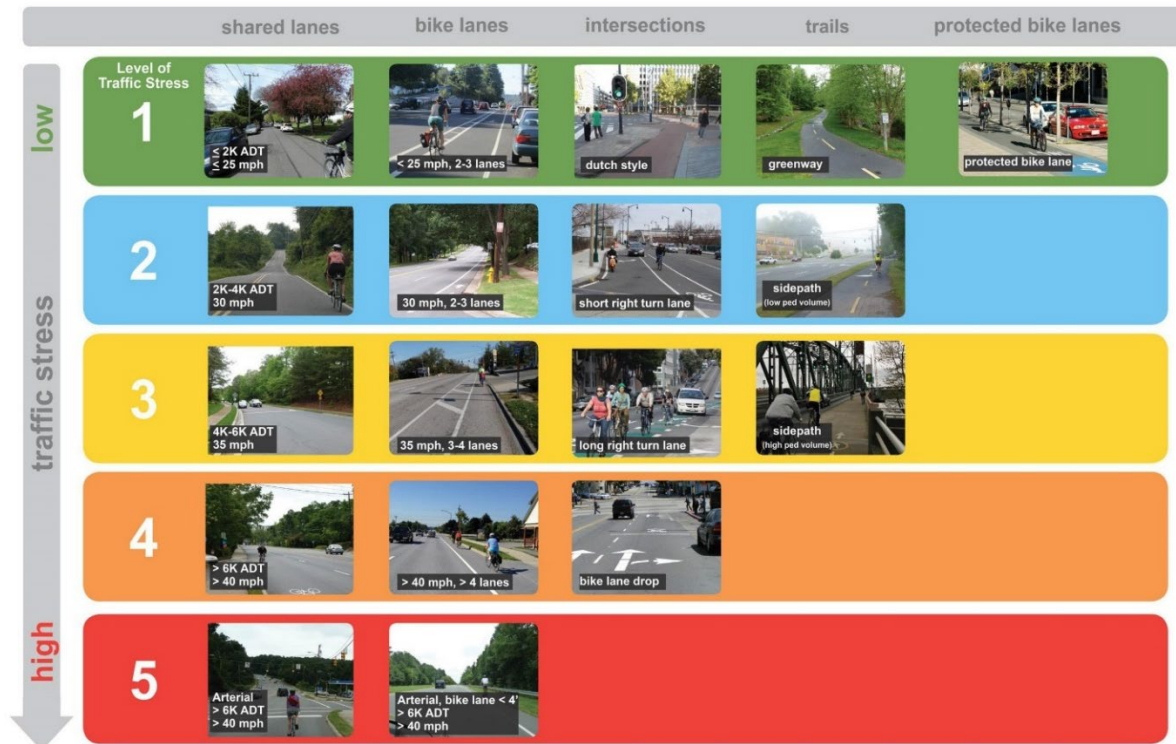


Table 6: Matrix of Pedestrian Comfort by Infrastructure Type

Pedestrian Facility	7 to 8-ft Sidewalk	10-ft Shared-use Path
Pedestrian LTS Score (1-4 scale)	2-3 (depending on speed limit)	2-3 (depending on speed limit)
Feet from traffic (horizontal buffer)	7+ ft	7+ ft
Vertical buffer type	Landscaped Buffer with Trees	Landscaped Buffer with Trees
Shared space with people bicycling?	No	Yes

Table 7: Matrix of Bicycle Comfort by Infrastructure Type

Bicycle Facility	Raised Curb-protected Bike Lane	10-ft Shared-use Path
City of Fort Collins Bicycle LTS Score (1-5 scale)	1	2
Feet from traffic (horizontal buffer)	2.5 ft Curb and Gutter	7+ ft
Vertical buffer type	Curb Only	Landscaped Buffer with Trees
Shared space with people walking?	No	Yes

VEHICLE TRAVEL TIME EFFICIENCY

This alternatives analysis found that there are not significant differences in travel time efficiency for private vehicles across any of the cross-section alternatives. This is because the lane configurations for vehicles are staying the same across all of the cross sections. No travel lanes are being taken away in any of the cross sections and at intersections all existing turn lanes will remain, since even in the BAT lane scenarios, the BAT lanes are shared right-turn lanes with vehicles at intersections.

Transit Signal Priority

Transit Signal Priority (TSP) is an additional option at intersections along the corridor and can improve transit travel times and reliability. TSP modifies the timing of signals when transit vehicles are present at the intersection. They can extend green times for transit vehicles to prevent them from getting stuck at an intersection for a full cycle or they signal transit vehicles through the intersection ahead of other vehicles where a queue jump lane is present. TSP is being included on the West Elizabeth BRT corridor in Fort Collins and an analysis of the most congested intersections of that corridor found that TSP would have a minimal impact on vehicle travel times.

CROSS SECTION ALTERNATIVES SUMMARY

Table 8 and **Table 9** display summary matrixes of the different cross section elements comparing their ranking in relative favorability for different criteria. Green squares indicate favorable, yellow squares indicate somewhat favorable, and red squares indicate unfavorable.

Table 8: Evaluation Criteria Rubric for Cross Sections by Travel Lane Configurations

Cross Section Elements	Bus Travel Time Efficiency*	Vehicle Travel Time Efficiency	Cost of Infrastructure Improvements	Enough ROW for a Separate Protected Bike Lane	Creates an Additional Buffer Between Private Vehicles and People Walking/Biking
Corridor Based BRT <u>without</u> Queue Jump Lanes	Yellow	Light Green	Light Red	Light Green	Light Red
Corridor Based BRT <u>with</u> Queue Jump Lanes	Light Green	Light Green	Light Red	Light Green	Light Red
BAT Lanes	Light Green	Light Green	Light Green	Light Red	Light Green

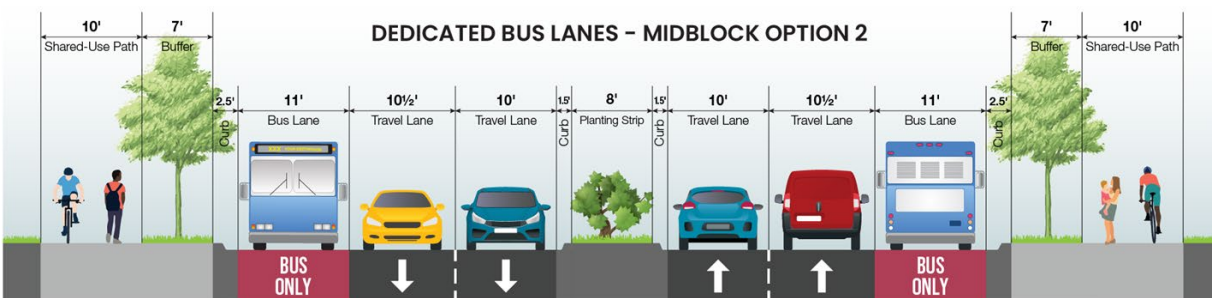
* Queue jump lanes or BAT lanes would improve bus travel time efficiency somewhat in the peak hours, but buses are unlikely to experience significant delay without these elements.

PREFERRED CORRIDOR CROSS SECTION

The preferred corridor cross section is for BAT lanes to be constructed along the length of the North College Avenue corridor within the existing curb-to-curb distance with existing sidewalks widened to shared-use paths only on select segments. This improvement would require narrowing the landscaped or painted median and restriping the travel lanes to accommodate the BAT lanes. This alternative allows buses to operate more reliably, eliminates conflicts with buses pulling out of stops into traffic, and provides a larger buffer between people using the multi-use paths and the general vehicle travel lanes.

Selecting this option precludes providing bike lanes on North College because the additional curb-to-curb space is needed for the BAT lanes. However, this option does improve the experience of using the existing sidewalks with the BAT lanes creating a larger horizontal buffer between the sidewalks and vehicle traffic.

Figure 22: BAT Lanes Midblock (Sidewalk Widened Behind Back-of-Walk)



Prioritizing widening the existing sidewalks to shared-use paths along targeted segments is preferred. The remainder of the shared-use paths along the corridor can be built as redevelopment occurs. Many of the sidewalks were only recently rebuilt and this effort required a lot of coordination with adjacent property owners. Additionally, due to the traffic volumes and vehicle speeds on the corridor even curb protected bike lanes are likely to feel uncomfortable for many people biking. For these reasons it is recommended that bicycle infrastructure and wayfinding improvements be concentrated on parallel corridors (Hickory Trail, Mason Street, Blue Spruce Drive) and new shared use paths be constructed on North College Avenue only to bridge gaps in the parallel street networks. There are two select segments recommended for improvement:

- **Section 1 (~1/2 mile long, only on west side of street):** A new shared-use path running the length between the pedestrian/bicycle bridges over the canal and Bristlecone Drive to the south.
- **Section 2 (~500 feet in long):** A new shared-use path between Willow Street and Vine Street connecting the separated bicycle and pedestrian paths south of the railroad tracks with the trail access points and underpass to the north.

Table 9: Evaluation Criteria Rubric for Cross Sections by Bicycle and Pedestrian Infrastructure

Cross Section Elements		Pedestrian Comfort*	Bicyclist Comfort*	Pedestrians and Bicyclists have Separate Paths	Can Accommodate BAT Lanes	Cost of Improvements
Shared-use Path	Existing sidewalk widened into the existing landscaped buffer.	Yellow	Yellow	Yellow	Green	Yellow
	Existing sidewalk widened behind the back of walk.	Green	Green	Yellow	Green	Red
	Curb moved to the edge of vehicle travel lane to accommodate shared-use path and large landscaped buffer in existing ROW.	Green	Green	Yellow	Red	Red
Curb Protected Bike Lane		Green	Red	Green	Red	Red

Due to existing vehicles speeds and the number of curb-cuts (driveways) along the corridor, North College Avenue will not be a “high-comfort” corridor for people walking or bicycling without reduction of the operating speed or reduction in the number of curb-cuts. However, having a large, landscaped buffer between people walking/biking and vehicles would significantly improve comfort for people walking and biking. Speed management is recommended to ensure safety and comfort for people using all modes.

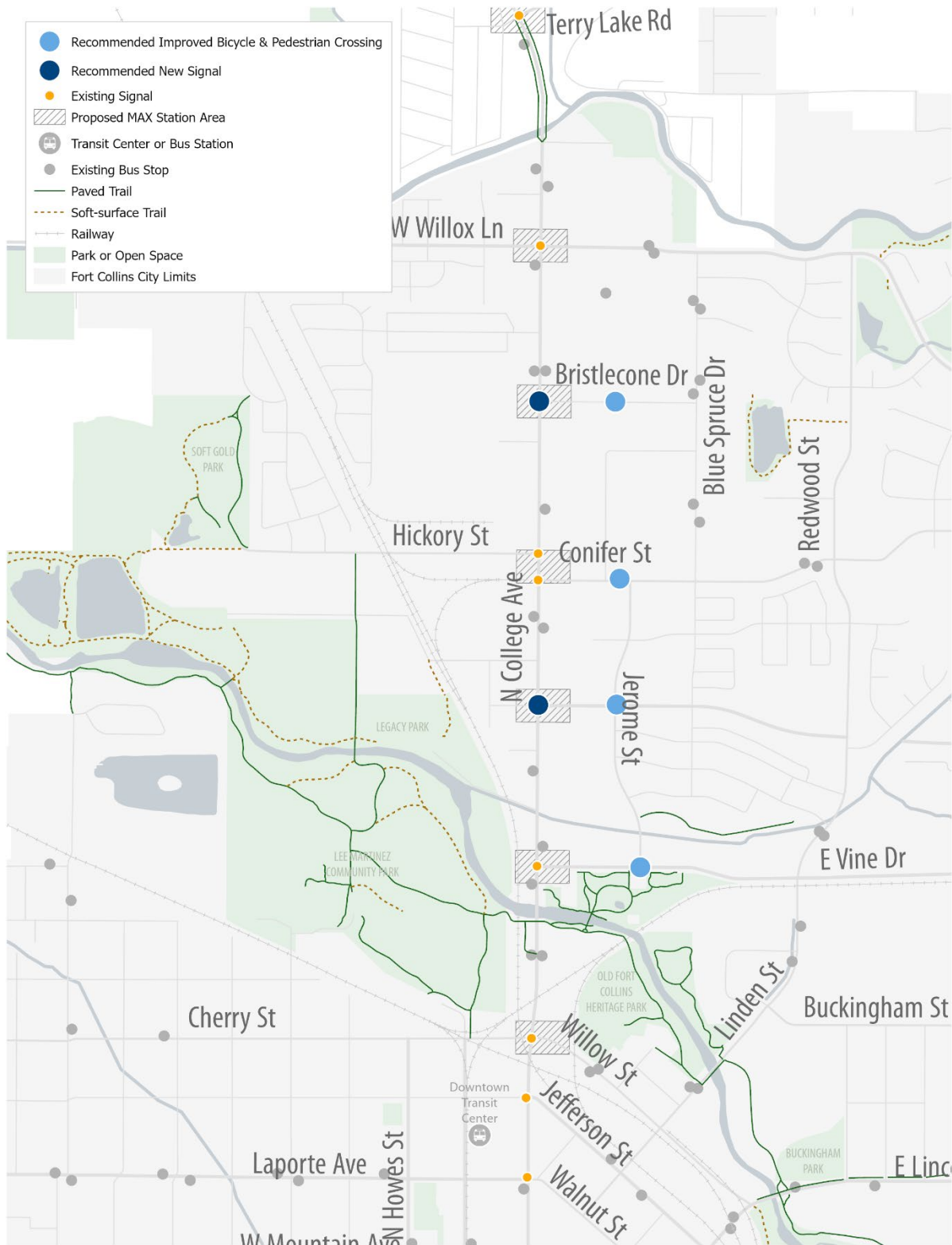
FIRST AND LAST MILE ACCESS

WALKING

Community input indicated one of the greatest challenges to walking on the corridor is the few controlled pedestrian crossings across North College Avenue. Additionally, bus stops located far from controlled crossings make it challenging to access the bus stops and reach destinations on the other side of the street. The preferred alternative from the North College MAX Plan will ensure each BRT station is adjacent to a signalized crossing and will align with previous planning efforts. Both the North College Corridor Plan and the CDOT 287 Access Management Plan recommended signalizing the intersection of North College and Bristlecone Drive. The North College Corridor Plan also recommended a signal at the intersection of North College Avenue and Suniga Road. These recommended signals are displayed in **Figure 23**.

BRT station pairings (two stations in the same area serving the different directions of the bus) will both be located near the controlled crossings and easily seen from the station across the street to make riding the bus more intuitive. More detailed recommendations on corridor crossings will be made in the preferred alternative once the higher-level route alignment and stop locations have been chosen.

Figure 23: Existing and Recommended Signalized Intersections



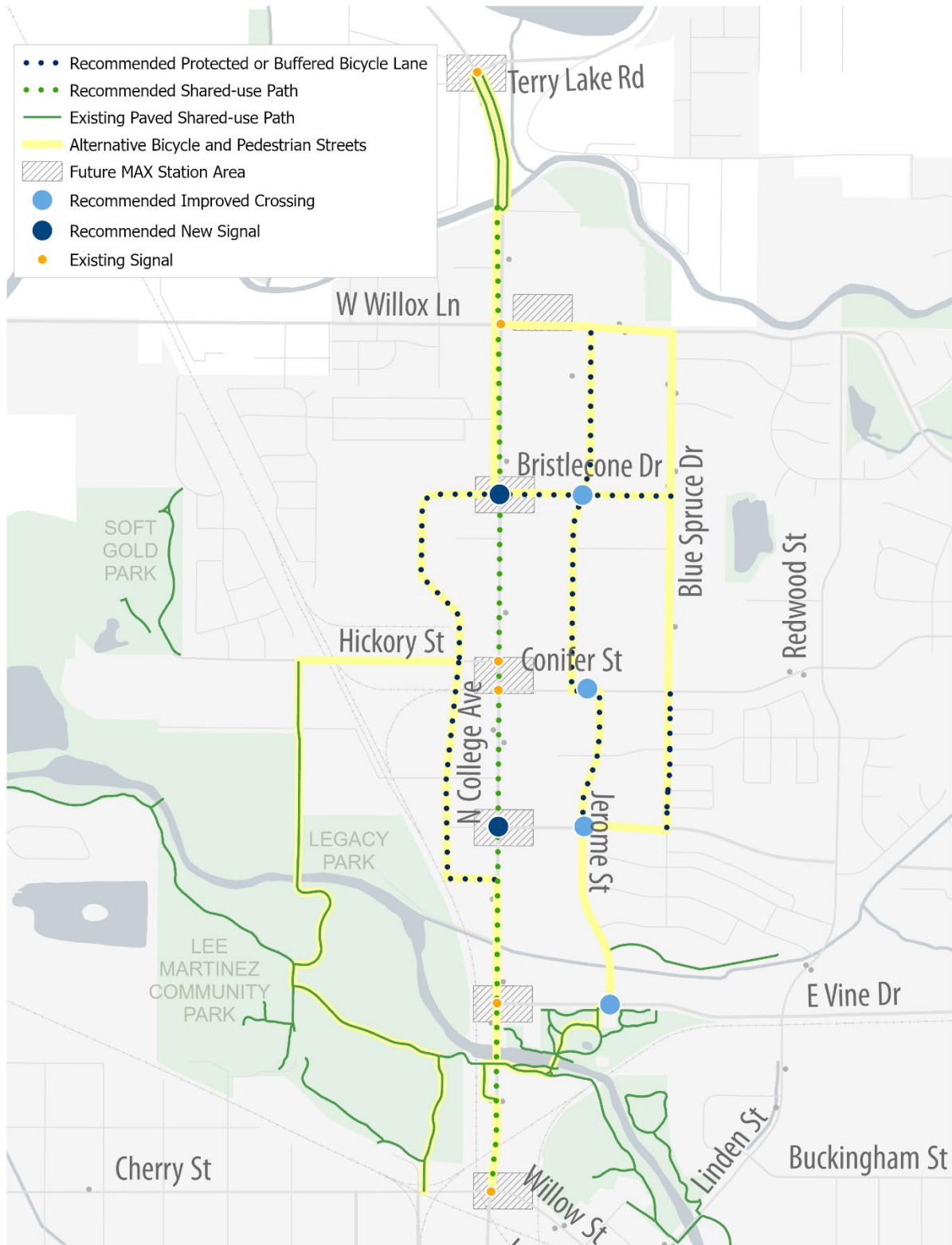
BICYCLING

A robust network of bicycle facilities already exists in the North College Avenue area, and the Active Modes Plan (which was underway at the time of this report) will build off of and improve this network for the safety and comfort of people bicycling. The greatest challenge brought up by community input to biking in the North College Avenue area is biking along North College Avenue itself. The community expressed that bicycling on the bike lanes on North College Avenue is uncomfortable. While improvements to biking along the corridor will be part of the preferred alternative, ensuring parallel corridors with bicycle facilities that have lower traffic speeds and volumes is also important to give people options for bicycling in the area.

Two parallel corridors already exist east of North College Avenue. Redwood Drive (which becomes Linden Drive south of Vine Street) provides a continuous bike lane from Downtown to the northern end of the North College Avenue corridor. Blue Spruce Drive also has a buffered bike lane for a short length between Willox Lane and Conifer Street. However, there is not currently a continuous biking corridor on the west side of North College Avenue.

However, the existing Hickory Street Trail presents an excellent opportunity for a low-stress bicycle corridor on the west side of North College Avenue. The trail currently runs from Mason Street (south of Cherry Street) to the buffered bicycle lanes on Hickory Street. It is recommended that Mason Street be completed (with high comfort bicycle facilities) north of Hickory Street and turn south of the North College Mobile Home Park to meet North College Avenue at the intersection of North College Avenue and Bristlecone Drive. Additionally, it is recommended that bike lanes be striped on Bristlecone Drive to create a seamless connection between this new Mason Street connection and the existing buffered bicycle lanes on Blue Spruce Drive. These recommendations are displayed in **Figure 24**.

Figure 24: Map of Proposed Bicycle Facilities



MICRO-MOBILITY

The City of Fort Collins is currently contracted with the company Spin to provide bikeshare and scooter share options in the city. Micro-mobility (like bikeshares and app enabled e-bikes and e-scooters) presents a great opportunity for creating first and last-mile solutions for accessing transit on the North College Avenue corridor. People whose origins or destinations may be further from the proposed BRT than they would be willing to walk can use micro-mobility solutions to get to and from BRT stations. It is recommended that all BRT stations include Spin (or future mobility provider) charging hubs and or parking areas for micro-mobility devices.

MICROTRANSIT

Microtransit is a form of on-demand response transit using a smartphone app to match trip requests in real-time. Microtransit typically uses small vans or shuttle buses and can be contracted turn-key or operated by an agency with purchased ride-matching technology. Microtransit can operate as a dynamic route with established time points or be point-to-point within a defined area (zone) as well as the possibility for flag stops.



Figure 25: Image of Microtransit Service in Denver called the "Montbello Connector"

Microtransit allows for transit service in smaller service area connecting low-medium density areas to key destinations. Benefits of microtransit are the ability to group trips to/from key destinations at similar times and it allows for fares that balance convenience and ridership. The data collected about trips in a microtransit system can also help inform the creation of a fixed route service in the future.

In north Fort Collins, microtransit service could be used as a first/last-mile connection for people walking to reach MAX service on North College Avenue or who wish to get from the MAX on North College Avenue to a destination further from the corridor.

MOBILITY HUBS

It is recommended that each BRT station on the North College Avenue corridor be considered a mobility hub, with the most northern station being the largest hub with the most amenities. All BRT stations should have:

- Intuitive information on transit options:
 - Live updating info on transit times
 - Maps of key destinations, transit routes, and bicycle facilities
- High comfort station amenities:

- Shelter
- Benches
- Trash cans
- Pedestrian scale lighting
- Kiosks for ticket purchases
- Bike parking (covered where possible)
- Micro-mobility charging hubs and parking areas

The northern most station (once this location is determined in the preferred alternative assessment) may also include the following additional amenities:

- Secure bicycle parking
- Park-n-ride (possibly through a shared parking agreement or through redevelopment at the former Albertson’s site)
- Restrooms
- Electric vehicle (EV) charging
- Car share
- Taxi/ride hailing loading zones
- Microtransit stop

Figure 26: Graphic of Possible Mobility Hub Elements



PREFERRED ALTERNATIVE SELECTION

Below is a condensed list of the recommendations for a preferred alternative for the North College Avenue corridor. Each of these preferred alternatives is described in more detail in their respective sections.

Preferred Route Alignment: MAX Service from Downtown to Willox Street roundabout, realigned Route 8 from King Soopers to Home Depot and Walmart on Lemay Avenue via Blue Spruce Drive, Linden Street, and Lincoln Avenue.

Preferred Corridor Cross Section: Business-access transit (BAT) lanes with sidewalks widened to shared-use paths. BAT lanes can be accommodated within the existing curb-to-curb width and should be implemented along the length of the corridor. Prioritize implementation of shared-use paths on select sections of North College Avenue in order to create complete networks with bicycle facilities on parallel corridors.

Preferred Pedestrian Crossing Improvements: Additional signals with crosswalks at Bristlecone Drive and Suniga Road. MAX BRT Stations consolidated from the existing bus stations to be on either side of each signalized intersection.

Preferred Bicycle Infrastructure Improvements: Bicycle infrastructure on proposed Mason Street extension connecting to Hickory Street, buffered or protected bike lanes on Bristlecone Drive between North College Avenue and Blue Spruce Drive, and buffered or protected bicycle lanes on Blue Spruce Drive from Conifer Street to Suniga Road. Wayfinding on North College Avenue and parallel bicycle facilities directing people how best to bike between key destinations and use the parallel street to bike the length of North College Avenue comfortably.

Additional Recommendations: New microtransit service that serves north Fort Collins and connecting surrounding neighborhoods to the MAX service on North College, The creation of mobility hubs at each of the new MAX BRT Stations.

APPENDIX A

SUMMARY OF NORTH COLLEGE AVENUE ON-BOARD QUESTIONNAIRE