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Long-Term Investment Corridors

projectconnect
New Transit Options for a Greater Austin

Enhancements
Short-term improvements to keep Austin moving.

Investments
Long-term projects to support our future.

Project Connect

Project Connect is the Central Texas high capacity transit plan that will create real, tangible transit projects that offer an alternative to mind-numbing traffic congestion. It's not about a single train or bus route, but a robust transit system that improves travel into, out of and around Central Austin from the surrounding region.

It will provide options that build upon one another and create a system to move more people, more quickly. The end result will connect residents, businesses, schools, services, and shopping through a high capacity transit network.

Long-term Investments

Project Connect has identified 3 types of high capacity transit corridors — Commuter, Connector and Circulator — to show how differences in corridor character may affect transit needs and potential solutions.

Project Connect began by looking at all previous transit corridor studies in the metropolitan area. Capital Metro worked with stakeholders and members of the public to present a set of priority transit corridors for feedback beginning at public workshops in early 2017.

Priority Corridors for long-term investment were determined based on several factors related to their ability to support high capacity transit. The Long-term Investment Briefing Book and individual Corridor Flip Books illustrate the process for identifying potential vehicle technologies, station locations, alignments and dedicated spaces to operate.

Key Terms

HCT	High Capacity Transit
BRT	Bus Rapid Transit
LRT	Light Rail Transit
HRT	Heavy Rail Transit
SoCo	South Congress
FTA	Federal Transit Administration
TOD	Transit Oriented Development
CIG	Capital Investment Grant
ROW	Right-of-Way
O&M	Operations and Maintenance
TC	Terminal Center
P&R	Park & Ride
ACC	Austin Community College
AV	Autonomous Vehicle

Cover Page Photo Courtesy of Larry D Moore via Wikipedia, Robb Williamson, ABC 13 Houston, and Slideshow Bruce via Flickr (clockwise)

Table of Contents

Project Connect Overview 1

Long-Term Investment Corridor Overview 5

Identifying Options 11

Considerations for HCT Investment Corridors 25

Corridor Analysis and Draft System Plan 33

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Chapter 1
Project Connect Overview

What is Project Connect?

Project Connect Timeline

What is Project Connect?

Project Connect is a regional plan to create a system of high capacity transit options that will connect people, places, and opportunities in an affordable, efficient, and sustainable way.

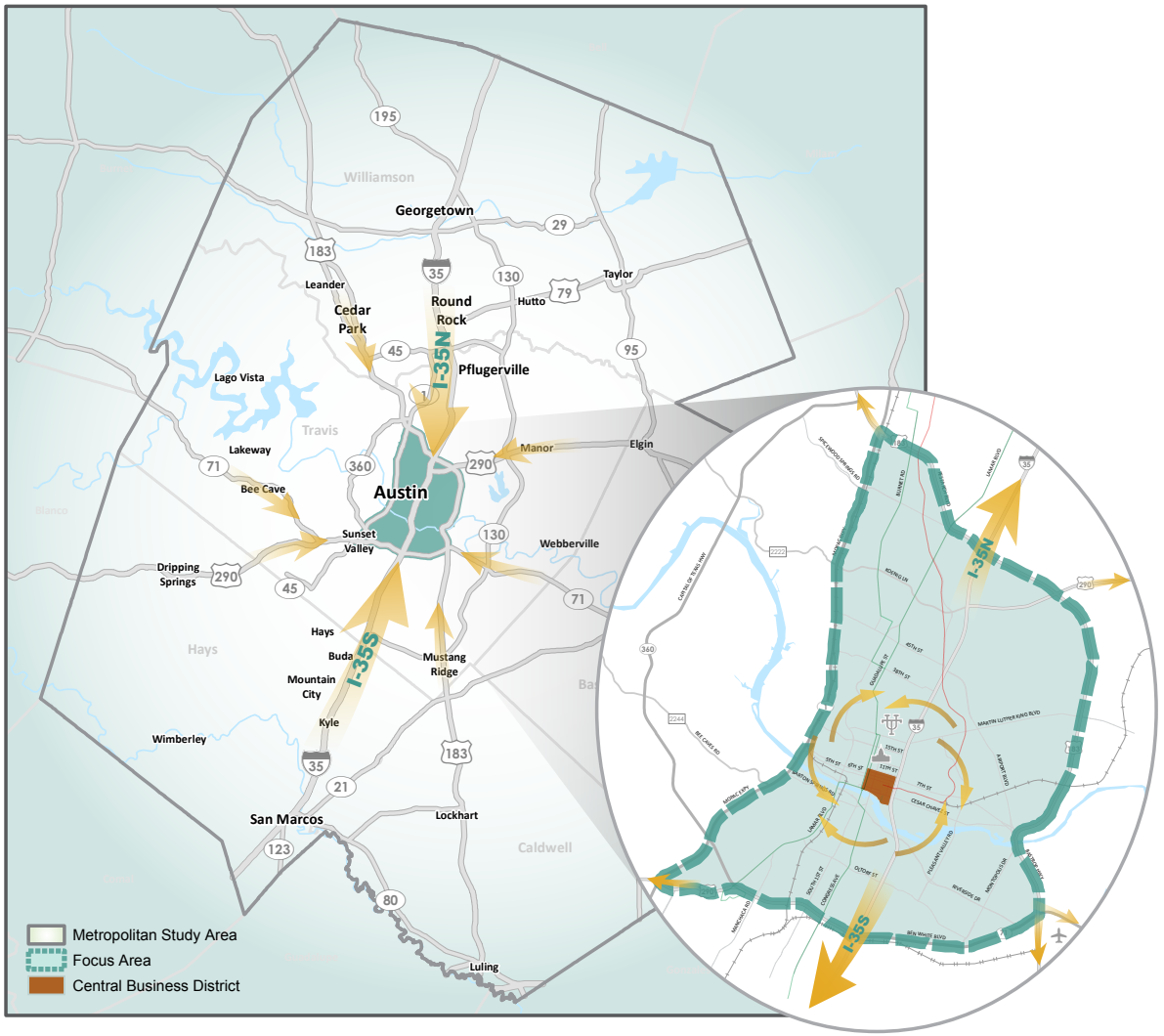
The program of **Short-term Enhancements** will address efficiency and operational needs for our existing transit network .

Project Connect's **Long-term Investment** program is developing a regional system plan capable of moving more people by maximizing the way we use our road space and right-of-way. It will bring real options forward to avoid traffic and produce a more balanced transportation system. These new options will help support the needs of everyone in our communities -- including those who do not currently take transit.

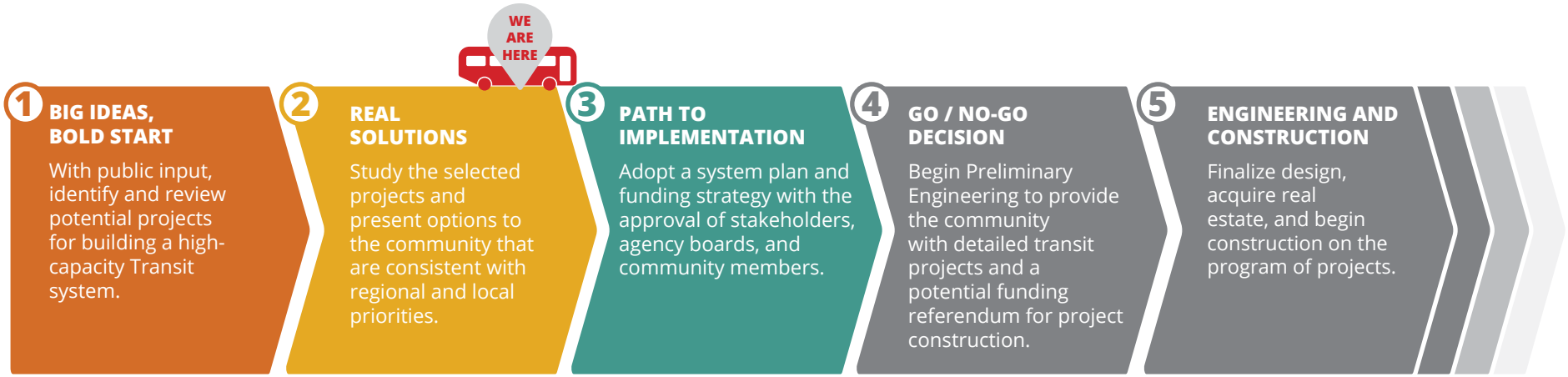
Regional Context

The greater metropolitan area is the economic engine of Central Texas and continues to add new jobs and residents. New activity centers continue to emerge within the region, increasing the demand for connected travel options into, out of and within the heart of Austin.

There are over 1 million daily trips into/out of Central Austin, as well as over 1 million trips within the area.



Project Connect Timeline



Project Connect will recommend several programs of projects to build out the regional high capacity transit system over the next 20 to 30 years. These programs are developed and implemented over several steps, illustrated by the timeline above.

As part of Project Connect, Capital Metro, stakeholders and members of the public are reviewing and analyzing corridors that have been proposed by different organizations, both public and private, as being good candidates for high capacity transit (HCT).

Step 1, completed in May 2017, evaluated a set of **33** potential corridors for long-term investment. Based on several factors that reflect the ability to support HCT service, the evaluation resulted in selection of 18 corridors for additional screening in Step 2.

Step 2 began in June 2017, with a multi-level screening of the **18** Long-term Investment corridors recommended in Step 1. The goal of the screening was to further prioritize the corridors and define the best combination of HCT service options to consider on each corridor.

Ultimately, Step 2 defined detailed Options on each corridor to compare potential benefits, costs and impacts of HCT solutions. The goal of step 2 is to determine how the Capital Metro HCT system should expand as the region grows, and which HCT investments will best support that growth.

Step 3, which will begin in June 2018, will identify specific priority projects, prepare funding plans and develop implementation strategies.

Chapter 2
Long-Term Investment Corridor Overview

What is a Long-term Investment?

Purpose and Need

What is High Capacity Transit?

How Does an HCT Move More People?

What is a Long-term Investment?

Project Connect has identified 3 types of high capacity transit corridors — Commuter, Connector and Circulator — to show how differences in corridor character may affect transit needs and potential solutions.

Connector

Connector Corridors are major arterial roadways that provide access between activity centers within Austin's central core. They serve corridors that feature high population and employment density and multiple activity centers.

Connector corridors experience high demand for trips to local employment and activity centers, resulting in a more steady demand for travel, not just during morning and evening rush hours.

Potential Connector Corridors

- 7th/Lake Austin
- Congress
- S. Lamar
- N. Lamar/ Guadalupe
- MLK Jr.
- Manor/Dean Keeton
- Oltorf
- Pleasant Valley
- Highland/Red River/Trinity
- Riverside
- 45th/Burnet
- Airport Blvd.

Commuter

Commuter Corridors extend beyond the Central Austin focus area and serve as alternatives to highways or expressways connecting to the Central Texas region.

They are typically established highway or rail corridors through suburban or rural environments that end in downtown Austin. Commuter corridors have high population and employment densities on both ends of the routes with a low concentration of trip generators and activity centers in between.

They experience a majority of transit demand from riders commuting from one city to another for work, trips that typically occur during the morning and evening rush hours.

Potential Commuter Corridors

- IH 35
- Green Line
- Metro Rail Red Line

Circulator

Circulator Corridors provide "last-mile" connections serving the densest areas of the focus area and Austin's central business district.

They generally connect major activity centers around the downtown, central business district and/or entertainment districts.

Circulator corridors experience consistent demand throughout the day, with no discernible peak period, because passenger trips are usually not to and from home.

Circulator corridors allow commuters to move around downtown after they arrive via transit from other areas.

Potential Circulator Corridors

- Downtown
- S. Congress
- Red River

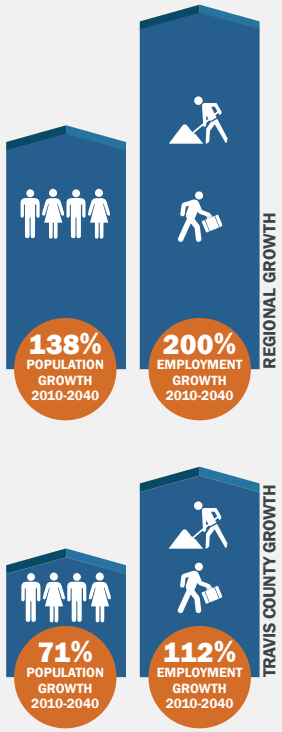
Purpose and Need

Why are the Long-term Investments important?

Project Connect's purpose is to improve existing high-capacity transit services and develop new high-capacity transit projects that provide efficient travel options to, from, and within Central Austin.

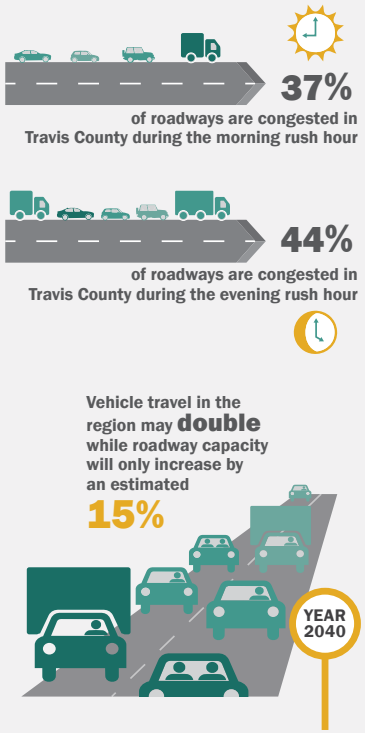
Project Need #1

Explosive growth



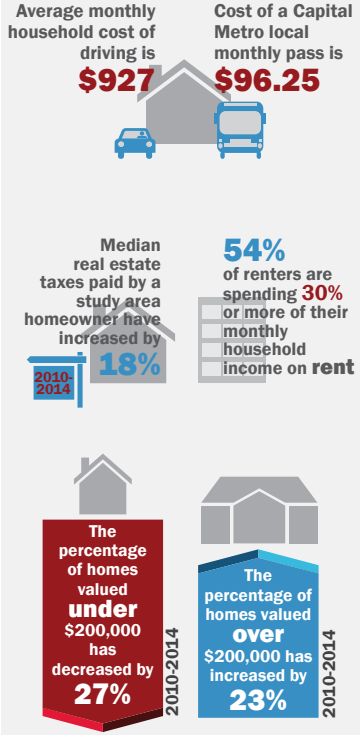
Project Need #2

Limited ability to build more roads



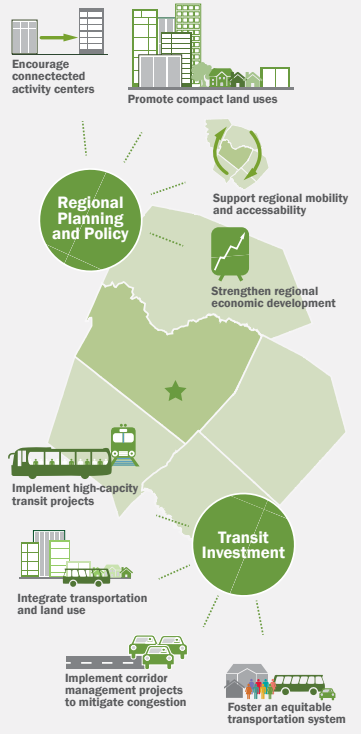
Project Need #3

Issues of affordability and cost of living



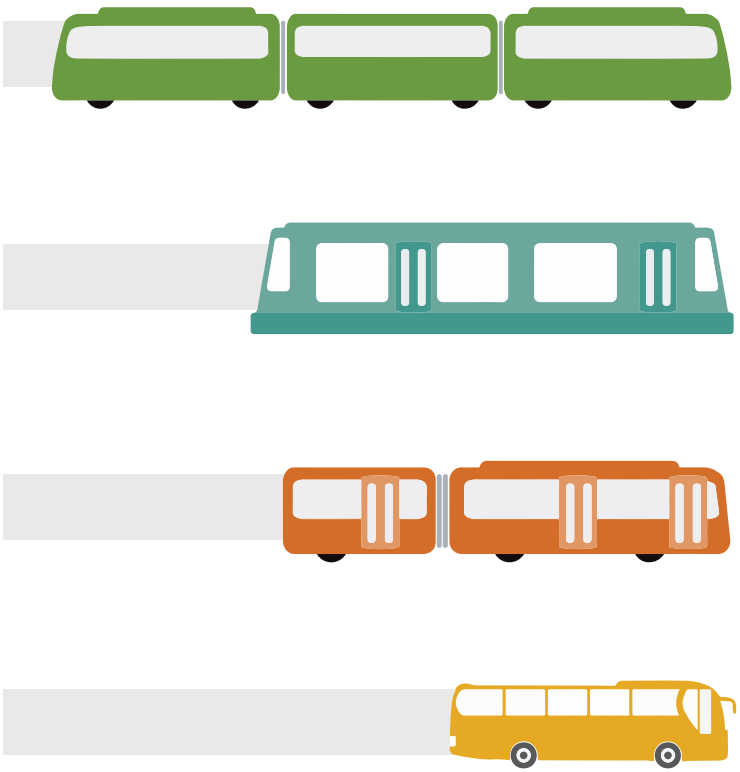
Project Need #4

A regional transit system is needed



What is High Capacity Transit?

High capacity transit (HCT) is a term for a variety of high-quality transit services including commuter rail, light rail, streetcar, bus rapid transit (BRT), and others. HCT service is fast, frequent, and convenient, so Austin residents and workers can depend on it for their daily needs. While each type of HCT has unique advantages and disadvantages, all forms of HCT move lots of people quickly and efficiently by taking riders out of the automobile congestion slowing down our roads today. Regardless of service type, a successful HCT network often includes coordinated land use planning to help neighborhoods take advantage of transit service, as well as good pedestrian and bicycle connections to help riders get to and from the station.



Commuter Rail

Commuter rail service uses heavier trains in exclusive right-of-way to move people over long distances. It works best when stops are spaced farther apart so that trains can maintain their high speed.

Light Rail

Light rail typically operates in an exclusive right-of-way in areas of higher population and employment densities. High-volume corridors with coordinated land use planning and connections to other travel modes are ideal for light rail HCT service.

Bus Rapid Transit (BRT)

BRT is a fast and frequent bus service that operates within exclusive transit lanes, with high-quality stations and off-board fare collection. BRT is often described as “light rail on rubber tires”, because it includes many of the same features as rail service.

Rapid Bus

Rapid Bus is very similar to BRT, but does not operate in dedicated transit lanes. Transit priority features, such as queue jump lanes and signal priority, can help make rapid bus service faster and more reliable and carry more riders than typical local bus service.

How does an HCT Move More People?

Building additional roadway capacity cannot solve Austin's congestion..so the best alternative is to find ways to move more people through the same space more efficiently. High capacity transit allows vehicles to operate in a dedicated space within an existing roadway so that they are not stuck in traffic during times of high traffic congestion.

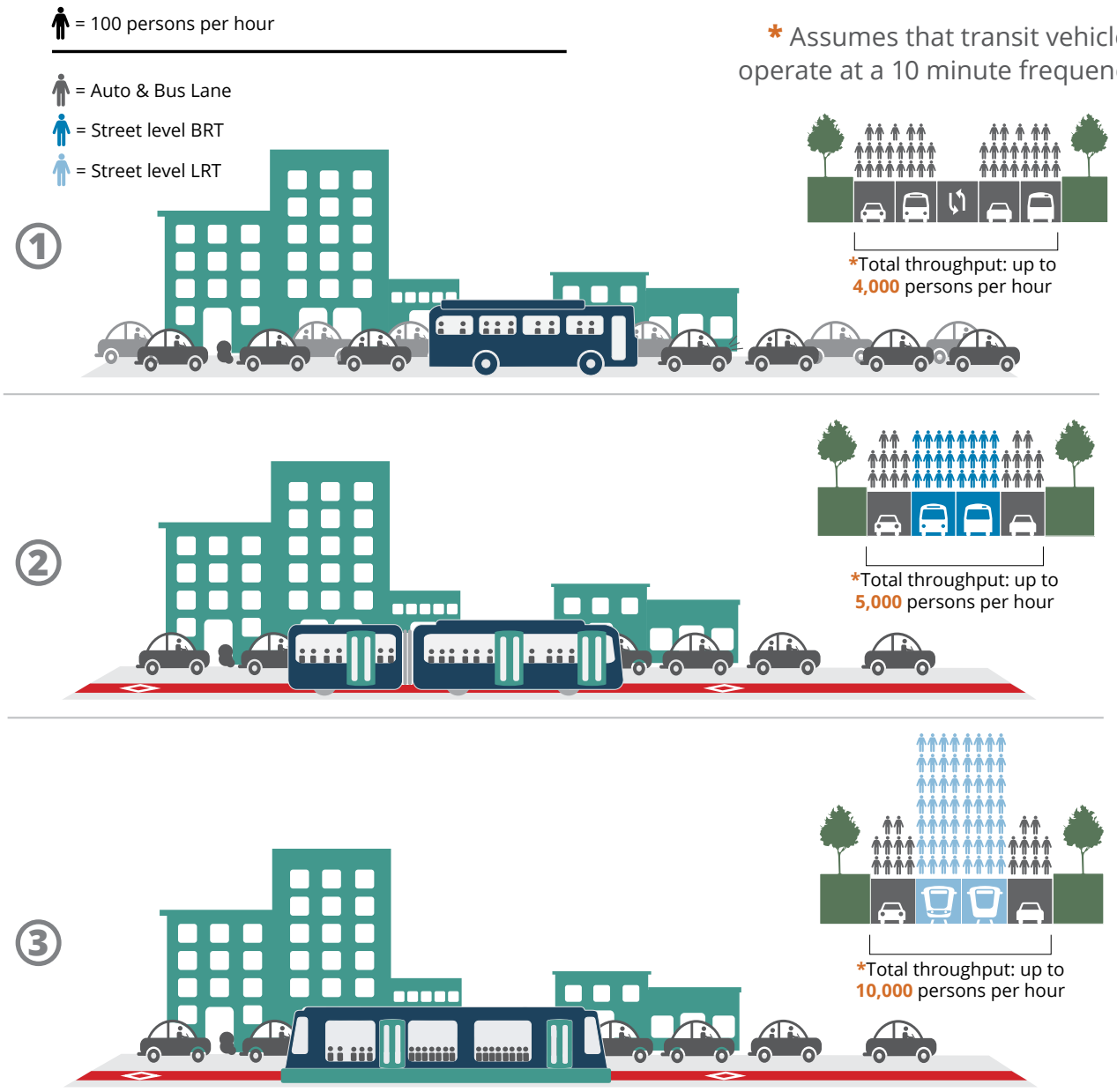
High capacity transit vehicles can carry anywhere from 60 - 225 passengers each and some vehicles can be joined together and function as "trains" for maximum carrying capacity.

Typical auto lanes can move about 1,000 people each during congested conditions. The illustrations to the right provide examples of how many people could moved through the same typical section of roadway.

1. Autos and transit sharing the lanes.

2. Autos and transit each have their own dedicated space (lower capacity transit vehicles).

3. Autos and transit each have their own dedicated space (higher capacity transit vehicles)



Chapter 3
Identifying Options

Step 2 Approach

What is an HCT Option?

Guideway Profiles

Step 2 Service Screening

Operations

Step 2 Connector Corridor Screening

Connector Corridor Options

Commuter Corridor Options

Circulator Corridor Options

Step 2 Approach

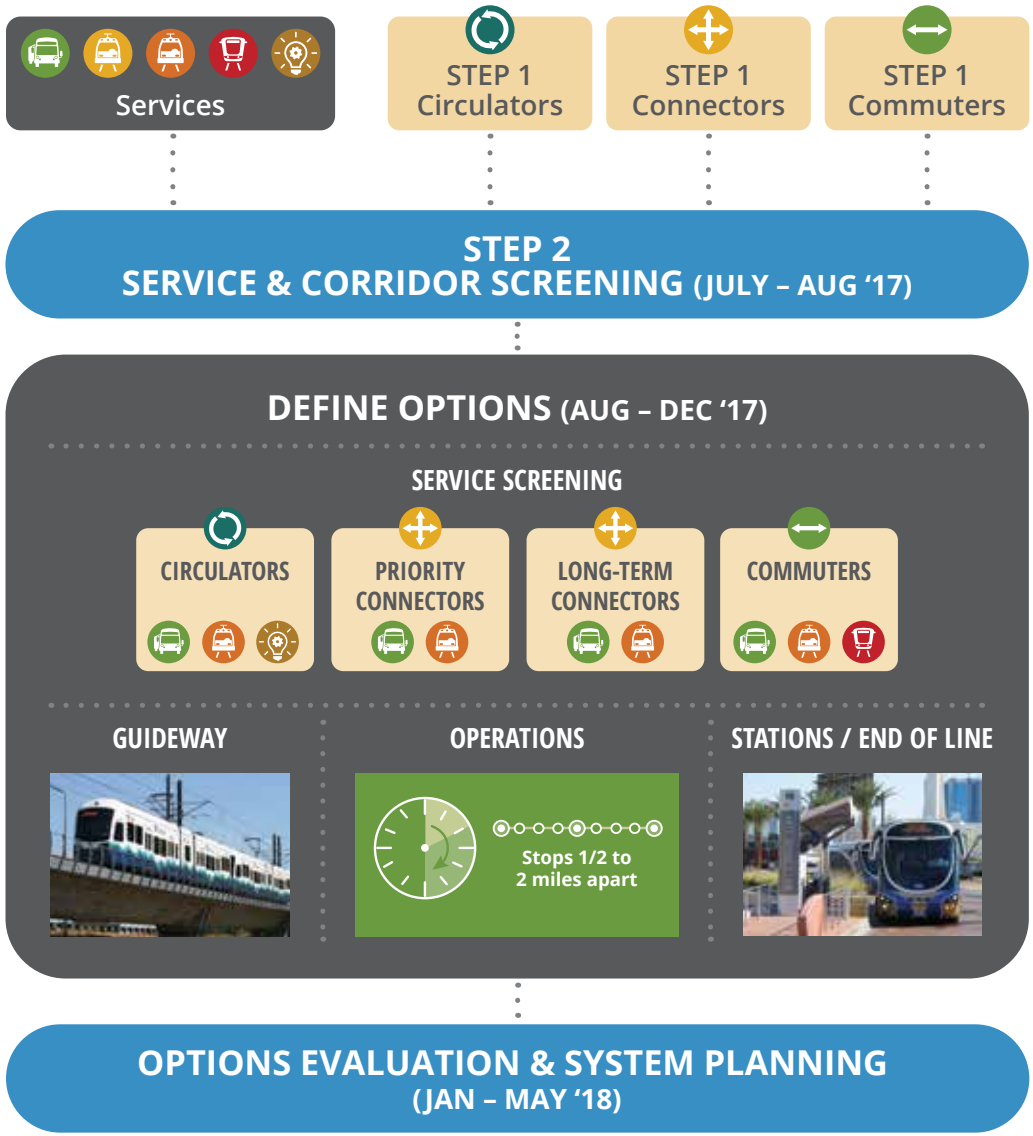
At the beginning of Step 2, the project team conducted a Corridor Screening to classify the long-term investments as either **'Priority Corridors'** or **'Long-Term Corridors'**. **Priority** Corridors are likely to benefit the most people in the immediate future and be most competitive for Federal funding grants to pay for construction. **Long-term** corridors will be considered for HCT service as they grow in density or become eligible for alternative funding opportunities. The Corridor Screening resulted in:

- Two Priority and One Long-term Commuter Corridors.
- Eight Priority and Four Long-term Connector Corridors.
- One Priority Circulator Corridor consolidated to analyze the downtown area

Refer to the Phase 2 Initial Screening Memo (January 2018) for further information.

Step 2 also conducted a Service Screening to determine the right type of vehicle to use for the trips served by Commuter, Connector and Circulator corridors. The Service Screening matched 2-3 reasonable vehicle technology options with the 3 Long-term corridor markets to develop a range of detailed Options for comparison.

The detailed Options also assume different combinations of transit guideway solutions. The Step 2 evaluation calculated standard data on transit service benefits and impacts to determine the best performing option for each corridor. The team will work with the Central Texas community to further inform the preferred option for each corridor through the remainder of Step 2.



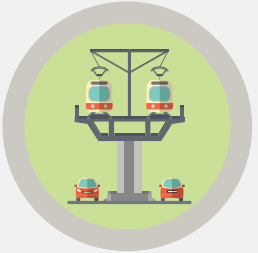
What is an HCT Option?

Defining the detailed options required more than knowing just the general route and mode options. Each Long-term investments option identifies appropriate ways to dedicate spaces (guideways) for transit to operate, select vehicle technology and set up service profiles to meet the potential demand.

Service assumptions

Guideway

High capacity guideways are dedicated spaces in which the transit operates. The guideway may use space within an existing roadway, railroad right-of-way (property), or new right-of-way (property). Based on the limitations of the existing spaces, the guideway may also operate at the street-level, elevated (on structure), or underground (in a tunnel). The location and type of guideway can affect other modes of travel that use the corridor.



Vehicle Technology

Although most of the speed benefits of HCT are gained from operating in its own guideway, the mode and technology used can also affect the efficiency of service. Transit 'Modes' are defined by the types of vehicles in operation and the propulsion (engine) technology that they use. They are typically some type of bus or rail vehicle. Different vehicle types can have a wide range of person-carrying capacity, but may also have different limitations on how much space is needed, operating speed or the type of guideway required.

Operations

Operating conditions of HCT depends on the length of trip and ridership (demand). The HCT service operating profile determines the amount of time vehicles are operating (span of service), how often vehicles stop at any given station (frequency) during different times of the day and the typical distance (spacing) between stations. Service operating profiles are usually tailored to efficiently meet the transit demand during the peak and off-peak travel periods within a corridor. They is always a balancing act between convenience for riders and operating cost to the agency.

Guideway Profiles

Side-Running Transit Lanes

Side-running transit lanes are similar to center-running transit lanes in many ways, including cost. Side-running transit lanes create fewer disruptions to turning auto traffic, but present more challenges for maintaining access to adjacent properties. As a result, transit speed and reliability are likely to be lower with a side-running configuration.

COST: Low

SPEED & RELIABILITY: Low

CONSTRUCTION CHALLENGES: Moderate

Center-Running Transit Lanes

Center-running transit is relatively inexpensive to construct and maintain. It can present some challenges by limiting access from one side of the street to the other, but can usually be built without directly impacting many adjacent properties. The speed and reliability of center-running transit often depends on the speed limit of the street and number of intersections the transit vehicle must navigate.

COST: Low

SPEED & RELIABILITY: Moderate

CONSTRUCTION CHALLENGES: Low

Guideway Profiles

Elevated Transit Lanes

Elevated transit lanes are expensive, but they can allow people and cars to pass freely underneath. Elevated structures create visual barriers for adjacent residents and businesses, and are harder for pedestrians to access. Transit speed and reliability are high, because elevated transit lanes can bypass traffic lights and road intersections.

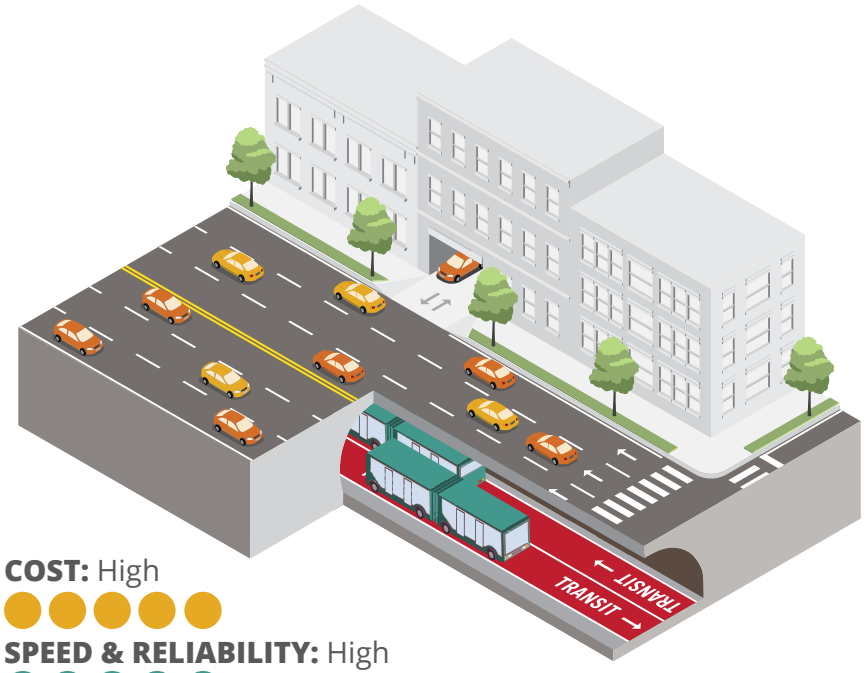
COST: High

SPEED & RELIABILITY: High

CONSTRUCTION CHALLENGES: High

Underground Transit Lanes

An underground transit configuration is the most expensive option, but it could provide the highest level of speed and reliability while creating the smallest impact on adjacent businesses and residents. Underground transit systems avoid competing with surface vehicles for space on the road.



COST: High

SPEED & RELIABILITY: High

CONSTRUCTION CHALLENGES: High

Step 2 Service Screening

To begin Step 2 of Project Connect, Long-term Investment corridors underwent an Initial Screening process to identify service assumption options for each type of corridor (Commuter, Connector, Circulator). The screening attempted to link appropriate vehicle technologies and operating profiles with corridor markets based on the typical high capacity transit needs. The project team generated data for each of these modes by compiling statistics from transit agencies across the country.

HIGH CAPACITY TRANSIT SERVICES

SERVICE		FREQUENCY	HOW MANY PEOPLE CAN IT CARRY PER HOUR DURING RUSH HOUR*	COST TO BUILD	MILEAGE BETWEEN STATIONS	REAL WORLD EXAMPLE
COMMUTER RAIL	A train operated in its right of way (ROW) to quickly carry riders from the downtown core to stops throughout the region.	Every 15 – 60 mins.	800 - 4,800 passengers	$$ - $$$$	Stops 1 - 5 miles apart	 Photo Courtesy of The University of Texas at Austin
LIGHT RAIL	Electrified rail service that operates in its own lane, providing rapid service to connect local activity centers.	Every 10 – 30 mins.	1,400 - 12,200 passengers	$$$ - $$$$	Stops 1/2 to 2 miles apart	 Photo Courtesy of Danny Sisk via Flickr
STREETCAR	Electrified rail service that can operate in mixed traffic or in its own lane. Typically used to circulate in dense, urban areas.	Every 5 – 15 mins.	2,700 - 10,800 passengers	$$ - $$$	Stops are 1/8 mile to 1/2 mile apart	 Photo Courtesy of Dan Honeckow via Flickr
BUS RAPID TRANSIT (BRT)	Bus routes that operate in mixed traffic or in their own lane and provide rapid service to connect local activity centers.	Every 10 – 30 mins.	700 - 2,000 passengers	$ - $$$	Stops 1/2 to 2 miles apart	

*This calculation is based on average vehicle capacity multiplied by the frequency of service during rush hour, the number of transit vehicles (allowing for multi-car trains or buses), and the number of transit lines operating in the same dedicated guideway for a one hour period in one direction only. A maximum of 2-car train is assumed at street-level guideway and 3-car train for an elevated guideway.

Step 2 Service Screening

Commuter Rail is **recommended** for further consideration in Step 2 Commuter Corridors.

LRT is **recommended** for further consideration in Step 2 Commuter, Connector and Circulator Corridors.

Streetcar is **considered** for implementation as part of Step 2 Circulator Corridors.

Dedicated BRT is **recommended** for further consideration in Step 2 Commuter, Connector, and Circulator Corridors.


Photo Courtesy of Daniel Schwen via wikimedia

Heavy Rail is **NOT recommended** for further consideration in Step 2. HRT carries the greatest number of passengers, but is also the most expensive to construct and operate. Corridor ridership demand does not support HRT investment at this time.


Photo Courtesy of Adam Winer via abc Action News

Autonomous vehicles and other emerging technologies will be **considered** for implementation through Project Connect as technology evolves to support high-capacity transit service. Due to a lack of data about implemented autonomous transit projects, the project team did not study the performance of AVs as one of the potential HCT scenarios.


Photo Courtesy of barry248 via Flickr

Aerial gondolas are **NOT recommended** for further consideration in Step 2 of Project Connect. Aerial gondolas are operated in areas where topography (such as a river crossing or steep hills) make providing transit service difficult.

Operations

There are generally two ways to move a large amount of people using HCT: 1) provide very fast and frequent service or 2) use vehicles that can carry a high number of passengers. The choice of guideway configuration has a significant impact on the potential operating speed. Service Operations include the times transit operates (weekdays and weekends), as well as how frequently they run and the typical distance between stops.

Project Connect Long-term Investment corridors have been described based on the different travel markets (trip types) that they serve: Commuter, Connector and Circulator. The needs of each corridor type may be served in different ways. The detailed Options developed and compared during Step 2 of Project Connect will be combinations of right-sized service vehicles, operating profiles and guideway assumptions.

When developing detailed service assumptions for each corridor, the existing conditions and challenges were also considered.

Vehicle Operations on Project Connect Corridors

Light rail vehicles are not considered on the Green and Red Line commuter corridors because freight rail service continues to operate on those corridors. They can only be compatible with Commuter Rail technology. The choice of guideway configuration has a significant on the operating speed. In order to minimize the different types of vehicles in service (and maintenance costs), Capital Metro will consider the use of a LRT vehicle that can function as a Streetcar for Circulator corridors.

- **Stop Spacing** is usually much farther apart for Commuter Corridors, since the service goes to areas where density may be low and residents may travel several miles to access the transit line. It is designed to pick up riders at large Park & Rides or major collection points (1 – 3 miles). Connector Corridors usually travel along busy roadways where dense pockets of residents and job centers are located, so stations are about 1-mile apart or less. Circulators operate in the most dense, busiest areas, where there are lots of people trying to take short trips to nearby destinations (2-4 blocks).

- **Service Frequency** is the amount of time between vehicles arriving at a station along the transit line. High-capacity transit usually has 2 or more frequencies, depending on the time of day and the expected demand. The highest demand (ridership) is usually during the morning and evening peak travel to work periods. During the mid-day or evening off-peak periods, frequency will decrease based on the typical demand for Commuter, Connector or Circulator market type. “It should be noted that some Federal grants programs require a minimum frequency during peak / off-peak periods for funding eligibility”.

- **Span of Service** is the amount of time that the HCT service is operated every day. The span will vary based on the Market (trip) type and the daily trip patterns that people usually make. Commuter corridors are generally operated to serve work trips between the early morning and evening. Connector and Circulator generally corridors carry people to and from work, social, lifestyle and entertainment centers so they typically operate from the early morning to the late evening and after hours.

Operations

*Operations shown are for typical weekday service) frequency and span of service may differ for week-ends and special events.

Commuter

Stops every 2 to 4 miles

Commuter Rail

ARRIVALS EVERY 15 MIN. DURING PEAK TO 60 MIN. OFF-PEAK*

WEEKDAY SPAN 16 HRS*

Connector

Stops every 1/2 to 2 miles

Light Rail

Rapid Bus / BRT

ARRIVALS EVERY 10 MIN. DURING PEAK TO 20 MIN. OFF-PEAK*

WEEKDAY SPAN 20+ HRS*

Circulator

Stops every 2 to 4 blocks

Light Rail

Rapid Bus / BRT

ARRIVALS EVERY 5-8 MIN. DURING PEAK TO 15 MIN. OFF-PEAK*

WEEKDAY SPAN 20+ HRS*

Step 2 Connector Corridor Screening

The project team conducted a simplified screening of the Connector Corridors at the beginning of Step 2 to identify corridors that showed the most promise for HCT implementation to be studied in greater detail during Step 2. The Step 2 Connector Corridor Screening used metrics that would identify corridors that are most likely to attract Federal funding and that address community interest in equity and affordability.

Refer to the Phase 2 Initial Screening Memorandum (January 2018).

Based on the result of this screening, **Eight Corridors** were identified as Priority Corridors for additional detailed study through Project Connect: 7th/Lake Austin, Congress, S. Lamar, N. Lamar / Guadalupe, MLK Jr., Highland / Red River / Trinity, Manor / Dean Keeton, Riverside.

Four Corridors were identified as Long-term Corridors, meaning that they will be set aside for future consideration once funding becomes available and/or the corridors become more supportive of HCT: Airport Blvd., Oltorf, Pleasant Valley, 45th / Burnet.

Screening Criteria	Employment	Population Density	Current Ridership	Zero-Car households	Income/Rent Balance	Implementation
N. Lamar/Guadalupe	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	**Priority**
Manor/Dean Keeton	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	**Priority**
Riverside	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	**Priority**
S. Lamar	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟡🟡	🟢🟢🟢	**Priority**
MLK Jr.	🟢🟢🟢	🟡🟡	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	**Priority**
Highland/Red River/Trinity	🟢🟢🟢	🟡🟡	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	**Priority**
Congress	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🟢🟢🟢	🔴	**Priority**
7th/Lake Austin	🟢🟢🟢	🟡🟡	🟡🟡	🟡🟡	🟢🟢🟢	**Priority**
Pleasant Valley	🔴	🟢🟢🟢	🔴	🟢🟢🟢	🟢🟢🟢	Long-Term
Airport Blvd.	🔴	🟡🟡	🔴	🟢🟢🟢	🟢🟢🟢	Long-Term
Oltorf	🔴	🟢🟢🟢	🔴	🟡🟡	🟢🟢🟢	Long-Term
45th/Burnet	🔴	🟡🟡	🔴	🔴	🟡🟡	Long-Term

Connector Corridor Options

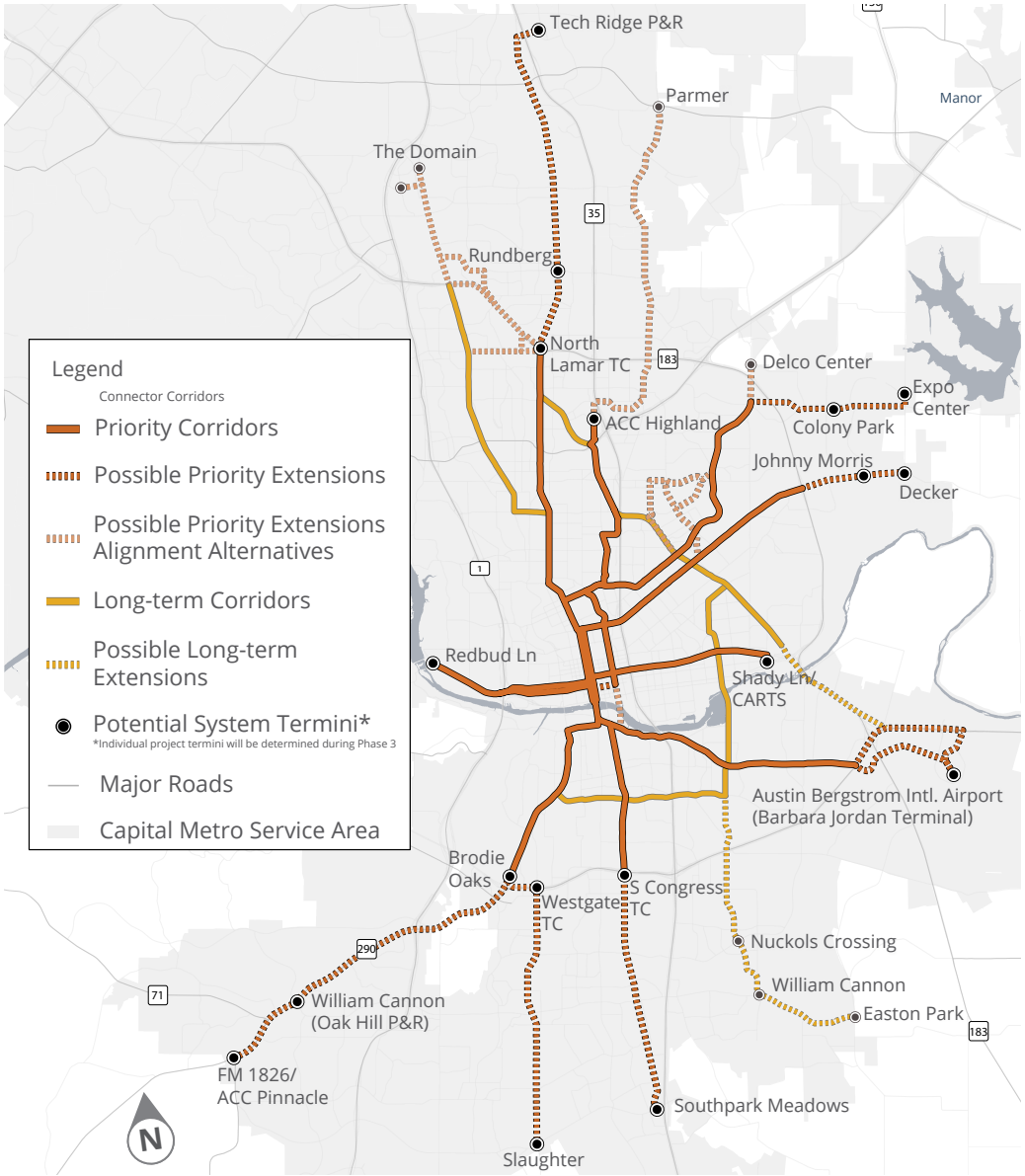
Connector Corridor routes were limited to the Focus Area limits of MoPac, US 183 and SH 71/Ben White Boulevard within Step 1 of Project Connect.

During Step 2, the study team performed additional technical analyses to understand how the end-of-line station locations might be modified to better connect people with destinations.

Some of the Corridors may be designed to allow future expansion in multiple directions to serve emerging markets. Potential route end-points and future expansion opportunities for the Step 2 Connector Corridors will be considered based on:

- Concentrations of people and jobs.
- Areas with transit oriented development opportunities.
- Accessibility to major connecting roadways, existing transit services, and Mobility Hubs.
- Equity opportunities for regional access to transit

Refer to the Connector Flip Books for details about each corridor.



Commuter Corridor Options

Green Line Commuter Rail

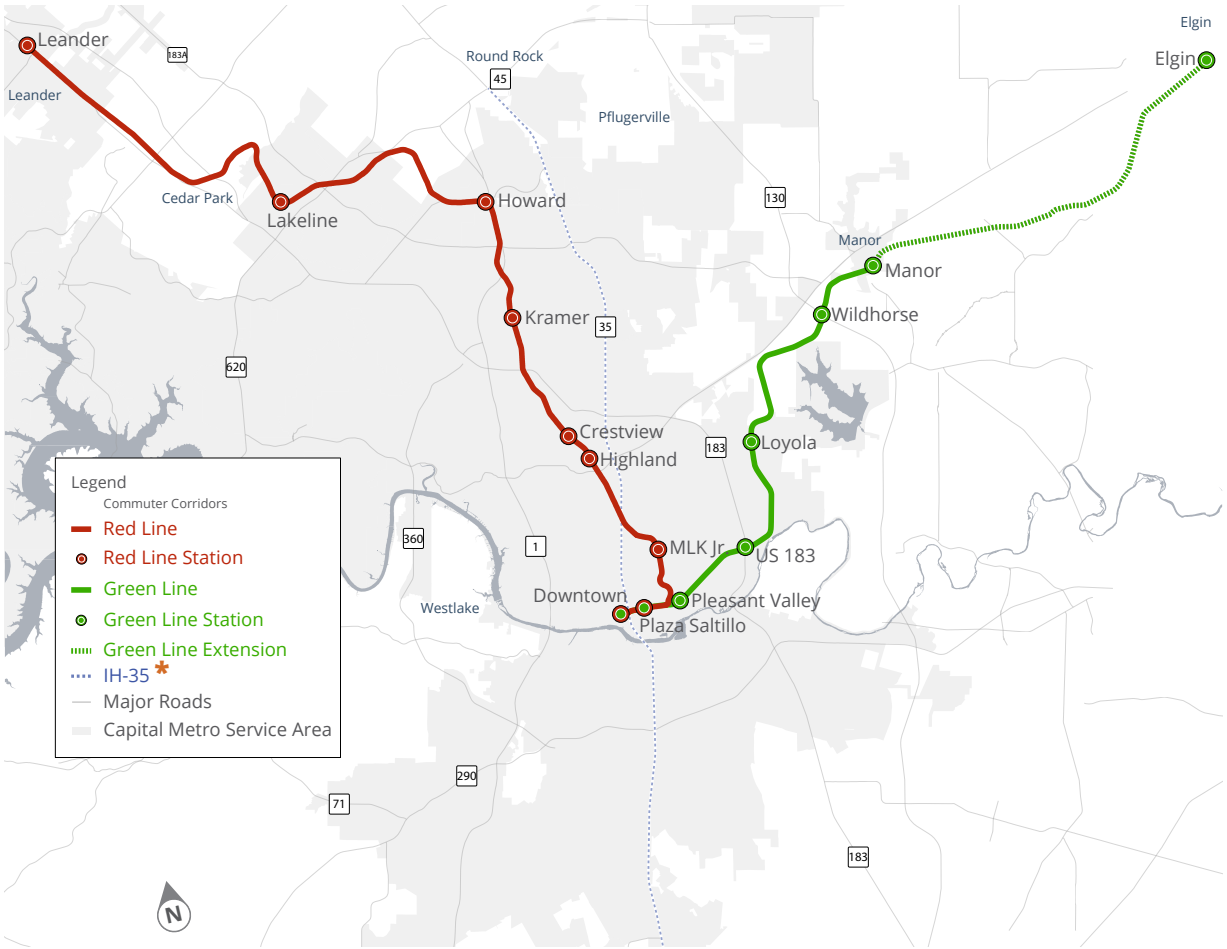
(New Service)

- The proposed Green Line Investment would provide a new commuter rail service to connect Downtown Austin; East Austin; Manor; Elgin; and Travis and Bastrop counties.
- As an "equity corridor," it could offer unique opportunities for more affordable housing options for the minority and low-income households along the corridor that could benefit from new high capacity transit access to jobs and services within Central Austin and beyond.

Red Line Commuter Rail

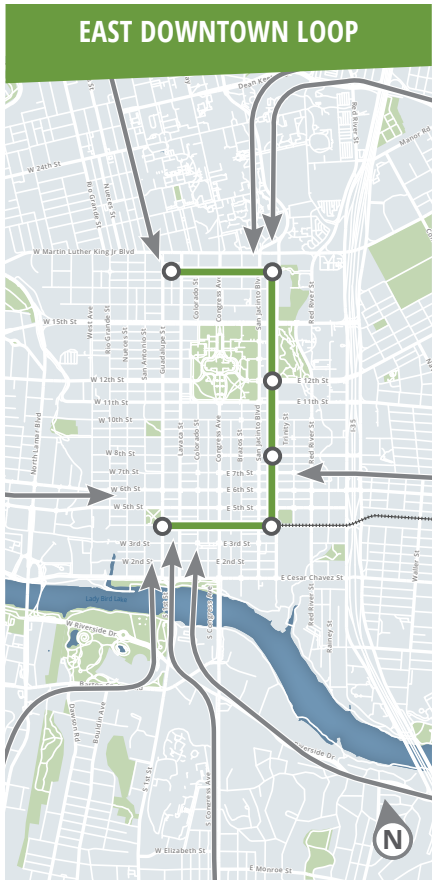
(Double Track)

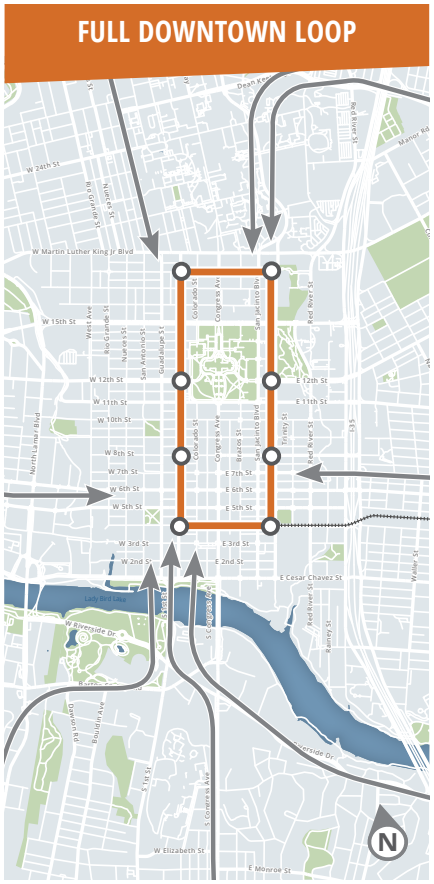
- The MetroRail Red Line Investment would expand upon the initial commuter rail investment by double-tracking the entire route in order to maximize service and operations for both commuter and freight rail.
- The double-track would allow commuter trains to pass each other while operating simultaneously in the southbound and northbound directions. It would also allow freight rail service to operate during the day. Refer to the Commuter Corridor Flip Book for further details

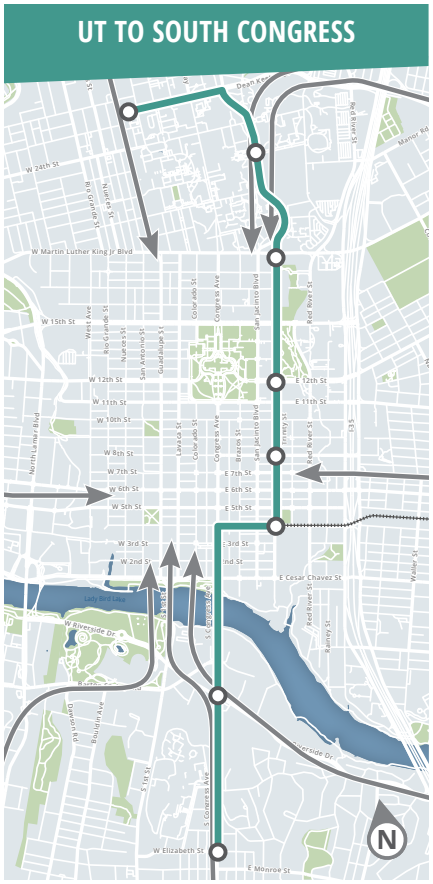


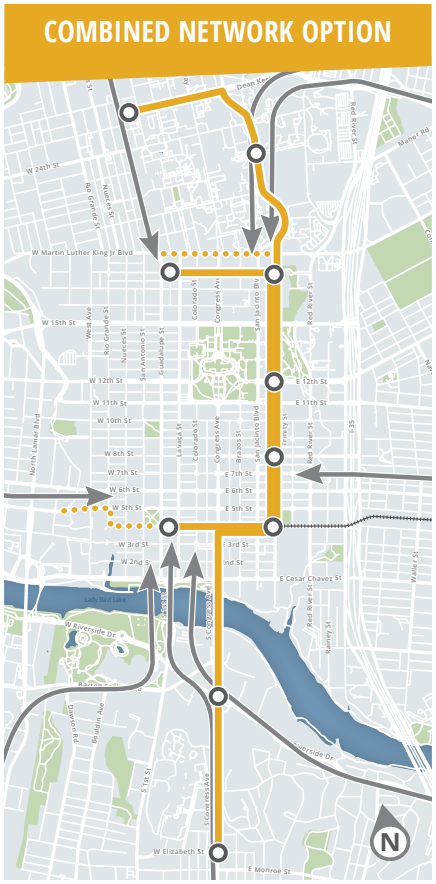
* TxDOT and Capital Metro have been coordinating for years on their Mobility35 Program. Due to recent changes in statewide policies, TxDOT put the I-35 project on hold in the Central Texas region. For this reason, there are no transit alternatives being explored for I-35 in Phase 2 of Project Connect. Nevertheless, TxDOT has indicated that they will continue to coordinate with Capital Metro in the future when the I-35 project planning starts again.

Circulator Corridor Options

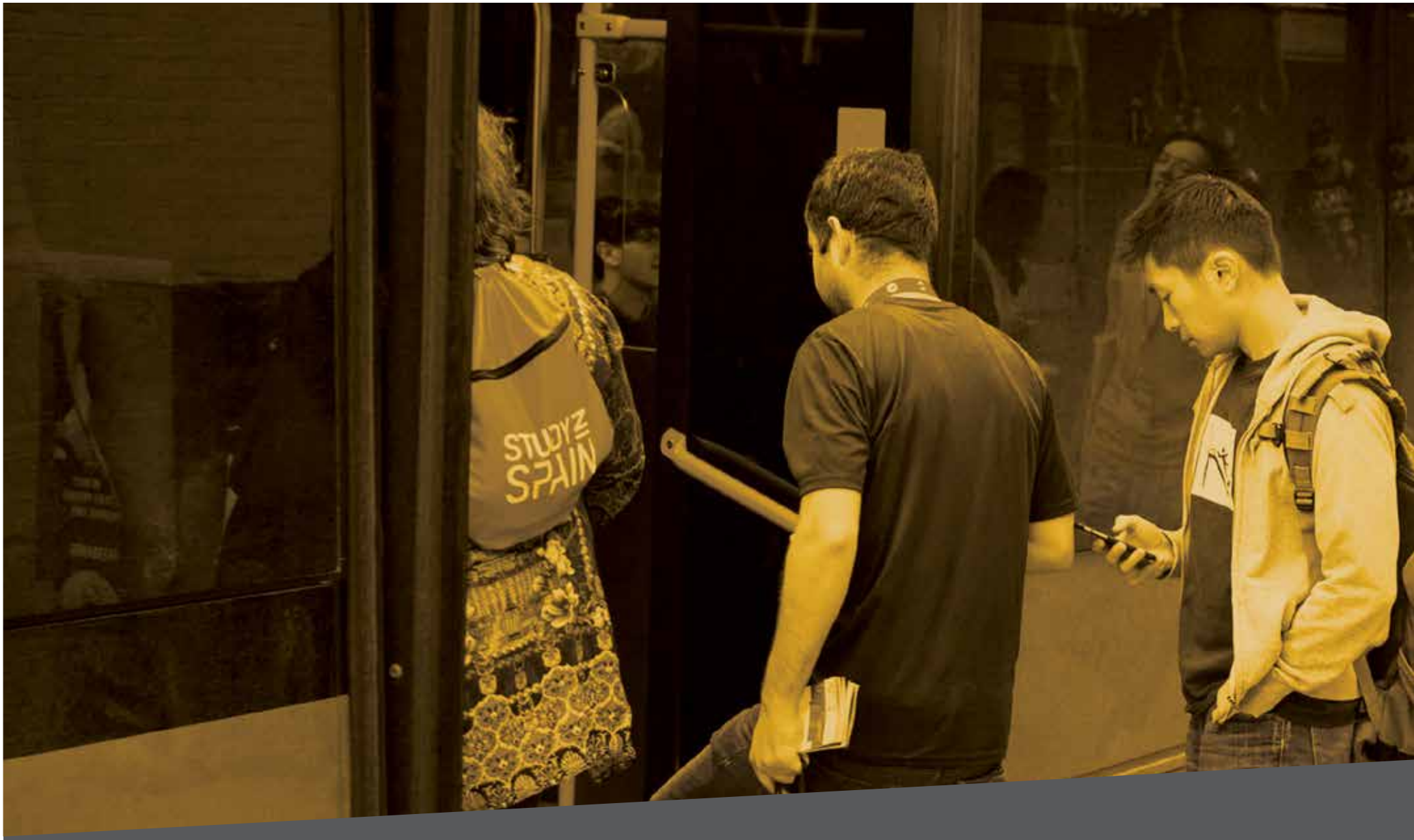








Part of the job of a circulator corridor is to provide last-mile connections to riders arriving downtown by other modes. With HCT service on connector and commuter corridors bringing in lots of riders from the surrounding region, a downtown circulator helps those riders get around downtown and reach their final destinations. The project team studied three options for how we could provide high-quality downtown circulation service depending on the final connector plan. The fourth option combines the East Downtown Loop and UT to South Congress Alignment. This option provides very frequent service on the downtown segment. Additionally, it fills travel pattern gaps with new east-west-connections, new connection south of the river, and new UT service. Refer to the Circulator Corridor Flip Book for further details.


STUDYZ
SPAIN

Chapter 4

Considerations for HCT Investment Corridors

Right-of-Way Challenges

Defining the Right Options

Tradeoffs for dedicating space for Transit

High Capacity Transit Station

Station Evaluation Results

Right-of-Way Challenges

Although implementing HCT is technically feasible on almost all of the investment corridors, there are areas within each corridor where right-of-way is constrained and/or barriers like bridges or hills may require creative design solutions. The map at right displays the areas that are most challenging for implementation of the Connector Corridors.

Major Challenges

Major structural conflicts, topographic constraints, or engineering obstacles present unique challenges for HCT implementation.

Moderate Challenges

Right-of-way requirements could impact existing structures or significantly impact parking and access for businesses. Broader outreach in affected areas should be undertaken in pre-design to identify viable options.

Few Challenges

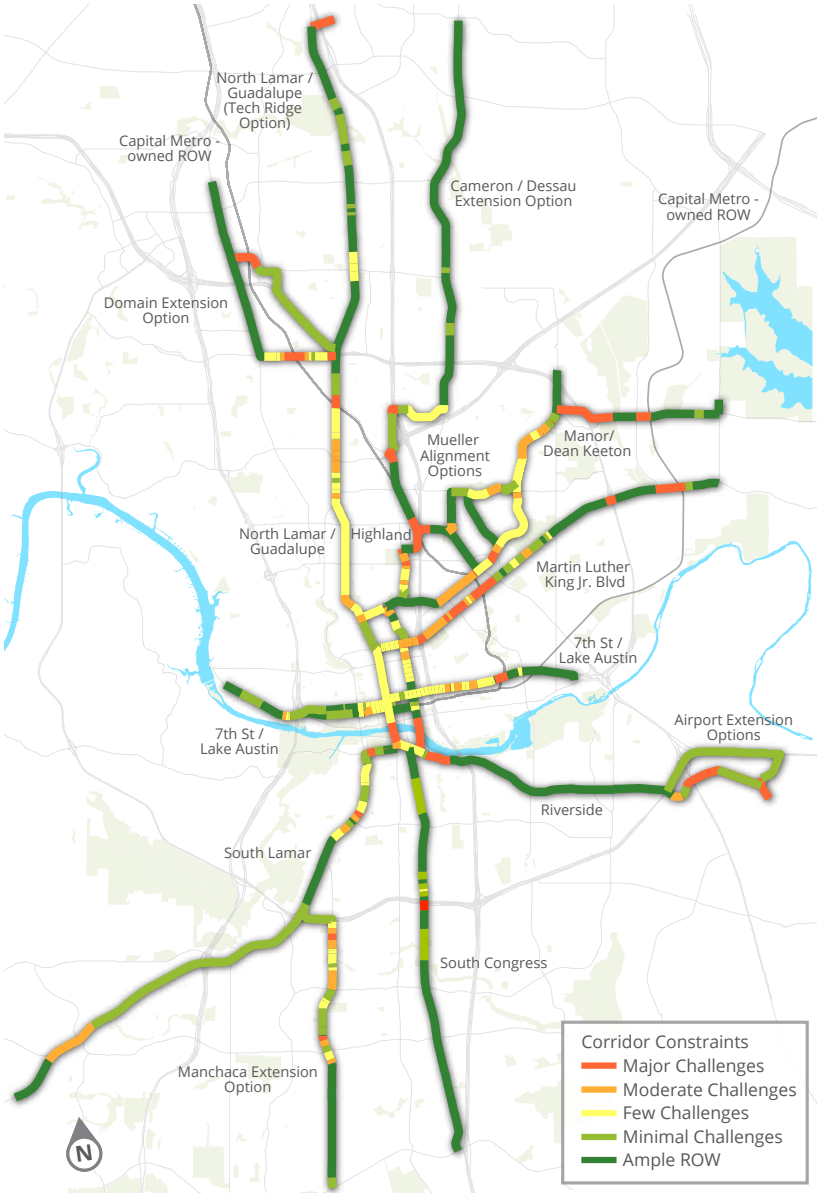
Some additional right-of-way may be necessary to implement HCT. Right-of-way needs could have a small impact on parking or access for businesses. Absent additional right-of-way, compromises would need to be made in the allocation of space. Significant dialogue with adjacent property owners should take place in pre-design.

Minimal Challenges

Existing right-of-way is sufficiently wide to accommodate HCT with minimal impacts to travel lanes. Some considerations may need to be given to ancillary street features like street trees, on-street parking, etc.

Minor Challenges, Ample ROW Available

More than enough right-of-way is available to accommodate HCT. These segments present opportunities for additional corridor enhancements.



Defining the Right Options

For each HCT Option considered on Long-term Investment corridors, Project Connect assumed an appropriate set of guideway and service assumptions to meet the needs and challenges of the corridor. The HCT Options considered for Project Connect Long-term Investments include at least one bus and one rail technology solution. The table below lists some of the potential pros and cons of operating different guideways and vehicle technologies on the different types of Long-term Investment corridors. Autonomous vehicle options may be considered as the technology becomes available for commercial use.

General Considerations	Connector	Commuter	Circulator
Bus Options	**Rapid Bus, Bus Rapid Transit (BRT)**	**Express Bus, Rapid Bus**	**Rapid Bus, Bus Rapid Transit (BRT)**
Pros • Cheaper and quicker to build • Less construction impacts and operating costs	**Pros** • Flexible to operate in mixed traffic, if space is limited for dedicated guideway	**Pros** • Can operate on highways and Express Lanes or major roadways • Flexible to exit highways and connect to off-site park & rides	**Pros** • Easier to adjust routing to meet changing Downtown trip patterns
Cons • Carries less people than rail	**Cons** • More easily impacted by traffic congestion	**Cons** • Limited opportunities for stations within highways and Express Lanes	**Cons** • May be hard to notice as different from local buses
Rail Options	**Light Rail**	**Commuter Rail**	**Light Rail**
Pros • Can run with multiple cars to add carrying capacity • More economic development / redevelopment potential	**Pros** • Lane Gain - carries more people than a lane of auto traffic • More attractive to drivers who have a choice of driving	**Pros** • Operates in completely separate space from autos • More opportunities for stations than bus on highway	**Pros** • Track can also be used by rail vehicles from Connector Corridors • Can be used to preserve dedicated space for future autonomous vehicles
Cons • More expensive to build and operate	**Cons** • Not compatible to operate in mixed traffic	**Cons** • Only operates in existing railroad ROW or expensive to acquire new ROW • Stations may not be easily accessible and connect with other services • May require RR crossing gates/signals that impact auto traffic	**Cons** • Potential operating conflicts with local bus routes and autos

Tradeoffs for Dedicating Space for Transit

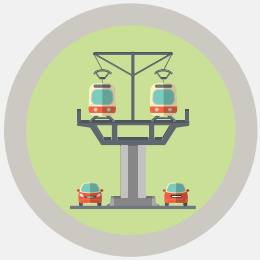
A transit guideway is the part of the roadway or rail right-of-way that dedicated transit travels on – it can be at street level, elevated, or underground. It allows HCT to operate without (or with minimal) interference from cars and trucks, making it faster and more reliable because it doesn't get stuck in traffic.

There are many potential benefits, impacts and tradeoffs associated with dedicating or converting spaces for transit use. Elements to consider while designing HCT lanes are shown below and these are applicable on a case by case basis :

Relative Benefits
Impacts to avoid/minimize
Tradeoffs to consider

Bike and Pedestrian Safety

An elevated or underground transit lane reduces potential conflicts with bicyclists and pedestrians, compared to street-level HCT lanes.



Grade Separation

An elevated or underground transit lane reduces potential conflicts with bicyclists and pedestrians, compared to street-level HCT lanes but it can increase construction cost.

Travel Lane Conversion

Street-level HCT often requires converting a traffic lane to a transit-only lane. With a HCT vehicle and frequent service, this lane can now move people more efficiently than cars.

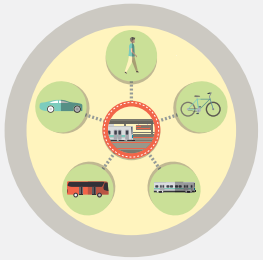
Construction Cost

Street-level HCT lanes are less expensive than elevated or underground HCT lanes because they require less new infrastructure. Rail HCT is more expensive than Bus HCT because it requires significantly more infrastructure.

Time for Implementation

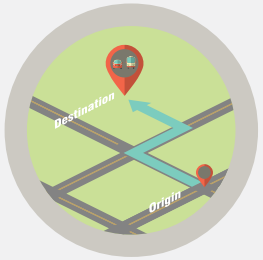
Street-level HCT is often the fastest to implement but it can be delayed based on utility conflict. Elevated HCT takes longer time but can also save time with less utility conflict. Underground HCT takes the longest time due to construction of tunnel.

Tradeoffs for Dedicating Space for Transit



Station Accessibility

Street-level HCT stations are typically faster and easier to access than elevated or underground HCT stations because no stairs, escalators, or elevators are necessary to reach them. HCT stations provides spaces for connections to other modes and services.

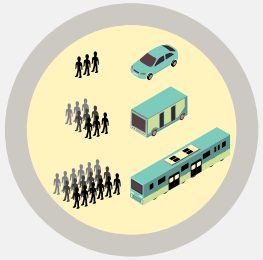


Last-Mile Connectivity

HCT station locations should be designed and built to allow simple, efficient and safe connections (pedestrian, bicycle, transit and auto) to the places that people want to go.

Transit Speed and Reliability

Street-level HCT lanes may be disrupted by car and truck traffic at intersections; elevated and underground HCT operate in a completely separate transit lane.



People Carrying Capacity

People carrying capacity reflects vehicle size and speed; larger and faster vehicles can carry more people per hour. Elevated or underground HCT can typically operate faster than street-level because there is no possibility of car/truck interference.

Driveway and Auto Access

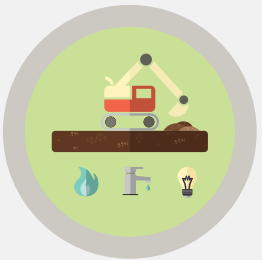
Street-level HCT lanes may restrict left turns to major intersections. Elevated HCT lanes may limit accessibility to commercial driveways in a few locations. Underground HCT lanes do not typically impact driveway or auto access.

ROW Widening or Expansion

Street-level HCT may require roadway widening or acquiring adjacent property to accommodate transit lanes. Elevated and underground HCT typically require minimal additional ROW.

Visual Barriers

Elevated HCT may block existing views and may introduce a visual element that is out of scale and character with the surrounding. Street-level HCT can easily integrate into the existing urban fabric. Underground HCT does not introduce visual barriers.



Potential Utility Impact

Street-level and underground HCT lane construction involves risk of disrupting existing surface and underground utilities. Elevated HCT lanes tend to have fewer potential utility impacts.

High Capacity Transit Station

Center Running Transit Guideway

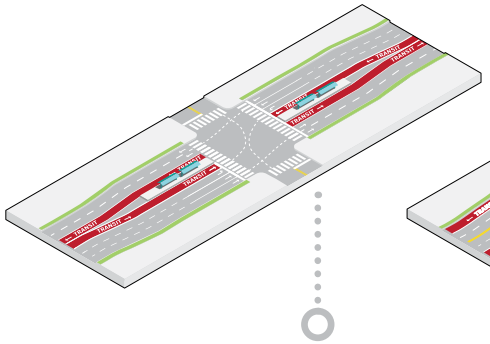


Photo Courtesy of Matt Johnson via Flickr

Seattle Central Link,
Columbia City Station

1. Pedestrian Access
2. Light Rail Station Platform

Side Running Transit Guideway

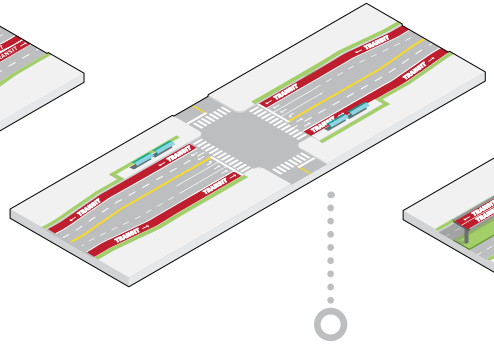


Photo Courtesy of DMY Engineering Consultants Inc.

DC Streetcar

1. Streetcar Platform
2. Pedestrian Access

Elevated Transit Guideway

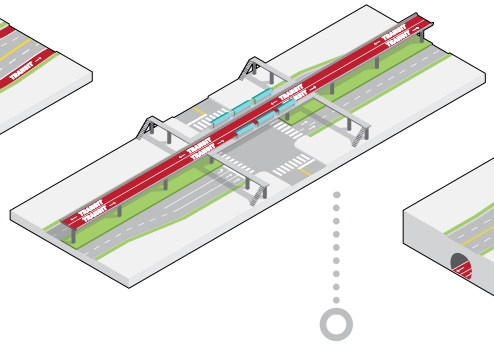


Photo Courtesy of SounderBruce via Flickr

Seattle Central Link,
Angle Lake Station

1. Light Rail Station Platform
2. Street-Level Access

Submerged Transit Guideway

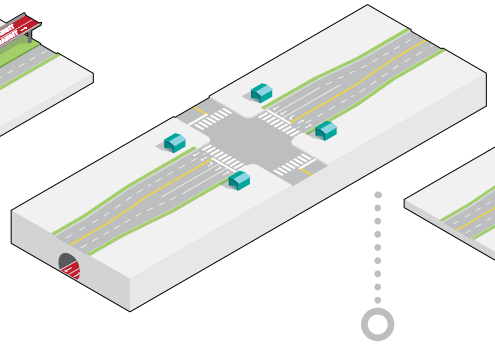


Photo Courtesy of Nelson\Nygaard

Downtown Seattle Transit Tunnel

1. Station Access
2. Shared Light Rail and Bus Guideway
3. Light Rail and Bus Station Platform

Independent Transit Guideway

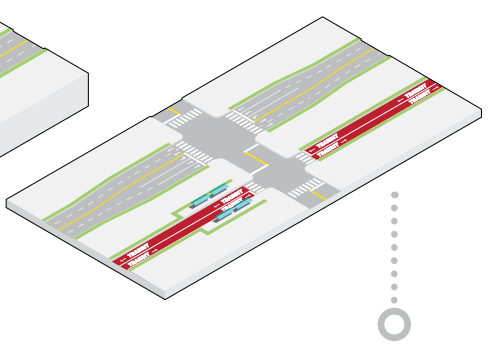


Photo Courtesy of Larry D. Moore via Wikimedia Commons

Red Line, Austin
Lakeline Station

1. Light Rail Station Platform
2. Station Access

Photo Courtesy of Nelson\Nygaard

Lane Transit District BRT Station,
Eugene, OR

1. BRT Station Platform

Photo Courtesy of Richard Eriksson via Next City

Portland MAX - N Denver Station

1. Streetcar Station Platform
2. Pedestrian Access

Photo Courtesy of Perkins+Will

Vancouver SkyTrain, Brentwood Station

1. Light Rail Station Platform
2. Street-Level Access
3. Pedestrian Bridge

Photo Courtesy of Nelson\Nygaard

Vancouver SkyTrain station entrance

1. Street-Level Access (Elevator)
2. Pedestrian Crossing

Photo Courtesy of SounderBruce via Flickr

Seattle Central Link,
SODO Station

1. Light Rail Station Platform
2. Street-Level Access

Station Evaluation Results

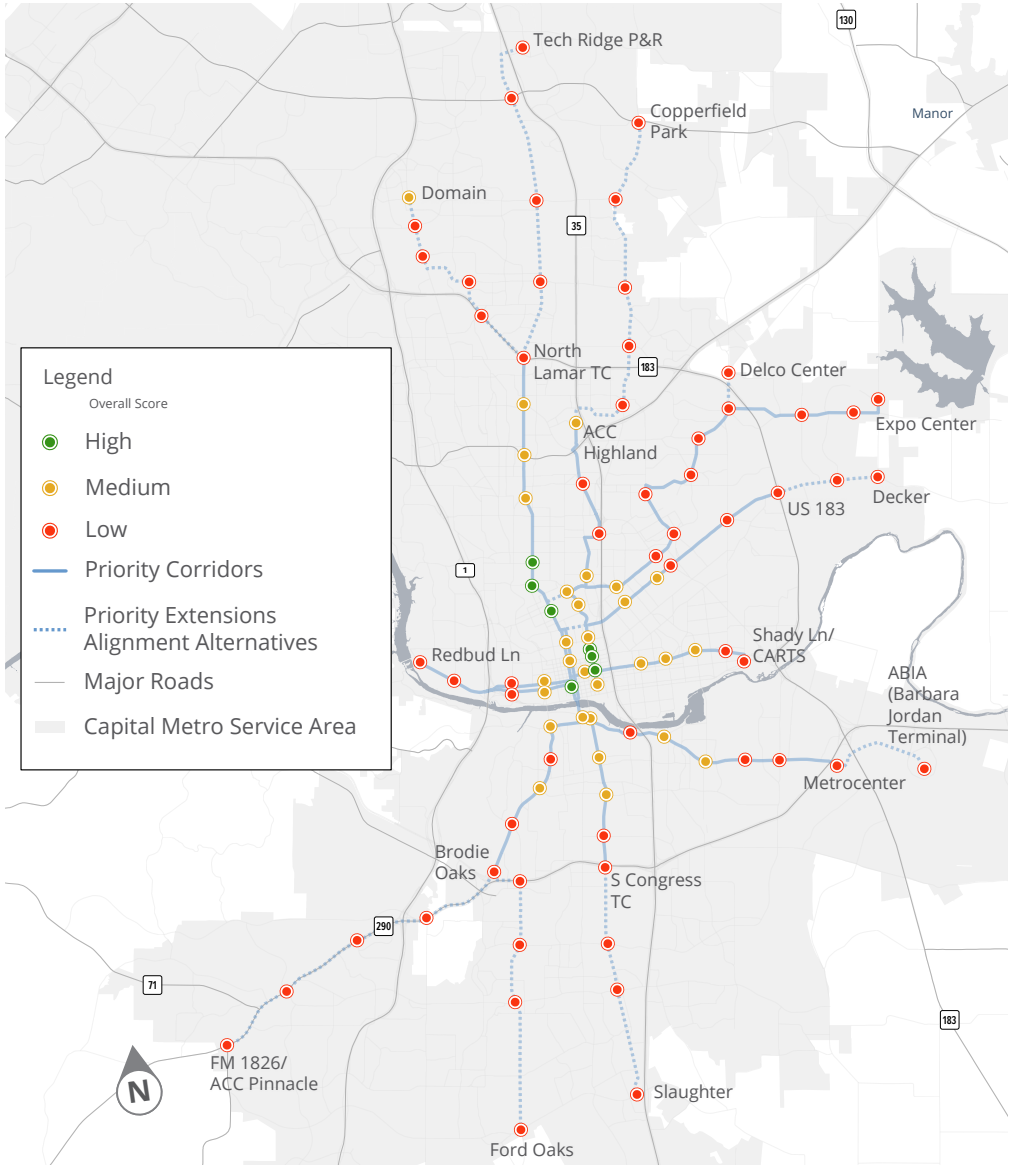
The project team conducted an analysis of possible station locations which start in Downtown Austin and progress along a corridor every ½ mile to 1 mile depending on major roads and destinations, and interconnect with existing and planned high frequency routes (Connections 2025) or proposed high capacity transit routes (Project Connect).

Station locations were then rated using quantitative and qualitative metrics that are crucial within FTA's Capital Investment Grant (CIG) program, formerly called New Starts/ Small Starts, and within Capital Metro's TOD Priority Tool. The TOD Priority Tool is currently used to encourage new transit-friendly infrastructure projects and new transit-oriented development (TOD) along the MetroRapid and MetroRail corridors. Seven metrics were chosen to evaluate station locations:

- **Population Density**
- **Employment Density**
- **Affordability**
- **Walkability**
- **Market Strength**
- **Major Destinations**
- **Transit Accessibility**

Therefore, Project Connect is considering both national best practices and local preferences for station analysis.

Stations were rated as High, Medium, or Low in transit-supportive character for each of the seven metrics. The point values for the high/medium/low were aggregated into an **Overall Score** based on these values.



Chapter 5
Corridor Analysis and Draft System Plan

Comparing Options - Connectors

Comparing Options - Commuters and Circulators

Draft High Capacity Transit System Plan

Other System Considerations

Funding and Implementation Approach

Comparing Options - Connectors

The project team developed a range of high capacity transit (HCT) options to help compare the level of investment that would be appropriate for the Priority corridors identified.

The options (Low and High) assume different combinations of service/ vehicle types and guideway profiles. The team tested the performance of lower and higher investment scenarios to gauge the potential differences in costs and performance (travel time and daily riders). The team used readily accessible data from other recently completed transit projects to project potential construction and operating & maintenance costs.

Detailed information regarding the specific alignment, guideway and service options considered for each corridor can be found in the individual Long-term Investment Corridor Flip Books.

Notes : The High options presented have different amounts of grade septation based on available ROW in the corridors. Dedicated guideway options were not analyzed for the Martin Luther King Jr corridor due to critical row constraints between downtown and Airport Blvd.

Lower Investment → Higher Investment

Service Types

Bus Rapid Transit (BRT)

Light Rail Transit (LRT)

Guideway Profiles

Street Level Guideway

Elevated Guideway

Corridor	Options	Estimated Daily Weekday Boardings (2025)	Capital Construction Cost (2018)	Operating & Maintenance Cost (2018)	Travel Time (to Downtown)	Implementation Impacts (ROW)	Community Preference
N. Lamar	Low	17,500	$700M	$6.6M	34 min	High	TBD
	High	29,500	$2.44B	$21.5M	23 min	Low	
South Congress	Low	11,000	$360M	$4.9M	28 min	Low	TBD
	High	18,500	$1.06B	$15.5M	21 min	Low	

Comparing Options - Connectors

Corridor	Options	Estimated Daily Weekday Boardings (2025)	Capital Construction Cost (2018)	Operating & Maintenance Cost (2018)	Travel Time (to Downtown)	Implementation Impacts (ROW)	Community Preference
S. Lamar	Low	7,500	$555.7M	$4.9M	32 min	High	TBD
	High	14,000	$1.6B	$20.2M	25 min	Mod	
Riverside	Low	8,500	$404.6M	$4.6M	29 min	Mod	TBD
	High	18,000	$1.28B	$15.5M	20 min	Low	
Manor/Dean Keeton	Low	8,000	$519.8M	$6.3M	29 min	High	TBD
	High	15,500	$1.56B	$20.2M	22 min	Mod	
Highland/ Red River/ Trinity	Low	4,500	$340.2M	$6.6M	22 min	High	TBD
	High	7,500	$876.4M	$28M	21 min	Mod	
7th/Lake Austin Blvd.	Low	2,500	$143M	$4.8M	26 min	Low	TBD
	High	7,500	$898M	$15.5M	14 min	Low	

Estimated costs were based on recent and similar vehicle technology and infrastructure investments in other U.S. cities. Maintenance facility needs are not included with potential costs. Anticipated ridership was obtained using FTA's Simplified Trips-on-Project Software (STOPS) model. Travel time was estimated using assumptions about roadway speed limits and grade separated HCT speed limits. ROW impacts were based on the street sections analysis and are rated as low, moderate or high.

While each of these Corridors is presented as a stand-alone investment, Project Connect is designed to create a HCT network for Austin – this network will amplify the benefits of each individual Corridor.

Comparing Options - Commuters & Circulators

Commuter Corridor

Commuter Corridor	Options	Estimated Daily Weekday Boardings (2025)	Capital Construction Cost (2018)	Operating & Maintenance Cost (2018)	Travel Time (to Downtown)	Maintenance Facility Type	Community Preference
Red Line	Full	10,000	$245M	$21M	55 min	Heavy	TBD
Green Line	Initial	1,800	$264M	$19M	36 min	Light	TBD
	Extension	1,900	$98M	$20M	52 min	-	

Circulator Corridor

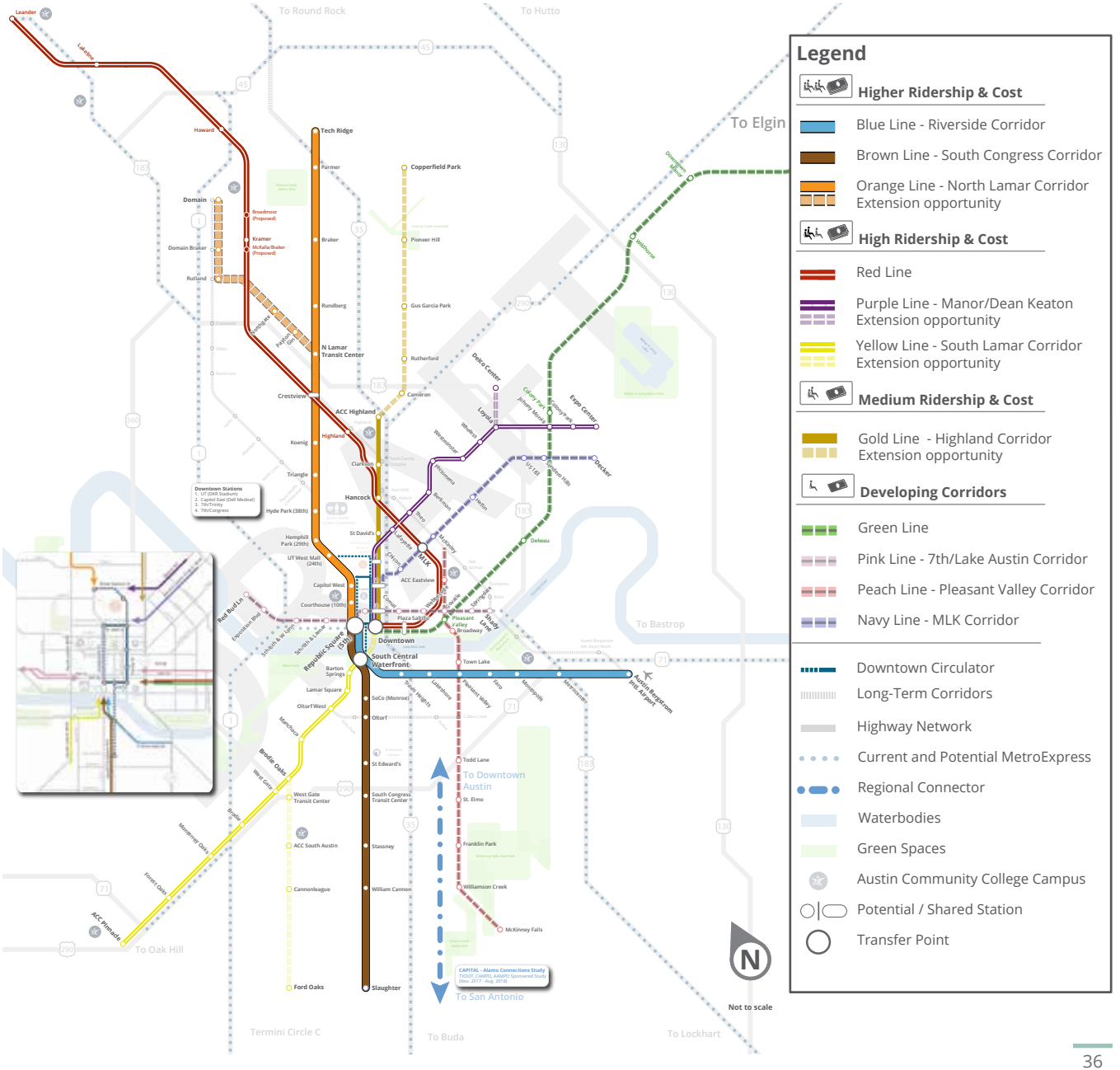
Option	Total Length	Estimated Construction Cost	Estimated Weekday Boardings	Improves Access Into Downtown	Complements Other Transit Services	Fills Gaps in Downtown Travel Patterns
East Downtown Loop	3.7 Miles	$19M - $148M	3,100 - 4,000	●	● ●	● ●
Full Downtown Loop	5.7 Miles	$29M - $228M	2,400 - 3,500	●	●	● ●
UT to SoCo	5.2 Miles	$26M - $208M	5,500 - 8,700	● ●	● ●	● ●
Combined Network Concept	8.9 Miles	$45M - $356M	5,900 - 7,900	● ●	● ● ●	● ● ●

Draft High Capacity Transit System Plan

The draft High Capacity Transit System Map shows the Priority, Long-term Investments that have been identified through the Project Connect corridor analysis and system planning efforts.

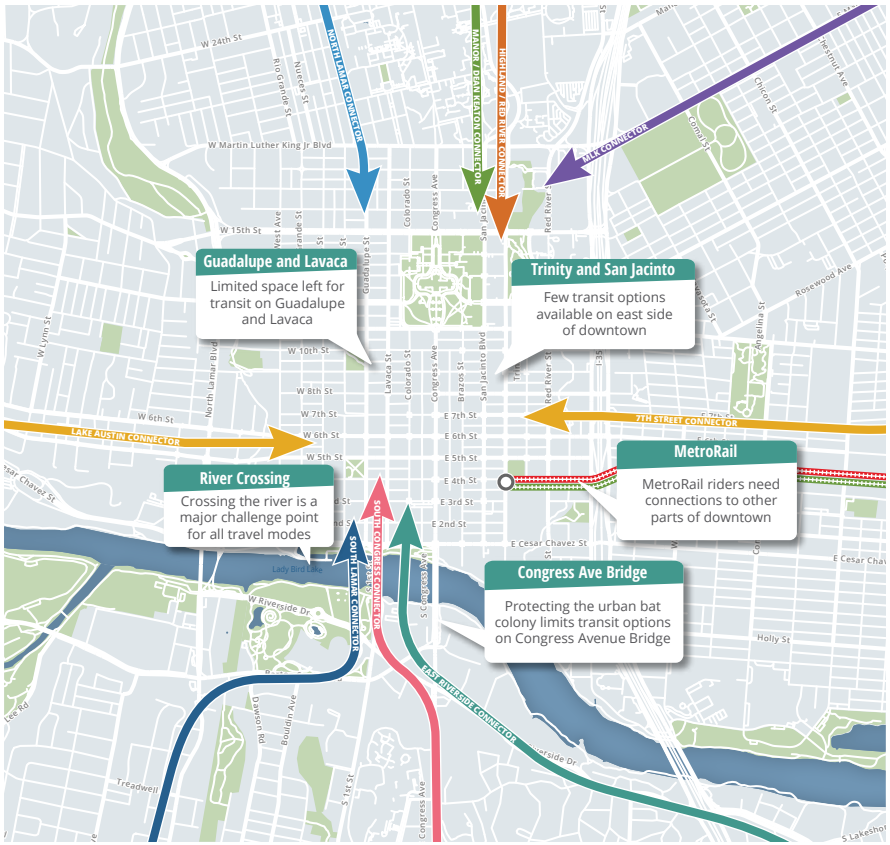
The technical analysis of potential transit demand (ridership) and costs associated with mode and guideway solutions has been used to identify a range of "right-sized" solutions for each Commuter, Connector and Circulator corridor. These draft solutions and potential funding opportunities will be explored in greater detail during Step 3 of Project Connect. We will develop several packages of projects that could be prioritized for construction over the next 20 years and beyond. The final vehicle technology, alignment, station location and grade separation recommendations will be determined during the Preliminary Engineering process, after project prioritization.

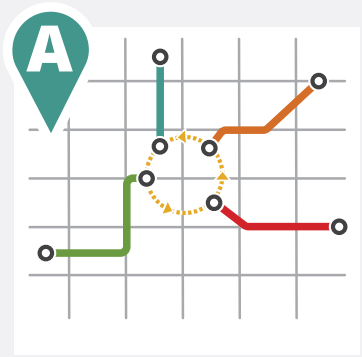
The approach to identifying the most critical corridors and potential funding opportunities is discussed in greater detail within the Funding and Implementation Briefing Book.

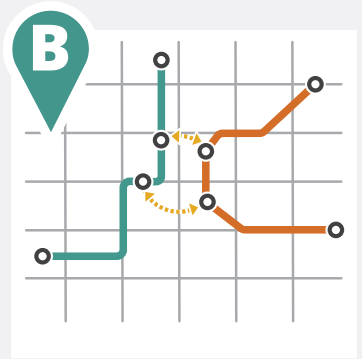


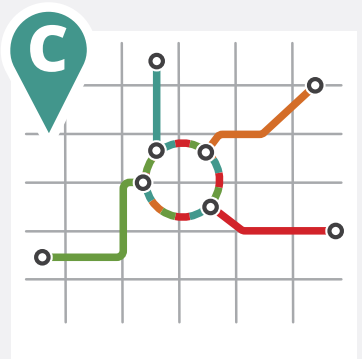
Other System Considerations

As the regional high capacity transit system gets built over time, competition for space to operate transit in the downtown area will become more intense. In order to the 10 Priority Commuter and Connector corridors together in Central Austin, Project Connect has identified 3 different operating patterns to deal with the potential bottlenecks (choke points) of the transportation network. Step 3 of this process will develop a strategy for investment in long-term solutions to efficiently bring HCT services into Central Austin.









Short Turn

Connector and Commuter routes arriving downtown head right back the way they came, while a downtown circulator delivers riders to their final destinations. The success of this option would rely on very frequent circulator service to reduce the waiting time for riders on the connector corridors to reach their final destinations.

Through Operations

Connector routes travel all the way through downtown and continue out the other side. A downtown circulator fills in any remaining travel gaps. This method would rely on connector service to provide some downtown circulation service, which could limit implementation speed and alignment options.

Shared Loop

Connector routes enter downtown and create a shared “loop” to provide downtown circulation before heading back the way they came. Due to the height restrictions of the city’s capitol view corridors and major service planning complications, this options was deemed to be infeasible.

Funding and Implementation Approach

Project Connect is a 30-year transit investment vision that will require sustained funding over the coming decades – we can't build everything at once!

The scale and type of projects included in this vision range from major capital investments that could take 10 years (each) to plan and construct, to enhancements to existing high capacity transit service that could be completed in less than a year. How can we develop a phased funding, financing, and implementation strategy to best match local priorities for investment?

The next step in Project Connect will explore ways to prioritize solutions for construction as well as secure sustainable and innovative funding sources to build out the high capacity transit system.

1. **Identify critical system needs**
   - Identify most beneficial Short-term projects and Long-term investments that support connected development and operational efficiency.
   - Support the Austin Strategic Mobility Plan's vision to get people out of their cars and onto transit by making transit the best option for mobility.
   - Identify strategic early investments that will address potential choke points where dedicating space for high capacity transit is critical for the system to operate efficiently in the future.

2. **Support equitable transit system investment**
   - Spread benefits throughout the entire Capital Metro network - to areas of dense development and riders that rely on transit, as well as riders that choose to take transit.
   - Consider geographic equity to make sure that benefits are felt throughout the region.

3. **Maximize competitiveness for federal and local funding**
   - Capital Metro will work with local partners and stakeholders to design projects that are best-positioned to win federal funding through an optimized balance of costs, benefits, impacts.
   - Work with local and regional partners to identify non-federal funding opportunities – and look for ways to leverage planned infrastructure investments to support Project Connect.

4. **Identify a realistic timetable to establish funding and financing**
   - Some of these funding and financing sources may require agreements or actions that could take time to set up. Other revenue sources may only be eligible to support specific projects or areas where the funds are generated.

5. **Pick the low-hanging fruit**
   - Some projects can be implemented more quickly than others. Project Connect implementation phasing is designed to identify those projects and get them started so that system improvements can be seen in the near-term while the larger-scale projects work through a multi-year implementation timetable.

Project Connect will work to identify potential funding and financing sources, and will continue as the details are finalized. These issues will be addressed with the completion of Project Connect through the end of 2018

Additional Information

Want to learn more?

Go to www.projectconnect.com to read more about the work we're doing through Project Connect.

Tell us what you think, take the Phase 2 Survey!

https://www.capmetroengage.org/en/provide-input

Additional Project Connect briefing books:

High Capacity Transit 101 briefing book

Investments program project flip books

Enhancements program briefing book and project flip books

Project Connect Funding and Financing briefing book

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with support from the City of Austin.

Prepared by AECOM, Nelson\Nygaard Consulting Associates, and Alliance Transportation Group with support from Bronner Group and Robin O'Connell Design

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