

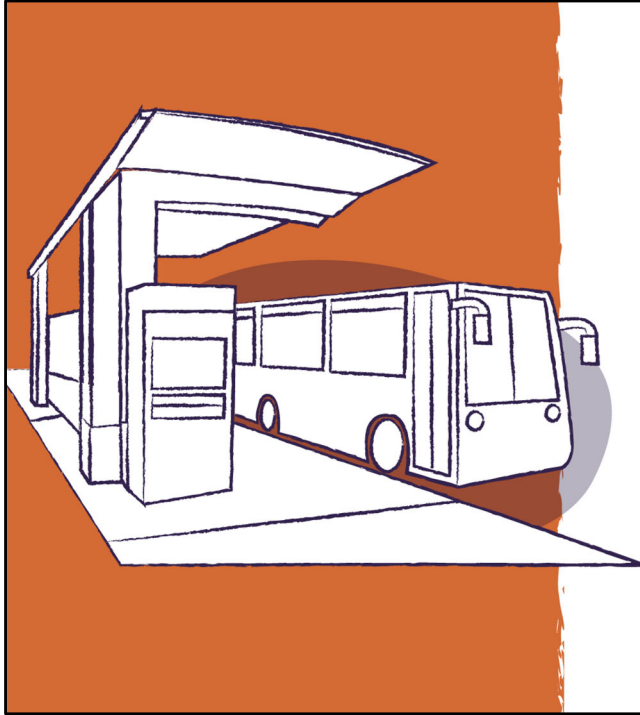
Tucson Rapid Transit



November 2023



Welcome and thank you for listening to this prerecorded presentation about Tucson Rapid Transit. This project is being led by the City of Tucson with professional services provided by HDR. I'm happy to share with you exciting information about a transit project that will transform mobility throughout Tucson.



What is Tucson Rapid Transit?

- A 15-mile high-capacity transit corridor project.
- The 5-mile north segment will be bus rapid transit (BRT).
 - BRT is a high-capacity bus service that improves travel speed and reliability, passenger capacity, and the rider experience.
- Connects Tohono T'adai Transit Center/Tucson Mall to downtown Tucson and the airport.

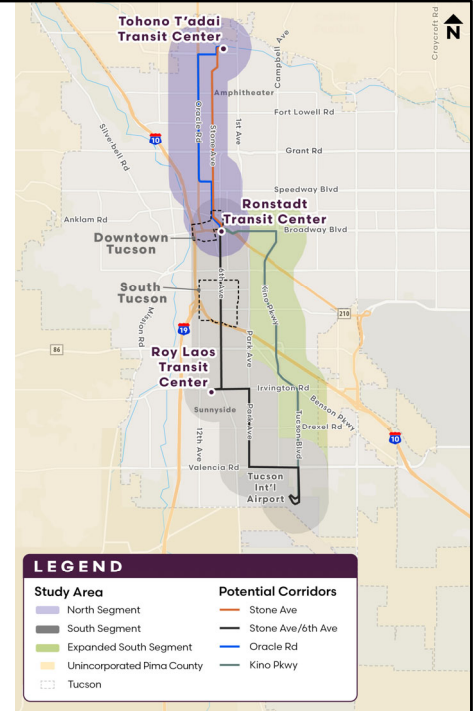
Tucson Rapid Transit is a study that is identifying a 15-mile high-capacity transit corridor to connect Tohono T'adai Transit Center/Tucson Mall to downtown Tucson and ultimately the Tucson International Airport.

This corridor has been split into two smaller segments, the north and the south, to create a more efficient study process and ultimately more efficient implementation. The north segment is a 5-mile segment between Tohono T'adai Transit Center and Downtown Tucson that will be bus rapid transit. Bus rapid transit is a high-capacity bus service that improves travel speed and reliability, passenger capacity, and the rider experience.

Where is Tucson Rapid Transit?

Corridor Segments

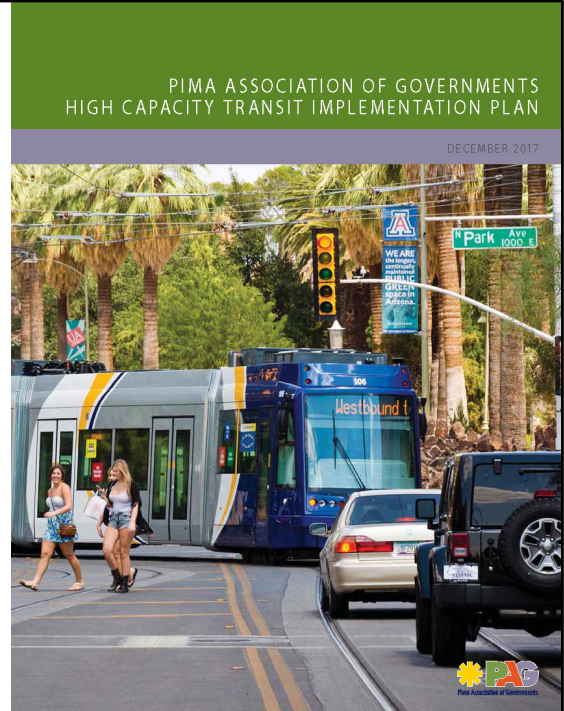
- **North Segment:** Tohono T'adai Transit Center/ Tucson Mall to the Ronstadt Transit Center/ downtown Tucson
- **South Segment:** Ronstadt Transit Center/downtown Tucson to the Tucson International Airport



This map shows the two segments I just mentioned. Each segment includes two corridors under consideration, which will be evaluated using multiple qualitative and quantitative criteria. The north segment, which specifically runs between Tohono T'adai Transit Center and Ronstadt Transit Center, has been approved into the Federal Transit Administration's Small Starts Capital Investment Grant Program and is exploring bus rapid transit on Oracle Road or Stone Avenue. The north segment is the focus of this presentation. The south segment will begin being evaluated in the near future.

Why Are We Doing This?

- BRT provides a more cost-efficient and enhanced transit experience.
- BRT can be planned, designed, and implemented at a much lower cost than other high-capacity transit.
- Offers an improved rider experience through enhanced stations, dedicated lanes, transit signal priority, and high rider capacity.
- Corridors were identified in the PAG High-Capacity Transit Implementation Plan.
- Corridors were identified in Move Tucson as high-capacity transit projects.

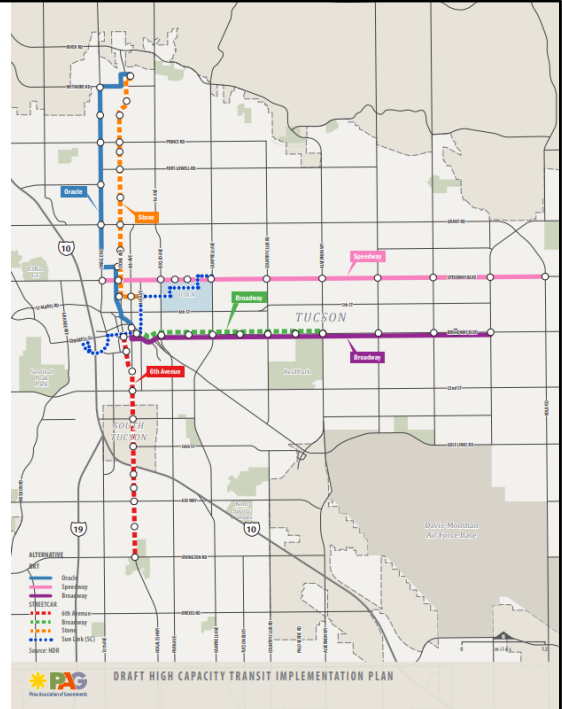


Why are we doing this?

Bus rapid transit, or BRT, provides a more cost-efficient and enhanced transit experience compared to local transit services currently offered. BRT can be planned, designed, and implemented at a much lower cost than other high-capacity transit services, such as rail or streetcar, while still offering an improved rider experience through enhanced stations, dedicated lanes, transit signal priority, and high rider capacity.

Why Are We Doing This?

- BRT provides a more cost-efficient and enhanced transit experience.
- BRT can be planned, designed, and implemented at a much lower cost than other high-capacity transit.
- Offers an improved rider experience through enhanced stations, dedicated lanes, transit signal priority, and high rider capacity.
- Corridors were identified in the PAG High-Capacity Transit Implementation Plan.
- Corridors were identified in Move Tucson as high-capacity transit projects.

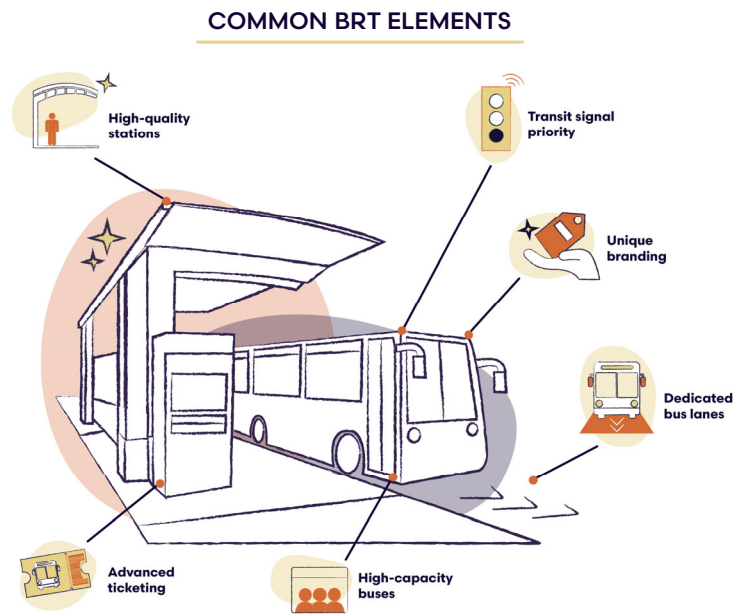


Additionally, these corridors have been identified in multiple plans as being well-suited for high-capacity transit. For example, the map on the slide depicts the results of the comprehensive transportation evaluation effort included in the Pima Association of Government's High-Capacity Transit Implementation Plan, completed in 2018. You'll see the study identified Oracle Road and Stone Avenue for high-capacity transit. In 2021, these corridors were carried forward and adopted as high-priority transit projects in Move Tucson, Tucson's city-wide transportation master plan. Most recently, the Norte Sur project, which shares the same study area boundaries as Tucson Rapid Transit, is grounded in the concept of high-capacity transit in the corridor and is actively working to develop equitable transit-oriented development (ETOD) strategies for the surrounding communities. Tucson Rapid Transit is the next step to bring an enhanced and rapid transit service in one of these corridors to life.

What is BRT?

A high-capacity bus service that improves:

- Travel speed and reliability.
- Passenger capacity.
- Rider experience.







So, what is BRT? BRT is one type of high-capacity transit. It is a high-capacity bus service that improves travel speed and reliability, passenger capacity, and the customer experience.

This slide depicts some of the common elements of a bus rapid transit system, including:

- dedicated bus lanes, which improve speed and reliability
- branded stations and vehicles for easy identification
- transit signal priority, which allows buses to communicate with a signal to let it know a bus is approaching and either hold the green or make it turn green faster
- and advanced ticketing, where you purchase your fare on the station platform to expedite the boarding process (much like for SunLink Streetcar). This also speeds up the overall travel time.

Why BRT?

| |  Operation |  Destinations |  Occupancy |  Run Time |
|----------------------------|--|---|---|---|
| Sun Tran Bus System | throughout the day | both in the city and the greater Tucson area | 40 passengers | every 15 to 30 minutes |
| Sun Express | during peak or commuter hours | from outlying areas to key destinations | 40 to 60 passengers | only 2 to 4 trips per day |
| BRT System | throughout the day | on a selected corridor, typically major roads, connecting to key destinations | 100 to 150 passengers | every 10 minutes |

BRT provides a more cost-efficient and enhanced transit experience compared to local transit services currently offered.

Bus rapid transit will be a new type of transit service for the City. Compared to existing service, it operates more frequently, runs faster via dedicated lanes and prioritized signalization, and can carry more people. As one of the most convenient forms of transit, this will improve the rider experience and attract new riders to the transit system (thereby taking cars OFF the road and improving mobility for all!). By connecting Tohono T’adai Transit Center to the Ronstadt Transit Center, the BRT service will also connect to over half of Sun Tran’s existing local and express routes. This frequency and connectivity opens many more doors for people to travel further to work, school, entertainment and any other destinations in a shorter amount of time.

Tucson Norte-Sur vs. Tucson Rapid Transit



Tucson Norte Sur Study:

the land-use planning and policy development along the transit corridors focused on affordable housing, multimodal connectivity, cultural preservation, and equitable policy development.



Tucson Rapid Transit Project:

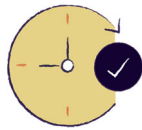
the identification and implementation of a specific bus rapid transit corridor, stations, and system elements.

Now some of you may be wondering how this project is different than the Norte Sur project. Well as mentioned, these projects do in fact share the same study area. Norte Sur and our project, Tucson Rapid Transit, are two peas in a pod, so to speak. Land use and transportation planning are interdependent on one another such that, for example, more narrow roads with building frontages close to the street encourage walking and biking, while multilane roads and big box stores with large parking lots encourage driving. The strategic plan that will come out of Norte Sur will guide future land use and real estate investments, infill development, and growth within the communities in the Norte Sur study area. Tucson Rapid Transit is the transportation component being planned in coordination with Norte Sur to best support the community's corridor vision and improve north-south mobility in the Tucson area. The Tucson Rapid Transit project will include identifying a preferred corridor, station locations, impacts to properties, a corridor configuration, costs, and more. It will also include extensive public engagement to ensure the project aligns with the vision of the community.

BRT Benefits



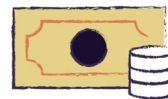
Increased safety



Faster, more frequent service



Improved connectivity



Increased cost efficiency



Improved boarding

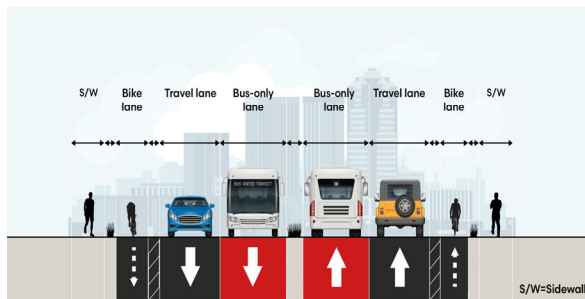
In addition to coordinating land use and transportation planning to better support one another, implementing BRT has many travel and operational benefits to the transit network. For example:

- BRT improves safety both at stations and along the corridor by improving lighting, pedestrian facilities, and bicycle facilities. Dedicated bus lanes also reduce conflicts between bus and vehicular traffic.
- As mentioned, dedicated bus lanes are a key element of a BRT system. These allow buses to travel faster by avoiding traffic in standard vehicle travel lanes. This is also an operational efficiency that saves the agency money.
- Additionally, by offering more frequent and faster service, people can get to where they want to go more conveniently thereby improving connectivity to community destinations.
- Lastly, BRT improves the boarding process by having platform-level boarding (which means the buses don't need to kneel for people using mobility devices). The platforms also have off-board fare collection which makes the boarding process faster.

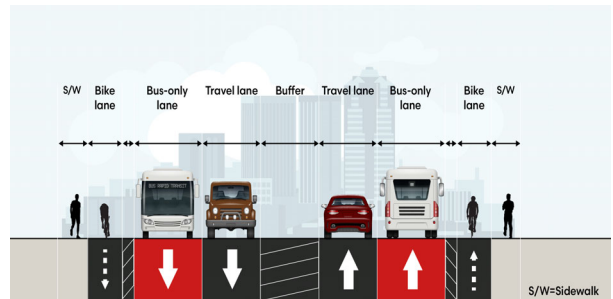
BRT Options

Center-running vs. Side-running

Center-running:
Operates in a center-running
dedicated bus lane



Side-running:
Operates in a side-running
(near the curb) dedicated bus lane



The City is evaluating two configuration options for BRT: center-running and side-running. As the name suggests, center-running BRT uses dedicated lanes in the middle of the roadway. This results in better travel speeds as it avoids conflicts with vehicles making right-turns into businesses or at intersections. However, it also reduces the availability of left-turns onto side streets and into businesses. Side-running BRT operates in the curb lane and because of this, requires sharing the space with vehicles in a limited capacity so they can make right-turns into businesses and at intersections. As a result, it operates slightly slower than center-running BRT but would have a smaller impact on access.

BRT Options

Center-running vs. Side-running

Center-running:
Operates in a center-running
dedicated bus lane



Albuquerque BRT (Albuquerque, NM)

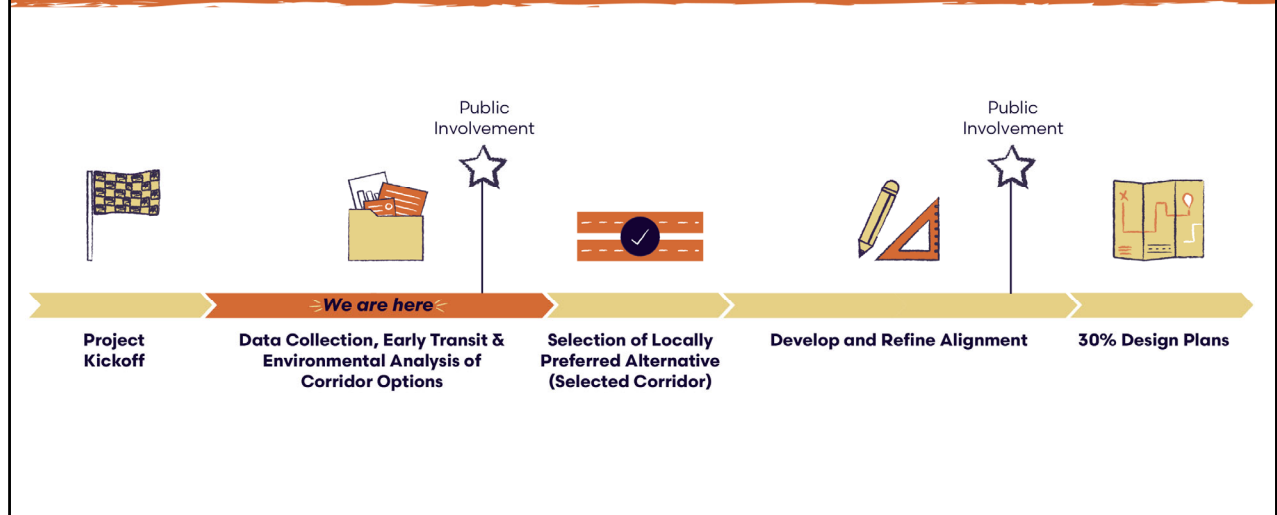
Side-running:
Operates in a side-running
(near the curb) dedicated bus lane



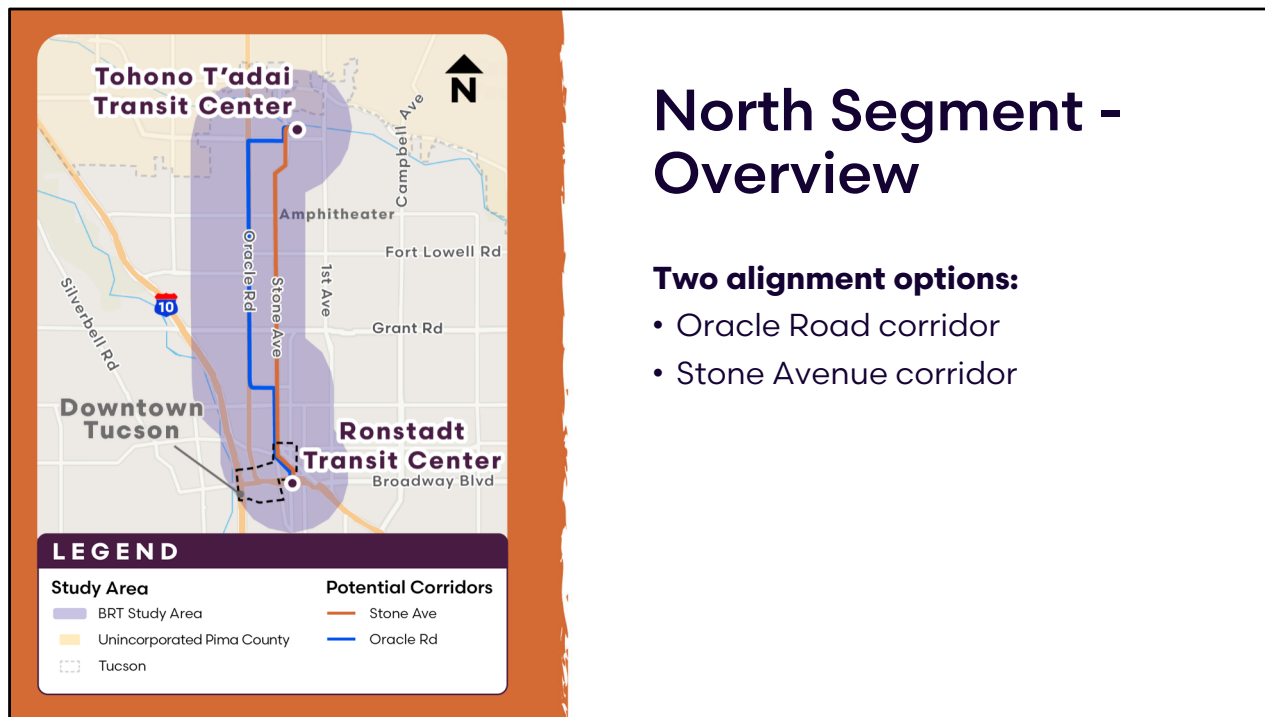
Metro D Line (Minneapolis, MN)

Here are some real-life examples of bus rapid transit projects. On the left is an example of center-running BRT in Albuquerque, New Mexico, and on the right is side-running BRT in Minneapolis, Minnesota.

North Segment - Process



So now to talk a little bit about the process. There is a lot of work that has recently been completed that has brought us to where we currently are. In addition to the High Capacity Transit Implementation and Move Tucson plans previously mentioned, the City is also wrapping up a Comprehensive Operational Analysis (COA) Study, which looked at the whole Sun Tran network to identify operational efficiencies and routes deserving of service improvements. The Tucson Rapid Transit project is drawing on all of these efforts and is moving forward with an analysis which will first: identify the preferred corridor, second: develop and refine the alignment, which includes analyzing center vs. side running and identification of station locations, and third: advance the preferred corridor and configuration concept into advanced design. The project has been accepted into FTA's Small Starts program, so our team will be following the guidance and regulations set forth in the program so the project will qualify for federal funding down the road.



Overview

- Starts at Tohono T’adai Transit Center
- Ends at Ronstadt Transit Center

Two alignment options:

- Stone Avenue corridor
- Oracle Road/State Route 77 corridor

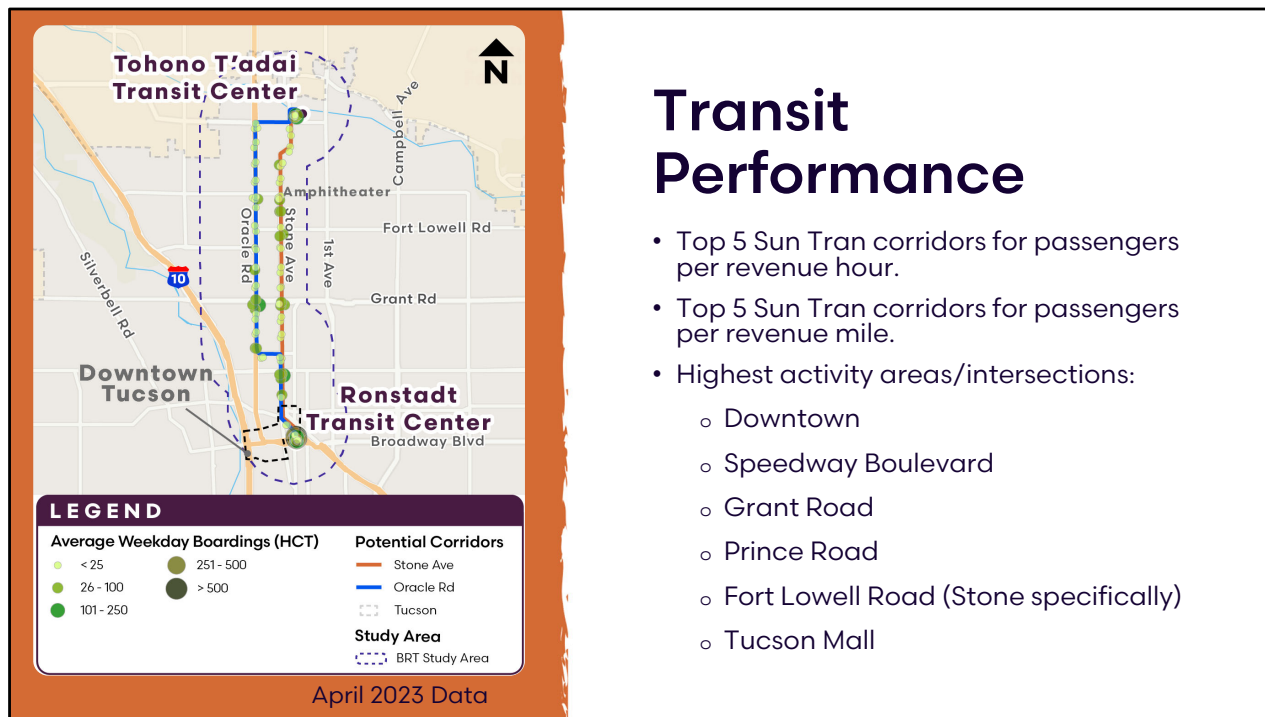
Now let’s dive into Tucson Rapid Transit – North Segment! As mentioned, the project includes two segments, but the north segment is the primary topic of today’s discussion. The north segment is exploring BRT on either Oracle Road or Stone Avenue. Both options would connect Tohono T’adai Transit Center and the Tucson Mall to the Ronstadt Transit Center and Downtown Tucson.

North Segment Transit Services

- East-west connections:
 - 3, 4, 5, 9, 17, 34, 61
- Other connections:
 - 10, 15, 34
- Transit Center Connections
 - Tohono T'adai
 - Ronstadt



By making the connection between two transit centers, the service on either corridor would connect to over half of Sun Tran’s local and express routes. The map on the right shows the existing Sun Tran network and what those connections look like.

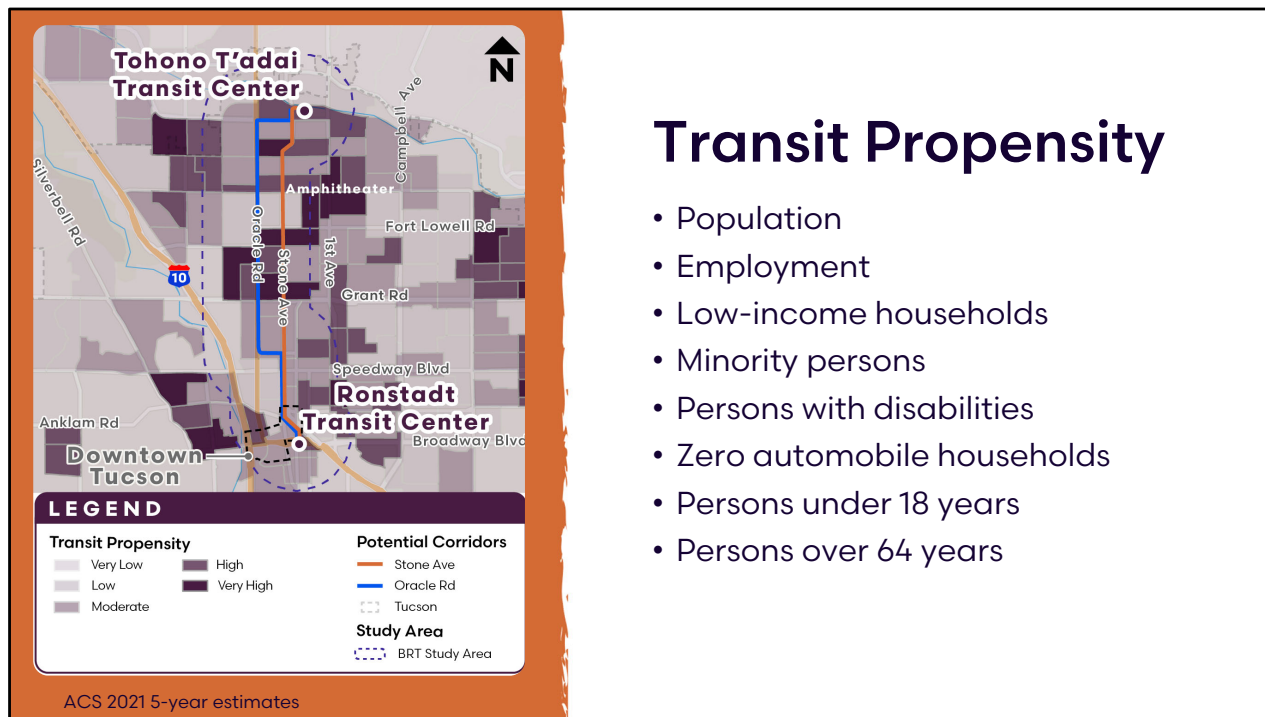


Both Stone Avenue and Oracle Road are some of the highest ridership corridors in the Sun Tran network. They both are in the top five for passengers per revenue hour and passenger per revenue mile, two metrics commonly used in transit planning to understand how productive a route is. The map on the slide shows average weekday boardings along the corridors – the larger the green symbol, the more riders there are at that location every day. Outside of the downtown area and Tucson Mall, high ridership intersections include Speedway Boulevard, Grant Road, Fort Lowell Road (specifically Fort Lowell and Stone), and Prince Road.

Additional Technical Details (not for script)

Oracle: passengers per revenue hour (31) and passengers per revenue mile (2.88)

Stone: passengers per revenue hour (30) and passengers per revenue mile (3.03)



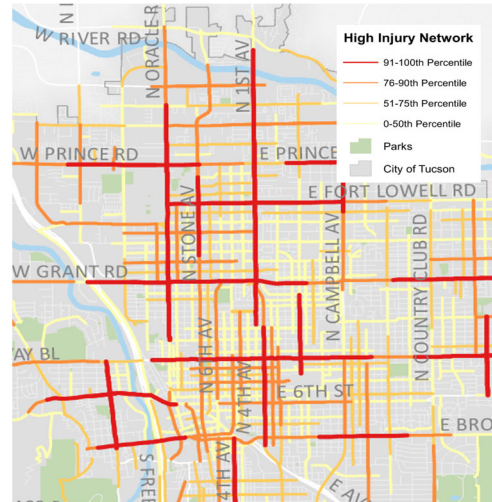
An important part of planning this project is also understanding who the project would serve. The map on this slide depicts a metric we call “transit propensity”. It is a metric that combines many sociodemographic metrics into a single measure. The sociodemographic characters included in the transit propensity metric are population, employment, low-income households, minority persons, persons with disabilities, zero automobile households, persons under 18, and persons over 64 years of age. These metrics are indicative of populations most likely to ride transit and the combined transit propensity metric allows us to view these as one overall score. The map shows both alignments would serve primarily moderate to very high transit propensity populations. There are only low areas of transit propensity between Fort Lowell Road and Prince Road and to the southwest of Drachman Street. These areas show up as lower propensity because they are educational institutions and not residential locations.

Additional Technical Details (not for script): all inputs are weighed equally in the transit propensity score.

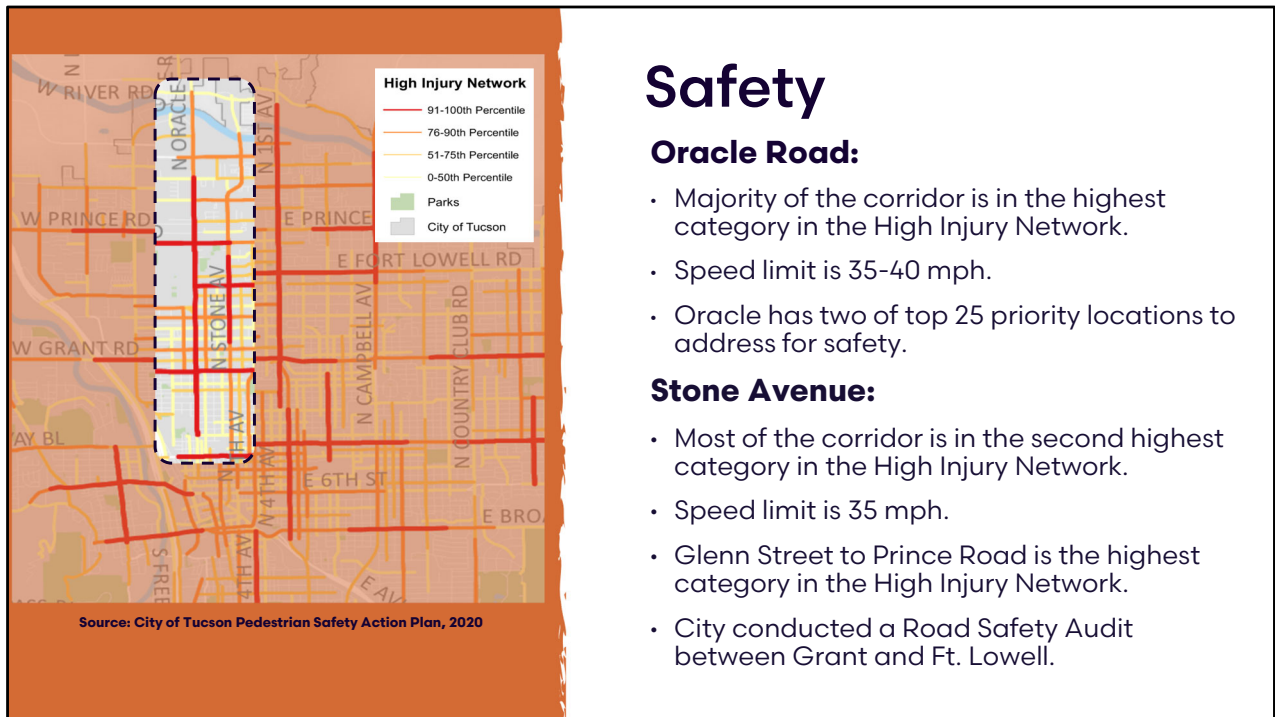
Safety

Pedestrian Safety Action Plan:

- **70%** of crashes occur within 300 feet of a transit stop.
- **75%** of crashes occur on roadways with posted speeds of 35 and 40 mph.



Safety is a core component of the Tucson Transit Rapid project. The map on this slide shows an analysis from the City of Tucson Pedestrian Safety Action Plan which was completed in 2020.



Safety

Oracle Road:


- Majority of the corridor is in the highest category in the High Injury Network.
- Speed limit is 35-40 mph.
- Oracle has two of top 25 priority locations to address for safety.

Stone Avenue:

- Most of the corridor is in the second highest category in the High Injury Network.
- Speed limit is 35 mph.
- Glenn Street to Prince Road is the highest category in the High Injury Network.
- City conducted a Road Safety Audit between Grant and Ft. Lowell.

You'll see most of Oracle Road is in the highest category in the High Injury Network, at least specifically the parts of Oracle being considered for BRT. This is important to note because the Ped Safety Action Plan identified multiple locations on Oracle as priority locations to address and importantly, Tucson Rapid Transit is not just a BRT project but is really a mobility project. It will include improvements to pedestrian and cyclist safety along the corridor and therefore really improve safety for all users.

The segments of Stone Avenue identified for BRT are primarily in the second-highest category of the High Injury Network, with only the segment from Glenn Street to Prince Road identified in the highest category of the High Injury Network. While this is a slightly safer corridor than Oracle Road, the mobility improvements associated with the project would be applied in either case so bike and ped safety will improve no matter what.



Preliminary Cost Estimates Include:

- Planning
- Engineering
- Roadway
- Stations
- Vehicles
- Right-of-way
- Utilities
- Construction

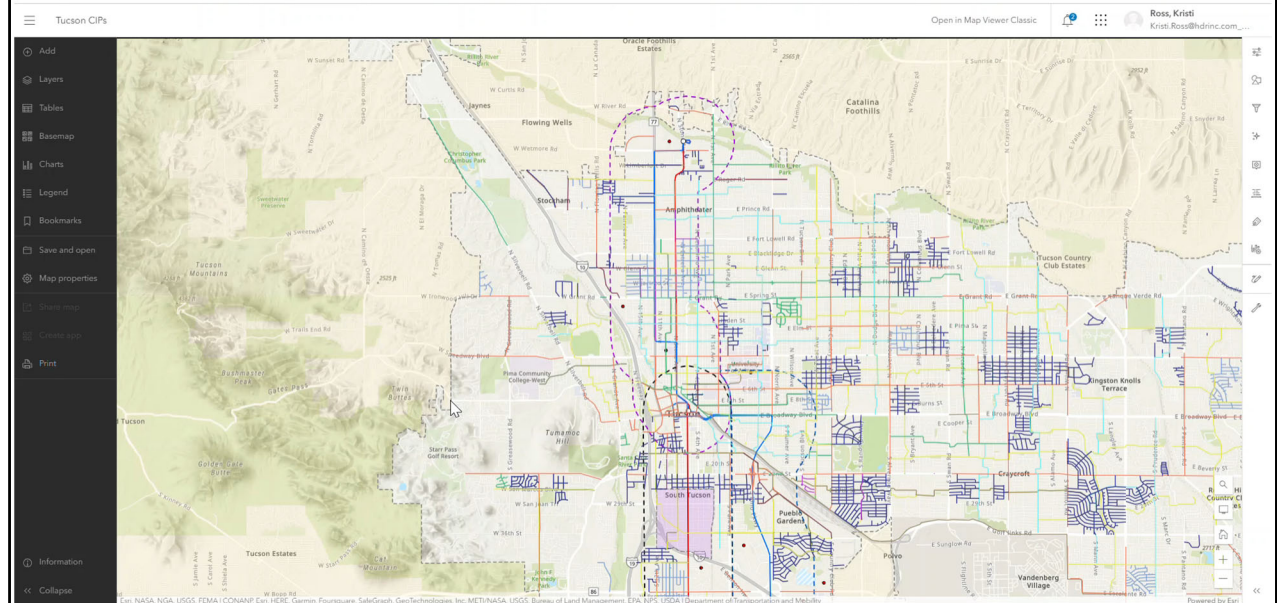
Preliminary costs: ~\$140M

Oracle Road is a little longer than Stone Avenue so would cost slightly more.

Not included: operational costs

In terms of cost, the project team has developed preliminary layouts to look at key elements that go into estimating these types of projects, which includes planning, engineering, roadway impacts, stations, new vehicles, right-of-way needs and purchases, utility relocation, and of course, construction. The very preliminary cost estimates put both corridors in the ballpark of about \$140 million dollars. Oracle Road is a slightly longer corridor than Stone so will inherently cost a little more because of that, but not significantly more.

North Segment – Other Projects

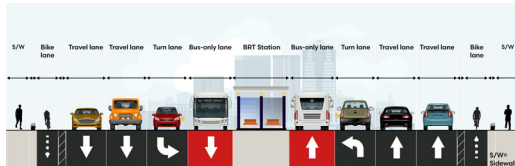


In terms of projects, Tucson has a lot going on. This slide shows a tool we have to track and coordinate with projects to avoid conflicts or identify opportunities for integrating efforts. As potential development projects are being planned and coming through the Norte Sur project, we plan to incorporate those into our planning efforts to ensure connectivity and appropriate multimodal amenities are provided.

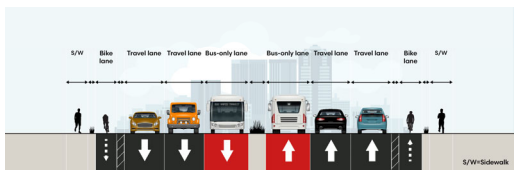
Center-Running Comparison

Oracle Road

Intersection

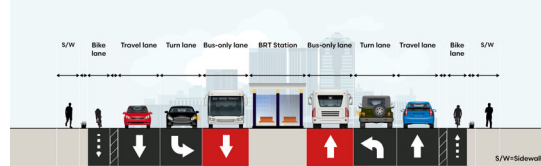


Mainline

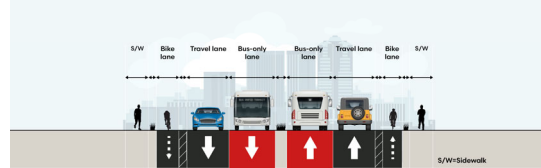


Stone Avenue

Intersection



Mainline



Included in the next steps of this study will be an extensive evaluation of center vs. side-running BRT on the preferred corridor. The images on this slide are very high-level cross sections comparing center-running BRT on Oracle Road (on the left) vs. Stone Avenue (on the right). The top images show the cross section at an intersection, which have more lanes to allow vehicles to make turning movements. The bottom images show how the system would look along the stretches of the corridor *not* at an intersection. A primary benefit of this configuration would be operational efficiencies related to travel speed and reliability; however, it would also reduce the availability of left turns into businesses and onto side streets.

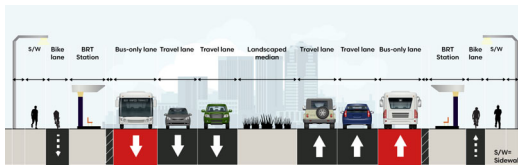
A key differentiation between the corridors is that Oracle Road is wider so would allow for two vehicular travel lanes, whereas Stone Avenue only has enough space for one vehicular travel lane in each direction.

Again, the operational and property impacts, as well as opportunities and challenges this option presents will be closely examined **as a next step**.

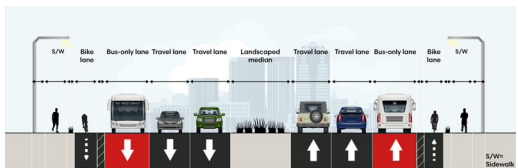
Side-Running Comparison

Oracle Road

Intersection

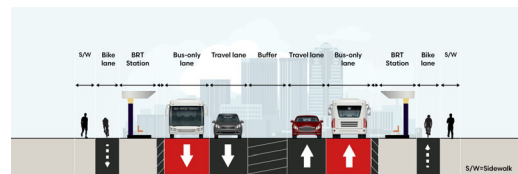


Mainline

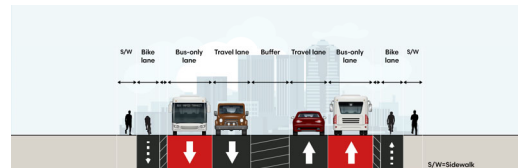


Stone Avenue

Intersection



Mainline







Like the last slide, the images on this slide are very high level and do not reflect any significant level of analysis or planning work to date. They depict what side-running on Oracle Road vs. Stone Avenue would look like and provide a general starting point for comparison. As with center-running, Oracle Road would again allow for two vehicular travel lanes while Stone Avenue only has space for one vehicular travel lane. A benefit of side-running BRT is that it generally impacts adjacent properties less, however travel speed and reliability are reduced as buses have to share the dedicated lane with vehicles making right turns onto side streets or into businesses.

Preliminary Evaluation Criteria

| Criteria | Definition |
|----------------------------|--|
| BRT travel time/operations | <ul style="list-style-type: none">• Minutes of transit travel time |
| Cost | <ul style="list-style-type: none">• Estimated cost of improvements |
| Property impacts | <ul style="list-style-type: none">• Number of total property takes (whole parcel)• Number of partial takes (part of a parcel) |
| Vehicle travel time | <ul style="list-style-type: none">• Minutes of personal vehicle travel time |

The work on the project to-date has included a very preliminary assessment of the corridors using the following criteria. The first is BRT travel time/operations, which looks at the minutes of travel time from start to end point. The cost criteria is focused on the estimated capital cost to build the project. Property impacts are the number of total or partial takes, and vehicle travel time is the minutes of travel time from start to end in a personal vehicle. These metrics were evaluated at a high-level but are going to be thoroughly evaluated as a next step.

Oracle Road vs. Stone Avenue

| | Oracle Rd | | Stone Ave | |
|--|---|---|--|---|
|  BRT Travel Time/Operations | Lower performing | | Higher performing | + |
|  Property Impacts | Fewer adjacent properties (potential for less impact) | + | More adjacent properties (potential for higher impact) | |
|  Vehicular Travel Time* | Higher performing | + | Lower performing | |
|  Cost | Higher cost | | Lower cost | + |

*With the assumption that a general travel lane would be reduced to accommodate a bus-only lane.

Based on the preliminary analysis done to-date, BRT on Oracle Road vs Stone Avenue would perform in the following ways:

- In regards to BRT travel time, Stone Avenue would provide a more direct point to point connection between Tohono T'adai and Ronstadt transit centers and so would offer faster travel times between destinations.
- However, in terms of property impacts, there are more parcels along Stone Avenue, and more which are closer to the street. Because of this there is greater potential of impacting more businesses and properties along Stone Avenue. Oracle Road has fewer adjacent parcels and would have a smaller impact on properties.
- In terms of vehicular travel time –because Oracle Road is wider than Stone Avenue, there would be space for two vehicular travel lanes, which would allow vehicles to travel faster.
- Finally, BRT on Stone Avenue is estimated to cost less than BRT on Oracle Road. The current estimated difference between the corridors is in the ballpark of \$2-3 million, with the additional cost for Oracle Road largely stemming from the additional mileage of the alignment. This additional mileage may also warrant an additional station. This level of analysis is not yet complete.

Next Step Evaluation Criteria

| Criteria | Definition |
|--------------------------------|---|
| Access | <ul style="list-style-type: none"> Number of affected property access points/driveways Number of affected left/right turn movements |
| Bike and pedestrian facilities | <ul style="list-style-type: none"> Access to BRT stations and existing facilities |
| BRT travel time/operations | <ul style="list-style-type: none"> Minutes of transit travel time |
| Community input | <ul style="list-style-type: none"> Community preference for the transit improvement |
| Cost | <ul style="list-style-type: none"> Estimated cost of improvements |
| Ridership | <ul style="list-style-type: none"> Average daily ridership (weekdays) |
| Property impacts | <ul style="list-style-type: none"> Number of total property takes (whole parcel) Number of partial takes (part of a parcel) |
| Vehicle travel time | <ul style="list-style-type: none"> Minutes of personal vehicle travel time |
| Reinvestment potential | <ul style="list-style-type: none"> Availability and land use compatibility of parcels to be rehabilitated, renovated, or redeveloped |

The next step for the project will be to advance the analysis from preliminary to comprehensive. This will include looking at the corridors with a much more quantitative lens and include more metrics to compare. The metrics identified so far include:

Access

- Number of affected property access points/driveways
- Number of affected left/right turn movements

Bike and pedestrian facilities

- Access to BRT stations and existing facilities

BRT travel time/operations

- Minutes of transit travel time

Community input

- Community preference for the transit improvement

Cost

- Estimated cost of improvements

Ridership

- Average daily ridership (weekdays)

Property impacts

- Number of total property takes (whole parcel)
- Number of partial takes (part of a parcel)

Vehicle travel time

- Minutes of personal vehicle travel time

Reinvestment potential

- Availability and land use compatibility of parcels to be rehabilitated, renovated, or redeveloped

As part of this outreach effort, we want to hear from you about which of the criteria we've identified are most important to you.

Next Steps

- **First phase of public comments accepted through Dec. 1, 2023.**
- Further evaluate public input and analyze the corridor options.
- Develop a Locally Preferred Alternative (LPA/preferred corridor).
- Mayor and Council approval in winter 2023/2024.
- Additional analysis and public outreach in 2024.

- The study team will collect public comments on the north segment through December 1.
- Team will evaluate public input and further analyze the corridor options to develop a Locally Preferred Alternative (LPA/preferred corridor)
- LPA will be shared for Mayor and Council approval in winter 2023/2024
- Once an LPA is selected, additional analysis and public outreach will occur in 2024

Your Input Matters.

Share your thoughts any time between Oct. 30 & Dec. 1

Why is your input important?

- Helps determine our first BRT corridor.
- Identifies community priorities in the design process.
- BRT is more successful when built to meet the unique needs of a community!

How to Comment

- Attend an event
- Visit tucsonrapidtransit.com to:
 - Take our survey
 - Leave a comment on the interactive map
- Email us at connect@tucsonrapidtransit.com
- Call us at 520.442.0302

So why is this important? BRT is a unique transit service that can be planned and implemented to best meet the needs of our community! That's why we want to hear from you on which corridor you prefer and what is a priority to YOU. This feedback is a critical step in helping us determine or locally preferred alternative, or selected corridor.

Share your thoughts anytime through December 1st, 2023. Using one of our comment options:

- Attend an event
- Visit tucsonrapidtransit.com to:
 - Take our survey
 - Leave a comment on the interactive map
- Email us at connect@tucsonrapidtransit.com
- Call us at 520.442.0302

Thank You!



Thank you for taking time to watch our presentation and please feel free to connect with us at TucsonRapidTransit.com!