North Central Texas Council of Governments

COLLIN COUNTY

Irving to Frisco Corridor Study

Final Report

PREPARED BY HDR

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Executive Summary

The evaluation of potential development of Regional Rail along the Irving to Frisco/Celina corridor has been paired with the broader Collin County Transit Study to positive effect. Considering an investment in a new Regional Rail service by almost any measure needs to be undertaken while also analyzing the broader mobility and land use context of that corridor, something that has been able to be accomplished through this approach. In this way, the corridor can be considered in a more holistic manner, resulting in a broader understanding of its potential role in the regional mobility network and the interactions and connectivity it can support not only for Collin County residents, but for the population of the region as a whole.

Study Overview

To accomplish this evaluation, the project team worked through a coordinated planning and analysis process, including:

- Analyzing alternatives for developing Regional Rail in the Irving to Frisco/Celina corridor building on prior studies of the corridor
- Developing travel demand and ridership analyses through use of the North Central Texas Council of Governments (NCTCOG) Regional Travel Model
- Conducting extensive community engagement with local jurisdictions in the corridor to identify potential station locations
- Integrating an assessment of potential Automated Transportation System (ATS) connections to provide increased accessibility and first/last mile services along the corridor
- Assessing the viability of extending Regional Rail beyond the initial project's northern limit of Frisco to also serve Prosper and Celina
- Preparing service level assumptions and associated estimates of capital and operating costs for Regional Rail service in the corridor (including three alternatives)
- Determining potential funding and governance approaches that could be used to develop a Regional Rail project in the corridor, and
- Evaluating existing and proposed land uses and development patterns in potential station areas and developing recommendations for more transit-supportive development patterns.

As a planning level evaluation, it should also be noted that this effort was limited to the evaluation of Regional Rail as the mode of service based on prior analyses of the corridor and the existence of an operating freight rail service. The study also did not assess rail infrastructure needs or undertake detailed engineering analysis, recognizing that additional work will be required to advance this project further towards implementation.

Role of Project Advisory Committee (PAC)

The Irving to Frisco Regional Rail Study leaned heavily on the input and engagement of a key group of stakeholders representing the local jurisdictions of Carrollton, Celina, The Colony, Dallas, Farmers Branch, Frisco, Irving, Plano, and Prosper; Collin, Dallas, and Denton Counties, the Burlington Northern Santa Fe (BNSF) railroad, and area transit agencies Dallas Area Rapid Transit (DART) and Denton County Transportation Authority (DCTA). This group met collectively eleven times over the course of the study and participated individually or as smaller working groups with the project team on many occasions throughout the effort to provide input and guidance. The collective input from the PAC shaped the overall study effort and its outcomes; the project team greatly appreciates their time and efforts. A list of PAC members can be found in Appendix C.

Key Findings

As described in more detail in the report sections that follow, developing a new Regional Rail line to provide mobility within the context of a major metropolitan area like Dallas-Ft. Worth is very complex and requires leadership, funding, coordination, and other factors to come together to create momentum towards implementation. Of course, this critical mix has been achieved successfully before and can be achieved again as the need for improved mobility in one of the fastest growing areas in the country continues to expand. Below are the key findings from the analysis:

- **Stations**: Beginning with a list of 21 potential station locations, the project team considered input from local communities to expand that list to 24 and then used an evaluation process and further engagement to result in a list of 12 station locations for further consideration and use in the modeling analysis. This includes potential station locations in Prosper and Celina, both of which are rapidly growing communities to the north of the original northern terminus of the proposed Regional Rail corridor.
- **Service**: While preliminary, the service parameters are assumed to be weekday only service initially, operating every 20 minutes bi-directionally in the peak periods and hourly during the remainder of the service period. Other alternatives, such as special event and weekend services, also remain as possible approaches. Given the magnitude of investment needed to develop 'full' service levels, a phased approach also merits consideration and is discussed in more detail in the *Summary of Results and Next Steps* section of this report.
- **Ridership**: A detailed examination of ridership potential was conducted and is explained in the travel demand section of this report. At a summary level, the 2045 NCTCOG Regional Travel Model indicates strong potential for this line, with more than 17,000 trips per day projected. This level of ridership relates well with comparable passenger rail both in Texas and nationally.

- **Cost**: Developing a Regional Rail service in the Irving to Frisco/Celina corridor is projected to cost between $1.21B and $1.55B in 2021 dollars, or between $43.2M and $41.5M per mile over the length of the corridor, which could vary between 27.9 and 37.4 miles depending on which stations are ultimately included. With service in place, annual operating costs, also in current year dollars, are estimated to be between $18.1M and $23.3M per year, again depending on the number of stations and length of the line.
- **Funding**: Simply put, there is no "silver bullet" available to address the funding needs for an Irving to Frisco/Celina Regional Rail service. Depending on the project approach and governance structure that is selected to manage implementation, funding sources are expected to include a mix of federal, limited state and significant local sources as well as both public and private contributions.
- **Governance**: With the corridor traversing up to nine cities and two counties and with ownership of the corridor shared between BNSF and DART, coordination and collaboration become effectively imperative for a Regional Rail project to move forward. Several governance approaches are reviewed as a part of this report, with a major consideration being that BNSF will only deal with one lead entity (i.e. transit agency or coalition of cities) in coordination of transit and freight operations along the corridor.

Next Steps

The ongoing collaborative effort with the PAC and stakeholders that the project team benefitted from, along with the technical analysis, points towards two potential pathways for advancing a Regional Rail project in the corridor. One potential pathway is to follow the 'traditional' passenger rail development process, while the other is to pursue a 'supply side' approach in close partnership with BNSF. Note that these two are not mutually exclusive, and each is explained in more detail in the full report. In addition to identifying these two potential paths, the PAC also reached agreement on three recommendations to maintain momentum and help the project move forward:

1. Confirming the need for ongoing coordination between stakeholders to move forward.
2. Supporting a supply side approach/partnership exploration with BNSF and initializing follow-on efforts with TxDOT and BNSF to advance passenger rail on the corridor.
3. Including appropriate study findings in the long-range Metropolitan Transportation Plan, including:
    a. Consideration of interlining with the west leg of TRE; and
    b. Extension of the corridor north to Celina as a part of the long-range vision for corridor development.

In summary, this analysis suggests that the need for Regional Rail in the Irving to Frisco corridor is less a matter of "if" than "when". Achieving progress can be accomplished by maintaining project momentum and for that reason the project team recommends that local officials continue to convene and work to develop an organizational structure to further collaboration.

Introduction

As one of the fastest growing counties nationwide, as well as one that is an integral part of the Dallas-Fort Worth metropolitan area of more than 7.5 million inhabitants, the mobility needs of Collin County are continually increasing. In November 2017, the Collin County Commissioners Court, supported by resolutions from five cities and seven chambers of commerce, requested assistance from the North Central Texas Council of Governments (NCTCOG) Regional Transportation Council (RTC) with developing a comprehensive approach to planning and implementing transit services outside of transit authority service areas. The RTC approved funding for a comprehensive transit study for Collin County ultimately resulting in a partner effort to this study.

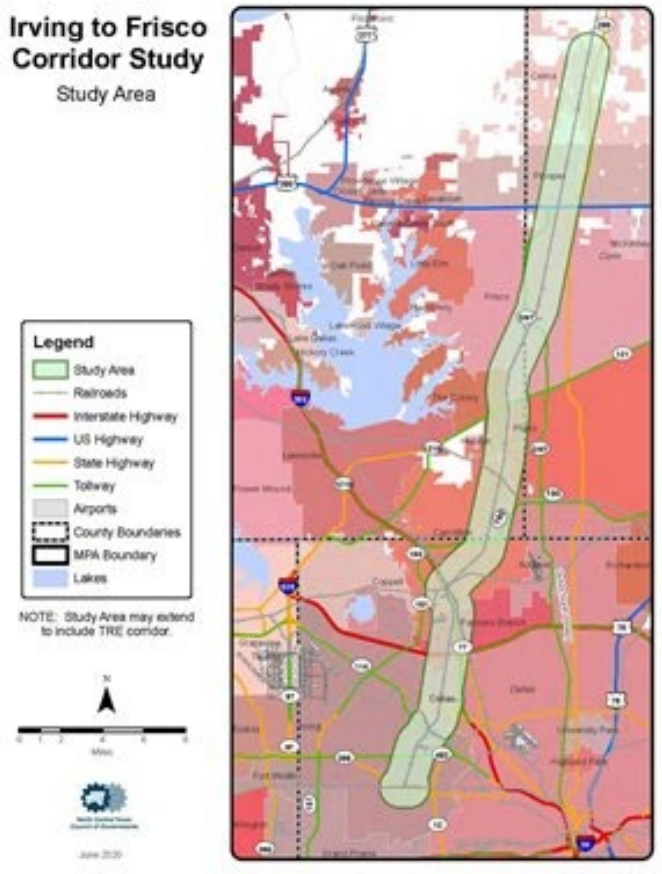


Figure 1: Irving to Frisco Corridor Study Map

As a closely related planning effort, the same project team that developed the Collin County Transit Study also was commissioned to assess the Irving to Frisco corridor for potential Regional Rail (passenger rail) service. Today the corridor is owned by DART in its southern section and by Burlington Northern Santa Fe (BNSF) for the middle and northern sections and is an active freight rail corridor.

History of Planning Along Corridor

- NCTCOG Frisco Corridor –Conceptual Engineering & Funding Study (May 2010)
- NCTCOG Collin County Transit Needs Assessment and Planning Study (September 2013)
- Collin County Mobility Plan (2014 Update)
- Collin County 2014 Mobility Plan (2016 Addendum)
- DART 2040 Transit System Plan –Frisco Corridor Transit Opportunities (July 2017)

• NCTCOG Mobility 2045 Plan –Frisco Line Regional Rail (June 2018)

Regional Connectivity (Passenger Rail)

When considering the potential for Regional Rail in the corridor, connectivity to existing and planned passenger rail services in the corridor is extremely important to support access and mobility for riders. Adjoining passenger rail lines in the metroplex to this corridor include:

- Trinity Railway Express (TRE) West to Fort Worth and East to Dallas
- DART Orange Line Light Rail Transit (LRT) to Las Colinas, Irving and DFW Airport
- Cotton Belt/Silver Line West to DFW Airport
- Cotton Belt/Silver Line East to Addison, Plano, and DART Red Line
- DART Green Line LRT South to Hospital District, Love Field, and Downtown Dallas
- DCTA A-Train North to Denton

Regional Connectivity (Multimodal)

Multimodal connections to the broader mobility network are also important determinants in the functionality of a new passenger rail corridor. For the Irving to Frisco/Celina corridor, key connections include those listed below:

- Sam Rayburn Tollway (SRT)/SH 121 – access to Plano Legacy West Business Area
- IH 35E in Downtown Carrollton Station
- SH 114 John Carpenter Freeway at South Las Colinas Station
- Principle Arterials
- Regional Veloweb shared use path along and/or within the corridor
- First/Last mile pedestrian, bicycle, and micromobility connections to all transit stations

Connections between future station areas and nearby pedestrian and bicycle (active transportation) networks are critical for first/last mile trips by transit riders to nearby employment, housing, and other destinations. While those active transportation connections are not a focus of this study, future efforts along this corridor will need to plan and establish pedestrian, bicycle, and micromobility connections, as well as a linear Regional Veloweb shared-use path generally along the corridor to encourage multimodal trips as represented in Mobility 2045 and other adopted local master plans. See map of existing and planned shared-use paths in proximity to this passenger rail corridor in Appendix G.

Study Development Process

As project sponsor, NCTCOG knows the importance of stakeholder engagement. The nature of this effort amplifies the importance in coordinating with key representatives of the many entities that have a potential role to play in the development of Regional Rail service in the corridor. A Project Advisory Committee (PAC) was formed at the outset of the effort, and the

group met regularly for the duration of the study, providing critical input and guidance throughout. A list of PAC members and meeting dates is provided in Appendix A. Further description of the project team roles are outlined in Figure 2 below.

Figure 2: Team Roles

The study was formally initiated in April 2020 with a kick-off meeting, and within the combined scope of work the following tasks were addressed for the Irving to Frisco Regional Rail Corridor:

- Irving to Frisco Corridor Land Use Analysis
- Irving to Frisco Alternatives Analysis
- Funding Plans
- Implementation Strategies
- Final Report

Each of these elements is addressed herein.

Preliminary Station Selection Process

Section Overview

Building off prior work by NCTCOG on the potential use of the Irving to Frisco rail corridor for passenger rail service, the study of preliminary station locations began with an initial list of 18

potential sites along the 33-mile corridor. Further, the study assumed that Regional Rail was the preferred mode given determinations made in the previous study efforts. The corridor was initially evaluated in three sections, as indicated below.

SOUTH SECTION

- Up to 4 locations from downtown Irving to downtown Carrollton
- Right-of-way owned by DART
- South Las Colinas station assumes a new Orange Line station for transfers

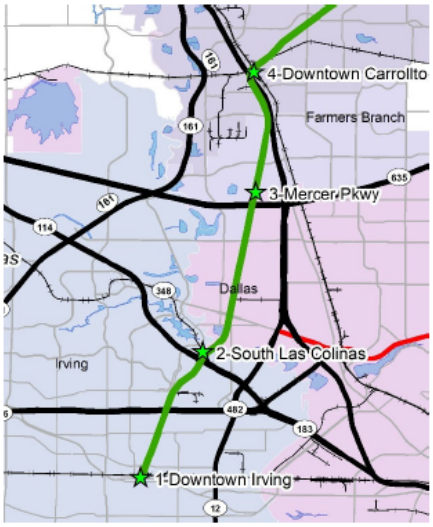


Figure 3: South Section

MIDDLE SECTION

- Up to 6 locations between downtown Carrollton and Sam Rayburn Tollway
- Right-of-way owned by BNSF
- Only one Hebron station will be recommended

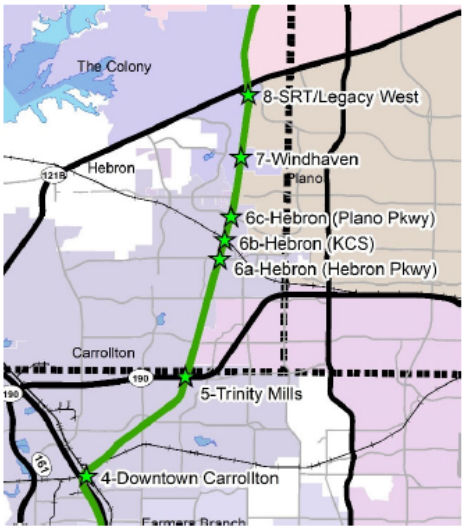


Figure 4: Middle Section

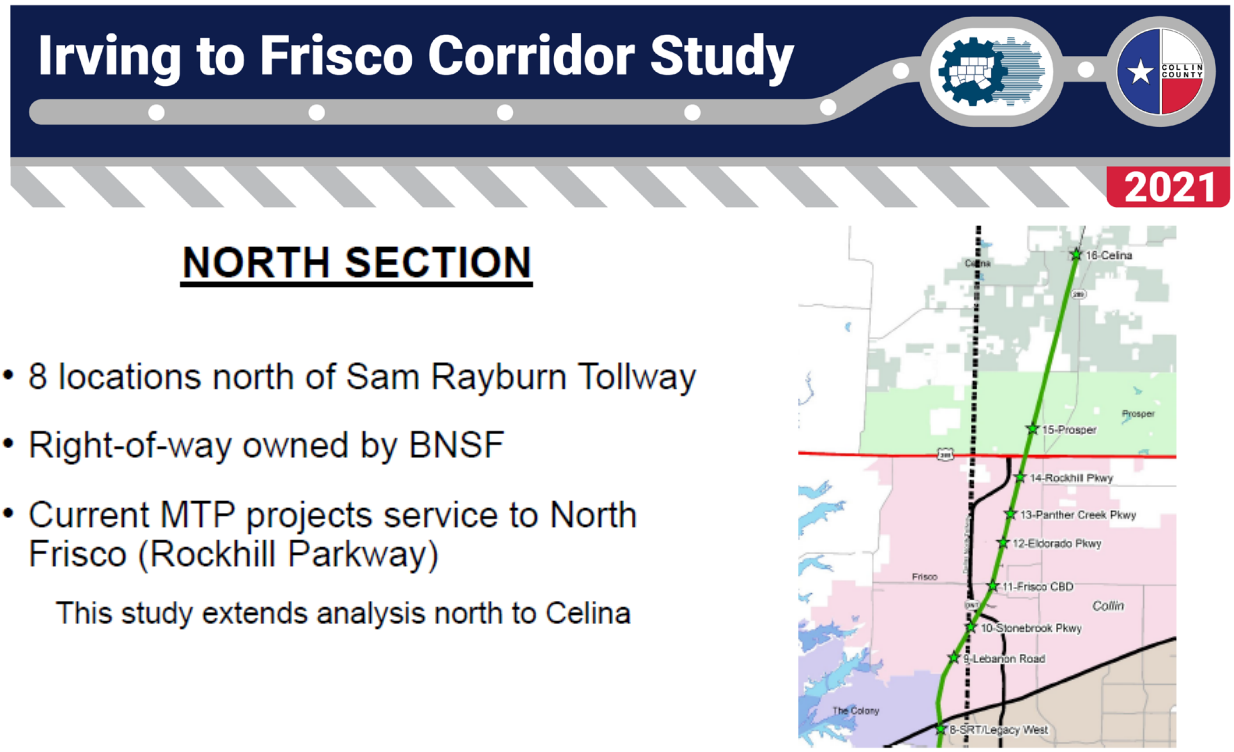


Figure 5: North Section

Station Analysis

With a base level of station information established, the project team initiated analysis and stakeholder engagement to sort the stations by their viability. This included referring to the prior work referenced above as well as the NCTCOG long-range Metropolitan Transportation Plan (Mobility 2045), which contains a Regional Rail project for the corridor with 10 stations. Over the June/July 2020 timeframe, the project team received feedback from Celina, Prosper, Frisco, The Colony, Plano, and Farmers Branch to help inform the analysis. This interactive effort yielded two new potential station locations and nine alternative locations for consideration, as indicated in Figure 6 below.

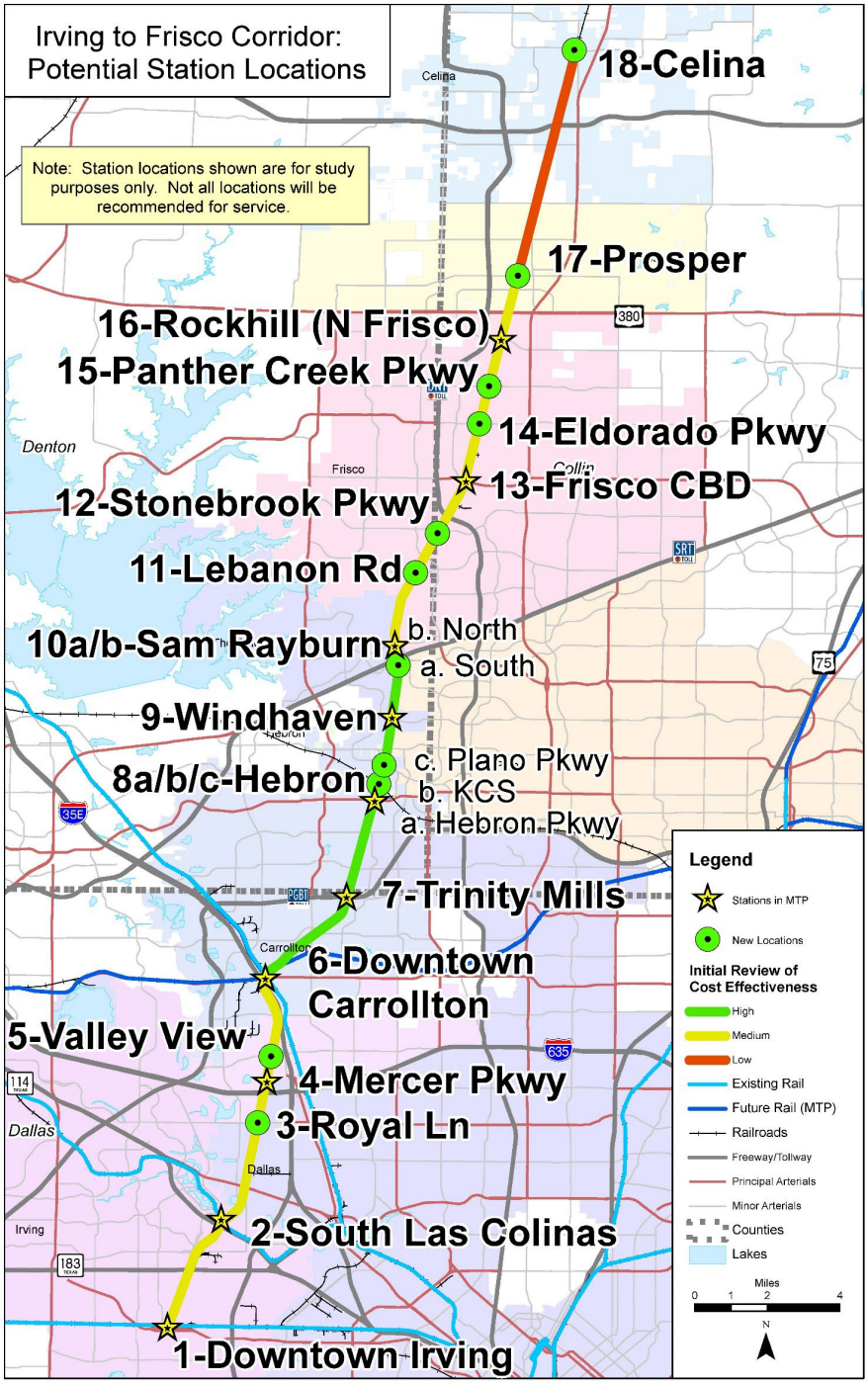


Figure 6: Initial List of Potential Station Locations Map

City coordination efforts continued to inform the process, with feedback eventually received from all cities along the corridor. This input helped to refine the map shown in Figure 6 to that shown below in Figure 7, with eleven stations receiving a preliminary assessment as "High Potential" stations (green star); three new potential stations identified (blue circle); two alternate potential stations also identified (orange circle); and finally, eight stations were identified as being "Low Potential" stations (gray circle).

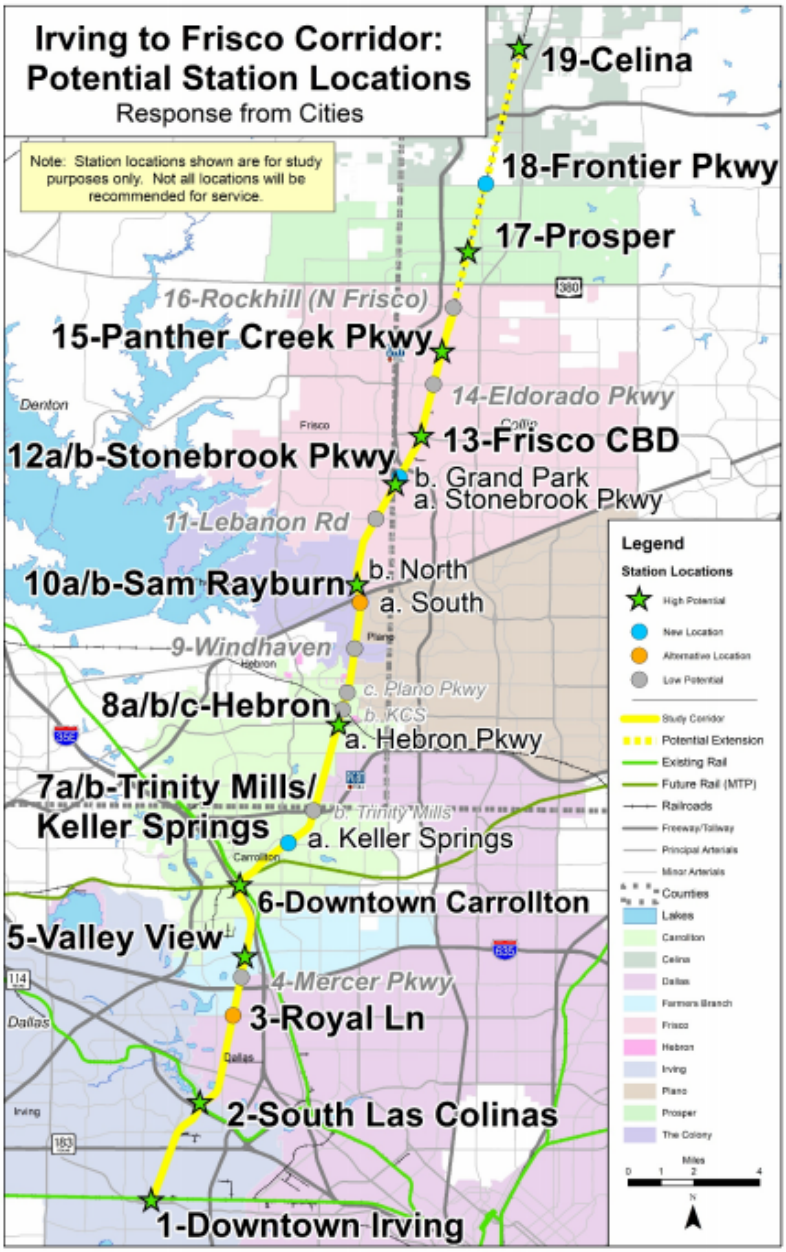
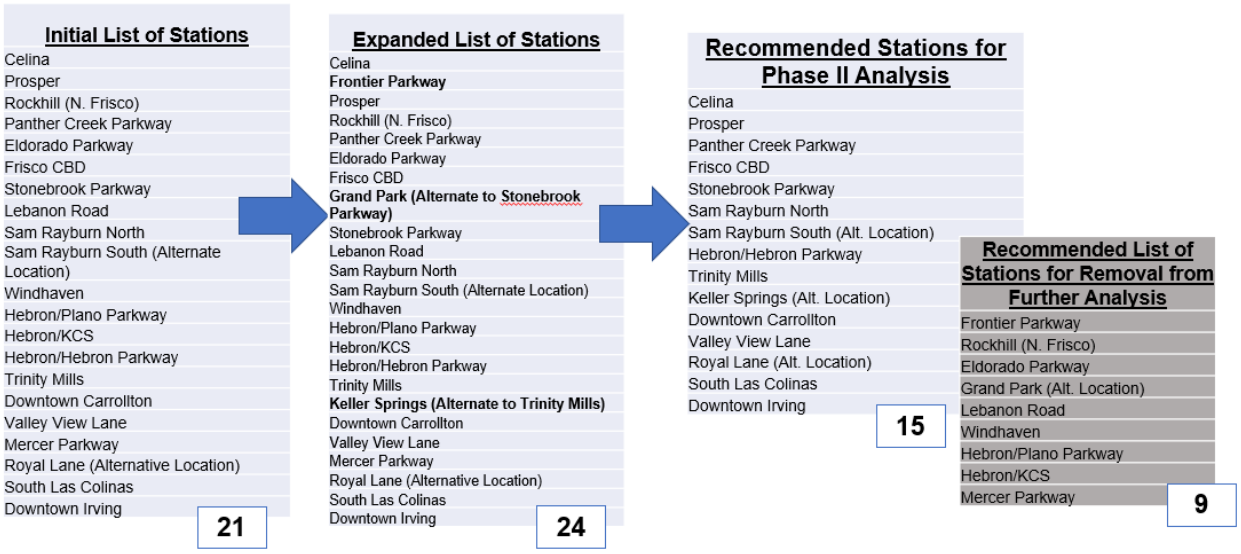


Figure 7: Revised List of Potential Station Locations Based on City Feedback

Combining technical analysis and stakeholder input, the list of potential stations was assessed beginning with an initial list of 21; expanded to 24; and then narrowed to a list of 15 with nine stations recommended for removal. This is shown graphically below.



Building on the working list of potential stations, the project team gathered best practices from comparable projects to develop criteria by which to further refine the selection process. The table below summarizes the primary objectives that are commonly used in station selection processes, suggested metrics, and a list of questions that can help to inform recommendations.

Objective	Suggested Metric(s)	Evaluation Criteria
Community/ Stakeholder Preference	Local government support; planning/zoning; future land use plans	• Local staff and elected officials concur with the station location? • Station area zoned for transit-supportive development types? • Willingness to re-zone or up-zone to support TOD? • Community indicated support for a regional rail station?
Access and Connectivity	Adjacent roadway volumes; first/last mile connections; transit connections; land use patterns; roadway network density; ridership catchment area	• Average daily traffic volumes? • Bicycle and pedestrian connections? • Transit routes nearby and level of service? • Street network and grid structure? • Intersection density? • Households within 15-minute drive time?
Physical Impacts	(Re)Development potential; right-of-way; property; environmental; utility impacts (initial screening)	• Adjacent and nearby parcels suitable for development or redevelopment? • Single-family homes in immediate proximity of the station? • Railroad right-of-way sufficient for station and/or additional tracks? • Environmentally sensitive features nearby? • Critical utilities nearby?
Operations	Station spacing; tangent (straight) track section	• Nearest proposed station location (at least 1 mile)? • Sufficient section of straight track to site a station and platform? • Near-level grade?

Table 1: Station Selection Criteria Example

With the intent to provide clarity and a readily understandable means of assessing the stations and their relative rating, a simple rating system of green (optimal); yellow (acceptable); and red (suboptimal) was used, as shown in the table below.

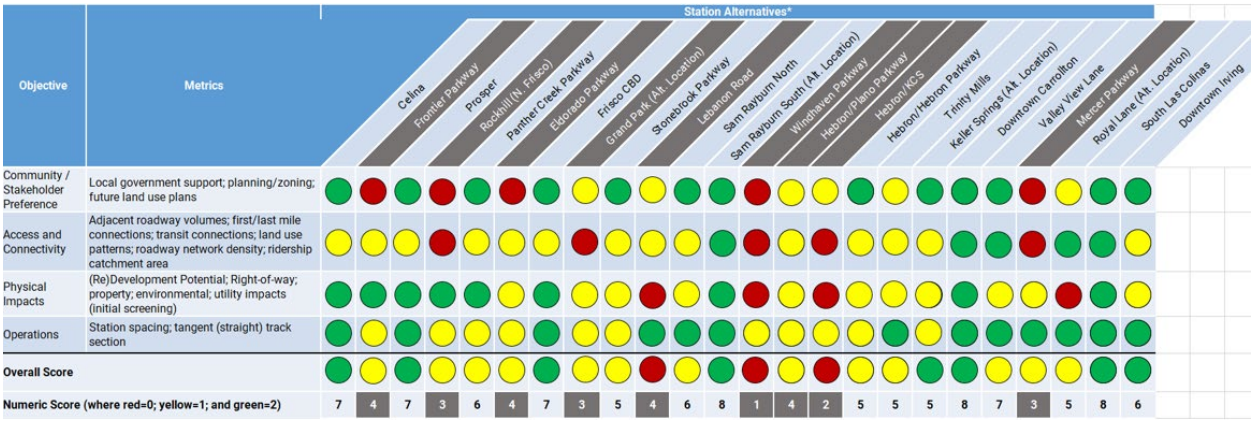


Table 2: Full Station Set Scoring Evaluation

As indicated, each station was scored on the four criteria and then given a cumulative score, which in turn was translated into a point system to produce a numeric rating. Based on the assessment of the universe of 24 potential station locations, those that received a numeric score of 4 or less were removed from further consideration, leaving 15 to move on to a second and more detailed analysis to further narrow the list of potential stations as shown in the table below.

Recommended Stations for Phase II Analysis
Celina
Prosper
Panther Creek Parkway
Frisco CBD
Stonebrook Parkway
Sam Rayburn North
Sam Rayburn South (Alt. Location)
Hebron/Hebron Parkway
Trinity Mills
Keller Springs (Alt. Location)
Downtown Carrollton
Valley View Lane
Royal Lane (Alt. Location)
South Las Colinas
Downtown Irving

With a need to further narrow the list of potential stations, the next step in the process was to use a third step of assessments focused on providing more optimal spacing between successive stations (traditionally 3 – 5 miles for regional rail technology). With this review, the project team reduced the number of potential stations to eleven, all of which then would be used to model future ridership and to test how the Irving to Frisco Regional Rail service would function within the context of the larger transportation network.

Summary of Results

The table below (Table 3) summarizes this process, with the Sam Rayburn North, Trinity Mills, Keller Springs, and Royal Lane locations all shown in grey as a result of the recommendation to remove them from further consideration in the third step of the project team's station assessment process.

Station Name	Phase I	Scoring	Phase II	Phase III	Phase IV
Celina	❑	7	❑	❑	❑
Frontier Parkway	❑	4			
Prosper	❑	7	❑	❑	❑
Rockhill (N. Frisco)	❑	3			
Panther Creek Pkwy	❑	6	❑	❑	❑
Eldorado Pkwy	❑	4			
Frisco CBD	❑	7	❑	❑	❑
Grand Park (Alt Location)	❑	3			
Stonebrook Pkwy	❑	5	❑	❑	❑
Lebanon Road	❑	4			
Sam Rayburn North	❑	6	❑		
Sam Rayburn South (Alt Location)	❑	8	❑	❑	❑
Windhaven Pkwy	❑	1			
Hebron/Plano Pkwy	❑	4			
Hebron/KCS	❑	2			
Hebron/Hebron Pkwy	❑	5	❑	❑	❑
Trinity Mills	❑	5	❑		
Downtown Carrollton / Keller Springs	❑	5	❑		❑
Downtown Carrollton	❑	8	❑	❑	❑
Valley View Lane	❑	7	❑	❑	❑
Mercer Pkwy	❑	3	❑		
Royal Lane (Alt Location)	❑	5	❑		❑
South Las Colinas (SH114)	❑	8	❑	❑	❑
Downtown Irving	❑	6	❑	❑	❑
Number of Stations	***24***		***15***	***11***	***13***

Table 3: Summary of Station Evaluation Process

As indicated in the lower right, eleven potential station locations remained following the Phase III assessment. This list was then reviewed with the PAC and feedback received resulted in two stations (Keller Springs / Downtown Carrollton and Royal Lane) being added back to the list of potential stations. These were then used in the modeling analysis described below. While the Royal Lane station was analyzed in the Land Use Analysis located in Appendix E, this station only served as an alternate location to the Valley View Lane station should further ridership modeling efforts deem the Valley View location to be unfavorable. The City of Farmers Branch made clear their preference of the Valley View Lane location over Royal Lane; for the purposes of the ridership modeling efforts below, only the Valley View Lane location was used, as it was found favorable from a ridership standpoint.

Corridor Alternatives Analysis

Section Overview

Building upon the preliminary station selection efforts, NCTCOG staff elected to utilize the in-house Regional Travel Model (RTM) to forecast ridership for several scenarios to answer the following specific questions related to this corridor:

- What ridership do we expect to attract to this corridor with the updated station locations as determined through the collaborative station location process described in the Station Analysis section above?
- Is ridership along the corridor affected by the introduction of higher-density development patterns (alternative demographics) expected around these future station locations?
- Where should the northern end of this passenger rail corridor terminate?
- Does interlining passenger trains along this corridor with other planned or existing regional rail corridors enhance ridership by removing the required transfer between corridors, saving passenger travel time?

The following sections seek to answer these questions and provide an analytical base for the resulting recommendations of this study in terms of potential ridership in the year 2045.

A summary table of the modeling efforts (singularly described as "runs") is included in Appendix C where each run is given a name/designation and description to clearly delineate its purpose. The following sections will each reference various runs based on these designations and descriptions to compare the resulting ridership and summarize the effects of changing characteristics of each run on said ridership. For convenience, the designation for each run will either start with a "B" (representing baseline runs, following the original corridor from Irving to Frisco), with an "E" (representing an extension north of Frisco), or with an "I" (representing an interlined scenario).

The following definitions and ridership characteristics apply to this report:

- All ridership forecasts are daily estimates for the year 2045
- Line ridership is defined as daily total number of boardings on the transit line
- Segment volume is defined as transit volumes between any two stations along the corridor (NOTE: summation of segment volume does not equal line ridership, since many trips on the line use multiple segments)
- Station ridership is defined as total boarding (on) and alighting (off) at the station

Updated Station Locations - Corridor Ridership Analysis

As this Irving-to-Frisco/Celina corridor has been the subject of previous studies by various entities as described in Introduction sections of this report, Mobility 2045 included this corridor with the station locations identified through previous efforts. Ridership, based on the official demographics of Mobility 2045 and the 2045 network of planned and existing roadways and

transit lines/access points, was readily available as produced by NCTCOG's RTM. NCTCOG staff built upon this modeled network and worked with the communities along the line to develop a slate of updated station locations as described in the Preliminary Station Selection Process section. This slate of updated locations was used to answer the first question posed by the project team:

> *What ridership do we expect to attract to this corridor with the updated station locations as determined through the collaborative station location process described in the Preliminary Station Selection Process section above?*

The line ridership for the original stations included in Mobility 2045 between Irving and north Frisco is forecasted to be 17,000 riders per day in 2045. With the updated stations (run B1a), the line ridership is forecasted to increase slightly to 17,800 riders per day in 2045. Comparative graphics of the segment and station ridership between both runs are included in Appendix C.

The results from this comparison indicate the updated stations have minimal effect on line ridership (increase of 5 percent) and the southern segment of the corridor between downtown Carrollton and downtown Irving still suffers from lower ridership (between 3,000 to 4,000 segment riders on average) similar to the Mobility 2045 ridership forecasts. This modeled run with the updated station scenario (B1a) becomes the baseline to compare future modeling forecasts in answering the questions posed in the sections below.

Alternative Demographics - Corridor Ridership Analysis

The forecasted line ridership for the corridor in the updated stations scenario (B1a) is based on the official population and employment demographic forecasts used in Mobility 2045. Since the presence of an active rail transit corridor is expected to shape future development and redevelopment at station locations, likely increasing the surrounding density, the following question was posed to the project team:

> *Is ridership along the corridor affected by the introduction of higher-density development patterns (alternative demographics) expected around these future station locations?*

Based on coordination with the various cities along the rail corridor, the project team developed various alternative demographic scenarios at the following stations: Panther Creek Parkway, Stonebrook Parkway, Sam Rayburn Tollway, Hebron Parkway, Carrollton City Hall (also known as Keller Springs), and Valley View Parkway. Alternative demographic scenarios were also developed for Celina and Prosper stations that are the subject of the northern terminus discussion in the section below. While these alternative demographics are not considered more accurate or an "improvement" over the official Mobility 2045 demographics for these station locations, they were used to determine what kind of effect significant densification around future stations might have on ridership within the corridor. These alternative demographics, in

combination with the official Mobility 2045 demographics, provide a range of expected ridership given the unknowns of future development and show the sensitivity of ridership to increases in population and employment centered at these planned station locations. Appendix D includes an overview of the alternative demographic methodology used for these stations as compared to the official Mobility 2045 demographics.

Supplementing the Mobility 2045 demographics with the alternative demographics around the planned station locations, the line ridership increased to 19,200 riders per day (run B1b) from 17,800 riders per day (B1a). While this does increase the line ridership by approximately 8 percent, these alternative demographics do not significantly affect the ridership along this corridor or increase the viability of any of the stations along the route. Through the modeling effort, the project team noticed more significant increases in local trips around the stations that were generated through the increase in population and mixed uses; relatively few of those new trips translated into transit ridership for this corridor. The results of the segment and station ridership of this alternative demographics run (B1b) and the baseline run (B1a) can be seen in Appendix C.

Northern Terminus - Corridor Ridership Analysis

As included in Mobility 2045, previous studies identified the future rail transit corridor to run from downtown Irving up to northern Frisco. At its southern terminus, this rail corridor forms a wye with the TRE corridor. To the north, the tracks for this freight rail corridor extend through Prosper and Celina into Oklahoma. While the southern terminus for future transit operations is limited by the existing east-west TRE service[1], the northern terminus in north Frisco is more flexible, prompting the following question:

> *Where should the northern end of this passenger rail corridor terminate for the purposes of this study?*

In posing this question to the Project Advisory Committee, both the Town of Prosper and the City of Celina, north of Frisco, provided detailed information to the committee on how their communities were preparing for future rail transit stations through various studies and incorporation through comprehensive/zoning planning efforts. Following this significant feedback, the project team developed a ridership alternative, including stations in both of these communities to see how well each station fared, as well as how the line ridership for the entire corridor was impacted.

[1] Any extension south of the TRE line would require new right-of-way, which would likely be expensive and disruptive to the downtown Irving community. No studies to date have seriously examined this possibility, and there is no clearly advantageous destination for such an extension. The possibility of a southern terminus being located north of downtown Irving, due to low ridership numbers south of downtown Carrollton, remains and will be addressed later in this section.

Line ridership for this extension scenario through Prosper to a northern terminus in Celina yielded 18,200 forecasted riders per day (run E1a), compared to run B1a with 17,800 riders per day. The station and segment volume comparison in Appendix C indicates that a majority of the riders using the northernmost Frisco station at Panther Creek Parkway in the baseline run (B1a) are diverted to the new stations in Prosper and Celina. While extending the line to the north does gain line ridership to the corridor (2 percent), the increase is quite minimal, as most of the ridership difference between these scenarios is simply a diversion of riders to more convenient stations rather than attracting new transit riders.

It should be noted, however, that ridership is only one characteristic considered in determining station locations. While the results of this comparison between the baseline scenario and the extension scenario may not provide compelling evidence to extend the line north of Frisco, other factors can play a much larger role in determining station locations and how far to the north this rail transit corridor should extend. This ridership modeling provides a data point to consider in those decision processes.

Travel Demand/Corridor Interlining Analysis

This transit rail corridor is unique in that it offers multiple opportunities for passengers to connect with other planned or existing transit rail corridors. As previously mentioned, the intersection with the TRE line at the downtown Irving station provides an opportunity to connect with the east-west TRE service between downtown Fort Worth and downtown Dallas. The other more significant station along the line, in terms of interchange with other transit rail lines, is downtown Carrollton, which offers an interchange opportunity with two other future rail lines—the DART (Dallas Area Rapid Transit) Silver Line and the Denton County Transportation Authority A-train[2]—as well as the current DART Green Line light rail system. This proximity raised the theoretical possibility of running trains not just between Irving and Frisco or beyond to Celina, but to other destinations as well. As transfers between transit modes require planning, waiting, and possible additional fare costs to the user, the use of interlining, or linking transit operations between separate corridors that share a common node (thereby removing the delay and other negative effects of a forced transfer), can promote high-capacity movements that may form between two separate corridors. For instance, if a significant number of trips in Frisco were destined for Dallas Fort Worth International Airport (DFWIA), an interlined opportunity from Frisco to DFWIA via downtown Carrollton may develop. Given this strategic opportunity to further analyze interlining scenarios using this Irving-to-Frisco/Celina corridor, the project team posed the following question:

[2] The A-train is an existing service, but it does not currently serve downtown Carrollton. It is projected to do so by 2045, which is the horizon year for this study.

Does interlining passenger trains along this corridor with other planned or existing regional rail corridors enhance ridership by removing the required transfer between corridors, saving passenger travel time?

A further impetus toward examining this question was the lower ridership levels identified between Irving and downtown Carrollton: it was considered that Irving might not be the preferred destination for riders coming south from Frisco. Thus, a study to gauge the potential of other terminal combinations was warranted. Figure 8 below details the flowchart of activities by the project team in identifying possible interlining routes for analysis, determining general travel demand patterns combined with high-level ridership modeling of the interlined routes, and further detailed modeling of short-listed interlined routes with the highest ridership potential.

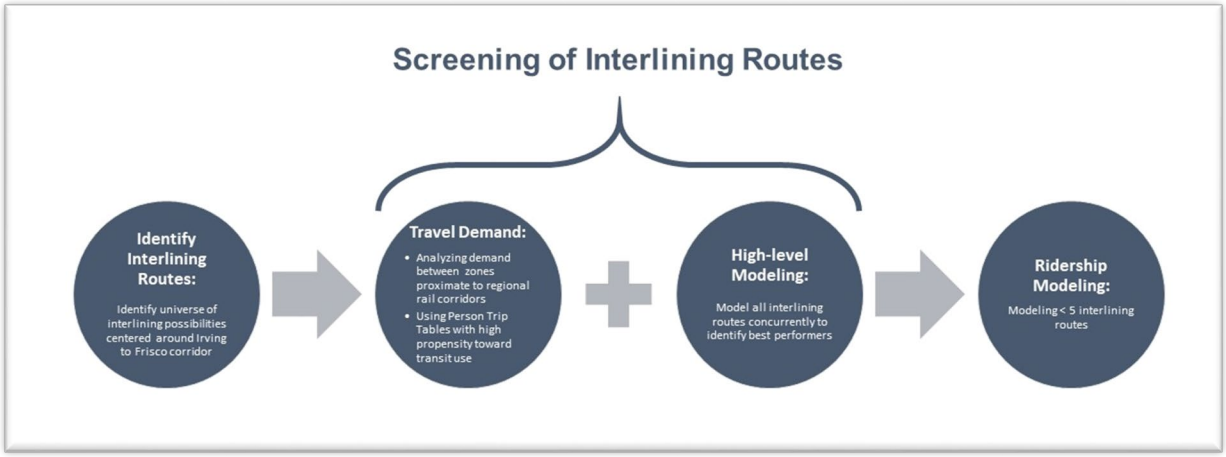


Figure 8: Diagram of Interlining Study Activities

Identifying Interlining Routes:

"Universe of Options"

The first stage of the interlining analysis was to identify all potential interlining routes. Since the purpose was to cast the widest possible net for potential connections, no routes were eliminated at this stage due to perceived issues of practicality. For example, this stage of the analysis includes a line from Frisco to Plano via Carrollton which, due to track geometry at Carrollton, would be difficult to implement. This issue will be revisited later in this report.

The lines involved included those that currently host or are planned to host commuter rail service and intersect the Irving-to-Frisco corridor. This includes the following lines:

- A-train (downtown Denton to downtown Carrollton)
- Trinity Railway Express (Fort Worth T&P Station to Dallas Union Station)

- TEXRail and Silver Line (Fort Worth T&P Station to Shiloh Road Station via Dallas Fort Worth International Airport Terminal B3)

This listing of potential lines omits the DART Green Line, which crosses the BNSF corridor at downtown Carrollton. Since the Green Line uses light rail technology, interlining with the other routes—which use regional rail technology—would require overcoming several regulatory and technological hurdles. Moreover, since the Green Line runs on an overhead viaduct, even if the regulatory and technological hurdles could be overcome, the only line that would be practical to integrate with the Green Line would be the A-train—a combination which is not relevant to this study.

Another line that was omitted from this analysis is the line owned by KCS (Kansas City Southern), which connects the west side of Denton to Garland, crossing the A-train near Lewisville, the BNSF line near Plano Parkway, and the Silver Line near the University of Texas at Dallas. These crossings suggest at least the theoretical possibility of connecting, for example, Frisco and Plano, without the need to go through downtown Carrollton at all. However, no service on the KCS line is currently anticipated through at least 2045, nor have stakeholders representing KCS been involved in this study. Therefore, the analysis did not include interlining possibilities with the KCS line.

Figure 9 shows the interlining options for the regional rail system near the BNSF corridor.

[3] By 2045, Mobility 2045 anticipates that, for all practical purposes, TEXRail and the Silver Line can be modeled as one continuous line, without requiring a transfer at the Dallas Fort Worth International Airport Terminal B Station.

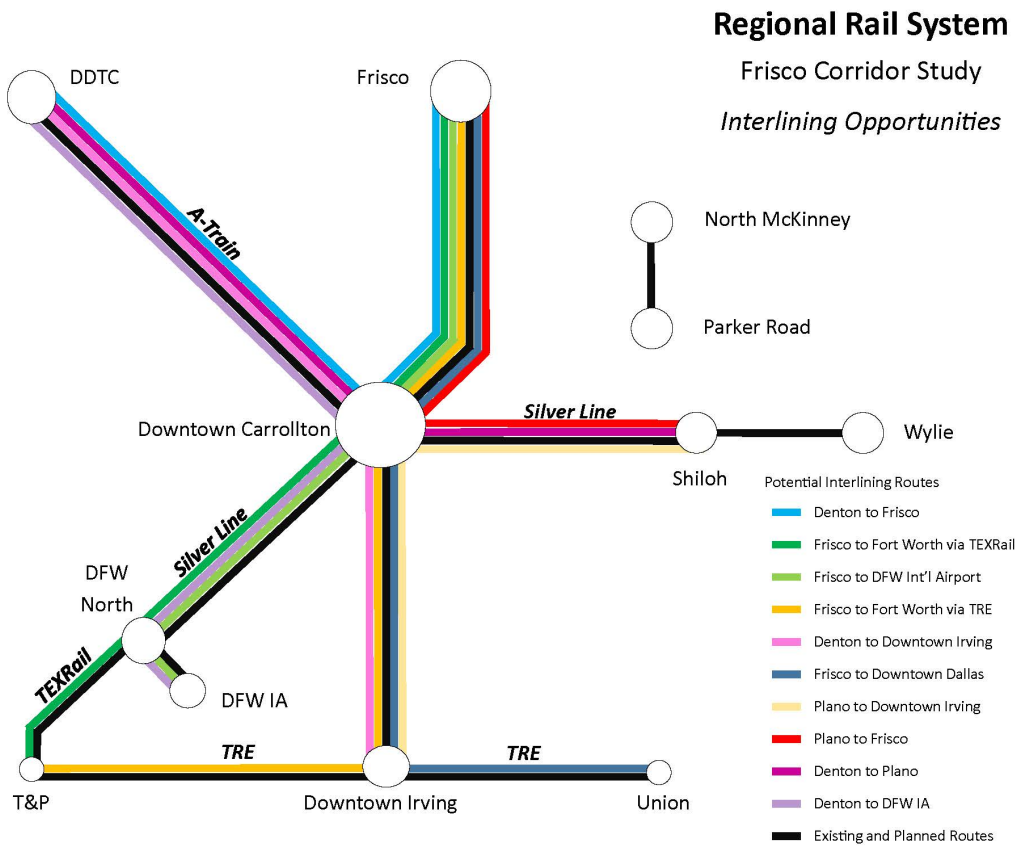


Figure 9: Interlining Options identified for high-level modeling

Travel Demand Analysis (Production-Attraction Trip Analysis)

For the next step, the project team reviewed the potential market across different sections of the network. To accomplish this, a series of study areas was created along the lines identified in the previous section. The study areas for the potential market that might be impacted by interlining were created along the rail lines radiating out from Irving and Carrollton using the Travel Survey Zones (TSZs) from Mobility 2045 within a radius of approximately 2 miles from each line. Junctions between lines and terminal stations served as boundaries between study areas.

With the study areas defined, the next step was to look at the number of potential trips between each pair of study areas. To gain a general understanding of all trip patterns regardless of mode, all trips generated (either produced from or attracted to) between these study areas were

evaluated to develop the maximum possible market for potential interlining. Figure 10 provides an outline of the study areas, along with the travel demand (measured in daily trips) to or from the study area on the northern section of the BNSF line between downtown Carrollton and Frisco.

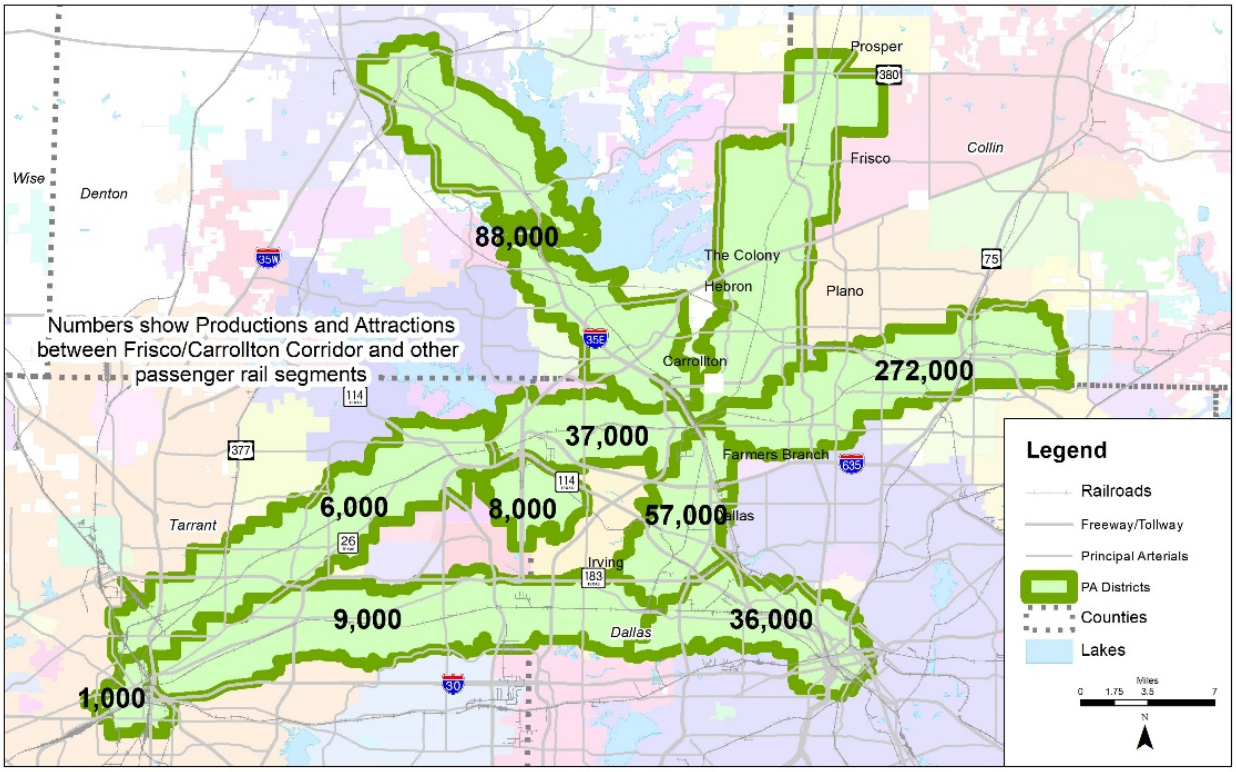


Figure 10: Trip Productions and Attractions in study areas.

With the number of trips produced in and trips attracted to each study area established, the overall travel demand between each pair of areas could be evaluated. Figure 11 lists the number of daily trips (travel demand) between different study area pairs. The graphic also shows the number of trips per mile of corridor required to serve that pair.

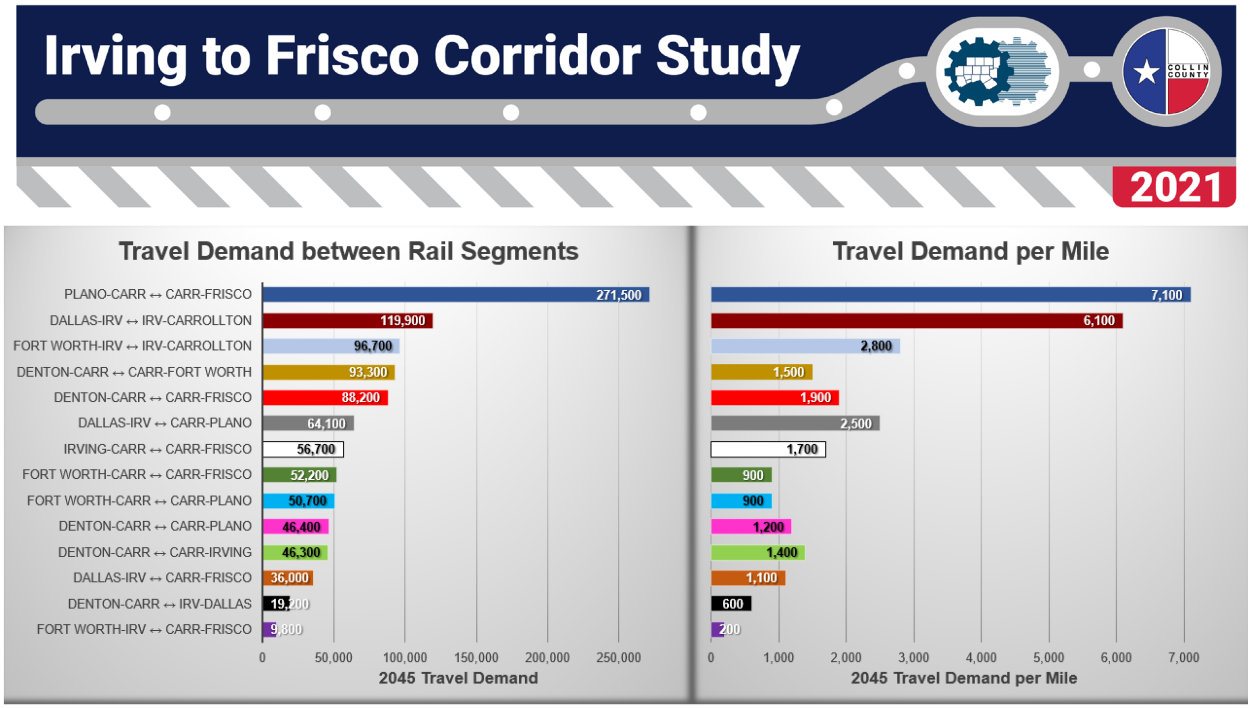


Figure 11: Travel Demand among corridor segments

Based on this graph, there is clearly an interest in moving between the eastern segment of the Silver Line (Plano-Carr in the graphic) and the northern segment of the Irving-to-Frisco line (Carr-Frisco), as well as the eastern segment of the TRE (Dallas-Irv) and the southern segment of the Irving-to-Frisco line (Irv-Carrollton). Movement from the western section of the TRE to the southern segment of the Irving-to-Frisco line also scores well. By contrast, there is relatively little demand for movement from the western segment of the TRE to the northern segment of the Irving-to-Frisco line. The demand between Fort Worth and Carrollton, along TEXRail and the Silver Line, to the area between Carrollton and Frisco, along the northern section of BNSF, is also surprisingly low considering the example cited earlier of anticipated trips between Frisco and DFWIA. It is important to remember that these results show total demand in 2045 and provide no information on how these trips are being made, or whether these trips are already being made via another form of existing or planned transit.

Interlining Ridership Modeling: High-Level

These lines shown in Figure 9 were then modeled using NCTCOG's RTM using the 2045 network, which assumes the planned roadway and transit projects to be built by 2045 exist and include 2045 population and employment forecasts.

All lines were modeled simultaneously with a 20-minute headway (frequency) in the peak period (several hours in the morning and afternoon when the most trips are experienced throughout the network) and a 60-minute off-peak headway.

Figure 12 shows the total ridership projected on each route. It is important to note the actual daily ridership numbers shown are not important since this particular scenario assumes all of the interlined routes exist at the same time to provide a general basis for comparison. The level of magnitude of ridership between each interlined route is of more importance and provides

insight into which routes provide the most benefit by reducing the number of transfers between different corridors. Of particular note are the two Frisco-to-Fort Worth routes (via the TRE and TEXRail corridors, respectively), which show both high ridership in terms of total ridership and in terms of riders per mile. This may seem surprising given the low interest in travel between the Frisco-to-Carrollton segment and Fort Worth in the travel demand analysis in the section above; however, this analysis includes trips made to and from intermediate destinations, which connects housing markets along the northern end of the Irving-to-Frisco/Celina line and the western leg of the TRE with a jobs market in Las Colinas and Farmers Branch. The routes from Frisco to Plano and Dallas both perform well. In contrast, the Frisco-to-Denton route does not perform well, reflecting the low number of trips between the Frisco-Carrollton and Denton-Carrollton zones from the travel demand analysis.

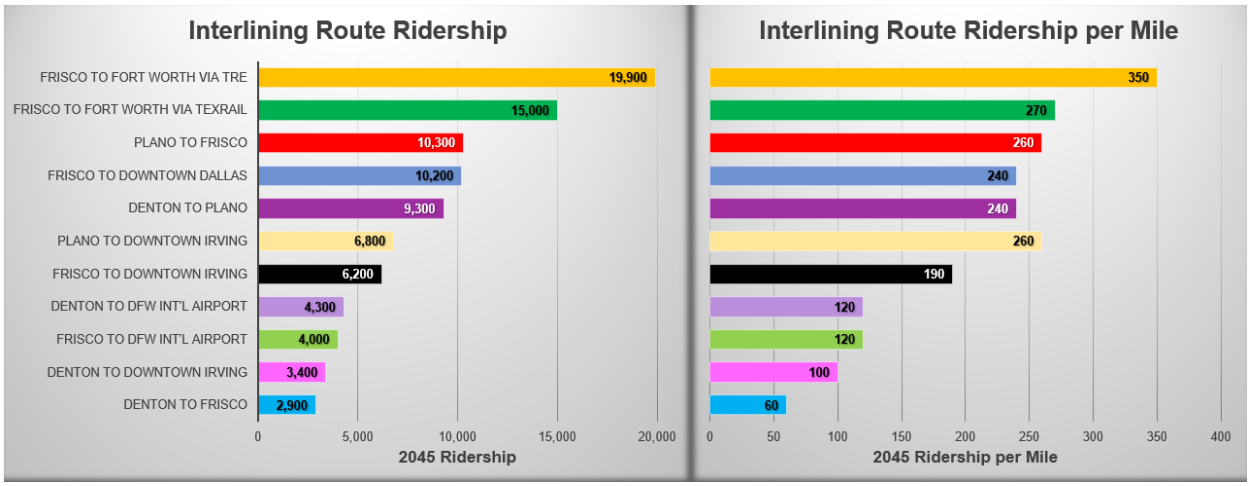


Figure 12: High-level modeling ridership results

Interlined Routes: Short-List

Analyzing the number of passengers per mile provided a means of narrowing down the scope of routes that would require a more rigorous level of analysis. Based on this measure, the top six performers were the two Frisco-to-Fort Worth lines (via the TRE line and TEXRail, respectively), the Plano-to-Frisco line, the line from Plano to downtown Irving, and the Frisco to downtown Dallas line. Comparing the modeled ridership to the original travel demand analysis provides some interesting insights in Figure 13 below.

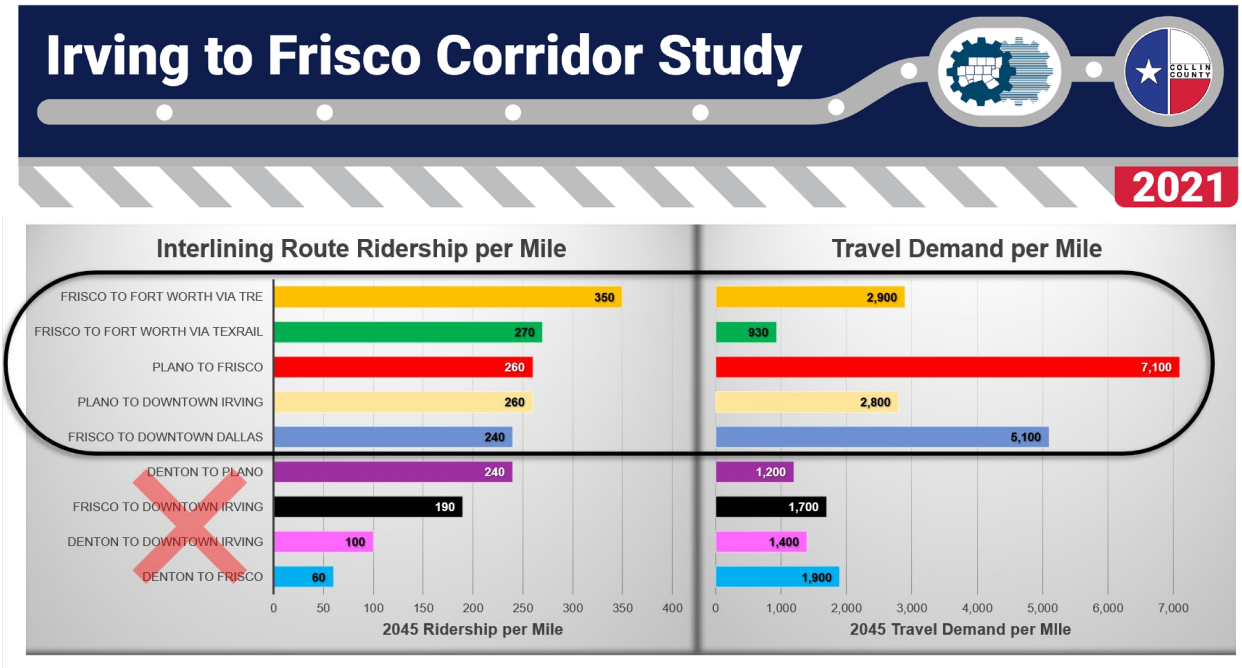


Figure 13: Ridership on short-listed routes

As a reminder, the total travel demand on the right side of the figure is a summation of all originating along one of the corridor legs that are destined along the other corridor legs, regardless of which mode they take; the interlining route ridership side of the figure are actual forecasted riders using the interlined rail transit service as opposed to driving, walking, or taking another mode. The difference in scale between both methodologies is not important; what is important are the relative differences between interlined corridors within each methodology. This comparison of methodologies produces interesting results, such as four of the six top performers on the Ridership per Mile graph are also top performers in the Travel Demand per Mile graph, which validates carrying those four routes over for further analysis. Of the remaining two top performing routes on the Ridership per Mile analysis, the Frisco-to-Fort Worth via TEXRail is carried forward on the ground that it is the second-best performing on the Ridership per Mile graph, regardless of its low performance on the other. The Denton-to-Plano route is removed from further analysis based on its middle-of-the-pack score on the Ridership per Mile graph, its low score on the Travel Demand per Mile graph, and the uncertainty that this movement can be reasonably accommodated at the Downtown Carrollton Station.

Through-Movement Analysis

Another approach to narrowing down the interlining options is to examine movements through the downtown Carrollton and downtown Irving stations. This provides insight into how many trips might benefit from a particular interlined service pattern where passengers don't have to deal with delays and costs associated with a forced transfer. For example, in the case of an interlined route between DFWIA and Frisco, trips between DFWIA Terminal B and downtown Carrollton will already be accommodated by the Silver Line, while trips between Frisco and downtown Carrollton will be served by the Irving-to-Frisco/Celina line, regardless of whether there is a through movement between these segments. The question of interest here is how many trips are moving from one segment to the other.

The number of daily trips making these movements are represented graphically below in Figure 14.

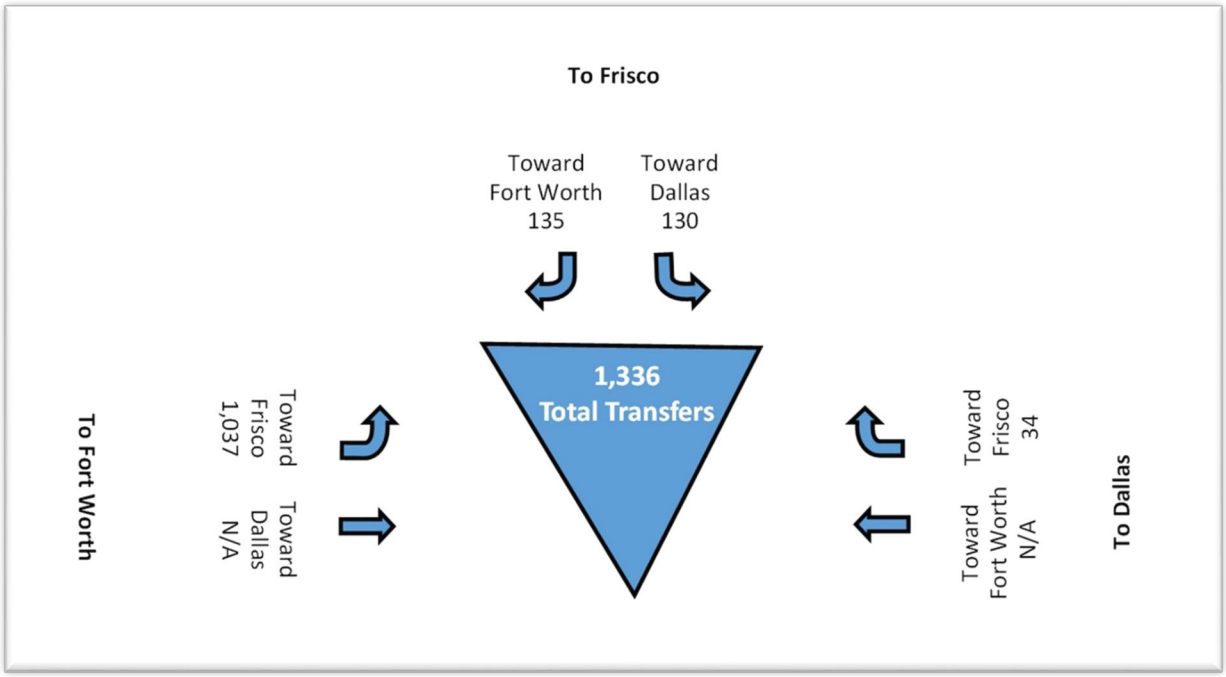


Figure 14: Forecast trips changing between Irving-to-Frisco and TRE routes in 2045.

This analysis confirms the relatively high demand for movement between the west and north branches of the junction that appeared in the travel demand analysis and shows that the demand is from trips produced on the west branch and attracted to the north branch.

Transfer analysis was also performed at downtown Carrollton, with the results shown in Figure 15. Again, since only transfers were considered, through trips (e.g. from the western Silver Line segment to the eastern Silver Line segment) are not included. Colors have been added to suggest the relative difficulty of providing the indicated movement with one-seat rail service, based on the general track geometry of the station area. This assessment does not necessarily account for current design efforts at the Downtown Carrollton Station.

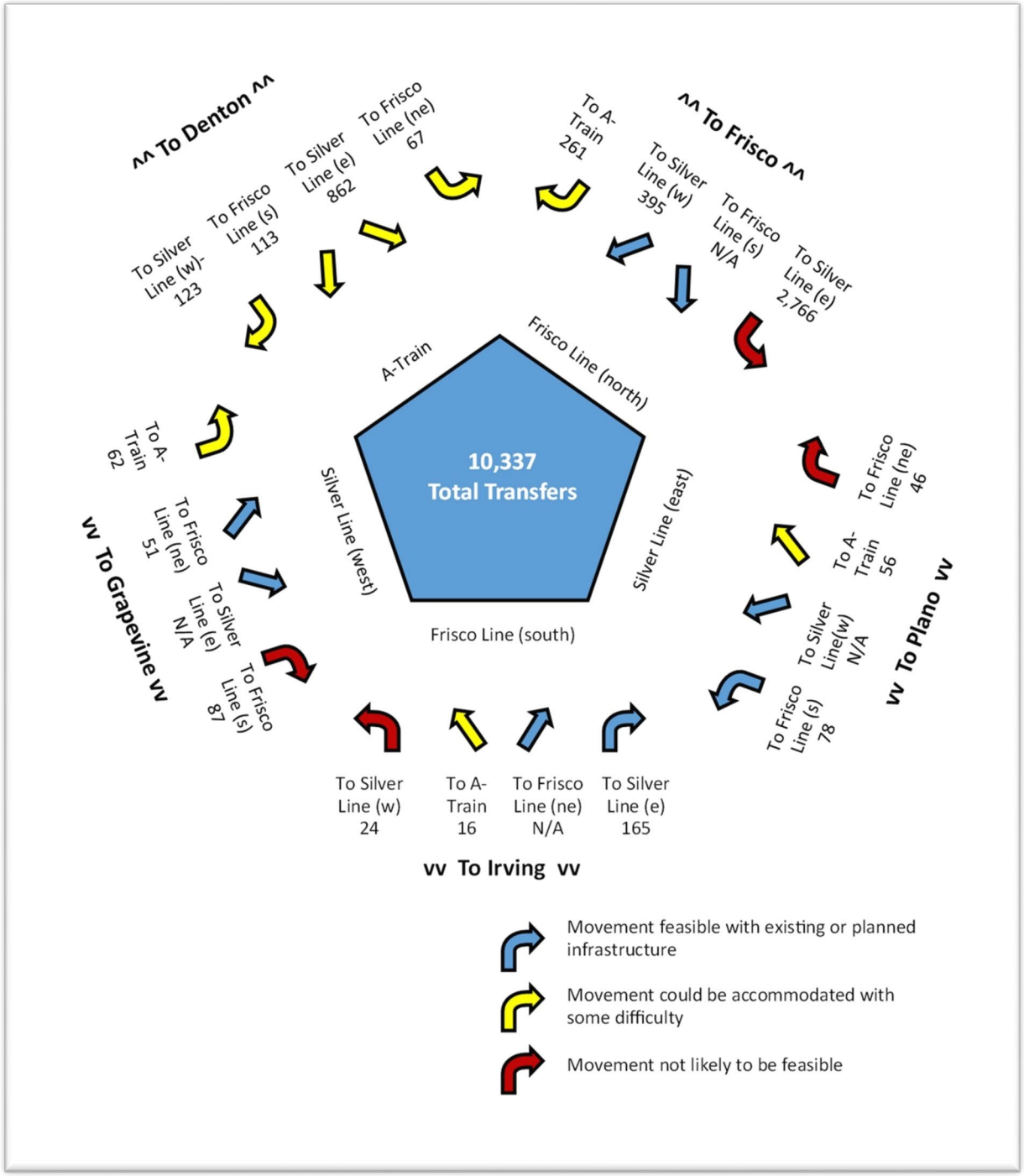


Figure 15: Forecast trips transferring among routes in 2045

Based on this analysis, the highest demand for transfers appears to be from the northern leg of the Irving-to-Frisco/Celina line to the eastern leg of the Silver Line, which also reflects findings from the travel demand analysis. The track geometry, however, is unfavorable for providing this as a through movement given the acute angle both corridors form when coming together approaching the station from the east. Apart from a serious investment in track realignment, the only option to provide such a through service would be to have the train enter the station from one leg and use a time-consuming reversing maneuver to reach the other leg. The movement from the southbound A-train to the eastern leg of the Silver Line also shows some benefit. However, while track geometry might permit this movement, the planned platforms would not be accessible, requiring the line to go through without stopping at the Downtown Carrollton Station.

Altogether these factors suggest the interlining opportunities with the highest potential are those at Irving rather than Carrollton.

Top Interlining Scenarios: Interline with TRE

Scenario I1a: Celina to Fort Worth and Dallas, Full TRE Service

At this point in the analysis, to better gage full ridership potential in a more detailed modeling exercise, the project team included service all the way up to a northern terminus in Celina for the top interlined routes between the BNSF corridor and the TRE. These model runs included a family of alternatives designed to test the potential of the surviving interlined routes. The first runs represented a “maximum” scenario, including service from Celina to both Fort Worth and Dallas, as well as full TRE service between Fort Worth and Dallas, as shown in Figure 16 below. These scenarios had the notable characteristic that, while in the baseline scenario trips from the Irving-to-Celina branch to either Fort Worth or Dallas would require a transfer at downtown Irving, in this interlined scenario no transfers were required. The headways on each of the three lines were 20 minutes in the peak period and 60 minutes in the off-peak.

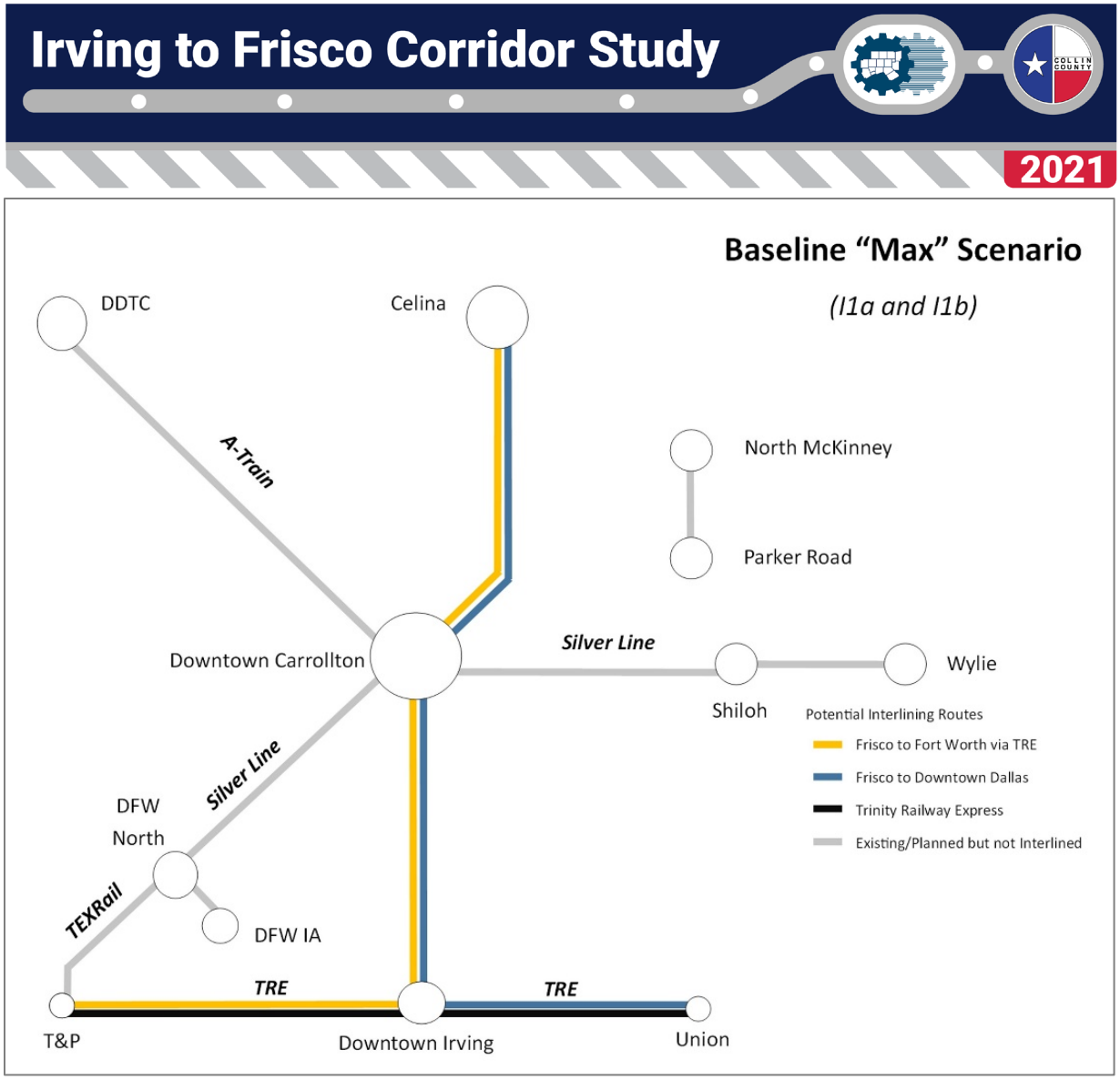


Figure 16: Diagram of Baseline "Max" scenario, featuring one-seat rides between Celina and Fort Worth, Celina and Dallas, and Dallas and Fort Worth

Figure 17 shows the station activity and volumes along each segment of the route from Irving to Celina for the interlined scenario with both legs of the TRE using demographics from Mobility 2045 (run I1a). These numbers are compared to the scenario in which the Irving-to-Frisco service is extended to Celina (run E1a described in sections above).

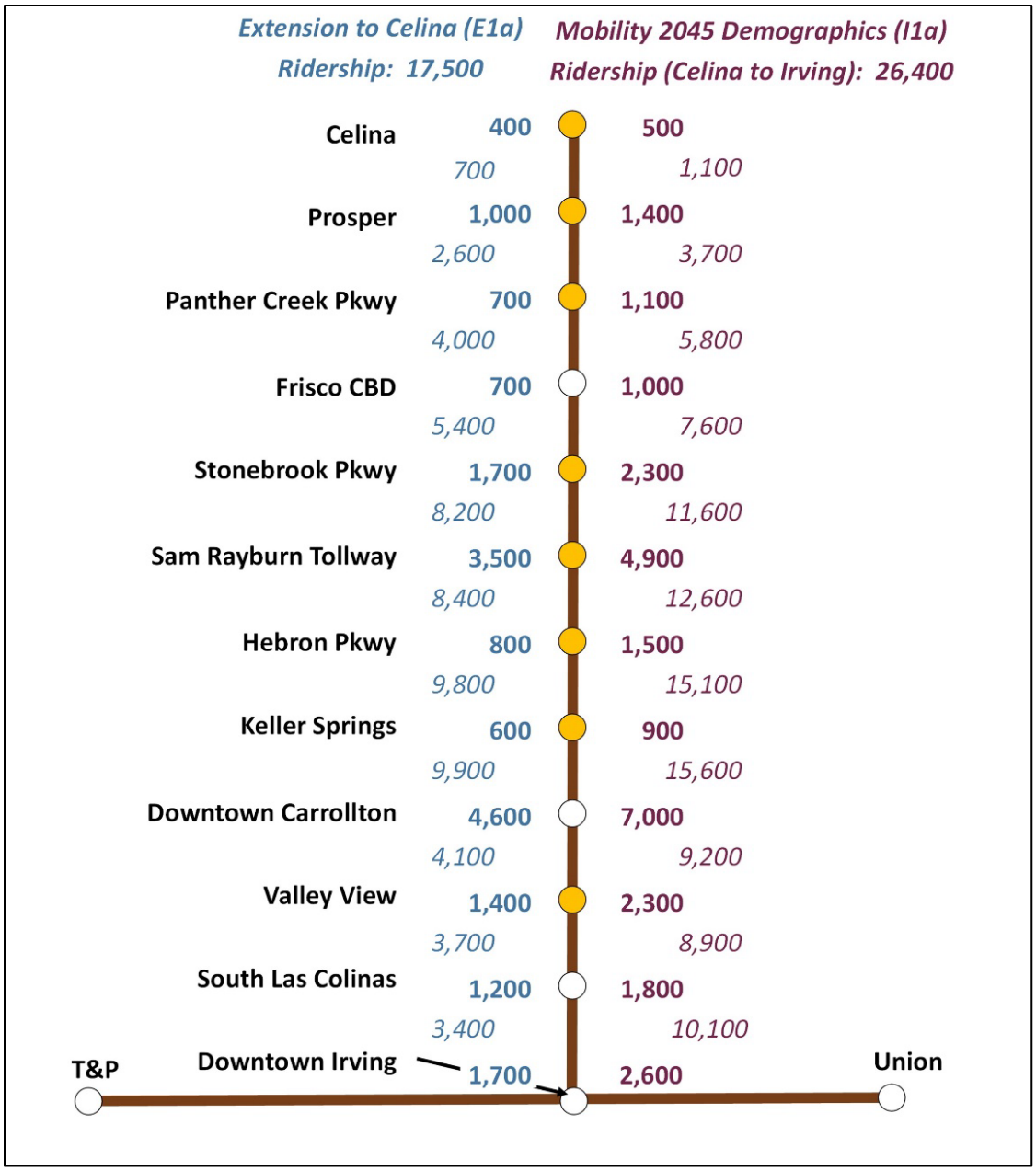


Figure 17: Modeled station ridership and segment volumes for extension to Celina (left) and "Baseline Max" (right) scenarios, downtown Irving to Celina section only

The absence of transfers at downtown Irving provides the opportunity to examine demand for such movements without the bias against transfers present in the model. A repeat of the previous station-level analysis produces the numbers in Figure 18. Again, there is the strong demand for movement between the western and northern branches.

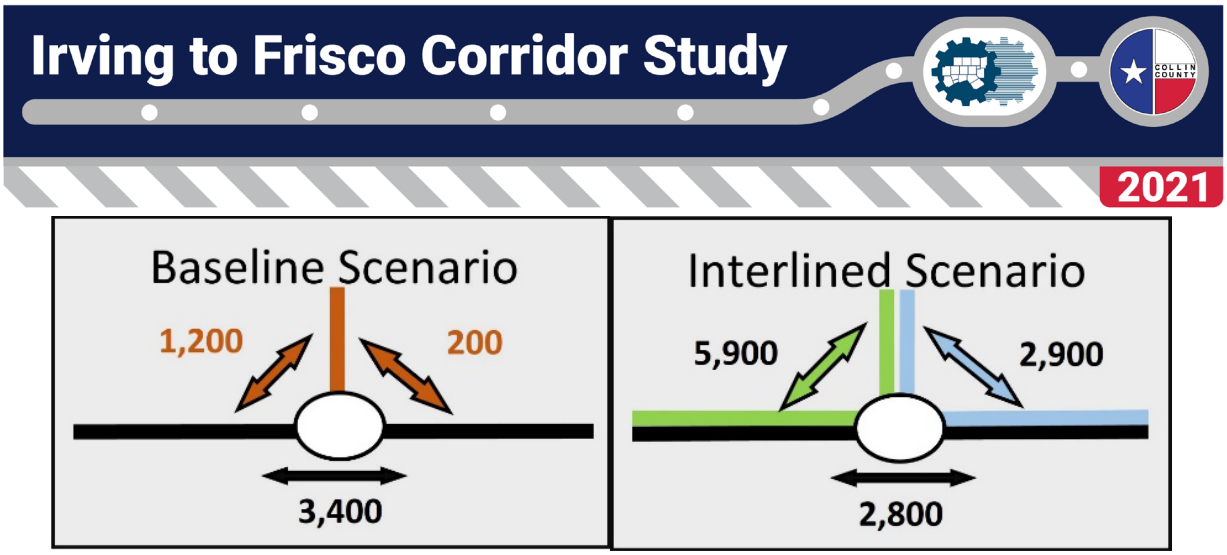


Figure 18: Effects of Interlining at downtown Irving, showing the difference between the baseline scenario (top), in which passengers must change trains if they want to transfer between the TRE line and the Frisco line, and the Interlined scenario, which offers a one-seat ride through downtown Irving regardless of destination.

Because this scenario includes 20/60 headways on all three routes, the effective headway on any of the three branches—from Irving to either Celina, Fort Worth, or Dallas—was 10 minutes in the peak and 30 minutes in the off-peak period. Achieving this in reality would require a significant level of investment on all three branches, potentially including double-tracked alignments almost exclusively dedicated to passenger service. Since this may not be realistic to achieve by 2045, another scenario was needed.

Scenario I2: Celina to Fort Worth, Irving to Dallas

This scenario was developed to take advantage of the relatively high volume of movements between the western and northern branches out of Irving while establishing a 20/60 headway on all three branches. This left the interlined service from Celina to Fort Worth and a truncated TRE service from downtown Irving to Dallas as seen in Figure 19.

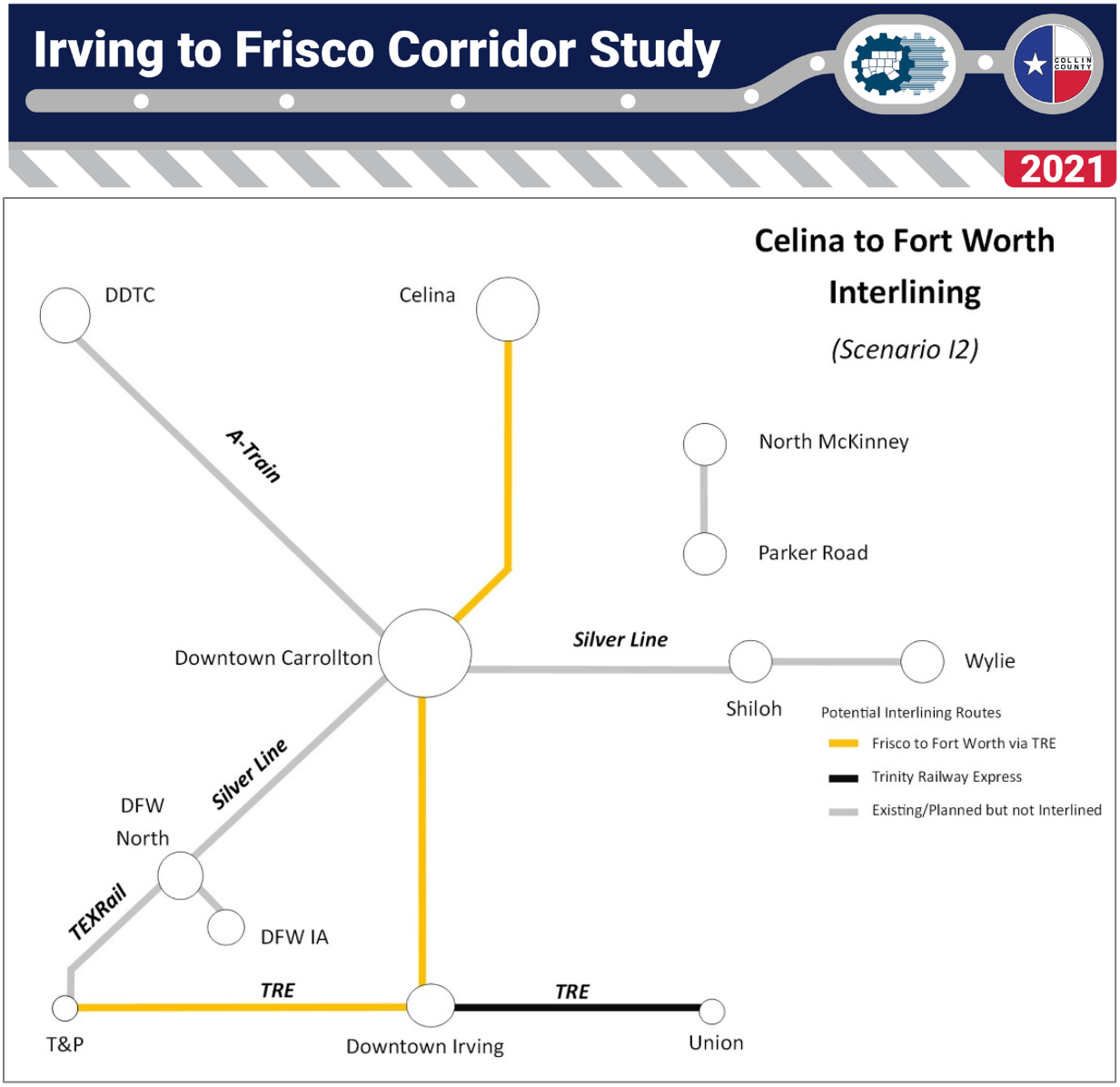


Figure 19: Diagram of Celina to Fort Worth interlining scenario, featuring the shortened TRE line between Dallas and downtown Irving

Figure 20 shows the station ridership and segment volumes for the section north of downtown Irving in the interlined scenario with only the west leg of the TRE (I2) compared to the Irving-to-Celina E1a scenario.

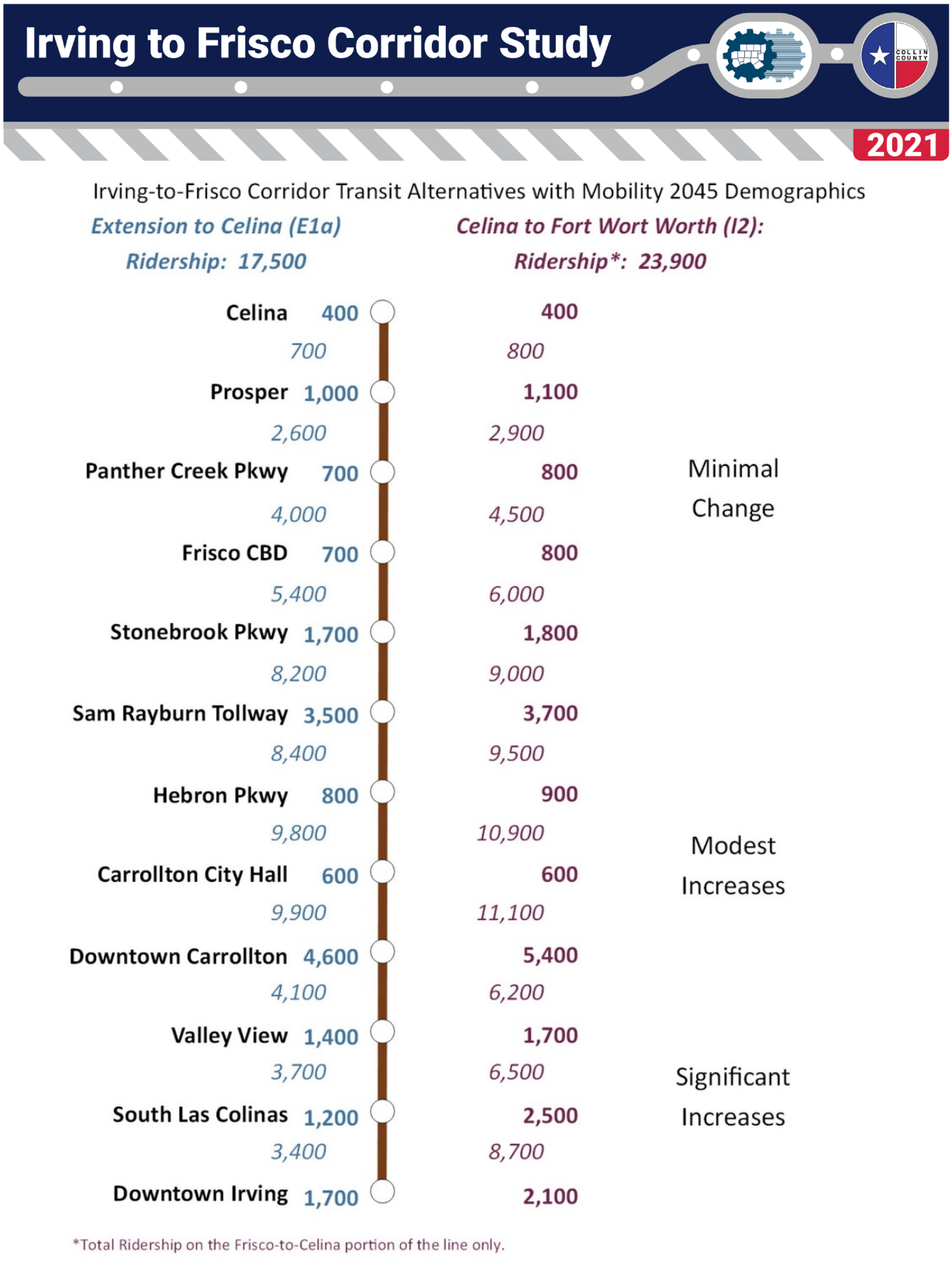


Figure 20: Irving-to-Frisco Forecast station ridership and segment volumes comparing the interlining scenario to the non-interlined scenario with service to Celina. This service pattern is more realistic than the "Baseline Max" scenario shown in Figure 16.

As evidenced by the station ridership and segment volume comparison above, the southern leg of the BNSF corridor from downtown Irving to downtown Carrollton experienced significant increases in ridership, almost doubling the ridership forecasted in scenario E1a which did not interline with the TRE. Further north of downtown Carrollton, the interline with the TRE had less of an effect on ridership, as the segment and station ridership forecasts are quite comparable. The overall line ridership for this interlined scenario I2 projected 23,900 daily riders on the corridor from downtown Irving to Celina in 2045 compared to the 17,500 daily riders in scenario E1a with a forced transfer in downtown Irving.

The forecasting results from this interlined scenario with the west leg of the TRE confirm the earlier travel demand and high-level interlining efforts that seem to demonstrate the connections between the employment markets along the southern end of the Irving-to-Frisco/Celina corridor and the predominant housing markets at the northern end of the Irving-to-Frisco/Celina corridor and along the western leg of the TRE.

Effects on Other Lines

Since this project would not occur in a vacuum, it is important to evaluate the effects on the interlining on existing services. Figure 21 presents a table showing ridership on the three-branch network (i.e. from downtown Irving to, respectively, Fort Worth, Dallas, and Celina) for the conventional scenario (TRE + Irving-to-Celina, E1a) and the interlined scenario (Fort Worth-to-Celina + Irving-to-Dallas, I2), as well as a diagram of changes to branch volumes and through trips.

Extension to Celina (E1a) **Riders** and *Trips Through Irving*
Celina to Fort Worth Interlining (I2) **Riders** and *Trips Through Irving*
Difference in **Riders** and *Trips Through Irving*

Line Ridership	Irving-to-Celina (E1a)	Interlining Frisco w/ west TRE leg (I2)
Celina to Irving	18,200	n/a
Celina to Fort Worth	n/a	31,400
TRE (Fort Worth to Dallas)	14,100	n/a
TRE (Irving to Dallas)	n/a	2,900
Total	32,300	34,300
Total Rail	292,500	293,000
Total Transit	621,500	623,900

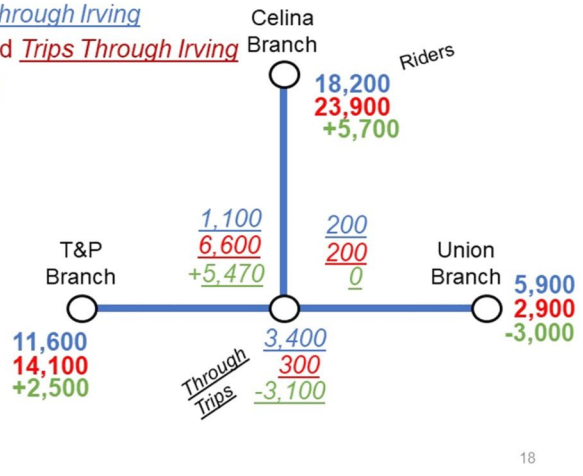


Figure 21: Impacts of interlining scenario on transfers at downtown Irving

There are several items of note here. First, the table shows a clear increase in the total ridership on these three branches in the interlined scenario I2 compared to the extension to Celina E1a. (Note that the interlined scenario includes the extension to Celina; the latter scenario is providing a basis for comparison.) However, this interlined scenario seems to only have a minimal effect on total rail and total transit ridership in the region. This suggests that the interlining scenario is either attracting new riders at the cost of alienating other riders or diverting existing riders from other transit routes.

The graphic to the right of the table, showing volumes on the branches and trips through downtown Irving, strongly suggests the latter. Through trips from the western branch to the eastern branch of the TRE fall roughly 90 percent in the I2 scenario, while volume on the eastern branch drops by roughly 50 percent. The requirement to transfer between the west leg of the TRE and the east leg of the TRE is pushing would-be riders either to other transit services or back to personal vehicles. The movement from the western branch to the northern branch, however, undergoes a significant increase, as does the total number of trips on each of the western and northern branches.

The movement between the northern branch and the eastern branch—which required a transfer in the E1a scenario and still requires one in the I2 scenario—is unchanged.

Figure 22 shows the change in ridership for the regional rail system and light rail system in the vicinity of the BNSF corridor—in net terms, as well as by percentage—between the I2 scenario and the E1a scenario.[4]

[4] In order to reduce the number of model runs required, the E1a scenario was run simultaneously with a scenario in which the Red Line was extended to Celina, which skewed ridership on the Red Line south of Parker Road. To avoid confusion, the diagram uses Red Line trip results from the B1a scenario, in which the Red Line terminates at Parker Road (as it does in the I2 scenario) and the service on the Irving-to-Celina corridor terminates in northern Frisco. This should be sufficient for the purposes of this analysis.

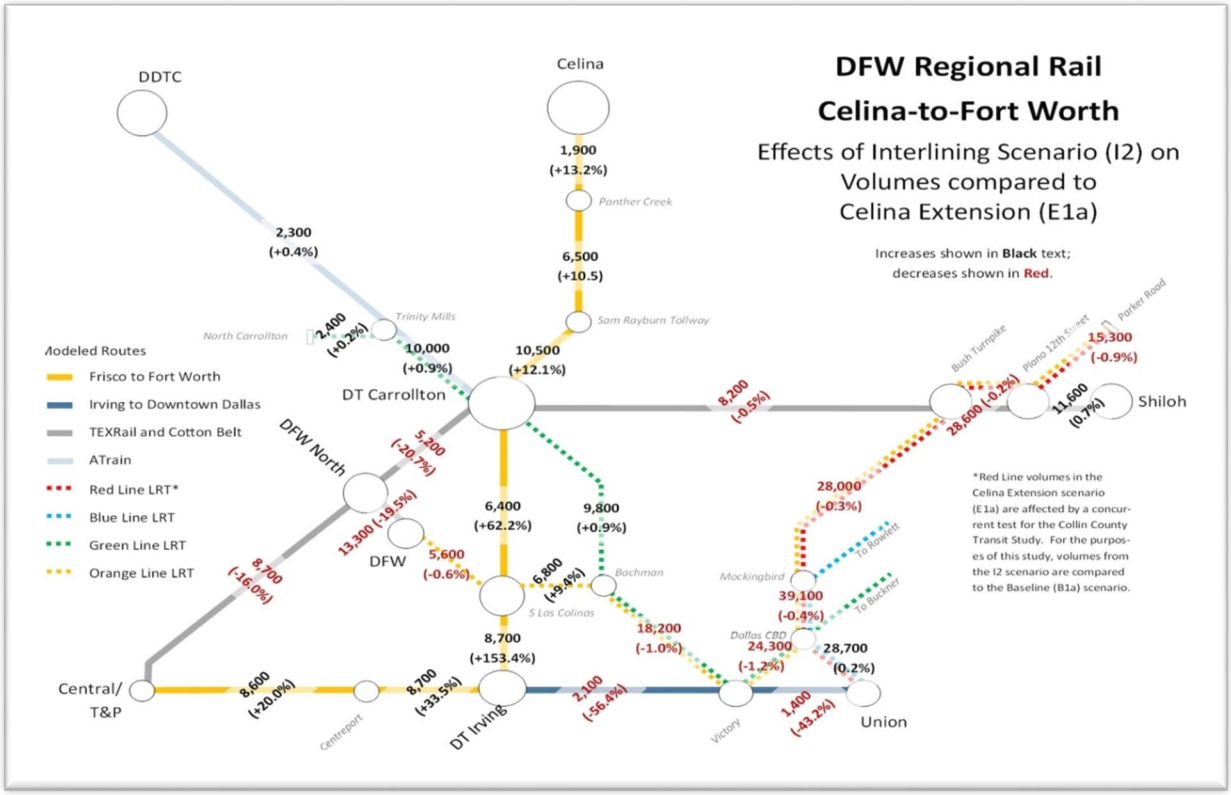


Figure 22: Impact of interlining on regional rail segment volumes

This map presents a number of important points. The significant movement between the west branch of the TRE line and the southern section of the Irving-to-Frisco line has already been mentioned. From this graph, though, it becomes clear that at least some of this movement comes at the expense of ridership on the TEXRail line: the interlined Irving-to-Frisco service appears to have a service advantage for trips to south Las Colinas and downtown Carrollton. Also, the loss of trips on the eastern branch of the TRE indicates that some riders are refusing to make the new transfer at downtown Irving to get from Fort Worth to Dallas or vice versa and are finding some other means to make the trip. Finally, this map shows that effects on the rest of the network—particularly the Red Line—are relatively minor, suggesting that the Frisco Line does not provide as much competition with the Red Line as their roughly parallel routes might suggest.

Lessons Learned

Downtown Irving to Downtown Carrollton

In the "Poor Man's Cost-Benefit Analysis", performed on the BNSF corridor with the stations and operations planned in Mobility 2045, different sections of the line were color-coded based on

how many trips were occurring over each section, compared to the high-level cost of constructing that section, as shown in the left-hand map of Figure 23. The high-level cost of construction was based on a per mile cost of a similar regional rail project throughout the region to provide general context of cost effectiveness per rider. This analysis was revisited after scenario I2 was completed with the new station locations identified in the map on the right of Figure 23.

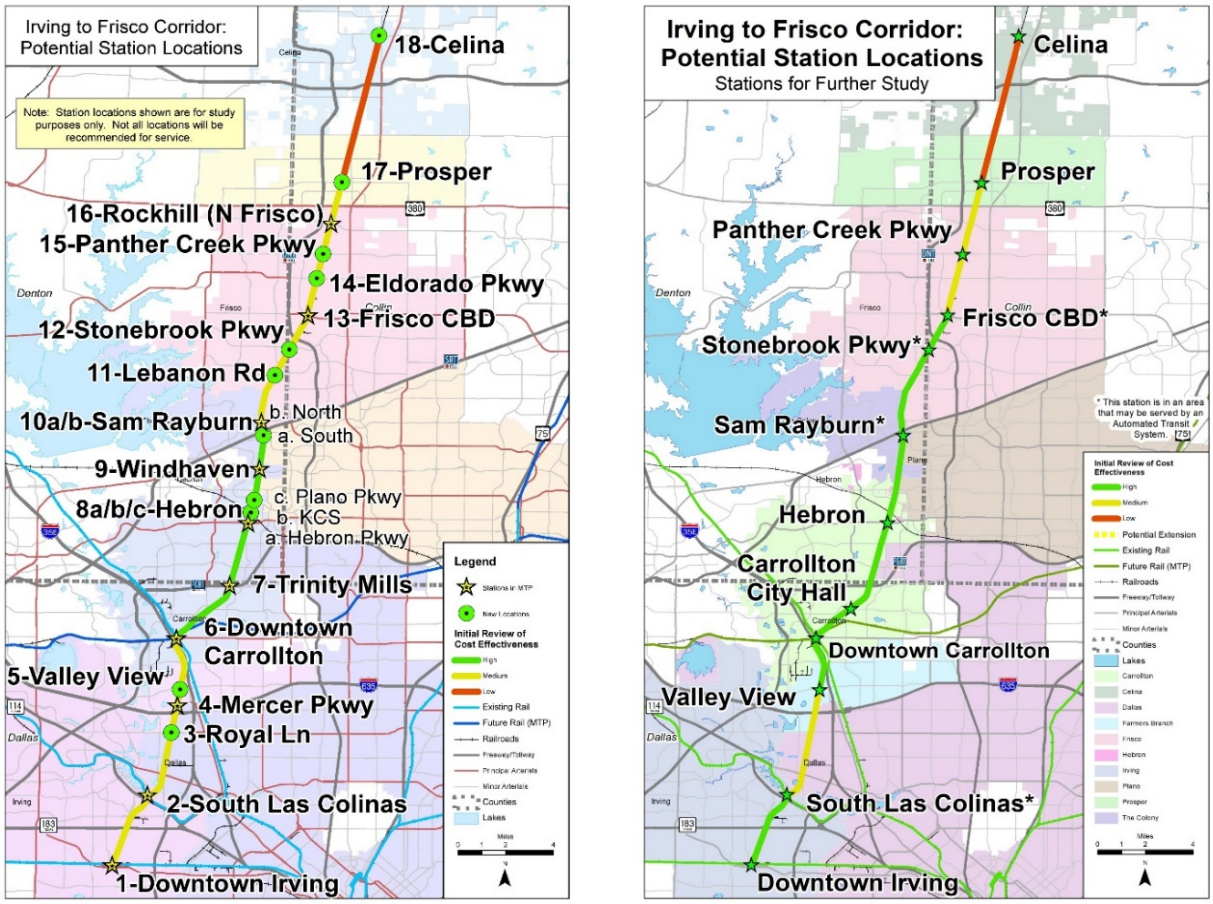


Figure 23: "Poor Man's Cost-Benefit Analysis": Cost-effectiveness of Irving-to-Frisco line segments, initial estimate (left) and with revised station locations and interlining to Fort Worth (right)

One significant change was the segment from south Irving to south Las Colinas moved from the "moderate" to "high" cost effectiveness category. (The section from Valley View to downtown Carrollton also moved into the "high" category. While the interlining undoubtedly contributed to this move, a larger contribution came from the replacement of the poorly performing Mercer Parkway Station to the more productive Valley View Station.) This aligns well with the boost in ridership on the Carrollton-to-Irving section noted previously, particularly the section between

downtown Irving and south Las Colinas. The significance of the interaction between the western TRE section and the Carrollton-to-Irving section stands in contrast to the relatively low impact interlining had on the sections north of downtown Carrollton. Not only is there a clear market for movement between the western TRE section and the Carrollton-to-Irving section, but the justification for providing service south of downtown Carrollton without the interlining becomes distinctly marginal in terms of ridership. As noted in both analyses, while the extension to Prosper may be relatively cost effective, pushing the terminus further north to Celina begins to significantly increase the costs per rider due to the distance between Celina and Prosper.

Track Configuration Issues

One operational issue that has not been comprehensively addressed in this assessment is the issue of platform locations that might accommodate this service. At present, the junction between the Irving-to-Frisco/Celina corridor and the TRE corridor is defined by a wye junction, with a single through track connecting the Madill subdivision to the east and west, respectively. (The northwestern chord includes a second track, but this is not connected to the west.) The southern leg of the junction is comprised of two tracks that merge into one west of the station and a small rail yard built to accommodate the right-of-way maintenance facility that occupies the center of the junction. This configuration is illustrated in Figure 24.

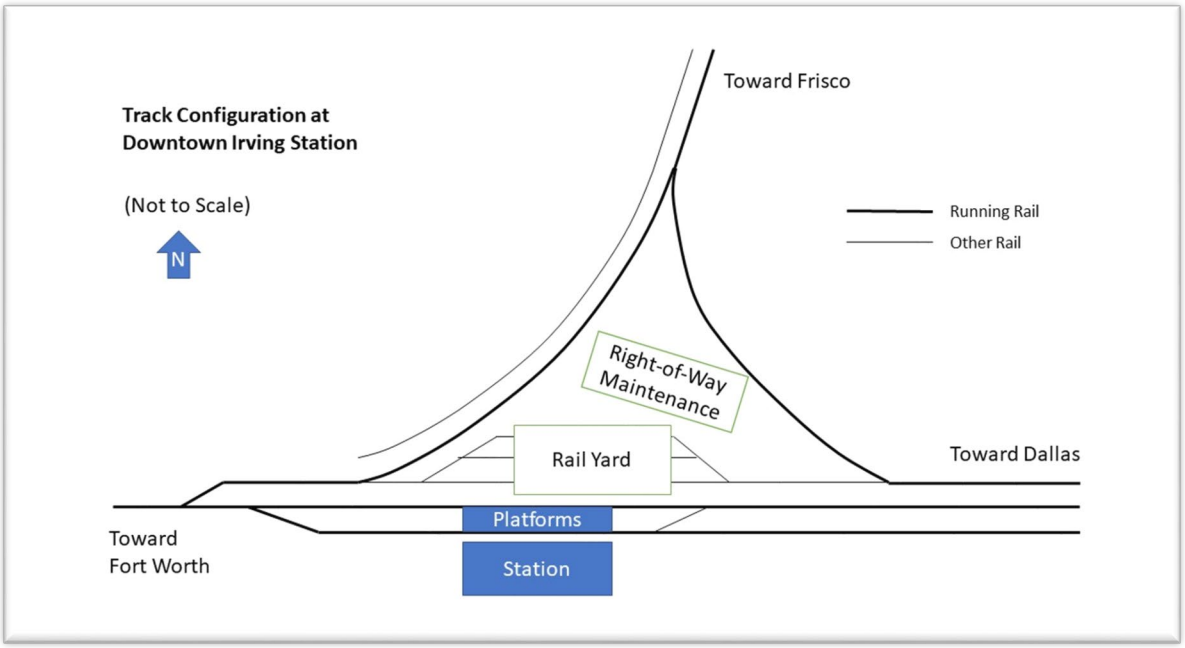


Figure 24: Diagram of approximate track configuration and station location at downtown Irving

The Downtown Irving Station is located on the outside of this southern leg. A service running from Frisco through Irving to Fort Worth would use the northwestern chord and would, therefore,

have no access to this station without complicated and time-consuming reversing movements. Further study would be required to identify potential modifications and service alternatives to address this issue.

A thorough examination of these possibilities is beyond the scope of the current study. It is sufficient to say that, if ridership estimates justify providing a connection to this station, some accommodation could be made to provide it.

Other considerations

As beneficial as this interlining scenario may be from the perspective of the Irving-to-Frisco/Celina corridor, this is not the only factor to be considered. Adopting such a service pattern would displace trips between Dallas and the western half of the TRE line. Moreover, this service pattern impacts areas and stakeholders well beyond the study area of the Irving-to-Frisco corridor. Any movement to advance this service plan would require outreach to and consensus with additional stakeholders.

While the adoption of an all-day service pattern requiring a transfer at Irving to move between Fort Worth and Dallas seems unlikely, there may be service patterns that accommodate both movements. For example, it may be possible to run select peak-hour trains between Fort Worth and Frisco—or perhaps, downtown Carrollton, since most of the volume from the western part of the TRE does not pass that station. A shorter service, perhaps from Centreport or west Irving up to downtown Carrollton might also be considered.

Interlining Analysis Summary

Of the interlining options studied, the opportunity with the best ridership characteristics is a through service from Celina to Fort Worth via downtown Irving. Such a service would take advantage of a currently underserved travel demand between the western end of the TRE line and the southern portion of the Irving-to-Frisco/Celina line.

However, this study is very preliminary and only demonstrates the market potential for such a service pattern. Further consideration of this pattern is warranted, but it must be accompanied by further analysis—including to identify potential impacts to the eastern portion of the TRE corridor—and stakeholder outreach.

Station Area and Land Use Analysis

Section Overview

The pattern of development within a reasonable distance for walking, bicycling, and micromobility (e.g., scooters, bikeshare services) generally recognized as being within ¼ to ½ mile radius of a high-capacity transit stop plays a major role in how people (customers) can or

will use transit. The 'ring' of development immediately beyond that (in some cases up to a 5-mile radius) also comes into play as bicycling and fixed route bus service as well as new mobility options such as scooters, bikeshare services, Uber/Lyft, shuttles and microtransit can all provide relatively quick access to the station. Finally, a larger radius, particularly for a terminal station on a rail line, also influences transit ridership as people can drive to the station (where parking is available). Related factors such as the quality of the urban streetscape; street crossings that pedestrians, bicyclists, and micromobility users can safely and comfortably traverse; shade; and adequate sidewalks, bikeways, and related active transportation facilities also significantly contribute to people's propensity to make transit their mode choice.

In recognition of the importance of place and development patterns near transit stations, two in-depth analyses were conducted as a part of this study. First, the project team examined each of the station locations that emerged from the screening process, examining past work, their current state and suggesting future actions that local governments could take to make each more 'transit-ready' in the future. This analysis is documented in Appendix E of this report. Second, an analysis was conducted of potential sites where Automated Transit Systems or "People Movers" could play a meaningful role in providing mobility and access, as discussed in the following section.

People Mover/Automated Transit Systems

What is a People Mover?

The term people mover can be used to reference a variety of systems and technologies. In this study, we will be looking at smart vehicles (group-rapid transit) that are autonomous with rubber tires, subsequently referred to as an ATS (Automated Transportation System). The preferred system would operate on a grade-separated guideway. This way vehicles can navigate within the guideways and avoid traffic altogether, removing short trips from the surface streets.

What is the Purpose of an ATS?

There are two primary functions of an ATS; to provide circulation to a development or to establish regional connections (most often to larger transit or rail systems). We will be looking at examples of both functions in our analysis. Depending on the location, an ATS facility can accomplish both functions, while other locations will be primed to accomplish one specific goal.

Considerations for Establishing an ATS

The first consideration for establishing an ATS is reviewing the current level of development for a given location. This analysis will look at a few greenfield developments, as well as retrofitting existing developments and ATS systems. A greenfield development, being an undeveloped site, allows for the development to establish itself around the preferred parameters of a people mover, maximizing land uses and minimizing parking structures. Retrofitting existing

developments would require fitting the ATS guideway within and around existing structures, while retrofitting an existing ATS system might require repurposing existing guideways. Examples of potential ATS retrofits in the region are DFW (Dallas Fort Worth) International Airport Skylink and the Las Colinas APT System.

The second consideration is how the ATS system interacts with traffic. As mentioned before, the preferred system would be grade-separated to avoid traffic. Additionally, a grade-separated system will pull trips from the roadway, alleviating congestion. Although the grade-separated system is preferred, there is value in developing an at-grade system with signal priority to pilot test the service before investing in infrastructure. Phasing in the at-grade system as such would generate demand for the eventual grade-separated system.

The third consideration is parking. The goal is to have minimal and consolidated parking, where the access to the arterial system is on the periphery of a development and that is where the parking garages are located. From there, the ATS system can provide pickup trips, then circulate throughout the development. Greenfield developments are especially favorable in this regard as consolidated parking structures can be planned where most optimal. Unfavorable conditions would be a development where each structure has its own parking. Current parking strategies separated by use and required by city code and lender requirements result in developments being pushed further apart, ultimately reducing walkability and access outside of vehicles. An ATS can support a high-density development with a walkable environment, which is still easily accessible by vehicles on the periphery.

The fourth and final consideration is funding. The system can be privately funded, publicly funded (or subsidized), or funded through a public-private partnership. The goal is to have a plan for capital and ongoing operating costs. A development implementing an ATS would require less parking, freeing up land for potentially revenue generating uses. Optimizing land uses and saving on parking costs allows the development to fund all, or a portion, of the ATS operating expenses.

These four considerations, along with the intended function of the ATS system, are major components which should guide the design leading to a successful system.

Planning for an ATS

In the wider vision of creating a standardized, easily replicable system for the region to stand the test of time; to capitalize on technology efficiencies between systems; and to facilitate separate but integrated systems in process and application, the North Central Texas Council of Governments is proceeding through a multi-effort process to standardize and gain economies of scale for automated transportation systems planned around the region.

Previous efforts center around developing demand and feasibility process standards for potential ATS locations. Current efforts, concurrent with this study, involve standardizing

infrastructure and vehicle technology specifications. Future efforts will involve identifying how to implement these systems through funding and governance structures once the site is known and the ATS vehicle and infrastructure specifications are determined.

Planning for an ATS involves the following three-step process:

- The first step is the regional feasibility analysis. This includes the utilization of a Geographic Information System regional mapping tool to determine population and employment density, employment mix, land uses, short trip density, and proximity to regional transit stations. Mapping the region using these variables highlights areas that lend themselves toward supporting a people mover. From here, larger trends throughout the region are shown and a discussion can begin on where a people mover makes the most sense in conjunction with other goals throughout the region. Following this discussion is the identification of specific sites and developments in the areas deemed most optimal.
- Step two is the site-specific feasibility analysis, using a feasibility analysis tool to determine the size of the development/area served, population and employment density by type, parking strategy, and proximity to transit stations. Parking strategies and proximity to transit were among the two factors being weighed more heavily throughout this analysis. Population and employment densities throughout the region remain low, having a minor impact on feasibility results when comparing sites. This analysis uses demographics from Mobility 2045, in conjunction with alternative demographics and development expectations provided by municipalities.
- Step three is operations analysis and ridership estimation. This uses a ridership estimation tool to determine site layout with a preferred ATS alignment and a detailed land use breakdown by Institute of Transportation Engineers code for zonal analysis. This last step is not a part of this current study effort but is intended to give insight into future efforts for those potential locations deemed feasible.

People Mover Demand

Figure 25 shows the regional mapping tool included in Mobility 2045, highlighting areas of potential demand for people movers. This is a zoomed in view on the southwest portion of Collin County and how it interacts with north Dallas and southeast Denton counties. Areas with a higher demand based on the various factors described above are shown in dark blue with a scale of lighter colors denoting less demand. Existing ATSs in the region are circled in red, those being DFW International Airport Skylink and the Las Colinas APT (Area Personal Transit) System. Looking at this map you will see that higher demand is primarily congregated around highways since denser residential and employment developments are located where convenient

access is readily available. However, this analysis is too broad for this study effort and does not illustrate those feasible locations near planned rail transit stations that could benefit from an ATS connection.

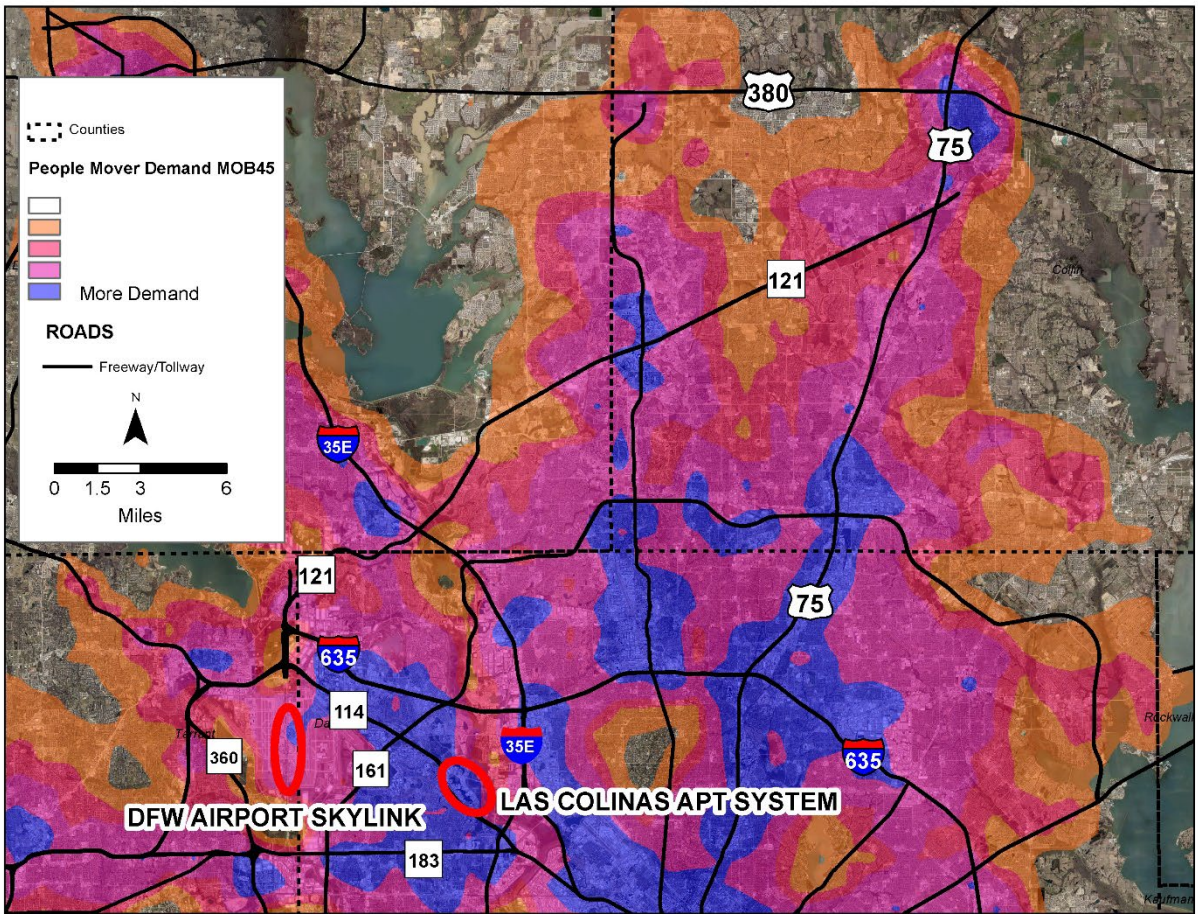


Figure 25: Mobility 2045 People Mover Demand

This analysis shows wider areas generating more demand along the US 75 corridor, Dallas North Tollway (between IH 635 and President George Bush Turnpike), and the larger part of Irving and Las Colinas.

Figure 26 shows a similar analysis to the previous one, with the added qualifier promoting locations within a certain distance of an existing or planned rail transit line station. With rail lines shown in green and adjusting the color scale to only highlight areas with higher demand, those potential higher demand areas along the rail corridors come into better focus.

This analysis shows more confined areas of demand along US 75, the Dallas Midtown area north of IH 635, downtown Frisco, and the Sam Rayburn Tollway Legacy Area.

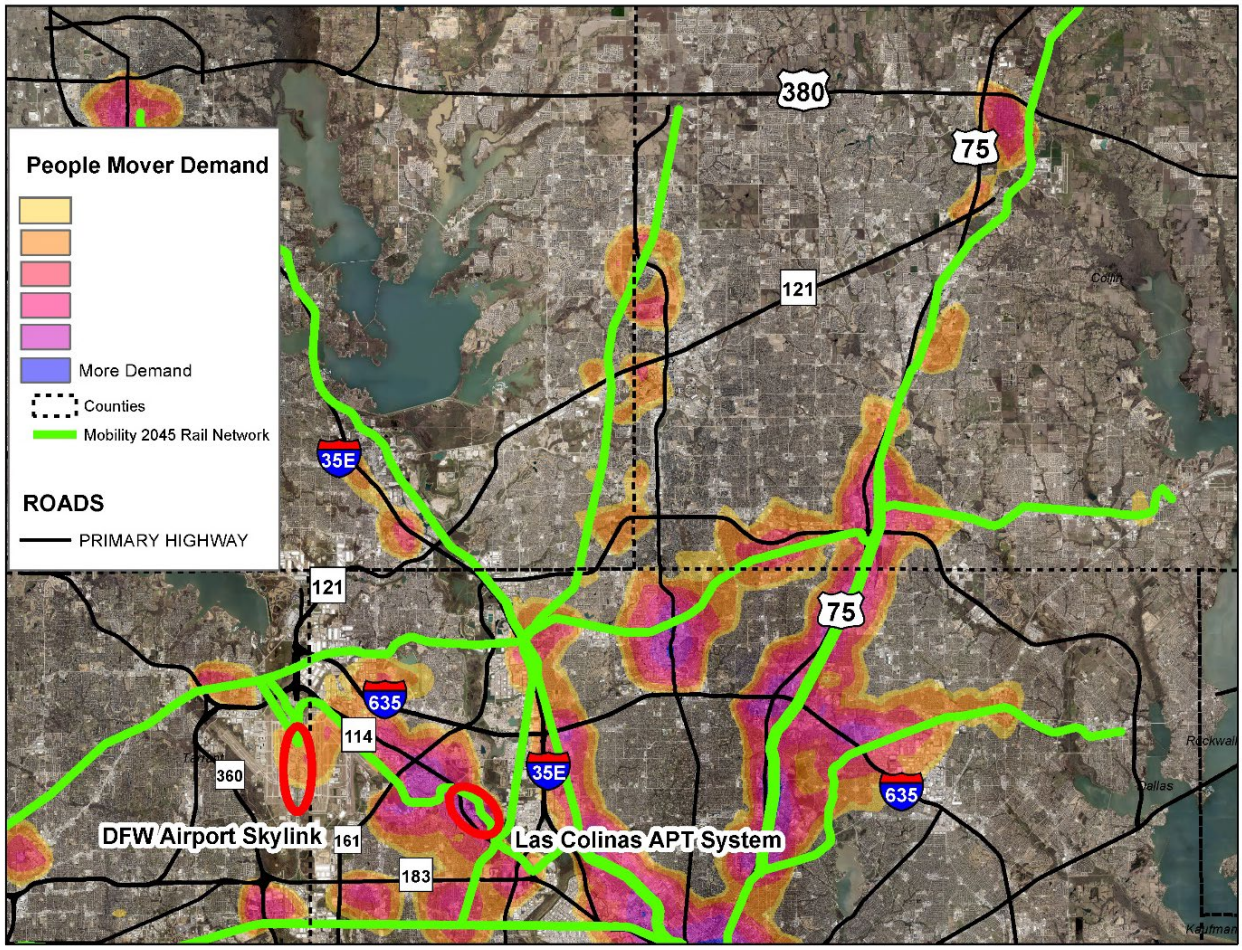


Figure 26: Mobility 2045 People Mover Demand Proximity to Transit Adjusted

In addition to the two existing ATS locations, the project team, in close coordination with the Project Advisory Committee, identified seven locations for further feasibility analysis. Below in Figure 27, these locations can be seen circled in red. All these locations were within a certain distance from existing or planned rail transit stations and exhibited certain characteristics, such as short trip density and population/employment densities that could be conducive for an ATS connection. For the Irving-to-Frisco Passenger Rail Corridor Study, the downtown Frisco Focus Area, the Legacy Focus Area, and the connection to the Las Colinas APT are reviewed in a more detailed feasibility analysis in the following section.

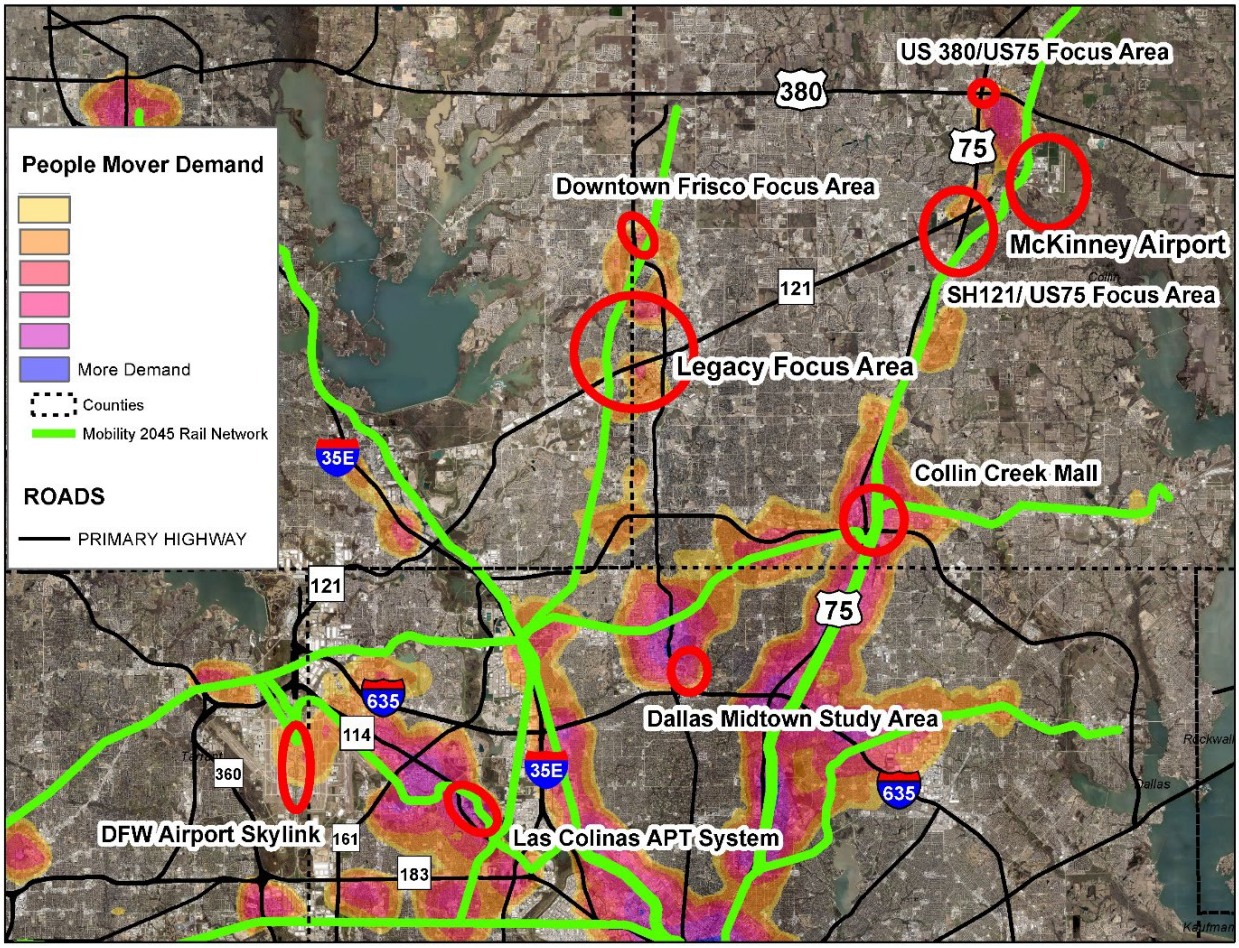


Figure 27: Identification of Potential Sites

Site and Feasibility Analysis

Las Colinas APT Retrofit

Figure 28 shows the Las Colinas APT System, in green, in proximity to existing and potential rail connections. This system has recently ceased current operations for the time being.

This location serves as a potential retrofit, as it is currently incorporating a monorail system. This is an opportunity to introduce next generation ATS technology on an existing guideway to serve the mixed uses existing in the area.

There is also an opportunity to connect the system from the South Las Colinas Station to the planned Frisco Line (blue), and the existing Dallas Area Rapid Transit Orange Line. As a part of this report, ridership modeling shows a significant increase in Las Colinas ridership coming from the Fort Worth leg of the Trinity Railway Express. An ATS connection with a station along this planned corridor, and with a planned station along the Orange Line, would further encourage ridership along these lines, reducing the number of transfers.

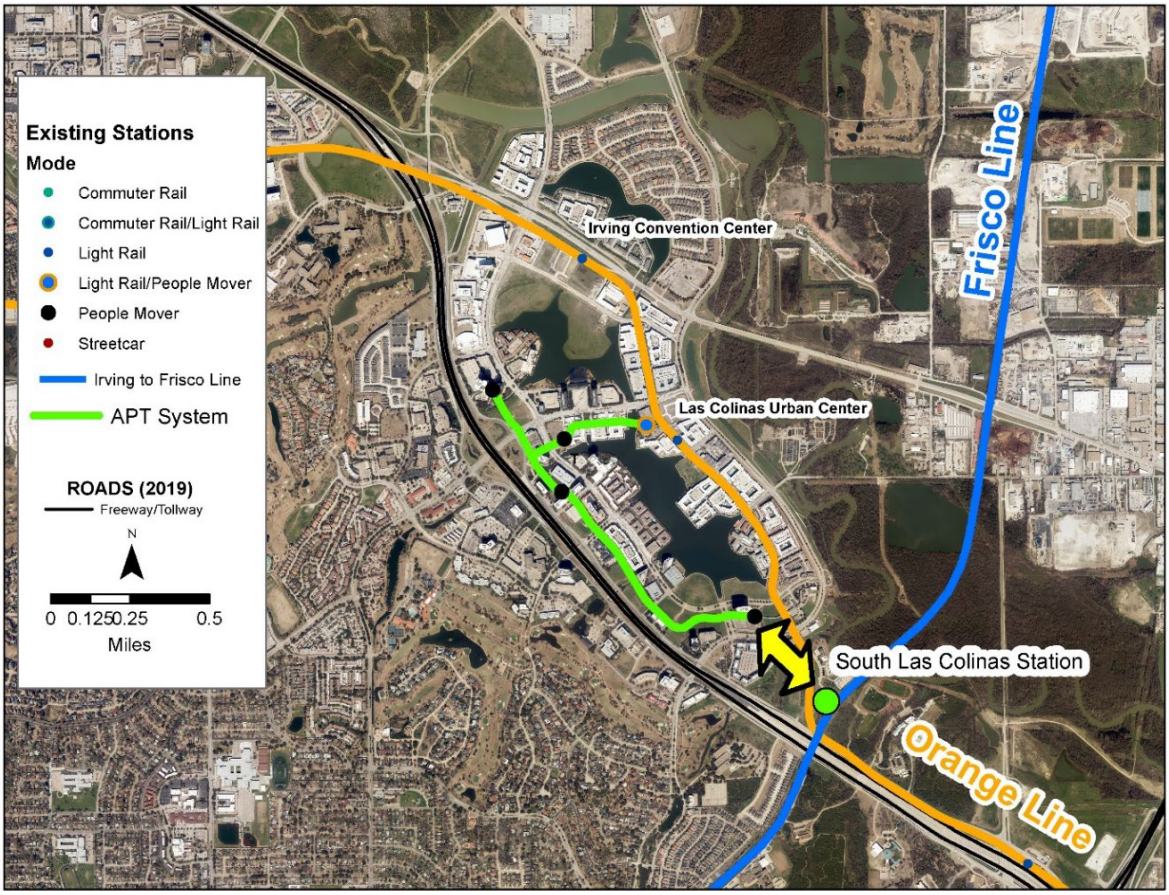


Figure 28: Las Colinas APT System Retrofit

As this site was already developed around an existing ATS, there was no need to employ the site-specific feasibility analysis tool used to understand the interactions of parking, transit connections, and population/employment densities. This site is considered feasible for an upgraded ATS with the connections and retrofit as described. Further efforts on parking consolidation and additional mixed uses to generate trips within the development would further encourage ridership on an upgraded system.

Sam Rayburn Tollway Legacy Area

Figure 29 pictures the Legacy/Star/Stonebriar area split into four different sites, with each site evaluated individually through a feasibility analysis based on its unique characteristics and demographics.

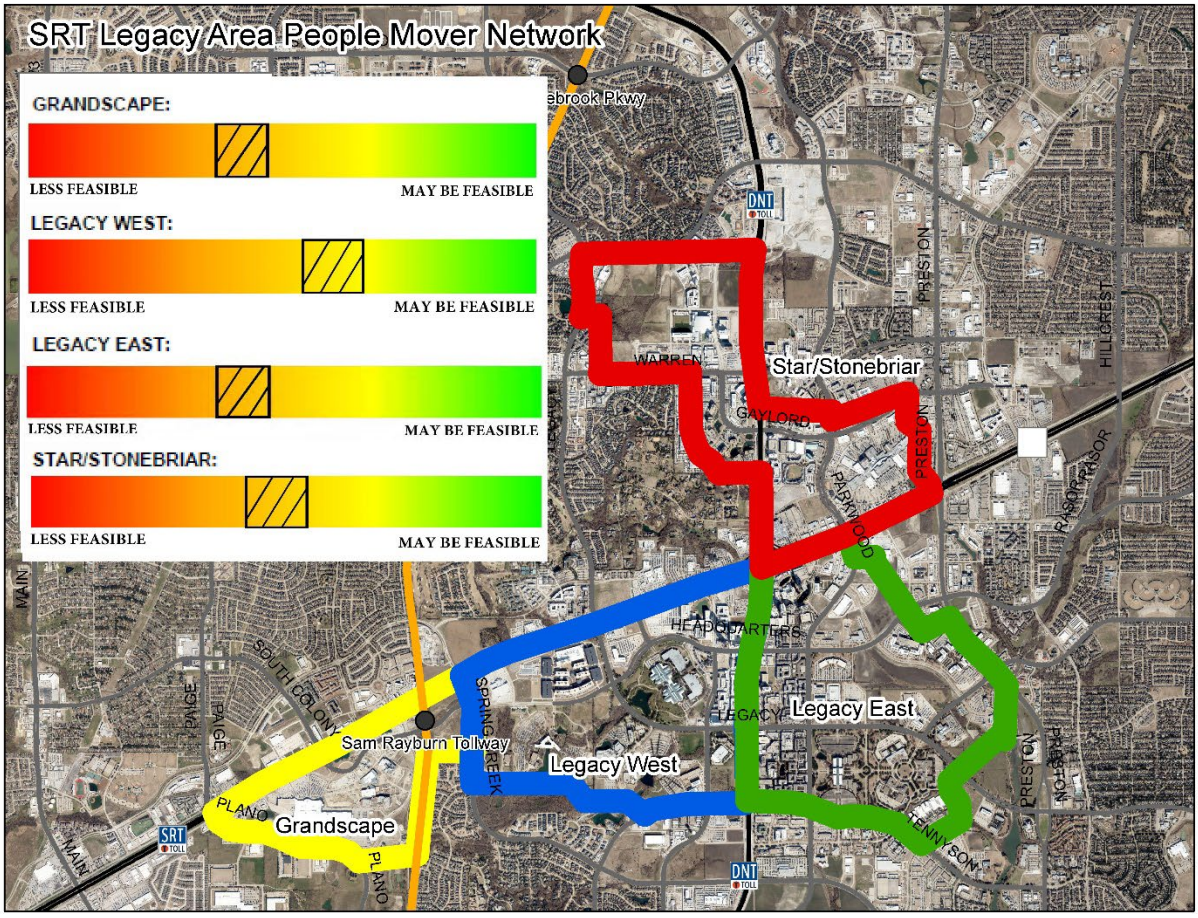


Figure 29: SRT Legacy Area Feasibility Results

Together, these areas have a significant pull on trips from around the region. There is a need, not only to get commuters to and from work, but also to provide circulation between all various

land uses within this focus area throughout the day. There is potential to create a couple connections to the planned Frisco corridor (in orange) via the Sam Rayburn Tollway (SRT) Station or Stonebrook Parkway Station.

Looking at the feasibility results, you will see a small variance between scores. Proximity to transit, as well as potential parking strategies, account for a majority of the variance. Parking strategy plays a big role in this location as there are currently many parking garages and a lack of consolidated parking. There is potential to repurpose existing garages and implement a development retrofit to include an ATS system. The ATS would circulate trips between consolidated garages and the surrounding land uses, as well as provide regional connections to the planned rail stations.

The scores, provided by the striped box on the bar of Less Feasible (red) to May Be Feasible (green), are a calculated range of values to provide context for understanding the feasibility of a site for an ATS. As previously stated, local jurisdictions provided helpful background data on population and employment densities, as well as existing and future land uses, to inform the analysis. The Legacy West and Star/Stonebriar areas seemed to fair the best throughout the analysis. Of all the Legacy Focus Area sites, Legacy West demonstrated the highest densities and development pattern to be conducive with an ATS. Lower scores in general, which are found on all sites reviewed throughout this study, can largely be contributed to lower population and employment densities region wide.

Downtown Frisco

In Figure 30, the downtown Frisco Area was outlined primarily with dense development in mind. This area offers access to sport events and close proximity to the Frisco CBD (Central Business District) Station on the Irving-to-Frisco line, in blue. A development retrofit with consolidated parking strategies would be necessary to provide a successful system to this area.

This site scored toward the lower end of all sites analyzed throughout the study, with population and employment densities being among the lowest reviewed. Although the Frisco CBD has good, planned connection to transit, it's not certain the currently projected lower population and employment densities would support an ATS.

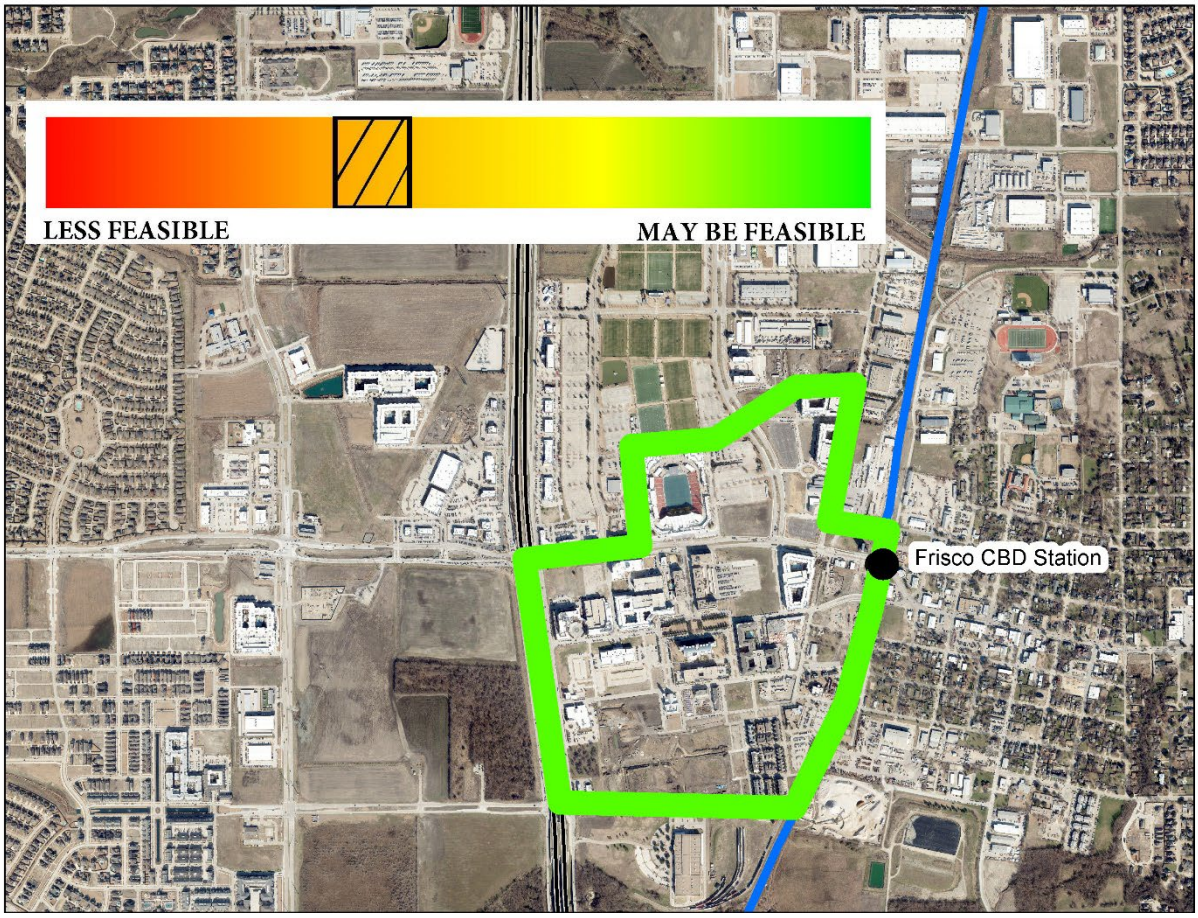


Figure 30: Downtown Frisco Feasibility Results

People Mover/Automated Transit System Summary

Sites the study deem more feasible for further study are the Las Colinas ATS retrofit, the Legacy West, and Star/Stonebriar area. Sites deemed less feasible are downtown Frisco, Legacy East, and Grandscape.

It is important to keep in mind this evaluation is a high-level development-based analysis for the potential to attract ridership. While many of these sites may warrant some sort of transit circulator/connection service, the basis of this evaluation was to review areas with more intense levels of activity that would ultimately require grade-separated service. Capital and operating costs were not considered in this evaluation.

Without careful planning, strategic parking consolidation, availability of the right mix of development uses, and attraction of higher population and employment densities, a grade-separated ATS will not be very successful in terms of ridership. The sites deemed more feasible

through this analysis still require additional planning to retrofit the existing infrastructure or development pattern to accommodate a successful ATS. Follow-up efforts from this analysis are recommended.

Funding Plans

Section Overview

Advancing a major transit project such as a Regional Rail line requires a major commitment to capital funding to address initial development and construction of the line and, equally important, the ability to fund maintenance and operations costs on an ongoing basis. In an area such as Collin County, where transit services are relatively limited, it is also critically important to consider the funding needed to develop a complementary transit network that can support and provide access and connectivity to a Regional Rail line. While it may be viable to develop a Regional Rail line with an initial emphasis on the use of park and rides to allow riders to effectively bring themselves to the service, facilitating a transition to one that focuses on TOD and connectivity for first/last mile connections by walking, biking, shuttles, and other means can leverage the investment and maximize the efficiency and effectiveness of the service. For the Irving to Frisco/Celina Regional Rail line, this study examines a range of potential funding sources, providing a 'menu' for consideration. Next is an examination of likely project costs and a preliminary set of alternatives for how project costs may be allocated by participating jurisdictions.

Potential Funding Sources

Four tables are provided below to show a range of funding sources potentially available from federal, state, local and other sources. Each source has strengths (such as consistency, scale of revenue stream, stability during economic downturns, public support, etc.) and weaknesses (such as volatility, risk level, political or public controversy, etc.) that need to be carefully considered when developing a detailed funding program at a later phase of project development. Equally important is the eligibility of the source to be used for capital, operating and maintenance costs. Some of the funding sources will carry restrictions on their use, or be of a limited timeframe, and those considerations also factor into the development of a funding program.

The Dallas-Fort Worth region has enjoyed significant success over several decades in attracting federal funding from the Federal Transit Administration (FTA) to support the development of its passenger rail system. Whereas federal funding sources in the past could constitute up to 80% of a project's capital costs, today that figure is generally below 50%, meaning that a strong reliance on other sources is required. The FTA and parent organization U.S. Department of Transportation (USDOT) manage a range of programs that may be able to serve as funding sources as shown in Table 4 below.

	Program	Description	Source of funds	Type of allocation	Allowable project types	Fiscal year (FY) 2019 funds available
Funding sources available for operating expenses *In general, the Federal Transit Administration (FTA) classifies operating expenses as costs necessary to operate, maintain, and manage a public transportation system to include driver salaries, fuel, and other items with a useful life of less than one year.*	FTA Urbanized Area Formula Grants (5307)	Funding for public transportation in urbanized areas (UZA) with populations of 50,000 or more. Distribution factors are more complex if population is less than 200,000. Eligible recipients are states or government authorities for one or more UZAs. Operating assistance for commuter rail is limited to: maintenance expenses; operating expenses in UZAs under 200,000 people; and security expenses (up to 1 percent of funds).	Highway Trust Fund	Formula	Capital, planning, job access and reverse commute, operations.	$5.3 billion
	FTA Rural Area Formula Program (5311)	Funding to states and Indian tribes for public transportation outside of urbanized areas, specifically areas with populations less than 50,000. Eligible applicants include states and Indian tribes. Eligible sub-recipients include a state or local government authority, a nonprofit organization, an operator of public transportation, or intercity bus service that receives Federal transit program grant funds indirectly through a recipient.	Highway Trust Fund	Formula	Capital, planning, job access and reverse commute, operations	$783 million (includes Rural Area Formula Grants, Tribal Transit Formula Grants, Tribal Transit Competitive Grants, and Appalachian Program Grants)
	Federal Highway Administration (FHWA) Congestion Mitigation and Air Quality Improvement (CMAQ) Program	Funding for transportation projects and other related efforts that contribute to air quality improvements and provide congestion relief in nonattainment or maintenance areas. Funds are distributed to states under the program. States that have no such designated areas still receive a minimum apportionment of funding for either air quality projects or other elements of flexible spending.	Highway Trust Fund	Formula	Capital, emissions reduction, operations, planning, and project development	$2.4 billion
	FTA Emergency Relief Program	Funding provided to states, territories, and transit agencies after a federally-declared emergency or disaster. Funding is given to public transportation agencies that have experienced serious damage to transit assets.	General Fund	N/A	Capital, operations	Based on need
Other available funding sources	Department of Transportation (DOT) Better Utilizing Investments to Leverage Development (BUILD) Transportation Grants	Funding awarded for surface transportation projects that have a significant impact in local and regional communities. Not more than 50 percent of FY 2019 funds could be awarded to projects in rural areas. In 2020, eligible applicants include state, local, and tribal governments, including transit agencies and other subdivisions of state or local governments. Previously known as the DOT Transportation Investment Generating Economic Recovery (TIGER) discretionary grant program.	General Fund	Competitive	Capital, planning	$900 million
	FHWA Surface Transportation Block Grant Program	Funding to states and localities for projects that preserve and improve conditions on any federal-aid highway, bridges and tunnels on any public road and transit capital projects, among other things.	Highway Trust Fund	Formula	Capital	$11.9 billion

	Program	Description	Source of funds	Type of allocation	Allowable project types	Fiscal year (FY) 2019 funds available
	FTA Capital Investment Grant Program (5309)	Funding to support the construction of new rail, bus rapid transit, and ferry systems, and to expand existing systems. Program includes four types of projects: New Starts, Small Starts, Core Capacity, and Interrelated Projects. States and local government authorities are eligible recipients.	General Fund	Competitive	Capital	$2.5 billion
	FTA State of Good Repair Grant Program (5337)	High Intensity Fixed Guideway funding distributes approximately 97 percent of the funds in this program for maintaining rail, bus rapid transit, trolleybus, and ferry systems. High Intensity Motorbus funding distributes approximately 3 percent of the funds in this program for bus service operated in high-occupancy vehicle lanes. FTA distributes funds to designated recipients in UZAs according to a statutory formula. Eligible recipients are states and local government authorities in urbanized areas with fixed guideway and high intensity motorbus systems in revenue service for at least seven years.	Highway Trust Fund	Formula	Capital	$2.9 billion

Source: GAO presentation of Congressional Research Service, DOT, FHWA, and FTA information. | GAO-21-355R

Table 4: Potential Federal Funding Sources

In addition to the potential funding sources identified, the USDOT also has several programs that can support project financing, with the difference being that the latter require payback, albeit over long timeframes and generally at very favorable rates relative to what can be found in the private lending market. Three such sources are listed in the table below.

Program	Description	Allowable project types
DOT Transportation Infrastructure Finance and Innovation Act (TIFIA)	Credit assistance for transportation projects of regional and national significance. Offers three types of financial assistance: direct loans, loan guarantees, and standby lines of credit.	Rehabilitation, capital, and planning.
DOT Railroad Rehabilitation and Improvement Financing (RRIF)	Direct loans and loan guarantees to finance the development of railroad infrastructure.	Rehabilitation, capital, planning, and refinancing.
DOT Private Activity Bonds (PAB)	Government-issued tax-exempt bonds used to finance certain projects that would otherwise be classified as "private activities." May also be issued for public transportation projects that receive TIFIA assistance.	Any surface transportation project receiving federal assistance under Title 23 of the U.S. Code, deals with highways and infrastructure finance.

Source: GAO presentation of Department of Transportation information. | GAO-21-355R

Table 5: Potential Federal Financing Sources

While historically the State of Texas has not played a major role in the funding of urban transit projects and programs in large metropolitan areas, there are several potential sources of funding that should be considered, including both grants and low-cost loans. Regional Mobility Authorities (RMAs), included in the list below, are created by the State of Texas and have the potential to be funding or financing partners for the development of a regional rail given their relatively broad legislative authority. However, given the existence of the North Texas Tollway Authority in the metroplex, any such partnership would need to be with that organization as the creation of a new RMA is not likely to occur. Other potential state-level options are shown below in Table 6.

State Funding	
State Infrastructure Bank Loans	Revolving loan fund that allows borrowers to access capital funds.
Transportation Reinvestment Zone	Captured ad valorem tax increments are set aside to finance transportation projects.
Regional Mobility Authority	Political subdivision formed by one or more counties to finance, acquire, design, construct, operate, maintain, expand, or extend transportation projects.
Transportation Development Credits	Federal funding tool that states can use to meet federal funding match requirements.

Table 6: Potential State Funding Sources

As noted above, in broad terms there has been an increased emphasis on the use of local funding over the past several decades, and consequently local governments have sought to expand the range of potential funding sources. For example, in Austin, Texas Capital Metro partnered with the City of Austin in 2019 to pass a major property tax-based assessment to fund its Project Connect System Plan, representing one of the first times that a Texas Metropolitan Transportation Authority (MTA) has been able to access this funding source rather than rely on the long-standing local sales tax for its primary revenue base. Table 7 shows several potential local funding sources that may be available.

Local Funding	
Transit Fare Revenue	Revenue earned from carrying passengers.
Sales Tax	Legal authority of local governments to impose a dedicated tax.
Local Contribution	Funds allocated to transit out of general revenue rather than a dedicated transit fund.
In-Kind Contribution	Non-cash assets or services that have value that benefits those outside the contributor's organization.
Non-Transit Related Revenue	Earnings received from investments, rental of buildings or property, parking fees, development fees.
Local Motor Vehicle Registration Fees	Flat rate fee or fee based on the vehicle value.

Table 7: Potential Local Funding Sources

Lastly, as local governments work to assemble a package of funding to enable projects such as Regional Rail to move forward, creative approaches are increasingly required. For this reason, a list of other sources of potential funding is shown below in Table 8. These funding sources are not sufficient on their own, and their applicability can vary based on local context, but they can represent a portion of a comprehensive funding package. One such source is value capture. Value capture strategies generate sustainable, long-term revenue streams that can help repay debt used to finance the upfront costs of building infrastructure, including transit projects.

Revenue from value capture strategies can also be used to fund the operations and maintenance costs of transit systems. Value capture strategies are public financing tools that recover a share of the value transit creates. Examples of value capture strategies used for transit include tax increment financing, special assessments, and joint development.[5]

Other Funding	
Auxiliary Transit Revenues	Advertisements on vehicles, fines for fare evasion.
Air Quality Surcharge	One-time charge of new vehicle based on the vehicles estimated lifespan.
Luxury Transportation Tax	Tax on yachts, private jets, and luxury vehicles that would help fund transportation.
Transit for Livable Communities	Funding for local areas to create station plans.
Value Capture	Capture future real estate values based on the enhancements from the project the fund construction.
Special Fuel Tax	Tax per volume of fuel sold rather than the cost of fuel.
Public Private Partnership	Collaboration between government and private sector that can be used to finance, build, and operate projects.
Tax Rate Election	Taxes that increase property tax to fund other projects.
University/Colleges	Partner with local university or college to fund transit.

Table 8: Other Potential Funding Sources

Project Cost Estimates

Building on the project team's national experience with the development of passenger rail systems, preliminary cost estimates were developed for the Irving to Frisco/Celina Regional Rail service. Three service scenarios were developed, and costs prepared for each, as shown in the table below.

Alt.	Limits	Length (Miles)	No. of Station Stops	No. of Vehicles	Total Project Implementation Cost (Year 2021 $M)	Cost/Mile ($M)
1	Downtown Irving to Downtown Celina	37.4	12	10	$1,553.0	$41.52
2	Downtown Irving to Downtown Prosper	31.0	11	8	$1,324.4	$42.72
3	Downtown Irving to Panther Creek Parkway in Frisco	27.9	10	7	$1,206.0	$43.26

Table 9: Preliminary Capital Cost Estimates

[5] Source: https://www.transit.dot.gov/valuecapture

As shown, the first alternative consists of the full Regional Rail corridor from Irving to Celina, the second assumes a northern terminus in Prosper, and the third in Frisco. Each alternative was examined in detail with factors such as the number and length of bridges, at-grade crossings, and other considerations that have cost implications taken into consideration. Service levels for all alternatives were assumed to be the same, with 20-minute peak period and 60-minute base headways (time between trains in each direction) on weekdays only. This level of service combined with an assumed average operating speed yielded the fleet (number of trains) requirements shown, logically with the longer service corridors requiring more trains to deliver comparable service. The trains are assumed to be modern diesel multiple unit (DMU) vehicles similar to what DART will be using to operate the Silver Line. Assuming current year costs, this analysis yielded total capital cost estimates ranging from $1.206B to $1.553B.

Along with the upfront capital costs, passenger rail service requires annual operations and maintenance costs. Thus, cost estimates were also prepared for this portion of the overall project commitment, as indicated in the table below.

Alt.	Limits	Length (Miles)	No. of Station Stops	No. of Vehicles	Total Annual Operating & Maintenance Cost
1	Downtown Irving to Downtown Celina	37.4	12	10	$24,251,000
2	Downtown Irving to Downtown Prosper	31.0	11	8	$20,101,100
3	Downtown Irving to Panther Creek Parkway in Frisco	27.9	10	7	$18,090,900

Table 10: Preliminary Operating and Maintenance Cost Estimates

The operating and maintenance costs were again driven by the operating assumptions and proposed level of service. Unit costs for each hour of service were derived from peer systems, resulting in a range of annual system costs from $18.01M to $24.25M per year in current year dollars.

Preliminary Cost Allocation by Jurisdiction

With an understanding of the preliminary capital, operations and maintenance costs in hand, a critical next step is to assess how those costs can be equitably and reasonably allocated amongst participating entities. Many communities join a transit agency or create an independent entity to enable participation in a transit project such as a Regional Rail line. Often the process of incorporation includes the development of either cost allocation principles, or the specific details regarding how each member entity is to share in the project cost. These approaches or methodologies are based on the unique geographic limits, development costs

and service being provided for the particular project. The following methodologies take these complex factors into consideration and provide context for the cost of the project and how it could be sustained by the entities receiving service, rather than a "typical" approach of how these projects are funded.

For this, it is helpful to begin by evaluating the context, which in the case of the Irving to Frisco line is relatively complex. Here are some of the relevant factors:

- Service To/From:
  - 3+ counties (depending on alignment and link with existing services)
  - Multiple cities and unincorporated areas traversed
- Dual Corridor Ownership:
  - Burlington Northern Santa Fe (BNSF)
  - DART
- Key Regional Connections:
  - DART LRT
  - TRE
  - DART Silver Line
- Key Local Connections at Each Station Area:
  - Local Bus Routes
  - First/Last Mile Connections (bike, walk, shuttle)
  - Microtransit
- Potential Timeframe:
  - To Be Determined

In addition to these factors highlighted above, there are several different methodological approaches that can be used to determine a preliminary estimate of cost sharing, each of which has advantages and disadvantages.

- Percentage of Alignment by Jurisdiction: Derived by measuring the percentage of the total alignment that falls within each jurisdiction and using that figure as a multiplier against the total project cost to get a pro rata share.
- Percentage of Stations by Jurisdiction: A second approach is to allocate costs based on the number of stations each jurisdiction has within its corporate limits.
- Percentage Based on Estimated Ridership by Jurisdiction: A third approach is to rely on the ridership modeling of the line to generate an estimate of the percentage of anticipated boardings that occur within each jurisdiction.

For the sake of developing high level costs associated with each community along the rail corridor to provide context for the magnitude of the investment, the project team only considered these three approaches in developing a cost sharing breakdown. While other methods including a combination of methods may end up being more amenable to all affected communities, the scope of this effort is to simply provide the context for the investment and generate further discussion and consensus building rather than spending the large effort likely required to actually reach a complex solution for an equally complex issue of cost sharing

amongst so many communities. The third approach was selected here because it relates most directly to the anticipated usage of the line by riders instead of the physical assets that comprise the line itself. Using this methodology, based on NCTCOG's well-established transportation modeling expertise, yields the figures shown in the two tables below.

City Name	Alternative #1		Alternative #2		Alternative #3	
	Percentage of Trip Origins	Capital Cost Allocation by City	Percentage of Trip Origins*	Capital Cost Allocation by City	Percentage of Trip Origins*	Capital Cost Allocation by City
Carrollton	7.8%	$121,091,000	7.9%	$104,266,000	8.2%	$98,486,000
Celina	5.0%	$76,977,000	4.0%	$53,499,000	3.2%	$38,459,000
Dallas	6.0%	$92,638,000	6.0%	$79,767,000	6.2%	$75,345,000
Farmers Branch	0.7%	$11,247,000	0.7%	$9,684,000	0.8%	$9,147,000
Frisco	36.4%	$564,890,000	36.7%	$486,405,000	38.1%	$459,438,000
Irving	14.3%	$221,679,000	14.4%	$190,879,000	14.9%	$180,297,000
Plano	12.5%	$194,173,000	12.6%	$167,195,000	13.1%	$157,926,000
The Colony	10.8%	$168,078,000	10.9%	$144,726,000	11.3%	$136,702,000
Prosper	6.6%	$102,197,000	6.6%	$87,998,000	4.2%	$51,060,000
Totals	**100.0%**	**$1,552,970,000**	**100.0%**	**$1,324,419,000**	**100.0%**	**$1,206,860,000**

*Alt 2 & 3 Trip Origin Percentages determined through station activity and interpolation. Further analysis required.

Table 11: Preliminary Capital Cost Allocations

	Alternative #1		Alternative #2		Alternative #3	
	Percentage of Trip Origins	O&M Cost Allocation by City	Percentage of Trip Origins*	O&M Cost Allocation by City	Percentage of Trip Origins*	O&M Cost Allocation by City
Carrollton	7.8%	$1,890,900	7.9%	$1,582,500	8.2%	$1,476,300
Celina	5.0%	$1,202,100	4.0%	$812,000	3.2%	$576,500
Dallas	6.0%	$1,446,600	6.0%	$1,210,600	6.2%	$1,129,400
Farmers Branch	0.7%	$175,600	0.7%	$147,000	0.8%	$137,100
Frisco	36.4%	$8,821,300	36.7%	$7,382,300	38.1%	$6,887,000
Irving	14.3%	$3,461,700	14.4%	$2,897,000	14.9%	$2,702,700
Plano	12.5%	$3,032,200	12.6%	$2,537,600	13.1%	$2,367,300
The Colony	10.8%	$2,624,700	10.9%	$2,196,500	11.3%	$2,049,200
Prosper	6.6%	$1,595,900	6.6%	$1,335,600	4.2%	$765,400
Totals	**100.0%**	**$24,251,000**	**100.0%**	**$20,101,100**	**100.0%**	**$18,090,900**

*Alt 2 & 3 Trip Origin Percentages determined through station activity and interpolation. Further analysis required.

Table 12: Preliminary Operations and Maintenance Cost Allocations

Clearly the costs, relative to the city budgets of the jurisdictions listed, are quite significant. While this is not necessarily surprising given that other large-scale public infrastructure projects also carry substantial, and in some cases, such as new highway expenditures, even higher costs, there are nonetheless some very challenging funding issues that will require resolution for the Irving to Frisco/Celina Regional Rail project to move forward. It should also be noted that the funding assumptions vary between those cities along the corridor that are already members of DART (Carrollton, Dallas, Farmers Branch, Irving, and Plano) and those that are not (Celina, The Colony, Frisco, and Prosper). Non-member cities that have not been allocating a one-cent share of their local sales tax to fund transit would, under this example, need to fully fund their proportionate share of project capital, operating, and maintenance costs. However, DART member cities that have allocated that amount to the transit agency would not be expected to make additional funds available, as their existing funding would be used towards to the project. In this or comparable funding scenarios, it is anticipated that the project would seek federal funding as well from one or more of the sources described in Table 4 above, which, based on past precedent, could substantially reduce the local funding required for the project to move forward (current estimates yield approximately 50% federal cost share of the capital improvements). Lastly, the scenario described above is just one possible approach, and this study is not recommending it as a preferred solution for the simple reason that more coordination and analysis is required prior to firming up details of this nature.

Implementation Strategies

Section Overview

One of the primary instigators for this study effort is to work with stakeholders to determine a path forward towards implementation. As one of the fastest growing counties in the country, with a clear and growing set of mobility challenges, it is apparent that there is simply no way to "build your way out of congestion" in Collin County. As one component of a balanced, multimodal transportation network, the Irving to Frisco/Celina Regional Rail project has strong potential to become a 'backbone' element, providing congestion-proof mobility within and beyond the county line. However, even if there were unanimous support for the concept of this Regional Rail line moving to implementation and operation, several challenges require resolution before this can happen. This section, focusing on implementation strategies, seeks to begin the process of finding answers to allow the project to advance.

Determining Project Stakeholders and Roles

In examining the project and through a series of discussions with the Project Advisory Committee, the project team developed a list of probable project stakeholders depending on the implementation path forward. This list includes local governments, transit authorities, county governments, the BNSF, regional entities (primarily NCTCOG), the State of Texas, and the

USDOT. The number and diversity of stakeholders and potential project participants is not unusual for a very large metropolitan area like Dallas-Fort Worth, however, that does not lessen the complexity involved in working to bring these groups together and seeking a shared understanding of the need for the project and a path to move towards implementation.

The project team also identified potential roles that these stakeholders may play in project development. These include funder, collaborator, service provider, FTA grantee (to be eligible to apply for and receive federal funding), and capital cost project partner (to share in capital costs for the corridor). The following graphic brings together these potential project partners and their possible roles.

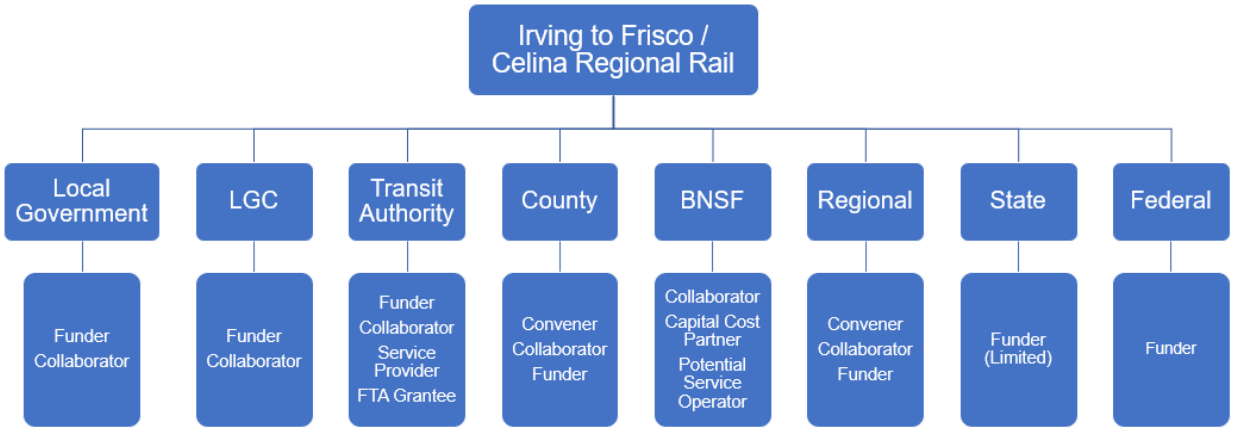


Figure 31: Potential Roles and Responsibilities

Another option beyond existing partners is to form a new organization to help advance the project effort. In this case, the project team examined several options including the creation of a new transit agency to take on a leadership role as well as other possible organizational structures. However, because the Regional Transportation Council at NCTCOG has made clear that there is strong support to retain the existing transit governance structures and existing organizations as the model going forward, the idea of a new transit organization was set aside. Following that analysis, and with knowledge of the success of somewhat similar efforts within the region using a legislatively created structure (see https://statutes.capitol.texas.gov/Docs/TN/htm/TN.431.htm) known as a Local Government Corporation, or LGC, the project team examined that approach for applicability here. LGC's have been used by the City of Mesquite and DART to successfully facilitate the development and ongoing operation of transit service. With a proven track record and existing legislative authority, LGC's are organizational structure that may play a key role in implementation, as discussed in more detail in the following section.

Implementation Models

Given the myriad challenges associated with developing Regional Rail line that extends across multiple jurisdictions, the project team examined a range of potential approaches for consideration. After this review, three approaches were identified for comparison. First, because the level of interest and financial capacity among local jurisdictions vary considerably, the idea of one or several local governments seeking to initiate the project independently emerged. Second, as mentioned in the preceding section, the use of a LGC was also identified. And third, perhaps the most obvious approach of joining an existing transit authority (DART or DCTA) was selected. While recognizing that other hybrid models may exist and while it may be possible that new funding, governance and/or implementation mechanisms are created in a future state legislative session, the three governance structures identified above are used here to compare and contrast different approaches and provide insight into their pros and cons. To that end, these three options were graded using a simple three-level rating based on seven criteria supporting successful project advancement, including the following:

- Coordinated Approach: Given the complex governance structure along the corridor, this factor assesses how the governance entity(ies) supports a coordinated approach that can mitigate many challenges that arise during project planning and development.
- Consistency with RTC Policy: This criterion gauges each approach for compliance with RTC policy, including a commitment to not adding additional transit agencies or authorities within the NCTCOG area.
- Rail Network Integration: To maximize the value and utility of a new rail line in the region, governance structures that best support a comprehensive approach with existing and other planned rail corridors are preferred.
- Compatible with BNSF Requirements: As an owner of a substantial portion of the corridor and a private enterprise, BNSF and compatibility with its interests play an important role in influencing the type of governance structure established. For instance, BNSF is not amenable to dealing with more than one entity in coordination of operations, financing maintenance activities, etc.
- Ease of Initial Implementation: This factor considers how the governance approach affects the ability to move from concept to service implementation in a timely fashion.
- Flexible Funding Sources: Here the assessment connects the governance approach to funding flexibility, which can be a factor in project advancement. An instance of a somewhat inflexible funding source may be sales tax given the state cap and many cities current use of sales tax.
- Long-Term Stability: Regional Rail services require long-term funding, and this factor weighs the role of the governance approach in achieving that objective.

These are shown in the table below.

	Local Government Annual Operating Budget (Independent Action)	Local Government Corporation (In Coordination with Existing Transit Agency)	Existing Transit Authority Membership – *DART or DCTA*
Coordinated Approach	☹	☺	☺
Consistency with RTC Policy	☹	😐	☺
Rail Network Integration	☹	😐	☺
Compatible with BNSF Requirements	☹	☺	☺
Ease of Initial Implementation	☹	☺	☹
Flexible funding sources	😐	☺	😐
Long-term Stability	☹	☹	☺

Table 13: Potential Implementation Strategies

The idea of local governments acting independently is, as the numerous 'sad faces' indicate, very unlikely to lead to a successful outcome. In addition to the perhaps obvious finding that no single city can carry a multijurisdictional project like Regional Rail, the BNSF has also made it clear in communications with the project team that they require a coordinated approach such that they only have formal relationships with one coordinating entity. Even if there were several local jurisdictions that separately agreed to fund and operate the project, the lack of coordination, continuity, and certainty make this alternative a non-starter.

In contrast, the use of a LGC has potential to address the shortcomings of the 'go it alone' approach by fostering coordination, meeting BNSF requirements, offering a relatively straightforward path to implementation and providing for funding flexibility through the ability to generate revenue through taxing authority. Of the two 'flavors' of LGCs – those created by municipalities and those created by Metropolitan Transit Authorities – the latter is advantageous as it brings with it a clear amount of buy-in from the entity that is likely to be the service provider and operator of the Regional Rail service.

The third option – membership in an existing transit authority – has many advantages as indicated in the table, meeting or exceeding almost all the identified metrics for success. However, that option, as has been the case for decades, is handicapped by state law that establishes a hard cap on the total amount of local sales tax that can be collected within a municipality. All non-DART member jurisdictions along the Irving to Frisco/Celina Regional Rail corridor (Celina, Prosper, The Colony and Frisco) have committed at least a portion of the one-percent sales tax that is required by state statute to be approved by voters for joining a transit authority to other needs. That means that the only way they could join a transit authority would be by means of two votes of their constituents, the first to rescind the existing tax occupying some or all of the one percent, and a second to approve a replacement (or possibly higher) full

one percent tax to go towards membership in the transit authority. While this is technically possible, in reality it is very difficult and unlikely in the near term. Therefore, while transit authority membership remains a 'gold standard' for supporting the advancement of new transit programs and projects with a substantial and near-permanent funding stream, it also remains elusive in the near term due to the constraints described above.

Summary of Results and Next Steps

Advancing a major transit capital project like a new Regional Rail service represents a very substantial undertaking for any region in the U.S., even a large and rapidly growing one like the Irving to Frisco corridor. Adding to the complexity here is the dual ownership status, with DART owning the southern section and BNSF the middle and northern sections, along with the many communities and multiple counties that the corridor traverses. Finally, the unavoidable issues relating to governance and funding are, as in almost every new passenger rail project, challenging to address both in terms of the upfront funding needed for project development and a reliable ongoing funding stream required to support operations and maintenance.

Despite these challenges, the presence of an existing rail corridor in a high growth corridor like Irving to Frisco/Celina represents a major opportunity to establish long-term, congestion-proof, high-capacity mobility and connectivity that promotes and supports economic development, access to jobs and opportunity for residents with environmental and community benefits. With the ability to catalyze development and foster mode shift to transit, a Regional Rail line in the corridor has the potential to help Collin County and surrounding areas along the corridor manage congestion as well.

Two Potential Approaches

To advance the project, two primary approaches were developed through a combined effort of the project team and the Project Advisory Committee.

'Traditional' Passenger Rail Development Process

The first, more traditional, approach is to pursue project development using primarily a combination of federal and local funding while seeking to maximize private sector engagement to the degree possible. This approach, used successfully by DART and DCTA for passenger rail projects, generally results in a "full-build" outcome under which the full corridor is planned and engineered to accommodate relatively high levels of service that can meet mid to long term ridership demand. While not all stations envisioned in an ultimate build-out scenario may be developed initially, and the level of service may be scaled with the intention of ramping up over time, this approach still will in most cases necessitate a major capital investment program ranging from the hundreds of millions of dollars to billions of dollars in initial costs.

With this approach and the higher initial investment requirements, the timeline and complexity of project development is naturally longer, both for due diligence and proper project management and execution, but also to work within the structure of the FTA's program requirements. As a result, it is not unreasonable to expect that a major regional rail corridor development program may take up to 10 years or longer from initial concept to actual service initiation. The graphic below summarizes the pros and cons of this approach.

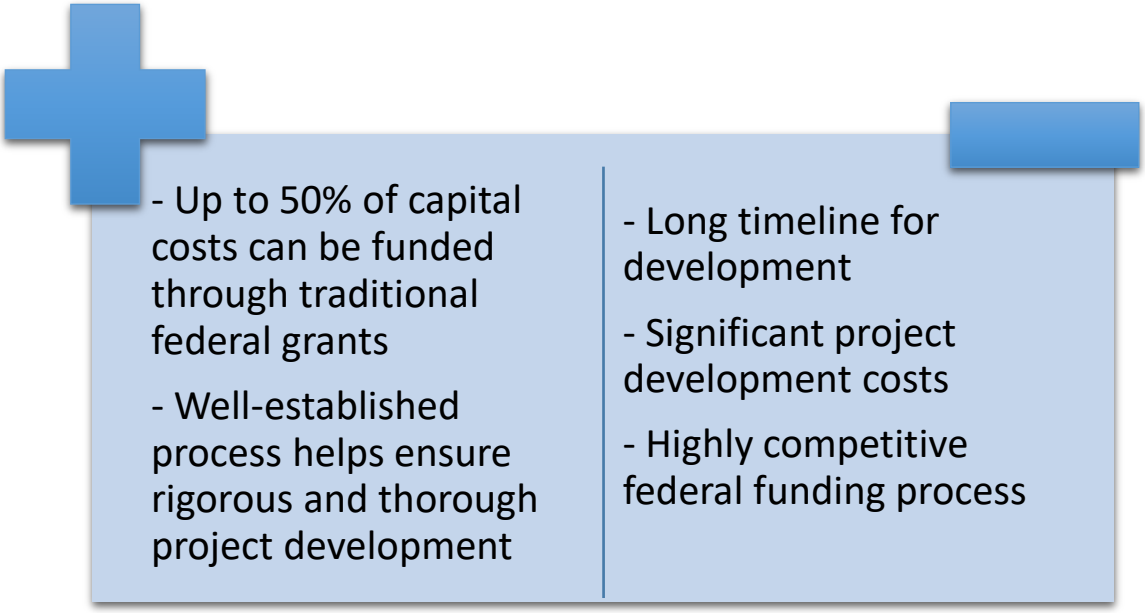


Figure 32: Pros and Cons of Traditional Project Development Approach

'Supply Side' Teaming Approach

As an alternative, close coordination with BNSF and DART may be able to yield a 'supply side' approach to the provision of passenger rail service in the Irving to Frisco/Celina corridor. The premise behind this approach is to coordinate with BNSF to identify gaps and service windows where passenger rail may be able to be 'inserted' into the rail corridor without major disruption to existing freight rail operations. Additionally, partnership with the BNSF to strategically identify and implement additional track capacity in key locations could mutually benefit freight operations and passenger movements by creating those opportune service windows. In such a scenario, the resulting service structure could be substantially different than a traditional approach that would focus on delivering work trips during the typical a.m. and p.m. peak periods each weekday (of course, the evolving nature of commuting post-pandemic has reduced travel volumes during these peak periods in the near term, with longer term impacts yet to be determined).

Instead, a 'supply side' approach could focus on special event services, such as to sporting events (for example, Capital Metro's Red Line commuter rail service in Austin has partnered with the local Major League Soccer team to build a rail station directly adjacent to the station and are planning to offer substantial service to provide access to the stadium that also has very limited parking). Another area where a 'supply side' oriented service could focus is on weekend service. By targeting recreational and work trips on weekends, there may be potential to attract trips in both directions (which increases operational efficiency) as shopping, event, and other destinations are developed in station areas. Both approaches are typically more compatible with freight rail operations than 'traditional' Regional Rail service on weekdays in the peak periods. However, in terms of generating ridership and delivering cost-effective service, these approaches are less proven.

Importantly, the 'supply side' approach is not incompatible with the 'traditional' approach and could be a precursor by demonstrating the value and benefits of Regional Rail in the corridor to the community and attracting a broader base of riders than the somewhat narrower focus on weekday commuters that characterizes most passenger rail services of this type. Pros and cons of the 'supply side' approach are summarized below.

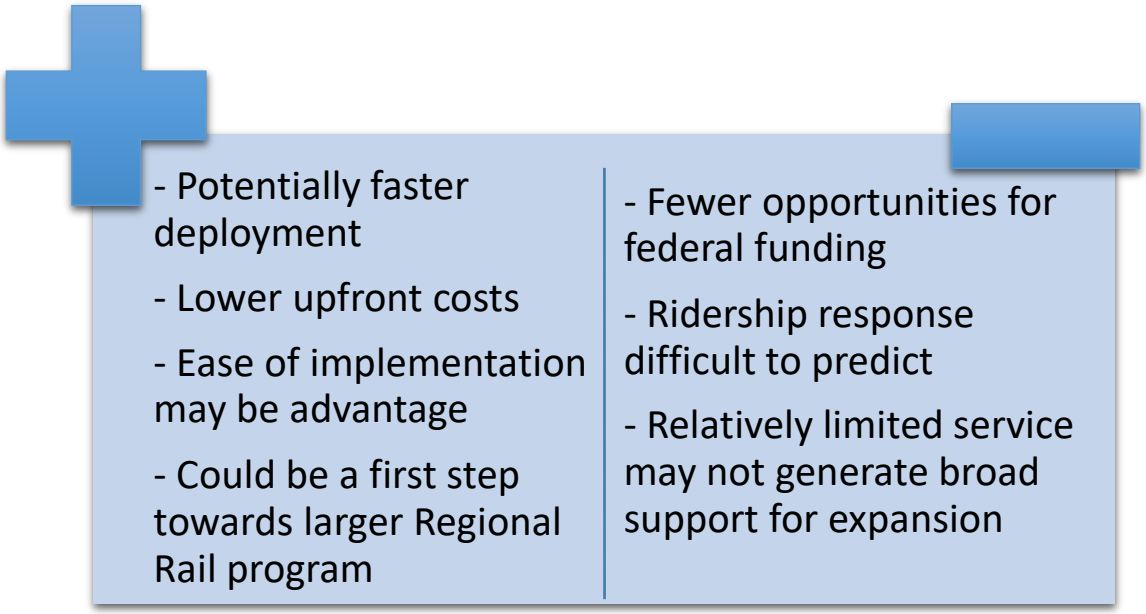


Figure 33: Pros and Cons of Supply Side Approach

PAC Study Consensus

Through the course of the planning effort, the PAC's knowledge of the opportunities and challenges in developing a Regional Rail project increased, and accordingly their input into clarifying a preferred direction grew. At the PAC's final meeting on August 17, 2021, the group discussed the alternatives available and coalesced around three key points:

1. Confirming the need for ongoing coordination between stakeholders to move forward.
2. Supporting a supply side approach/partnership exploration with BNSF and initializing follow-on efforts with TxDOT and BNSF to advance passenger rail on the corridor.
3. Including appropriate study findings in the long-range Metropolitan Transportation Plan, including:
    a. Consideration of interlining with the west leg of TRE; and
    b. Extension of the corridor north to Celina as a part of the long-range vision for corridor development.

In summary, this analysis suggests that the need for Regional Rail in the Irving to Frisco corridor is less a matter of "if" than "when". The rapid and ongoing growth that Collin County and surrounding areas face for the foreseeable future point to a need for a more diverse mobility portfolio with a critical need being the development of high-quality, reliable, and attractive alternatives to travel by automobile. It is clear that auto travel will continue to be the dominant mode, but as has been repeatedly shown, there is simply no way to avoid crippling congestion as metropolitan areas grow without investing in and planning for a future with more options for walking, biking, and transit use.

Appendices

A. List of PAC Members
B. List of PAC Meeting Dates
C. Table of Model Runs
D. Alternative Demographics Analysis
E. Irving to Frisco/Celina Rail Corridor: Station Land Use Analysis Draft Report
F. TOD Best Practices Report
G. Multimodal Network Map
H. Irving to Frisco College/University Interest Survey Responses

APPENDIX A: LIST OF PAC MEMBERS

Agency	First Name	Last Name	Job Title
BNSF	DJ	Mitchell	
BNSF	Megan	Shea	
BNSF	Paul	Cristina	
Carrollton	Tom	Hammons	Transportation Division Manager
Celina	Andy	Glasgow	Assistant Director of Engineering
Celina	Dusty	McAfee	Development Services Director
Celina Representative	Abra	Nusser	Kimley Horn Consultant
Collin County	Clarence	Daugherty	Director of Engineering
Collin County	Susan	Fletcher	Commissioner (Precinct 1)
Colony	Ron	Hartline	Director of Engineering and Planning
Dallas	Gus	Khankarli	Assistant Director of Transportation
Dallas County	Micah	Baker	Senior Transportation Planner
Dallas County	Minesha	Reese	Transportation Planner
DART	Bonnie	Murphy	Vice President, Commuter Rail
DART	Hans-Michael	Ruthe	Project Manager I/Service Planning
DART	John	Hoppie	Project Manager
DCTA	Tim	Palermo	Senior Regional Planner
Denton County	Shannon	Joski	Director of Administration
Denton County	John	Polster	Transportation Consultant
Farmers Branch	Shane	Davis	Director of Sustainability and Public Health
Farmers Branch	Tina	Firgens	Director of Planning
Frisco	Brian	Moen	Assistant Director of Transportation
Frisco	Kerin	Smith	Senior Traffic Engineer
Frisco	Paul	Knippel	Director of Engineering
Irving	Chris	Collier	Traffic Engineering Manager
Irving	Dan	Vedral	Traffic and Transportation Director
Irving	Melissa	Baker	Transportation Planner
Plano	Drew	Brawner	Senior Planner - Mobility
Plano	Robert	Saylor	Senior Transportation Engineer
Prosper	Alex	Glushko	Planning Manager
Prosper	David	Fenton	Civil Engineer

List of Temporary/Replaced Members on Committee

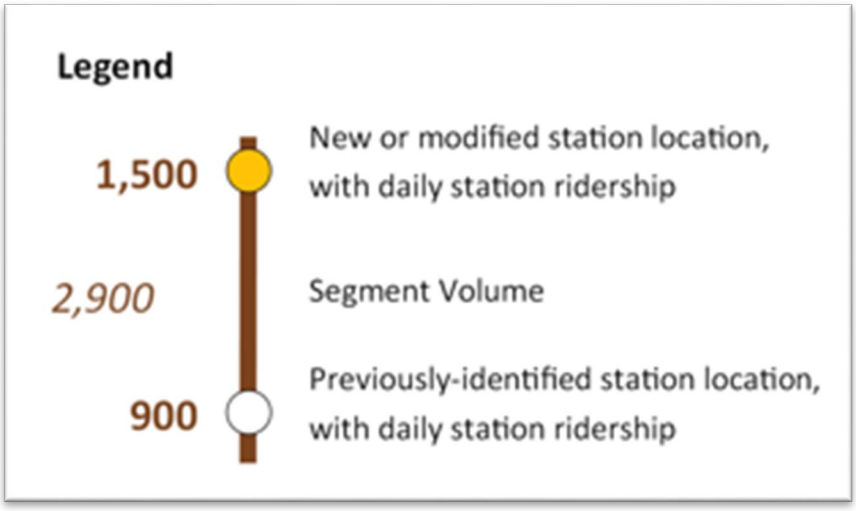
Agency	First Name	Last Name	Job Title
Dallas	Mike	Rogers	Director of Transportation
DCTA	Lindsey	Baker	

APPENDIX B: LIST OF PAC MEETING DATES

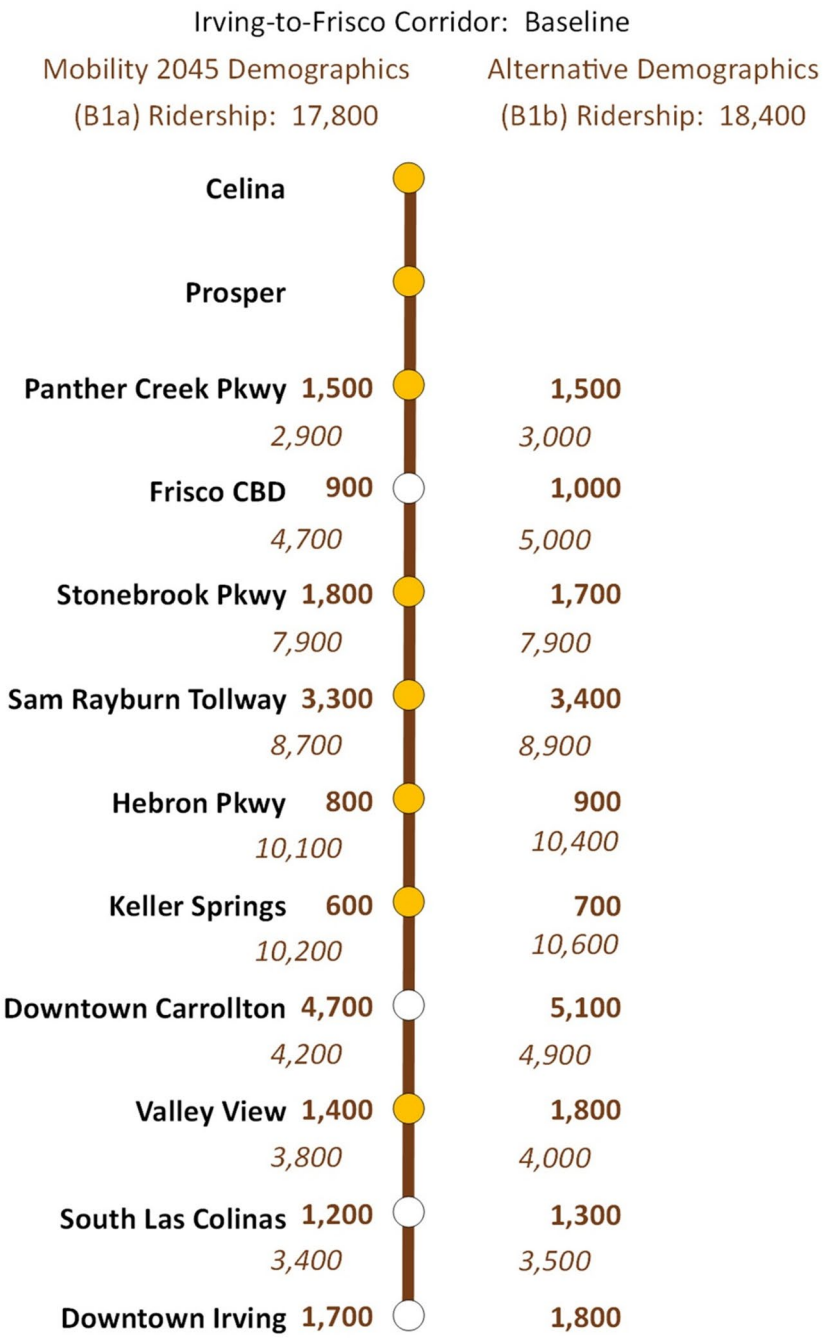
Irving to Frisco Passenger Rail Study
5/21/20
6/18/20
8/6/20
9/17/20
10/15/20
12/17/20
1/21/21
4/15/21
5/20/21
6/17/21
8/17/21

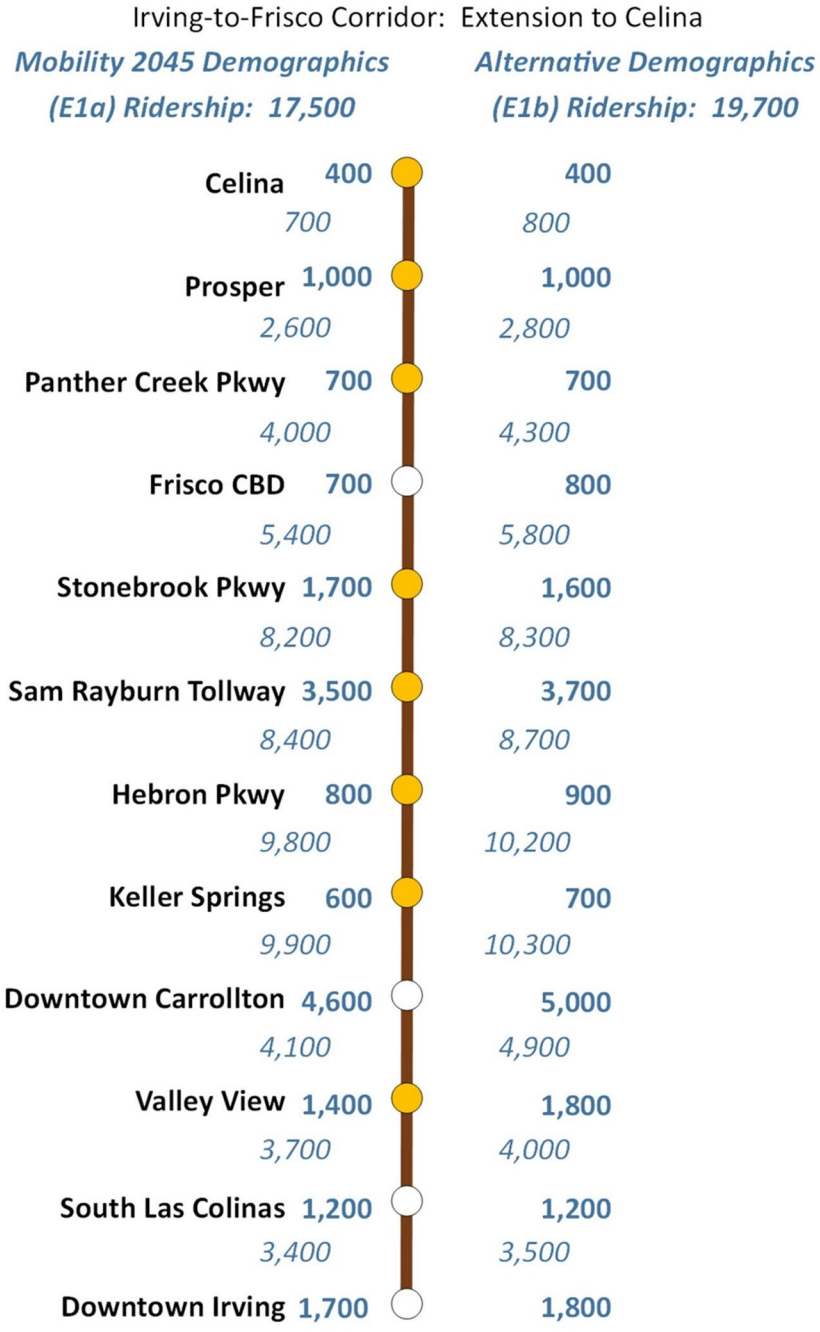
APPENDIX C: TABLE OF MODEL RUNS

Scenario Family	Name	Description
Baseline	B1a	Service from Irving to Frisco; updated stations; Mobility 2045 Demographics
	B1b	Service from Irving to Frisco; updated stations; Alternative Demographics
Extension	E1a	Service from Irving to Celina; updated stations; Mobility 2045 Demographics
	E1b	Service from Irving to Celina; updated stations; Alternative Demographics
Interlining	I1a	"Max": Service from Celina to T&P, Celina to Union, and T&P to Union (TRE); Mobility 2045 Demographics
	I1b	"Max": Service from Celina to T&P, Celina to Union, and T&P to Union (TRE); Alternative Demographics
	I2	Service from Celina to T&P, South Irving to Union; Demographics TBD
Phasing	P1	Service from Irving to Frisco, Prosper or Celina; omit one or more low-ridership stations; Demographics TBD
	P2	Service from Irving to Frisco, Prosper, or Celina; omit one or more low-ridership stations; Demographics TBD
	P3	Service limits TBD; Demographics TBD; consolidated recommendations for "phased" implementation based on P1 and P2

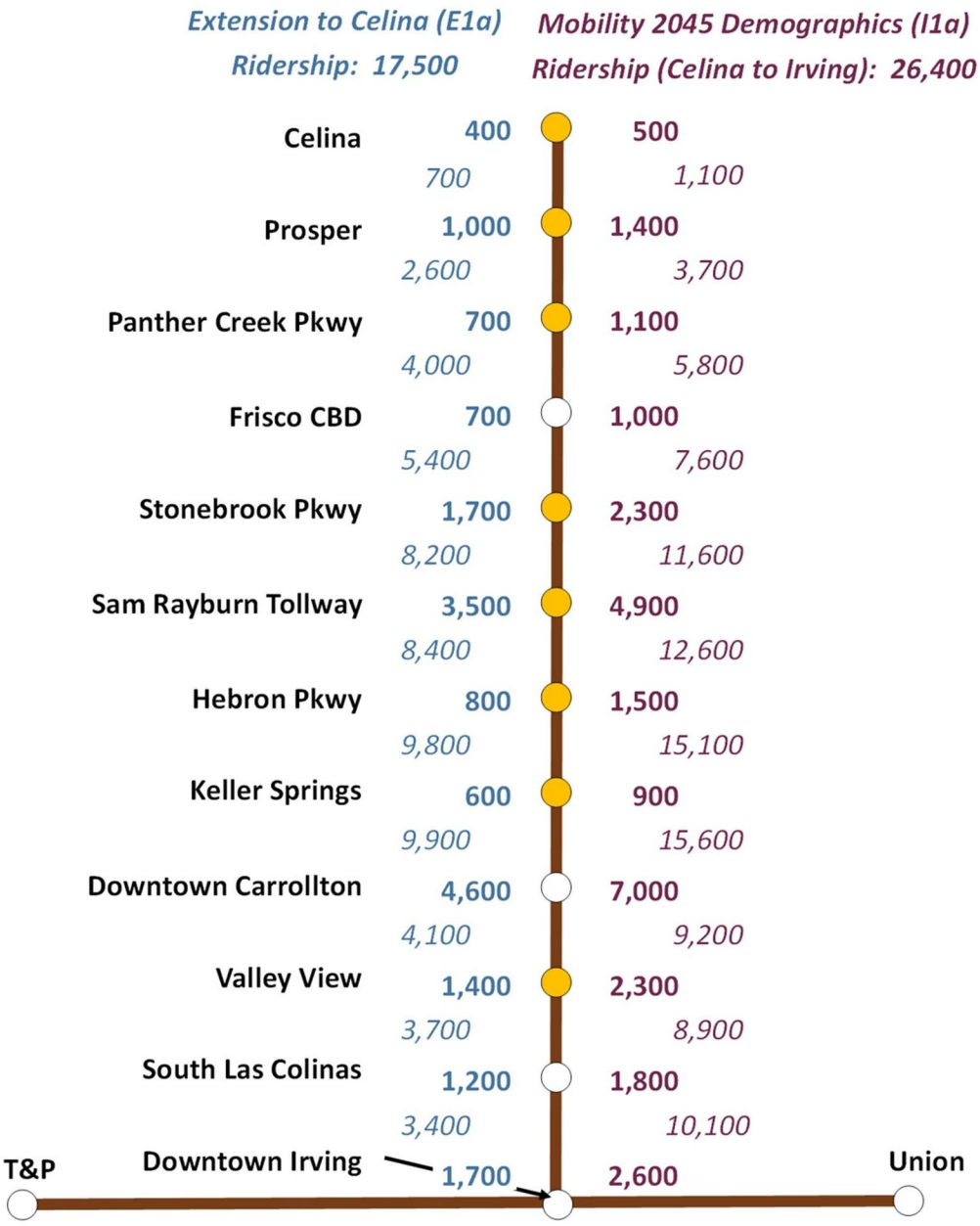


Note: The Legend above applies to each of the six graphics shown on the following pages.

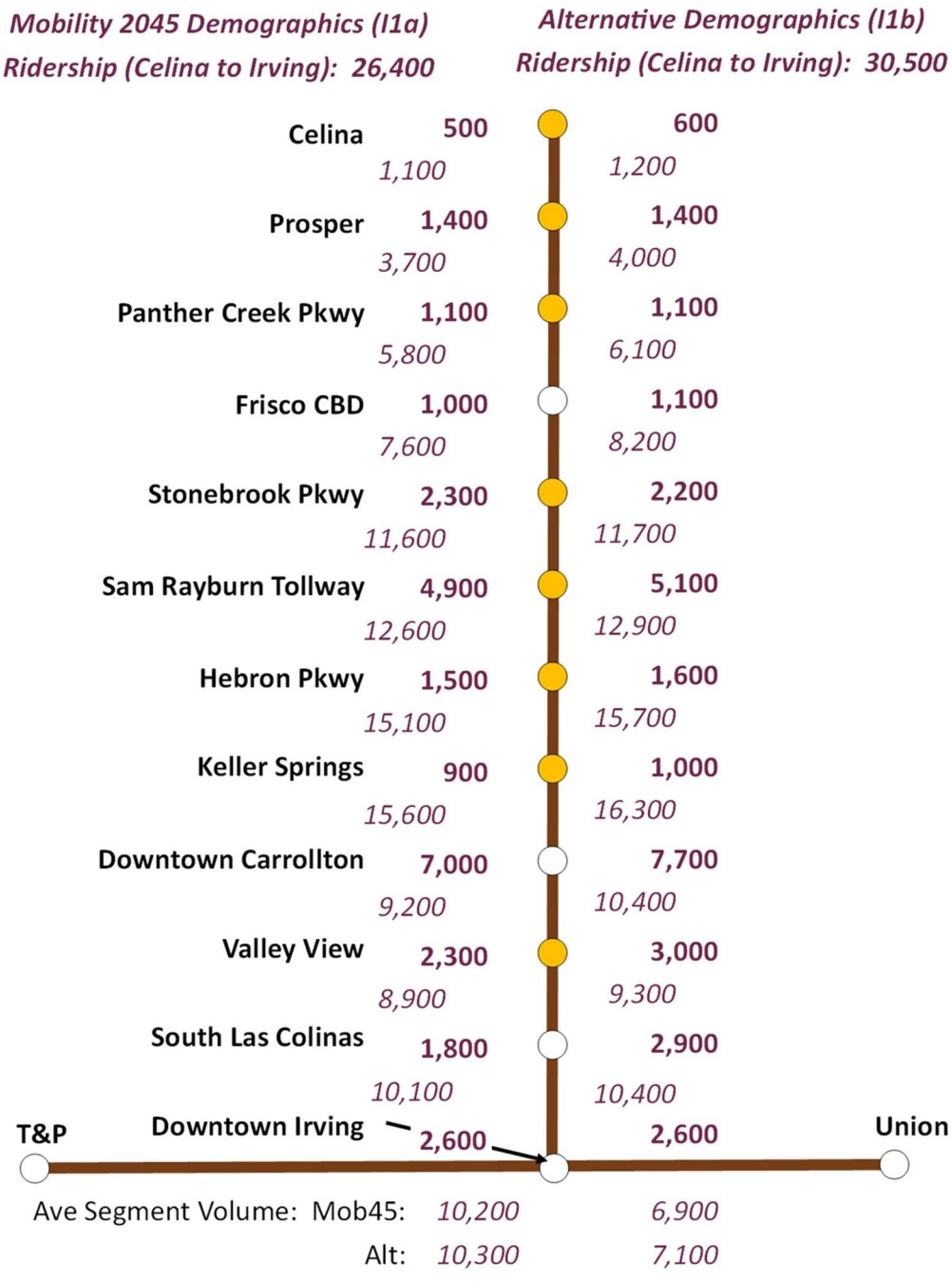

Irving-to-Frisco Corridor: Baseline
Mobility 2045 Demographics
(B1a) Ridership: 17,800
Alternative Demographics
(B1b) Ridership: 18,400
Celina
Prosper
Panther Creek Pkwy 1,500
2,900
1,500
3,000
Frisco CBD 900
4,700
1,000
5,000
Stonebrook Pkwy 1,800
7,900
1,700
7,900
Sam Rayburn Tollway 3,300
8,700
3,400
8,900
Hebron Pkwy 800
10,100
900
10,400
Keller Springs 600
10,200
700
10,600
Downtown Carrollton 4,700
4,200
5,100
4,900
Valley View 1,400
3,800
1,800
4,000
South Las Colinas 1,200
3,400
1,300
3,500
Downtown Irving 1,700
1,800


Irving-to-Frisco Corridor: Extension to Celina
Mobility 2045 Demographics
(E1a) Ridership: 17,500
Alternative Demographics
(E1b) Ridership: 19,700
Celina 400 700 400 800
Prosper 1,000 2,600 1,000 2,800
Panther Creek Pkwy 700 4,000 700 4,300
Frisco CBD 700 5,400 800 5,800
Stonebrook Pkwy 1,700 8,200 1,600 8,300
Sam Rayburn Tollway 3,500 8,400 3,700 8,700
Hebron Pkwy 800 9,800 900 10,200
Keller Springs 600 9,900 700 10,300
Downtown Carrollton 4,600 4,100 5,000 4,900
Valley View 1,400 3,700 1,800 4,000
South Las Colinas 1,200 3,400 1,200 3,500
Downtown Irving 1,700 1,800

Irving-to-Frisco Corridor Transit Alternatives with Alternative Demographics



Irving-to-Frisco Corridor Transit Alternatives with Alternative Demographics



Corrected baseline (stations and flow) and baseline max stations

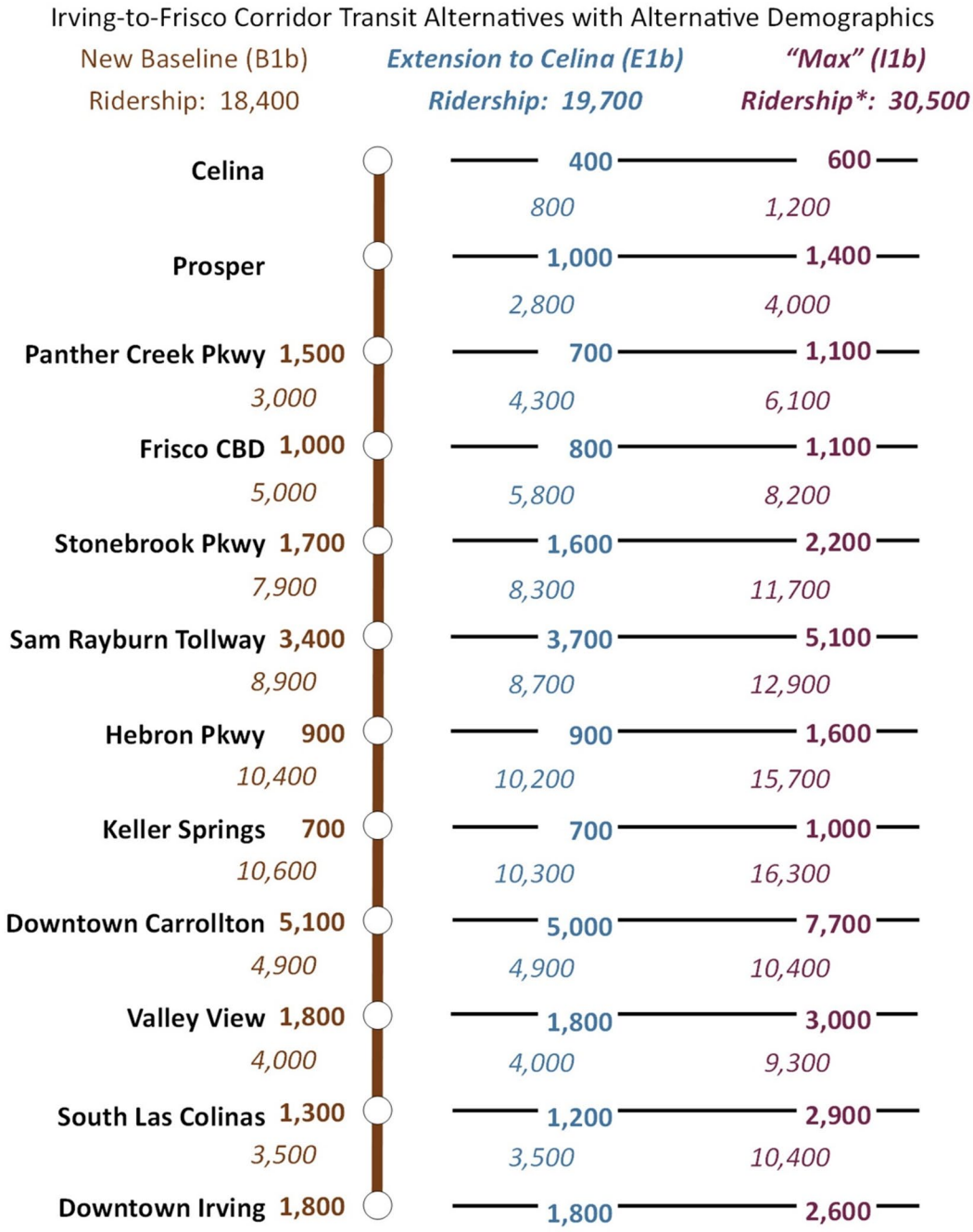
Irving-to-Frisco Corridor Transit Alternatives with Mobility 2045 Demographics

	New Baseline (B1a) Ridership: 17,800	*Extension to Celina (E1a) Ridership: 17,500*	*"Max" (I1a) Ridership*: 26,400*
Celina		400	500
		700	1,100
Prosper		1,000	1,400
		2,600	3,700
Panther Creek Pkwy	1,500	700	1,100
	2,900	4,000	5,800
Frisco CBD	900	700	1,000
	4,700	5,400	7,600
Stonebrook Pkwy	1,800	1,700	2,300
	7,900	8,200	11,600
Sam Rayburn Tollway	3,300	3,500	4,900
	8,700	8,400	12,600
Hebron Pkwy	800	800	1,500
	10,100	9,800	15,100
Keller Springs	600	600	900
	10,200	9,900	15,600
Downtown Carrollton	4,700	4,600	7,000
	4,200	4,100	9,200
Valley View	1,400	1,400	2,300
	3,800	3,700	8,900
South Las Colinas	1,200	1,200	1,800
	3,400	3,400	10,100
Downtown Irving	1,700	1,700	2,600

*Total Ridership on the Frisco-to-Celina portion of the line only.

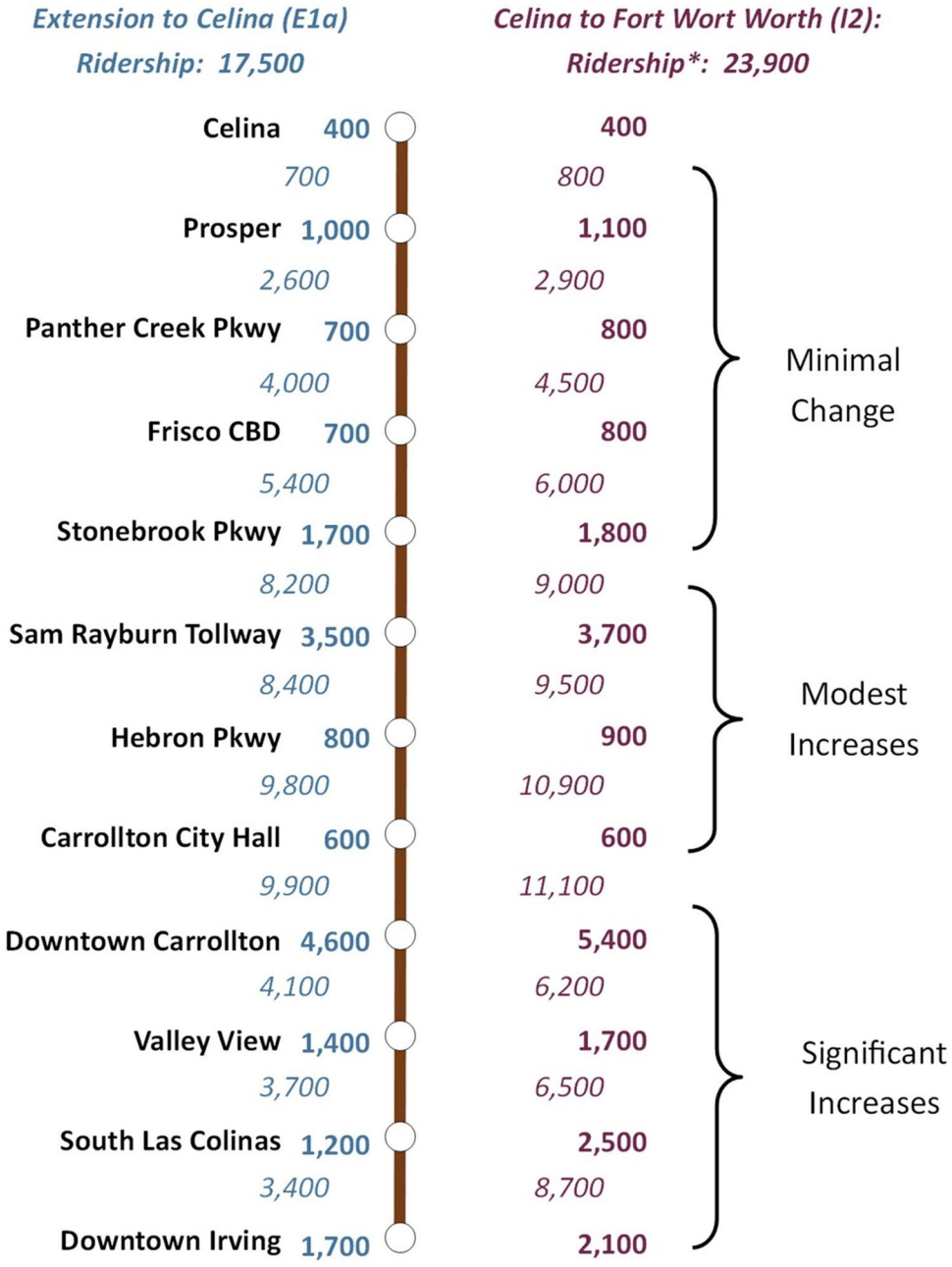
dumpfornow

Irving-to-Frisco Corridor Transit Alternatives with Alternative Demographics



*Total Ridership on the Frisco-to-Celina portion of the line only.

Irving-to-Frisco Corridor Transit Alternatives with Mobility 2045 Demographics



*Total Ridership on the Frisco-to-Celina portion of the line only.

APPENDIX D: ALTERNATIVE DEMOGRAPHICS ANALYSIS

To assist in the evaluation of ridership potential, and based on input from the PAC, the project team used a software tool called Urban Footprint™ to undertake a "what-if" analysis of future land use in proximity to eight of the potential station locations. These included:

- Celina
- Prosper
- Panther Creek Parkway
- Stonebrook Parkway
- SRT South
- Hebron Parkway
- Keller Springs
- Valley View

In each of these areas, data from the NCTCOG RTM was used to identify geographic locations around each of the potential stations listed above that represent the 'area of influence' where the presence of a Regional Rail Station could be expected to affect land use and development patterns. As the analysis was based on the use of Traffic Survey Zones (TSZs), as used by NCTCOG's RTM, the project team identified the TSZs that contained or fell within close proximity (1/2 mile or less) of each potential station location. Within each of these zones, the project team used the Urban Footprint™ software to conduct 'what-if' analyses of future land use in 2045 based on an intensification of activity owing to the presence of a passenger rail station. Three scenarios were developed for each of the eight station areas by adjusting future land uses at the parcel level that might reasonably occur with the existence of a passenger rail station.

For example, in the 'area of influence' surrounding Valley View, one scenario resulted in 14 low intensity industrial parcels being converted to low-rise mixed use; a second saw 88 low intensity warehouse parcels being converted to Main Street commercial mixed-use; and a third had 80 low intensity strip commercial parcels being converted to low-rise mixed use. In each case, the software produced revised estimates of population, dwelling units, and employment within the 'area of influence.' The outputs were then compared to the baseline results from the NCTCOG RTM model as well as being 'ground-truthed' for reasonableness by technical team members. One scenario that the team determined to be most realistic was then selected and provided to NCTCOG for use in the alternative demographic analysis using the RTM.

An example of this analysis, using the Valley View potential station area, is shown on the following page.

Total parcels in TSZ: 523

	Scenarios			
	No-build	(1) Increase	(2) Increase	(3) Increase
Population	2,263	20,846	33,606	34,383
Dwelling Units	1,314	12,920	20,408	20,321
Employment	19,376	9,710	17,638	12,455

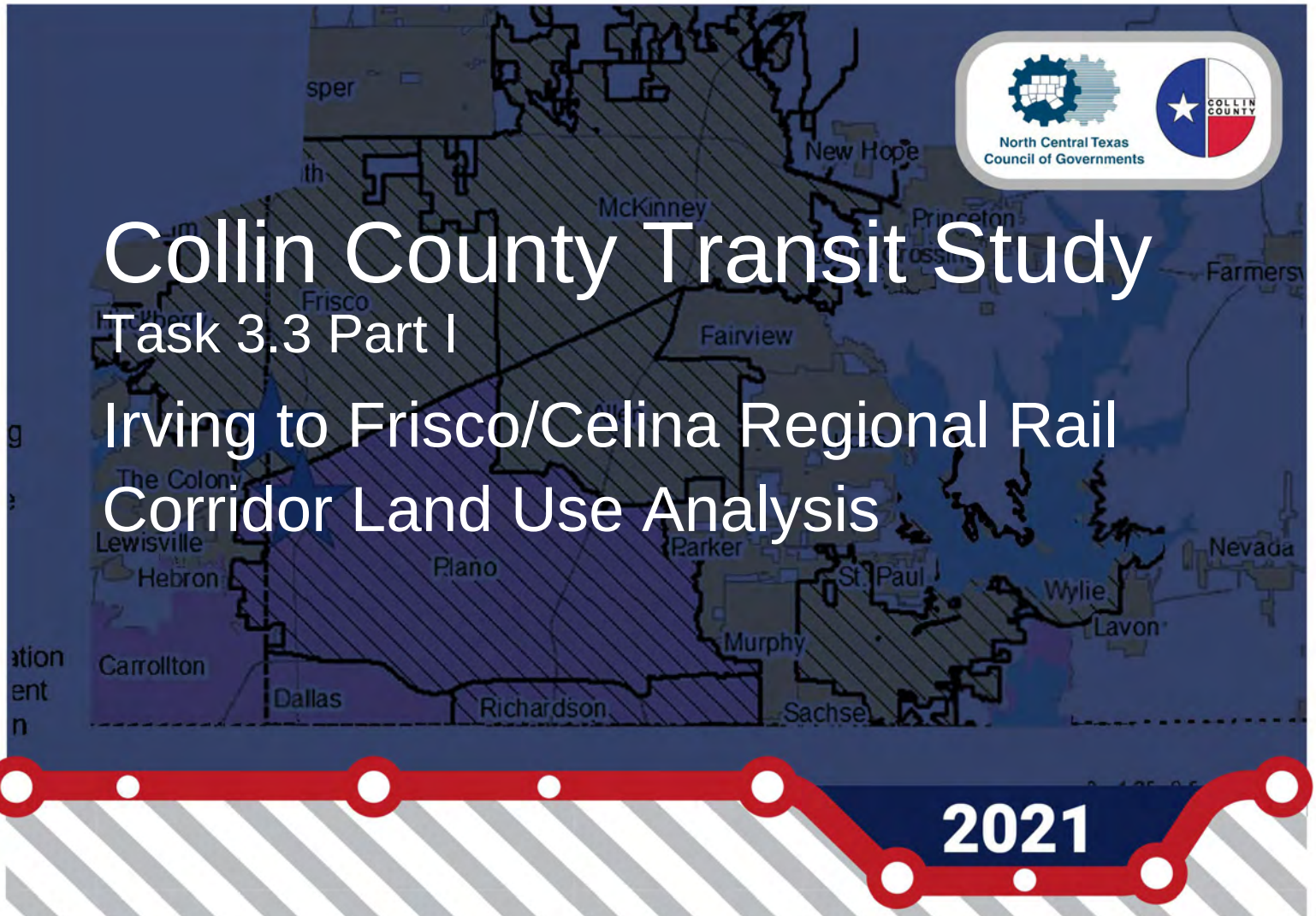
Scenario changes

1. Low intensity industrial to low-rise mixed use (14 parcels)
2. Low intensity warehouse to Main Street commercial/mixed-use low (88 parcels)
3. Low intensity strip commercial to low-rise mixed use (80 parcels)

	TSZ ID																	
	314		315		318		320		377		378		1055					
	2005	2045	2005	2045	2005	2045	2005	2045	2005	2045	2005	2045	2005	2045				
	6	4	-	-	76	71	2	2	1	1	7	5	-	1,745				
	2	2	-	-	32	32	1	1	1	1	3	3	-	781				
	4,398	6,321	1,611	3,842	1,883	6,436	783	2,215	2,731	6,550	1,135	2,393	5,358	7,959				
	Dallas		Dallas		Dallas		Dallas		Dallas		Dallas		Dallas					
	County																	

APPENDIX E: IRVING TO FRISCO/CELINA RAIL CORRIDOR: STATION LAND USE ANALYSIS DRAFT REPORT

NOTE: REPORT INCLUDED ON FOLLOWING PAGES



North Central Texas Council of Governments

COLLIN COUNTY

Collin County Transit Study

Task 3.3 Part I

Irving to Frisco/Celina Regional Rail Corridor Land Use Analysis

2021

Collin County Transit Study 2021

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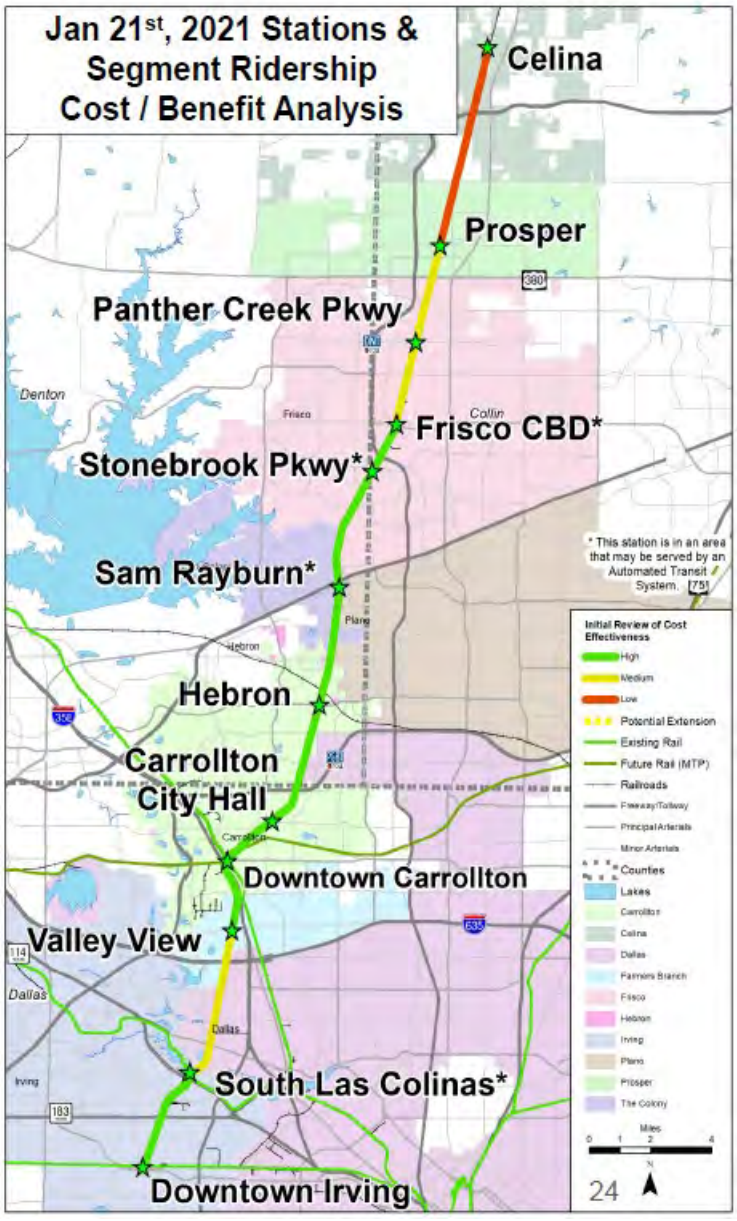
Introduction

Figure 1: Irving-to-Frisco Passenger Rail Corridor



This land use analysis describes the land development conditions and vision for the 12 identified station areas comprising the 37-mile Irving-to-Frisco Passenger Rail Corridor, shown in **Figure 1**. This corridor stretches from downtown Irving to Malone Street in Celina passing through Dallas, Denton, and Collin Counties.

As with many other freight rail corridors in metropolitan areas, it has been in place for many decades. The Burlington Santa Fe Northern (BNSF) Railway owns the section from Celina to Carrollton, while DART owns the section from Carrollton to Irving. Freight rail operates on both sections. Ownership of the corridor is being evaluated within this study effort.

As one component of the Collin County Transit Planning Study, the Irving to Frisco (and possible extension of service to Celina) rail corridor has worked through an extensive process to refine the list of potential station locations. Land use information and development opportunities for each of the twelve potential station areas are provided below.

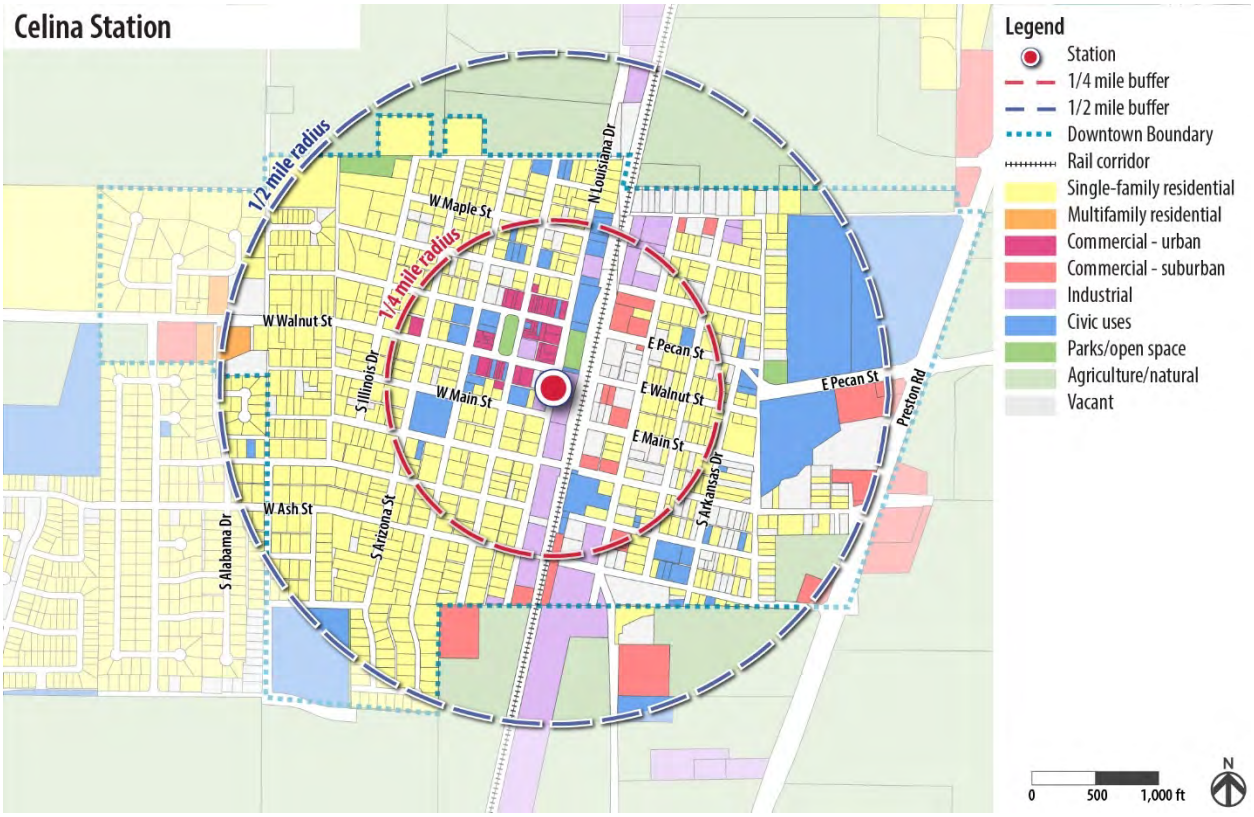
Celina

Existing Conditions

Downtown Celina is a mixture of civic, commercial, industrial, and residential uses as shown in **Figure 2**. The parcels around the proposed station are zoned commercial, community facilities, historic district, industrial, and old town residential. The presence of a gridded street network

with the rail corridor functioning as a central spine is a positive for future transit-supportive development and redevelopment opportunities.

Figure 2: Celina Existing Land Use



Long-Range Plans

The City of Celina has multiple long-range plans that support commuter rail in their city. One of the most recent plans is the Celina Downtown Master Plan.

- Comprehensive Plan (2021) – update approved May 2021
- Downtown Master Plan (2019) – want commercial opportunities
- Downtown Code (2021) – this code will promote urban development outlined in the Downtown Master Plan
- Parks Master Plan (2020)
- Trails Master Plan (2019)
- Zoning Ordinance (2019)
- Subdivision Ordinance (2019)

The City of Celina has four Downtown Incentive Programs that were created to promote Downtown by encouraging development and improvements to both residential and commercial projects in the downtown area near the proposed station location.[1]

- The Neighborhood Empowerment Zone (NEZ) program offers a reduction of building permit fees and impact fees for commercial or residential new construction or remodeling within the defined geographical area.
- The Downtown Improvement Programs (DIP) provides reimbursement grants of 50 percent of cost, up to $25,000, for meaningful additions to the public realm including facade improvements, lighting, public art, seating, and other projects that will directly benefit the citizens of Celina as they enjoy the downtown area.
- The Residential Tax Reinvestment Program (RTRP) provides a one-time payment on the City ad-valorem tax increase due to a signification improvement and/or expansion to an existing residential exterior in the downtown area when applicants spend a minimum of $20,000.
- Live music entertainment is a priority set forth from the Downtown Master Plan and the City is supporting this effort through a Live Music Incentive opportunity for eligible downtown businesses. Businesses can receive up to $1,000 per venue.

In addition to those four Incentive Programs, there are two Tax Increment Reinvestment Zones (TIRZ) in the Downtown area. Those include TIRZ 5[2] and TIRZ 11[3]. Further, Celina has completed a Transit Readiness Memo; Pecan Street Design; East Gateway Special Area Plan; Entertainment District Study; and 2018-2020 Strategic Plan. The City is currently undertaking a "Celina Downtown Station Preliminary Design" effort to directly support a future rail station in their community.

---

[1] "Downtown Incentive Programs: Celina, TX - Life Connected." Downtown Incentive Programs | Celina, TX - Life Connected, www.celina-tx.gov/1322/Downtown-Programs.

[2] Old Celina TIRZ 5, https://www.celina-tx.gov/DocumentCenter/View/5847/Ordinance-3_8_2016-2016-16---Old-Celina.

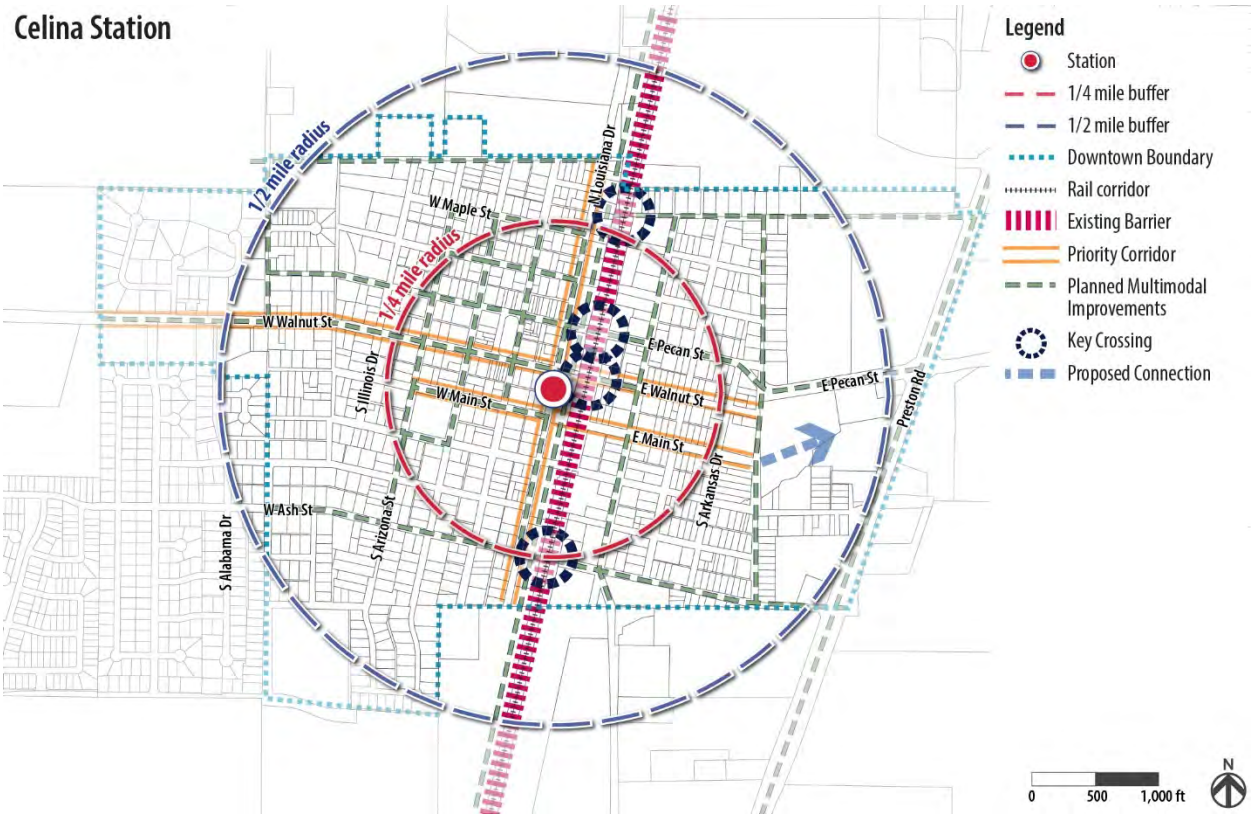
[3] Downtown TIRZ 11, https://www.celina-tx.gov/DocumentCenter/View/5846/Ordinance-12_12_2017-2017-136---Downtown-Celina-Replaces-TIRZ-1?bidId=.

Access and Connectivity

Celina is making improvements to its Downtown. Those include improvements to the roadway, water, sewer, lighting, and landscape. The Trails Master Plan has several connections to the Thoroughfare Spine Trail with secondary connections to the Greenbelt Spine Trail and the Railroad Spine Trail. The Railroad Spine Trail runs adjacent to the Burlington Northern Santa Fe (BNSF) Railroad.

Downtown Celina is laid out in a well-connected grid of streets and blocks, as shown in **Figure 3**. The railroad line presents the most significant barrier somewhat limiting east-west travel, though the crossing spacing is relatively close. The Downtown Master Plan includes planned improvements of several streets in the downtown core as well as streets connecting the core to the larger downtown area. These planned improvements are focused on making streets more attractive to walking and biking, which greatly would improve access to the planned station. As the station area develops and redevelops, easily walkable and bikeable corridors should be prioritized connecting to and across the tracks to the areas of growth.

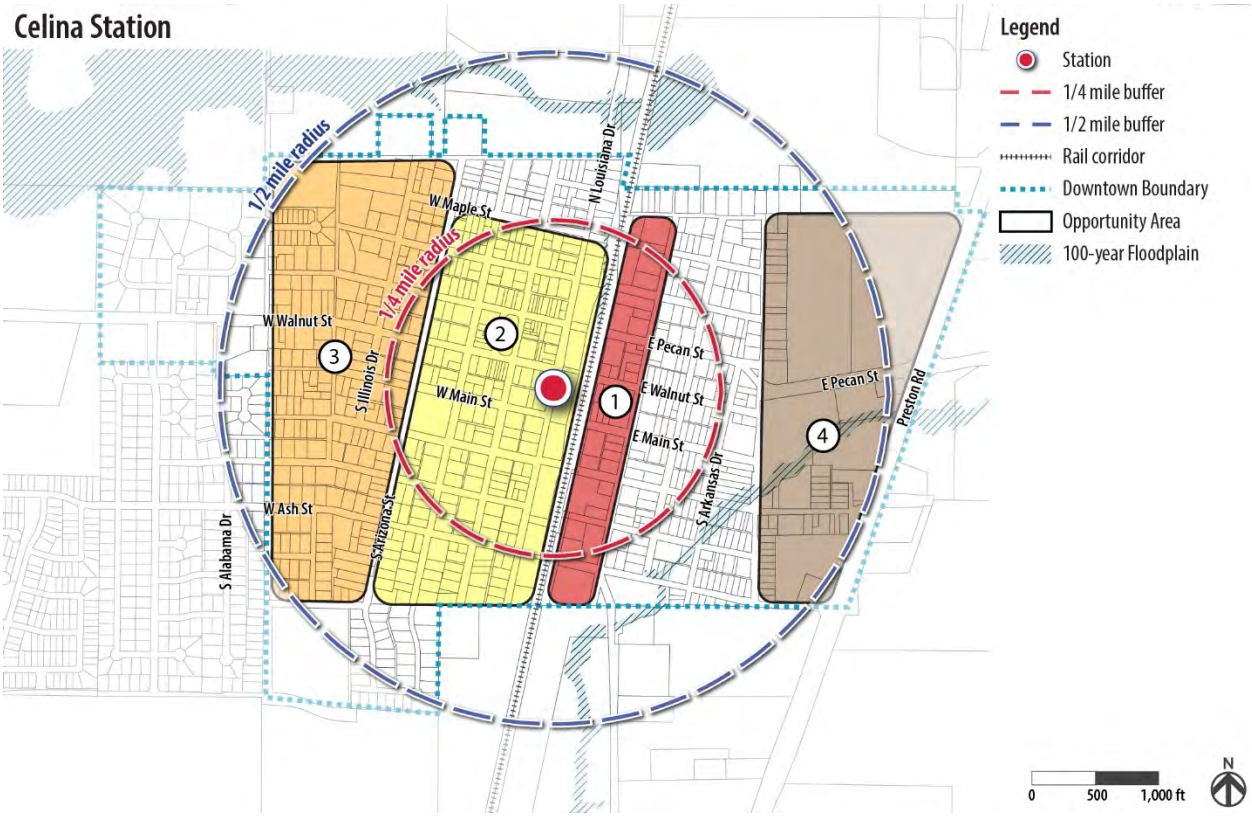
Figure 3: Celina Connectivity



Transit-Oriented Development Opportunities

The Downtown Master Plan describes a vision for the established downtown, building on its history. The plan describes a series of districts, each with a unique mix of character and use and identifies opportunities for infill and redevelopment within each district, with multimodal improvements to the street network to make walking and biking more attractive. The four opportunity areas shown in **Figure 4** are informed by the character districts with additional considerations for access to the planned station and are further described below:

Figure 4: Celina Development Opportunities



Opportunity Area 1: Vacant or underused heritage industrial areas along the railroad tracks should be a priority for redevelopment. These areas may be mixed-use and medium density, scaling down in areas closest to existing homes.

Opportunity Area 2: Celina's walkable commercial/mixed-use core is planned to be intensified and reinforced with additional commercial development to draw customers downtown. Higher density residential infill can provide quality housing within walking distance from the downtown core and the station. Infill development should focus on creating an interesting and comfortable walking environment on corridors connecting to the station area.

Opportunity Area 3: This historic, established single-family area within easy walking distance from downtown and the station can be strengthened with modest and context-sensitive infill and densification.

Opportunity Area 4: Eastern gateway has significant redevelopment potential for higher density residential uses within walking distance of the station. Future development in this area should connect easily to existing street grid, allowing for a potential reduction of necessary parking.

Context-sensitive Infill Development:

North Downtown District - Omaha Nebraska. Photo courtesy of HDR

Prosper

Existing Conditions

The land uses around the proposed station location includes agriculture, civic, commercial, industrial, residential, and vacant land as shown in **Figure 5**. Zoning for the proposed station location is Original Town. Zoning around the area includes Downtown Commercial, Downtown Office, PD67 (Gates of Prosper), PD80 (Prosper Town Hall Library building), single family.

The Gates of Prosper will include a mix of community activities, personal services, office, retail, and residential by providing four individual but integrated Subdistricts. The four Subdistricts include Regional Retail, a Lifestyle Center, a Downtown Center, and a Residential Neighborhood. The Downtown Center Subdistrict will serve the purpose of providing an active living and working community benefiting from its proximity to the existing town core and the planned Lifestyle and Regional Retail Centers. The Lifestyle Subdistrict will serve the purpose of providing a compact, neighborhood and pedestrian-scale mixture of office, retail, personal service, residential and community activities on single or contiguous building sites. The Regional Retail Subdistrict will serve the purpose of providing for the needs of the community by facilitating the development of regional-serving retail, personal service, and office uses. The Residential Neighborhood Subdistrict will serve the purpose of providing a planned residential community to serve the needs of the Town by facilitating a range of housing opportunities.[4]

The Prosper Town Hall Library Building PD includes a Town Hall accommodating various governmental departments, the Council Chambers, and the public Library.[5]

[4] Gates of Prosper Planned Development 67, https://www.prospertx.gov/wp-content/uploads/PD-67-Gates-of-Prosper-Ord-18-55.pdf.

[5] Prosper Town Hall Library Building Planned Development 80, https://www.prospertx.gov/wp-content/uploads/PD-80-Town-Hall-PD-DTO.pdf.

Figure 5: Prosper Existing Land Use

Long-Range Plans

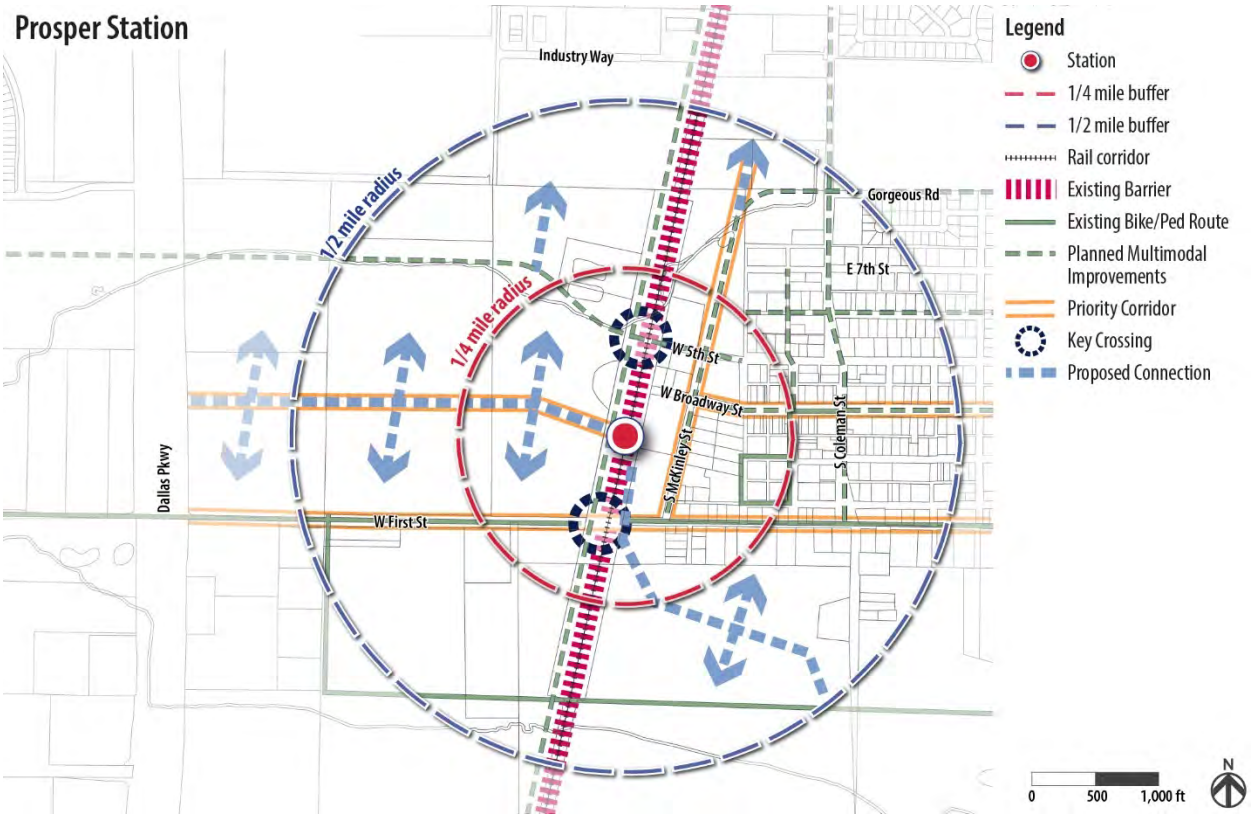
- Comprehensive Plan (2012) – recent updates to Thoroughfare and Future Land Use
- Development Manual (2020)
- Hike and Bike Trail Master Plan (2020)
- Old Town Insert (2019) – great cross-sections for Complete Streets
- Old Town Area Assessment (2017)
- Parks Master Plan (2015)
- Thoroughfare Plan (2020)
- Zoning Ordinance (2005) – updated in 2018

TIRZ 1 encompasses the proposed station location. Just north of the proposed station location is the Neighborhood Empowerment Zone 1.

Access and Connectivity

The Town of Prosper's Thoroughfare Plan, and Hike and Bike Trails Master Plan, identify direct connections to the BNSF Railroad Trail from commercial and residential areas within the town and neighboring cities. With various redevelopment plans projected within a half-mile radius of the station location, **Figure 6** illustrates important future connections for safe and comfortable walk- and bike-ability; especially as they lead to the transit station. Safe, legible, and educational components at key railway crossings are important to making both sides of the rail tracks part of a transit-oriented district. Priority downtown corridors should be studied for enhanced multi-modal connectivity, such as Broadway connecting the historic core to the transit station.

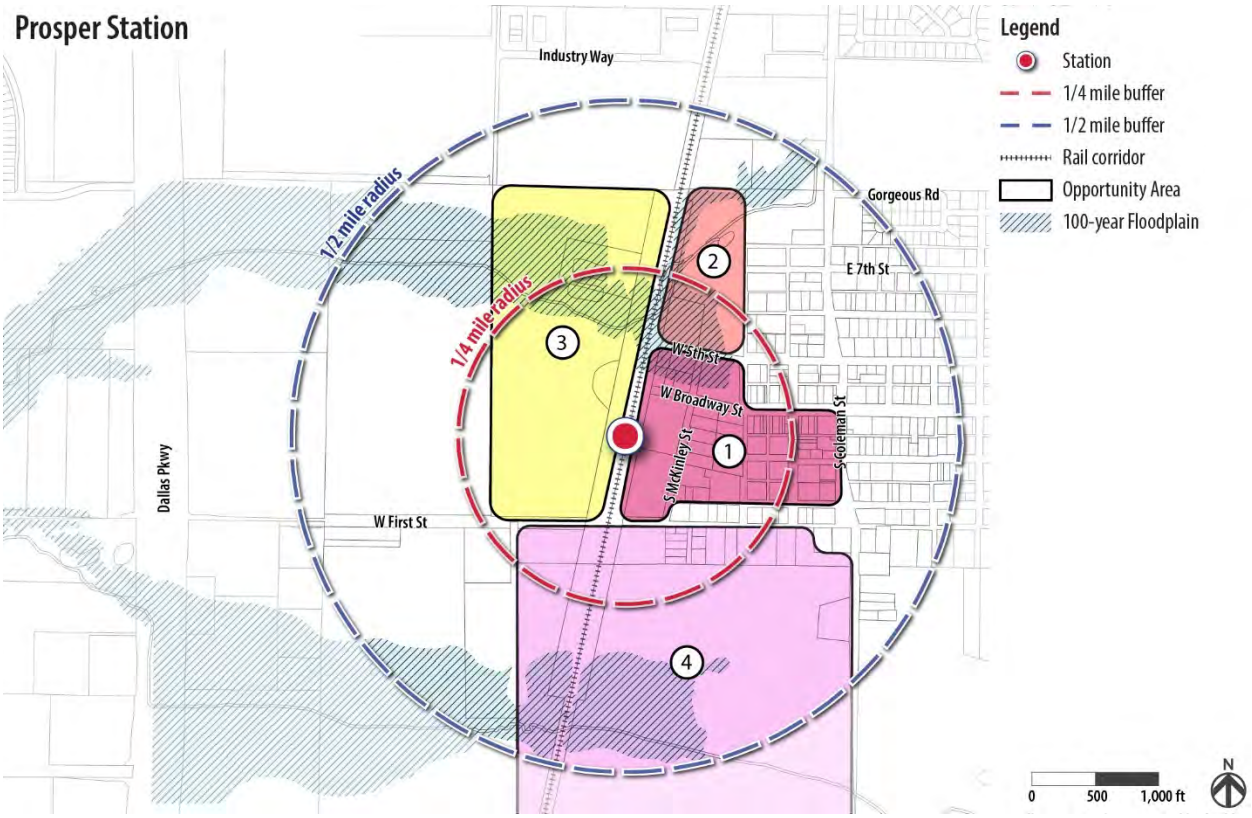
Figure 6: Prosper Connectivity



Transit-Oriented Development Opportunities

Although existing land-use conditions show agriculture or natural characteristics, the Town of Prosper's zoning classifications permit an increase in Single-family residential, Commercial, and Mixed-use designations. Development of agricultural or vacant parcels within the study area should consider their proximity to the 100-year floodplain shown in **Figure 7**. Opportunity areas can be described as follows:

Figure 7: Prosper Development Opportunities



Opportunity Area 1: With the Prosper Town Hall as a focal point, additional mixed-use development within the Prosper Old Town Core will bring interest and diversity to the community's center. Maintaining an appropriate scale of development would introduce welcome density and build on the existing town character as a rural center. Development in this area should serve to make a seamless connection between the town center and the station and focus on active uses in between the two. Contemporary mixed-use development, such as the Silo Food Truck Park, is already well underway.

Opportunity Area 2: To the north-east of the station stop, expanded retail can serve as an amenity to the Town of Prosper. Given the vicinity to the transit station, this area should be planned with the ideas of walkability in mind, avoiding elements that discourage walking such as large parking fields and blank facades. This area, though likely largely retail in

nature, may consider a mix of uses that are connected through an expanded network of narrow streets, wide sidewalks and possibly a central square or green.

Opportunity Area 3: Where development is feasible, this area shows an opportunity for expanded housing options connected to transit. Identified as a single-family district, this area should still provide easy connectivity to the transit station and offer a gradient of density that increases closer to the station area – including row homes, duplexes and, possibly, small apartment buildings. The increase in housing here should provide a range of costs and types, emphasizing the benefits and accessibility of transit-oriented development.

Opportunity Area 4: To the south is a mixed-use planned development that should continue to reflect the town character and ensure a focus on the station accessibility. With the Gates of Prosper development directly to the south, a mixed-use development in this area can serve as a connector between the Old Town Core and the newly developed area. Given its relatively isolated location, this area can consider a larger scale of density and intensity of uses and should provide pedestrian and bicycle connections that connect directly to the station.

Adaptive reuse of existing structures:

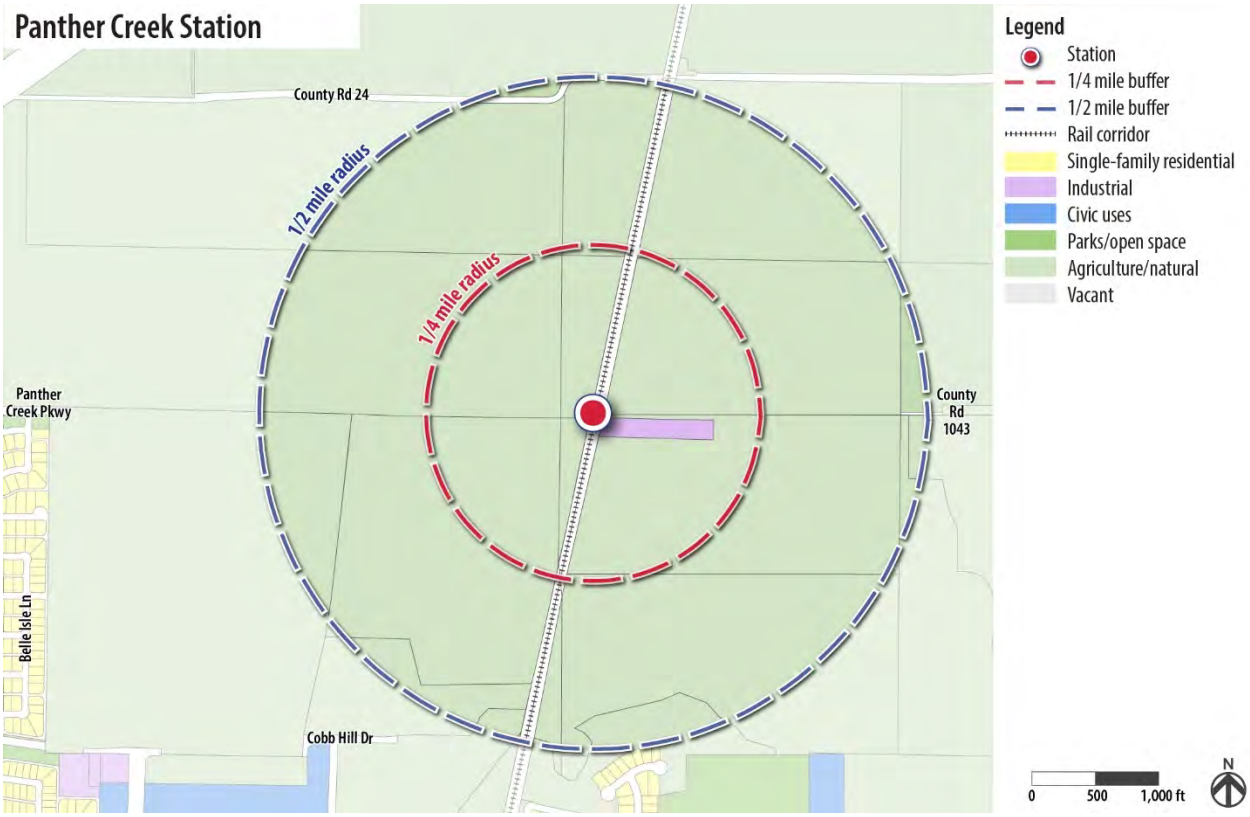
Tyler Station - Dallas, Texas. Photo courtesy of DART

Panther Creek Parkway

Existing Conditions

This area is experiencing significant large-lot single-family residential growth adjacent to the Dallas North Tollway to the west and south of Panther Creek Parkway, and to the east along Preston Road. In contrast, the area directly adjacent to the proposed rail station appears undeveloped in the current aerial maps. Atmos Energy owns the parcel on the southeast corner of the intersection of the rail line and the parkway, as shown in **Figure 8**, with the adjacent area a part of the Panther Creek Sports Complex.

Figure 8: Panther Creek Existing Land Use



Long-Range Plans

- Frisco: Progress in Motion Comprehensive Plan (2015)
- Hike and Bike Master Plan (2019)
- Neighborhood Design Strategy (2017)
- Zoning Ordinance (2013)

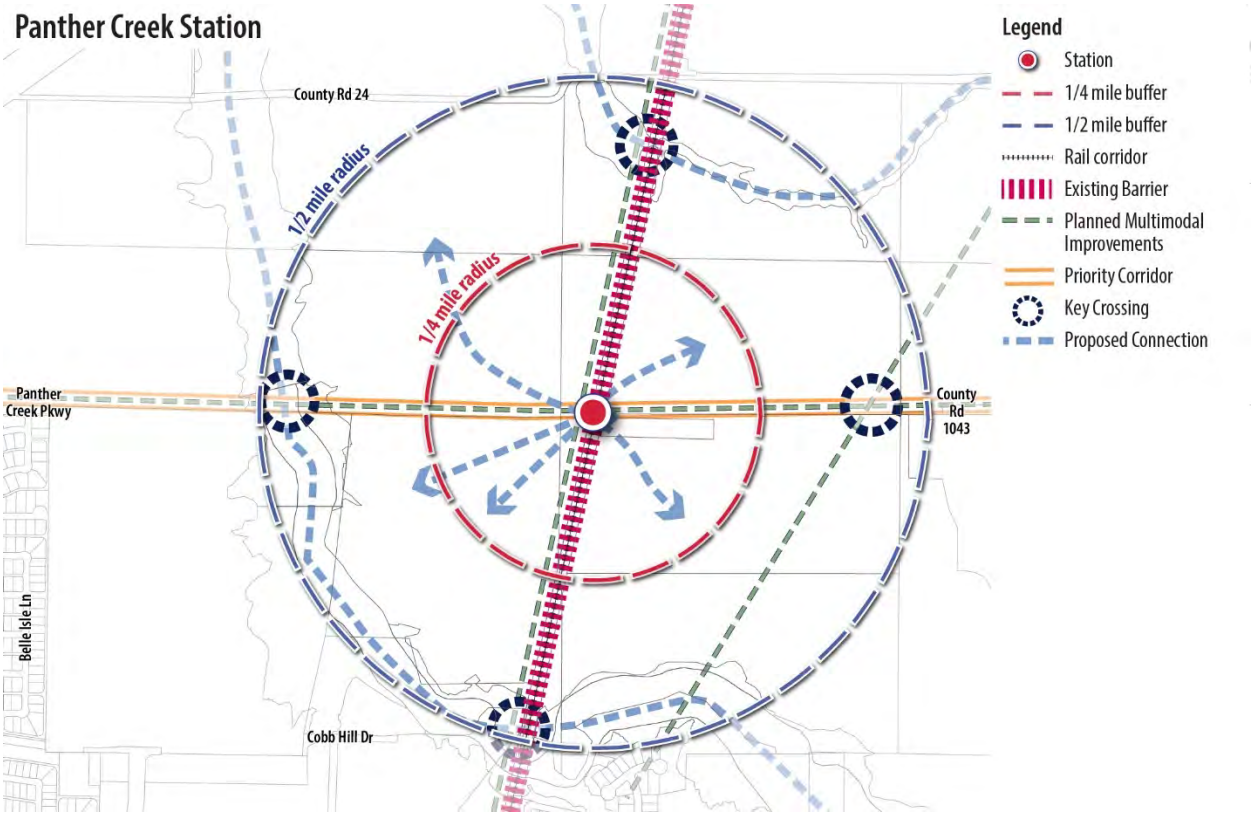
The most significant planning effort is the Fields development that the Frisco Planning and Zoning Commission accommodated by approving rezoning in February 2020. This 2,100-acre

project proposes multiple districts with more than 5,000 single family, 8,500 multifamily and 1,000 student housing units. Additionally, the University of North Texas plans to develop a new campus along with the proposed PGA headquarters, hotel, and commercial development.

Access and Connectivity

Due to little existing development there is currently no direct access from the station site to Panther Creek Parkway, with the planned station located in the gap between the existing east and west roadway segments. Bike and pedestrian connectivity is nearly non-existent given the lack of development in the immediate context of the planned station location. With the significant amount of planned development, access to the area will dramatically change over time, however special care needs to be taken to ensure that future connections prioritize access to the transit station. The City of Frisco Hike and Bike Master Plan also identifies the Veloweb regional trail following the existing BNSF rail corridor as shown in **Figure 9**.

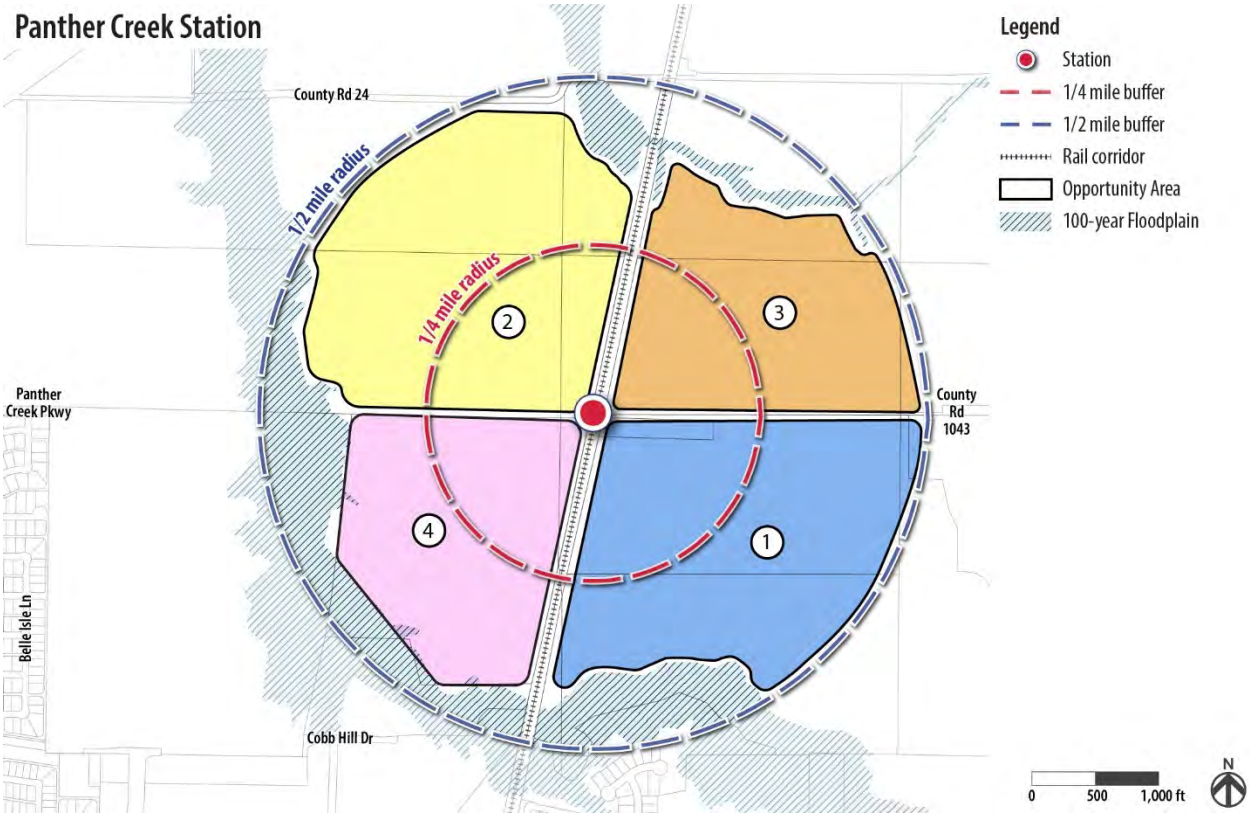
Figure 9: Panther Creek Connectivity



Transit-Oriented Development Opportunities

As the housing, sports complex and campus developments are not yet constructed, there is a significant opportunity to proactively and effectively establish key bike and pedestrian connectivity between the planned station and existing and proposed residential sites. Opportunity areas as shown in **Figure 10** can be described as follows:

Figure 10: Panther Creek Parkway Development Opportunities



Opportunity Area 1: Ensure a strong system of bike and pedestrian circulation is developed in association with the North Texas University campus development efforts. Convenient campus access via public transit benefits students, staff, and all neighboring residents and uses by reducing traffic and parking demands. Areas closest to the station should prioritize student living and other amenities to better connect the student body to the region.

Opportunity Area 2: Identify opportunities to reorient the planned Fields East Village development to locate the most dense and intensive uses as close to the station as possible, to create a true town center. As development has not yet begun, the opportunity to create a significant TOD area is possible with proper planning and design.

Opportunity Area 3: Prioritize resident connectivity to transit by modifying the planned residential community's circulation, to better accommodate non-motorized modes of transportation and minimize the first/last-mile gaps that hinder ridership.

Opportunity Area 4: This area has no planned development but offers the same opportunity as the other areas for creating a major transit-oriented district. As the landowner begins to engage the City and other stakeholders, planning guidance should heavily prioritize transit-supportive uses and scales of development. Connections in this area should orient towards transit and parking may be reduced or shared to maximize transit ridership potential.

Strong pedestrian and bicycle connections to a mix of uses:

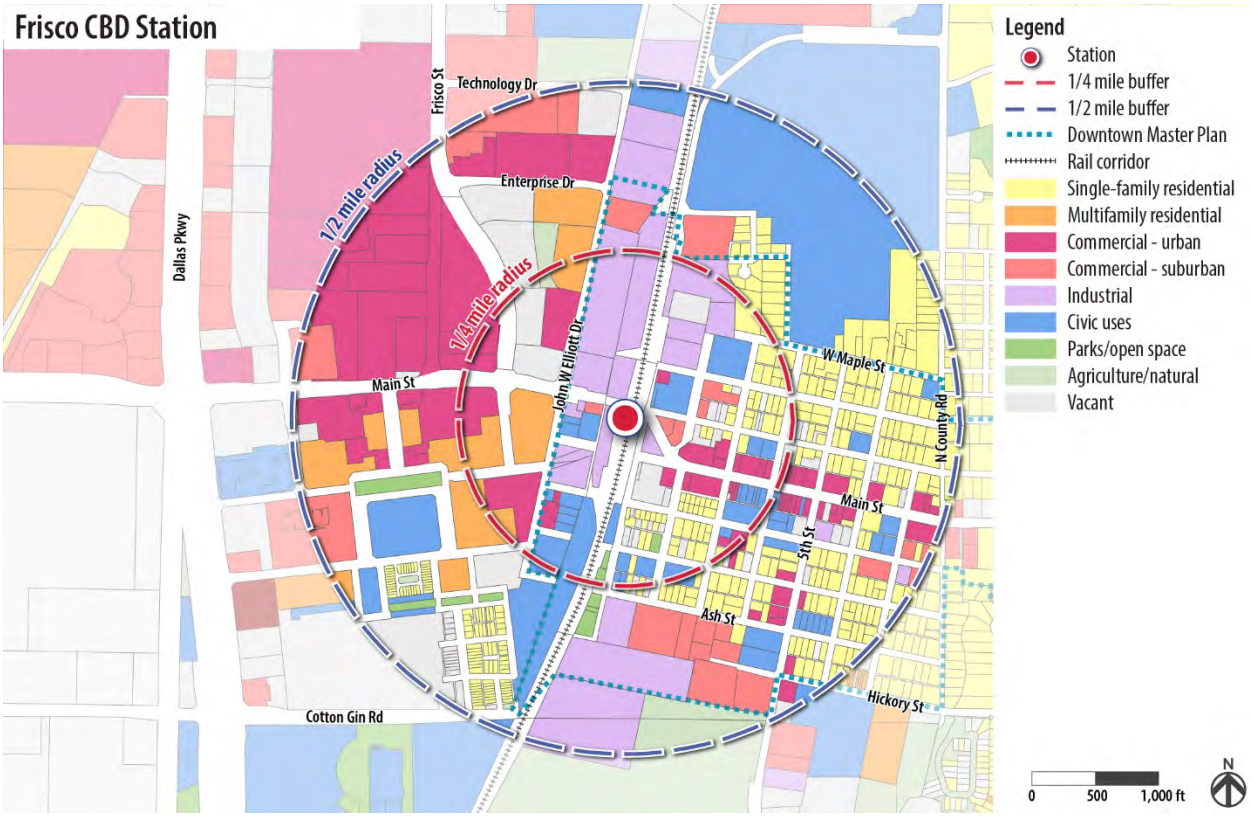
Santa Row – San Jose, California. Photo courtesy of Wikipedia

Frisco Central Business District

Existing Conditions

The land uses around the proposed station are civic, commercial, industrial, residential, and vacant land, as illustrated in **Figure 11**. The existing street network, relative proximity to the Dallas North Tollway, and availability of vacant parcels create the opportunity for transit-oriented development in the area surrounding the proposed station. Main Street serves as the east/west spine of downtown, crossing the rail corridor and connecting existing low-density residential and light commercial uses at the east to the multifamily and civic areas in development to the west.

Figure 11: Frisco CBD Existing Land Use



Long-Range Plans

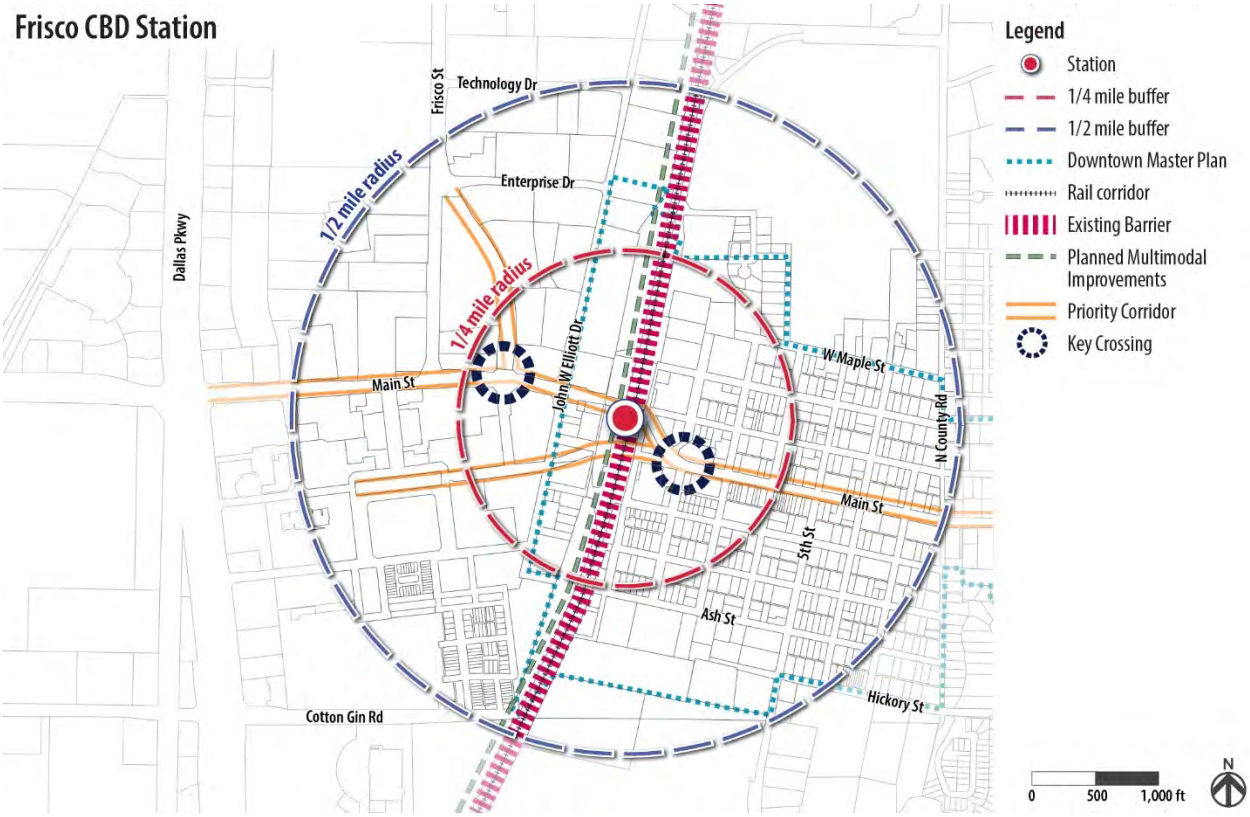
- Downtown Architectural Design Standards (2002)
- Downtown Master Plan (2018)
- Downtown Street Improvements and Plaza (2020)
- Frisco: Progress in Motion Comprehensive Plan (2015)
- Hike and Bike Master Plan (2019)
- Zoning Ordinance (2013)

The Downtown Master Plan (2018) cited above includes the proposed rail station as a future assumption and proposes surrounding development based on community feedback.

Access and Connectivity

The City of Frisco Hike and Bike Master Plan identifies Main Street as a future Parkway Trail, and other streets in proximity of the proposed station area as proposed on-street bikeways. Additionally, the Veloweb regional trail is identified in or adjacent to the existing BNSF rail corridor as shown in **Figure 12**. Priority corridors on both sides of the tracks are vehicle-dominant, and should be studied for multi-modal opportunities as the station comes on line to provide better and safer walking and biking experiences in the area. Streets connecting the large area of redevelopment on the west side of the tracks should introduce street trees, sidewalks setback from the streets, and bike lanes whenever possible.

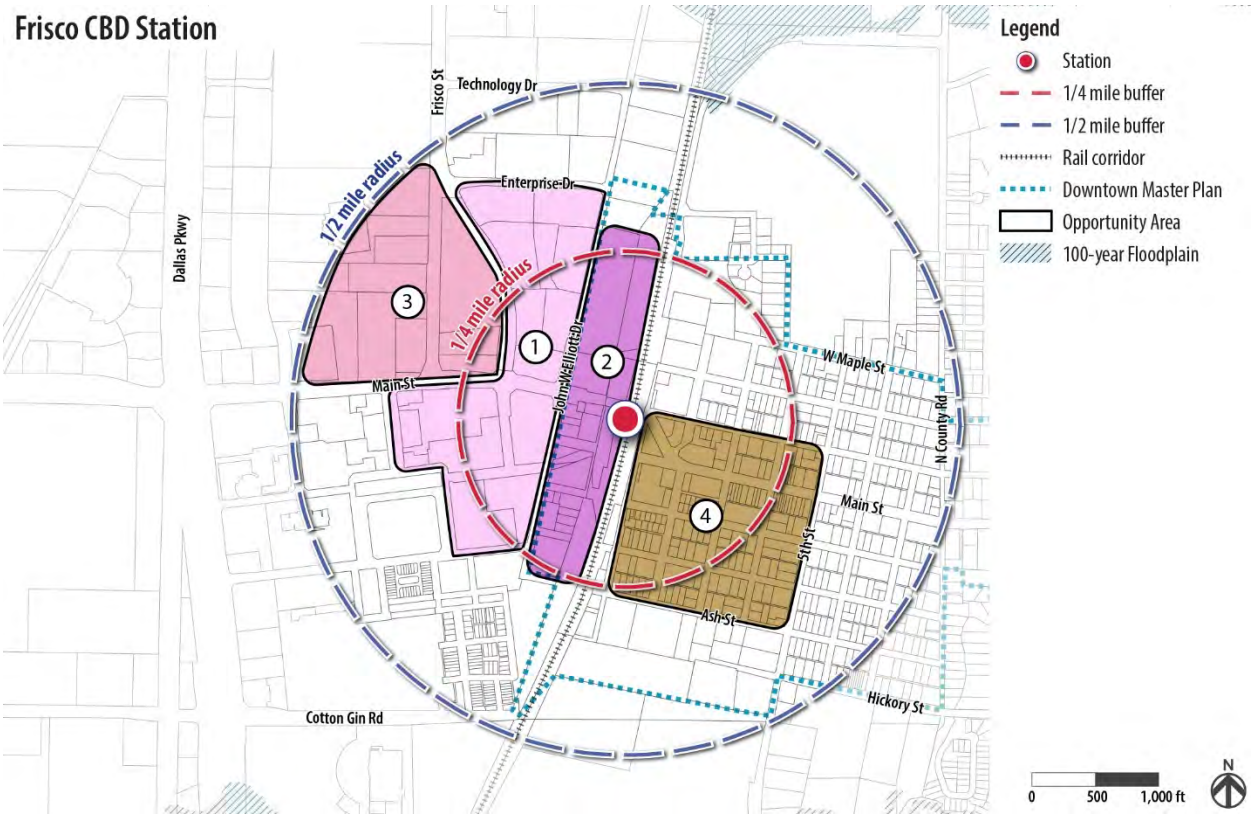
Figure 12: Frisco CBD Circulation



Transit-Oriented Development Opportunities

Although the station area is divided by the BNSF railway, there is currently a good mix of uses and connectivity on each side of the railway. Current development surrounding Toyota Stadium is bringing a lot of new activity and interest to the area, in addition to the existing community character of the downtown. Opportunity areas shown in **Figure 13** distinguish specific quadrants around the station that can further contribute to transit-oriented development:

Figure 13: Frisco CBD Development Opportunities



Opportunity Area 1: The development in progress west of the rail corridor favorably increases density and establishes new civic destinations. Ensure transit connectivity is prioritized in planned near-future development by requiring transit-supportive uses and adjusting parking requirements to free up space for improved bike and pedestrian circulation.

Opportunity Area 2: Development of the sliver of parcels located between First Street and John W. Elliott Drive could be of significant scale, should facilitate easy access to transit, and will further activate the east/west connection across the rail corridor.

Opportunity Area 3: Establish clearly marked, safe and convenient bike and pedestrian circulation routes between the planned station and the newly constructed Toyota Stadium

and Soccer Center, National Soccer Hall of Fame, and Frisco Fresh Market. These uses are major attractions and easy connections to the transit station can remove cars from the road and attract users who may not be able to access it by car.

Opportunity Area 4: Though most of the new development is occurring west of the rail tracks, the historic core of Frisco remains an important opportunity for infill development. This development should reflect the scale and character of the existing buildings and public realm, but prioritize added density and intensity, especially as you approach the station. Active uses should be considered on the ground-floor to provide a comfortable and vibrant walking experience.

Infill development that respects a town's historic scale:

North Downtown District - Omaha Nebraska. Photo courtesy of HDR

Active ground-floor uses:

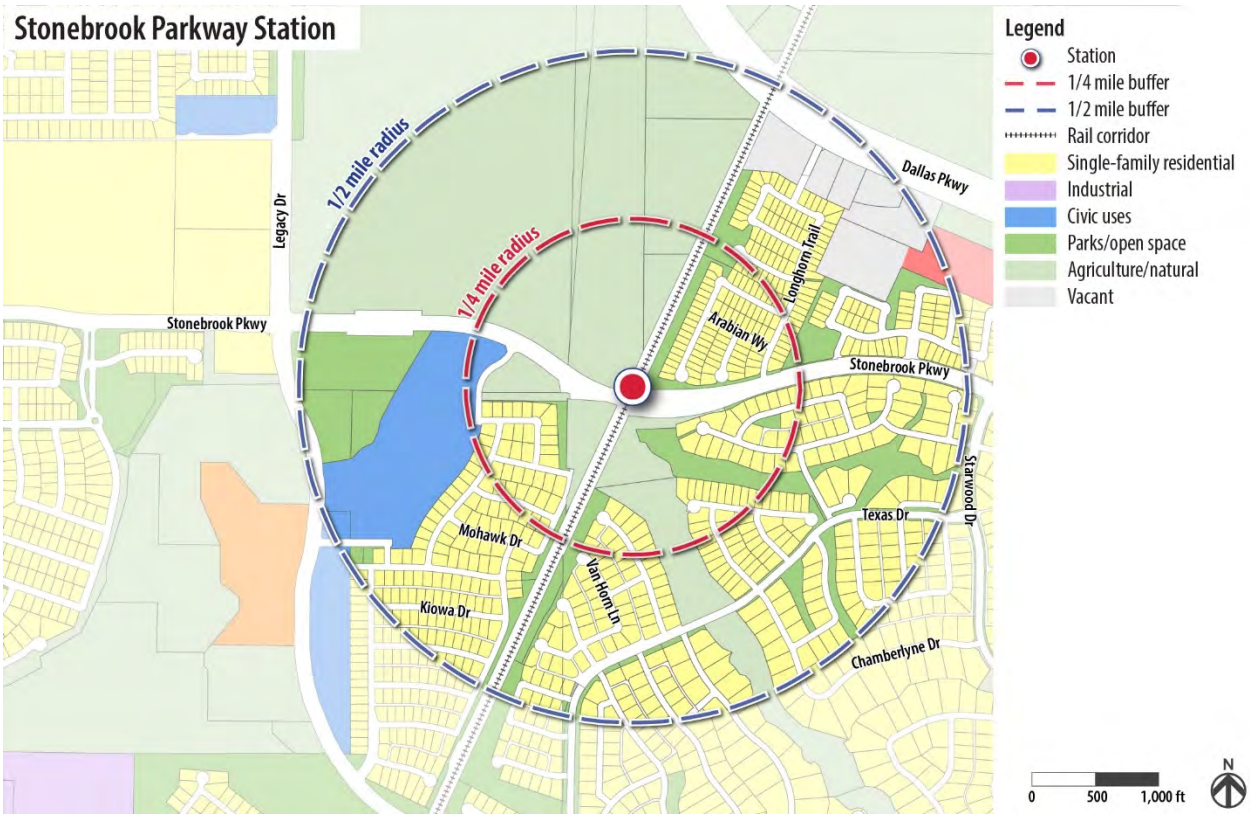
Fruitvale Village – Oakland, California. Photo courtesy of Eric Fredericks/Flickr

Stonebrook Parkway

Existing Conditions

The land uses around the proposed station location are civic, open space, and residential as illustrated in **Figure 14**.

Figure 14: Stonebrook Existing Land Use



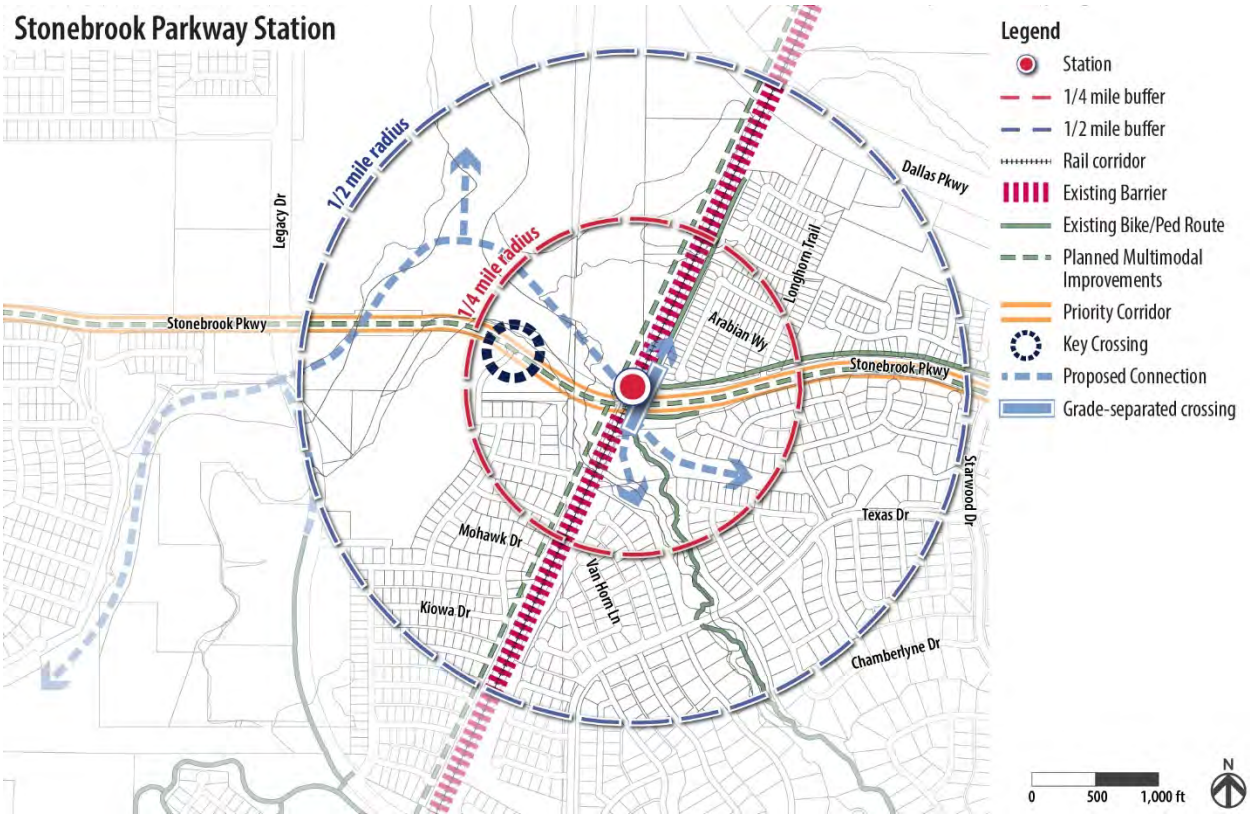
Long-Range Plans

- Frisco: Progress in Motion Comprehensive Plan (2015)
- Hike and Bike Master Plan (2019)
- Neighborhood Design Strategy (2017)
- Zoning Ordinance (2013)

Access and Connectivity

Stonebrook Parkway is a major regional connection, though it is not currently an attractive or comfortable corridor for biking or walking. Given the suburban pattern of development surrounding the station area, there are few intuitive connections for those travelling through the area, especially on bike or foot. However, the creek-adjacent trail does provide strong connectivity to the southeast, the Veloweb regional trail is identified in or adjacent to the existing BNSF rail corridor, and the City of Frisco Hike and Bike Master Plan identifies Stonebrook Parkway as a Parkway Trail in the future. Stonebrook Parkway may still prove a major challenge for future transit station access due to its width and grade separation from the rail tracks. As a result, a non-vehicular bridge as shown in **Figure 15**, should be considered to connect the north and south areas adjacent to the rail tracks.

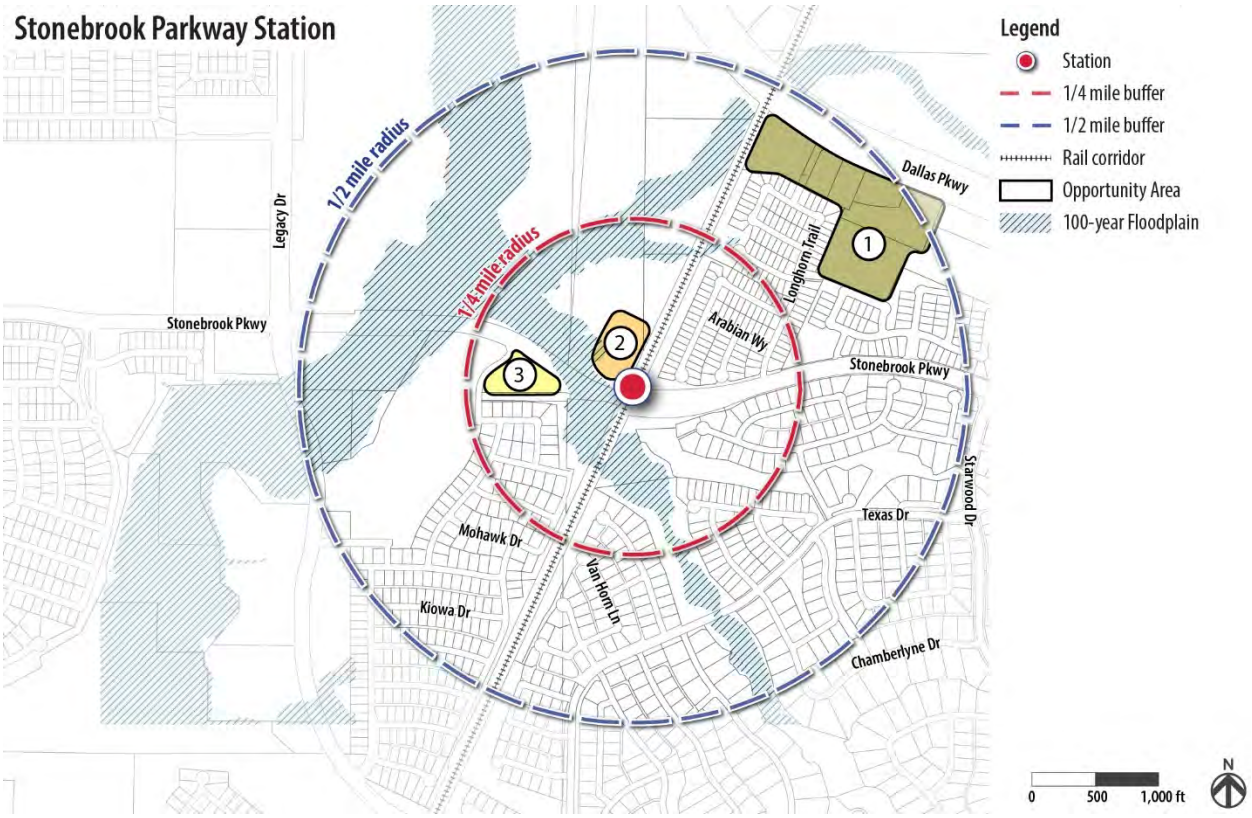
Figure 15: Stonebrook Connectivity



Transit-Oriented Development Opportunities

The Stonebrook Parkway area does not have many opportunities available for new development in close proximity to the transit station area. Therefore, the primary focus should be on providing stronger connections to the existing communities in order to make transit use more of a possibility for existing and future residents. Opportunity Areas as shown in **Figure 16**, where new development is possible, can focus on making the area more of a complete community with a mix of daily uses or amenities.

Figure 16: Stonebrook Development Opportunities



Opportunity Area 1: This area to the northeast of the station site is the only area with larger-scale development potential. This area can be oriented to jobs, retail, and density missing from the remainder of the station area. This mix of uses will make the station more successful by providing increased ridership, reducing car trips, and make daily needs easier to accommodate in close proximity to existing residents. The trail running north from the station area along the tracks should be extended and improved to provide great connectivity to the transit area.

Opportunity Area 2: Though parks and open space are not good candidates for commercial redevelopment, this area may provide an opportunity for enhanced community amenity if it is used for transit station access. With the extension of Fighting Eagles Lane to

the north, the existing Grand Park will have much greater access. If park space is used for transit infrastructure, there should be a "give-back" to the community in the form of new amenities and access to a great open space.

Opportunity Area 3: This small vacant site sits directly across the street from the Legacy Christian Academy campus. Its future use can be an expansion of community-serving infrastructure such as a recreation center or community hub with shared workspace or other public uses. It may also provide an opportunity for medium density residential building with great access to transit.

Necessary transit infrastructure provides new access and amenities for open space:

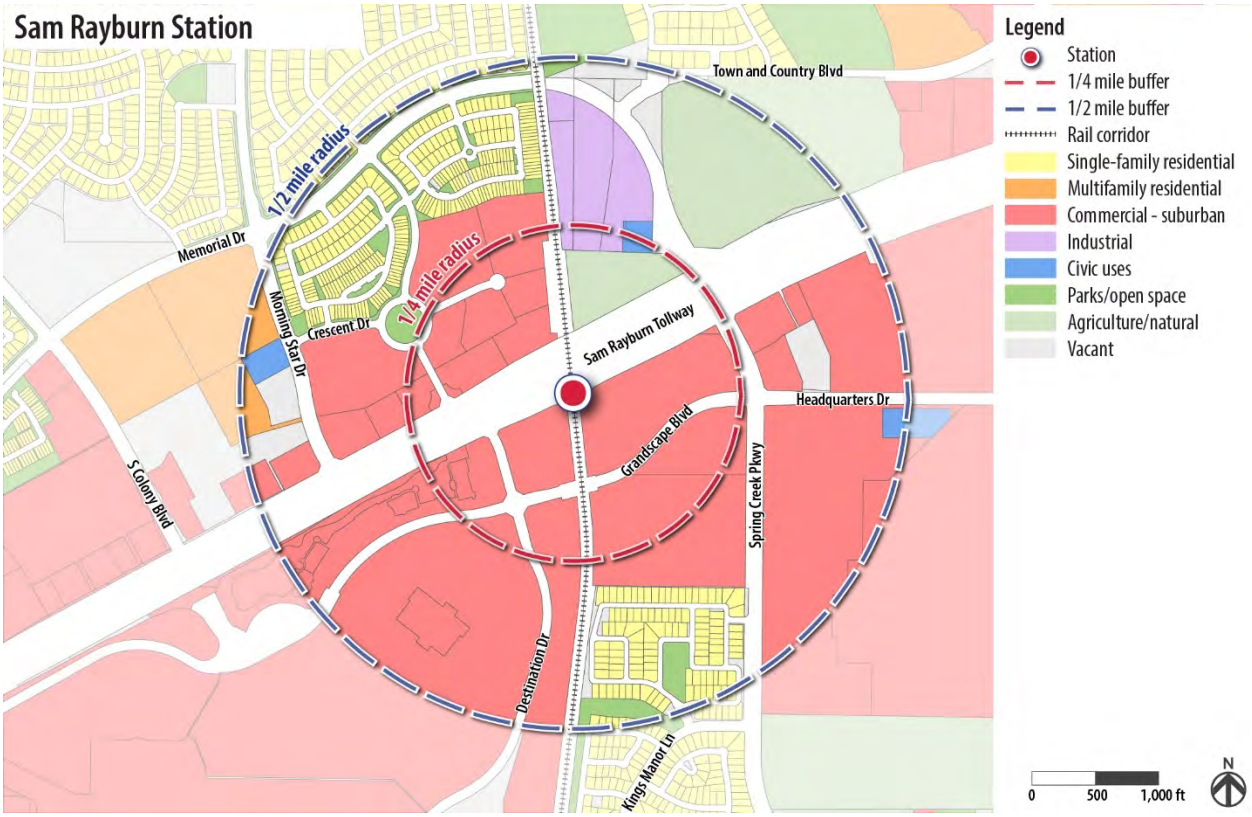
Star Lake Light Rail Station – Kent, Washington. Photo courtesy of Sound Transit

Sam Rayburn South

Existing Conditions

As shown in **Figure 17**, the surrounding land uses of the proposed station location are commercial, industrial, agricultural/natural, and a few vacant parcels to the north. Zoning is restricted to PD25 Grandscape, and the location is proximate to major retail such as Nebraska Furniture Mart, Grandscape and more to the west. Large employers and office campuses are located to the east, including Toyota, Frito-Lay, Ericsson and others in the Legacy West area.

Figure 17: Sam Rayburn Existing Land Use



Long-Range Plans

The Colony

- Subdivision Ordinance
- Zoning Ordinance

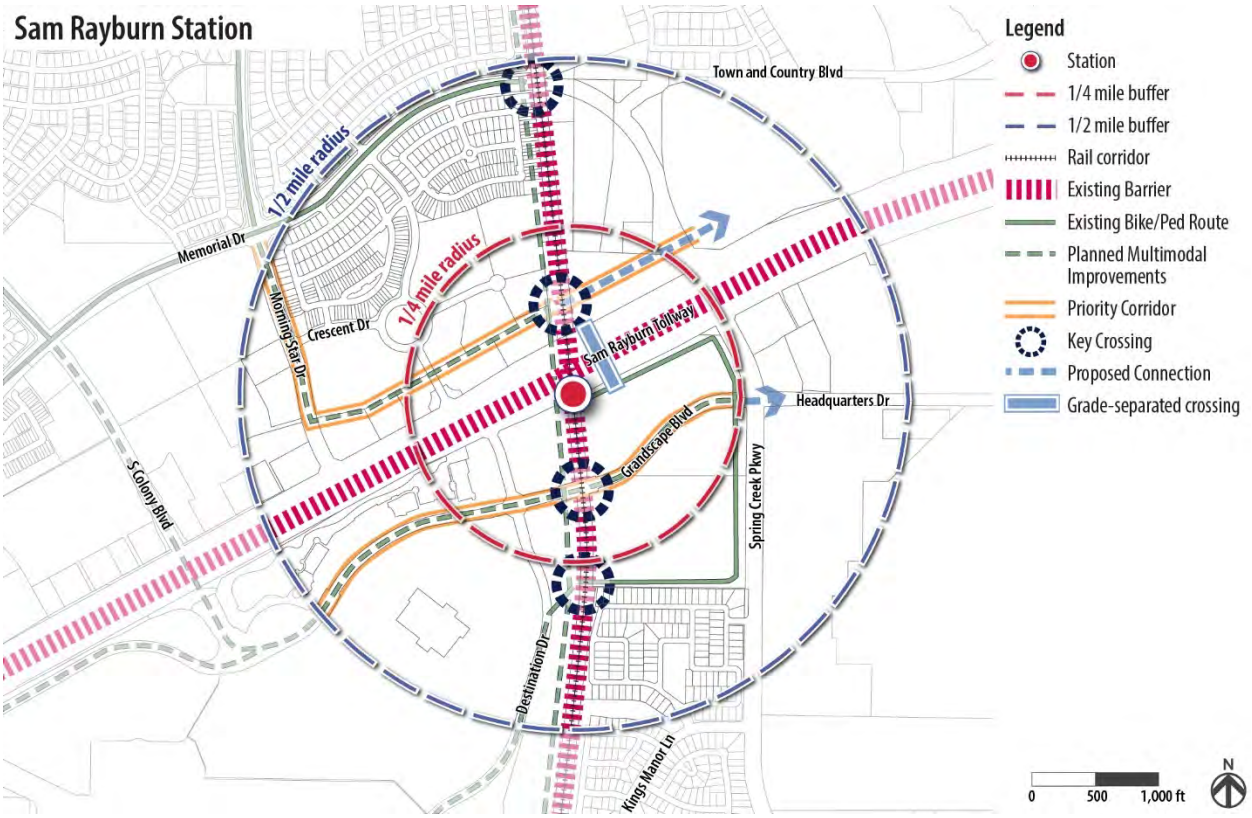
The City of Frisco

- Frisco: Progress in Motion Comprehensive Plan (2015)
- Hike and Bike Master Plan (2019)
- Neighborhood Design Strategy (2017)
- Zoning Ordinance (2013)

Access and Connectivity

The area around the proposed station is undergoing substantial redevelopment with new roadway connections. As this is not currently a station area and is adjacent to the Sam Rayburn Tollway, much of this new infrastructure is oriented towards vehicle travel. Grandscape Boulevard – a critical connection from the station to developing areas – has minimal pedestrian or bike space but could be considered for shared-use paths as the station is built and development follows. Long term planning efforts are considering connections from the station to nearby developments beyond the ½ mile walkshed, such as Legacy West, through automated transportation services and other micro-mobility options. This will extend the reach of the station's impact. As shown in **Figure 18** the Tollway is a significant barrier for connectivity north-south, especially for bikes and pedestrians. A trail connection under the Tollway parallel to the rail corridor should be studied to better connect the north and south sides of the area and provide opportunity for transit-oriented development on both sides of the Tollway. All future roadways should consider safe, comfortable multi-modal access and adequate accommodations for first and last mile connections to the future station.

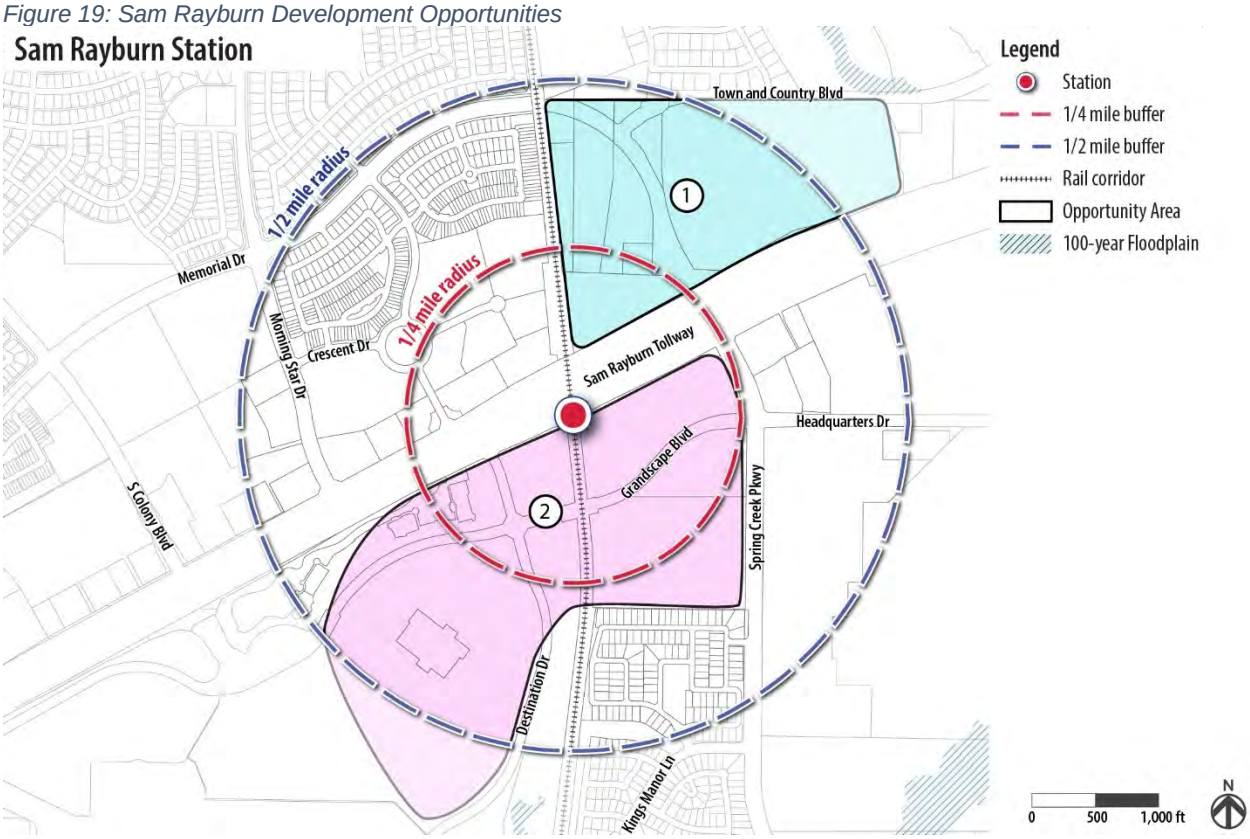
Figure 18: Sam Rayburn Connectivity



Transit-Oriented Development Opportunities

The areas closest to the station area are undergoing large scale development as part of the Grandscape project and others. The vision for this area includes a walkable district within Grandscape but surrounding this district will be dominated by large parking fields. This auto-oriented development was planned prior to transit considerations. As a result, opportunities may be limited in the near term for TOD, but the following considerations can be given within opportunity areas shown in **Figure 19**:

Figure 19: Sam Rayburn Development Opportunities



Opportunity Area 1: A strong trail connection under the Tollway to the station area will allow for this area to accommodate development that can help drive ridership and provide needed housing and other uses. With existing un- or under-developed land, this area has the opportunity to redevelop as a walkable transit village that provides easy and safe connections to the station. Without additional connectivity, this area does not provide meaningful TOD opportunity.

Opportunity Area 2: Though much of the area is under construction or built, remaining parcels – especially those within close proximity to the station area – may be reconsidered for a more pedestrian oriented environment. In the interim, wide shared use paths should be considered to connect the built-out interior area with the station, and help pedestrians and bicyclists navigate through the large parking areas.

Easy and safe connections to a walkable transit village:

Richmond Transit Center – Richmond, California. Photo courtesy of HDR

Transit services as an anchor for new development:

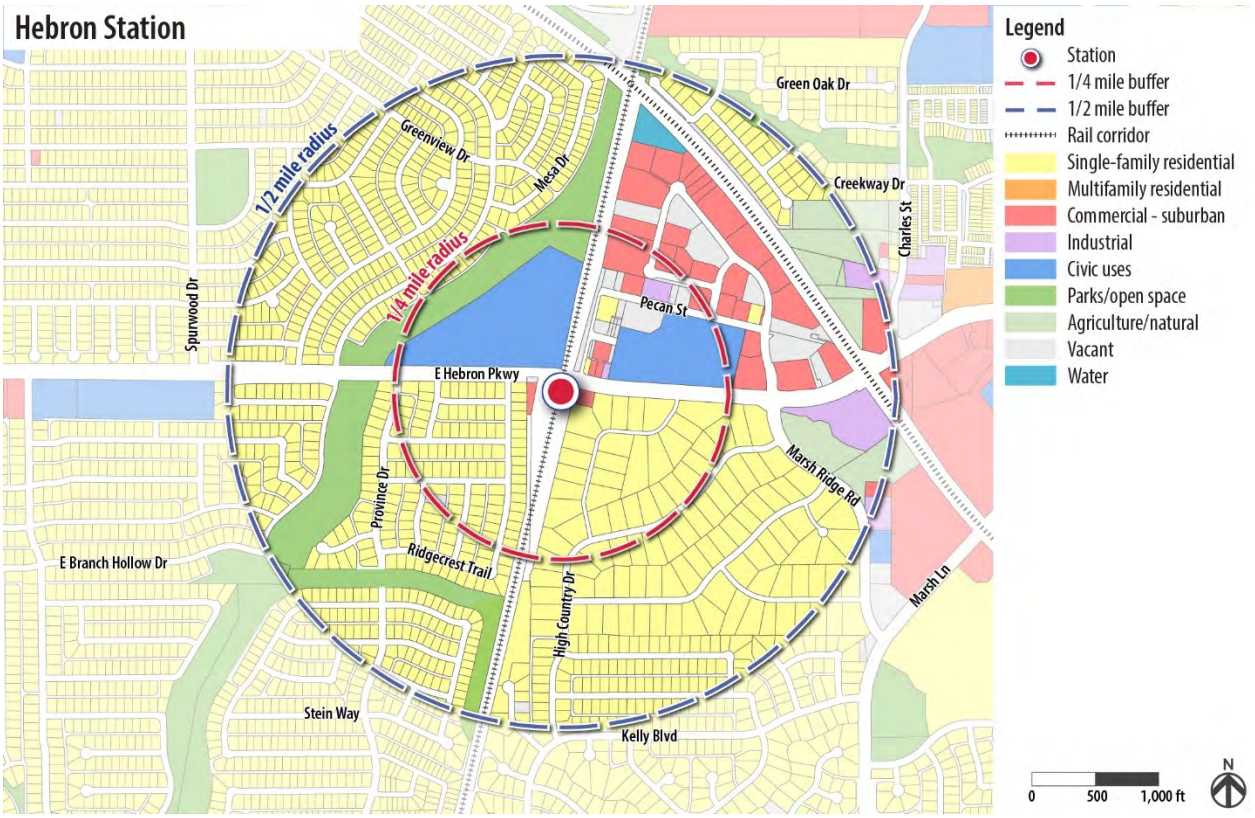
Downtown Garland Station – Dallas, Texas. Photo courtesy of DART

Hebron Parkway

Existing Conditions

Surrounding land uses include civic, commercial, residential, and vacant land as shown in **Figure 20**. The civic uses are two large religious centers.

Figure 20: Hebron Existing Land Use



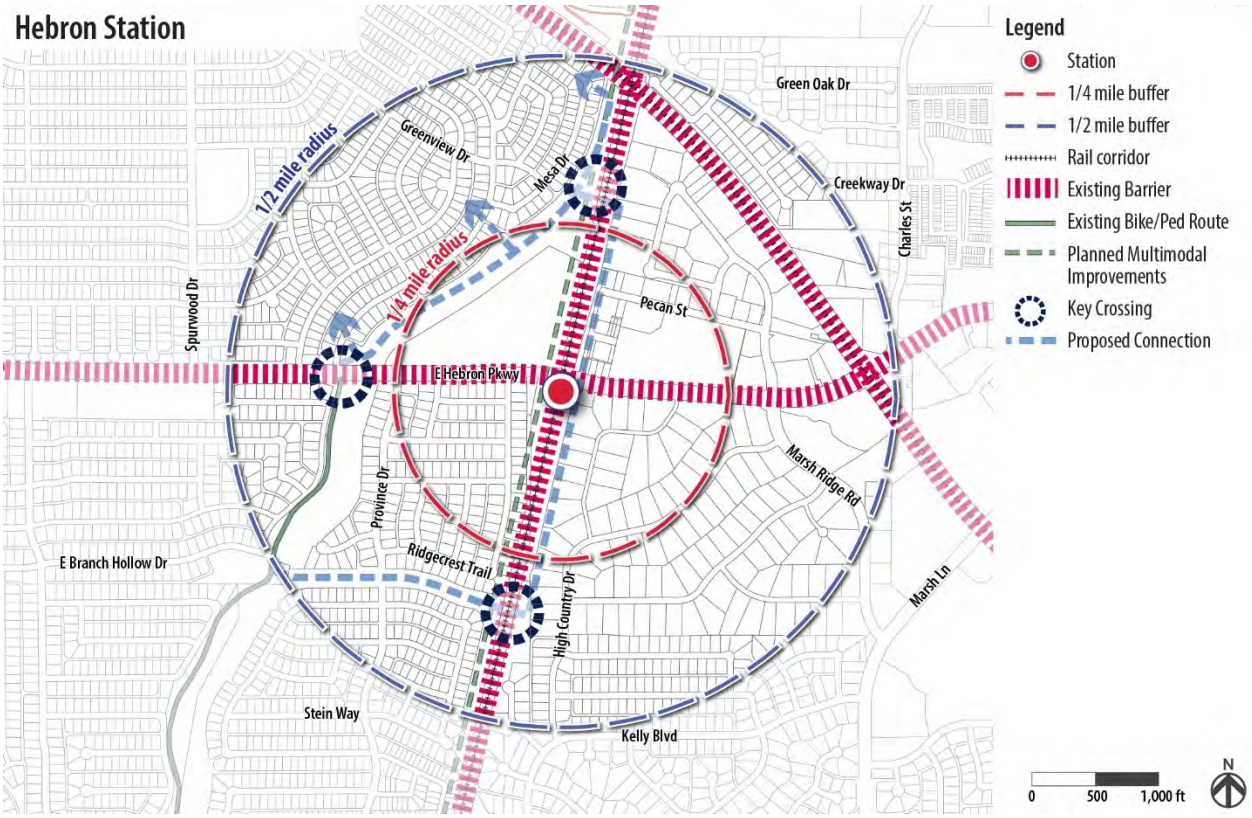
Long-Range Plans

- Carrollton By Design Comprehensive Plan (2003)
- Zoning Ordinance

Access and Connectivity

The Hebron Parkway is a major corridor that connects the station area to the region. It has minimal space for pedestrians and no dedicated bike lanes. In some cases, sidewalks are missing completely, including a small segment directly next to the rail corridor. The Parkway, especially in areas within close proximity to the station area, could be redesigned or lightly retrofitted to provide a more comfortable walking and biking experience and provide a safe connection between existing neighborhoods and the station area. Just west of the station, as shown in **Figure 21**, Carrollton's Blue Trail travels through Branch Hollow Park. This trail connection is an important link between the station area and points south. The trail should be studied for extension both north of the Parkway and along the parkway for major multi-modal access improvements.

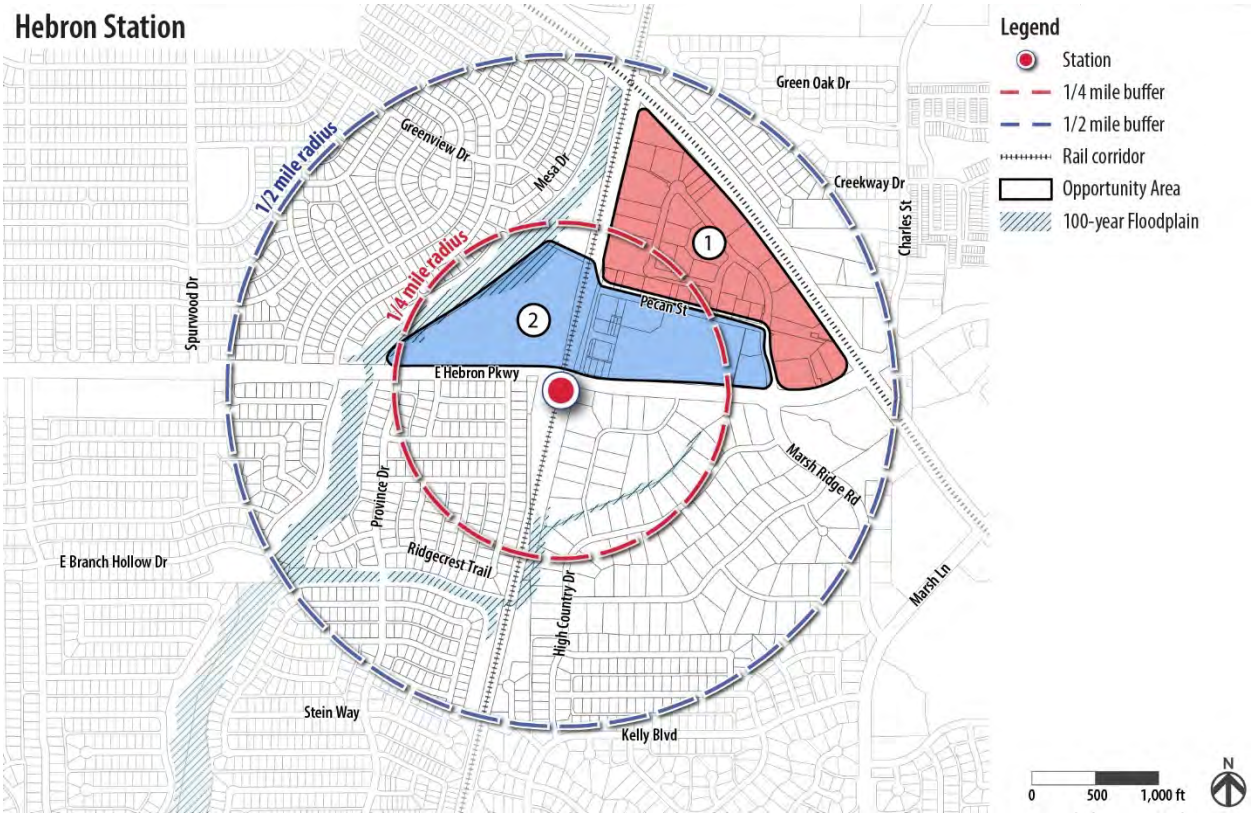
Figure 21: Hebron Connectivity



Transit-Oriented Development Opportunities

The area is a mix of institutional and commercial uses and established residential communities. Each of these areas have varying degrees of potential for TOD. The existing uses – such as local businesses, churches, and schools – may be prioritized, even as the land use pattern may change. Opportunity areas as shown in **Figure 22** can be described as follows:

Figure 22: Hebron Development Opportunities



Opportunity Area 1: The commercial district to the north has developed over the past two decades and contains many commercial and light industrial uses that depend on vehicle travel. This area may be studied for near-term strategic infill for transit-supportive uses and, in the long term, may be redeveloped as a significant transit village that may provide replacement space for some of the existing businesses along with new residences and other community-serving uses.

Opportunity Area 2: The church, school, and other uses are important community assets that should be preserved. However, they occupy large amounts of land that can be transformed to create more TOD potential while preserving these critical uses. The institutional leaders may be good partners for creating opportunities for TOD and creating a vibrant mixed-use area.

Creation of business district to the scale of transit-oriented development:

Orenco Station – Hillsboro, Oregon. Photo courtesy of PositivelyPortland.com

Transit village that accommodates new residential density and other community services:

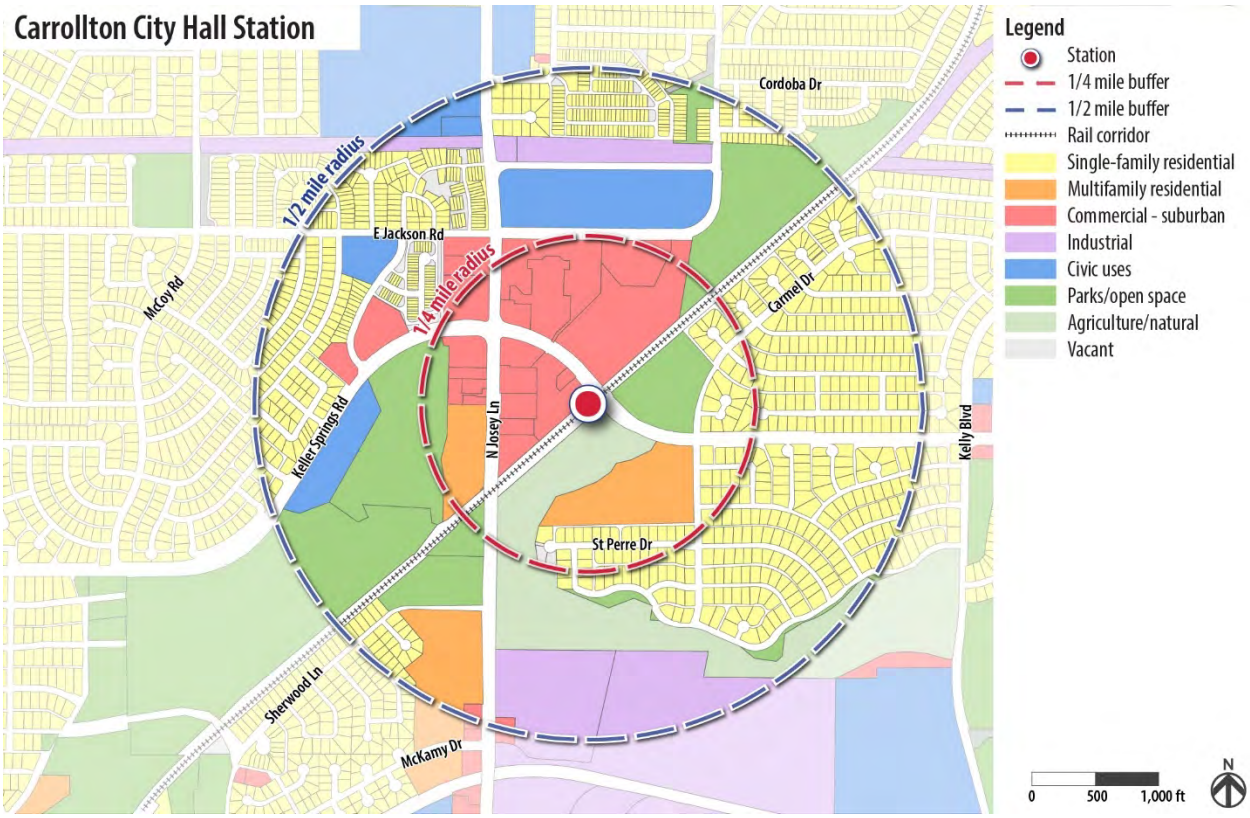
McClintock-Apache Station – Tempe, Arizona. Photo courtesy of Steven Vance/Flickr

Carrollton City Hall

Existing Conditions

The land uses around the proposed station location are commercial, multi-family residential and parks/open space as illustrated in **Figure 23**.

Figure 23: Carrollton City Hall Existing Land Use



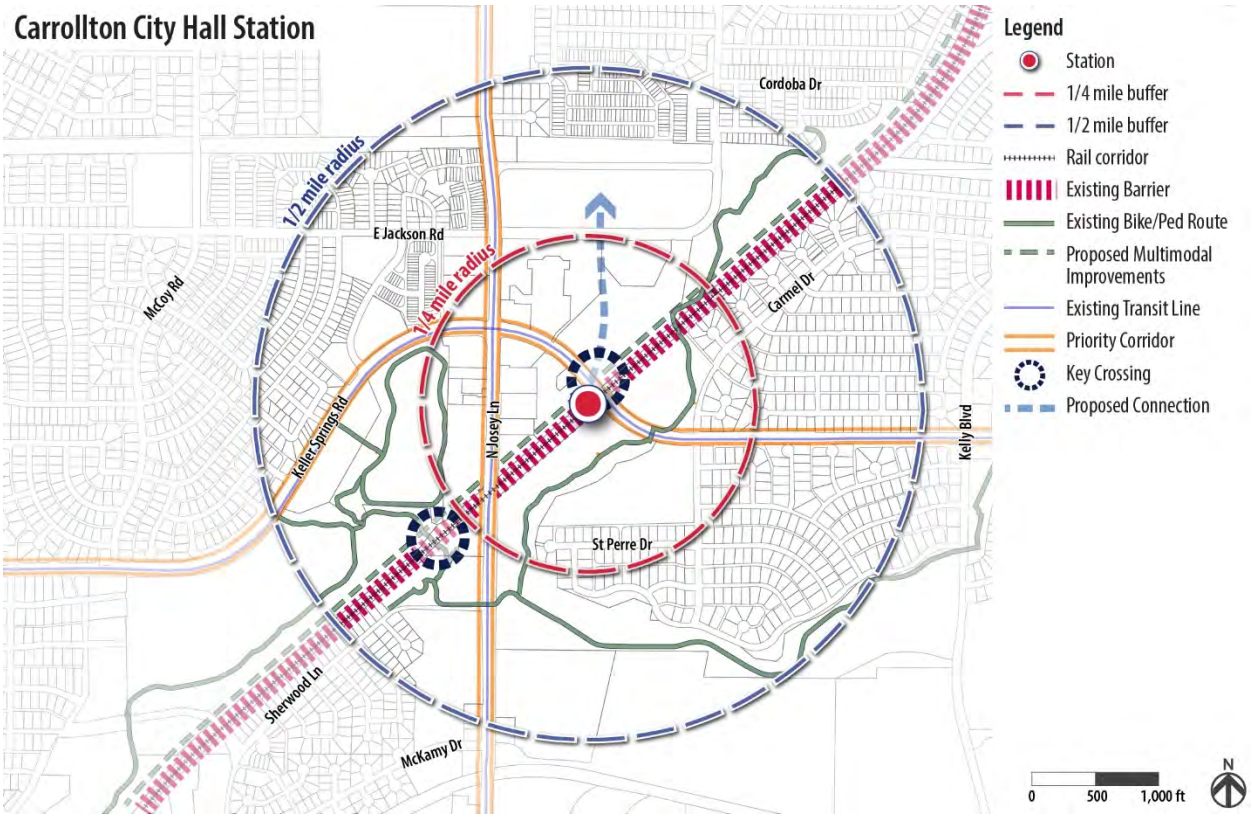
Long-Range Plans

- Carrollton By Design Comprehensive Plan (2003)
- Zoning Ordinance

Access and Connectivity

The station area sits near the intersection of two major roadways – Keller Springs Road and Josey Lane - that provide important vehicle connectivity to the area. These roads, however, do not provide a comfortable walking or biking experience and, often, sidewalks have no protection or buffer from car traffic. Furthermore, the areas where these two roads are crossed by the rail corridor do not have safe crossings and will make transit station access more difficult or discourage travel by foot or bike. The station area is also not easily connected to the important civic uses such as City Hall, the police stations, and library. However, as shown in **Figure 24** the Purple and Green Trails are major amenities and provide great connection to the area and region. In addition to these important trails, walkable and safe connections should be prioritized from major institutions to the transit station area on existing or new streets.

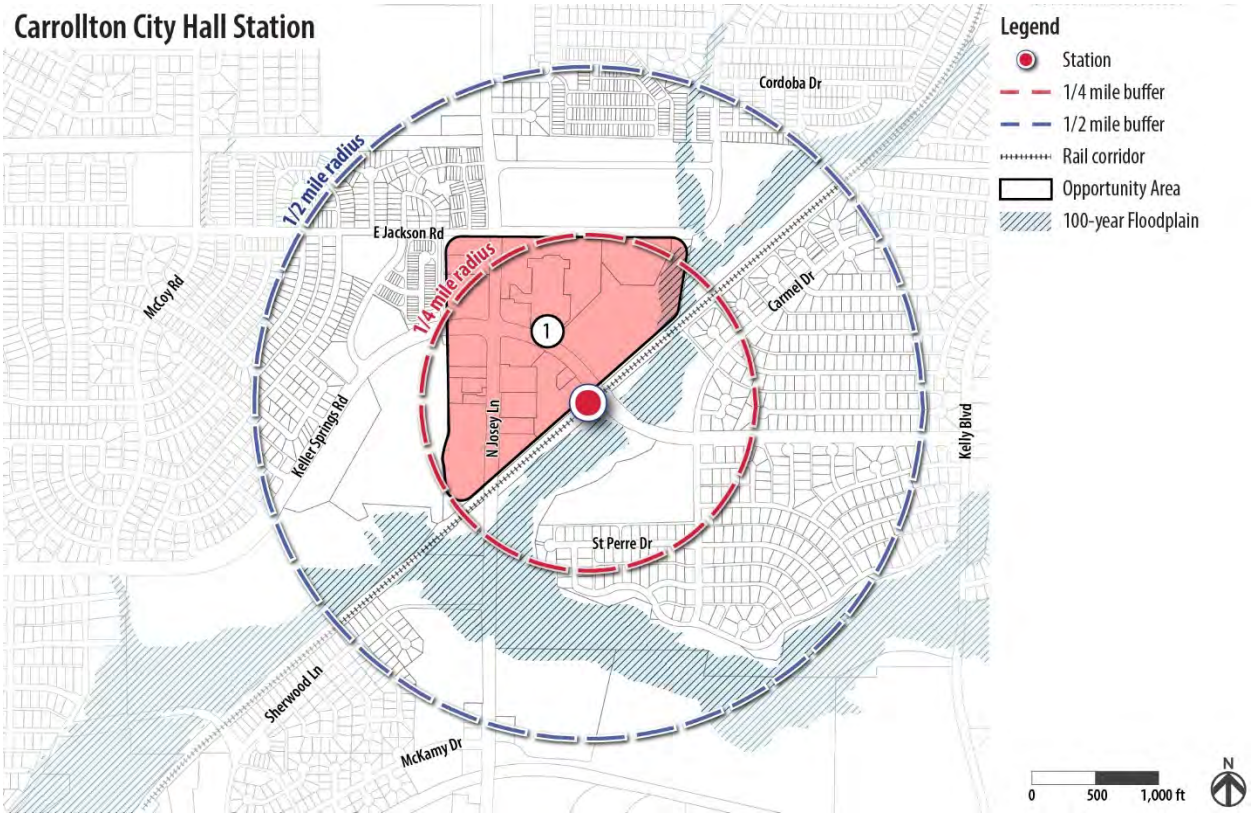
Figure 24: Carrollton City Hall Connectivity



Transit-Oriented Development Opportunities

Much of the area surrounding the station location is dominated by regional parks and other open spaces. Though great parks can be a destination, they do not tend to promote additional transit ridership and generally cannot be developed for other uses. As a result, the commercial areas north of the station, as seen in **Figure 25,** may be the primary TOD opportunity.

Figure 25: Carrollton City Hall Development Opportunities



Opportunity Area 1: The shopping centers east of Josey Lane adjacent to the train tracks are a good opportunity for future strategic infill or full redevelopment. The area south of Keller Springs is made up of smaller parcels and uses. These may be redeveloped individually for residential and other uses but consolidating these parcels for a larger vision will provide greater opportunity for a connected mixed-use transit district. North of Keller Springs, the large shopping centers provide an easier foundation for TOD. Though these centers may be successful in the near-term, they may be great opportunities for a larger-scale redevelopment of a transit village down the line. As that occurs, new street and path connections should be prioritized to better connect the civic uses to the north to parks, trails, amenities, and the transit station.

Mixed-use transit district as a foundation for infill or redevelopment:

Central Park – Denver, Colorado. Photo courtesy of Matthew Lloyd /Flickr

Mixed-use development with an emphasis on pedestrian amenities:

Downtown Bellevue – Bellevue, Washington. Photo courtesy of HDR

Downtown Carrollton

Existing Conditions

The area is zoned as a Transit Center District – Downtown Carrollton Transit Center. The goals of this district[6] are:

- To capitalize on the convergence of regional transit, freeways and arterial roadways by creating major urban and village centers which offer a variety of housing, retail and office uses.
- To provide development and land use flexibility within the framework of a form-based development code.
- To provide a mix of residential, retail and office uses in a pedestrian-friendly district.

The intent of this district is:

- To provide a comfortable and attractive environment for pedestrians.
- To construct buildings close to the sidewalk and street.
- To construct continuous building frontage along block faces and provide for pedestrian and auto access to mid-block parking.
- To provide shared parking both on-street and in the center of blocks that will benefit the entire district.
- To contribute to the definition and use of public parks and plazas.
- To design streets and buildings which contribute to the creation of safe environments.
- To build on the existing character reflected in Downtown Carrollton.

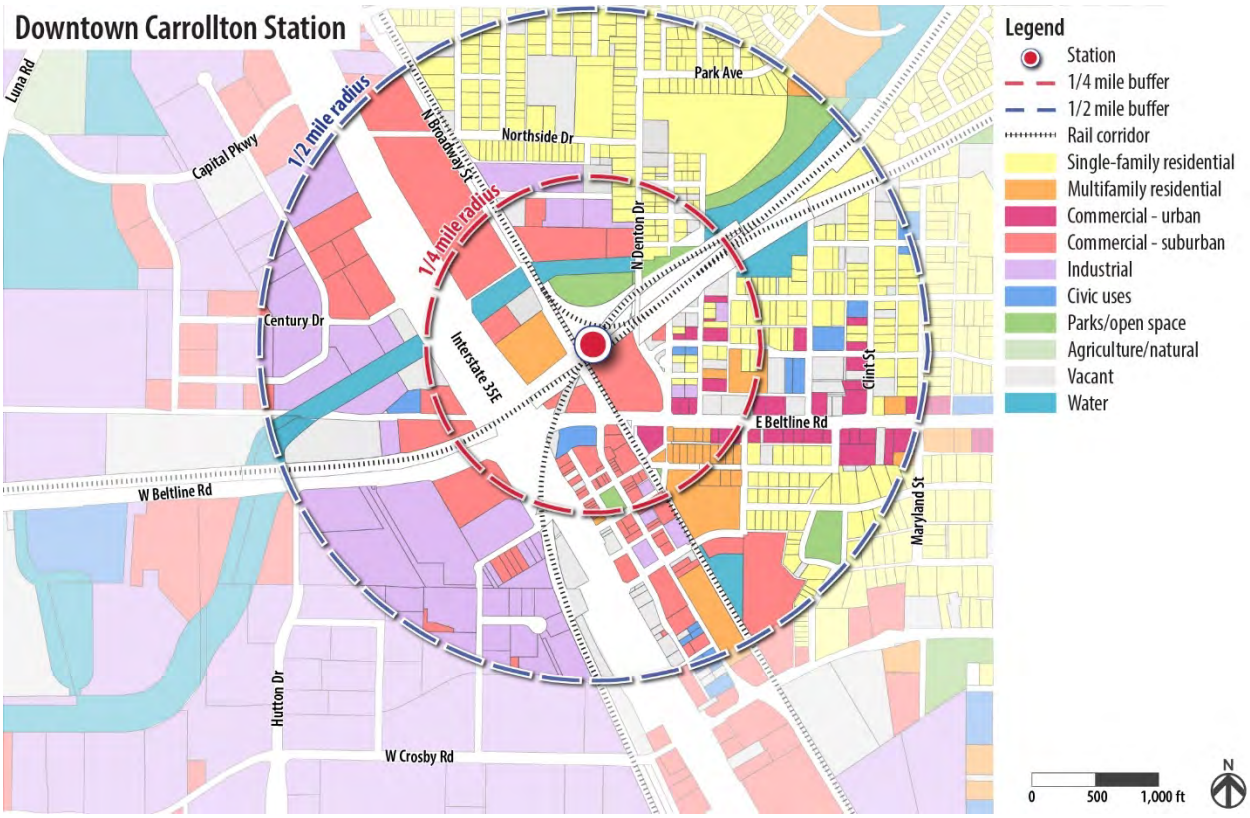
This proposed station location is within TIRZ 1. The City of Carrollton and Dallas County have committed to participate at a 65 percent rate - that is, 65 percent of future revenue increases in the zone will be used to fund infrastructure improvements within the zone.[7]Another economic incentive available is the Public/ Private Agreement Program for Transit-Oriented Development. The purpose of this program to provide assistance only for projects where such assistance is necessary to stimulate private investment to add further value to the project above current zoning requirements.[8] Existing land uses are shown in **Figure 26**.

[6] "City of Carrollton, TX." Transit Center Zoning District | City of Carrollton, TX, www.cityofcarrollton.com/business/carrollton-development/tod/transit-center-zoning-district.

[7] "City of Carrollton, TX." Tax Increment Reinvestment Zone (TIRZ) | City of Carrollton, TX, www.cityofcarrollton.com/business/carrollton-development/tod/tax-increment-reinvestment-zone-tirz.

[8] "City of Carrollton, TX." Public/Private Agreement Program | City of Carrollton, TX, www.cityofcarrollton.com/departments/departments-a-f/economic-development/incentives/public-private-agreement-program.

Figure 26: Downtown Carrollton Existing Land Use



Long-Range Plans

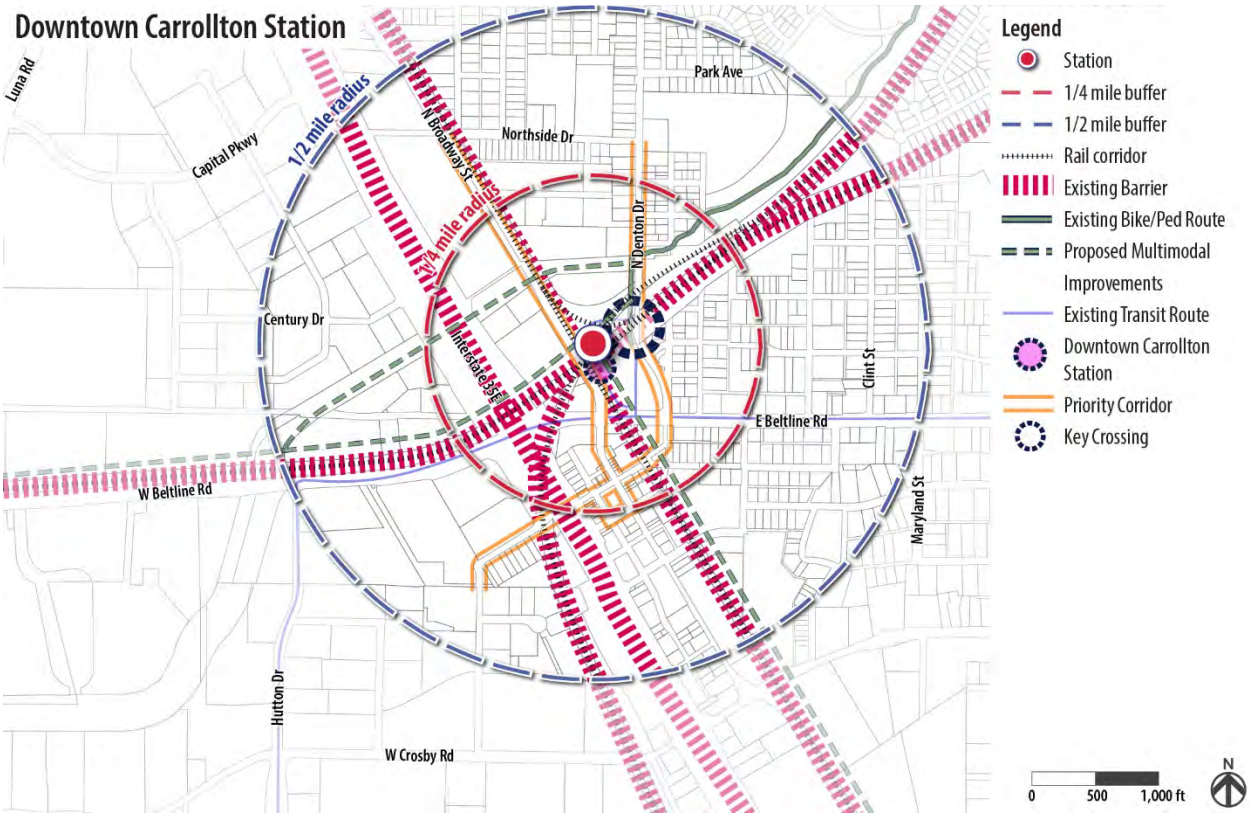
- Carrollton By Design Comprehensive Plan (2003)
- Zoning Ordinance

Access and Connectivity

The Dallas Area Rapid Transit (DART) Green Line runs perpendicular to the proposed alignment, with the Downtown Carrollton DART Station adjacent to the proposed station location. The addition of another rail line, while complex to design, would create one of the most transit-rich locations in the entire region. This connection will provide access to Famers Branch, Love Field Airport, Southwestern Medical District, Downtown Dallas, and Baylor University Center as well as Downtown Denton and Lewisville through A-train operated by Denton County Transportation Authority (DCTA). Future plans to extend DCTA's A-Train to this location, as well as current construction of DART's Silver line, would further connect to DFW Airport and Addison Transit Center and provide significant mobility options within the region. From a bike and pedestrian perspective, both the Green and Purple Trails are in the immediate area and provide connectivity to the northeast, east and southwest.

The context of the Downtown Carrollton stations is highly constrained, presenting significant, enduring barriers to connectivity. Interstate 35 restricts east-west connectivity, particularly for people traveling on foot and bike as the few connections across the interstate are fairly hostile places for non-motorized travelers. The major east-west connection—Beltline Road—is in itself a significant barrier for pedestrians and bicyclists traveling north and south and attempting to cross. The existing I-35 underpass over the Beltline and College Avenue is a great opportunity to provide connectivity from the station to the planned extension of the Cotton Belt Trail along Belt Line Road. This connection can happen as an early step or be developed in tandem with the Silver Line construction. As shown in **Figure 27**, three separate rail corridors within the vicinity create further barriers for travel, both east-west and north-south. Within this very constricted and auto-centric environment, improvements should focus on making walking and biking along and across Beltline Road safer and more comfortable to allow for more equitable access to the station from the surrounding areas.

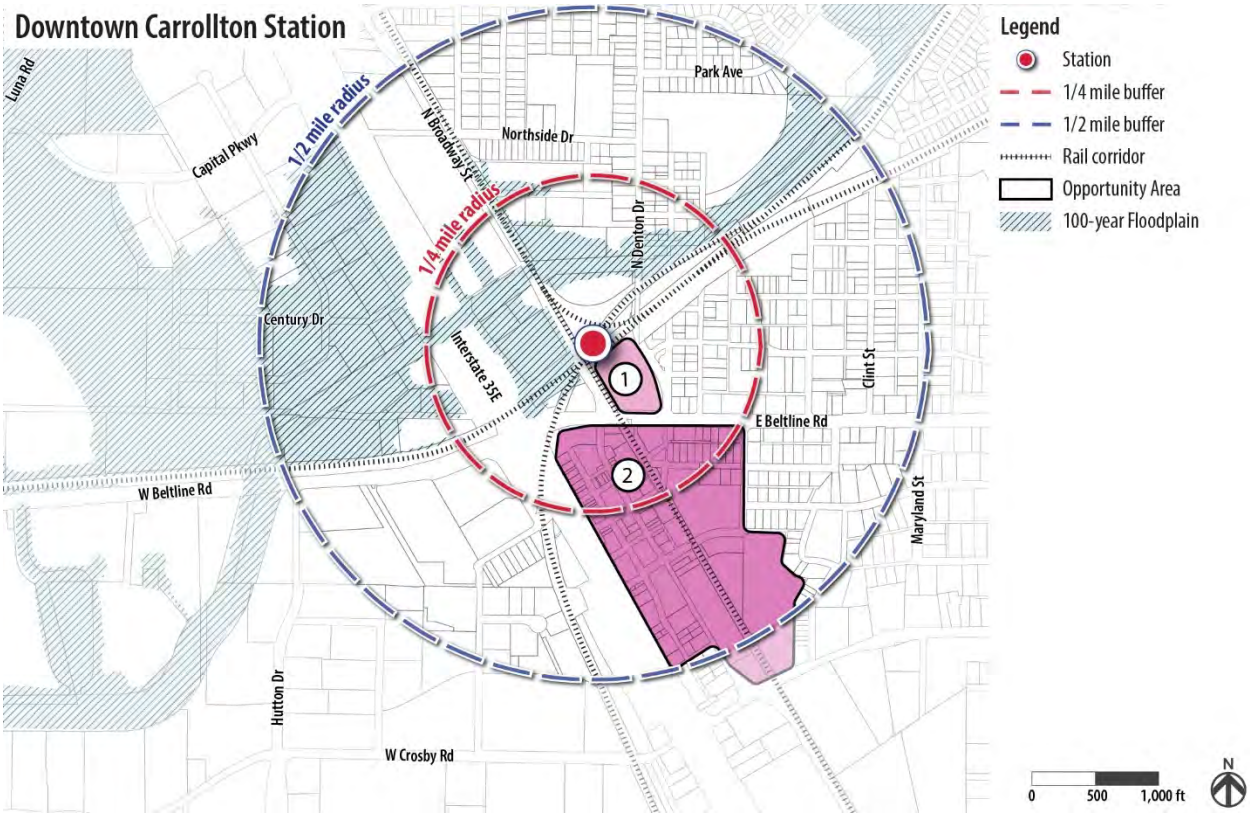
Figure 27: Downtown Carrollton Connectivity



Transit-Oriented Development Opportunities

The constrained environment of the Downtown Carrollton station provides few opportunities for additional transit-oriented development. Two areas within the vicinity of the station as shown in **Figure 28**, however, present opportunities for strategic infill or redevelopment and can be described as follows:

Figure 28: Downtown Carrollton Development Opportunities



Opportunity Area 1: The existing park-and-ride lot at the station is ripe for redevelopment, which should combine required parking (adjusted to reflect the actual demand) with commercial and residential uses to both generate ridership and provide services to riders. As a publicly owned lot, opportunities for Joint Development or other public-private-partnerships should be explored to provide needed uses and services immediately adjacent to transit, such as attainable housing or other community resources.

Opportunity Area 2: The area south of Beltline Road has begun to urbanize, with recent high-density mixed-use developments and walkable streets. As the area continues to mature, this pattern of quality urban development should spread west to densify and intensify the established blocks along Broadway Street. Future development in this area should reflect the existing character of the old town core while allowing for context-sensitive density.

Expansion of existing institutions as station-oriented growth:

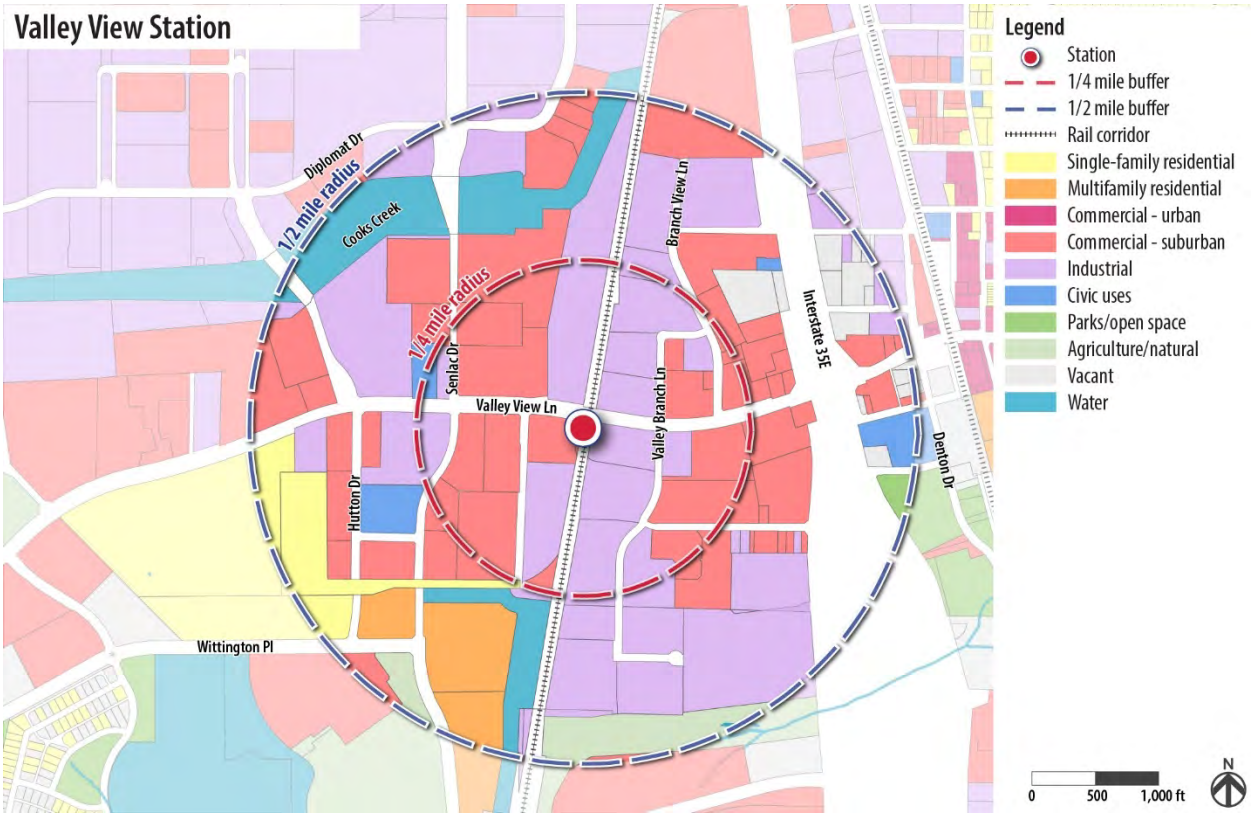
DART Downtown Carrollton Station – Carrollton, Texas. Photo courtesy of Jeffrey Wood/Flickr

Valley View Lane

Existing Conditions

Land uses around the proposed station location include commercial and industrial as shown in **Figure 29**. The area is predominantly filled with distribution warehouses. The zoning is PD77 PD25. These zoning districts allow for commercial, educational, entertainment, institutional, recreational, retail, transportation, and utility uses. The building setbacks vary depending upon street frontage, typical of suburban development, and will want to be revisited to support transit-oriented development types.

Figure 29: Valley View Existing Land Use



Long-Range Plans

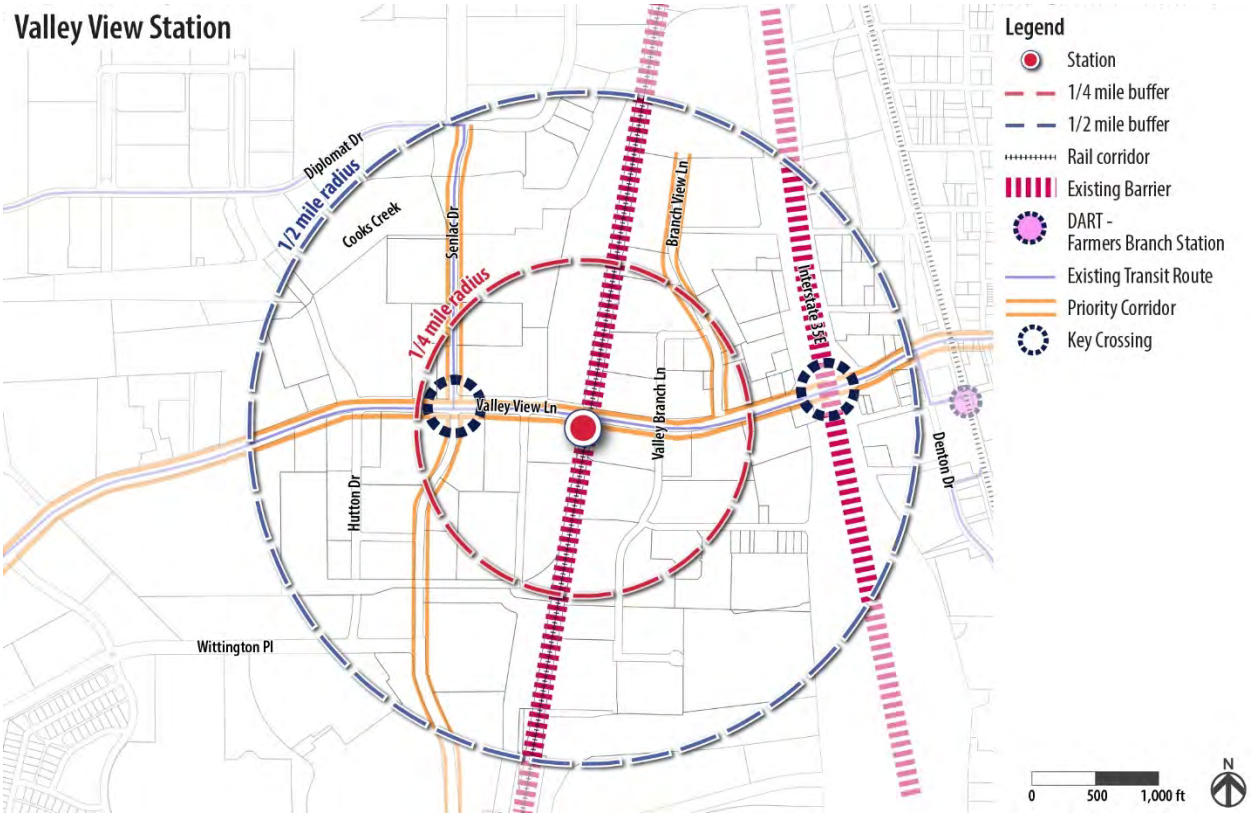
- Trails Master Plan (2015)
- Westside Plan - https://content.civicplus.com/api/assets/60f38369-d985-4ea1-a8ca-9bc5aa65eec2
- IH-35 Corridor Study - https://content.civicplus.com/api/assets/8d811698-684f-44b2-8c71-e416c23959dd

Access and Connectivity

DART operates three bus routes along Valley View Lane, the 400, 533 and 535 routes, with bus stops accessible from the proposed station area. Bike and pedestrian access, however, is limited with interrupted sidewalks and little to no bike infrastructure. The city's adopted IH-35E Corridor Vision Study recommends improving bike and pedestrian east/west connectivity along Valley View Lane and at the intersection with IH-35E. The study also recommends developing new sidewalks to create continuous connections with a focus along Valley View Lane and surrounding area. Additionally, the city has worked with TxDOT to redesign the intersection of Valley View Lane at IH-35E to improve east/west bike and pedestrian connectivity under the IH-35E bridge with the upcoming highway widening project.

Significant barriers to connectivity in the vicinity of Valley View station are shown in **Figure 30** and include Interstate 35E and the rail line, restricting east-west travel. Valley View Lane, the main east-west thoroughfare, is a major roadway that can be daunting to cross for non-motorized travelers. Cooks Creek, which runs parallel to Valley View Lane, presents additional restrictions to north-south connectivity. Improvements should focus on improving the environment of the major corridors to make them more attractive to people on foot or bike. Where redevelopment occurs, new local streets or walkways should provide additional routes for non-motorized travelers accessing the station.

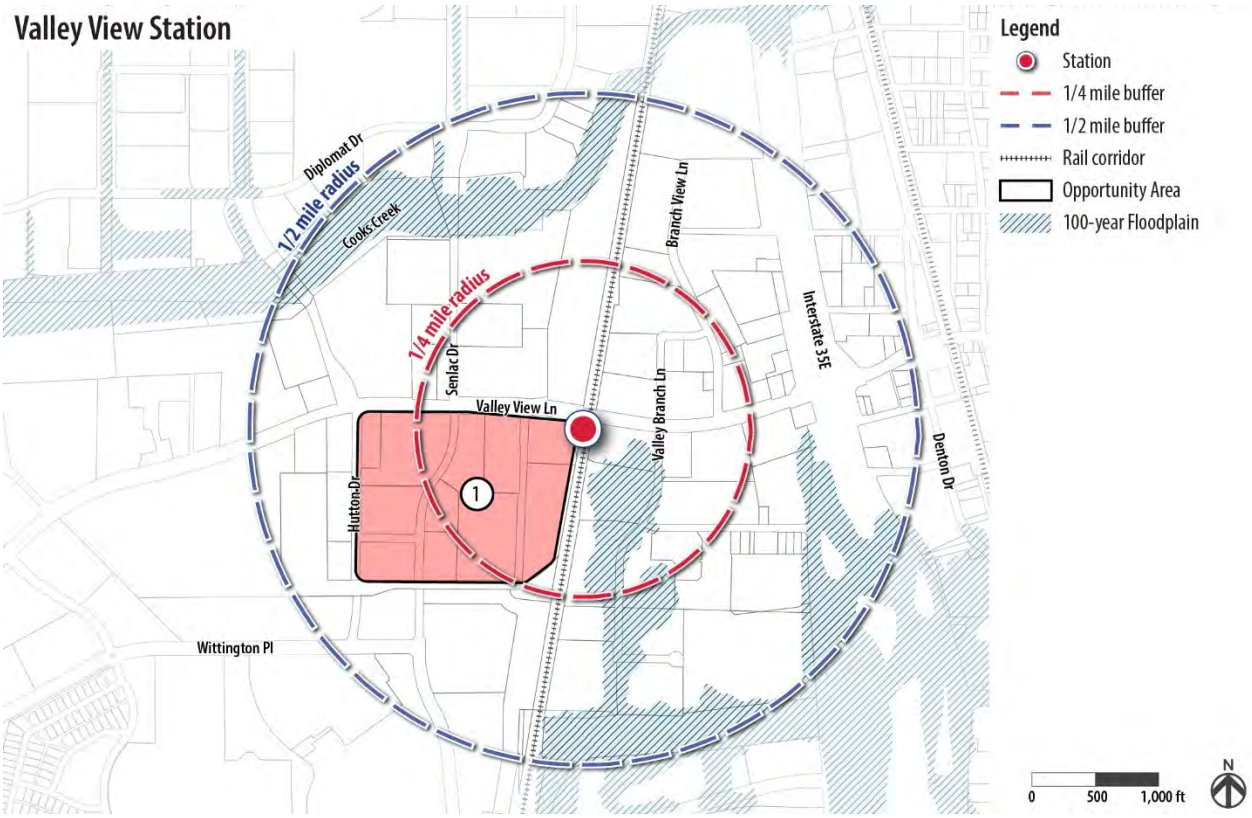
Figure 30: Valley View Connectivity



Transit-Oriented Development Opportunities

The area surrounding the Valley View station is dominated by auto-oriented commercial and employment uses. While the development intensity is fairly low, significant redevelopment of employment uses in the near term is unlikely. There are two larger recent/ongoing residential developments in the southwest quadrant, separated from the station by an aging area of low-intensity commercial and employment uses, which present an opportunity area (**Figure 31**) for intensification and/or redevelopment:

Figure 31: Valley View Development Opportunities



Opportunity Area 1: The existing commercial and employment uses should be intensified and redeveloped as a mixed-use area to provide a transition between the station and the new residential districts. With the minimal infrastructure in the area, this zone should be studied further for the potential to attract development while retaining valuable jobs housed in the existing uses.

High density residential directly adjacent to transit line:

Farmer's Branch Transit Station – Farmer's Branch, Texas. Photo courtesy of DART

Transition from station to adjacent communities:

Downtown Plano – Plano, Texas. Photo courtesy of David Wilson/Flickr

Royal Lane

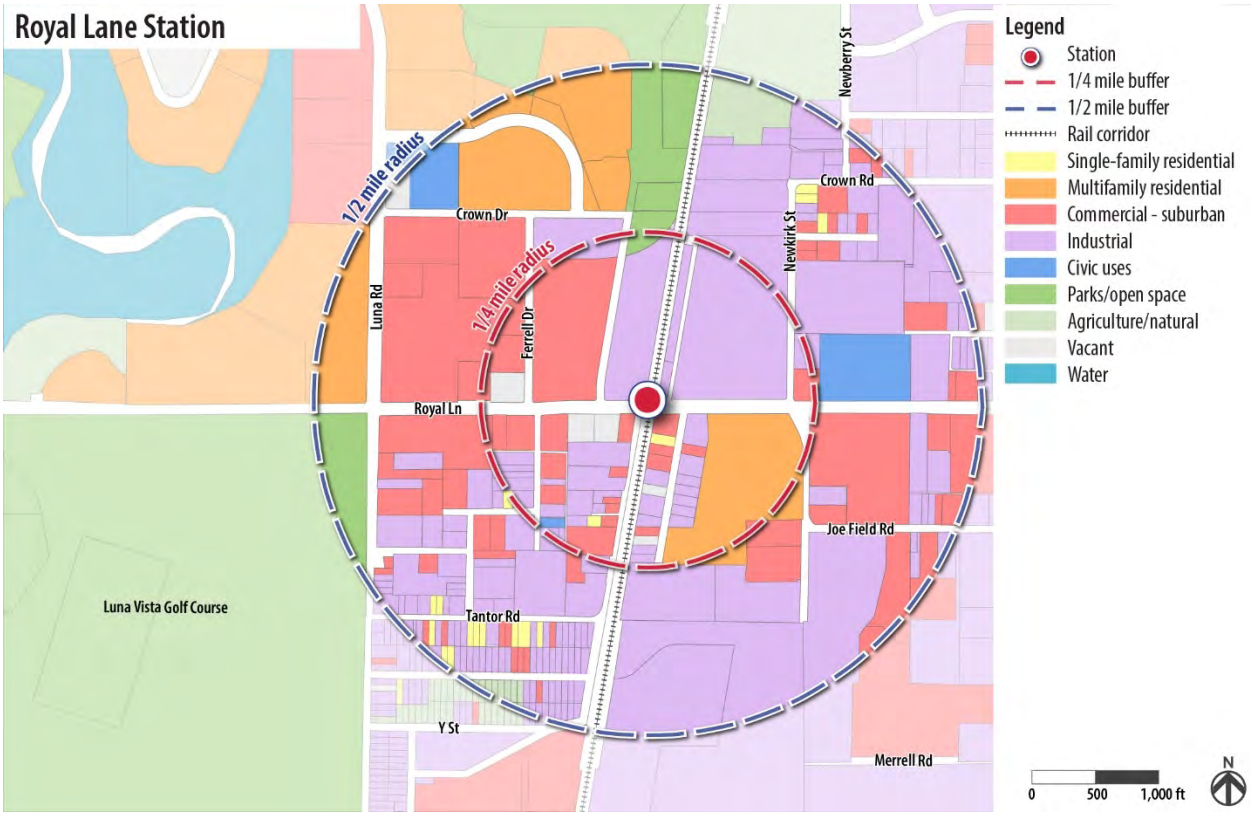
Although this station location was originally identified as an alternate location to the Valley View station and included in this land use analysis, this station is no longer recommended given the station spacing between the Valley View station and the South Las Colinas station.

Existing Conditions

The existing land use around the proposed station location includes commercial, industrial, and vacant as illustrated in **Figure 32**. The area is mostly filled with distribution warehouse and storage yards. There are some areas of redevelopment with multifamily.

The area is zoned PD22[10] within Farmers Branch and Industrial Research District (IR) within the City of Dallas. PD22 allows for light industrial land uses. Building setbacks vary from 25-50 feet depending on frontage. Consider revisiting zoning to support transit-oriented type development.

Figure 32: Royal Lane Existing Land Use



[10] Planned Development District 22: https://www.farmersbranchtx.gov/DocumentCenter/View/451/PD-22-Ordinance-1162?bidId=

Long-Range Plans

The northwestern portion of Royal Lane is within the City of Farmers Branch.

- Comprehensive Plan (1989)
- East Side Comprehensive Plan (2016)
- Trails Master Plan (2015)

The remainder of the area is within the City of Dallas.

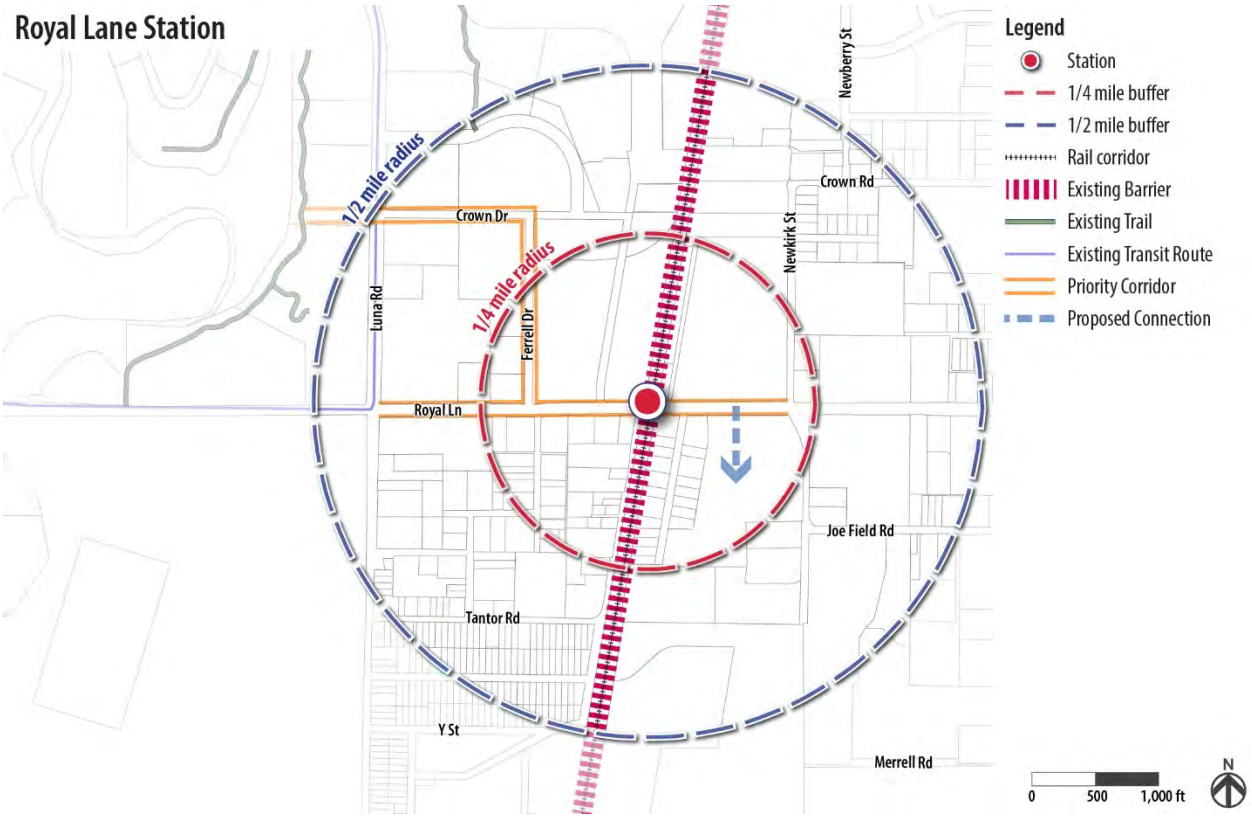
- Complete Streets Design Manual (2016)
- Comprehensive Housing Policy (2018)
- Connect Dallas Strategic Mobility Plan (2021)
- Dallas Area Rapid Transit Light Rail Project Design Criteria (2003)
- Dallas Bikeway Plan (2011)
- Dallas Development Code
- Dallas Trail Network Plan (2008)
- forward Dallas! Comprehensive Plan (2006) – currently being updated
- Urban Design Guidelines for Projects Located in City of Dallas Tax Increment Financing (TIF) Districts (2015)
- Urban Transit Design Guidelines (2017)

Access and Connectivity

In part due to the industrial nature of this station area, bike and pedestrian access are limited with incomplete sidewalks and little to no bike infrastructure. DART's Royal Lane Station served by the Green light rail line, lies about 1.6 miles to the east of the proposed station area, suggesting a possible connection in the future between the two lines. DART also operates bus route 403 on Royal Lane to the west of the proposed station area, providing access to the North Irving Transit Center and Farmers Branch Green Line Station.

Proposed connections extend out from the station location as shown in **Figure 33** and connect to existing trails on the west, and emphasize the need to connect to adjacent residential and commercial uses to the east.

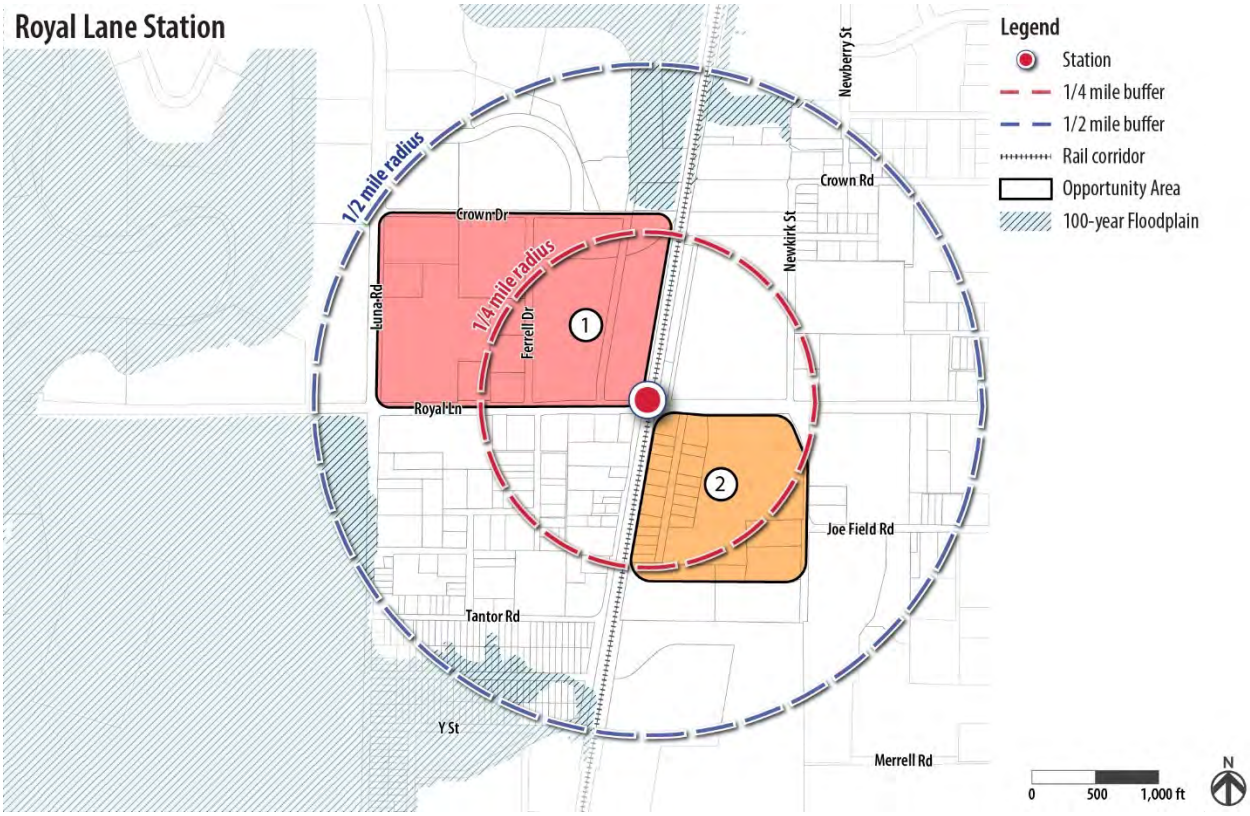
Figure 33: Royal Lane Connectivity



Transit-Oriented Development Opportunities

The station location is situated along the Royal Lane thoroughfare, which is an important connection for existing multi-family residential and light industrial land uses. Unfortunately, the existing environment prioritizes driving over walking or bicycling. The area may not have the infrastructure present to support large transit-supportive development but can be phased in over time. Existing jobs in the area are important and should be considered and offset as future development converts this area to other uses. Opportunity areas as shown in **Figure 34** can be described as follows:

Figure 34: Royal Lane Development Opportunities



Opportunity Area 1: Infill development within the area to the north-west can help make a more pedestrian friendly environment – with a tighter development footprint, and direct connections to the station. With existing high-density multi-family residences already in this area, there is an opportunity to develop a mixed-use district that provides greater density, jobs, retail, and community amenities and provide better access to the transit station for the residents of the existing homes.

Opportunity Area 2: This area has a mix of smaller scale light-industrial and commercial uses and affordable residential areas. The areas that run along the track make a good opportunity for denser redevelopment while using the opportunity to provide better connections for the existing residents.

Increased density along rail corridor:

Del Mar Station – Pasadena, California. Photo courtesy of LA Wad/Flickr

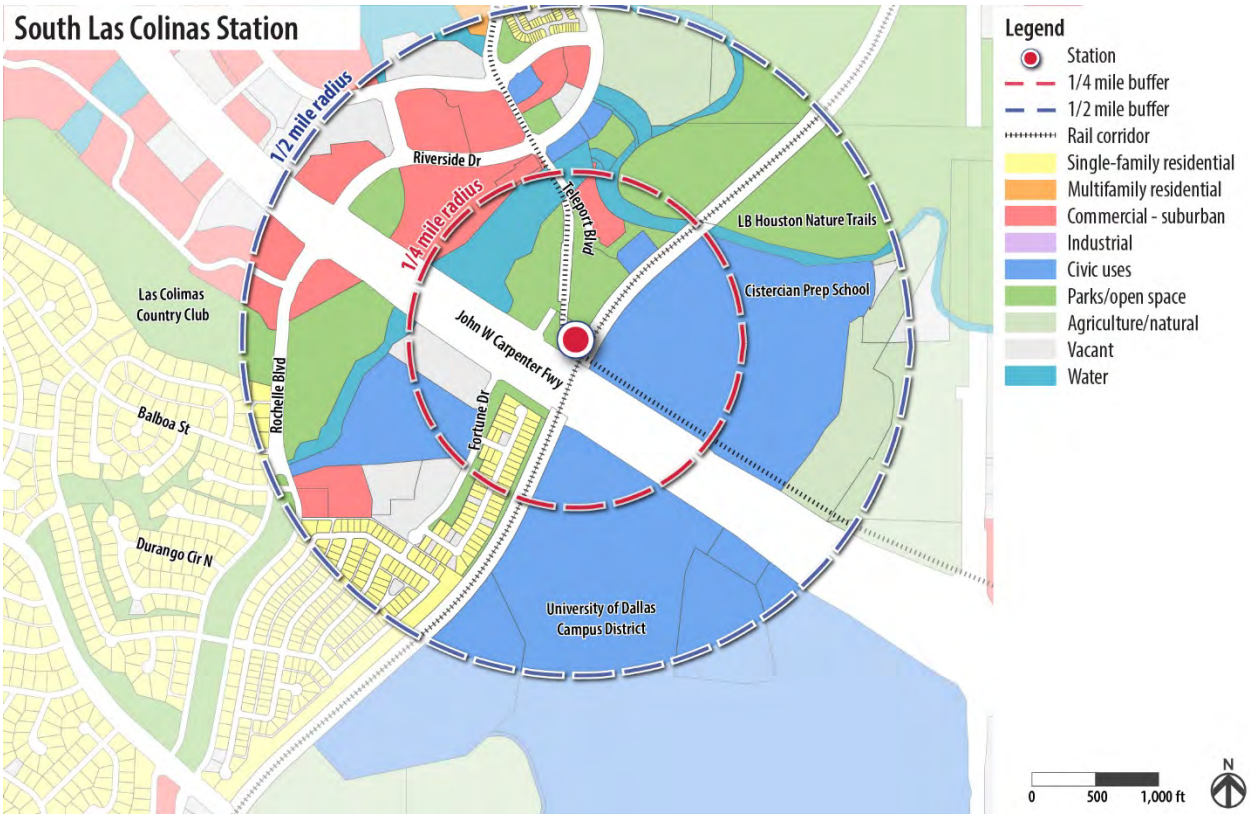
South Las Colinas

Existing Conditions

The existing land use around the proposed station location includes civic, residential, and vacant land as shown in **Figure 35**.

To the north-west is the Las Colinas Urban Center, which serves as a mixed-use regional destination. There are established institutional uses to the east and south of the station, such as the Cistercian Abbey and Preparatory School, and the University of Dallas campus.

Figure 35: South Las Colinas Existing Land Use



Long-Range Plans

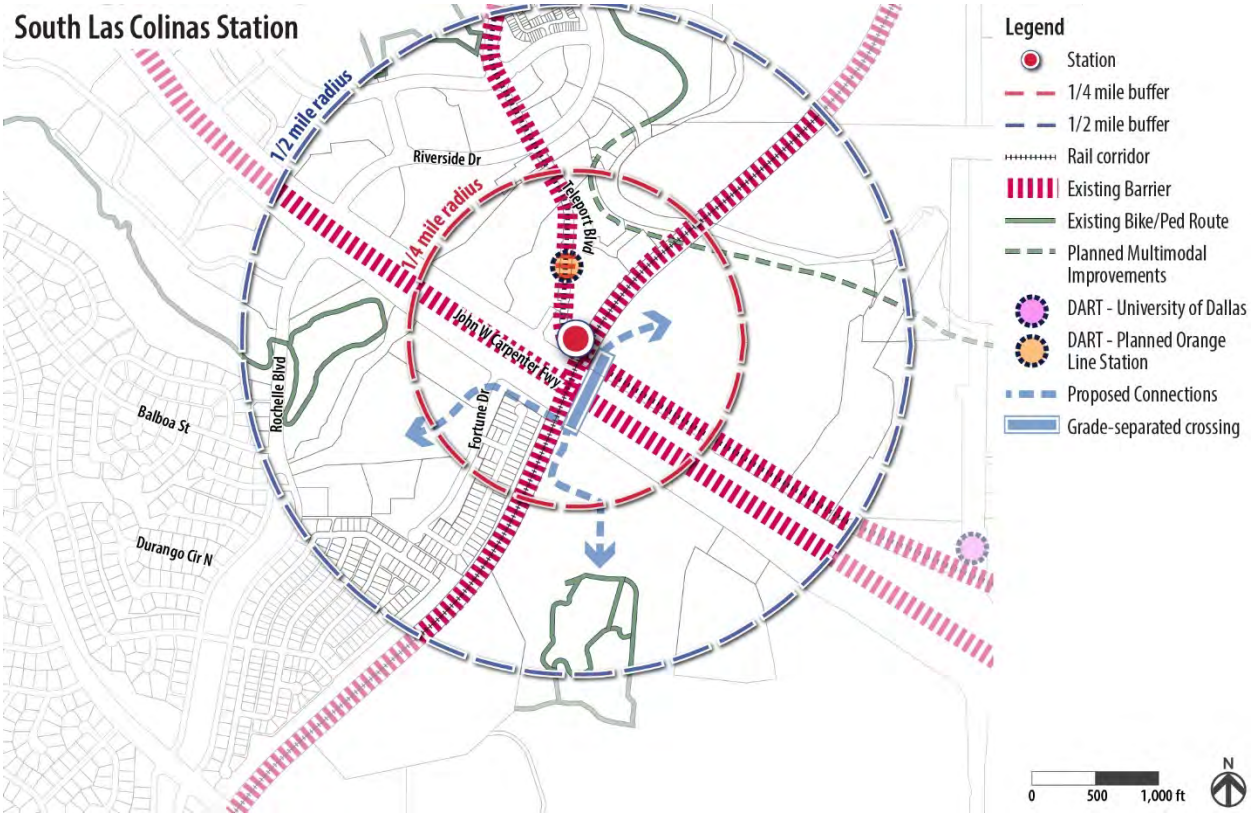
- Urban Center Master Plan (2013)
- Economic Development Strategic Plan (2017)
- Imagine Irving Comprehensive Plan (2017)
- Land Bank Properties
- Unified Development Code (updated 2020)
    - Subdivision Design and Improvements
- Zoning Ordinance

Access and Connectivity

The DART Orange Line runs perpendicular to the BNSF rail line and includes a planned station in proximity to the proposed alignment. The Orange Line provides a direct connection to DFW Airport, the Irving Convention Center, North Lake College, Las Colinas, University of Dallas, Love Field Airport, Southwestern Medical District, Downtown Dallas, the City of Richardson, and Downtown Plano. Future planning efforts also consider automated transportation systems as a connection between the Las Colinas Area Personal Transit system and the Orange Line/Irving-to-Frisco junction.

John Carpenter Freeway and regional railway lines are connectivity barriers at this station. This poses a challenge for station connectivity to the south of John Carpenter Freeway, as barriers will have to be strategically mitigated in order to properly connect the station. Proposed connections, as shown in **Figure 36**, imply grade-separated crossings that will greatly enhance opportunities for station use and access. To the south, connections to the University of Dallas will be important in creating well-used and reliable access for the institution's staff, students, and visitors. Connections to the north should be studied to better connect the station area with the Las Colinas Urban Center.

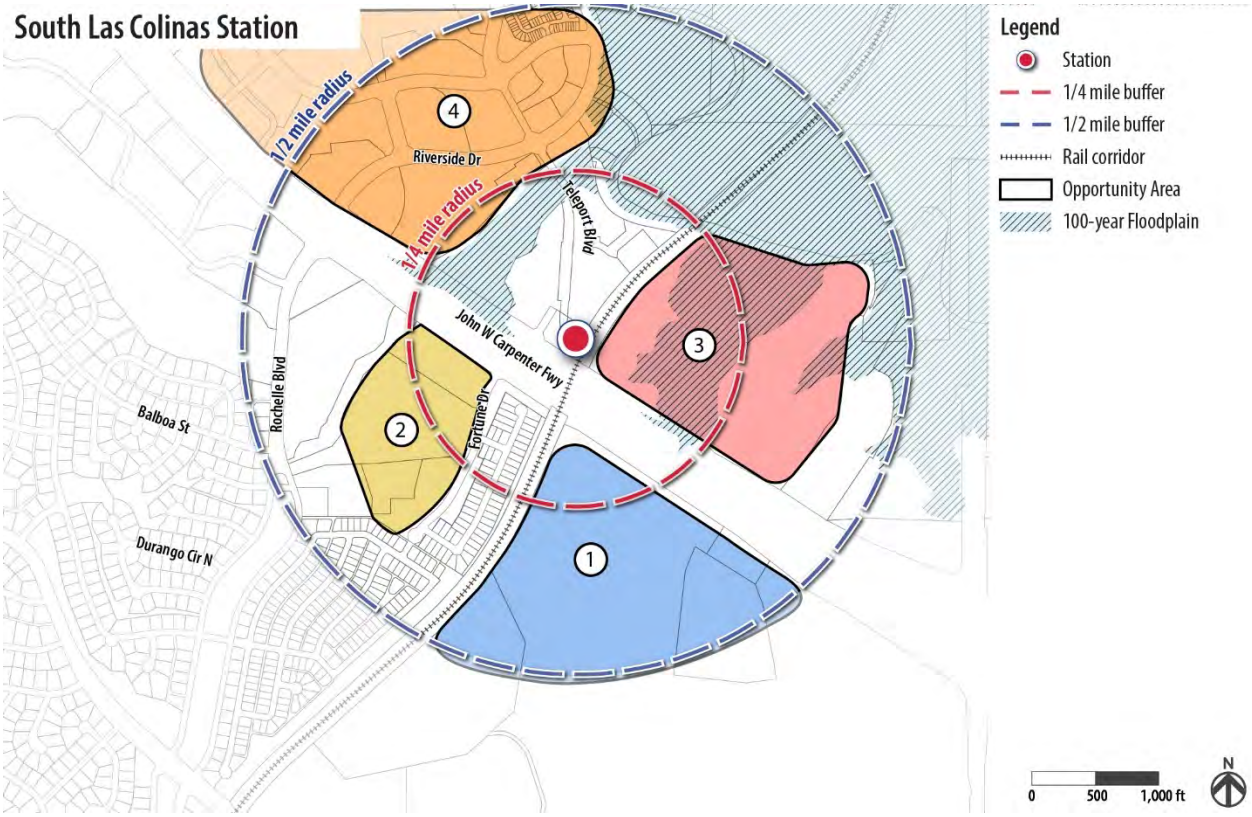
Figure 36: South Las Colinas Connectivity



Transit-Oriented Development Opportunities

Proximity to the Las Colinas Urban Center, and potential development around the future Orange line station exhibit an opportunity to maximize transit-oriented development adjacent to this proposed station. Although the surrounding institutional uses may not pose substantial development opportunities, strategic partnerships may allow for additional planned growth oriented to the station. Opportunity areas (**Figure 37**) to the south of John Carpenter Freeway are:

Figure 37: South Las Colinas Development Opportunities



Opportunity Area 1: The University of Dallas, which provides an important institution and desirable destination in proximity to the station. As the university grows, student housing and daily amenities and services should be prioritized near the station to connect the student body and staff to the region. Strategic station-oriented growth may offer increased campus density and a steady flow of users for the proposed station.

Opportunity Area 2: The Dallas County Utility site offers an opportunity to add a greater mix and intensity of uses to complement the existing civic institution. As transit is brought on line, the large amounts of surface parking may be reconsidered for infill development to bring additional office space, retail, and other uses to broaden the available

services and amenities to the area. Additional shared-use paths would also be considered an amenity to the area, creating a more transit-friendly and walkable development pattern.

Opportunity Area 3: The Cistercian Abbey and Preparatory School site is a well-established campus immediately adjacent to the proposed station location. Even though much of the site is undeveloped, it's development potential is limited by a 100-year floodplain occupying a sizable swath of the site. However, the area offers a potential for the development of grade-separated landings and/or station services. Partnerships may be possible with the school to allow for strategic infill of the remaining site outside of the floodplain. This development can be uses – like hospitality or residences – that equally benefit the school and its users.

Opportunity Area 4: The Las Colinas Urban Center is well-developed so far, with a variety of civic uses, campus settings, corporate office destinations, and the Las Colinas APT service. Remaining vacant parcels offer an opportunity to reinforce a more walkable development pattern by providing a network of shared-use paths and pedestrian accommodations oriented towards the proposed station location. While the majority of the Las Colinas Urban Center is more than a half-mile from the proposed station, the additional planned Orange Line stop at South Las Colinas Station would allow for easy transfers between trains at multiple locations along the service lines; thus making the entirety of Las Colinas accessible by train.

Open spaces and civic uses anchor TOD:

Star Lake Light Rail Station – Kent, Washington. Photo courtesy of Sound Transit

Mixed-use development with character defining features that reflect the existing community:

Downtown Rowlett – Rowlett, Texas. Photo courtesy of DART

Downtown Irving

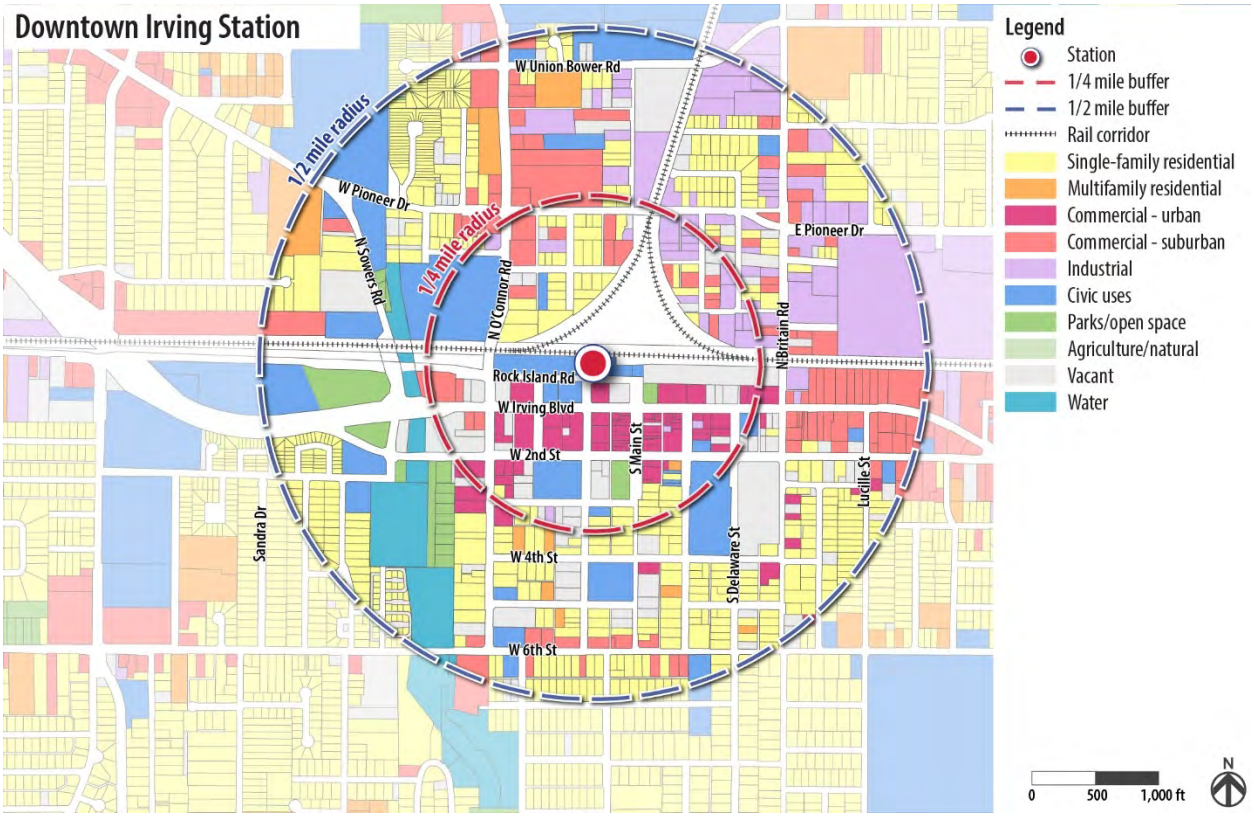
Existing Conditions

The existing land use around the proposed station location is a mixture of civic, commercial, industrial, residential, and vacant land as shown in **Figure 38**.

The existing zoning for the proposed station area is Heritage Crossing District (HCD). The HCD is a pedestrian oriented, mixed-use, urban infill redevelopment, providing shopping, employment, housing, and business and personal services. The HCD supports economic development, a sustainable tax base, and job creation/retention by:

- Providing a streamlined and simplified city approval process
- Establishing adjacency predictability in the built environment
- Offering flexibility to changing market conditions
- Reducing risk to private investment/development
- Synchronizing private investment/development with public capital investment policies
- Calibrating zoning regulations with a vision for redevelopment within the HCD

Figure 38: Downtown Irving Existing Land Use



Long-Range Plans

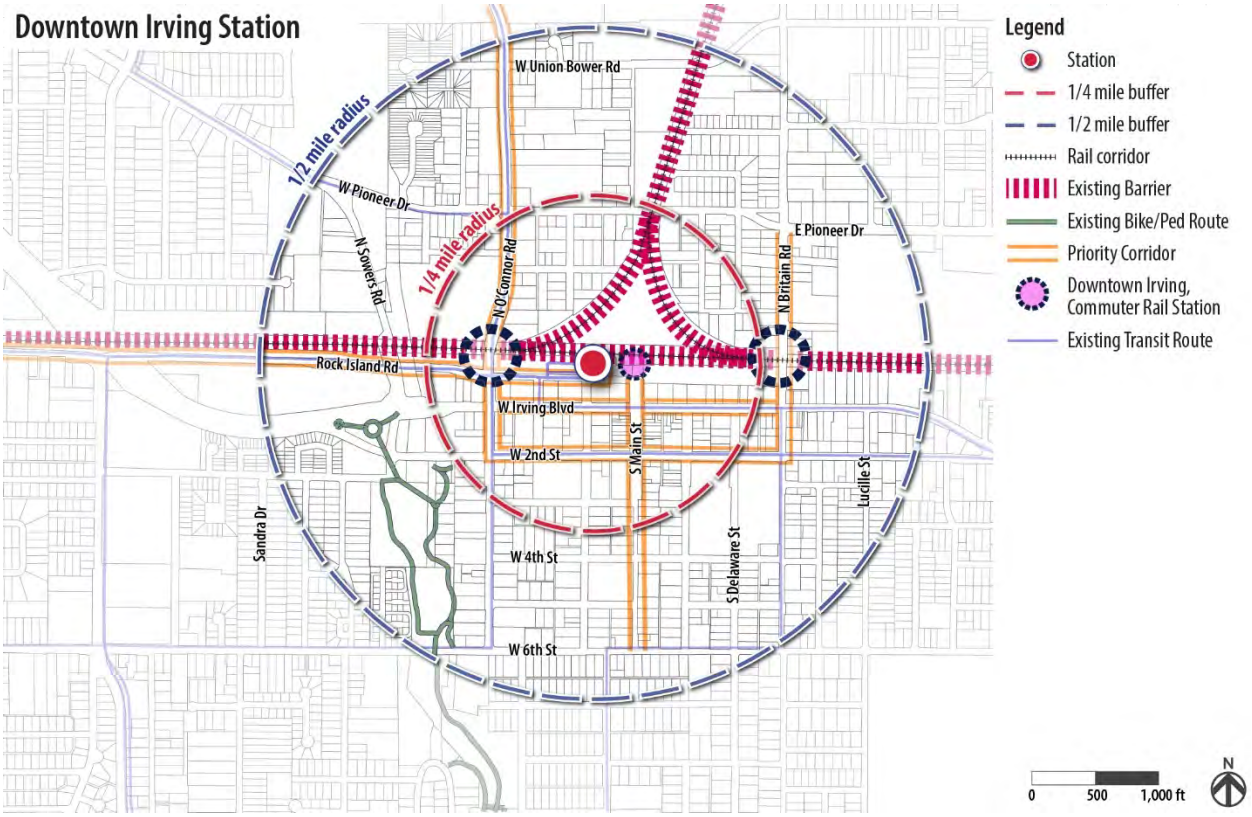
- Economic Development Strategic Plan (2017)
- Imagine Irving Comprehensive Plan (2017)
- Land Bank Properties
- Unified Development Code (updated 2020)
  - Subdivision Design and Improvements
- Zoning Ordinance

Access and Connectivity

For purposes of this land use analysis, it is assumed that the South Irving Station for the Trinity Railway Express (TRE) commuter rail is located adjacent to the proposed station location. The TRE commuter line serves Downtown Fort Worth, DFW Airport, Downtown Irving, and Downtown Dallas; and with multiple local bus routes also serving this station, the addition of another rail line would create a transit hub that has the potential to connect the entire region.

The area around the Downtown Irving station site is made difficult to navigate as a result of the rail lines, storage yards, and other large scale uses. A transformation of the pedestrian corridors that lead to and from the existing and proposed stations - along Main Street, Irving Boulevard, and Rock Island Road - into comfortable and safe pedestrian experiences is critical in making a great transit-oriented district (**Figure 39**). The well-established, multi-modal transit network in the area make this a strong opportunity for TOD.

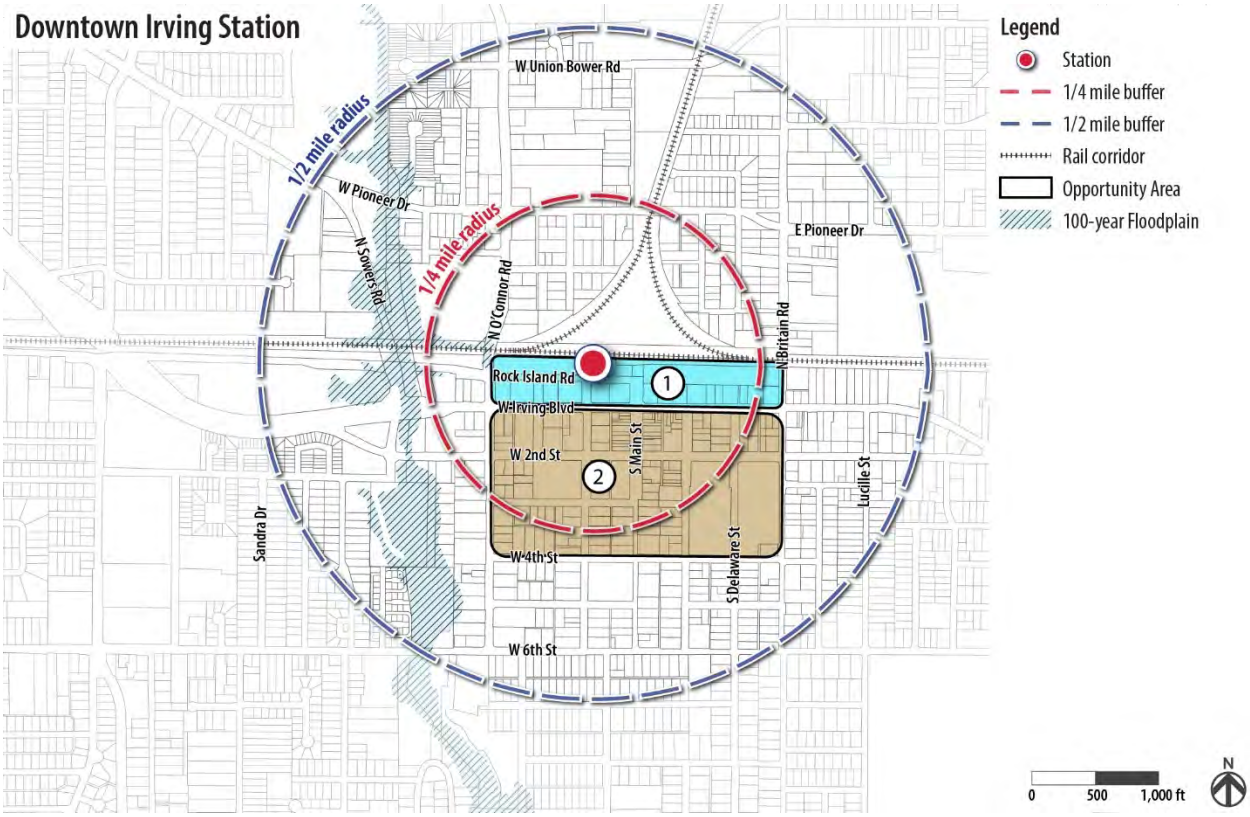
Figure 39: Downtown Irving Connectivity



Transit-Oriented Development Opportunities

With proximity to a bus and transit station, the Downtown Irving district is ideal for future transit-oriented development. District parking is currently available but can be consolidated further to replace surface parking with mixed-use commercial or main street retail. Two primary opportunity areas, as shown in **Figure 40**, become apparent:

Figure 40: Downtown Irving Development Opportunities



Opportunity Area 1: There are various vacant and underused parcels from O'Conner Road to Britain Road, between Rock Island Road and Irving Boulevard, that are at the "doorstep" of the transit station and serve as opportunities for transit-oriented infill development. These parcels can be developed to increase mixed-use residential density around the station and may be the best opportunity to promote a vibrant, well-connected, transit-oriented environment that will generate increased ridership and make this location a destination from other areas along the line.

Opportunity Area 2: Surface parking lots and other underused or vacant parcels are abundant in the downtown core. Finding opportunities for infill development that can both support the character of downtown as well as add needed housing and other amenities within walking distance of the station will help build a thriving district and provide access and housing choices to those who are likely to use transit the most.

Intensified commercial and employment uses in the form of a mixed-use district:

Englewood Station –Englewood, Colorado. Photo courtesy of HDR

Large-scale development to support transit ridership:

DART Downtown Carrollton Station – Carrollton, Texas. Photo courtesy of DART

Station Area Land Use Analysis Summary

The twelve station areas detailed above represent a diversity of land uses, development patterns, street networks, demographic characteristics, accessibility and more. While the twelve sites are connected by the common thread of the rail corridor, there is no single approach or plan that can be effectively applied to help these locations become transit supportive and "rail-ready." Instead, station area planning will need to occur at each site that recognizes and builds upon the unique characteristics of the community and residents and that reflects their values and priorities, balanced with a focus on the regional connectivity that the new passenger rail service can deliver.

APPENDIX F: TOD BEST PRACTICES REPORT

NOTE: REPORT INCLUDED ON FOLLOWING PAGES

North Central Texas Council of Governments

COLLIN COUNTY TRANSIT ORIENTED DEVELOPMENT GUIDELINES

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2 Guidelines Organization

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4. TOD TYPES & DESIGN

19 TOD Typologies
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Fruitvale Village - Oakland California

1 INTRODUCTION

1.1 A Resource for TOD in North Texas

Transit-Oriented Development (TOD) is being embraced around the country as a way to leverage improved mobility, attract quality investment, and build more sustainable, livable, and competitive communities. The Dallas and North Texas region - with some of the country's best known and admired TOD examples - is a leader in providing meaningful growth and change around stations. Successful TOD is a win-win-win proposition providing transit service providers with improved ridership, providing cities and towns with new centers and districts that supply jobs and revenue, and, most importantly, providing the community with homes, services, amenities, and destinations that improve their quality of life and create more equitable and healthy places.

Expanding on the early success of TOD in the region, these Guidelines are designed to build greater understanding of TOD's benefits to North Texas communities, promote collaborative planning, and provide guidance to elevate the quality and performance of future projects. As a resource for area stakeholders, customers, developers, municipalities, and the general public, the Guidelines will help shape decision making about private development strategy, local land use and development policy, place making, and capital investment programming.

From early visioning and analysis through project design and implementation, the Guidelines serve as a tool to support collaboration among North Central Texas Council of Governments, Collin County, and cities and land use authorities, property owners and developers, and regional advocates for smart growth, equitable economic development, and improved livability.

1.2 Guidelines Organization

The Guidelines are organized in three major sections as follows:

- **Understanding Transit Oriented Development.** Defines TOD, describes the qualities of successful TODs, and reports the broad benefits of building transit supportive neighborhoods and districts.
- **Delivering TOD In North Texas.** Describes collaboration with municipalities, and identifies Station Area Contexts & Opportunities.
- **TOD Types & Design.** Defines TOD Typologies and provides guidance for the planning, design, and development of TOD places and projects.

RELATED RESOURCES

Organizations around the country provide strong guidance and information for using TOD as a resource for creating stronger and more connected communities. Several examples are included below:

National Resources and Technical Assistance For Transit-Oriented Developement
https://todresources.org/

FTA Joint Development Brochure
https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/funding/funding-finance-resources/joint-development/64731/joint-development-brochure.pdf

NCTCOG Parking Study
www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/Landuse/

The Economic and Fiscal Impacts of Development near DART Stations
www.dart.org/about/economicimpact.asp

Ten Principles for Successful Development around Transit
http://www.reconnectingamerica.org/assets/Uploads/bestpractice086.pdf

Phoenix Mobility Hub - Phoenix, Arizona

Healthline BRT - Cleveland, Ohio

2

UNDERSTANDING TRANSIT ORIENTED DEVELOPMENT

2.1 TOD Defined

TOD, an abbreviation of the phrase Transit Oriented Development, is used to describe a type of community or district designed to capitalize on transit accessibility. Planned as compact, walkable, mixed use places, TODs offer people greater transportation choices, reduce dependence on automobiles, support more sustainable and equitable development, and build demand for enhanced transit services.

Typically, TODs are medium- to high-density mixed use developments centered on a rail station or rapid transit stop. As all transit trips begin and end with a walking trip, pedestrian-friendliness is a key factor in TOD planning and design. Successful TODs are designed with walkable streets and public spaces, buildings with active ground floor uses and pedestrian-oriented entries and facades, and convenient connections to transit. With robust transit service and the right mix of uses, TODs have proven successful in expanding mobility options; reducing parking demand, auto dependence, and transportation costs; and increasing transit ridership.

TOD is taking root across the country, providing many examples of growth and change that is oriented towards a transit line but reflective of their contexts. Cities and regions like Portland, Denver, and the California Bay area provide many strong examples. However, excellent local TOD examples are available right in your backyard, including Mockingbird Station, Downtown Plano, and CityLine in Richardson. These local examples are nationally recognized as TOD success stories.

Successful TOD projects and places share a number of qualities setting them apart from more conventional forms of development. As highlighted below, successful TODs are walkable and connected, dense and diverse, and context-sensitive:

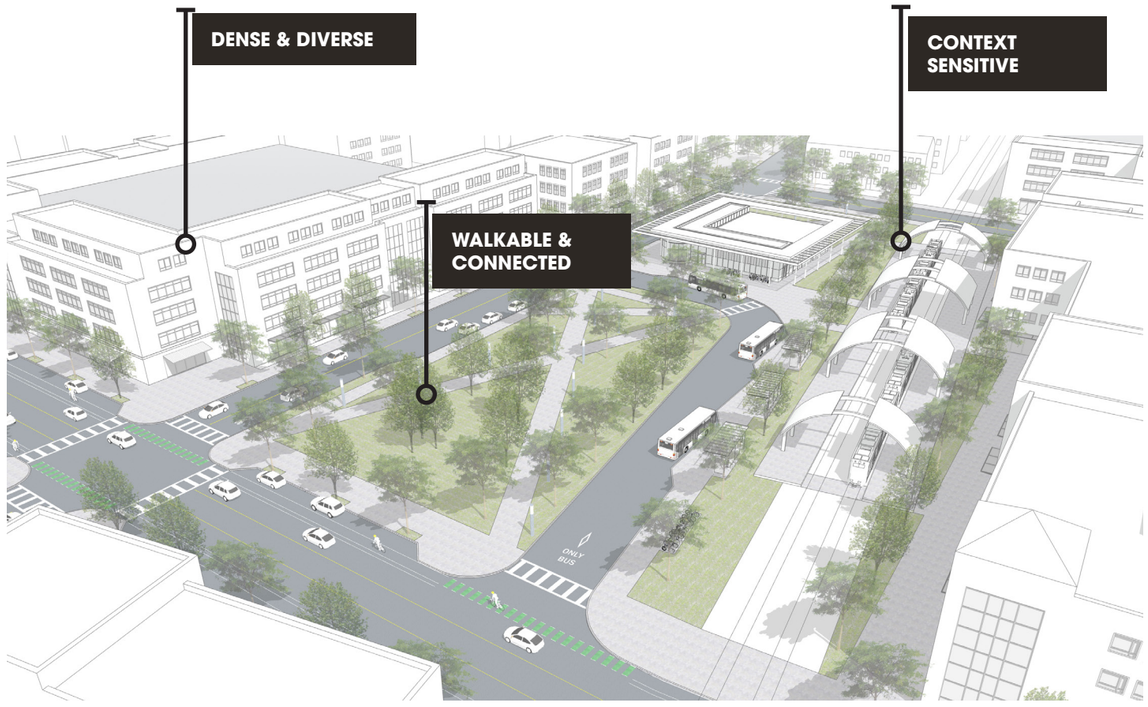
- **Walkable & Connected.** Access and mobility are key features of successful TODs. First and foremost, TODs are places that encourage walking—a critical factor shaping connectivity to transit. Successful TODs provide pedestrian-friendly streetscapes and public spaces, building frontages oriented to sidewalks, and high-quality urban design contributing to a distinct sense of place and community. TODs are also multi-modal places, providing accommodations for a variety of travel options, from local and regional transit, private cars and delivery vehicles, to last mile mobility options like bike share, car share, and

emerging forms of micro-mobility. TODs typically provide less vehicular parking than comparable developments not located near transit. Parking should not be the dominant land use in a TOD area and should be located and priced in a way that discourages unnecessary vehicle trips and promotes walkability, aesthetic cohesion, and reserves valuable real estate for higher uses.

- Dense & Diverse. Successful TODs include a dense mix of complementary uses, including housing, retail and services, employment, entertainment, and civic uses. Diverse uses and demographics in a TOD help increase market resiliency, reduce auto dependence, and leverage public investment in transportation and transit infrastructure. Diverse housing choices—including options for lower income residents who rely on public transit—can accommodate households of various sizes, lifestyles, and income levels, help build market demand for a variety of goods and services, and deliver lower combined housing and transportation costs for TOD residents. Residential or employment density in a TOD should be commensurate with the transit infrastructure investment to generate ridership. The "right" density varies by context, but should be denser and more intensive than development not connected to transit. The density will vary widely in different contexts, but as a general rule can range from 12 units per acre in lower scale districts to 30 units or more per acre in more urban districts.
- **Context Sensitive.** Transit oriented projects are not "one size fits all"—the scale, character, intensity, and use mix of projects can vary greatly depending on their location in the region and the needs of surrounding communities. TOD projects and places are designed to fit the scale of surrounding neighborhoods, offer uses to serve community needs, and advance local objectives for place-making, community building, economic development, and neighborhood improvement.

People within a half-mile radius are 5 times as likely to walk to a major transit stop than others.

—TRANSIT-ORIENTED DEVELOPMENT: FACTORS AND ELEMENTS OF SUCCESS, CENTER FOR TRANSIT ORIENTED DEVELOPMENT




Richmon Transit Center - Richmond, California

Downtown Rowlett - Rowlett, Texas

2.2 TOD Benefits Collin County and the Region

TOD projects and places improve the livability, competitiveness, and resilience of North Texas communities. As highlighted below, TODs provide a range of benefits to Collin County and North Texas communities. People living and working in TODs rely less on car travel to meet their daily needs, have access to a wider range of housing and shopping options, and are better connected to jobs, services, and other destinations across the region.

TOD, if approached correctly, can provide benefits to communities, cities and towns, and the transit agencies who serve them. Below are a few ways in which TOD can promote stronger communities that are more competitive, healthy, fiscally strong, and resilient.

- **Build Ridership.** TOD can improve Collin County's ability to provide high quality transit service to North Texas communities. TOD development has an important and positive influence on transit use within a half mile. As TOD concentrates destinations and activity close to stations, ridership levels increase. As reported in a recent publication of the Urban Land Institute and American Planning Association, "…every shred of available evidence points to the significance of density in promoting walking and transit use. Higher densities mean more residents and employers within walking distance of transit stops and stations."
- **Promote "Location Efficiency".** With the right mix and intensity of uses clustered in walkable districts along transit corridors, people can take care of daily needs without having to drive from place to place. Lower auto dependence leads to reductions in automobile travel distances and lower demand for parking at both trip origins and destinations. With a wider range of housing choices and price points, TOD projects can help lower combined housing and transportation costs and expand alternatives for affordable living.
- **Create Walkable Destinations.** Pedestrian friendliness is a key characteristic of successful TODs. TODs with pedestrian-friendly design features—generously-scaled and continuous sidewalks, buffers between sidewalks and traffic, well-marked street crossings, and active storefronts and prominent entries—generate high levels of pedestrian activity, and improve public health.
- **Deliver Higher Values and Fiscal Benefits.** Studies locally and from across the country demonstrate the economic benefits of TODs. As cited above, various UNT studies found significant economic and fiscal impacts of development projects, on transit-adjacent and publicly owned stations. TODs are shown to have higher commercial and residential property values than similar properties in auto-oriented locations, and they tend to generate higher local tax revenues on a per-square-foot basis— for example, a UNT studies show, that in Dallas, new development within a quarter mile of DART stations result in significantly higher property values and property tax contributions compared to control properties. TOD projects also place lesser demand on local infrastructure, build local tax base, and ease local government financial burdens.
- **Increase Safety for Pedestrians and Bicyclists.** Enhanced walkability and better bicycle infrastructure results in direct safety benefits for bicyclists and pedestrians. Improved traffic control and safety enhancements reduce the number and severity of collisions with automobiles. Pedestrian and cyclist safety increases as these modes of travel become more visible and well-established. In addition, increased pedestrian and bicycle activity produces more "eyes on the street" to enhance security.
- **Improve Air Quality and Reduce Energy Consumption.** Automobile use is one of the primary sources of air pollution, energy consumption, and greenhouse gas emissions in the United States. On a passenger-miles-traveled basis, pedestrian, bicycle, and transit trips result in lower levels of energy use and greenhouse gas emissions. As a result, TODs can help improve local and regional air quality and reduce energy consumption by facilitating transit use, pedestrian activity, and bicycling.

- **Serve Emerging Markets.** TOD projects and places expand the range of housing and lifestyle options available to meet changing market demands. Both millennials and empty nesters are prime target markets for TOD projects. According to recent research by the Urban Land Institute, 60 percent of millennials want to live and work in areas where they can use their cars less, and empty nesters exhibit similar desires. These demands are well understood by major corporations positioning to compete for talented workers.

Englewood Station - Englewood, Colorado

3 DELIVERING TOD IN NORTH TEXAS

3.1 A Collaborative Effort

Supporting and encouraging TOD in North Texas takes intensive levels of collaboration and commitment. Local jurisdictions, the development community, transit providers, and regional planning advocates all play important roles in creating opportunities for living and working near transit stations and transfer centers.

3.1.1 Planning & Advocacy Organizations

North Central Texas Council of Governments (NCTCOG), along with other important planning and advocacy groups such as the North Texas Chamber of Commerce, ULI North Texas, American Public Transportation Association, Federal Transit Administration, and others, serve important educational, strategic, and advocacy roles. These organizations provide educational resources, advocacy, and assistance on a wide range of TOD and TOD-related projects, including development feasibility, housing affordability and equity, parking strategy, urban design, and more. Through grants and technical support, they can also bring additional resources to the table to strengthen TOD initiatives and programs.

NCTCOG's recent report *Transportation and Gentrification: A Toolbox for Positive Neighborhood Change*, is an excellent source of information for local planning officials. The report, addressing the causes and concerns related to community change and gentrification, offers strategies focused on housing market affordability and includes suggestions about how equitable public engagement can lead to inclusive revitalization.

3.1.2 Transit Providers

Transit agencies, such as DART, can promote TOD through the provision of high quality, frequent, and reliable transit service. A transit station serving high-frequency and -capacity service generates immediate value to surrounding properties and creates a competitive advantage over places and communities that are not served by transit lines. In many cases, a transit station will own significant real estate

- including prime transit-adjacent locations - that can be leveraged for providing TOD. Joint Development, as defined by the FTA, can be a powerful tool in delivering TOD that is more equitable for the surrounding community, such as affordable housing, community services, and public amenities.

3.1.3 Local Jurisdiction Partnerships

TOD opportunities in North Texas are guided by the efforts of the municipalities served by transit-adjacent and publicly owned stations and transfer centers. For many of these communities, TOD has become a special focus of their planning, economic development, and capital investment programs. These communities have crafted detailed policy and regulatory programs to guide private investment, structured incentive programs, designed and built TOD supportive infrastructure, and worked with community partners to ensure understanding and acceptance of projects.

Planning for TOD at the local level starts with community visioning and long range planning followed by more detailed project and station area planning and design. Ultimately, communities influence TOD through the application of comprehensive land use plans, land use and development regulations, economic development and redevelopment programs, and capital projects.

Beyond planning, municipalities can access a number of available tools to influence the feasibility and attractiveness of TOD investment. For example, municipalities may offer incentives such as financing infrastructure through Tax Increment Financing (TIF) revenue, discounting sale of publicly owned properties, or completing or supporting site remediation to create shovel-ready development opportunities. Aligning these local tools to support TOD has proven successful in cities across the region, and provide excellent local models to build upon.

Del Mar Station - Pasadena, California

McClintock-Apache Station - Tempe, Arizona

Downtown Garland Station - Dallas, Texas

3.1.4 Property Owners & Developers

Station area property owners and developers collaborate with Collin County and municipalities to identify and assess investment opportunities, draft project plans, attract private capital, and deliver individual TOD projects. Collectively, they play a critical role in helping ensure local plans and policies are sensitive to station area market conditions.

3.2 Station Area Context & Opportunities

3.2.1 Transit Stations & Property

At the heart of any station area is the transit station itself as well as transfer centers, and transit-supportive facilities including bus and shuttle stops, kiss-and-ride locations, and parking areas. In combination, these core facilities are designed to deliver unparalleled access to destinations across the transit network. These elements make up a network of invaluable access and connectivity that make TOD opportunities part of a larger ecosystem and set of destinations including services, amenities, homes, and jobs.

ROLES IN DELIVERING TOD

PLANNING & ADVOCACY ORGANIZATIONS

- Advocacy for TOD Projects & Investments
- Stakeholder and Community Education
- Technical Assistance for Planning and Projects
- Best Practices and Case Studies for Topics like Housing Affordability & Parking

TRANSIT PROVIDERS

- Transit Service, Transit Infrastructure, & Station/ Transfer Center Improvements
- Development Opportunities for DART and other transit providers property, including. Underutilized Parking
- Project Selection & Oversight

MUNICIPALITIES

- TOD Visioning & Goal Setting Exercises
- Station Area & TOD Planning
- Transit-Supportive Land Use Policies and Codes
- TOD-Supportive Infrastructure and Mobility Investments

DEVELOPERS & PROPERTY OWNERS

- Collaboration with DART, other transit providers, and municipalities
- Identify and Assess Investment Opportunities
- Private Project Feasibility and Financing
- TOD Project Design and Construction

In addition to the service provided at these stations, public entities may own the land and infrastructure surrounding the station. These areas are potential opportunities for joint development that can lead to a transit agency or municipality taking a leadership role in delivering TOD. Using joint development as a tool to deliver TOD has the added benefit of removing certain barriers to providing uses that may not be provided through normal market activity such as affordable or attainable housing, community services, or other lower revenue uses that make TOD successful.

3.2.2 Station Area Conditions

Several factors influence the potential for TOD investment on transit-adjacent and publicly-owned sites and other properties within a one-half mile walking distance of transit stations and transfer centers. Conditions within these “walk sheds” varies widely.

Understanding how factors like land use, access, parcel configuration, ownership, and the presence of environmental and other constraints impact development potential is a critical early step in planning for TOD.

Development context is an important driver of opportunity. Urban locations and traditional downtowns, with street grids, block structures, supportive local transit, and the potential for shared parking or district-level parking management, naturally lend themselves to TOD investment. In locations without these conditions, including auto-oriented commercial areas and older industrial districts, attracting TOD may require municipalities to employ more targeted, location-specific strategies and actions.

Ownership patterns and parcel configurations also impact TOD potential and timing. Prime areas for TOD are often locations with larger parcel sizes, large blocks in common ownership, underutilized sites and buildings, and motivated owners interested in capitalizing on transit accessibility and market opportunities. But not all station areas are equally primed for investment. Many stations are in areas with small lot sizes, disjointed uses, and fragmented patterns of ownership. In these more challenged locations, municipalities may focus on encouraging transit-oriented infill development and incremental change. Identifying catalyst sites and pilot projects, including underused parking, can lay the groundwork for longer term, station area wide changes.

3.2.3 Development Opportunities

Real estate market conditions are among the most powerful drivers of TOD projects. Although access to frequent, high capacity transit is proven to influence a project’s potential, a range of other factors drives investor decision making regional and local market conditions, locational and access advantages, competitive supply, capital availability, and regulatory entitlements certainty all play important roles in moving projects from early vision to implementation.

NCTCOG, local jurisdictions and land use authorities, and other planning entities can study key station areas in order to assess the market potential and market readiness of station sites sets the stage for initiatives designed to leverage competitive advantage of more attractive locations as well as improve the position of more challenged areas. Understanding the barriers to successful, high-quality TOD will help prioritize investments or partnerships that may help create opportunity where it currently does not exist. Planning and advocacy entities can highlight the attributes of a station and the community that surrounds it and work to solve for the challenges that keep it from meeting its potential.

3.2.4 First Mile/Last Mile Mobility

Planning for first mile/last mile access and connectivity in and around station areas is increasingly important as new technologies place new demands on roadways, streetscapes, and public spaces. New mobility options greatly improve station area mobility and extend the benefits of transit access well beyond a short walking distance. Transportation network companies like Uber and Lyft, bikeshare and e-scooter services, car sharing services like Zip Car, and private shuttles and circulators all extend the range of benefits associated with proximity to transit. To fully utilize these first mile/last mile mobility services curbside access, parking strategy, and public space allocation are critical issues to address in station design and station area planning.

As all of these mobility options begun to connect to transit stations, they can be combined into more purposeful and cohesive “mobility hubs”. The purpose of a mobility hub is to provide a safe, comfortable, and intuitive connection from one mode of transportation to another within close proximity. Station areas make ideal locations for mobility hubs as riders using the high-capacity transit service can quickly connect to one of several other modes to make it to their final destination. These hubs will further promote a more walkable, bikeable, and active station and TOD area.

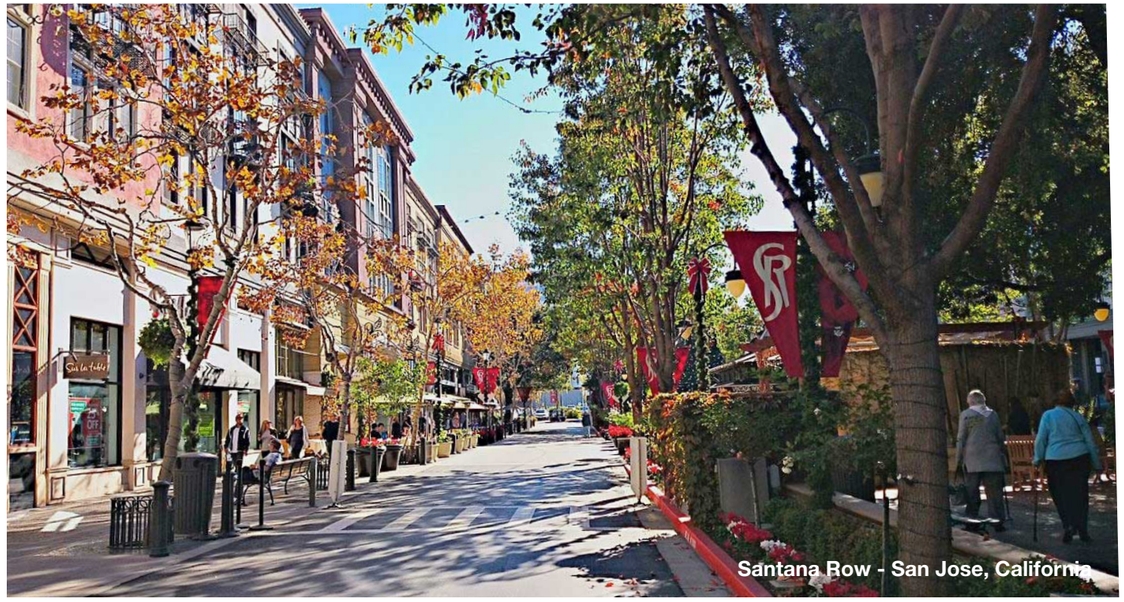
3.2.5 Expanded Housing Options

Communities across the region are struggling to find ways to meet the housing needs of North Texas families. Affordable housing shortages, a dwindling supply of homes for first-time buyers, and rising prices at all levels have sparked concerns among regional leaders. In a recently completed study, the City of Dallas estimates it has a shortage of 20,000 housing units and six of ten families in the City are paying more for housing each month than they can afford. Research also shows housing affordability challenges are shared across the region, from very low income households to those with limited assets and lower wage jobs. Teachers, first responders, and other essential workers in a range of industries struggle to find affordable places to live and are increasingly impacted by neighborhood change, gentrification, and displacement.

The threat of being priced out of the market is a harsh reality for low-income residents in transitioning neighborhoods.

Workforce housing and low income housing are terms used to describe housing offered for sale or rent at prices affordable to moderate and lower income households. Communities typically define workforce housing as being affordable to households with incomes between 80% and 120% of the Area Median Income (AMI) and low income housing as being affordable to households with incomes less than 80% of AMI. (According to U.S. Department of Housing and Urban Development, the 2018 AMI for a four person household in the Dallas Metro Area was $77,200.) Households in moderate and lower income categories face significant challenges finding affordable housing, especially options offering high levels of transit service and regional accessibility.

Recent research shows that almost one in two renters in the Dallas region pays 30 percent or more of their income on rent, and one in five pays 50 percent or more. As the region’s economy has expanded, an increasing number of households have fallen into these cost burdened categories, thus increasing the urgency to find solutions to meet the growing demand for affordable options.



Santana Row - San Jose, California

Successful TOD is a win-win-win proposition providing stronger and more equitable communities, improved and growing ridership, and economic strength and resiliency for cities and towns.

Strategic TOD investment within Collin County can help solve for these large challenges by providing affordable housing options connected to job centers and other daily needs. Transit Station Areas and TOD projects are great locations for workforce and affordable housing units. Low-income households are less likely to own a car and more likely to rely entirely on public transit to access a wide range of destinations—from work and shopping to daycare, education, and social services. By providing more affordable housing opportunities near transit, households who would otherwise be priced out of the market can live close to transit and have ready access to opportunities across the region.

The inclusion of workforce and low income housing in TODs can help address the region's significant and intensifying housing affordability challenge. TODs that include diverse forms of workforce and low income housing can help accomplish the following:

- Increase economic self-sufficiency by providing accessible and reliable access to employment, education, healthcare, and support service destinations across the North Texas region;
- Increase access to jobs and educational opportunities for transit reliant residents, and lessens travel costs for those with lower and moderate incomes;
- Relieve economic stress on high cost burdened households;
- Build system-wide ridership by improving transit access for those most reliant on public transportation services;
- Provide for a wider range of housing choices and price points then may be found in auto-oriented communities.

3.2.6 Parking

TOD projects require significantly fewer parking spaces than conventional development for a variety of reasons. Transit access reduces reliance on automobile trips and leads to a lower rate of auto ownership by TOD residents. In addition, the overall walkability of TOD projects reduces reliance on automobiles to access destinations such as retail, services, civic institutions, and places of employment, thus reducing parking demand. Micro mobility services provide for alternative modes to access transit and project destinations from beyond the walk shed, and may further reduce the necessity for personal auto trips and parking. Lastly, mixed use TODs are "park-once" destinations and provide opportunities for shared parking, which utilizes parking spaces for multiple uses with complementary peak periods and reduces the overall need for parking.

NCTCOG, in partnership with DART and the cities of Dallas, Richardson, Plano, and Garland studied parking use at TODs along the DART Red & Blue lines. The 2018 study evaluated conditions at 16 privately owned sites with structured and surface parking near 11 stations spread over the four municipalities. The study found that 13 of 16 sites never peaked above 80% utilization, suggesting that required parking ratios resulted in excess spaces. Affordable housing TODs in the study used less parking (peak use 40-50%). Higher end market rate projects had higher peak use (90%+), cost burdening affordable units with excess parking. Furthermore, 10 of 16 sites provided more parking spaces than required by code, suggesting that lenders can have strong influence on amount of parking developers build.


Mobility Hub - Salt Lake City, Utah

Many recent studies have highlighted the link between affordable housing, lower parking utilizations, and increased ridership including a 2020 RTD – Denver's transit agency – report entitled Residential Parking in Station Areas shows substantial data that income-restricted and affordable housing development at a transit station is much less likely to use the parking provided, even as many of these properties have lower parking provision per unit than market rate. In addition, these same income restricted properties are much more likely to house those likely to take transit. This reduced need for parking coupled with an increase of ridership can be a win-win for transit agencies, communities, and cities and towns housing transit stations.

In many ways, providing substantial parking at station area is a self-fulfilling prophecy. If you provide a lot of parking, those who rely on automobile travel are much more likely to live in the TOD area. If those who rely on automobile travel dominate a TOD area, ridership will likely not increase substantially and additional traffic may be created due to the density. Planning for users and development types requiring reduced parking is one of the most important elements of a successful TOD area.

These studies suggest a range of potential strategies to address excess parking at and around transit stations including adopting parking policies supporting the right-sizing of parking and implementation of district-wide parking management programs for TOD projects and station areas. Transit providers could also explore the potential to reduce the size of or re-purpose underutilized agency-owned parking facilities. Municipalities have a host of possible strategies at their disposal. The study suggests municipalities could: right size parking requirements in TOD areas based on observed local utilization data and development context; unbundle cost of parking from cost of housing; incentivize shared parking, where multiple land uses with complementary peak times utilize the same parking facilities more efficiently, rather than providing individual parking lots that frequently remain underutilized (shared parking is often managed district-wide as a "park once" district, with facilities that are consolidated to maximize efficiency and include on-street parking in the supply calculation to further reduce the need for off-street parking); encourage the use of programs and technologies, e.g. district-wide parking pricing and management initiatives and use of automated space availability monitoring and guidance apps, to maximize the use of available spaces; and consider long term potential of conversion of parking facilities to other land-uses as increased non-automobile mode split and autonomous vehicles reduce demand for individual, on-site parking spaces—best achieved by designing parking lots as city blocks sized for future development and parking structures with minimal ramps, ceiling heights, and building depths that allow for future adaptive remodel as occupied space.


West Village, Dallas Texas

4 TOD TYPES & DESIGN

4.1 TOD Typologies

A TOD typology is an analytical tool that groups station areas into several “types” based on context and predominant mode of access. The typologies provide broad parameters for the scale and intensity of development, use mix, access, and market potential. As a starting point for collaboration between Collin County, municipalities, and key stakeholders, the typologies serve as a foundation for station area planning, design, and development initiatives.

The TOD typologies described below provide starting points for collaboration between Collin County, municipalities, TOD developers, and other stakeholders. Typologies may change as areas are transformed with improved access, connectivity, and private investment.

> Next-generation projects will orient to infill, urbanizing suburbs, and transit-oriented development… People will seek greater convenience and want to reduce expenses.
>
> —EMERGING TRENDS IN REAL ESTATE, URBAN LAND INSTITUTE

TYPOLOGY CHARACTERISTICS

Plano Town Center - Eric Fredericks, CC BY-SA 2.0

Farmers Branch

Downtowns & Town Centers

The region's traditional downtowns and newer town centers are irreplaceable assets that provide a unique character and setting perfectly suited to accommodate improved transit and TOD. With a mix of low and mid-rise buildings lining pedestrian friendly streets and public spaces, these districts serve as retail and entertainment destinations and tend to include a mix of moderate density residential, office, retail, and entertainment uses catering to the daily needs of residents and workers in surrounding suburban communities. The patterns and scale of development tends to support the potential for reduced parking requirements as well as shared parking and district-level parking management. Walking and bicycling are the predominant modes of transit access.

Community Centers

Community Centers are local activity centers in a suburban context with a mix of commercial and multifamily residential uses near a transit station. Smaller in scale than Downtowns or Town Centers, Community Centers transition quickly to abutting lower density residential or commercial areas. As a result, walkability beyond the core of Community Centers may be limited, and kiss and ride and/or park and ride amenities are often accommodated to facilitate car access to transit in addition to walking and bike access. Walking, bicycling, and personal vehicle are the predominant modes of transit access.

TYPOLOGY CHARACTERISTICS

Celina – CC by 2.0

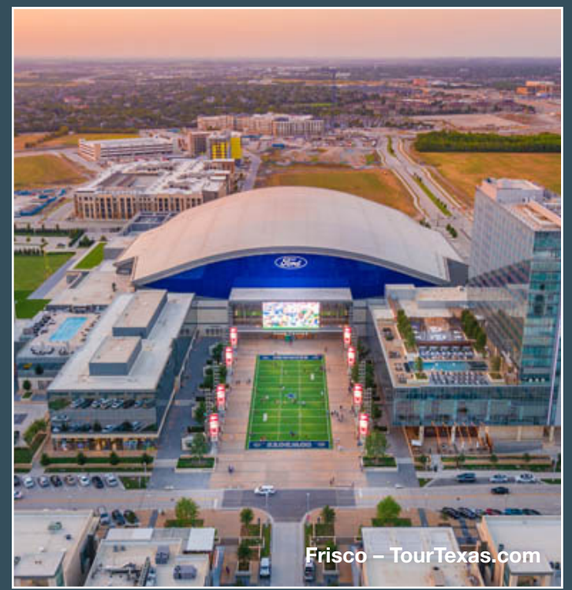
Farmers Branch – Google Earth

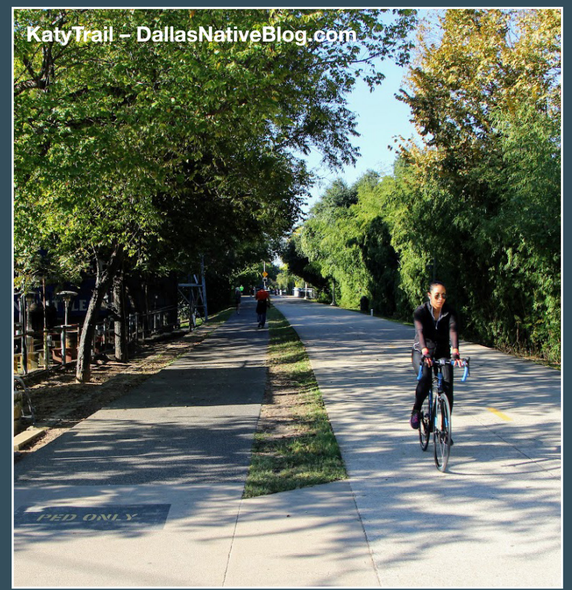
Rural Centers

Rural Centers are smaller communities with traditional downtown cores on a smaller scale than the Downtowns or Community Centers. These centers have small retail cores or streets serving the local community primarily surrounded by lower density, single family homes. New development adds needed housing and other uses but preserves the character of the small town. Those within walking or biking distance may be limited by the smaller town size, therefore these stations may serve a larger region and will likely need park and ride facilities. Walking and biking continue to be primary connections for those nearby.

Emerging Districts

Emerging districts are areas that currently do not exhibit TOD characteristics. These include areas that are industrial or dominated by uses accessibly mainly or solely by personal vehicle. These areas may or may not have the infrastructure available to easily accommodate large scale new development. Planning and investment by the local jurisdictions and land use authorities may be necessary to unlock the potential of the areas as more walkable, bikeable, and connected places. Balancing existing jobs and uses with future residential, commercial, and retail uses is important to preserving the strength of the existing districts.





Destination Districts

Destination Districts are areas with an exclusive or predominant use, such as medical, employment, cultural, sporting or entertainment. Destination Districts typically include large structures (such as stadiums, hospitals, institutional buildings), often arranged in a campus setting, and require more flexibility on block size. Complementary secondary uses support transit users and may include retail, personal services, restaurants, and lodging, ideally located between the transit station and the primary use to facilitate walking access. Walking is the predominant mode of transit access, though often transit is a secondary mode of access to the district's destinations. Proper district planning that includes direct and interesting walking routes between the transit station and the destinations could make transit access more competitive.

Connected Communities

Connected Communities are defined by established residential areas with strengthened connections to high-quality transit. These places may have fewer opportunities for new TOD development but can gain new transit ridership by providing more, safer, and easy connections to a transit station. Strategic infill development may provide needed services, housing, and amenities for future and existing residents. These locations may have less available land and fewer vehicular connections to provide substantial park and ride facilities. Connected Communities rely heavily on improved multi-modal connections, in many cases, where they currently may not exist.

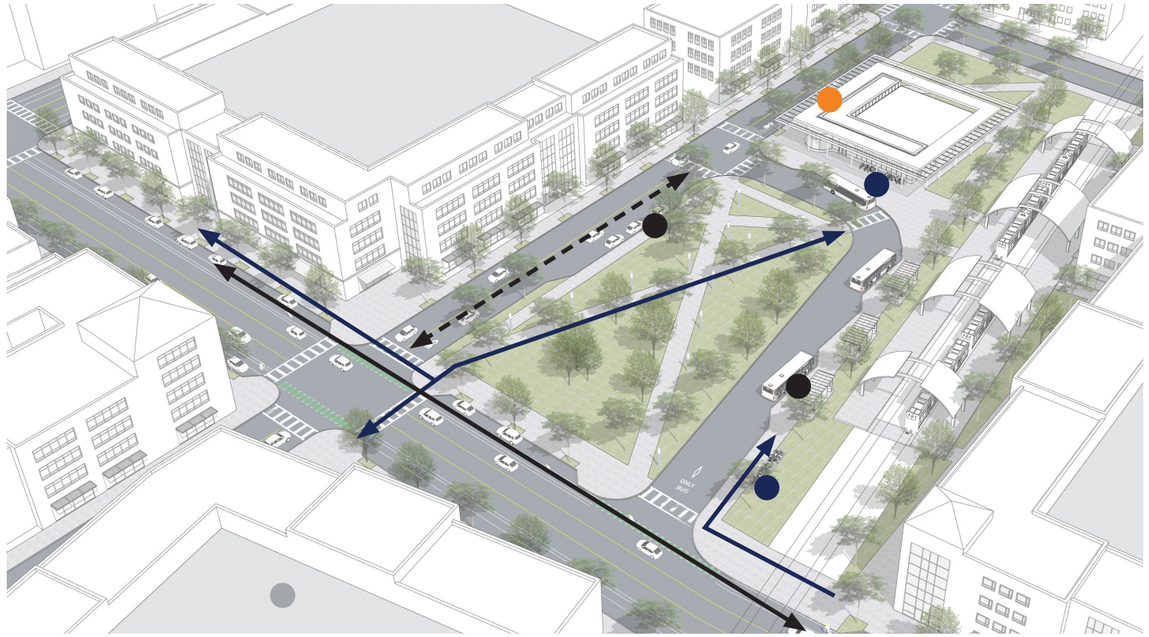
4.2 TOD Design

This section of the guidelines defines the preferred design character, form, and quality of development for successful TOD projects and places. The guidance below offers a reference for municipalities as they develop and refine local TOD plans and development regulations, and a reference for use by developers and property owners responding to TOD RFPs and planning for TOD projects.

4.2.1 Development Pattern

Street & Pathway Network

- TOD projects should include an interconnected, fine-grained grid of pedestrian- and bicycle-friendly streets and pathways that form development blocks and accommodate local circulation. Walking and bicycling should get preferential treatment over vehicular traffic.
- Street networks should serve as an extension of the existing street network in the surrounding area. TOD projects should provide street and pathway connections to the surrounding context wherever feasible. Street or pathway stub outs or set aside rights-of-way should be located strategically to accommodate future connections to undeveloped neighboring sites or developments that currently do not allow connections.
- Cul-de-sacs should be avoided except where topography or existing natural features prevent a feasible roadway connection, or as a temporary facility to provide future connections to an abutting site.
- TOD projects should contribute to a hierarchical bike network that provides uninterrupted access to the transit station with context-sensitive bike facilities. These may range from shared roadways on low traffic neighborhood streets to physically separated and protected bike lanes or cycle tracks on major thoroughfares.

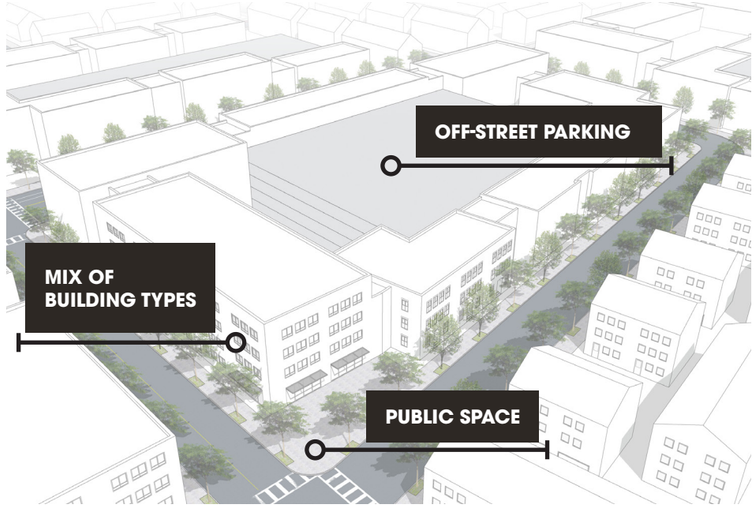


Block Size & Configuration

- TOD projects should consist of development blocks scaled to accommodate a mix of appropriate building types, public spaces, as well as required off-street parking and service areas.
- Overly large block sizes should be avoided to maintain a walkable scale.

Potential for Long Term Transformation

- Streets and blocks should be configured in a fashion that allows future intensification and transformation with minimal disruption to the network. For instance, parking lots should be laid out to accommodate footprints of anticipated future buildings or parking structures in their place.



Bike Parking

Bike Share/ E-Scooter Hub

Transit Transfer

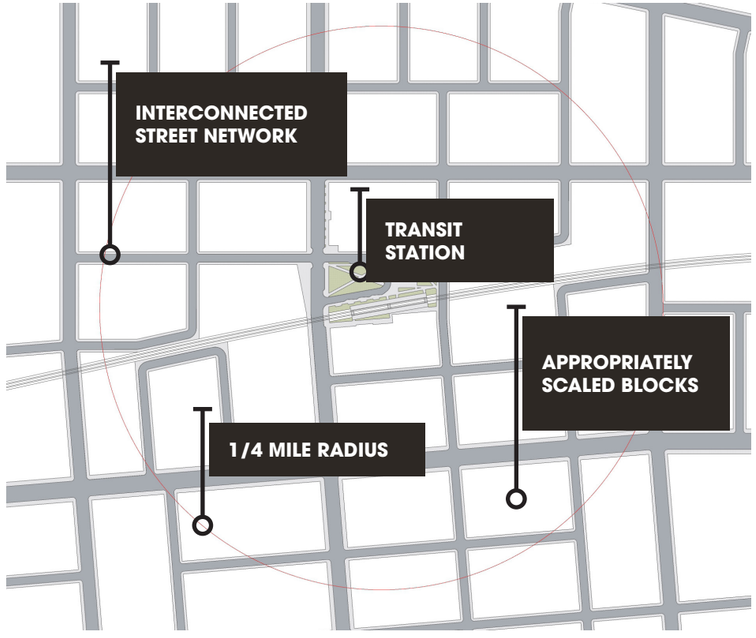
Ride Share Drop Off/Pick Up

Park & Ride

Key Walking Route

Bike Lane

Shared Bike Route (Sharrow)



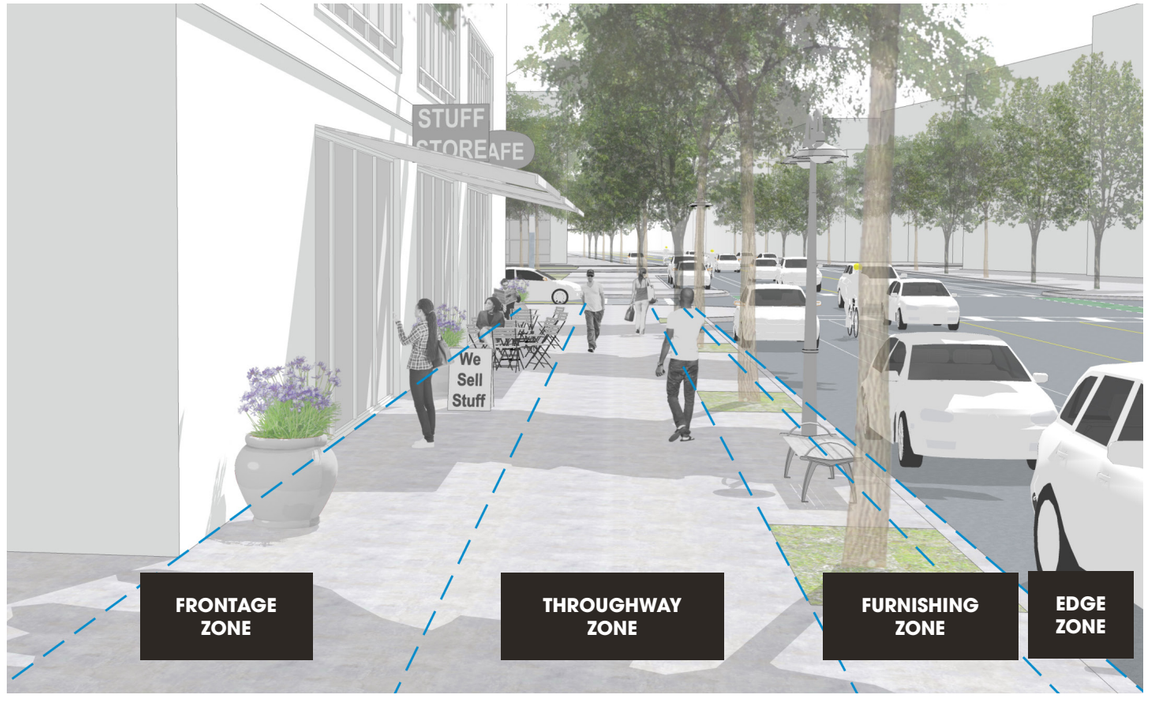
4.2.2 Streets & Public Spaces

Street Types

- Streets in TOD projects should be designed to encourage low speed vehicular traffic and the safe movement of pedestrians and bicyclists. Street widths should be minimal, with narrow travel lanes, to reduce crossing distances for pedestrians. Multi-lane roadways within TOD projects should be discouraged.
- Primary walking and cycling routes should accommodate those modes through adequate facilities, which may include protected bike lanes, cycle tracks, multi-use paths, and off-street walkways.
- Streets in TOD projects should be designed to accommodate emerging micro-mobility modes, including bike share programs and e-scooters.

Streetscape Design

- To create safe and attractive pedestrian environments, buildings should be placed along and oriented to public streets.
- Streets providing pedestrian connections between transit stations and major walking destinations should be lined with buildings designed to allow active ground floor uses.
- Streets in TOD projects should be reflective of their context and include a roadside design that invites walking. The roadside – the portion of the street between the curb and the right-of-way or building facade – consists of four zones:
  - » Edge Zone: Includes the curb and required clearances.
  - » Furnishing Zone: Provides a buffer between pedestrians and vehicles and may range in width to include a variety of elements, depending on context, such as street trees and other landscape features, pedestrian-scaled lighting, street furnishings, street signage, and utility elements.
  - » Throughway Zone: The walking zone free of obstacles, which may range in width subject to the context.
  - » Frontage Zone: The area between the building façade and the throughway zone, typical in urban context without private front yards. The frontage zone provides room for building entrances and allows for the placement of café seating and other private street furnishings, business signage, and merchandise display. The width of the frontage zone may vary depending on context and use and may be minimal in purely residential contexts.



Public Spaces

- TOD projects should include public gathering spaces connected by pedestrian-friendly streets and pathways. Public spaces—such as parks, greens, squares and plazas—should be well defined and programmed appropriate to their location and context. Public spaces should include elements such as seating, shade trees, shade structures, play equipment, lighting, and other amenities to support their intended active and/or passive uses.
- Transit stations should be integrated into a well-designed and well-connected public space that serves both transit riders and the general population of the TOD.
- Public space design should consider accommodations for private bicycle parking, bicycle-share stations, e-scooter hubs, and other emerging micro mobility technologies.
- Bicycle parking should be provided near transit stations with easy access to and from bicycle routes. Bicycle parking should provide adequate amenities for secure storage of bicycles and may include open shelters, individual lockers, or fully enclosed and locked shelters.
- Micromobility stations and hubs, including bike share and e-scooters, should be accommodated near station locations to provide easy access. Facilities should be designed to minimize conflicts with pedestrian routes and provide for the orderly parking of bikes and scooters.

On-Street Parking & Curb-Side Uses

- On-street parking should be provided on all streets in TOD projects to provide a buffer between pedestrians and moving traffic, deliver high-turnover spots to support storefront retail uses, and to reduce the need for off-street parking.
- To avoid the use of street parking as informal park and ride parking, non-resident street parking should be short-term only through the use of parking time limits or pricing.
- Pick-up/drop-off zones for ride share services and kiss & ride should be provided in a manner that avoids conflicts with transit vehicles, pedestrians or bicyclists. Pick-up/drop-off zones should be located to reduce out of direction travel for vehicles and discourage risky maneuvers. To give priority to non-motorized modes pick-up/drop-off zones should be located at some distance from the transit station.
- Paratransit access should be provided near station locations to adequately serve transit riders with limited mobility.

With compact development, people drive 20-40 percent less, at minimal or reduced costs, while reaping other fiscal and health benefits.

—GROWING COOLER, URBAN LAND INSTITUTE

4.2.3 Density/Intensity

Use Mix

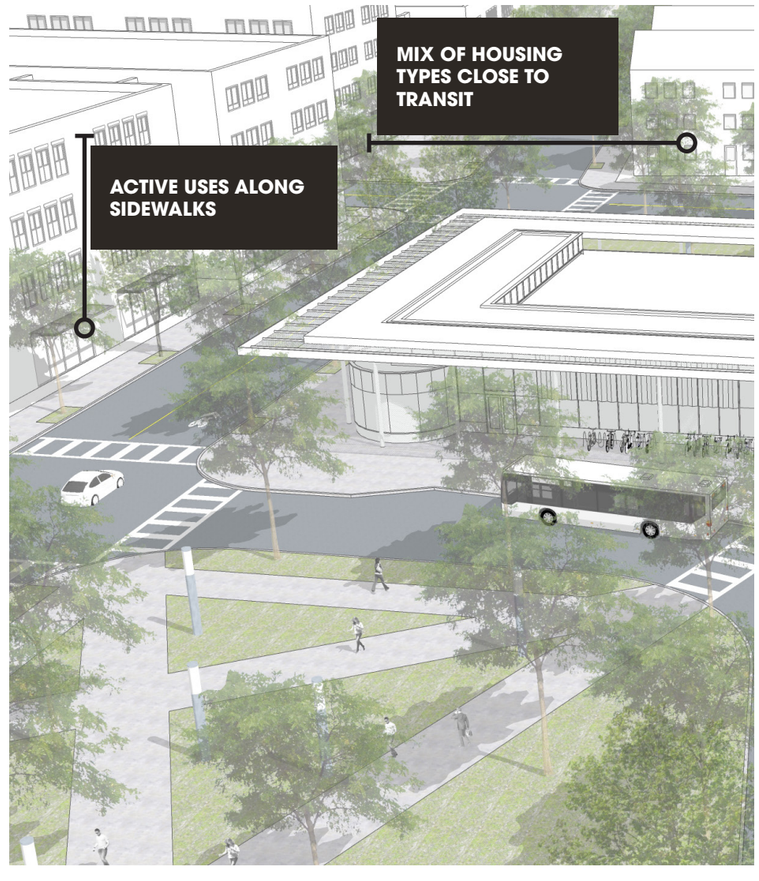
- TOD projects should be designed to include primary transit-trip generators plus supportive uses to serve for daily needs to reduce car dependency for non-commute trips. Primary trip generators may be high-density residential uses with complementary retail and service uses, or may be employment uses with supporting residential, retail and service uses.
- A mix of uses is critical at the core of a TOD project, surrounding the transit station, and should include high activity uses such as retail. Beyond the core area the use mix is less critical and predominantly residential or employment uses may be acceptable.
- Single-use developments are generally incompatible with TOD. The exception may be destination districts such as large sports or entertainment venues, or educational or medical campuses.

Development Intensity

- TOD projects should provide an average development density and intensity sufficient to generate the ridership that supports the existing or desired transit service.
- The allocation of density/intensity in a TOD project may vary, depending on the location or context. A larger area with consistent density/intensity may be appropriate in urban locations, whereas a more confined core of high density/intensity development that transitions to lower density/intensity away from the station may be appropriate in a lower density context.

Equitable Housing

- TOD projects should provide a range of housing types for households of varying ages, demographics, and income levels. Housing options for people relying on transit should be provided near stations.
- Inclusion of affordable housing is preferred, and should be incorporated in projects. North Central Texas Council of Governments encourages service areas cities to adopt targeted policy, regulatory, and incentive programs to promote workforce and affordable housing options. Localities should explore the following as methods to promote equity and

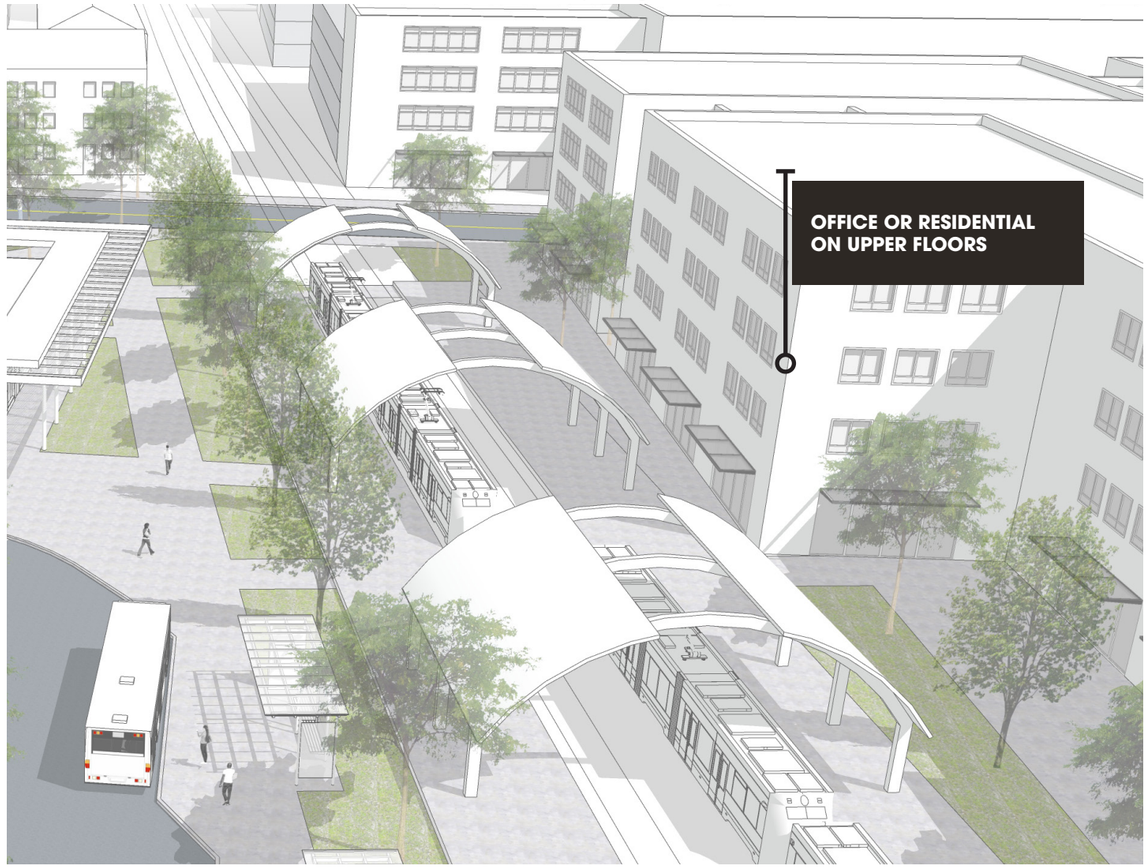


affordability in TOD projects:

- » Adoption of equitable TOD policies by municipalities to support the creation and promotion of mixed-income and mixed-use communities around transit;
- » Development of policy, regulatory, and financial incentives to include workforce and affordable housing in projects on Transit-adjacent and publicly-owned sites.
- » Reduction or removal of project requirements with the potential to increase the cost of individual housing units, including parking minimums, impact fees, permit fees, etc.
- » Implementation of programs and initiatives at the local level designed to create or maintain affordability, limit project and per unit costs, and provide long term maintenance of cost restrictions, including low interest loans and grants for rehabilitation, reconstructed, and long term rent restrictions; incremental or wholesale densification of station areas through regulatory change or bonus provisions; inclusionary policies or requirements; regulatory, project review, and fee relief; and parking reductions and parking cost unbundling.

Limits on Incompatible Uses

- Primarily auto-oriented uses (such as strip commercial or office park uses) or uses generating little to no pedestrian activity (such as warehousing or mini storage) are not compatible with TOD projects.
- Drive-thru restaurants or banks should not be permitted in TOD projects. If they are present, such uses should be located in the rear of buildings and designed to minimize their visibility from public streets and spaces.



4.2.4 Site & Building Design

Building Scale

- Building heights within TOD projects should be the tallest near transit stations. A transition of building heights may be appropriate where a TOD project abuts a lower density/ intensity development.

Building Frontages

- Buildings should be placed along and oriented to public streets and public spaces. To maintain building continuity a significant percentage of the lot width should be occupied by a building located at the setback or build-to line.
- Primary building entries should be located along the street frontage with direct access from a public street or public space.
- Active ground floor uses such as retail and service establishments are encouraged, particularly on primary walking and cycling routes. To allow flexibility, ground floor ceiling heights that allow for commercial use should be encouraged irrespective of initial use.

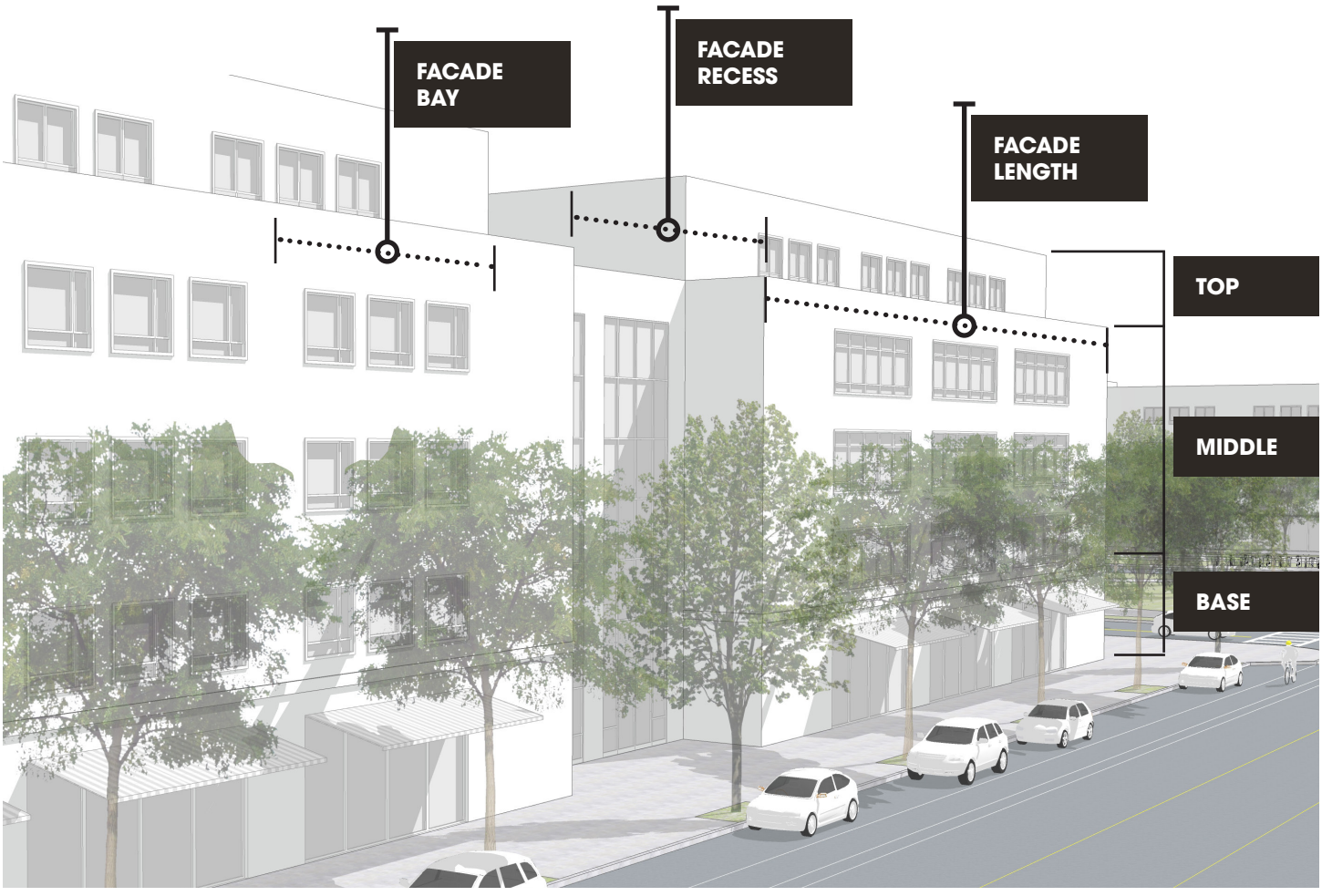
Facades

- Building facades should generally be designed with a distinct base, middle, and top. Long building facades should be composed of façade bays and intermittent recesses.
- Building facades along streets and public spaces should be designed with attractive ground floor facades, well-defined building entries, and quality building materials.
- Ground floor facades of buildings with ground floor retail, restaurant, office, professional service, and personal service uses should be designed with a high percentage on transparent windows and doors.

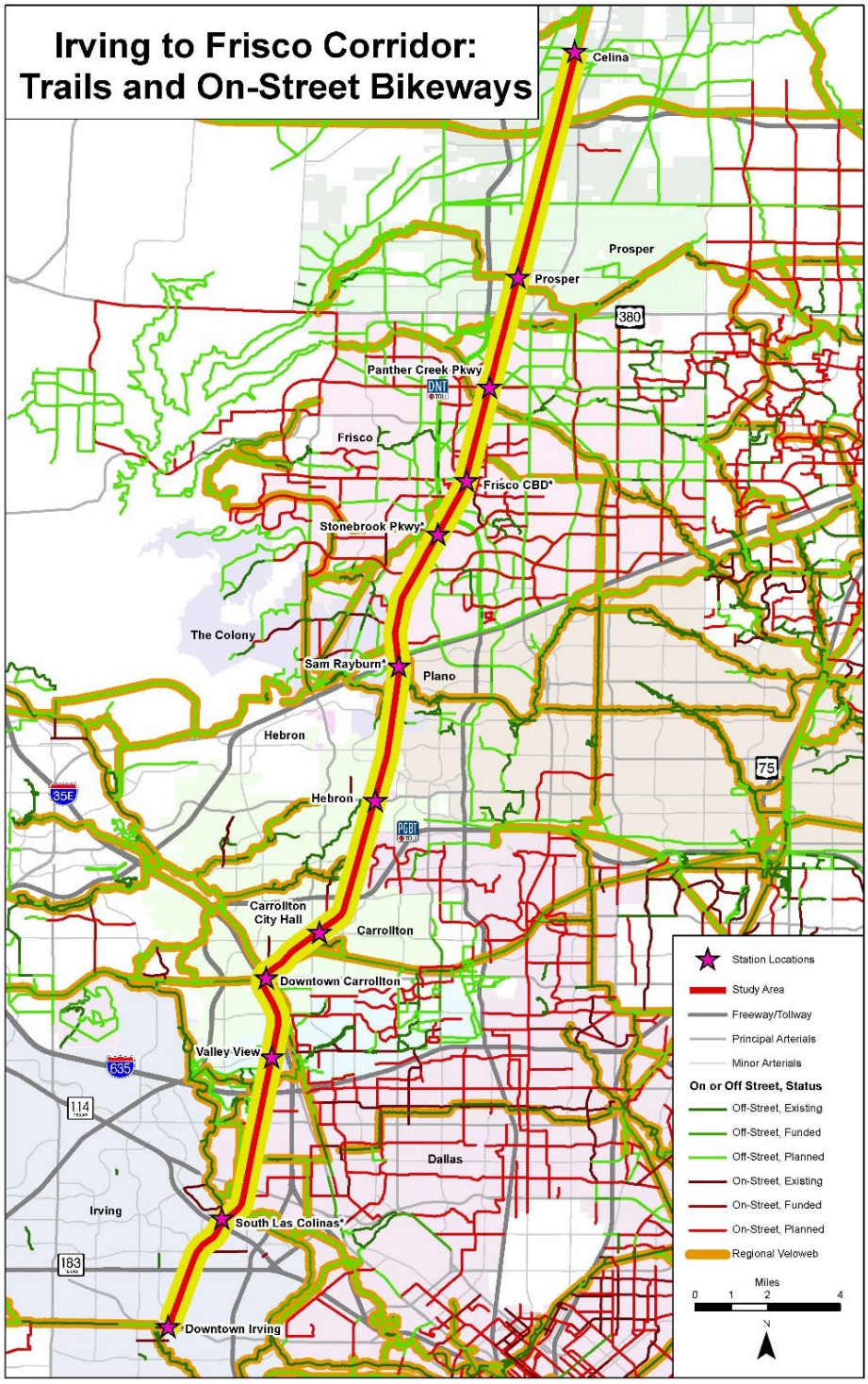
- Ground floor facades of buildings with residential uses should provide vertical separation and enhance privacy by slightly elevating the finished floor elevation of ground floor residential space along pedestrian walkways.
- Blank façade walls should be discouraged and limited in size to maintain an interesting streetscape.

Off-Street Parking

- Off-street parking should be placed behind buildings and out of sight from public spaces.
- Transit park and ride lots or structures should be located with sufficient distance from transit stations to encourage pedestrian flow along streets lined with businesses.
- TOD projects should provide a limited supply of parking to encourage the use of transit, walking and bicycling. A reduction of required parking should be considered. Shared parking strategies should be considered to reduce the overall parking supply and increase the efficiency of use of available land.
- Long-term parking intended for park-and-ride service and kiss-and-rides (drop-off locations) and rideshare pickup areas are located some distance from the stop (approximately 1/8 of a mile) to encourage transit users to frequent local businesses and services along the way.



APPENDIX G: MULTIMODAL NETWORK MAP



APPENDIX H: IRVING TO FRISCO COLLEGE/UNIVERSITY INTEREST SURVEY RESPONSES

NOTE: TABLE INCLUDED ON FOLLOWING PAGES

ID	Start time	Completion time	Please provide your name and organization	Should corridor capital and operating costs be broken out differently than suggested by the project team? What do you see as an equitable approach?	Given the big lift of funding and operating a full-service passenger line in this corridor, is your city or organization interested in phasing service (for example, by operating limited, peak-peri...	Is your city or community already actively engaged or interested in initiating station area planning activities? Are there specific areas where NCTCOG could provide additional support to help make...	All things considered (service, cost/funding, governance), what do you see as the preferred path forward for your community? What are the biggest barriers that you believe would need to be overcome?	Would you be interested in maintaining momentum on this project? If so, what do you see as next steps/level of participation for the cities along this corridor?
1	7/7/21 15:25:34	7/7/21 15:27:09	City of Irving	The City of Irving supports funding the project through existing transit agencies wherever possible. As a member of DART, Irving supports funding the cost allocation assigned to Irving with the understanding that there will be no further financial commitment by the City of Irving other than the existing 1 cent DART dedicated sales tax. In addition we understand that the existing service levels by DART will not be impacted in any manner due to the funding of this project.	Given the high capital costs of construction and the potential difficulties in acquiring funding from non-transit member cities, Irving may be interested in exploring a phased construction approach, with the early-phase construction focusing on corridors containing existing transit-member cities (Irving, Dallas, Farmers Branch, Carrollton, Plano). Later phase construction could occur once adequate funding commitments are received from the non-transit-member cities as long as there will be no further financial commitment by the City of Irving other than the existing 1 cent DART dedicated sales tax. In addition we understand that the existing service levels by DART will not be impacted in any manner due to the funding of this project	It would be helpful to understand the general footprint of real estate needed for proposed station construction, so as to wisely guide any future proposed surrounding development. (For Irving, this would be needed only at the “Downtown Irving” station. The real estate for the “South Las Colinas” station was acquired during the Orange Line construction.)	Irving’s preferred path forward would be a phased construction approach (early focus on existing transit-member cities), funding through the appropriate transit agency (DART, possibly DCTA). Biggest Barrier: As a DART member-city, transit equity and cost allocations to non-transit-member cities will be an important consideration. As with previous responses, it is our understanding that there will be no further financial commitment by the City of Irving other than the existing 1 cent DART dedicated sales tax. In addition we understand that the existing service levels by DART will not be impacted in any manner due to the funding of this project.	Perhaps a meeting with the DART member-cities along the corridor to coordinate a go-forward strategy that includes local input on planning and land use, as well as federal funding opportunities that will be needed for funding. Since Irving has been a founding member of DART for over 38 years it is our understanding that there will be no further financial commitment by the City of Irving other than the existing 1 cent DART dedicated sales tax. In addition we understand that the existing service levels by DART will not be impacted in any manner due to the funding of this project.
2	7/8/21 10:27:32	7/8/21 10:59:30	Ron Hartline, P.E. - Director of Engineering City of The Colony	Yes, the length of the project and number of stations being proposed leads to very large up front capital and operating costs. The City of The Colony is participating as a stakeholder to listen, participate and facilitate cooperation as needed to support this committee and the proposed regional rail study. However, funding a regional rail system is not a priority for the city at this time as there is no local need. A more limited, more affordable phased approach we likely be necessary for the city to ever consider raising the funding needed for a regional rail line to a higher priority.	Yes, see answer to question 2 above.	There have been no planning activities to date other than the results of this study and general limited discussions regarding the topic.	Barriers include the following. 1) Funding 2) Determining a limited phased approach that all stakeholders will be able to agree to impliment.	The City of The Colony will actively participate to maintain momentum on this project, provide input and assist in regional planning as needed to keep momentum moving on this project. But regarding funding, refer to item 2 above.
3	7/26/21 10:14:05	7/26/21 10:30:39	Hans-Michael Ruthe DART	Annual operating cost estimates (assuming a full 7 day schedule) should always be included in the presentation of capital costs. This is the most equitable approach in my opinion	We in Service Planning are not interested in this. To us it seems to be the most difficult way to build and sustain ridership	Not that I am aware of	This should be built out to Downtown Carrollton first. That way it would be wholly within the DART Service Area, and could be marketed as such to the DART Board of Directors. Then, if possible, the project should be added to the long-range plan for further study and possible inclusion in the DART Business Plan. If there are interests in extending the corridor north, this capital cost (and a fraction of the operating cost) should be borne by the non-DART entities.	Next steps for this project, in my opinion, is preparing a version of it within DART Service Area and approaching the long-range planning staff for consideration by the DART Board

ID	Start time	Completion time	Please provide your name and organization	Should corridor capital and operating costs be broken out differently than suggested by the project team? What do you see as an equitable approach?	Given the big lift of funding and operating a full-service passenger line in this corridor, is your city or organization interested in phasing service (for example, by operating limited, peak-peri...	Is your city or community already actively engaged or interested in initiating station area planning activities? Are there specific areas where NCTCOG could provide additional support to help make...	All things considered (service, cost/funding, governance), what do you see as the preferred path forward for your community? What are the biggest barriers that you believe would need to be overcome?	Would you be interested in maintaining momentum on this project? If so, what do you see as next steps/level of participation for the cities along this corridor?
4	7/27/21 9:34:06	7/27/21 9:37:35	Drew Brawner, Robert Saylor (City of Plano)	It is our understanding that this study assumes Plano and the other DART member cities would defer to DART for funding and operation decisions, and that capital costs would not require additional local funds. Is this an accurate assumption? And would it be helpful to break out the allocated cost by DART and non-DART cities?	It seems this question is primarily influenced by the funding capabilities of the non-DART cities. Plano's primary interest in this corridor is its connectivity to the Legacy West employment/activity center. Peak period service may be a useful initial phase, but in the long term this area needs consistent enhanced transit service to promote the area as transit-reliable.	Plano is not currently engaged in station area planning for this corridor, since the station location would be just outside our city limits. However, we would be supportive of future planning efforts as it relates to transit access to the Legacy West area. For our other planned/existing rail stations, Plano has taken a proactive role in planning. For example, Plano is actively developing a market assessment for the future Silver Line stations to inform land use planning efforts. Plano will also continue to evaluate planning efforts in the Downtown Transit Corridor as part of the Downtown Plano Vision and Strategy Update.	The biggest barrier to transit expansion beyond Plano is the unknown interest/funding level from adjacent communities who are not current members of a transit authority. Plano will continue to support exploring options to expand transit service beyond our city limits. We understand the demand for transit exists to our north and is exemplified with the high ridership at the Parker Road station.	Plano will continue support planning efforts of this rail corridor. However, we also know there are other corridors and transit service types that could have more direct impacts to our city's mobility choices. These include a Legacy area circulator, Collin Creek redevelopment connectivity, Red Line extension, etc. It would be worth further exploring the cost/benefit and projected ridership of other transit investments in comparison to the Irving to Frisco line. It is interesting that in DART's High Capacity Corridor Screening Evaluation Report (Sept 2020), they give the Irving-Legacy Regional Rail a low rating in comparison to other potential corridors such as the Red Line Extension or a Dallas North Tollway enhanced transit corridor which received higher ratings in potential riders per mile and cost per trip. I think we need additional justification on why this Irving to Frisco corridor should be a top priority over other regional transit initiatives.
5	7/30/21 14:04:05	7/30/21 14:33:06	Brian Moen, City of Frisco	The suggested approach is a good starting point, but other cost distribution models should be considered. For example, length of line within a city? Number of stops? Should the county or cities outside of the line within Collin and Denton County be included? Does BNSF contribute if they can benefit from any improvements made along the line?	Phasing service seems to make sense in order to lessen the total upfront cost and demonstrate utilization.	Stations are noted in our long range comprehensive plan. We are open to NCTCOG staff sharing their guidance and expertise in planning for these station locations.	The preferred path would include refining the costs estimates/allocations and identifying potential federal and private sector funding options. Finalizing a governance model and identify project champions also need to be done. The biggest barriers are believed associated with capital and operating costs.	Yes, we are interested in maintaining momentum. A small working group with representation from each stakeholder along the line including Dart, DCTA, and Collin and Denton Counties should be formed to begin working on the issues identified in question #5.
6	8/2/21 6:01:45	8/2/21 6:18:52	Abra Nusser on behalf of City of Celina	This question is a bit awkward as I'm fairly certain the members of the Committee may not have the knowledge or understanding to answer it. Corridor capital and operating costs should reflect potential cost participation from the various sources, as well as associated timing and variables, and there is not yet an understanding of what those would be. Asking what an equitable approach is for presenting data or technical information to Committee members does not seem like a relevant question.	Phasing should be expected throughout all facets of construction and operation no matter which city is involved.	Yes NCTCOG can make specific recommendations for each stage a city may be going through in its planning efforts-- kind of like a flow chart. Funding for planning efforts would also be well received as they most likely have to be completed by consultants. NCTCOG can also prepare a Regional Transit System Plan that could identify key components to a full regional strategy, including transit agency development, that cities could work within.	Regional coordination and planning and funding will be key.	It has been challenging to identify where we are and where we are headed with the project, but it is absolutely imperative that the project continue. Having periodic meetings is helpful, but with so many busy people on the line, it needs to be clear what they/we can actively and realistically weigh in on. Asking questions about an equitable presentation of technical information or about each city's preferred path could be answers prepared and presented to the Committee. There is a fundamental level of stakeholder involvement with the counties, BNSF, DCTA, DART, etc that seems to be missing. There also seems to be a "why" or a shared vision missing-- seems like we skipped all the way to "how" but there hasn't been a logical progression of foundational components, and the "how" seems jumbled. So many of the cities in the region are not even informed on what transit is, its various components, how the different pieces could fit together, the benefits, how to make it work, etc. Celina is invested in being a leader in transit and will continue to put that investment toward planning and collaboration.
7	8/5/21 10:25:15	8/5/21 10:29:31	David Fenton - Town of Prosper	Re-evaluation of the trip origins presented especially in comparison to Celina given the magnitude of their population as compared to Prosper's. Basing percentage of trip origins on population accordingly.	Yes.	Not currently engaged in station planning. Anticipate an update to the comprehensive plan in 2022. We have multiple planning efforts ongoing within the Town which may result in the need for additional support from NCTCOG depending on these results.	For Prosper to remain a candidate for a rail stop downtown. Providing service for an equitable cost. Funding.	Yes. Obtaining a grant from the Federal Govt. for further development.