CapMetro

Red Line Trail Study

Trail Design Memorandum

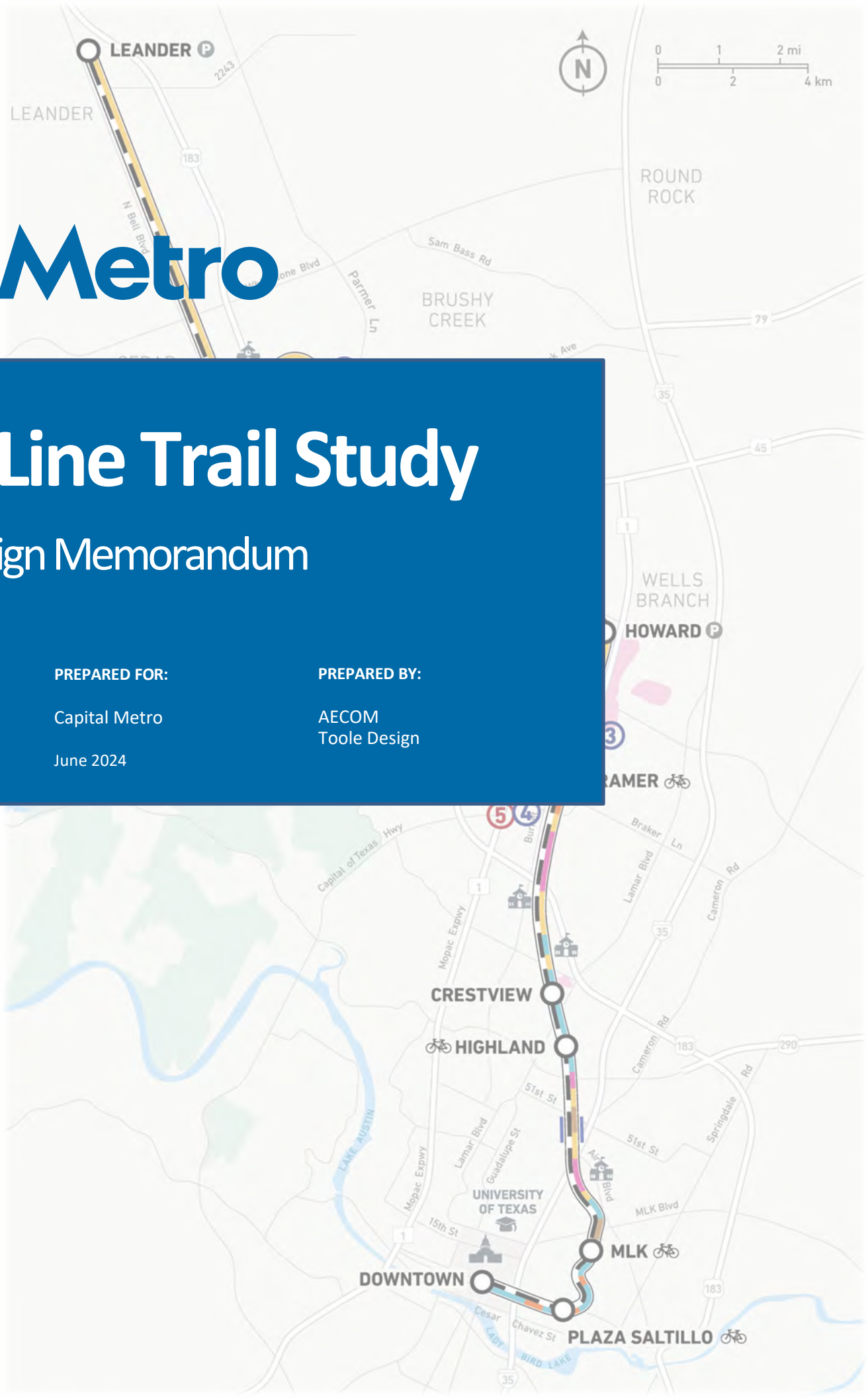
PREPARED FOR:

Capital Metro

June 2024

PREPARED BY:

AECOM
Toole Design



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1. Introduction

The purpose of this memorandum is to describe and showcase concept-level graphics and designs that were developed for various trail alignment scenarios. The concept graphics and designs introduced in this memo are intended to illustrate what the trail may look and feel like based on CapMetro and jurisdictional guidelines. The goal of the graphics and concepts is to illustrate applied design guidelines, future and existing double tracking, and jurisdictional preferences for trail width and other trail design elements. The graphics and concepts were used to provide visual context during the May 2024 Virtual Open House. Moving forward, the graphics and designs will aid discussions between CapMetro and the jurisdictions, serve as an educational tool, and provide support for potential funding pursuits. All graphics and designs included in this memorandum are conceptual and not intended as final designs.

2. Methodology

The Existing Conditions analysis and field visits were used to inform the development of the concepts and graphics included in this memo. Guidelines were another primary source of reference. As a part of the Red Line Trail Study, CapMetro formalized internal and external guidelines and processes needed for the design and construction of a trail within CapMetro ROW. The procedures and guidance can be found in the *CapMetro Design Guidelines for a Trail within the CapMetro Right-of-Way* and *Trail Projects within CapMetro Rail Right-of-Way Standard Operating Procedures*, which are available on CapMetro's Rail ROW website. These documents served as primary resources for the development of the materials introduced in this memorandum. Major elements covered in each of the documents are listed below.

1. CapMetro Design Guidelines

- Provides uniform and consistent standards for rail-with-trail design, construction, and maintenance within CapMetro Rail ROW based on freight and commuter rail operational needs, the dynamic envelope, operating speeds, frequency of service, safety, and space needed for maintenance vehicles, equipment for both commuter and freight trains, potential derailments, and other unforeseen incidents.
- Covers minimum recommended parameters, such as setbacks, grade crossings, surfaces, utilities, landscaping, fencing, lighting, drainage, and access.
- References CapMetro, federal, and state minimum standards and general requirements.

2. Trail Projects within CapMetro Rail ROW Standard Operating Procedures (SOP)

- Created to guide external entities and internal CapMetro departments through the process of reviewing, authorizing, and coordinating the design and construction of a trail project within Rail ROW.
- Outlines critical information, responsibilities, and requirements.
- Details external entities' roles and processes for the application materials and coordination.
- Details CapMetro's internal roles and processes for review and coordination.

3. All Relevant Design Guidance

Several sources of local and national standards and guidelines were referenced during the development of the following concept designs and graphics. The following list, as well as standards and guidelines listed in the Relevant Guidelines section of the Existing Conditions Memorandum, should continue to be referred to during future phases of trail design development.

- CapMetro Design Guidelines for a Trail within the CapMetro Right-of-Way, 2024
- Trail Projects within CapMetro Rail Right-of-Way Standard Operating Procedures, 2024
- City of Austin Transportation Criteria Manual
- AASHTO Guide for the Development of Bicycle Facilities, 2012
- MUTCD 11th Edition, 2023
- TxDOT MUTCD (TMUTCD), effective 2014
- TxDOT Roadway Design Manual, 2022
- TxDOT Bicycle Accommodation Design Guidance, 2021
- City of Austin Urban Trails Plan, 2023
- FHWA Rails-with-Trails: Best Practices and Lessons Learned, 2021
- City of Leander Parks and Recreation Plan, 2019
- City of Cedar Park Trails Master Plan, 2010
- Lower Colorado River Authority (LCRA) Guidelines

3. Feasibility Tiers

As part of the Trail Alignment Possibilities task, the Toole Design Team analyzed the CapMetro Rail ROW to identify areas that could support a trail that meets CapMetro's preferred setback distance of 25 feet. During the analysis, Toole Design identified three tiers to characterize the complexity and feasibility of constructing a trail within CapMetro ROW.

The three feasibility tiers were developed based on CapMetro's guidelines (primarily based on preferred setback distances informed by train dynamic envelope, speed, and other operational needs), state and federal requirements, and double tracking considerations. A trail width range of 11 to 16 feet was used for determining spacing for the trail, based on local jurisdiction standards and the potential for the trail's width to flex in response to site conditions or constraints[1]. In areas with existing bicycle and pedestrian infrastructure, segments were still analyzed for potential relocation or expansion within the CapMetro Rail ROW and assigned a feasibility tier. The feasibility tiers are described in the table below for reference. For more detail on the Rail ROW analysis and methodology used, see the *Red Line Trail Study Right-of-Way Alignment Notes and Methodology* memorandum.

1 The preferred trail widths are based on local jurisdictional standards. The City of Austin trail width standards are context sensitive with a preference for dual track trails that separate pedestrians and cyclists where space permits. The standard minimum width for a shared use trail in the City of Austin is 12 feet, but trail width can be reduced to 10 feet in constrained areas and extended to 16 feet when space allows. In the City of Leander and the City of Cedar Park, the standard trail width is 12 feet.

Table 1. Feasibility Tier Definitions

FEASIBILITY TIER	CRITERIA
Tier 1: Compatible with Future or Existing Double Tracking	• Identified segment can meet CapMetro preferred setback of 25 feet* AND • Is compatible with **current or future double tracking** along the Red Line corridor. Future double tracking assumes 15 feet between centerlines of rails and double tracking centered within the ROW (may assume relocation of existing track)**AND • Is not eliminated by any other geological/physical constraint present in available data
Tier 2: Meets CapMetro Preferred Setback	• Identified segment can meet CapMetro preferred setback of 25 feet* AND • Is compatible with **prioritized double tracking projects along the Red Line corridor but not future double tracking along the entire corridor**, assuming 15 feet between centerlines of rails and double tracking centered within the ROW (may assume relocation of existing track)**
Tier 3: Does not meet CapMetro Preferred Setback	• Identified segment **cannot meet** CapMetro preferred setback of 25 feet but may be physically feasible* • Due to constraints and safety considerations, requires further discussion and coordination with CapMetro to explore and determine context-sensitive options and variance possibilities through the SOP.

** Based on side with greater availability of unused ROW if tracks are not centered within the ROW*
***Setback will be measured from centerline of closest track*

The right-of-way analysis found that none of the corridor segments met Tier 2 criteria. The lack of Tier 2 segments was due to the increments of ROW width and how they corresponded with the CapMetro Guidelines. The following table provides a summary of the mileage and percentage of the study corridor according to feasibility tier.

FEASIBILITY TIER/STATUS	TOTAL LENGTH (MILES)	PERCENT OF STUDY CORRIDOR
Tier 1	13.07	40%
Tier 2	0	0%
Tier 3	19.44	60%
TOTAL	**32.51**	**100%**

4. Crossing Design

The Red Line route crosses many roadways with a range of widths and posted speed limits. Locations where the rail crosses a roadway, such as mid-block locations that lack traffic control, do not always have ideal conditions for creating safe pedestrian crossings. While trains can rely on bells, lights, and gates, additional crossing treatments and infrastructure may be necessary to create safe crossing conditions for trail users. A tailored effort in the design of the required trail-road crossings will be required to ensure the safety of trail and roadway users.

All at-grade trail-road crossings should follow basic safety principles, including crosswalks at a minimum 25-foot setback per CapMetro Design Guidelines. All trail-road crossings should, at a minimum, consider

high-visibility pavement markings and the appropriate warning signage as outlined in the MUTCD. All crosswalks, ramps, and trails must also follow ADA compliance and any standards set by the agency who owns the crossing roadway.

Designers should also consider multiple types of crossing treatments based on context, including jurisdictional standards and roadway volumes and speeds. For example, trail users could be redirected to an existing intersection that has crossing treatments if it is within a short distance (up to 350 feet), whereas other crossings may require more advance signalized treatments. The existence of roadside constraints such as utility poles and drainage areas may control which crossing types are most feasible. More details on trail-road crossings near railroad crossings can be found in the Trail Crossings at Street Right-of-Way and Rail Tracks memo.

Mid-block crossings (such as at Whitestone Boulevard) will require coordination between Rail Signal and authorities having jurisdiction (AHJ), in this case TxDOT, to ensure crossing infrastructure does not impact or create confusion for drivers at the adjacent, existing rail-road crossing. Designers may refer to the existing crossings at I-35 in downtown Austin between the Downtown Stations and Plaza Saltillo Station.

The example trail crossing diagram below shows potential treatments that could be incorporated at applicable locations to provide a safe trail crossing adjacent to the rail. The diagram depicts safety feature options and their appropriate locations. Actual crossing designs will require coordination with CapMetro Rail Signal and TxDOT.

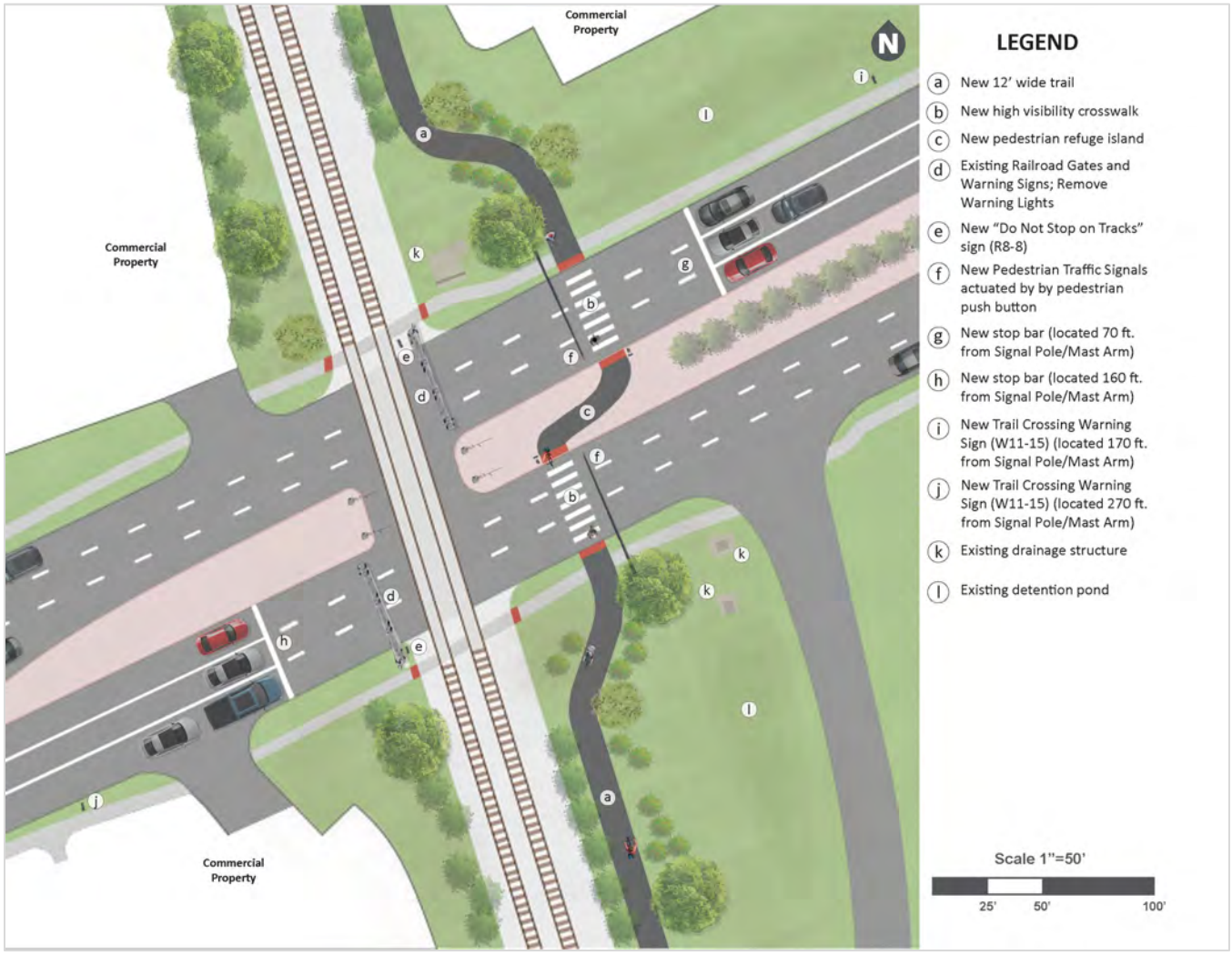


Figure 1. Example Trail Crossing Diagram (See Appendix A for full scale version)

5. Cross Sections and Graphics

Cross sections were developed to illustrate the relationship of space between the rail, trail, and adjacent features along the study corridor. Graphics were created to provide a sense of the trail experience from a user perspective and provide reference for future design work. Locations for both cross sections and graphics were carefully selected to be representative of conditions that would occur throughout the study corridor. All cross sections and graphics depict points within Tier 1 segments of the corridor, apart from the McKalla Station cross section, which depicts a successfully completed section of trail along a Tier 3 segment. Double tracking is shown in all cross sections in alignment with CapMetro's long-term vision to provide double tracking along the entire corridor. Labels in the cross sections are provided to indicate whether the double tracking is existing or future. The side of the track where the trail is shown was selected to minimize new crossings and provide connectivity to stations, however, the side of the rail along with other major and minor details are preliminary in nature and subject to change with further planning, design, and coordination with stakeholders such as LCRA and TxDOT.

Full scale versions for the cross sections and graphics can be found in Appendix A.

4. City of Leander: North of Crystal Falls Parkway

This cross section depicts the potential trail layout in Leander between Crystal Falls Parkway and E Sonny Drive. The CapMetro ROW is 90 feet wide in this location, which allows for the preferred setback distance of 25 feet (measured from centerline of closest track to closest edge of trail). This cross section shows how the trail could be routed adjacent to the back of commercial buildings, which is a common scenario along the Red Line corridor.

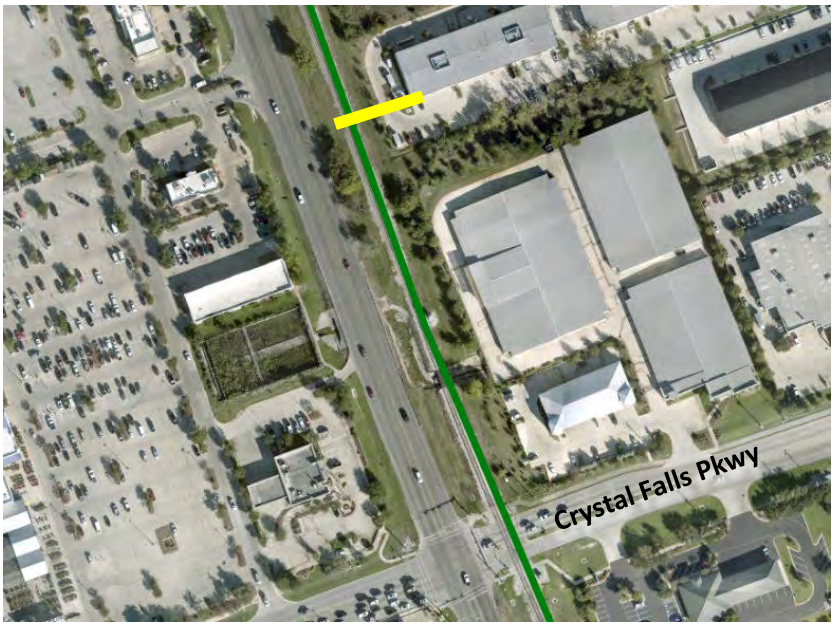


Figure 2. Aerial imagery of cross section location. Green line indicates Red Line Rail corridor. Yellow highlight shows cross section

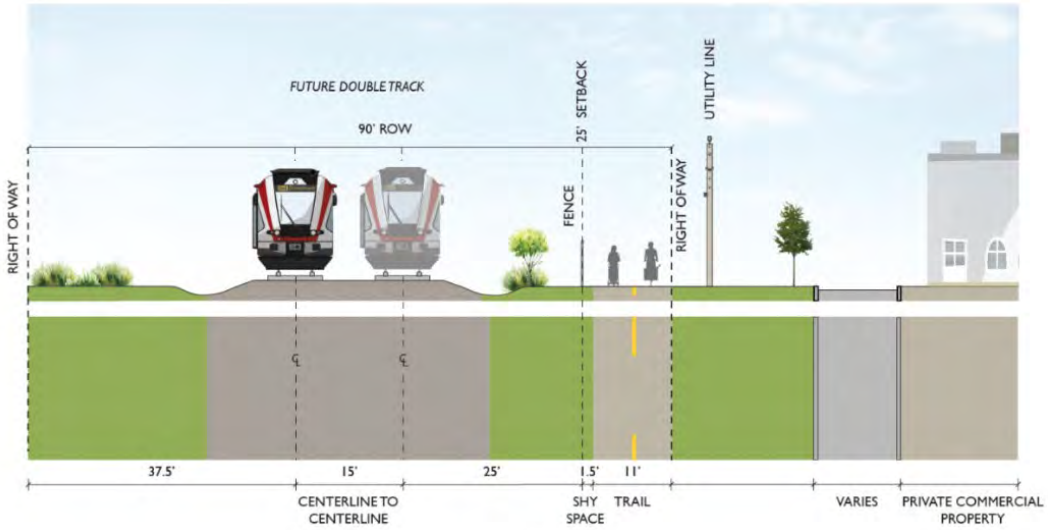


Figure 3. City of Leander: North of Crystal Falls Parkway

5. City of Leander: South of Crystal Falls Parkway

The following cross section depicts the potential trail layout in Leander between Block House Drive and Crystal Falls Parkway. The CapMetro ROW is 100 feet wide in this location, which allows for the preferred setback of 25 feet. This cross section shows how the trail could parallel residential backyards, which occurs over several stretches along the Red Line corridor. The specific section shown in the cross section is currently experiencing overgrowth of trees and understory vegetation within the CapMetro ROW. There is also a potential for a trail connection to the Horizon Park HOA park property near this cross section location.

Figure 4. Aerial imagery of cross section location. Green line indicates Red Line Rail corridor. Yellow highlight shows cross section

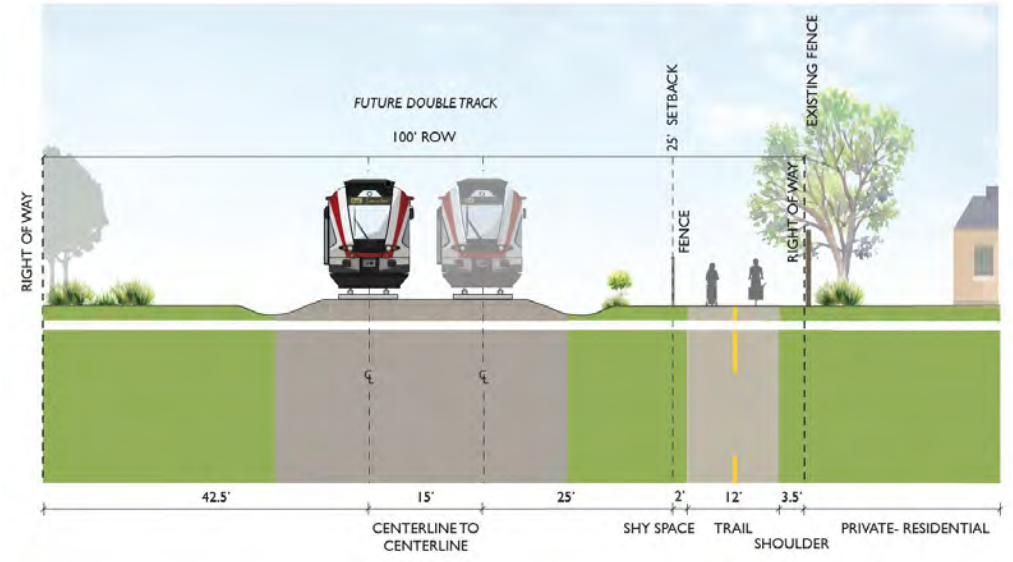


Figure 5. City of Leander: South of Crystal Falls Parkway

6. City of Cedar Park: East Whitestone Boulevard to East New Hope Drive

The cross section in Cedar Park between E Whitestone Boulevard and E New Hope Drive depicts the common scenario of the trail sharing space with a utility corridor. The Lower Colorado River Authority (LCRA) guidelines for utility corridors indicate that vegetation must be kept at 10 feet or lower in height within 30 feet of either side of the utility poles. Further coordination with LCRA will be necessary as planning and design progresses for sections of trail that would share space with utility corridors.

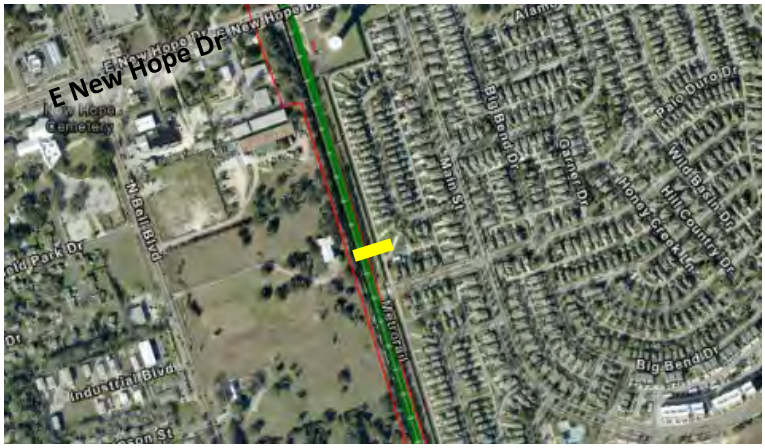


Figure 6. Aerial imagery of cross section location. Green line indicates Red Line Rail corridor. Yellow highlight shows cross section

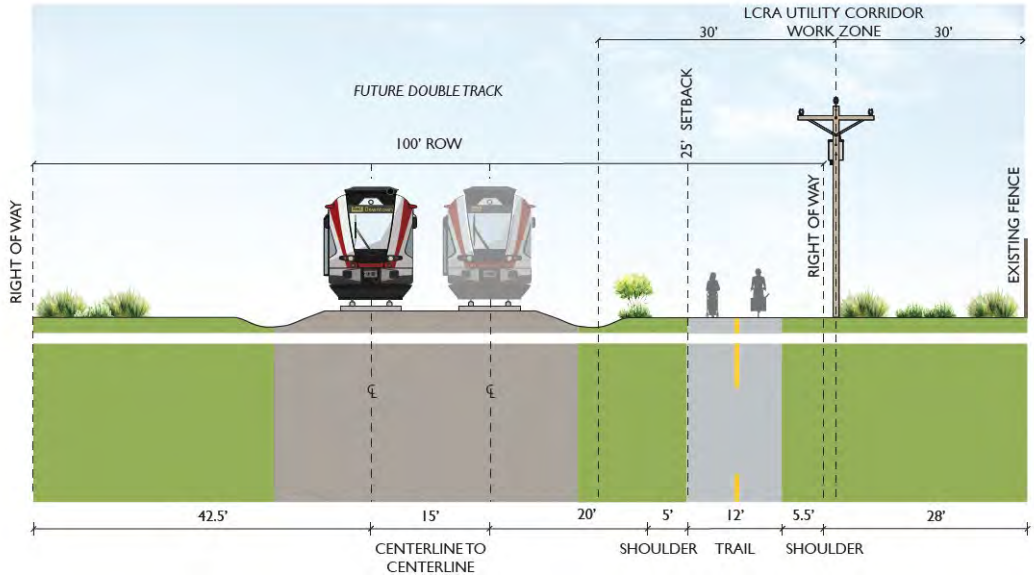


Figure 7. City of Cedar Park: E Whitestone Boulevard and E New Hope Drive

7. City of Cedar Park: US Route 183 Underpass

The perspective of the future Red Line Trail at the US 183 underpass depicts how the trail would be situated between the tracks and the overpass substructure. Structural pieces of the bridge may provide an opportunity for incorporating murals or other artwork along the trail pending coordination with TxDOT. The existing ditch would be maintained while the existing shorter chain-link fence would be upgraded to a taller welded wire mesh style fence with lockable gates every half-mile and "No Trespassing" warning signs (per CapMetro Guidelines) to provide separation between the trail and rail. Vegetation in the buffer between the rail and trail would be kept low to avoid impeding sightlines at the crossing located just left of this viewpoint.

Figure 8. US Route 183 Underpass at Brushy Creek 80.34

8. City of Cedar Park: Brushy Creek Recreation Park

The following graphic depicts what the trail might look like through Brushy Creek Recreation Park. The CapMetro ROW is 100 feet wide in this location, allowing for the preferred 25 feet setback. The Red Line Trail would likely see significant recreation use through this section with connections to athletic fields and the Brushy Creek Trail. Designers should consider how the trail can connect to the park to integrate the trail with other recreational offerings.

Figure 9. City of Cedar Park: Brushy Creek Recreation Park

9. City of Austin: South of Spectrum Drive

This cross section shows what the trail could look like south of Spectrum Drive in the City of Austin. This area shows how the trail could interface with the utility corridor as well as commercial properties. The trail may have opportunities to connect properties that host retail stores or offices. The CapMetro ROW is 100 feet wide in this location, allowing for the preferred setback of 25 feet.

Figure 10. Aerial imagery of cross section location. Green line indicates Red Line Rail corridor. Yellow highlight shows cross section

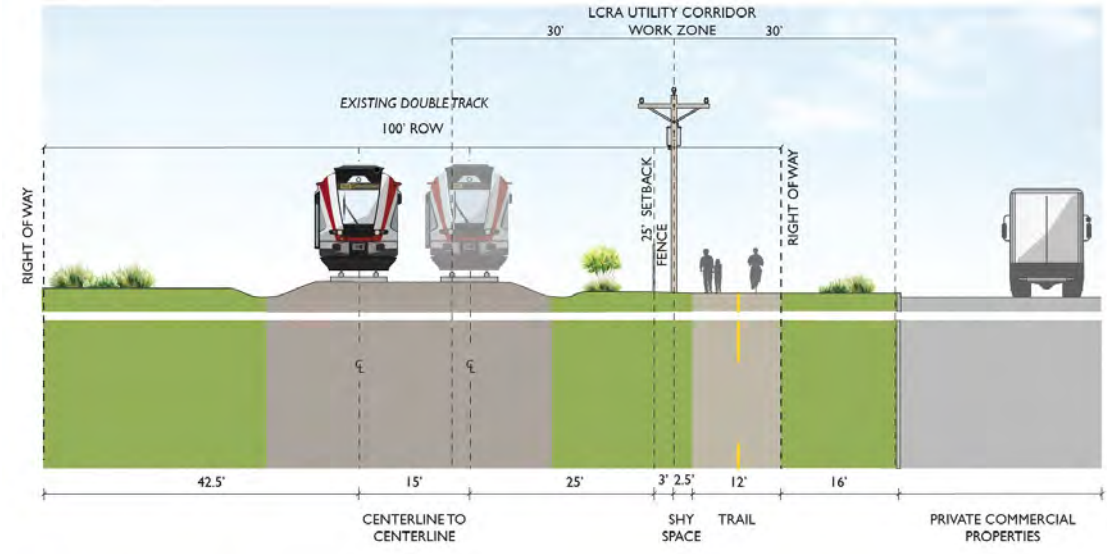


Figure 11. City of Austin: South of Spectrum Drive

10. City of Austin: Howard Station

The following cross section and graphic show how the existing trail facility at Howard Station could be widened to accommodate people biking and walking along the trail in addition to transit riders. The CapMetro ROW is 100 feet wide in this location, and trail widening could occur outside of the preferred 25-foot setback. The trail could provide direct station access allowing for easy connections to transit for trail users. Trail through-traffic is separated from people waiting, boarding, and exiting trains on the platform. Crosswalk markings or potentially dismount zones may be considered as ways to minimize conflicts between trail users and train passengers crossing the trail.

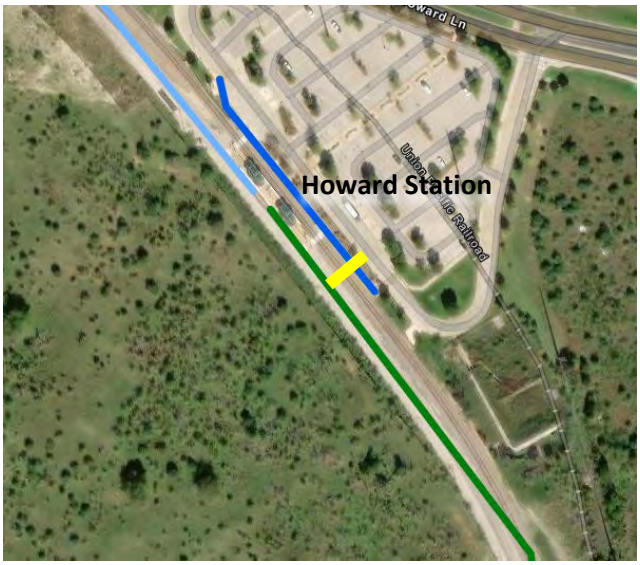


Figure 12. Aerial imagery of cross section location. Yellow highlight shows cross section

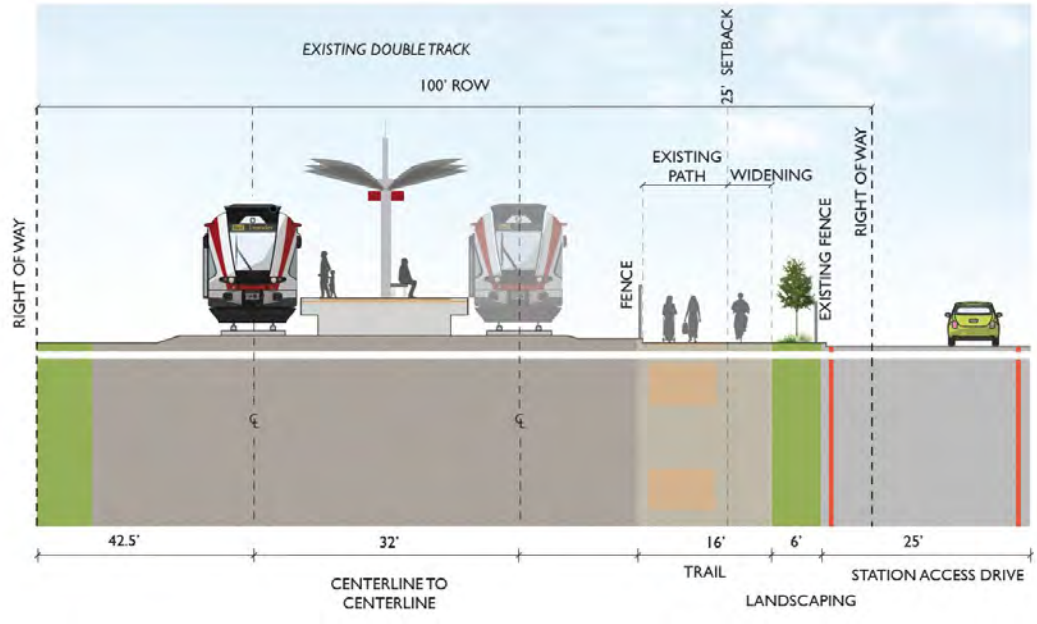


Figure 13. City of Austin: Howard Station Cross Section

Figure 14. City of Austin: Howard Station Perspective

11. City of Austin: Waters Park Road

The following cross section shows how the trail may look along Waters Park Road. In this section, the trail could function as both a rail-with-trail and a side path along the lower-volume road. Designers will need to consider how the trail can be designed to be compatible with roadway drainage. The CapMetro ROW is 100 feet wide in this area, allowing for the preferred 25 feet setback.

Figure 15. Aerial imagery of cross section location. Yellow highlight shows cross section

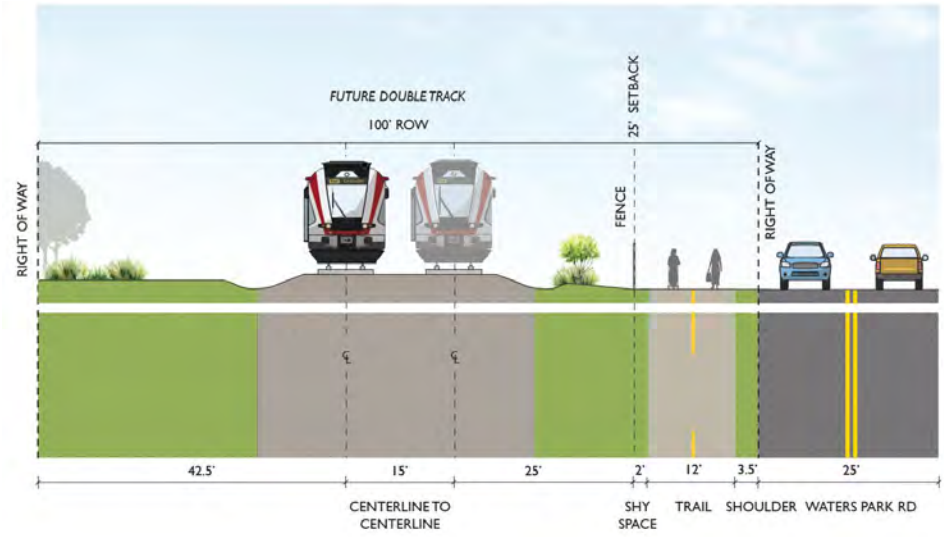


Figure 16. City of Austin: Waters Park Road

City of Austin: North of McKalla Station

The construction of McKalla Station demonstrates the potential complexities and necessary collaboration in constructing the trail within a Tier 3 area including constrained ROW, drainage and utility conflicts, and rail modifications. Due to those space limitations, CapMetro had to ask for a waiver to construct parts of the new drainage system inside the City of Austin's public utility easement. A section of the trail also had to be reinforced with 10" thick concrete pavement to withstand additional loads, allowing Austin Energy to service the energy transmissions towers located along the trail. Constrained conditions also prompted variances from preferred setbacks. Close setbacks are approved on a case-by-case basis, since they can be a safety concern for freight trains along the corridor causing additional need for safety mitigation measures. The cost of replacing rail ties and track maintenance also rises in Tier 3 areas. As the space available for replacing ties decreases or if fencing presents an access barrier, it increases the costs and labor associated with replacing ties, making it more challenging with maintenance crews and equipment to reach the tracks.

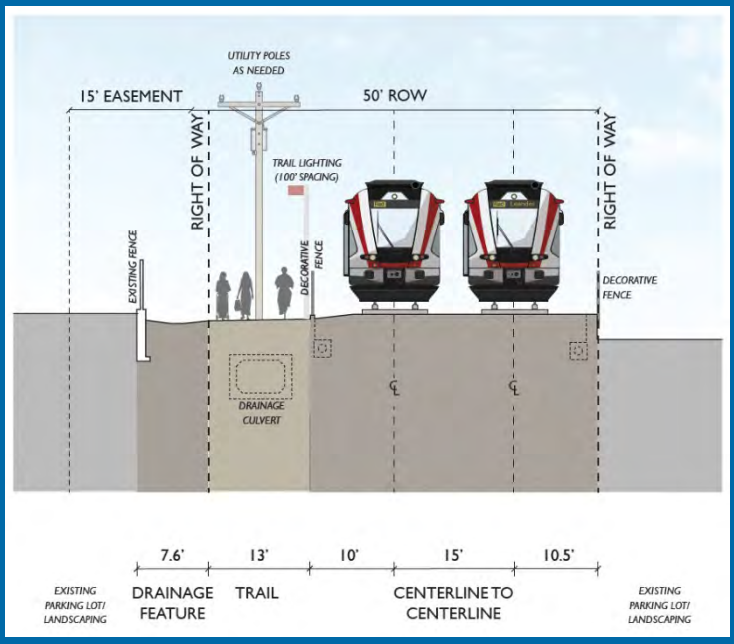


Figure 17. City of Austin: North of McKalla Station

6. Pilot Segment

The development of a pilot segment is intended to provide alternative perspectives on trail design and act as a first step in providing the coverage needed across the corridor while emphasizing the unique transit/trail interactions or alternatives that occur throughout the 3 tiers of feasibility. The design details of this scenario, described below, adhere to CapMetro's Design Guidelines and their Standard Operating Procedures but are at a conceptual level of design based on available information and survey data. However, further design will require more recent survey and coordination with third party entities, specifically utility companies.

The nearly 1-mile pilot segment extends from East Whitestone Boulevard to East New Hope Drive between Lakeline Station and Leander Station in the City of Cedar Park. This segment exemplifies Tier 1 feasibility featuring a consistent 100-foot ROW, compatibility with future double tracking, and minimal geological and physical constraints. The preferred 25-foot minimum setback from the centerline of the nearest track should be achievable with occasional exceptions to avoid utility impacts. Design

considerations for the roadway crossings are detailed in additional Red Line Trail documents; a conceptual design is shown as part of the pilot segment. A full plan view of the pilot segment concept drawings can be found in Appendix A.

7. Conclusion

The concept designs and graphics included in this memorandum are intended to serve as reference points for discussions between CapMetro and jurisdictions as planning for segments of the trail is initiated. Graphics will also be practical for communicating concepts and the general look and feel of the trail to the public. When using the drawings and graphics in future contexts, it will be important to continue to remind all parties of the conceptual nature of these materials, and that additional survey, design, and engagement will be required as the project moves forward.

Appendix A. Trail Crossings at Street Right-of-Way and Rail Tracks

Red Line Trail Study
Trail Crossings at Street Right-of-Way and Rail Tracks

PREPARED BY:

AECOM

JUNE 2024

1. Purpose

This document is intended to provide guidance on the appropriate implementation of countermeasures related to the addition of an urban trail at existing street right-of-ways and railroad tracks. More specifically, this document was created to assist entities in lieu of CapMetro in the planning and design of trail-street and trail-rail crossings during implementation of an urban trail that runs generally parallel to the existing Red Line commuter rail.

2. Overview

The Red Line route contains many roadway crossings, with a range of widths and operating speeds, through multiple jurisdictions. While this document presents a general workflow, a more tailored effort in the design of the required trail-road crossings will be required primarily to ensure the safety of trail and roadway users. The guidance provided in this document follows information gathered from the AASHTO *Guide for the Development of Bicycle Facilities* (2012), the MUTCD 11th Edition (Dec. 2023), the FHWA *Rails with Trails Best Practices and Lessons Learned* report (May 2021), CapMetro's *Design Guidelines for a Trail Project within CapMetro Rail Right of Way* (Feb 26, 2024), and other published guides. All at-grade trail-road crossings should follow the basic safety principles outlined in these guides. References to specific sections in these documents can be found throughout this document, and links to these guides can be found at the end of this report.

For the implementation of a trail-rail crossing, there are unique requirements, standards, and policies. CapMetro has established guidelines with requirements including CapMetro policy, regulatory responsibility, approval process, design criteria and other important requirements for a trail crossing the railroad. For the most up-to-date requirements, please see CapMetro's *Design Guidelines for a Trail Project within CapMetro Rail Right of Way* (2024). The implementation of any new rail crossing is also subject to CapMetro *Rail Right of Way Standard Operating Procedures* (2024), involving a more tailored effort in the design and workflow.

3. General Requirements

Although each trail-road crossing should be treated on a case-by-case basis, the following is general guidance that should be applied to nearly all cases.

3.1 Crosswalk

All at-grade trail-road crossings will require a crosswalk with high-visibility pavement markings (MUTCD Fig. 3C-1). Green-colored pavement markings should be used in conjunction with traditional white markings to indicate to drivers the presence of bicyclists (MUTCD 9E).

3.2 Signage

Every crossing should include the appropriate signage as outlined in the MUTCD, including but not limited to 'Bike Xing' (W79) signs, 'Stop' (R1) signs, advance warning signs for trail and roadway users, bikeway directional signage, vehicular railroad crossing signs, and any treatment-specific signage. In places where a trail or sidewalk crosses a rail, at a minimum a flashing-light signal assembly (MUTCD Fig. 8E-7) should be installed, preferably with a pedestrian gate (MUTCD Fig. 8E-8). See *Figure 1*.

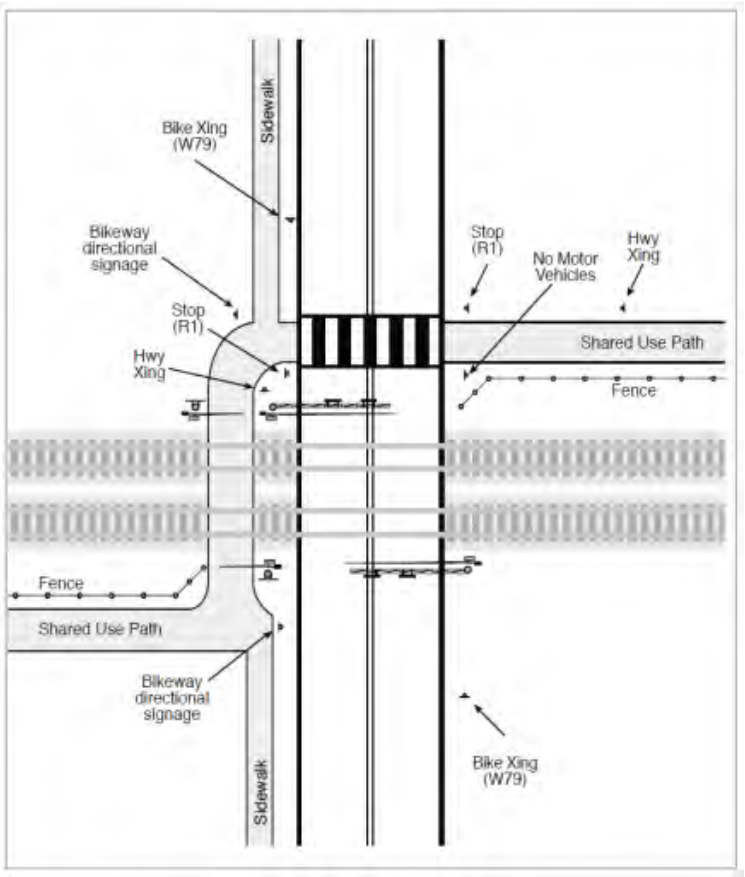


Figure 1: FHWA "Roadway and Track Crossing" (Rails with Trails 2021)

3.3 Setback

No formal consensus exists for the appropriate setback for trails near rails or crossings near rails. In general, a 10' offset from the centerline of the nearest track to the edge of the crosswalk is considered minimum per established criteria (FHWA 2021); however, CapMetro guidance recommends a minimum setback of at least 25' (2024). Crosswalks and trails should always be set outside of any railroad signal gates, which should fully cover the bicycle and pedestrian pathway. At an absolute minimum, any trail or crosswalk must lay outside of the train's dynamic envelope (MUTCD Fig. 8A-1). The location of the crosswalk relative to the rails will be determined by several factors discussed within this document, including the setbacks above and both median and roadside constraints. See *Section 3.2* for more information.

3.4 ADA & Other Standards

All crosswalks, ramps, and sidewalks should follow ADA compliance and any standards set by the agency who owns the crossing roadway. Specifically for the Red Line, this includes the cities of Austin, Cedar Park and Leander, TxDOT, CTRMA, Travis County, and Williamson County level streets with Red Line roadway crossings. All portions of design must also follow standards set by CapMetro report RWT-GDL 2.0 “Design Guidelines for a Trail Project within CapMetro Rail Right of Way.”

4. Types of Trail-Road Crossings Parallel to Rail

There are three general options for at-grade trail-road crossings near rails: rerouting users to an existing roadway intersection, unsignalized midblock crossings, and signalized midblock crossings.

4.1 Trail Crossings Near Existing Roadway Intersections

Trail-road crossings at high speed and/or high-volume roadways and located within 350' of an existing signalized roadway intersection should reroute trail users to the intersection. However, in cases where trail users would be required to cross the tracks to reach the signalized intersection, this option is less preferable and would require additional treatments as discussed under the *Trail-Rail Crossings*. An example of a crossing near an intersection is shown in *Figure 2*. In locations where the sidewalk leading to the intersection and/or a crosswalk at the intersection do not currently exist, these assets must be installed, following ADA compliance and any local regulations. Pedestrians might be inclined to take shortcuts and avoid designated pedestrian crossings. This tendency should be taken into account when designing the crossing, with appropriate fencing and channelization provided to guide and protect users.

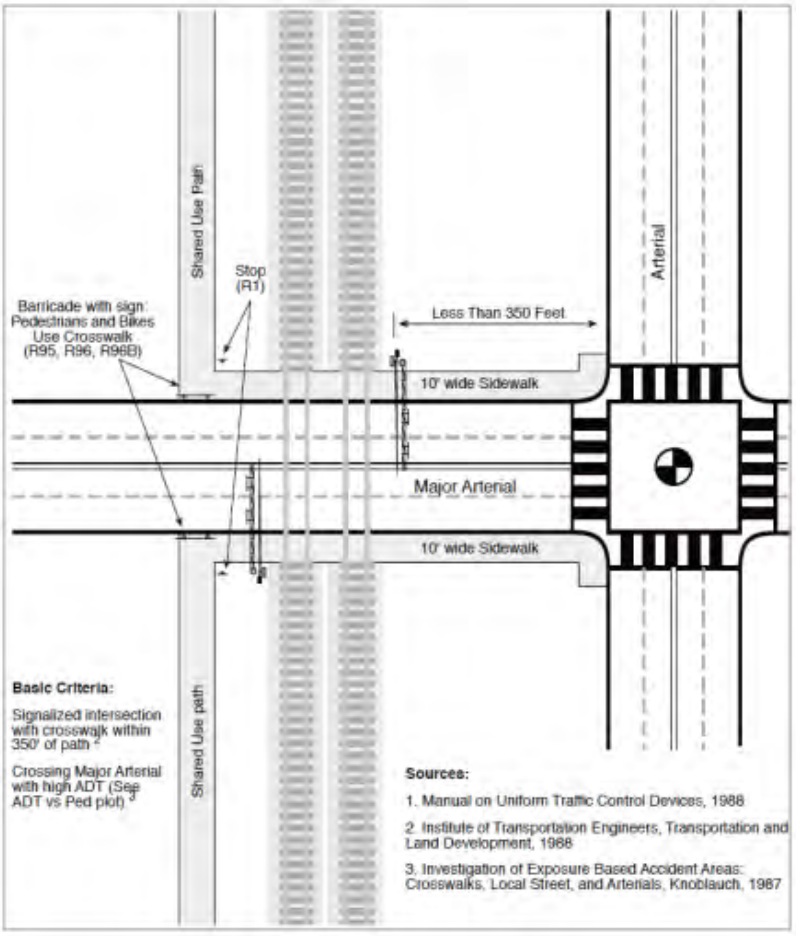


Figure 2: FHWA "Roadway Crossing Type 3 (Reroute Trail Users to Nearest Signalized Intersection)" (Rails with Trails 2021)

4.2 Unsignalized Midblock Trail-Road Crossings

For trail-road crossings located mid-block (a minimum 350' from nearest intersection), *an unsignalized crossing* may be employed in areas where sight lines are adequate and traffic volumes and operating speeds are low. Unsignalized crossings should follow all guidelines and standards previously described. For more specific treatments, refer to the crossing matrix in Table 1 of the FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (2018) or the Crossing Matrix for Uncontrolled Crossings the CoA *Crossing Guidelines* (2012).

4.3 Signalized Midblock Trail-Road Crossings

At a trail-road crossing that is parallel to rail (no rail crossing), signalization may be determined by jurisdictional preference and standards. *(See Figure 3)*. At signalized crossings, pedestrian push buttons should be placed on both sides of the crossing, and when activated should allow a user to cross both directions of traffic when possible. Additional push buttons may be installed in medians if a minimum 6' wide pedestrian refuge is installed. The push buttons will activate a signal phase for trail users to complete the crossing. It is recommended that the signalization remain independent of any existing signalization for the railroad crossing to ensure compliance and reduce confusion for drivers. Specifically, pedestrian hybrid beacons (PHBs) are not acceptable near rail crossings due to conflicting flashing signals and resulting driver confusion/non-compliance. For more specific treatments, refer to the crossing matrix in Table 1 of the FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (2018) or the Crossing Matrix for Uncontrolled Crossings in the CoA *Crossing Guidelines* (2012).

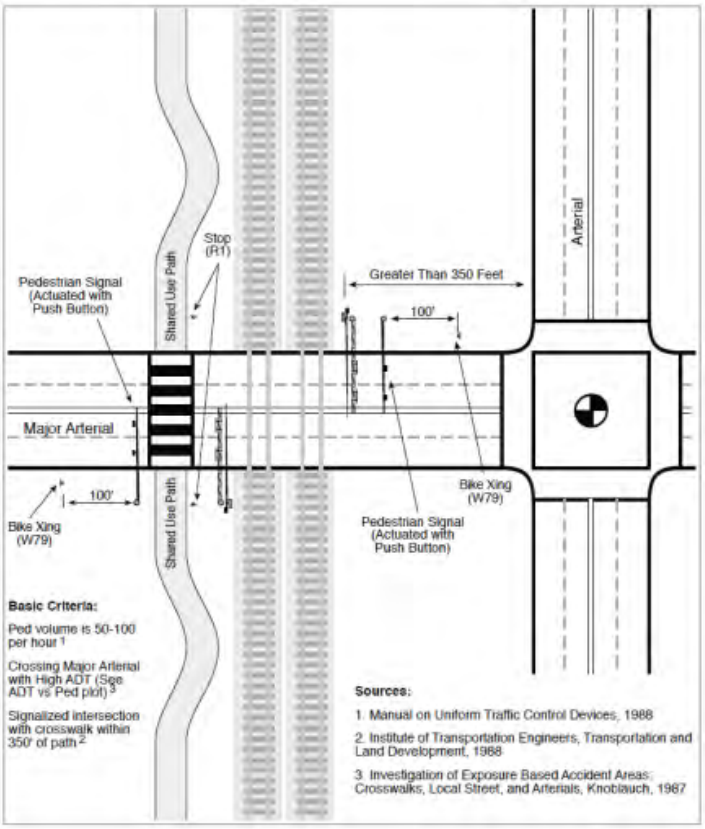


Figure 3: FWHA "Roadway Crossing Type 1 (Signalized Crossing)" (Rails with Trails 2021)

5. Trail-Rail Crossings

At some instances along the trail and at intersections, the trail may be required to cross over the rail. When this is required, it is always preferred that the trail use an existing rail crossing as opposed to an additional location. In all instances, grade-separation is preferred (CapMetro 2024). In instances where grade-separation is not feasible, the trail should cross the tracks as close to 90 degrees as possible, with a minumum crossing angle of 60 degrees to prevent bicycle tires from lodging in the flange of embedded track (FHWA 2021). Full signalization is required, should be integrated with railroad crossing equipment, and at a minimum should include lights and gates and where visibility is impaired, cantilevers. All installed warning devices must follow CapMetro guidance (2019). Pedestrian-trail grade crossing active warning devices must be installed 15' from the centerline of the nearest track, or at a minumum of 12' with a design deviation (CapMetro 2014).

6. Additional Considerations

6.1 Crossings with Existing Overhead Flashing-Light

Some railroad crossings have existing flashing-light signals installed on overhead structures as shown below. These signals are set to flash when a train is passing and *optionally* installed for increased visibility (MUTCD Section 8C-02). At crossings where signalization is warranted, traffic signals should be installed but do not take priority over railroad grade crossing equipment. See *Section 2.3* above for more information.

Figure 4: Existing overhead RR crossing structure at Red Line and E Whitestone Blvd (Source: Google Maps)

6.2 Roadside Constraints

Roadside constraints, including railroad equipment, are located within public or CapMetro ROW at many roadway crossing locations. This includes communication cabinets, utility poles, drainage ditches, and existing signal equipment and signage. Additionally, every at-grade rail crossing will have signals with intermediate signal houses approximately every 2 miles. Per MUTCD (2023), signal houses should have a clearance of at least 30 feet from the edge of the highway, and where conditions allow, at least 25 feet from the nearest rail. All of these constraints should be addressed on a case-by-case basis and will require a combination of strategies to avoid or relocate the constraints. Examples include adjusting the location of the crosswalk relative to the rail, trail transitions prior to the roadway crossing, and offset crosswalks ("Z" crossings). As these strategies are employed, avoiding ROW acquisition outside existing CapMetro ROW and public ROW should be prioritized.

6.3 Offset Crossings

In general, straight crossings are recommended where possible. Straight crossings promote a faster pedestrian crossing time and easier navigation for cyclists. However, “Z” crossings provide line of sight for both pedestrians and vehicles, enhancing pedestrian safety. A “Z” crossing may be considered where median or roadside constraints prevent a straight crossing or if enhanced pedestrian safety is a priority. When a “Z” crossing is used, special care should be taken in design to ensure high utilization and incorporation of elements that accommodate different types of bicycles. Elements ensuring relative ease of use for bicycles (wider curved openings and transitions instead of right angles) and compliance from pedestrians (vertical barriers such as planters) should be employed.

7. Example Workflow for Trail-Road Crossings

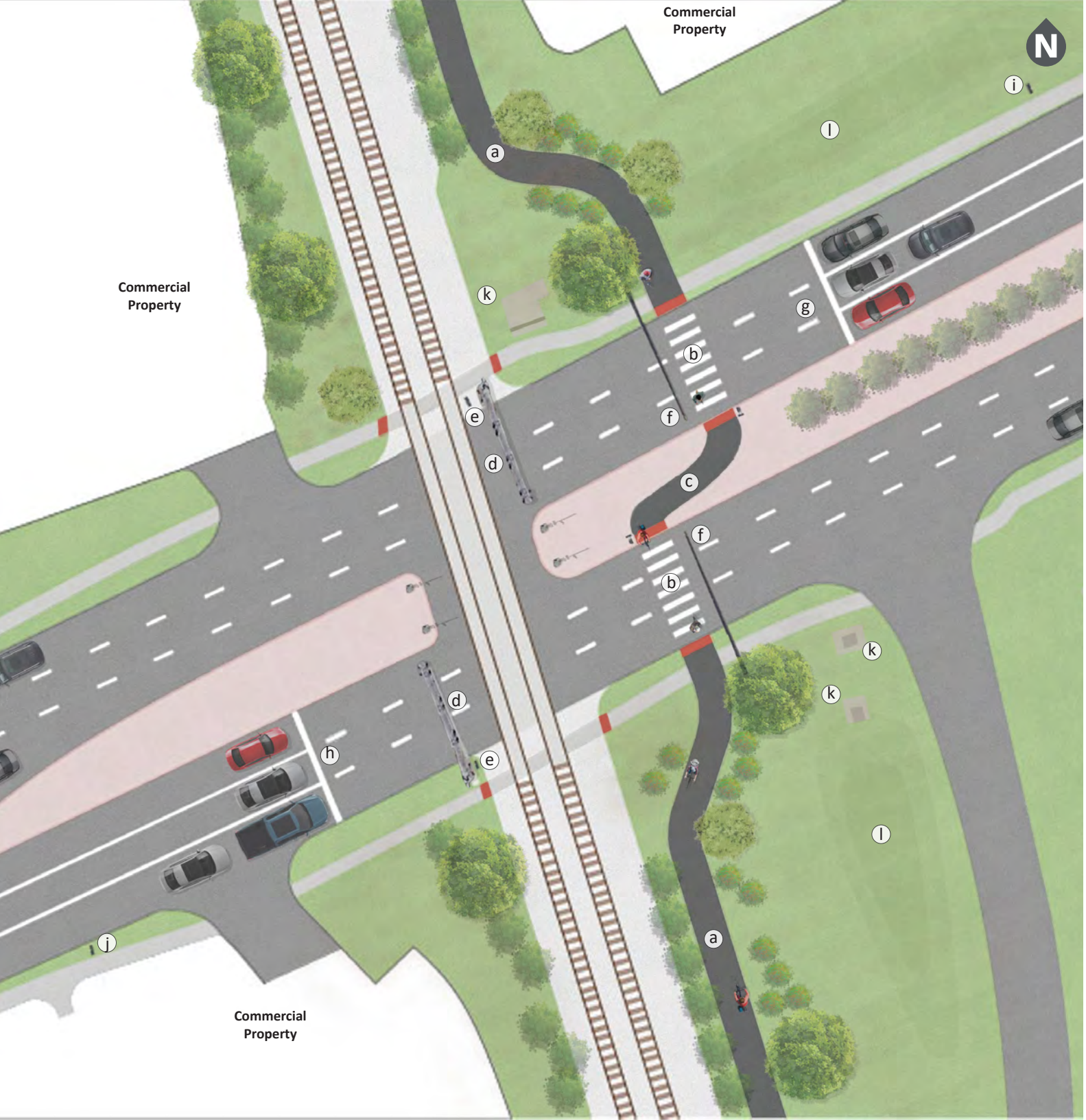
An example workflow is shown below. The workflow illustrated is intended to guide planners and designers through the process of selecting the appropriate crossing type and related treatments for a trail-road crossing. Each treatment will require the use of standards and criteria discussed in, but not limited to, this document. Specifically, if a trail-rail crossing is required, it is subject to CapMetro *Rail Right of Way Standard Operating Procedures* (2024). The workflow should be treated as a living document and modified accordingly as the design process progresses.


START
Choose crossing type
Trail-rail crossing
Follow CapMetro Standard Operating Procedures
Trail-road crossing
< 350' to intersection?
No
Yes
Set crosswalk using setback standards outlines by CapMetro (25' from track centerline)
Adjust to account for roadside constraints
Signalized
Unsignalized
Reroute to intersection
Set appropriate jurisdictional traffic signalization with pedestrian push buttons and phase
RRFB / Other
Construct additional sidewalk / crosswalk at intersection as need
Set stop bars and other signage
Add general signage
End
*Ped islands should always be considered where exist. medians >6'
*High visibility crosswalk markings, night lighting, and warning signs should always be considered

Sources

1. AASHTO *Guide for Development of Bicycle Facilities*, 2012 (Link)
2. FHWA *Rails with Trails Best Practices and Lessons Learned* (Pg.70-74), May 2021 (Link)
3. FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*, July 2018 (link)
4. CoA *Crossing Guidelines*, Sept 2012 (Link)
5. CoA *Transportation Criteria Manual* (Section 4, 5) (Link)
6. MUTCD 11th Edition, December 2023 (Link)
7. CapMetro *Design Guidelines for a Trail Project within CapMetro Rail Right of Way*, Feb 26, 2024
8. CapMetro *Rail Systems Highway-Rail Grade Crossing Design Criteria*, 2014
9. CapMetro *Railroad Grade Crossing Standard and Procedure*, 2019
10. CapMetro *Rail Right of Way Standard Operating Procedures,* 2024

Appendix B. Cross Sections and Graphics



Example Trail Crossing Diagram

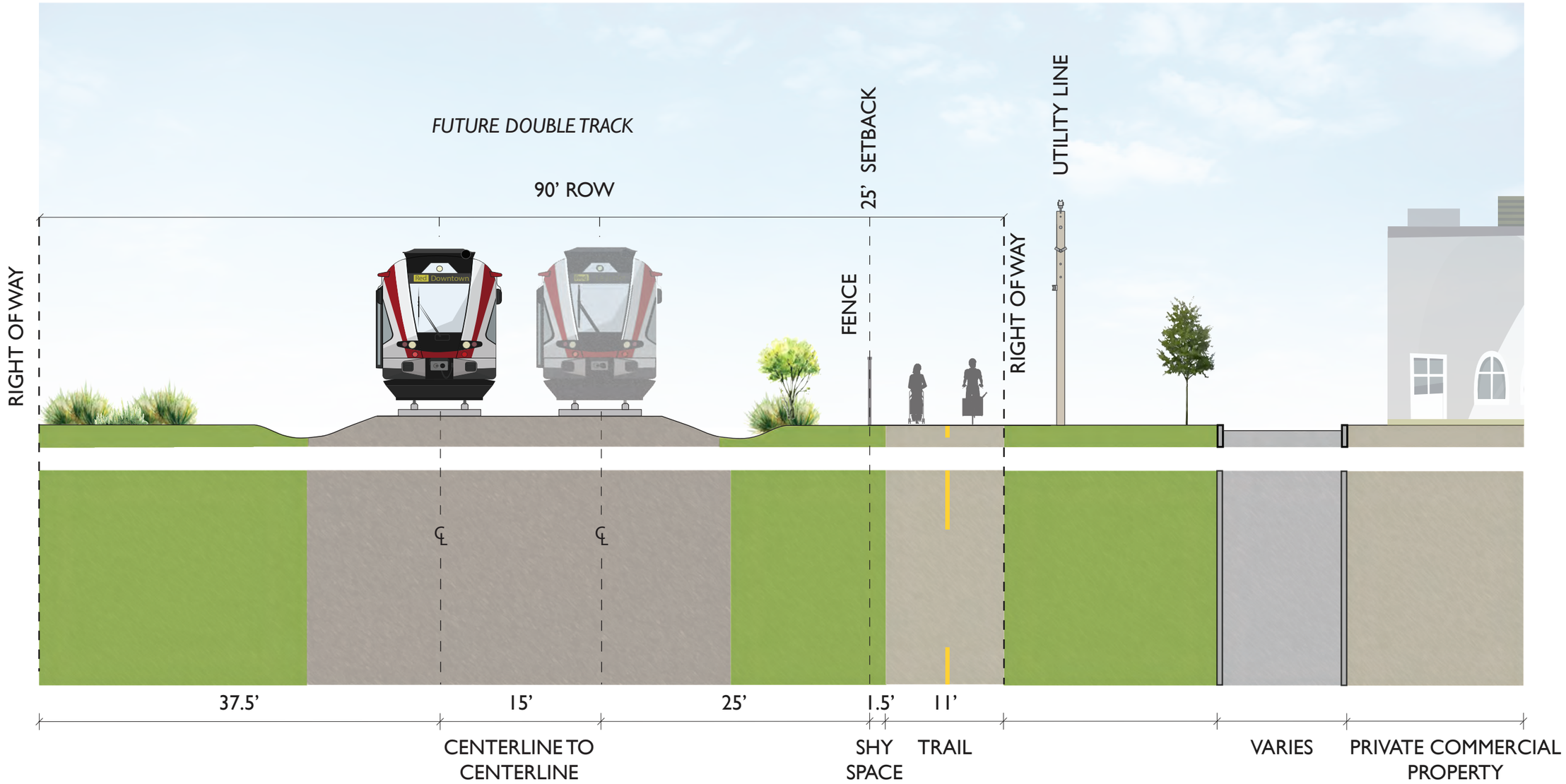
LEGEND

- (a) New 12’ wide trail
- (b) New high visibility crosswalk
- (c) New pedestrian refuge island
- (d) Existing Railroad Gates and Warning Signs; Remove Warning Lights
- (e) New “Do Not Stop on Tracks” sign (R8-8)
- (f) New Pedestrian Traffic Signals actuated by by pedestrian push button
- (g) New stop bar (located 70 ft. from Signal Pole/Mast Arm)
- (h) New stop bar (located 160 ft. from Signal Pole/Mast Arm)
- (i) New Trail Crossing Warning Sign (W11-15) (located 170 ft. from Signal Pole/Mast Arm)
- (j) New Trail Crossing Warning Sign (W11-15) (located 270 ft. from Signal Pole/Mast Arm)
- (k) Existing drainage structure
- (l) Existing detention pond

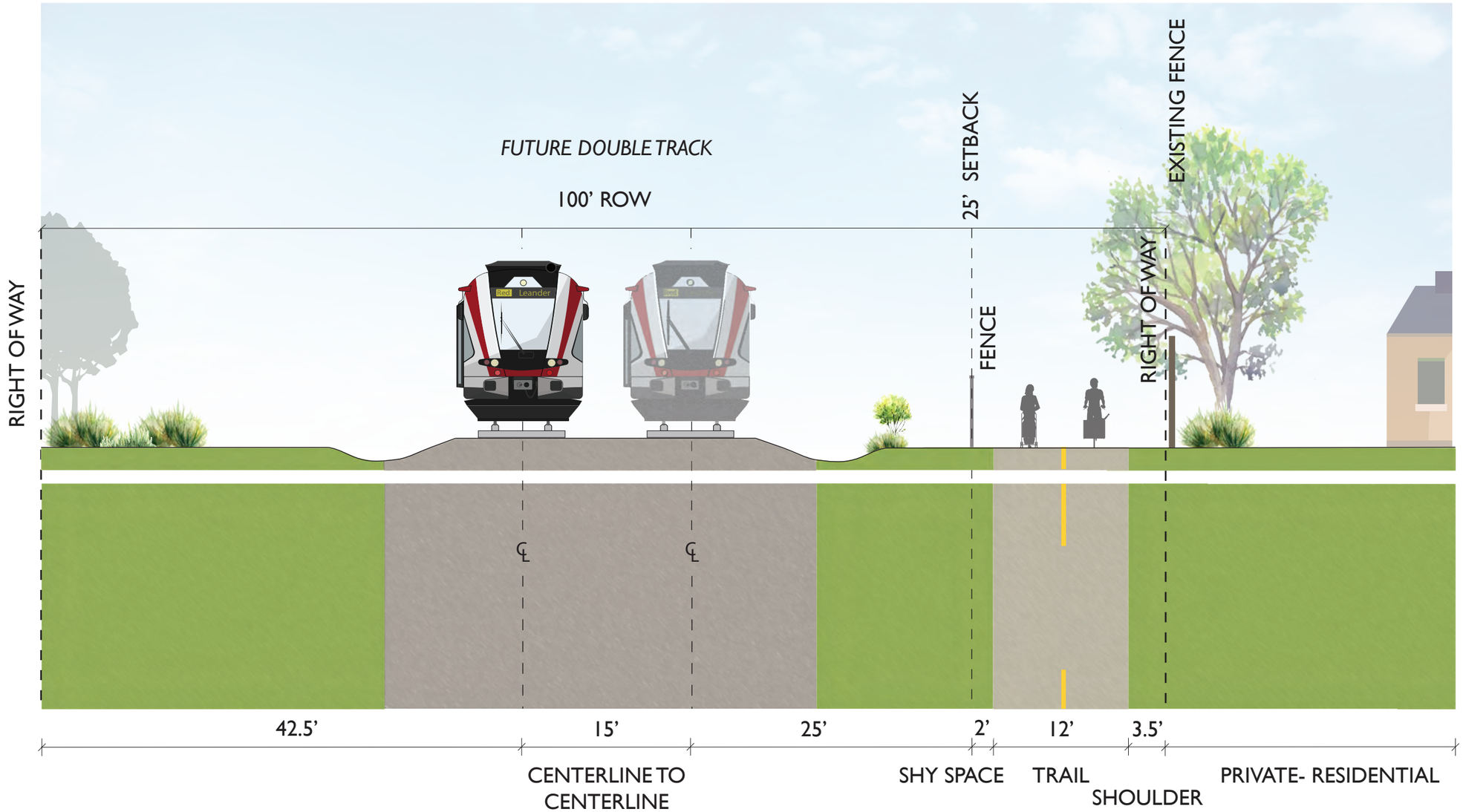
Scale 1”=50’

25’ 50’ 100’

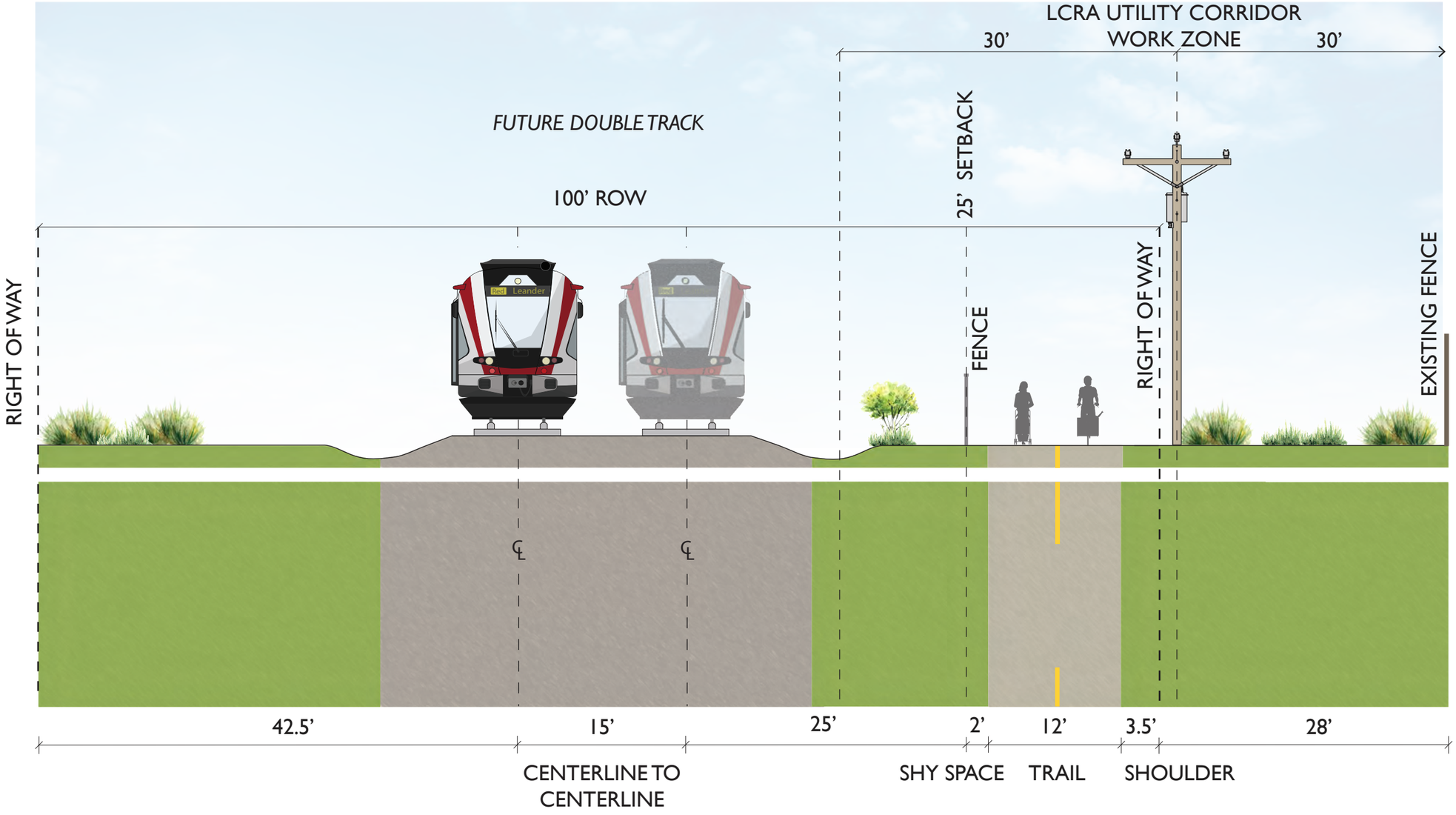
1. City of Leander: North of Crystal Falls Parkway



2. City of Leander: South of Crystal Falls Parkway

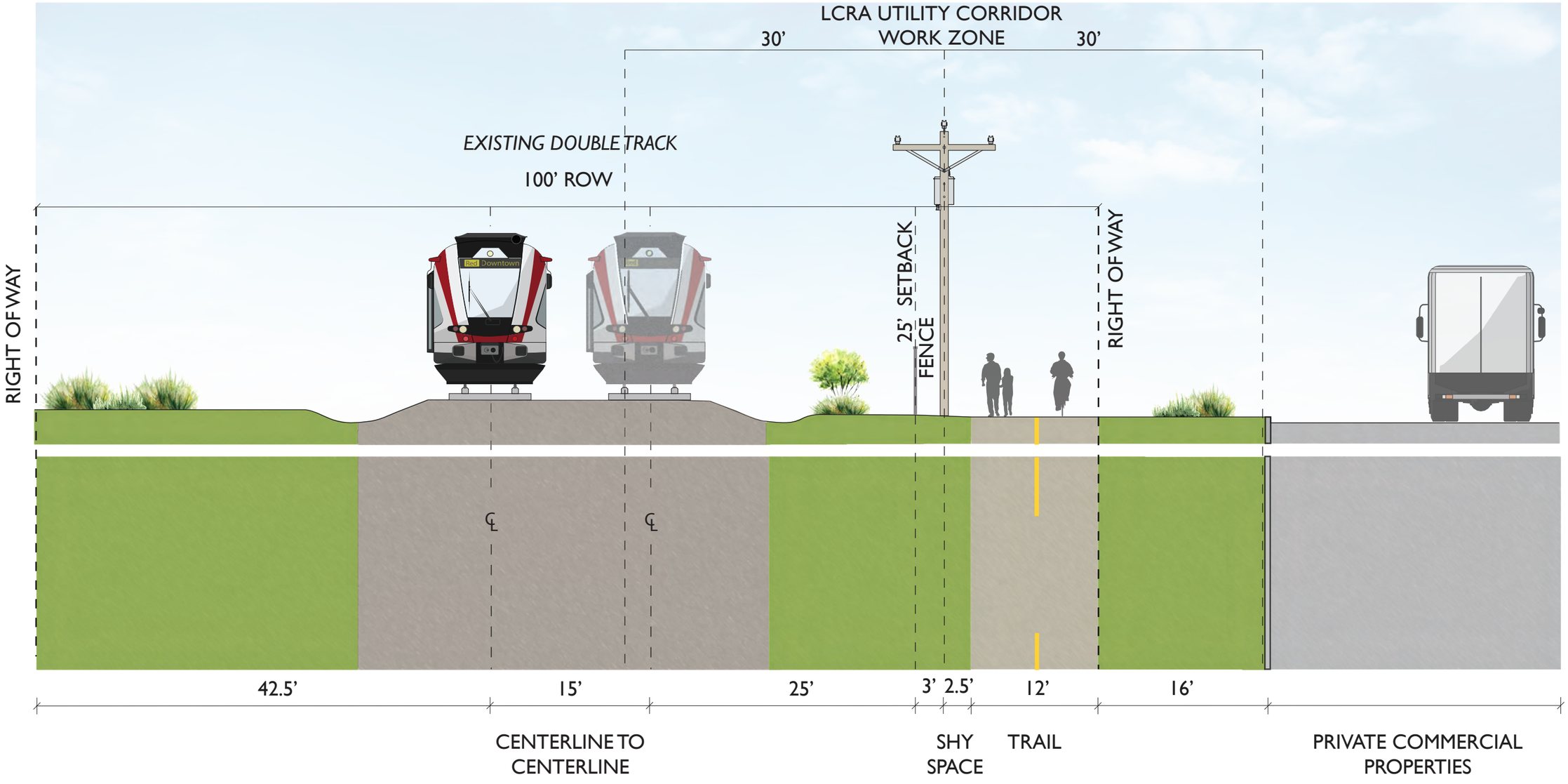


3. City of Cedar Park: East Whitestone Boulevard to East New Hope Drive

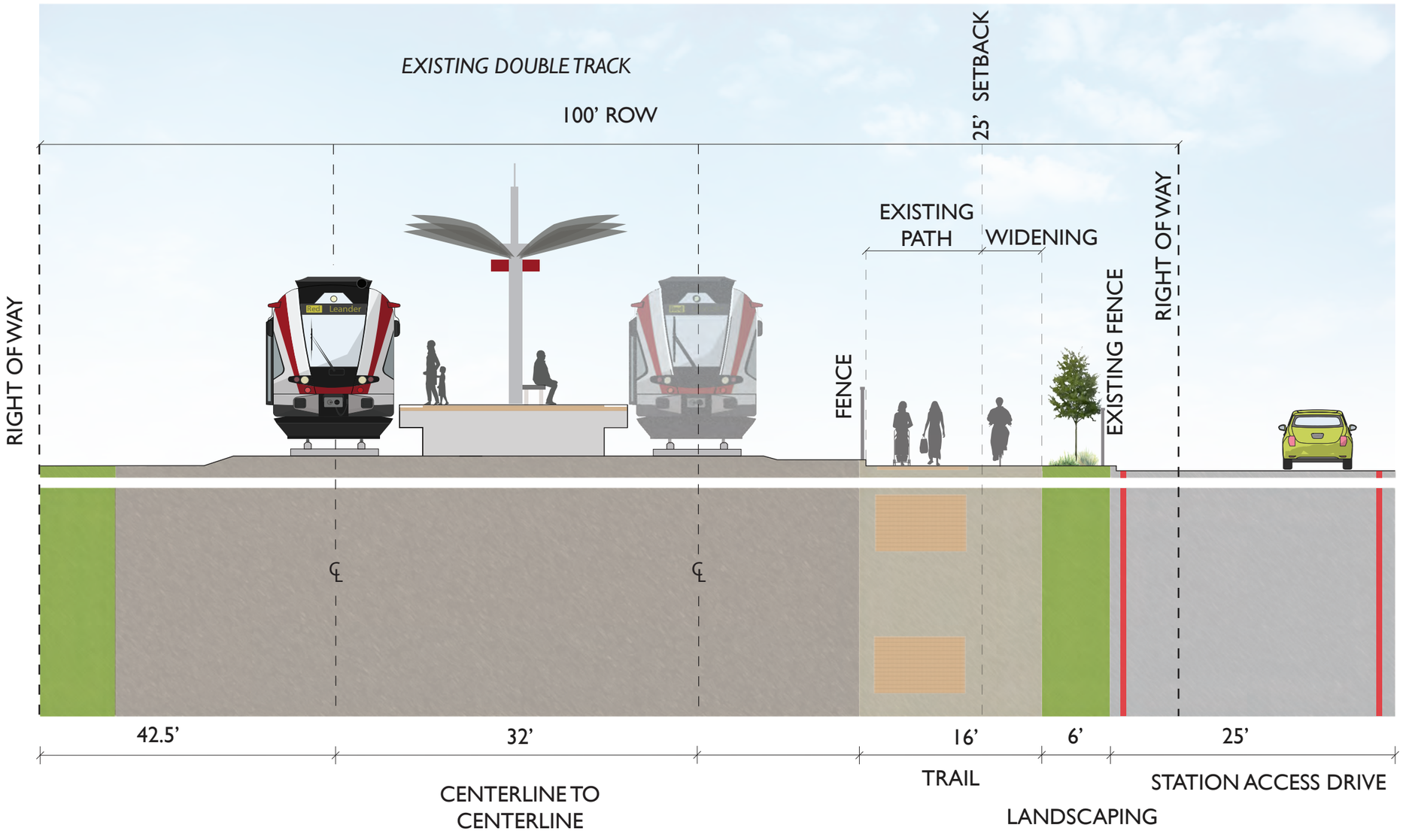



CROSSING
ROAD

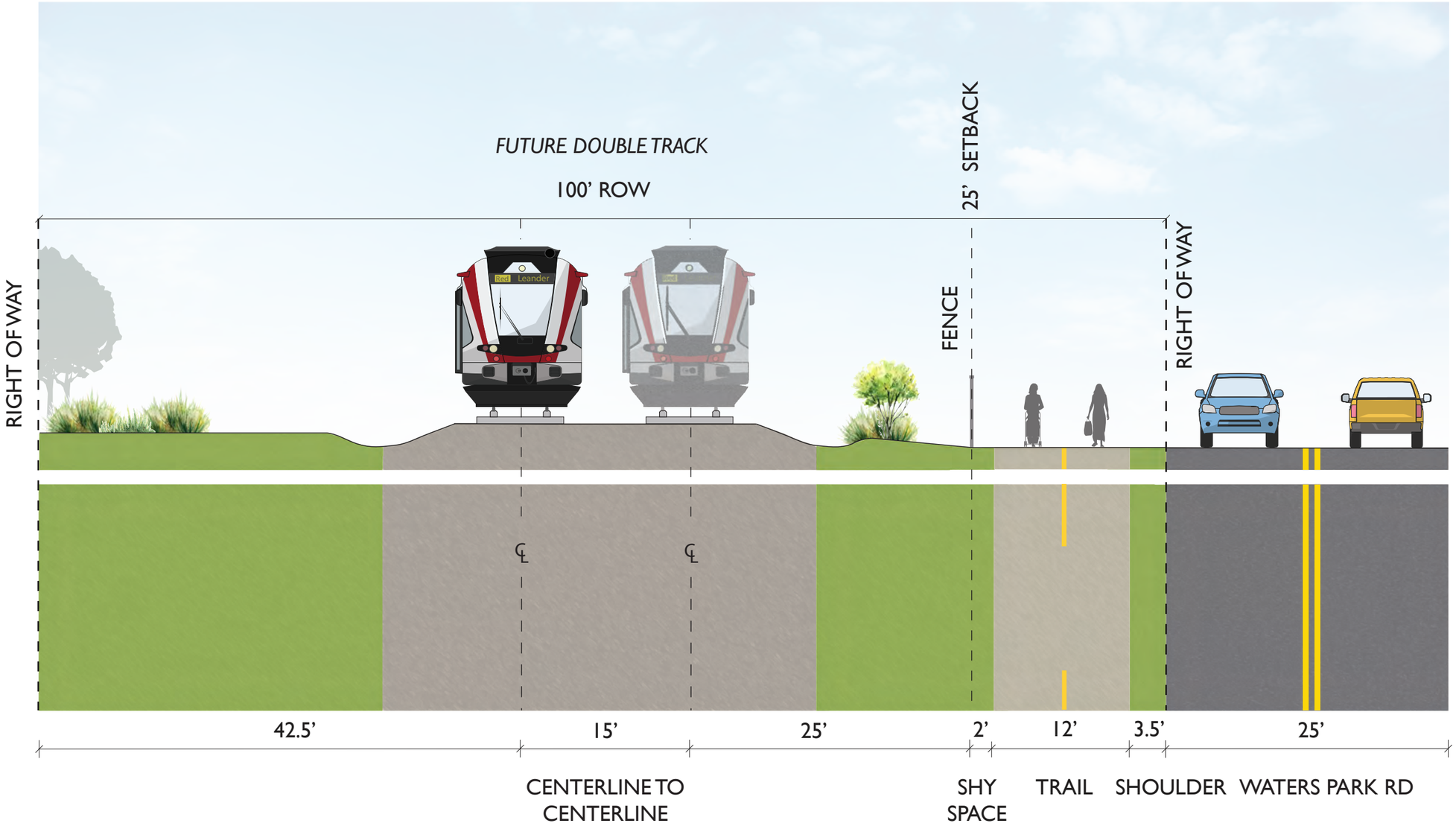
6. City of Austin: South of Spectrum Drive



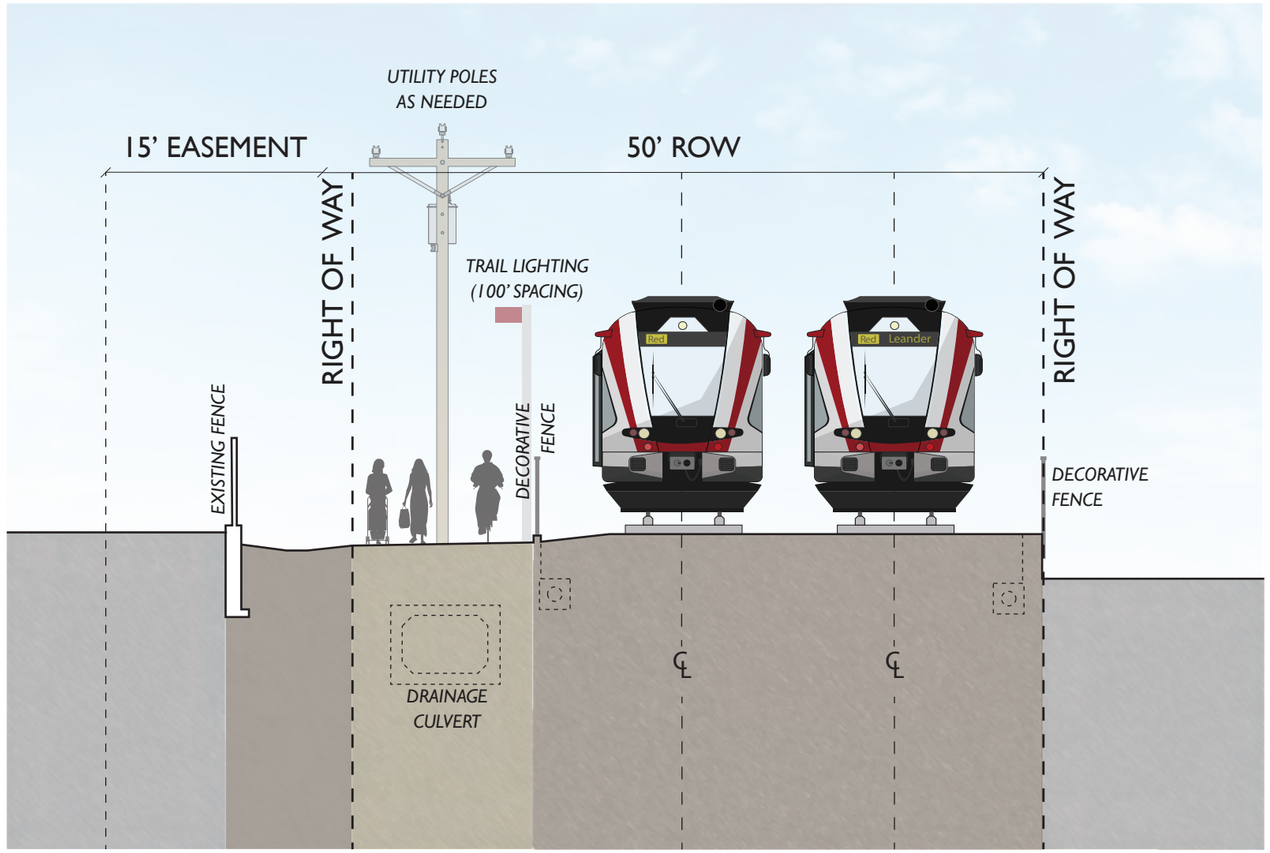
7. City of Austin: Howard Station



8. City of Austin: Waters Park Road

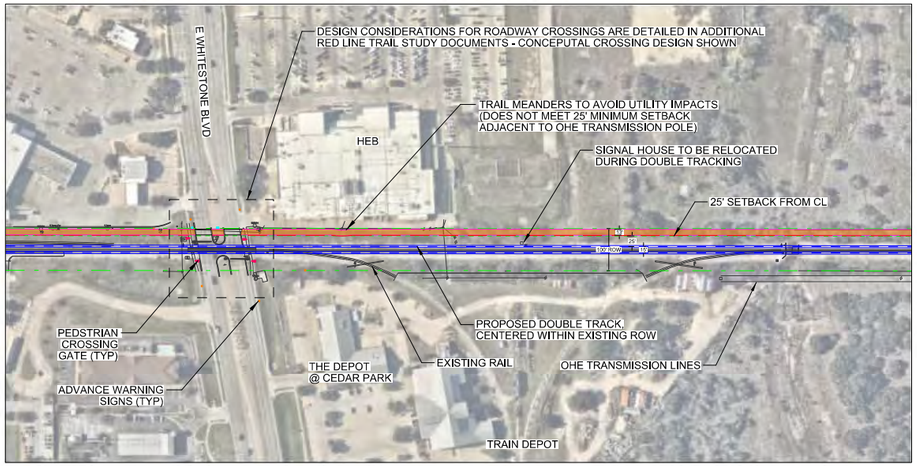


9. City of Austin: North of McKalla Station



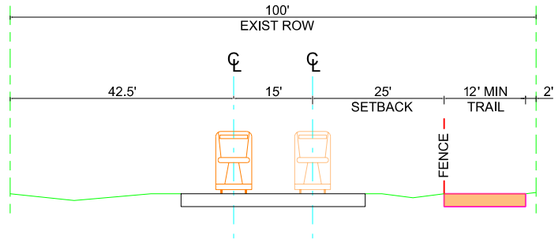
Appendix C. Pilot Segment Concept

OVERALL PLAN VIEW
1"=30'



DETAILED VIEW
1"=10'

*SOUTH OF E WHITESTONE, TRAIL IS CONCEPTUALLY LOCATED TO THE WEST OF TRACKS FOR CONTINUITY - IF FUTURE TRAIL DESIGN IS LOCATED TO EAST, THE EXISTING PEDESTRIAN RAIL CROSSING AT E WHITESTONE SHALL BE DESIGNED WITH IMPROVEMENTS



TYPICAL SECTION
NOT TO SCALE

LEGEND

- EXISTING CAP METRO ROW
- RED LINE TRAIL
- PROPOSED FENCE
- FUTURE DOUBLE TRACKING

AECOM
13640 BRIARWICK DRIVE, SUITE 200
AUSTIN, TX 78729
TBPE REG. NO. F-3580

CapMetro

SCALE	AS NOTED
DRAWN	
DESIGNED	
CHECKED	
IN CHARGE	
DATE	4/19/2024

CONTRACT SHEET No. 1 OF 1

RED LINE TRAIL STUDY

PILOT SEGMENT
E WHITESTONE BLVD TO NEW HOPE DR
OVERALL PLAN VIEW
DETAILED VIEW
TYPICAL SECTION

CONTRACT	DWG No.	REV

PLOTDRIVER$PLTDRV$
PENTABLE$PENTBL$$
DATE$DATE$
PLOTTING TIMESTMES
File Name=$FILE$$
User Name=$USER$