



Austin Transit Partnership

Austin Light Rail

Utility Rules of Practice Revision 01

Austin, TX

September 13, 2024

DATE: September 13, 2024

PROJECT: Austin Light Rail

TO: Lindsay Wood, Executive Vice President Engineering and Construction, Austin Transit Partnership

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Robert Goode, Assistant City Manager, City of Austin

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Richard Mendoza, Director, Transportation and Public Works Department

Shay Ralls Roalson, Director, Austin Water

Greg Canally, Executive Director, Austin Transit Partnership

FROM: Liane Conte, Chief of Staff, Project Connect Office, Management Services Department, City of Austin

John Rhone, Senior Vice President LRT Project Integration, Austin Transit Partnership

CC: Jennifer Simmons, Managing Engineer, Project Connect Office, Management Services Department, City of Austin

SUBJECT: Utility Rules of Practice Revision 01

Voters in Austin approved Proposition A, a \$7.1 billion dollar investment in mass transportation in November 2020. The referendum marked a milestone in our city's effort to implement a high-capacity transit solution. This solution is essential to achieving the goal of reducing "drive-alone to work" trips to 50% of all modes of transportation.

Austin City Council and Capital Metropolitan Transportation Authority (CapMetro) formed Austin Transit Partnership (ATP) as a local government corporation with the purpose of implementing voter mandated high-capacity transit solutions with funding from local taxes and federal matching financial support. A Joint Powers Agreement among ATP, CapMetro, and the City of Austin was approved by each of the three entities that states:

The Parties commit to working on the Utility Rules of Practice ("UROP") to serve as the methodology for analyzing, reviewing, and approving potential utility conflicts for Austin Light Rail.



As noted by The Eno Center for Transportation, a leading organization in transportation studies:

Utility relocation is among the most complex elements of a transit project and is frequently cited as a major cost and timeline driver.

Project Connect Office, the city's liaison department, in coordination with ATP and the city utility departments developed the Utility Rules of Practice (UROP) as a methodology reviewing and approving utility conflicts along the proposed LRT alignment. The document is a comprehensive solution to the effort to relocate utilities for the purpose of implementing high-capacity transit.

To that end, we request the signatures of the applicable representatives of the City of Austin and Austin Transit Partnership as a commitment to use the UROP in the development, review, and approval of plans issued for construction by Austin Transit Partnership.

Signed by:

Liane Conte
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9/16/2024 | 11:39 AM PDT

Liane Conte
Chief of Staff, Project Connect Office, Management Services Department, City of Austin

DocuSigned by:

John Rhone
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John Rhone
Senior Vice President LRT Project Integration, Austin Transit Partnership

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed as of the date the signatures below.

CITY OF AUSTIN

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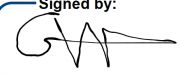
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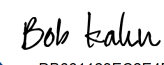
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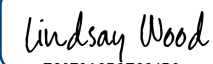
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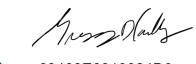
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AUSTIN TRANSIT PARTNERSHIP

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Greg Canally, Executive Director

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Appendix A: Sample Utility Tracking Matrix (UTM)

List of Acronyms and Abbreviations

Term/Acronym	Definition
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AE	Austin Energy
ALR	Austin Light Rail
ASMP	Austin Strategic Mobility Plan
ATP	Austin Transit Partnership
AUS	Austin Bergstrom International Airport
AW	Austin Water
CADD	Computer Aided Drafting and Design
CapMetro	Capital Metropolitan Transportation Authority
City	City of Austin
CFR	Code of Federal Regulations
COA	City of Austin
CPO	Corridor Project Office
CTRMA	Central Texas Regional Mobility Authority
DCM	City of Austin Drainage Criteria Manual
ECM	City of Austin Environmental Criteria Manual
FHWA	Federal Highway Administration
HVAC	Heating, Ventilation, and Air Conditioning
ILA	Interlocal Agreement
LOC	limits of construction
LOF	likelihood of failure
LRT	light rail transit
LRV	light rail vehicle
NESC	National Electric Safety Code
OCS	Overhead Contact System
PCO	Project Connect Office
Project	Austin Light Rail Project
PVC	Polyvinyl Chloride
PROWAG	Public Right of Way Accessibility Guidelines
SBO	Street and Bridge Operations
SH	State Highway
SPL	Standard Products List
SUE	Subsurface Utility Engineering
TCEQ	Texas Commission on Environmental Quality
TCM	City of Austin Transportation Criteria Manual
TPW	City of Austin Transportation and Public Works Department
TxDOT	Texas Department of Transportation
UCM	City of Austin Utilities Criteria Manual
UFZ	Utility Free Zone
UROP	Utility Rules of Practice
URZ	Utility Review Zone
UTM	Utility Tracking Matrix
WPD	City of Austin Watershed Protection Department

1 Introduction

Capital Metropolitan Transportation Authority (CapMetro) began developing the Project Connect System Plan in 2016 to create a system of light rail transit (LRT) options along with enhancing and expanding existing services that will connect people, places, and opportunities in an efficient, affordable, and sustainable way. The Project Connect area includes the five-county metropolitan statistical area of Bastrop, Caldwell, Hays, Travis, and Williamson counties (Central Texas). In 2018, the CapMetro Board of Directors approved the Long-Term Vision Plan (2018), which identified several MetroRapid corridors for potential investment in LRT as a tool to address growth pressures, improve mobility, and connect Central Texans to their travel destinations. It has since been refined to reflect CapMetro's response to growth challenges. It is projected that the current Central Texas population of 2 million will double by 2040. In that same time, road capacity is expected to increase by only 15 percent. This growth will cause additional strain on the roadway network, result in increased travel times and travel costs, decrease mobility, hinder the region's economic health, and threaten air quality.

In 2019, the Austin City Council approved the Austin Strategic Mobility Plan (ASMP), which establishes a policy goal to quadruple the share of commuters who use transit by 2039. The Project Connect Vision Plan is included as an integral part of the ASMP and both initiatives provide a way forward for addressing future mobility challenges in the region. The first round of public engagement for this process ended on January 30, 2022. The second round of public engagement began on February 28 and closed on March 31, 2022. The final draft of the proposed ASMP Amendments was published on May 3, 2022. A Public Hearing at City Council was held on May 19, 2022, and City Council approved the amendments unanimously during the City Council meeting held on June 9, 2022.

The Vision Plan continued to be developed into the Project Connect System Plan which was adopted by CapMetro's Board of Directors in June 2020. In November 2020, Austin voters approved a referendum ("Prop A") to provide a dedicated revenue stream to fund investments in Project Connect, a program of transit improvements, including Austin Light Rail. And in June 2023, the Austin Light Rail Implementation Plan was adopted by the City Council, CapMetro Board, and Austin Transit Partnership (ATP) as the Austin Light Rail – Phase 1 project.

ATP is the independent local government corporation, formed by the City of Austin (City) and CapMetro, responsible for the overall implementation of the Project Connect program and the day-to-day implementation, planning, financing, execution and oversight of Austin Light Rail. ATP represents a strong partnership between CapMetro and the City and will focus on a broadly shared commitment to improving Austin and creating a more equitable place to live through improved transit options. Its purpose is to deliver the program with reliability, efficiency, and transparency.

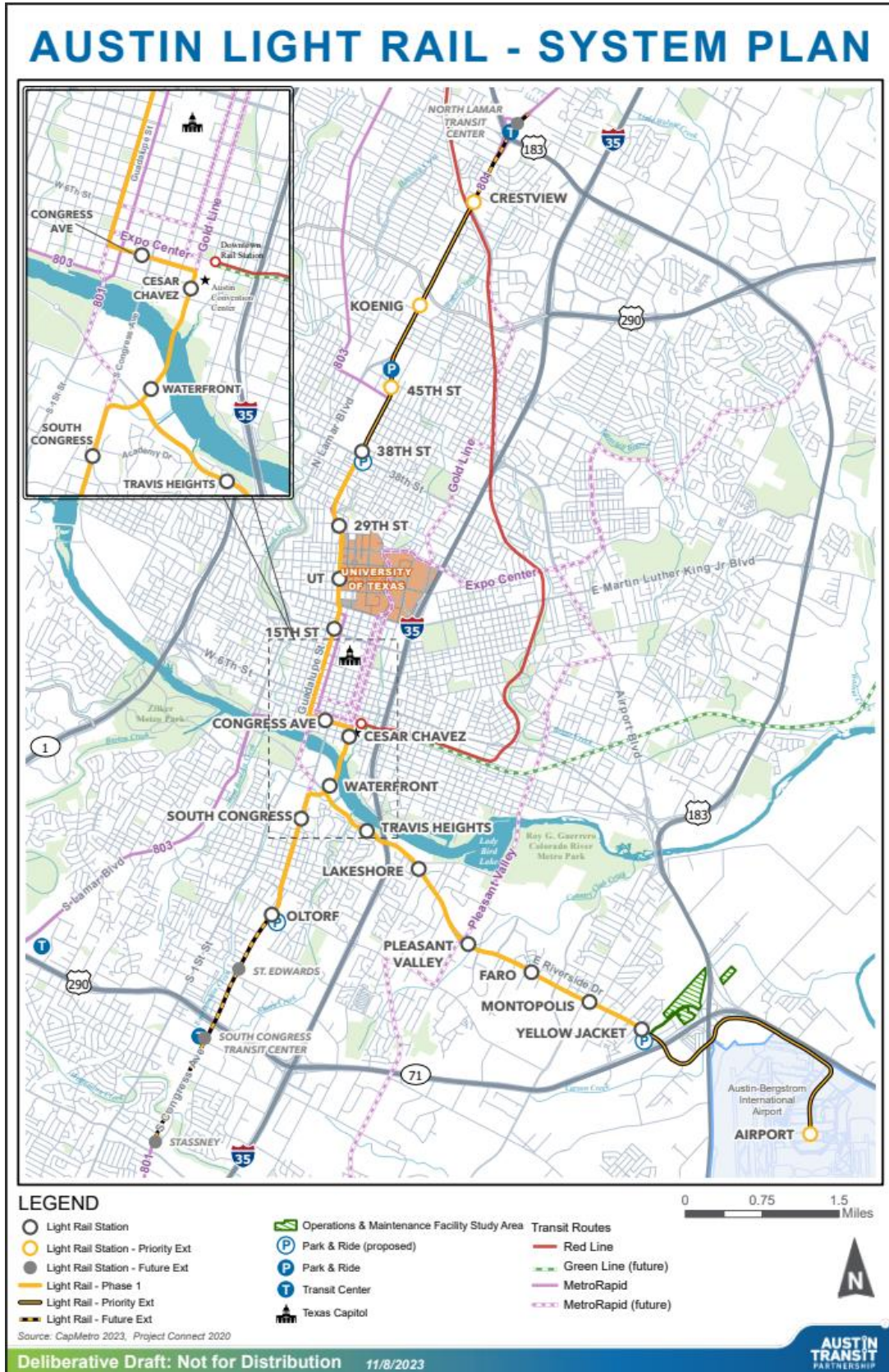
Utility accommodation and potential relocation will be an important part of Project Connect design and future construction. Early coordination with the City of Austin utility departments and private utilities are paramount as utility conflicts are being identified. The engineering teams

working on the Austin Light Rail (ALR) Project design are actively collecting utility data using subsurface utility engineering (SUE) to accurately document the location of existing utilities so that as the design progresses, conflicts can be identified and resolved early in the process.

ATP, in coordination with the City of Austin and CapMetro, proposes to construct the Austin Light Rail – Phase 1 project, a 9.8-mile Light Rail Transit (LRT) branched line extending north, south and east of downtown. Beginning at the intersection of Guadalupe Street and 38th Street, the in-street, LRT-dedicated, double-tracked, 15-station alignment would extend south past the University of Texas and the Texas State Capitol. At the intersection of Guadalupe Street and 3rd Street, the alignment would turn east on 3rd Street, cross Congress Avenue, and connect to Trinity Street. The alignment would continue south on Trinity Street and cross Lady Bird Lake on a new LRT bridge. On the south shore of Lady Bird Lake, the alignment would connect to East Riverside Drive, where it would split into two branches. The western branch of the split would cross East Bouldin Creek and extend south on Congress Avenue, with a terminus at the intersection of Congress Avenue and Oltorf Street. From East Riverside Drive, the alignment would continue southeast along East Riverside Drive to terminate just west of SH-71 at the Yellow Jacket station.

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Figure 1: Light Rail Transit System Plan & Project Limits



Deliberative Draft: Not for Distribution 11/8/2023

1.1 Document Intentions

The Utility Rules of Practice (UROP) contains methodology for reviewing and mitigating potential public utility conflicts along the proposed LRT alignment. It will document most of the common utility conflict situations, whether to relocate the utility or leave the utility in place. This document provides definitions of commonly used terms to assist with understanding utilities and their relationship to the LRT guideway. References to City and other agency standards are cited to provide guidance of relocated infrastructure. Upon completion of the ALR Project, all City utility infrastructure relocated, or replaced as a result of construction, will be owned and maintained by the City.

To familiarize City, CapMetro and ATP staff, typical sections of common guideway configurations (perpendicular crossings, parallel running, and retaining walls) are included in the document to illustrate the relationship between the LRT guideway and City utilities. The objective of the UROP is to address the following items:

1. The need to establish the design criteria is an important aspect to advance the LRT design elements. Ordinance No. [20211029-004](#) adopted on October 29, 2021, by the City of Austin, established the guidance with respect to permitting and compliance with criteria manuals. Ordinance No. [20221115-048](#) passed and approved on November 15, 2022, and took effect on November 28, 2022, supersedes the previous ordinance and establishes the current guidance with respect to permitting and compliance with current criteria manuals. All document references and hyperlinks contained in the UROP shall refer to the versions of these documents based on this Ordinance.

Future revisions to LRT alignment, design criteria documents or code amendments will be amended into the UROP, as applicable. The City and ATP agree to work cooperatively in seeking modifications to these documents that benefit the ALR Project. References and links cited in the UROP will provide active links to these documents.

2. Balance the ability of utility companies to maintain, repair, and upgrade their infrastructure with LRT operations.
3. Provide a methodology for identifying and addressing conflicts and clearances between utilities and the LRT guideway.
4. Reference current City documents identifying standards for design, material, inspection and testing for relocated utilities when in conflict with the ALR Project and operation.
5. Identify clearances for the facilitation of typical construction and maintenance practices.
 - a. City utility maintenance, repair, and upgrade of infrastructure, protecting their assets and the public's health and safety.
 - b. LRT operations in the immediate vicinity of utility infrastructure.

6. Cover commonly expected utility issues. In the event that a unique resolution becomes necessary for an unusual condition that is not specifically or adequately addressed in the UROP, affected parties will collaboratively resolve these situations on a case-by-case basis.
7. Private utility companies operating in City right-of-way are covered under existing City Franchise Agreements. The UROP is written specific to city-owned utilities. ATP will follow similar objectives identified in this document with private utility owners. A list of companies potentially affected by the ALR Project is provided in this document. Existing franchise agreements and applicable city code sections requiring the relocation of private utilities will be reviewed on a case-by-case basis.
8. Facilities associated with the support of the LRT operations will be covered in separate documents and not specifically addressed in the UROP. It is noted that all new utilities needed to support the function of each facility will be designed and installed in accordance with City code.

The UROP document is not intended to supersede the City's established standards, codes, and criteria, nor the design, construction or operational documents that will be created as the project progresses through the various stages of design and construction. The design, construction and operational documents will be created in partnership and cooperation between ATP, CapMetro and the City utilities.

CapMetro, the City of Austin, Texas Department of Transportation (TxDOT), and Central Texas Regional Mobility Authority (CTRMA) continue to progress critical projects in the region. All agencies will be communicating and cooperating with each other through various communication channels.

1.2 Assumptions & Definitions

Included in this section is a summary of general assumptions made during the formulation of the UROP. These assumptions are needed to establish a basis of understanding for some elements of the ALR Project.

1.2.1 General

1. **Soils:** Individual soil conditions are not factored into the UROP. It should be noted that the clearances provided in the UROP are typical dimensions for the purpose of initial assessment. Adverse soil conditions may be encountered on the LRT corridor, and those conditions can result in the need for increased depths or the need for increased horizontal separation from the guideway. These clearances and the associated risks should be evaluated on a case-by-case basis during the ALR Project design by an engineer familiar with the utility and the associated soil conditions.
2. **Corrosion:** Specific industry-standard methods for addressing potential corrosion issues will be designed into the LRT system, including an insulating rubberized boot around the rails, insulation in various parts of the overhead and underground systems, and ground rods installed at all Overhead Contact System (OCS) poles. These methods are intended to mitigate the potential for stray currents emanating from the LRT. Stray currents are electric discharges released into the subgrade that have the potential to accelerate the rate of corrosion on ferrous materials in the subgrade, such as metal

conduits and piping. Corrosion control, including cathodic protection, can be effectively used to mitigate corrosion concerns potentially resulting from stray currents emanating into the subgrade from the LRT system.

3. Corrosion Control: Corrosion control refers to various steps that can be taken to protect and therefore lengthen the lifespan of metallic subsurface infrastructure from potential causes of corrosion, particularly pipes and conduit.

Common techniques of corrosion control include polywrap encasement and cathodic protection. Polywrap encasement is the installation of a polyethylene sleeve around metallic pipe, which protects the pipe from corrosion caused by surrounding soils and stray currents. Cathodic protection utilizes sacrificial anodes to pull electrical currents from utility piping, thereby reducing corrosion on the utility infrastructure. It is assumed that potential utilities affected by the ALR Project do not have any cathodic protection in place, with the possible exception of existing larger natural gas infrastructure. The UROP highlights the issues pertaining to polywrap encasement, cathodic protection, and corrosion control in relation to a variety of conditions. Ductile iron carrier pipes and steel casing pipes are particularly susceptible to corrosion in this condition, while fiberglass and plastics are not. The impacts of those decisions, including potential long term maintenance programs that can accompany cathodic protection systems are considered. All metallic utility carrier and casing pipes shall be reviewed for the potential to corrode and, if necessary, designed with appropriate corrosion protection measures for internal and external corrosion in accord with latest industry standards, local, state, and federal rules, regulations, and laws.

Ultimately, corrosion control will be addressed in the ALR Project design by the project design team. Further consultation with individual utility agencies will be needed as the design progresses.

4. Utility (Utilities): A utility is a service to the public such as power, telephone, communications, water, gas, oil, wastewater, reclaimed water, drainage, or irrigation.

Utility applies to all private lines as well as public, including electric power transmission, electrical power service, telephone, television coaxial cable, water, gas, petroleum products, chemicals, steam, wastewater, and similar lines. Such utilities may involve underground, surface appurtenances or overhead facilities either singularly or in combination.

5. Overhead Utility Conflicts: LRT system elements such as light rail vehicles and traction power distribution, have not yet been determined. The UROP will identify the need to follow Austin Energy Design Criteria required clearances for both transmission and distribution lines and any communication lines that have been allowed to use Austin Energy infrastructure.
6. Operator: Group responsible for providing revenue services and maintenance of LRT system.

1.2.2 Guideway

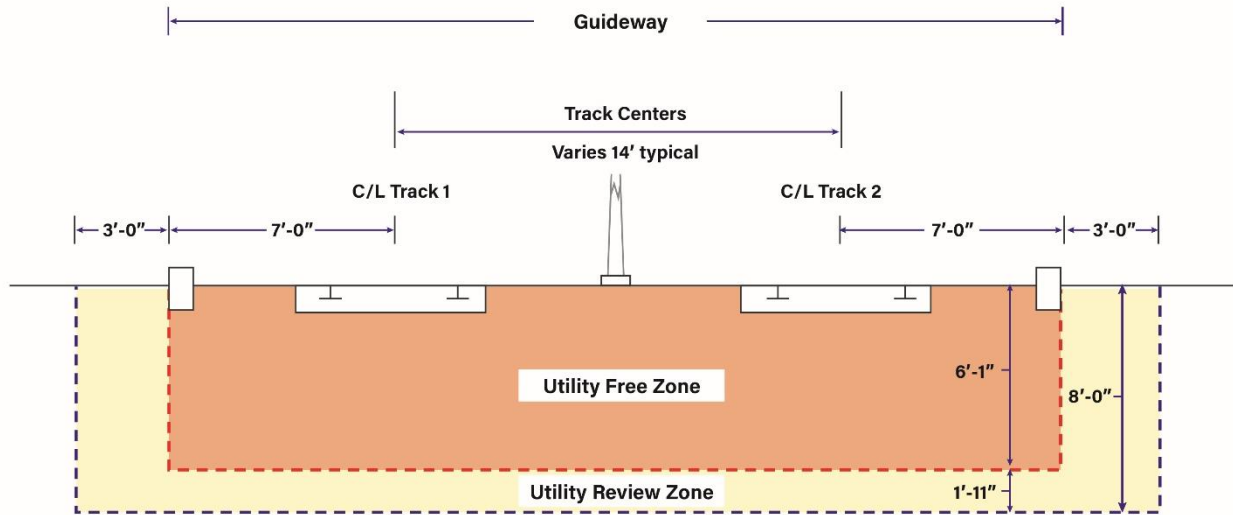
Design of the LRT guideway, and the integration of that slab into the surrounding roadway environment, is a critical component to the project and its impacts on utilities and other

infrastructure. The approach of maintaining LRT service while installing or maintaining utilities under the guideway will typically require a detour of vehicular traffic, while the LRT service will continue to operate under most situations. If a utility needs to be replaced from underneath the guideway after construction has been completed and service has begun, coordination and cooperation between the Operator and the utility owner will be required. ATP, with City and CapMetro feedback, will develop an operations manual that will include common situations providing better definition of responsibilities.

1. LRT Guideway (At Grade): The LRT guideway consists of two parallel tracks serving bi-directional trains. The typical separation of the tracks is 14 feet from centerline of track to centerline of track. The embedded tracks are supported by concrete foundations directly under the tracks. The typical width of the LRT Guideway is 28'-0". See Figure 2 for typical LRT Guideway cross-section.
2. LRT Vehicle: The width of the vehicle will be between 8 feet and 8 feet 6 inches. Depending on the selection of the vehicle, the dynamic envelope of the vehicle will range from 6 inches on tangent sections, with slightly more while the vehicle is traveling in the curved portions of the alignment.
3. LRT Operation: The UROP is being established with the intent to minimize disruptions to the operational schedule of the LRT resulting from the performance of routine utility maintenance on the corridor. Routine utility maintenance would constitute any activities programmed and scheduled preemptively by the utility owner as opposed to unplanned emergency repair work. Emergency repair work will require cooperation and coordination between the Operator and the affected utility owner. Operational protocols will be developed separately to address these types of situations.
4. LRT Loading and Vibration: LRT loading will not exceed 2.5MT (2,500kg) per meter of vehicle length. As such, the LRT loading, and vibration will not govern utility relocations and is accounted for in the designated zones of influence (Utility Free Zone plus Utility Review Zone described below). ***Loading and vibrations limits during construction will be defined in construction provision documents. ATP and the City will work together to develop language that protects existing infrastructure during construction.***

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Figure 2: Typical LRT Guideway Cross-Section



For all utilities that will be reconstructed and remain in the Utility Review Zone (URZ), described later in this document, the material, class, and thickness, including carrier pipes, conduits and casings shall be designed to withstand the full range of expected internal and external pressures and loads. Pipes that are relocated below or pipes that are already below the URZ may not be impacted by loading or vibrations. A condition assessment will be performed for the utilities that will remain below the guideway and are not impacted by construction. Condition assessment details will be reviewed by each utility and ATP. All pipes within the construction limits will be protected during construction for loading and vibration.

For utility clearances for infrastructure above the guideway, please refer to Section 2.5.2 of this document for guidance.

1.2.3 Definitions

1. **Betterment** – Improvements and/or upgrades to City infrastructure as part of the ALR Project desired by the City that are not integral to the planned functioning of the project. Improvements that provide for greater capacity, capability, durability, efficiency, or function, to the existing utility system, except for meeting current state and local codes, are considered a betterment and not eligible for reimbursement from Federal Transit Administration.
2. **Casing pipe** (encasement pipe) – pipe used in underground construction to allow repair or replacement of utility lines without disruption to the LRT guideway structure. The utility line will be located within the casing pipe. Utility lines can be removed from casing pipes, which will support the soil and surrounding earth in case of a utility line failure. Casing pipes used for Austin Energy chilled water will be fully grouted.
3. **Condition Assessment** – an evaluation of an existing utility to determine the condition or state of the utility. Condition assessments can consist of, but are not limited to, evaluation of age, maintenance record, and physical inspection.

4. Finished grade – elevation of the ground surface, such as the top of road, guideway, or top of rail.
5. In-situ Wastewater Rehabilitation – repair of an existing wastewater line in place using trenchless technologies such as pipe lining or pipe bursting.
6. Offset Manhole – a concrete structure that allows access for maintenance and inspection that is set off the alignment of the pipe. Offset distance varies depending on the utility and utility maintenance needs. Offset manholes are not permitted on Austin Water and Austin Energy infrastructure regardless the amount of offset.
7. Manhole Frame and Cover – an access point to a below ground utility infrastructure. This item governs construction of pre-cast and cast-in-place wastewater manholes, storm water manholes, storm water junction boxes and cast-in-place wastewater junction boxes, complete in place, including excavation, installation, backfilling and surface restoration; required items including rings, covers, coatings, and appurtenances; and incidental work such as pumping and drainage necessary to complete the work. Contractor-performed acceptance testing is required for wastewater manholes.
8. Manhole Riser/Cone Section – precast concrete sections that make up a typical manhole, the riser sections being stacked end to end—one on top of the other—to form the vertical circular part and the cone section being placed on the upper most riser section to transition to the smaller frame and cover at the surface.
9. Parallel Utility – a utility line running along the LRT alignment at a zero to five-degree angle, where a zero-degree angle is parallel to the guideway.
10. Perpendicular Utility – a utility line crossing the LRT alignment at an angle ranging from forty-five to ninety degrees across the proposed guideway, where a ninety-degree crossing is perpendicular to the guideway.
11. Pipe Joint – the point where two pipe sections join to each other, or a term used to refer to a full “joint”, or piece, of pipe, from end of pipe to end of pipe. Methods of pipe joining vary based on material of construction and expected operating pressure.
12. Pipe Fitting – an item connecting two pipe sections to provide a sealed joint, based on the specifications of the type of service and pipe material.
13. Restrained waterline – a water line that is protected from unbalanced hydrostatic and hydrodynamic forces (generally called thrust forces). Typical forms of restraint include external joint restraint (such as mechanical joint or harness type devices), integral joint restraint (such as restrained joint pipe), bolt through restraint (such as “Foster Adapters”), or concrete thrust blocking.
14. Service Connection (Tap) – a typically small diameter water or reclaimed water service pipe or wastewater lateral providing service to a property from a water, reclaimed water, or wastewater main. Taps are typically installed perpendicular to the main utility line. Taps may also be referred to as water, reclaimed water, and wastewater services.
15. Reclaimed Water – treated effluent from a wastewater treatment plant that can be used for non-potable purposes, such as irrigation, cooling towers, and toilet flushing. Austin’s reclaimed water meets all state regulations for non-potable use.

16. Force main – a force main is a pressurized wastewater pipe that conveys wastewater under pressure from the discharge side of the pump. Lift stations collect wastewater and pump it from a lower to a higher elevation or across landscapes where deep excavation is not feasible.
17. Skewed utility – a utility line crossing the LRT alignment with an angle of intersection greater than five degrees and less than forty-five degrees, where a zero-degree crossing is parallel to the guideway.
18. Supported Trench Wall – the supported wall of a construction ditch or trench for the purpose of preventing the surrounding soil from sloughing into the trench. Trench boxes are commonly used for this purpose.
19. Utility Tracking Matrix (UTM) – a tool used to organize, track and manage utilities within the LRT corridor with detailed information such as utility owner, location, type, size, material, and length of impact.
20. Utility Free Zone (UFZ) – for at-grade section, the area bound by boundaries depicted in Figure 2 above. Utilities within this zone shall be relocated outside the UFZ.
21. Utility Review Zone (URZ) – for at-grade section, the area bound by boundaries depicted in Figure 2 above. Utilities within this zone will be reviewed based on utility relocation criteria.
22. Wastewater service crossing – any wastewater line that runs from a public wastewater main under the guideway to serve a single property. Services from the wastewater main to the City-owned cleanout at the property line are owned and maintained by the City.
23. Water service crossing – any waterline that runs from a public water main under the guideway to serve a single property. Services from the water main to the customer meter are owned and maintained by the city.

1.3 Utility Evaluation Approach

Several factors will need to be considered when determining whether a utility is in conflict or not. Below are a few considerations to assist with the determination; however, this should not be viewed as an all-inclusive list. Certain situations will need to be reviewed on a case-by-case basis and covered under other sections of this document.

1. Can the utility in question remain below the guideway without being considered a conflict that requires action? Criteria has been established to relocate automatically when in the UFZ, to review when in close proximity to the guideway (i.e., in the URZ), and to remain when below the URZ, pending a review of condition. Utilities below the URZ may require protection in place, such as casing pipe.
2. If the existing utility can remain under the guideway, what is the a) age, b) size, c) depth, d) maintenance history, e) material, f) condition of the utility, and g) future demand on the utility? Evaluation of pipe condition to withstand construction activities over utilities will also be evaluated.

- a. Pipes have a limited lifespan based on material properties and installation methods used, does the utility have sufficient remaining useful life to be retained in place?
 - b. Materials near the end of their expected life-span or prone to maintenance problems due to concerns raised by the utility or LRT may justify replacement of existing infrastructure.
 - c. Construction activities occurring over existing utilities can disrupt service and/or cause damage to the utility.
 - d. Pipes are generally sized to meet future demand but may be undersized when new projections are considered. Is the existing size of pipe adequate to meet the future needs of the area? Code consideration and betterments would need to be discussed on a case-by-case basis.
3. A template for the Utility Tracking Matrix (UTM) (see Appendix A) has been developed and is being utilized to track utilities within the LRT guideway. The matrix will identify the owner, utility type, size, and length of impact. The UTM will be used to track all conflicts through resolution. The matrix is intended to be a living document that will be modified, as necessary.,
 4. All utility services must be maintained during construction. Temporary services must be in function if the main services are shut off during construction. These temporary services shall include water supply, wastewater bypass, gas, light, and power. Special Provisions will be written to requiring the construction contractor to install, operate, protect, and maintain the respective temporary services during the construction period until the permanent utility can be placed back into service.

1.4 Skewed Utility Crossings

Skewed crossings are defined as any utility crossing with an angle of intersection greater than five degrees and less than forty-five degrees, where a zero-degree crossing is parallel to the guideway. Angles of intersection within this range cause an extended length of pipe to be located beneath the guideway. To minimize the length of pipe or conduit located beneath the guideway, the section of the pipe or conduit located beneath the guideway shall be reviewed on a case-by-case basis to determine if it can be relocated to allow for an angle of intersection ranging from forty-five to ninety degrees. For water main crossings, a forty-five-degree crossing will be considered to maximize the water main's hydraulic capacity while reducing the length of water main beneath the guideway. Further review of these instances will need to be discussed with Austin Water. Additional information regarding relocating skewed crossing utilities is covered under perpendicular crossings in Section 3.1.

To achieve an acceptable angle of intersection, the utility pipe may be modified per current City and industry standards to obtain the desired crossing angle. If bends are required to be installed on pressurized pipes, the bends will be installed 3 feet beyond the end of the casing pipe, or a minimum of 13 feet from the center of the nearest LRT track, whichever is greater. For relocated water mains, they shall be properly restrained. For wastewater non-pressurized pipe, manholes will be used to transition the crossing under the guideway.

Skewed crossings will be reviewed if the crossing is impacted by LRT construction. ATP will reduce the crossing length in consultation with the utility owner. Skewed crossings not impacted by construction will be reviewed on a case-by-case basis to reduce the skewed length.

1.5 Condition Assessment

A condition assessment is not needed at every conflict location, especially at locations where pipe relocation or modification is required. However, a condition assessment will be required for locations where existing city utility will remain under the guideway. ATP and City utility owners will develop condition assessment criteria jointly, to determine the feasibility of leaving utility infrastructure under the guideway.

Assessment tools include but are not limited to:

1. Initial assessment may include, but not limited to, records research to determine pipe material, size, and age of wastewater, water, reclaimed water, and stormwater infrastructure.
2. If additional assessment information is necessary, the condition of the existing utility may be reviewed via video inspection or other inspection means. These inspections will provide information on the physical condition of the existing utility in the proposed LRT corridor, as well as the number and location of service taps, if applicable.

1.6 Betterments

Concurrent activities that are requested by the City that are not integral to the functioning of the ALR Project will be considered a betterment request. Where utility relocations are required due to impacts from the ALR Project construction, ATP will prepare utility relocation designs that provide customer service equal to or better than offered by the existing utility. Due to the long-term nature of the LRT investment and the utility assets within the LRT right of way, betterments requested by the City should be included in the project unless it can be clearly demonstrated that including such work will cause a significant impact to cost and/or schedule of the project. Betterment requests during the construction phase will be considered on a case-by-case basis based on the request's overall impact to the construction phasing and schedule. All betterment requests rejected by ATP will be identified in advance of necessary design deadlines allowing the requesting agency an opportunity to make any necessary adjustments prior to rejecting the betterment request outright.

Where an impacted City utility desires to upgrade the service capacity, capability, appearance, efficiency, or function of City services over that which currently exists and where the upgrade is not required by other City code and a conflict with the planned ALR Project does not exist, the impacted utility shall include a "betterment" in the scope and plans issued for construction and the City will bear the cost beyond that necessitated by the ALR Project construction or regulatory requirements. Where an impacted City utility desires to upgrade the service capacity, capability, appearance, efficiency, or function of City services over that which currently exists and a conflict with the planned ALR Project does exist, the impacted utility shall include a "cost-sharing" in the scope and plans issued for construction and the City will bear its proportionate share of costs.

Meeting existing standards, code or criteria for utilities are not considered betterments. This may include upsizing where City of Austin Land Development Code (LDC) and associated criteria manuals require upsizing or different types of materials and its applicability to these regulations for utilities directly impacted as a result of construction. Similarly, a replacement facility that serves the function but is not identical to the existing facility is not considered a betterment.

If ATP and the City concur with the betterment request, ATP will provide a scope, cost estimate and schedule that will include design and construction impacts for the City Department requesting the betterment to approve before implementing into the project. An Inter-Local Agreement (ILA) will be processed to account for the added project expenditures.

1.7 Abandoned, Retired, & Decommissioned Utilities

Existing abandoned and existing retired utilities impacted by LRT construction shall be capped, plugged, filled, removed, or otherwise addressed in a manner deemed necessary by the owning utility to maintain the integrity of the City right of way. Removals or capped utilities must extend a minimum distance of 10 feet from the centerline of the nearest LRT track.

Proposed abandoned and proposed retired utilities impacted by LRT construction shall be taken out of service using the utility owner and industry standard procedures. In determining whether to abandon or retire a facility in place rather than be removed during construction, the owning City department will consider such factors as: present or potential congestion of utility installations; railway construction or maintenance requirements; cost and difficulty of removal; impact to ATP facilities in the case of a utility collapse; whether or not the facilities contain any hazardous materials; the potential for the facilities to have to be removed by the City at some future date; and traffic and safety requirements. Utilities that require removal will be removed from underneath the guideway a minimum distance of 10 feet from the centerline of the nearest LRT track.

Utilities impacted by LRT construction containing asbestos will be removed from beneath the guideway, regardless of depth. City, State, and Federal standards will be followed where abatement of asbestos containing utilities are removed. All work related to asbestos-cement pipe will comply with City utility standard practices and City and state criteria and code. Asbestos-cemented pipes not impacted by LRT construction but encountered during construction will be reviewed by ATP and the identified utility owner to determine any mitigation needed.

1.8 Utility Owners Within the Project Footprint

There are a number of private utility companies and public utility departments potentially being impacted by the LRT construction. Existing franchise agreements and applicable city code sections will be reviewed for each private utility company with respect to relocation. The guiding principles of the UROP will be used in relocating private utilities.

1.9 Procurement of Services (Design, Construction, Inspection)

It is likely that most identified utilities that are impacted by LRT construction and need to be relocated or replaced, will continue to be designed as part of the overall LRT design, with permit applications submitted to the City at various stages of the process. However, in the event that a standalone contract is needed, to expedite the procurement of consultant services for utility relocation or replacement activities, for design, construction, and inspection services, the City utility departments at their request have the opportunity to utilize ATP contracts to perform advance work on their affected utilities. This would be instead of the City expending resources to expedite the work on behalf of ATP. ATP will work directly with the requesting utility owner to conform to specific contracting requirements that they may have in place. City standards and criteria will be used in establishing these contracts.

It is anticipated that the ATP office will be coordinating the following activities:

1. Design Services

- a. An initial conceptual design of the relocated utilities consistent with City's design standards for water, reclaimed water, chilled water, wastewater, and stormwater facilities will be done by the design consultants.
- b. Working with the City utilities, approved consultants can be retained to assist with the design of the relocated utilities. The City will participate as an equal partner on the selection committee for consulting design services.
- c. The designs shall meet or exceed the functional (size, slope, capacity) and operational (accessibility and maintenance worker safety) requirements of the original utility being replaced.
- d. ATP and the City shall jointly establish utility design standards and specifications for installation conditions unique to rail projects, including cathodic protection standards. Cathodic protection systems shall be maintained by the Operator. Non-standard construction methods, technologies, and materials shall be reviewed and approved by the City's Transportation and Public Works Department (TPW).

2. Condition Assessments

- a. Condition assessments will be needed for those existing utilities that will remain under the LRT guideway. Utility department criteria will be used as a basis to determine what utilities will need to be replaced and those that can remain under the guideway. A condition assessment consultant shall be retained and funded by ATP to perform these services.

3. Installation Inspection

- a. It is anticipated that the City may be performing the following activities:
 - i. Removal, modification, and replacement of City utilities may be inspected by representatives of the city department owning the utility and by inspectors typically involved in capital improvement program construction work. The City

shall be authorized to visit the construction as needed during working hours to inspect the work. ATP shall allow the City the same rights as ATP over management of the work. Any direction to stop utility work by the City will be communicated to ATP immediately upon stopping utility replacement work if it is not progressing in accordance with City standards or requirements. Reimbursement of costs to perform these services will be agreed to by ATP and the City in a separate agreement.

1.10 Material

The materials specified for utility facilities shall conform to City standards, codes, and requirements, as well as accepted practices and industry standards and shall be designed for long service life and to minimize utility servicing and maintenance. All material utilized on the ALR Project will need to comply with Buy America provisions of CFR 635.410 as amended.

1.11 Design Waiver and Variance

ATP retains the right to request a waiver to City design requirements. All modifications to design requirements must be documented and approved by the City prior to issuance of a permit for construction. In determining whether to grant a waiver to design requirements, ATP and the City agree to consider all relevant factors, including but not limited to:

1. The UROP document does not waive or otherwise revise any approval process requirement that is set forth in the LDC and the criteria manuals.
2. The waiver or variance meets the intent of the design requirement and is equally protective of public health without resulting in a degradation of service.
3. There is exceptional or undue hardship on the applicant, or a physical impracticality.
4. A waiver or variance will not impair the railway operations, maintenance, or safety, nor otherwise conflict with the purposes of the City code and criteria.
5. A waiver or variance would not be detrimental to the public health, welfare, or safety of the public.
6. The process for approval of variances and waivers shall be coordinated through the City's Project Connect Office (PCO). PCO staff will assist ATP in seeking amendments to City code, criteria and/or administrative processes needed to realize LRT implementation. The affected City Department retains the authority for the approval or denial of requested variances and waivers.

1.12 Record Drawings

Record drawings of abandoned, retired, relocated, protected-in-place, adjusted, and modified utilities shall show the final location or modification of each utility as required in project specifications and will be provided to ATP by the contractor. Record drawings shall conform to City Departmental standards and be provided to City departments upon receipt by ATP. CADD standards will be agreed to in a separate document.

1.13 Permitting

ATP will follow the applicable permit application process for construction in place for the ALR Project at the time of project submittal. Reviews will be conducted in accordance with existing code, criteria, agreed to permitting process between ATP and COA, and with the guidance of UROP provisions.

2 City of Austin Utilities

The City of Austin owns and maintains numerous utilities that provide essential services to the residents of Austin. Constructing the LRT system, as part of implementing ALR Project, water, reclaimed water, wastewater, stormwater, chilled water, energy transmission, energy distribution, protection system communications, signal systems and street lighting will be impacted. PCO is responsible for facilitating coordination between ATP and City utilities, to deliver the project in a timely manner.

Utility systems will be reviewed during the design phase to determine construction sequencing and/or phasing needed to maintain service levels to all customers during construction. Coordination between ATP and the utility owners will be needed during the design and construction phases of the project.

2.1 Austin Water (AW) – Water, Reclaimed Water, Wastewater Force Mains, & Pressurized Services

Pressurized mains can represent a risk to the existing roadway and guideway, as failure of a pipeline could potentially undermine both. To help mitigate this risk, the UROP requires the following for pressurized mains that will remain under the guideway to protect both the LRT guideway and utility infrastructure:

- Protecting existing pressurized infrastructure during construction of the guideway
- Protecting existing pressurized infrastructure during any future guideway maintenance
- Minimizing conflicts between pressurized infrastructure access locations and LRT operations
- Eliminate access to pressurized facilities within the width of the URZ.
- Relocate pressurized infrastructure below the URZ and provide a casing pipe to protect both guideway and pipeline.
- Minimizing disruptions to LRT operations and protecting the LRT guideway and rail during future pressurized infrastructure maintenance
- Reference: [LAND DEVELOPMENT CODE \(LDC\): CHAPTER 25-9. - WATER AND WASTEWATER.](#) of the Austin, Texas – Code of Ordinances.

2.2 Austin Water (AW) – Gravity Wastewater & Services

Wastewater mains can represent a risk to the existing roadway and guideway, as failure of a main could potentially undermine both. The depth and grade requirements of existing gravity wastewater mains, including interconnecting laterals and services, make the relocation of

existing wastewater mains challenging. The UROP focuses on establishing evaluation criteria aimed at:

- Protecting existing wastewater facilities in the vicinity of the LRT guideway,
- Eliminating access to wastewater facilities within the width of the URZ,
- Reducing the need for wastewater relocations, as practical,
- Minimizing disruptions to LRT operations and maintenance and protecting the LRT guideway including rail during future wastewater infrastructure maintenance.

2.3 Austin Water (AW) - Utility Relocation Requirements

The following information is intended to provide further context of the relationship the UROP has with design and construction documents related to AW utility infrastructure. AW will continue to have review and approval responsibilities for the design and construction of its infrastructure as the ALR Project continues through the implementation process.

The City of Austin Utilities Criteria Manual provides guidelines and criteria for design, construction and coordination of water, wastewater, and reclaimed water facilities within and outside the City to the boundaries of the utility service areas and shall be the standard used for water, reclaimed water, and wastewater infrastructure design.

Reference - [UTILITIES CRITERIA MANUAL | Utilities Criteria Manual | Austin, TX | Municode Library](#)

2.3.1 Material Criteria

Through previous investigation, testing and usage by AW, certain types, brands, and models of some products have established a satisfactory record for certain services. These products have been tabulated by manufacturer's names and identifying numbers on Standard Products Lists (SPL). Construction-related SPLs have been assembled into AW's "Standard Products List". The SPL should not be interpreted as being pre-approved lists of products meeting the requirements for a given construction project. However, products included in the lists shall not be substituted unless they are approved by the engineer of record and AW.

The purpose of the SPL's is to expedite review, by the engineer of record and, if necessary, the AW Standard Products Committee, of Contractor product submittals. The SPL current at the time of plan approval will govern. See Utilities Criteria Manual Section 2.4.2 for details on AW Standard Product Approval Process.

Reference: <http://www.austintexas.gov/page/current-standard-products-lists>

Reference: [Utilities Criteria Manual Section 2.9.2 for details on AW Pipe Design Criteria for Sizing and Materials.](#)

2.3.2 Design Criteria

Per Texas Commission on Environmental Quality (TCEQ) criteria, established in Texas Administrative Code Title 30, including but not limited to Chapters 210, 217 and 290, the utility shall provide adequate service that is operable, maintainable, and shall protect public health and safety. Design requirements which are necessary and reasonable, may be established as a condition of service by the utility. The utility may also require necessary and reasonable design measures regarding constructability, when activities encroach on property rights, pose environmental risks, or conflict with another utility.

All drawings for such facilities shall be prepared by or under the supervision of a Professional Engineer licensed by the State of Texas.

See Utilities Criteria Manual Reference - [UTILITIES CRITERIA MANUAL | Utilities Criteria Manual | Austin, TX | Municode Library](#) for details on AW design requirements.

All projects are required to be designed in accordance with Standard Specifications Manual. All variations are subject to the approval of AW.

Reference: [Standard Specifications Manual | Austin, TX | Municode Library](#)

2.3.3 Installation Criteria

Construction plans for AW facilities will be submitted electronically using the City's Austin Build & Connect Portal ([Interactive Development Review Permitting and Inspection | AustinTexas.gov - The Official Website of the City of Austin](#)) or other process later defined in a separate agreement between ATP and COA

Reference: [Utilities Criteria Manual Section 2.5.0 for details on City of Austin Construction Plan information and submittal requirements.](#)

2.3.4 Inspection Criteria

ATP will work with AW to determine AW inspection needs on the project. If inspection is needed / required, requests will follow standards for such services, mutually agreed to by ATP and AW.

Reference: [Utilities Criteria Manual Section 2.6.0 for details on City of Austin Construction Inspection and City Acceptance.](#)

2.3.5 City Acceptance

To obtain final City acceptance of a project, COA and ATP agree to work collaboratively during the permitting process and will use reference: [Standard Specifications Manual Section 1806S – Final Acceptance 9-26-12](#) as guidance, along with;

Reference: [Utilities Criteria Manual Section 2.6.0 for details on City of Austin Construction Inspection and City Acceptance.](#)

2.3.6 Record Drawings

The Engineer of Record shall submit record drawings and intersection field sketches to ATP using Section 1.12 Record Drawings of this document, as guidance.

2.4 Watershed Protection Department (WPD)-Storm Water

Storm water infrastructure includes the following primary asset classes: storm drain system (storm drains, inlets, manholes and outfalls), open drainage channels (including creeks) and stormwater control measures (i.e., flood detention and water quality ponds). Failure of stormwater infrastructure in the existing roadway, guideway, and adjacent right-of-way can result in an increased risk to flooding, impact storm water quality in the receiving watershed and surrounding community. Failure of components of the storm drain system can result in increased flooding with potential for increased risk for the loss of life and property damage. In addition to impacts of flooding, subsurface voids (i.e., sink holes) can develop which endanger the structural integrity of roadways, sidewalks, and nearby structures. The depth of a utility below the ground surface can affect the short-term level of risk to the physical stability of surface features, whereas a storm drain failure impact to flooding is less dependent on the depth of the utility. The ability to inspect stormwater infrastructure to verify physical condition can inform the likelihood of failure (LOF) of the asset and assist in the evaluation of their suitability for being located under the guideway. Hydraulic models also allow the evaluation of the capacity of the system to meet current standards and reduce the risk of flooding that may impact the operation of the LRT and associated roadway improvements.

This section addresses storm water infrastructure and the potential for conflicts and opportunities along the LRT corridor. The UROP focuses on:

- Protecting existing storm water infrastructure during construction of the LRT guideway
- Protecting existing storm water infrastructure during any future LRT guideway maintenance
- Minimizing conflicts between storm water access locations and LRT operations
- Minimizing disruptions to LRT operations and protecting the LRT guideway and rail during future storm water maintenance
- System replacements, relocation and upgrades required to reduce the risk of structural surface impacts and flooding to the LRT and its operations.
- Avoidance of adverse (floodplain and environment) impact due to construction associated with the LRT.
- Consideration of regulatory requirements to meet current standards associated with the ALR Project.
- Reference: [LAND DEVELOPMENT CODE \(LDC\): CHAPTER 25-7. - DRAINAGE](#) of the Austin, Texas – Code of Ordinances.

2.4.1 WPD Utility Relocation Requirements

The following information is intended to provide further context of the relationship the UROP has with design and construction documents related to WPD utility infrastructure. The WPD will continue to have review and approval responsibilities for the design and construction of its infrastructure as it continues through the process.

The City of Austin Drainage Criteria, Environmental Criteria, Utilities Criteria, Transportation Criteria Manuals, Land Development Code for Drainage (LDC 25-7) and Environment (25-8) provide requirements for design, construction and associated impacts and coordination of stormwater facilities within the City of Austin and outside the City to the boundaries of the utility service areas.

Reference: [City of Austin CODE and CRITERIA MANUALS - Municode Library](#)

1. [Drainage Criteria Manual](#)
2. [Environmental Criteria Manual](#)
3. [Land Development Code – Drainage 25-7](#)
4. [Land Development Code – Environment 25-8](#)

2.4.1.1 Material Criteria

All drainage system components that are within public right-of-way or public drainage easements provides the City the right to maintain these systems. Infrastructure shall be manufactured and installed in compliance with the [City of Austin Standard Specifications and Standards](#) and all portions of the [City of Austin's Drainage Criteria Manual](#), [Environmental Criteria Manual](#) and applicable sections of the [Utilities Criteria Manual](#) and [Transportation Criteria Manual](#) published by the City of Austin, unless:

- Those components are located solely on private property,
- That private property consists solely of the property being developed and
- Those components are privately maintained.

2.4.1.2 Design Criteria

The City of Austin's Drainage Criteria Manual (DCM) provides standards for the evaluation and design of stormwater infrastructure. The DCM also defines the drainage policy associated with development and construction projects. This includes practices that regulate how storm water runoff is managed on a developed site including linear transportation projects, bridges/culverts capacity requirements and requirement that no development will result in additional adverse flooding, erosion, or water quality impacts on other property in accordance with Chapters 25-7 and 25-8 of the Land Development Code. Specific sections of the DCM and ECM of interest for transportation projects include, but not limited to:

1. DCM Section 1.2.0 for general details on City of Austin drainage design requirements.
2. DCM Section 3 provides requirements for hydraulic design of streets.
3. DCM Section 4.1.0 lists the requirements used in the design of inlets to be located in streets.

4. DCM Section 5.2.0 lists the guidelines of storm drain systems located in public right of way or public drainage easements to promote proper operation of these systems and to minimize maintenance requirements.
5. DCM Section 6.4.1 and 6.4.2 in the Drainage Criteria Manual lists the key parameters for design of open channels.
6. DCM Section 7 list requirement for the hydraulic design of bridges and culverts (not including structural design).
7. DCM Section 8 list requirements for the design of flood detention ponds and participation in the Regional Stormwater Management Program (RSMP).
8. ECM Section 1 (1.4, 1.6, 1.9) and DCM Section 1.2.4 list requirements for post-construction stormwater quality management due to development and construction activities.

2.4.2 General Guidance for Design of Stormwater Infrastructure

This section provides additional guidance on criteria of interest for storm water infrastructure associated with the LRT project.

1. As required by the City of Austin Drainage Criteria and Land Development Code Atlas 14 hydrology or identified surrogates such as 500-yr FEMA existing conditions floodplain = COA 100-yr fully developed where updated floodplain models are not available will be used to analyze the existing and proposed conditions for the ALR Project.
2. Impacted storm drains are the following:

Pipes within the UFZ will be relocated and sized to meet code. Pipes in the URZ where the guideway is above the storm drains will be Class IV RCP or higher. Pipes that do not meet this requirement will be replaced and sized to meet code. Pipes and inlets that accept drainage from LRT will be sized to meet drainage criteria within the limits of construction (LOC) of the project. Construction of a new manhole to end upsizing will be considered on a case-by-case basis.
3. Non-Impacted storm drains are the following:

Pipes outside the URZ that do not accept runoff from the project LOC and are not physically affected by construction are considered non-impacted. All non-impacted existing storm drains that will remain under the guideway will have a condition assessment done. Pipes in poor condition will be replaced by the project, ATP considers the replacement as a betterment. Pipes in good condition, can be left in place at the discretion of WPD. Pipes identified to be replaced will be designed and constructed by ATP as a betterment. Cost associated with this work will be paid by the city.
4. All pipes discharging into a public drain system shall have a minimum diameter of 18 inches and shall be constructed of reinforced concrete per COA standards. In all cases, ease of maintenance and/or repair will be reviewed to confirm ability to maintain the infrastructure.

2.4.2.1 Culverts & Bridges

Culverts and bridges within City of Austin right-of-way are under the operation of the TPW Street and Bridge Operations Division (SBO). SBO provides oversight for the structural functionality of these structures and will review the evaluation of structural competence to meet current standard for vehicular and LRT operations. WPD provides operational and maintenance services to sustain the conveyance of storm water through the structures to ensure they meet their intended level of service for hydraulic performance. WPD's primary function is to inspect for debris and blockages and remove them as needed to ensure the structures perform to their intended capacity. WPD also evaluates the hydraulic performance of City maintained structures and rates them based on the understood risk due to floodwater depths and velocities overtopping the roadway. For the ALR Project culvert and bridge crossings, ATP will analyze for hydraulic capacity using City of Austin Drainage Criteria for fully developed land use conditions to determine whether it would meet LDC and DCM requirements for new construction.

Where the existing capacity is sufficient to meet DCM for new development, at a minimum the proposed impact that the LRT design will have on the floodplain and/or drainage system at the crossing (upstream and downstream) will be mitigated. The investment of providing new infrastructure for these crossings and potential cost sharing is being reviewed and documented under a separate process. For specific locations impacted please refer to the LRT design.

2.4.2.2 Street Running (At grade, trench sections & aerial retained sections)

Street Running segments include at grade sections where the LRT tracks are embedded in the street cross-section, trench sections where the LRT tracks are below the street section and are open to the surface and the third area is where the LRT tracks are either coming in or out of an aerial portion where the LRT tracks are supported by retaining wall sections. All storm drains will be reviewed to determine impacts caused by construction or need to convey new drainage away from the guideway.

1. Conveyance

- a. Existing perpendicular storm drain under the guideway and impacted by LRT construction (including physical construction impacts, surcharge loadings and maintenance access), will be replaced to meet LDC/DCM for conveyance.
- b. Existing parallel storm drain infrastructure below the horizontal extents of the URZ that conflict with the guideway and/or have access within the guideway will be relocated outside of the guideway. Relocated pipes will be reconstructed and upsized to meet LDC/DCM for conveyance.
- c. ATP will be responsible for mitigating impacts from the increase in stormwater runoff from the new impervious surface created by the construction project.
- d. Deep parallel storm tunnels will be assessed on a case-by-case basis to evaluate whether they should be left in place with the concurrence from WPD depending on access needs, structural resilience, maintenance access and feasibility of relocation.

- e. Where existing catch basin laterals and trunk lines outside the limits of the guideway can be retained to accommodate the drainage needs associated with the ALR Project, they will be reviewed on a case-by-case basis to accept the drainage from the contributing project drainage areas including new increases in impervious surface because of the construction project. Infrastructure not impacted or utilized by the project construction and not identified by ATP as a needed benefit for the long-term project operations of the LRT, additional deficiencies in the lateral or trunk line system to meet the current criteria for new construction may be considered as a betterment and will require cost participation.
- f. New catch basin laterals and trunk lines required for the ALR Project will be designed per current City standards. Connections will be made to existing structures using accepted DCM criteria and City standards.

2. Water Quality

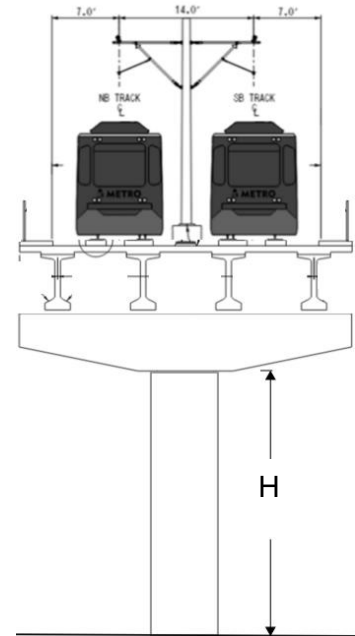
- a. ATP agrees that water quality is needed as part of the Street Running portion of the ALR Project.
- b. LDC 25-8-211 requires water quality controls for new or redeveloped impervious cover > 8000 SF. ATP and the City agree to work cooperatively to seek a systematic approach to water quality and jointly pursue a LDC amendment as needed. ATP will review options available through City regulations which may include payment-in-lieu or other exceptions where applicable once the responsibility of the LRT construction impact has been determined.
- c. Urban Payment In Lieu is established but does not guarantee ATP can use this option in all locations. A Water Quality Plan and Tech Memo will need to be prepared for each permit / applicable locations to determine feasibility of water quality infrastructure. WPD will review for compliance and recommendation to use "Payment In Lieu."
- d. A code amendment for "Suburban" Payment In Lieu was approved in May 2022 through the Corridor Project Office (CPO) actions. The Suburban Payment In Lieu does not guarantee ATP can use this option in all locations. A Water Quality Plan and Tech Memo will need to be prepared for each permit / applicable locations to determine feasibility of water quality infrastructure. WPD will review for compliance and recommendation to use "Payment In Lieu"

3. Clear Lane Width

- a. Clear lane of travel concurrence is needed for Emergency Response Services. This will be reviewed on a case-by-case basis. Where existing conditions are out of compliance with the clear lane of travel and LRT construction does not make the situation worse; concurrence to retain existing non-compliance conditions will be obtained from Emergency Services reviewers. Watershed Protection will acquiesce to Emergency Service with that determination.
- b. Design calculations will be needed for level of impact at specific locations.

2.4.2.3 Elevated on Bridge Structure

Storm drain systems located under the elevated portion of the ALR Project are potentially impacted in several ways. The existing street drainage system may be impacted due to location of the elevated guideway and future access to these facilities. A review of the available clearance from the ground surface to the bottom of the aerial structure will be needed on a case-by-case basis. When the height or clearance is below 14 feet (defined as H) and where there is concurrence that storm drains are suitable to remain in place, special precautions are needed to confirm the ability of maintaining access with construction equipment. In this critical clearance area, all crossings will need to be reviewed regardless of size. Areas that have greater than 14 feet vertical clearance will still need to be reviewed based on the existing drain pipe size and clearances. Aerial Running system that are 14 feet vertical clearance or less above the ground surface and where the storm drain is to remain in place, WPD and ATP will prepare Operation and Maintenance manuals /agreements needed for future operations and utility maintenance. Another potential impact is the associated drainage that is carried on the guideway itself.



1. Conveyance

- a. Storm drains impacted by bridge construction, (i.e., pier or footing placement) will be replaced to meet current standards for conveyance. ATP will be responsible for reconstruction of existing pipe and upsizing to meet current standards for new development when impacted by bridge construction to the nearest existing structure or to a new structure within the project limits.
- b. The increase in drainage from the elevated guideway will be addressed by ATP. Storm drains accepting this drainage will be upsized to meet code within the LOC.
- c. Storm drains not impacted by the aerial guideway will not be upsized for existing conveyance needs. A review of the street reconstruction in the elevated section area will be needed to determine any associated code requirements.
- d. Open conveyance systems accepting drainage will be reviewed on a case-by-case basis.

2. Water Quality

- a. Water quality will be required on the drainage coming from the elevated guideway. Water quality calculations will use the current formula used in the Land Development Code for water runoff.
- b. Water quality in the pavement section associated with the elevated guideway will be reviewed on a case-by-case basis to determine if any associated code requirements are met (i.e., repaving the street and impacting less than 18 inches from the surface).

3. Clear Lane Width

- a. While it is not anticipated that the elevated guideway section will increase flooding, a review of increase flows into any existing storm drain system will be required as part of the hydraulic analysis of the ALR Project. Increased runoff caused by the elevated guideway will be mitigated to alleviate the flooding caused by this increase. A mutually agreed upon review of downstream infrastructure between ATP and WPD may be needed to eliminate flooding caused by the LRT construction.
- b. In situations where flooding is occurring under the existing conditions, a clear lane of travel concurrence is needed for Emergency Response Services. This will be reviewed on a case-by-case basis. Where existing conditions are out of compliance with the clear lane of travel and the LRT construction does not make the situation worse; concurrence to retain existing non-compliance conditions will be obtained from Emergency Services reviewers. Watershed Protection will acquiesce to Emergency Service with that determination.

2.4.3 Installation Criteria

Installation of all stormwater infrastructure will follow the Austin, Texas – Drainage Criteria Manual, City Standards, and specifications and /or best practices where applicable. ATP and WPD will work collaboratively to develop design strategies that benefit both parties that reduce the overall cost of the project. Construction plans for WPD infrastructure shall be submitted electronically to the department prior to construction and record drawings provided during project close-out.

2.4.4 Inspection Criteria

It is recommended that accurate location and elevation data for all utilities located under the guideways be maintained for future reference. It is anticipated that future installation of services crossing under the guideway will be installed by directional boring methods. To assist with future installations in avoiding impacts to the existing guideway and utilities retained under the slab, documentation of vertical locations will be required to identify a “clear zone” under the slab.

ATP will work with the WPD to determine WPD inspection needs on the project. If inspection is needed and/or required all requests will follow standards for such services mutually agreed to by ATP and WPD.

Reference: [Utilities Criteria Manual Section 2.6.0 for details on City of Austin Construction Inspection and City Acceptance.](#)

2.4.5 City Acceptance

To obtain final City acceptance of a project, COA and ATP agree to work collaboratively during the permitting process and will use reference [Standard Specifications Manual Section 1806S – Final Acceptance 9-26-12](#) as guidance.

2.4.6 Record Drawings

The Engineer of Record shall submit record drawings and intersection field sketches to ATP using Section 1.12 Record Drawings of this document, as guidance.

2.5 Austin Energy

Austin Energy's mission is, "To safely deliver clean, affordable, reliable energy and excellent customer service." In this context "safely" applies to the Field Operations personnel who operate and maintain our system and the public who live and work around our assets.

2.5.1 Austin Energy Underground (Street Lights, Distribution, & Transmission)

Electric utility infrastructure is critical to the public's safety and well-being of the residents of Austin. As such, keeping all utilities maintained during and after construction is an important goal of ATP. Design, construction, and operation documentation will be needed as the design progresses and more details are known. ATP and AE will work cooperatively on those documents to safeguard the public's trust with both agencies.

Electric utilities are considered to be in conflict with the LRT guideway if it falls within the defined UFZ. All utilities located in this defined area will need to be relocated either below or outside of the UFZ. If an electric utility is located outside of the UFZ, the utility will need to be reviewed to determine if it is in conflict and needs to be relocated or if it can remain in place. If the utility is located outside of UFZ and still beneath the guideway, the following items should be considered:

1. Direct excavation access to dry public utilities under the guideway shall not be permitted.
2. Maintenance of underground utility systems will be restricted to outside of the URZ.
3. Emergency situations will be addressed in the design and construction documents during construction and in the LRT operations policies once the LRT becomes operational in coordination with Austin Energy.

The development of the UROP focuses on:

- Protecting existing electric utilities during construction of the LRT system.
- Minimizing conflicts between electric utility access locations and LRT operations.
- Placing future electric utilities in a location that does not conflict with guideway locations.

2.5.1.1 Utility Relocation Requirements

1. **Clearance Criteria.** Clearances for conduits, cables and other underground facilities are needed to protect the electrical infrastructure from other utilities and accidental damage because of proximity to the ground surface. Austin Energy has established standard clearance from gas lines, fuel lines and steam lines. As part of the UROP, minimum clearances will be adhered to, to protect both Austin Energy infrastructure and LRT.

See Utilities Criteria Manual Section-1 for Austin Energy Design Criteria here - [Mini TOC: SECTION 1 - AUSTIN ENERGY DESIGN CRITERIA | Utilities Criteria Manual | Austin, TX | Municode Library](#)

2. Installation of Overhead Contact System (OCS) pole foundations can negatively impact existing street lighting circuits and other private utility underground cables behind the curb line. Careful location of OCS poles in coordination with selective relocation of subsurface cables will be done to mitigate this conflict.
3. The Austin Energy manholes that connect the various power duct banks in downtown Austin represent significant infrastructure. Relocation of one of these manholes may result in the need to relocate a significant portion of duct bank systems between manholes. To mitigate this potentially significant cost, efforts will be made to retain these manholes in place where feasible. It is anticipated that potential mitigations will be assessed on a case-by-case basis in the design process in consultation with AE. A safety evaluation will be performed as needed for potential mitigations. The manholes are considered “confined spaces” with energized high voltage cables present. Austin Energy retains the final decision as to the safety and functionality of a proposed mitigation and shall review and approve the design and inspection of the proposed mitigation measure.

2.5.2 Austin Energy Overhead (Distribution and Street Lights)

Overhead utilities such as power lines and streetlights require standardized specifications for proper installation and operations. The UROP references the City of Austin Design Criteria for these items.

National Electrical Safety Code (NESC) establishes the minimum design requirements regarding the design and installation of communication cables and other facilities on, underneath, or, in proximity to electric infrastructure. Austin Energy's design standards may nonetheless exceed those of the NESC - in any given instance the more stringent of the two requirements shall apply unless a specific variance has been granted by Austin Energy in writing.

See Utilities Criteria Manual Section-1 for Austin Energy Design Criteria here - [Mini TOC: SECTION 1 - AUSTIN ENERGY DESIGN CRITERIA | Utilities Criteria Manual | Austin, TX | Municode Library](#) and Utilities Criteria Manual Section-6 for Austin Energy Pole Attachments here - [SECTION 6 - AUSTIN ENERGY POLE ATTACHMENTS | Utilities Criteria Manual | Austin, TX | Municode Library](#)

2.5.2.1 Overhead Contact System (OCS)

1. The LRT will require OCS to provide power to the light rail vehicle (LRV).
2. Clearances between the OCS and any other overhead utility are strictly governed by the latest version of the National Electrical Safety Code (NESC).
3. Air clearances shall be maintained between live conductors (including the pantograph) and any grounded fixed structure accordance with the AREMA Manual Chapter 33, Part 2, local, state and national codes.

2.5.2.2 Distribution Engineering (overhead electric, 12.47 kV typ. on wood poles typ.)

Distribution has similar requirements (*to Transmission*), Austin Energy Design Guidelines outline clearances from conductor at rest with maximum sag from the OCS (assumed to be 20' tall) and clearances from the track itself will be adhered to.

See Utilities Criteria Manual Section-1 for Austin Energy Design Criteria here - [Mini TOC: SECTION 1 - AUSTIN ENERGY DESIGN CRITERIA | Utilities Criteria Manual | Austin, TX | Municode Library](#)

Questions or concerns about clearances should be directed to Austin Energy. For conflict resolution, software modeling of the line will need to be done by Austin Energy or a model from the design engineer shall be provided to them for review and approval.

2.5.2.3 Street Lighting

Street lighting impacted by LRT construction will use design standards following the latest edition of TxMUTCD, PROWAG, and NESC to meet the current level of lighting impacted by construction. Further design criteria for lighting will be developed between ATP, AE and COA as final design progresses.

ATP will be responsible for the design of all lighting infrastructure impacted as a result of the ALR Project. Lighting and associated infrastructure should be situated so as not to infringe on the clearance envelope around the OCS and LRV. Infrastructure that cannot be located outside the clearance envelope will be identified and ATP will work with AE to develop operation and maintenance language to address these situations.

2.5.3 Austin Energy Transmission Engineering (overhead electric, 69kV & 138kV)

For overhead transmission lines, all clearances will need to follow Austin Energy Design Criteria Guidelines. Any variances from these clearances will need to be approved by Austin Energy.

It should be noted that some of the Austin Energy overhead system do carry telecommunication lines. ATP will coordinate with Austin Energy and telecommunications companies to identify clearance conflicts that might exist and to cooperatively work together to mitigate these types of conflict.

2.5.4 Austin Energy (District Energy & Cooling)

District energy and cooling meets customers' heating/ventilation/air-conditioning (HVAC) and other requirements through a network of underground equipment (including pipes and fiber conduit) serving multiple buildings in a particular service area. A district cooling plant distributes chilled water to customers' buildings through a set of heat exchangers in the customer's mechanical room. District energy facilities provide electricity or steam to customers. Austin Energy owns and operates district cooling facilities in the Central Business Zoning District, and the North Burnet/Gateway (NBG) Zoning District and district energy and district cooling facilities in the Mueller Planned Unit Development area. Austin Energy may expand into additional areas

to meet customer demand. District energy and cooling provide benefits to developers, building owners, building occupants, and the general public by reducing initial capital investment costs for development, lowering operational expenses, increasing building space for other uses, and reducing environmental impacts by shifting electricity usage to times when renewable resources are available.

2.5.4.1 Utility Appurtenances

Relocated chilled waterlines shall be installed per AE District Energy & Cooling Specifications and Details, with welded steel pipe and consideration of placing the watermain in casing pipe will be done on a case-by-case basis. The casing pipe shall be installed to the maximum extent possible for the section of pipe located beneath the guideway. The casing pipe for AE chilled water will be grouted per their specifications.

Valves and other appurtenances located beneath the guideway shall be relocated outside of the proposed casing. Isolation valves must be in-line with the pipe. Valve risers and communication vaults shall be above piping. All relocated pipe shall have same valves and other appurtenances (valve risers, communication vaults, connection points, etc.) as existing pipe. No deletions are allowed. Operators shall not manipulate valves for chilled water pipes. All modifications will require hot taps and/or line stops. Chilled water service cannot be shut down for any modifications. Accessible emergency shutoff valves, where warranted by local jurisdictions or utility owners, shall be located on each side of the crossing, outside of the guideway a minimum distance of 10 feet from the centerline of the nearest LRT track.

2.5.5 Utility Relocation Requirements

2.5.5.1 Material & Installation Criteria

Furnishing and installation of all AE materials for constructing pipe mains, service connections, temporary service lines and including all applicable work such as excavating, bedding, jointing, backfilling materials, tests, concrete trench cap, concrete cap and encasement, etc., prescribed under this item will be done in accordance with the provisions of the [AE Design Criteria Manual](#), [AE District Energy & Cooling Specifications and Details](#), and [City of Austin Utilities Criteria Manual](#) as mutually agreed to between ATP and AE in a separate agreement.

All products installed as part of the chilled water system shall be confirmed with AE. All modifications to the chilled water system will need to occur between mid-November and end of February or agreed upon dates by AE. There can only be one modification of AE chilled water lines done at any one time.

Modifications of chilled water systems are required to be built in accordance with the Standard Specifications Manual and AE District Energy & Cooling Specifications and Details, which include other requirements not addressed here. All variations are subject to the approval of Austin Energy (AE). *For all requirements see Standard Specifications Manual here - [Standard Specifications Manual | Austin, TX | Municode Library](#) and [AE District Energy & Cooling Specifications and Details](#).*

2.5.5.2 Design Criteria

All piping/fiber conduit modifications will adhere to the Austin Energy District Energy & Cooling Special Specifications. If relocations are required easement acquisitions will need to be addressed if moving into private property.

ATP will be responsible for the design of all impacted AE chilled water infrastructure as a result of the ALR Project.

Relocated chilled water systems will require a hydraulic study to be coordinated with Austin Energy. The replacement and relocation will only be permitted upon written approval by AE District Energy & Cooling.

ATP will be responsible for the construction of all impacted AE chilled water infrastructure as a result of the ALR Project.

2.5.5.3 Design “Supporting Construction Documents”

If exposing AE pipe, vaults, valves, fiber conduits and any other appurtenance of AE chilled water transmission lines, all listed are to be supported per best practice standards for weight, size, and type. Support mechanism shall be submitted to and reviewed by AE DEC before implementation for each crossing.

AE DEC shall have access to all AE vaults and valves at all times unless otherwise approved in writing. Each valve and vault will be approved individually.

2.5.5.4 Inspection Criteria

ATP will work with the AE to determine inspection needs on the ALR Project. If inspection is needed / required all requests will follow standards for such services. An AE inspector must always be onsite for any installations and relocations impacting their utilities.

2.5.5.5 Record Drawings

The Engineer of Record shall submit record drawings and intersection field sketches, to ATP using Section 1.12 Record Drawings of this document, as guidance.

2.6 Transportation and Public Works Department (TPW) – Traffic Signals

Traffic signals and associated communication infrastructure within the City right-of-way are owned and operated by the Transportation and Public Works Department Arterial Management Division (TPW-Signals). Traffic signals within TxDOT right-of-way are typically owned by TxDOT and operated by the City of Austin under maintenance agreement. Overhead and underground traffic signal infrastructure requires standardized specifications for proper installation and operations. The UROP references the City of Austin Design Criteria for these items.

2.6.1 Design Criteria

All traffic signal infrastructure shall meet the minimum requirements in effect established by the Standard Specifications Manual, Standards Manual (details), Utilities Criteria Manual (UCM), and Transportation Criteria Manual (TCM) unless specifically approved otherwise by TPW-Signals. Additional design criteria for the placement of traffic signal equipment include the latest edition of the TxMUTCD and PROWAG. The National Electrical Safety Code (NESC) establishes the minimum design requirements regarding the design and installation of communication cables and other facilities on, underneath, or, in proximity to electric infrastructure. Further design criteria for traffic signal crossings will be developed between ATP, TPW, and TxDOT where applicable, as final design progresses.

ATP will be responsible for the design of all traffic signal infrastructure impacted as a result of the ALR Project. Traffic signals and associated infrastructure should be situated so as not to infringe on the clearance envelope around the OCS and LRT vehicle. Infrastructure that cannot be located outside the clearance envelope will be identified and ATP will work with TPW-Signals to develop operation and maintenance language to address these situations.

2.6.2 Inspection Criteria

ATP will work with TPW-Signals to determine inspection needs on the project. If inspection is needed / required, all requests will follow standards for such services mutually agreed to between ATP and TPW-Signals. A TPW-Signals Inspector must always be onsite for any installations and relocations impacting their utilities.

2.6.3 Record Drawings

The Engineer of Record shall submit record drawings and intersection field sketches, to ATP using Section 1.12 Record Drawings of this document, as guidance.

2.7 Transportation and Public Works Department (TPW) - Street & Bridge Operations

2.7.1 General Guidance

The following guidance is the recommended technical approach for Streets, Bridges, Culverts, Retaining Walls, Sidewalks, Ramps, and Trails related to utility construction from TPW.

2.7.2 Analysis & Evaluation

Analyze and evaluate existing conditions of Public Works infrastructure for the ALR Project using the latest guidance in codes, guides, and criteria from the City of Austin, TxDOT, AASHTO, FHWA, ACI, and other applicable industry standards for each type of infrastructure temporarily impacted by utility relocation.

2.7.3 Installation, Restoration, & Repair

All installation, restoration, and repair of Public Works infrastructure including but not limited to streets, bridges, culverts, retaining walls, sidewalks, ramps, and trails must follow City of Austin Standards, Specifications, Details, and Criteria.

2.7.4 Temporary Surface Infrastructure

Due to the extended timeframe of the ALR Project, it is likely that portions of surface restorations after utility relocations and adjustments will be of a temporary nature. Most of the existing pavements along the proposed routes are currently asphalt (flexible) pavements and will be repaired and restored in kind during this utility relocation phase of construction.

Although concrete outside bus lanes may be selected for the permanent pavement solution, asphaltic pavement will be used for temporary pavements. This interim solution of using an asphaltic (flexible) pavement will be acceptable for all lanes including bus lanes where utilities may be relocated years in advance of the guideway construction.

Any temporary infrastructure must be designed adequately to withstand traffic and use over the expected construction period including normal public use, anticipated excess loadings from construction activities, and construction and detoured traffic. The design period (life) and design capacity shall also consider a modest margin of overdesign for delays and unanticipated traffic or loadings respectively.

2.7.5 Design Criteria

2.7.5.1 General

All Public Works infrastructure shall meet the minimum requirements in affect established in the Standard Specifications Manual, Standards Manual (details), Utilities Criteria Manual (UCM), and Transportation Criteria Manual (TCM) unless specifically approved otherwise by TPW for temporary construction as a result of utility relocation and mutually agreed to between ATP and COA.

2.7.5.2 Pavements

Pavements temporarily affected by utility relocations and adjustments shall be restored per the UCM standard criteria. All utility plans will include, at a minimum, the Street & Bridge Standard Surface Restoration Plan Notes and applicable standard details. Additional details will be developed during the design development phase in cooperation between ATP and COA.

Any new or temporary pavements will be designed per the new TCM Section 14: Pavement Design and Appendix B: Pavement Design Guidelines or applicable standards mutually agreed to between ATP and COA.

2.7.5.3 Sidewalks & Ramps

Sidewalks and ramps impacted by utility relocation must provide an ADA appropriate, temporary accessible path and/or detour per Local, State, and Federal requirements throughout the utility relocation and full construction period.

2.7.6 Inspection Criteria

Inspection and testing of all surface infrastructure shall be in accordance with the appropriate sections of the Standard Specifications Manual as mutually agreed to between ATP and COA.

2.7.7 Standard Restoration Plan Notes

The standard surface restoration notes in the UCM: [5.9.0 - PAVEMENT AND SURFACE STRUCTURE REPAIRS | Utilities Criteria Manual | Austin, TX | Municode Library](#) will be used on all utility relocation plans that affect any Public Works infrastructure as agreed to between ATP and COA. Applicable sections of the TCM will also apply.

2.8 Austin Bergstrom International Airport (AUS)

1. The City of Austin owns and operates AUS in accordance with local and national standards (COA, TSA, FAA, etc.). These standards are sometimes different from local standards and will take precedent over this rule of practice in the event of a conflict.
2. Drainage and Water quality is managed on site using a series of onsite infrastructure and through regional management approaches. All designs, construction, and/or impervious cover, on all AUS property, will need to follow this approach. Any impacts to current or approved plans for storm water infrastructure on AUS property will be the responsibility of ATP to mitigate.
3. Management of utilities is done through a utility corridor management program. All water, wastewater, and dry utilities, that are maintained by the utility owner, are placed inside a utility corridor managed by AUS. Any conflicts as a result of the LRT construction to these utilities will need to be mitigated in accordance with that utility's standards and agreements.

3 Utility Relocation Typical Sections

As part of the UROP, utility conflicts will be highlighted using various typical sections found in the ALR Project design for underground utilities that are: 1) perpendicular crossing (including skewed crossing criteria), 2) parallel running under the guideway, 3) retaining wall cut sections (also referred to as U Section), and 4) retaining wall fill sections.

Note: All utilities will need to be relocated outside of the UFZ.

1. Austin Energy Transmission and Distribution overhead systems are not covered in the typical sections in Section 3. All required clearance will be achieved through the design. If a variance is needed, AE and ATP agree to work cooperatively to reach

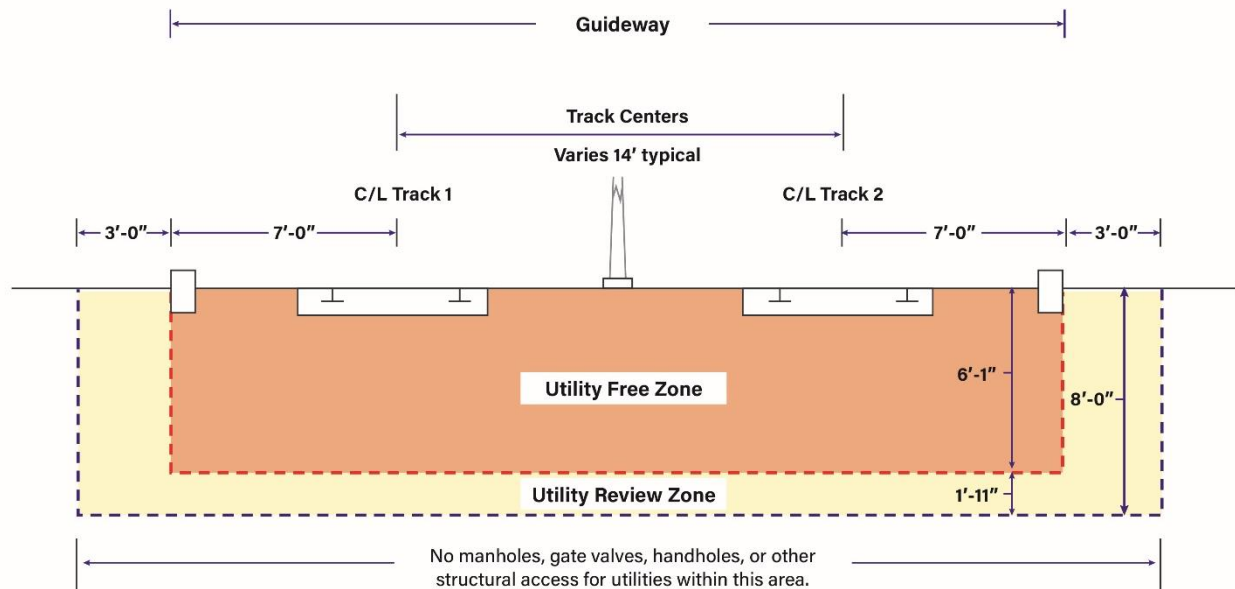
resolution on the issue. All relocation of these utilities will follow the Utilities Criteria Manual Section-1 for Austin Energy Design Criteria here - [Mini TOC: SECTION 1 - AUSTIN ENERGY DESIGN CRITERIA | Utilities Criteria Manual | Austin, TX | Municode Library](#) and Utilities Criteria Manual Section-6 for Austin Energy Pole Attachments here - [SECTION 6 - AUSTIN ENERGY POLE ATTACHMENTS | Utilities Criteria Manual | Austin, TX | Municode Library](#).

2. Elevated guideway sections are not covered in the typical sections in Section 3. Situations where footings and associated infrastructure to support the guideway impact existing utilities will be managed in the design process and will be mitigated on a case-by-case basis. ATP and the affected utility owners agree to work cooperatively to resolve utility conflicts.
3. See Section 2.4.1.2 Stormwater Design Criteria for Conveyance, Flooding and Water Quality participation from ATP.

3.1 Perpendicular & Skewed Crossings (Underground)

Perpendicular crossings are defined as any utility crossing ranging from forty-five to ninety degrees across the LRT guideway, where a ninety-degree crossing is perpendicular to the LRT guideway. Skewed crossings are defined as any utility crossing with an angle of intersection greater than five degrees and less than forty-five degrees, where a zero-degree crossing is parallel to the guideway. It is the intent of the UROP to shorten all crossings that are skewed to a minimum of forty-five degrees to a desirable ninety degrees which would provide the shortest crossing of the guideway. All skewed crossings will be reviewed with the utility owner prior to making any final decisions on relocation of the utility.

Figure 3: Perpendicular Crossing to Guideway



3.1.1 Wastewater

1. All existing perpendicular gravity wastewater mains that will remain in the URZ or below the URZ will have a condition assessment (criteria agreed to by ATP and AW) to evaluate structural integrity of the pipe.
2. Existing perpendicular gravity wastewater mains that will remain in the URZ and agreed to be in good condition will be evaluated for suitability for encasement with a split casing. Suitable pipes include PVC pipe less than 24-inches in diameter and less than 20-years old. Other installations will be reviewed by ATP and AW on a case-by-case basis for suitability. Pipes not deemed suitable will be replaced and placed into a continuous casing pipe. Consideration of betterments or cost-sharing will be reviewed on a case-by-case basis for these situations.
 - a. The end of the casing pipe will be extended to a minimum distance of 10 feet from the center line of the nearest LRT track. Situations where large pipes and infrastructure are being encased, the end of the casing pipe will be reviewed by ATP and AW to determine the appropriate termination of the casing pipe.
3. A special detail for split casing will be developed by ATP and reviewed and approved by AW during final design. The detail will address end seals, allowable casing pipe joint deflection, sealing casing pipe joints, poly-wrapping casing pipe, and joint restraint installation for carrier pipe.
4. All existing perpendicular gravity wastewater mains that will remain below the URZ and agreed to be in good condition, with access (manhole) within the guideway will have the access relocated outside the guideway to a minimum distance of 10 feet with a desired distance of 13 feet from the center line of the nearest LRT track. The existing mains will be replaced and placed into a continuous casing pipe. If only a portion of the pipe requires reconstruction to make the new connections, the remaining existing pipe may be left in place and casing pipe will not be used.
5. All existing perpendicular gravity wastewater mains that will remain below the URZ and agreed to be in good condition, where access locations are outside of the guideway a minimum distance of 10 feet from the center line of the nearest LRT track, will remain in place with no further action needed. Situations where large pipes and access are located between 10 feet and 13 feet from the center line of the nearest LRT track will be reviewed by ATP and AW on a case-by-case basis for relocation.
 - a. This is applicable to PVC pipe; other pipe materials will be reviewed on a case-by-case basis. Where suitable, gravity wastewater mains may be lined using in situ technologies to allow the pipe to remain in place without a casing pipe.
6. Written agreement between ATP and the City will be developed prior to construction that details how AW will access pipes that remain under the guideway and are not encased in the event of a failure.
7. All existing perpendicular gravity wastewater mains that will remain under the guideway at any depth agreed to be in poor condition or of a material that is no longer approved by AW will be replaced and placed into a continuous casing pipe. The end of the casing pipe will be extended to a minimum distance of 10 feet from the center line of the

nearest LRT track. Situations where large pipes and infrastructure are being encased, the end of the casing pipe will be reviewed by ATP and the City to determine the appropriate termination of the casing pipe. Consideration of betterments will be reviewed on a case-by-case basis for these situations.

8. All new metal casing pipe installed by open cut will be double-wrapped in 8 mil poly-wrap for corrosion control. If desired in addition to double poly-wrap, cathodic protection may be installed. A written agreement will be developed prior to construction to define where cathodic protection is installed and ATP's responsibilities for maintenance and reporting.
9. All new lift stations and force mains proposed for replacement of a gravity wastewater line will be reviewed by AW on a case-by case basis. ATP will prepare an evaluation that addresses feasibility and constructability of both a gravity solution as well as a pumped solution. Alternative assessment criteria will include constructability, capital cost, and 30-year life cycle operating cost. New lift stations will include odor control. New force main piping material will be polyethylene.
10. Offset manholes will not be used on AW infrastructure.
11. All wastewater crossings that cross the guideway on a skew and in conflict with the LRT construction will be reviewed to reduce the skew angle on a case-by-case basis. Skewed crossings will be allowed if the wastewater system is in good condition and access locations are outside the URZ width.

3.1.2 Stormwater

1. All storm drains that will remain in the URZ will be reviewed to determine what Class of pipe is required. If the existing pipe is less than Class IV it will be reviewed for condition and replaced, if necessary, and upsized to meet LDC for conveyance to a logical termination point with a minimum Class IV pipe.
2. All manholes or other access to stormwater systems shall be located a minimum distance of 10 feet from the centerline of the nearest LRT track. Situations where large pipes and access are located between 10 feet and 15 feet from the center line of the nearest LRT track will be reviewed by ATP and WPD on a case-by-case basis for relocation.
3. All existing perpendicular storm drains that are: 1) non-impacted by ALR Project, 2) will remain below the URZ, 3) agreed to be in good condition, and 4) with access locations outside of the guideway a minimum distance of 10 feet from the center line of the nearest LRT track, will remain in place with no further action needed. Unless otherwise required by code or specified herein as "impacted storm drains" (see section 2.4.1.3) indicating upgrade to provided, additional upsizing to meet existing conveyance issues will be considered a betterment.
4. All existing storm drains that cross the guideway on a skew and in conflict with the LRT construction will be reviewed to reduce the skew angle on a case-by-case basis. Skewed crossings will be allowed if the stormwater system is in good condition and access locations are outside the URZ width.

3.1.3 Pressurized Water Systems (Potable, Cooling, Reclaimed, Chilled Water, & Force Main)

1. All existing perpendicular pressurized water mains located in either the UFZ or URZ will be replaced and relocated below the URZ. In addition, the section of new pipe that remains below the URZ will be placed into a solid continuous casing pipe. The end of the casing pipe will be extended to a minimum distance of 10 feet from the center line of the nearest LRT track. In situations where large pipes and infrastructure are being relocated, the end of the casing pipe will be reviewed by ATP and the City to determine the appropriate termination of the casing pipe. The new pipe will connect to a new gate-valve located outside a minimum distance of 13 feet or more, from the center line of the nearest LRT track, and/ or connected to an existing gate-valve or shutoff valve based on its location. All new valves must be accessible by a vehicle for valve exercising and maintenance.
2. All existing perpendicular pressurized mains below the URZ will have a condition assessment (criteria agreed to by ATP and the City) to evaluate structural integrity of the pipe. Pipes agreed to be in good condition will be evaluated for suitability for encasement with split casing. Suitable pipes include ductile iron or PVC pipe less than 24-inches in diameter. A determination of age for specific material will be evaluated as part of the condition assessment. Other installations will be reviewed by ATP and AW on a case-by-case basis. The end of the casing pipe will be extended to a minimum distance of 10 feet from the center line of the nearest LRT track.
3. A special detail for split casing will be developed by ATP and reviewed and approved by AW during final design. The detail will address end seals, allowable casing pipe joint deflection, sealing casing pipe joints, poly-wrapping casing pipe, and joint restraint installation for carrier pipe.
4. All existing perpendicular pressurized mains that are rated in poor condition after the condition assessment or of a material that is no longer approved by AW or AE will be replaced and placed into a continuous casing pipe. The end of the casing pipe will be extended to a minimum distance of 10 feet from the center line of the nearest LRT track. Consideration of betterments will be reviewed on a case-by-case basis for these situations.
5. All new metal piping and all new metal casing pipe installed by open cut shall be double-wrapped in 8 mil poly-wrap for corrosion control. If desired, in addition to double poly-wrap, cathodic protection may be installed. A written agreement will be developed during the design process to define where cathodic protection will be installed and ATP's responsibilities for maintenance and reporting.
6. All pressurized water crossings that cross the guideway on a skew and in conflict with the LRT construction will be reviewed to reduce the skew angle. Skewed crossings will be allowed if the pressurized water system is in good condition, the system is located below the URZ, and access locations are outside the URZ width.
7. If bends are installed in the waterline, the casing pipe will extend from as close as practical (allowing space for end seal and workspace) from bend to bend beneath the guideway. The casing pipe shall be a minimum of 3 feet away from the bend.

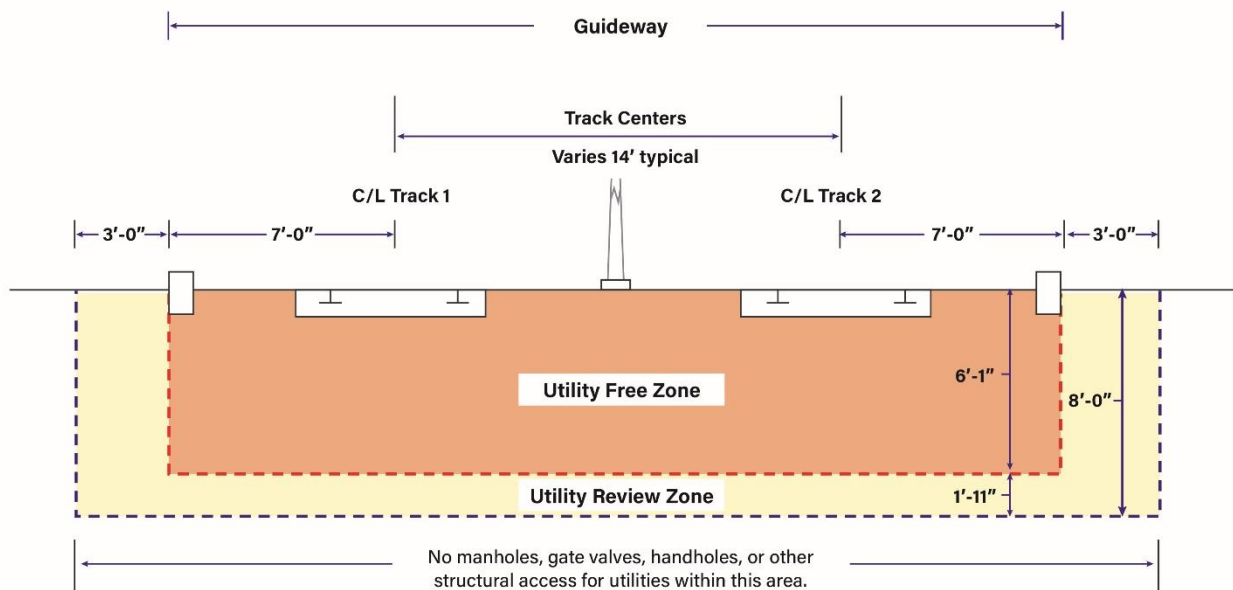
3.1.4 Electrical Underground (Street Lights, Electric Distribution, & Traffic Signal)

1. All pipe and conduit crossings shall be located below the UFZ
2. All manholes, handholes or other access to electric systems shall be located outside of the width of the URZ.
3. Traffic signal conduit, signal poles, and manholes/handholes may be located inside UFZ when it's not feasible to locate them outside of UFZ. Where feasible, manholes/handholes shall be located a minimum distance of 10 ft from nearest track center.
4. Pipe and conduit crossings can remain in the URZ. Those systems that remain in the URZ will have a condition assessment to determine replacement or not.
5. All pipe and conduits that cross the guideway on a skew and in conflict with the LRT construction will be reviewed to reduce the skew angle. Skewed crossings will be allowed if the pipe and conduit is in good condition and access locations are outside the URZ.

3.2 Parallel & Longitudinal (Underground)

Parallel utilities are defined as any utility parallel to the LRT guideway at a zero to five-degree angle, where a zero-degree angle is parallel to the LRT guideway. In most instances utilities running parallel to the guideway and within the URZ will likely need all or a portion of the system to be relocated due to the access locations falling within the URZ. A review of the systems will need to be done on a case-by-case basis to determine the most cost-effective solution with respect to relocation.

Figure 4: Parallel & Longitudinal Crossing to Guideway



3.2.1 Wastewater

1. All existing parallel gravity wastewater mains under the guideway regardless of depth with access within the URZ will be relocated with a new pipe meeting the current standards outside the guideway a minimum distance of 13 feet from the center line of the nearest LRT track. No casing pipe will be required for the new relocated parallel pipe.
2. Larger existing parallel gravity wastewater mains (generally 24 inches or larger) that are located between 10 feet and 13 feet from the center line of the nearest LRT track will be reviewed by ATP and AW on a case-by-case basis for relocation.
3. Manholes located between 10 feet and 13 feet from the center line of the nearest LRT track will be reviewed on a case-by-case basis for relocation because of size and depth.
4. All wastewater force mains fall under pressurized lines. See Section 3.2.3 for details.

3.2.2 Stormwater

1. All existing parallel storm drains located under the guideway with access within the guideway width, will be relocated with a new pipe meeting the current standards outside the guideway, a minimum of 10 feet from the center line of the nearest LRT track with a desired 15 feet. Deep storm drain facilities will be reviewed on a case-by-case basis. No casing pipe will be required for the new relocated parallel pipe.
2. Larger existing parallel storm drains (24 inches or larger) that are located between 10 feet and 13 feet from the center line of the nearest LRT track will be reviewed by ATP and WPD on a case-by-case basis for relocation.

3.2.3 Pressurized Water Systems (Potable, Cooling, Reclaimed, Chilled Water, & Force Main)

1. All existing parallel pressurized mains located under the guideway regardless of depth, with access within the guideway width, will be relocated with a new pipe meeting the current standards outside the guideway, a minimum of 13' from the center line of the nearest LRT track. No casing pipe will be required for the new relocated parallel pipe.
2. Larger existing parallel pressurized mains (24 inches or larger) that are located between 10 feet and 13 feet from the center line of the nearest LRT track will be reviewed by ATP and AW and AE (chilled water) on a case-by-case basis for relocation.

3.2.4 Electrical Underground (Street Lights, Electric Distribution, & Traffic Signal)

1. All AE manholes, handholes or other access to electric systems shall be located a minimum distance of 10 feet from the center line of the nearest LRT track.
2. Traffic signal conduit and manholes/handholes may be located inside UFZ when it's not feasible to locate them outside of UFZ. Where feasible, manholes/handholes shall be located 10 ft from nearest track center.

3. Portions of parallel running conduit or pipe can remain in the URZ if access locations are a minimum distance of 10 feet from the centerline of the nearest LRT track. Those systems that remain in the URZ will have a condition assessment to evaluate structural integrity of the conduit or pipe.

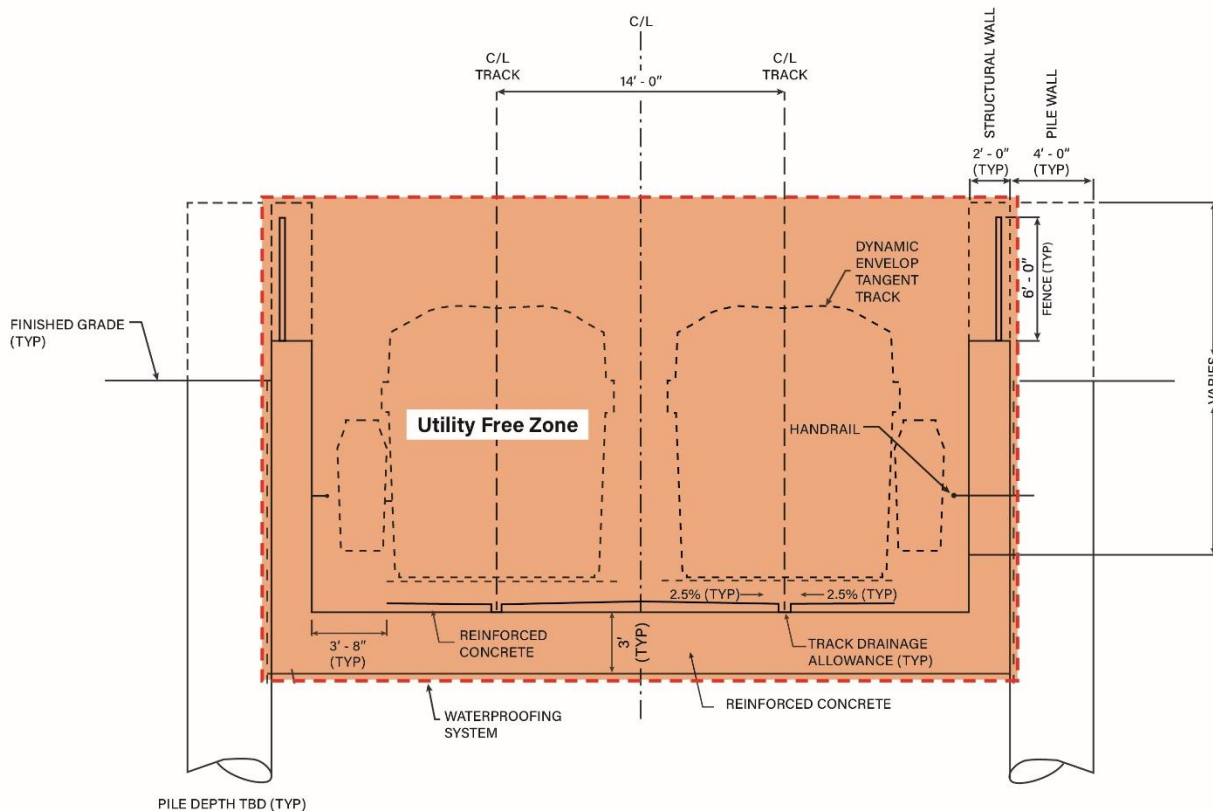
3.3 Retaining Wall

3.3.1 Retaining Wall (Cut)

Structures that are constructed within the right-of-way or in easements will present challenges for utilities adjacent to those structures. Design of structures to be constructed in the right-of-way and in easements is governed by Section 13 of the Transportation Criteria Manual. The impacts of constructing retaining walls adjacent to utilities will be reviewed on a case-by-case basis.

NOTE: All parallel utilities located under the guideway will need to be relocated in these sections. Perpendicular utility crossings under the retaining wall section will be reviewed on a case-by-case basis to determine if they need to be relocated. Utility Review Zone is defined by the retaining wall design. Parallel utilities outside the retaining wall section will be reviewed on a case-by-case basis depending on the retaining wall design.

Figure 5: Retaining Wall Cut Cross-Section

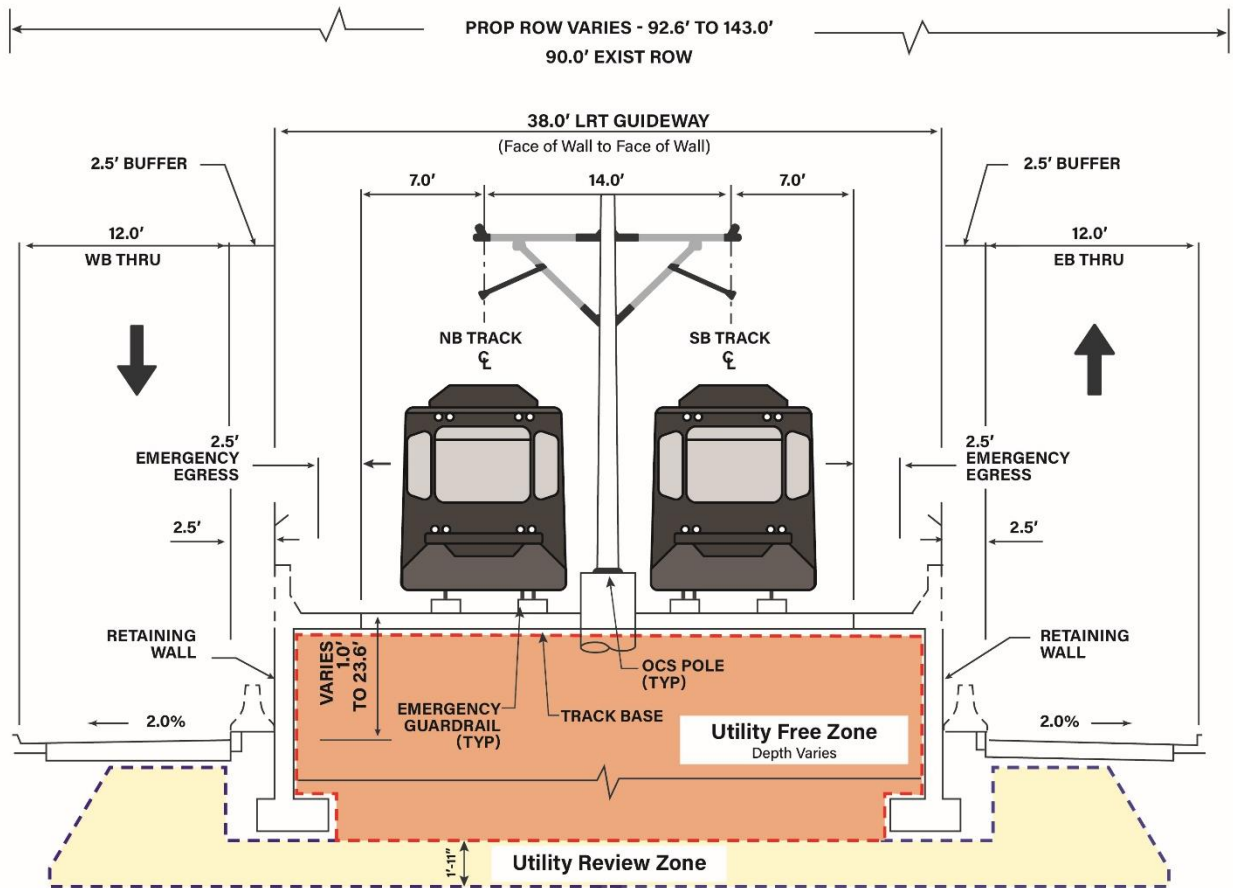


3.3.2 Retaining Wall (Fill)

Structures that are constructed within the right-of-way or in easements will present challenges for utilities adjacent to those structures. Design of structures to be constructed in the right-of-way and in easements is governed by Section 13 of the Transportation Criteria Manual. The impacts of constructing retaining walls structures adjacent to utilities will be reviewed on a case-by-case basis.

NOTE: All parallel utilities located under the guideway will need to be relocated in these sections. Perpendicular utility crossings under the retaining wall section will be reviewed on a case-by-case basis to determine if they need to be relocated. Utility Review Zone is defined by the retaining wall design. Parallel utilities outside the retaining wall section will be reviewed on a case-by-case basis depending on the retaining wall design.

Figure 6: Retaining Wall Fill Cross-Section



APPENDIX 'A'

Sample Utility Tracking Matrix (UTM)

DRAFT UTILITY TRACKING MATRIX																				
PLAN SHEET NO.	FACILITY INFO			CONFLICT LOCATION								SUE			CONFLICT ASSESSMENT			COMMENTS		
	Size / Material	Description / Age / condition	FACILITY OWNER(S)	Roadway / Alignment (Stationing is off of SB Track)	Length (ft)	Segment Direction	Begin Station	Offset (ft)	LT / RT	End Station	Offset (ft)	LT / RT	UTILITY ORIENTATION	CURRENT SUE QUALITY LEVEL	DATE OF SUE	CONFLICT (Y/N)	REASON FOR CONFLICT		PROTECT IN PLACE, RELOCATE, ABANDON, AVOID	REPLACE-IN-KIND, COST PARTICIPATION, BETTERMENT
SEGMENT [1] S Congress																				
FROM: Long Bow LN (ALR NB 91+12)				S CONGRESS AVE				TO: E Riverside DR (ALR NB 10+00)												
1	1" FOC	Duct	Zayo	SB Track	1174		91+33	34.8	LT	79+59	33.6	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate	Replace-In-Kind	
1	1" FOC	Duct	ATT	SB Track	795		91+33	36.0	LT	83+38	36.8	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	1071		91+33	46.0	LT	80+62	39.3	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate	Replace-In-Kind	
1	Unknown	Gas	TGS	SB Track	88		90+48	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	8" PVC	Wastewater	COA	SB Track	1213		90+20	22.1	LT	78+07	67.5	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate	Replace-In-Kind	
1	12" CI	Water	COA	SB Track	71		90+05	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	107		89+95	-	-	-	-	-	Crossing (Skewed)	D	2022	Y	Crossing Over UFZ	Relocate	Replace-In-Kind	
1	8" PVC	Wastewater	COA	SB Track	74		89+37	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	96		87+08	-	-	-	-	-	Crossing (skewed)	A	2022	Y	Crossing Over UFZ	Relocate	Replace-In-Kind	
1	Unknown	Gas	TGS	SB Track	95		85+82	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	94		84+64	-	-	-	-	-	Crossing	D	2022	Y	Crossing Over UFZ	Relocate	Replace-In-Kind	
1	2" CS	Gas	TGS	SB Track	291		83+13	2.3	LT	80+22	7.8	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate	Replace-In-Kind	
1	2" CS	Gas	TGS	SB Track	20		83+13	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	Centurylink	SB Track	95		83+10	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	24" CI	Water	COA	SB Track	78		82+78	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	61		82+65	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	Centurylink	SB Track	71		82+57	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	1" FOC	Duct	Zayo	SB Track	20		82+57	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	Verizon MCI, ATT, Centurylink	SB Track	75		82+54	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	133		81+31	-	-	-	-	-	Crossing	A	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	6" CI	Water	COA	SB Track	77		80+31	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate and Upsize to 8" WL		
1	Unknown BS	Gas	TGS	SB Track	31		80+27	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	100		78+79	-	-	-	-	-	Crossing	A	2022	Y	Crossing Over Tracks	Relocate	Replace-In-Kind	
1	10" CI	Water	COA	SB Track	100		78+75	-	-	78+16	-	-	Crossing (skewed)	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	Unknown	Gas	TGS	SB Track	110		75+17	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	2" CS	Gas	TGS	SB Track	71		71+71	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	2" CI	Water	COA	SB Track	146		71+71	-	-	70+91	-	-	Crossing (Skewed)	D	2022	Y	Crossing Under UFZ	Relocate and upsize to 8" WL		
1	8" PVC	Wastewater	COA	SB Track	160		71+87	-	-	70+32	-	-	Crossing (Skewed)	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	10" CI	Water	COA	SB Track	95		70+86	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	43		70+69	-	-	-	-	-	Crossing (Skewed)	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	6" UNK	Wastewater	COA	SB Track	572		70+29	16.4	LT	64+57	59.5	LT	Longitudinal	D	2022	Y	Longitudinal Under UFZ	Relocate and Upsize to 8" WWL		
1	8" UNK	Wastewater	COA	SB Track	36		67+23	-	-	-	-	-	Crossing (Skewed)	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	6" CI	Water	COA	SB Track	67		64+80	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate and Upsize to 8" WL		
1	12" BS	Gas	TGS	SB Track	251		64+33	57.0	LT	61+82	56.8	LT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	1.25" WI	Gas	TGS	SB Track	174		64+16	32.9	RT	62+42	33.1	RT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	4" CS	Gas	TGS	SB Track	63		61+79	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	6" CI	Water	COA	SB Track	119		58+41	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate and Upsize to 8" WL		
1	4" FOC	Duct	ATT	SB Track	81		58+33	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	1.25" PE	Gas	TGS	SB Track	133		58+16	35.5	RT	56+83	35.7	RT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	OH Electric Line	OH Electric Distribution	AE	SB Track	170		55+08	-	-	-	-	-	Crossing	A	2022	Y	Crossing Over UFZ	Underground	Replace-In-Kind	
1	8" CI	Water	COA	SB Track	58		54+68	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	6" CI	Water	COA	SB Track	52		51+33	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate and Upsize to 8" WL		
1	12" CI	Water	COA	SB Track	676		51+05	27.6	RT	44+29	30.5	RT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	6" PE	Gas	TGS	SB Track	1401		50+89	44.6	LT	36+88	38.5	RT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	4" FOC	Duct	CenturyLink	SB Track	50		48+00	-	-	-	-	-	Crossing	D	2022	Y	Crossing Over UFZ	Relocate	Replace-In-Kind	
1	8" DI	Water	COA	SB Track	44		47+82	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	44		47+64	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	44		47+50	-	-	-	-	-	Crossing	D	2022	Y	Crossing Under UFZ	Relocate	Replace-In-Kind	
1	4" FOC	Duct	ATT	SB Track	1411		47+46	36.7	LT	33+35	52.5	LT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	
1	8" PVC	Wastewater	COA	SB Track	249		42+94	35.7	LT	40+45	35.3	LT	Longitudinal	D	2022	Y	Cascading Impact	Relocate	Replace-In-Kind	