



Preliminary Engineering Geotechnical Inventory and Concept Design Report – 10% Level

GPC6, C-2012668-02, Task Order #39 Dallas CBD Second Light
Rail Alignment (D2 Subway)

First Draft – For Review Only

Dallas, TX
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This Report was Prepared for DART
General Planning Consultant Six Managed by HDR



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- Attachment B. TM 6 – Cavern Final Lining Loads
- Attachment C. TM 8 – Assessment of Minimum Rock Cover Over Crown
- Attachment D. TM 11 – Interim Geotechnical Memorandum for Critical Structures and Summary of Criteria



1 INTRODUCTION

This preliminary Geotechnical Inventory and Concept Design Report summarizes the current inventory of geotechnical information and provides compendium of the main design considerations for the construction of the underground portion of the DART D2 Light Rail Transit (LRT) project. The project is an undertaking of Dallas Area Rapid Transit (DART).

This report was prepared by General Planning Consultant Six (GPC6) and managed by HDR on behalf of DART.

The project alignment discussed in this report is based on the Locally Preferred Alignment (LPA) dated October 8, 2018 and draft boring logs available as of December 4, 2018.

This concept design report consists of a compilation of four Technical Memoranda (TMs) addressing relevant geotechnical issues associated with ground characterization, rock loading on station cavern final lining, assessment of minimum rock cover required over the cavern, and geotechnical evaluation of critical structures along the underground project alignment.

This report presents the TMs listed in Table 1-1. Each TM was based on the project alignment and geotechnical data available at the indicated time prepared.

Table 1-1. Summary of Technical Memoranda

Attachment	Technical Memorandum (First DRAFT)	Date prepared
A	TM 3 – Preliminary Ground Characterization	January 24, 2019
B	TM 6 – Cavern Final Lining Loads	September 28, 2018
C	TM 8 – Assessment of Minimum Rock Cover over Station Crown	September 28, 2018
D	TM 11 – Interim Geotechnical Memorandum for Critical Structures and Summary of Criteria	February 15, 2019

2 PROJECT DESCRIPTION

2.1 DART D2 Project Overview

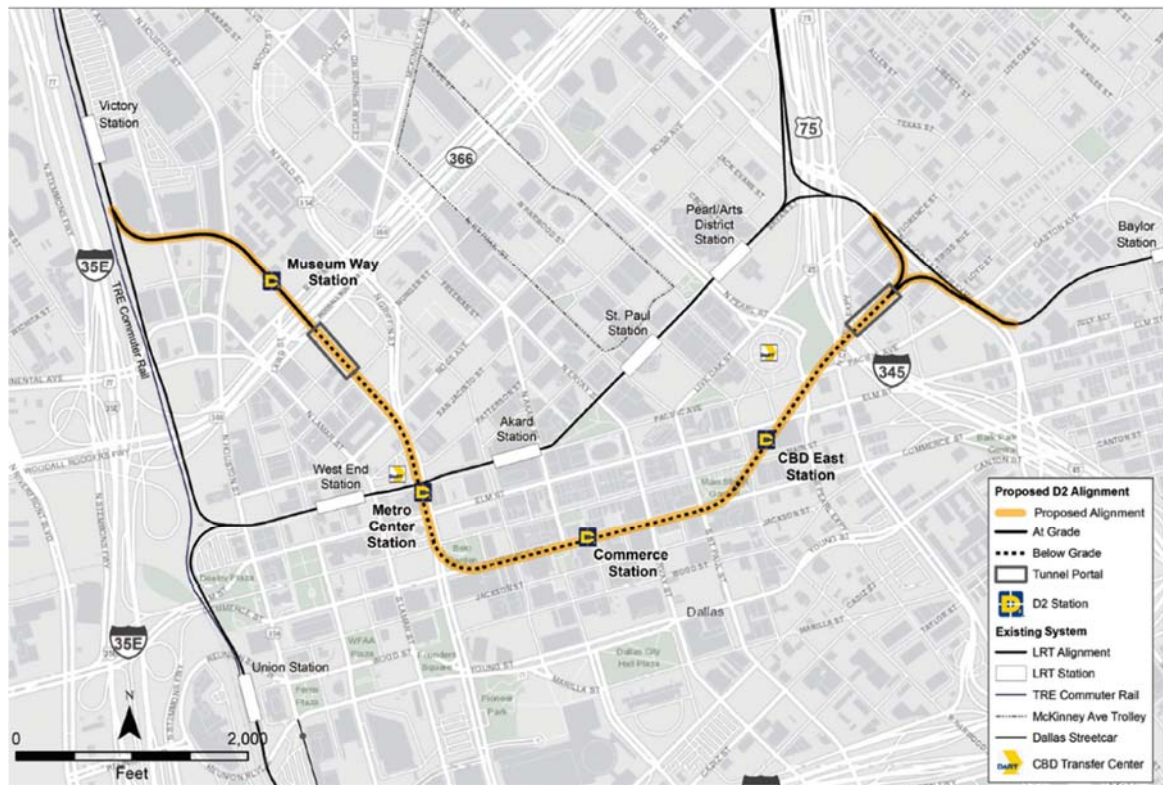
The DART D2 project is a planned light rail project within the central business district of Dallas, Texas. Figure 2-1 shows a project location plan. The 2.3-mile long Locally Preferred Alternative (LPA) extends generally east – west from Victory Park to Deep Ellum via Commerce Street and downtown Dallas. It ties into the existing DART Light Rail Transit system at Victory Avenue and at South Good-Latimer Expressway.

As configured as of October 8, 2018, the DART D2 LPA includes four stations, three of which are underground, along with underground cross passages and two tunnel portals. The



underground portion of the LPA, including tunnel portals, is 6,250 feet long. Depth from the ground surface to planned top of rail ranges from 53 feet to 68 feet, averaging about 59 feet. Subsequent alignment revisions are expected to lower the alignment at Commerce Station, shift to avoid the existing parking structure, and change the Metro Center and CBD East Stations to cut-and-cover construction methods.

Figure 2-1. DART D2 Project Location Plan



2.2 DART D2 Alignment

The alignment location plan shown in Figure 2-1 is the alignment current as of October 8, 2018. The alignment begins south of Victory Station, moves through a switch off the existing light rail alignment, and then proceeds in a southeasterly direction within DART-owned right-of-way in the center of Museum Way and through the parking lot adjacent to the Perot Museum of Nature and Science. Adjacent to the Perot Museum is an at-grade light rail station (Museum Way Station). After leaving the station, the alignment crosses under Woodall Rodgers Freeway at street level, and then begins its transition underground. The alignment enters a property currently occupied by a parking lot and descends into a tunnel. The alignment remains underground until IH 345. After passing under Hord Street near the Dallas World Aquarium, the alignment turns under North Griffin Street. Between San Jacinto Avenue and Elm Street is an underground station (Metro Center Station). This station will provide the ability to transfer to the existing DART West Transfer Center and the West End and Akard light rail stations.



After crossing under Main Street, the alignment turns east under Belo Garden and follows under Commerce Street. Another underground station is under Commerce Street approximately between Akard and Ervay (Commerce Station). After passing under St. Paul Street, the alignment turns northeast under Main Street Garden Park. The alignment crosses diagonally across city blocks, with another underground station (Central Business District (CBD) East Station) between Main Street and Elm Street. This station will provide opportunities to transfer to buses at the existing DART East Transfer Center.

After passing under Cesar Chavez Boulevard, the alignment begins the transition back to the surface. This transition is under IH 345 and along Swiss Avenue. Immediately after returning to the surface, the alignment comes to a switch that will allow trains to move either north or south along rebuilt Good-Latimer tracks.

The LPA current as of October 8, 2018, introduces four new stations, one surface station (Museum Way) and three underground stations (Metro Center, Commerce, and CBD East). The underground stations will be accessed by stairs, elevators and/or escalators and will include emergency egress and ventilation shafts.

3 PRELIMINARY DESIGN ANALYSES

A preliminary screening was performed for estimated settlement induced by planned tunnel construction. The following parameters were considered to determine locations potentially susceptible to settlement due to proposed underground construction of tunnels, portals and stations:

- Thickness of cover above tunnel crown
- Anticipated ground conditions
- Groundwater conditions
- Presence of utility and/or other buried potential obstructions along the underground alignment.
- Locations of historic or other sensitive structures with respect to proposed excavations
- Anticipated construction methods
- Anticipated dewatering requirements
- Anticipated maximum ground losses
- Anticipated future development

Based on this preliminary screening, we conclude that the U-section approach and shallow cut-and-cover structures at both portals would be sensitive to ground displacement during excavation.

Preliminary design analyses will be performed after receipt of finalized site-specific geotechnical data and as-built building foundation records.



TM 11 presents an interim geotechnical evaluation of critical structures, including preliminary design parameters and design pressure diagrams. Design analyses for foundations, retaining walls, and support of excavations for underground guideway U-sections and cut-and-cover box sections will be performed after receipt of the final Geotechnical Data Report. The preliminary draft geotechnical design parameters presented in TM 11 were developed from draft project geotechnical data as well as data collected from other projects in the absence of the final Geotechnical Data Report. The draft data are not considered sufficiently reliable for completion of preliminary design analyses.

4 CONCEPT DESIGN

The First Draft Technical Memoranda provided in Attachments A, B, C, and D represent compendium of considerations of important design concepts associated with the underground elements of DART D2. During the subsequent 20 percent design phase, some of these TMs will be further developed as Geotechnical Design Memoranda, based on the updated project alignment and the final Geotechnical Data Report.

5 CONCLUSIONS

This report presents the current inventory of geotechnical information (TM 3) and provides compendium of main design considerations for the construction of the underground portion of the DART D2 LRT project, including rock support loading on the station cavern (TM 6), assessment of minimum required rock cover (TM 8), and a 10 percent-level summary of criteria for geotechnical analyses of critical structures (TM 11).

Design analyses for proposed foundations, retaining walls, and support of excavations will be performed after finalized site-specific geotechnical data and as-built foundation records are available. Analyses will include tunneling-induced settlement estimates for existing foundations systems and global stability of walls. These analyses should be based on the latest project alignment.



ATTACHMENT A

TM 3 – PRELIMINARY GROUND CHARACTERIZATION



ATTACHMENT B

TM 6 – Cavern Final Lining Loads



ATTACHMENT C

TM 8 – Assessment of Minimum Rock Cover Over Crown



ATTACHMENT D

TM 11 – Interim Geotechnical Memorandum for Critical Structures and Summary of Criteria