Dallas to Houston High-Speed Rail
Final Environmental Impact Statement

Final EIS:
Main Text II

Federal Railroad
Administration

3.11 Transportation

3.11.1 Introduction

The HSR system would interact with the existing transportation system of roadways, highways, railroads, transit facilities, pedestrian/bicycle facilities and aviation infrastructure. This section documents the existing conditions in the Study Area and the changes that would be necessary to accommodate the Project and what impacts to the existing transportation network would occur.

Because the Project would modify the existing transportation network, this section provides an assessment of existing and future regional traffic patterns and volumes, intersection conditions, connectivity to transit facilities and aviation and freight railroad operations.

3.11.2 Regulatory Context

Federal

FRA's *Procedures for Considering Environmental Impacts* states that EISs should consider possible impacts to all modes of transportation, including passenger and freight rail, as well as potential impacts to roadway traffic congestion.[1]

As described in 14 C.F.R. 77.9, FAA requires notification of certain proposed construction or the alteration of existing structures that may obstruct air navigation and/or navigational and communication facilities. Coordination with FAA is required for any activities that might affect airport operation or safety.

State Regulations

TxDOT has regulatory authority over all federal and state roadway systems in Texas. Any modifications would require review and approval by TxDOT. TxDOT maintains the Texas Rural Transportation Plan,[2]which includes transportation projects outside MPOs. The TxDOT Aviation Division, which provides assistance to general aviation airports, is notified along with FAA of any impacts to regional airports.

Local Regulations

Local (city or county) public works departments govern roads not under TxDOT jurisdiction.

3.11.3 Methodology

The following sections present the approach to data collection, assumptions regarding design elements of the Project and the evaluation of potential impacts. The existing transportation system conditions were documented by collecting data from transportation agencies and conducting an inventory of conditions in the Study Area. The transportation Study Area includes existing and proposed transportation infrastructure within a 1-mile buffer of the track centerline of the Project and a 1.5 mile buffer around the Dallas, Brazos Valley Intermediate and Houston Terminal Stations options to account for local traffic. Dallas and Houston traffic impact analysis guidelines included in **Table 3.11-1** were used to help determine the traffic impacts and mitigation.

[1] FRA, "Procedures for Considering Environmental Impacts," 64.Federal Register 28545, May 26, 1999.
[2] Current TRTP is available at: https://www.txdot.gov/government/reports/statewide-plan/trtp-2035-report.html

3.11.3.1 Local Framework

Relevant regional and local transportation plans and policies that guide transportation planning, funding and project implementation are listed in **Table 3.11-1**. These local plans and policies were considered in the preparation of this analysis.

Table 3.11-1: Regional and Local Transportation Plans and Policies

Plan or Policy	Summary
TEXAS	
Texas Rail Plan, 2019 Update (TxDOT)	Details the current status of the rail system (freight and passenger rail) in Texas, forecasts potential volume and identifies opportunities for improvement. The Dallas to Houston corridor was identified within the plan, and specifically the HSR system proposed by TCRR was identified as an initiative of the High-Speed Intercity Rail Program.
NCTCOG: Dallas, Ellis and Navarro Counties	
Texas Metropolitan Mobility Plan, September 2006 (NCTCOG)	The Texas Metropolitan Mobility Plan addresses statewide initiatives to quantify long-range needs in the larger metropolitan areas of the state and to develop a short-range prioritized listing of projects aimed at improving mobility, reducing traffic congestion and mitigating air quality impacts. This plan serves as a comprehensive, multi-modal blueprint for transportation systems and services in the DFW Metropolitan Area. The plan focuses on the magnitude of unmet transportation needs for the region and provides decision-makers with an estimate for additional funding needed.
Metropolitan Transportation Plan: Mobility 2045, June 2018 (NCTCOG)	Mobility 2045 guides the implementation of multi-modal transportation improvements, policies and programs in the 16-county DFW Metropolitan Planning Area through 2045. The plan was adopted June 2018 by the Regional Transportation Council. Mobility 2045 recognizes four HSR corridors, including Oklahoma City to south Texas, Fort Worth to Shreveport, Fort Worth to Dallas, and Dallas to Houston. The plan states, "the Dallas to Houston corridor has been identified as having the most potential for high-speed passenger rail service. An effort led by the private sector is analyzing the corridor for environmental impacts, alignment options, station locations, and funding options." The plan also recommends a "one seat" ride from South Texas to Houston, by connecting the grade-separated HSR corridors.
Vision North Texas 2050	Vision North Texas is a partnership of public, private and academic organizations with a focus on rail and coordinated investments in park-and-ride facilities, bicycle infrastructure and pedestrian amenities. It notes the importance of a regional coordination structure for project oversight and development of transportation demand management strategies. It also discusses the possibility of a regional bus system.
Dallas County	
DART 2040 Transit System Plan	The 2040 Transit System Plan is being developed using a phased approach. Phase One focuses on the bus network through a comprehensive operations analysis effort to identify efficiencies, improvements and to build ridership. Phase Two will evaluate longer-term projects and programs, integrate the bus recommendations and identify regional expansion opportunities.
D2: Dallas Central Business District Second Light Rail Alignment (DART)	The D2 Project is the future second DART light rail alignment through downtown Dallas. The D2 Project will increase system capacity, provide operational flexibility and serve new markets. It is a critical element of sustaining the DART system into the future by adding core capacity to the network.
Keep It Moving, Dallas (TxDOT)	TxDOT maintains this website to post information on transportation projects in the Dallas area. The website allows users to download engineering designs and schematics, public hearing notices and dates and other project-related documents.
Dallas Master Thoroughfare/Central Business District Plan	The Dallas Master Thoroughfare/Central Business District Plan is a long range plan to provide efficient flow of traffic throughout the City of Dallas. It provides both the dimensional and functional classifications of roadways.

Table 3.11-1: Regional and Local Transportation Plans and Policies	
Plan or Policy	**Summary**
Ellis County	
Ellis County Thoroughfare Plan	The Ellis County Thoroughfare Plan is a long-range plan for the projected traffic movement needs of the entire county for the next 25 to 30 years. In preparation for this anticipated growth, Ellis County updated its most recent Thoroughfare Plan in 2019. At public meetings held during the planning process, residents and county officials noted that rural roads are already being overwhelmed by traffic from new, predominantly residential communities in the county. According to the Thoroughfare Plan, community members expressed an interest in balancing future development and maintaining the county's rural feel. The plan also acknowledges the need to better connect with transit initiatives being planned in the region as future growth occurs, but it stops short of making specific recommendations on transit besides suggesting that the county continue to participate in regional transit discussions.
EnVision Midlothian 2025 (2018)	City of Midlothian's 2007 comprehensive plan update defines the community vision for Midlothian's future development, including a section on the future transportation needs of the city. The plan identifies a potential future commuter rail station in Midlothian as one of six key transportation issues that will face the city in the coming decades, since two of the passenger rail corridors that NCTCOG has studied would terminate in Midlothian.
City of Red Oak Downtown Vision Plan (2007)	In addition to the possibility of commuter rail, the plan suggests that the city should consider transit opportunities within the city, such as bus service, which may become necessary in the future. Bus service would be a valuable service to residents who do not own cars or can no longer drive.
City of Waxahachie 2016 Comprehensive Plan Addendum	The City of Waxahachie addresses the possibility of commuter rail to serve the city one day, since it was identified as a potential corridor in NCTCOG's rail study. One of the policies of the transportation section of Waxahachie's Comprehensive Plan is to pursue establishment of this regional transit system and to investigate the feasibility of complementing this with an internal transit system.
Heart of Texas COG: Freestone and Limestone Counties	
2017 Coordinated Regional Public Transportation Plan (HOTCOG)	This 2017 report projects a population increase of 19 percent from 2017 to 2035. The transit system for the region outside Waco is defined as “generally a demand response service.” Future HSR projects are not mentioned.
Connections 2040: The Waco Metropolitan Transportation Plan (HOTCOG)	Waco’s 2010 transportation plan update defines the community vision for the future transportation needs of the city. The plan identifies future passenger rail station (as an alternative to IH-35) as one of five principal transportation issues.
Brazos Valley Council of Governments: Grimes, Leon, and Madison Counties	
Coordinated Regional Public Transportation Plan (2017) (BVCOG)	This update to the 2011 report aims to create a reliable, cost-effective, efficient transportation network in the Brazos Valley region using the existing transportation resources throughout the region. The goal of this plan is to bring diverse resources together to expand and enhance transportation services while realizing cost savings through the consolidation of operating expenses. High-speed rail is not specifically referenced in the plan.
H-GAC: Waller and Harris Counties	
2040 Regional Transportation Plan (H-GAC)	H-GAC projects up to 4 million more residents and over 1.5 million more jobs in the region by 2040. The report reflects over $86 billion in revenue for the next 25 years. It lays out current conditions for the region’s roadway systems, transit system, bicycle/pedestrian system and freight system. A commuter rail line along US 290/Hempstead Highway is noted in the plan. HSR is not specifically mentioned in the plan.

Table 3.11-1: Regional and Local Transportation Plans and Policies	
Plan or Policy	**Summary**
METRONext	METRONext was a ballot proposition approved by voters in the METRO service area in November 2019. The referendum allows METRO to borrow up to $3.5 billion, repaid with future revenues from the agency's 1 percent sales tax within the transit service area. The proposition includes a plan for expansions across several types of transportation, investments in service and accessibility, and improved transit connections to the Houston Terminal Station. METRO is currently further defining the projects that would connect to the Houston Terminal Station and these projects have not been formally defined or approved. Projects in METRONext that are in H-GAC's RTP 2040 are included in **Table 3.11-35**.
Houston Bike Plan (2017)	This report covers bikeways in the Houston area network. The existing network has 495 miles of dedicated and shared bikeways, on-road and off-road. The future network would contain 1,789 miles of on-street and off-street facilities.
Houston Major Thoroughfare and Freeway Plan (MTFP)	The Houston MTFP is produced annually and is generally accepted as the basic guideline for implementation of major thoroughfare and highway improvements in the City. The MTFP does not address the construction schedule for roadway projects but identifies sections of roadways that are in need of expansion, either by lengthening or widening only.

Source: AECOM 2019

3.11.3.2 Freight Rail Facilities

All Build Alternatives would cross existing freight rail lines. Portions of the Project would also cross existing freight rail yards and operate parallel to existing freight rail tracks. Most interactions with existing freight rail lines would occur near Dallas and Houston. The Project would cross active, inactive and abandoned spurs and main lines of the following companies:

- BNSF
- UPRR
- TU Electric Big Brown Steam Electric Station Rail (TUEX)
- Texas Utilities General Company (TEXU)

Each freight rail line crossed by the Project was inventoried and existing operations and geometric conditions were collected. In conjunction with other data, such as surrounding development and environmental and engineering constraints, TCRR developed crossing configurations to span the existing freight rail infrastructure. This information was reviewed to assess the impact of the HSR system on existing freight and passenger rail systems.

3.11.3.3 Roadways, Intersections and Traffic Circulation

FRA evaluated the impact to intersections around the Dallas and Houston Terminal Stations from the Project. The evaluation was based on the conceptual station designs in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**[3] Existing daily and peak hour traffic volumes at selected locations were collected from TxDOT, NCTCOG, H-GAC and the municipal agencies in the Study Area. The 2040 roadway and transit network was developed from committed and planned changes to the transportation system, as detailed in NCTCOG's Mobility 2040 and H-GAC's 2040 Regional Transportation Plan. These plans provide a guide for maintaining and improving the current transportation system and identify priorities for transportation investments. Additionally, limited field reconnaissance was conducted in spring 2016 to confirm the existing roadway and transit network configuration.

[3] The Final Conceptual Engineering Design Report and the LOD include intersection improvements based on TCRR traffic analysis.

3.11.3.4 Roadway and Crossing Design Elements

As part of the conceptual design process TCRR used the following design guidelines.

The design of all roadways would comply with the design guidelines of the applicable regulatory authorities (i.e., city, county or TxDOT standards). For cases where the local jurisdictions have no design guidelines, the latest American Association of State Highway and Transportation Officials (AASHTO) design criteria would be used.[4]

The basis for all roadway design would use the TxDOT functional classification and comply with the TxDOT Roadway Design Manual.[5] The functional classification of each roadway is used to set the design speed; the roadway design manual provides the geometric requirements for any proposed modifications.

Additional information about Project design can be found in **Appendix F, TCRR Final Conceptual Engineering Report** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details**.

Existing and planned roadways that intersect the Study Area were compiled and classified as the following types of facilities:[6]

- **Interstate:** Interstates are the highest classification of arterials. Roadways in this functional classification category are officially designated as interstates by the USDOT.
- **Principal Arterial:** Principal arterials serve major centers of metropolitan areas, provide a high degree of mobility and can provide mobility through rural areas. Unlike their access-controlled counterparts (e.g., interstates and freeways), abutting land uses can be served directly.
- **Minor Arterial:** Minor arterials provide service for trips of moderate length, serve geographic areas that are smaller than principle arterials and offer connectivity to the higher arterial system.
- **Major and Minor Collectors:** Collectors gather traffic from local roads and funnel it to the arterial network.
- **Local Road:** Local roads are not intended for use in long distance travel, except at the origin or destination end of the trip, and they are often designed to discourage through traffic.

Each roadway was inventoried for daily traffic volumes, existing travel patterns, and geometric conditions. In conjunction with other data, such as surrounding development and transportation plans, environmental and engineering constraints and the availability of alternative routing, TCRR proposed revised configurations of the existing infrastructure relative to the Project (see **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**). The proposed configurations include:

- **Road under railway:** There are two conditions where this configuration would occur: (1) the road would be depressed (below grade) beneath the railway or (2) the road would remain at-grade while the railway would be elevated (viaduct).
- **Road over railway:** Either the road would be elevated to go over the railway or the road would remain at-grade and the railway would be depressed.
- **Relocation:** Existing road would be relocated to avoid conflict with the railway.
- **Road Adjustment:** —Existing road would be realigned to avoid conflict with the railway.
- **Reroute:** Public and private roadways, approaching from one or both sides of the railway, would be rerouted on new access roads (maintained by TCRR) to an alternate, nearby crossing.

[4] AASHTO, *Roadside Design Guide (RDG) 4th edition*, October 2011.
[5] TxDOT, *Roadway Design Manual*, Revised April 2018, http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf.
[6] FHWA, *Highway Functional Classification Concepts*, 2013.

- **Closure:** Private roadway on either side of the railway would be closed and traffic would be required to use existing alternate routes.

3.11.3.5 Roadway Traffic Operations Standards

Traffic analysis of roadways and intersections is based on the *Highway Capacity Manual* (HCM).[7] Level of Service (LOS) is the main unit of measure for reporting the operating quality of a roadway. The growth rates used to evaluate traffic impacts were based on the regional travel demand model results. The growth rates from the travel demand model are higher and thus more conservative than typical growth rates for developed areas. Roadways (including freeways) and intersections are rated from "A" through "F." LOS A is the highest operating condition where traffic flows at or above the posted speed limit, while LOS F is the lowest condition where there is frequent slowing of traffic and vehicles are bumper to bumper.

For freeway mainlines, the HCM methodology determines LOS based on the density of the freeway segment, which is the number of vehicles within the section of roadway for a period of time, presented in vehicles per mile per lane (v/mi/ln). For freeway-ramp junctions, the HCM methodology determines the LOS based on density of vehicles in the area of the freeway directly downstream or upstream of the analysis ramp, presented in v/mi/ln. **Table 3.11-2** presents the defined LOS threshold values for freeway sections and ramp junctions.

Table 3.11-2: Freeway Mainline and Ramp Junction Level of Service Description

Level of Service	Freeway Density Range (v/mi/ln)	Ramp (Merge and Diverge area) Density Range (v/mi/ln)
A	≤11	≤10
B	>11-18	>10-20
C	>18-26	>20-28
D	>26-35	>28-35
E	>35-45	>35
F	>45	Demand exceeds capacity

Source: Transportation Research Board 2010

Intersection LOS is based on anticipated delays at the intersection. The intersection delay thresholds for assigning peak hour LOS grades are shown in **Table 3.11-3**. TxDOT considers LOS E and F unacceptable.

Table 3.11-3: Intersection LOS Criteria

Level of Service	Control Delay[a] (seconds/vehicle)	
	Unsignalized Intersection	Signalized Intersection
A	≤10	≤10
B	>10-15	>10-20
C	>15-25	>20-35
D	>25-35	>35-55
E	>35-50	>55-80
F	>50	>80

Source: Transportation Research Board 2010

[a] Defined as delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue and the time needed for vehicles to accelerate to their desired speed.

[7] Transportation Research Board, *Fifth Edition Highway Capacity Manual*, 2010.

Based on a review of local agency and similar statewide projects, the following criteria were established to determine whether the Project would result is an adverse impact on a roadway or intersection:

- It would worsen segment or intersection LOS (in either AM or PM peak periods) from D or better to E or F.
- At a signalized intersection with a peak period LOS of E or F, it would increase average delay by at least 4 seconds.
- At an unsignalized intersection with a peak LOS of E or F, it would increase delay by 5 seconds or more (measured as average delay for all-way stop and for worst movement for a multi-way stop intersection) if the intersection satisfied at least one traffic signal warrant for more than 1 hour of the day.

Where impacts are identified, mitigation would be recommended to improve the quality of operations either to "without project" (No Build) or satisfactory levels, whichever is worse. For the transportation analysis, FRA evaluated three scenarios – No Build Alternative, the Build (the Project, including all Build Alternatives and Houston Terminal Station options), and the Build with modifications. FRA compared the No Build to the Build without modifications to identify where modifications and/or mitigation would be needed to bring the LOS to a level consistent with the No Build Alternative.

Horizon year 2040 traffic conditions at an impacted intersection would be sufficiently mitigated if, during both AM and PM peak hours, the average delay per vehicle falls within the limits of (b) and (c) above, or if the intersection LOS is restored to D or better. The AM peak hour is the hour with the highest volume between 7 AM and 9 AM, and the PM peak hour is the hour with the highest volume between 4 PM and 6 PM.

3.11.3.6 Traffic Forecasting for Horizon Year 2040

Future 2040 No Build and Build (or Project) traffic volumes were developed using the travel demand models from the local MPOs. The peak hour link volumes for each intersection approach were obtained from the 2040 model runs. Some links appeared to have volumes that were not specifically validated, so a maximum growth rate was set at 4.0 percent for Dallas and 2.2 percent for Houston based on historical growth rates. In the absence of travel demand model data for the Brazos Valley Intermediate Station, a 2.0 percent growth rate was used, based on historical growth rates in the area.

Synchro software was used to analyze the intersections, incorporating lane geometries, volumes, speeds and signal timing to analyze the intersection delay and to provide an LOS.[8]

3.11.3.7 Station Area Analysis

In order to determine traffic effects around terminal stations (Dallas Terminal Station and Houston Terminal Station options) and Brazos Valley Intermediate Station, estimation of future 2040 No Build traffic volumes was necessary. The 2040 volumes were obtained from the travel demand models of the MPO serving the area of the station. Volumes were generated for each Build Alternative and then added to the 2040 future year No Build volumes. The LOS for each Build Alternative was then compared to the LOS in the No Build Alternative. The impact of the Build Alternatives equals the Build Alternatives traffic volume minus the No Build volume. A positive number represents a negative impact, while a negative number represents a positive impact.

[8] Synchro is a standard software used by traffic engineers and is accepted by the City of Dallas, City of Houston, TxDOT and EPA.

In order to analyze the existing conditions of the local roadway network in proximity to the terminal stations (Dallas Terminal Station and Houston Terminal Station options), peak hour turning movement counts were collected at 54 intersections. Also, 24-hour segment volumes were collected at 26 roadway locations and 34 freeway and ramp locations in the Study Area surrounding the proposed stations in Dallas (one location) and Houston (one of three proposed locations).[9] The traffic counts were entered into Synchro to establish existing LOS.

3.11.3.8 Passenger Rail and Transit Facilities

Passenger rail and transit operations and ridership data were collected from Amtrak, DART, METRO and the Brazos Transit District. Existing and planned transit lines that would be crossed by the Project and/or would serve the terminal stations (Dallas Terminal Station and Houston Terminal Station options) were compiled. Each transit route was inventoried and existing headways and service areas were analyzed. This information was reviewed to assess the impact of the HSR system on existing transit systems.

3.11.3.9 Pedestrian and Bicycle Facilities

Data concerning bicycle and pedestrian facilities were collected from NCTCOG, H-GAC and the cities in the Study Area. On-road, non-motorized transportation facilities, including bike lanes, bike routes and multi-use paths or trails, were obtained from the inventory of roadway crossings discussed above. Facilities designed for use by bicycles, whether on-road or off-road, are defined as bikeways. All facilities in an existing roadway ROW are considered on-road. Off-road facilities, or facilities not within an existing roadway ROW, are discussed separately in **Section 3.17, Recreational Facilities**.

3.11.3.10 Aviation Facilities

Commercial and general aviation airports were identified through airport lists maintained by FAA.[10] Private airports were identified through aerial photography. Where airports were located within the Study Area, a runway protection zone (RPZ) analysis (based on the FAA Advisory Circular No. 150/5300-13) was conducted to ensure that the Project would not create an incompatible use within the RPZ. Additionally, approach surfaces defined by 14 C.F.R. 77 were examined against the Project to ensure no obstructions to imaginary airspace surfaces or hazards to air navigation would be created by the Project. This analysis assessed the height of the potential HSR system in the vicinity of the airports and their respective RPZs and approach surfaces in accordance with aforementioned reference documents.

3.11.4 Affected Environment

The purpose of this section is to provide an overview of the transportation system within the Study Area.

[9] Traffic counts were conducted in October 2015. The Houston Northwest Mall Terminal Option and Houston Industrial Site Terminal Option were proposed locations after traffic counts had been collected. While traffic counts were not collected in the immediate vicinity of these options, they are located within 1.3 miles of the Houston Northwest Transit Terminal Option. Therefore, data are anticipated to be similar for these locations.

[10] FAA, "Airport Data & Contact Information," January 20, 2020, http://www.faa.gov/airports/airport_safety/airportdata_5010/.

3.11.4.1 Dallas County

3.11.4.1.1 Freight Rail Network

While BNSF, UPRR, TUEX and TEXU all operate within Dallas County, only BNSF, UPRR and DART-owned railroads would be crossed by one or more of the Build Alternatives. As detailed in **Chapter 1.0, Introduction**, Amtrak's daily *Texas Eagle* between Chicago and San Antonio stops at Dallas Union Station, with the route extending to Los Angeles three days a week. Amtrak uses TRE, BNSF and UPRR tracks by agreement.

Table 3.11-4 identifies the locations in Dallas County where the Project would cross existing railroad tracks (freight or transit). Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-4: Railroad Crossings in Dallas County

Mapbook Page	Segment	Build Alternative	Owner of Railroad	Line Type	Line Status
2	1	A, B, C, D, E and F	DART	Business Lead	Active
2	1	A, B, C, D, E and F	DART	Spur Line	Pulled*
2	1	A, B, C, D, E and F	DART	Spur Line	Active
2	1	A, B, C, D, E and F	BNSF	Main Line	Active
2	1	A, B, C, D, E and F	UPRR	Spur Line	Inactive/Abandoned
3	1	A, B, C, D, E and F	UPRR	Spur Line	Active
3	1	A, B, C, D, E and F	UPRR	Spur Line	Active
3	1	A, B, C, D, E and F	BNSF	Main Line	Active
6	1	A, B, C, D, E and F	UPRR	Spur Line	Pulled[a]

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019
[a] A pulled rail line represents a track that has been physically removed.

3.11.4.1.2 Roadway Network

TxDOT (Dallas District), the City of Dallas and Dallas County are responsible for roadways within Dallas County. **Table 3.11-5** contains a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-38**. Roadway impacts are also identified in **Appendix D**, **Project Footprint Mapbook**.

Table 3.11-5: Roadways in Dallas County Study Area

Mapbook Page	Street Name	Classification	# Lanes	Segment	Build Alternative
1	Hotel Street	Major Collector	4	1	A, B, C, D, E and F
1	Cadiz Street	Principal Arterial	2	1	A, B, C, D, E and F
2	Corinth Street	Principal Arterial	4	1	A, B, C, D, E and F
2	Forest Street	Local Road	2	1	A, B, C, D, E and F
3	Cedar Crest Boulevard	Minor Arterial	6	1	A, B, C, D, E and F
3	Lenway Street	Local Road	2	1	A, B, C, D, E and F
3	Private Plant Maint. Road	Local Road	1	1	A, B, C, D, E and F
6	East Overton Road	Major Collector	6	1	A, B, C, D, E and F
6	Bulova Street	Local Road	2	1	A, B, C, D, E and F
6	Cotton Lane	Local Road	2	1	A, B, C, D, E and F
6	Shindoll Street	Local Road	2	1	A, B, C, D, E and F
6	Overton Court	Local Road	2	1	A, B, C, D, E and F

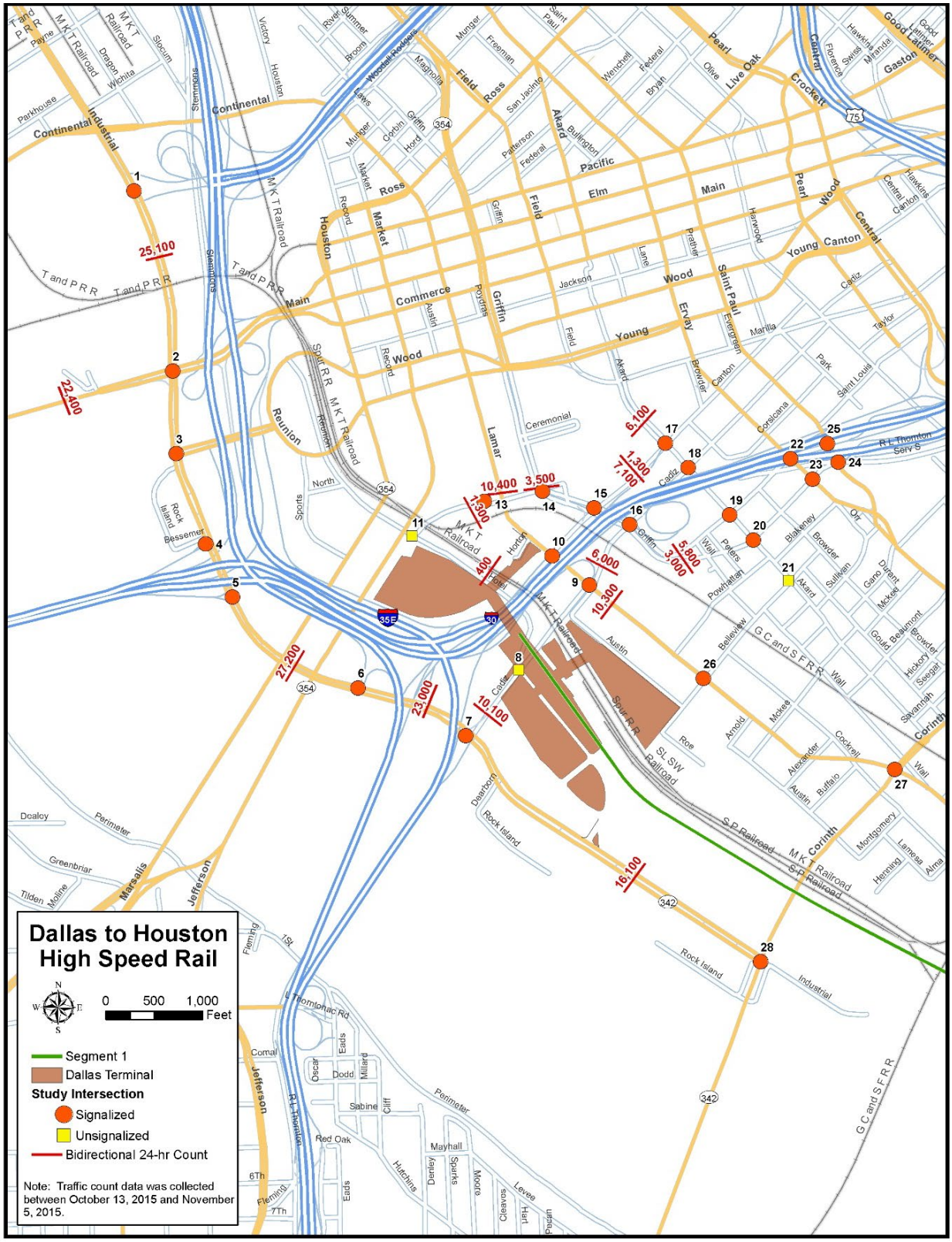
Table 3.11-5: Roadways in Dallas County Study Area					
Mapbook Page	**Street Name**	**Classification**	**# Lanes**	**Segment**	**Build Alternative**
6	Jaffee Street	Local Road	2	1	A, B, C, D, E and F
7	East Illinois Avenue	Principal Arterial	6[a]	1	A, B, C, D, E and F
7	Le Forge/Le May Avenue	Local Road	2	1	A, B, C, D, E and F
8	Mayforge Drive	Local Road	2	1	A, B, C, D, E and F
8	Loop 12	On-Ramp (SB to WB)	1	1	A, B, C, D, E and F
8	Loop 12	On-Ramp (EB to SB)	1	1	A, B, C, D, E and F
8	Loop 12	On-Ramp (EB to SB)	1	1	A, B, C, D, E and F
8	Loop 12	Principal Arterial (WB)	3	1	A, B, C, D, E and F
8	Loop 12	Principal Arterial (EB)	3	1	A, B, C, D, E and F
8	Loop 12	On-Ramp (SB to EB)	1	1	A, B, C, D, E and F
8	Loop 12	On-Ramp (SB to EB)	1	1	A, B, C, D, E and F
8	Loop 12	Off-Ramp (EB to SB)	1	1	A, B, C, D, E and F
10	Simpson Stuart Road	Principal Arterial	6	1	A, B, C, D, E and F
11	JJ Lemmon Road	Major Collector	4	1	A, B, C, D, E and F
12	IH-20 Frontage Road	Interstate (WB)	2	1	A, B, C, D, E and F
12	IH-20	Interstate (WB)	4	1	A, B, C, D, E and F
12	IH-20	Interstate (EB)	4	1	A, B, C, D, E and F
12	IH-20 Frontage Road	Interstate (EB)	2	1	A, B, C, D, E and F
12	Langdon Road	Major Collector	2	1	A, B, C, D, E and F
13	Cleveland Road	Major Collector	2	1	A, B, C, D, E and F
14	Private Road	Local Road	1	1	A, B, C, D, E and F
14	Private Road	Local Road	1	1	A, B, C, D, E and F
14	Private Road	Local Road	1	1	A, B, C, D, E and F
14	Private Road	Local Road	1	1	A, B, C, D, E and F
15	Witt Road	Major Collector	2	1	A, B, C, D, E and F
15	Lancaster-Hutchins Road	Minor Arterial	2	1	A, B, C, D, E and F
16	Wintergreen Road	Minor Arterial	2	1	A, B, C, D, E and F
17	Cornell Road	Minor Collector	2	1	A, B, C, D, E and F
17	Pleasant Run Road	Major Collector	2	1	A, B, C, D, E and F
18	Greene Road	Local Road	2	1	A, B, C, D, E and F
19	Beltline Road	Principal Arterial	2	1	A, B, C, D, E and F
21	Watermill Road	Local Road	2	1	A, B, C, D, E and F
21	Hash Road	Local Road	2	1	A, B, C, D, E and F
22	Raintree Drive	Local Road	2	1	A, B, C, D, E and F

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019
[a] Two left turn lanes were included in the lane count for eastbound Illinois Avenue.

3.11.4.1.3 Station Area

Figure 3.11-1 shows the location of the proposed Dallas Terminal Station. Area turning movement counts were collected at the major intersections (24 signalized and 3 unsignalized) within approximately 1 mile of the Dallas Terminal Station. The peak hour volumes are included in **Appendix E, Traffic Operation Technical Memorandum**. Existing LOS at the proposed Dallas Terminal Station intersections were calculated using the Synchro 7 model and were based on existing roadway geometry, AM/PM peak hour turning movement counts and traffic signal timing. The LOS for these intersections is presented in **Table 3.11-6**. All roadway intersections in the Dallas Study Area are currently operating at LOS D or better. The detailed reports that include the roadway geometry are found in **Appendix E, Traffic Operation Technical Memorandum**.

Figure 3.11-1: Dallas Terminal Station Intersection Turning Movement Counts



Source: AECOM 2019

Table 3.11-6: Dallas Terminal Station Intersections Existing LOS (Delay in Seconds per Vehicle)

Map ID[a]	Intersection	AM	PM
		Existing	Existing
1	Woodall Rodgers Freeway/Riverfront Boulevard	C (33)	D (37)
2	Riverfront Boulevard/Commerce Street	D (40)	D (46)
3	Reunion Boulevard/Riverfront Boulevard	A (8)	A (8)
4	WB Frontage Road IH-30/Riverfront Boulevard	A (8)	B (11)
5	EB Frontage Road IH-30/Riverfront Boulevard	B (17)	C (23)
6	IH-35E/Riverfront Boulevard	A (6)	A (10)
7	Riverfront Boulevard/Cadiz Street	D (53)	C (34)
8	Cadiz Street/Hotel Street (unsignalized)	A (1)	A (1)
9	Cadiz Street/Lamar Street	B (15)	B (15)
10	Canton Street/Lamar Street	B (12)	B (12)
11	Hotel Street/Memorial Drive (unsignalized)	A (4)	A (4)
13	Lamar Street/Memorial Drive	B (12)	B (13)
14	Griffin Street/Memorial Drive	C (24)	B (19)
15	Canton Street/Griffin Street	A (9)	B (12)
16	Cadiz Street/Griffin Street	B (14)	A (8)
17	Canton Street/Akard Street	B (12)	B (17)
18	Cadiz Street/Akard Street	B (13)	B (11)
19	Griffin Street W/Akard Street	B (11)	B (13)
20	Griffin Street E/Akard Street	B (12)	B (12)
21	Belleview Street/Akard Street (unsignalized)	A (3)	A (10)
22	Griffin Street W/Ervy Street	A (5)	A (6)
23	Griffin Street E /Ervy Street	B (12)	C (20)
24	Griffin Street E/St Paul Street	A (8)	A (7)
25	Griffin Street W/St Paul Street	B (10)	C (20)
26	Lamar Street/Belleview Street	B (13)	B (11)
27	Lamar Street/Corinth Street	C (21)	B (20)
28	Corinth Street/Riverfront Boulevard	C (21)	D (53)

Source: AECOM, 2019
Note: Intersection 12 was removed from the analysis.
[a] MAP ID refers to **Figure 3.11-1.**

3.11.4.1.4 Transit Services

The Dallas Terminal Station would be located south of the DART Convention Center Station on Segment 1 and would cross two active DART light rail lines, as well as bus routes that serve downtown Dallas.

DART provides bus and/or rail services to 13 cities in the DFW region and DART operates 140 bus routes in its service area (including local, express, suburban, crosstown, D-link, shuttle, FLEX and rail feeder routes). The network of DART light rail, bus routes and other services moves more than 304,000 passengers per weekday.[11]

DART operates 29 local bus routes that serve downtown Dallas. Some of these routes link the suburbs with downtown Dallas. Eight express routes transport passengers with few or no stops between endpoints. The express routes typically use the high-occupancy vehicle (HOV) lanes on freeways, when possible. Fourteen suburban routes link suburban neighborhoods to transit centers. Sixty feeder bus

[11] DART, *DART Reference Book*, March 2019.

routes start or end at existing rail stations. DART offers special destination service to major employers, tourist attractions, commercial centers and airports. DART also offers FLEX, shuttles and on-call services.

The Dallas streetcar is a 1.6-mile dedicated urban rail route that provides commuters in Oak Cliff access to transit connections at Dallas Union Station. The M-Line, or McKinney Avenue Trolley, uses replicas of historic urban rail cars on a non-dedicated guideway, operating from the Dallas Arts District to DART light rail at Cityplace/Uptown Station.

DART operates 93 miles of light rail. The Dallas Terminal Station would be situated between two DART light rail stations − Convention Center and Cedars – both of which are served by the Red and Blue Lines. The Convention Center Station located just north of the Dallas Terminal Station adjoins the Kay Bailey Hutchinson Convention Center and is served by multiple modes. The Cedars Station is located east of the proposed Dallas Terminal Station at the intersection of Belleview and Wall Streets. **Figure 3.11-2** illustrates the DART services at and around these stations and Union Station farther northwest.

TRE, the commuter rail jointly operated by DART and Trinity Metro, provides 6-day service between Dallas Union Station and Fort Worth T&P Station.

3.11.4.1.5 On-Road Pedestrian and Bicycle Facilities

While there are no dedicated bicycle lanes or facilities near the Dallas Terminal Station, Lamar Street (located to the south) is categorized as an on-street bicycle route according to the City of Dallas' 2011 Bike Plan.[12]

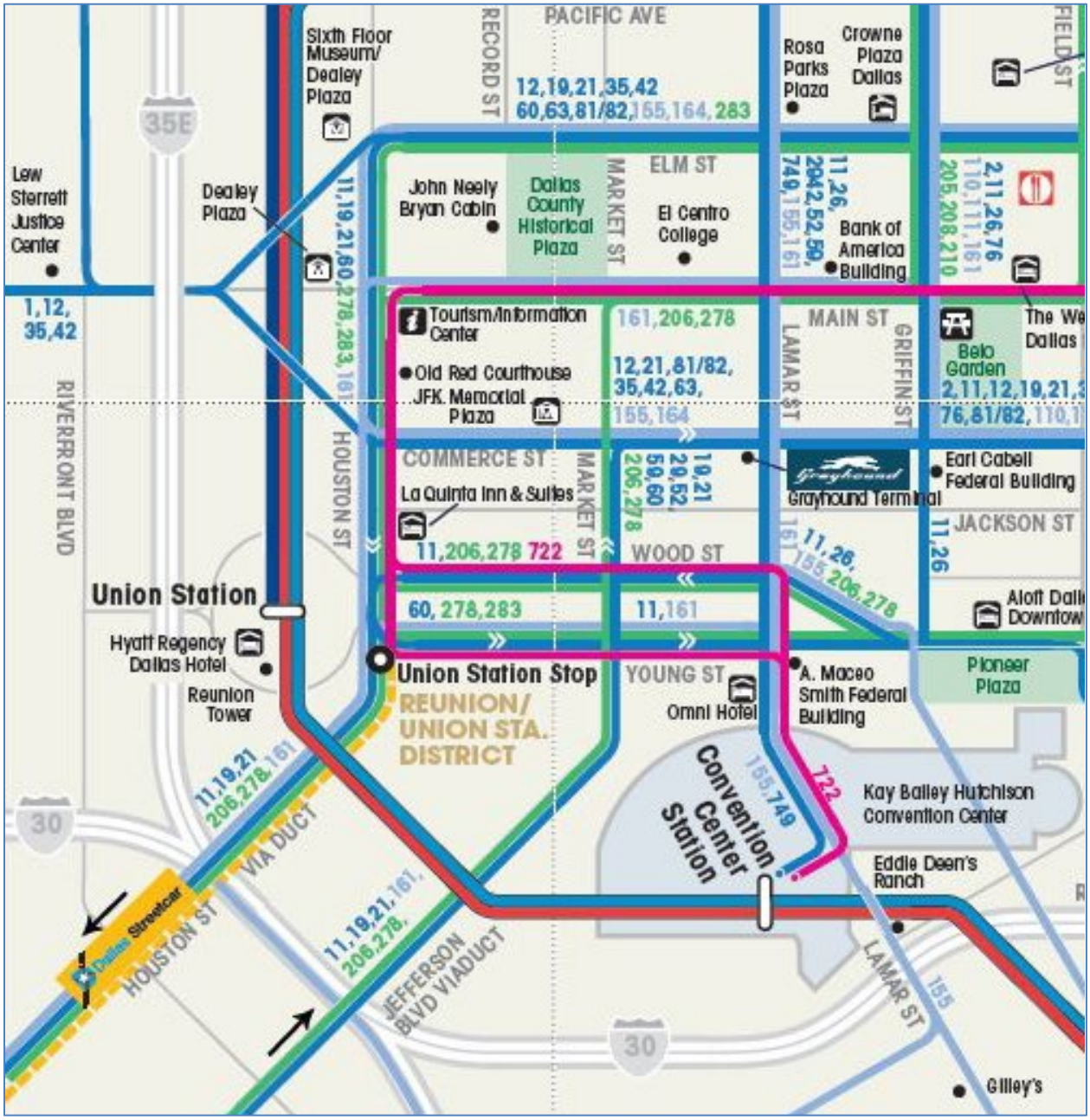
Table 3.11-7 lists each on-road pedestrian or bicycle facility that falls within the Study Area.

3.11.4.1.6 Aviation

The general aviation, city-owned, Lancaster Airport would be 0.4 mile outside of the Study Area, as depicted in **Appendix D, Community and Cultural Resources Mapbook**.

[12] City of Dallas, 2011 Dallas Bike Plan, June 8, 2011, Available: https://dallascityhall.com/departments/transportation/bikeway/Pages/bikeplan2011.aspx

Figure 3.11-2: DART Service around Union Station



Source: DART 2018

Table 3.11-7: On-Road Pedestrian and Bicycle Facilities in Dallas County	
Name	**Length within Study Area (miles)**
Bicycle corridor[a] (divided*) on Elam	0.23
Bicycle corridor (undivided) on Belleview	0.07
Bicycle corridor on Cedar Crest	0.52
Bicycle corridor (divided) on Corinth	0.41
Bicycle corridor (divided) on Corinth	0.10
Bicycle corridor (divided) on Riverfront	0.86
Bicycle corridor (divided) on Riverfront	2.48
Bicycle corridor (undivided) on Lamar Street	0.59
Bicycle corridor (divided) on Lamar Street	1.23
Bicycle corridor (divided) on Overton	0.50
Bicycle corridor (divided) on Hatcher	0.26
Bicycle corridor (divided) on Camp Wisdom	0.51
Bicycle corridor (undivided) on Lamar	0.18
Bellview Connector	0.60

Source: AECOM 2019

[a] bicycle corridor may consist of a bike route, bike lanes, wide curb lanes or multi-use path(s) within the roadway ROW. "Divided" refers to the physical separation of non-motorized traffic directions.

3.11.4.1.7 Planned Projects

Table 3.11-8 lists planned transportation capacity improvement projects in the Study Area.

Table 3.11-8: Planned Transportation Projects in Dallas County Study Area						
Project	**Mode**	**Lanes Before/ After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
D2 Subway (DART)	Light Rail	N/A	Light rail	2024	2	1,400
IH 20	Roadway	8/8 (freeway) 6/6 (frontage)	Freeway	2017-2040	20	$276
Loop 9	Roadway	0/6	State Highway	2029-35	10	$358
Waxahachie Commuter Rail	Regional Rail	N/A	Regional Rail	2028-2037	31	$1,488

Source: TxDOT 2019

N/A = not applicable

3.11.4.2 Ellis County

3.11.4.2.1 Freight Rail Network

BNSF and UPRR operate within the Study Area. **Table 3.11-9** identifies the locations in Ellis County where the Project would cross existing railroad tracks (freight or transit). Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-9: Railroad Crossings in Ellis County					
Mapbook Page	**Segment**	**Build Alternative**	**Railroad Company**	**Line Type**	**Line Status**
39	2A	A, B, and C	UPRR	Main Line	Active
45	2A	A, B, and C	BNSF	Main Line	Active
71	2B	D, E and F	UPRR	Main Line	Active
78	2B	D, E and F	BNSF	Main Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.2.2 Roadway Network

The primary agencies responsible for roadway crossings are TxDOT Dallas District and Ellis County. **Table 3.11-10** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-42.** Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-10: Roadways in Ellis County Study Area					
Mapbook Page	**Street Name**	**Classification**	**# Lanes**	**Segment**	**Build Alternative**
23	Stainback Road	Major Collector	2	1	A, B, C, D, E and F
24	FM 664	Minor Arterial	2	1	A, B, C, D, E and F
24	Bluff Springs Road	Local Road	2	1	A, B, C, D, E and F
25	Private Road	Local Road	1	2A	A, B, and C
25 & 57	FM 983	Minor Collector	2	2A & 2B	A, B, C, D, E and F
26 & 58	Ewing Road	Local Road	2	2A & 2B	A, B, C, D, E and F
27 & 59	Private Road	Local Road	2	2A	A, B, and C
29 & 61	Risinger Road	Local Road	2	2A & 2B	A, B, C, D, E and F
30	Private Road	Local Road	1	2A	A, B, and C
30 & 62	Palmyra Road	Local Road	2	2A & 2B	A, B, C, D, E and F
30	Private Road	Local Road	1	2A	A, B, and C
31 & 63	Epps Road	Local Road	2	2A & 2B	A, B, C, D, E and F
32 & 64	FM 813	Minor Collector	2	2A & 2B	A, B, C, D, E and F
34 & 66	FM 878	Minor Collector	2	2A & 2B	A, B, C, D, E and F
35 & 67	Ebenezer Road	Local Road	2	2A & 2B	A, B, C, D, E and F
26 & 68	Wilson Road	Local Road	2	2A & 2B	A, B, C, D, E and F
39 & 71	FM 879	Minor Collector	2	2A & 2B	A, B, C, D, E and F
40	Private Road	Local Road	1	2A	A, B, and C
41 & 73	Old Boyce Road	Local Road	2	2A & 2B	A, B, C, D, E and F
42	Mustang Road	Local Road	2	2A	A, B, and C
42 & 74	Old Church Road	Local Road	2	2A & 2B	A, B, C, D, E and F
43 & 75	US 287 (WB)	Principal Arterial	4	2A & 2B	A, B, C, D, E and F
43 & 75	US 287 (EB)	Principal Arterial	4	2A & 2B	A, B, C, D, E and F
44 & 76	Old Waxahachie Road	Local Road	2	2A & 2B	A, B, C, D, E and F
46 & 77	Getzendaner Road	Local Road	2	2A & 2B	A, B, C, D, E and F
47 & 80	FM 984	Minor Collector	2	2A & 2B	A, B, C, D, E and F
47 & 79	Walker Road	Local Road	2	2A & 2B	A, B, C, D, E and F
51	Private Road	Local Road	1	2A	A, B, and C
55 & 87	FM 984	Minor Collector	2	2A & 2B	A, B, C, D, E and F
57	Private Road	Local Road	1	2B	D, E and F
57	Private Road	Local Road	1	2B	D, E and F
61	Private Road	Local Road	1	2B	D, E and F
62	Private Road	Local Road	2	2B	D, E and F

Table 3.11-10: Roadways in Ellis County Study Area					
Mapbook Page	**Street Name**	**Classification**	**# Lanes**	**Segment**	**Build Alternative**
62	Private Road	Local Road	1	2B	D, E and F
64	Private Road	Local Road	1	2B	D, E and F
64	Almand Road	Local Road	2	2B	D, E and F
66	Private Road	Local Road	1	2B	D, E and F
66	Private Road	Local Road	1	2B	D, E and F
72	Private Road	Local Road	2	2B	D, E and F
73	Private Road	Local Road	1	2B	D, E and F
80	Private Road	Local Road	1	2B	D, E and F
80	Private Road	Local Road	1	2B	D, E and F
80	Private Road	Local Road	1	2B	D, E and F
84	Private Road	Local Road	1	2B	D, E and F
85	Private Road	Local Road	1	2B	D, E and F
89	Davis Road	Local Road	1	3A	A and D
90 & 127	Bassinger Road	Local Road	2	3A, 3B & 3C	A, B, D and E

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.2.3 Passenger Rail and Transit Services

Community Transit Service, Inc. (CTS) provides on-demand bus and van transit service in all of Ellis County. Service is provided Monday through Saturday between the hours of 5:00 AM and 5:30 PM. Requests for transit services must be made at least two days in advance.

3.11.4.2.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.2.5 Aviation

The Dallas South Port Authority is a privately owned, private use, turf runway approximately 0.06 mile west from Segment 1, as depicted in **Appendix D, Community and Cultural Resources Mapbook**.

3.11.4.2.6 Planned Projects

Table 3.11-11 provides a list of planned transportation capacity improvement projects within the Study Area.

Table 3.11-11: Planned Transportation Projects in Ellis County Study Area						
Project	**Mode**	**Lanes Before/After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
FM 664	Roadway	2/6	Divided Urban	2023	3	$149

Source: TxDOT 2019

3.11.4.3 Navarro County

3.11.4.3.1 Freight Rail Network

BNSF, UPRR and TUEX operate within the Study Area. **Table 3-11.12** identifies the locations in Navarro County where the Project would cross existing railroad tracks (freight or transit). Construction of the

Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-12: Railroad Crossings in Navarro County

Mapbook Page	Segment	Build Alternative	Railroad Company	Line Type	Line Status
122	3A	A and D	UPRR	Main Line	Active
142	3B	B and E	UPRR	Main Line	Active
193	3C	C and F	UPRR	Main Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.3.2 Roadway Network

The primary agencies responsible for roadway impacts are TxDOT Dallas District and Navarro County. **Table 3.11-13** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-43**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-13: Roadways in Navarro County Study Area

Mapbook Page	Street Name	Classification	Lane	Segment	Build Alternative
91 & 128	County Road 4785/CR 1330	Local Road	2	3A, 3B & 3C	A, B, D and E
93 & 128	County Road 1320	Local Road	2	3A, 3B & 3C	A, B, D and E
93 & 130	County Road 1300	Minor Collector	2	3A & 3C	A, C, D and F
95 &104	FM 1126	Major Collector	2	3A & 3C	A, C, D and F
96 &132	County Road 1230/1145	Local Road	2	3A & 3B	A, B, D and E
97 & 133	County Road 1220	Local Road	2	3A, 3B & 3C	A, B, D and E
98 & 135	SH 22	Minor Arterial	2	3A, 3B & 3C	A, B, D and E
98	County Road 2070	Local Road	2	3A & 3C	A, C, D and F
103 & 139	FM 744	Minor Arterial	2	3A, 3B & 3C	A, B, D and E
105 & 142	SH 31 (WB)	Principal Arterial	2	3A, 3B & 3C	A, B, D and E
105 & 142	SH 31 (EB)	Principal Arterial	2	3A, 3B & 3C	A, B, D and E
105	Private Road	Local Road	2	3A	A & D
106	County Road 3030	Local Road	2	3A & 3C	A, C, D and F
108	County Road 3110	Local Road	2	3A & 3C	A, C, D and F
108	County Road 3120	Minor Collector	2	3A & 3C	A, C, D and F
111 & 147	FM 709	Major Collector	2	3A, 3B & 3C	A, B, D and E
114	County Road 0040	Local Road	2	3A & 3C	A, C, D and F
116 & 156	FM 1394	Major Collector	2	3A & 3B & 3C	A, B, C, D, E and F
117	County Road 2110	Local Road	2	3A & 3B	A, B, D and E
119	County Road 2190	Local Road	2	3A	A & D
119	County Road 2190	Local Road	2	3A	A & D
119	County Road 2190	Local Road	2	3A	A & D
121 & 160	FM 641	Minor Collector	2	3A & 3B	A, B, D and E
122 & 160 & 193	SH 14	Minor Arterial	2	3A & 3B & 3C	A, B, C, D, E and F
123 & 162 & 197	County Road 2380	Local Road	2	3A & 3B & 3C	A, B, C, D, E and F
124 & 163	County Road 2420	Local Road	2	3A & 3B	A, B, D and E
131	FM 1126	Minor Collector	2	3B	B and E
129	Private Road	Local Road	1	3B	B and E
129	Private Road	Local Road	1	3B	B and E
130	Private Road	Local Road	1	3B	B and E
131	Private Road	Local Road	1	3B	B and E

Table 3.11-13: Roadways in Navarro County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
130	County Road 4777/ NW CR 1300	Local Road	1	3B	B and E
134	County Road 1160	Local Road	1	3B	B and E
137	County Road 2050	Local Road	1	3B	B and E
143	Shumard Oak Lane	Local Road	2	3B	B and E
143	County Road 1090/ Liberty Drive	Local Road	2	3B	B and E
143	Red Oak Lane	Local Road	2	3B	B and E
144	Oak Valley Lane	Local Road	2	3B	B and E
147	Private Road	Local Road	2	3B	B and E
148	County Road 30	Local Road	2	3B	B and E
149	County Road 30	Local Road	2	3B	B and E
149	County Road 30	Local Road	2	3B	B and E
153	County Road 30	Local Road	2	3B	B and E
147	Private Road	Local Road	2	3B	B and E
148	Private Road	Local Road	2	3B	B and E
149	County Road 5159	Local Road	2	3B	B and E
146	County Road 1140	Local Road	2	3B	B and E
148	Private Road	Local Road	2	3B	B and E
148	Private Road	Local Road	2	3B	B and E
148	Private Road	Local Road	2	3B	B and E
148	Private Road	Local Road	2	3B	B and E
149	County Road 5159	Local Road	2	3B	B and E
150	Private Road	Local Road	2	3B	B and E
152	Private Road	Local Road	2	3B	B and E
158	County Road 2190	Local Road	2	3B	A, B, D and E
192	County Road 2120	Local Road	2	3C	C and F
193	County Road 2130	Local Road	2	3C	C and F
194	County Road 2348	Local Road	2	3C	C and F
194	County Road 2344	Local Road	2	3C	C and F

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.3.3 Passenger Rail and Transit Services

CTS provides on-demand bus and van transit service. The service is available throughout all of Navarro County. Service is provided Monday through Saturday between the hours of 5:00 AM and 5:30 PM. Requests for transit services must be made at least two days in advance.

3.11.4.3.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.3.5 Aviation

Anxiety Aerodrome is a privately owned, private use, turf runway within the Study Area (see **Appendix D, Community and Cultural Resources Mapbook**).

3.11.4.3.6 Planned Projects

Table 3.11-14 lists planned transportation capacity improvement projects in the Study Area.

Table 3.11-14: Planned Transportation Projects in Navarro County Study Area						
Project	**Mode**	**Lanes Before/ After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
SH 31 Relief Route	Roadway	0/2	Rural Arterial Roadway	2020	18	$106

Source: TxDOT 2018

3.11.4.4 Freestone County

3.11.4.4.1 Freight Rail Network

BNSF, UPRR and TUEX operate within the Study Area. **Table 3-11.15** identifies the locations in Freestone County where the Project would cross existing railroad tracks. Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D Project Footprint Mapbook**.

Table 3.11-15: Railroad Crossings in Freestone County					
Mapbook Page	**Segment**	**Build Alternative**	**Railroad Company**	**Line Type**	**Line Status**
201	3C	C and F	BNSF	Main Line	Active
209	3C	C and F	TUEX	Main Line	Active
315	4	A, B, D and E	TUEX	Main Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.4.2 Roadway Network

The primary agencies responsible for roadway crossings are the TxDOT Bryan District and Freestone County. **Table 3.11-16** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-44**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-16: Roadways in Freestone County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
198	County Road 1041	Local Road	2	3C	C and F
199 & 315	FM 246	Minor Collector	2	3C & 4	C and F
201	County Road 1051	Local Road	2	3C	C and F
203	FM 80	Major Collector	2	3C	C and F
203	County Road 1100	Local Road	2	3C	C and F
204	County Road 1101	Local Road	2	3C	C and F
205	FM 833W	Major Collector	2	3C	C and F
207	County Road 1090	Local Road	2	3C	C and F
208	IH-45 Frontage Road [a]	Major Collector	2	3C	C and F
209	Private Road	Local Road	1	3C	C and F
209	County Road 1080	Local Road	2	3C	C and F
209	County Road 1171	Local Road	2	3C	C and F
210	County Road 1150	Local Road	2	3C	C and F
212	Private Road	Local Road	1	3C	C and F
212	Private Road	Local Road	1	3C	C and F
213	Private Road	Local Road	1	3C	C and F
213	IH-45 Ramps [b]	On/Off Ramp	1	3C	C and F

Table 3.11-16: Roadways in Freestone County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
213	FM 27/ Commerce Street	Major Collector	2	3C	C and F
214	Teague Street	Minor Arterial	2	3C	C and F
216	Church Street	Local Road	2	3C	C and F
217	County Road 610	Major Collector	2	3C	C and F
222	County Road 660	Local Road	2	3C	C and F
226	TX 179	Major Collector	2	3C	C and F
226	County Road 675	Local Road	2	3C	C and F
226	Private Road	Local Road	1	3C	C and F
227	FM 489	Major Collector	2	3C	C and F
235	County Road 691	Local Road	2	3C	C and F
314	Private Road	Local Road	1	4	A, B, D and E
316	County Road 995	Local Road	2	4	A, B, D and E
317	Private Road	Local Road	1	4	A, B, D and E
317	Private Road	Local Road	1	4	A, B, D and E
318	Private Road	Local Road	1	4	A, B, D and E
319	FM 27	Major Collector	2	4	A, B, D and E
320	Private Road	Local Road	1	4	A, B, D and E
320	FM 1366	Minor Collector	2	4	A, B, D and E
321	County Road 960	Local Road	2	4	A, B, D and E
322	Private Road	Local Road	1	4	A, B, D and E
323	County Road 961	Local Road	2	4	A, B, D and E
324	County Road 964	Local Road	2	4	A, B, D and E
324	County Road 963	Local Road	2	4	A, B, D and E
326	Private Road	Local Road	1	4	A, B, D and E
327	County Road 930	Local Road	2	4	A, B, D and E
329	US 84	Minor Arterial	2	4	A, B, D and E
330	Private Road	Local Road	1	4	A, B, D and E
330	FM 2777	Minor Collector	2	4	A, B, D and E
331	Private Road	Local Road	1	4	A, B, D and E
331	Private Road	Local Road	1	4	A, B, D and E
332	FM 1365	Major Collector	2	4	A, B, D and E
333	Private Road	Local Road	1	4	A, B, D and E
334	County Road 890	Local Road	2	4	A, B, D and E
336	County Road 844	Local Road	2	4	A, B, D and E
337	Private Road	Local Road	1	4	A, B, D and E
337	Private Road	Local Road	1	4	A, B, D and E
337	Private Road	Local Road	1	4	A, B, D and E
338	Private Road	Local Road	1	4	A, B, D and E
338	Private Road	Local Road	1	4	A, B, D and E
339	Private Road	Local Road	1	4	A, B, D and E
339	Private Road	Local Road	1	4	A, B, D and E
339	Private Road	Local Road	1	4	A, B, D and E
339	Private Road	Local Road	1	4	A, B, D and E

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019
Note: Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads.
[a] IH-45 Frontage Roads would be impacted 26 times along Segment 3C in Freestone County. For more information about the modifications, see **Table 3.11-43.**
[b] IH-45 Ramps would be impacted 8 times along Segment 3C in Freestone County. For more information about modifications, see **Table 3.11-43.**

3.11.4.4.3 Passenger Rail and Transit Services

Demand response (i.e., no fixed routes) transportation is provided in Freestone County by the Heart of Texas Rural Transit District (HOTRTD), a transportation service for seniors and for the disabled of any age.

3.11.4.4.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.4.5 Aviation

There are no aviation facilities within the Study Area.

3.11.4.4.6 Planned Projects

Table 3.11-17 lists planned transportation capacity improvement projects within the Study Area.

Table 3.11-17: Planned Transportation Projects in Freestone County Study Area

Project	Mode	Lanes Before/After	Classification	Year Complete	Length (miles)	Cost ($M)
IH-45	Roadway	4/6	Freeway	Beyond 2020	32	$370
IH-45 Frontage Road Conversions	Roadway	2/2	Frontage Road	2019 (bid date)	5	$9

Source: TXDOT 2019

3.11.4.5 Limestone County

3.11.4.5.1 Freight Rail Network

BNSF, UPRR and TEXU operate within the county, but there are no freight lines within the Study Area. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

3.11.4.5.2 Roadway Network

The primary agencies responsible for roadway crossings are the TxDOT Waco District and Limestone County. **Table 3.11-18** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-45**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-18: Roadways in Limestone County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
341	Private Road	Local Road	1	4	A, B, D and E
342	Private Road	Local Road	1	4	A, B, D and E
342	Private Road	Local Road	1	4	A, B, D and E
342	Private Road	Local Road	1	4	A, B, D and E
343	Private Road	Local Road	1	4	A, B, D and E
343	Private Road	Local Road	1	4	A, B, D and E
344	Private Road	Major Collector	1	4	A, B, D and E
344	SH 164	Local Road	2	4	A, B, D and E
344	Private Road	Local Road	2	4	A, B, D and E
344	Private Road	Local Road	1	4	A, B, D and E
346	Private Road	Local Road	1	4	A, B, D and E
346	Private Road	Local Road	1	4	A, B, D and E
346	Private Road	Local Road	1	4	A, B, D and E
347	County Road 828	Local Road	1	4	A, B, D and E
347	Private Road	Local Road	2	4	A, B, D and E
348	Private Road	Local Road	1	4	A, B, D and E
348	Private Road	Local Road	1	4	A, B, D and E
349	Private Road	Local Road	1	4	A, B, D and E
350	Private Road	Local Road	1	4	A, B, D and E
350	Private Road	Local Road	1	4	A, B, D and E
351	Private Road	Local Road	1	4	A, B, D and E
351	Private Road	Local Road	1	4	A, B, D and E
351	Private Road	Local Road	1	4	A, B, D and E
351	County Road 882	Minor Collector	1	4	A, B, D and E
353	Private Road	Local Road	2	4	A, B, D and E
353	County Road 884	Major Collector	1	4	A, B, D and E
353	FM 1512	Local Road	2	4	A, B, D and E
353	County Road 879	Local Road	2	4	A, B, D and E
354	Private Road	Local Road	2	4	A, B, D and E

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.5.3 Passenger Rail and Transit Services

Demand response transportation is provided in Limestone County by HOTRTD, a transportation service for seniors and for the disabled of any age.

3.11.4.5.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.5.5 Aviation

There are no aviation facilities within the Study Area.

3.11.4.5.6 Planned Projects

Table 3.11-19 lists planned transportation capacity improvement projects within the Study Area.

Table 3.11-19: Planned Transportation Projects in Limestone County						
Project	**Mode**	**Lanes Before/After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
FM 39	Roadway	2/2 (add shoulders only)	Rural Highway	To be determined	9	$5
SH 164 - Add passing lanes	Roadway	2/2	Rural Highway	To be determined	31	To be determined
US 84 – Widen shoulders, add passing lanes	Roadway	2/2	Rural Highway	To be determined	1.2	To be determined (unfunded)
US 84 – Widen from FM 1365 east	Roadway	2/4	Rural Highway	To be determined	1.05	To be determined (unfunded)

Source: TXDOT 2019

3.11.4.6 Leon County

3.11.4.6.1 Freight Rail Network

BNSF and UPRR operate within the Study Area. **Table 3.11-20** identifies the locations in Leon County where the Project would cross existing railroad tracks. Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-20: Railroad Crossings in Leon County					
Mapbook Page	**Segment**	**Build Alternative**	**Railroad Company**	**Line Type**	**Line Status**
240	3C	C and F	UPRR	Main Line	Active
262	4	A, B, D and E	UPRR	Main Line	Active
368	4	A, B, D and E	BNSF	Main Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.6.2 Roadway Network

The primary agencies responsible for roadway crossings are the TxDOT Bryan District and Leon County. **Table 3.11-21** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-46**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-21: Roadways in Leon County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
235	Private Road	Local Road	1	3C	C and F
238	SH 164	Minor Arterial	2	3C	C and F
238	IH-45 Frontage Road[a]	Major Collector	1	3C	C and F
238	County Road 331	Local Road	2	3C	C and F
240	US 79 On-Ramp	Principal Arterial	2	3C	C and F
240	US 79 WB	Principal Arterial	2	3C	C and F
240	US 79 EB	Principal Arterial	2	3C	C and F

Table 3.11-21: Roadways in Leon County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
240	IH-45 Ramp [b]	Major Collector	1	3C	C and F
240	S Craig Drive	Local Road	2	3C	C and F
240	County Road 306	Local Road	2	3C	C and F
240	Private Road	Major Collector	1	3C	C and F
246	County Road 3051	Local Road	2	3C	C and F
249	County Road 314/304	Local Road	2	3C	C and F
256	County Road 317	Local Road	2	3C	C and F
258	County Road 318	Local Road	2	3C	C and F
258	SH 7	Minor Arterial	2	3C	C and F
259	County Road 423	Local Road	2	3C	C and F
260	County Road 413	Local Road	2	3C	C and F
261	County Road 477	Minor Collector	2	3C	C and F
278 & 383	FM 977	Minor Collector	2	3C & 4	A, B, D and E
280	County Road 400	Local Road	2	3C	C and F
283 & 389	SH-OSR	Local Road	2	3C & 4	A, B, C, D, E and F
355	Private Road	Local Road	1	4	A, B, D and E
355	Private Road	Local Road	1	4	A, B, D and E
356	Private Road	Local Road	1	4	A, B, D and E
356	Private Road	Local Road	1	4	A, B, D and E
356	Private Road	Local Road	1	4	A, B, D and E
357	Private Road	Local Road	1	4	A, B, D and E
358	FM 1512	Minor Collector	2	4	A, B, D and E
359	Private Road	Local Road	1	4	A, B, D and E
359	FM 1469	Local Road	2	4	A, B, D and E
360	Private Road	Local Road	1	4	A, B, D and E
360	Private Road	Local Road	1	4	A, B, D and E
361	Private Road	Local Road	1	4	A, B, D and E
361	County Road 344	Local Road	1	4	A, B, D and E
362	US 79	Local Road	2	4	A, B, D and E
366	County Road 347	Local Road	2	4	A, B, D and E
366	Private Road	Local Road	1	4	A, B, D and E
368	County Road 391	Local Road	2	4	A, B, D and E
370	County Road 392	Minor Collector	2	4	A, B, D and E
370	SH 7	Local Road	2	4	A, B, D and E
370	FM 39	Local Road	2	4	A, B, D and E
372	Private Road	Local Road	1	4	A, B, D and E
374	Private Road	Local Road	1	4	A, B, D and E
376	Private Road	Local Road	1	4	A, B, D and E
376	Private Road	Local Road	1	4	A, B, D and E
377	Private Road	Local Road	1	4	A, B, D and E
377	Private Road 4255	Local Road	1	4	A, B, D and E
380	Private Road	Local Road	1	4	A, B, D and E
380	Private Road	Local Road	1	4	A, B, D and E
384	County Road 408	Local Road	2	4	A, B, D and E
384	Private Road	Local Road	1	4	A, B, D and E
385	County Road 408	Local Road	2	4	A, B, D and E
385	Private Road	Local Road	1	4	A, B, D and E
386	Private Road	Local Road	1	4	A, B, D and E
389	Private Road	Local Road	1	4	A, B, D and E
389	SH OSR County Line Road	Major Collector	2	4	A, B, D and E

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

Note: Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads.

[a] IH-45 Frontage Roads would be impacted 43 times along Segment 3C in Leon County. For more information about the modifications, see **Table 3.11-45.**

[b] IH-45 Ramps would be impacted three times along Segment 3C in Leon County. For more information about modifications, see **Table 3.11-45.**

3.11.4.6.3 Passenger Rail and Transit Services

Demand response transportation is provided in Leon County by HOTRTD, a transportation service for seniors and for the disabled of any age.

3.11.4.6.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.6.5 Aviation

There are no aviation facilities within the Study Area.

3.11.4.6.6 Planned Projects

Table 3.11-22 lists planned transportation capacity improvement projects within the Study Area.

Table 3.11-22: Planned Transportation Projects in Leon County Study Area

Project	Mode	Lanes Before/After	Classification	Year Complete	Length (miles)	Cost ($M)
IH-45	Roadway	4/6	Freeway	To be determined	17	$26
US 79	Roadway	2/4	Divided Highway	To be determined	10	$46

Source: TXDOT 2019

3.11.4.7 Madison County

3.11.4.7.1 Freight Rail Network

BNSF operates within the county, but there are no railroad tracks within the Study Area. Construction of the Project would not require modifications to the existing rail system. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

3.11.4.7.2 Roadway Network

The primary agencies responsible for roadway crossings are the TxDOT Bryan District and Madison County. **Table 3.11-23** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-47**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-23: Roadways in Madison County Study Area

Mapbook Page	Street Name	Classification	Lane	Segment	Build Alternative
283	IH45 Ramp	Local Road	1	3C	C and F
283	IH45 Frontage Road	Local Road	2	3C	C and F
284	Quail Lane	Local Road	2	3C	C and F
285	Hendrix Lane	Minor Arterial	2	3C	C and F

Table 3.11-23: Roadways in Madison County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
286	Private Road	Local Road	1	3C	C and F
287	Waldrip Road	Local Road	2	3C	C and F
288	Greenbriar Road	Local Road	2	3C	C and F
288	Private Road	Local Road	1	3C	C and F
294	Private Road	Local Road	1	3C	C and F
295 & 397	FM 978	Local Road	2	3C & 4	A, B, C, D, E and F
295	Private Road	Local Road	1	3C	C and F
298 & 401	FM 1452	Major Collector	2	3C & 4	A, B, C, D, E and F
299	Private Road	Local Road	1	3C	C and F
300	Private Road	Local Road	1	3C	C and F
301	Cottonwood Road	Local Road	2	3C	C and F
301 & 403	US 190 (potential IH-14)	Local Road	2	3C & 4	A, B, C, D, E and F
303	Private Road	Local Road	1	3C	C and F
305 & 407	FM 1372	Minor Collector	2	3C & 4	A, B, C, D, E and F
306	Private Road	Local Road	1	3C	C and F
307	Bethel Cemetery Road	Local Road	2	3C	C and F
389	Skains Lane	Local Road	2	4	A, B, D and E
390	Metzler Lane	Local Road	2	4	A, B, D and E
390	Dawkins Road	Local Road	2	4	A, B, D and E
392	Dawkins Road	Local Road	2	4	A, B, D and E
394	FM 2289	Minor Collector	2	4	A, B, D and E
395 & 397	Poteet Road	Local Road	2	4	A, B, D and E
397	Private Road	Local Road	1	4	A, B, D and E
401	Private Road	Local Road	1	4	A, B, D and E
401	Private Road	Local Road	1	4	A, B, D and E
401	Private Road	Local Road	1	4	A, B, D and E
402	Oxford Cemetery Road	Local Road	2	4	A, B, D and E
402	Oxford Cemetery Road	Local Road	2	4	A, B, D and E
402	Private Road	Local Road	1	4	A, B, D and E
402	Private Road	Local Road	1	4	A, B, D and E
404	Clark Road	Local Road	2	4	A, B, D and E
404	Private Road	Local Road	1	4	A, B, D and E
404	Moss Lane	Local Road	2	4	A, B, D and E
405	Strawther Road	Local Road	2	4	A, B, D and E
407	Private Road	Local Road	1	4	A, B, D and E
409	Private Road	Local Road	1	4	A, B, D and E

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.7.3 Passenger Rail and Transit Services

The Brazos Transit District, headquartered in Bryan, offers fixed-route bus service in Bryan-College Station and demand response service in Madison County and 16 other counties in central and east Texas.

3.11.4.7.4 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

3.11.4.7.5 Aviation

There are no aviation facilities within the Study Area.

3.11.4.7.6 Planned Projects

Table 3.11-24 lists planned transportation capacity improvement projects within the Study Area.

Table 3.11-24: Planned Transportation Projects in Madison County Study Area

Project	Mode	Lanes Before/After	Classification	Year Complete	Length (miles)	Cost ($M)
IH-45	Roadway	4/4	Freeway	To be determined	19	$6
SH 21/US 190, east of North Zulch to Madisonville	Roadway	2/4	Divided Highway	To be determined	11	$56
SH 21 Relief Route	Roadway	To be determined	To be determined	To be determined		$44.5
US 190/I-10[a]	Roadway	To be determined	To be determined	To be determined	NA	NA

Source: TxDOT 2019

[a] This feasibility study was conducted in 2011 and is part of the overall IH-14 "Gulf Coast Strategic Highway," a highway proposed as an interstate between west Texas and Mississippi. A portion of the route has been constructed in Bell County, Texas.

3.11.4.8 Grimes County

3.11.4.8.1 Freight Rail Network

The BNSF, UPRR and the Texas Municipal Power Agency operate within the Study Area. **Table 3.11-25** identifies the locations in Grimes County where the Project would cross existing railroad tracks. Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-25: Railroad Crossings in Grimes County

Mapbook Page	Segment	Build Alternative	Railroad Company	Line Type	Line Status
428	5	A, B, C, D, E and F	BNSF	Main Line	Active
459	5	A, B, C, D, E and F	UPRR	Main Line	Active
459	5	A, B, C, D, E and F	BNSF	Main Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.8.2 Roadway Network

The primary agencies responsible for roadway impacts are the TxDOT Bryan District and Grimes County. **Table 3.11-26** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-48**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-26: Roadways in Grimes County Study Area

Mapbook Page	Street Name	Classification	Lane	Segment	Build Alternative
308	Private Road	Local Road	1	3C	C and F
308	County Road 119	Minor Collector	2	3C	C and F
312	FM 1696	Major Collector	2	5	A, B, C, D, E and F

Table 3.11-26: Roadways in Grimes County Study Area					
410	Private Road	Local Road	1	5	A, B, C, D, E and F
410	Maintenance Road	Local Road	1	5	A, B, C, D, E and F
411	Private Road	Local Road	1	5	A, B, C, D, E and F
413	County Road 114	Local Road	2	3C & 4	A, B, D and E
417	Private Road	Local Road	1	5	A, B, C, D, E and F
419	County Road 123	Local Road	2	5	A, B, C, D, E and F
421	Private Road	Local Road	1	5	A, B, C, D, E and F
425	County Road 150	Local Road	2	5	A, B, C, D, E and F
425	Private Road	Minor Arterial	1	5	A, B, C, D, E and F
426	Neff Lane	Local Road	2	5	A, B, C, D, E and F
427	County Road 155	Local Road	2	5	A, B, C, D, E and F
428	FM 39	Local Road	2	5	A, B, C, D, E and F
429	County Road 178	Local Road	2	5	A, B, C, D, E and F
429	County Road 176	Local Road	2	5	A, B, C, D, E and F
431	Private Road	Local Road	1	5	A, B, C, D, E and F
433	High Star Lane	Local Road	2	5	A, B, C, D, E and F
433	Luthe Road	Local Road	2	5	A, B, C, D, E and F
434	Private Road	Major Collector	1	5	A, B, C, D, E and F
434	County Road 279	Local Road	2	5	A, B, C, D, E and F
434	County Road 226	Local Road	2	5	A, B, C, D, E and F
435	SH 30	Local Road	2	5	A, B, C, D, E and F
436	SH 90	Local Road	2	5	A, B, C, D, E and F
437	Private Road	Local Road	1	5	A, B, C, D, E and F
437	Private Road	Minor Collector	1	5	A, B, C, D, E and F
438	County Road 219	Local Road	2	5	A, B, C, D, E and F
439	County Road 220	Local Road	2	5	A, B, C, D, E and F
442	FM 149	Local Road	2	5	A, B, C, D, E and F
442	Private Road	Local Road	1	5	A, B, C, D, E and F
444	FM 2819	Local Road	2	5	A, B, C, D, E and F
447	FM 1774	Local Road	2	5	A, B, C, D, E and F
448	County Road 215	Minor Collector	2	5	A, B, C, D, E and F
451	Rolling Hills	Local Road	2	5	A, B, C, D, E and F
452	Chisum Trail	Local Road	2	5	A, B, C, D, E and F
452	FM 2445	Local Road	2	5	A, B, C, D, E and F
454	Private Road	Local Road	1	5	A, B, C, D, E and F
455	County Road 313	Local Road	2	5	A, B, C, D, E and F
456	Private Road	Minor Collector	1	5	A, B, C, D, E and F
457	High Oaks Drive	Local Road	2	5	A, B, C, D, E and F
458	County Road 311	Major Collector	2	5	A, B, C, D, E and F
459	Private Road	Local Road	1	5	A, B, C, D, E and F
459	SH 105	Local Road	2	5	A, B, C, D, E and F
460	Mitchell Lane	Local Road	2	5	A, B, C, D, E and F
462	Private Road	Local Road	1	5	A, B, C, D, E and F
462	Pavlock Road	Minor Arterial	2	5	A, B, C, D, E and F
463	Private Road	Local Road	1	5	A, B, C, D, E and F
463	SH 249 (under construction)[a]	Local Road	1	5	A, B, C, D, E and F
465	County Road 302	Local Road	2	5	A, B, C, D, E and F
467	Clark Road	Local Road	2	5	A, B, C, D, E and F
468	Bronco Lane	Local Road	2	5	A, B, C, D, E and F

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

[a] This road is a future public road that is currently under construction.

3.11.4.8.3 Station Area

Figure 3.11-3, on the following page, shows the location of the proposed Brazos Valley Intermediate Station. Turning movement counts were collected at the study intersection near the proposed Brazos Valley Intermediate Station, with peak hour volumes included in **Appendix E**, **Traffic Operations Technical Memorandum**.

The intersection of the two rural highways, SH 30 and SH 90, is a four-way stop and the existing LOS is shown in **Table 3.11-27**. The intersection is in a rural location and does not experience substantial congestion.

Table 3.11-27: Brazos Valley Intermediate Station Intersection LOS (Delay in Seconds per Vehicle)

Intersection	AM	PM
	Existing	Existing
SH 30/SH 90 (unsignalized)	B (10)	B (11)

Source: AECOM 2019

3.11.4.8.4 Passenger Rail and Transit Services

The Brazos Transit District, headquartered in Bryan, offers fixed route bus service in Bryan-College Station and demand response service in Grimes County and 16 other counties in central and east Texas.

3.11.4.8.5 On-Road Pedestrian and Bicycle Facilities

There are no pedestrian or bicycle facilities within the Study Area.

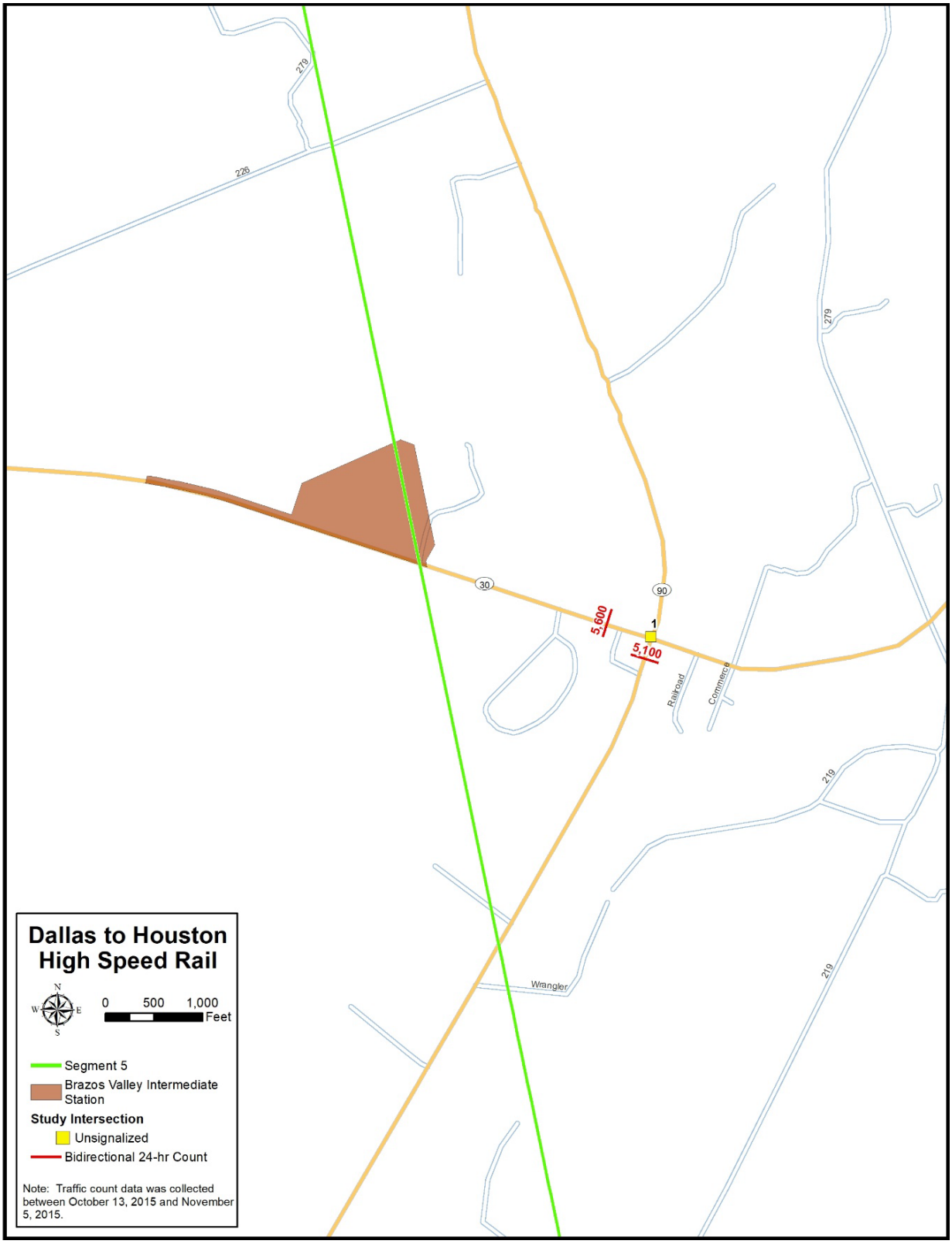
3.11.4.8.6 Aviation

There are no aviation facilities within the Study Area.

3.11.4.8.7 Planned Projects

Table 3.11-28 lists planned capacity improvement projects within the Study Area.

Figure 3.11-3: Brazos Valley Intermediate Station Turning Movement Counts



Source: AECOM 2019

Table 3.11-28: Planned Transportation Projects in Grimes County Study Area						
Project	**Mode**	**Lanes Before/After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
SH 249	Roadway	New location of toll road, 2 lanes proposed; convert shoulders for 4 lanes when needed	Freeway	To be determined	10	$175
SH 105	Roadway	2/4	Freeway	To be determined	13	To be determined
SH 30	Roadway	2/4	Freeway	To be determined	15	To be determined

Source: TXDOT 2019

3.11.4.9 Waller County

3.11.4.9.1 Freight Rail Network

UPRR operates in Waller County, but there are no rail lines within the Study Area. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

3.11.4.9.2 Roadway Network

The primary agencies responsible for roadway crossings are the TxDOT Houston District and Waller County. **Table 3.11-29** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-51**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-29: Roadways in Waller County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
469	Riley Road	Local Road	2	5	A, B, C, D, E and F
471	Foxwood Drive	Local Road	2	5	A, B, C, D, E and F
474	Private Road	Local Road	1	5	A, B, C, D, E and F
475	Murphy Road	Local Road	2	5	A, B, C, D, E and F
476	Bowler Road	Minor Collector	2	5	A, B, C, D, E and F
477	FM 1488	Major Collector	2	5	A, B, C, D, E and F
477	Hegar Road	Major Collector	2	5	A, B, C, D, E and F
477	Joseph Road	Local Road	2	5	A, B, C, D, E and F
477	Private Road	Local Road	1	5	A, B, C, D, E and F
478	Private Road	Local Road	1	5	A, B, C, D, E and F
479	Private Road	Local Road	1	5	A, B, C, D, E and F

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

3.11.4.9.3 Passenger Rail and Transit Services

Colorado Valley Transit provides bus service and 24-hour door-to-door and curb-to-curb service in four counties, including Waller. There are proposed future routes in the communities of Brookshire, Hempstead, Prairie View, and Waller; however, the proposed future routes do not intersect the Study Area and are contained within each of the communities.

3.11.4.9.4 On-Road Pedestrian and Bicycle Facilities

FM 1488 is the only route identified as a bikeway within the Study Area.

3.11.4.9.5 Aviation

There are no aviation facilities within the Study Area.

3.11.4.9.6 Planned Projects

There were no planned projects identified within the Study Area.

3.11.4.10 Harris County

3.11.4.10.1 Freight Rail Network

BNSF and UPRR operate within the Study Area. **Table 3.11-30** identifies the locations in Harris County where the Project would cross existing railroad tracks. Construction of the Project would not require modifications to the existing rail system. Each location is identified by rail operator, rail type (main or spur line) and whether that line is in active status. The location of existing freight rail is noted in **Appendix D, Project Footprint Mapbook**.

Table 3.11-30: Railroad Crossings in Harris County

Mapbook Page	Segment	Build Alternative	Railroad Company	Line Type	Line Status
488	5	A, B, C, D, E and F	UPRR	Spur Line	Active
496	5	A, B, C, D, E and F	UPRR	Main Line	Active
508	5	A, B, C, D, E and F	Private	Spur Line	Active
512	5	A, B, C, D, E and F	Private	Spur Line	Active
515	5	A, B, C, D, E and F	UPRR	Spur Line	Active
516	5	A, B, C, D, E and F	Private	Spur Line	Active
517	5	A, B, C, D, E and F	Private	Spur Line	Active
517	5	A, B, C, D, E and F	Private	Spur Line	Active
524	5	A, B, C, D, E and F	UPRR	Spur Line	Active
524	5: IND	A, B, C, D, E and F	UPRR	Main Line	Active
524	5: IND	A, B, C, D, E and F	UPRR	Spur Line	Active
526	5: IND	A, B, C, D, E and F	UPRR	Spur Line	Active
526	5: IND	A, B, C, D, E and F	UPRR	Spur Line	Active
526	5: IND	A, B, C, D, E and F	UPRR	Spur Line	Active
531	5: NWTC	A, B, C, D, E and F	UPRR	Main Line	Active
531	5: NWTC	A, B, C, D, E and F	Private	Spur Line	Active
531	5: NWTC	A, B, C, D, E and F	Private	Spur Line	Active
531	5: NWTC	A, B, C, D, E and F	UPRR	Spur Line	Active

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

IND = Industrial Site Terminal Station Option; NWTC = Northwest Transit Center Terminal Option

3.11.4.10.2 Roadway Network

TxDOT (Houston District), the City of Houston and Harris County are responsible for the roadways in Harris County. **Table 3.11-31** provides a list of roadways that the Project would cross. If modifications to the roadways are required, the modifications are reported in **Table 3.11-52**. Roadway impacts are also identified in **Appendix D, Project Footprint Mapbook**.

Table 3.11-31: Roadways in Harris County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
481	Castle Road	Local Road	2	5	A, B, C, D, E and F
482	Private Road	Local Road	1	5	A, B, C, D, E and F
484	Private Road	Local Road	1	5	A, B, C, D, E and F
484	Private Road	Local Road	1	5	A, B, C, D, E and F
484	Waller Spring Creek Road	Local Road	2	5	A, B, C, D, E and F
485	Kari Lane (Private)	Local Road	1	5	A, B, C, D, E and F
485	Jaime Lane (Private)	Local Road	1	5	A, B, C, D, E and F
486	FM 2920	Major Collector	2	5	A, B, C, D, E and F
486	Private Drive	Local Road	1	5	A, B, C, D, E and F
487	US 290	Principal Arterial	2	5	A, B, C, D, E and F
487	Private Drive	Local Road	1	5	A, B, C, D, E and F
488	Hempstead Highway	Principal Arterial	2	5	A, B, C, D, E and F
488	Old Washington Road	Local Road	2	5	A, B, C, D, E and F
489	Burton Cemetery Road	Local Road	2	5	A, B, C, D, E and F
489	Private Road	Local Road	1	5	A, B, C, D, E and F
491	Betka Road	Local Road	2	5	A, B, C, D, E and F
491	Private Road	Local Road	1	5	A, B, C, D, E and F
492	Private Road	Local Road	1	5	A, B, C, D, E and F
492	Private Road	Local Road	1	5	A, B, C, D, E and F
493	Private Road	Local Road	1	5	A, B, C, D, E and F
493	Warren Ranch Road	Local Road	2	5	A, B, C, D, E and F
494	Private Road	Local Road	1	5	A, B, C, D, E and F
496	Katy Hockley Road	Major Collector	2	5	A, B, C, D, E and F
496	Private Road	Local Road	1	5	A, B, C, D, E and F
497	House Road	Local Road	2	5	A, B, C, D, E and F
498	SH 99 (SB)	Frontage Road	6	5	A, B, C, D, E and F
498	SH 99 (SB)	Principal Arterial	6	5	A, B, C, D, E and F
498	SH 99 (NB)	Principal Arterial	6	5	A, B, C, D, E and F
498	SH 99 (NB)	Frontage Road	6	5	A, B, C, D, E and F
499	Private Road	Local Road	1	5	A, B, C, D, E and F
499	Private Road	Local Road	1	5	A, B, C, D, E and F
499	Private Road	Local Road	1	5	A, B, C, D, E and F
501	Private Road	Local Road	1	5	A, B, C, D, E and F
502	Private Road	Local Road	1	5	A, B, C, D, E and F
504	Private Road	Local Road	1	5	A, B, C, D, E and F
504	Private Road	Local Road	1	5	A, B, C, D, E and F
504	House Hahl Road	Local Road	2	5	A, B, C, D, E and F
504	Fry Road	Minor Arterial	5 [a]	5	A, B, C, D, E and F
504	Private Road	Local Road	1	5	A, B, C, D, E and F
505	Spring Boulevard	Local Road	2	5	A, B, C, D, E and F
505	Cypress Drive	Local Road	1	5	A, B, C, D, E and F
506	Barker Cypress Road	Major Arterial	5 [a]	5	A, B, C, D, E and F
508	Private Drive	Local Road	1	5	A, B, C, D, E and F
509	Telge Road	Major Arterial	4	5	A, B, C, D, E and F
509	Berwick Drive	Local Road	2	5	A, B, C, D, E and F
509	Private Drive	Local Road	1	5	A, B, C, D, E and F
510	Private Road	Local Road	1	5	A, B, C, D, E and F
511	Huffmeister Road	Major Arterial	5 [a]	5	A, B, C, D, E and F
511	SH 6	Principal Arterial	6	5	A, B, C, D, E and F
511	Private Road	Local Road	1	5	A, B, C, D, E and F
511	Maintenance Road (Public)	Local Road	1	5	A, B, C, D, E and F

Table 3.11-31: Roadways in Harris County Study Area					
Mapbook Page	**Street Name**	**Classification**	**Lane**	**Segment**	**Build Alternative**
512	Daniel Drive	Local Road	2	5	A, B, C, D, E and F
512	Eldridge Pkwy	Principal Arterial	6 [a]	5	A, B, C, D, E and F
513	West Road	Principal Arterial	6 [a]	5	A, B, C, D, E and F
514	Private Drive	Local Road	1	5	A, B, C, D, E and F
514	Private Drive	Local Road	1	5	A, B, C, D, E and F
514	Taylor Road	Local Road	2	5	A, B, C, D, E and F
515	Wright Road	Local Road	2	5	A, B, C, D, E and F
515	Jones Road	Principal Arterial	6 [a]	5	A, B, C, D, E and F
515	Private Road	Local Road	1	5	A, B, C, D, E and F
516	Private Road	Local Road	1	5	A, B, C, D, E and F
516	FM 529/ Spencer Road	Principal Arterial	5	5	A, B, C, D, E and F
516	Britmoore Road	Local Road	2	5	A, B, C, D, E and F
516	Senate Avenue	Local Road	4	5	A, B, C, D, E and F
516	SH 8 SB Frontage	Principal Arterial	2	5	A, B, C, D, E and F
516	SH 8 SB	Principal Arterial	2	5	A, B, C, D, E and F
517	SH 8 NB	Principal Arterial	2	5	A, B, C, D, E and F
517	SH 8 NB Frontage	Principal Arterial	2	5	A, B, C, D, E and F
518	Perimeter Park Drive	Local Road	2	5	A, B, C, D, E and F
518	Little York Road	Principal Arterial	5 [a]	5	A, B, C, D, E and F
519	Gessner Road	Principal Arterial	5 [a]	5	A, B, C, D, E and F
517	Windfern Road	Local Road	1	5	A, B, C, D, E and F
518	Campbell Road/Spite St	Minor Arterial	2	5	A, B, C, D, E and F
518	Tidwell Road	Minor Arterial	4	5	A, B, C, D, E and F
519	Blalock Road/Fairbanks N Houston Road	Major Arterial	5 [a]	5	A, B, C, D, E and F
519	Pinemont Drive	Minor Arterial	3 [a]	5	A, B, C, D, E and F
521	Clay Road/43rd St	Principal Arterial	6 [a]	5	A, B, C, D, E and F
522	Rayson Road	Local Road	2	5	A, B, C, D, E and F
522	Bingle Road	Principal Arterial	6 [a]	5	A, B, C, D, E and F
523	Kempwood Drive/34th Street	Minor Arterial	6 [a]	5	A, B, C, D, E and F
523	Central Coast Crest/Wirtcrest Lane	Local Road	2	5	A, B, C, D, E and F
523	Antoine Drive	Minor Arterial	6[a]	5	A, B, C, D, E and F

Source: TCRR Final Conceptual Engineering Plans and Details, ARUP, 2019

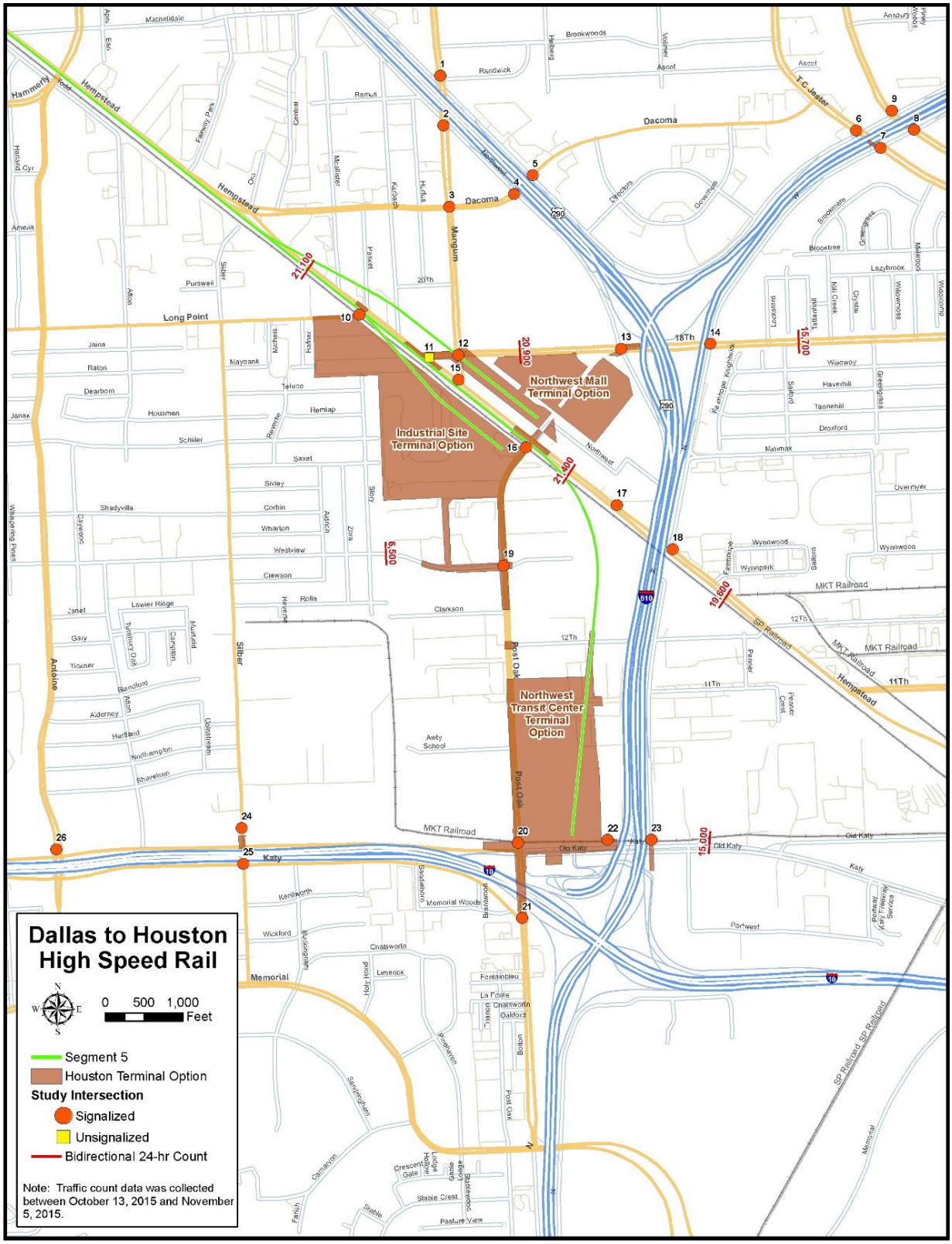
Notes: 1. Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads. 2. The Houston MTFP includes 11 proposed roadways highlighted that are not yet funded and do not yet have specific locations. These roadways are noted in **Appendix G, TCRR Final Conceptual Engineering Plans and Details**. These roadways were not included in **Table 3.11-31**.

[a] These roadways are separated boulevards and are counted as one roadway crossing.

3.11.4.10.3 Station Area

Figure 3.11-4 shows the locations of the Houston Terminal Station options. Turning movement counts were collected at the major intersections (25 signalized and 1 unsignalized) within approximately 1 mile of the Houston Terminal Station options: Industrial Site, Northwest Mall and Northwest Transit Center. The current peak hour volumes are included in **Appendix E, Traffic Operations Technical Memorandum.**

Figure 3.11-4: Houston Terminal Station Options Turning Movement Counts



Source: AECOM 2019

Based on the roadway geometry, the AM and PM turning movement counts and the existing traffic signal timing, the existing LOS at the intersections in the Study Area are presented in **Table 3.11-32**. These levels of service apply to all three locations under consideration for the Houston Terminal Station options. See **Appendix E, Traffic Operations Technical Memorandum,** for the detailed reports showing roadway geometry.

The Study Area intersections operate at LOS D or better, except the intersection of westbound IH-610/TC Jester Boulevard in the AM peak hour and two intersections along Old Katy Road in the PM peak.

Table 3.11-32: LOS – Houston Terminal Station Options Intersections LOS (Delay in Seconds per Vehicle)

Map ID[a]	Intersection	AM	PM
		Existing	Existing
1	NB Frontage Road US 290/Mangum Road	C (29)	C (25)
2	SB Frontage Road US 290/Mangum Road	C (33)	C (34)
3	Mangum Road/Dacoma Street	C (33)	C (29)
4	SB Frontage Road US 290/Dacoma Street	C (32)	C (29)
5	NB Frontage Road US 290/Dacoma Street	C (25)	C (33)
6	WB Frontage Road IH-610/TC Jester Boulevard	**E** (73)	D (40)
7	EB Frontage RoadIH-610/TC Jester Boulevard	D (48)	D (46)
8	EB Frontage Road IH-610/E TC Jester Boulevard	D (39)	D (37)
9	WB Frontage Road IH-610/E TC Jester Boulevard	**F (91)**	C (29)
10	Long Point Road/Hempstead Road	B (17)	B (18)
11	18th Street/Hempstead Road (unsignalized)	A (2)	A (2)
12	Mangum Road/18th Street	C (26)	C (34)
13	SB Frontage Road IH-610/18th Street	C (28)	D (43)
14	NB Frontage Road IH-610/18th Street	D (38)	C (35)
15	Mangum Road/Hempstead Road	C (25)	C (29)
16	Post Oak Road/Hempstead Road	C (27)	C (29)
17	SB Frontage Road IH-610/Hempstead Road	C (29)	C (31)
18	NB Frontage Road IH-610/Hempstead Road	B (12)	B (16)
19	Post Oak Road/Westview Drive	B (19)	C (31)
20	Post Oak Road/Old Katy Road	D (46)	**F** (98)
21	Post Oak Road/EB IH-10	C (24)	B (17)
22	SB Frontage Road IH-610/Old Katy Road	C (24)	**E** (59)
23	NB Frontage Road IH-610/Old Katy Road	C (23)	D (52)
24	WB Frontage Road IH-10/Silber Road	C (25)	C (28)
25	EB Frontage Road IH-10/Silber Road	C (24)	D (47)
26	WB Frontage Road IH-10/Antoine Drive	C (31)	C (26)

Source: AECOM 2019

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better

[a] MAP ID refers to **Figure 3.11-4.**

3.11.4.10.4 Passenger Rail and Transit Services

Amtrak's *Sunset Limited* serves Houston three times a week per direction as it travels between New Orleans and Los Angeles. The Amtrak station is located in downtown Houston, near the intersection of IH-45 and IH-10.

METRO provides transit to 15 cities in the Houston area by both bus and rail. METRO has 114 bus transit routes. Local service typically operates on city streets, with the majority of routes serving downtown

Houston. Express service caters to riders who work downtown and live in outlying communities. Many express routes travel in the HOV lane of a freeway and serve at least one park-and-ride.

The Northwest Transit Center is a hub for bus routes in northwest Houston. There are 12 bus routes that serve the North West Transit Center according to the METRO Trip mobile app as of January 2020. The routes are shown in **Table 3.11-33**.[13] One of the Houston Terminal Station options is adjacent to the Northwest Transit Center.

Table 3.11-33: Northwest Transit Center Bus Routes

Number	Route Name	Frequency (min)	From	To	Daily Weekday Ridership
33	Post Oak	15	Hempstead TC	Bellaire TC	1,701
39	Katy Freeway	30-60	Northwest TC	Upland Drive	291
47	Hillcroft	15-30	Northwest TC	Airport Boulevard	2,914
49	Chimney Rock/S Post Oak	15-30	Northwest TC	Ridgemont	2,707
58	Hammerly	30-60	Northwest TC	West Belt	522
70	Memorial	30-60	Northwest TC	Britmoore	322
72	Westview	30-60	Northwest TC	Britmoore	349
84	Buffalo Speedway	15-30	Northwest TC	W. Bellfort Street	1,606
85	Antoine/Washington	15-30	Downtown TC	Greenspoint TC	6,260
160	Memorial City Express	15	Downtown TC	Memorial City	79
161	Wilcrest Express	15	Downtown TC	W Bellfort P&R	2,811
162	Memorial Express	15	Downtown TC	Addicks P&R	1,193

Source: METRO, 2020

TC = transit center; P&R = Park and Ride

3.11.4.10.5 On-Road Pedestrian and Bicycle Facilities

Several miles of pedestrian and bicycle facilities fall within the Study Area (see **Table 3.11-34**).

[13] Metro, Monthly Ridership Report, January 9, 2020, https://www.ridemetro.org/Pages/RidershipReport-122019.aspx.

Table 3.11-34: On-Road Pedestrian and Bicycle Facilities in Harris County	
Name	**Length Near Project (miles)**
Bike lane projects (N-0420-20)	2.44
Bike lane projects (N-0420-12)	0.91
Bike lane projects (N-0420-10)	0.76
Existing bike lane on W 43rd Street	0.27
Existing bike lane on W Clay Road	0.33
Existing bike lane on Antoine Drive	0.59
Existing bike lane on Hammerly Boulevard	0.25
Existing bike lane on Kempwood Drive	0.17
Existing bike lane on Wirt Road	0.15
Existing bike lane on N Post Oak Road	0.86
Existing bike lane on Westview Drive	0.02
Existing bike lane on FM 529	0.49
Existing signed shared roadway on W 12th Street	0.09
Existing signed shoulder bike route on FM 2920	0.50
Existing bike lane on Pinemont Drive	0.68
Existing signed shoulder bike route on FM 1488	0.50
Existing signed shared roadway on N Post Oak Road/N Post Oak Lane	0.02
Existing signed shared roadway on W 12th Street	0.29
Existing bike lane on W Loop N	0.36

Source: AECOM 2019

3.11.4.10.6 Aviation

There are currently no aviation facilities within the Study Area. Weiser Air Park was reported in the Draft EIS because it was a privately owned, general aviation facility located adjacent to US 290. It was approximately 0.08 mile from the Study Area (refer to **Appendix D**, **Community and Cultural Resources Mapbook**). The property is no longer a general aviation facility. Weiser Air Park was purchased in September 2019 by a private buyer and is closed.

3.11.4.10.7 Planned Projects

Table 3.11-35 provides a list of planned transportation capacity improvement projects within the Study Area.

Table 3.11-35: Planned Transportation Projects in Harris County Study Area						
Project	**Mode**	**Lanes Before/After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
FM 2920 Widening	Roadway	2/4	Highway	2038	13.7	$166
US 290 Widening	Roadway	4/10 (6 main lanes, 2 2-lane frontage roads)	Freeway	TBD	6	$59
Hempstead Toll Road	Roadway	4/8 (4 managed lanes, 2 2-lane frontage road)	Freeway	2035	5	$429
Hempstead Toll Road	Roadway		Freeway	2035	3	$446
Hempstead Toll Road	Roadway		Freeway	2035	3	$347
Hempstead Toll Road	Roadway		Freeway	2035	4	$310

Table 3.11-35: Planned Transportation Projects in Harris County Study Area						
Project	**Mode**	**Lanes Before/After**	**Classification**	**Year Complete**	**Length (miles)**	**Cost ($M)**
IH-610	Roadway	4/8 (inter-change, 4 managed lanes, 2 2-lane frontage roads	Freeway	2035	1	$352
Uptown Bus Rapid Transit	Bus Rapid Transit	Exclusive lanes for bus	N/A	2020	5	$625
Inner Katy Corridor Extension	High Capacity Transit	N/A	N/A	2026	7	$420
Uptown-Galleria Line Extension to Hempstead Intermodal Terminal (HSR Houston Terminal Station)	High Capacity Transit	N/A	N/A	2035	0.5	60
US 290 Transit Rail (commuter rail, high-capacity transit, 6 stations	Rail	N/A	N/A	2025	45	$1,081

Source: TxDOT Project Tracker for Harris County, July 2019, H-GAC 2040 Regional Transportation Plan (H-GAC 2045 project tracker), TXDOT State Rail Plan (2019), https://www.my290.com/environmental/120-hempstead-managed-toll-road.html

N/A = not applicable

3.11.5 Environmental Consequences

3.11.5.1 No Build Alternative

Under the No Build Alternative, the HSR system would not be constructed. Rail passengers would continue to travel on Amtrak via the *Texas Eagle* and *Sunset Limited* through San Antonio to travel between Dallas and Houston. Passenger rail travel between Dallas and Houston would continue on this circuitous route and take more than 17 hours while traveling on shared freight rail lines.

As detailed within **Section 1.2, Purpose and Need for the Dallas to Houston High-Speed Rail Project**, due to increasing congestion on IH-45, automobile travel times between the two regions are projected to increase as travel speeds decrease. Flight time between the two regions is relatively short.

The existing transportation network would remain with the exception of planned and programmed projects. Vehicular transportation would continue to be the primary mode of travel and roadway LOS would continue to deteriorate. Future travel delays for both road and air passengers would be exacerbated due to population growth and changing commute patterns. The projected increase in intercity travel would continue to be serviced by existing modes – car, bus, passenger rail (Amtrak) and air.

In order to meet the needs of growing travel demand spurred by population growth and a decrease in the level of service of existing transportation systems, both Dallas and Houston are addressing much needed infrastructure improvements. Intercity and intracity transportation infrastructure would require significant expansion and maintenance in the future.

3.11.5.2 Build Alternatives

Introducing the HSR system as a new mode of transportation would change the transportation network within not only the Study Area, but the State of Texas. The implementation of the Project would result in a long-term shift in how people travel, particularly between DFW and Houston. An independent ridership and revenue forecast conducted by TCRR, and summarized in **Appendix J, Ridership Demand Forecasting Methodology Assessment Technical Memorandum**, projected that the HSR system would transport approximately 7.2 million passengers annually by 2040.[14] TCRR's data determined that cars made up 94 percent of all travel modes in 2017 and would make up 69 percent in 2029 (a 25 percent decrease of the total travel mode), while the HSR would go from no market share in 2017 to 29 percent in 2029, taking percentages from car and air modes. **Table 3.11-36** illustrates this projected market shift.

Table 3.11-36: Projected Travel Mode Shifts

Trip Type	2017 Market	2029 Market
Car	94%	69%
HSR	-	29%
Air	5.6%	2%
Bus	0.4%	0.0%

Source: TCRR, 2019 (see **Appendix J, Ridership Demand Forecasting Methodology Assessment Technical Memorandum**)

In relative terms of the car trip type, there is a reduction of cars trips from 94 percent to 69 percent (25 percent). This is calculated into a total 26 percent mode shift from car trip to HSR trip (94 percent of 2017 market divided by 25 percent reduction in 2029 market). A beneficial impact of the HSR system would be the introduction of a direct passenger rail connection between Dallas and Houston that does not currently exist. There would be no interruptions to current passenger rail service between Dallas and Houston, because the service does not currently exist. Additionally, the HSR system would provide enhanced multi-modal connectivity with existing transportation services.

No long-term adverse impacts would likely occur for existing on-road pedestrian and bicycle facilities. These facilities would be crossed on viaduct and are subject to the same disruption in service as the roadways.

Regardless of Build Alternative, there would be 27 rail crossings by the HSR system.[15] All Build Alternatives would cross existing freight railroads and light rail transit lines on viaduct. Impacts to these modes of transportation would be limited to temporary disruption of service during construction. As a result of **TR-CM #1: Freight and Transit Crossing Easements**, described below, no long-term or permanent operational impact to existing freight rail or transit infrastructure would occur. Where the HSR system would run parallel to freight railroads, ROW barriers would be constructed to protect the viaduct support columns.

Implementation of the Project would result in direct and indirect impacts to the existing transportation network within the Study Area. As detailed below for each county, the number of roads that would be crossed varies from 216 (Build Alternative C) to 251 (Build Alternative E). Approximately 55 percent of the Project would be constructed on viaduct, minimizing permanent impacts to public roads. Approximately 83 percent of the public road crossings on the Preferred Alternative (Build Alternative A) would be rail over the roadway or roadway over rail and would not include re-routing of the existing

[14] As discussed in further detail in **Section 3.1.1.2, Introduction, Service Levels**, even though TCRR provided updated ridership estimates of 6.4 million in 2029 and 9.9 million in 2040; the original ridership estimates used in the Draft EIS of 4.4 million in 2026 and 7.2 million in 2040 have been carried forward by FRA in the Final EIS to conduct conservative analyses in the Final EIS.

[15] This does not include rail crossings at the Houston Terminal Station options (see **Table 3.11-30**).

public road. As detailed in **Section 3.11.3.3, Roadways, Intersections and Traffic Circulation**, road modifications could include road under railway (crossed on viaduct, but some modification may still be required for clearance), road over railway, relocation, readjustment, reroute or closure. Therefore, the number of roads permanently impacted would vary from 97 (Build Alternative C) to 157 (Build Alternative E). Road crossings that would require modification – through relocation, reroute, closure or changes to the horizontal or vertical alignment of the existing road – are discussed in detail by county. Reroutes to existing roads would result in the addition of approximately 16.6 miles (Build Alternative D) to 45 miles (Alternative C) of publicly accessible roads. Additionally, roads around the Houston Terminal Station options may require modification to address localized changes in traffic patterns. Bus service on impacted roadways would experience similar delays during construction.

Regardless of Build Alternative, all roads within the Study Area would experience a temporary disruption of service during construction. Construction activities would result in construction traffic on nearby and adjacent roads. Construction activities would also result in traffic delays and temporary road closures on roads crossed by the Project. As outlined in **Section 3.2.5.2, Air Quality, Environmental Consequences, Build Alternatives,** on-road construction vehicles (e.g., light commercial trucks and passenger trucks) would be used during all aspects of the construction. Construction trips could be either short or long hauls, depending on the construction type and the materials being used. Construction traffic would be expected for the four types of expected construction activities: track, TMF, MOW facilities and stations. Estimates of construction miles per year are presented in **Table 3.11-37**.

Table 3.11-37: Estimated Miles of Construction Traffic per Year

County	Length of Project in County[a]	Track Related Trips (miles per year)	TMF Related Trips (miles per year)[b]	Maintenance of Way Trips (miles per year)[c]	Station Trips (miles per year)	Total Construction (miles per year)
Dallas	16.8	59,984	1,722,240	1,653,600	3,282,240	6,718,064
Ellis	26.9	95,960	-	1,653,600	0	1,749,560
Navarro	28.8	102,514	-	1,653,600	-	1,756,114
Freestone	20.2	71,881	-	1,653,600	-	1,725,481
Limestone	11.8	42,138	-	1,653,600	-	1,695,738
Leon	27.5	97,847	-	1,653,600	-	1,751,447
Madison	15.2	54,178	-	-	-	54,178
Grimes	42.4	151,028	-	1,653,600	3,282,240	5,086,868
Waller	8.8	31,417	-	-	0	31,417
Harris	39.8	141,695	1,722,240	3,307,200	3,282,240	8,453,375

Source: AECOM 2019

Note: The table is an estimation used for comparative purposes to show anticipated construction-related traffic volumes only. Estimates for miles traveled for construction trips are high level and are not specified between public and private road trips/travel.

[a] Mileage reported is for Build Alternative A, the Preferred Alignment.

[b] TMFs are only located in Dallas and Harris Counties.

[c] MOW facilities are located in eight project counties (not Madison or Waller). As reported in Section **3.2.5, Air Quality**, **Environmental Consequences,** estimated emissions from construction trips/miles were only calculated for nonattainment areas. The average per county with one MOW facility was used to estimate miles of trips per year for nonattainment counties.

Harris County is expected to see the greatest number of construction-related miles per year, with approximately 8.4 million, while Waller County is expected to see 31,400 miles per year due to track-related construction activity. In general, the amount of track-related construction activity is based on the length of the Project in each county. The construction of proposed stations would contribute to approximately 3.3 million miles per year of construction activity. As expected, due to the stations,

Harris, Dallas and Grimes Counties are expected to see the greatest miles of construction activity per year.

As detailed **in Section 3.11.6, Avoidance, Minimization and Mitigation**, compliance and mitigation measures would mitigate direct impacts and delays to traffic caused by increased construction volumes.

3.11.5.2.1 Dallas County

Roadway Network

Table 3.11-38 identifies 10 roads (public and private) in Dallas County that would be permanently impacted (meaning re-routed, closed, reconstructed or otherwise modified) by the Project. **Table 3.11-5** lists all roads that the Project would cross, including those with no impact (i.e., where the project is on viaduct). As requested from the cities of Dallas and Houston, **Table 3.11-38** includes projects from the master thoroughfare plans that are funded and to be constructed.

Table 3.11-38: Dallas County Roadway Modifications

Segment	Build Alternative	Road Name	Impact	Modification	New (feet)	Removed (feet)
1	A, B, C, D, E and F	Hotel Street[a]	Reroute/ Road under Rail	The proposed Dallas Terminal Station would be built at this location. Hotel Street would be rerouted under the Project. Approximately 300 feet of Hotel Street would be removed. 1,200 feet of new road would be built along the northern side of the station. Travelers along Hotel Street would be rerouted along the station to connect to Riverfront Boulevard.	1,200	300
1	A, B, C, D, E and F	Bulova Street	Reroute/Road under Rail	Bulova Street would be rerouted to go under the Project.	-	-
1	A, B, C, D, E and F	Cotton Lane	Reroute/Road under Rail	Cotton Lane would be rerouted to go under the Project.	-	-
1	A, B, C, D, E and F	Le May Avenue/ Le Forge Avenue	Road Adjustment	The termini of Le May Avenue and Le Forge Avenue would be closed.	-	400
1	A, B, C, D, E and F	Cleveland Road	Reroute/ Road under Rail	The portion of Cleveland Road that would cross under the Project would be closed. Cleveland Road would be rerouted approximately a third of a mile to the north on a new access road. This new access road would be located on both the east and west sides of the Project.	4,100	1,200

Table 3.11-38: Dallas County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New (feet)**	**Removed (feet)**
1	A, B, C, D, E and F	Private Drive	Closure	The terminus of the Private Drive would be crossed by the Project and removed. Approximately 1,300 of the Private Drive would still have access to Lancaster-Hutchins Road to the east (refer to **Appendix D, Project Footprint Mapbook**, page 14).	-	-
1	A, B, C, D, E and F	Cornell Road	Reroute	Approximately 1,500 feet of Cornell Road would be replaced by 1,500 feet of new public road constructed on the west side of the Project.	1,500	1,500
1	A,B,C,D,E, and F	Watermill Road	Reroute	Watermill Road would be rerouted approximately 400 feet to the north to cross under the Project.	900	150
1	A,B,C,D,E, and F	Hash Road	Road over Rail	Approximately 1,800 feet of Hash Road would be reconstructed over Segment 1.	-	-
1	A,B,C,D,E, and F	Raintree Drive	Road Adjustment	The terminus of Raintree Drive would be closed due to the Project. Approximately 100 feet of Raintree Road would be removed.	-	100

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes:
1) Refer to **Table 3.11-5** for a complete list of both public and private roadway interactions with the Project in Dallas County, including rail over rail.
2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.
3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.
[a] This modification is part of the Dallas Terminal Station site.

Traffic Impacts at the Dallas Terminal Station

Approximately 96 percent of the trips to the Dallas Terminal Station would be by motor vehicle, as documented in **Appendix J, Ridership Demand Forecasting Methodology Assessment Technical Memorandum**. These trips were allocated to the local roadway network and the route assignment by mode and direction. **Table 3.11-39** summarizes the trip direction and mode of the motor vehicles arriving and departing the Dallas Terminal Station. The modeling data are found in **Appendix E, Traffic Operations Technical Memorandum**.

Table 3.11-39: Dallas Terminal Station Trip Direction and Mode						
	% of Total	Drive and Park	Rental Car	Pick-up/ Drop-off	Taxi and Bus	Total
North (IH-35)	34	81	32	155	243	511
West (IH-30)	19	45	18	87	136	286
South (IH-35)	15	36	14	68	107	225
East (IH-30)	18	43	17	82	129	271
Riverfront Boulevard	5	12	5	22	36	75
Oak Cliff (via Corinth Street)	1	2	1	5	7	15
South Dallas (Lamar Street)	4	10	4	18	28	60
Downtown (Hotel Street)	1	2	1	5	7	15
Downtown (Lamar Street)	3	7	3	14	21	45
Total	**100**	**238**	**95**	**456**	**714**	**1,503**

Source: TCRR 2019

Traffic delays are expected to increase around the Dallas Terminal Station in both the No Build and Build scenarios. As reported in **Table 3.11-6**, all the 28 intersections around the Dallas Terminal Station are currently experiencing an acceptable LOS (i.e., LOS D or better). **Table 3.11-40** lists the 2040 peak period intersection conditions under the No Build, Project and modified conditions.

The No Build scenario incorporates traffic volume projections from the NCTCOG travel demand model. The model forecasts volumes that represent growth rates as high as 4 percent per year from existing volumes. This results in projected 2040 No Build conditions that would be congested and yield LOS E or F at some intersections. FRA analyzed the No Build scenario traffic projections around the Dallas Terminal Station and found that LOS would decrease to an unacceptable LOS E or F for six intersections in the AM No Build and seven in the PM No Build scenarios. The Belleview Street/Akard Street intersection, in particular, was projected to have a sharp drop in LOS.

Table 3.11-40: Dallas Terminal Station Impacts 2040 LOS (Delay in Seconds per Vehicle)							
Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
Woodall Rodgers Freeway/Riverfront Boulevard	**F (119)**	D (48)	**F (127)**	D (50)	**F (127)**	D (50)	**Y**
Riverfront Boulevard/Commerce Street	**F (90)**	**F (98)**	**F (131)**	**F (98)**	**F (82)**	**F (97)**	**Y**
Reunion Boulevard/Riverfront Boulevard	C (25)	B (17)	C (27)	C (21)	C (27)	C (21)	N
WBFR IH-30/Riverfront Boulevard	A (9)	B (17)	A (9)	C (34)	A (9)	C (34)	N
EBFR IH-30/Riverfront Boulevard	C (28)	C (22)	C (32)	D (41)	C (32)	D (41)	N
IH-35E/Riverfront Boulevard	A (8)	B (13)	A (9)	B (12)	B (9)	B (12)	N
Riverfront Boulevard/Cadiz Street	**F (175)**	**F (147)**	**F (406)**	**F (275)**	**F (137)**	**F (185)**	**Y**
Cadiz Street/Hotel Street	A (9)	A (10)	A (9)	B (11)	A (9)	B (11)	N
Cadiz Street/Lamar Street	**E (61)**	**F (90)**	**F (106)**	**F (190)**	D (49)	**F (115)**	**Y**
Canton Street/Lamar Street	B (13)	B (15)	B (16)	B (17)	B (16)	B (17)	N
Hotel Street/Memorial Drive (unsignalized)	A (9)	B (10)	**F (67)**	B (14)	D (33)	D (35)	**Y**
Lamar Street/Memorial Drive	B (16)	B (14)	B (16)	B (14)	B (16)	B (14)	N

Table 3.11-40: Dallas Terminal Station Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
Griffin Street/Memorial Drive	D (53)	C (28)	D (53)	C (28)	D (53)	C (28)	N
Canton Street/Griffin Street	B (11)	C (21)	B (14)	**F (144)**	C (29)	D (48)	**Y**
Cadiz Street/Griffin Street	B (15)	B (13)	B (16)	B (14)	B (16)	B (12)	N
Canton Street/Akard Street	C (26)	**F (90)**	C (29)	**F (111)**	D (38)	D (44)	**Y**
Cadiz Street/Akard Street	C (28)	B (15)	D (42)	B (16)	D (42)	B (15)	N
Griffin Street W/Akard Street	B (15)	B (12)	B (16)	B (13)	B (16)	B (13)	N
Griffin Street E/Akard Street	B (11)	C (21)	B (11)	C (21)	B (11)	C (21)	N
Belleview Street/Akard Street (unsignalized)	**F (318)**	**F (1531)**	**F(NA)[a]**	**F(NA)[a]**	**F (490)**	**F (216)**	**Y**
Griffin Street W/Ervy Street	B (16)	A (5)	C (23)	A (7)	C (23)	A (7)	N
Griffin Street E/Ervy Street	B (15)	B (14)	B (14)	C (35)	B (14)	C (35)	N
Griffin Street E/St Paul Street	A (6)	C (32)	A (9)	**E (59)**	A (9)	**E (59)**	**Y**
Griffin Street W/St Paul Street	B (18)	B (15)	C (26)	B (17)	C (26)	B (17)	N
Lamar Street/Belleview Street	B (19)	B (17)	**F (139)**	D (40)	**E (60)**	D (49)	**Y**
Lamar Street/Corinth Street	D (35)	**E (56)**	D (43)	**E (69)**	D (43)	**E (69)**	**Y**
Corinth Street/Riverfront Boulevard	**F (189)**	**F (186)**	**F (201)**	**F (191)**	**F (177)**	**F (104)**	**Y**

Source: AECOM 2019

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of LOS D or better.
[a] The delay result generated was too high and far exceeded the threshold.

The Build scenarios also saw a decrease in LOS. Eight intersections would decrease to an unacceptable LOS E or F in the AM Build. Nine intersections would decrease to an unacceptable LOS E or F in the PM Build. The Belleview Street/Akard Street intersection and the Riverfront Boulevard/Cadiz Street intersection, in particular, were projected to have a sharp drop in LOS. Overall, 12 intersections would experience some type of adverse impact (either in the AM, PM or both), as shown in **Table 3.11-40**. FRA identified potential intersection modifications to mitigate LOS delays, as shown in **Table 3.11-41**.

Table 3.11-41: Dallas Terminal Station Intersection Design Modifications

Intersection	Improvement
Riverfront Boulevard/Commerce Street	• Add right turn bay to northbound approach to provide dual right turn bays
Riverfront Boulevard/Cadiz Street	• Add additional northbound left turn bay to provide dual left-turns • Construct left turn bay in the southbound approach and convert the existing left turn lane to a second right turn lane • Provide a right turn arrow signal to allow the southbound right turns to overlap with the southeast bound left turn
Cadiz Street/Lamar Street	• Add a right-turn bay to southwest bound approach and convert the shared through-right to a through-only lane • Add a right turn bay to southeast bound approach
Hotel Street/Memorial Drive (unsignalized)	• Convert the intersection for all-way stop to stop controlled on the northbound and southbound approaches (along Memorial Drive), and free movement on the eastbound and westbound approaches (along Hotel Street)
Canton Street/Griffin Street	• Adjust the signal timing to provide protected-permissive left turn on the westbound approach, as opposed to just permissive

Table 3.11-41: Dallas Terminal Station Intersection Design Modifications	
Intersection	**Improvement**
Canton Street/Akard Street	• Convert one northwest bound through lane to a shared through/left lane
Belleview Street/Akard Street (unsignalized)	• Convert the lane configuration in the northeast bound approach to one exclusive left turn lane and one shared through/right turn lane • Adjust signal timing to provide a protected-permissive left turn phase for the southeast bound approach
Lamar Street/Belleview Street	• Provide stop control on both approaches of Akard Street to make the intersection four-way stop-controlled
Corinth Street/Riverfront Boulevard	• Add a right turn bay to the northbound approach and convert the shared through/right to a through only lane • Add a right turn bay to the northwest bound approach and convert the single lane for all movements to a shared through/left lane

Source: AECOM 2019

The proposed intersection modifications would likely improve the LOS in the Project to No Build conditions or better, including the severely congested intersections. Note that some may experience a negligible beneficial impact in LOS as a result of the HSR system (i.e., Lamar Street/Corinth Street). With modified conditions, four intersections would operate at LOS E or F for both the AM and PM peak periods, two intersections would operate at LOS E or F for the AM peak period and two intersections would operate at LOS E or F for the PM peak period. The proposed intersection modifications would result in substantial reductions in delay over the non-modified Build scenario and the majority would show improvement or no change over the No Build scenario.

FRA evaluated traffic impacts to intersections around the Dallas Terminal Station. The evaluation was based on the conceptual station designs in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**[16] Impacts to intersections are shown in **Table 3.11-40**. Typical intersection modifications that would mitigate the impacts are shown in **Table 3.11-41**; however, actual improvements will be coordinated between the City of Dallas and TxDOT. TCRR will perform a full traffic impact analysis (TIA) that complies with City of Dallas TIA guidelines, as determined applicable through consultation with City of Dallas. TxDOT and the City of Dallas will ultimately decide on intersection improvements to mitigate LOS impacts; therefore, the intersection improvements shown in **Table 3.11-41** are not included in the LOD and are purely for informational purposes.

Passenger Rail and Transit Services

As stated previously under **Traffic Impacts at the Dallas Terminal Station**, the Project could increase ridership on the DART system. Since the HSR service would disembark large numbers of people at one time, there could be occasional capacity issues at peak periods at the Convention Center and Cedars DART stations that are near the Dallas Terminal Station. During non-peak periods, the less frequent light rail train services may not be sufficient to absorb disembarking HSR passengers. Additional coordination with DART would be required to assess potential last-mile/first-mile needs and identify opportunities/barriers to enhance operational capacity.

[16] The TCRR Final Conceptual Engineering Report and the LOD include intersection improvements based on TCRR traffic analysis.

It is anticipated that 4 percent of access to the Dallas Terminal Station would occur via non-motorized modes (in person trips), as shown in **Appendix J, Ridership Demand Forecasting Methodology Assessment Technical Memorandum**.

Should the Project be constructed, DART and Trinity Metro, the two agencies who co-manage the TRE, could extend the TRE commuter rail line from Union Station to the Dallas Terminal Station. Currently, DART is considering the development of a second downtown light rail line. This line could be extended south towards the proposed terminal. These improvements would improve the multi-modal connectivity of HSR with the DART system.

Long-term, DART's bus service could be increased or rerouted to provide better non-rail access to/from the terminal stations.

As noted in **Section 2.2.5.1, Alternatives Considered, Amtrak Through-Ticketing Agreement**, per its agreements with Amtrak, Texas Central would provide a transfer service between the Dallas Terminal Station and the Dallas Union Station, where the Texas Eagle Amtrak route connects. The approximately 0.8 mile one-way trip would travel down Young Street, South Lamar Street and Cadiz Street, as illustrated on **Figure 3.11-5**.

Amtrak estimates that approximately 4,000 to 4,500 passengers would be served by the transfer service by the year 2026. This estimate increases to 16,100 by the year 2035. These estimates also include passengers who would choose to walk to the nearby Dallas Convention Center DART station and then travel on to the Dallas Union Station (an approximately 10 minute trip).

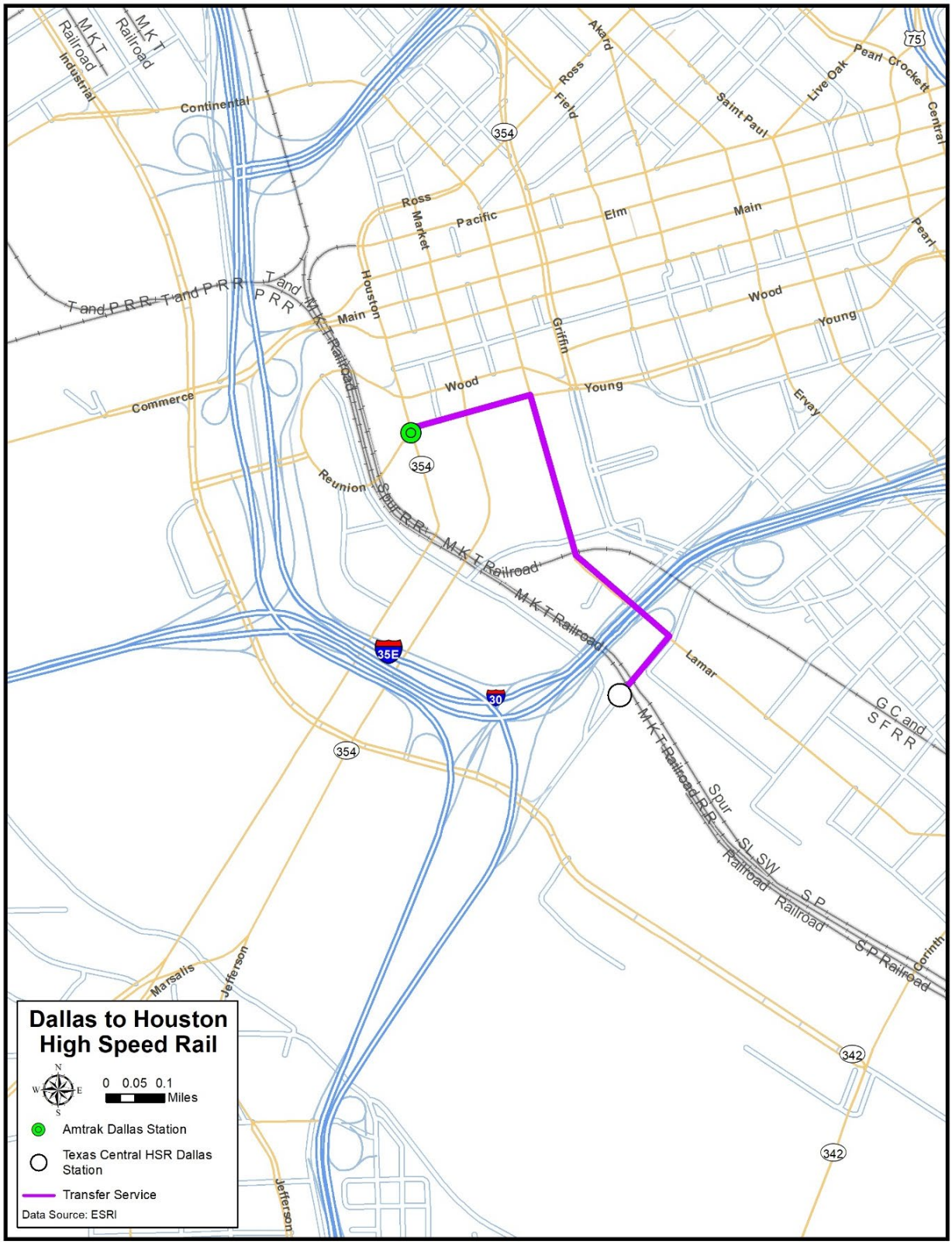
On-Road Pedestrian and Bicycle Facilities

The Dallas Terminal Station design would incorporate new sidewalk and pedestrian infrastructure to the area. A pedestrian bridge of approximately 500 feet would be added to connect Austin Street and a potential parking zone to the Dallas Terminal Station. There is also potential for a pedestrian bridge of approximately 1,900 feet that would extend east toward the DART Convention Center station. Four pedestrian plazas would also be constructed near these bridges. For detailed drawings of the Dallas **Terminal Station site and proposed pedestrian infrastructure, refer to** Appendix F, TCRR Conceptual Engineering Design and Constructability Reports**.**

Aviation

The Lancaster Airport, located southeast of the intersection of Ferris and East Beltline Roads in Dallas County, would be approximately one-quarter mile west of Segment 1 of the Project. The Project would be outside of FAA-regulated RPZs. There would be no temporary or permanent impacts to this facility as a result of the Project.

Figure 3.11-5: Route from Dallas Terminal Station to Dallas Union Station



Source: AECOM 2019

3.11.5.2.2 Ellis County

Roadway Network

Table 3.11-42 identifies 25 roads (public and private) in Ellis County that would be permanently impacted by the Project.

3.11.5.2.3 Navarro County

Roadway Network

Table 3.11-43 identifies 33 roads (public and private) in Navarro County that would be permanently impacted by the Project.

The Anxiety Aerodrome is a privately owned, private use, turf aviation facility located southeast of State Route 31 W and SW 1000 in Navarro County. Segment 3B would directly intersect this private airfield. This action would require the parcel acquisition and closure of this facility.

3.11.5.2.4 Freestone County

Roadway Network

Table 3.11-44 identifies 33 roads (public and private) in Freestone County that would be permanently impacted by the Project.

3.11.5.2.5 Limestone County

Roadway Network

Table 3.11-45 identifies 15 roads (only private) in Limestone County that would be permanently impacted by the Project.

3.11.5.2.6 Leon County

Roadway Network

Table 3.11-46 identifies 34 roads (public and private) in Leon County that would be permanently impacted by the Project.

3.11.5.2.7 Madison County

Roadway Network

Table 3.11-47 identifies 19 roads (public and private) in Madison County that would be permanently impacted by the Project.

3.11.5.2.8 Grimes County

Roadway Network

Table 3.11-48 identifies 23 roads (public and private) in Grimes County that would be permanently impacted by the Project.

Table 3.11-42: Ellis County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
2A	A, B, and C	Private Road	Closure	This Private Road is a driveway that connects to a driveway to the south. The second driveway connects to FM 983. The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook,** page 25)	-	-
2A	A, B, and C	Private Road	Closure	This private road connects to FM 983. The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 25)	-	-
2A	A, B, and C	Ewing Road	Reroute	Approximately 400 feet of Ewing Road that would cross under Segment 2A would be removed. Ewing Road would be rerouted approximately 3,500 feet to the north to connect with FM 983. The new alignment would run along the east side of the Project.	3,500	400
2A	A, B, and C	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 27)	-	-
2A	A, B, and C	Private Road	Reroute	Approximately 200 feet of the private road that would cross the Project would be closed. Approximately 2,400 feet of shared access road would provide access.	-	-
2A	A, B, and C	Getzendaner Road	Reroute	Approximately 300 feet of Getzendaner Road that would cross the Project would be removed. Approximately 3,100 feet of public access road would connect Getzendaner Road to FM 984.	3,100	300
2A	A, B, and C	Bacak Road	Road over Rail	Approximately 1,600 feet of Bacak Road would be reconstructed over Segment 2A.	-	-
2A	A, B, and C	FM 984	Reroute/ Road over Rail	Approximately 3,400 feet of new public road would be constructed on the northern side of the current alignment. FM 984 and Hodge Road (to the east) would cross the Project.	3,400	2,500

Source: TCRR Conceptual Engineering Plans and Details, ARUP, 2019. Additional measurements by AECOM, 2019

Notes: 1) Refer to **Table 3.11-10** for a complete list of all existing (both public and private) roadway interactions with the Project in Ellis County, including rail over rail.
2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.
3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**
4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.
[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-42: Ellis County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
2B	D, E and F	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 57)	-	-
2B	D, E and F	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 57)	-	-
2B	D, E and F	Ewing Road	Reroute/ Road over Rail	Approximately 700 feet of Ewing Road would be removed to allow for realignment and a road over rail construction of Ewing Road. The new alignment would run along the east side of the Project and would connect to FM 983 to the west and north. Approximately 4,500 feet of Ewing Road would be reconstructed over Segment 2B.	4,500	700
2B	D, E and F	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 61)	-	-
2B	D, E and F	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 62)	-	-
2B	D, E and F	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 62)	-	-
2B	D, E and F	Epps Road	Reroute	Approximately 1,900 feet of Epps Road would be rerouted and reconstructed under Segment 2B.	1,900	1,000
2B	D, E and F	Private Road	Closure	This private road provides connections to Almand Road. The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 64)	-	-
2B	D, E and F	Wilson Road	Road over Rail	Approximately 2,000 feet of Wilson Road would be reconstructed over Segment 2B. Private driveway access would require approximately 400 feet of new road.	-	-

Source: TCRR Conceptual Engineering Plans and Details, ARUP, 2019. Additional measurements by AECOM, 2019

Notes: 1) Refer to **Table 3.11-10** for a complete list of all existing (both public and private) roadway interactions with the Project in Ellis County, including rail over rail.
2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.
3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**
4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.
[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-42: Ellis County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
2B	D, E and F	Private Drive	Reroute	Segment 2B would require the closure of the existing private drive. Access would be provided via a new shared access road (refer to **Appendix D, Project Footprint Mapbook**, page 80)	-	-
2B	D, E and F	Private Drive	Reroute	Segment 2B would require the closure of the existing private drive. Access would be provided via a new shared access road (refer to **Appendix D, Project Footprint Mapbook**, page 80)	-	-
2B	D, E and F	Private Road	Reroute	Segment 2B would require the closure of the existing private road. Access would be provided via a new shared access road (refer to **Appendix D, Project Footprint Mapbook**, page 80)	-	-
2B	D, E and F	FM 984	Reroute/Road under Rail	The portion of FM 984 that would cross Segment 2B would be removed. New public road would be constructed to reroute FM 984 under the Project. The new reroute would be approximately 2,500 feet in length.	2,500	1,600
2B	D, E and F	Private Road	Closure	This private road would be impacted by a proposed maintenance of way facility and would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 84)	-	-
2B	D, E and F	Private Road	Closure	This private road would be impacted by a proposed maintenance of way facility and would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 85)	-	-
2B	D, E and F	FM 984	Reroute/ Road over Rail	Approximately 3,100 feet of FM 984 would be reconstructed over Segment 2B.	-	-
3A	A and D	Davis Road (Private)	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 89)	-	-

Source: TCRR Conceptual Engineering Plans and Details, ARUP, 2019. Additional measurements by AECOM, 2019

Notes: 1) Refer to **Table 3.11-10** for a complete list of all existing (both public and private) roadway interactions with the Project in Ellis County, including rail over rail.
2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.
3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**
4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.
[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-43: Navarro County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3A & 3C	A and D	County Road 1320	Reroute	Approximately 300 feet would be removed. Access would be provided by approximately 2,800 feet of new access road extending north from CR 1300 on the east side of Segment 3A.	2,800	300
3A & 3C	A and D	County Road 1300	Road over Rail	Approximately 1,620 feet of CR 1300 that would cross Segment 3A would be removed. Approximately 2,200 feet of CR 1300 would be rerouted and reconstructed over Segment 3A.	1,400	1,620
3A & 3C	A and D	County Road 2080	Road over Rail	Approximately 200 feet of CR 2080 would be reconstructed over Segment 3A.	-	-
3A & 3C	A and D	FM 1126	Reroute/Road under Rail	Segment 3A of the Project would impede travel on FM 1126. Approximately 4,300 feet of new public access road would be constructed on the east side of the Project to connect north to FM 744. Approximately 900 feet of FM 1126 would be removed due to interaction with the Project.	4,300	900
3A	A and D	Private Drive	Closure	The portion of private drive that would cross Segment 3A would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 131).	-	-
3A & 3C	A and D	FM 709	Reroute/Road over Rail	Approximately 1,650 feet of FM 709 would be rerouted and reconstructed over Segment 3A.	1,500	780
3A	A and D	County Road 40	Road over Rail	Approximately 1,800 feet of CR 40 would be removed. CR 40 would be rerouted to go over the Project. The new length of CR 40 would be approximately 1,800 feet.	-	-
3A	A and D	County Road 2190	Reroute	CR 2190 would be rerouted to the west of the current alignment. The new public road would be approximately 2,100 feet in length. Approximately 2,500 feet of CR 2190 would be removed, shortening the overall length of CR 2190 by approximately 400 feet.	2,100	2,500
3B	B and E	Private Road	Reroute	The private road would retain access through approximately 700 feet of access road located on the east side of the Project. The access road would provide access to CR 1320 (refer to **Appendix D, Project Footprint Mapbook**, page 129)	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-13** for a complete list of all existing (both public and private) roadway interactions with the Project in Navarro County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-43: Navarro County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3B	B and E	Private Road	Closure	The portion of private road (driveway) that would cross Segment 3B would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 129).	-	-
3B	B and E	Private Road	Closure	The portion of private road (driveway) that would cross Segment 3B would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 130).	-	-
3B	B and E	County Road 4777	Road over Rail	Approximately 3,240 feet of CR 4777 would be rerouted and reconstructed over Segment 3B.	-	-
3B	B and E	County Road 1220	Road over Rail	Approximately 1,300 feet of CR 1220 would be reconstructed over Segment 3B.	-	-
3B	B and E	FM 744	Road over Rail	Over 6,500 feet of FM 744 would be reconstructed over Segment 3B.	-	-
3B	B and E	Shumard Oak Lane	Reroute	Segment 3B of the Project would block access to the western terminus of Shumard Oak Lane. Approximately 200 feet of Shumard Oak Lane would be removed. A public access road on the west side of the Project would connect to SH 31, approximately 6,300 feet to the north.	6,300	200
3B	B and E	County Road 1160	Reroute	Approximately 200 feet of CR 1160 would be closed. New public access road would be constructed along the east side of the Project. CR 1160 would be rerouted approximately 4,300 feet to connect to CR 1220 to the north.	4,300	200
3B	B and E	County Road 2050	Reroute/ Road over Rail	Approximately 4,500 feet of CR 2050 would be removed and 4,100 feet would be reconstructed and realigned over Segment 3B.	4,100	4,500

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-13** for a complete list of all existing (both public and private) roadway interactions with the Project in Navarro County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-43: Navarro County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3B	B and E	County Road 1090	Reroute	Segment 3B of the Project would block CR 1090. New access roads would be built on the east and west sides of the Project. 1,000 feet of new access road on the east side of the Project would connect to new access roads being used by Red Oak Lane and Oak Valley Lane (see below). The road would travel under the Project approximately 1.3 miles south of the current location. Approximately 2,300 feet of new access road on the west side of the Project would connect CR 1090 to Oak Valley Lane and the new access road shared by Red Oak and Oak Valley. In all, travelers on CR 1090 would be rerouted approximately 2.6 miles and would utilize public access road shared with Red Oak Lane and Oak Valley Lane.	3,300	-
3B	B and E	Red Oak Lane	Reroute	Segment 3B of the Project would block Red Oak Lane. New access roads would be constructed on both the east and west sides of the Project. Approximately 1,500 feet of new access road on the eastern side of the Project would connect to access road utilized by Oak Valley Lane (see below). Red Oak Lane would cross under the Project approximately 1 mile to the south of the current location.	1,500	-
3B	B and E	Oak Valley Lane	Reroute	Segment 3B of the Project would block Oak Valley Lane. Oak Valley Lane would be rerouted to cross under the Project approximately 4,300 feet south of the current crossing. New access roads would be constructed on both the east and west sides of the Project, resulting in approximately 8,500 feet of new road.	8,500	-
3B	B and E	County Road 5149 /CR 1130	Road over Rail	The portion of CR 5149 that would cross Segment 3B would be blocked. Approximately 3,600 feet would be reconstructed to go over Segment 3B. Approximately 2,100 feet of new road would be constructed to connect to CR 1110.	2,100	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-13** for a complete list of all existing (both public and private) roadway interactions with the Project in Navarro County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-43: Navarro County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3B	B and E	County Road 1140	Reroute	CR 1140 would be blocked by the Project. Approximately 3,400 feet of new public road would be constructed on the east side of Segment 3B north to CR 5149.	3,400	-
3B	B and E	Private Road	Reroute	This private road is a driveway. The driveway would be blocked by the Project. Approximately 2,000 feet of access road would provide connection to County Road 1140 (refer to **Appendix D, Project Footprint Mapbook**, page 147).	-	-
3B	B and E	Private Road	Closure	The portion of private road (driveway) that would cross Segment 3B would be closed (refer to **Appendix D, Project Footprint Mapbook**, Page 147).	-	-
3B	B and E	FM 709	Road over Rail	Approximately 460 feet of FM 709 that would cross Segment 3B would be closed. Approximately 3,000 feet of FM 709 would be reconstructed over Segment 3B. Private drive access would require approximately 2,550 feet of new public road.	2,550	460
3B	B and E	Private Road	Reroute	This private road is a driveway that currently connects to County Road 30. Approximately 800 feet of access road would be provided to connect this driveway to CR 30 (refer to **Appendix D, Project Footprint Mapbook**, page 148).	-	-
3B	B and E	Private Road	Reroute	Access would be provided by the construction of approximately 1,000 feet of shared access road on the east side of the Project (refer to **Appendix D, Project Footprint Mapbook**, page 152).	-	-
3B	B and E	County Road 2110	Road over Rail	The portion of CR 2110 that would cross Segment 3B would be removed. Approximately 2,300 feet of CR 2110 would be reconstructed over Segment 3B.	-	-
3B	B and E	County Road 2190	Reroute	CR 2190 would be rerouted slightly to travel on the east side of the Project. The realignment would shorten CR 2190 by approximately 260 feet.	-	260

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-13** for a complete list of all existing (both public and private) roadway interactions with the Project in Navarro County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-43: Navarro County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	County Road 40	Reroute	CR 40 would be blocked by the Project. Access under the Project would be made available approximately 2,200 feet north of the current crossing location. Two new public access roads totaling approximately 5,000 feet would provide a reroute under the Project.	5,000	
3C	C and F	County Road 2344	Reroute	CR 2344 would be blocked by Segment 3C of the Project. A new access road would be constructed along the eastern side of the Project to reroute CR 2344 approximately 1,600 feet south of the current crossing. CR 2344 would go under the Project. This new crossing would be shared with CR 2348 (to the south). A total 2,300 feet of new road would be constructed to reroute CR 2344. Existing road on the western side of the Project would be used to create a new route for CR 2344.	2,300	-
3C	C and F	County Road 2348	Reroute	CR 2348 would be blocked by Segment 3C of the Project. A new access road would be constructed along the eastern and western sides of the Project to reroute CR 2348 approximately 1,800 feet north of the current crossing. CR 2348 would go under the Project. A total of 4,200 feet of new road would be constructed to reroute CR 2348.	4,200	-
3C	C and F	County Road 2380	Road over Rail	The portion of CR 2380 that would cross Segment 3C would be closed. Approximately 2,000 feet of CR 2380 would be reconstructed over Segment 3C.	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-13** for a complete list of all existing (both public and private) roadway interactions with the Project in Navarro County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-44: Freestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	FM 246	Road over Rail	The portion of FM 246 crossing Segment 3C would be removed. Approximately 2,500 feet of FM 246 would be reconstructed over Segment 3C.	-	-
3C	C and F	County Road 1041	Road over Rail	The portion of CR 1041 crossing Segment 3C would be removed. Approximately 1,700 feet of CR 1041 would be reconstructed over Segment 3C.	-	-
3C	C and F	County Road 1100	Road over Rail	The portion of CR 1100 crossing Segment 3C would be removed. Approximately 2,200 feet of CR 1100 would be reconstructed over Segment 3C.	-	-
3C	C and F	County Road 1101	Road over Rail	The portion of CR 1101 that would cross Segment 3C would be removed. Approximately 1,600 feet of CR 1101 would be constructed over the Project.	-	-
3C	C and F	FM 833W	Road over Rail	The portion of CR 833W that would cross Segment 3C would be closed. Approximately 2,500 feet of CR 833W would be reconstructed over the Project.	-	-
3C	C and F	IH-45 Frontage Road	Relocation	Approximately 5.5 miles of frontage road would be relocated approximately 100-500 feet west and outside of the Segment 3C ROW.	9,000	8,580
3C	C and F	County Road 1171	Reroute	A public access road would be constructed along the western edge of Segment 3C. The terminus of CR 1171 would move approximately 200 feet to the west, shortening CR 1171 by approximately 200 feet.	-	200
3C	C and F	County Road 1150	Reroute	A public access road would be constructed along the western edge of Segment 3C. The terminus of CR 1150 shortening CR 1150 by approximately 100 feet.	-	100
3C	C and F	Private Road	Road Closure	The portion of the Private Road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 213).	-	-
3C	C and F	Church Street	Road over Rail	Project would create insufficient vertical clearance on existing Church Street. Approximately 1,200 feet of Church Street would be reconstructed over IH-45 to connect to the IH-45 Frontage Road.	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-16** for a complete list of all existing (both public and private) roadway interactions with the Project in Freestone County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed **in TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-44: Freestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	County Road 610	Reroute	A public access road would be constructed along the western edge of Segment 3C. The terminus of CR 610 would move approximately 600 feet to the west, shortening CR 610 by approximately 600 feet.	-	600
3C	C and F	County Road 660	Road over Rail	The portion of CR 660 that would cross Segment 3C would be removed. Approximately 2,400 feet of CR 660 would be reconstructed over Segment 3C (refer to **Appendix D, Project Footprint Mapbook**, page 314).	-	-
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed.	-	-
4	A, B, D and E	County Road 995	Road over Rail	The portion of CR 995 that would cross Segment 4 would be closed. Approximately 2,900 feet of CR 995 would be reconstructed over Segment 4.	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Approximately 200 feet of the private road would be removed, ultimately closing approximately 360 feet of private road that would intersect with the Project (refer to **Appendix D, Project Footprint Mapbook**, page 316).	-	-
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 317).	-	-
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 317).	-	-
4	A, B, D and E	FM 1366	Road Over Rail	The portion of FM 1366 that would cross Segment 4 would be closed. Approximately 2,600 feet of FM 1366 would be reconstructed over Segment 4.	-	-
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 320).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-16** for a complete list of all existing (both public and private) roadway interactions with the Project in Freestone County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed **in TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-44: Freestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 322).	-	-
4	A, B, D and E	County Road 963	Reroute	The terminus of County Road 963 would intersect with Segment 4. Approximately 300 feet of CR 963 would be removed.	-	300
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross the Project would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 326).	-	-
4	A, B, D and E	FM 2777	Reroute	FM 2777 would be realigned to the western side of the Project. Approximately 3,000 feet of FM 2777 would be removed and 5,500 feet would be reconstructed.	5,500	3,000
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 330).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 331).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 333).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-16** for a complete list of all existing (both public and private) roadway interactions with the Project in Freestone County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed **in TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-44: Freestone County Roadway Modifications

Segment	Build Alt.	Road Name	Impact	Modification	New[a] (feet)	Removed[a] (feet)
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on the west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 337).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-16** for a complete list of all existing (both public and private) roadway interactions with the Project in Freestone County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed **in TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-45: Limestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	Oil field service road. This would propose to close the private road (refer to **Appendix D, Project Footprint Mapbook**, page 342).	-	-
4	A, B, D and E	Private Road	Closure	Oil field service road. Wells would still be accessible from SH 164 (refer to **Appendix D, Project Footprint Mapbook**, page 342)	-	-
4	A, B, D and E	Private Road	Closure	Oil field service road. Wells would still be accessible from SH 164 (refer to **Appendix D, Project Footprint Mapbook**, page 342).	-	-
4	A, B, D and E	Private Road	Closure	Oil field service road. This would propose to close the private road. Wells would still be accessible from SH 164 (refer to **Appendix D, Project Footprint Mapbook**, page 343).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through a shared access road connecting to County Road 828 and SH 164. Wells on east side of Project would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 343).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County Road 828 and SH 164. Wells on east side of Segment 4 would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 346).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County Road 828 and SH 164. Wells on east side of Segment 4 would be accessible from Texaco Service Road through to County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 346).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-18** for a complete list of all existing (both public and private) roadway interactions with the Project in Limestone County, including rail over rail.

Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-45: Limestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	Lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County Road 828 and SH 164. Wells on east side of Segment 4 would be accessible from Texaco Service Road connecting to County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 347).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road that connects an oil pad to County Road 828. Oil pads and properties still accessible from County Road 828 with removal of this road (refer to **Appendix D, Project Footprint Mapbook**, page 348).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County roads 882 and 828. Wells on east side of Segment 4 would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 348).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County roads 882 and 828. Wells on east side of Segment 4 would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 349).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County roads 882 and 828. Wells on east side of Segment 4 would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 350).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-18** for a complete list of all existing (both public and private) roadway interactions with the Project in Limestone County, including rail over rail.

Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-45: Limestone County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County roads 882 and 828. Wells on east side of Segment 4 would be accessible from County Road 828 (refer to **Appendix D, Project Footprint Mapbook**, page 350).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County Road 882. Wells on east side of Project would be accessible from County Road 866 (refer to **Appendix D, Project Footprint Mapbook**, page 350).	-	-
4	A, B, D and E	Private Road	Closure	This is a lightly used road between oil pads. Access to wells on west side of Segment 4 would be provided through shared access road connecting to County Road 882. Wells on east side of Segment 4 would be accessible from County Road 866 (refer to **Appendix D, Project Footprint Mapbook**, page 351).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-18** for a complete list of all existing (both public and private) roadway interactions with the Project in Limestone County, including rail over rail.

Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-46: Leon County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	IH-45 frontage	Relocation	This would relocate the frontage road to IH-45 and would create an access road from SH 164 to US 79, approximately 1.5 miles.	7,000	5,700
3C	C and F	IH-45 frontage	Relocation	This would relocate the frontage road to IH-45 and would create an access road from approximately Industrial Way to County Road 3051, approximately 5 miles.	26,400	25,290
3C	C and F	County Road 3051	Reroute	This would provide access similar to the existing access via access road to cross street. Approximately 380 feet of CR 3051 would be removed.	-	380
3C	C and F	County Road 314	Road over Rail	The portion of CR 314 that would cross Segment 3C would be closed. Approximately 2,500 feet of CR 314 would be reconstructed over Segment 3C.	-	-
3C	C and F	IH-45 frontage	Relocation	This would relocate frontage road to outside Segment 4, approximately 6.7 miles to the south.	77,650	40,000
3C	C and F	County Road 317	Reroute	Approximately 400 feet of CR 317 would be removed. Approximately 7,500 feet of access road would be provided on the west side of the Project to connect south to SH 7.	12,780	400
3C	C and F	County Road 318	Reroute	Approximately 400 feet of CR 318 would be removed. Access around the Project would be provided by a new access road constructed on the west side of the Project. This access road would be shared with the reroutes provided for CR 317. The new access road would be approximately 2,000 feet in length.	-	400
3C	C and F	SH 7	Road Over Rail	The portion of SH 7 that would cross Segment 3Cwould be closed. Approximately 2,000 feet of SH 7 would be reconstructed over Segment 3C.	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-21** for a complete list of all existing (both public and private) roadway interactions with the Project in Leon County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-46: Leon County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	County Road 477	Reroute	A public access road would be constructed on the east side of the Project to connect CR 477 to Old Bryan Road, approximately 3,500 feet to the north. Travelers along CR 477 would be able to travel under the Project on Old Bryan Road. Approximately 230 feet of CR 477 would be removed.	3,500	230
3C	C and F	IH-45	Relocation	This would relocate existing roadside park.	17,650	20,050
3C	C and F	FM 977	Road over Rail	The portion of FM 977 that would cross Segment 3C would be closed. Approximately 2,800 feet of FM 977 would be reconstructed over Segment 3C.	-	-
3C	C and F	IH-45	Relocation	This would relocate existing roadside park.	9,800	11,000
3C	C and F	CR 400	Road over Rail	The portion of CR 400 that would cross Segment 3C would be closed. Approximately 1,900 feet of CR 400 would be reconstructed over the Project.	-	-
4	A, B, D and E	Private Road	Closure	The portion of the private road that would cross Segment 4 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 355).	-	-
4	A, B, D and E	Private Road	Closure	Oil pad on west side of Segment 4 would be accessible from FM 1512. Access would be provided east of rail via shared access road that ties into FM 1512, approximately 10,000 feet south and 10,000 feet north (refer to **Appendix D, Project Footprint Mapbook**, page 355).	-	-
4	A, B, D and E	Private Road	Closure	Oil pad on west side of Segment 4 would be accessible from FM 1512. Access would be provided to oil pads east of rail via shared access road that ties into FM 1512, approximately 9,700 feet south and 10,200 feet north (refer to **Appendix D, Project Footprint Mapbook**, page 356).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-21** for a complete list of all existing (both public and private) roadway interactions with the Project in Leon County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-46: Leon County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	Oil pad on west side of Segment 4 would be accessible from FM 1512. Access would be provided to oil pads east of rail via a shared access road to FM 1512, approximately 7,000 feet south (refer to **Appendix D, Project Footprint Mapbook**, page 356).	-	-
4	A, B, D and E	Private Road	Closure	This road leads to an oil pad that would still be accessible from FM 1512 (refer to **Appendix D, Project Footprint Mapbook**, page 356).	-	-
4	A, B, D and E	Private Road	Closure	This road leads to an oil pad that would be acquired by Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 357)	-	-
4	A, B, D and E	FM 1512	Reroute	Approximately 3,400 feet of FM 1512 would be rerouted under Segment 4, approximately 300 feet north of the current alignment.	3,400	2,000
4	A, B, D and E	Private Road	Reroute	This road leads to an oil pad that would be acquired (refer to **Appendix D, Project Footprint Mapbook**, page 359).	-	-
4	A, B, D and E	Private Road	Closure	This road leads to an oil pad that would be acquired (refer to **Appendix D, Project Footprint Mapbook**, page 361).	-	-
4	A, B, D and E	County Road 344/347	Reroute	Crossing would be provided 2,000 feet south at US 79. Approximately 300 feet of CR 344/347 would be removed. New public access roads on the north and south side of the Project would allow travel under the Project. The new public access roads would be approximately 2,000 feet in length.	2,000	300
4	A, B, D and E	Private Road	Closure	The east side would be accessible from County Road 347; the west side would be provided an access road (refer to **Appendix D, Project Footprint Mapbook**, page 364).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-21** for a complete list of all existing (both public and private) roadway interactions with the Project in Leon County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-46: Leon County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	Oil field service road would be closed. Well pad would still accessible from County Road 347 (refer to **Appendix D, Project Footprint Mapbook**, page 366).	-	-
4	A, B, D and E	Private Road	Reroute	This is a private road. Access would be provided through approximately 0.5 miles of new road. Road would travel under the Project (refer to **Appendix D, Project Footprint Mapbook**, page 372).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 374).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 376).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 376).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 377).	-	-
4	A, B, D and E	County Road 408	Reroute	County Road 408 would be intersected by the Project in two locations. New access road on the west side of the Project would be constructed to reroute traffic approximately 6,000 feet. Approximately 600 feet of CR 408 would be removed.	6,000	600

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-21** for a complete list of all existing (both public and private) roadway interactions with the Project in Leon County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-46: Leon County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on west side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 384).	-	-
4	A, B, D and E	Private Road	Closure	Private road would tie into access road that would access to OSR and FM 977 (refer to **Appendix D, Project Footprint Mapbook**, page 386).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-21** for a complete list of all existing (both public and private) roadway interactions with the Project in Leon County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan**.

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a]Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-47: Madison County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
3C	C and F	IH-45 Frontage	Reroute	This would relocate frontage road to outside Segment 3C on approximately 5,500 feet of new access road connecting SH OSR to Hendrix Lane.	8,400	8,400
3C	C and F	Quail Lane	Reroute	Quail Lane currently connects to IH-45 Frontage Road. The frontage road is being realigned along the Project, which would shorten Quail Lane by approximately 100 feet.	-	100
3C	C and F	Hendrix Lane	Road over Rail	The portion of Hendrix Lane that would cross Segment 3C would be closed. Approximately 2,200 feet of Waldrip Road would be rerouted and reconstructed over the Project.	-	-
3C	C and F	IH-45	Relocation	This would relocate frontage road to outside Segment 3C on approximately 5,500 feet of new access road connecting to Hendrix Lane.	5,500	4,500
3C	C and F	Private Road	Closure	The portion of the private dirt road that would cross Segment 3C would be closed. Property will have access via FM 1372 to the north.	-	-
3C	C and F	Waldrip Road	Road over Rail	The portion of Hendrix Lane that would cross Segment 3C would be closed. Approximately 2,000 feet of Waldrip Road would be rerouted and reconstructed over the Project.	-	-
3C	C and F	Private Road	Reroute	The portion of the dirt road that would cross Segment 3C would be closed. Access could be maintained through approximately 3,000 feet of access road to connect south to Greenbriar Road.	-	-
3C	C and F	FM 1452	Road over Rail	The portion of FM 1452 that would cross Segment 3C would be closed. Approximately 3,000 feet of FM 1452 would be constructed over Segment 3C.	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-23** for a complete list of all existing (both public and private) roadway interactions with the Project in Madison County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-47: Madison County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Poteet Road	Reroute/ Road under Rail	Approximately 200 feet would of Poteet Road would be removed and Poteet Road would be rerouted to travel under the Project. The new crossing location would be approximately 1,800 feet south of the current crossing location. The new rerouted roads would be constructed on the east and west sides of the Project and would total approximately 4,000 feet.	4,000	200
4	A, B, D and E	Poteet Road	Reroute	Approximately 800 feet of Poteet Road that would cross Segment 4 would be removed. A new public access road would be constructed on the east side of the Project and would connect to FM 978, approximately 2,400 feet to the south.	1,100	800
4	A, B, D and E	FM 978	Reroute/Road under Rail	FM 978 would be rerouted around Segment 4 of the Project. Approximately 2,400 feet of FM 978 would be rerouted and reconstructed under Segment 4. Approximately 2,400 feet of FM 978 would be removed.	2,400	2,200
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Segment 4 would tie into shared access road providing circulation to FM 978 (refer to **Appendix D, Project Footprint Mapbook**, page 397).	-	-
4	A, B, D and E	Private Road	Closure	This would be a closure of minor private road or trail. Property would still be accessible from Caldwell Road (refer to **Appendix D, Project Footprint Mapbook**, page 401).	-	-
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on east side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 401).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-23** for a complete list of all existing (both public and private) roadway interactions with the Project in Madison County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-47: Madison County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	This is a minor private road or trail. Shared access road would be provided on east side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 401).	-	-
4	A, B, D and E	Private Road	Reroute	This is a minor private road or trail that would tie into shared access road providing circulation to US 190 (refer to **Appendix D, Project Footprint Mapbook**, page 402).	-	-
4	A, B, D and E	Oxford Cemetery Road	Reroute	Approximately 1,300 feet of Oxford Cemetery Road would be removed and the road would be relocated slightly west to avoid Segment 4. The Road would be rerouted slightly west of the Project. The new reroute would be approximately 800 feet in length.	800	1,300
4	A, B, D and E	Private Road	Reroute	The Private Road would lose access to Oxford Cemetery Road due to the Project. A public access road along the eastern side of the Project would provide access south to SH 21. Approximately 3,000 feet of access round would be provided (refer to **Appendix D, Project Footprint Mapbook**, page 402).	-	-
4	A, B, D and E	Private Road	Closure	This road would be acquired because it leads to an oil well that would be acquired (refer to **Appendix D, Project Footprint Mapbook**, page 407).	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-23** for a complete list of all existing (both public and private) roadway interactions with the Project in Madison County, including rail over rail.

2) Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

3) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

4) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-48: Grimes County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
4	A, B, D and E	Private Road	Closure	The portion of the road that would cross Segment 4 would be closed. Access would be provided on an access road on the east side of Segment 4 (refer to **Appendix D, Project Footprint Mapbook**, page 417).	-	-
5	A, B, C, D, E and F	Dirt Road	Reroute	The portion of the road that would cross Segment 5 would be closed. Access would be provided on an access road on the east side of Segment 5 to CR 123 (16,000 feet north (refer to **Appendix D, Project Footprint Mapbook**, page 421).	-	-
5	A, B, C, D, E and F	Dirt Road	Closure	The portion of the road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 425).	-	-
5	A, B, C, D, E and F	Neff Lane	Reroute	Approximately 200 feet of Neff Lane would be closed. Neff Lane would be rerouted approximately 3,500 feet to pass under the Project approximately 1,600 feet north of the current crossing.	3,500	200
5	A, B, C, D, E and F	County Road 155	Reroute	Approximately 1,100 feet of CR 155 that would cross Segment 5 would be removed. Access would be provided on an approximately 5,200 feet of new public road on the east side of Segment 5 to SH 90.	5,200	1,100
5	A, B, C, D, E and F	High Star Lane	Reroute	Approximately 300 feet of High Star Lane that would cross Segment 5 would be removed. Access would be provided on an access road on the west side of Segment 5 to Luthe Road.	830	300
5	A, B, C, D, E and F	Luthe Road	Reroute	Approximately 1,400 feet of new road would connect Luthe Road directly to FM 226. Approximately 400 feet of Luthe Road would be removed. The new alignment decreases the overall length of travel by approximately 1,000 feet but portion of Luthe Road will remain to provide access to private residences (refer to **Appendix D, Project Footprint Mapbook**, page 434).	1,400	400
5	A, B, C, D, E and F	Private Road	Closure	The portion of private road that would cross Segment 5 would be closed.	-	-

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-26** for a complete list of all existing (both public and private) roadway interactions with the Project in Grimes County, including rail over rail.

2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-48: Grimes County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
5	A, B, C, D, E and F	County Road 279	Reroute	Approximately 1,400 feet of new road would connect CR 279 directly to FM 226. Approximately 400 feet of CR 279 would be removed. The new alignment decreases the overall length of travel by approximately 1,000 feet but portion of Luthe Road will remain to provide access to private residences.	1,400	400
5	A, B, C, D, E and F	County Road 226	Road over Rail	Approximately 1,700 feet of County Road 226 would be reconstructed over the Project.	-	-
5	A, B, C, D, E and F	Private Road	Closure	The portion of private road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 437).	-	-
5	A, B, C, D, E and F	Private Road	Closure	The portion of private road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 437).	-	-
5	A, B, C, D, E and F	County Road 220	Reroute	CR 220 would be rerouted to travel under the Project. Approximately 2,100 new road would be constructed on the east side of the Project. Approximately 600 feet of current CR 220 would be removed.	2,100	600
5	A, B, C, D, E and F	FM 149	Road over Rail	The portion of FM 149 that would cross Segment 5 would be closed. Approximately 4,000 feet of FM 149 would be reconstructed over Segment 5.	-	-
5	A, B, C, D, E and F	Private Road	Closure	The portion of the road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 442).	-	-
5	A, B, C, D, E and F	FM 1774	Road over Rail	The portion of FM 1774 that would cross Segment 5 would be closed. Approximately 2,400 feet of FM 1774 would be reconstructed over Segment 5.	-	-
5	A, B, C, D, E and F	Rolling Hills Road	Reroute	Segment 5 would create insufficient vertical clearance on existing Rolling Hills Road and would be closed. Rolling Hills Road would be south rerouted to FM 2445 on new access roads on either side of Segment 5 extending approximately 1 mile to the south.	5,500	150

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-26** for a complete list of all existing (both public and private) roadway interactions with the Project in Grimes County, including rail over rail.

2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-48: Grimes County Roadway Modifications						
Segment	**Build Alt.**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
5	A, B, C, D, E and F	Lizard Drive (Chisum Trail)	Reroute	Segment 5 would create insufficient vertical clearance on existing Lizard Drive. Instead of turning to the west, Lizard Drive would continue south to FM 2445, approximately 2,300 feet to the south. Approximately 150 feet of Lizard Drive would be removed and 2,300 feet would be added to travel on the eastern side of the Project.	2,300	150
5	A, B, C, D, E and F	Private Road	Closure	The portion of the dirt road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 454).	-	-
5	A, B, C, D, E and F	Mitchell Lane (Private)	Closure	The portion of Mitchell Lane (private) that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 460).	-	-
5	A, B, C, D, E and F	Private Road	Closure	The portion of the dirt road that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 462).	-	-
5	A, B, C, D, E and F	Pavlock Road	Reroute	Pavlock Road (private) would be closed by Segment 5 of the Project (refer to **Appendix D, Project Footprint Mapbook**, page 462).	-	-
5	A, B, C, D, E and F	Bronco Lane	Reroute	Approximately 3,900 feet of access road would be constructed on the east side of the Project to connect north to Clark Road.	3,900	480

Source: **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, ARUP, 2019. Additional measurements by AECOM, 2019.

Notes: 1) Refer to **Table 3.11-26** for a complete list of all existing (both public and private) roadway interactions with the Project in Grimes County, including rail over rail.

2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Traffic Impacts at the Brazos Valley Intermediate Station

The Brazos Valley Intermediate Station would be located northwest of the intersection of SH 30/SH 90 in Grimes County in the community of Roans Prairie. This station would be approximately 25 miles east of Bryan/College Station and 25 miles west of Huntsville. TCRR has assumed ridership for the Brazos Valley Intermediate Station would be 15 percent of the 2,280 peak hour ridership of the Houston Terminal Station, or 342 passengers. The peak hour passenger rates were then used to determine the number of vehicle trips per mode. These trips were then broken down further by the direction from which trips were arriving and departing. The directional trips for each mode can be seen in **Table 3.11-49**. Modes of access other than motor vehicles are not included in the table. Due to the lack of development in this rural area, bicycle and pedestrian trips are not expected.

Table 3.11-49: Brazos Valley Intermediate Station Trip Direction and Mode

	Percent of Total	Drive and Park	Rental Car	Pick-up/ Drop-off	Taxi and Bus	Total
North (SH 90)	10%	10	1	3	3	44
South (SH 90)	10%	10	2	3	2	44
West (SH 30)	60%	60	8	17	14	265
East (SH 30)	20%	20	3	5	5	88
Total	100%	100	14	28	24	441

Source: TCRR 2019

Additionally, while the station may have less of an impact on traffic than the two urban terminal stations in Dallas and Houston, it would be located on a three-lane highway (two lanes westbound and one lane eastbound) and the station construction would bring increased traffic congestion and potential delays for travelers along SH 30.

Traffic delays are expected to increase around the Brazos Valley Intermediate Station in both the No Build and Build Scenarios. As reported in **Table 3.11-27**, the intersection of SH 30/SH 90 is currently experiencing acceptable LOS (i.e., LOS D or better). **Table 3.11-50** lists the 2040 peak period intersection conditions under the No Build, Build and modified conditions.

Table 3.11-50: Brazos Valley Intermediate Station Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
SH 30/SH 90 (unsignalized)	**F (84)**	D (31)	**F (193)**	**F (124)**	C (29)	C (26)	Y

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

FRA analyzed the No Build scenario traffic projections around the Brazos Valley Intermediate Station and found that LOS would decrease to an unacceptable LOS E or F in the AM but would remain acceptable in the PM. The AM No Build scenario is expected to decrease from LOS B to F, and the PM No Build scenario is expected to decrease from LOS B to LOS D.

The Build scenarios would have a more pronounced decrease in LOS. The SH 30/SH 90 intersection would decrease to an unacceptable LOS F in both the AM and PM Build scenarios, as shown in **Table 3.11-50**. The SH 30/SH 90 intersection would experience an adverse impact in both the AM and PM Build scenarios, dropping from current LOS B to LOS F.

FRA evaluated traffic impacts to intersections around the Brazos Valley Intermediate Station. The evaluation was based on conceptual station designs in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details**.[17] Impacts to the SH 30/SH 90 intersection are shown in **Table 3.11-40**. Typical intersection modifications include the installation of a traffic signal; however, actual improvements will be coordinated with TxDOT. TCRR will perform a full TIA that complies with TxDOT guidelines. TxDOT will ultimately decide on intersection improvements (i.e., signalization) and are not included in the LOD. This modification is shown for informational purposes only.

Passenger Rail and Transit Services

The Brazos Valley Intermediate Station would be located in a rural and sparsely populated area along SH 30. As noted in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, the Brazos Valley Intermediate Station would expect to experience less than 2 percent non-motorized access due to the lack of a high-capacity transit network in the vicinity of the stations.

Transit service could be provided by the Brazos Transit District or other entities to serve the Brazos Valley Intermediate Station. Currently, the Brazos Transit District does not have consistent service to this proposed station, but the agency is developing a service plan. As noted in **Section 4.3.1.3.2, Indirect Effects and Cumulative Impacts, Transportation,** the Brazos Valley Intermediate Station site is approximately 25.6 miles east of College Station, Texas (the location of Texas A&M University). The implementation of a shuttle route between the university and the station site is a reasonably foreseeable action given the relatively proximity between the university and station site.

3.11.5.2.9 Waller County

Roadway Network

Table 3.11-51 identifies eight roads (public and private) in Waller County that would be permanently impacted by the Project.

3.11.5.2.10 Harris County

Roadway Network

Table 3.11-52 identifies 12 roads (public and private) in Harris County that would be permanently impacted by the Project.

[17] The Final Conceptual Engineering Report and the LOD include intersection improvements based on TCRR traffic analysis.

Table 3.11-51: Waller County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a](feet)**	**Removed[a] (feet)**
5	A, B, C, D, E and F	Foxwood Drive	Road Adjustment	Approximately 250 feet of Foxwood Drive that would be crossed by Segment 5 would be closed and three impacted properties would be acquired on the east side of Segment 5.	-	250
5	A, B, C, D, E and F	Unnamed residential farm road	Reroute	Portion of the drive that would be crossed by Segment 5 would be closed. Access would be provided by crossing at Murphy Road, approximately 2,400 feet south (refer to **Appendix D, Project Footprint Mapbook**, page 474)	-	-
5	A, B, C, D, E and F	Bowler Road	Reroute	Approximately 500 feet of Bowler Road that would cross Segment 5 would be relocated slightly west to travel under Segment 5.	-	-
5	A, B, C, D, E and F	Hegar Road	Reroute	Segment 5 would create insufficient vertical clearance on existing Hegar Road. Approximately 1,600 feet of Hegar Road would be realigned and shifted slightly to the east.	-	-
5	A, B, C, D, E and F	Joseph Road	Reroute	Segment 5 would create insufficient vertical clearance on existing Joseph Road. Approximately 300 feet of Joseph Road would be removed. Joseph Road would be rerouted to FM1488 on new public roads on either side of Segment 5. Travelers along Joseph Road would travel north on new public road to FM 1488 and south once they cross under the Project at FM 1488. New travel distance would be approximately 6,000 feet.	6,000	300
5	A, B, C, D, E and F	Dirt Driveway	Reroute	The portion of the drive that would cross Segment 5 would be closed. Access would be provided on an access road on the east side of Segment 5 (refer to **Appendix D, Project Footprint Mapbook**, page 477).	-	-

Table 3.11-51: Waller County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a](feet)**	**Removed[a] (feet)**
5	A, B, C, D, E and F	Dirt Driveway	Reroute	The portion of the drive that would cross Segment 5 would be closed. Access would be provided on an access road on the east side of Segment 5 (refer to **Appendix D, Project Footprint Mapbook**, page 478).	-	-
5	A, B, C, D, E and F	Private Road	Reroute	Access would be provided through access road. Approximately 1.3 miles of access road connect to Castle Road to the south (refer to **Appendix D, Project Footprint Mapbook**, page 479).	-	-

Source: AECOM 2019

Notes: 1) Refer to **Table 3.11-29** for a complete list of all existing (both public and private) roadway interactions with the Project in Waller County, including rail over rail.

2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[a] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Table 3.11-52: Harris County Roadway Modifications						
Segment	**Build Alternative**	**Road Name**	**Impact**	**Modification**	**New[a] (feet)**	**Removed[a] (feet)**
5	A, B, C, D, E and F	Private Road	Closure	The portion of the drive that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 484).	-	-
5	A, B, C, D, E and F	Private Road	Closure	The portion of the drive that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 484).	-	-
5	A, B, C, D, E and F	Waller Spring Creek Road	Road over Rail	Approximately 2,200 feet of Waller Spring Creek Road will be built over the Project.	-	-
5	A, B, C, D, E and F	Kari Lane (Private)	Reroute	The portion of Kari Lane (Private) that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 485).	-	-
5	A, B, C, D, E and F	Jamie Lane (Private)	Closure	The portion of Jamie Lane (Private) that would cross Segment 5 would be closed (refer to **Appendix D, Project Footprint Mapbook**, page 485).	-	-
5	A, B, C, D, E and F	Spring Boulevard	Reroute	The Project is on viaduct at this location. Spring Boulevard, however, would be rerouted approximately 60 feet to the west in order to run along the west side of the Project.	-	-
5	A, B, C, D, E and F	Taylor/ Wright Road	Reroute	The Project is on viaduct at this location; however, the intersection of Taylor Road and Wright Road would be impeded. Taylor/Wright Roads would be relocated approximately 50 feet west under Segment 5.	-	-
5	A, B, C, D, E and F	SH 8 (SB) Frontage Road	Road over Rail	Approximately 1,000 feet of the Project would be constructed under SH 8. SH 8 would not experience modifications in roadway length.	-	-
5	A, B, C, D, E and F	SH 8 (SB) lanes	Road over Rail	Approximately 1,000 feet of the Project would be constructed under SH 8. SH 8 would not experience modifications in roadway length.	-	-
5	A, B, C, D, E and F	SH 8 (NB) lanes	Road over Rail	Approximately 1,000 feet of the Project would be constructed under SH 8. SH 8 would not experience modifications in roadway length.	-	-
5	A, B, C, D, E and F	SH 8 (NB) Frontage Road	Road over Rail	Approximately 1,000 feet of the Project would be constructed under SH 8. SH 8 would not experience modifications in roadway length.	-	-

Table 3.11-52: Harris County Roadway Modifications

Segment	Build Alternative	Road Name	Impact	Modification	New[a] (feet)	Removed[a] (feet)
5	A, B, C, D, E and F	Perimeter Park Drive	Reroute	Segment 5 would create insufficient vertical clearance on existing Perimeter Park Drive. Approximately 250 feet of Perimeter Park Drive would be removed. Perimeter Park Drive would be rerouted to West Little York Road on a new access road extending approximately 1,800 feet to the south.	1,800	250

Source: AECOM, 2019

Notes: 1) Refer to **Table 3.11-31** for a complete list of all existing (both public and private) roadway interactions with the Project in Harris County, including rail over rail.

2) Access to structures not displaced or acquired by the Project shall be provided during construction, as discussed in **TR-MM#1: Traffic Control Plan.**

3) TCRR shall coordinate with landowners to provide access to structures not displaced or acquired, as discussed in **TR-MM#4: Private Access**.

[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

Traffic Impacts at the Houston Industrial Site Terminal Station Option

The Houston Industrial Site Terminal Station Option would be located southwest of the intersection of Post Oak and Hempstead Roads near the interchange of IH-610/US 290. The total trips generated by the proposed terminal were split by mode of vehicular transportation and the travel directions. The summary of trips by mode and direction can be seen in **Table 3.11-53**. The trips were then allocated to the local roadway network based upon the mode of transportation. The route assignment by mode and direction can be seen in **Appendix E, Traffic Operations Technical Memorandum**. Modes other than motor vehicles are not included in the table but are expected to account for less than 2 percent of HSR access, as shown in **Appendix J, Ridership Demand Forecasting Methodology Assessment Technical Memorandum.**

Table 3.11-53: Houston Industrial Site Terminal Station Option Trip Direction and Mode

	Pct. of Total	Drive and Park	Rental Car	Pickup/ Drop-off	Taxi and Bus	Total
North and Northeast (IH-610)	23%	72	24	100	132	328
Inner North (via Mangum Road)	1%	3	1	4	6	14
Northwest (US 290)	11%	35	11	48	63	157
West (IH-10)	14%	44	15	61	80	200
Hempstead Road (NW)	2%	6	2	9	11	28
Post Oak Road	2%	6	2	9	11	28
South (IH-610)	25%	78	26	109	143	356
East (IH-10)	19%	59	20	83	109	271
Inner SW (via Hempstead Road)	2%	7	2	9	11	29
Inner NW (via 18th Street)	1%	3	1	4	6	14
Total	**100%**	**313**	**104**	**436**	**572**	**1,425**

Source: TCRR 2019

Traffic delays are excepted to increase around the Houston Industrial Site Terminal Station Option in both the No Build and Build scenarios. As reported in **Table 3.11-32**, all but 4 of the 26 intersections around the Houston Industrial Site Terminal Station Option are currently experiencing an acceptable LOS (i.e., LOS D or better). **Table 3.11-54** lists the 2040 peak period intersection conditions under the No Build, Build and modified conditions.

Table 3.11-54: Houston Industrial Site Terminal Station Option Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
NBFR US 290/Mangum Road	D (37)	**E (67)**	D (38)	**E (70)**	D (38)	**E (70)**	**Y**
SBFR US 290/Mangum Road	D (39)	D (59)	D (41)	**E (67)**	D (42)	**E (66)**	**Y**
Mangum Road/Dacoma St	D (46)	**E (62)**	**F (113)**	**F (109)**	**E (66)**	**E (68)**	**Y**
SBFR US 290/Dacoma St	**F (202)**	**F (128)**	**F (209)**	**F (132)**	**F (141)**	**F (95)**	**Y**
NBFR US 290/Dacoma St	**F (110)**	**F (86)**	**F (149)**	**F (110)**	**F (103)**	**F (81)**	**Y**
WBFR IH-610/TC Jester Blvd	**F (340)**	**F (190)**	**F (341)**	**F (190)**	**F (329)**	**F (188)**	**Y**
EBFR IH-610/TC Jester Blvd	**F (111)**	**F (202)**	**F (116)**	**F (216)**	**F (108)**	**F (196)**	**Y**
EBFR IH-610/E TC Jester Blvd	**F (78)**	**F (124)**	**F (93)**	**F (135)**	**E (79)**	**F (122)**	**Y**
WBFR IH-610/E TC Jester Blvd	**F (316)**	**F (129)**	**F (325)**	**F (140)**	**F (316)**	**F (128)**	**Y**
Long Point Road/Hempstead Road	**F (81)**	**F (92)**	**F (90)**	**F (89)**	**F (79)**	**F (87)**	**Y**

Table 3.11-54: Houston Industrial Site Terminal Station Option Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
18th Street/Hempstead Road	**F(NA)** [a]	**F(NA)** [a]	**F(NA)** [a]	**F(NA)**[a]	C (26)	**F (82)**	**Y**
Mangum Road/18th Street	D (44)	**E (69)**	**F (106)**	**F (182)**	D (45)	**F (73)**	**Y**
SBFR IH-610/18th Street	D (58)	**F (138)**	**F (111)**	**F (247)**	D (48)	**F (111)**	**N**
NBFR IH-610/18th Street	**E (67)**	**F (110)**	**F (132)**	**F (140)**	**E (67)**	**F (95)**	**Y**
Mangum Road/Hempstead Road	C (24)	C (32)	**E (64)**	**E (74)**	D (51)	D (55)	**Y**
Post Oak Road/Hempstead Road	**F (96)**	**F (102)**	**F (310)**	**F (319)**	**F (196)**	**F (173)**	**Y**
SBFR IH-610/Hempstead Road	**F (134)**	**F (130)**	**F (212)**	**F (152)**	**F (127)**	**F (81)**	**Y**
NBFR IH-610/Hempstead Road	D (40)	**F (147)**	D (47)	**F (180)**	D (40)	**F (129)**	**Y**
Post Oak Road/Westview Drive	**F (92)**	**E (77)**	**F (269)**	**F (161)**	**E (79)**	**F (80)**	**Y**
Post Oak Road/Old Katy Road	**F (186)**	**F (210)**	**F (224)**	**F (291)**	**F (202)**	**F (190)**	**Y**
Post Oak Road/EB IH-10	**F (123)**	**F (95)**	**F (131)**	**F (109)**	**F (131)**	**F (109)**	**Y**
SBFR IH-610/Old Katy Road	D (49)	**F (148)**	D (50)	**F (143)**	C (28)	**F (86)**	**N**
NBFR IH-610/Old Katy Road	D (46)	**F (132)**	**E (72)**	**F (139)**	D (39)	**F (84)**	**Y**
WBFR IH-10/Silber Road	D (51)	**F (131)**	**E (59)**	**F (146)**	D (44)	**F (125)**	**Y**
EBFR IH-10/Silber Road	**E (74)**	**F (253)**	**F (83)**	**F (256)**	**E (58)**	**F (231)**	**Y**
WBFR IH-10/Antoine Drive	**F (119)**	**F (83)**	**F (131)**	**F (83)**	**F (109)**	**E (71)**	**Y**

Source: AECOM, 2019

[a] The delay result generated was too high and far exceeded the threshold.

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

The No Build scenario incorporates traffic volume projections from the H-GAC travel demand model. The model forecasts volumes that represent growth rates as high as 4 percent per year from existing volumes. FRA analyzed the No Build scenario traffic projections around the Houston Industrial Site Terminal Station Option and found that LOS would decrease to an unacceptable LOS E or F for 16 intersections in the AM No Build and 24 in the PM No Build scenarios. Only two intersections—Southbound frontage road(SBFR) to US 290/Mangum Drive and Mangum Road/Hempstead Road —would have an acceptable LOS (i.e., D or better).

The Build scenarios would also have a decrease in LOS. Twenty-two intersections would decrease to an unacceptable LOS E or F in the AM Build. All 26 intersections would decrease to an unacceptable LOS E or F in the PM Build. Overall, 24 intersections would experience some type of adverse impact (either in the AM, PM or both), as shown in **Table 3.11-54**.

FRA identified potential intersection modifications to mitigate LOS delays, as shown in **Table 3.11-55**. The proposed intersection modifications would improve the LOS in the Build to No Build conditions or better including the severely congested intersections. All but two of the intersections currently operate a LOS E or F. Under the Build scenario with no intersection improvements, all but four of the intersections would operate at LOS E or F for both AM and PM peak periods and the remaining four intersections would be at LOS E or F for one of the two AM/PM peak periods. The majority of the intersections would experience substantial increases in delay over the No Build Alternative. With the intersection improvements, intersections would operate at essentially the same LOS with close to the same amount of delay as the No Build scenario.

FRA evaluated traffic impacts to intersections around the Houston Industrial Site Terminal Station Option. The evaluation was based on the conceptual station designs in the **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**[18] Impacts to intersections are shown in **Table 3.11-54**. Typical intersection modifications that would mitigate the impacts are shown in **Table 3.11-55**; however, actual improvements will be coordinated between the City of Houston and TxDOT. TCRR will perform a full TIA that complies with City of Houston TIA guidelines. TxDOT and the City of Houston will ultimately decide on intersection improvements to mitigate LOS impacts; therefore, the intersection improvements shown in **Table 3.11-55** are not included in the LOD and are purely for informational purposes.

Table 3.11-55: Industrial Site Terminal Station Option Intersection Design Modifications

Intersection	Improvement
Mangum Road/Dacoma Street	• Add one right-turn bay to northbound approach and convert the shared through/right lane to a through-only lane • Convert the left turn movement of all approaches from protected to protected-permissive
SBFR US 290/Dacoma Street	• Add a right-turn bay to the northeast bound approach
NBFR US 290/Dacoma Street	• Add a right-turn bay to the southwest bound approach • Convert the through-only lane to a shared through/left turn lane in the northwest bound approach
WBFR IH-610/TC Jester Boulevard	• Convert the westbound shared through/left turn lane to a through-only lane
EBFR IH-610/TC Jester Boulevard	• Convert the eastbound shared through/left turn lane to a through-only lane
EBFR IH-610/E TC Jester Boulevard	• Convert the eastbound shared through/left turn lane to a through-only lane
Long Point Road/ Hempstead Road	• Prohibit left-turns for southeast bound approach • Provide a right turn arrow signal to allow the northeast bound right turns overlap with the northwest bound left turn
18th Street/Hempstead Road (unsignalized)	• Install traffic signal with 120 cycle length • Give the southeast bound left turn a protected phase
Mangum Road/18th Street	• Add additional lane for through movements in the westbound approach and convert right-turn lane to a storage bay for right turns • Convert the left turn movements of the eastbound, southbound and westbound approaches from protected to protected-permissive • Convert the northbound approach to one shared through/left turn lane, one through-only lane and one right-only lane.
SBFR IH-610/18th Street	• Convert the shared through/right turn lane to through only and add two right-turn bays to eastbound approach • Convert the shared through/left turn lane in the southbound approach to a through-only lane
NBFR IH-610/18th Street	• Add one through lane to westbound approach
Mangum Road/Hempstead Road	• Provide a right turn arrow signal to allow the northwest bound right turns overlap with the southbound left turn

[18] The Final Conceptual Engineering Report and the LOD include intersection improvements based on TCRR traffic analysis.

Table 3.11-55: Industrial Site Terminal Station Option Intersection Design Modifications

Intersection	Improvement
Post Oak Road/Hempstead Road	• Add one left-turn bay to northwest bound approach • Convert southwest bound approach center left/through lane to a through- only lane • Add one right-turn bay to northeast bound approach and convert the approach lane configuration to dual lefts, one through/right and one right-turn lane • Convert the left turn phase on the southwest bound approach from split to protected-permissive • Convert the left turn phase on the northeast bound approach from split to protected
SBFR IH-610/Hempstead Road	• Add one through lane to southeast bound approach to provide three through lanes
Post Oak Road/Westview Drive	• Add one right-turn bay to southbound approach and convert the shared through/right turn lane to a through-only lane • Add one left turn bay to the northbound approach to provide dual left turn bays
Post Oak Road/Old Katy Road	• Provide a right turn arrow signal for the westbound approach to overlap with the southbound left turn • Add a right-turn bay to the eastbound approach and convert the shared through/right turn lane to through-only lane • Provide right turn arrow signal for southbound approach to overlap with the eastbound left turn • Add one right-turn bay to the southbound
SBFR IH-610/Old Katy Road	• Add one through lane to the eastbound approach • Convert the southbound through only lane to a shared through/right turn lane
NBFR IH-610/Old Katy Road	• Add one through lane to the eastbound approach
WBFR IH-10/Silber Road	• Convert the northbound approach center lane from a shared through/left-turn lane to a through-only lane • Convert the southbound shared through/right to a right-only lane
WBFR IH-10/Antoine Drive	• Convert the westbound approach shared through/left lane to a through-only lane • Convert the southbound approach shared through/right lane to right-only lane • Add a right turn bay to the westbound approach to provide dual right turns

Source: AECOM 2019

Traffic Impacts at the Houston Northwest Mall Terminal Station Option

The Houston Northwest Mall Terminal Station Option would be located on the site of the existing Northwest Mall near the interchange of IH-610/US 290. The total trips generated by the proposed terminal were split by mode of vehicular transportation and the direction of arrival or departure. The summary of trips per mode by direction can be seen in **Table 3.11-56**. The trips were then allocated to the local roadway network based upon the mode of transportation. The route assignment by mode and direction can be seen in **Appendix E, Traffic Operations Technical Memorandum**. Modes of access other than motor vehicles are not included in the table, but would be expected to account for less than 4 percent of HSR access.

Table 3.11-56: Houston Northwest Mall Terminal Station Option Trip Direction and Mode

	Percent of Total	Drive and Park	Rental Car	Pickup/ Drop-off	Taxi and Bus	Total
North and Northeast (IH-610)	23%	72	24	100	132	328
Inner North (via Mangum Road)	1%	3	1	4	6	14
Northwest (US 290)	11%	35	11	48	63	157
West (IH-10)	14%	44	15	61	80	200
Hempstead Road (NW)	2%	6	2	9	11	28
Post Oak Road	2%	6	2	9	11	28
South (IH-610)	25%	78	26	109	143	356
East (IH-10)	19%	59	20	83	109	271
Inner SW (via Hempstead Road)	2%	7	2	9	11	29
Inner NW (via 18th Street)	1%	3	1	4	6	14
Total	**100%**	**313**	**104**	**436**	**572**	**1,425**

Source: AECOM 2019

Traffic delays are expected to increase around the Houston Northwest Mall Terminal Station Option in both the No Build and Build scenarios. As reported in **Table 3.11-32**, all but 4 of the 26 intersections around the Houston Northwest Mall Terminal Station Option are currently experiencing an acceptable LOS (i.e., LOS D or better). **Table 3.11-57** lists the 2040 peak period intersection conditions under the No Build, Project and modified conditions.

Under the No Build Alternative only two intersections would operate at an acceptable LOS of D or better. Eight of the 26 intersections would operate at an acceptable LOS during the AM peak period, but would be at LOS E or F during the PM peak period. The remaining 16 intersections would operate at LOS E or F for both AM and PM peak periods.

Table 3.11-57: Northwest Mall Terminal Station Option Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
NB US 290/Mangum Road	D (37)	**E (67)**	D (38)	**E (70)**	D (38)	**E (70)**	**Y**
SB US 290/Mangum Road	D (39)	D (59)	D (42)	**E (68)**	D (42)	D (68)	**Y**
Mangum Road/Dacoma Street	D (46)	**E (62)**	**F (100)**	**F (102)**	**E (59)**	**E (63)**	**Y**
SB US 290/Dacoma Street	**F (202)**	**F (128)**	**F (211)**	**F (134)**	**F (144)**	**E (93)**	**Y**
NB US 290/Dacoma Street	**F (110)**	**F (86)**	**F (145)**	**F (108)**	**F (101)**	**F (85)**	**Y**
WB IH-610/TC Jester Boulevard	**F (340)**	**F (190)**	**F (329)**	**F (190)**	**F (329)**	**F (188)**	**Y**
EB IH-610/TC Jester Boulevard	**F (111)**	**F (202)**	**F (116)**	**F (216)**	**F (108)**	**F (196)**	**Y**
EB IH-610/E TC Jester Boulevard	**F (78)**	**F (124)**	**F (93)**	**F (135)**	**E (78)**	**F (122)**	**Y**
WB IH-610/E TC Jester Boulevard	**F (316)**	**F (129)**	**F (325)**	**F (140)**	**F (316)**	**F (128)**	**Y**
Long Point Road/Hempstead Road	**F (81)**	**F (92)**	**F (84)**	**E (78)**	**E (75)**	**E (78)**	**N**
18th Street/Hempstead Road (unsignalized)	**F(NA)[a]**	**F(NA)[a]**	**F(NA)[a]**	**F(NA)[a]**	C (23)	D (50)	**Y**
Mangum Road/18th Street	D (44)	**E (69)**	D (44)	**E (69)**	D (44)	E (69)	**N**

Table 3.11-57: Northwest Mall Terminal Station Option Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Adverse Impact (Y/N)
SB IH-610/18th Street	D (58)	**F (138)**	**F (188)**	**F (283)**	**F (79)**	**F (102)**	**Y**
NB IH-610/18th Street	**E (67)**	**F (110)**	**F (199)**	**F (145)**	**F (123)**	**F (114)**	**Y**
Mangum Road/Hempstead Road	C (24)	C (32)	C (33)	C (34)	D (45)	D (39)	**N**
Post Oak Road/Hempstead Road	**F (96)**	**F (102)**	**F (201)**	**F (194)**	**F (105)**	**F (108)**	**Y**
SB IH-610/Hempstead Road	**F (134)**	**F (130)**	**F (139)**	**F (135)**	D (50)	**E (68)**	**Y**
NB IH-610/Hempstead Road	D (40)	**F (147)**	D (44)	**F (153)**	C (35)	**F (86)**	**Y**
Post Oak Road/Westview Drive	**F (92)**	**E (77)**	**F (112)**	**F (84)**	**E (61)**	D (50)	**Y**
Post Oak Road/Old Katy Road	**F (186)**	**F (210)**	**F (209)**	**F (229)**	**F (196)**	**F (194)**	**Y**
Post Oak Road/EB IH-10	**F (123)**	**F (95)**	**F (121)**	**F (103)**	**F (121)**	**F (103)**	**Y**
SB IH-610/Old Katy Road	D (49)	**F (148)**	D (49)	**F (148)**	D (44)	**F (101)**	**N**
NB IH-610/Old Katy Road	D (46)	**F (132)**	D (46)	**F (132)**	D (43)	**F (111)**	**N**
WB IH-10/Silber Road	D (51)	**F (131)**	D (55)	**F (133)**	D (40)	**F (112)**	**Y**
EB IH-10/Silber Road	**E (74)**	**F (253)**	**E (73)**	**F (249)**	**D (51)**	**F (215)**	**N**
WB IH-10/Antoine Drive	**F (119)**	**F (83)**	**F (122)**	**F (83)**	**F (102)**	**E (64)**	**Y**

Source: AECOM, 2019

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

[a] The delay result generated was too high and far exceeded the threshold

Under the Build scenario, all intersections would experience an increase in delay with 18 of the 26 intersections operating at LOS E or F during both the AM and PM peak periods and 7 operating at LOS E or F during the PM peak period. One intersection would operate at an acceptable of LOS C and D for the AM and PM peak periods, respectively. FRA identified potential intersection modifications to mitigate LOS delays, as shown in **Table 3.11-58**.

With the intersection improvements, all the intersections would operate at essentially the same LOS as the No Build Alternative, considering the anticipated increase rise in population and traffic congestion, as shown in **Table 3.11-57**.

FRA evaluated traffic impacts to intersections around the Houston Northwest Mall Terminal Station Option. The evaluation was based on the conceptual station designs in the **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**[19] Impacts to intersections are shown in **Table 3.11-57**. Typical intersection modifications that would mitigate the impacts are shown in **Table 3.11-58**; however, actual improvements will be coordinated between the City of Houston and TxDOT. TCRR will perform a full TIA that complies with City of Houston TIA guidelines. TxDOT and the City of Houston will ultimately decide on intersection improvements to mitigate LOS impacts; therefore, the intersection improvements shown in **Table 3.11-58** are not included in the LOD and are purely for informational purposes.

[19] The Final Conceptual Engineering Report and the LOD include intersection improvements based on TCRR traffic analysis.

Table 3.11-58: Houston Northwest Mall Terminal Station Option Intersection Design Modifications

Intersection	Improvement
Mangum Road/Dacoma Street	• Add one right turn bay to northbound approach and convert the shared through/right to a through-only lane • Convert the left turn movement of all approaches from protected to protected-permissive
SBFR US 290/Dacoma Street	• Add a right-turn bay to the northeast bound approach
NBFR US 290/Dacoma Street	• Add a right-turn bay to the southwest bound approach • Convert the northwest bound approach through-only lane to a shared through/left turn lane
WBFR IH-610/TC Jester Boulevard	• Convert the westbound shared through/left turn lane to a through-only
EBFR IH-610/TC Jester Boulevard	• Convert the eastbound shared through/left turn lane to a through-only
EBFR IH-610/E TC Jester Boulevard	• Convert the eastbound shared through/left turn lane to a through-only
Long Point Road/Hempstead Road	• Prohibit left-turns for southeast bound approach
18th Street/Hempstead Road (unsignalized)	• Install a traffic signal with 120 cycle length • Give the southeast bound left turn a protected phase
SBFR IH-610/18th Street	• Convert the eastbound approach shared through/right turn lane to a through-only lane and add two right-turn bays • Convert the southbound approach shared through/left turn lane to a through-only lane
NBFR IH-610/18th Street	• Add one through lane to westbound approach
Post Oak Road/Hempstead Road	• Add one left-turn bay to northwest bound approach • Convert the southwest bound approach center left/through lane to a through-only lane • Add one right-turn and one left turn bay to northeast bound approach and convert the shared through/left to a through-only lane • Convert the left turn phases on the northeast and southwest bound approaches from split to protected. • Convert the left turn phase of the southwest bound approach from protected to protected-permissive • Add a right turn bay to the southeast bound approach to provide dual right turns
SBFR IH-610/Hempstead Road	• Add one through lane to southeast bound approach to provide three through lanes
NBFR IH-610/Hempstead Road	• Convert northwest bound approach right-turn lane to a shared through/right-turn lane
Post Oak Road/Westview Drive	• Add one right-turn bay to southbound approach and convert the shared through/right turn lane to a through-only lane • Convert the left turn phase on the northbound approach to protected-permissive
Post Oak Road/Old Katy Road	• Provide a right turn arrow signal for the westbound approach to overlap with the southbound left turn • Add a right turn bay to the eastbound approach and convert the shared through/right turn lane to a through-only lane • Provide a right turn arrow signal for southbound approach to overlap with the eastbound left turn
SBFR IH-610/Old Katy Road	• Add one through lane to the eastbound approach
NBFR IH-610/Old Katy Road	• Add one through lane to the eastbound approach
WBFR IH-10/Silber Road	• Convert the northbound approach center lane from a shared through/left-turn lane to a through-only lane • Convert the southbound approach to two through lanes and one right- only lane

Table 3.11-58: Houston Northwest Mall Terminal Station Option Intersection Design Modifications	
Intersection	**Improvement**
EBFR IH-10/Silber Road	• Convert the eastbound approach shared through/left to a through-only lane • Convert the northbound approach shared through-right to a right-turn only
WBFR IH-10/Antoine Drive	• Convert the westbound approach shared through/left to a through-only lane • Convert the southbound approach shared through/right to a right-only lane • Add a right turn bay to the westbound approach to provide dual right turns

Source: AECOM, 2019

Traffic Impacts at the Houston Northwest Transit Center Terminal Station

The Houston Northwest Transit Center Terminal Station Option would be located on the northeast corner of Post Oak and Old Katy Roads near the IH-10/IH-610 interchange. The total trips generated by the proposed terminal were split by mode of vehicular transportation and the direction of arrival or departure. The summary of trips per mode by direction can be seen in **Table 3.11-59**. The trips were then allocated to the local roadway network based upon the mode of transportation. The route assignment by mode and direction can be seen in **Appendix E, Traffic Operations Technical Memorandum**. Modes of access other than motor vehicles are not included in the table but would be expected to account for less than 4 percent of HSR access (in person trips).

Table 3.11-59: Northwest Transit Center Terminal Station Option Trip Direction and Mode						
	Percent of Total	**Drive and Park**	**Rental Car**	**Pickup/ Drop-off**	**Taxi and Bus**	**Total**
North and Northeast (IH-610)	23%	72	24	100	132	328
Inner North (via Mangum Road)	1%	3	1	4	6	14
Northwest (US 290)	11%	35	11	48	63	157
West (IH-10)	14%	44	15	61	80	200
Hempstead Road	2%	6	2	9	11	28
Post Oak Road	2%	6	2	9	11	28
South (IH-610)	25%	78	26	109	143	356
East (IH-10)	19%	59	20	83	109	271
Inner SW (via Hempstead Road)	2%	7	2	9	11	29
Inner NW (via 18th Street)	1%	3	1	4	6	14
Total	**100%**	**313**	**104**	**436**	**572**	**1,425**

Source: AECOM 2019

Traffic delays are expected to increase around the Houston Northwest Transit Center Terminal Station Option in both the No Build and Build scenarios. As reported in **Table 3.11-32**, all but 4 of the 26 intersections around the Houston Northwest Mall Site Terminal Station Option are currently experiencing an acceptable LOS (i.e., LOS D or better). **Table 3.11-60** lists the 2040 peak period intersection conditions under the No Build, Project and modified conditions.

Under the No Build Alternative, only two intersections would operate at an acceptable LOS of D or better in both the AM and PM peak periods. Eight of the 26 intersections would operate at an acceptable LOS during the AM peak period but would be at LOS E or F during the PM peak period. The remaining 16 intersections would operate at LOS E or F for both AM and PM peak periods.

Table 3.11-60: Houston Northwest Transit Center Terminal Station Option Impacts 2040 LOS (Delay in Seconds per Vehicle)

Intersection	AM No Build	PM No Build	AM Build	PM Build	AM Modified	PM Modified	Impact (Y/N)
NBFR US 290/Mangum Road	D (37)	**E (67)**	D (38)	**E (70)**	D (38)	**E (70)**	**Y**
SBFR US 290/Mangum Road	D (39)	D (59)	D (42)	**E (67)**	D (42)	**E (67)**	**Y**
Mangum Road/Dacoma Street	D (46)	**E (62)**	D (53)	**E (77)**	D (42)	D (53)	**Y**
SBFR US 290/Dacoma Street	**F (202)**	**F (128)**	**F (202)**	**F (128)**	**F (130)**	**F (85)**	**N**
NBFR US 290/Dacoma Street	**F (110)**	**F (86)**	**F (110)**	**F (86)**	**F (92)**	**E (80)**	**N**
WBFR IH-610/TC Jester Boulevard	**F (340)**	**F (190)**	**F (341)**	**F (198)**	**F (236)**	**F (114)**	**Y**
EBFR IH-610/TC Jester Boulevard	**F (111)**	**F (202)**	**F (134)**	**F (240)**	**F (92)**	**F (190)**	**Y**
EBFR IH-610/E TC Jester Boulevard	**F (78)**	**F (124)**	**F (110)**	**F (151)**	**F (88)**	**F (127)**	**Y**
WBFR IH-610/E TC Jester Boulevard	**F (316)**	**F (129)**	**F (345)**	**F (151)**	**F (258)**	**F (123)**	**Y**
Long Point Road/Hempstead Road	**F (81)**	**F (92)**	**F (84)**	**E (78)**	**E (75)**	**E (78)**	**Y**
18th Street/Hempstead Road	**F(NA)[a]**	**F(NA) [a]**	**F(NA) [a]**	**F(NA) [a]**	B (20)	D (52)	**Y**
Mangum Road/18th Street	D (44)	**E (69)**	**E (64)**	**F (120)**	D (51)	**E (68)**	**Y**
SBFR IH-610/18th Street	D (58)	**F (138)**	**E (79)**	**F (192)**	D (48)	**F (98)**	**Y**
NBFR IH-610/18th Street	**E (67)**	**F (110)**	**F (106)**	**F (144)**	**E (60)**	**F (103)**	**Y**
Mangum Road/Hempstead Road	C (24)	C (32)	D (43)	D (54)	D (43)	D (55)	N
Post Oak Road/Hempstead Road	**F (96)**	**F (102)**	**F (171)**	**F (167)**	**F (113)**	**F (119)**	**Y**
SBFR IH-610/Hempstead Road	**F (134)**	**F (130)**	**F (134)**	**F (130)**	D (47)	**E (65)**	**N**
NBFR IH-610/Hempstead Road	D (40)	**F (147)**	D (40)	**F (147)**	C (32)	**F (82)**	**N**
Post Oak Road/Westview Drive	**F (92)**	**E (77)**	**F (118)**	**F (101)**	**E (71)**	**E (65)**	**Y**
Post Oak Road/Old Katy Road	**F (186)**	**F (210)**	**F (278)**	**F (279)**	**F (258)**	**F (240)**	**Y**
Post Oak Road/EB IH-10	**F (123)**	**F (95)**	**F (163)**	**F (124)**	**F (163)**	**F (124)**	**Y**
SBFR IH-610/Old Katy Road	D (49)	**F (148)**	**E (61)**	**F (155)**	**E (61)**	**F (138)**	**Y**
NBFR IH-610/Old Katy Road	D (46)	**F (132)**	**F (91)**	**F (172)**	**E (73)**	**F (135)**	**Y**
WBFR IH-10/Silber Road	D (51)	**F (131)**	**E (61)**	**F (152)**	D (49)	**F (129)**	**Y**
EBFR IH-10/Silber Road	**E (74)**	**F (253)**	**F (84)**	**F (263)**	D (55)	**F (228)**	**Y**
WBFR IH-10/Antoine Drive	**F (119)**	**F (83)**	**F (131)**	**F (83)**	**F (112)**	D (47)	**Y**

Source: AECOM 2019

Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.
[a] The delay result generated was too high and far exceeded the threshold

Under the Project, all intersections would experience an increase in delay with 21 of the 26 intersections operating at LOS E or F during both the AM and PM peak periods and 4 operating at LOS E or F during the PM peak period. One intersection would operate at an acceptable LOS D for the AM and PM peak periods. FRA identified potential intersection modifications to mitigate LOS delays, as shown in **Table 3.11-61**.

With the intersection improvements all the intersections would operate as well or better than the No Build Alternative, with three intersections operating at acceptable LOS for both AM and PM peak hours. All the intersections would show improvement in the overall amount of delay.

FRA evaluated traffic impacts to intersections around the Houston Northwest Transit Center Terminal Station Option. The evaluation was based on the conceptual station designs in the **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**[20] Impacts to intersections are shown in **Table 3.11-60**. Typical intersection modifications that would mitigate the impacts are shown in **Table 3.11-61**; however, actual improvements will be coordinated between the City of Houston and TxDOT. TCRR will perform a full TIA that complies with City of Houston TIA guidelines. TxDOT and the City of Houston will ultimately decide on intersection improvements to mitigate LOS impacts; therefore, the intersection improvements shown in **Table 3.11-61** are not included in the LOD and are purely for informational purposes.

Table 3.11-61: Houston Northwest Transit Center Terminal Station Option Intersection Design Modifications

Intersection	Improvement
Mangum Road/Dacoma Street	• Add one right-turn bay to northbound approach and convert the shared through/right to a through-only lane • Convert the left turn movement of all approaches from protected to protected-permissive
Dacoma Street/US 290 SBFR	• Add a right-turn bay to the northeast bound approach
Dacoma Street/US 290 NBFR	• Add a right-turn bay to the southwest bound approach and convert the shared through/right to a through-only lane • Convert the northwest bound center lane from through-only to a shared through/left lane
TC Jester Boulevard/IH-610 WB FR	• Convert the westbound shared through/left to a through-only lane • Add a right turn bay to the southeast bound approach and convert the shared through/right to a through-only lane
TC Jester Boulevard/IH-610 EB FR	• Convert the eastbound shared through/left to a through-only lane • Add a right turn bay to the northwest bound approach and convert the shared through/right to a through-only lane
E TC Jester Boulevard/IH-610 EB FR	• Convert the eastbound shared through/left turn lane to a through-only lane • Add a right turn bay to the northwest bound approach and convert the shared through/right to a through-only lane
E TC Jester Boulevard/IH-610 WB FR	• Convert the shared through/right in the southeast bound approach to right-only lane
Hempstead Road/Long Point Road	• Prohibit left-turns for southeast bound approach
W 18th Street/Hempstead Road	• Install a traffic signal with 120 cycle length • Give the southeast bound left turn a protected phase
Mangum Road/18th Street	• Add an additional through lane to the westbound approach • Convert all left turn phases from protected to protected-permissive
W 18th Street/IH-610 SBFR	• Convert the eastbound shared through/right to through only and add one right turn bay • Convert the southbound shared through/left turn lane to a through-only lane
W 18th Street/IH-610 NBFR	• Add one through lane to westbound approach
Post Oak Road/ Hempstead Road	• Add one left-turn bay to northeast bound approach and convert the approach lane configuration to dual left turns, one through movement and one right turn • Convert the southwest bound approach center shared through/left to a through-only lane • Add a right turn bay to the eastbound approach to provide dual right turns
Hempstead Road/IH-610 SBFR	• Add one through lane to the southeast bound approach to provide three through lanes

[20] The Final Conceptual Engineering Report and the LOD include intersection improvements based on TCRR traffic analysis.

Table 3.11-61: Houston Northwest Transit Center Terminal Station Option Intersection Design Modifications

Intersection	Improvement
Hempstead Road/IH-610 NBFR	• Convert the northwest bound approach right-turn lane to a shared through/right-turn lane
Post Oak Road/ Westview Drive	• Add one right-turn bay to southbound approach and convert the shared through/right turn lane to a through-only lane • Convert the left turn phase on the northbound approach to protected-permissive
Post Oak Road/Old Katy Road	• Provide a right turn arrow signal for the westbound approach to overlap with the southbound left turn • Add A right-turn bay to the eastbound approach and convert the shared through/right to a through-only lane • Provide a right turn arrow signal for southbound approach to overlap with the eastbound left turn
Old Katy Road/IH-610 NBFR	• Convert the right-only lane to a shared through/right turn lane in the westbound approach • Convert the lane configuration in the northbound approach to dual left turn lanes and one shared through/right turn lane
Silber Road/IH-10 WBFR	• Convert the lane configuration in the southbound approach to two through lanes and one right-only lane
Silber Road/IH-10 EBFR	• Convert the eastbound approach shared through/left to a through-only lane • Convert the northbound approach shared through/right to a right-turn only lane
Antoine Drive/IH-10 WBFR	• Convert the westbound approach shared through/left lane to a through-only lane • Add a right turn bay to the westbound approach to provide dual right turns

Source: AECOM 2019

Passenger Rail and Transit Services

The Houston Terminal Station options would be expected to experience 2 percent non-motorized access due to the lack of a high-capacity transit network in the vicinity of the stations.

All the Houston Terminal Station options would impact local bus routes provided by METRO. It would be anticipated that METRO's bus service would be increased or rerouted to provide better access to the Houston Terminal Station. **TR-MM#3: Transit Coordination** requires TCRR to coordinate directly with METRO for connections to and from the Houston Terminal Station.

The Project would impact a portion of the West Little York park-and-ride located in the southeast quadrant of the 190 Beltway interchange. This facility serves four peak-hour bus routes. The Project would take a small portion of the southeastern edge of the parking lot for temporary construction. Approximately 10 parking spaces would be impacted. Coordination with METRO would be required to determine the adverse effects of the partial taking and mitigation, if needed. Additionally, if the park-and-ride was funded with federal funds, coordination with FTA would be required.

As discussed in **Section 1.1.3.2, Roles of Cooperating Agencies, Surface Transportation Board**, TCRR and Amtrak entered into a Voluntary Coordination Agreement and then executed a Reservation and Ticketing Agreement to give interstate passengers the ability to travel on, and transfer between, both TCRR and Amtrak systems on a single through ticket. As detailed within TCRR's August 21, 2019, STB filing, [21] it is anticipated that the Project would, after a 3-year ramp up period, transport 18,300 to 20,500 passengers each year utilizing the single through ticket. **Section 2.2.5.1, Alternatives Considered, Amtrak Through-Ticketing Agreement,** states that per its agreement with Amtrak, TCRR will provide a

[21] TCRR, Petitioners Response to the Surface Transportation Board's Request for Additional Information, August 21, 2019, https://www.stb.gov/Filings/all.nsf/d6ef3e0bc7fe3c6085256fe1004f61cb/9624ee8dee0f382f8525845e003b1120/$FILE/248366.pdf.

shuttle service between the Houston Terminal Station and the downtown Amtrak Houston station. Amtrak's *Sunset Limited* route connects to Houston's Amtrak station. Refer to **Figure 3.11-6** for more information.

Amtrak estimates that approximately 1,100 to 1,200 passengers would be served by the transfer service by the year 2026. This estimate increases to 4,400 by the year 2035. Refer to **Section 2.2.5.1, Alternatives Considered, Amtrak Through-Ticketing Agreement,** and TCRR's August 21, 2019, STB filing, for more information about the proposed Amtrak transfer service between the Houston Terminal Station and Houston's Amtrak station.

On-Road Pedestrian and Bicycle Facilities

Each of the three Houston Terminal Station options would introduce new pedestrian and sidewalk infrastructure.

The Houston Industrial Site Terminal Station Option, as shown in **Appendix F, TCRR Conceptual Engineering Design and Constructability Reports**, would include three new pedestrian bridges to connect parking zones to the platform site. New sidewalks would be constructed on an unnamed road that would connect from Parking Zone 1 to Westview Drive. Approximately 2,300 feet of new sidewalk are proposed along this road. Approximately 600 feet of new sidewalk would be constructed along a new unnamed road that would be parallel to Westview Drive. Additionally, two new pedestrian plazas to serve the proposed station would be included near the platform site.

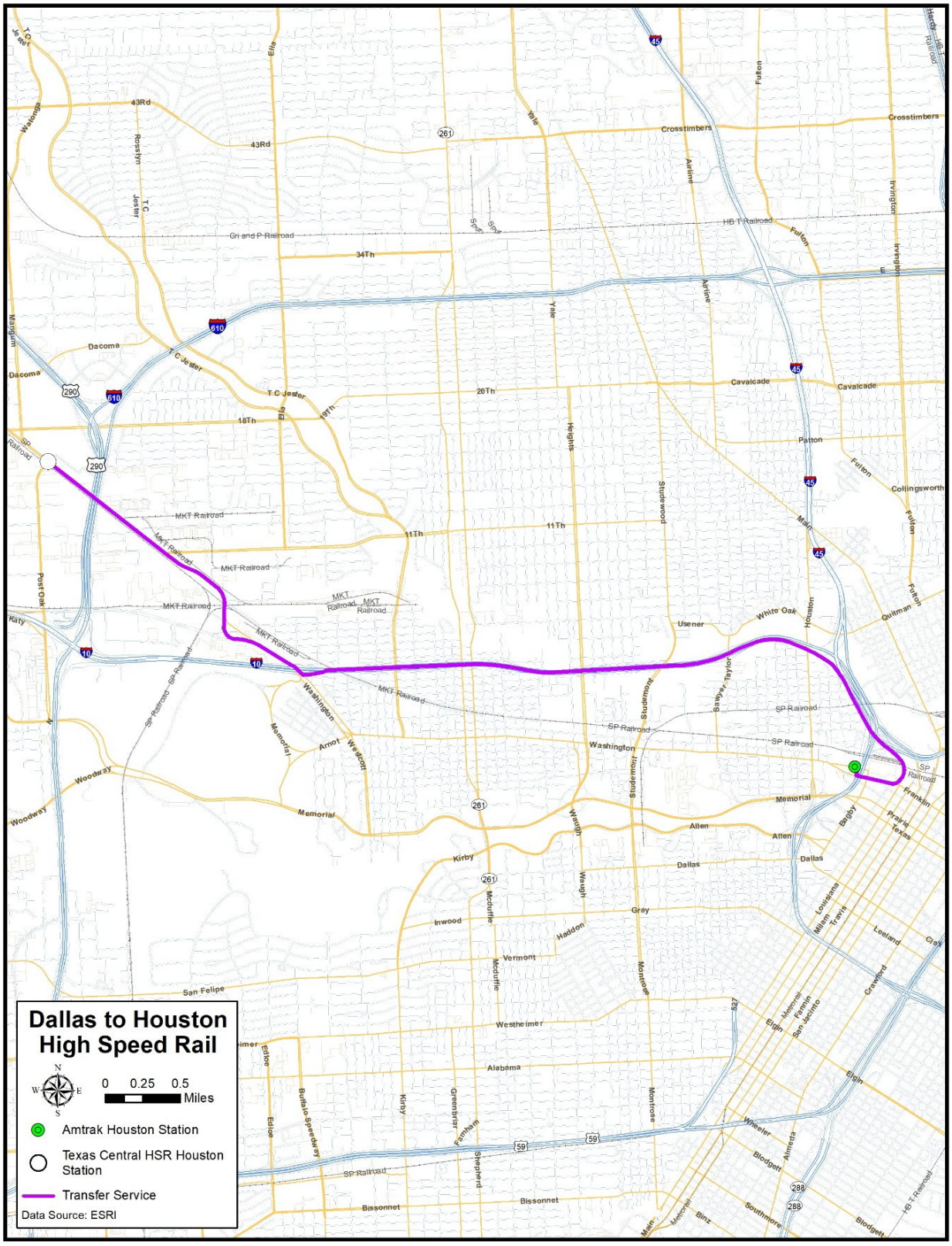
The Houston Northwest Mall Terminal Station Option, as shown in **Appendix F, TCRR Conceptual Engineering Design and Constructability Reports**, would include approximately 700 feet of new pedestrian bridge that would connect the platform to Parking Zones 1 and 2. Two new pedestrian plazas would also be included in this design.

The Houston Northwest Transit Center Terminal Station Option, as shown in **Appendix F, TCRR Conceptual Engineering Design and Constructability Reports**, would include a pedestrian bridge (approximately 800 feet) that would cross Old Katy Road to connect to the METRO Northwest Transit Center site. The entire site would include a large pedestrian plaza that would front Old Katy Road and Post Oak Road., as well an unnamed road that would connect Post Oak Road to US 290 Frontage Road South.

3.11.6 Avoidance, Minimization and Mitigation

Design features were employed throughout the development of the Project to avoid and minimize impacts to the natural, social, physical and cultural environment. As detailed within the counties above, the number of public roads that would be crossed by the Project varies from 185 (Build Alternative F) to 204 (Build Alternatives A and B). The number of private roads that would be crossed by the Project varies from 112 (Build Alternative F) to 133 (Build Alternative A). Approximately 55 percent of the Project would be constructed on viaduct, minimizing permanent impacts to public roads. Approximately 83 percent of the public road crossings on the Preferred Alternative (Build Alternative A) would be rail over the roadway or roadway over rail and would not include re-routing of the existing public road. As detailed **in Section 3.11.3.4, Roadway and Crossing Design Elements**, road modifications could include road under railway (crossed on viaduct, but some modification may still be required for clearance), road over railway, relocation, reroute, closure or acquisition. The number of public and private roads proposed to be modified in some way varies from 104 (Build Alternative C) to 159 (Build Alternative E).

Figure 3.11-6: Route from Houston Terminal Station to Houston Amtrak Station



Source: AECOM 2019

3.11.6.1 Compliance Measures

TCRR would be required to comply with the following Compliance Measures (CM):

TR-CM#1: Freight and Transit Crossing Easements. Prior to construction, TCRR shall coordinate directly with freight railroad operators (BNSF, UPRR, TUEX and TEXU) and the transit agencies (DART) to obtain crossing easements, determine safety requirements during construction, and manage construction schedules to correspond with freight and transit operations.

TR-CM#2: Roadway Access Permit. Prior to construction, TCRR shall coordinate with TxDOT and local jurisdictions to obtain the authorization to construct access driveways on road ROWs.

TR-CM#3: Road Closure Permit. Prior to construction, TCRR shall coordinate with TxDOT and the local municipalities to obtain authorization for the temporary closure of state ROW (incorporated/unincorporated). The TxDOT District Engineer shall review closure requests of state roads, while the county would review local roads.

TR-CM#4: **ROW Barriers.** Where the HSR system would cross and/or parallel to freight railroads, TCRR shall coordinate with local railroads to install the appropriate column protection and permanent barriers per industry standards and regulations.

3.11.6.2 Mitigation Measures

TCRR would be required to implement following Mitigation Measures (MM):

TR-MM#1: Traffic Control Plan. Prior to construction, TCRR shall develop one comprehensive traffic control plan or multiple plans that correspond to construction phasing in order to minimize traffic disruption. The plan(s) shall comply with TxDOT's *Manual on Uniform Traffic Control Devices* (MUTCD) requirements.[22] TCRR shall develop the plan(s) in consultation with TxDOT and applicable local jurisdictions, including emergency services. The traffic control plan(s) will address, at minimum:

- Detours for traffic flows
- Signage
- Striping and pavement markings
- Emergency access (i.e., fire, ambulance, police) and results of analysis of emergency response times as required in **SS-MM#1: Model Construction Impacts on Emergency Response Times)**
- Provisions for safe and efficient operation of all modes of transportation during construction
- Road and lane closures
- Traffic delays
- Agreements to repair roads in the event roads are damaged during construction
- A description of how TCRR will comply with mitigation measures related to traffic control

With the exception of temporary closures during non-business hours or for periods of less than 1 hour, TCRR shall maintain driveway access to all businesses and residences throughout construction. If a given property has multiple driveways, at least one shall remain open at all times.

TCRR would maintain access to all businesses and residences and would ensure access is maintained throughout construction with appropriate signage directing drivers to access points. In addition to

[22] Current version is TxDOT, Texas Manual on Uniform Traffic Control Devices (TMUTCD), Revision 2 October 9, 2014, Available: https://www.txdot.gov/government/enforcement/signage/tmutcd.html

complying with TxDOT's MUTCD, the traffic control plan will include the following notification requirements, at minimum:

- TCRR shall communicate traffic control measures with the public, local officials and the media prior to and during construction activities. Communication may include media alerts, direct mailings to area businesses and property owners, information on freeway variable message signs and paid newspaper notices.
- TCRR shall provide a construction notice to residents and businesses in the vicinity of the alignment at least 14 calendar days prior to construction.
- TCRRs shall contact local emergency services (hospital, fire, police) at least 14 calendar days in advance of ramp, lane or road closures so that they can arrange for alternate travel routes.
- TCRR shall notify the public a minimum of 14 calendar days in advance of any road closures.
- At least 14 calendar days prior to construction, TCRR shall place advance warning signs at locations designated by the TxDOT to notify motorists, pedestrians and bicyclists of construction-related delays.
- After construction begins, TCRR shall notify the public and business owners of temporary access changes during construction at least 7 calendar days in advance of the change.

TR-MM#2: Intersection Improvements. Prior to construction and operation, TCRR will perform a full TIA that complies with the City of Dallas, City of Houston, or TxDOT TIA guidelines, as determined applicable through consultation with City of Dallas, City of Houston and TxDOT. A list of intersections that may need to be improved based on preliminary traffic analysis and design is included previously in **3.11.5.2, Environmental Consequences**; however, the actual location and extent of intersection improvements will be subject to the TIA process. TCRR shall implement intersection improvements as required by the applicable TIA process.

TR-MM#3: Transit Coordination. Prior to construction, TCRR shall coordinate directly with all transit agencies (DART, METRO, CTS, HOTRTD, Brazos Transit District and Colorado Valley Transit) to manage construction schedules to correspond with freight and transit operations. TCRR shall also coordinate directly with all transit agencies for connections to and from the proposed station sites, including scheduling and facility improvements/design.

TR-MM#4: Private Access. Prior to construction, TCRR shall coordinate with landowners to provide access to structures that would not be displaced or acquired by the Project.

3.11.7 Build Alternatives Comparison

Table 3.11-62 summarizes the impacts for each Build Alternative on roadways, transit services, rail facilities and operations, on-road pedestrian and bicycle facilities and airports. During construction, there may be disruption to traffic on roadways, transit services, freight or commuter rail services or pedestrian/bicycle facilities. Implementation of the Project would result in direct and indirect impacts to the existing transportation network within the Study Area. The total number of publicly accessible and private roads permanently modified (i.e., road would experience some type of construction) varies from 102 (Build Alternative C) to 158 (Build Alternative E). Reroutes to existing publicly accessible roads would result in the addition of approximately 16.6 miles (Build Alternative D) to 46.9 miles (Alternative C) of public roads.

Alternatives B and E would require the acquisition and closure or relocation of the Anxiety Aerodrome in Navarro County.

Table 3.11-62: Summary of Transportation Impacts by Build Alternative						
	ALT A	**ALT B**	**ALT C**	**ALT D**	**ALT E**	**ALT F**
Rail Crossings [a]	27	27	27	27	27	27
Rail Facilities and Operations	There would be no permanent or long-term operational impacts associated with any of rail crossings as the Build Alternative would be fully grade separated.					
Road Modifications [b] (*Public and Private*)	138	150	102	145	158	110
Road Modifications [c] (*Public only*)	59	66	79	60	67	80
Length added to Public Roads (miles)	16.8	21.4	46.9	16.6	21.2	46.7
Length removed from Public Roads (miles)	5.1	5.0	27.2	5.2	5.1	27.2
Transit Services	All alternatives would have the same impacts on transit services. All alternatives could increase ridership on local transit systems, particularly in Dallas or where local rail connections would be most accessible from the station.					
On-Road Pedestrian & Bicycle Facilities	None of the segments would permanently impact on-road pedestrian or bicycle facilities.					
Impacts to airports [d]	0	1	0	0	1	0

Source: AECOM 2019

[a] Totals for rail impacts do not include rail at Houston Terminal Station options. Totals also include DART-owned rail lines in Dallas County.
[b] Road modifications reflect the number of reroutes, road adjustments or road over rail constructions that would occur. Some roads are affected by multiple modifications (such as IH-45). Modifications do not reflect total number of roads but total number of road construction sites.
[c] Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.
[d] Anxiety Aerodome would be directly impacted by Segment 3B, which are part of Build Alternatives B and E

Table 3.11-63 summarizes the traffic impacts for the three Houston Terminal Station options. The Houston Northwest Transit Center Terminal Station Option would have the fewest (22) intersections at LOS E or F, and the Houston Industrial Site Terminal Station Option would have the most (25). There would be no differences in the intersection traffic impacts at the proposed Dallas Terminal Station between the Build Alternatives.

Table 3.11-63: Summary of Houston Terminal Station Options			
	Northwest Transit Center Terminal	**Northwest Mall Terminal**	**Industrial Site Terminal**
Number of Intersections at LOS E or F	22	24	25

Source: AECOM 2019

3.12 Elderly and Handicapped

3.12.1 Introduction

This section assesses possible barriers to mobility-impaired individuals, including seniors, handicapped and disabled individuals on the trainset and at stations. This section does not discuss station or on trainset emergency protocols related to elderly and handicapped passengers. Refer to **Section 3.16, Safety and Security**, for information related to emergency trainset and station evacuations.

3.12.2 Regulatory Context

Federal

FRA's *Procedures for Considering Environmental Impacts* states that this EIS shall assess possible barriers to elderly and handicapped.[1]

Transportation Services for Individuals with Disabilities (49 C.F.R. 37)

The purpose of 49 C.F.R. 37 is to implement transportation provisions of the ADA.[2] Key areas of the regulation that pertain to passenger rail accessibility for the elderly and handicapped include:

- Section 37.5, Nondiscrimination, ensures that no individual with disabilities are discriminated against.
- Section 37.7, Standards for accessible vehicles, ensures that each rail vehicle is accessible to and usable by individuals with disabilities.
- Section 37.9, Standards for accessible transportation facilities, requires all transportation facilities to comply with the 2010 *ADA Standards for Accessible Design.*[3]
- Section 37.42, Service in an Integrated Setting to Passengers at Intercity, Commuter and High-Speed Rail Station Platforms Constructed or Altered After February 1, 2012, ensures that passengers with disabilities can easily locate appropriate ingress and egress points on the station platform or trainset.
- Section 37.45, Construction and alteration of transportation facilities by private entities, ensures that construction and alterations to transit facilities by private parties comply with the Title III regulations of the ADA.
- Section 37.55, Intercity rail station accessibility, requires all intercity rail stations to be readily accessible by individuals with disabilities.
- Section 37.107, Acquisition of passenger rail cars by private entities primarily engaged in the business of transporting people, requires new passenger rail cars to be ADA compliant and readily accessible by people with disabilities.

Americans with Disabilities Act Accessibility Specifications for Transportation Vehicles (49 C.F.R. 38)

The purpose of 49 C.F.R. 38 is to provide minimum guidelines and requirements for the accessibility standards in 49 C.F.R. 37 of this title for transportation vehicles required by the ADA to be accessible.

[1] FRA, *Procedures for Considering Environmental Impacts*, Issued 1999, 64 C.F.R. 28545 et seq.
[2] 42 U.S.C. 1201 et seq.
[3] U.S. Department of Justice, *2010 ADA Standards for Accessible Design,* Washington, DC: Department of Justice, 2010.

This regulation includes specific accessibility requirements for intercity rail cars and systems, including passenger coaches, single- and bi-level lounge cars, single- and bi-level dining cars, restrooms, sleeper cars, doorways, lighting, public information systems and many other elements.

2012 Texas Accessibility Standards

In addition to minimum standards set by federal regulations put forth in the ADA, the 2012 Texas Accessibility Standards (TAS) provides additional regulation specific to the state of Texas. As stated in the code, Section 101.1 General, "These standards are intended to be consistent to those contained in the 2010 [ADA] Standards of Accessible Design…" with additions noted. Key provisions include:

- Section 218, Scoping Requirements – Transportation Facilities
- Section 810, Special Rooms, Spaces and Elements – Transportation Facilities

3.12.3 Methodology

Data collection consisted of estimating the portion of the population that is elderly (65 or older) or handicapped based on U.S. Census ACS 2017 5-Year Estimate data for the counties where stations are proposed. The Study Area is limited to Dallas, Grimes and Harris Counties because these are the counties where stations are proposed. Additionally, desktop research was conducted to identify common accessibility issues and concerns for passenger rail platforms and current best practices for avoiding or minimizing accessibility issues.

Regulations, guidance and best practices for meeting the *2010 ADA Standards for Accessible Design*[4] were used as the basis for this analysis. ADA compliance specifications for parking facilities are detailed in **Table 3.12-1**.

Table 3.12-1: Parking ADA Compliant Specifications

Total Number of Parking Spaces (Surface Lot or Garage)			Minimum Number of Accessible Parking Spaces Required
1	–	25	1
26	–	50	2
51	–	75	3
76	–	100	4
101	–	150	5
151	–	200	6
201	–	300	7
301	–	400	8
401	–	500	9
501	–	1,000	2% of total parking spaces
1,001 and Over			20 accessible parking spaces, plus 1 for each 100, or fraction thereof, over 1,000

Source: U.S. Department of Justice 2010

3.12.4 Affected Environment

Station areas, including platforms, and vehicles are the primary locations identified where difficulties for handicapped and elderly users could occur. **Table 3.12.-2** provides general information regarding demographics of handicapped and elderly populations in the counties with stations. **Table 3.12-2 also**

[4] U.S. Department of Justice, *2010 ADA Standards for Accessible Design,* Washington, DC: Department of Justice, 2010.

summarizes U.S. Census data on the number of people who report as disabled or are elderly. The highest percentages of disabled and elderly populations occur in Grimes County

Table 3.12-2: Handicapped and Elderly Populations

Counties	Disabled Population	Elderly Population	Total Population Estimate
Dallas County	244,427	249,200	2,552,213
Grimes County	3,022	3,972	27,358
Harris County	414,213	426,123	4,525,519

Source: U.S. Census Bureau ACS 2017 5-year estimates

Each station area would provide short-term and long-term parking spaces in the form of surface lots and or garages that include ADA accessible spaces. Parking areas would also include sidewalks, curb cuts, signals and wayfinding necessary to meet ADA requirements.

Platforms and vehicles would be designed to meet ADA rules and regulations. Additional details are discussed in the following section.

3.12.5 Environmental Consequences

3.12.5.1 No Build Alternative

Under the No Build Alternative, TCRR would not construct and operate the HSR system and its associated facilities. Mobility-impaired individuals, including seniors, handicapped and disabled individuals, within the Study Area would not have access to an HSR system that, otherwise, would provide a safe, reliable and efficient passenger rail mode of transportation between Dallas and Houston.

3.12.5.2 Build Alternatives

This section describes the station, vehicle and design elements that would be accessible to people with disabilities. Each station area, including platforms, escalators, elevators, handrails, doors, doorways, gates, benches and signage, would adhere to the minimum guidelines and requirements for the accessibility standards, as described in 49 C.F.R. 37 and 38, and in compliance with ADA accessibility standards. Pedestrian infrastructure would provide safe and ADA-accessible passage from parking areas to ticketing, concessions, restrooms and platform areas. Additionally, electronic, ADA-compliant passenger information displays would be implemented to communicate real-time trainset status, general boarding announcements and security messages in both visual and audible formats.

3.12.5.2.1 Dallas Terminal Station

Per TCRR's *Dallas to Houston High-Speed Rail Final Conceptual Engineering Report, Chapter 6, Stations* (refer to **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**), parking demand at the Dallas Terminal Station was calculated using ridership projections and mode split analyses. These data support the planning for parking needs of 6,340 parking spaces. This analysis accounts for rental car facility parking needs. For a parking facility that includes more than 1,001 parking spaces, ADA compliance specifications (detailed in **Table 3.12-1**) require a minimum of 20 accessible parking spaces, plus 1 for each additional 100 or fraction thereof, over 1,000.[5] Therefore, all the Build Alternatives would provide 74 accessible parking spaces. The Dallas Terminal Station parking facility would include specified parking spaces and corresponding signage, curb ramps and detectable warnings.

[5] U.S. Department of Justice, *2010 ADA Standards for Accessible Design,* Washington, DC: Department of Justice, 2010.

3.12.5.2.2 Brazos Valley Intermediate Station

Per TCRR's *Dallas to Houston High-Speed Rail Final Conceptual Engineering Report, Chapter 6, Stations* (refer to **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**), 1,280 parking spaces would be provided. This analysis accounts for rental car facility parking needs. As detailed in **Table 3.12-1,** ADA compliance specifications would require that all the Build Alternatives provide 23 accessible parking spaces. The Brazos Valley Intermediate Station parking facility would include specified parking spaces and corresponding signage, curb ramps and detectable warnings.

3.12.5.2.3 Houston Terminal Station Options

Per TCRR's *Dallas to Houston High-Speed Rail Final Conceptual Engineering Report, Chapter 6, Stations* (refer to **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**), parking needs at the all three Houston Terminal Station options would require 7,580 parking spaces. This analysis accounts for rental car facility parking needs. This would require that the Project provide 86 accessible parking spaces. The Houston Terminal Station parking facility would include specified parking spaces and corresponding signage, curb ramps and detectable warnings.

3.12.5.2.4 Rail Car Assessment

The HSR trainset would consist of eight cars that include first and business class seating. The dimensions and specifications detailed in **Table 3.12-3** provide vehicle ADA specifications that would be implemented for the Project. Additional information can be found in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**.

Table 3.12-3: Vehicle ADA Compliant Specifications

Vehicle Specifications	Measurement/Specifications
Doorways and illumination	32.3 inches (820 mm) wide; 2-foot candles illumination on door threshold
Train car vestibules	42 inches (1,067 mm) wide
Seating	1 wheelchair location per train car that is 32 inches by 63 inches (813 mm by 16 mm) 1 regular coach transfer seat with pivoting armrest 1 wheelchair storage location Located near window Accessible call button
Interior-passageways	34 inches (870 mm)
Restrooms	37 inches (928 mm) door width 35 inches by 60 inches (889 mm by 1,524 mm) clear floor area • Permanently installed fixtures may overlap this area a maximum of 6 inches (152 mm), if the lowest portion of the fixture is a minimum of 9 inches (229 mm) above the floor, and may overlap a maximum of 19 inches (483 mm), if the lowest portion of the fixture is a minimum of 29 inches (737 mm) above the floor. Water closet shall be 17 inches (432 mm) to 19 inches (229 mm) measured to the top of the toilet seat. Grab bar, 24 inches (610 mm), located behind water closet Horizontal grab bar, 40 inches (1,016 mm), on at least one side wall Flush valves, 40 inches (1,016 mm) above the floor

Source: U.S. Department of Justice 49 C.F.R. 38, 2010

Each rail car, including doorways, signage, interior circulation, handrails, stanchions, floor surfaces, information systems and vestibules, would adhere to the minimum guidelines and requirements for the accessibility standards, as described in 49 C.F.R. 37 and 38. In addition, the Project would implement level boarding at all stations, thereby eliminating the concern of uneven boarding and height variations between the station platform and the HSR trainset.

3.12.6 Avoidance, Minimization and Mitigation

Project design features, such as level boarding, would be employed to avoid and minimize impacts to the elderly and handicapped. As a best practice, the primary reference for design guidelines is the *2010 ADA Standards for Accessible Design*.[6]

Additionally, as part of the station design and programming, TCRR will develop a user-friendly guide that would be available online and at the stations during operations. The guide would provide information to travelers with disabilities and include sections on planning your trip, navigating throughout the stations, boarding and exiting the trainset, navigating on the trainset, emergency procedures and additional procedures that passengers should adhere to while using the HSR system.

3.12.6.1 Compliance Measures and Permitting

TCRR would be required to comply with the following Compliance Measure (CM):

EH-CM#1: Compliance with ADA and TAS. For design and operation of the Project, TCRR shall comply with all applicable statutes and regulations as outlined in ADA and TAS.

3.12.7 Build Alternatives Comparison

The Build Alternatives and Houston Terminal Station options would be designed, constructed and operated in compliance with 49 C.F.R. 37 and 38, and ADA, as enforced by U.S. Department of Justice; therefore, there would be no impacts related to accessibility of the HSR system for the elderly and handicapped.

[6] U.S. Department of Justice, *2010 ADA Standards for Accessible Design,* Washington, DC: Department of Justice, 2010.

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3.13 Land Use

3.13.1 Introduction

This section provides background information on existing and planned land uses and evaluates the compatibility of the Project with sensitive land uses (e.g., residences and schools) and applicable land use plans. Temporary and permanent conversion of existing land uses to transportation use as a result of the Project is discussed. This section also includes potential mitigation actions that would prevent, diminish or offset adverse land use impacts.

3.13.2 Regulatory Context

Federal

FRA's *Procedures for Considering Environmental Impacts* identifies specific requirements in relation to land use. These include assessing impacts of the Project to local land use controls, comprehensive regional planning and development within the affected environment.[1]

Farmland Protection Policy Act of 1981

The Farmland Protection Policy Act of 1981[2] requires federal agencies to examine the effects of federal programs that would result in conversion of farmland to a non-agricultural action using the criteria set forth in the Act. There are three main types of special status farmland protected under this Act: Prime Farmland, Unique Farmland and Farmland of Statewide or Local Importance. The farmland being impacted does not have to be currently used for agriculture production. Prime Farmland refers to land that has the best combination of physical and chemical characteristics for agricultural production. Unique farmland is used to produce a specific high-value product. Farmland of statewide or local importance has been deemed significant by a state or local government agency. If the assessment results in adverse effects, FRA must consider alternatives to lessen them in coordination with NRCS. To initiate coordination and receive a rating from an NRCS District Conservationist, FRA must complete the appropriate paperwork. NRCS will issue a score for the Project's permanent footprint. Scores over 160 points require the evaluation of at least one alternative project site.

Agricultural Act of 2014

The Agricultural Act of 2014 (also known as the Farm Bill)[3] is the primary agricultural and food policy tool of the federal government and addresses both agriculture and all other affairs under the purview of USDA. A key provision of the Act is the creation of the Agricultural Conservation Easement Program, which protects the long-term viability of the nation's food supply by preventing conversion of productive working lands to non-agricultural uses. Protected land provides additional public benefits, including environmental quality, historic preservation, wildlife habitat and protection of open space. The Agricultural Conservation Easement Program consolidates three former programs—the Wetlands Reserve Program, Grassland Reserve Program and Farm and Ranch Land Protection Program. In Texas, the program is administered by TPWD (refer to Texas Farm and Ranch Lands Conservation, below for additional information). Under the program, NRCS and TPWD help landowners protect working

[1] FRA, Federal Register Vol. 64, No. 101, pp 28545-28556, May 26, 1999.
[2] 7 U.S.C. 73; 7 C.F.R. 658.
[3] House Resolution 2642; Public Law 113–79.

agricultural lands and limit non-agricultural uses of the land from fragmentation and development. There are options for both permanent easements and 30-year easements.

Uniform Relocation Assistance and Real Property Acquisition Polices Act of 1970

The Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (Uniform Act)[4] ensures that persons displaced as a result of a federal action or a project that incorporates federal financial assistance are treated fairly, consistently and equitably. Fair, consistent and equitable treatment includes ensuring the displaced persons are able to acquire decent, safe and sanitary housing within their financial means. The Uniform Act requires that appraisals be completed for any potentially acquired properties prior to the acquisition process. Property owners must be given a written offer of just compensation that clearly outlines what is being acquired. Relocation expenses may be included in the compensation. Property owners must also be given 90 days written notice to vacate the property prior to possession.[5]

State

Texas Farm and Ranch Lands Conservation Program

The Texas Farm and Ranch Lands Conservation Program[6] complements the TPWD mission to conserve natural resources by protecting working lands from fragmentation and development. The program maintains and enhances the ecological and agricultural productivity of these lands through agricultural conservation easements. The purpose of the program is to enable and facilitate the purchase and donation of agricultural conservation easements.

Texas Parks and Wildlife Department

Pursuant to the authority contained in Texas Parks and Wildlife Code, Title 2, Chapter 11, Subchapter H, TPWD has adopted the Land and Water Resources Conservation and Recreation Plan to guide the development of lands under the TPWD's management. The plan is arranged into four goals. The goals are intended to promote stewardship on public and private lands and waters; protect unique natural and cultural resources; encourage partnerships with all stakeholders; use science as the backbone of decision-making; promote participation in the outdoors; instill appreciation of nature in our citizens, young and old; and promote business approaches that leverage industry standards and best practices to support our mission.[7]

Texas Transportation Code, Title 5, Chapters 112 and 131

The Texas Transportation Code authorizes railroads to acquire the real property rights needed in order to construct, operate and maintain a railroad through the use of eminent domain. As part of the eminent domain process under the State of Texas, TCRR would also be required to comply with the Texas Property Code and Texas Administrative Code.

[4] 42 U.S.C. Chapter 61.
[5] TCRR would be obligated to comply with the Uniform Act if it receives federal financial assistance for the Project.
[6] Texas Parks and Wildlife Code, Title 5, Subtitle E, Chapter 84.
[7] TPWD, *Land and Water Resources Conservation and Recreation Plan*, January 2015.

Texas Property Code, Title 4, Chapter 21

The Texas Property Code requires entities exercising eminent domain to compensate landowners in a way that places them in the same financial position they would have been in prior to acquisition. The eminent domain process provides certain safeguards to landowners. Under Sections 21.0113 and 21.012 of the Texas Property Code, a railroad company that seeks to file a condemnation proceeding must certify that it has made a bona fide offer to purchase the property without the use of eminent domain authority. If TCRR receives federal financial assistance for the Project, it must comply with the Uniform Act, which would supersede the state property code.

Texas Administrative Code, Title 10 Subtitle E Chapter 2206 – Subchapter A

Similar to the federal Uniform Act, this section of the Texas Administrative Code provides for the protection of Texas citizens and their property in regard to an agency or private action taken within the state. This code establishes the procedures regarding lands acquired for the benefit of Texas and ensures the fair treatment for those affected property owners. In order to exercise eminent domain under state law, TCRR would also comply with this administrative code. If TCRR receives federal financial assistance for the Project, it must comply with the Uniform Act, which would supersede this state administrative code.

Local Government

While none of the counties within the Study Area have formal comprehensive plans that guide land use development, they do have regulations regarding property subdivision that are further discussed in **Table 3.13-1**. In Texas, cities can also adopt zoning ordinances regarding the management of land.

Table 3.13-1: Local Plans and Ordinances

County/ City/Town	Plan/ Regulation	Section	Guidance
North Central Texas Council of Governments	Mobility 2045 Metropolitan Transportation Plan	TR3-005	Supports the planning and development of sustainable land uses near grade-separated HSR locations by coordinating with the cities of Fort Worth, Arlington and Dallas
Dallas	Cedars Tax Increment Financing District	Entire document	Provides finance plan, public improvement plan, and design guidelines for Cedars area of Dallas, including development around DART train stations and the convention center
	Dallas Code of Ordinances	Section 51 Zoning Regulations	Provides land use, density, and setback regulations.
	Dallas Building Code	Chapter 53, Section 406.5	Provides area and height regulations for parking garages.
Hutchins	Zoning Ordinance	Section 12: Site Plan Review	Provides the review process for nonresidential developments. Outlines compliance with design standards, including parking and loading, vehicular and pedestrian circulations, etc.
Ellis County	Rules, Regulations, and Specifications for Subdivisions and Manufactured Homes	Entire document	Provides regulations for plat developments in areas not located within municipality boundaries.

Table 3.13-1: Local Plans and Ordinances			
County/ City/Town	**Plan/ Regulation**	**Section**	**Guidance**
Freestone County	Regulations for Subdivision Plats, Street Construction, and Drainage	Article 1: Plats	Provides regulations for plat developments in areas not located within municipality boundaries.
Fairfield	Subdivision Regulations	Division 2: Subdivision and Platting Regulations	Provide regulations on land development and the platting process.
	Fairfield Code of Ordinances	Chapter 14: Zoning Regulations	Provides land use, density, and setback regulations.
Leon County	Not applicable	Not applicable	Not applicable
Grimes County	Subdivision Rules and Regulations	Sections VII - XIV	Grimes County does not regulate zoning but does regulate subdivision plat requirements.
Waller County	Subdivision and Development Regulations	Entire document	Provides regulations for plat developments in areas not located within municipality boundaries.
Houston	Houston Development Regulations	Chapter 33: Planning and Development, Division 2	Provides building site requirements and standards, including parking, landscaping, and lot delineation requirements.
		Chapter 38: Railroads	Provides the permitting and general development requirements for rail development.
		Chapter 42: Subdivision, Developments and Platting	Provides development regulations and standards.

Source: AECOM 2019

In addition to the local plans and ordinances discussed in **Table 3.13-1**, several cities have developed comprehensive plans that include land use policies or guidelines.

Forward Dallas! Comprehensive Plan (2006)

The relevant aspects of this plan include a vision to create a cohesive overview of Dallas's future. It includes a policy program to assess land use, economic development, housing, transportation, urban design, the environment and neighborhood actions.[8] This plan does not specifically reference HSR or a station.

Downtown Dallas 360 (2017)

Downtown Dallas 360 has served as the guiding plan for Downtown since 2011 and was updated in 2017. Authored as a public-private partnership among Downtown Dallas, Inc. (DDI), the City of Dallas, private interests and the community, it has established a collective vision and implementation strategy for downtown. A key concept is to adopt transformative strategies; inter-city rail using Union Station as a multi-modal hub is one of those strategies.[9]

[8] City of Dallas, *Forward Dallas! Comprehensive Plan*, June 2006.
[9] Downtown Dallas, *Downtown Dallas 360: A Complete and Connected City Center*, 2017.

City of Lancaster Comprehensive Plan (2016)

The City of Lancaster Comprehensive Plan (2033 Plan) establishes goals including land use, open space and transportation objectives that help to shape and direct growth and development for the next 10 years and beyond. The plan outlines future transportation policies for the City and discusses transit-oriented development (TOD) land use principles and overall impacts of HSR.[10]

City of Wilmer Community Plan (2009)

The City of Wilmer Community Plan (2030 Plan) is a guide for physical development, natural resource conservation, growth, housing and neighborhoods, infrastructure to support a growing community and context-sensitive development strategies that preserve the community's identity.[11] The plan does not specifically reference HSR.

City of Ferris Draft Comprehensive Plan (2013)

The plan provides information on the city's existing conditions and recent trends. The plan helps shape and direct growth and development for the next 20 years and beyond.[12] The plan does not specifically reference HSR.

City of Waxahachie Comprehensive Plan (2016)

The plan documents the physical and socioeconomic (demographic) characteristics unique to Waxahachie and the surrounding area.[13] The plan does not specifically reference HSR, but does include the potential implementation of rail transportation (e.g., light rail, commuter rail and freight trains).

City of Corsicana Comprehensive Plan (2007)

The plan establishes a generalized pattern of land use and thoroughfares. It also recommends strategies of action required to implement the elements of vision contained in the document.[14] The plan does not specifically reference HSR.

City of Jersey Village Comprehensive Plan (2016)

The plan is a guide for the City of Jersey Village to reach its vision and goals through growth and development over the next 15 to 20 years. Much of the focus of this plan is around the US 290 corridor and its related economic development. While HSR is not specifically addressed, the plan does promote active dialogue for long-term investment within or adjacent to the existing rail corridor.[15]

Plan Houston (2015)

Plan Houston supports the city's continued success by providing a consensus around Houston's goals and policies, and encourages coordination and partnerships, thus enabling more effective government. The plan establishes vision and goals for the entire community as well as 12 core strategies that describe the role the city plays in achieving the community's vision and goals.[16] The plan does not reference

[10] City of Lancaster, *Comprehensive Plan*, October 2016.
[11] City of Wilmer, *Community Plan*, June 2009.
[12] City of Ferris, *Comprehensive Plan*, September 2013.
[13] City of Waxahachie, *Comprehensive Plan Addendum*, 2016.
[14] City of Corsicana, *Comprehensive Plan*, June 2007.
[15] City of Jersey Village, *Comprehensive Plan*, February 2016.
[16] City of Houston, *Plan Houston: Opportunity. Diversity. Community. Home*, 2015.

specific infrastructure improvements to support the 12 core strategies, but it discusses the need to sustain quality infrastructure, connect people and places, and partner with others, both public and private.

3.13.3 Methodology

The methodology for the assessment of structure displacements and land acquisitions; agriculture, special status farmland and agricultural conservation easements; and station area land use and zoning is discussed below.

3.13.3.1 Study Area

The Study Area varied depending on the land use assessment for the track and the stations. For the track, the Study Area for land use conversion is a half-mile wide area (a quarter-mile on either side of the HSR track centerlines) for the Project, which includes the LOD (i.e., footprint) of the track and ancillary facilities (e.g., TMFs and MOW facilities). For stations, the Study Area for land use conversion is a half-mile radius from the center of the station, which created a 1-mile buffer that includes the station areas and adjacent properties.

3.13.3.2 Data Collection

Land use in the Study Area was identified based on information obtained from local and regional applicable planning documents, readily available GIS data, aerial photography interpretation and windshield surveys. GIS data, obtained from county tax appraisal districts, included property boundaries and the assigned state land use codes. Approximately 100 unique state land use codes were reviewed and grouped into the following 13 distinct land use categories based on shared predominant characteristics.

- **Agriculture**: active farmed cropland and specialty crop production
- **Civic**: city- or state-owned land for public use
- **Commercial**: retail facilities
- **Forested Areas**: mixed hardwood and evergreen forests, forests planted primarily for timber harvest and fruit/nut tree orchards
- **Industrial**: utility stations, manufacturing or industrial plants, landfills, mines and quarries
- **Parks/Recreation**: designated open space areas for the enjoyment of the public
- **Residential**: rural and developed residential property including single- and multiple-family dwellings
- **Rural**: low-density residential or commercial property on lots larger than 5 acres
- **Transportation**: roads and railroads that are crossed by the Project LOD
- **Unclassified**: no category assigned by the county appraisal district (CAD)
- **Utilities**: ROW owned by utility companies for conveyance of utilities, including electricity, water and energy products
- **Vacant**: non-developed land
- **Water Features**: lakes, ponds and major waterbodies

Additional data were obtained from the City of Dallas, NCTCOG, H-GAC and TPWD to identify land use classifications of properties with non-descript state land use codes. Study Area soil data were obtained from NRCS to determine the potential for prime farmland and/or farmland of statewide importance.

At stations locations, city ordinances and development plans were reviewed for the City of Dallas, the community of Roans Prairie and the City of Houston.

3.13.3.3 Assessment

The assessment evaluated two main categories of impacts: conversion and acquisition. Conversion refers to the change in land use to a transportation use from any other use, and may be temporary or permanent. Temporary conversion is defined as the use of land for the period of construction (approximately 4 years). Permanent conversion is defined as the permanent conversion of land from its original use to a transportation use. Permanent conversion would include direct impacts of the Build Alternatives, including stations and ancillary facilities. Permanent or temporary conversion of land use can create indirect impacts adjacent to the LOD. Acquisition refers to a change in the ownership of or right to use the property and may also be classified as either permanent or temporary acquisition (i.e., leased) depending on the duration of impact. While converted property may also be acquired, this assessment considers conversion and acquisition as two different types of impact. A quantitative GIS assessment was performed using the 13 land use categories to determine temporary or permanent conversion of land uses to a transportation use under the Project.

3.13.3.3.1 Existing Land Use

Specific land use information within the Study Area was collected to establish the context of site-specific impacts based on the 13 distinct land use categories. Land use information was collected from existing plans, review of aerial photography and windshield surveys. Additionally, the intensity or density of land use in and along the track area was evaluated and the overall character or harmony of the land use was reviewed.

3.13.3.3.2 Station Area Land Use

Station location options were developed in coordination with the cities and local transit agencies for station placement, access and other pertinent issues. Within the station areas, field surveys were conducted to facilitate the assessment of land use compatibility and identify and locate sensitive land uses. Direct impacts include conversion of existing non-transportation land use to transportation use, and the required property acquisitions for the Project. Due to the size of the station footprints, the land use conversion at each station area was also evaluated for changes in pattern, intensity and character. For Dallas, Grimes and Harris Counties, zoning and land use ordinances were reviewed to understand the pattern or distribution of land use types. The intensity or density of land use in the area was evaluated and the overall character or harmony of the land use was reviewed.

The HSR stations may cause indirect impacts including changes to adjacent land uses as a result of the Project. Indirect impacts are discussed in **Section 3.14, Socioeconomics and Community Facilities,** and **Chapter 4.0, Indirect and Cumulative Impacts**.

3.13.3.3.3 Agriculture, Special Status Farmland and Agricultural Conservation Easements

There are three main types of special status farmland assessed in this EIS: prime farmland, unique farmland and farmland of statewide or local importance. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is suitable for cropland, pastureland, rangeland or forestland. It has the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.

Unique farmland includes land that is not classified as prime farmland, but is similar to it, in that unique farmland has the ability to be used for specific high-value food and fiber crops.

Farmland of statewide importance is land that meets specific criteria based on the physical and chemical properties of the soils, and the climatic environment of soil occurrence. Farmland of statewide importance includes all prime farmland as identified by NRCS in addition to all lands generally falling into Capability Classes I, II and III that meet certain criteria regarding soil moisture, soil temperature, slope and erosion, permeability, flooding, drainage, soil salinity, hydrogen ion content and/or rock fragments.

Agricultural conservation easements are created when a landowner voluntarily signs a written agreement with a government entity or a qualified conservation organization (the holder) to restrict certain uses of the property to protect its natural, productive or cultural features. In Texas, the program is administered by TPWD.

NRCS mapped soil data were collected for the Study Area to complete a Farmland Conversion Impact Rating Form (Form AD-106) in compliance with the Farmland Protection Policy Act. FRA initiated NRCS coordination and submitted Form AD-106 to NRCS for their review and rating.

To calculate the direct permanent conversion of special status farmland to a non-agricultural use, the acreage for each Build Alternative was quantified. The calculation of acreage to be permanently converted includes the LOD and a 25-foot setback added to the LOD to account for indirect loss of productive farmland to accommodate the use of farm and ranch equipment and changes in irrigation.

Since the Project is subject to the Farmland Protection Policy Act, the Farmland Conversion Impact Rating for the Build Alternatives was calculated by NRCS to determine the potential impact to protected farmland. NRCS considers a Farmland Conversion Impact Rating score of greater than 160 to be a conversion that causes adverse effects. Build Alternatives with a combined Farmland Conversion Impact Rating score of greater than 160 would be significant and would require additional coordination with NRCS to determine appropriate mitigation. A rating score of 160 or less would not require further consideration for protection. As presented in the Draft EIS, FRA received an initial prime farmland report from NRCS on September 9, 2016, for the Project. Additional coordination was conducted with NRCS to address the revised LOD as defined in the Final EIS. NRCS provided new Farmland Conversion Impact Rating scores ranged from 78 to 125. Therefore, no further coordination with NRCS regarding prime farmland is required.[17]

In addition, farmland parcels bisected by the Project that would result in remnant parcel(s) either too small or physically constrained to be used were identified. Factors considered in determining whether a parcel constitutes a remnant parcel included size, shape, location, and access to the parcel. These remnant parcels, while not considered a permanent conversion of land use by the Project, were identified for potential acquisition, as discussed further below.

3.13.3.3.4 Structure Displacement and Land Acquisition

The identification of parcels for potential acquisition was based on factors such as the displacement of structures in or within proximity of the LOD, percentage of the overall parcel impacted by the LOD, permanent disruption to access and the creation of remnant parcels.

Aerial photography was reviewed and limited field surveys were conducted to identify structures located within 200 feet of the LOD. For the purpose of this analysis, structures were identified through aerial photography as distinct rooftops and then given one of the following seven general classifications:

[17] USDA NRCS, April 19, 2019.

- **Agricultural:** barns and sheds related to livestock and/or agrarian uses
- **Cultural/Civic:** owned and/or operated by a municipality/government body, includes cemeteries
- **Commercial:** businesses (retail, gas stations, hotels, etc.), office, or industrial uses
- **Community Facilities:** places of worship, schools, park features, etc.
- **Oil/Gas:** structures related to the extraction of oil and natural gas (wells, sheds, etc.)
- **Residential:** houses, mobile trailers, modular residences, garages, apartment buildings, etc.
- **Transportation/Utilities:** electrical substations, water towers, helipads, park and ride facilities, etc.

These structures were then identified as primary or secondary features. A structure was considered secondary if it was an ancillary use to the primary structure. For example, if a property had a single-family home and a detached garage, the detached garage was classified as secondary because its use provided support to the primary structure on the property (the single-family home).

- Primary structures
    - civic/municipal buildings
    - agricultural businesses
    - commercial
    - community facilities
    - residences
    - transportation/utility infrastructure (including water towers and electric substations)
    - oil/gas wells
    - modular residences
- Secondary structures
    - ancillary agricultural structures (i.e., barns)
    - carports
    - sheds
    - garages
    - mobile trailers

In this analysis, a primary or secondary structure was categorized as a either a displacement or an acquisition.

Structure Displacement

A structure displacement occurred when a structure was directly impacted by the LOD or within 50 feet of the LOD, as described below. Both primary and secondary structures could be deemed displaced. If a primary structure was deemed displaced, the entire parcel would be deemed a take.

In general, displacements occurred when a structure was within 50 feet of the LOD; however, each structure was reviewed on a case by case basis. Two exceptions to structure displacements occurred when either:

- structures were located within 50 feet of a proposed station
- the Project was located within existing public ROW (i.e., intersection modifications around the Dallas or Houston Terminal Stations).

If a secondary structure was deemed displaced, it would not automatically result in a full acquisition of the parcel and would be reviewed through the structure and land acquisition processes outlined in **Appendix E, Land Use Technical Memorandum**.

Structures: categorized as primary or secondary

Structure Displacement: structure is located directly within the LOD or within 50 feet of the edge of the LOD

Structure Acquisition: structure is located more than 50 feet outside of the LOD but it is in a parcel that would be acquired

Parcel Acquisition:

full take: permanent acquisition of the entire parcel

partial take: permanent acquisition of a portion of the parcel

temporary take: temporary acquisition or use of the entire parcel

temporary partial take: temporary acquisition or use of a portion of the parcel

Structure Acquisition

A structure acquisition occurred when a structure is more than 50 feet from the LOD but located on a parcel that would be acquired. Both primary and secondary structures could be deemed an acquisition. Each potential structural acquisition was reviewed on a case by case basis and exceptions included impacts to apartment complexes, warehouses and oil/gas wells.

Refer to **Appendix E, Land Use Technical Memorandum,** for more details about the structural displacement and acquisition process that was used to gauge impacts of the Project on structures in and around the LOD.

Land Acquisition

GIS analysis identified parcel boundaries within and adjacent to the LOD. A parcel was defined using the county-level appraisal district boundaries. Parcel boundaries and ownership were refined and validated through property and deed research. A property owner may have multiple parcels, but for this analysis, all data are estimated at the parcel level. A remnant is defined as a parcel bisected by the Project that would result in a remaining piece(s) that would be too small, oddly shaped, or physically constrained to be used, and/or would be determined to have little or no value by the property owner. For purposes of this analysis, any remnant parcels that would maintain access and/or would be large enough to be used by the landowner in a productive manner would not be acquired.

Land/parcel acquisition was also classified as either permanent or temporary acquisition (e.g., leased) depending on the duration of impact. Permanent acquisition would occur for parcels within the HSR ROW, while parcels within temporary construction areas were deemed temporary takes. There are four categories of anticipated parcel acquisition based on the location and duration of impacts:

- **Full Take:** permanent acquisition of the entire parcel
- **Partial Take:** permanent acquisition of a portion of the parcel
- **Temporary Take:** temporary acquisition or use of the entire parcel
- **Temporary Partial Take:** temporary acquisition or use of a portion of the parcel

To conservatively estimate acquisitions and relocations, primary structures were deemed acquisitions when they were on a parcel that was more than 30 percent impacted even though the structure itself

was greater than 50 feet from the LOD. This assumption allows for a worst-case assessment of potential property acquisition impacts.

Potential land acquisition and easements would be subject to ROW negotiation between TCRR and the property owner and may result in a reduction of acquired property. In cases of mineral rights on properties, TCRR intends to acquire rights not already severed from the surface unless specifically requested by the landowner. As a result of these negotiations, TCRR may also acquire property beyond the LOD. These areas of acquisition cannot be identified at this time and any attempt to do so would be speculative. Therefore, the analysis of estimated potential land acquisition in this Final EIS is limited to the methodology described above and is for comparative purposes only.

3.13.4 Affected Environment

3.13.4.1 Existing Land Use

Existing land use for the Project and the surrounding area is depicted in **Appendix D, Land Use Mapbook**. **Table 3.13-2** summarizes the land ownership that would be crossed by the Build Alternatives. The majority of the Project would cross private land. Lands under local/state or federal jurisdictions affected by the Project would be minimal. These lands are typically owned or managed by TxDOT, TPWD, or local governments (city or county). A large portion of state land associated with Fort Boggy State Park would be crossed (approximately 10,750 feet) by Segment 3C (Build Alternatives C and F) in Leon County. Approximately 2,800 feet of federal USACE-owned property associated with Bardwell Lake would be crossed on Segment 2B (Build Alternatives B and E) in Ellis County. Neither Fort Boggy State Park nor Bardwell Lake would be impacted by the identified Preferred Alternative (Build Alternative A).

Table 3.13-2: Summary of Land Ownership Crossed

County/Segment	Percent of Total Length			
	Private	Local/State	Federal	Total
Dallas				
Segment 1	99.4%	0.6%	-	100%
Ellis				
Segment 1	98.0%	2.0%	-	100%
Segment 2A	98.9%	1.1%	-	100%
Segment 2B	96.7%	1.1%	2.3%	100%
Segment 3A	99.6%	0.4%	-	100%
Segment 3B	99.6%	0.4%	-	100%
Segment 3C	99.6%	0.4%	-	100%
Navarro				
Segment 3A	99.1%	0.9%	-	100%
Segment 3B	99.1%	0.9%	-	100%
Segment 3C	99.2%	0.8%	-	100%
Freestone				
Segment 3A	100.0%	-	-	100%
Segment 3B	100.0%	-	-	100%
Segment 3C	48.3%	51.7%	-	100%
Segment 4	99.3%	0.7%	-	100%
Limestone				
Segment 4	99.3%	0.7%	-	100%
Leon				
Segment 3C	37.0%	63.0%	-	100%
Segment 4	99.3%	0.7%	-	100%

Table 3.13-2: Summary of Land Ownership Crossed				
County/Segment	**Percent of Total Length**			
	Private	**Local/State**	**Federal**	**Total**
Madison				
Segment 3C	90.4%	9.6%	-	100%
Segment 4	98.9%	1.1%	-	100%
Grimes				
Segment 3C	100.0%	-	-	100%
Segment 4	99.8%	0.2%	-	100%
Segment 5	99.3%	0.7%	-	100%
Waller				
Segment 5	99.3%	0.7%	-	100%
Harris				
Segment 5	99.0%	1.0%	-	100%
Houston Terminal Station Options				
Industrial Site	100.0%	-	-	100%
Northwest Mall	100.0%	-	-	100%
Northwest Transit Center	100.0%	-	-	100%

Source: TxDOT 2018, Freestone CAD 2017, Madison CAD 2017, Harris CAD 2017, Contract Land Staff (CLS) 2018

Table 3.13-3 shows existing land use within the Study Area. Land use tabulations were based on source data identified from federal, state, regional, county and local agencies and municipalities that quantify land use under the definitions described in **Section 3.13.3.2, Data Collection**. Of the nearly 129,000 acres of land within the one-half mile Study Area, agricultural lands account for the largest land use category, followed by transportation, commercial and residential land uses at far lesser amounts.

3.13.4.1.1 Station Area Land Use

Table 3.13-4 summarizes the land use classifications within one-half mile of a center point for each station option. As stated in **Section 3.13.3.1, Study Area**, the land use Study Area is a ¼-mile to ½-mile buffer around the LOD (including the stations). However, for the purposes of targeting land uses only around the stations in this section, a ½ mile radius around the center of the station was used. The parts of the LOD shown on **Figures 3.13-1** through **Figure 3.13-6** that are disconnected from the main LOD reflect intersection improvements that TCRR proposed (see **Appendix F, TCRR Final Conceptual Engineering Design Report**).

Dallas Terminal Station

The area surrounding the Dallas Terminal Station is loosely organized around a northwest/southeast street grid. The terminal station would be bound by the IH-35E/IH-30 interchange and Cadiz Street on the west, UPRR to the north, Corinth Street on the east and South Riverfront Boulevard/Trinity River on the south. The terminal station area would be immediately south of downtown Dallas.

Table 3.13-3: Existing Land Use within One-Half Mile Study Area in Acres

County/ Segment	Agriculture	Civic	Commercial	Forested Acres	Industrial	Parks/ Recreation	Residential	Rural	Transportation	Unclassified	Utilities	Vacant	Water Features	Total
Dallas														
Segment 1[a]	1,603.5	27.0	1,922.0	-	234.3	145.0	270.7	142.6	796.8	5.8	94.5	137.6	73.2	5,453.1
Ellis														
Segment 1	345.8	-	0.8	-	-	-	81.8	32.2	10.1	-	-	5.4	-	476.1
Segment 2A	6,383.1	5.2	70.6	-	-	29.1	432.2	422.4	82.9	-	1.6	67.0	-	7,494.1
Segment 2B	6,055.5	-	68.8	-	-	162.5	546.9	421.9	80.9	-	-	74.8	-	7,411.3
Segment 3A	650.8	-	-	-	-	-	-	-	0.8	-	-	-	-	651.6
Segment 3B	651.3	-	-	-	-	-	-	-	0.9	-	-	-	-	652.2
Segment 3C	650.8	-	-	-	-	-	-	-	0.8	-	-	-	-	651.6
Navarro														
Segment 3A	8,962.5	1.0	0.4	-	-	-	79.0	-	141.0	-	16.5	9.7	-	9,210.1
Segment 3B	8,504.3	16.4	0.4	-	-	-	510.7	-	185.2	-	-	77.0	-	9,294.0
Segment 3C	8,892.9	1.0	0.7	-	-	-	251.0	-	154.8	-	16.5	21.3	-	9,338.2
Freestone														
Segment 3A	8.0	-	-	-	-	-	-	-	-	-	-	-	-	8.0
Segment 3B	8.0	-	-	-	-	-	-	-	-	-	-	-	-	8.0
Segment 3C	8,248.9	24.1	225.3	-	73.0	-	100.0	-	1,688.0	-	4.6	63.2	-	10,427.1
Segment 4	6,267.9	6.4	2.1	-	-	-	18.1	-	70.1	2.5	76.8	2.1	-	6,446.0
Limestone														
Segment 4	3,735.4	10.3	-	-	-	-	25.6	-	-	5.6	0.4	-	14.8	3,792.1
Leon														
Segment 3C	4,555.8	-	43.3	213.6	-	477.8	435.8	144.3	1,699.4	1,025.0	2.0	499.0	-	9,096.0
Segment 4	6,577.4	-	-	103.7	-	-	160.6	725.8	75.2	409.3	-	736.9	-	8,788.9
Madison														
Segment 3C	5,162.0	-	3.9	-	-	-	70.4	137.0	241.1	-	-	40.1	-	5,654.5
Segment 4	4,491.1	-	-	-	-	-	36.6	131.3	108.3	-	-	99.2	-	4,866.5

Table 3.13-3: Existing Land Use within One-Half Mile Study Area in Acres

County/ Segment	Agriculture	Civic	Commercial	Forested Acres	Industrial	Parks/ Recreation	Residential	Rural	Transportation	Unclassified	Utilities	Vacant	Water Features	Total
Grimes														
Segment 3C	1,033.8	-	-	-	-	-	-	-	1.8	-	-	-	-	1,035.6
Segment 4	1,021.1	-	-	-	-	-	-	-	2.0	-	-	-	-	1,023.1
Segment 5 [a]	10,444.8	5.9	1.0		8.2	0.6	671.0	580.8	303.1	-	1.9	526.9	-	12,544.2
Waller														
Segment 5	2,024.4	4.5	25.6	86.2	-	0.1	290.4	253.4	60.1	0.2	25.9	41.6	-	2,812.4
Harris														
Segment 5 [a]	5,339.3	529.1	2,460.9	-	267.8	0.9	710.9	-	1,554.9	6.3	47.4	665.1	-	11,582.6
Total	**101,618.4**	**630.9**	**4,825.8**	**403.5**	**583.3**	**816.0**	**4,691.7**	**2,991.7**	**7,258.2**	**1,454.7**	**288.1**	**3,066.9**	**88.0**	**128,717.3**

Source: Dallas CAD 2017, Ellis CAD 2017, Navarro CAD 2017, Freestone CAD 2017, Limestone CAD 2017, Leon CAD 2015, Madison CAD 2017, Grimes CAD 2017, Waller CAD 2017, Harris CAD 2017, CLS 2018

[a] Includes a portion of the Dallas and Brazos Valley Intermediate Station area acreage; Houston Terminal Station Options land uses are described in **Table 3.13-2.**

Table 3.13-4: Existing Land Use within One-Half Mile of Station in Acres													
Stations	**Agriculture**	**Commercial**	**Industrial**	**Residential**	**Civic**	**Rural**	**Transportation**	**Water Features**	**Parks/ Recreation**	**Unclassified**	**Utilities**	**Vacant**	**Total**
Dallas Terminal Station[a]	2.4	184.1	3.3	8.7	44.0	-	182.8	19.7	45.2	-	4.1	8.5	502.7
Brazos Valley Intermediate Station[a]	416.5	-	-	4.1	-	69.9	11.7	-	-	0.2	-	0.4	502.7
Houston Terminal Station Options													
Industrial Site	-	182.1	51.0	95.6	82.3	-	80.1	-	-	-	1.6	10.4	503.1
Northwest Mall	-	147.1	47.8	34.1	109.0	-	136.2	-	-	-	2.2	26.1	502.6
Northwest Transit	-	179.3	17.7	81.0	135.8	-	128.3	-	-	-	-	16.6	558.7

Source: Dallas CAD 2017, Grimes CAD 2017, Harris CAD 2017, CLS 2018

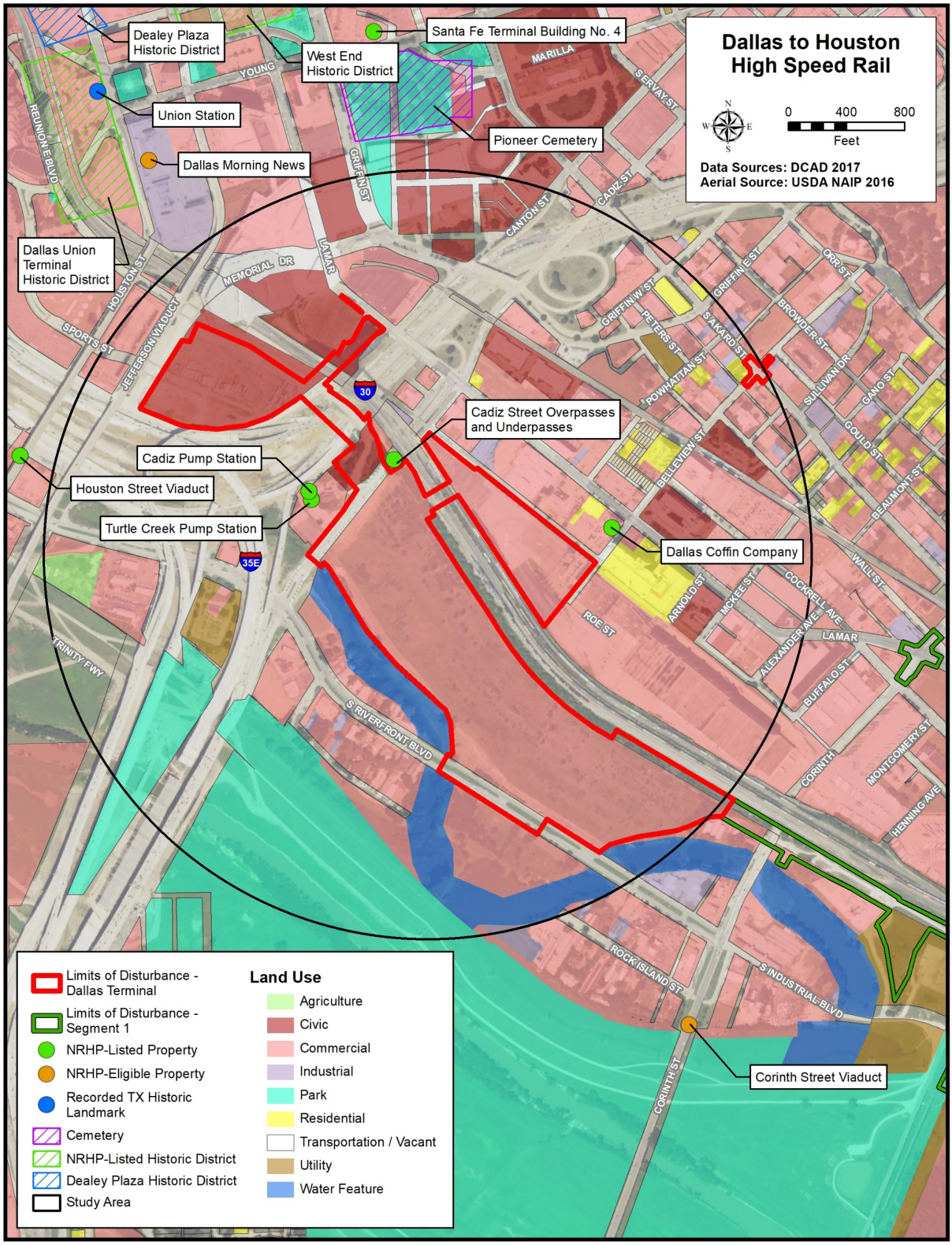
[a] Acreages for these stations are included as part of the respective segment within **Table 3.13-4.**

As shown in **Table 3.13-5**, existing land use around the Dallas Terminal Station primarily consists of a mix of commercial and transportation uses. The character of the existing site is vacant/open space, while the character of the surrounding area can generally be described as commercial/retail and mid-rise residential. Notable land use features within the Study Area include Kay Bailey Hutchison Convention Center, Dallas Police Headquarters, Southside on Lamar mid-rise residential development and the Trinity River to the immediate south. The Dallas Union Station Historic District lies immediately northeast of the terminal station Study Area. **Figure 3.13-1** depicts the existing land uses around the Dallas Terminal Station.

Zoning at and around the Dallas Terminal Station area is controlled by the City of Dallas zoning regulations under Chapter 51A, Article IV of the Dallas Development Code that was approved by Ordinance Number 10962 on June 12, 2013. The parcels selected for the terminal site are currently zoned as Planned Development and Central Area. The Industrial Manufacturing zoning designation is also found within the Study Area of the Dallas Terminal Station but is to the south of the LOD for the proposed Dallas Terminal Station. The Planned Development zoning designation offers design flexibility for land use and carries specific development conditions. One of the allowable land uses for the planned development is a "railroad passenger station."[18] The Central Area zoning designation accommodates existing development in the central area of Dallas and seeks to prevent the increase of street congestion. The Industrial Manufacturing designation carries specific development conditions.[19] **Figure 3.13-2** depicts the existing zoning around the Dallas Terminal Station.

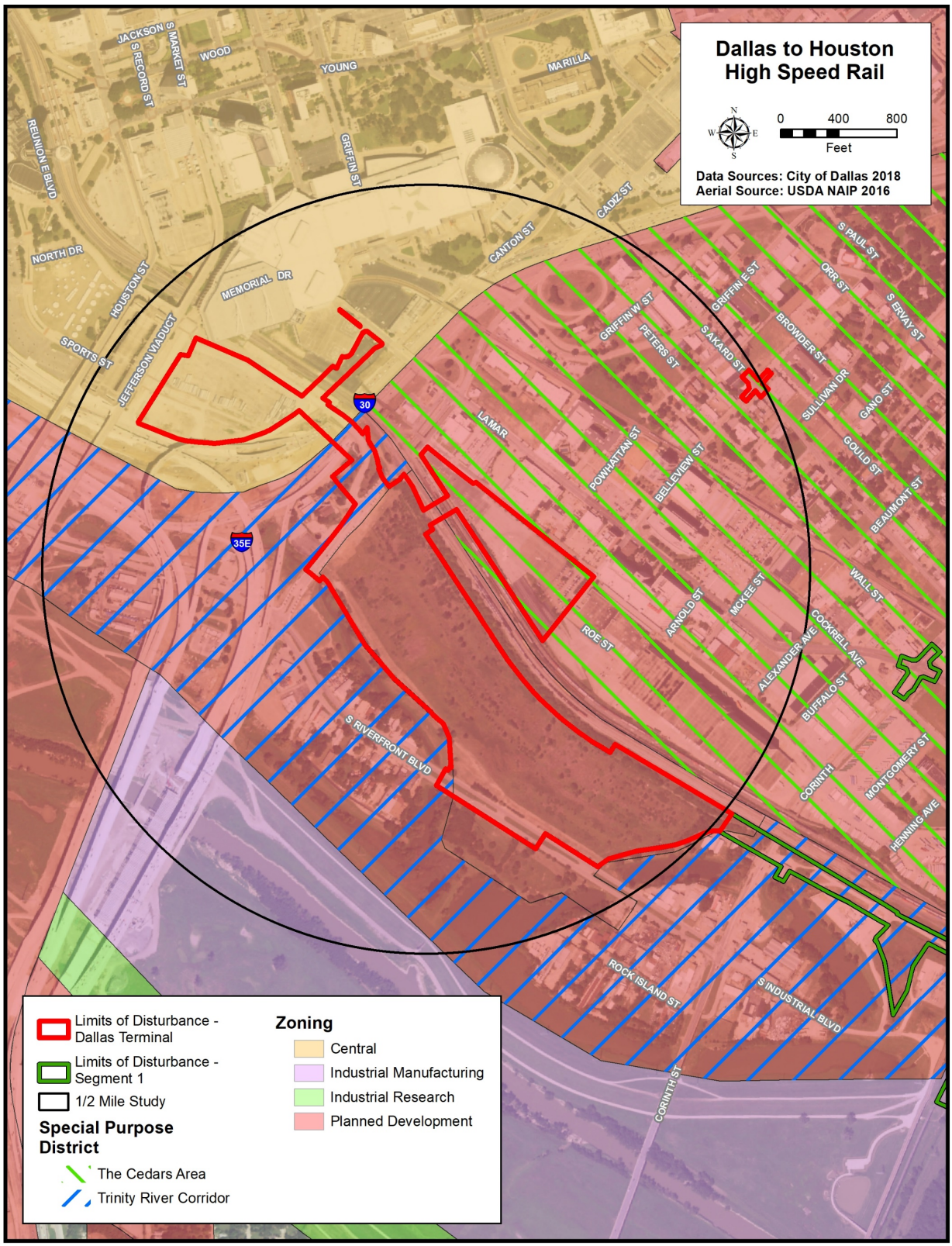
[18] City of Dallas Planned Development, Article 800, SEC. 51P-800.108.,MAIN USES PERMITTED, October 22, 2008.
[19] City of Dallas, Dallas Development Code, Ordinance No. 10962, Article 4 Zoning Regulations, Division 51-4.100, June 12 2013.

Figure 3.13-1: Dallas Terminal Station Area Existing Land Use



Source: AECOM 2019

Figure 3.13-2: Dallas Terminal Station Area Zoning



Source: AECOM 2019

There are two special purpose districts within the Study Area. The Cedars Area Special Purpose District is north of the Dallas Terminal Station and has been designated to help attract businesses and residents as an extension of the Dallas Central Business District. The District was approved by Ordinance Number 20395 on July 26, 1989.[20] The Trinity River Corridor Special Purpose District is south of the Dallas Terminal Station and has been designated to guide land use and development in the corridor through form-based zoning.[21] This District was approved by Ordinance Number 27331 on September 24, 2008.[22] **Figure 3.13-2** depicts the existing special purpose districts around the Dallas Terminal Station.

Brazos Valley Intermediate Station

The area surrounding the Brazos Valley Intermediate Station is mainly agricultural, with a small amount of rural land use near the unincorporated community of Roans Prairie. **Table 3.13-4** provides a breakdown of the existing land uses around the Brazos Valley Intermediate Station. This station site would be just northwest of the intersection of SH 30 and SH 90 in Grimes County. The character of the station site is rural. Because the station site would be in an unincorporated area, no zoning ordinances apply. As summarized in **Table 3.13-1**, while Grimes County does not regulate zoning, the county does regulate subdivision plat requirements. **Figure 3.13-3** depicts existing land uses around the Brazos Valley Intermediate Station.

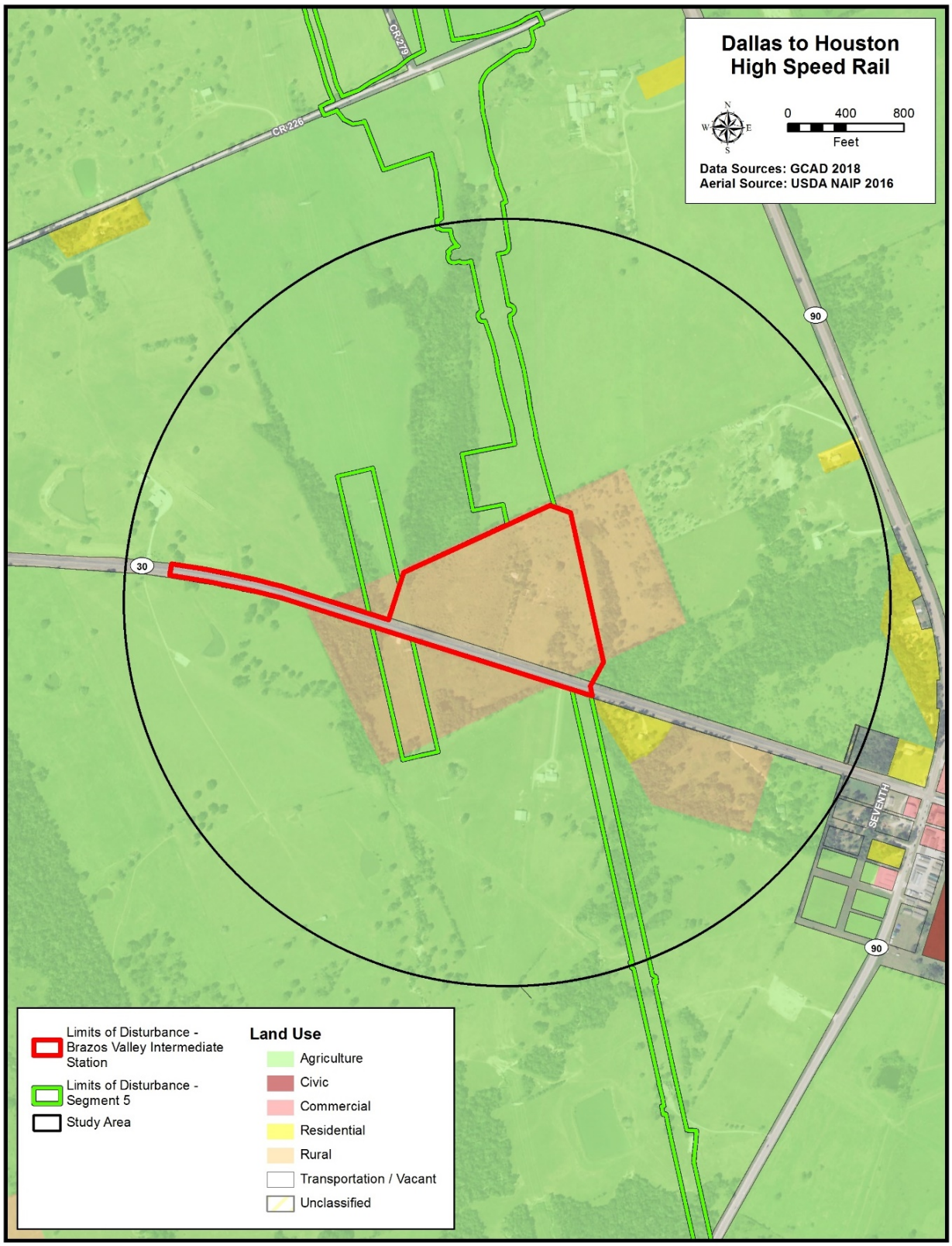
Houston Terminal Station Options

Houston does not use zoning to regulate development, but rather site development plan codes. These are utilized to check for compliance with regulations that include property subdivision, parking, tree and shrub requirements, setbacks and access. The site development plan codes outlined in Chapter 42 of the Code of Ordinances of the City of Houston were approved by Ordinance Number 2015-639 on June 24, 2015. Characteristics of each Houston Terminal Station Option are described below.

Houston Industrial Site Terminal Station Option: The area surrounding the Houston Industrial Site Terminal Station Option is loosely organized around a north/south street grid. The terminal site would be bound by Story Street on the west, Hempstead Road on the north, Post Oak Road on the east and Westview Drive on the south. The terminal area would be approximately 8 miles northwest of downtown Houston. **Table 3.13-4** provides a breakdown of the existing land uses around the Houston Industrial Site Terminal Station Option. Existing land use within the Study Area primarily consists of a mix of commercial, residential, civic and transportation uses. The character of the terminal area LOD is a mix of industrial and vacant/open space, while the character of the area surrounding the terminal area can generally be described as commercial, residential and civic. Notable land uses within the Study Area include the Houston Independent School District Hattie Mae White Educational Support Center and Northwest Mall (currently vacant). **Figure 3.13-4** depicts existing land uses around the Houston Industrial Site Terminal Station Option.

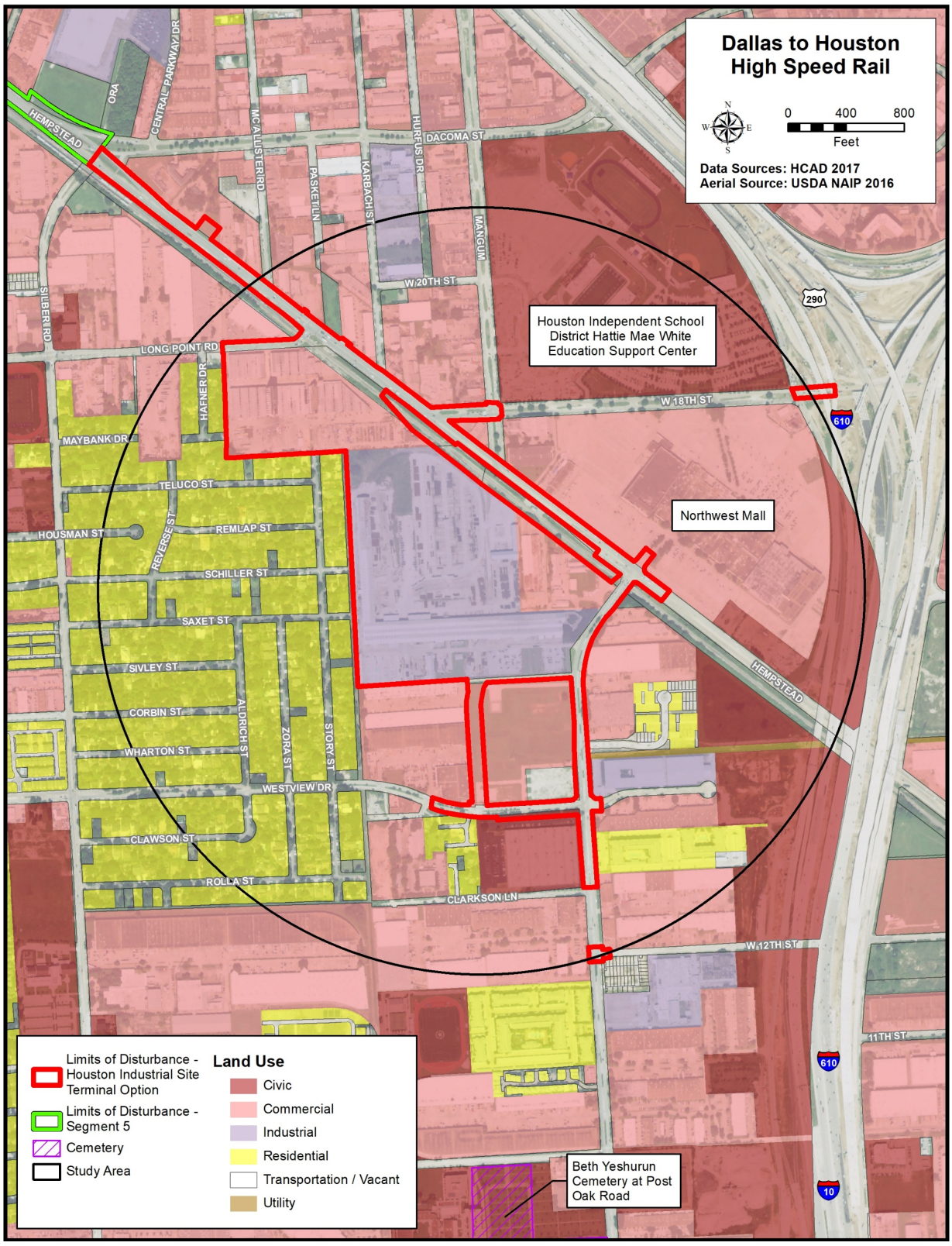
[20] City of Dallas, Dallas Development Code, Ordinance No. 20395, Article 317, PD 317, Cedars Area Special Purpose District, July 26 1989.
[21] The Form-Based Code Institute defines form-based code as a land development regulation that fosters predictable built results and a high-quality public realm by using physical form (rather than separation of uses) as the organizing principle for the code. A form-based code is a regulation, not a mere guideline, adopted into city, town, or county law. A form-based code offers a powerful alternative to conventional zoning regulation. Accessed July 2017, http://formbasedcodes.org/definition/.
[22] City of Dallas, Dallas Development Code, Ordinance No. 27331, Article 784, PD 784, Trinity River Corridor Special Purpose District, 2008.

Figure 3.13-3: Brazos Valley Intermediate Station Area Existing Land Use



Source: AECOM 2019

Figure 3.13-4: Houston Industrial Site Terminal Station Option Area Existing Land Use



Source: AECOM 2019

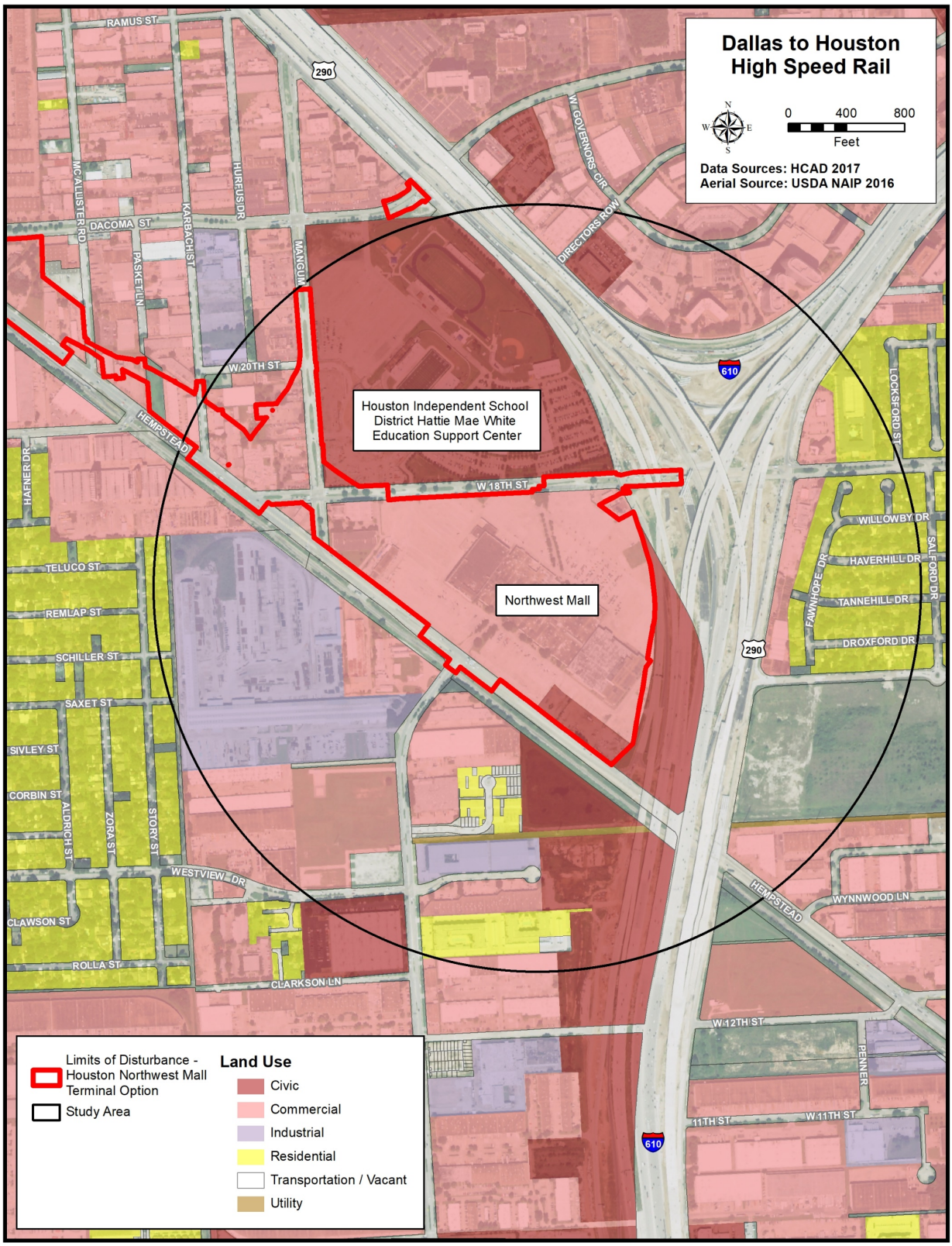
Houston Northwest Mall Terminal Station Option: The area surrounding the Houston Northwest Mall Terminal Station Option is also loosely organized around a north/south street grid. The terminal site would be bound by Magnum Road on the west, West 18th Street on the north, IH-610 on the east and Hempstead Road on the south. The terminal area would be approximately 8 miles northwest of downtown Houston. **Table 3.13-4** provides a breakdown of the existing land uses around the Houston Northwest Mall Terminal Station Option. Existing land use within the Study Area primarily consists of a mix of commercial, civic, industrial and transportation uses. The character of the terminal LOD is a mix of commercial and vacant buildings, while the character of the area surrounding the terminal can generally be described as industrial, civic and residential. Notable land use features within the Study Area include the Houston Independent School District Hattie Mae White Educational Support Center and Northwest Mall (currently vacant). **Figure 3.13-5** depicts existing land uses around the Houston Northwest Mall Terminal Station Option.

Houston Northwest Transit Center Terminal Station Option: The area surrounding the Houston Northwest Transit Center Terminal Station Option is also loosely organized around a north/south street grid. The terminal site would be bound by Post Oak Road on the west, West 12th Street on the north, IH-610 on the east and IH-10 and the Northwest Transit Center to the south. The terminal area would be approximately 8 miles northwest of downtown Houston. **Table 3.13-4** provides a breakdown of the existing land uses around the Houston Northwest Transit Center Terminal Station Option. Existing land use within the Study Area primarily consists of a mix of commercial, transportation and civic uses. The character of the terminal LOD would be a mix of industrial, transportation, commercial, residential and vacant/open space, while the character of the area surrounding the terminal can generally be described as commercial and residential. Notable land use features within the Study Area include the Beth Yeshurun Cemetery at Post Oak Road, Awty International School, Houston Polo Club and Houston First Baptist Church. **Figure 3.13-6** depicts existing land uses around the Houston Northwest Transit Center Terminal Station Option.

3.13.4.2 Agriculture, Special Status Farmland and Agricultural Conservation Easements

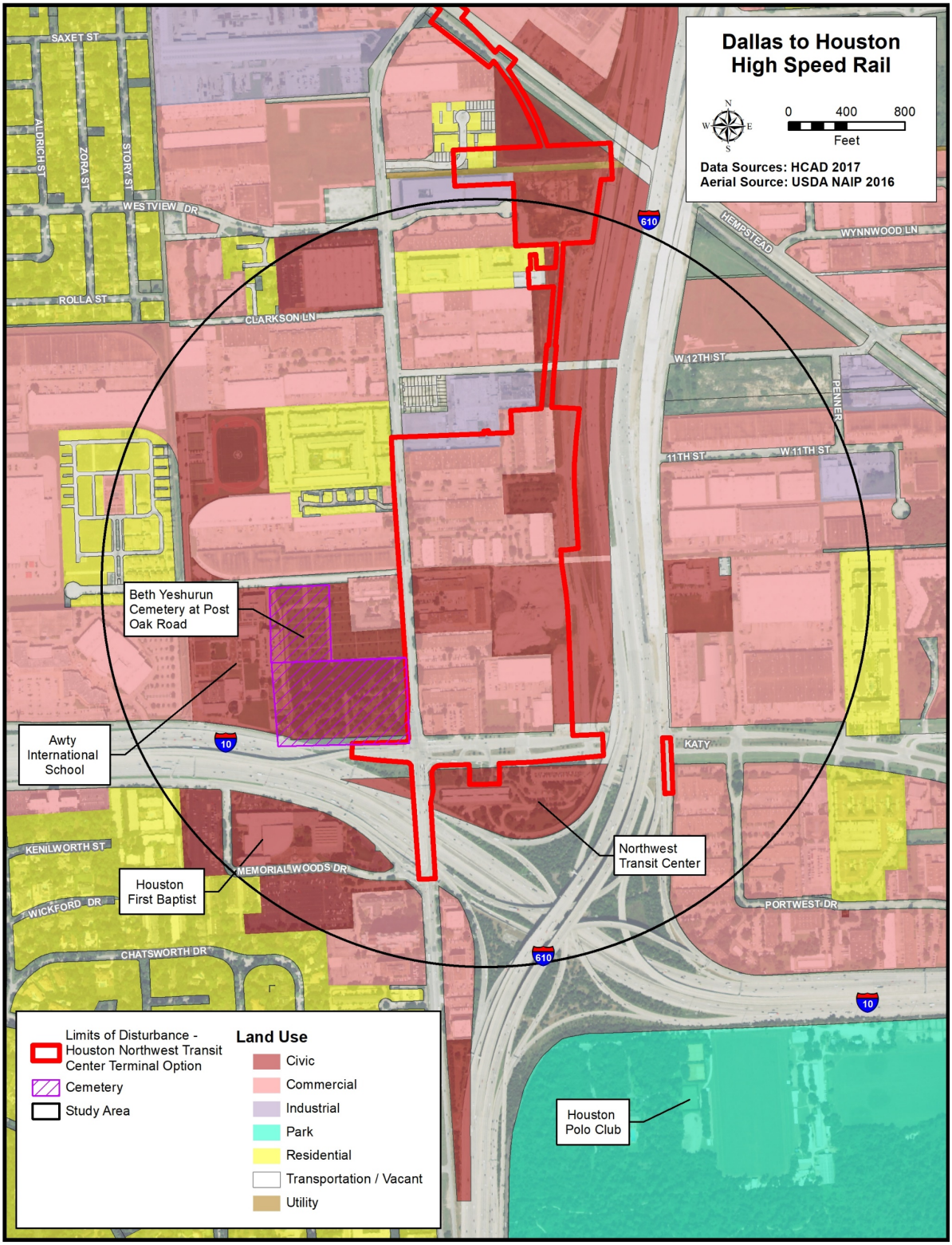
Texas agricultural lands are undergoing a fundamental change, largely driven by population growth, which has future implications for rural economies, food security and conservation of other natural resources such as water. From 1997 through 2017, the Texas population increased from 19 million to 28 million residents, an increase of 32 percent— or nearly 450,000 new residents annually. The majority of the population increases occurred within the state's top 25 highest growth counties, with notable growth experienced in the DFW and Houston metropolitan areas. This amount of population change over a 20-year period led to a net loss of approximately 6.9 million acres of agricultural lands in Texas that were converted to non-agricultural uses. The rate of conversion increased from 2012 to 2017, most likely due to the end of the economic recession that began in 2008.

Figure 3.13-5: Houston Northwest Mall Terminal Station Option Area Existing Land Use



Source: AECOM 2019

Figure 3.13-6: Houston Northwest Transit Center Terminal Station Option Area Existing Land Use



Source: AECOM 2019

3.13.4.2.1 Agriculture

Agriculture in Texas produces more than 200 different crops, including more than 20 types of fruits and nuts, more than 30 types of vegetables and more than 20 field crops, as well as lumber, nursery stock, livestock, poultry and dairy products. According to the 2017 Texas Census of Agriculture, there were nearly 250,000 farms spread over 127 million acres in the state used for agricultural production. Of that total, over 29 million acres were used for harvested or irrigated cropland and the remaining areas were primarily used for livestock purposes. The total value of agricultural production in Texas in 2017 was nearly $25 billion, with crops accounting for nearly $7 billion and livestock accounting for $18 billion. The top five commodities in 2017 were cattle, chickens, cotton, dairy and grains/oilseeds/dry beans/dry peas.[23]

The 10 counties directly impacted by the Project (i.e., Dallas, Ellis, Navarro, Freestone, Leon, Limestone, Madison, Grimes, Waller and Harris) were also substantial agricultural producers in 2017, as seen in the Texas Census of Agriculture. **Table 3.13-5** provides additional details regarding agriculture statistics in Texas and in these 10 counties.

Based on the 2017 data, detailed in **Table 3.13-5**, the total acreage of farms in the 10 counties impacted by the Project is almost 3.5 million, which is approximately 3 percent of the total acres of farms in Texas. The average farm size in the 10 counties is 210 acres, which is less than half the size of the average Texas farm at 511 acres. The total market value of crops sold in the 10 counties was approximately $265 million, which represents approximately 4 percent of the total market value of crops sold in Texas, which was $6.9 billion.

The contribution of the 10 counties to the agricultural production of Texas as a whole, while substantial, is small in comparison to the remainder of the state. Overall, 3 of the 10 counties rank in the top 25 percent of all Texas counties in agricultural production value. The highest-ranking of the 10 counties in terms of agricultural production is Leon County, which also ranked 27 of all 254 Texas counties, while the lowest-ranking county of the 10 counties was Dallas at 160 of all 254 Texas counties.

3.13.4.2.2 Livestock

Livestock are animals kept or raised for use or profit and are common throughout the 10 counties, particularly in the rural counties. As shown in **Table 3.13-5**, livestock is a significant contributor to rural economies. The top livestock raised in 7 of the 10 counties analyzed was beef cows. The total market value of livestock sold in the 10 counties in 2017 was $415 million, which represents approximately 2 percent of the total market value of livestock sold in Texas, which was $18 billion. The contribution of the 10 counties to the livestock production of Texas as a whole is small in comparison to the remainder of the state. Additionally, due to the relatively small percentage of county land impacted by the Project, the total market share of Texas livestock directly impacted by the Project would be less than 2 percent.

In all 10 counties, the general practice is to fence/gate grazing areas to prevent livestock from crossing onto adjacent landowner property, as well as transportation corridors. Based upon an aerial photography review and limited field surveys of the Study Area, no confined feeding operations for livestock, such as cattle or sheep, were identified within the Study Area.

[23] USDA, "2017 Census of Agriculture, Texas State and County Data," Volume 1 Geographic Area Series Part 43A, Table 1 County Summary Highlights and Table 8 Farms, Land in Farms, Value of Land and Buildings and Land Use: 2017, May 2019.

Table 3.13-5: 2017 Agricultural Statistics

	Total Farms [a]	Land in Farms (acres) [a]	Average Size (acres) [a]	Percent Cropland (of land in farms) [a]	Percent Pastureland (of land in farms) [a]	Estimated Market Value of Land and Buildings (per acre) [a]	Total Cropland (acres) [a]	Top Crop [a]	Market Value of Crops Sold ($000s) [a]	Top Livestock [a]	Market Value of Livestock Sold ($000s) [a]	County Rank within Texas (of 254 Counties) [b]	Land Enrolled in Conservation (acres) [a]
Texas	248,416	127,036,184	511	23.1	69.2	$1,917	29,360,229	Cotton	$6,894,307	Beef Cows	$18,029,734	N/A	2,913,311
Dallas	775	63,949	83	40.8	42.7	$8,097	26,100	Wheat	$25,914	Beef Cows	$3,867	160	3,737
Ellis	2,551	473,413	186	46.8	46.6	$3,211	221,498	Grains	$53,457	Beef Cows	$19,689	79	3,986
Navarro	2,471	558,947	226	31.9	54.5	$2,349	178,564	Cotton	$33,646	Beef Cows	$39,660	78	3,269
Freestone	1,459	414,112	284	13.5	61.2	$2,565	55,720	Forage	$4,659	Chickens	$63,472	84	N/A
Limestone	1,284	492,631	384	14.8	70.0	$1,842	72,996	Grains	$10,018	Beef Cows	$56,239	88	1,354
Leon	1,951	487,598	250	14.6	52.7	$3,037	71,219	Forage	$10,058	Chickens	$159,346	27	205
Madison	977	245,552	251	13.8	70.0	$2,996	33,964	N/A	N/A	Chickens	N/A	42	752
Grimes	1,771	340,833	192	15.9	64.0	$3,847	54,265	Forage	$14,041	Beef Cows	$33,468	120	61
Waller	1,881	253,194	135	28.2	56.0	$4,670	71,422	Nursery	$76,311	Beef Cows	$26,058	53	181
Harris	1,891	218,659	116	24.1	61.8	$8,635	52,722	Nursery	$37,169	Beef Cows	$13,443	116	859

Notes:
N/A – not available
Forage – land used for all hay and all haylage, grass silage and greenchop
[a] Source: USDA "2017 Census of Agriculture, Texas State and County Data," Volume 1 Geographic Area Series Part 43A. Table 1 County Summary Highlights and Table 8 Farms, Land in Farms, Value of Land and Buildings and Land Use: 2017. May 2019.
[b] Source: USDA "2017 Census of Agriculture County Profile Sheets" for Dallas, Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes, Waller and Harris counties.

3.13.4.2.3 Special Status Farmlands and Agricultural Conservation Easements

As defined in **Section 3.13.3, Methodology**, special status farmlands include prime farmland, unique, statewide or locally important farmland. **Table 3.13-6** shows special status farmland within each county and the Study Area, as well as prime farmland that could be used for agricultural purposes if this farmland were drained. Overall, there are approximately 63,700 acres of special status farmland in the 10 counties, while there are approximately 2.2 million total acres in the 10 counties. There are approximately 36,200 acres of prime farmland and about 26,300 acres of farmland of statewide importance in the 10 counties. This compares against nearly 1.3 million acres of prime farmland and about 811,100 acres of farmland of statewide importance within all 10 counties.

Table 3.13-6: Special Status Farmland within a Quarter Mile of Project Build Alternative Centerlines in Acres

County/ Segment	Prime Farmland	Farmland of Statewide Importance	Prime Farmland if Drained	Total Special Status Farmland
Dallas				
Countywide	89,089.8	31,416.0	-	120,505.8
Segment 1	1,097.3	219.4	-	1,316.7
Ellis				
Countywide	210,506.0	69,285.6	-	279,791.6
Segment 1	330.4	-	-	330.4
Segment 2A	4,808.6	29.8	-	4,838.4
Segment 2B	4,584.5	29.8	-	4,614.3
Segment 3A	563.8	28.4	-	592.2
Segment 3B	561.7	32.4	-	594.0
Segment 3C	563.8	28.4	-	592.2
Navarro				
Countywide	132,678.9	257,291.4	-	389,970.3
Segment 3A	2,427.8	3,259.1	-	5,686.9
Segment 3B	2,851.9	3,862.7	-	6,714.6
Segment 3C	2,383.8	2842.4	-	5,226.2
Segment 4	-	-	-	0.0
Freestone				
Countywide	51,146.0	126,760.5	-	177,906.5
Segment 3A	-	8.0	-	8.0
Segment 3B	-	8.0	-	8.0
Segment 3C	785.2	3,383.9	-	4,169.1
Segment 4	548.1	2,822.7	-	3,370.8
Limestone				
Countywide	113,259.3	202,603.6	-	315,862.9
Segment 4	1,213.8	389.1	-	1602.9
Leon				
Countywide	92,937.6	41,044.6	2,166.4	136,148.6
Segment 3C	1096.0	722.3	-	1,818.3
Segment 4	2089.1	718.9	-	2,808.0
Madison				
Countywide	74,718.7	58,509.1	-	133,227.8
Segment 3C	1,549.9	1,188.2	-	2,738.1
Segment 4	1,456.7	1,451.6	-	2,908.3

Table 3.13-6: Special Status Farmland within a Quarter Mile of Project Build Alternative Centerlines in Acres

County/ Segment	Prime Farmland	Farmland of Statewide Importance	Prime Farmland if Drained	Total Special Status Farmland
Grimes				
Countywide	74,047.5	117,881.2	52.7	191,981.4
Segment 3C	10.4	108.4	-	118.7
Segment 4	22.3	64.8	-	87.1
Segment 5	1,626.8	4,051.4	9.7	5,687.9
Waller				
Countywide	178,823.0	43,199.9	6,937.4	228,960.3
Segment 5	995.6	157.7	-	1,153.3
Harris				
Countywide	381,149.0	65,678.3	56,775.8	503,603.1
Segment 5	4,608.8	934.0	1,171.1	6,713.9
Total Counties	1,285,096.5	811,066.6	65,932.3	2,162,095.4
Total within Study Area	36,176.2	26,341.3	1,180.8	63,698.3
Houston Terminal Station Options				
Industrial Site	-	-	-	0.0
Northwest Mall	-	-	-	0.0
Northwest Transit Center	-	-	-	0.0

Source: Dallas, Freestone, Grimes, Harris, Leon, Madison, Navarro, and Waller Counties: NRCS, 2017; Ellis, and Limestone Counties: NRCS, 2017

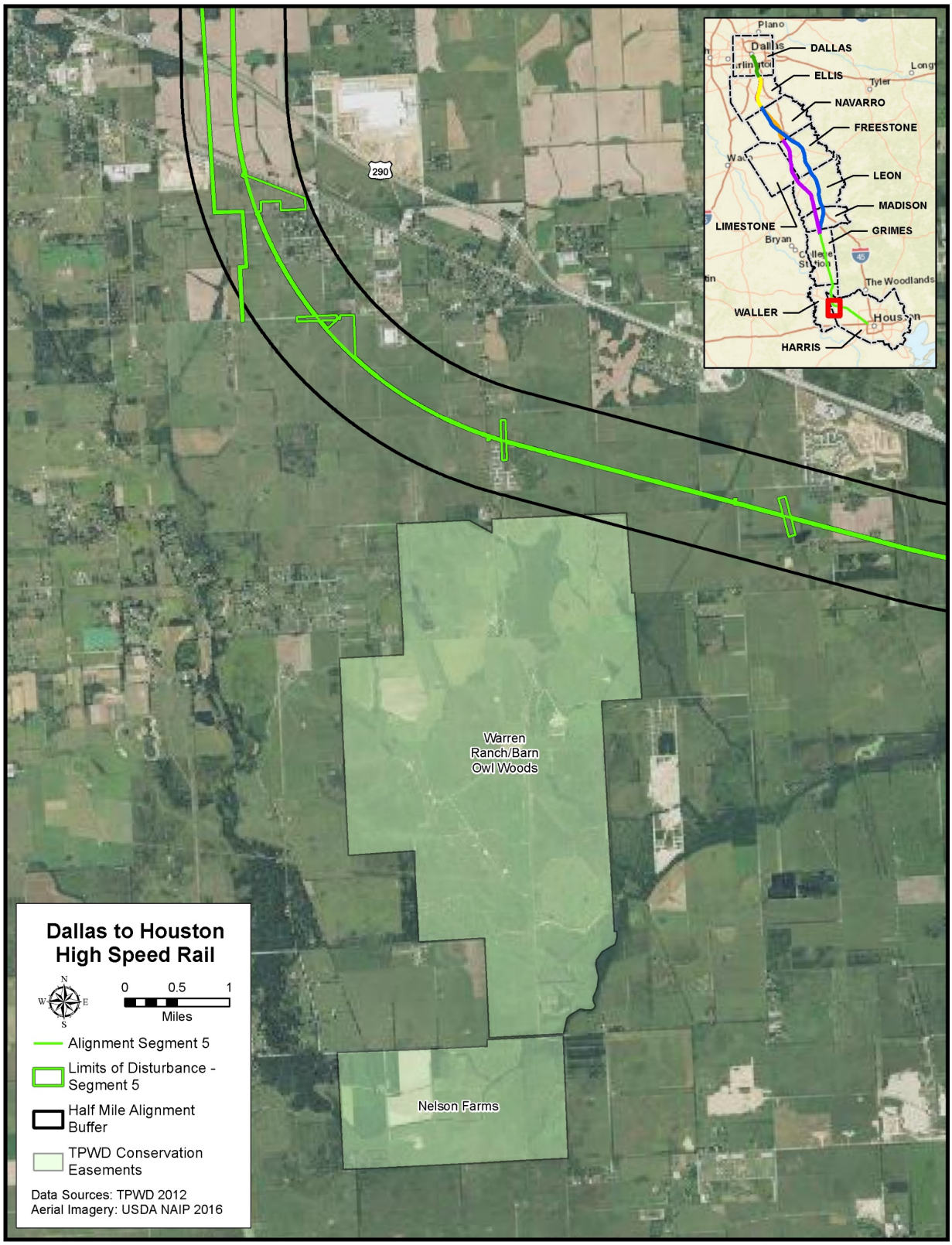
As detailed in **Table 3.13-5**, land enrolled in agricultural conservation easements totaled 14,404 acres within all 10 counties.[24] As noted in **Section 3.13.4.2, Agriculture, Special Status Farmland and Agricultural Conservation Easements**, Agricultural Conservation Easements protect the long-term viability of the nation's food supply by preventing conversion of productive working lands to non-agricultural uses.[25] Easements can range from permanent to term-limited and include specific limitations, such as development restrictions, as agreed upon by the landowner and the owner of the conservation easement. There is only one Agricultural Conservation Easement (Warren Ranch/Barn Owl Woods Conservation) land area within one-half mile of the Project, which is located in Harris County. The half-mile Study Area intersects approximately 22 acres of this conservation easement, as shown on **Figure 3.13-7**.

3.13.4.3 Structures and Land

Table 3.13-7 identifies the number and type of structures within 200 feet of the LOD. As described in **Section 3.13.4.2, Agriculture, Special Status Farmland and Agricultural Conservation Easements**, the number of structures is based on distinct and separate rooftops as identified through aerial photography. Overall, primary residences and secondary barn/sheds account for two-thirds of all structures.

[24] USDA, "2017 Census of Agriculture, Texas State and County Data," Volume 1 Geographic Area Series Part 43A, Table 1 County Summary Highlights and Table 8 Farms, Land in Farms, Value of Land and Buildings and Land Use: 2017, May 2019.
[25] USDA NRCS, Agricultural Conservation Easement Program, March 2014.

Figure 3.13-7: Agricultural Conservation Easement Land Area



Source: AECOM 2019

Table 3.13-7: Primary and Secondary Structures within 200 Feet of LOD									
County/Segment	**Agriculture/ Sheds**	**Commercial**	**Community Facilities**	**Civic**	**Cultural Resources**	**Oil/Gas**	**Residential**	**Transportation/ Utilities**	**Total**
Dallas									
Segment 1	85	114	1	3	-	-	73	6	283
Ellis									
Segment 1	12	-	-	-	-	-	17	-	29
Segment 2A	60	-	-	-	-	-	38	-	98
Segment 2B	113	-	-	-	-	-	66	1	180
Segment 3A	2	-	-	-	-	-	-	-	2
Segment 3B	-	-	-	-	-	-	-	-	0
Segment 3C	2	-	-	-	-	-	-	-	2
Navarro									
Segment 3A	53	-	-	-	-	-	18	1	72
Segment 3B	137	1	-	1	-	2	77	-	218
Segment 3C	56	-	-	-	-	-	28	1	85
Freestone									
Segment 3C	40	48	3	-	-	24	24	3	142
Segment 4	43	-	-	-	-	3	15	-	61
Limestone									
Segment 4	17	-	-	-	-	17	5	-	39
Leon									
Segment 3C	59	31	1	-	-	5	43	6	145
Segment 4	41	-	-	-	-	13	25	-	78
Madison									
Segment 3C	28	5	-	-	-	5	16	-	54
Segment 4	60	-	1	-	1	9	32	2	105
Grimes									
Segment 3C	1	-	-	-	-	-	1	-	2
Segment 4	-	-	-	-	-	-	1	-	1
Segment 5	119	6	-	-	-	2	68	1	196
Waller									
Segment 5	72	4	-	-	-	-	62	5	143
Harris									
Segment 5	116	410	19	5	-	6	343	12	911
Total	1,116	619	25	9	1	86	952	38	2,846
Houston Terminal Station Options									
Industrial Site	12	62	-	1	-	-	50	-	125
Northwest Mall	7	65	2	-	-	-	-	1	75
Northwest Transit Center	4	73	4	-	1	-	22	1	105

Source: AECOM 2019

Table 3.13-8 identifies the number of parcels within the LOD. The number of parcels does not reflect the number of impacted landowners. It is not uncommon for a landowner to subdivide their land into multiple parcels or for a parcel to have multiple landowners (e.g., inherited land to multiple beneficiaries). Overall, there are 3,375 parcels within the Study Area. Each Build Alternative is comprised of approximately 2,280 parcels.

Table 3.13-8: Parcels within LOD		
County/Segment	Parcels	
	Count	Acres
Dallas		
Segment 1	302	811.3
Ellis		
Segment 1	19	69.3
Segment 2A	176	964.9
Segment 2B	196	988.8
Segment 3A	4	57.5
Segment 3B	4	59.1
Segment 3C	4	57.5
Navarro		
Segment 3A	166	1,060.5
Segment 3B	259	1,238.9
Segment 3C	173	1,157.6
Freestone		
Segment 3A	1	0.73
Segment 3B	1	1.36
Segment 3C	247	1,398.8
Segment 4	152	900.9
Limestone		
Segment 4	68	337.6
Leon		
Segment 3C	161	1,442.9
Segment 4	153	1,216.6
Madison		
Segment 3C	93	625.3
Segment 4	97	602.9
Grimes		
Segment 3C	12	103.8
Segment 4	13	69.0
Segment 5	438	1,540.2
Waller		
Segment 5	110	330.7
Harris		
Segment 5	526	1,369.9
Total	3,375	16,406
Northwest Transit Center	69	113.0
Industrial Site[a]	48	100.9
Northwest Mall	49	107.4

Source: Dallas CAD 2017, Ellis CAD 2017, Navarro CAD 2017, Freestone CAD 2017, Limestone CAD 2017, Leon CAD 2017, Madison CAD 2017, Grimes CAD 2017, Waller CAD 2017, Harris CAD 2017, CLS 2018

[a] Industrial site no longer includes roadway modifications on Old Katy Road, which resulted in a decrease in affected parcels.

3.13.5 Environmental Consequences

As described in **Section 3.1, Introduction**, the LOD is the basis on which to evaluate construction and operational impacts. Operational impacts refer to those associated with the permanent ROW. These would be considered long-term impacts as they would last the life of the Project. Construction impacts include all areas that would be temporarily disturbed during construction of the Project.

3.13.5.1 No Build Alternative

Under the No Build Alternative, the HSR system would not be built and the NCTCOG's *Mobility 2045* vision of HSR being a part of the regional transportation system would not be met. Additionally, the H-GAC *Bridging our Communities 2040 Regional Transportation Plan* was updated (2016[26]) to include intercity rail. The No Build Alternative would not meet this plan. While the *2016 Texas Rail Plan Update*[27] references TxDOT's role in the oversight of this EIS, the plan does not specify intercity passenger rail as an initiative of the state; therefore, the No Build Alternative would not support or conflict with the plan. No other regional or local plans mention HSR or the Project; therefore, the No Build Alternative would not support or conflict with other regional or local plans.

Under the No Build Alternative, there would be no conversion of existing land use or change to special status farmland and agricultural conservation easements due to the implementation of HSR. Additionally, structure displacements and parcel/land acquisition associated with the Project would not occur. Existing land use conditions would be subject to anticipated population and economic growth patterns. In the No Build Alternative, the HSR system would not be constructed or operated. Existing trends affecting land uses would be expected to continue without the contribution of the Project.

As a result of anticipated economic and population growth within the Dallas and Houston metropolitan regions, an increase in intercity travel demand would be expected. Therefore, under the No Build Alternative, it would be expected that there would be greater need for air and road transportation infrastructure expansion. Planned transportation projects within the Study Area are outlined in **Section 3.11.4, Transportation, Affected Environment**. TxDOT has planned and programmed transportation improvements along the IH-45 corridor. These planned and programmed transportation improvements would likely create short-term travel delays during construction but could improve travel times in the long term. Expansion of TxDOT roadways would likely require acquiring properties for new ROW for frontage roads, additional lanes and on and off ramps. Roads that connect to IH-45 may need to be expanded to support additional traffic. The impacts of these projects are discussed in **Section 4.4, Indirect Effects and Cumulative Impacts, Cumulative Impacts**.

3.13.5.2 Build Alternatives

3.13.5.2.1 Consistency with Regional and Local Land Use Plans

The counties and cities in the Study Area regulate the location and intensity of development through general plans, zoning regulations and land use ordinances. These adopted general plans include policies related to infill development, developing mixed uses, improving mobility and enhancing downtown areas. A review of regional and local land use plans found that at least three directly identify the HSR Project and have incorporated the Project into their plans. These plans include NCTCOG's *Mobility 2045*, *Downtown Dallas 360* Plan and the City of Lancaster*'s Comprehensive Plan*.

Mobility 2045

The Project would comply with this regional transportation plan that was developed by NCTCOG. The plan states that the North Central Texas region has been identified as a potential hub for passenger rail

[26] H-GAC, "H-GAC Bridging our Communities 2040 Regional Transportation Plan" 2016. Available: http://www.h-gac.com/regional-transportation-plan/2040/default.aspx

[27] TxDOT, *2016 Texas Rail Plan Update*, May 2016, accessed November 2019, https://ftp.dot.state.tx.us/pub/txdot-info/rail/2016-rail-plan/chapter-1.pdf.

in the United States. The Project has been incorporated into the *Mobility 2045* plan and serves as an important component to developing HSR networks within the DFW region.[28]

Downtown Dallas 360

This plan is a strategic document that sets a long-term guide for the downtown area while advancing urban mobility, building complete neighborhoods and promote placemaking principles. Updated and approved by Dallas City Council in December 2017, the plan specifically mentions the Project, stating, "In order to maximize the benefit of such a neighborhood for the city and in order to create a neighborhood that maximizes the livability and transit-oriented nature desired, it is important to establish a development framework that can guide development in an appropriate way, regardless of the final outcome of high-speed rail."[29]

As noted in **4.3.1.1, Indirect Effects and Cumulative Impacts, Dallas Terminal Station**, since the Downtown Dallas 360 plan was updated in 2017, the City of Dallas initiated planning for the area. The City of Dallas released a Request for Statement of Qualifications (RFQ) for the Kay Bailey Hutchison Convention Center Dallas (KBHCCD) Master Plan on September 18, 2019. The RFQ requests further study on the feasibility of a multi-modal hub that would connect to the Dallas Terminal Station, connect to light rail, commuter rail, Amtrak, and streetcar, and include regional and local bus service, rideshare service, pedestrian/bicycle connections, and a vertiport for vertical take-off and landing vehicles.[30]

City of Lancaster Comprehensive Plan

The plan, updated in 2016, establishes a community driven to guide the direction of the city. The Future Land Use Implementation Strategy directly addresses the Project by stating that land use management strategies should include "buffer requirements to minimize safety, visual and noise impacts of potential High-Speed Rail." The plan also addresses the Project when it states that a guiding transportation policy would include minimizing impacts of potential HSR. Additionally, the plan aims for the city to "participate in the North Central Texas region's processes for evaluating and designing commuter tail and high-speed rail service so these plans can provide the greatest benefit for Lancaster residents and businesses."[31]

As discussed in **3.13.2, Regulatory Context**, a review of regional and local land use plans that interact with the Project found that the remaining comprehensive plans do not directly address the Project or HSR technology in general. Some plans, such as the City of Waxahachie and City of Jersey Village comprehensive plans, discuss the implementation of rail transportation and TOD around rail, but do not specify HSR. The City of Houston's comprehensive plan, *Plan Houston*, does not reference HSR technology or the Project but does support public and private efforts to connect people and places through infrastructure improvements.

Further, it was found that the Project would not conflict with other regional plans, such as the HOTCOG *Coordinated Regional Public Transportation Plan,*[32] BVCOG *Here to There Coordinated Regional Public*

[28] NCTCOG, *Mobility 2045,* June 14, 2018, Available:https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/MTP/6-Mobility-Options.pdf.
[29] Downtown Dallas, *Downtown Dallas 360: A Complete and Connected City Center*, 2017.
[30] City of Dallas, "Request for Qualifications for Professional Services for the Kay Bailey Hutchison Convention Center Dallas (KBHCCD) Master Plan, Solicitation Number CIZ 1862." Released September 18, 2019.
[31] City of Lancaster, Comprehensive Plan, October 2016.
[32] HOTCOG, Heart of Texas Regionally Coordinated Transportation Plan, 2017, Available: https://hotcog.org/wp-content/uploads/2016/09/2017-RTCP-Public-Comment-Document.pdf

Transportation Plan and H-GAC *Bridging Our Communities 2040 Regional Transportation Plan*,[33] which do not mention HSR as a long-term mobility solution.

3.13.5.2.2 Existing Land Use Conversion

The existing land use within the quarter mile Study Area of the LOD would change to transportation use. The Project would operate in a "closed system," which means that there would be no at-grade crossing of the track alignment. Given this "closed system" and relatively narrow footprint, indirect land use conversion along the track of the Project would be limited to the station areas and the 25-foot setback added to the LOD for the loss of productive farmland. Additionally, the narrow footprint for the track and ancillary facilities would not significantly change the pattern or distribution of land use types.

The Project would convert land use within the LOD during temporary (construction) and permanent (operation) activities. The width of the LOD would vary throughout all Build Alternatives and would be influenced by topography and whether the rail infrastructure would be below grade, on embankment or on viaduct. Because portions of the Build Alternatives would be on viaduct, the permanent conversion of land use to a transportation use may not prohibit the long-term existing use of the land (e.g., ranch land, recreational land, utilities and water); however, for the purposes of this analysis, a permanent change of land use was assumed. The land use conversion impact analysis also accounts for additional temporary construction workspace areas, such as contractor yards, and improvements required for construction period access roads, as well as maintenance facilities. **Table 3.13-9** shows the anticipated temporary and permanent land use conversion during construction and operation by Project segment and county.

The land use most affected by the Project for temporary and permanent land use conversion would be agricultural. Minimal temporary land use conversions would be anticipated with industrial, residential, rural, transportation, civic, utilities and unclassified land use. However, all 13 land use categories would be expected to experience some type of permanent land use conversion, with minimal conversions expected in industrial, civic, parks/recreation, utilities, forested areas, water features and unclassified lands.

As shown in **Table 3.13-10**, total permanent and temporary land use conversions would vary depending on the Build Alternative and would range from approximately 9,182 to 9,708 acres. Build Alternatives D and A would have the least total permanent land use conversion (approximately 6,600 acres and 6,630 acres, respectively), while Build Alternatives C and F would have the most (approximately 7,305 acres and 7,276 acres, respectively). Build Alternative C would have the least temporary land use conversion (approximately 2,393.2 acres), while Build Alternative D would have the most (approximately 2,592 acres). This illustrates that the overall total land use conversion would not vary significantly between the Build Alternatives.

Impacts to parks/recreation and forested areas would be more prevalent under Build Alternatives C and F. This is discussed further in **Section 3.6.5.2, Natural Resources, Build Alternatives** and **Section 3.17.5.2, Recreational Facilities, Build Alternatives**. An easement would be required to traverse the federally owned land (Bardwell Lake) within Segment 2B, under Build Alternatives C and F, in Ellis County. As shown in **Table 3.13-9**, this easement would convert 32.6 acres of existing recreational land to a transportation use. This action, on a federal property, would require a Section 408 permit from USACE. This permit is discussed in more detail in **Section 3.7.4.2, Waters of the U.S., Ellis County**.

[33] H-GAC, "H-GAC Bridging our Communities 2040 Regional Transportation Plan" 2016. Available: http://www.h-gac.com/regional-transportation-plan/2040/default.aspx

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Table 3.13-9: Temporary and Permanent Land Use Conversions within LOD in Acres by County and Segment

County/ Segment	Agriculture		Civic		Commercial		Forested Acres		Industrial		Park		Residential		Rural		Transportation		Unclassified		Utilities		Vacant		Water Features		Total	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Dallas																												
Segment 1	145.3	166.8	-	14.3	84.8	218.2	-	-	19.8	15.4	5.9	9.2	2.5	13.8	0.0	21.9	17.2	38.8	0.0	0.5	23.8	5.8	4.3	12.8	0.3	1.0	303.9	518.7
Ellis																												
Segment 1	37.4	24.6	-	-	-	-	-	-	-	-	-	-	0.2	2.6	0.1	3.7	-	0.2	-	-	-	-	-	0.2	-	-	37.7	31.4
Segment 2A	261.8	548.5	-	-	-	5.1	-	-	-	-	2.3	-	4.1	43.0	25.5	43.5	4.0	5.6	-	-	-	-	2.4	6.7	-	-	300.1	652.3
Segment 2B	267.5	534.0	-	-	-	3.7	-	-	-	-	15.7	9.8	10.0	50.3	26.8	32.6	2.3	5.8	-	-	-	-	16.9	6.4	-	-	339.2	642.5
Segment 3A	0.0	57.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	57.7
Segment 3B	-	59.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	59.3
Segment 3C	0.0	57.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	57.7
Navarro																												
Segment 3A	275.7	742.3	-	-	0.1	0.0	-	-	-	-	-	-		8.8	-	-	1.7	20.6	-	-	0.2	-	-	-	-	-	277.8	771.7
Segment 3B	256.1	864.0	-	-	-	0.1	-	-	-	-	-	-	0.2	39.6	-	-	1.0	50.2	-	-	-	-	-	9.7	-	-	257.3	963.5
Segment 3C	293.0	783.0	-	-	0.1	0.1	-	-	-	-	-	-	1.1	40.8	-	-	2.7	22.4	-	-	0.2	-	-	-	-	-	297.1	846.2
Freestone																												
Segment 3A	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.7
Segment 3B	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	1.4
Segment 3C	325.8	666.6	-	3.6	5.4	18.7	-	-	0.5	2.9	-	-	0.3	6.9	-	-	7.0	369.0	-	-	-	-	0.0	1.1	-	-	339.0	1068.8
Segment 4	235.8	636.6	-	-	-	-	-	-	-	-	-	-	0.0	0.8	-	-	0.3	18.4	-	-	-	1.9	-	-	-	-	236.1	657.8
Limestone																												
Segment 4	23.5	310.8	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	23.5	312.6
Leon																												
Segment 3C	26.2	685.6	-	-	0.1	2.9	-	40.4	-	-	-	13.7	0.0	24.4	-	8.7	18.2	473.3	0.4	0.3	-	1.3	76.7	28.0	-	-	121.7	1278.4
Segment 4	203.9	744.8	-	-	-	-	-	3.8	-	-	-	-	0.1	24.2	23.3	99.0	0.3	11.8	0.2	0.5	-	-	6.2	85.5	-	-	234.0	969.6
Madison																												
Segment 3C	14.4	507.4	-	-	-	0.3	-	-	-	-	-	-	-	4.3	0.1	17.6	0.5	65.7	-	-	-	-	-	1.0	-	-	15.0	596.3
Segment 4	172.8	388.0	-	-	-		-	-	-	-	-	-	0.0	4.3	0.5	9.0	0.9	14.5	-	-	-	-	0.0	6.4	-	-	174.2	422.2
Grimes																												
Segment 3C	12.6	88.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	12.6	89.8
Segment 4	-	68.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	0.0	68.7
Segment 5	361.9	925.7	-	-	0.1	0.0	-	-	-	0.8	-	0.6	0.7	42.3	33.1	55.5	7.1	43.8	-	-	-	0.0	-	54.6	-	-	402.9	1123.4
Waller																												
Segment 5	8.2	227.5	-	-	0.0	0.1	0.1	1.6	-	-	-	0.1	0.8	39.8	11.6	16.4	0.5	10.0	-	-	8.4	2.1	-	4.7	-	-	29.6	302.4
Harris																												
Segment 5	444.4	409.1	29.0	42.1	12.6	54.1	-	-	0.4	18.2	-	-	2.2	17.6	-	-	16.1	116.5	-	-	20.5	0.9	8.3	71.9	-	-	533.6	730.3
Total	3,366.4	9,499.2	29.0	61.8	103.2	303.4	0.1	45.8	20.8	37.3	23.9	33.5	22.1	363.4	121.1	307.9	79.9	1,267.7	0.7	1.5	53.2	12.0	114.8	288.9	0.3	1.0	3,935.2	12,223.2
Industrial Site[a]	-	-	-	0.6	0.0	25.8	-	-	-	43.5	-	-	-	0.0	-	-	0.0	22.2	-	-	-	-	0.0	0.2	-	-	0.0	92.2
Northwest Mall[a]	-	-	3.1	0.7	24.2	49.5	-	-	-	-	-	-	-	-	-	-	0.1	25.6	-	-	-	-	0.0	0.8	-	-	27.4	76.5
Northwest Transit Ctr[a]	-	-	8.3	23.5	0.8	32.1	-	-	0.7	3.0	-	-	0.7	0.1	-	-	0.3	29.7	-	-	1.0	0.1	0.1	0.3	-	-	11.8	88.7

Source: Dallas CAD 2017, Ellis CAD 2017, Navarro CAD 2017, Freestone CAD 2017, Limestone CAD 2017, Leon CAD 2017, Madison CAD 2017, Grimes CAD 2017, Waller CAD 2017, Harris CAD 2017, CLS 2018

[a] Included in this value is the associated portion of the HSR LOD from the common point just west of the intersection of McAllister and Hempstead Roads.

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Because Build Alternatives C and F would be located on viaduct in this area, the future recreational use of this land could continue, as detailed in **Section 3.17.5.2, Recreational Facilities, Build Alternatives**.

Table 3.13-10: Temporary and Permanent Land Use Conversions within LOD in Acres by Build Alternative

		ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Agriculture	Temp	2,170.7	2,151.1	1,931.1	2,176.4	2,156.8	1,936.8
	Perm	5,251.6	5,375.6	5,090.8	5,237.1	5,361.0	5,076.2
Commercial	Temp	97.7	97.6	103.1	97.7	97.6	103.1
	Perm	277.6	277.7	299.6	276.3	276.3	298.2
Industrial	Temp	20.3	20.3	20.8	20.3	20.3	20.8
	Perm	34.4	34.4	37.3	34.4	34.4	37.3
Residential	Temp	10.5	10.7	11.9	16.5	16.6	17.9
	Perm	197.2	228.0	235.5	204.6	235.3	242.9
Rural	Temp	94.2	94.2	70.5	95.4	95.4	71.7
	Perm	249.0	249.0	167.3	238.1	238.1	156.4
Transportation	Temp	48.2	47.5	73.3	46.4	45.7	71.6
	Perm	280.9	310.5	1146.7	281.0	310.6	1,146.8
Civic	Temp	29.0	29.0	29.0	29.0	29.0	29.0
	Perm	58.1	58.1	60.1	58.1	58.1	60.1
Parks/ Recreation	Temp	8.2	8.2	8.2	21.6	21.6	21.6
	Perm	19.8	19.8	33.5	10.0	10.0	23.7
Utilities	Temp	53.0	52.7	53.0	53.0	52.7	53.0
	Perm	10.6	10.6	10.0	10.6	10.6	10.0
Forested Areas	Temp	0.1	0.1	0.1	0.1	0.1	0.1
	Perm	5.4	5.4	42.0	5.4	5.4	42.0
Water Features	Temp	0.3	0.3	0.3	3	3	3
	Perm	1.1	1.1	2	2	2	2
Vacant	Temp	21.1	21.1	91.6	35.7	35.7	106.2
	Perm	242.8	252.5	180.9	242.6	252.3	180.6
Unclassified	Temp	0.3	0.3	0.4	0.3	0.3	0.4
	Perm	1.1	1.1	0.8	1.1	1.1	0.8
Total	Temp	2,553.4	2,532.9	2,393.2	2,592.4	2,571.9	2,432.3
	Perm	6,629.6	6,823.8	7,305.3	6,600.3	6,794.4	7,275.9

Source: Dallas CAD 2017, Ellis CAD 2017, Navarro CAD 2017, Freestone CAD 2017, Limestone CAD 2017, Leon CAD 2017, Madison CAD 2017, Grimes CAD 2017, Waller CAD 2017, Harris CAD 2017, CLS 2018

3.13.5.2.3 Station Area Land Use

The stations would be designed to accommodate long-term operations, as well as the needs of the traveling public. The program-level spaces for each station would address the following needs, and would be very similar to the spaces found in commercial service airports.

- **Public Areas:** information kiosks, baggage storage, public restrooms, public concourses, restaurants, coffee and newsstands, public parking and rental car facilities
- **Ticketed Passengers:** access to restaurants, restrooms and secured concourses (allowances would be made in sizing station for first class lounges, meeting rooms and private work areas)
- **Facilities:** space necessary for the running of the trainset, such as custodial equipment, loading dock and yard, kitchen areas (for trainsets), employee service corridors, etc.
- **Security:** control rooms, security offices, etc.
- **Staff Welfare:** employee parking, lockers, offices, break rooms, etc.

The terminal stations in Dallas and Houston would be larger than the Brazos Valley Intermediate Station because Dallas and Houston would be terminal cities and would serve the majority of HSR passengers. The terminal stations in Dallas and Houston would be approximately 4 million square feet, which would mainly include parking areas. Of the total square footage, approximately 268,000 square feet would include non-parking uses, see **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**.

Dallas Terminal Station

The Dallas Terminal Station would convert about 63 acres of commercial and civic land to a transportation use. The remaining approximately 32 acres of the terminal station site are already used for transportation (e.g., UPRR, IH-30 and surrounding roadways).

Zoning designations at and around the Dallas Terminal Station area are Planned Development and Central Area. The Planned Development zoning designation offers design flexibility for land use and carries specific development conditions, while the Central Area zoning designation accommodates existing development in the central area of Dallas and seeks to prevent the increase of street congestion. Prior to construction, TCRR would be required to obtain a development permit from the City of Dallas for the Dallas Terminal Station. During the permitting process, TCRR would coordinate with the City of Dallas to ensure compliance with relevant zoning and special purpose district regulations. As previously described, one of the allowable land uses for the planned development is a railroad passenger station. Therefore, no impacts with the zoning designations or special purpose districts would occur as there would be no conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the Dallas Terminal Station.

Over the last several years the area surrounding the proposed Dallas Terminal Station, also known as The Cedars, has experienced major development via the conversion of existing commercial and industrial land uses to new commercial or residential land uses. The Dallas Terminal Station could indirectly lead to increased land use densities in proximity to the terminal station and accelerate the development of TOD in downtown Dallas, which would be consistent with local plans and policies and existing redevelopment efforts in the area. Development in the Dallas Terminal Station area is being planned and is reasonably foreseeable with or without the Dallas Terminal Station. However, the Project, including the Dallas Terminal Station, would accelerate this development. Refer to **Section 4.3.1.1, Indirect Effects and Cumulative Impacts, Dallas Terminal Station,** for a discussion of development related impacts and indirect effects of the Project.

The construction and operation of the Dallas Terminal Station would also bring additional traffic to the station area (see **Section 3.11.5.2, Transportation, Build Alternatives**).

Brazos Valley Intermediate Station

Construction and operation of the Brazos Valley Intermediate Station could change the character of land use in the area. Grimes County does not regulate zoning but does regulate subdivision plat requirements. As such, there are no adopted land use regulations for the site but development must adhere to Grimes County Subdivision Rules and Regulations.[34] The Brazos Valley Intermediate Station would convert approximately 24 acres of agricultural and rural land to a transportation use. This would include the conversion of approximately 22 acres of special status farmland. The remaining 6 acres of the station site are already used for transportation as the proposed site would be west of the intersection of SH 30 and SH 90. Civic and commercial land uses exist around this intersection. The

[34]Grimes County Subdivision Rules and Regulations, approved July 26, 2011.

introduction of the Brazos Valley Intermediate Station would affect the context of the surrounding area—agricultural to transportation—and the magnitude of the development on the station site would be greater than the nearby existing civic and commercial development. Refer to **Section 4.3.1.2, Indirect Effects and Cumulative Impacts, Brazos Valley Intermediate Station,** for a discussion of indirect development-related impacts. The construction and operation of the Brazos Valley Intermediate Station would also bring additional traffic to the area (see **Section 3.11.5.2, Transportation, Build Alternatives**).

Houston Terminal Station Options

As previously stated, the City of Houston does not have zoning. TCRR would be required to submit station site plans that are in compliance with development regulations that may include property subdivision, parking, tree and shrub requirements, setbacks and access. Prior to construction, TCRR would be required to obtain a development permit from the City of Houston for the Houston Terminal Station. During the permitting and construction process, TCRR would coordinate with the City of Houston to ensure compliance with relevant site development regulations and the overall policy goals outlined in *Plan Houston* (2015), as referenced in **Section 3.13.2, Regulatory Context**.

All three station options are located in currently developed, high-density areas of Houston, and the conversion of these areas to a transportation land use would result in redevelopment on that site. Transportation projects can result in TOD around and near station areas. **Chapter 4.0, Indirect Effects and Cumulative Impacts,** addresses the potential for this Project to influence development around the station areas. The construction and operation of any of the Houston Terminal Station options would also bring additional traffic to each respective station area (see **Section 3.11.5.2, Transportation, Build Alternatives**).

The land use impacts of each Houston Terminal Station Option are discussed below.

Houston Industrial Site Terminal Station Option

The Houston Industrial Site Terminal Station Option would convert about 92 acres of primarily industrial and commercial lands to a transportation use. The surrounding land uses, also consisting of industrial and commercial land use, would be compatible with the station; therefore, construction and operation of the Houston Industrial Site Terminal Station Option would not substantially change the pattern and intensity of land use in the area. Because of the developed nature of this area, the land use conversion from commercial and industrial to transportation would not substantially change the character of the area.

Houston Northwest Mall Terminal Station Option

The Houston Northwest Mall Terminal Station Option would convert about 77 acres of commercial land to a transportation use. Construction and operation of the Houston Northwest Mall Terminal Station Option would substantially change the pattern and intensity of land use in the area. The land uses in the area are mainly commercial or vacant, as the Northwest Mall site itself is a vacant mall. The area also has a considerable amount of transportation uses, being the conflux of Hempstead Highway, IH-610 and US 290. Therefore, the station would be compatible with adjacent commercial and transportation land uses.

Houston Northwest Transit Center Terminal Station Option

The Houston Northwest Transit Center Terminal Station Option would convert about 89 acres of commercial and transportation land to a transportation use. Construction and operation of the Houston Northwest Transit Center Terminal Station Option would not substantially change the pattern and

intensity of land use in the area and would be compatible with adjacent commercial and industrial land uses. The proximity to METRO's Northwest Transit Center would enhance regional connectivity by allowing connections between METRO and HSR through pedestrian bridges over Old Katy Road to the Metro Northwest Transit Center, as discussed in **Appendix F, TCRR Final Conceptual Engineering Design Report**. The character of the area would not substantially change due to the land use conversion from commercial and industrial to transportation.

3.13.5.2.4 Agriculture, Special Status Farmland and Agricultural Conservation Easements

Agriculture

Impacts of the Project on agriculture would include the loss of crops within the LOD and fragmentation of existing fields. Temporarily disturbed agricultural land within the LOD would be taken out of production during the construction period. Following construction, any non-agricultural uses in the temporary disturbed areas could revert to their previous agricultural use. Permanently disturbed agricultural land within the LOD would not be returned to agricultural use.

As shown in **Table 3.13-10**, permanent conversion of agricultural lands would range from approximately 5,076 acres under Build Alternative F to 5,375 acres under Build Alternative B, while temporary conversion would range from 1,931 acres (Build Alternative C) to 2,176 acres (Build Alternative D). Build Alternative F would have the lowest conversion of agricultural lands (permanent and temporary) at 7,013 acres. Build Alternative B would have the highest conversion of agricultural lands at 7,526 acres. Based on **Table 3.13-5**, crop lands represent approximately 24 percent of all agricultural land within the Study Area counties. Using these county approximations of crop lands, it is anticipated that the permanent conversion of crop lands would range from approximately 1,239 acres under Build Alternative F to 1,311 acres under Build Alternative B.

Since the crop types can vary year to year, the potential loss of income due to the permanent conversion of agricultural lands is estimated at $329 per acre and is further discussed in **Section 3.14.5.2.3, Socioeconomics and Community Facilities, Economic Impacts.** Impacts to non-special status farmland (agriculture) would not require additional coordination with NRCS or specific mitigation.

TCRR would coordinate with landowners regarding those areas that would be temporarily and permanently disturbed regarding crop production. TCRR's negotiations could result in fragmented fields (i.e., remnant parcels) being absorbed by adjacent landowners or compensation for remnant parcels. TCRR would need to acquire property access prior to the start of construction on that property.

Pastureland

As shown in **Table 3.13-10**, pastures (i.e., grazing lands) represent approximately 58 percent of all agricultural lands within the Study Area counties. The permanent conversion of grazing lands would range from approximately 2,944 acres under Build Alternative F to 3,118 acres under Build Alternative B. Unlike crop land, the permanent conversion of pastureland would not directly result in the loss of livestock revenue, which is further discussed in **Section 3.14.5.2.3, Socioeconomics and Community Facilities, Economic Impacts**.

Impacts of the Project on livestock would include fragmentation of pasturelands and a possible barrier to herd movement. Approximately 55 percent of the Project would be constructed on viaduct, allowing for unimpeded movement of herd beneath the tracks in these areas. In areas not on viaduct, herds could be relocated to adjacent or other pasturelands. While herds could move beneath the viaduct, security fencing would prevent livestock access to HSR ROW in areas not on viaduct.

TCRR negotiations with landowners would include either compensation for impacts to livestock or mitigation to assist the landowner in managing livestock on the remaining property, such as access to water resources, additional fencing, underpasses and/or gates for overall herd movement. TCRR would coordinate with landowners to relocate livestock during the construction period. TCRR would need to acquire property access prior to the start of construction on that property.

Special Status Farmland and Agricultural Conservation Easements

The Project would result in special status farmland (e.g., prime farmland, unique, statewide or locally important farmland) conversion to a transportation use. Special status farmland is a subset of the overall agricultural lands discussed above. **Table 3.13-11** shows the anticipated special status farmland conversion during temporary (construction) and permanent (operation) activities. Warren Ranch/Barn Owl Woods, an Agricultural Conservation Easement land located in Harris County, would not be converted to a transportation use because it is located outside the LOD.

The rural counties within the Study Area contain special status farmland. These lands are a vital part of the Texas landscape and their potential conversion to non-agricultural uses represents a fundamental change that would be irreversible. Prime farmland conversion accounts for over half of the special status farmland within the LOD. Regardless of the Build Alternative, the total amount of special status farmland impacted would be similar—ranging from approximately 4,991 acres under Build Alternative F to 5,455 acres under Build Alternative B. **Table 3.13-12** illustrates the temporary, permanent and indirect conversion of special status farmlands by Build Alternative.

The average acreage of special status farmlands being permanently converted to a non-agricultural use of the Project would be approximately 3,600 acres. Within the Study Area, there is nearly 2.2 million acres of special status farmlands. The permanent loss of 3,600 acres of special status farmland represents approximately 0.2 percent of all special status farmland within the 10 counties. On average, approximately 1,630 acres of special status farmland, regardless of the Build Alternative, would be temporarily impacted during the construction period. The likelihood of the temporarily impacted special status farmland areas being available for future agricultural use would be high, as much of these areas would be returned to their pre-disturbance condition.

In order to account for the indirect conversion of special status farmlands, a 25-foot setback was added to the permanent LOD to accommodate the use of farm and ranch equipment or impacts such as induced wind and changes in irrigation. FRA's analysis assumed the landowner would maintain ownership of the setback but require compensation for the loss in agricultural production. The average acreage of indirect impact would be an additional 825 acres of special status farmland, regardless of the Build Alternative.

3.13.5.2.5 Structure Displacement and Land Acquisition

At this stage of the Project design, identifying the individual circumstances surrounding each partial acquisition of parcels is not possible. To conservatively estimate acquisitions and relocations, primary structures were deemed acquisitions when they were on a parcel that was more than 30 percent impacted even though the structure itself was greater than 50 feet from the LOD. If primary structures were located on a parcel that was impacted at least 30 percent by the Project, the structures were deemed acquisitions. This assumption allows for a worst-case assessment of potential property acquisition impacts. TCRR would negotiate final full and partial parcel acquisition on a case-by-case basis prior to construction.

Table 3.13-11: Special Status Farmland Conversion within LOD in Acres												
County/ Segment	**Prime Farmland**			**Farmland of Statewide Importance**			**Prime Farmland, if Drained**			**Total Special Status Farmland**		
	Temp	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**
Dallas												
Segment 1	107.1	118.9	26.3	17.8	11.2	3.7	-	-	-	**124.9**	**130.8**	**30.0**
Ellis												
Segment 1	37.7	24.4	6.8	-	-	-				**37.7**	**24.4**	**6.8**
Segment 2A	255.5	486.9	113.8	-	7.6	-	-	-	-	**255.5**	**494.5**	**114.3**
Segment 2B	264.2	436.6	104.6	-	6.9	0.6	-	-	-	**264.1**	**443.5**	**105.1**
Segment 3A	-	46.6	12.1	-	1.8	0.7	-	-	-	**0.0**	**48.4**	**12.9**
Segment 3B	-	54.8	12.1	-	1.6	0.7	-	-	-	**0.0**	**56.4**	**12.8**
Segment 3C	-	46.6	12.1	-	1.8	0.7	-	-	-	**0.0**	**48.4**	**12.9**
Navarro												
Segment 3A	96.4	241.7	57.1	129.0	275.2	69.7	-	-	-	**225.4**	**516.9**	**126.8**
Segment 3B	117.8	310.1	72.9	87.2	427.9	94.5	-	-	-	**205.0**	**738.0**	**167.4**
Segment 3C	88.4	237.2	54.5	146.7	286.9	64.6	-	-	-	**235.0**	**524.1**	**119.1**
Freestone												
Segment 3A	-	-	-	-	0.7	0.2	-	-	-	**0.0**	**0.7**	**0.2**
Segment 3B	-	-	-	-	1.4	0.3	-	-	-	**0.0**	**1.4**	**0.3**
Segment 3C	22.3	100.9	21.5	94.4	440.9	85.2	-	-	-	**116.8**	**541.8**	**106.7**
Segment 4	3.3	47.1	11.7	165.4	348.1	71.3	-	-	-	**168.7**	**395.2**	**83.0**
Limestone												
Segment 4	9.8	120.0	27.7	5.0	18.3	4.6	-	-	-	**14.8**	**138.3**	**32.3**
Leon												
Segment 3C	0.6	200.9	37.1	8.4	83.9	18.3	-	-	-	**9.0**	**284.7**	**55.4**
Segment 4	75.3	247.0	48.6	15.6	82.5	17.4	-	-	-	**90.9**	**329.5**	**66.0**
Madison												
Segment 3C	0.2	189.8	37.8	9.2	130.8	26.3	-	-	-	**9.4**	**320.7**	**64.2**
Segment 4	33.5	133.6	38.3	97.0	122.2	36.7	-	-	-	**130.5**	**255.8**	**75.0**
Grimes												
Segment 3C	-	-	-	9.1	7.7	2.9	-	-	-	**9.1**	**7.7**	**2.9**
Segment 4	-	-	-	-	3.7	1.5	-	-	-	**0.0**	**3.7**	**1.5**
Segment 5	24.1	148.8	38.7	122.4	422.3	95.4	-	-	-	**146.4**	**571.2**	**134.1**
Waller												
Segment 5	9.9	124.3	21.3	0.1	20.4	4.4	-	-	-	**10.0**	**144.7**	**25.7**

Table 3.13-11: Special Status Farmland Conversion within LOD in Acres												
County/ Segment	**Prime Farmland**			**Farmland of Statewide Importance**			**Prime Farmland, if Drained**			**Total Special Status Farmland**		
	Temp	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**	**Temp**	**Perm**	**25-foot Setback**
Harris												
Segment 5	449.7	344.3	98.1	22.3	42.9	18.2	33.9	93.2	22.7	**505.9**	**480.4**	**139.0**
Total	**1,595.8**	**3,660.4**	**853.1**	**929.6**	**2,747.5**	**618.4**	**33.9**	**93.2**	**22.7**	**2,559.3**	**6,501.1**	**1,494.3**

Source: AECOM, 2019; Dallas, Freestone, Grimes, Harris, Leon, Madison, Navarro, and Waller Counties: NRCS, 2018; Ellis, and Limestone Counties: NRCS, 2018.

Note: A 25-foot setback was added to the LOD as an additional easement to account for indirect loss of productive farmland to accommodate the use of farm and ranch equipment or impacts such as induced wind and changes in irrigation.

Table 3.13-12: Special Status Farmland Conversion by Build Alternative							
		ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Prime Farmland	Temp	1,102.2	1,123.7	995.6	1,110.9	1,132.9	1,004.2
	Perm	2,083.7	2,160.3	2,023.0	2,033.3	2,109.9	1,972.6
	25-foot Setback	500.5	516.3	354.3	491.3	507.1	458.8
Farmland of Statewide Importance	Temp	574.6	532.8	430.3	574.6	532.8	430.3
	Perm	1,357.6	1,510.8	1,457.1	1,356.9	1,510.2	1,456.5
	25-foot Setback	324.3	349.1	320.3	324.3	349.2	320.4
Prime Farmland, if Drained	Temp	33.9	33.9	33.9	33.9	33.93	33.9
	Perm	93.2	93.22	93.2	93.2	93.2	93.2
	25-foot Setback	22.7	22.7	22.7	22.7	22.7	22.7
Total Special Status Farmland	Temp	1,710.8	1,690.4	1,459.8	1,719.4	1,699.0	1,468.5
	Perm	3,534.5	3,764.3	3,573.4	3,483.5	3,713.3	3,522.3
	25-foot Setback	847.5	888.2	697.3	838.3	878.9	801.9

Source: AECOM 2019

As detailed in **Table 3.13-7**, there are approximately 2,850 structures (primary and secondary) within 200 feet of the LOD for all Build Alternatives. **Table 3.13-13** identifies those primary and secondary structures classified as commercial, residential and community facilities that are located directly within the LOD or within 50 feet of the LOD. Due to the proximity of the primary structure within and/or near the LOD, these structures would be displaced. For the purpose of determining displacements in **Table 3.13-13**, field investigation and detailed site aerial photography analysis (and in some cases interviews with property management) were conducted to more accurately reflect the impact to residences and businesses. Some businesses within the LOD operate as a complex with multiple buildings and, therefore, would count as a single displacement. Apartment buildings within the LOD contain multiple dwelling units within a single building, and each unit would count as a displacement.

An inventory of impacted parcels by CAD ID number is included in **Appendix E, Land Use Technical Memorandum**.

Table 3.13-13: Structure Displacements within LOD (Primary and Secondary)								
County/ Segment	Commercial		Residential		Community Facilities		Total	
	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
Dallas								
Segment 1	12	18	42	4	-	-	56	22
Ellis								
Segment 1	-	-	7	2	-	-	7	2
Segment 2A	-	-	11	2	-	-	11	2
Segment 2B	-	-	25	5	-	-	25	5
Segment 3A	-	-	-	-	-	-	0	0
Segment 3B	-	-	-	-	-	-	0	0
Segment 3C	-	-	-	-	-	-	0	0
Navarro								
Segment 3A	-	-	11	-	-	-	11	0
Segment 3B	-	-	31	12	-	-	31	12
Segment 3C	-	-	16	-	-	-	16	0

Table 3.13-13: Structure Displacements within LOD (Primary and Secondary)

County/ Segment	Commercial		Residential		Community Facilities		Total	
	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
Freestone								
Segment 3A	-	-	-	-	-	-	0	0
Segment 3B	-	-	-	-	-	-	0	0
Segment 3C	12	15	6	3	1	2	19	20
Segment 4	-	-	3	1	-	-	3	1
Limestone								
Segment 4	-	-	3	-	-	-	3	-
Leon								
Segment 3C	11	8	17	12	1	-	29	20
Segment 4	-	-	10	6	-	-	10	6
Madison								
Segment 3C	-	-	7	2	-	-	7	2
Segment 4	-	-	15	6	1	-	16	6
Grimes								
Segment 3C	-	-	-	-	-	-	-	-
Segment 4	-	-	-	-	-	-	-	-
Segment 5	1	-	32	10	-	-	33	10
Waller								
Segment 5	-	-	26	3	-		26	3
Harris								
Segment 5	27	20	75	3	1		103	23
TOTAL	63	61	337	71	4	2	406	134
Houston Terminal Station Options								
Industrial Site [a]	14	12	-	-	-	-	14	12
Northwest Mall [a]	22	8	-	-	-	-	22	8
Northwest Transit Center [a]	15	13	-	1	1	2	16	16

Source: AECOM 2019

[a] Included in this value is the associated portion of the HSR LOD from the common point just west of the intersection of McAllister and Hempstead roads.

Depending on the Build Alternative the estimated primary structure displacement of businesses would range from 42 under Build Alternatives A, B, D and E to 65 under Build Alternatives C and F. The estimated primary structure displacement of residences would range from 235 under Build Alternative A to 269 under Build Alternative E. Displacement of secondary residential structures, such as sheds and detached garages, would range from 37 under Build Alternatives A and C to 52 under Build Alternative E. Displacement of secondary commercial structures would range from 38 under Build Alternatives A, B, D and E to 61 under Build Alternatives C and F.

Table 3.13-14 shows the estimated number of parcels that would be potentially acquired. As stated in the methodology, these estimates are for comparative purposes only and are detailed within **Appendix E, Land Use Technical Memorandum**. It is anticipated that total permanent acquisition would range from 1,731 parcels under Build Alternative A to 1,847 parcels under Build Alternative E, while the temporary use of parcels would range from 258 under Build Alternative F to 277 under Build Alternative B and is shown in **Table 3.13-17**.

Table 3.13-14: Estimated Parcel Acquisition (Number of Parcels)					
	Partial Take	**Full Take**	**Temporary Partial Take**	**Temporary Take**	**Total**
Dallas					
Segment 1	94	107	24	1	226
Ellis					
Segment 1	8	7	1	-	16
Segment 2A	115	23	19	-	157
Segment 2B	135	36	17	1	189
Segment 3A	3	-	1	-	4
Segment 3B	2	1	-	-	3
Segment 3C	3	-	-	-	3
Navarro					
Segment 3A	111	30	10	1	152
Segment 3B	169	55	17	-	241
Segment 3C	105	39	17	1	162
Segment 4	-	-	-	-	-
Freestone					
Segment 3C	168	58	24	2	252
Segment 4	110	26	15	-	151
Limestone					
Segment 4	55	5	5	-	65
Leon					
Segment 3C	101	46	6	-	153
Segment 4	96	26	15	-	137
Madison					
Segment 3C	66	14	1	-	81
Segment 4	53	25	17	-	95
Grimes					
Segment 3C	10	-	-	-	10
Segment 4	12	-	-	-	12
Segment 5	209	173	27	-	410
Waller					
Segment 5	55	38	4	-	97
Harris					
Segment 5	224	124	123	9	480
Total	1,904	833	343	15	3,095
Houston Terminal Station Options					
Industrial Site[a]	18	7	2	-	27
Northwest Mall[a]	12	28	1	-	41
Northwest Transit Center[a]	27	16	-	-	43

Source: AECOM 2019

[a] Included in this value is the associated portion of the HSR LOD from the common point just west of the intersection of McAllister and Hempstead Roads.

Construction staging and access areas would be temporary impacts, and properties would be returned to the owner upon completion of construction. As needed, TCRR would secure access and construction easements from adjacent property owners for construction staging. Roadway work completed as part of construction would be transferred by TCRR back to appropriate jurisdictions and adjacent properties, as appropriate. During construction, adjacent properties may be exposed to noise, dust and heavy vehicle traffic that could adversely affect property use and is further discussed in **Section 3.2.5.2.1, Air Quality,**

Construction Emissions, and **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**. Access to properties could also be restricted during construction and is further discussed in **Section 3.11.5.2.1, Transportation, Dallas County**.

Table 3.13-15 shows the estimated number of all primary (residential, business, oil/gas, etc.) and secondary structures (e.g., barn/shed) that could be potentially impacted as a result of parcel acquisition. TCRR would negotiate all structure and parcel acquisitions, estimated in **Tables 3.13-16** and **3.13-15**, respectively, with the property owners on a case-by-case basis during the ROW acquisition . TCRR would communicate its intent to both the owners and tenants of affected structures and parcels. TCRR would need to acquire property access prior to the start of construction on that property.

Table 3.13-15: Estimated Structure Acquisition (Number of Primary and Secondary Structures)

County/ Segment	Agriculture		Commercial		Community Facilities		Cultural/Civic Resources		Oil/Gas		Residential		Transportation/ Utilities		Total	
	P[a]	S[a]	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Dallas																
Segment 1	-	27	2	1	-	-	-	-	-	-	3	-	-	-	**5**	**28**
Ellis																
Segment 1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**3**
Segment 2A	-	11	-	-	-	-	-	-	-	-	3	-	-	-	**3**	**11**
Segment 2B	-	18	-	-	-	-	-	-	-	-	4	2	-	-	**4**	**20**
Segment 3A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
Segment 3B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
Segment 3C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
Navarro																
Segment 3A	-	34	-	-	-	-	-	-	-	-	5	-	-	-	**5**	**34**
Segment 3B	-	61	-	-	-	-	-	-	-	-	5	1	-	-	**5**	**62**
Segment 3C	-	17	-	-	-	-	-	-	-	-	4	-	-	-	**4**	**17**
Freestone																
Segment 3C	-	35	-	1	-	-	-	-	4	-	9	-	-	1	**13**	**37**
Segment 4	-	11	-	-	-	-	-	-	-	-	4	-	-	-	**4**	**11**
Limestone																
Segment 4	-	6	-	-	-	-	-	-	3	-	3	-	-	-	**6**	**6**
Leon																
Segment 3C	-	13	3	2	-	-	-	-	1	2	7	2	-	-	**11**	**19**
Segment 4	-	5	-	-	-	-	-	-	1	-	4	-	-	-	**5**	**5**
Madison																
Segment 3C	-	7	-	-	-	-	-	-	2	-	1	1	-	-	**3**	**8**
Segment 4	1	15	-	-	-	-	1	-	-	-	4	2	-	-	**6**	**17**
Grimes																
Segment 3C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
Segment 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
Segment 5	-	39	-	1	-	-	-	-	2	-	10	2	-	-	**12**	**42**
Waller																

Table 3.13-15: Estimated Structure Acquisition (Number of Primary and Secondary Structures)

County/ Segment	Agriculture		Commercial		Community Facilities		Cultural/Civic Resources		Oil/Gas		Residential		Transportation/ Utilities		Total	
	P[a]	S[a]	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Segment 5	-	15	-	-	-	-	-	-	-	-	7	1	-	-	**7**	**16**
Harris																
Segment 5	-	35	2	4	-	0	1	-	4	1	6	-	-	-	**13**	**45**
Total	**1**	**352**	**7**	**9**	**0**	**0**	**2**	**0**	**17**	**3**	**79**	**11**	**0**	**1**	**106**	**381**
Houston Terminal Station Options																
Industrial Site [b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northwest Mall [b]	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Northwest Transit [b]	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-

Source: AECOM 2019

[a] P = Primary Structure, S = Secondary Structure

[b] Included in this value is the associated portion of the HSR LOD from the common point just west of the intersection of McAllister and Hempstead Roads.

As defined by TCRR, "When an [option] offer is accepted, a portion of the agreed-upon purchase price will be paid to landowners at that time. Landowners will keep this payment whether the Project ultimately needs to purchase the land or not. The landowner will then receive the remainder of the purchase amount when the Project proceeds to the construction phase and the full purchase of the property is executed at the agreed upon terms."[35] TCRR has published their *Guiding Principles for Land Acquisition and Landowner Right*s for all property acquisitions, developed in accordance with the Texas Landowner's Bill of Rights.[36,37] No public housing would be impacted by the Project.

The Project would impact a number of businesses, including small, family-owned shops, larger chain or franchise businesses, gas stations and industrial sites through parcel acquisition. As shown in **Table 3.13-16**, depending on the Build Alternative the estimated total (primary and secondary) structure acquisition of businesses would range from 12 under Build Alternatives A, B, D, and E to 18 under Build Alternatives C and F. The Project would also require the acquisition of residential dwelling units (single-family homes on small and large lots, farms/ranches and apartment complexes). Depending on the Build Alternative this estimated structure acquisition of primary and secondary residential structures would range from 49 under Build Alternative A to 54 under Build Alternative F. Both owner-occupied and tenant-occupied residences would be affected. A database search of both commercial properties (industrial, office, retail and land) and residential properties for sale and for lease was conducted to assess the availability of properties to serve as replacement for those displaced by the Project.

[35] TCRR, "Working with Landowners," accessed June 2019, https://www.texascentral.com/landowners/.
[36] TCRR, *Guiding Principles for Land Acquisition and Landowner Right*s, accessed June 2019, https://www.texascentral.com/wp-content/uploads/2015/12/TCPBillofRights.pdf.
[37] Office of the Attorney General of Texas, "The State of Texas Landowner's Bill of Rights," revised February 2012, accessed June 2019, https://www.texasattorneygeneral.gov/sites/default/files/files/divisions/general-oag/LandownersBillofRights.pdf.

Table 3.13-16: Summary of Structure Acquisition (Number of Primary and Secondary Structures) by Build Alternative

Structure Classification	Build Alternatives					
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Agriculture	196	223	196	203	230	203
Commercial	12	12	18	12	12	18
Community Facilities	0	0	0	0	0	0
Cultural/Civic Resources	2	2	1	2	2	1
Oil/Gas	12	12	17	12	12	17
Residential	49	50	51	52	53	54
Transportation/Utilities	0	0	1	0	0	1
TOTAL	**271**	**299**	**284**	**281**	**309**	**294**

Source: AECOM, 2019

Note: Table includes primary and secondary structure totals combined.

As detailed in **Table 3.13-15**, the majority of structure acquisitions are secondary structures such as agricultural buildings like barns/sheds. The majority of primary structures that would be acquired are residential.

Some residences and businesses that are classified as acquisitions by FRA may be located within low income or minority populations. These are discussed in detail in **Section 3.18, Environmental Justice**.

As detailed in **Table 3.13-13**, depending on the Build Alternative, the following community facilities may be displaced. These facilities, discussed in further detail in **Section 3.14.5.2.5, Socioeconomics and Community Facilities, Impacts to Community Facilities, Freestone County**, include:

- Mount Zion Missionary Baptist Church (Freestone County): impacted by Build Alternatives C and F
- Hopewell Church (Leon County): impacted by Build Alternatives C and F
- Union Church (Madison County): impacted by Build Alternatives A, B, D and E
- Connection School of Houston (Harris County): impacted by all Build Alternatives
- Awty International School Early Learning Center campus: impacted by the Northwest Transit Center Terminal Option site

3.13.6 Avoidance, Minimization and Mitigation

Design features were employed throughout the development of the Project to the natural, social, physical and cultural environment in order to avoid and minimize impacts. In developing the Build Alternatives, TCRR identified co-location opportunities adjacent to existing transportation infrastructure, utility corridors and other development to the greatest extent practicable to avoid and minimize impacts to parcel and structure acquisition and land use conversion. Within the six Build Alternatives, 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure. In some cases, it would be necessary to diverge from this infrastructure to avoid land use impacts. For example, as shown in **Appendix G, TCRR Final Conceptual Engineering Plans and Details,** the LOD would deviate from paralleling a utility line to pass just west of the City of Ferris to avoid property impacts near the City of Red Oak. Other design features include maximizing the use of viaduct to minimize property access and parcel severance impacts. Approximately 55 percent of the Project would be on viaduct.

3.13.6.1 Compliance Measures

TCRR would be required to comply with the following Compliance Measures (CM):

LU-CM#1: Permanent ROW Agreements. Prior to construction, TCRR shall coordinate with TxDOT to obtain approval and necessary agreements for the use of state-owned ROW. In addition, for Build Alternative C or F, TCRR shall coordinate with TPWD and the Texas Parks and Wildlife Commission to pursue approval and necessary agreements for the use of state-owned property (i.e., Fort Boggy State Park).

LU-CM#2: Dallas Terminal Station Development Permit. Prior to construction, TCRR shall obtain a development permit from the City of Dallas for the Dallas Terminal Station. During the permitting process, TCRR shall coordinate with the City of Dallas to ensure that the Dallas Terminal Station complies with relevant zoning and special purpose district regulations.

LU-CM#3: Houston Terminal Station Development Plan Code Compliance. Prior to construction, TCRR shall coordinate with the City of Houston to check development plan codes for compliance with regulations that include property subdivision, parking, tree and shrub requirements, setbacks and access. During the permitting and construction process, TCRR shall coordinate with the City of Houston to ensure compliance with relevant site development regulations.

LU-CM#4: Houston Terminal Station Site Development Related Permits. Prior to construction, TCRR shall obtain site development related permits, such as building code permits, encroachments permits for utilities that support the station and a stormwater quality permit. During the permitting process, TCRR shall coordinate with the City of Houston to ensure that the development of the Houston Terminal Station complies with relevant permits.

LU-CM#5: Adhere to Development Regulations. TCRR shall adhere to applicable development regulations for any ancillary facilities (e.g., stations, TMF and MOW facilities, TPSSs, maintenance roads and signal houses) that would be required and constructed. **Table 3.13-1** summarizes the local plans and regulations that provide guidance for the aesthetic character of each community.

The following Compliance Measure (CM) would be required only if TCRR applies for and receives federal financial assistance.

LU-CM#6: Uniform Relocation Assistance and Real Property Acquisition Policies Act. If TCRR receives Federal financial assistance for the funding of the Project, it shall comply with the Uniform Act.

Additional compliance measures related to land use conversion are documented under the following resources: **NV-CM#1: Compliance with Local Regulations** as discussed in more detail in **Section 3.4.5.2, Noise and Vibration, Build Alternatives**.

3.13.6.2 Mitigation Measures

TCRR would be required to implement the following Mitigation Measures (MM):

LU-MM#1: Temporary Conversion of Land. TCRR shall return temporarily impacted land to its pre-Project condition following the completion of construction activities in that area, unless otherwise determined through visual mitigation measures in the Landscaping Plan (**AS-MM#5**) or **AS-MM#1: Visual Screening.**

LU-MM#2: Agriculture and Livestock Management. Prior to the start of construction, TCRR shall coordinate with landowners identified as owning displaced or acquired property, as outlined in **Section 3.11, Land Use,** and **Appendix E, Land Use Technical Memorandum,** to determine individual property

owner temporary needs for livestock management during construction, as well as permanent needs during operation of the system. During construction, this could include the use of temporary fencing or the relocation of livestock to alternate pastures. Measures to avoid conflicts could involve the use of enhanced creek crossings and access to maintain open movement of livestock, as well as farming or ranching equipment. Permanent needs would include negotiating livestock and/or equipment crossing along areas of the alignment that are not on viaduct. TCRR shall negotiate with the landowner to provide adequate access (crossings) or compensation for land that is severed. TCRR shall negotiate these management needs on a case-by-case basis with the affected landowners and shall incorporate the outcome of negotiations into the written agreements with the affected landowners, prior to the start of construction on that property.

LU-MM#3: Acquisition and Relocation Mitigation Plan. TCRR shall develop an acquisition and relocation mitigation plan as detailed in in **Appendix I, TCRR Plans and Public Outreach**. These plans are often used for large infrastructure projects that displace a high number of residences and businesses and are considered successful in minimizing the impact to property owners. TCRR will make the plan available to the public. The plan will meet the following objectives, at minimum:

- Provide affected owners assistance in situations when relocation is necessary
- Make a best effort to minimize the permanent closure of displaced businesses as a result of relocations
- Within the limits of established laws and regulations, minimize the economic disruption caused by relocation

The relocation mitigation plan shall include the following components, at a minimum:

- Appraisal, acquisition and relocation process descriptions that describe the activities of the appraisal and relocation specialists
- Clear protocols for assigning appraisal and relocation staff to affected property owners, tenants or other residents on an individual basis
- A process to establish individualized assistance to affected property owners, tenants or other residents in applying for funding, including research to summarize loans, grants and federal aid available, and research of demographically similar areas for relocation

For elderly and handicapped persons with dwellings displaced or acquired, replacement housing shall meet or be functionally equivalent for specific accessibility needs to the displacement dwelling. Replacement dwellings should be free of any barriers that would preclude reasonable ingress, egress or use of the dwelling by that displaced person. If adequate dwellings that meets accessibility needs cannot be identified, TCRR shall provide funding for accessibility housing improvements of equal or better standard to those that were displaced.

3.13.7 Build Alternatives Comparison

The summary of land use impacts by Build Alternative is shown in **Table 3.13-17**. The summary of impacts for the Houston Terminal Station Options is shown separately in **Table 3.13-18**. Overall, the land use impacts of the Build Alternatives would be similar for land use conversions, including special status farmland, structure displacements and permanent and temporary acquisitions.

Build Alternatives A and D would have the least total permanent land use conversion (approximately 6,600 acres), while Build Alternative C and F would have the most (approximately 7,300 acres). This illustrates that the overall total land use conversion would not vary significantly between the Build Alternatives. Build Alternative F would have the lowest conversion of agricultural lands (permanent and

temporary) at 7,013 acres. Build Alternative B would have the highest conversion of agricultural lands at 7,526 acres.

Table 3.13-17: Summary of Land Use Impacts by Build Alternatives

Characteristic		Area of Potential Impacts					
		ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Regional and Local Land Use Plans		No conflict	No conflict	No conflict	No conflict	No conflict	No conflict
Existing Land Use Conversion (acres)	Temp	2,553.4	2,532.9	2,393.2	2,592.4	2,571.9	2,432.3
	Perm	6,619.8	6,814.0	7,295.6	6,610.0	6,804.1	7,285.7
Special Status Farmland Conversion (acres)	Temp	1,710.8	1,690.4	1,459.8	1,719.4	1,699.0	1,468.5
	Perm	3,534.5	3,764.3	3,573.4	3,483.5	3,713.3	3,522.3
	Indirect	847.5	888.2	697.3	815.6	856.2	779.2
Primary Structure Displacements (within LOD and 50 feet)	Commercial	42	42	65	42	42	65
	Residence	235	255	239	249	269	253
	Community Facilities	2	2	3	2	2	3
Estimated Permanent Parcel Acquisitions		1,731	1,814	1,789	1,764	1,847	1,822
Estimated Temporary Parcel Acquisitions		272	277	259	271	276	258
Estimated Total Structure Acquisitions (Primary and Secondary)	Agriculture	196	223	196	203	230	203
	Commercial	12	12	18	12	12	18
	Community Facilities	0	0	0	0	0	0
	Cultural/Civic Resources	2	2	1	2	2	1
	Oil and Gas	12	12	17	12	12	17
	Residence	49	50	51	52	53	54
	Transportation and Utilities	0	0	1	0	0	1
	Total of Structure Acquisitions	271	299	284	281	309	294

Source: AECOM 2019.

Table 3.13-18: Summary of Land Use Impacts for Houston Terminal Station Options

Characteristic		Area of Potential Impacts		
		Industrial Site	Northwest Mall	Northwest Transit Center
Land Use Regional and Local Land Use Plans		No conflict	No conflict	No conflict
Existing Land Use Conversion (acres)	Temp	-	27.4	11.8
	Perm	92.2	75.8	88.7
Primary Structure Displacements (Commercial)		14	22	15
Primary Structure Displacements (Community Facilities)		0	0	1
Estimated Permanent Parcel Acquisitions		25	40	43
Estimated Temporary Parcel Acquisitions		2	1	-
Estimated Total Structure Acquisitions (Commercial - Primary and Secondary)		0	1	-

Source: AECOM, 2019

Note: There would be no conversions of special status farmland. Also included in these values are the associated portions of the HSR LOD from the common point just west of the intersection of McAllister and Hempstead Roads.

It is anticipated that total permanent parcel acquisition would range from 1,731 parcels under Build Alternative A to 1,847 parcels under Build Alternative E, while the temporary use of parcels would range from 258 parcels under Build Alternative F to 277 parcels under Build Alternative B. Depending on the Build Alternative, the estimated total structure acquisition would range from approximately 271 structures under Build Alternative A to 309 structures under Build Alternative E. Depending on the Build Alternative, the estimated total structure acquisition (primary and secondary) of commercial structures would range from 12 under Build Alternatives A, B, D and E to 18 under Build Alternatives C and F. Depending on the Build Alternative, the estimated total structure acquisition (primary and secondary) of residences would range from 49 residences under Build Alternative A to 54 residences under Build Alternative F.

Primary displacements—structures located directly within the proposed LOD or within 50 feet of the LOD—vary based on the Build Alternative. Build Alternative A would displace the least amount of residences with a total of 235, while Build Alternative E would displace the most residences with 269. Commercial displacements would range from 42 with Build Alternatives A, B, D, and E to 65 with Build Alternatives C and F.

While the Northwest Mall Terminal Station Option would have the smallest permanent footprint, it would have the largest displacement of primary business structures (22) and the second highest number of permanent parcel acquisitions (40). The Industrial Site Terminal Station Option would have the largest footprint but would displace the fewest primary business structures (14) and would permanently acquire the fewest number of parcels (25).

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3.14 Socioeconomics and Community Facilities

3.14.1 Introduction

This section describes the existing socioeconomic setting, community facilities and services, neighborhoods and demographics (populations and households) of the Study Area and/or Economic Analysis Areas as defined in **Section 3.14.4, Affected Environment**. To ensure that potential effects to people and communities are integrated into the decision-making process for transportation investments, NEPA requires the consideration of social and economic impacts of the Project. Minority and low-income populations are more specifically discussed in **Section 3.18, Environmental Justice**.

A community is defined as a group of people that share access and linkages, community facilities and local businesses in the surrounding area that provide opportunities for residents to gather and interact. In urban and suburban areas communities tend to be smaller and more densely populated, often defined by neighborhood boundaries. In rural areas, communities are not as easily demarcated due to larger tracts of private property ownership and lack of community facilities. This does not mean that rural communities are less cohesive, just less clearly defined. These data provide the community and neighborhood context within the Study Areas used to determine potential impacts of the No Build and Build Alternatives and Houston Terminal Station Options.

3.14.2 Regulatory Context

Federal

FRA's *Procedures for Considering Environmental Impacts* requires an assessment of the potential impacts to the socioeconomic environment and community facilities.[1] This EIS assesses impacts on the socioeconomic environment, including the number and types of employment sectors; the potential for community disruption or cohesion; demographic shifts; the need for and availability of relocation housing; impacts on commerce, including existing business districts, metropolitan areas and the immediate area of the Project and impacts on local government services and revenues.

Additional regulations and policies that guide the assessment of demographics and community impacts are as follows:

- Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, national origin, age, sex or disability in programs and activities receiving federal financial assistance.
- Americans with Disabilities Act of 1990 prohibits discrimination based on disability.[2]
- Uniform Relocation and Real Property Acquisition Policies Act of 1970, as amended, ensures people displaced as a result of a federal action or undertaking involving federal funds are treated fairly, consistently and equitably.[3] This act protects people from disproportionate impacts as a result of a project designed to benefit the public as a whole. USDOT approval of financial assistance to TCRR through USDOT credit programs would require compliance with this Act for property acquired through voluntary agreement with a landowner, as well as property acquired through eminent domain.

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64.Federal Register 28545 et seq.
[2] 42 U.S.C. 12101 et seq.
[3] 42 U.S.C. 4601 et seq.

- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires that each federal agency "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."[4]

3.14.3 Methodology

3.14.3.1 Demographic Profile

The Study Area for the demographic analysis and the community impact assessment is defined as a quarter-mile buffer from the LOD. The demographic profile was developed using U.S. Census Bureau (USCB) survey data for populations from 1970 to 2010 and American Community Survey (ACS) 2017 5-year estimate data for percent minority and percent Hispanic, median household incomes and poverty levels. A total of 134 block groups were identified within the Study Area for evaluation. Some block groups have land areas that do not fall completely within the Study Area boundary. In those cases, the most conservative approach was taken by analyzing the entire block group. County level data are intended to provide an overview of the Study Area. Detailed demographic data are available in **Appendix E**, **Socioeconomics and Community Facilities Technical Memorandum**.

Household population projections were derived from the ACS 2017 5-year estimate data. Countywide population projections are based on population projections from the Office of the State Demographer, Texas State Data Center. Existing employment data was derived from USCB, County Business Patterns year 2016 data. These data show the number of employees and payroll by sector in each of the counties within the Study Area. The USCB uses a set of income thresholds that vary by family size and composition to identify individuals living in poverty. If a family's total income is less than the poverty threshold for a family of its size and composition, then that family, and every individual in it, is considered to be below the poverty level.[5]

According to the USCB, a housing unit is defined as a house, apartment, mobile home or trailer, group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters. Occupied housing units are defined as the usual place of residence of the person(s) living in it at the time of the census.

3.14.3.2 Economic Conditions

FRA's economic analysis considers five economic analysis areas to understand the broader impacts of the Project on certain counties, groups of counties and the entire state. Evaluating different economic analysis areas provided the flexibility to understand the varying impacts of the Project on rural, urban and statewide interests. Smaller geographies allowed for the detection of economic impacts felt by a particular community that may not be evident in larger analysis areas. At the same time, larger analysis areas provided a way to capture macro-level economic impacts due to the spur of economic interactions between counties. Economic impacts were assessed using the following economic analysis areas:

- Counties within the Study Area (Dallas, Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes, Waller and Harris)

[4] Presidential Documents, Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, Federal Register, Vol. 62, No. 78. 19885-19888, April 23, 1997.
[5] USCB ACS, "About," accessed February 2020, https://www.census.gov/topics/income-poverty/poverty/about.html.

- Dallas County only
- Harris County only
- Intermediate counties (Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes and Waller)
- State of Texas

Several components of the economic analysis (detailed below) rely on 2016 Regional Input-Output Modeling System (RIMSII) economic input-output multipliers obtained from the U.S. Bureau of Economic Analysis (BEA) for each of the five Economic Analysis Study Areas. RIMSII supplies a series of multipliers that help to estimate the ripple effects of an investment on the larger economy based on detailed information about existing industries and supply chains within the defined geography. This section reports existing economic conditions and direct impacts of the Project at the county level, where available. However, total economic impact, which includes RIMSII modeled components, is reported only for the five Economic Analysis Study Areas.

The 2016 RIMSII Model multipliers, and all other data sources used for the economic analysis, were inflation-adjusted to 2019 dollar values for consistency in reporting. All conversions were based on the U.S. Office of Management and Budget chained price estimates[6] included in **Appendix E, Socioeconomics and Community Facilities Technical Memorandum**.

The study time period associated with the economic analysis is from 2016 (the start of Project capital expenditures) through 2040. One-time capital expenditures, some of which may have already occurred and others that would occur over the construction timeframe, are totaled and reported in 2019 dollar values. Other economic impacts may recur annually. To estimate the employment, earnings and total tax impact across all Study Area jurisdictions over the entirety of the study time period, this analysis used the Capital Cost Estimate and Construction Schedule, as documented in **Appendix F**, **TCRR Final Conceptual Engineering Design and Constructability Reports,** to understand the number of years within the study period that a particular impact may occur.

- The Property tax impacts associated with the acquisition of property would recur annually for 20 years through 2040. Although impacts associated with earlier acquisition may start sooner, this analysis conservatively assumes all tax effects of acquisitions happening concurrently, immediately preceding construction activities scheduled to start in 2020.
- Property tax impacts associated with track work improvements and maintenance facilities are calculated beginning in 2023 and recurring annually for 18 years through 2040.
- Property taxes associated with the Dallas Terminal Station, Brazos Valley Intermediate Station, and Houston Terminal Station are calculated beginning in 2024 and recurring annually for 17 years through 2040.
- Impacts associated with service provision (employment, earnings and induced sales and excise taxes associated with increased permanent employment) are calculated beginning in 2025 and recurring annually for 16 years through 2040.
- Property premiums around station areas are assumed for the last 10 years of rail operation, beginning in 2030. Land values around stations could start to climb much sooner, but some delay was assumed to reflect a more conservative approach.

3.14.3.2.1 Capital Investment

The impact of capital investment in the Study Area is based on the high-level cost estimates documented in **Appendix F**, **TCRR Final Conceptual Engineering Design and Constructability Reports**.

[6] Office of Management and Budget, Table 10.1 Gross Domestic Product and Deflators Used in the Historical Tables: 1940-2023.

This includes separate estimates for direct costs such as construction labor, materials or equipment; professional services costs such as design, environmental permitting or Project administration; and systems and rolling stock costs. Capital Investment for the Project in construction and professional services would lead to temporary jobs in those industries and indirect job growth in supporting and service industries. The capital costs associated with systems and rolling stock, which would be sourced from outside the state, would not contribute to induced spending in any of the Economic Analysis Areas. These costs are included when determining the real property improvements described in **Section 3.14.3.2.5, Property Tax Revenues**.

The Project represents a corridor of investment rather than a single point. It would require labor and materials in each county to construct the Project. In order to determine the economic impact of the Project on a particular area, assumptions were made about the proportion of the initial investment that would occur within each area. Construction cost detail is insufficient to allocate by geography. **Table 3.14-1** documents the allocation assumptions for construction and professional services costs in each Economic Analysis Area. This allocation assumes that longer mileage in rural counties will be offset by higher grade separation and station costs in urban counties for a roughly even split.

Table 3.14-1: Assumed Share of Investment by Geography

Economic Analysis Area	Construction Allocation	Professional Services Allocation
All Project Counties	100%	100%
Dallas County	33%	50%
Harris County	33%	50%
Intermediate Counties	34%	0%
State of Texas	100%	100%

Source: AECOM 2019

Employment growth and associated earnings were calculated based on the initial capital investment using RIMSII multipliers for each Economic Analysis Area. These estimated additional earnings resulting from the Project's capital investment were then used to estimate induced consumption of taxable goods and services based on the Bureau of Labor Statistics (BLS) Consumer Expenditure Survey (**Appendix E, Socioeconomics and Community Facilities Technical Memorandum**) and Title 34 Texas Administrative Code, Chapter 3 to determine household purchases subject to sales tax. For all expenditures subject to sales tax, a state sales tax rate of 6.25 percent in addition to an average local sales tax rate for each Economic Analysis Area (as listed on **Table 3.14-2**) was applied. An effective excise tax rate, based on the excise tax per unit divided by the average unit cost, was also applied to expenditures subject to state excise tax.[7][8]

Table 3.14-2: Sales and Excise Tax Rates

Economic Analysis Area	Local Sales Tax Rate		
All Project Counties	1.92%		
Dallas County	2.00%		
Harris County	2.00%		
Intermediate Counties	1.44%		
State of Texas (Average local rate)	1.35%		
Expenditures subject to Excise Tax	**State Excise Tax**	**Average Unit Cost**	**Effective Excise Rate**
Spirits	$ 2.40 / gallon	$ 76.60 / gallon	3.1%
Wine	$ 0.20 / gallon	$ 53.61 / gallon	0.4%
Beer	$ 0.20 / gallon	$ 11.27 / gallon	1.8%

[7] Sales Tax Handbook, accessed February 2020, https://www.salestaxhandbook.com/texas.
[8] BLS, CPI-Average Price Data, Customized Tables, accessed February 2020, https://data.bls.gov/cgi-bin/dsrv?ap.

Table 3.14-2: Sales and Excise Tax Rates			
Economic Analysis Area	**Local Sales Tax Rate**		
Gasoline	$ 0.20 / gallon	$ 2.60 / gallon	7.7%
Tobacco (Cigarettes)	$ 1.75 / pack	$ 5.78 / pack	30.3%

Source: AECOM 2019; Sales Tax Handbook 2019; and BLS Average Price Data 2019

3.14.3.2.2 Employment, Earnings, and Sales and Excise Tax

FRA's analysis utilized TCRR's Conceptual Engineering Report (refer to **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**) for estimates of direct operational employment by occupational category. Employment reported for each station and maintenance facility was assigned to the county in which the facility would be located. For the purpose of this analysis, the 106 administrative staff were assigned only to All Project Counties and State of Texas Economic Analysis Areas.

BLS Occupational Employment Statistics by occupation sector were used to calculate estimated earnings resulting from the projected employment. TCRR operations staffing estimates are consistent across all Build Alternatives and terminal station options; therefore, permanent employment and earnings impacts were not distinguished by Build Alternative.

RIMSII multipliers were used to determine annual employment and earnings in each Economic Analysis Area occurring as a direct, indirect or induced effect of annual operating investment. The same consumer expenditure model described in **Section 3.14.3.2.1, Capital Investment**, was used to estimate the impacts to state and local sales and excise tax revenues as a result of permanent employment changes.

3.14.3.2.3 Property Premiums

Empirical economic research on the economic impact of rail access and the value of walkable community centers indicates that there are often positive impacts on property values in proximity to rail stations. Because there are uncertainties concerning the timing of the premium amount of the premium for HSR service, and growth in value prior to the premium impact occurring, the analysis was completed using a range of premium values within two buffer areas based on 2017-2018 property values (2019 adjusted). For the purposes of this analysis, a low- and high-end range for potential property premium effects was developed, based on a 4 to 8 percent increase in property values within a quarter-mile of the stations and a 2 to 4 percent increase between a quarter-mile and half-mile from the stations. These assumptions represent conservative estimates on the low end of a range of documented outcomes.[9]

Property values within a quarter-mile and between a quarter-mile and half-mile of the Dallas Terminal Station, Brazos Valley Intermediate Station, and the three Houston Terminal Station Options were based on 2017-2018 assessments from Dallas, Grimes and Harris Counties, respectively. Establishing buffers for properties at varying distances from the proposed stations allowed the analysis to capture some of the decrease in premiums that would occur at increased distances from the station. These buffers exclude parcels directly impacted by the Project and do not account for the value of new investment

[9] The analysis of property premiums around stations relies on a variety of literature documenting the station area effects of traditional mass transit (including both light rail and commuter rail projects) as well as professional judgement. There are currently no studies documenting the effects of high-speed mass transit on a North American real estate market; however, the primary factors that can influence property values, such as presence or lack of hazardous freight cargo, noise and vibration effects, and the activity generated at a station area, would be of a similar nature for HSR technology as for traditional mass transit. Preliminary ridership estimates for the Project indicate that activity generated at the station areas (positively correlated with property premiums) would be much higher for HSR compared to traditional rail transit projects, indicating that the factors assumed would most likely be conservative.

that may occur as a result of the Project. For this reason, station areas surrounded by vacant or low-density parcels, such as the Brazos Valley Intermediate Station in Grimes County, may experience a larger than anticipated effect as a result of speculative private investment. This analysis included only the non-speculative value increase based on existing land uses.

3.14.3.2.4 Business and Agricultural Displacements

Some economically productive properties may be lost as a result of the acquisition of agricultural land or the displacement of a business. Agricultural land acquisitions by county and the methodology for determining acquisitions and agricultural land use are provided in **Section 3.13.4.2, Land Use, Agriculture, Special Status Farmland and Agricultural Conservation Easements**. Since the crop types can vary year-to-year, the potential loss of income was calculated on price per acre, as derived from **Table 3.13-6 (Section 3.13, Land Use)**. Loss of crops due to the permanent conversion of agricultural lands was estimated at $329 per acre, based on the average market value of crops sold within the Land Use Study Area.[10] The methodology for determining business displacements is included in **Appendix E, Land Use Technical Memorandum**.

3.14.3.2.5 Property Tax Revenues

The impact to property tax revenue associated with potential property acquisitions, displacement and relocation was determined by identifying the properties that would be impacted by the Project. The full and partial permanent acquisitions that would be required under each Build Alternative of the Project were determined as described in **Appendix E, Land Use Technical Memorandum.**

County Appraisal District data from the Dallas County Appraisal District, Ellis County Appraisal District, Navarro County Appraisal District, Freestone County Appraisal District, Limestone County Appraisal District, Madison County Appraisal District, Grimes County Appraisal District, Waller County Appraisal District, and Harris County Appraisal District were collected to determine assessed land and improvement values, exemption information, agricultural production and applicable taxing jurisdictions. A GIS analysis of the full property acreage and take acreage (for partial acquisitions) in comparison to county parcel size was used to determine the proportion of county valuation to be applied in the analysis.

In Leon County, where detailed property records were not available, a weighted blend based on acreage of all other impacted parcels in counties with similar land use compositions (i.e., Navarro, Freestone, Limestone, Madison, and Grimes) was used to approximate the taxable value after similar levels of homestead and agricultural exemptions.

To determine the overall impact to tax revenue, the difference in taxable value between existing and future scenarios, as described in detail below, was multiplied by the 2017-2018 tax rate for each taxing jurisdiction the parcel was located within, including county, school district, city and special districts.

Tax exempt parcels that would be either partially or fully acquired were reclassified as taxable for the portion of the parcel that would be acquired. Because of data constraints for Harris County where all exempt properties were valued at zero dollars, it was assumed that tax exempt properties, most of which were part of TxDOT ROW, would remain tax exempt and instead of being acquired would be shared through an easement or special agreement. The following rules were used to calculate the

[10] Based on values presented in **Table 3.13-6**, Madison County was excluded from this analysis because USDA withheld market value of crops in this county to avoid disclosing data for individual operations.

taxable value for the existing properties as a baseline, as well as for three future tax impact scenarios (High, Low, and Probabilistic):

- Existing taxable value equal to zero for fully exempt properties, otherwise the sum of:
  - Assessed value of non-agricultural land
  - Agricultural productivity
  - Assessed value for improvements
  - Less any applicable homestead, over 65, or disability exemptions
- Taxable value for full acquisitions under all future impact scenarios equal to the sum of:
  - Assessed value of all agricultural and non-agricultural land
  - No improvement value
  - No applicable exemptions
- Taxable value for partial acquisitions under high taxable value (low impact) scenario:
  - Total assessed land value proportional to impacted parcel acreage
  - Assessed value of non-agricultural land plus agricultural productivity, both proportional to the unimpacted parcel acreage
  - 100 percent of the improvement value would remain on the market assuming none of the structure(s) would be impacted
  - Homestead, over 65, and disability deductions applied to unimpacted portion of parcel
- Taxable value for partial acquisitions under low taxable value (high impact) scenario:
  - Total assessed land value proportional to impacted parcel acreage
  - Assessed value of non-agricultural land plus agricultural productivity, both proportional to the unimpacted parcel acreage
  - None of the improvement value would remain on the market assuming that the entire structure or all structures would be impacted
- Taxable value for partial acquisitions under probabilistic impact scenario:
  - Total assessed land value proportional to impacted parcel acreage
  - Assessed value of non-agricultural land plus agricultural productivity, both proportional to the unimpacted parcel acreage
  - Assumes that the percentage of the structure(s) that is/are impacted is proportional to the percentage of the parcel land that is taken
  - Homestead, over 65, and disability deductions applied to unimpacted portion of parcel

The facility and fixed guideway improvements constructed under the Project would also represent an increase in the taxable value for the jurisdictions in which they would be located. Because precise capital costs by category and improvement locations are not available, FRA's analysis used standard industry facility costs generated for stations and maintenance facilities and allocated the remaining TCRR reported construction costs by fixed guideway length.

The allocation attributed to station costs for each of the three station areas was based on average archetype station capital costs from the California High-Speed Train Program EIR/EIS.[11] As station costs were reported in 2003 dollars, they were inflated to 2019 dollars for the analysis using the U.S. Office of

[11] California High Speed Rail Authority, California High-Speed Train Program EIR/EIS, Appendix E, Table E-2: High Speed Train Passenger Station Cost, January 2004, http://www.hsr.ca.gov/docs/programs/eir-eis/statewide_techrpt_Cap_OPcost_appn_E.pdf.

Management and Budget chained price estimates.[12] Based on available information about the proposed TCRR stations, the Dallas and Houston Terminal Stations would most closely resemble the aerial urban archetype station for the California High Speed Rail. This analysis allocated a lower cost for the Brazos Valley Intermediate Station, similar to the California High Speed Rail typical at-grade suburban station.

It was assumed that the assessed improvement value of each station would be equal to the cost required to build it and would depreciate over time based on an assumption of 54 years of useful life for facilities and 38 years for trackwork[13]. It is not likely that facilities or trackwork would need to be replaced during the study time period, allowing use of a constant, linear depreciation formula. To determine the total tax impact of the station improvements, it was assumed that the Dallas Terminal Station would be located within the City of Dallas, Dallas County, Dallas County Community College, Parkland Hospital and Dallas ISD taxing jurisdictions for a total property tax rate of $2.85 per $100 in value. The Brazos Valley Intermediate Station was assumed to generate tax revenue for Grimes County and the Anderson-Shiro ISD with a combined rate of $1.90 per $100. All three Houston Terminal Station Options were assumed to have the same value and tax rate, located within the City of Houston, Harris County, Houston Community College, Harris County Flood Control, Port of Houston, Harris County Hospital District, and Houston ISD taxing jurisdictions for a total combined tax rate of $2.53 per $100 valuation.

To determine the property tax impact of the station area land value premium, a similar tax structure as previously described for station capital costs was applied to both the high-end and low-end estimates of the property premium. It was assumed that all properties within the half-mile buffer zones around stations would be taxable, and tax deductions and exemptions were not considered for this analysis of property premium tax impacts.

3.14.3.3 Neighborhood Cohesion and Community Facilities

A quarter-mile Study Area around the LOD was used to assess impacts to neighborhoods and community facilities. Data collection methodology for neighborhood cohesion and community facilities included desktop and GIS research as well as direct communications with cities, counties, members of the public, other agencies and stakeholders. Field reconnaissance was conducted where additional information was needed. Fieldwork included windshield surveys within public ROW and other public areas in select portions of the Study Area. Windshield surveys were used to verify data gathered via desktop and other secondary research methods, and to collect new data to fill potential gaps in information.

FRA assessed communities impacted by the Project based on their geographic location in relation to the Project. FRA defined communities by the presence of residences within proximity to one another as well as the presence of commercial businesses or civic facilities (grocery stores, churches, parks, etc.) that support the overall welfare and/or lifestyle of the residents. Impacts to community character have the potential to substantially change the uses, aesthetic or visual nature of an existing community. For this Project, FRA identified impacts to community cohesion that would potentially bisect, cut through, displace or isolate a community or significant number of residential units within a community. Impacts to cohesion would include impacts that disrupt the operation of the neighborhood as a cohesive unit.

[12] Office of Management and Budget, Table 10.1: Gross Domestic Product and Deflators Used in the Historical Tables: 1940-2023.

[13] Capital costs were not available by detailed SCC code. As a result, USDOT guidance on useful life by SCC code could not be used directly but did inform assumptions. FRA used a conservative estimate of 38 years for the useful life of trackwork (based on blended lifespan of guideway and track elements within the SCC 10 category) and 54 years for facilities (based on blended lifespan of station and maintenance facility cost items within the SCC 20 and SCC 30 categories).

For this assessment, community facilities are described as schools, hospitals, places of worship, community centers, municipal facilities and cemeteries. Generally, these are facilities that serve their surrounding neighborhoods or places where nearby residents may gather for community activities. Direct impacts, including physical acquisition, displacement or a relocation of community facilities, are evaluated in this section. Additional impacts occur from other resource areas, such as noise and vibration, visual and aesthetics, transportation or air quality, and create a perceived impact to neighborhood character or community facilities. These impacts are mostly construction related and would be temporary. Potential construction-related impacts would be mitigated through BMPs, compliance measures and mitigation measures outlined in their respective sections and are discussed further in **Section 3.14.5.2.1, Impacts Common to all Build Alternatives**.

3.14.4 Affected Environment

3.14.4.1 Community Setting

This section describes the community character and key jurisdictional boundaries in the Community Facilities Study Area by county and segment. Block level demographic data describing the highlighted counties in **Section 3.14.4.2, Community Character,** can be found in **Appendix E, Socioeconomics and Community Facilities Technical Memorandum**.

3.14.4.2 Community Character

3.14.4.2.1 Dallas County

The neighborhoods within the Study Area in Dallas County are a mix of urban and suburban developments and semi-rural/farming communities. Urban neighborhoods are primarily located in the City of Dallas along the Project from downtown Dallas to approximately Ledbetter Drive. Near downtown, the neighborhood is composed of high-density, multi-family apartments, some commercial services, industrial buildings, vacant lots and large parking lots.

South of downtown Dallas, the Study Area is characterized by urban single-family residential areas buffered by industrial uses adjacent to the Trinity River. Established urban single-family communities are also located south and east of the Trinity River. Following the IH-45 corridor southeast, industrial uses and floodplains serve as a buffer to many residential neighborhoods.

Suburban communities exist from Ledbetter Drive to IH-20 within the City of Dallas. These are of medium-low density north of IH-20 and low-density south of IH-20. The Study Area within the cities of Hutchins, Lancaster and Wilmer are primarily comprised of semi-rural, agricultural communities.

3.14.4.2.2 Ellis County

Neighborhoods within the Study Area in Ellis County consist of a mix of exurban, semi-rural and agricultural communities. Exurban refers to prosperous communities beyond the suburbs that are commuter towns for an urban area. The character is generally similar within Segments 2A and 2B. The neighborhood along FM 664, west of the City of Ferris, is a mixture of exurban and semi-rural. From FM 983 to FM 813, neighborhoods are semi-rural mixed with agricultural use. In the southern portion of the county, the neighborhoods become more rural with expansive agriculture operations.

3.14.4.2.3 Navarro County

The communities within the Study Area in Navarro County are rural, with few homes per square mile and large pastures and croplands. The character of these communities is generally the same for Segments 3A, 3B and 3C. Housing is a mixture of new, old and abandoned structures. There are also hunting ranches in the Study Area, such as Cotton Mesa Ranch, a large ranch with native and exotic game.

3.14.4.2.4 Freestone County

The communities within the Study Area in Freestone County are rural and can be distinguished depending on the segment.

- **Segment 3C:** The communities adjacent to Segment 3C are in the central portion of the county and generally follow IH-45. This segment passes through the City of Fairfield, but west of the downtown area. The city has a regional hospital outside of the Study Area, and is mostly a low-density, single-family community. Land use within this portion of the Study Area is primarily industrial and commercial. Outside of the City of Fairfield, the neighborhoods on the east and west sides of IH-45 are low-density, with a high concentration of oil and gas well development.
- **Segment 4:** The area in the northwestern part of the county primarily consists of small farms, pastures, wooded areas and open spaces. South of FM 1365, west of the City of Teague, the area becomes more industrial with oil and gas well development.

3.14.4.2.5 Limestone County

In Limestone County, the communities within the Study Area follow Segment 4. These communities are rural and have a high concentration of oil and gas well development. Communities along this segment are west of the Jewett coal mine. Land uses through Limestone County are largely dedicated to agricultural production, and oil and natural gas extraction.

3.14.4.2.6 Leon County

The communities within the Study Area in Leon County are rural and can be distinguished depending on the segment.

- **Segment 3C:** The communities adjacent to Segment 3C are located in the central portion of the county and generally follow IH-45. Segment 3C passes through the cities of Buffalo and Centerville, west of their respective downtown areas. While there are concentrations of retail land uses near the IH-45 intersections, land use is primarily low-density, single-family neighborhoods with land dedicated to agricultural uses.
- **Segment 4:** Communities along Segment 4 in the western portion of the county are rural and dedicated to agricultural land uses. There is a moderate amount of oil and gas well activity in the northern part of the county that dissipates to the south.

3.14.4.2.7 Madison County

The Study Area within Madison County is rural with few homes per square mile. Land use is comprised of a mixture of large pastures, cropland and forested areas. These rural areas lie between the City of Madisonville to the east and the City of Normangee to the west. These communities are similar in rural character for both Segments 3C and 4. The one distinguishing characteristic of Segment 4 is that it parallels an existing utility easement.

3.14.4.2.8 Grimes County

Grimes County lies approximately 40 miles northwest of Houston. The Study Area within Grimes County is mostly rural and with few homes per square mile. Large agricultural lands for ranching or crops are located throughout Segments 3C, 4 and 5. There are some forested areas near the southern border of the county. The Build Alternatives are adjacent to a utility easement for the entire length of the county along Segment 4. The density of homes increases south of SH 105.

3.14.4.2.9 Waller County

The communities within the Study Area in Waller County are rural with few homes per square mile. There is a mixture of pastures and croplands, as well as a large forested area in the northeast corner of the county. Segment 5 would pass through Waller County approximately one-half mile from an undeveloped sub-division near the Kickapoo Preserve neighborhood.

3.14.4.2.10 Harris County

The communities within the Study Area in Harris County are a mix of rural, exurban and urban areas. In the northwest corner of the county, Segment 5 would pass between the cities of Waller and Hockley. These communities are characterized as a mix of rural, pastures, cropland and exurban communities. Towards the south end of US 290, the communities become more urban.

Segment 5 would pass through the cities of Cypress and Jersey Village, as the Study Area straddles US 290. These are urban communities with a large presence of single-family residential communities. Commercial, retail and some industrial uses typically face the highway and provide a buffer for the residential areas.

South of the intersection of US 290 and Sam Houston Parkway, Segment 5 would enter the City of Houston and follow Hempstead Road and the UPRR ROW. Urban, single family neighborhoods are located on either side of the road and rail, mostly buffered by low-density commercial and industrial uses. At the southern end of Segment 5, near IH-610, the community along Post Oak Boulevard is denser with multi-family apartments and a shopping mall. The communities maintain some industrial uses until Segment 5 approaches IH-10 and the community is characterized by low-density office parks and multi-family apartments.

3.14.4.3 Demographics

This section identifies selected demographic and household characteristics of the counties within the Study Area. Detailed block group level demographic information can be found in **Section 3.18, Environmental Justice,** and **Appendix E, Socioeconomics and Community Facilities Technical Memorandum**. **Table 3.14-3** provides 2017 ACS 5-year demographic data for the countywide populations within the Study Area. The demographic categories include total population, percent minority population, percent Hispanic origin, percent low income (below the poverty level), median household income and percentage of Limited English Proficiency (LEP) residents. County level demographic information is intended to provide context and an overview of population characteristics within the 10-county Study Area.

Table 3.14-3: Demographic Characteristics of Population by County							
County	2017 Population	Percent Children under 18-years old	Percent Minority Population	Percent Hispanic Origin	Percent Low-Income	Median Household Income	Percent LEP Population
Dallas	2,618,148	26.4	33.1	40.2	14.8	$53,626	12
Ellis	173,620	26.9	14.5	26.3	8.5	$67,371	4
Navarro	48,701	26.2	18.6	27.3	16.9	$45,103	6
Freestone	19,625	23	20.1	15.4	16.1	$45,890	2
Limestone	23,527	22.8	21.4	22.4	19.1	$40,356	6
Leon	17,243	22.7	10.5	14.6	16.1	$44,875	4
Madison	14,222	21.1	24.4	23	18.3	$44,004	2
Grimes	28,082	22.6	19.1	24.4	18	$49,745	4
Waller	51,307	24.3	29.5	30.1	15.5	$53,506	6
Harris	4,652,980	26.9	30.2	43	15.9	$57,791	12

Source: USCB ACS 2017 5-year estimates

Dallas and Harris Counties are the two most populous and diverse counties with the highest percentages of minority, Hispanic origin and LEP populations. Ellis County has the highest median household income and one of the lowest minority populations and poverty rates within the Study Area. Counties with a population of less than 50,000 (Navarro, Freestone, Limestone, Leon, Madison, and Grimes) have the highest percentage of low-income population in the Study Area. Block group level demographic information was used to identify areas that qualified as minority or low-income populations communities; further discussed in **Section 3.18, Environmental Justice**.

3.14.4.4 Population Projections

According to the State of Texas demographer, the countywide populations for the counties within the Study Area will increase by over 20 percent to over 8.3 million between 2010 and 2040. The highest rates of increase are projected in the most urban counties that already have some of the largest populations, including Dallas and Harris Counties. **Table 3.14-4** profiles the countywide population projections for the Study Area as well as number and percent change in population from 2010 to 2040.

Table 3.14-4: Population Projections by County (2010 - 2040)				
Area	2010 Population	2040 Population	2010-2040 Change	Percent Change
Dallas County	2,368,139	2,938,026	569,887	24.1%
Ellis County	149,610	174,273	24,663	16.5%
Navarro County	47,735	55,682	7,947	16.6%
Freestone County	19,816	21,473	1,657	8.4%
Limestone County	23,384	25,953	2,569	11.0%
Leon County	16,801	17,505	704	4.2%
Madison County	13,664	15,278	1,614	11.8%
Grimes County	26,604	29,642	3,038	11.4%
Waller County	43,205	53,603	10,398	24.1%
Harris County	4,092,459	5,011,544	919,085	22.5%
Total All Counties	6,801,417	8,342,979	1,541,562	22.7%

Source: State of Texas, Office of the State Demographer, TPEPP, 2015

Table 3.14-5 describes household characteristics in the Study Area, including the number and percentage of occupied housing units, average household size and percentage of households without access to vehicles.

Table 3.14-5: Selected Household Characteristics of Population by County				
County	**Number of Occupied Housing Units**	**Percent of Occupied Housing Units**	**Average Household Size (persons)**	**Percent of Housing Units without Vehicles**
Dallas County	906,179	92	2.78	7.1
Ellis County	54,725	93	2.97	2.8
Navarro County	17,660	84	2.73	5.3
Freestone County	7,232	79	2.49	5.7
Limestone County	8,100	78	2.77	6.4
Leon County	6,245	65	2.7	4.4
Madison County	4,174	80	2.35	5.3
Grimes County	8,980	81	2.65	5
Waller County	14,698	89	2.96	4
Harris County	1,562,813	91	2.87	6.2

Source: ACS, 2017 5-year estimates

3.14.4.5 Economic Setting

3.14.4.5.1 Employment

The majority of the employment along the Project is located within Dallas and Harris Counties, with 1.5 million and 2.0 million jobs, respectively. More importantly, there is a great deal of job diversity within these two counties. There are fewer jobs in the rural counties of the Study Area, where population is also lower. **Table 3.14-6** shows total employment, payroll and the top three employment sectors by county.

Table 3.14-6: County Employment (2016)			
County	**Total Employment**	**Annual Payroll ($1,000)**	**Top 3 Sectors**
Dallas	1,456,092	$88,126,899	• Health Care and Social Assistance • Professional, Scientific and Technology Services • Administrative, support, waste management and remediation services
Ellis	42,063	$1,659,735	• Manufacturing • Retail Trade • Accommodation and Food Service
Navarro	13,374	$421,271	• Health Care and Social Assistance • Manufacturing • Retail Trade
Freestone	3,504	$139,637	• Accommodation and Food Services • Health Care and Social Assistance • Retail Trade
Limestone	5,046	$179,345	• Health Care and Social Assistance • Retail Trade • Manufacturing
Leon	4,408	$225,115	• Construction • Manufacturing • Mining Quarrying, and Oil and Gas Extraction
Madison	2,920	$88,795	• Retail Trade • Mining Quarrying, and Oil and Gas Extraction • Accommodation and Food Service

Table 3.14-6: County Employment (2016)			
County	**Total Employment**	**Annual Payroll ($1,000)**	**Top 3 Sectors**
Grimes	5,286	$226,896	• Manufacturing • Retail Trade • Wholesale Trade
Waller	10,720	$445,732	• Manufacturing • Health Care and Social Assistance • Wholesale Trade
Harris	2,045,435	$129,246,109	• Health Care and Social Assistance • Retail Trade • Accommodation and Food Services

Source: USCB 2016 County Business Patterns, 2018

3.14.4.5.2 Tax Revenues

The State of Texas does not collect a personal income tax, so the bulk of funding for local jurisdictions comes from a combination of sales and property taxes. The state collects a 6.25 percent state sales tax on all retail sales, leases and rentals of most goods, as well as taxable services. Local taxing jurisdictions (i.e., cities, counties, special purpose districts and transit authorities) can also impose up to 2 percent sales tax for a maximum combined rate of 8.25 percent. Within the Study Area, only Navarro, Leon, Madison, and Grimes Counties collect a county sales tax.

General funds for other counties and financing for school districts throughout the Study Area are dependent on property tax revenues. 2018 property tax rates for counties within the Study Area range from $0.2431 in Dallas County to $0.7892 in Limestone County per $100 in valuation. School District property tax rates for properties within the LOD range from $1.13 for Blooming Grove ISD to $1.6265 for Rice ISD, both located in Navarro County. Property taxes for cities and special districts only apply within designated areas but can add from $0.36502 in the City of Centerville to $0.8675 in the City of Lancaster. The highest total effective rate occurs within a special district, Dallas County's Flood Control Division #1, at $1.8 per $100 valuation.[14]

Various property tax exemptions apply to existing properties within the LOD. Properties used for agricultural production are assessed based on their productivity rather than the full appraised value of the property. As shown in **Table 3.14-7**, over half of the affected properties in Ellis, Navarro, Freestone, Limestone, and Madison Counties had an agricultural or timber use exemption (included together as "agricultural properties"). State- and county-owned properties are completely exempt and contribute no property tax, while properties owned by other local jurisdictions may be exempt from select jurisdictional property taxes. The highest rates of exempt properties within the LOD occur in Dallas and Harris Counties. Homestead exemptions, including additional exemptions for disabled, over-65, or widowed homeowners, allow the deduction of a portion of the home's assessed value from the taxable value. The highest percentage of properties within the LOD qualifying for a homestead exemption occurs in the suburban county of Ellis, followed by Waller County.

[14] Texas State Comptroller, "Tax Rates and Levies," accessed February 2020, https://www.comptroller.texas.gov/taxes/property-tax/rates/index.php.

Table 3.14-7: Tax Exemption Status within the LOD			
County	**Agricultural Properties**	**Exempt Properties**	**Homestead Properties**
Dallas	15%	14%	17%
Ellis	68%	0%	52%
Navarro	74%	0%	9%
Freestone	64%	1%	9%
Limestone	93%	0%	9%
Leon	*Detailed exemption data not available*		
Madison	84%	0%	3%
Grimes	44%	0%	12%
Waller	31%	7%	34%
Harris	13%	10%	13%

Source: 2017-2018 County Appraisal Tax Rolls, AECOM, 2019

Note: Approximate percentages based on average of segment and station alternatives within a county.

3.14.4.5.3 Agricultural Economy

This section provides a general overview of the agricultural economy within the Study Area. As noted in **Table 3.13-6** in **Section 3.13.4.2.1, Land Use, Agriculture**, farms in Study Area counties represent approximately 7 percent of the total number of farms within the State of Texas, and 3 percent of the total acres of farms. While cotton is the top producing crop in Texas, the Study Area counties primarily produce wheat, corn, sunflower seeds and forage. The market value of agricultural land per acre is higher in the Study Area counties than the rest of the state; however, none of the Study Area counties are within the top 10 percent in terms of total agricultural production within the state. The market value of crops and livestock produced within Study Area counties is approximately $680 million, representing about 3.2 percent of agricultural production within the state.

3.14.4.6 Community Facilities

This section provides a general overview of community facilities located within the Study Area. Community facilities include schools, hospitals, places of worship, community centers, municipal facilities and cemeteries. **Tables 3.14-8** through **3.14-17** list community facilities by county and are depicted in the **Appendix D, Community and Cultural Resources Mapbook**.

Table 3.14-8: Dallas County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Schools			
1	Dallas Community College District	1601 S. Lamar Street, Dallas, TX 75215	1
6	Wilmer-Hutchins High School	5520 Langdon Road, Dallas, TX 75241	1
9	AIA Lancaster Elementary School	901 E. Beltline Road, Lancaster, TX 75146	1
Churches			
1	Wayside Missionary Baptist Church	1518 Beaumont Street, Dallas, TX 75215	1
2	Damascus Missionary Baptist Church	3600 S. Cleveland Street, Dallas, TX 75215	1
3	Wiley Chapel Baptist Church	3744 Kolloch Drive, Dallas, TX 75216	1
3	Rejoicing Tabernacle Church of God in Christ	3731 Fordham Road, Dallas, TX 75216	1
4	Church of Revelation	4350 Kolloch Drive, Dallas, TX 75216	1
4	Friendship Missionary Baptist Church	4360 Kolloch Drive, Dallas, TX 75216	1
4	Kingdom United Baptist Church	4431 Hedgdon Drive, Suite B, Dallas, TX 75216	1
4	Galilee Missionary Baptist Church	4535 Vandervort Drive, Dallas, TX 75216	1

Table 3.14-8: Dallas County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
6	College Park Baptist Church	6350 J.J. Lemmon Road, Dallas, TX 75241	1
6	Full Faith Deliverance Church	6518 J.J. Lemmon Road, Dallas, TX 75241	1
Community Centers			
1	Dallas Convention Center	650 S. Griffin Street, Dallas, TX 75202	1
4	Fruitdale Recreation Center	4408 Vandervort Drive, Dallas, TX 75216	1
Cemeteries			
1	Pioneer Park Cemetery	1201 Marilla Street, Dallas, TX 75201	1
4	Smith Family Cemetery	3820 E. Illinois Avenue, Dallas, TX 75216	1
3	Honey Springs (Bulova/Homecoming) Cemetery	Dallas, TX 75216	1
Museums			
1	Old City Park	1515 S Harwood Street, Dallas, TX 75215	1

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-9: Ellis County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Cemeteries[a]			
22	Boren Cemetery	950 Boren Drive, Waxahachie, TX 75165	2A

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

[A] Geaslin Cemetery has been removed from the Community Facilities list due to its lack of public access. The protocol to access the cemetery requires an individual to request access from the property owner through legal channels. These access limitations do not allow for true public use of this facility.

Table 3.14-10: Navarro County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Cemeteries			
56, 75, 94	Anderson Family Cemetery	SW CR 0040, Richland, TX 76681	3A, 3B, 3C
60, 79	Shelton Family Cemetery	SW CR 2410, Richland, TX 76681	3A, 3B

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-11: Freestone County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Church			
106	Mount Zion Missionary Baptist Church	700 IH-45, Fairfield, TX 75840	3C
Community Center			
162	Furney-Richardson Community Center (Historic)	Teague, TX 75860	4
Cemeteries			
102	Johnson 2 (HTC)	CR 1131, Fairfield, TX 75840	3C
102	Johnson 1	CR 1131, Fairfield, TX 75840	3C
154	Red	CR 995, Wortham, TX 76693	4
164	Unknown Cemetery (S of Asia)	CR 844, Mexia, TX 7667	4

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-12: Limestone County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Churches			
172	New Hope Church	CR 884, Jewett, TX 75846	4
Cemeteries			
168	Personville Cemetery	Yeagua Street, Groesbeck, TX 76642	4
172	New Hope Cemetery	CR 884, Jewett, TX 75846	4

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-13: Leon County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Schools			
177	Leon ISD Campus	12168 US Highway 79, Jewett, TX 75846	4
Churches			
117	Miracle Christian Center	1109 N Hill Street, Buffalo, TX 75831	4
126	Hopewell Church	Centerville, TX 75833	3C
174	Little Flock Church	Jewett, TX 75846	4
Community Centers			
117	Buffalo Civic Center/Library	1005 Hill Street, Buffalo, TX 75831	3C
Cemeteries			
119	Graham Cemetery	Buffalo, TX 75831	3C
121	Nettles Cemetery	Buffalo, TX 75831	3C
121	Liberty Cemetery	CR 303 Cemetery, Buffalo, TX 75831	3C
174	Little Flock Cemetery	20190 FM Road 1512, Jewett, TX 75846	4

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-14: Madison County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Churches			
140	The Dwelling Place Church	2185 Waldrip Road, Madisonville, TX 77864	3C
145	Fellowship Church	FM 1452, Madisonville, TX 77864	3C
191	Union Church	FM 2289, Normangee, TX 77871	4
Cemeteries			
140	Sweet Home	Waldrip Road, Madisonville, TX 77864	3C
190	Randolph Cemetery	5577 Dawkins Road, Normangee, TX 77871	4
192	Ten Mile Cemetery	FM 2289, Normangee, TX 77871	4
196	Oxford Cemetery	8150 HWY 21, Madisonville, TX 77864	4

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-15: Grimes County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Churches			
152, 202	Shiloh Church	FM 1696, Bedias, TX 77831	5
Cemeteries			
151	Grimes County Bethel Cemetery	FM 410B, Madisonville, TX 77831	5
152, 202	Pankey-Shiloh	FM 1696, Bedias, TX 77831	5
206	Union Hill	CR 150, Bedias, TX 77831	5
208, 209	Singleton	CR 176, Singleton, TX 77831	5
212	Ratliff	7554 HWY 90, Anderson, TX 77830	5

Table 3.14-15: Grimes County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
212	Old Oakland	3796 CR 219, Anderson, TX 77830	5
216	Mason	CR 222, Anderson, TX 77830	5

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-16: Waller County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Community Center			
233	Science of the Soul Study Center	24689 Kickapoo Road, Hockley TX 77447	5

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

Table 3.14-17: Harris County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Schools			
244	The Connection School of Houston	15815 House and Hahl Road, Cypress, TX 77433	5
246	Cy-Fair Senior High School	22602 Hempstead Highway, Cypress, TX 77429	5
246	Arnold Middle School	11111 Telge Road, Cypress, TX 77429	5
247	Cypress Falls Senior High School	9811 Huffmeister Road, Houston, TX 77095	5
250	Dean Middle School	14104 Reo Street, Houston TX 77040	5
250	Bane Elementary School	5805 Kaiser Street, Houston, TX 77040	5
251	The Panda Path School Spring Branch ISD	8575 Pitner Road Houston, TX 77080	5
253-254,256	HISD Hattie Mae White Educational Support Center	4400 W 18th St, Houston, TX 77092	Northwest Mall Terminal
254	Awty International School	7455 Awty School Lane, Houston, TX 77055	Northwest Transit Center Terminal
255,257	Awty International School Early Learning Campus	1110 N. Post Oak Road, Houston, TX 77055	Northwest Transit Center Terminal
Churches			
244	St. Aidan's Episcopal Church	13131 Fry Road, Cypress, TX 77433	5
248	Jersey Village Baptist Church	16518 Jersey Drive, Jersey Village, TX 77040	5
250	Mountain of Faith Christian Center Church	10135 Talley Lane, Houston, TX 77041	5
250	Fairbanks United Methodist Church	14210 Aston Street, Houston, TX 77040	5
250	Christian Family Church	14406 Hempstead Road, Houston, TX 77040	5
250	First United Methodist Korean Church	14184 Reo Street, Houston, TX 77040	5
252	Templo Pentecostal Gestemani	Ryson Street, Houston, TX 77080	5
252	Church of Christ – Brookhollow	W 34^{t} Street, Houston, TX 77092	5
252	Hindu Worship Society	2223 Wirtcrest Lane, Houston, TX 77055	5
252	Assurance of Hope Church of God in Christ	3038 Antoine Drive, Houston, TX 77092	5
253	Templo El Buen Samaritano	6640 Long Point Road, Houston, TX 77055	5

Table 3.14-17: Harris County Community Facilities			
Mapbook Page	**Name**	**Address**	**Segment**
Community Centers			
246	Veterans of Foreign Wars	21902 Northwest Freeway, Cypress, TX 77429	5
251	Spring Spirit Sports and Education Complex	8526 Pitner Road, Houston, TX 77080	5
251	Spring Branch Family Development Center	8575 Pitner Road, Houston, TX 77080	5
252	Northwest Educational Center	2910 Antoine Drive #107, Houston, TX 77092	5
253-254,256	HISD Delmar Sports Complex	2020 Magnum Road, Houston, TX, 77092	Northwest Mall Terminal
Cemeteries			
250	Fairbanks	Stonington Street, Houston, TX 77040	5
254	Beth Yeshurun-Post Oak	1037 N Post Oak Road, Houston, TX 77055	5
Hospital			
246	North Cypress Medical Center	21214 Northwest Freeway, Cypress, TX 77429	5

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2019

3.14.5 Environmental Consequences

3.14.5.1 No Build Alternative

Growth in population, households and employment would occur under the No Build and Build Alternatives with the Houston Terminal Station Options. Projected 2040 demographic growth representing the No Build Alternative is summarized in **Table 3.14-4**.

Under the No Build Alternative, TCRR would not construct or operate an HSR system and its associated facilities. The potential for impacts from implementation of the Project on community character, demographic composition, children's health and safety and community facilities within the Study Area would not occur, nor would potential economic impacts (positive or negative) associated with the Project.

Without the Project, increasing demand for intercity travel between Dallas and Houston may result in additional infrastructure improvements along interstates or other modes of travel. The construction of this additional infrastructure could have negative socioeconomic impacts, such as property acquisitions and displacements of residential and business populations, and stresses on locally provided services, as well as positive or negative economic impacts.

3.14.5.2 Build Alternatives

3.14.5.2.1 Impacts Common to All Build Alternatives

Construction Impacts

Construction of the Project would include ground clearing, placement of fill material for track temporary staging areas; new, replaced or extended culverts and bridges and temporary access road development. These activities support construction and would occur in the Study Area for all Build Alternatives. During construction, short-term impacts from increased noise, dust and vehicular congestion resulting from road closures and detours could occur within communities. These are further discussed with mitigation measures in **Section 3.2, Air Quality; Section 3.4, Noise and Vibration;** and **Section 3.11,**

Transportation. Specific construction impacts relating to identified communities are described in **Section 3.14.5.2.2, Impacts to Community Character and Cohesion**. Some economic impacts associated with construction, such as the influx of capital investment and construction-related job growth, would be common to all Build Alternatives. However, economic impacts are presented as the net impact to jobs, earnings and tax revenue across a variety of tax mechanisms and economic indicators, some of which do vary by alternative. For more information, see **Section 3.14.5.2.3, Economic Impacts**.

Operational Impacts

Localized changes in demographics would result from the Project's displacement of residences and businesses, as described in **Appendix E, Land Use Technical Memorandum.** Some migration to the metropolitan regions may occur to fill employment vacancies or as a result of improved transportation conditions; however, the overall demographic composition of the region would not perceptibly change. Some economic impacts associated with operation of the Project, such as the employment and earnings of TCRR's employees and projected job growth in supporting industries, would be common to all Build Alternatives. However, economic impacts are presented as the net impact to jobs, earnings and tax revenue across a variety of tax mechanisms and economic factors, some of which do vary by alternative. For more information, see **Section 3.14.5.2.3, Economic Impacts**.

3.14.5.2.2 Impacts to Community Character and Cohesion

Community character is defined by a community's geographic location, typology, diversity, and spatial location of physical structures (including transportation and/or utility infrastructure and residential structures), general population density, general aesthetic and visual appearance (including green and or open/recreational space), and general assessment of land uses. Per this definition, a community must have some element of residential use. Cohesion is reflected in the neighborhood's ability to function and be recognized as a singular unit. Community cohesion is a function of density and can be a concern, particularly in urban and suburban areas where a transportation infrastructure can create a localized barrier between a residential community and social or commercial resources. In rural areas, which are less dense, there would be more flexibility to maintain connectivity, especially to community facilities.

Linear transportation infrastructure, such as the Project, have a narrow footprint and typically do not substantially change the pattern and intensity of land use in the broader cities and counties in which they are located. TCRR designed the Project to avoid and minimize impacts to established communities to the maximum extent practicable. From a community character and cohesion perspective, the impact of converting existing land use to a transportation use is dependent on the Project's track configuration (i.e., at-grade, embankment or viaduct), density of the community and location of and access to community facilities.

The Project's track configuration would be a critical component to maintaining community connectivity. In some locations, the Project could create a barrier to community services. To avoid this impact approximately 55 percent of the Project has been designed on viaduct to maintain existing access to the maximum extent practicable and minimize connectivity and access impacts. Additionally, the reconfiguration and construction of existing and new roadways would minimize connectivity and access impacts.

The following paragraphs describe the potential impacts to communities where an impact to character and/or cohesion would occur. Acquisitions and displacements would be subject to negotiation by TCRR with the property owner. Also, if TCRR receives USDOT assistance for the funding of the Project, it must

comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act for all real property acquired for the Project; additional information can be found in **Section 3.13, Land Use**.

Segment 1

Downtown Dallas

The area around the station site is currently transitioning from mostly older or abandoned industrial structures to new and/or redeveloped recreational, commercial and mixed-use development. New restaurants and movie theatres have recently opened. This area also includes the Jack Evans Police Headquarters. Residential uses would be a quarter-mile from the station location and separated by the UPRR ROW. Residential uses include multi-family apartment complexes, low-density townhomes and single-family homes. The introduction of a newly constructed station in an area currently undergoing a transition would not impact community character as adjacent uses are already commercial and mixed-use. The Dallas Terminal Station would not bisect any neighborhoods or impact community cohesion. The addition of the station and the overall transportation amenities would be compatible with the existing roadway and highway network, large artistic bridges and overall development within the downtown area.

Le May and Le Forge Neighborhood

Within Dallas County, one neighborhood of 34 homes on 40 lots located between Illinois Avenue and Loop 12 would be directly affected by the Project. This neighborhood is also discussed in **Section 3.18.5.3.6, Environmental Justice, Aesthetics and Scenic Resources**. Two streets, Le May and Le Forge Avenues, create a horseshoe-shaped neighborhood that is completely isolated from the rest of the Cedar Crest community and is bounded by two transportation corridors – IH-45 on the east and UPRR on the west. Located to the west of UPRR, the Cedar Crest community is a City of Dallas neighborhood that consists of more than 500 homes primarily located between IH-35E and IH-45. Segment 1 of the Build Alternatives would parallel UPRR and pass on viaduct to the east of the greater Cedar Crest community and cut through the western edge of the Le May and Le Forge neighborhood, permanently displacing a minimum of 14 homes in this low-income, minority area. Due to this neighborhood's isolation, the character of the larger Cedar Crest community would not be adversely impacted by this displacement; however, the cohesive character of the Le May and Le Forge neighborhood would be impacted. Only 20 homes would remain, and a portion of Le May and Le Forge Avenues would be adjacent to the viaduct infrastructure. In order to mitigate community cohesion impacts to the Le May and Le Forge neighborhood, TCRR is required to relocate the entire neighborhood as described in **Section 3.18.6.1, Environmental Justice, Mitigation Measures, EJ-MM#1: Le May and Le Forge Neighborhood Mitigation**. It may be possible to relocate residents of the Le May and Le Forge neighborhood within the Cedar Crest community. If the Le May and Le Forge residents were relocated to Cedar Crest they would represent less than 10 percent of the Cedar Crest community.

In 2018 the average total value for the single-family homes in the Le May and Le Forge neighborhood per Dallas Appraisal District was $21,292.[15] A search of available real estate in the 75216 zip-code, where the Le May and Le Forge neighborhood is located, showed 97 homes for sale, ranging from $61,000 to $269,000.[16] Additionally, there are 16 vacant lots available from $25,000 to $52,000. Although ample replacement housing is available within 3 miles of the neighborhood, it may not be accessible to all residents of Le May and Le Forge. In addition, the available housing may not replicate

[15] AECOM calculation based on 2018 Dallas County Appraisal District data.
[16] Zillow, "Homes for Sale, Homes for Rent and Apartments for Rent Search," accessed February 2020, http://www.zillow.com/.

the existing community cohesion. For example, an elderly resident may currently receive care from a neighbor, or another resident may currently provide childcare for a neighbor. If the residents do not have the ability to financially replace these services, a greater burden would be added to the residents than just the relocation of their home. Outreach efforts to this community to understand the existing connections between residents are documented in **Section 3.18.3.6, Environmental Justice, Outreach,** and **Section 3.18.5.3.9, Environmental Justice, Community Cohesion**. **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation** is specific to the Le May and Le Forge neighborhood and detailed in **Section 3.18.6, Environmental Justice, Avoidance, Minimization and Mitigation**.

Hash Road and Nail Drive Community

This community of approximately 14 homes ranging from mobile homes and vacant lots to large lot single-family homes is located in southern Dallas County at the intersection of Hash Road and Nail Drive. This community is also discussed in **Section 3.18.5, Environmental Justice, Environmental Consequences**. Segment 1 of the Build Alternatives would displace approximately eight homes on the west side of Nail Drive. Remaining homes on the east side of Nail Drive would have the Project crossing on the west side of Nail Drive via cut track configuration crossing under Hash Road and transitioning to embankment farther southeast. Potential aesthetic and visual impacts would be mitigated through BMPs outlined in **Section 3.10, Aesthetics and Scenic Resources**. Addition of the Project would alter the cohesion and character of this rural community.

Segments 2A, 2B, 3A, 3B, 3C and 4

FRA did not identify community impacts that would potentially bisect, cut through, displace or isolate a community or significant number of residential units within populations along these segments. Therefore, no impacts to community character and cohesion would occur along these segments as a result of the Project.

Segment 5

Saddle Creek Forest Development

This custom home development is located along the Grimes and Waller County line on Riley Road and Saddle Creek Forest Parkway. Lot sizes range up to 8 acres and the community has 7 miles of riding trails and several small lakes.[17] While the development's infrastructure is in place, a majority (approximately 83 percent) of the lots are vacant. The development is traversed by the CenterPoint high-voltage transmission line. Segment 5 would directly impact 14 undeveloped parcels on the east side of the transmission line, resulting in acquisition of those parcels. This would account for 2.9 percent of the 479 developable lots in the development. There are 27 vacant lots and one house for sale in the Saddle Creek Forest gated community.[18] These undeveloped lots are valued at $29,500 to $99,000. Additionally, vacant lots in Saddle Creek Forest are "build to suit," meaning that an individual must hire contractors to develop their private lot. The neighborhood adopted its Declaration of Covenants, Conditions and Restrictions in 2005; therefore, vacant lots have likely been vacant for more than a decade. FRA reviewed the Grimes County Appraisal District data and determined that individual landowners purchased the 14 vacant lots and in some cases, a single landowner may own more than one of the impacted lots. The Project would not adversely impact the community character and

[17] Saddle Creek Forest POA, "Living in Saddle Creek Forest POA," accessed February 2020, http://www.saddlecreekforestpoa.com/1.
[18] Zillow, "Homes for Sale, Homes for Rent and Apartments for Rent Search," accessed January 2019, http://www.zillow.com/.

cohesion of this development as the lots to be acquired are undeveloped parcels, already separated from the neighborhood by overhead transmission lines.

Plantation Forest Development [Magnolia Place and Magnolia Plantation Subdivision]

The Plantation Forest Development is located along Plantation Drive, a north-south oriented street located in Waller County adjacent to the Saddle Creek Forest Development. The development is located within a low income or minority block group, and this community is also discussed in **Section 3.18, Environmental Justice**. The character in this area is a semi-rural single-family residential development with lots typically 1 acre in size. Plantation Forest runs parallel to the existing CenterPoint high-voltage transmission line and has 26 homes that range in value from $46,000 to $320,000. The same houses and lots noted for sale within the vicinity of the Saddle Creek Forest Development are also within a 3-mile radius of the Plantation Forest neighborhood. There are no homes listed for sale in the Plantation Forest Development and there are four undeveloped lots.[19] Segment 5 would be constructed on embankment through the Plantation Forest Development. The Project would directly impact and displace 12 of the homes on the west side of Plantation Drive. The remaining 14 homes on the east side would not be directly impacted, but the community character and cohesion would be altered with the addition of the HSR system. Landowners who previously had views of other homes in this development would now see the HSR system. Approaching Riley Road, which intersects Plantation Drive, the Project would transition from embankment to viaduct. Appropriate screening would be necessary to mitigate visual impacts of the HSR system crossing on embankment through the neighborhood and on viaduct at the approach of Riley Road. TCRR shall mitigate potential aesthetic and visual impacts due to the rail's proximity to the neighborhood as outlined in **AS-MM#1: Visual Screening** and **AS-MM#2: Design Stations to Adapt to Local Context**. Visual and aesthetic mitigation measures can be found in **Section 3.10, Aesthetics and Scenic Resources,** and **Section 3.18 Environmental Justice**. According to the **Section 3.4, Noise and Vibration** analysis, moderate noise impacts would occur at homes that are not displaced by the LOD.

White Oak Falls Neighborhood

White Oak Falls is a neighborhood development located in Cypress, Texas, adjacent to Cy-Falls Senior High School. The community contains more than 700 homes. Approximately 66 homes, adjacent to the existing UPRR ROW, would be displaced by Segment 5. According to Harris County Appraisal District 2018 information, homes adjacent to the UPRR ROW range from approximately $160,000 to $220,000. The neighborhood is not located within a low income or minority identified block group. There are 284 homes for sale in a 3-mile radius of the neighborhood. These homes range in value from $100,000 to $700,000. Due to the location of these homes (along the perimeter) within the neighborhood, the displacement of these homes would not result in an adverse impact to the cohesion of the entire neighborhood. The remaining homes in the neighborhood would not be bisected by Segment 5. Homes that would remain on Kirkland Woods Drive, Twila Springs Drive and May Showers Circle, nearest to Segment 5, would experience moderate noise impacts as shown in **Section 3.4.5.2.4, Noise and Vibration, HSR Operational Noise Impacts,** and would not require noise mitigation measures. Visual and aesthetic impacts as a result of the Project would affect homes on the perimeter of the White Oak Falls neighborhood. The adjacent HSR system infrastructure would be elevated approximately 45 feet from ground level and highly visible. Currently, a vegetation barrier (i.e., row of dense shrubbery) screens and separates the homes from the existing UPRR ROW. TCRR shall mitigate visual impacts as outlined in **AS-MM#1: Visual Screening** and **AS-MM#2: Design Stations to Adapt to Local Context**. Additional

[19] Ibid.

mitigation measures are detailed in **Section 3.10.7, Aesthetics and Scenic Resources, Build Alternatives Comparison**.

Houston Terminal Station Options

There are three Houston Terminal Station Options. The Houston Industrial Site Terminal Station Option would convert about 104 acres of primarily industrial, commercial and vacant lands to a transportation-related use. There are no residences located within the footprint of the Houston Industrial Station Option; therefore, construction and operation of the Houston Industrial Site Terminal Station Option would not substantially change the community character and cohesion of the area. However, the edge of the LOD would abut an established neighborhood to the west of the station location. No severe or moderate noise impacts were identified in this location in **Section 3.4, Noise and Vibration**.

The Houston Northwest Mall Terminal Station Option would not adversely impact community character or cohesion as there are no residential uses in the immediate area of the station. The addition of the station would convert about 95 acres of predominately commercial land to transportation.

The Houston Northwest Transit Center Terminal Station Option would convert approximately 85 acres of commercial and vacant land to a transportation use. The station location would not displace any residential structures in its immediate footprint; however, a multi-family apartment complex would be adjacent to the LOD. Additionally, the main campus of the Awty International School is approximately a quarter-mile from the Houston Northwest Transit Center Terminal Station Option. An Awty International School Early Learning Campus would be displaced by the Houston Northwest Transit Center Terminal Station Option and would require mitigation to minimize the community facilities impact. The character of this area is generally urban with primarily commercial uses. The analysis completed in **Section 3.4, Noise and Vibration,** did not identify noise impacts at these locations.

Construction and operation of the Houston Northwest Transit Center Terminal Station Option would enhance regional connectivity by offering a direct connection to the existing Houston Metro bus service. Additionally, the City of Houston and the Gulf Coast Rail District are studying potential commuter rail connections from the proposed terminal station option to downtown Houston, which could add additional mode choices to the regional network. The addition of the Northwest Transit Center Terminal Station Option would be compatible with existing land uses, and not interrupt the cohesion of any neighborhoods. Therefore, no adverse impacts to community character or cohesion would occur.

3.14.5.2.3 Economic Impacts

This section describes potential direct and indirect impacts on the economy that may occur as a result of the Project. The economic modeling for this EIS considers the overall direct and indirect impacts to the economy that may occur as a result of the Project, including employment and earnings, property impacts, property tax and net change in tax revenue. Indirect effects of an action may occur later in time or as part of a chain of events but are still reasonably foreseeable. Indirect economic impacts would occur when an initial change in spending results in diminishing rounds of new spending as financial resources work their way through an economy. With each new round of spending, some financial resources leave the economy in the form of savings, taxes and imports. Direct and indirect economic impacts can be either temporary, such as those from construction or capital investments, or permanent resulting from continued operation of the HSR system.

TCRR reported that it would pay a total of $2.5 billion in taxes to state and local jurisdictions by the year 2040.[20] This estimate does not include detail sufficient to distinguish annual sales tax and property tax impacts. An independent analysis, detailed in the following sections, confirms a net positive tax impact, estimated to generate between $3.1 billion and $3.6 billion in state and local tax revenues by 2040. Over the timeframe between this analysis and TCRR's initial reports, the potential impact to ROW and potential property displacement has been refined to minimize potential negative impacts. This has limited the negative economic impact associated with removal of productive structures and increased the overall positive economic impact associated with the Project. This potential tax revenue represents a positive impact to local and state jurisdictions, many of which would experience an increase in operating budget as a result of implementation of the Project.

Temporary Impacts: Capital Investment

TCRR estimates capital costs for the HSR system between $16 billion and $19 billion ($2019). Similarly, detailed cost estimates are not available for each Build Alternative; however, the range of capital costs is sufficient to estimate employment, earnings and tax impacts resulting from TCRR's capital investment. The capital estimate includes construction labor, materials, indirect costs and approximately $2.6 billion for systems and rolling stock. Systems and rolling stock, which would likely be sourced from outside of the state, were excluded from estimates of induced spending within the local economy. ROW acquisition costs offset the loss of existing economic uses and do not create new economic value other than through real estate transaction fees, which are not included in this analysis. TCRR's Construction Cost Estimates are provided in **Table 3.14-18** as well as **Appendix F**, **TCRR Final Conceptual Engineering Design and Constructability Reports**.

Table 3.14-18: Construction Cost Estimate, 2019

Direct Labor, Materials, & Equipment Costs (61%)	$8.7B
Indirect Costs[a] (39%)	$5.6B
Total Civil Infrastructure & Fixed Facilities	**$14.3B +/- $1B**
Systems & Rolling Stock[b]	$2.5B +/- $.5B
Total Construction Cost Estimate	**$16.8B +/- $1.5B**

Source: Appendix A8 of the TCRR Constructability report v7.

[a] Includes overhead & profit, design services, safety, QA/QC, project administration, etc.

[b] Includes signals, power distribution, communications, train control, fare collection, and rolling stock.

The injection of capital into the construction and professional industries would lead to direct, indirect and induced employment earnings of up to $10.8 billion in the State of Texas, spurring an additional $359 million in state and local tax revenue. The impact within each Economic Analysis Area is shown in **Table 3.14-19.** These impacts would be spread over the pre-operational period, which would include the engineering, acquisition, construction and procurement phases. The numbers below reflect the sum of all employment earnings and tax revenue accrued over the pre-operational period.

[20] Texas Central Railway, accessed February 2020, https://www.texascentral.com/infrastructure/.

Table 3.14-19: One-time Capital Investment Impacts				
Economic Analysis Area	**Total Earnings (2019 millions)**	**Employment (Job Years)**	**Local Sales Tax (2019 millions)**	**State Sales & Excise Tax (2019 millions)**
All Project Counties	$6,395	120,688	$44.5	$175.7
Dallas County	$1,972	36,826	$13.7	$51.6
Harris County	$2,720	51,387	$20.9	$77.8
Intermediate Counties	$919	17,263	$4.6	$24.9
State of Texas	$10,814	214,760	$63.8	$295.5

Source: AECOM 2019

Temporary Impacts: Construction

Construction of the Project has the potential to impact the economy of the Study Area in both positive and negative ways. As described in **Table 3.14-19**, over 120,000 annual employment positions and approximately $6.4 billion in additional earnings would accrue to the Project counties as a result of the capital investment. However, some individual businesses near the LOD may experience reduced customer access, excessive vibration or noise, visual clutter that deters customers or other effects that may serve to temporarily diminish the profitability of the business.

The effect of construction would depend on the nature and market of each potentially affected business. For example, businesses providing food, lodging or personal items that may be used by construction employees may experience a positive impact. Businesses providing specialty or niche services or those that do not interact with customers on-site may not experience any negative effects, provided basic access would be maintained. Businesses that rely on a quiet environment (e.g., audio/video production, day care centers) may be negatively impacted by construction. Measures that would be taken to reduce the effects of noise and vibration are documented in **Section 3.4.6, Noise and Vibration, Avoidance, Minimization and Mitigation** and remedies for individual businesses affected by system operation or Project Construction are detailed in **Section 3.13.6.2, Land Use, Mitigation Measures**. At a regional level, however, any negative impacts to businesses during construction would be temporary and likely offset by the increased spending of temporary construction workers. Therefore, any negative impacts to individual businesses would not be adverse to the regional economy.

Although a substantial investment, the Project's annual construction cost would represent 3 percent of the state's $93 billion ($2019) construction Gross Domestic Product (GDP)[21] and is not likely to create an undue burden on the other construction projects or construction labor capabilities within the state. As discussed in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, the majority of the aggregates used for ballast, sub-ballast, concrete and other needs would come from existing quarries located within the State of Texas. A preliminary estimate of materials required for HSR line construction is contained in **Appendix E, Air Quality Technical Memorandum**. Sand and rock aggregates and materials utilized for concrete mixes would come primarily from regional sources of commercially established quarries and mills within 50 to 200 miles. However, it is anticipated that some aggregates would need to be purchased from out of state quarries. The RIMS II multipliers used for the economic impact analysis account for some degree of purchases occurring outside the Study Area based on regional and industry trends, and by using these multipliers, this analysis assumes that the regional economy would capture a similar proportion of the Project's aggregate needs.

[21] BEA, Interactive Tables, accessed February 2020, https://www.bea.gov/data/gdp/gdp-state.

Permanent Impacts: Employment, Earnings, and Sales and Excise Tax

The Project would create new permanent HSR jobs to operate and maintain the HSR system. TCRR's staffing estimates are consistent across all Build Alternatives. These positions represent net new jobs, over and above the current projected job growth in the Study Area**. Table 3.14-20** summarizes the county, location, and estimated volume of new HSR jobs created. These numbers represent jobs created by the HSR system directly and do not capture additional employment supported through the spending by new employees and purchases of supplies. The majority of new HSR jobs would be located in Dallas County or Harris County, at the urban stations and TMFs.

Table 3.14-20 also describes the net increase in HSR jobs compared to the existing job base in each Economic Analysis Area to determine whether these would be large or small job gains for these economies. Direct employment and earnings growth (as a percentage of existing employment and earnings, respectively) would be highest for the Intermediate Counties Economic Analysis Area with 0.2 percent and 2.2 percent growth, respectively. However, all Economic Analysis Areas would experience a growth in earnings.

Table 3.14-20: Direct Employment and Earnings Impacts

Economic Analysis Area	Direct Employment (minimum annual)[a]	Percent of Existing Employment	Percent of Existing Unemployment	Direct Annual Earnings (2019 millions)	Percent of Existing Earnings
All Project Counties	1494	<0.1%	0.6%	$ 94.9	<0.1%
Dallas County	604	<0.1%	0.8%	$ 37.6	< 0.1%
Harris County	620	<0.1%	0.4%	$ 38.6	< 0.1%
Intermediate Counties	164	0.2%	1.6%	$ 10.1	2.2%
State of Texas	1494	<0.1%	0.2%	$ 94.9	0.3%

Source: AECOM 2019

[a] TCRR staffing assumptions include growth between 2023 and 2040, reflecting anticipated increases in ridership and services. This analysis uses the more conservative 2023 staffing assumptions throughout the life of the Project to avoid speculation as to the Project's viability or ridership potential.

The total direct and indirect effects on employment and earnings, as determined using RIMS II multipliers, are shown in **Table 3.14-21**. Every permanent job from the HSR system would indirectly spur two to four jobs in supporting industries based on the Economic Analysis Area economy. These additional jobs would generate larger beneficial impacts to employment earnings than those paid directly by TCRR. The total of these direct and indirect impacts to earnings were used to estimate the potential increase in spending and associated sales tax revenues. With average taxable expenditures ranging from 35 to 45 percent, these earnings result in approximately $6.3 million annual sales tax revenue for the state, and a combined $1.5 million in sales tax revenue for local jurisdictions. This positive impact on tax revenues would occur annually, as it would create permanent changes to employment and earnings within the regional economy.

Table 3.14-21: Permanent Employment Impacts				
Economic Analysis Area	**Annual Earnings (2019 millions)**	**Employment (minimum annual) [a, b]**	**Local Sales Tax (2019 millions)**	**State Sales & Excise Tax (2019 millions)**
All Project Counties	$215	5,588	$1.5	$5.9
Dallas County	$83	2,255	$0.6	$2.2
Harris County	$80	2,102	$0.6	$2.3
Intermediate Counties	$15	359	$0.1	$0.4
State of Texas	$232	6,403	$1.5	$6.3

Source: AECOM 2019

[a] TCRR staffing assumptions include growth between 2023 and 2040, reflecting anticipated increases in ridership and services. This analysis uses the more conservative 2023 staffing assumptions throughout the life of the Project to avoid speculation as to the Project's viability or ridership potential.

[b] Employment, earnings and tax estimates are based on economic demand and do not include potential losses for businesses displaced by the Project that are unable to relocate within the Study Area or new businesses attracted to the area for reasons not related to induced demand.

The net new employment and earnings projected to be generated by the Project would result in positive impacts in all Economic Analysis Areas. Indirect job growth would account for approximately 2 percent of total unemployment or less and would primarily be in service and support industries that could be filled from within the Economic Analysis Area. Positive job growth would not be likely to create burdensome demands on a region's existing labor supply or require additional population growth to support these positions. Therefore, no impact to expansion of community facilities, such as schools, libraries, parks, municipal utilities, hospitals or emergency services, would occur beyond those necessary to serve the natural growth under the No Build Alternative.

Permanent Impacts: Property Premiums

Operation and maintenance of the Project could also lead to development and changes to property values around station areas. Economies of agglomeration would result from improved transportation efficiency between the Dallas Terminal Station, the Brazos Valley Intermediate Station and the three Houston Terminal Station Options. Fast, reliable and economically competitive transportation could increase the supply of skilled workers available, decrease the costs of work-related travel and improve supply chains for an overall positive impact to the Study Area.

Studies have shown a positive effect between residential and commercial property values and rapid rail/commuter transit.[22] Rapid rail and commuter rail systems, which operate at higher speeds and provide a more regionally accessible transit system, have a wider sphere of influence for positive land premiums around stations compared to light rail transit. The HSR system would operate at even higher speeds and provide a connection between the two most populous cities in Texas, so it is assumed that property values around the Project's proposed station areas would experience a similar positive impact.

[22] The analysis of property premiums around stations relies on a variety of literature documenting the station area effects of mass transit (including both light rail, commuter rail, and HSR projects) as well as professional judgement. The variety of available studies utilize differing methodology and approaches; however, the primary factors that can influence property values would be of a similar nature for HSR technology as for traditional mass transit. For example, presence of hazardous freight cargo is negatively correlated with property values, but, as for studies of traditional mass transit, the HSR Project does not involve the transportation of hazardous materials. Noise and vibration are negatively correlated with property values, but, similar to traditional mass transit, Project noise levels are not expected to exceed that of the background environment where stations are planned. Station area activity (the movement of people in and around the stations) is positively correlated with property premiums, and Project ridership estimates indicate higher levels of station area activity than for traditional rail transit projects. As a result, the factors used for this analysis are assumed to be conservative estimates of the potential for property value growth around station areas.

Data are less clear regarding the potential effects on property values near rail corridors without nearby station access. Where the effects were studied, some projects resulted in a minor impact or temporary negative impacts prior to operations that dissipated as Project details were refined. One study in San Francisco showed a possible negative relationship for residential properties within 984 feet of the Caltrain rapid/commuter rail line ROW. At the time of the study, the Caltrain rapid/commuter rail line was diesel powered and produced more noise[23] than other projects studied and would not be comparable to the proposed HSR system.

Many of the reasons for decreased property values around other transportation projects, such as noise and vibration impacts, would not apply to the electrified HSR design. To the extent that noise or vibration levels could negatively impact specific individual properties, mitigation measures, as described in **Section 3.4.6.2, Noise and Vibration, Mitigation Measures**, would be applied. All properties identified as permanent acquisitions, whether to accommodate the Project or as part of an environmental mitigation strategy, were accounted for economically in the property tax impact discussion below. The potential for negative property value impacts would be limited and would be offset by an equally likely potential for a positive station area impacts that would exceed expectations. As a result, no macro-level economic effects are anticipated.

The operation of the HSR system would provide riders within a half-mile of the stations with greater access to the other HSR stations, thereby broadening the regional economy. As a result, residents and commercial businesses may be willing to pay a premium for locations near stations. An estimate of the potential increase in property value around these stations is shown in **Table 3.14-22.** This estimate does not include any new development or large-scale redevelopment projects. The property premium would likely take effect 1 year before the opening of the service, when construction would be nearing completion.

Table 3.14-22: Range of Property Premium Impacts by Station Area, $2019 (M)

Station Area	Total Value in 1/4 Mile Buffer	Total Value in 1/4 - 1/2 Mile Buffer	Property Premium for 1/4 Mile Buffer		Property Premium for 1/4-1/2 Mile Buffer		Total Premium for 1/2 Mile Buffer	
			Low (4%)	High (8%)	Low (2%)	High (4%)	Low	High
Dallas Terminal Station	$692.6	$754.3	$27.7	$55.4	$15.1	$30.2	$42.8	$85.6
Brazos Valley Intermediate Station	$6.7	$8.1	$0.3	$0.5	$0.2	$0.3	$0.4	$0.9
Northwest Transit Center Terminal Station Option	$321.1	$931.5	$12.8	$25.7	$18.6	$37.3	$31.5	$63.0
Northwest Mall Terminal Station Option	$175.4	$629.3	$7.0	$14.0	$12.6	$25.2	$19.6	$39.2
Houston Industrial Site Terminal Station Option	$295.8	$466.9	$11.8	$23.7	$9.3	$18.7	$21.2	$42.3
Total Premium in the 1/2 Mile Buffer							**Low**	**High**
Dallas Terminal Station, Brazos Valley Intermediate Station, and Houston Northwest Transit Center Terminal Station Option							**$74.7**	**$149.4**
Dallas Terminal Station, Brazos Valley Intermediate Station, and Houston Northwest Mall Terminal Station Option							**$62.8**	**$125.6**
Dallas Terminal Station, Brazos Valley Intermediate Station, and Houston Industrial Site Terminal Station Option							**$64.4**	**$128.8**

Source: AECOM 2019

[23] Parsons Brinkerhoff, *The Effect of Rail Transit on Property Values: A Summary of Studies*, February 27, 2001, accessed April 2016, https://drcog.org/documents/The_effect_of_Rail_Transit_on_Property_Values_Summary_of_Studies1.pdf.

It was estimated that within a half-mile of the proposed stations, property assessment values would increase between $62.8 million and $149.4 million. Property assessment values around the Dallas Terminal Station (Dallas County) would be expected to increase between $42.8 million and $85.6 million. Properties around the Brazos Valley Intermediate Station (Grimes County) would be expected to increase between $430,000 and $860,000 prior to any potential private investment that could occur as a result of the Project. Of the three Houston Terminal Station Options in Harris County, the Northwest Mall Terminal Station Option would have the lowest property premium of between $19.6 million and $39.2 million. The Northwest Transit Center Terminal Station Option would have the highest premium of between $31.5 million and $63.0 million. The Houston Terminal Station Options are comprised of a large amount of state and county-owned ROW. These have no value. As a result, the property premium impacts reported for the Houston Terminal Station Options may undercount the true increase in value. Increased value for state-owned parcels would not affect the tax base but could represent an increase in value for publicly owned assets. The increase in values for properties within the half-mile buffer of the stations would result in an increase of the tax base for local jurisdictions. The effect of premiums on property tax revenues is discussed in the following sections.

Permanent Impacts: Business Displacements

As documented in **Section 3.13, Land Use,** and detailed in **Appendix E, Land Use Technical Memorandum**, as many as 102 (Build Alternatives C or F, Northwest Transit Center Terminal Station Option) individual businesses could be displaced.[24] **Table 3.14-23** summarizes these impacts by county and Build Alternative. The majority of business displacements would occur in Harris County. All parcel acquisition and structure displacements resulting from Project would be negotiated between the landowner and TCRR. This analysis assumes that negotiated prices would reflect the fair market value of displaced businesses, allowing for investment in new or similar businesses outside the LOD. The overall impacts of specific business displacements on the regional economy would depend on whether or not individual business owners would choose to reinvest the proceeds from the sale of property within the Study Area and whether other investments may occur to meet the market needs left by the displaced industry.

Table 3.14-23: Number of Business Displacements and Acquisitions by Build Alternative

County	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Dallas	17	17	17	17	17	17
Ellis	0	0	0	0	0	0
Freestone	0	0	12	0	0	12
Leon	0	0	14	0	0	14
Madison	0	0	0	0	0	0
Grimes	1	1	1	1	1	1
Harris (track only)	31	31	31	31	31	31
Houston Industrial Site Terminal Station Option	14	14	14	14	14	14
Northwest Transit Center Terminal Station Option	24	24	24	24	24	24
Northwest Mall Terminal Station Option	27	27	27	27	27	27
Total	**62-75**	**62-75**	**89-102**	**62-75**	**62-75**	**89-102**

Source: AECOM 2019

[24] Includes unknown but potential displacements that could occur through acquisition.

In addition to business directly displaced by the Project, the Project could indirectly affect highway-oriented business (such as fuel or food service industries) through the reduction of travel on I-45. To the extent that a reduction in highway traffic may lead to decreased sales, the expected population growth and increasing congestion on I-45 (refer to **Section 1.2, Introduction, Purpose and Need**) would lead to increasing vehicle hours of travel on I-45, minimizing effects experienced by existing businesses. Reduced travel on I-45 as a result of the Project could dampen future business development on I-45 compared to the No Build condition. Regional sales tax projections developed for this analysis are derived from a demand-based (input-output) economic model, which estimates expenditures based on earnings. Whether travel-oriented business growth clusters along I-45 or around other travel nodes does not change the expected availability of expendable household income available within the Study Area. As a result, the locational decisions of individual businesses are not expected to noticeably affect tax revenue estimates for the region.

Permanent Impacts: Agricultural Displacements

Construction of the Project would impact agricultural production within the Study Area due to permanent land use conversion and the displacement of agricultural facilities. Since the crop types can vary year-to-year, the potential loss of income was calculated based on price per acre, as derived from data in **Table 3.13-6** (**Section 3.13, Land Use**). Loss of crops due to the permanent conversion of agricultural lands was estimated at $329 per acre. Therefore, the average loss of crop income across all Build Alternatives would range from $408,000 (Build Alternative F) to $431,000 (Build Alternative B) annually. This would represent an approximately 1 percent loss in the average annual market value of crops across all counties within the Study Area. Given that 76 percent of the All Project Counties Economic Analysis Area is agricultural, and that an average of only 24 percent of this land is being used for crop production, there would be adequate available agricultural land within the Study Area counties to offset any crop production losses. The permanent conversion of pastureland would not directly result in the loss of livestock revenue, as the primary economic asset (livestock) can be relocated more readily than agricultural crops and are less dependent on available acreage.

Permanent Impacts: Property Tax

The acquisition of property for construction of each Build Alternative would impact the available property tax revenue in a variety of ways:

- Agricultural properties or portions of properties that are taxed based on the agricultural productivity would be taxed based on the higher total appraised value once acquired by TCRR, leading to an increase in tax revenue.
- Properties or portions of properties currently receiving homestead, over-65, or disabled homeowner exemptions would not be exempt once acquired by TCRR, leading to an increase in tax revenue.
- Structural improvements displaced by construction of any of the Build Alternatives would lead to a loss in taxable value.

Table 3.14-24 summarizes the high, low and probabilistic property tax impacts due to the acquisition of real property in each Economic Analysis Area by alignment and station alternative.

Table 3.14-24: Net Change in Property Tax Revenue for Acquired Property (2017-2018 Assessments, 2019 adjusted, thousands)

Segment/Regional Totals	Future-High	Future-Low	Future-Probabilistic
Segment 1	$1,013	$136	$983
Segment 2A	$29	-$49	$18
Segment 2B	$21	-$116	$3
Segment 3A	$84	$46	$73
Segment 3B	$65	-$33	$54
Segment 3C	$199	-$10	$170
Segment 4	$133	$20	$121
Segment 5	-$56	-$10,186	-$727
Industrial Site Terminal Station Option	-$13	-$127	-$21
Northwest Mall Terminal Station Option	-$388	-$491	-$394
Northwest Transit Center Option	-$183	-$938	-$198
All Project Counties			
Alternative A	$1,203	-$10,032	$468
Alternative B	$1,183	-$10,112	$449
Alternative C	$1,184	-$10,109	$444
Alternative D	$1,195	-$10,099	$453
Alternative E	$1,176	-$10,179	$434
Alternative F	$1,177	-$10,176	$430
Dallas County			
Alternatives A-F	$1,013	$144	$983
Intermediate Counties			
Alternative A	$189	-$10,176	-$515
Alternative B	$170	-$10,256	-$534
Alternative C	$171	-$10,253	-$539
Alternative D	$182	-$10,243	-$530
Alternative E	$162	-$10,323	-$549
Alternative F	$163	-$10,320	-$553
Harris County			
Industrial Site Terminal Station Option	-$211	-$10,150	-$844
Northwest Mall Terminal Station Option	-$586	-$10,514	-$1,217
Northwest Transit Center Option	-$381	-$10,961	-$1,022
State of Texas			
Alternative A	$1,203	-$10,032	$468
Alternative B	$1,183	-$10,112	$449
Alternative C	$1,184	-$10,109	$444
Alternative D	$1,195	-$10,099	$453
Alternative E	$1,176	-$10,179	$434
Alternative F	$1,177	-$10,176	$430

Source: AECOM 2019

Notes: Leon County tax impacts are based on weighted blend of taxable values per acre for all segments in Navarro, Freestone, Limestone, Madison and Grimes Counties.

In addition to impacts from land acquisitions, the improvements constructed under the Project would generate tax revenue for the jurisdictions in which they would be located. Construction cost estimates from TCRR were allocated to each jurisdiction as described in **Section 3.14.3, Methodology**. These costs were used to generate an estimate of potential taxable improvements and projected tax revenues in each county, as summarized in **Table 3.14-25**. Because these property taxes are based on built improvements, they would be subject to depreciation as the assets age. Figures in the **Table 3.14-25**

would reflect the first year of operation, with annual depreciation as noted. All values are given in current-year (2019) dollar values.

Table 3.14-25: Estimated Property Tax Revenue from HSR Improvements (2019 millions)

Asset	Estimated Value of Asset	Estimated Year-built Tax Revenue	Annual Depreciation of Tax Revenue
Dallas Terminal Station	$160	$4.56	$0.08
Brazos Valley Intermediate Station	$10	$0.19	$0.00
Houston Terminal Station	$160	$4.05	$0.07
Dallas TMF	$520	$14.82	$0.27
MOW-EW-1 / MOW-EE-1	$140	$2.67	$0.05
MOW-WT-2 / MOW-IH-1	$140	$2.69	$0.05
MOW-WT-2 / MOW-IH-2	$140	$2.49	$0.05
MOW-HN-2	$140	$2.66	$0.05
MOW-HN-5	$140	$3.14	$0.06
Houston TMF	$520	$11.65	$0.22
Track	$6,930	$139.87 - $140.07	$3.68
Total	**$9,000**	**$187.99 - $188.19**	**$4.95**

Source: AECOM 2019

The property premium around station areas discussed in the previous section would also generate property tax revenue, providing an additional benefit to the taxing jurisdictions. As shown in **Table 3.14-26,** all Houston Terminal Station Options would add the highest potential revenue of proposed station areas. The Houston Industrial Site Terminal Station Option would generate the highest potential revenue for Harris County and local jurisdictions. Tax revenues for the Dallas Terminal and Brazos Valley Intermediate Stations would apply to all Build Alternatives.

Table 3.14-26: Estimated Tax Revenue from Property Premium (2017-2018 Assessments, 2019 adjusted, millions)

Station	Total Station Premium (Low)	Tax Revenue on Station Premium (Low)	Total Station Premium (High)	Tax Revenue on Station Premium (High)
Dallas Terminal Station	$42.79	$1.12	$85.58	$2.25
Brazos Valley Intermediate Station	$0.43	$0.01	$0.86	$0.02
Industrial Site Terminal Station Option	$31.48	$0.70	$62.95	$1.39
Northwest Mall Terminal Station Option	$19.60	$0.43	$39.20	$0.87
Northwest Transit Center Terminal Station Option	$21.17	$0.47	$42.34	$0.94

Source: AECOM 2019

The combined effect of property acquisition, capital investment, and station area premiums on property tax revenues across the 10-County Economic Analysis Area would be positive for each of the Build Alternatives, with a total property tax impact along the corridor that could range between $2.6 billion and $3.1 billion by the year 2040, as shown in **Table 3.14-27**. Differences between Build Alternatives are minimal and are described in **Section 3.14.7, Build Alternatives Comparison**. The impact to property tax revenue would be beneficial for all local jurisdictions throughout the Study Area. These additional

resources would benefit schools, libraries, parks, municipal utilities, hospitals and emergency services that are funded through property taxes.

Table 3.14-27: Net Property Tax Impact of Acquisitions, Improvements and Station Area Premiums through 2040 (2019 millions)

Economic Analysis Area	Low	High
All Project Counties	$2,609	$3,117
Dallas County	$490	$527
Harris County	$422	$659
Intermediate Counties	$1,697	$1,930
State of Texas	$2,609	$3,117

Source: AECOM 2019

Table 3.14-28: Net Tax Impact through 2040 (2019 millions)

Economic Analysis Area	Sales & Excise Tax (Construction)	Net Sales & Excise Tax (Operations)	Net Property Tax (Low)	Net Property Tax (High)	Total Tax Impact (Low)	Total Tax Impact (High)
All Project Counties	$220	$118	$2,609	$3,117	$2,948	$3,455
Dallas County	$65	$44	$490	$527	$600	$637
Harris County	$99	$47	$422	$659	$567	$805
Intermediate Counties	$30	$8	$1,697	$1,930	$1,734	$1,968
State of Texas	$359	$126	$2,609	$3,117	$3,095	$3,602

Source: AECOM 2019

3.14.5.2.4 Impacts to Children's Health and Safety

Federal agencies are required to identify, assess and minimize environmental health and safety risks to children. This may include the release of toxic fumes into the air near a school, water or soil contamination that could impact school children or heavily congested roadways and pedestrian access that represent safety concerns. FRA identified schools within the Study Area and assessed the likelihood of each school and its children experiencing any adverse impact due to the construction or operation of the Project.

During the public comment period, commenters expressed concern for the safety of children who walk to school, and/or for young motorists in rural communities commuting to school with increased construction traffic on roadways. Potential impacts to pedestrian safety occur in rural, suburban and urban areas along the Project; therefore, planning efforts would incorporate appropriate mitigation as outlined in **TR-MM#1: Traffic Control Plan**. Pedestrian safety elements could include elements of "Complete Streets" design and/or "Safe Routes to Schools" criteria. In addition to traditional school zones, these criteria include but are not limited to signalized pedestrian crossings, high visibility crosswalks, adequate sidewalks, slower speed limits, traffic calming measures, no at-grade rail crossings, on- or off-street bike lanes and/or shared use paths.

Twelve schools and/or school facilities identified within the Study Area would be directly impacted by, adjacent or within 1,000 feet of the LOD. All school facilities would occur on Build Alternatives A, B, D, E, and all but the one, Leon ISD, would occur for Build Alternatives C and F. All the facilities would experience potential impacts to children's health and safety due to temporary construction. However, these impacts would be mitigated through the use of BMPs and other mitigation measures. No severe or moderate noise impacts are anticipated in proximity to the schools identified; therefore, no potential

impacts to children's learning ability while in classrooms would be anticipated. The 12 schools and school facilities identified are detailed below.

Dallas Community College District

The Dallas Community College District is located on South Lamar Street in the Cedars neighborhood of Dallas on Segment 1 of the Build Alternatives. The building would be approximately 800 feet from the Dallas Terminal Station. This location is used as an administrative office for the community college and a search of courses offered by the college does not list this location as an educational facility. Therefore, no adverse impacts to children's health and safety would be anticipated.

Wilmer-Hutchins School in Dallas County

The Wilmer-Hutchins School in Dallas County, located on Segment 1, would be over 2,000 feet from the Dallas TMF facility that would be constructed north of IH-20. The Project would cross IH-20 on viaduct and no adverse impacts to roadways would be anticipated. However, during construction indirect impacts to children's health and safety could include: localized air quality impacts due to the movement and operation of construction vehicles, potential exposure to toxic fumes used during the construction of the Project and increased traffic on Langdon Road. **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport** describe mitigation measures for air quality and construction best practices. Traffic control plans would include procedures for any temporary road closures and alterations to school crossings to prevent impacts to pedestrians, vehicles and bus traffic, as outlined in **TR-MM#1: Traffic Control Plan**. The TMF facility and warehouse north of the school would represent a potential permanent impact to children's health and safety due to the use of hazardous chemicals for maintenance and operation of the HSR system and the potential for increased roadway traffic from TMF facility operations. All hazardous materials would be handled and stored in accordance with state and federal regulations, as described in **HM-MM#2: Hazardous Materials Management**. Primary ingress and egress of vehicle traffic for the TMF would likely be via Simpson Stuart Road, IH-45 and IH-20. Traffic could also utilize J.J. Lemmon Road, which crosses adjacent to the Wilmer Hutchins School. Therefore, increases in roadway traffic would likely be minimal due to the TMF's access to larger arterials.

AIA Lancaster Elementary School in Dallas County

The AIA Lancaster Elementary School in Dallas County, on Segment 1, would be located approximately 750 feet from a temporary construction zone of the LOD. As outlined in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, this temporary construction site is identified as a "proposed precast yard." Precast yards include space for a Batch Plant, materials storage, power station, equipment yard and space for molding. Temporary construction impacts could include localized air quality impacts and increased roadway traffic. No adverse impacts would be anticipated with the mitigation measures outlined in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport** and **HM-MM#2: Hazardous Materials Management** and **TR-MM#1: Traffic Control Plan**.

Leon ISD in Leon County

Leon ISD in Leon County, on Segment 4, would be located approximately 900 feet from the LOD. A temporary construction area would be located approximately 1,700 feet southeast of the school. The Project would cross northeast of the school on viaduct. Potential impacts to US 79 would be minimal as no roadway rerouting would occur. The school's outdoor sports facilities would be located more than 2,000 feet from the LOD. Indirect impacts to children's health and safety could include localized air quality impacts due to the movement and operation of construction vehicles, potential exposure to toxic fumes during the construction of the Project and increased traffic on US 79 and County Road 348. BMPs and mitigation measures would include a construction plan to minimize air quality impacts, the handling of hazardous materials in accordance with state and federal regulations and traffic control plans. Additionally, pedestrian infrastructure leading to Leon ISD is non-existent and it is likely that students do not often walk to the school facility. Mitigation measures are outlined in **Section 3.2.6, Air Quality, Section 3.5.6, Hazardous Materials and Section, 3.11.6 Transportation.** No adverse impacts would be anticipated with **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport**.

Connection School of Houston

The Connection School of Houston is a private non-profit school that would be directly impacted by the LOD on Segment 5. The school is located in Cypress, at House & Hahl Road and Hempstead Road. The Project would cross the parcel on viaduct and displace six structures on the property. School buildings on the property appear to be semi-permanent structures that could be moved south on the existing property. Mitigation for potential impacts is outlined in **SC-MM#8: Acquisition of The Connection School of Houston**.

Cy-Fair High School and Arnold Junior High School

Cy-Fair High School and Arnold Junior High School are located adjacent to US 290 on Segment 5. The Project in this location would be on the south side of US 290 approximately 500 feet from the school facilities. In this location, the Project would be travelling on viaduct and no road rerouting would occur. Potential impacts could be indirect related to temporary construction activities and minimized through the use of BMPs outlined **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport** and **HM-MM#2: Hazardous Materials Management** and **TR-MM#1: Traffic Control Plan**. No adverse impacts to children's health and safety would be anticipated.

Cypress Falls High School

Cypress Falls High School located on Segment 5 in Harris County would be located approximately 150 feet from a temporary construction zone and large drainage area necessary for the HSR system. The school is separated by Huffmeister Road and outdoor sports facilities would be located more than 13,000 feet from the LOD. Impacts to children's health and safety could include localized air quality impacts due to the movement and operation of construction vehicles, potential exposure to toxic fumes used during the construction of the Project and increased traffic on Huffmeister Road. Air quality and hazardous materials impacts would be handled through BMPs and mitigation measures outlined in **AQ-**

CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities and **AQ-MM#7: Construction Materials Transport** and **HM-MM#2: Hazardous Materials Management**. Increased traffic congestion due to the construction of the Project around Cypress Falls High School would be mitigated through **TR-MM#1: Traffic Control Plan**. Additionally, Cypress Falls High School has multiple ingress and egress routes leading from the main buildings; however, pedestrian facilities are not visible in aerial imagery. Traffic control plans would need to account for potential children walking to school from adjacent neighborhoods.

Dean Middle and Bane Elementary Schools

Dean Middle and Bane Elementary Schools are located over 1,200 and 700 feet, respectively, northeast of Hempstead Road and the Build Alternatives on Segment 5. The schools are served by minor arterials and a major arterial –Fairbanks North Houston Road. In this location, the Project would be travelling on viaduct and no road rerouting would occur. Potential impacts could be indirect related to temporary construction activities and minimized through the use of BMPs outlined in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport** and **HM-MM#2: Hazardous Materials Management** and **TR-MM#1: Traffic Control Plan**. No adverse impacts to children's health and safety would be anticipated.

Panda Path School

The Panda Path School is located on Segment 5 in the Spring Branch Family Development Center primarily serving pre-kindergarten students. The facility is located on Pitner Road and Sowden Road, roughly 500 feet southwest of the Project. A UPRR rail line also separates the school and the Project. In this location, the Project would be travelling on viaduct and no road rerouting would occur. Potential impacts could be related to temporary construction activities and minimized through the use of BMPs outlined in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities** and **AQ-MM#7: Construction Materials Transport** and **HM-MM#2: Hazardous Materials Management** and **TR-MM#1: Traffic Control Plan**. No adverse impacts to children's health and safety would be anticipated.

Main Campus of Awty International School in Harris County

The main campus of the Awty International School in Harris County would be located approximately 1,000 feet from the Northwest Transit Center Terminal Station Option. Existing buildings located at North Post Oak Road and Awty School Lane were renovated to become the new Awty Early Learning Center. The new campus, opened in August 2017, would be directly impacted by the Houston Northwest Transit Center Station Area. Mitigation measures would be necessary for the displacement of the Awty Early Learning Center campus and are outlined in **SC-MM#9: Acquisition of the Awty International School Early Learning Campus**. Temporary impacts to children's health and safety related to the construction of the station would include localized air quality impacts, exposure to fumes from hazardous materials, and increased traffic congestion. Air quality Compliance and mitigation measures identified to minimize impacts from emissions and dust that could impact localized air quality during construction are identified in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1:**

Dust Suppression Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities and **AQ-MM#7: Construction Materials Transport.** Hazardous materials mitigation measures are identified as, **HM-MM#2: Hazardous Materials Management**. Construction and operation of the Houston Northwest Transit Center Terminal Station Option would produce increased traffic located approximately 1,000 feet from the main Awty International School campus on Post Oak Boulevard. During public outreach sessions held in November 2018, school officials expressed their concerns regarding pedestrian safety for students walking to campus and increased traffic due to any new station in the area. Potential pedestrian impacts around the Houston Terminal Station options, particularly the Northwest Transit Center Terminal Station Option, would be avoided through compliance with **LU-CM#3: Houston Terminal Station Development Plan Code Compliance**, **LU-CM#4: Houston Terminal Station Site Development Related Permits**, and **LU-CM#5: Adhere to Development Regulations** (see **Section 3.13.6.1, Land Use, Compliance Measures**). Potential impacts would be further mitigated through **TR-MM#1: Traffic Control Plan** and **TR-MM#2: Intersection Improvements** (see **Section 3.11.6.2, Transportation, Mitigation Measures**).

3.14.5.2.5 Impacts to Community Facilities

Table 3.14-8 through **Table 3.14-17** identify 85 community facilities within the Study Area across all the Build Alternatives. Of those 85, five facilities would be directly impacted, depending on the Build Alternative. One facility would be impacted at the Houston Northwest Transit Center Terminal Station Option.

Dallas County

Two community facilities along Segment 1 in Dallas County would be impacted by the Build Alternatives, the Smith Family Cemetery and the Honey Springs Cemetery. Impacts to this community facility are discussed below. The remaining 17 facilities, as described in **Table 3.14-8**, would be outside of the LOD and are not anticipated to experience adverse impacts from construction or operation of the Project.

Smith Family Cemetery

The Smith Family Cemetery is a 0.15-acre property abutting a parking lot associated with the Linfield Elementary School. Both the cemetery and the school are discussed in **Section 3.19.5.2.1, Cultural Resources, Segment 1**. Based on FRA's review of the Dallas County Appraisal District data, the property is owned by the Southern Dallas Development Corporation. As of field visits conducted in July 2018, the old elementary school is a vacant and derelict structure. The Project would displace the structure and the parcel would result in a full take. The Project would span the southwestern edge of the Smith Family Cemetery. Approximately 800 square feet of the cemetery boundaries would be intersected by the LOD. Per the THC, the consideration of cemeteries near any Project infrastructure must include a 75-foot buffer from the perimeter of the cemetery to account for unknown/unmarked burial sites adjacent to the cemetery property. The design would incorporate pier placements that account for the boundary of the cemetery as well as the 75-foot buffer. The benefit of this buffer would mean that access to the cemetery and the memorial would remain unimpeded. The Smith Family Cemetery is currently bounded by a large boulevard to its immediate north and IH-45 to its east. The cemetery's proximity to adjacent transportation infrastructure currently does not provide a meditative environment for visitors, and this would remain unchanged with the addition of the HSR infrastructure, which would introduce intermittent noise to the already busy area. Given the height of the structure at this point (approximately 49 feet above the cemetery) and the parameters set forth in **Section 3.4.5.2.5, Noise**

and Vibration, Operational Noise and Vibration Impacts (within 40 feet to the rail), no adverse noise impact would be anticipated.

Honey Springs Cemetery

Segment 1 of the Build Alternatives would span the western portion of the Honey Springs Cemetery, which includes a memorial at the front gate. As described in **Section 3.19.5.2.1, Cultural Resources, Segment 1**, the cemetery is an NRHP-eligible historic property. The design would incorporate pier placements that account for the boundary of the cemetery as well as the 75-foot buffer required by THC on the western portion of the cemetery. The benefit of this buffer would mean that access to the cemetery and the memorial would remain unimpeded. The cemetery's proximity to IH-45 does not create a meditative environment for visitors. This would remain unchanged with the addition of the HSR infrastructure, which would introduce intermittent noise to the already busy area. Given the height of the structure at this point (approximately 48.5 feet above the cemetery) and the parameters set forth in **Section 3.4.5.2.5, Noise and Vibration, Operational Noise and Vibration Impacts** (within 40 feet to the rail), no adverse noise impact would be anticipated.

Ellis County

One community facility in Ellis County would be impacted by the Project, as described in **Table 3.14-9**. Impacts to this community facility are discussed below.

The Boren Cemetery would be located approximately 250 feet from the Segment 2A LOD. During construction, temporary impacts could occur due to construction lighting, noise, dust and increased traffic on Old Waxahachie Road north of the cemetery. As noted in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**, daytime construction noise would extend 40 to 200 feet from the noise source and nighttime construction noise would extend 125 to 200 feet from the noise source. BMPs and mitigation measures are outlined in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, NV-MM#2: Noise Control Plan, AS-MM#6: Construction Lighting Plan** and **TR-MM#1: Traffic Control Plan**. Adverse impacts to the cemetery would not be anticipated with appropriate mitigation measures.

Navarro County

Two community facilities in Navarro County would be impacted by the Project, as described in **Table 3.14-10**. Impacts to these community facilities are discussed below.

Anderson Family Cemetery

Anderson Family Cemetery is located on SW County Road 0040 approximately 200 feet from roadway improvements proposed as part of the Project. The cemetery is located on Segments 3A, 3B and 3C of the Build Alternatives. The cemetery is in a secluded location on private property and has no structure or markings visible from the ROW. Additional information on this resource can be found in **Section 3.19.4.2.3, Cultural Resources, Navarro County,** and **Appendix E, Cultural Resources Technical Memorandum**. During construction, temporary indirect impacts could occur due to noise and vibration, dust, temporary construction lighting and increases traffic on nearby roadways. Mitigation measures are outlined in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, NV-MM#2: Noise Control Plan, AS-MM#6: Construction Lighting Plan** and **TR-MM#1: Traffic Control Plan.** No adverse impacts would be anticipated with appropriate mitigation measures.

Shelton Family Cemetery

Shelton Family Cemetery would be over 900 feet from the HSR system rail and approximately 500 feet from potential improvements to electrical utility lines. The cemetery is located on private property with no visible structure. A dirt driveway provides access from County Road 2410. No adverse impacts would be anticipated at this location.

Freestone County

Three community facilities along Segment 3C were identified in Freestone County, as described in **Table 3.14-11**. One community facility, Mount Zion Missionary Baptist Church, would be displaced by the LOD. TCRR and the property owners would negotiate to discuss relocation in order to mitigate the impact. The remaining two facilities, as described in **Table 3.14-11**, would be located more than 600 feet from the LOD and would not experience adverse impacts from the construction or operation of the Project.

Along Segment 4, three community facilities were identified: the Furney-Richardson Community Center, Red Cemetery and Asia Cemetery. The Furney Richardson Community Center would be over 800 feet from the Project and no adverse impacts from construction or operation.

Red Cemetery

Red Cemetery is located on County Road 995 over 350 feet from roadway improvements proposed as part of the Project. The cemetery would be located approximately 700 feet from the HSR system tracks. Access to the cemetery would be maintained during construction. Temporary impacts could include noise and vibration, dust, temporary construction lighting and increases traffic on nearby roadways. Mitigation measures are outlined in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, 3NV-MM#2: Noise Control Plan, AS-MM#6: Construction Lighting Plan** and **TR-MM#1: Traffic Control Plan.** No adverse impacts would be anticipated with appropriate mitigation measures.

Asia Cemetery

Asia Cemetery is located on County Road 844 approximately 300 feet from drainage improvements proposed as part of Segment 4 of the Build Alternatives. The cemetery would be located over 850 feet from the HSR System tracks. Access to the cemetery would be maintained during construction. Temporary impacts could include noise and vibration, dust, temporary construction lighting and increases traffic on nearby roadways. Mitigation measures are outlined in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, NV-MM#2: Noise Control Plan, AS-MM#6: Construction Lighting Plan** and **TR-MM#1: Traffic Control Plan.** No adverse impacts would be anticipated with appropriate mitigation measures.

Limestone County

All three community facilities, as described in **Table 3.14-12**, would be located over 530 feet from the LOD and would not experience adverse impacts from the construction or operation of the Project.

Leon County

Five community facilities were identified along Segment 3C, as described in **Table 3.14-13**. One community facility, the Hopewell Church, would be directly impacted through potential displacement of the primary structure on the property. The church structure (Hopewell Church) would be within 50 feet of the LOD, which would meet a land acquisition scenario involving a primary structure displacement.

Per the definitions set in the land acquisitions scenarios **Section 3.13.3.3.4, Land Use, Table 3.13-2,** the entire parcel would be acquired**.**

The Nettles Cemetery is located along the service road of IH-45 and would be approximately 100 feet from Build Alternatives C and F. In this location, Build Alternatives C and F would be constructed as cut and retain fill alongside IH-45, and the IH-45 service road would be moved west closer to the cemetery boundaries. The topography in this location and the track configuration would potentially hide the track from view. Currently, the cemetery is located upon a berm overlooking the existing IH-45 corridor. Aesthetic and visual impacts caused by the Project infrastructure could be mitigated, as outlined in **AS-MM#3: Preserve Existing Vegetation and Feather Edges,** and **AS-MM#5 Landscaping Plan**. Temporary impacts to the Nettles Cemetery would be due to construction of the Project. Construction would only occur in daytime hours and noise would extend 200 feet from its source. With the existing IH-45 corridor, the addition of the Project as new transportation infrastructure would not adversely alter the existing environment for visitors of the cemetery; therefore, no adverse impacts would occur.

The remaining three facilities along Segment 3C, as described in **Table 3.14-13**, would be located more than 500 feet from the LOD and would not experience adverse impacts from construction or operation of the Project.

Four community facilities, as described in **Table 3.14-13**, were identified along Segment 4. Leon ISD would be located approximately 900 feet from the LOD. Noise impacts related to construction of the Project would not be adverse considering the distance from the source and receivers, as well as the existing transportation infrastructure. Permanent aesthetic and visual impacts would be caused by the Project crossing nearby on viaduct. However, as outlined in **Section 3.10.5.2.8, Aesthetics and Scenic Resources, Landscape Unit #6 Central Eastern Rural, Fairfield to Old San Antonio Road (Freestone, Limestone and Leon Counties)** impacts would not be adverse. During construction increased congestion on roadways could occur due to construction vehicles. Prior to construction, TCRR and stakeholders would develop a traffic control plan to help mitigate congestion.

The remaining three facilities would be located more than 500 feet from the LOD and would not experience adverse impacts from construction or operation of the Project.

Madison County

Seven community facilities were identified along Segment 4, as described in **Table 3.14-14**. Union Church would be displaced by the LOD and the property would be acquired. Mitigation of the displacement would include negotiation between the property owner and TCRR to discuss compensation and relocation. Additionally, the Ten Mile Cemetery adjacent to the church would be located within 50 feet of the LOD. There would be no primary structure displaced within the 50 feet of the LOD and the Project would be crossing on viaduct. Construction of the Project would cause temporary impacts related to noise and aesthetic and visual impacts. Additionally, increased traffic due to construction vehicles could temporarily impact the cemetery. Mitigation would be necessary through BMPs that can be found in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport, NV-MM#2: Noise Control Plan, AS-MM#6: Construction Lighting Plan** and **TR-MM#1: Traffic Control Plan.** Ten Mile cemetery is evaluated in **Section 3.10.5.2.10, Aesthetics and Scenic Resources, Landscape Unit #8 Rural Brazos Valley, Old San Antonio Road to Plantersville (Leon, Madison and Grimes Counties)**. In **Section 3.10.7, Aesthetics and Scenic Resources, Build Alternatives Comparison**, introduction of viaduct in this rural setting is described as an adverse visual impact across all Build Alternatives. Additional information regarding Ten Mile Cemetery can be found in **Section 3.19.5.2.4, Cultural Resources, Segment 4**.

Another facility, Randolph Cemetery, would be adjacent to the LOD. The cemetery would be in proximity to a drainage area necessary for the HSR system. The railway track would be partly on viaduct and embankment crossing approximately 375 feet from the cemetery boundaries. **Section 3.4.5.2.5, Noise and Vibration, Operational Vibration Impacts**, did not identify any sensitive receivers nearby; therefore, noise impacts would not occur at this facility. However, construction noise impacts would temporarily affect the meditative environment of this cemetery. With mitigation measures noise impacts would not be adverse. Permanent impacts would include aesthetic and visual impacts due to the addition of the HSR system infrastructure crossing nearby on viaduct and transitioning to embankment. Mitigation measures related to at-grade crossings can be found in **AS-MM#3: Preserve Existing Vegetation and Feather Edges** and **AS-MM#5 Landscaping Plan.**

The remaining four facilities, as described in **Table 3.14-14**, would be located more than 500 feet from the LOD and would not experience adverse impacts from construction or operation of the Project.

Grimes County

Eight community facilities were identified along Segment 5 in Grimes County, as described in **Table 3.14-15**.

The Ratliff Cemetery would be located approximately 100 feet of the LOD. **Section 3.4.5.2.5, Noise and Vibration, Operational Vibration Impacts**, did not identify any sensitive receivers nearby; therefore, no permanent noise impacts would occur at this facility. However, construction noise impacts would temporarily affect the meditative environment of this cemetery. Permanent impacts would include aesthetic and visual impacts due to the addition of the HSR system infrastructure crossing nearby via a cut configuration. Mitigation measures related to below-grade crossings can be found in **AS-MM#3: Preserve Existing Vegetation and Feather Edges** and **AS-MM#5 Landscaping Plan**. Additional information regarding the Ratliff Cemetery can be found in **Section 3.19.5.2.5, Cultural Resources, Segment 5**.

The Union Hill Cemetery would be located within 150 feet of the LOD and directly within an electrical transmission line easement. Construction noise would temporarily impact the area near the Union Hill Cemetery; however, through the **Section 3.4.5.2.5, Noise and Vibration, Operational Vibration Impacts** analysis, no sensitive receivers were identified in proximity to the LOD. Aesthetic and visual impacts would not be adverse as existing utility infrastructure traverses the entire cemetery. The addition of infrastructure necessary for the Project would not adversely impact the aesthetic and visual nature of the facility. Additional information regarding the Union Hill Cemetery can be found in **Section 3.19.5.2.5, Cultural Resources, Segment 5**.

The remaining six community facilities, as described in **Table 3.14-15**, would be located more than 800 feet from the LOD and would not experience adverse impacts from the construction or operation of the Project.

Waller County

The Science of the Soul Study Center is a spiritual and religious center, and the only community facility identified in Waller County on Segment 5. As described in **Section 3.13.5.2.5, Land Use**, **Table 3.13-16.** Approximately 22 percent of the property associated with the Science of the Soul Study Center would be directly impacted. Based on the acquisition and displacement analysis completed in **Section 3.13.5.2.5, Land Use, Structure Displacement and Land Acquisition**, the parcel would be partially acquired. Property acquisition and mitigation decisions would be negotiated between TCRR and property owners.

Harris County

Twenty-seven community facilities were identified in Harris County, on Segment 5, as described in **Table 3.14-17**, and twenty-three of those would be located more than 250 feet from the LOD. Through the Houston area and particularly the US 290 and Hempstead Road corridor, the Project would be constructed adjacent to or within the existing ROW. Therefore, the majority of community facilities in Harris County are separated from the Project by transportation infrastructure or other buildings. **Section 3.4.5.2.5, Noise and Vibration, Operational Vibration Impacts**, noted severe and moderate noise impacts along US 290 due to the Project, but none would be located near community facilities. Additionally, transportation impacts as a result of construction would be mitigated through BMPs outlined in **TR-MM#1: Traffic Control Plan.** These 23 facilities would not experience adverse impacts from the construction or operation of the Project.

The Connection School of Houston would be directly impacted by the Project. This resource is also discussed in **Section 3.14.5.2.4, Impacts to Children's Health and Safety**. Mitigation measures are outlined in **SC-MM#8: Acquisition of The Connection School of Houston**.

The Awty International School Early Learning Center campus would be displaced by the Northwest Transit Center Station. Mitigation is outlined in **SC-MM#9: Acquisition of the Awty International School Early Learning Campus**. This resource is also discussed in **Section 3.14.5.2.4, Impacts to Children's Health and Safety**.

The two remaining facilities would be the Cypress Falls Senior High School and the Beth Yeshurun-Post Oak Cemetery. The Cypress Falls Senior High School would be located approximately 150 feet from the LOD and separated by Huffmeister Road. The LOD in this location would include a temporary construction zone and a drainage area. Construction impacts would produce temporary noise, dust and transportation impacts. However, given the urban environment in which the school is located, construction noise impacts would not be adverse with mitigation. Additionally, dust and transportation impacts would be mitigated through BMPs outlined in **AQ-MM#1: Dust Suppression Techniques, AQ-MM#2: Materials Transport** and **TR-MM#1: Traffic Control Plan.**

The Beth Yeshurun-Post Oak Cemetery would be abutting roadway improvements along North Post Oak Boulevard that would be made for the Northwest Transit Center Terminal Station Option. The cemetery would temporarily experience construction noise, potential dust, and transportation impacts due to station construction. Due to the urban environment in which the cemetery is located, construction noise impacts would not be adverse after mitigation. Long-term impacts caused by increased traffic induced by the Northwest Transit Center Terminal Station Option would be mitigated through transportation infrastructure improvements. Aesthetic and visual impacts would not be adverse because of the urban context in which the cemetery is located, as well as the existing IH-10 transportation infrastructure adjacent to the cemetery.

3.14.6 Avoidance, Minimization and Mitigation

Design features were employed to avoid and minimize impacts to the socioeconomic environment. In developing the Build Alternatives, TCRR avoided towns and cities of the two urban counties and identified co-location opportunities with transportation and utility corridors to minimize impacts to many socioeconomic resources. Within the six end-to-end Build Alternatives, 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure. Other design features include maximizing the use of viaduct to minimize community facility impacts, as well as incorporating 75-foot buffers around cemeteries to account for any unmarked burials sites. Approximately 55 percent of the Project would be constructed on viaduct.

3.14.6.1 Compliance Measures

No compliance measures were identified for this section.

3.14.6.2 Mitigation Measures

TCRR would be required to implement the following socioeconomic mitigation measures (MM):

SC-MM#1: Construction Management Plan. Prior to the start of construction, TCRR shall develop one comprehensive construction management plan or multiple plans that correspond to construction phasing. The Construction Management Plan shall include:

- Planned timing of construction activities by construction phase or by county.
- A description of how TCRR will comply with mitigation measures related to construction, including but not limited to dust control measures in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program** and **AQ-MM#1: Dust Suppression Techniques** to **AQ-MM#7: Construction Materials Transport, NV-MM#2: Construction Noise Control Plan** including measures to reduce the impact of noise on sensitive receivers at community facilities, **AS-MM#6: Construction Lighting Plan** and **AS-MM-#9: Aesthetic and Visual Guidelines for Construction Security Fencing.**

TCRR shall make the Construction Management Plan available to the public, local (city and county) jurisdictions, emergency responders, and school districts on TCRR's Project website.[25]

SC-MM#2: Le May and Le Forge Neighborhood Mitigation. Mitigation for potential community cohesion impacts outlined in this section would be covered through measures outlined in **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation**.

SC-MM#3: Hash and Nail Road and Plantation Forest Neighborhood Mitigation. See **EJ-MM#2: Hash and Nail Road Community and Plantation Forest Community Mitigation.**

SC-MM#4: White Oak Falls Mitigation. For properties that will be acquired, TCRR shall comply with **LU-MM#3: Acquisition and Relocation Mitigation Plan**. For properties that are not acquired, TCRR will comply with **AS-MM#1: Outreach to Adjacent Neighborhoods** and **AS-MM#2: Design Stations to Adapt to Local Context**.

SC-MM#5: Relocation of Mount Zion Missionary Baptist Church. Mount Zion Missionary Baptist Church would not be displaced by Build Alternative A, the identified Preferred Alternative; it would be displaced by Build Alternatives C and F. For any acquisitions or relocations, TCRR shall comply with **LU-MM#3: Acquisition and Relocation Mitigation Plan**. In addition, TCRR shall provide assistance to the church in notifying patrons and the nearby community of relocation.

SC-MM#6: Relocation of Hopewell Church. The Hopewell Church parcel would not be acquired for Build Alternative A, the identified Preferred Alternative, it would be acquired for Build Alternatives C and F. For any acquisitions or relocations, TCRR shall comply with **LU-MM#3: Acquisition and Relocation Mitigation Plan**. In addition, TCRR shall provide assistance to the church in notifying patrons and the nearby community of relocation.

SC-MM#7: Relocation of Union Church. Union Church would be displaced by Build Alternative A, the identified Preferred Alternative. For any acquisitions or relocations, TCRR shall comply with **LU-MM#3:**

[25] As of January 2020, TCRR is hosting their Project website at https://www.texascentral.com/.

Acquisition and Relocation Mitigation Plan. In addition, TCRR shall provide assistance to the church in notifying patrons and the nearby community of relocation.

SC-MM#8: Acquisition of The Connection School of Houston. The Connection School would be displaced by all the Build Alternatives. For any acquisitions or relocations, TCRR shall comply with **LU-MM#3: Acquisition and Relocation Mitigation Plan**. In addition, TCRR shall further coordinate with the school to access relocating displaced structures on existing property.

SC-MM#9: Acquisition of the Awty International School Early Learning Campus. This resource would not be displaced by Build Alternative A, the identified Preferred Station Area. The Early Learning Campus is an annex of the Awty International School main campus located on the west side of Post Oak Road. The Early Learning Campus would be displaced by the Northwest Transit Center Terminal Station Option. TCRR shall comply with **LU-MM#3: Acquisition and Relocation Mitigation Plan**. In addition, TCRR shall further coordinate with the school to assess potential for relocation of the displaced campus and shall explore relocating displaced structures on existing property.

3.14.7 Build Alternatives Comparison

Table 3.14-29 presents a summary of the socioeconomic and community facilities impacts for the Build Alternatives. All impacts related to community character and cohesion would occur on common segments to all Build Alternatives. Economic impacts would provide a direct benefit to the station areas, which are common to all Build Alternatives. The temporary construction employment benefits would be comparable along all the Build Alternatives.

Table 3.14-29: Summary of Socioeconomic Impacts by Build Alternative

Resource Area	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Houston Station Option		
							Industrial Site Terminal	Northwest Mall Terminal	Northwest Transit Center Terminal
Community Character and Cohesion	4	4	4	4	4	4	--	--	--
Economic Impacts [a]	Positive	Positive	Positive	Positive	Positive	Positive	--	--	--
Employment (job years)	317,207	317,207	317,207	317,207	317,207	317,207	--	--	--
Earnings (2019 billions)	$14.5	$14.5	$14.5	$14.5	$14.5	$14.5	--	--	--
Tax Revenue	Positive	Positive	Positive	Positive	Positive	Positive	--	--	--
Children's Health and Safety [b]	0	0	0	0	0	0	--	--	1
Community Facilities	5	5	5	5	5	5	--	--	1

Sources: AECOM 2019

[a] All economic impacts include the total of one-time construction impacts plus 16 years of operating impacts from 2025 to 2040.

[b] Children's health and safety impacts are the result of temporary construction effects. These impacts will no longer exist once construction has ended.

Impacts relating to community and cohesion would include temporary construction related impacts, potential visible changes due to the construction and operation of the Build Alternatives, beneficial economic development and potential displacement of residences. These impacts would occur within four neighborhoods on all Build Alternatives: Le May and Le Forge Neighborhood, Hash Road and Nail Drive Community, Plantation Forest Development and the White Oak Falls Neighborhood. Terms of residential displacements and relocations would be subject to one on one negotiation between private owners and TCRR and in accordance with the measures described in **Section 3.14.6, Avoidance, Minimization and Mitigation**.

Three community facilities are located on common segments and would therefore be impacted by all the Build Alternatives: Smith Family Cemetery, Honey Springs Cemetery and the Connection School of Houston. Mount Zion Missionary Baptist Church and Hopewell Church would only be directly impacted and displaced under Build Alternatives C and F. Build Alternatives A, B, D and E would impact one facility, Union Church and Ten Mile Cemetery. One community facility, the Awty International School Early Learning Campus, would be impacted at the Houston Northwest Transit Center Terminal Station Option.

3.15 Electromagnetic Fields

3.15.1 Introduction

This section provides information about EMFs—what they are, how they are measured and what government regulations and industry standards have been developed to verify safe use of equipment and devices that intentionally or unintentionally generate EMFs. For this EIS, a review was conducted of published scientific research and HSR technical specifications. Based on this review, EMF levels expected to be generated during operations of the alternatives are identified and compared to national and international standards for safe human exposure to EMFs, including standards for electromagnetic interference (EMI) with implanted medical devices. This section also analyzes the potential for operation of the alternatives to result in EMI with sensitive electronic equipment used at commercial, industrial, scientific and medical facilities that may occur within the EMF Study Area.

All sources of electricity produce both electric and magnetic fields. Electric fields result from the strength of the electric charge, and magnetic fields are produced from the motion of the charge. Together, the combination of electric and magnetic fields are referred to as "electromagnetic fields." EMFs are invisible, nonionizing radiation. EMFs are commonly produced by both natural and man-made sources. Under extreme conditions, such as a lightning strike, EMF health hazards can include shocks and burns, although such conditions are rare.

Electric field strength is measured in units of volts per meter (V/m). Field strength increases as voltage rises. Any object with an electric charge has a voltage at its surface and can create an electric field. When electrical charges move together (current), they create a magnetic field. Magnetic fields can exert forces on other electric currents. The strength of a magnetic field depends on the current, configuration/size of the source and distance from the source. Higher currents create higher magnetic fields and they grow weaker as the distance from the source increases. Magnetic field strength has several units of measure, the most commonly used are milligauss (mG) and microTesla (µT). Ten mG equals one µT.

EMFs are characterized in terms of their frequency, which is the number of times the electromagnetic field increases and decreases its intensity each second. In the U.S., electric power operates at a frequency of 60 Hz. Electric power system components are sources of EMFs, operating at a frequency of 60 Hz. Radio and other communication systems operate at much higher frequencies, often in the range of 500,000 Hz (500 kilohertz [kHz]) to 6,000,000,000 Hz (6 gigahertz [GHz]).

Unit Definitions and Conversions

Hertz (Hz): Unit of frequency equal to one cycle per second

Volts per Meter (V/m): Unit of electric field strength (intensity)

1,000 V/m = 1 kilovolt/m

Gauss (G): Unit of magnetic flux density (intensity) (English units)

1 G = 1,000 milligauss (mG)

Tesla (T): Unit of magnetic flux density (intensity) (International units)

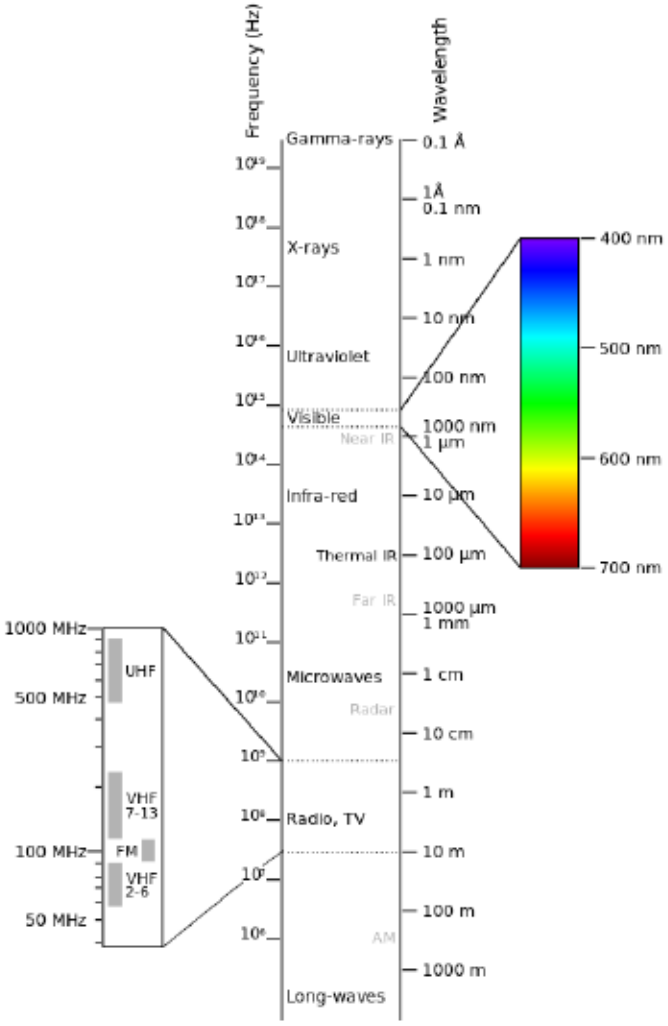
1 T = 1 million microTesla (µT)

1 G = 100 µT

milliWatts per square centimeter (mW/cm^2): Unit of power density (intensity) of EMFs

As shown on **Figure 3.15-1**, the electromagnetic (EM) spectrum can be described in terms of wavelength (λ), measured in meters, or frequency, measured in Hertz. **Table 3.15-1** breaks the frequency spectrum into bands and lists the commonly used definition of each band.

Figure 3.15-1: The Electromagnetic Spectrum



Source: V. Blacus, Electromagnetic-Spectrum.svg, Wikimedia Commons, 2012, https://commons.wikimedia.org/wiki/File:Electromagnetic-Spectrum.svg.

3.15.2 Health Effects of EMF

Reputable authorities on the subject of EMFs include the World Health Organization and the International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP determined that humans can perceive EMFs in some situations and that perception can be annoying, although not physically harmful. To prevent those acute health effects and annoyance, ICNIRP developed guidelines for human exposure to EMF. ICNIRP states, "adherence to these restrictions protects workers and members of the public from adverse health effects from exposure to low-frequency EMF." As part of this effort, ICNIRP also reviewed "epidemiological and biological data concerning chronic conditions" (i.e., effects on the neuroendocrine system, neurodegenerative disorders, cardiovascular effects, reproduction and development effects and cancer) and "concluded that there is no compelling evidence that they are causally related to EMF exposure."[1] Additionally, ICNIRP concluded that insufficient reliable research exists to determine whether a link is possible between the adverse health effects and long-term, elevated EMF exposure. ICNIRP stated that more research is necessary in these areas.[2]

Table 3.15-1: EMF Frequency Ranges

Frequency Range	Label (Abbreviation)
3 Hz to 30 Hz	Extremely Low Frequency (ELF)
30 Hz to 300 Hz	Super Low Frequency (SLF)
300 Hz to 3 kHz	Ultra Low Frequency (ULF)
3 kHz to 30 kHz	Very Low Frequency (VLF)

[1] ICNIRP, "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields, ICNIRP Guidelines," *Health Physics Society*, April 1998, 74(4), p494-522.

[2] A. Ahlbom, E. Cardis, A. Green, M. Linet, D. Savitz, and A. Swerdlow, "Review of the Epidemiologic Literature on EMF and Health," *Environmental Health Perspectives* 109(6):911-933, ICNIRP Standing Committee on Epidemiology, 2001.

Table 3.15-1: EMF Frequency Ranges	
Frequency Range	**Label (Abbreviation)**
30 kHz to 300 kHz	Low Frequency (LF)
300 kHz to 3 MHz	Medium Frequency (MF)
3 MHz to 30 MHz	High Frequency (HF)
30 MHz to 300 MHz	Very High Frequency (VHF)
300 MHz to 3 GHz	Ultra High Frequency (UHF)

Source: Glenn Elert, *The Physics Hypertextbook*, Electromagnetic Spectrum, https://physics.info/em-spectrum/

The U.S. National Institutes of Health tasked the National Institute of Environmental Health Sciences with studying and making recommendations on EMF and human health. The National Institute of Environmental Health Sciences published reports outlining their interpretations and recommendations.[3,4,5] The National Institute of Environmental Health Sciences concluded that for most health outcomes no evidence is present that EMF exposure typically encountered in daily public or industrial settings has adverse health effects.

Many everyday electrical objects emit relatively high EMFs when functioning; however, ICNIRP has determined that these items do not cause health problems.[6] While some of these levels exceed the ICNIRP standard, these devices are considered safe. The strength of an EMF rapidly decreases with distance away from its source; thus, EMFs higher than background levels are usually found close to EMF sources. **Table 3.15-2** illustrates the magnitude that some common electrical devices are capable of outputting.[7] Note that the values in **Table 3.15-2** are instantaneous values, while the ICNIRP limit is time averaged over 30 minutes for the public.

Table 3.15-2: Example EMF Sources		
Source	**Magnetic Field 6 Inches Away**	
	µT	**mG**
ICNIRP Limit (60 Hz)	200	2,000
Microwave Oven	30	300
Mixer	60	600
Hair Dryer	70	700
Vacuum Cleaner	70	700
Electric Can Opener	150	1,500

Source: National Institute of Environmental Health Sciences 2002

Hz = hertz, µT = microTesla, mG = milligauss

[3] National Institute of Environmental Health Sciences, "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields," *NIH Publication* 99-4493, May 4, 1999, accessed December 2019, https://www.niehs.nih.gov/health/assets/docs_p_z/report_powerline_electric_mg_predates_508.pdf.

[4] J.E. Moulder, "The Electric and Magnetic Fields Research and Public Information Dissemination (EMF-RAPID) Program," *Radiation Resources* 153(5 pt 2):613-616, 2000, accessed December 2019, https://www.jstor.org/stable/3580161?seq=1#metadata_info_tab_contents

[5] National Institute of Environmental Health Sciences, "EMF: Electric and Magnetic Fields associated with the Use of Electric Power, Questions & Answers," June 2002, accessed December 2019, https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf.

[6] A. Ahlbom, E. Cardis, A. Green, M. Linet, D. Savitz, and A. Swerdlow, "Review of the Epidemiologic Literature on EMF and Health," *Environmental Health Perspectives* 109(6):911-933, ICNIRP (International Commission for Non-Ionizing Radiation Protection) Standing Committee on Epidemiology, 2001.

[7] National Institute of Environmental Health Sciences, "EMF: Electric and Magnetic Fields associated with the Use of Electric Power, Questions & Answers," June 2002, accessed December 2019, https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf.

3.15.3 Regulatory Context

From a regulatory standpoint, the Federal Communications Commission (FCC) and OSHA have developed standards for EMF exposure in occupational settings. Neither the federal government nor the State of Texas has standards for residential EMF exposure.

Federal

FRA regulations within 49 C.F.R. Parts 236.8, 238.225 and 236 Appendix C provide safety standards for passenger equipment and rules, standards and instructions regarding operating characteristics of electromagnetic, electronic or electrical apparatus.

- 49 C.F.R. 236.8 defines the operating characteristics of electromagnetic apparatus and provides for maintenance of the electronic equipment.
- 49 C.F.R. 238.225 requires that the train equipment not produce "electrical noise" that affects the safe performance of the train's control, signaling or communications equipment; and that train equipment suppress electromagnetic transients whenever possible.
- 49 C.F.R. 236 Appendix C requires that the train must operate safely when subjected to external sources of EMF or EMI.

Under 47 C.F.R. 15, FCC provides rules and regulations for licensed and unlicensed radiofrequency transmissions. Most telecommunications devices sold in the U.S., whether they radiate intentionally or unintentionally, must comply with Part 15. However, Part 15 does not govern any device used exclusively in a vehicle, including on HSR trainsets.

FCC provides guidance for evaluating whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to radiofrequency fields.[8] The FCC limits are partially based on the IEEE C95.1 standard.[9]

OSHA 29 C.F.R. 1910.97, Subpart G [10] contains safety standards for occupational exposure to nonionizing electromagnetic radiation. **Table 3.15-3** summarizes OSHA standards.

FCC 47 C.F.R. 1.1310 is based on the 1992 version of the American National Standards Institute (ANSI)/IEEE C95.1 safety standard.[11] **Table 3.15-3** shows maximum permissible exposures (MPEs) contained in ANSI/IEEE C95.1 and FCC standards at frequencies of 450, 900 and 5,000 MHz, which covers the range of frequencies that may be used by HSR radio systems. FCC MPEs are based on an average time of 30 minutes for exposure of the general public and 30 minutes for occupational exposure. As shown in **Table 3.15-3**, the differences between ANSI/IEEE C95.1 and FCC MPEs are negligible.[12] Note that Table **3.15-3** includes electric field MPEs, but not magnetic field MPEs, as neither ANSI, IEEE, OSHA, or FCC have MPEs for magnetic fields above 300 MHz.

[8] FCC Office of Engineering and Technology, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,* Bulletin 65, Edition 97-01, August 1999, accessed December 2019, https://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf.

[9] IEEE C95.1-2005, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," April 19, 2006.

[10] OSHA, Occupational and Environmental control: Non-Ionizing Radiation, 29 C.F.R. 1910.97, 2013, accessed December 2019, https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9745.

[11] IEEE C95.1-2005, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," April 19, 2006.

[12] FCC Office of Engineering & Technology, Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields, OET Bulletin 56, 4th Edition, August 1999.

Table 3.15-3: Radiofrequency Emission Safety Levels Expressed as Maximum Permissible Exposures

Frequency	ANSI/IEEE C95.1 MPE (mW/cm^2)		FCC MPE (mW/cm^2)		OSHA MPE (mW/cm^2)	
	General Public	Occupational	General Public	Occupational	General Public	Occupational
450 MHz	0.225	1.5	1.5	0.3	NA	10
900 MHz	0.45	3.0	3.0	0.6	NA	10
5,000 MHz	1.0	10	5.0	1.0	NA	10

Source: IEEE 2002; FCC 2010; OSHA 2010

ANSI/IEEE = American National Standards Institute/Institute of Electrical and Electronics Engineers

mW/cm^2 = milliwatts per square centimeter

Regional and Local

EMF ordinances exist within Texas, including the City of Houston. The City of Houston Airport Land Use Regulations, Article VI, Section 9-360,[13] prohibit the use or generation of EMI within either the airport land or the airport land use envelope that may adversely impact airport operations or safety. Research on regional and local ordinances for areas impacted by the HSR did not identify any other regulations pertinent to EMF.

3.15.4 Methodology

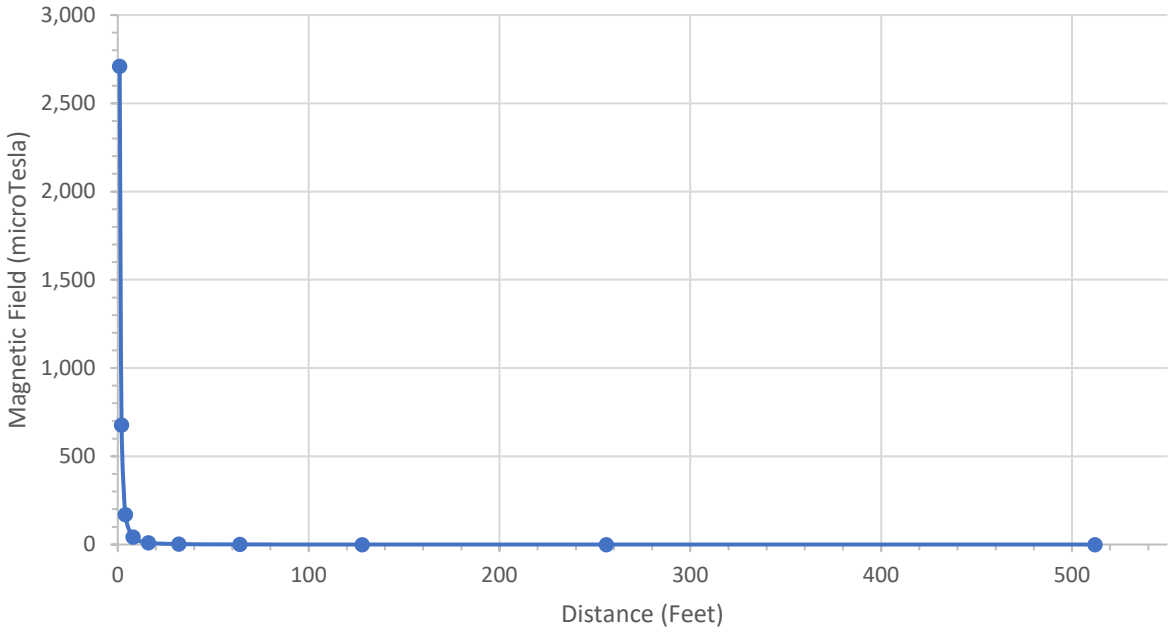
The inverse square law applies to EMF. The inverse-square law means that EMF levels would substantially decrease with increased distance from the source. Therefore, for the purposes of this analysis, the EMF Study Area is defined as 500 feet from the centerline of the HSR track. Beyond this distance, the EMF would be below background levels.

As described above, EMF strength falls off rapidly with distance. Assuming a worst-case magnetic field of 2,710 µT, which is the IEEE occupational exposure limit, the magnetic field would drop off following the inverse-square law to below 1 µT within 60 feet, as illustrated on **Figure 3.15-2**.

Maps, surveys, photographs and databases were reviewed to identify sensitive receptors within the EMF Study Area that could be susceptible to EMFs produced by the Project. Sensitive receptors include universities, medical institutions, high-tech businesses, airports and governmental facilities (i.e., police and fire) that may use equipment that could be affected by new sources of EMFs. For completeness, the review of potentially impacted sensitive receptors was expanded to include schools, which may have wireless networks for tablets and laptops, and parks, which could be used for flying remote-controlled planes and drones. EMF calculations on the HSR system were not completed as part of this analysis.

[13] City of Houston, Airport Land Use Regulations, Article VI, Section 9-360, accessed December 2019, http://system.gocampaign.com/file/511295.

Figure 3.15-2: Magnetic Field Strength as a Function of Distance



Source: AECOM 2016

3.15.4.1 EMF Guidance Documents Review

A variety of organizations have published recommendations for EMFs. These recommendations are not regulations but are frequently cited by organizations as a means of demonstrating low EMF levels. For example, JRC reported that the N700-Series Tokaido Shinkansen complies with the ICNIRP EMF exposure levels for the general public.[14] The discussion below is divided into national/international, state and regional guidance.

3.15.4.1.1 National/International

ICNIRP has adopted EMF exposure guidelines and standards in the extremely low frequency and radiofrequency bands of the EM spectrum. The ICNIRP standards address EMF exposure by the general public and workers in an occupational setting and are widely used within the U.S. and abroad. The ICNIRP recommendations are based on the epidemiological data available from verifiable research studies.[15] Based on ICNIRP's work, the European Union has adopted these same standards for EMF exposure.[16] **Table 3.15-4** summarizes these standards. While the guidelines are voluntary, the levels are designed to prevent potential health risks associated with EMF exposure.

[14] Central Japan Railway Company, "Environmental Report, 2010," Global Environmental Committee, accessed December 2019, http://jr-central.co.jp.
[15] ICNIRP, "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields," *Health Physics Society* 74(4):494-522, April 1998.
[16] Council Recommendation (1999/519/EC), "On the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)," *Official Journal of the European Communities*, July 12, 1999.

Table 3.15-4: 2010 International Commission on Non-Ionizing Radiation Protection Electric Field Exposure Limits

Frequency	Electric Field Strength (V/m)	Magnetic Field (μT)
Occupational: 60 Hz	10,000	400 (4,000 mG)
Public: 60 Hz	5,000	100 (1,000 mG)

Hz = hertz, V/m = volts per meter, μT = microTesla,

IEEE Standard C95.6, IEEE *Standard for Safety Levels With Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz*, is often referenced within the U.S. and has been formally adopted by ANSI. The IEEE standard specifies MPEs for the general public and for occupational exposure to extremely low frequency EMFs, which have frequencies of 0 to 3 kHz. **Tables 3.15-5** and **3.15-6** present IEEE Standard C95.6 exposure levels, with the 60 Hz levels highlighted for comparison.[17] Note that the IEEE exposure levels are guidelines only, not regulations.

Table 3.15-5: IEEE C95.6 Magnetic Field Maximum Potential Exposure Levels for the General Public

Body Part	Frequency Range (Hz)	Magnetic-Field (mG)
Head and Torso	20 – 759	9,040
	759 – 3,000	6,870,000/f
	60	9,040 (904 μT)
Arms or Legs	<10.7	3,530,000
	10.7 – 3,000	37,900,000/f
	60	632,000 (63,200 μT)

Source: IEEE 2002

f = frequency, /f = divide by the frequency, mG = milligauss

Table 3.15-6: IEEE C95.6 Electric Field Maximum Potential Exposure Levels for the General Public

Body Part	Frequency Range (Hz)	Electric Field (V/m)
Whole Body	1 – 368	5,000
	368 – 3,000	$1.84 \times 10^6/f$
	60	5,000

Source: IEEE, 2002

Hz = hertz, /f = divide by the frequency, MPE = maximum permissible exposure, V/m = volts per meter

In 2006, ANSI adopted IEEE Standard C95.1, as its standard for safe human exposure to EMF in the radiofrequency portion of the electromagnetic spectrum.[18] The HSR control and communications systems would use radio signals within the range covered by this standard. The C95.1 Standard specifies MPE levels for whole and partial body exposure to electromagnetic energy.

Both the IEEE C95.6 and C95.1 standards specify safety levels for occupational and general public exposure. For each, the exposure levels are frequency dependent. The general public exposure safety levels are stricter because workers are assumed to have knowledge of occupational risks and are better equipped to protect themselves (e.g., through use of personal safety equipment). The general public

[17] IEEE, "IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz," *IEEE Standard* C95.6-2002, October 2002.

[18] IEEE C95.1-2005, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," April 19, 2006.

safety levels are intended to protect members of the public, including pregnant women, infants, the unborn and the infirm, from short-term and long-term exposure to EMFs. The safety levels are set at 10 to 50 times below the levels at which scientific research shows harmful health effects may occur, thus incorporating a large safety factor.[19]

The American Conference of Governmental Industrial Hygienists recommends that occupational EMF exposure levels should not exceed 10 Gauss (10,000 mG, or 1 µT). The American Conference of Governmental Industrial Hygienists also recommends that workers with pacemakers should not exceed 1 Gauss (1,000 mG or 0.1 µT). The American Conference of Governmental Industrial Hygienists 10 Gauss guideline level is intended to prevent effects such as induced currents in cells or nerve stimulation. The American Conference of Governmental Industrial Hygienists guidelines are for occupational exposure only. Note that occupational EMF exposure is reasonably anticipated exposure to EMFs that may result from performance of an employee's duties.

3.15.4.1.2 State

The Texas Public Utility Commission published two recommendations for EMF. In both reports, the Public Utility Commission reviewed research regarding EMF and potential health impacts.

In 1992, the Public Utility Commission published their initial review, Electro-Magnetic Health Effects Committee Report,[20] which stated, "The Committee concludes that at present there is insufficient evidence regarding human health effects of EMF to provide the basis for a health-based standard."

In 2012, the Public Utility Commission re-evaluated the published literature on health effects and EMF exposure. The Infrastructure & Reliability Division[21] concluded, "Staff has determined that the large body of scientific research reveals no definite or proven biological effects from exposure to low-level [radiofrequency] signals."

3.15.4.1.3 Regional

Within the State of Texas, ordinances related to EMFs include the following:

- The City of Houston Airport Land Use Regulations, Article VI, Section 9-360[22].
- City of Taylor, Texas, Zoning Ordinance 2009, Part III, Article 14 Section 9
- City of Weatherford, Texas, Zoning Ordinance, Chapter 5, Section 12-5-8(6)
- City of Cibolo, Texas, Unified Development Code, Article 7, 2013, Section 7.2.5 and Section 7.2.9

These ordinances limit EMF from interfering with other electronic equipment. The only ordinance discussed above that is within the EMF Study Area is the City of Houston Land Use Regulations, which prohibit the use or generation of EMI within either the airport land or the airport land use envelope that may adversely impact airport operations or safety.

[19] Ibid.

[20] Texas Public Utility Commission, *Health Effects of Exposure to Powerline-Frequency Electric and Magnetic Fields*, March 1992, accessed December 2019, http://www.centerpointenergy.com/en-us/Documents/PUCT_Health_Effects_of_Exposure_to_Powerline_Frequency_EMF.pdf.

[21] Texas Public Utility Commission, *Report on Health and Radiofrequency Electromagnetic Fields from Advanced Meters*, December 12, 2012, accessed December 2019, http://www.silverspringnet.com/wp-content/uploads/smartmeterrfemfhealth12-14-2012.pdf.

[22] City of Houston, Airport Land Use Regulations, Article VI, Section 9-360, accessed December 2019, http://system.gocampaign.com/file/511295.

3.15.4.2 Literature Review

HSR is used in many other countries, where studies have been performed on the amount of EMFs that human beings are subjected to. For example, in Australia, Halgamuge et al. conducted a study to determine the long-term effects of EMF exposure from HSR systems on the passengers and workers. The study also summarizes other research on EMF exposure due to high-speed trainsets from around the world, including the United Kingdom, China, Japan, Switzerland, Germany and Russia. The study concluded that values measured as a part of the study were "far lower" than the ICNIRP recommended levels, which are summarized in **Table 3.15-7**.[23]

JRC notes that their N700-Series Tokaido Shinkansen trainset abides by all environmental laws. Further, the document states that JRC conducted EMF testing of both the interior and exterior of their N700-Series Tokaido Shinkansen trainset. The EMF inside the trainset and along the tracks is approximately one-third of the ICNIRP guidelines and is safe for persons with medical pacemakers. JRC has been able to achieve these low values through the implementation of high-performance magnetic shields on the trainsets.[24]

A study of high-speed trainsets in 2013 found that EMI is present from electrical currents in the catenary, rails and the earth. The extent of EMI is dependent on a number of factors, including the voltage used, the distance between substations and relative geography.[25]

A study of the Italian HSR has modeled the EMFs associated with the pantograph and the substations and concluded that EMFs are expected to be within ICNIRP guidelines.[26]

Finally, Muc conducted a study in 2013 of EMFs associated with the Shinkansen trainset systems, including the N700-Series Shinkansen. The study found that EMF field levels varied based on position within the trainset compartment, with a maximum of 250 µT reported.[27]

Table 3.15-7 summarizes the results of these reports and compares the reported values to the ICNIRP limit for general public exposure, which is used as a standard in Europe, and the IEEE standard for general public exposure, which is used in the U.S. These standards are highlighted in gray. All reported values are lower than the IEEE standards.

EMFs are emitted from natural and man-made sources. The earth has a natural magnetic field to which human beings are constantly exposed. In Dallas, the total magnetic field is approximately 49 µT (0.49 Gauss, or 490 mG), and in Houston, the total magnetic field is approximately 47 µT (0.47 Gauss, or 470 mG).[28]

[23] M. Halgamuge; C. D. Abeyrathne, and P. Mendis, "Measurement and Analysis of Electromagnetic Fields from Trams, Trains and Hybrid Cars," *Radiation Protection Dosimetry* 141(3):255-268, 2010.
[24] Central Japan Railway Company, *Environmental Report*, Global Environmental Committee, 2010, accessed December 2019, http://jr-central.co.jp.
[25] F. P. Banko and J. H. Xue, "Pioneering the Application of High Speed Rail Express Trainsets in the United States," Parsons Brinckerhoff, 2010 William Barclay Parsons Fellowship, *Parsons Brinckerhoff Group, Monograph 26*, 2013.
[26] Italian High Speed Railway Lines, *The MI-TO Project. Multidisciplinary Project Final Report*, 2006, accessed December 2019 https://workstory.s3.amazonaws.com/assets/890279/ASP_Report.pdf.
[27] A.M. Muc, *Electromagnetic Fields Associated with Transportation Systems*, Radiation Health Safety Consulting, Health Canada, 2001.
[28] National Geophysical Data Center, "Grid of Magnetic Field Estimated Values," 2015, http://www.ngdc.noaa.gov/geomag-web/#igrfgrid.

Table 3.15-7: EMFs and High-Speed Trainsets	
Source	**Magnetic Field (mG)**
IEEE Public Standard (U.S.)	9,040
ICNIRP Public Limit (Europe)	2,000
JRC (2010) – Shinkansen	~660
Muc (2013) – Shinkansen	2,500

mG = milligauss

Man-made sources within the Study Area include telecommunication transmitters that broadcast over a large area, electrical substations, AM and FM radio stations, time signal transmitters, maritime and land mobile radio transmitters, air-to-ground transceivers, cellular telephone antennas and television station transmission antennas.

As previously stated, sensitive receptors include locations where EMF from the Project could potentially interfere with sensitive electronics, such as emergency (police and fire) stations, hospitals, airports and research institutions, schools and parks. **Table 3.15-8** presents the sensitive receptors within the EMF Study Area. Note that sensitive receptors are located in areas where the track alignment will be on viaduct or an elevated platform. An elevated platform further increases the distance between the sensitive receptor and the HSR, allowing a greater distance for EMF levels to decrease.

Table 3.15-8: Potential EMF Sensitive Receptors				
County	**Sensitive Receptor Name**	**Type**	**Community and Cultural Resources Mapbook**	**Distance (feet)[a]**
Dallas	Fruitdale Park	Park	4	280
Harris	Northern Cypress Medical Center	Hospital	246	460
Harris	Cy-Fair High School	School	246	470
Harris	Arnold Middle School	School	246	470
Harris	The Panda Path School	School	251-252	430
Harris	Weiser Airpark	Airport	246	450
Harris	Houston Independent School District (HISD) Hattie Mae White Educational Support Center	School	253, 253 and 256	80
Harris	Houston Police Department	Police	250	180

Source: AECOM 2019

[a] Approximate distance in feet from centerline of track to edge of potential receptor property.

For a summary of the distribution of residential housing throughout the Study Area, refer to **Section 3.13, Land Use**.

3.15.5 Environmental Consequences

HSR system operations would generate EMFs in both the extremely low frequency and radiofrequency portions of the electromagnetic spectrum as follows:

- Extremely low frequency electric and magnetic fields generated by the electric power supply and distribution system serving the Project and its traction power system, including the TPSSs and on-train electric motors: The 25 kV power lines supplying electricity to the traction system and the flow of currents providing power to the HSR trainsets would produce the 60 Hz fields. Along the tracks, the flow of propulsion currents to the trainsets in the rails would produce the fields.
- Extremely low frequency harmonic fields from trainset vehicles: Depending on the design of power equipment in the HSR trainsets, powered electronics would produce currents at

frequencies in the kHz range. Potential sources include power conversion units, switching power supplies, motor drives and auxiliary power systems. Unlike the traction power system, these sources are highly localized in the trainsets and move along the track as the trainsets travel. The power distribution system primarily would generate extremely low frequency EMFs at 60 Hz and also at harmonics (multiples) of 60 Hz (such as 120, 180 and 240 Hz).

- Radiofrequency: The HSR system would use a variety of communications, data transmission and monitoring systems—both on and off vehicles—operating in the radiofrequency portion of the spectrum.

In addition, ungrounded metal structures may be subject to stray currents induced by passing trainsets. Stray currents can cause shock hazards to living beings and corrosion to metal structures, such as in reinforced concrete structures.[29] Induced currents may result in arcing, which has the potential to impact nearby EMF receivers. To mitigate this risk, **see EMF-CM#1: Fencing and Metal Grounding**.

3.15.5.1 No Build Alternative

Under the No Build Alternative, the HSR system would not be constructed or operated; therefore, ambient EMF conditions would remain the same as existing conditions. Sensitive receptors would not be subject to potential EMF or EMI from the construction or implementation of the HSR system.

3.15.5.2 Build Alternatives

3.15.5.2.1 Construction Impacts

Construction of the Project would be limited to within the LOD. These areas would be periodically subjected to increased EMF during the use of electric and electronic construction equipment, such as two-way communication radios and power equipment. This standard equipment is regulated by FCC and associated EMFs would be within the FCC regulatory limits. Typical construction equipment would not interfere with the operation of other nearby electric and electronic equipment; therefore, the impacts from construction activities of the Project would not be significant.

3.15.5.2.2 Operational Impacts

During operation, the Project would generate EMF/EMI both at 60 Hz and harmonics, as well as at radiofrequencies for HSR signaling and communication equipment. EMF exposure levels within and outside the existing Shinkansen trainsets are reported by Shinkansen to be below ICNIRP guidelines;[30] therefore, passengers on the trainset, waiting at the platform or beyond the external security fencing of the HSR ROW would not be exposed to EMF levels above the ICNIRP guidelines. Additionally, HSR equipment would comply with FCC requirements and not adversely interfere with other electric or electronic equipment.

3.15.5.2.3 Radio and Television Interference

No impact would be expected, as the HSR system would operate on different frequency bands. The FCC allocates different bands of the electromagnetic spectrum for different uses; cellular phones, radio control equipment and other communication devices have dedicated bands so that EMI cannot occur.

[29] C. Morrow, "Design of Reinforced Concrete Civil Structures to Mitigate Against Stray Current Corrosion with a Rail Corridor," 8th Australian Small Bridges Conference, November 28, 2017.
[30] JRC, *Environmental Report, 2010*, Global Environmental Committee, 2010, accessed December 2019, http://jr-central.co.jp.

3.15.5.2.4 Induced Currents and Shock Hazards

The generation of EMF from the HSR system can result in induced currents in nearby metal structures. These currents can lead to shock hazards to humans and animals if touched. The stray current may also lead to corrosion of metal unless properly grounded or otherwise protected. These induced currents and shock hazards can be minimized by grounding all metallic structures. Therefore, metal equipment surrounding the HSR system (i.e., metal fencing) would be grounded to minimize induced currents and shock hazards and maintained to prevent corrosion. See **EMF-CM#1: Fencing and Metal Grounding**.

3.15.5.2.5 Cardiac Pacemakers

The electric fields associated with the HSR system may be of sufficient magnitude to impact operation of a few older-model pacemakers; in such cases, the older-model pacemakers may revert to an asynchronous pacing while in the presence of the HSR system. Cardiovascular specialists do not consider prolonged asynchronous pacing to be a problem. Cardiovascular specialists commonly use asynchronous pacing to check pacemaker operation; therefore, while the HSR system's electric field may impact operation of some older-model pacemakers while in the presence of the HSR system, the result of the interference would be of short duration and not considered harmful. Pacemakers revert to their normal mode of operation once out of the immediate area of the HSR system.

Unlike high-voltage transmission lines, EMF exposure from the HSR system would not be constant. EMF exposure would only occur as the trainset passes by. Additionally, the exposure level would be lower than a high-voltage transmission line, as the Shinkansen website states that the trainset reportedly complies with the ICNIRP standards. As previously stated, the EMF inside the trainset and along the tracks is approximately one-third of the ICNIRP guidelines and is safe for persons with medical pacemakers.

3.15.5.2.6 Segment 1

In Dallas County, Segment 1 potential sensitive receptors include Fruitdale Park and the Trinity River Greenbelt Park. Locations and distances from the centerline of the track are presented in **Table 3.15-8**. The two parks are within 500 feet of the centerline of the track but are not expected to experience an EMF exposure impact from operation of the Project, as the operation would be periodic in nature, and use of electronic equipment at the park would not operate on the same electromagnetic frequency. FCC allocates different bands of the electromagnetic spectrum for different uses; cellular phones, radio control equipment and other communication devices have dedicated bands so that EMI cannot occur.

3.15.5.2.7 Segment 2A, 2B, 3A, 3B, 3C and 4

There are no potential EMF sensitive receptors in Ellis, Navarro, Limestone, Freestone, Leon and Madison Counties. Therefore, Segments 2A, 2B, 3A, 3B, 3C and 4 would not create an EMF exposure impact during operations of the Project.

3.15.5.2.8 Segment 5

Segment 5 would extend through Grimes, Waller and Harris Counties. No potential sensitive receptors were identified within 500 feet of the EMF Study Area within Grimes or Waller Counties. Potential EMF sensitive receptors were identified in Harris County: Northern Cypress Medical Center, The Panda Path School and Weiser Airport. The distances between the center line of the HSR track and the edge of the property of these sensitive receptors would be approximately 450 feet, which would be at the edge of

the analysis area where EMF levels from the Project would be minimal. In addition, the Project would comply with federal regulations, as summarized in **Table 3.15-3**.

3.15.6 Avoidance, Minimization and Mitigation

To avoid and minimize impacts to the social and physical environment, TCRR will comply with FCC regulations and ICNIRP guidelines for project equipment regarding EMFs. In addition, TCRR would be required to comply with the following Compliance Measure (CM).

EMF-CM#1: Fencing and Metal Grounding. As part of the general operation and maintenance of the HSR system, the external fencing and any other grounded metallic objects would be routinely inspected and replaced as necessary.

3.15.7 Build Alternatives Comparison

No EMI or adverse EMF exposure would occur from any of the Build Alternatives or Houston Terminal Station options.

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3.16 Safety and Security

3.16.1 Introduction

This section of the EIS considers the identification and management of safety and security issues that could result from natural disasters, safety incidents or criminal acts that would have the potential to affect the HSR system and the ability for emergency services to respond to incidents on or off the HSR system. This section also provides details on safety issues for construction and operation of the Project, including the measures and regulations currently in place, or that would be implemented to protect communities through which the Project would pass.

The safety and security within and adjacent to HSR vehicles and facilities is discussed for the Project as a whole, while the impacts to local emergency service providers are presented at the county level. Additionally, the analysis of safety and security includes human and environmental hazards. To address these hazards, different Study Areas were defined for each resource topic, as described in **Section 3.16.3, Methodology**.

3.16.2 Regulatory Context

Federal

Railroad Safety Statutes and Regulations

The railroad safety statutes mandate requirements to promote safety in an effort to reduce accidents and incidents associated with railroad operations.[1] Under those statutes, Congress authorized FRA to issue regulations needed to implement these requirements, which are codified at 49 C.F.R. 200-299. Several of these regulations would likely be applicable regardless of Project operating speeds or technology, such as Part 219, which addresses the control of drug and alcohol use; Part 225, which addresses accident/incident reporting; Part 214, which regulates railroad workplace safety; Part 228, which addresses hours-of-service requirements for train employees, dispatchers and signal maintainers; Part 239, which provides passenger train emergency preparedness requirements; and Parts 240 and 242, which address locomotive engineer and conductor certification.

Rail Safety Improvement Act of 2008

In September 2008, Congress enacted the Rail Safety Improvement Act (RSIA),[2] which establishes work hour limitations for rail operators and requires positive train control (PTC) technology to be installed across the U.S. rail network by 2015. In October 2015, Congress extended the deadline for PTC compliance to December 31, 2018, under the Positive Train Control Enforcement and Implementation (PCTEI) Act .[3]

Department of Homeland Security, Transportation Security Administration

The enactment of the Aviation and Transportation Security Act[4] in November 2001 established the Transportation Security Administration (TSA) as the administration responsible for transportation

[1] 49 U.S.C.. 201-213 and 49 C.F.R. 200-299.
[2] Public Law 110-432, 122 Statutes 4854 (October 16, 2008) (codified at 49 U.S.C. 20157).
[3] Public Law 114-73, 129 Statutes 568, 576-82 (October 29, 2015) (codified at 49 U.S.C. 20157(a)(1), (a)(2)(B), (k)).
[4] 49 C.F.R. 1580.

security screening and enforcement.[5] TSA administrative rules for rail transportation security are codified under 49 C.F.R. 1580.

Security Directives RAILPAX-04-01 and RAILPAX-04-02

On May 24, 2004, TSA issued Security Directives RAILPAX-04-01 and RAILPAX-04-02, which require passenger rail systems to implement certain security measures to address potential terrorist threats and establish a consistent baseline of protective measures applicable to all passenger rail operators. Specific requirements of TSA security directives are considered Sensitive Security Information, and not publicly available. Generally, RAILPAX-04-01 requires rail transportation operators to report potential threats and security concerns to law enforcement and the TSA, to designate a primary and alternate security coordinator, and to provide vulnerability assessments to TSA.[6]

Criminal Procedure

Section 1992 of U.S. Criminal Procedure prohibits terrorist attacks and other violence against railroad carriers and against mass transportation systems on land, on water or through the air.[7] Unlawful activity under this statute includes acts that target the vehicle, track, systems, infrastructure, passengers or operators of mass transit as well as surveillance with the intent to commit such acts or conveyance of false information in regard to unlawful actions defined under this statute.

Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA) enacted in 1986 requires industry to report on the storage, use, and release of hazardous substances to federal, state, and local governments and requires those governing bodies to use this information to prepare for chemical emergencies.[8]

State

Texas Senate Bill 975

Senate Bill 975, passed June 15, 2017, regulates privately owned HSR operators.[9] It requires compliance with TSA rules for intercity passenger rail; completion of periodic risk-based threat and vulnerability assessments; and implementation of appropriate security measures in response to the results of the assessments. In addition, the bill requires HSR operators to collect and investigate security threat reports submitted by members of the public and designate employees with emergency management responsibilities and requires those employees to complete emergency management training with the Texas Department of Public Safety. The designated emergency management personnel are required to coordinate with designated law enforcement agencies, the state's Emergency Management Council and TDEM.

[5] 49 U.S.C. 114.
[6] FTA, *Transit Agency Security and Emergency Management Protective Measures*, Appendix B: Suggested Protective Measures, November 2006.
[7] 18 U.S.C. 1992.
[8] (42 U.S.C. 116)
[9] Senate Bill 975, Relating to the security of high-speed rail operated by a private entity, 2017.

Texas Emergency Management Plan, 2019 Update

The Texas Emergency Management Plan[10] describes how the state will mitigate against, prepare for, respond to and recover from the impact of hazards to public health and safety, including natural disasters, technological accidents, homeland security threats and other emergency situations. It identifies emergency management tasks and responsibilities and establishes the State Emergency Management Council for coordination of state and local agencies. Appendix D of the plan provides a summary of emergency responsibilities for each state agency.

Texas Homeland Security Strategic Plan 2015-2020

The *Texas Homeland Security Strategic Plan 2015-2020* serves as a guide for managing homeland security risk by developing capabilities, planning for their employment and coordinating action at the state, regional, local, tribal and private sector levels.[11] The plan identifies the state's critical infrastructure and documents existing threats and hazards. It establishes goals for homeland security planning and requires each state agency with a role in homeland security and each council of governments to develop an annual implementation plan. The Texas Office of Homeland Security provides templates for these plans and ensures completion by appropriate agencies and regions.

State of Texas Hazard Mitigation Plan

The State of Texas Hazard Mitigation Plan[12] was updated in 2018 and is maintained in compliance with the Disaster Mitigation Act of 2000.[13] The plan applies to all state agencies, boards and departments with assigned mitigation responsibilities, and provides local guidance for the planning process as well as risk assessment and mitigation strategies to eliminate or reduce the effects of future disasters throughout Texas. The plan also outlines the state's mitigation program and its role in funding, technical assistance programs and monitoring the implementation of local mitigation measures.

Local

Dallas County Emergency Management Plan

The Dallas County Emergency Management Plan (EMP) includes a hazard and risk assessment for the county that identifies several natural and social hazards including storms, tornadoes, hail, flooding, extreme temperatures, earthquakes, fires, pandemics, civil disorders and terrorist attacks. The EMP also includes several annexes relating to warning and communications systems, shelter and mass care, evacuation procedures, emergency service coordination and resource management. The EMP is reviewed and updated annually by the Dallas County Department of Homeland Security and Emergency Management.

Dallas County Hazard Mitigation Action Plan, 2015 Update

The Dallas County Hazard Mitigation Action Plan (HAZMAP) was collaboratively developed by Dallas County, 10 local jurisdictions and NCTCOG to identify hazards and vulnerabilities and to develop projects or action items that could be implemented within Dallas County to mitigate the hazards identified. The

[10] Texas Department of Public Safety, Texas Division of Emergency Management, Preparedness Section, *Texas Emergency Management Plan February 2019*, https://www.preparingtexas.org/Resources/documents/State%20and%20Fed%20Plans/2019_Texas_Basic_Plan_Draft.pdf.
[11] Texas Department of Public Safety, *Texas Homeland Security Strategic Plan 2015-2020*, September 2015, https://www.dps.texas.gov/director_staff/txhomelandsecstratplan2015-2020.pdf.
[12] TDEM, *State of Texas Hazard Mitigation Plan*, October 2018, http://tdem.wpengine.com/wp-content/uploads/2019/08/txHazMitPlan.pdf.
[13] Public Law 106-390.

plan includes detailed tables documenting the recent occurrences of and damages associated with multiple types of hazards, including floods, tornadoes, droughts, hazardous materials incidents, earthquakes, aircraft accidents, civil disorders and others. Following the risk assessment, the plan presents specific hazard mitigation goals and objectives, and outlines a series of action items to address each objective. Action items include local planning and regulations, structure and infrastructure projects, education and awareness programs and technical and financial support.

Ellis County Hazard Mitigation Action Plan

The Ellis County HAZMAP was prepared in 2014 by the Ellis County Hazard Mitigation Planning Team consisting of representatives from Ellis County and 14 local jurisdictions. The plan includes the identification of hazards and a risk assessment for each, an assessment of existing local capabilities and mitigation strategies including specific action items for each jurisdiction. Implementation of action items is tracked bi-annually. The Ellis County HAZMAP is evaluated annually for effectiveness and formally updated every 5 years.

Navarro County Hazard Mitigation Action Plan

The Navarro County HAZMAP was approved by FEMA in 2014. It was developed by the Navarro County Hazard Mitigation Planning Committee and representatives from Navarro County, the City of Corsicana and the City of Kerens. The plan includes hazard identification, risk assessment, capabilities assessment and mitigation strategies. The mitigation strategies include a table of specific action items for each jurisdiction, which are monitored bi-annually by the Navarro County Emergency Management Coordinator. The Navarro County HAZMAP is evaluated annually and formally updated every 5 years.

Limestone County Hazard Mitigation Plan

The Limestone County Hazard Mitigation Plan was prepared by the Limestone County Office of Emergency Management and approved in 2014. It assesses the potential impact of eight hazards including dam failure, drought, flood, hail, thunderstorm, tornado, wildfire and winter storms. Following the hazards assessment, a series of mitigation actions are described, including potential costs and benefits, organization responsible for implementation, estimated completion date, potential funding sources, and objectives. The plan is updated every 5 years.

Madison County Hazard Mitigation Plan Update, Mitigating Risk: Protecting Madison County from All Hazards, 2013–2018

The Madison County Hazard Mitigation Plan uses FEMA's multi-hazards model to identify and rank hazards based on the potential for damages. Top priority hazards identified include floods, droughts, hurricanes, fires, severe winds, tornadoes, hail, dam failures and excessive heat. The plan develops 6 goals and 21 supporting objectives to reduce or eliminate the long-range risk of damages from these hazards. The plan presents a series of action statements, which include a description of the action, estimated costs, benefits, the responsible organization for implementing each action, an implementation schedule, objective(s), priorities and potential funding sources. A representative from each jurisdiction is responsible for continual monitoring of action items pertaining to their jurisdiction and notifying BVCOG of any needed changes in the plan based upon their monitoring activities. This mitigation action plan is formally reviewed and updated every 5 years.

Grimes County Hazard Mitigation Plan Update, Mitigating Risk: Protecting Grimes County from All Hazards, 2013–2018

The Grimes County Hazard Mitigation Plan uses FEMA's multi-hazards model to identify and rank hazards based on potential for damages. Top priority hazards identified include floods, droughts, hurricanes, fires, winter storms, tornadoes, hail, thunderstorms, dam failures and excessive heat. The plan aims to reduce or eliminate the long-range risk of damages from these hazards through the development of goals, supporting objectives and a series of action statements to be implemented by local jurisdictions. Action statements include a description, estimated costs and benefits, responsibilities, schedule, priorities and potential funding sources. A representative from each jurisdiction is responsible for continual monitoring of action items pertaining to their jurisdiction and notifying BVCOG of any needed changes in the plan based upon their monitoring activities. This mitigation action plan is formally reviewed and updated every 5 years.

Emergency Management Plan for Grimes County and Participating Jurisdictions

The EMP for Grimes County provides general guidance for emergency management activities and an overview of the county's methods for mitigation, preparedness, response and recovery. The plan assigns responsibilities for various emergency tasks and applies to all local officials, departments and agencies. The EMP identifies the following hazards as occasional or likely to occur: drought, flash flooding, flooding, hurricanes, tornadoes, wildfires, winter storms, energy shortages, hazardous materials spills, structural fires, water or electric failures, civil disorders and terrorism. The plan includes annexes describing warning and communications systems, shelter and mass care, evacuation procedures, emergency service coordination, resource management and other pertinent topics. The EMP is reviewed and updated annually.

Emergency Management Plan for Waller County and the Cities of Brookshire, Hempstead, Pattison, Pine Island, Prairie View and Waller, 2011

The EMP for Waller County provides general guidance for emergency management activities and an overview of the county's methods for mitigation, preparedness, response and recovery. The plan assigns responsibilities for various emergency tasks and applies to all local officials, departments and agencies. The EMP identifies the following hazards as occasional or likely to occur: drought, flash flooding, flooding, hurricanes, tornadoes, wildfire, winter storms, energy shortages, hazardous materials spills, structural fires, water system failures, civil disorders and terrorism. The plan includes annexes describing warning and communications systems, shelter and mass care, evacuation procedures, emergency service coordination, resource management and other pertinent topics. The EMP is reviewed and updated annually.

2017 Waller County Hazard Mitigation Plan

H-GAC's 2011 Regional Hazard Mitigation Plan, which was previously the Hazard Mitigation Plan of record for Waller County, expired on October 11, 2017, and is replaced by separate county-level Hazard Mitigation Plans, including the 2017 Waller County Hazard Mitigation Plan. This plan was developed through a partnership between Waller County and the cities of Brookshire, Hempstead, Pattison, Pine Island, Prairie View and Waller, with assistance from H-GAC. The top priority hazards identified include hurricane, flood, wildfire, drought and tornado. In addition, the plan documents hazards associated with hail, winter weather and severe thunderstorm. Over 90 critical facilities, including schools; correctional facilities; emergency medical services (EMS), fire and police stations; emergency operations centers; shelters; dams and electric substations; a Superfund site; and Toxics Release Inventory facilities. The

plan uses FEMA's HAZUS model to estimate potential losses for identified hazards. A mitigation action plan of specific programs and projects intended to reduce the impact of hazards are included with a feasibility score, implementation costs and timeframe for each action.

Harris County Texas Multi-Hazard Mitigation Plan

The Harris County Multi-Hazard Mitigation Plan includes the identification of hazards present in Harris County, a risk analysis of those hazards, an assessment of local capabilities and a series of mitigation strategies. The risk analysis identified flooding and hurricanes as high risk and tornadoes, thunderstorms, drought, extreme heat, hail, wildfires, hazardous materials spills and pipeline failures as moderate risk hazards. The plan identifies over 600 specific mitigation actions to be implemented by participating communities and agencies within Harris County. Mitigation actions include both pre-existing projects and new actions and are prioritized with cost funding and schedule criteria. The plan is updated every 5 years with the most recent version approved in June 2015.

3.16.3 Methodology

3.16.3.1 Study Area

The potential for natural hazards was evaluated at the county level. Crime was evaluated for the jurisdictions where stations are planned. Because the trainset would operate on a closed system, criminal activity that could affect passenger safety would funnel through station areas. Traffic and rail passenger safety are generally discussed at the state and national level, and the potential for terrorism activity is addressed qualitatively at the state and national level.

The Study Area for emergency service providers was defined separately for each service based on an understanding of the relationship between service boundaries, facility locations and the Project. Regarding law enforcement, Texas Local Government Code Title 11, Section 341 gives local police county-wide jurisdiction. County Sheriffs and state and federal law enforcement agencies also have jurisdictions corresponding to county or multi-county boundaries. Therefore, the entire 10-county area is used as the Study Area for public safety, and all law enforcement agencies within each county are identified as part of the affected environment.

With the exception of Dallas County, fire protection and EMS are generally organized into districts that provide seamless service coverage across a county. The geographic analysis identifies all fire or EMS districts that are either intersected by the LOD or provide service within a quarter-mile of the proposed alignments. Dallas County employs a Closest Unit Model that is used for emergency dispatch and does not consider jurisdictional boundaries when assigning fire and medical responders to an incident located anywhere in the county. This means that all emergency responders in the county could potentially be impacted by the Project regardless of where the emergency response vehicle is garaged. As such, the Study Area for fire and EMS includes all of Dallas County and the impact evaluation includes an assessment of how the Project may affect the cohesive provision of services in Dallas County.

To identify an appropriate number of hospitals in both urban and rural areas, two criteria were used to define the affected environment. First, all hospitals within a quarter-mile were considered for this analysis. In addition, the nearest hospitals to any point along the Project were identified.

3.16.3.2 Assessment

The three-step process for identifying potential impacts to safety or security include:

1. Establishing the risk of a particular hazard by examining existing and historical conditions
2. Evaluating proposed technology in light of its ability to withstand or avoid a particular hazard
3. Determining the potential to impede hazard response or mitigation in areas surrounding the Project or at construction sites

3.16.3.2.1 Natural Hazards

Safety hazards were identified by determining the frequency and severity of natural disasters, such as flooding, tornadoes, earthquakes, hurricanes and tropical storms within the Study Area. This assessment used an inventory of earthquake data from USGS to identify the locations most affected by earthquakes and their average intensity. Ground movement with a magnitude below 2.5 is generally not perceptible outside a seismograph and, therefore, not included in the USGS data or this analysis. Hazards associated with tornadoes, hurricanes, tropical storms, wildfires, floods, or flash flooding were evaluated using data from the National Oceanic Atmospheric Association (NOAA).

This study relies on definitions of weather events and direct damage assessment methodology established by NOAA. Flood events are recorded where water inundates a normally dry area, posing a threat to life or property. Flash flooding requires this inundation to occur rapidly (within minutes to hours of the causative event). Wildfires are included in the NOAA database only if they result in property damage or casualties.

For a rotating column of air to be classified in the NOAA database as a tornado, it must come into contact with the ground and present evidence of cross-path wind, wind convergence or missiles. Prior to 2007, tornados were classified using the Fujita scale (F0 to F5); more recent events use the Enhanced Fujita scale (EF0 to EF5). Tornados of category F0/EF0 have wind speeds below 72/85 mph, are typically associated with minimal damage[14], and are not included in this analysis. Hurricanes and tropical storms are separate categories of tropical cyclones, which differ only in intensity. Tropical storms have wind speeds between 39 and 73 mph, and hurricanes have speeds above 73 mph. Hurricane and tropical storm designations will often alternate as the cyclone picks up speed or slows down over land, such as with hurricanes Irene, Isabel, and Harvey, and for this reason are treated together for purposes of this EIS. A single storm episode may produce multiple floods, coastal flood, flash flood, tornado or other events. NOAA data for hurricanes and tropical storms includes only the damages and casualties directly attributable to high winds, with flood or other damage included under separate event entries. Natural hazard tables in **Section 3.16.4, Affected Environment,** include all events, with the number of separate storm episodes clarified in the narrative.

The historical frequency of events is described in terms of the number of each type of event recorded within a specific timeframe and classified as:

- **Low:** Probable occurrence in a timeframe exceeding 5 years or not at all
- **Medium:** Probable occurrence within 5 years
- **High:** Probable occurrence within 1 year

The severity is described in terms of average recorded property damage, loss of life and injuries per event and is classified as:

- **N/A:** Historic damages associated with an event incalculable due to low historic frequency

[14] The Fujita and Enhanced Fujita scales estimate different wind speeds due to evolving wind-monitoring technology, but both F0 and EF0 tornados are associated with storms producing similar damage indicators, such as the unearthing of shallow rooted vegetation, broken twigs, and occasional damage to chimneys. At this speed, tornados would produce similar conditions for safe train operations as other strong wind events or thunderstorms.

- **Low:** No loss of life or injury with property damage less than $100,000 per average event
- **Medium:** Occasional but infrequent death or injury or average property damage between $100,000 and $1 million per event
- **High:** Multiple deaths or injuries or average property damage exceeding $1 million per event

3.16.3.2.2 Criminal Activity

Potential on-board and station security hazards were measured using 2017 Federal Bureau of Investigation (FBI) crime rates for jurisdictions where stations are proposed. Crime rates are categorized according to the standards used by the FBI's Uniform Crime Reporting Program, a program that is used to standardize and track reporting of crime on a national level. Because the HSR system is a closed system, crime is evaluated around station areas where passengers would be able to get on and off the trainset. Crime rates in the City of Dallas were used to determine conditions at the Dallas Terminal Station, and rates for the City of Houston were used for the three Houston Terminal Station Options. The proposed location for the Brazos Valley Intermediate Station, the City of Roans Prairie, was not included in the FBI's database; therefore, crime rates for Grimes County are used as a proxy for this community.

The potential security risk from terrorist activities was analyzed. This analysis describes terrorist activity at the state level based on the National Consortium for the Study of Terrorism and Responses to Terrorism (START)'s Global Terrorism Database, which logs terrorist activity occurring between 1970 and 2017. An activity was categorized as terrorism if it met criteria established by START:[15]

- The act must be aimed at attaining a political, economic, religious or social goal.
- There must be evidence of an intention to coerce, intimidate or convey some other message to a larger audience (or audiences) than the immediate victims.
- The action must be outside the context of legitimate warfare activities.

In order to maintain a means of comparing hazards of different types, the same standards for low, medium and high frequency or severity that were applied to natural disasters are also applied to the assessments for crime and terrorism.

3.16.3.2.3 Emergency Services

A geographic analysis of emergency service facilities and jurisdictional boundaries was used to determine emergency services providers with jurisdiction within the Study Area. This information, in conjunction with a database of local roadway impacts, was used to determine potential effects on response time or emergency management. For fire and EMS service areas bisected by the Project, an inventory of roads providing connections between both sides of the Project was conducted to determine the number of roads that would be modified and the potential for those modifications to affect response times. For each service area, through roads are defined as public roads that would span the alignment. Through roads that would span the alignment at a location outside of the service area were also included if they provide a critical connection from one side of the service area to another. At an assumed average speed of 30 mph[16], a 1,000-foot change in route length would result in a change in

[15] University of Maryland, National Consortium for the Study of Terrorism and Responses to Terrorism (START), Global Terrorism Database, accessed November 2018, https://www.start.umd.edu/gtd/about/.

[16] Rough order of magnitude approximation to estimate potential travel times implications. Average speeds ranging from 20 to 40 mph would yield travel time impacts between 17 and 37 seconds and are indistinguishable when rounded to the nearest minute. Speeds will vary for each individual road modification, and response time implications should be reassessed using local information and construction detail as described in **SS-MM#1: Model Construction Impacts on Emergency Response Times**.

through travel time of less than half a minute. This analysis presents estimates of potential impacts to through travel times, rounded to the nearest minute, for each permanent road modification resulting in 1,000 feet or more of route length. These approximations are intended to provide a framework for understanding the extent and magnitude of changes within a response area, but do not represent an assessment of impacts to emergency response times. Response time impacts are dependent on the existing transportation network, dispatch and response locations, and alternate routes and should be modeled using detailed CAD software in consultation with each potentially affected emergency responder (see **SS-MM#1: Model Construction Impacts on Emergency Response Times**).

Specific temporary impacts would depend on the schedule, duration and concentration of the construction. However, this analysis evaluates the probability of construction period impacts to an emergency responder based on the number of modifications affecting through roads as follows:

- **Low:** Less than 50 percent of through roads require reconstruction or modification.
- **Medium:** 50 percent or more of through roads require reconstruction or modification, but at least two through roads remain unaffected.
- **High:** Project construction requires reconstruction or modification of all or all but one of the service area's through roads.
- **Localized:** Meets criteria for high impact potential, but only affects 10 percent or less of the existing service area. These areas are called out separately from areas of high potential, as they may represent places that could be addressed through collaboration with a neighboring jurisdiction or slight revision of service boundaries.

3.16.4 Affected Environment

In describing the affected environment and evaluating potential impacts, this section is organized first around a discussion of hazards, whether natural or to the social environment, and second around providers of emergency services. **Section 3.16.4.1, Natural Hazards,** describes the historical frequency and severity of natural hazards, including hurricane, tropical storms, coastal flood, flood, flash flood, tornado, wildfire and earthquakes. **Section 3.16.4.2, Criminal Activity,** summarizes crime and terrorism, and **Section 3.16.4.3, Transportation Hazards,** compares transportation safety by mode of travel. **Section 3.16.4.4, Emergency Services,** includes an inventory of emergency response resources.

3.16.4.1 Natural Hazards

The potential for natural disasters including earthquakes, floods, tornadoes, wildfires or hurricanes is variable from the northern portion of the Study Area to the southern portion. The historical frequency and severity of these extreme weather conditions is presented in **Table 3.16-1** for each county. The potential for earthquakes is limited to Dallas and Ellis Counties as discussed in **Section 3.20.4.1.3, Soils and Geology, Seismicity,** and **Section 3.20.4.2.2, Geology**. Wildfires can occur throughout the study area. The majority of wildfires in all Study Area counties occurred during the same period of time in late summer of 2011.[17]

Category F1/EF1 and F2/EF2 tornados occur throughout the study area. Tornadoes at F2/EF2 intensity have wind speeds up to 157 mph and represent conditions in which light objects such as roof tiles or branches can become missiles, windows are blown in and boxcars can be pushed. Category F3/EF3 and EF4 tornadoes have occurred in Dallas, Ellis and Harris Counties. At these intensities, storms can demolish buildings, overturn trains, uproot large trees or lift cars from the ground.

[17] NOAA, Storm Events Database (2000 to 2017).

The potential for major hurricane or tropical storm damage is higher in the southern portion of the Study Area. In addition to high velocity winds, hurricanes and tropical storms may present the additional complication of coastal inundation. Coastal inundation zones are located on the southeast side of Harris County.[18] In addition to direct damage, large hurricanes can affect the Study Area indirectly. For example, mass evacuations that occurred in Harris County while anticipating Hurricane Rita led to some fatalities when an evacuation bus caught fire. Hurricane Ike, which did not reach Harris County, nonetheless caused damage from flooding and power outages. Flooding is described in detail in **Section 3.8.4, Floodplains, Affected Environment**.

Table 3.16-1: Natural Hazards Inventory

County	Events (2000-2017)	Frequency (per Year)	Frequency Category	Property Damage (per Event)	Casualties (per Event)	Severity Category
Dallas County						
Earthquake	57	3.17	High	N/A	N/A	N/A
Tornado	11	0.61	Med	$39,118,000	44.5	High
Flood	18	1.00	High	$2,011,944	0.1	Med
Flash Flood	135	7.50	High	$175,215	0.1	Med
Hurricane/ Tropical Storm	0	0.00	Low	N/A	N/A	N/A
Wildfires	3	0.17	Low	$121,667	0.0	Med
Ellis County						
Earthquake	9	0.50	Med	$0	0.0	Low
Tornado	5	0.28	Med	$1,883,000	9.4	High
Flood	8	0.44	Med	$15,000	0.0	Low
Flash Flood	55	3.06	High	$115,200	0.0	Med
Hurricane/ Tropical Storm	0	0.00	N/A	N/A	N/A	N/A
Wildfires	4	0.22	Med	$132,750	0.0	Med
Navarro County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	5	0.28	Med	$282,000	1.0	Med
Flood	10	0.56	Med	$1,750	0.0	Low
Flash Flood	49	2.72	High	$20,869,816	0.1	High
Hurricane/ Tropical Storm	1	0.06	Low	$30,000	0.0	Low
Wildfires	7	0.39	Med	$57,143	0.0	Low
Freestone County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	0	0.00	Low	N/A	N/A	N/A
Flood	7	0.39	Med	$286	0.0	Low
Flash Flood	24	1.33	High	$80,771	0.0	Low
Hurricane/ Tropical Storm	1	0.06	Low	$30,000	0.0	Low
Wildfires	1	0.06	Low	$1,100,000	0.0	High
Limestone County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	3	0.17	Low	$466,667	7.0	High
Flood	9	0.50	Med	$1,111	0.0	Low
Flash Flood	55	3.06	High	$29,218	0.0	Low
Hurricane/ Tropical Storm	1	0.06	Low	$30,000	0.0	Low
Wildfires	2	0.11	Low	$16,500	0.0	Low
Leon County						
Earthquake	0	0.00	Low	N/A	N/A	N/A

[18] NOAA, Storm Surge Archives, 2018 dataset.

Table 3.16-1: Natural Hazards Inventory						
County	**Events (2000-2017)**	**Frequency (per Year)**	**Frequency Category**	**Property Damage (per Event)**	**Casualties (per Event)**	**Severity Category**
Tornado	0	0.00	Low	N/A	N/A	N/A
Flood	5	0.28	Med	$20,000	0.0	Low
Flash Flood	22	1.22	High	$17,364	0.0	Low
Hurricane/ Tropical Storm	1	0.06	Low	$150,000	0.0	Med
Wildfires	2	0.11	Low	$1,625,000	0.0	High
Madison County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	2	0.11	Low	$402,500	2.5	High
Flood	1	0.06	Low	$0	0.0	Low
Flash Flood	14	0.78	Med	$24,143	0.0	Low
Hurricane/ Tropical Storm	2	0.11	Low	$43,500,000	0.0	High
Wildfires	0	0.00	Low	N/A	N/A	N/A
Grimes County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	3	0.17	Low	$166,667	0.0	Med
Flood	0	0.00	Low	N/A	N/A	N/A
Flash Flood	31	1.72	High	$62,129	0.0	Low
Hurricane/ Tropical Storm	4	0.22	Med	$15,517,500	0.0	High
Wildfires	1	0.06	Low	$7,000,000	0.0	High
Waller County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	2	0.11	Low	$350,000	0.0	Med
Flood	0	0.00	Low	$0	0.0	Low
Flash Flood	13	0.72	Med	$550,923	0.1	Med
Hurricane/Tropical Storm	3	0.17	Low	$120,340,000	0.0	High
Wildfires	1[a]	0.06	Low	Unavailable	Unavailable	High
Harris County						
Earthquake	0	0.00	Low	N/A	N/A	N/A
Tornado	16	0.89	Med	$1,247,938	0.6	High
Flood	3	0.17	Low	$1,920,000	0.0	High
Flash Flood	127	7.06	High	$79,514,929	0.5	High
Hurricane/ Tropical Storm	8	0.44	Med	$2,140,001,000	7.3	High
Wildfires	0	0.00	Low	N/A	N/A	N/A

Source: NOAA, Storm Events Database (2000 to 2017), USGS, Earthquake Hazards Program (2000-2017)

[a] NOAA does not report a separate wildfire event for Waller County; however, the narrative description for a 2011 wildfire event attributed to Grimes and Montgomery Counties noted that parts of the fire spread into Waller County. Damages specific to Waller County were not available, so this analysis assumes similar conditions as reported for Grimes County.

3.16.4.2 Criminal Activity

Criminal activity, as defined in this section, includes an assessment of both local crime rates as well as terrorism events within the Study Area. FBI Uniform Crime rates for Dallas, Houston, and Grimes Counties are shown in **Table 3.16-2**. Crime rates for all types of criminal activity were higher in Dallas and Houston than the national or state averages. Grimes County had a higher than average murder rate, but incidents of all other crime types were below national and state averages.[19]

[19] FBI, 2017 Uniform Crime Reports, accessed February 2020, https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017.

Table 3.16-2: Reported Crime Rates for 2017 per 10,000 Residents								
Location	**Murder**	**Rape**	**Robbery**	**Aggravated Assault**	**Burglary**	**Larceny-Theft**	**Vehicle Theft**	**Arson**
City of Dallas	1.2	6.2	32.7	37.3	73.8	185.6	59.1	2.6
City of Houston	1.2	5.8	41.8	60.7	73.2	290.1	49.6	2.8
Grimes County	1.1	0.0	1.8	6.8	19.9	30.3	2.8	0.4
Texas	0.5	5.1	11.4	26.9	47.4	184.9	24.0	-
National	0.5	4.2	9.8	24.9	43.0	169.4	23.7	-

Source: FBI, Uniform Crime Reports 2017, United States Census Bureau Population Estimates, July 1, 2017

In Dallas, the DART system also publishes statistics for crime that occurs on transit vehicles or at facilities.[20] Total crimes reported for 2014 through 2017 by DART Police are presented in **Table 3.16-3**. Non-violent larceny-theft is the most common offense with 418 to 542 incidents, per annum, reported from 2014 to 2017. The rate of crime on the DART system has steadily increased up to 38 incidents per 10,000 average weekday riders in 2017. Similar data are not publicly available for the Houston Metro transit system.

Table 3.16-3: Total Reported DART Crimes for 2014-2017								
Year	**Murder**	**Rape**	**Robbery**	**Aggravated Assault**	**Burglary**	**Larceny-Theft**	**Vehicle Theft**	**Arson**
2014	0	1	96	23	2	418	25	1
2015	0	1	101	30	0	515	33	0
2016	1	2	157	48	4	516	36	2
2017	0	6	157	54	1	542	39	1

Source: DART Police Statistic Reports January to December 2014-2017

Crime in all parts of the Study Area represents a hazard of high frequency, in the sense that criminal activity is likely to occur many times over the course of the year. Approximately one out of every five crimes is violent, with the majority of crimes being non-violent burglary or theft. Available data do not publish the number of injuries, fatalities or property damage for each criminal act, but it is assumed that the severity rating for criminal activity would be medium to high.

Based on data from START described below, the historic frequency of terrorist activity is medium (probable occurrence every 5 years) for Dallas County and low for all other counties in the Study Area. The frequency of terrorism that specifically targets transit infrastructure is low for all counties. Terrorism, on average across the state, and within Dallas and Harris Counties specifically, is associated with a high severity due to potential for loss of life.

START's Global Terrorism Database identified 19 terrorism events in Texas between 2000 and 2017.[21] Adjusting for the large geographic area of the state, Texas ranks lower than the national average for number of terrorism events occurring per square mile. Between 2000 and 2017, terrorism in Texas directly affected 75 individuals, including 19 fatalities and 56 injuries.[22] Prior to 2015, no incidents occurred in Study Area counties, with all casualties reported for Texas occurring either around the State Capitol in Austin or the Fort Hood military instillation both over 100 miles from the Project. In recent years, there has been an increase in terrorism activity in Dallas and Harris Counties. In Harris County, assailants set fire to an African American church on July 15, 2015; on August 19, 2017, police prevented an attempted bombing of a confederate monument. Neither incident resulted in fatality or injury. In

[20] DART Police Statistics January to December 2014-2017, accessed February 2020, https://www.dart.org/about/dartpolice/dartpolicestats.asp.
[21] University of Maryland, START, Global Terrorism Database (2000-2017).
[22] Fatalities and injuries exclude those who committed the terrorist activity.

Dallas County, an armed assault of the Curtis Culwell Center on May 3, 2015, resulted in the non-fatal injury of one security officer and the death of both armed perpetrators. Another armed assault on July 7, 2016, led to the deaths of four police officers and the assailant as well as nine non-fatal injuries. On December 15, 2016, one reporter was injured as the result of a seizure-inducing electronic communication (classified by START as an assassination attempt). On July 7, 2017, assailants set fire to an African-American LGBT Community Center, resulting in minor property damage but no casualties.

No incidents of terrorism directed at rail stations or infrastructure have been reported in the state. At the national level only 5 out of 382 terrorism events identified by START (1 percent) were directed at public transit facilities. Two bombing attempts at passenger rail stations, one in Harlem, New York in 2010 and the other in Chester, Pennsylvania in 2011, were both prevented, resulting in no injury or property damage. On September 18, 2016, security forces defused four out of five explosive devices near a train station in Elizabeth, New Jersey, resulting in minor property damage but no injury. The fourth incident occurred on October 22, 2017, when a white extremist breached a secure area of an Amtrak train which triggered an emergency application of the train's brakes but did not lead to any damage or injury. Finally, on December 11, 2017, an attempted suicide bomber caused injury to himself and three others at a Port Authority bus terminal in Manhattan, New York. Military installations, places of worship, schools, and government buildings were all several times more likely to be targeted than transportation infrastructure.

3.16.4.3 Transportation Hazards

Table 3.16-4 summarizes total transportation related fatalities across a variety of travel modes. As shown, highway fatalities comprise the vast majority (over 90 percent per year). Railroad fatalities include both freight and Amtrak incidents, while transit fatalities include all transit modes for entities required to report to FTA. As described in more detail in **Section 1.2.2.5, Introduction, Need, Safety**, railroad fatalities primarily involve highway-rail grade crossings and trespassing pedestrians on railroad property. Project features, including restricted access and prohibition of any public highway-rail grade crossings, would reduce these specific safety concerns.

Table 3.16-4: National Transportation Fatalities by Mode

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	AVG.
Highway	37,423	33,883	32,999	32,479	33,782	32,893	32,744	35,484	37,806	37,133	34,663
Railroad	804	695	735	681	669	702	768	749	760	824	739
Air Travel	568	548	477	499	450	429	443	406	413	346	458
Transit	192	233	222	226	265	273	236	254	257	241	240

Accident, injury and fatality rates per vehicle mile for transit modes are reported in **Table 3.16-5**. The designated transit modes are based on FTA classifications. Heavy rail and commuter rail have the lowest accident rate per 100 million VMT, but because of higher passenger loads, also tend to result in more fatalities per accident and a higher average fatality rate per 100 million VMT Injury and fatality rates may also include non-passengers involved in an accident with a transit vehicle.

Table 3.16-5: 2018 Transit Fatalities

Transit Mode	Accidents per 100 Million Vehicle Miles	Injured Persons per100 Million Vehicle Miles	Fatalities per100 Million Vehicle Miles
Motor Bus	232	320	3.2
Light Rail	656	202	23.8
Heavy Rail	30	19	5.8

Table 3.16-5: 2018 Transit Fatalities			
Transit Mode	**Accidents per 100 Million Vehicle Miles**	**Injured Persons per100 Million Vehicle Miles**	**Fatalities per100 Million Vehicle Miles**
Commuter Rail	22	28	7.2
Demand Responsive	101	98	0.2
Van Pool	14	9	0.0
Automated Guideway	0	0	19.6

Source: Bureau of Transportation Statistics, Table 2-33, Transit Safety Data by Mode for All Reported Accidents, accessed October 2018

In addition to the comparison of total fatalities and fatalities per vehicle mile shown in **Tables 3.16-4** and **3.16-5**, it is also important to compare fatalities per passenger mile, as this is a more useful metric for an individual choosing the safest mode of travel for a particular trip. Transportation safety economist Ian Savage published a 2013 study estimating fatality rates per billion passenger miles based on nearly a decade of transportation fatality data, multiple mode crash statistics and occupancy rates. As shown in **Table 3.16-6**, this study estimates 0.43 passenger deaths per billion miles traveled by commuter rail and Amtrak and 0.24 deaths per billion miles on urban mass transit, compared with 7.28 deaths per billion miles for car drivers or passengers. In other words, making a particular trip by car increases a traveler's odds of fatality by 30 times compared to making the same trip by urban mass transit. Motorcycle was the riskiest mode of travel, with 212.57 fatalities per billion passenger miles, and commercial air travel was the safest, with a fatality rate of 0.07 per billion passenger miles.

Similar accident and fatality statistics are not available for systems operating technology comparable to the Project; however, Japan's Tokaido Shinkansen, which does operate a similar technology, has a proven safety record. In the over 50 years the Tokaido Shinkansen has been in service, it has moved over 6 billion passengers with zero passenger fatalities or injuries due to train accidents such as a derailment or collision.

Table 3.16-6: Passenger Fatalities per Billion Passenger Miles (2000-2009)	
Transit Mode	**Fatalities per billion passenger miles**
Riding a motorcycle	212.57
Driving or passenger in a car or light truck	7.28
Passenger on a local ferry boat	3.17
Passenger on commuter rail and Amtrak	0.43
Passenger on urban mass transit rail [a]	0.24
Passenger on a bus [b]	0.11
Passenger on commercial aviation	0.07

Source: Ian Savage, "Comparing the Fatality Risks in United States Transportation Across Modes and Over Time," Table 2, Passenger Fatalities per Billion Passenger Miles 2000-2009, 2013

[a] Includes assault and violent acts while onboard a train, based on 2002-2009 data.

[b] Transit, intercity, school or charter buses holding more than 10 passengers.

3.16.4.4 Emergency Services

This section identifies the existing emergency service providers and facilities in the Study Area. Service providers include law enforcement, fire and emergency medical services. Medical services include EMS districts and hospitals. **Figures 3.16-1** through **3.16-3** show the location of existing emergency service providers in the 10-county Study Area. Each service provider is labeled with a distinct map key corresponding to the service provided. Fire districts have labels beginning with an F, EMS districts are preceded by an E, and hospitals are labeled with an H.

Law enforcement is provided in overlapping layers of federal, state, county and local jurisdictions. Federal law enforcement authorities such as FBI; Drug Enforcement Administration (DEA); Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF); Immigrations and Customs Enforcement (ICE); and TSA have statutory authority to enforce certain federal laws anywhere in the Study Area. Similarly, federal agencies that provide medical, fire or emergency management services such as FEMA, the National Disaster Medical System (NDMS), DOI, and the U.S. Forest Service would have jurisdiction anywhere in the Study Area in the event of a declared disaster.

At the state level, Texas Department of Public Safety, through its Texas Highway Patrol division, is a fully empowered police agency with authority to enforce criminal law anywhere in the state. Although the highway patrol's primary task is enforcement of state traffic laws, troopers may also be responsible for general policing duties due to limited local law enforcement. Each county also includes a county sheriff's office, which has police jurisdiction countywide and serves as the primary responder in unincorporated areas and towns or villages without a dedicated police force. In addition, cities provide another layer of police protection. Although a city's police force is primarily focused on law enforcement within its jurisdictional boundaries, Texas state law allows city police to enforce laws anywhere in the county. For this reason, all law enforcement agencies located within a Study Area county have been identified.

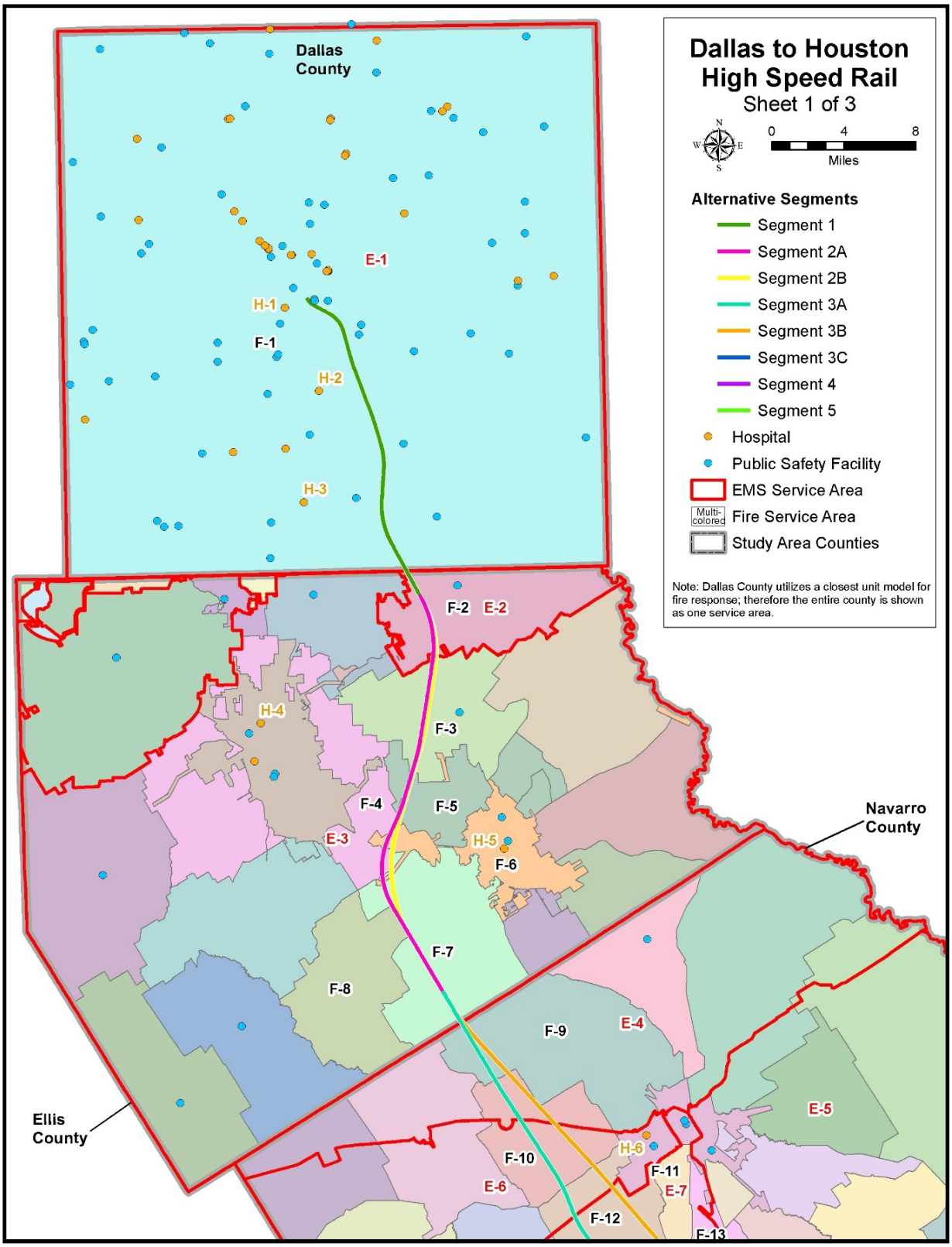
Fire and EMS districts that include part of the LOD, or that come within a quarter-mile of the Project, as described in the methodology, are documented by county in **Tables 3.16-7** through **3.16-16** along with all law enforcement agencies and the nearest hospital facilities. The map key provided in the tables corresponds to the labels used on **Figures 3.16-1** through **3.16-3**. Tables identify the Project segment or segments for which each EMS or Fire District was identified. In addition, law enforcement agencies are distinguished if their physical boundary includes a particular station area or segment or if they were identified due to countywide jurisdiction.

3.16.4.4.1 Dallas County

In addition to the state and federal agencies referenced above, 22 municipal police departments, 7 campus police and the County Sherriff's office provide police protection in Dallas County, as shown in **Table 3.16-7**. Fire and EMS response are managed at the county level, with Dallas County employing a closest-unit model that would dispatch the nearest available fire or EMS vehicle to an incident regardless of jurisdictional boundaries. In addition, three hospitals are located within the Study Area for Segment 1. Med-evac helicopter service providers in Dallas County include Phi Air Medical[23] in North Dallas and CareFlite based at Methodist Dallas Medical Center.[24]

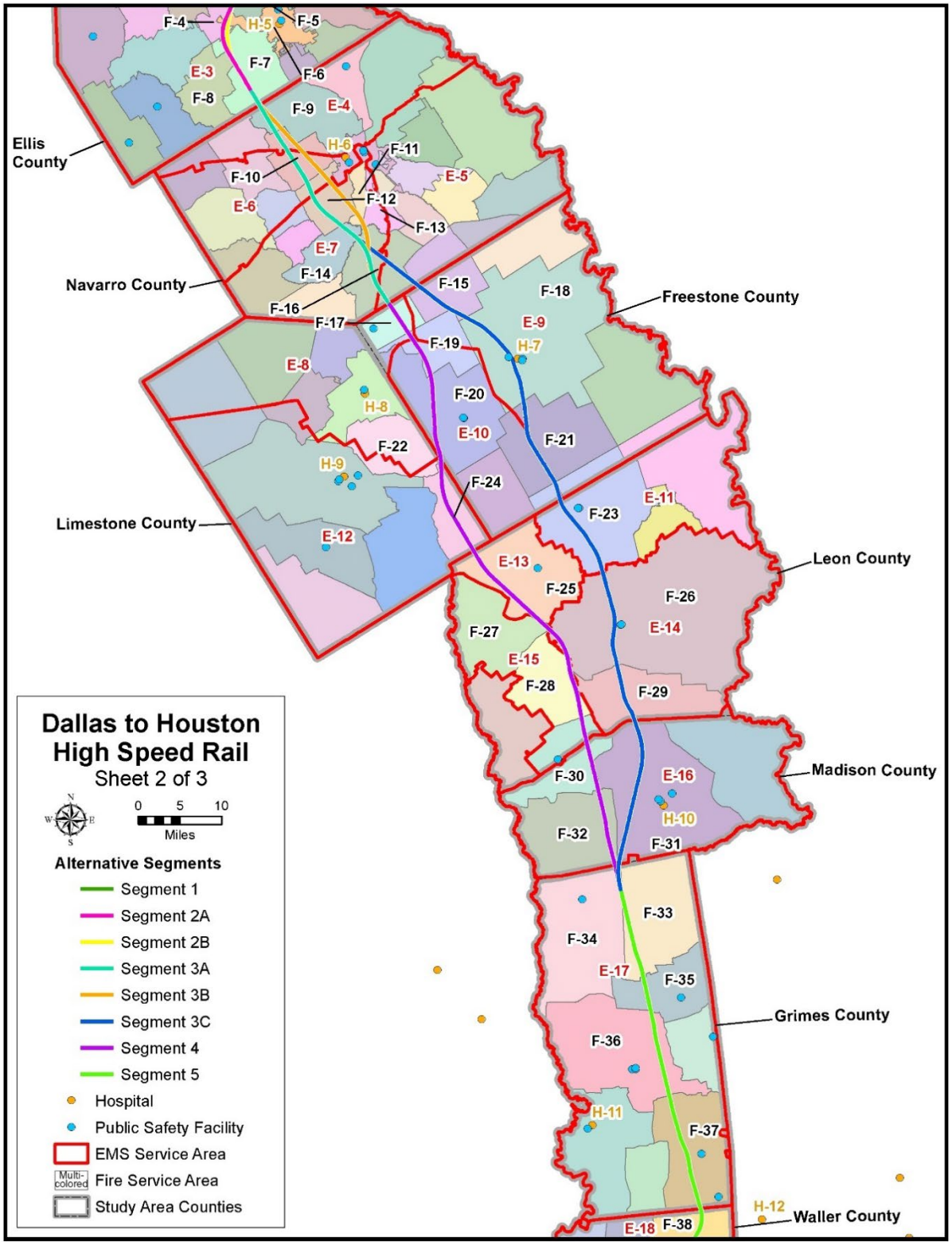
[23] Phi Air Medical, accessed October 2019, http://www.phiairmedical.com/where-we-are/national-map.html.
[24] CareFlite, accessed October 2019.

Figure 3.16-1: Emergency Service Providers, Dallas and Ellis Counties



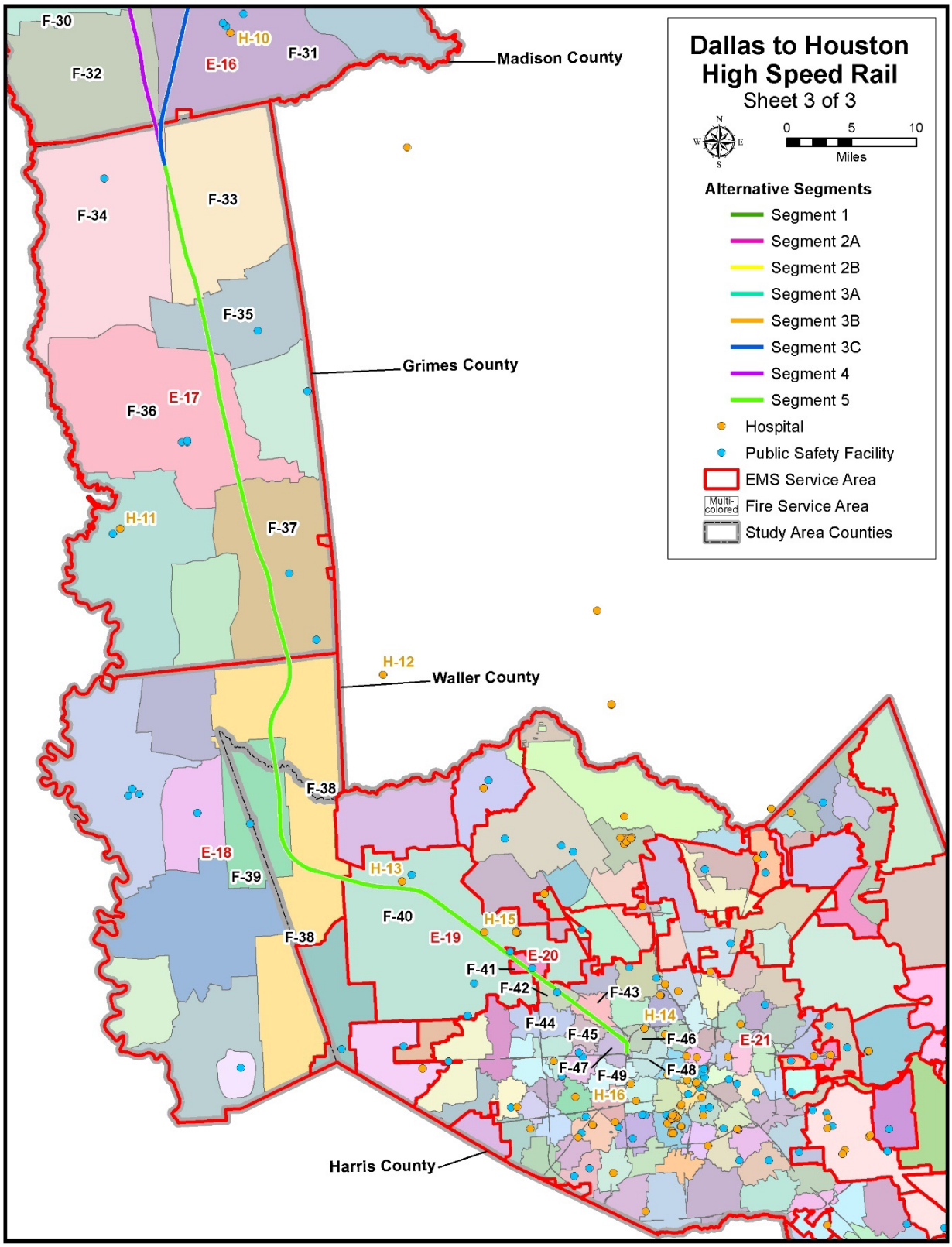
Source: AECOM 2019

Figure 3.16-2: Emergency Service Providers, Navarro, Freestone, Limestone, Leon, Madison and Grimes Counties



Source: AECOM 2019

Figure 3.16-3: Emergency Service Providers, Waller and Harris Counties



Source: AECOM 2019

Table 3.16-7: Dallas County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment/Station Area**	
Dallas Police Department Sector 150 and Beat 151	Dallas Terminal Station Area	
Texas Department of Public Safety, Region 1A	Segment 1	
Dallas County Sheriff's Office	Segment 1	
Dallas Police Department (Multiple Facilities)	Segment 1	
Hutchins Police Department	Segment 1	
Lancaster Police Department	Segment 1	
Wilmer Police Department	Segment 1	
Addison Police Department	Countywide Jurisdiction	
Balch Springs Police Department	Countywide Jurisdiction	
Cedar Hill Independent School District (CHISD) Police Department	Countywide Jurisdiction	
Cedar Hill Police Department	Countywide Jurisdiction	
Coppell Police Department	Countywide Jurisdiction	
Dallas Baptist University (DBU) Police Department	Countywide Jurisdiction	
Dallas Community College District Police Department	Countywide Jurisdiction	
Dallas Independent School District (DISD) Police Department	Countywide Jurisdiction	
DeSoto Police Department	Countywide Jurisdiction	
Duncanville Police Department	Countywide Jurisdiction	
Farmers Branch Police Department	Countywide Jurisdiction	
Garland Police Department (Multiple Facilities)	Countywide Jurisdiction	
Glen Heights Police Department	Countywide Jurisdiction	
Grand Prairie Police Department (Multiple Facilities)	Countywide Jurisdiction	
Highland Park Police Department	Countywide Jurisdiction	
Irving Police Department (Multiple Facilities)	Countywide Jurisdiction	
Mesquite Police Department (Multiple Facilities)	Countywide Jurisdiction	
Richardson Police Department	Countywide Jurisdiction	
Rowlett Police Department	Countywide Jurisdiction	
Sachse Police Department	Countywide Jurisdiction	
Seagoville Police Department	Countywide Jurisdiction	
Southern Methodist University (SMU) Police Department	Countywide Jurisdiction	
University of North Texas (UNT) Dallas Police Department	Countywide Jurisdiction	
University of Texas (UT) Dallas Police Department	Countywide Jurisdiction	
University Park City Police	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Dallas County Fire (Uses Closest Unit Model [a])	Segment 1	F-1
Emergency Medical Services	**Segment**	**Map Key**
Dallas County EMS (Uses Closest Unit Model [a])	Segment 1	E-1
Methodist Medical Center	Segment 1	H-1
Dallas VA Medical Center	Segment 1	H-2
Medical Center at Lancaster	Segment 1	H-3

Source: AECOM 2019

[a] Closest Unit Model in Dallas County will dispatch the nearest fire or medical unit regardless of jurisdiction.

3.16.4.4.2 Ellis County

Nine municipal and one campus police department provide law enforcement in Ellis County, as shown in **Table 3.16-8**. Seven fire districts provide service to Segments 2A and 2B. EMS service in Ellis County is contracted through two separate private providers, CareFlite and American Medical Response. Two hospitals serve Segments 2A and 2B. Within Ellis County Air Evac Lifeteam #74 in Waxahachie provides

med-evac helicopter service[25]. Lifeteam is affiliated with AMR EMS through the Global Medical Response (GMR) family of companies. CareFlite EMS is affiliated with CareFlite helicopters housed in neighboring counties.

Table 3.16-8: Ellis County Existing Emergency Service Providers

Law Enforcement Agency	Segment	
Texas Department of Public Safety, Region 1A	Segment 2A/2B	
Ellis County Sheriff's Office	Segment 2A/2B	
Ennis Police Department	Segment 2A/2B	
Ferris Police Department	Segment 2A/2B	
Palmer Police Department	Segment 2A/2B	
Italy Police Department	Countywide Jurisdiction	
Maypearl Police Department	Countywide Jurisdiction	
Milford Police Department	Countywide Jurisdiction	
Midlothian Police Department	Countywide Jurisdiction	
Navarro College Department of Public Safety	Countywide Jurisdiction	
Red Oak Police Department	Countywide Jurisdiction	
Waxahachie Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Ferris Fire Department	Segment 2A/2B	F-2
Palmer Volunteer Fire Department	Segment 2A/2B	F-3
Ellis County ESD #6	Segment 2A/2B	F-4
Garrett Area Rural Volunteer Fire Department	Segment 2A/2B	F-5
Ennis Fire Department	Segment 2A/2B	F-6
Bardwell Area Volunteer Fire Department	Segment 2A/2B	F-7
Avalon Volunteer Fire Department	Segment 2A/2B	F-8
Emergency Medical Services	**Segment**	**Map Key**
AMR	Segment 2A/2B	E-3
CareFlite	Segment 2A/2B	E-2
Baylor Scott & White – Waxahachie	Segment 2A/2B	H-4
Ennis Regional Medical Center	Segment 2A/2B	H-5

Source: AECOM 2019

3.16.4.4.3 Navarro County

Two municipal and one campus police department, as well as the Navarro County Sherriff's Office, provide law enforcement in Navarro County, as shown in **Table 3.16-9**. Five fire districts, four EMS districts and one hospital serve all three segment alternatives in the county. In addition, Segment 3B traverses the Retreat Volunteer Fire Department (VFD) and Angus VFD, while the Pursley VFD serves Segments 3A and 3C. Segment 3C also crosses into the southern corner of Streetman VFD's service area. In Navarro County, Phi Air Medical[26] provides helicopter med-evac services based near Corsicana.

[25]Air Evac Lifeteam, accessed February 2020, https://lifeteam.net/service-area/.
[26] Phi Air Medical, accessed October 2019, http://www.phiairmedical.com/where-we-are/national-map.html.

Table 3.16-9: Navarro County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 1A	Segment 3A/3B/3C	
Navarro County Sheriff's Office	Segment 3A/3B/3C	
Corsicana Police Department	Segment 3B/Navarro County	
Navarro College Department of Public Safety	Countywide Jurisdiction	
Rice Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Emhouse Volunteer Fire Department	Segment 3A/3B/3C	F-9
Barry Volunteer Fire Department	Segment 3A/3B/3C	F-10
Retreat Volunteer Fire Department	Segment 3B	F-11
Corbet-Oak Valley Volunteer Fire Department	Segment 3A/3B/3C	F-12
Angus Volunteer Fire Department	Segment 3B	F-13
Pursley Volunteer Fire Department	Segment 3A/3C	F-14
Streetman Volunteer Fire Department	Segment 3C	F-15
Richland Volunteer Fire Department	Segment 3A/3B/3C	F-16
Emergency Medical Services	**Segment**	**Map Key**
Corsicana EMS District 4	Segment 3A/3B/3C	E-4
Corsicana EMS District 2	Segment 3A/3B/3C	E-5
Corsicana EMS District 3	Segment 3A/3B/3C	E-6
Corsicana EMS District 1	Segment 3A/3B/3C	E-7
Navarro Regional Hospital	Segment 3A/3B/3C	H-6
Parkview Regional Hospital (Limestone County)	Segment 3A/3B/3C	H-8

Source: AECOM 2019

3.16.4.4.4 Freestone County

Three municipal law enforcement agencies and the Freestone County Sherriff's Office provide police protection in Freestone County, as shown in **Table 3.16-10**. In addition, Segment 3C is served by five fire districts, two EMS districts and one emergency medical facility. Segment 4 is served by three fire districts, two EMS districts and two emergency medical facilities. In Freestone County, Air Evac Lifeteam #53 in Fairfield provides med-evac helicopter service.[27]

Table 3.16-10: Freestone County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 6C	Segment 3C/4	
Freestone County Sheriff's Office	Segment 3C/4	
Fairfield City Police Department	Segment 3C	
Teague Police Department	Countywide Jurisdiction	
Wortham Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Streetman Fire Department	Segment 3C	F-15
Wortham Fire Department	Segment 4	F-17
Fairfield Fire Department	Segment 3C	F-18
Kirvin Fire Department	Segment 3C/4	F-19
Teague Fire Department	Segment 4	F-20
Dew Fire Department	Segment 3C	F-21
Buffalo Volunteer Fire Department	Segment 3C	F-23
Emergency Medical Services	**Segment**	**Map Key**

[27]Air Evac Lifeteam, accessed October 2019, https://lifeteam.net/service-area/.

Table 3.16-10: Freestone County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Mexia EMS	Segment 4	E-8
Fairfield EMS	Segment 3C	E-9
Teague EMS	Segment 3C/4	E-10
Freestone Medical Center	Segment 3C/4	H-7
Parkview Regional Hospital (Limestone County)	Segment 4	H-8

Source: AECOM 2019

3.16.4.4.5 Limestone County

As shown in **Table 3.16-11**, local law enforcement in Limestone County consists of the County Sherriff's Office, three municipal police departments and one campus police agency. Segment 4 is also served by the Lake Limestone Fire Department, Limestone EMS, and two emergency medical facilities. Shiloh Fire Department provides service within ¼ mile of Segment 4 but does not extend across the alignment.

Table 3.16-11: Limestone County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 6C	Segment 4	
Limestone County Sheriff's Office	Segment 4	
City of Mexia Police Department	Countywide Jurisdiction	
Groesbeck Police Department	Countywide Jurisdiction	
Navarro College Department of Public Safety	Countywide Jurisdiction	
Teague Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Shiloh Fire Department [a]	Segment 4	F-22
Lake Limestone Fire Department	Segment 4	F-24
Emergency Medical Services	**Segment**	**Map Key**
Limestone EMS	Segment 4	E-12
Parkview Regional Hospital	Segment 4	H-8
Limestone Medical Center	Segment 4	H-9

Source: AECOM 2019

[a] Shiloh Fire Department provides service within ¼ mile of Segment 4 but does not extend across the alignment.

3.16.4.4.6 Leon County

As shown in **Table 3.16-12**, three municipal police departments and the Leon County Sherriff's Office provide law enforcement in Leon County. Segment 3C is served by three fire districts and two EMS districts, while Segment 4 is served by six fire districts and three EMS districts. The nearest hospitals serving the Leon County segments are located in Limestone, Freestone, and Madison Counties and are documented in tables for both counties.

Table 3.16-12: Leon County Existing Emergency Service Providers	
Law Enforcement Agency	**Segment**
Texas Department of Public Safety, Region 2D	Segment 3C/4
Leon County Sheriff's Office	Segment 3C/4
Buffalo City Police Department	Segment 3C/Leon County
Jewett Police Department	Leon County
Normangee Police Department	Leon County

Table 3.16-12: Leon County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Fire Protection Services	**Segment**	**Map Key**
Buffalo Volunteer Fire Department	Segment 3C	F-23
Jewett Volunteer Fire Department	Segment 4	F-25
Centerville Volunteer Fire Department	Segment 3C/4	F-26
Marquez Volunteer Fire Department	Segment 4	F-27
Flynn Volunteer Fire Department	Segment 4	F-28
Leona Volunteer Fire Department	Segment 3C/4	F-29
Normangee Volunteer Fire Department	Segment 4	F-30
Emergency Medical Services	**Segment**	**Map Key**
Allegiance EMS	Segment 3C	E-11
Jewett EMS 2	Segment 4	E-13
Texas Medical Response	Segment 3C/4	E-14
Jewett EMS	Segment 4	E-15
Limestone Medical Center (Limestone County)	Segment 4	H-9
Freestone Medical Center (Freestone County)	Segment 3C	H-7
CHI Saint Joseph Health Madison Hospital (Madison County)	Segment 3C/4	H-10

Source: AECOM 2019

3.16.4.4.7 Madison County

The Madison County Sherriff's Office and Madisonville Police Department provide local law enforcement in Madison County. As shown in **Table 3.16-13**, Segment 3C is served by two fire districts, while Segment 4 is served by three. The Madison County EMS and CHI Saint Joseph Health Madison Hospital provide emergency medical services to both segment alternatives.

Table 3.16-13: Madison County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 2D	Segment 3C/4	
Madison County Sheriff's Office	Segment 3C/4	
Madisonville Police Department	Segment 3C/4	
Fire Protection Services	**Segment**	**Map Key**
Normangee Volunteer Fire Department	Segment 4	F-30
Madisonville Fire Department	Segment 3C/4	F-31
North Zulch Fire Department	Segment 3C/4	F-32
Emergency Medical Services	**Segment**	**Map Key**
Madison County EMS	Segment 3C/4	E-16
CHI Saint Joseph Health Madison Hospital	Segment 3C/4	H-10

Source: AECOM 2019

3.16.4.4.8 Grimes County

Six municipal police departments, the County Sherriff's Office and County Constable provide law enforcement in Grimes County, as shown in **Table 3.16-14**. In addition, Segment 5 is served by five fire districts, one EMS district and two hospitals.

Table 3.16-14: Grimes County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 2D	Segment 3C/4/5	
Grimes County Sheriff's Office	Segment 3C/4/5	
Grimes County Constable	Segment 3C/4/5	
Anderson Police Department	Countywide Jurisdiction	
Navasota Police Department	Countywide Jurisdiction	
Plantersville Police Department	Countywide Jurisdiction	
Richards Police Department	Countywide Jurisdiction	
Shiro Police Department	Countywide Jurisdiction	
Todd Mission Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Bedias Volunteer Fire Department	Segment 5	F-33
Iola Volunteer Fire Department	Segment 3C/4/5	F-34
Shiro Volunteer Fire Department	Segment 5	F-35
Anderson Volunteer Fire Department	Segment 5	F-36
Plantersville Volunteer Fire Department	Segment 5	F-37
Emergency Medical Services	**Segment**	**Map Key**
St. Jo EMS	Segment 3C/4/5	E-17
CHI Saint Joseph Health Madison Hospital (Madison County)	Segment 3C/4/5	H-10
CHI Saint Joseph Health Grimes Hospital	Segment 5	H-11

Source: AECOM 2019

3.16.4.4.9 Waller County

Six municipal police departments, one campus police department and the Waller County Sherriff's Office have law enforcement jurisdiction in Waller County, as shown in **Table 3.16-15**. In addition, Segment 5 in Waller County is served by two fire districts and the Waller County EMS district. The nearest emergency medical facilities are the Affinity Emergency Center at Magnolia and the Memorial Hermann Cypress Hospital.

Table 3.16-15: Waller County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
Texas Department of Public Safety, Region 2C	Segment 5	
Waller County Sheriff's Office	Segment 5	
Waller Police Department	Segment 5	
Hempstead Police Department	Countywide Jurisdiction	
Katy Police Department	Countywide Jurisdiction	
Katy Independent School District (Katy ISD) Police Department	Countywide Jurisdiction	
Prairie View Police Department	Countywide Jurisdiction	
Brookshire Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Tri County Volunteer Fire Department	Segment 5	F-38
Waller Volunteer Fire Department	Segment 5	F-39
Emergency Medical Services	**Segment**	**Map Key**
Waller County EMS	Segment 5	E-18
Affinity Emergency Center at Magnolia (Montgomery County)	Segment 5	H-12
Memorial Hermann Cypress Hospital (Harris County)	Segment 5	H-13

Source: AECOM 2019

3.16.4.4.10 Harris County

As shown in **Table 3.16-16**, over 30 municipal and campus police departments, the Harris County Constable and the Harris County Sherriff's Office have law enforcement jurisdiction in Harris County. In addition, Segment 5 traverses the Waller, Tri-County, Cy-Fair, and Jersey Village fire service areas as well as eight station areas within the Houston Fire Department. In Harris County, Segment 5 is served by four EMS districts and four Hospitals. Med-evac service providers based in Harris County include Phi Air Medical,[28] REACH Air Medical Services, CareFlite,[29] and Memorial Herman Life Flight. Memorial Herman's 150-mile service area would include parts of the Project in Grimes, Madison, and Leon Counties.[30]

Table 3.16-16: Harris County Existing Emergency Service Providers

Law Enforcement Agency	Segment
Houston Police Department's Northwest Division, Districts 4 and 5 and Beat 5F10	Houston Terminal Station Area
Texas Department of Public Safety, Region 2A	Segment 5
Harris County Constable	Segment 5
Harris County Sheriff's Office	Segment 5
Houston Police Department	Segment 5
Jersey Village Police Department	Segment 5
Baytown Police Department	Countywide Jurisdiction
Bellaire Police Department	Countywide Jurisdiction
Deer Park Police Department	Countywide Jurisdiction
Galena Park Police Department	Countywide Jurisdiction
Hedwig Village Police Department	Countywide Jurisdiction
Houston Baptist University (HBU) Police Department	Countywide Jurisdiction
Houston Community College Police	Countywide Jurisdiction
Humble Police Department	Countywide Jurisdiction
Jacinto City Police Department	Countywide Jurisdiction
Katy Police Department	Countywide Jurisdiction
Katy Independent School District (Katy ISD) Police Department	Countywide Jurisdiction
Klein Independent School District (Klein ISD) Police Department	Countywide Jurisdiction
La Porte Police Department	Countywide Jurisdiction
Lakeview Police Department	Countywide Jurisdiction
Memorial Villages Police Department	Countywide Jurisdiction
Morgan's Point Police Department	Countywide Jurisdiction
Nassau Bay Police Department	Countywide Jurisdiction
Pasadena Police Department	Countywide Jurisdiction
Rice University Police Department	Countywide Jurisdiction
Seabrook Police Department	Countywide Jurisdiction
Shoreacres Police Department	Countywide Jurisdiction
South Houston Police Department	Countywide Jurisdiction
Southside Place Police Department	Countywide Jurisdiction
Spring Valley Police Department	Countywide Jurisdiction
Texas Southern University (TSU) Police Department	Countywide Jurisdiction
Tomball Police Department	Countywide Jurisdiction
University of Houston Police Department	Countywide Jurisdiction
Waller Police Department	Countywide Jurisdiction
Webster Police Department	Countywide Jurisdiction

[28] Phi Air Medical, accessed February 2020, http://www.phiairmedical.com/where-we-are/national-map.html.
[29] CareFlite, accessed February 2020, https://www.careflite.org/AboutUs.aspx.
[30] Memorial Herman Life Flight, accessed October 2019, https://trauma.memorialhermann.org/life-flight/.

Table 3.16-16: Harris County Existing Emergency Service Providers		
Law Enforcement Agency	**Segment**	
West University Place Police Department	Countywide Jurisdiction	
Fire Protection Services	**Segment**	**Map Key**
Waller Volunteer Fire Department	Segment 5	F-39
Tri County Volunteer Fire Department	Segment 5	F-38
Cy-Fair Volunteer Fire Department	Segment 5	F-40
Jersey Village Fire Department	Segment 5	F-41
Houston Fire Department – Station 66	Segment 5	F-42
Houston Fire Department – Station 50	Segment 5	F-43
Houston Fire Department – Station 77	Segment 5	F-44
Houston Fire Department – Station 5	Segment 5	F-45
Houston Fire Department – Arson Division	Segment 5	F-46
Houston Fire Department – Station 38	Segment 5	F-47
Houston Fire Department – Station 11	Segment 5	F-48
Houston Fire Department – Station 2	Segment 5	F-49
Emergency Medical Services	**Segment**	**Map Key**
Waller/Harris County EMS	Segment 5	E-18
Cy-Fair EMS	Segment 5	E-19
Jersey Village EMS	Segment 5	E-20
Houston EMS	Segment 5	E-21
Memorial Hermann Cypress Hospital	Segment 5	H-13
North Cypress Medical Center	Segment 5	H-15
Memorial Hermann Greater Heights Hospital	Segment 5	H-14
Saint Jude's Children's Hospital	Segment 5	H-16

Source: AECOM 2019

3.16.5 Environmental Consequences

3.16.5.1 No Build Alternative

The No Build Alternative reflects existing conditions and programmed infrastructure projects and improvements. Under the No Build Alternative, similar safety and security hazards and resources would exist as those documented in **Section 3.16.4, Affected Environment**. The No Build Alternative assumes no safety or security impacts as a result of HSR operations. Other safety and security hazards could increase relative to existing conditions as a result of other planned projects and population growth as follows:

- Natural hazards would likely occur at the same frequency with potential for damage increasing as population density and property values increase.
- Traffic accidents and fatalities could increase proportionally with increasing VMTs.
- Frequency of criminal activity could increase with increases in population.
- The demand for law enforcement, fire protection and EMS would increase with population and business growth.
- Emergency response times would remain steady, as programmed transportation improvements offset congestion and the number of emergency responders and resources increase to serve an expanding population.

The impacts of planned projects including several transportation projects in Dallas County and one in Harris County are discussed in **Section 4.4, Indirect Effects and Cumulative Impacts, Cumulative Impacts**.

3.16.5.2 Build Alternatives

The organization of this section (Environmental Consequences for Safety and Security) differs from other sections within this Final EIS, in that the evaluation of potential impacts is presented thematically. Impacts are assumed to be common to all Build Alternatives with the exception of emergency response, which is summarized by segment in the analysis that follows.

TCRR proposes to implement the Tokaido Shinkansen HSR system with minimal modifications, including its design safety elements, systems approach, culture of safety and accident avoidance principles. Accident avoidance principles covering all aspects of system design, operations, inspection, testing and maintenance and training are the foundations for the Tokaido Shinkansen's proven safety record. These key elements of accident avoidance have been monitored and refined over five decades to result in an expert level of understanding of the principles necessary for safe design and operation of an HSR system. These principles lead to HSR system operations and design features (detailed as avoidance measures in **Section 3.16.6, Avoidance, Minimization, and Mitigation**) that would eliminate the risk of train-to-motor vehicle collisions and high-speed train-to-train collisions.

3.16.5.2.1 Impacts Related to HSR Operations

This section addresses potential environmental impacts related to derailment, collision or other operational or mechanical failure of the Project during normal operations. Potential impacts related to fire or severe weather are evaluated separately in the following subsections.

Train derailments occur when any of a train's wheels leave its designated location on the track. The potential impact of derailment is a combination of the likelihood for derailment to occur, the potential for a derailed vehicle to leave the track area or overturn, and the likelihood that a derailed vehicle could leave the HSR ROW. A derailment contained within the HSR ROW could represent an impact primarily to passenger safety. If a derailed vehicle left the HSR ROW, there could be additional impacts to persons and properties immediately adjacent to the operational corridor in the event of a collision. The hazard to adjacent properties would be defined by the length of travel beyond the operational corridor based on the train's momentum and any barriers to movement. Communities located adjacent to the Project are described in **Section 3.14.4, Socioeconomics and Community Facilities, Affected Environment.** The HSR system would be an electric-powered, multiple unit passenger trainset, so a derailment would not introduce additional impacts related to fuel combustion or the transportation of hazardous freight cargo.

Between 2001 and 2010, U.S. train derailments resulting in accidents occurred most commonly as a result of broken rails or rail welds, with other notable causes including track geometry, bearing failure or broken wheels, buckled track, obstructions, and improper train handling or braking.[31] The potential for derailment would be mitigated through regular inspection, testing and maintenance of the HSR track and equipment (see **SS-CM#3: Inspection, Testing, and Maintenance**); daily operation of a sweeper vehicle to inspect the ROW for obstructions; a design that would minimize curvature and maximize the use of crossties; and automatic train control (ATC). FRA proposes in the NPRM a requirement that TCRR utilize the JRC Tokaido Shinkansen ATC signaling system. The proposed ATC signaling system would meet

[31] X. Liu, M. R. Saat, and C. P. L. Barkan, "Analysis of Causes of Major Train Derailment and Their Effect on Accident Rates," Transportation Research Record: *Journal of the Transportation Research Board*, 2289(1), 154–163. doi: 10.3141/2289-20, 2012.

or exceed all federal PTC requirements, and would control operations and movements of the trainset, including those trainset movements in stations and maintenance facilities, at all speeds. JRC's ATC helps prevent over-speed derailments[32] and has the ability to detect broken rails and prevent the trainset from entering the affected track circuit. As a result of these measures, the potential for impact to passenger safety as a result of an HSR derailment would not exceed the No Build condition, in which trips would be made using existing transportation modes. Accident and fatality rates for existing transportation modes are described in **Tables 3.16-4** through **3.16-6**.

Impacts related to collisions would occur if an HSR vehicle were to strike a person, animal, vehicle or other object, either on the HSR track or as a result of an HSR derailment. The potential for derailment would be mitigated through the measures previously described. To minimize the potential for collisions within the ROW, the Project would be built within a dedicated ROW that is completely grade separated from freight, automobile and pedestrian traffic. Additionally, by avoiding bi-directional service, TCRR would mitigate the risk of head on collisions as trainsets would never need to travel through the same section of track in opposite directions. Further, TCRR's ATC system would control trainset movements at all locations, further mitigating the potential for train-to-train collisions.

To mitigate the potential for collision with a person, animal or vehicle in the ROW, FRA proposes in the NPRM a requirement that TCRR develop, adopt and comply with a Right of Way Barrier Plan (see **SS-CM#9: ROW Barrier Plan**). This plan would address unauthorized access to the ROW, including vandalism, objects thrown or dropped from overhead structures onto the ROW, and intrusion of vehicles from adjacent ROW. As specified in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, TCRR will install security fencing, physical barriers and an intrusion detection system to secure the entire ROW. Overhead road structures will have guard rails as required by TxDOT to prevent vehicle intrusion onto the rail ROW.

The Project design employs controlled access across the length of the Project using a combination of viaduct sections and security fencing (where the Project is not on viaduct), embedded 18 inches deep into the ground to deter burrowing animals from entering the rail corridor (following BMPs for feral hogs identified by Texas A&M University and Texas Department of Agriculture). TCRR will develop additional fencing specifications as it advances design for the Project. In the NPRM, FRA proposes a requirement that TCRR protect the foundations of rail bridges located over highways or navigable waterways against the impact of road vehicles or water-borne vessels. To mitigate the potential for collisions in the event of an incident on adjacent freight rail, TCRR will coordinate with local railroads to install appropriate barriers where the HSR system would run parallel to freight railroads, as specified in **TR-CM#4: ROW Barriers.**

Mechanical failure could pose some risk to passengers or employees if confined on a non-operational vehicle and could introduce safety hazards for employees performing emergency maintenance. Additionally, mechanical failure of the doors could impact the safety of boarding or alighting passengers. TCRR's Inspection, Testing and Maintenance Program (see **SS-CM#3: Inspection, Testing, and Maintenance**) would minimize the occurrence of mechanical failure. TCRR's Emergency Preparedness Plan (see **SS-CM#1: Emergency Preparedness Plan**) would specify safe evacuation routes and emergency procedures in the event of a mechanical failure. The HSR design would include emergency exit path markings and signage, emergency lighting, emergency access windows and roof access on every car. In addition, the HSR ROW will have walkways along elevated and at-grade sections with vertical access provided in compliance with applicable OSHA and ADA standards for emergency access and egress (see **SS-CM#7: Compliant Facility Design** and **EH-CM#1: Compliance with ADA and TAS).** FRA

[32] There have been no overspeed derailments in over 50 years of operation.

proposes in the NPRM a requirement that TCRR shall not conduct scheduled ROW maintenance on a section of the ROW prior to that section of the ROW being cleared of all revenue service trainsets, and proper action is taken by the general control center staff to protect incursion into established maintenance zones by revenue trainsets. Additionally, the railroad shall not commence revenue service prior to completion of the maintenance activities, that section of the ROW being cleared of all MOW equipment.

To further mitigate risks associated with emergency maintenance activities and passenger evacuation activities, employees would receive safety training in compliance with **SS-CM#2: System Safety Program**. FRA proposed in the NPRM a requirement that TCRR shall have station platform attendants on the platform in proximity to the train protection switches and shall have operating rules requiring coordination between on-board crew and station platform attendants to ensure safety during passenger boarding and alighting from trainsets at stations. The N700-Series trainset doors are equipped with interior manual release mechanisms, exterior door indicator lights that can be seen by the platform attendant, and a manual door override located on the exterior of each car.

3.16.5.2.2 Impacts Related to Natural Hazards

The Project would include elements, such as station facilities, passenger vehicles, maintenance facilities and the traction power stations, that are at risk from extreme weather or seismic events that would create a need for the safe evacuation of passengers and employees.

Tables in **Section 3.20.4.1.3, Soils and Geology, Seismicity,** document that no seismic activity in the Study Area has exceeded a magnitude of 3.6. Ground movement of this magnitude is perceptible but rarely causes damage, and is unlikely to physically move an object the size of a Shinkansen trainset or its infrastructure.[33] As stated in **SG-MM#1: Erodibility, Shrink-swell Potential, Corrosion, and Settlement,** TCRR shall incorporate soil stabilization techniques, such as lime stabilization and outside fill, to minimize and mitigate hazards associated with erodibility, shrink-swell potential, corrosion potential, settlement, and slope failures. Given the low severity of historic ground movement in the study area and the soil stabilization around the Project infrastructure, it is unlikely that seismic activity would adversely impact operations.

Tornadoes would need to reach approximately category F3 (wind speeds of 158 to 206 mph) or higher to physically overturn a trainset, should a trainset be running.[34] A category F3 tornado has only occurred in the 10-county Study Area four times in the last 15 years.[35] Smaller tornadoes and other severe storms may produce enough wind to blow large debris onto the tracks. The probability of a tornado crossing the HSR infrastructure is comparable to other linear infrastructure, such as a highway. However, under severe storm conditions, the Project would differ from a highway in three notable ways. First, Project trainsets are much heavier and harder to move than personal automobiles. Second, TCRR has the ability to suspended operations under severe storm conditions, whereas highway travel is more susceptible to individual choices. Third, the frequency of trainsets operating over a given point of infrastructure would be less than passenger vehicles traveling on a highway, allowing more time for TCRR to detect and respond to hazardous conditions or damaged infrastructure before the next trainset passed. The

[33] GNS Science, The Richter Magnitude Scale, accessed August 2019, https://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/Monitoring-Earthquakes/Other-earthquake-questions/What-is-the-difference-between-Magnitude-and-Intensity/The-Richter-Magnitude-Scale.
[34] NOAA, Fujita Tornado Damage Scale, accessed February 2020, https://www.spc.noaa.gov/faq/tornado/f-scale.html.
[35] NOAA, Storm Events Database (2000 to 2017).

potential for severe weather to impact HSR passenger safety would not exceed the No Build condition, in which trips would be made using existing transportation modes.

Hurricanes and tropical storms are typically large and slow moving and can be detected in advance, allowing for the suspension of HSR service before a hurricane reaches the rail corridor. The likelihood of hurricanes or tropical storms adversely impacting the active operations of the Project is low. The probability of a hurricane or tropical storm crossing the HSR infrastructure is comparable to other linear infrastructure.

Adequate drainage along the Project and at facilities is the key to preventing safety hazards related to flooding and flash flooding. There are several strategies to reduce the impacts to floodplains, including retaining existing elevations, constructing storm water mitigation measures, constructing retention/detention ponds and minimizing fill in sensitive areas. Compliance measures that address potential impacts are described in **Section 3.8.6.1, Floodplains, Compliance Measures**. Stormwater runoff control is discussed in **Section 3.3.6, Water Quality, Avoidance, Minimization and Mitigation.**

Compliance measure **SS-CM#4: Perform Hazard Analysis** describes requirements regarding TCRR's Hazard Analysis. The Hazard Analysis methodology and assessment criteria require TCRR to establish the process used to identify and analyze hazards; methods for determining frequency, severity, and corresponding risk of identified hazards; procedures for identifying hazard controls or mitigating actions; and risk management roles and responsibilities within the organization. Natural hazards identified through this process would be addressed with appropriate hazard controls and procedures. In its NPRM, FRA proposes a requirement that TCRR shall install rain, flood and wind detectors in locations identified by the railroad, based on relevant criteria used by JRC to provide adequate warning of when operational restrictions may be necessary due to adverse weather conditions. Operating restrictions shall be defined in the railroad's operating rules.

The HSR system's intrusion detection system, embedded throughout the HSR rail corridor, would detect debris that breaks through the barrier and would suspend HSR service until the tracks could be inspected and cleared. FRA proposes in the NPRM regulation requiring TCRR to conduct special inspections of the track and ROW in the event of fire, flood, severe storm, temperature extremes or other conditions that may damage track infrastructure. Sweeper vehicles, which inspect the ROW for obstacles, could be deployed following any service disruption or severe weather event. Given the system technology that would be implemented and the ability of TCRR to suspend service in the event of severe weather or infrastructure damage, it is unlikely that the Project would impact passenger safety beyond the No Build condition.

3.16.5.2.3 Impacts Related to Fire Safety

Fire on the HSR trainset or at facilities could represent an impact to the safety of passengers or employees. Impacts related to fire on the trainset would be mitigated through adherence to the guidelines described under **SS-CM#5: Fire Safety**. As stated in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** design of the guideway would follow codes and standards deemed applicable to the operation of the railroad and would be advanced in consultation and coordination with key stakeholders along the corridor**.** For stations, applicable fire and life safety standards would be applied in conjunction with applicable building codes, including but not limited to, the International Building Code, to provide for fire and life safety. During more detailed design, TCRR would coordinate with applicable regulatory bodies to incorporate requirements as required. In compliance with federal OSHA standards and as described under **SS-CM#7: Compliant Facility Design,**

station areas would include emergency access and egress plans designed to increase the effectiveness and timeliness of emergency response.

3.16.5.2.4 Impacts Related to Station Access

Induced traffic around station areas could impact the safety of passengers, employees or others in or around the station area. Impacts would be avoided where possible through improvements or direct connections to pedestrian, bike, and vehicle access points. Similar to local airports, all station options would include parking and car rental facilities associated with the station building. The station building would directly connect to these facilities by pedestrian bridges to reduce pedestrian interactions with vehicle traffic. Similar to local airports, drop-off and pick-up would be provided at station entrances to also reduce pedestrian interactions with vehicle traffic. Unsafe pedestrian movements around station areas would be minimized through rerouted DART and Houston Metro bus services, a pedestrian crossing to Dallas Union Station, and shuttle service to Houston's Amtrak Station (see **Section 3.11.5.2, Transportation, Build Alternatives**).TCRR would work with the cities of Dallas and Houston, as well as Dallas, Houston, and Grimes County safety officials to identify and improve key pedestrian and bicycle routes to the planned stations in an effort to improve accessibility and reduce the potential for accidents in the station area.

As discussed in **Section 3.11.5, Transportation, Environmental Consequences**, several roadway access improvements are proposed at and around the station areas, including additional turn lanes and modified approaches to maintain or improve the LOS for roadways that would carry additional capacity as a result of the Project. **TR-MM#3: Transit Coordination** describes the specific intersection improvements required to mitigate traffic safety impacts at each potential station area.

3.16.5.2.5 Impacts Related to Construction Site Safety

Any large infrastructure investment has the potential to impact health and safety as a result of construction-related activities. The potential health effects of construction vehicle and equipment emissions are documented in **Section 3.2.5.2.1, Air Quality, Build Alternatives Comparison, Construction Emissions**. The short-term emission increases during the construction period would be reduced through the implementation of several mitigation measures identified in **Section 3.2.6.2, Air Quality, Mitigation Measures,** including dust suppression, wet materials transport, construction vehicle speed and idling limitations, road maintenance and phasing of ground movement.

If not properly operated, secured and maintained, construction equipment could also create a risk to the physical safety of employees, contractors or other individuals present on construction sites. In addition, movement of vehicles or equipment to a site or between sites could present additional hazards to nearby traffic or pedestrian movements. Construction site access would be limited to authorized personnel and would be secured following procedures identified through TCRR's System Security Plan (see **SS-CM#8: System Security Plan)** to mitigate threats and vulnerabilities identified through the Hazard Analysis process (see **SS-CM#4: Perform Hazard Analysis).** Potential construction traffic safety impacts would be mitigated through the implementation of a Traffic Control Plan (as described in **TR-MM#1: Traffic Control Plan** in **Section 3.11.6.2, Transportation, Mitigation Measures**).

3.16.5.2.6 Impacts to Security

Criminal or terrorist activity at facilities, vandalism or tampering with the trainsets would also represent a security threat with the potential to impact the integrity of the previously described safety systems.

Other criminal activity, such as theft or violence, directed at employees or passengers on the HSR trainsets or at stations would also represent an impact to passenger and employee security.

Violence and acts of terrorism against rail carriers are prohibited under criminal statute.[36] To further deter vandalism or tampering with the HSR equipment or facilities, TCRR will develop a ROW barrier plan (see **SS-CM#9: ROW Barrier Plan**) that addresses prevention of unauthorized access to the ROW, including shielding from dropped objects and protection of support columns. As described in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, the HSR system features would include perimeter fencing, closed circuit television and security lighting, where appropriate, that could deter or facilitate early detection of targeted attacks. Bridges will also be actively monitored by closed circuit television and by physical inspections. These features would also help to prevent suicide attempts. As part of its rulemaking petition, TCRR states that trainsets would never be left unattended on mainline track or siding outside of a facility or terminal, which would minimize the opportunity for tampering with the trainset.

To mitigate impacts to the personal security of passengers and employees, TCRR would employ controlled access to trainsets and security monitoring systems throughout its facilities. Passenger screening techniques will be developed through TCRR's System Security Plan (see **SS-CM#8: System Security Plan**) but may include a variety of active and passive screening techniques, such as bag checks or video surveillance. As part of operations, TCRR proposes to establish and maintain a private security department to monitor safety and security on vehicles and at facilities, as well as coordinate with local city and county law enforcement. Security services would be increased proportionately with increased ridership, as described in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**.

3.16.5.2.7 Impacts to Emergency Response

Response to Incidents on HSR Trainsets or at HSR Facilities

The need for emergency services to access the HSR ROW would consist primarily of non-preventable incidents such as a passenger or employee medical emergency. Emergency access would be provided at station areas, TMFs, MOWs facilities and ERMSAs for passengers on board the HSR trainset. On average, ERMSAs would be spaced at 2- to 3-mile intervals, with a maximum distance of 3.5 miles between staging areas, for all Build Alternatives. At operating speeds, the trainset would pass an ERMSA approximately every minute. The number and average spacing of ERMSA access points within each EMS district along Build Alternative A, the identified Preferred Alternative, is given in **Table 3.16-17**. Each ERMSA includes space to stage six ambulance and two fire trucks, as shown in **Figure 3.16-4**. Vertical access and roadway configuration vary based on location. Additional design data for ERMSA facilities are available in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and location details are available in **Appendix G, TCRR Final Conceptual Engineering Plans and Details, Volume 2**.

Table 3.16-17: ERMSA Locations by EMS Provider

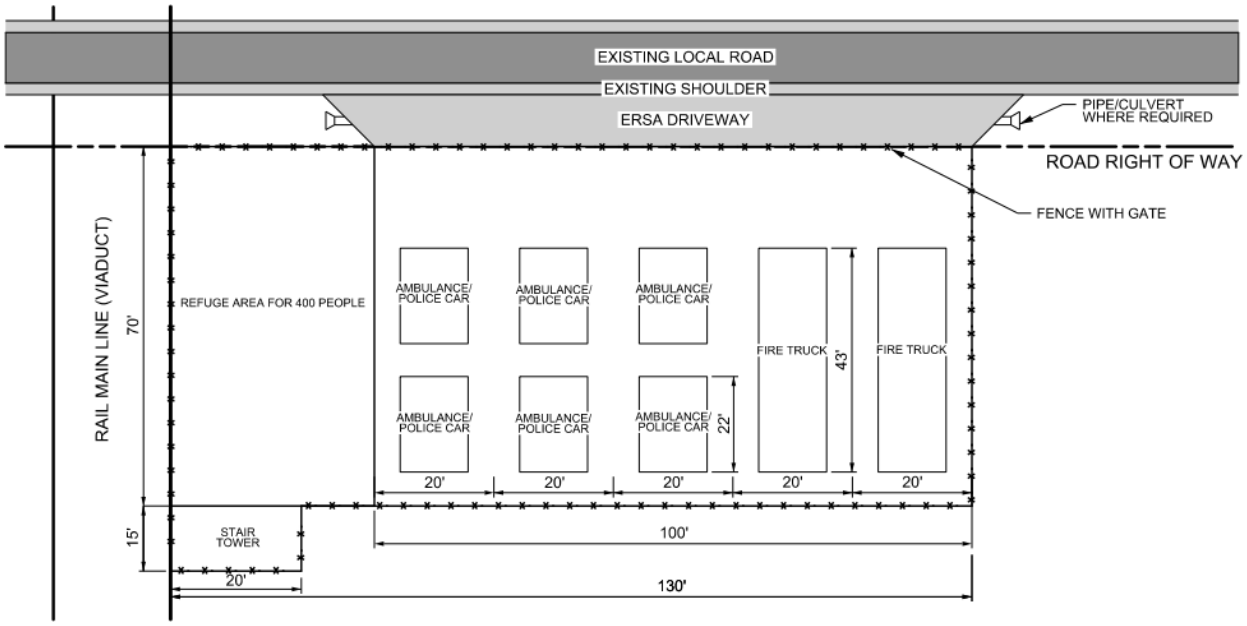
EMS District	County	ERMSA Locations	Average Spacing within EMS District
AMR EMS	Ellis	9	2.4 miles
CareFlite EMS	Ellis	3	2.5 miles
Corsicana EMS District 1	Navarro	6	2.4 miles

[36] 18 U.S.C. 1992.

Table 3.16-17: ERMSA Locations by EMS Provider			
EMS District	**County**	**ERMSA Locations**	**Average Spacing within EMS District**
Corsicana EMS District 2	Navarro	2	1.7 miles
Corsicana EMS District 3	Navarro	3	1.7 miles
Corsicana EMS District 4	Navarro	2	2.8 miles
Cy-Fair EMS	Harris	8	2.1 miles
Dallas County EMS	Dallas	6	2.1 miles
Houston EMS	Harris	3	2.5 miles
Jewett EMS	Leon	4	2.2 miles
Jewett EMS 2	Leon	4	2.5 miles
Limestone EMS	Limestone	5	2.7 miles
Madison County EMS	Madison	7	2.4 miles
Mexia EMS	Freestone	2	2.6 miles
St Jo EMS	Grimes	12	2.6 miles
Teague EMS	Freestone	5	2.5 miles
Texas Medical Response EMS	Leon	3	2.4 miles
Waller County EMS	Waller and Harris	5	2.2 miles

Source: TCRR, Final Conceptual Engineering Drawings Volume 2, AECOM 2018

Figure 3.16-4: Proposed ERMSA Layout on Viaduct along Local or Access Roads



Source: TCRR, Final Conceptual Engineering (FCE) Plans and Details v2

While the potential for accidents on the HSR is very low due to the Project design features previously discussed, TCRR would develop an Emergency Preparedness Plan, as discussed in **SS-CM#1: Emergency Preparedness Plan** to facilitate emergency response in case of severe weather events, medical emergencies or other emergencies. TCRR would coordinate with each local emergency response jurisdiction to share the Emergency Preparedness Plan and to provide training for emergency response involving TCRR's unique equipment, facilities and communications interface.

Emergency Response Service Levels during Construction

Temporary and permanent road closures and modified traffic routing would occur during the construction period. At these individual construction sites, lane closures and detours could potentially create a distraction to automobile drivers, pedestrians and cyclists resulting in potential safety impacts. In addition, road closures, detours and localized automobile congestion could increase the response time for law enforcement, fire and emergency services personnel, public transportation and school buses.

Impacts to bicyclist, pedestrian and automobile drivers' safety will be mitigated through **TR-MM#1: Traffic Control Plan**, which calls for the development and implementation of a traffic control plan for each temporary road closure establishing procedures, including access to residences and businesses during construction, lane closure, signage and flag persons, temporary detour provisions, alternative bus and delivery routes, emergency vehicle access, pedestrian access, and alternative access locations. Local jurisdictions would have review and permitting authority over these plans prior to any temporary lane closures and, through this process, could minimize the potential for service delays.

The Project would require construction on roadways that provide access across emergency response and fire protection jurisdictions. **Tables 3.16-18** and **3.16-19**, respectively, document the number of through roads, or roads that would connect both sides of a service area crossed by the Project as well as the number of those through roads identified for realignment or intersection modification, which could result in delays during the construction. The level of construction activity for each jurisdiction is shown in the tables as low, medium, high or localized, based on the criteria established in **Section 3.16.3, Methodology**. These are not quantitative measurements of response time impacts, but rather qualitative assessments meant to identify areas that may be of particular interest to TxDOT or the applicable local jurisdiction during continuing coordination, permitting and construction.

The assessment of specific measured response time impacts cannot occur until the duration, extent and timing of each planned roadway modification has been developed through the Road Closure Permit process. In all cases, closures during construction would be short-term until the permanent road crossing is constructed (i.e., rail over road, road over rail, or rerouting).

Local jurisdictions have review and permitting authority over detailed construction plans that include roadway modifications. Through this process, local jurisdictions would have the authority to ensure that TCRR's construction approach maintains acceptable emergency response times during the construction phase.

Table 3.16-18: Build Alternatives Construction Impacts on EMS Areas

Map Key	EMS Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
E-1	Dallas County	Dallas	23	5	Low	23	5	Low	23	5	Low
E-2	CareFlite	Ellis	7	2	Low	7	2	Low	7	2	Low
E-3	AMR	Ellis	23	10	Low	23	10	Low	23	10	Low
E-4	Corsicana - District 4	Navarro	7	3	Medium	7	4	High	7	3	Medium
E-5	Corsicana - District 2	Navarro	4	1	Low	4	1	Low	4	3	Localized
E-6	Corsicana - District 3	Navarro	4	3	High	3	2	High	4	3	High
E-7	Corsicana - District 1	Navarro	11	4	Low	16	9	Medium	9	3	Low
E-8	Mexia EMS	Freestone and Limestone	2	0	Low	2	0	Low	No Impact to Service Area		
E-9	Fairfield EMS	Freestone	No Impact to Service Area			No Impact to Service Area			23	18	Medium
E-10	Teague EMS	Freestone	11	6	Medium	11	6	Medium	7	3	Low
E-11	Allegiance	Leon	No Impact to Service Area			No Impact to Service Area			12	9	Medium
E-12	Limestone EMS	Limestone	6	2	Low	6	2	Low	No Impact to Service Area		
E-13	Jewett EMS 2	Leon	6	3	Medium	6	3	Medium	No Impact to Service Area		
E-14	Texas Medical Response	Leon	2	1	Localized	2	1	Localized	7	5	Medium
E-15	Jewett EMS	Leon	7	1	Low	7	1	Low	No Impact to Service Area		
E-16	Madison County EMS	Maddison	15	4	Low	15	4	Low	11	6	Medium
E-17	St Jo EMS	Grimes	30	18	Medium	30	18	Medium	30	18	Medium
E-18	Waller County EMS	Waller and Harris	13	3	Low	13	3	Low	13	3	Low
E-19	Cy Fair EMS	Harris	11	0	Low	11	0	Low	11	0	Low
E-20	Jersey Village EMS	Harris	3	0	Low	3	0	Low	3	0	Low
E-21	Houston EMS	Harris	17	4	Low	17	4	Low	17	4	Low
E-1	Dallas County	Dallas	23	5	Low	23	5	Low	23	5	Low
E-2	CareFlite	Ellis	7	2	Low	7	2	Low	7	2	Low
E-3	AMR	Ellis	24	11	Low	24	11	Low	24	11	Low

Table 3.16-18: Build Alternatives Construction Impacts on EMS Areas

Map Key	EMS Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
E-4	Corsicana - District 4	Navarro	7	3	Medium	7	4	High	7	3	Medium
E-5	Corsicana - District 2	Navarro	4	1	Low	4	1	Low	4	3	Localized
E-6	Corsicana - District 3	Navarro	4	3	High	3	2	High	4	3	High
E-7	Corsicana - District 1	Navarro	11	4	Low	16	9	Medium	9	3	Low
E-8	Mexia EMS	Freestone and Limestone	**2**	**0**	**Low**	**2**	**0**	**Low**	No Impact to Service Area		
E-9	Fairfield EMS	Freestone	No Impact to Service Area			No Impact to Service Area			23	18	Medium
E-10	Teague EMS	Freestone	11	6	Medium	11	6	Medium	7	11	Medium
E-11	Allegiance	Leon	No Impact to Service Area			No Impact to Service Area			12	9	Medium
E-12	Limestone EMS	Limestone	6	2	Low	6	2	Low	No Impact to Service Area		
E-13	Jewett EMS 2	Leon	6	3	Medium	6	3	Medium	No Impact to Service Area		
E-14	Texas Medical Response	Leon	2	1	Localized	2	1	Localized	7	5	Medium
E-15	Jewett EMS	Leon	7	1	Low	7	1	Low	No Impact to Service Area		
E-16	Madison County EMS	Maddison	15	4	Low	15	4	Low	11	6	Medium
E-17	St Jo EMS	Grimes	30	18	Medium	30	18	Medium	30	18	Medium
E-18	Waller County EMS	Waller and Harris	13	3	Low	13	3	Low	13	3	Low
E-19	Cy Fair EMS	Harris	11	0	Low	11	0	Low	11	0	Low
E-20	Jersey Village EMS	Harris	3	0	Low	3	0	Low	3	0	Low
E-21	Houston EMS	Harris	17	4	Low	17	4	Low	17	4	Low

Source: AECOM 2019

Table 3.16-19: Build Alternatives Construction Impacts on Fire Protection Services

Map Key	Fire Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
F-1	Dallas County Model[A]	Dallas	23	5	Low	23	5	Low	23	5	Low
F-2	Ferris FD	Ellis	6	1	Low	6	1	Low	6	1	Low
F-3	Palmer VFD	Ellis	8	3	Low	8	3	Low	8	3	Low
F-4	Ellis County ESD #6	Ellis	3	1	Low	3	1	Low	3	1	Low
F-5	Garrett Area Rural VFD	Ellis	1	0	Low	1	0	Low	1	0	Low
F-6	Ennis FD	Ellis	2	0	Low	2	0	Low	2	0	Low
F-7	Bardwell Area VFD	Ellis	10	5	Medium	10	5	Medium	10	5	Medium
F-8	Avalon VFD	Ellis	2	1	Localized	2	1	Localized	2	1	Localized
F-9	Emhouse VFD	Navarro	4	2	Medium	3	1	Low	4	2	Medium
F-10	Barry VFD	Navarro	7	2	Low	7	4	Medium	7	2	Low
F-11	Retreat VFD	Navarro	No Impact to Service Area			3	1	Low	No Impact to Service Area		
F-12	Corbet-Oak Valley VFD	Navarro	6	3	Medium	9	7	Medium	6	3	Medium
F-13	Angus VFD	Navarro	No Impact to Service Area			2	0	Low	No Impact to Service Area		
F-14	Pursley VFD	Navarro	1	1	Localized	No Impact to Service Area			1	1	Localized
F-15	Streetman VFD	Navarro and Freestone	No Impact to Service Area			No Impact to Service Area			8	6	Medium
F-16	Richland VFD	Navarro	9	3	Low	9	2	Low	8	5	Medium
F-17	Wortham FD	Freestone	3	1	Low	3	1	Low	No Impact to Service Area		
F-18	Fairfield FD	Freestone	No Impact to Service Area			No Impact to Service Area			16	12	Medium
F-19	Kirvin FD	Freestone	5	3	Medium	5	3	Medium	0	0	Localized
F-20	Teague FD	Freestone	7	3	Low	7	3	Low	No Impact to Service Area		
F-21	Dew FD	Freestone	No Impact to Service Area			No Impact to Service Area			10	4	Low
F-23	Buffalo VFD	Leon and Freestone	No Impact to Service Area			No Impact to Service Area			10	8	Medium
F-24	E. Lake Limestone FD	Limestone	9	5	Medium	9	5	Medium	No Impact to Service Area		
F-25	Jewett VFD	Leon	7	4	Medium	7	4	Medium	No Impact to Service Area		

Source: AECOM 2019

A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.

Table 3.16-19: Build Alternatives Construction Impacts on Fire Protection Services

Map Key	Fire Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
F-26	Centerville VFD	Leon	1	1	Localized	1	1	Localized	10	9	High
F-27	Marquez VFD	Leon	3	0	Low	3	0	Low	No Impact to Service Area		
F-28	Flynn VFD	Leon	3	2	Localized	3	2	Localized	No Impact to Service Area		
F-29	Leona VFD	Leon	0	0	Localized	0	0	Localized	3	3	High
F-30	Normangee VFD	Leon and Madison	7	3	Low	7	3	Low	No Impact to Service Area		
F-31	Madisonville FD	Madison	2	1	Localized	2	1	Localized	10	5	Medium
F-32	North Zulch FD	Madison	8	3	Low	8	3	Low	1	0	Localized
F-33	Bedias VFD	Grimes	7	3	Low	7	3	Low	7	3	Low
F-34	Iola VFD	Grimes	1	1	Localized	1	1	Localized	1	1	Localized
F-35	Shiro VFD	Grimes	5	3	Medium	5	3	Medium	5	3	Medium
F-36	Anderson VFD	Grimes	8	4	Medium	8	4	Medium	8	4	Medium
F-37	Plantersville VFD	Grimes	11	6	Medium	11	6	Medium	11	6	Medium
F-38	Tri County VFD	Waller and Harris	9	4	Low	9	4	Low	9	4	Low
F-39	Waller VFD	Waller	9	2	Low	9	2	Low	9	2	Low
F-40	Cy Fair VFD[A]	Harris	12	2	Low	12	2	Low	12	2	Low
F-41	Jersey Village Fire	Harris	4	2	Medium	4	2	Medium	4	2	Medium
F-42	Houston Fire Station 66	Harris	11	7	Medium	11	7	Medium	11	7	Medium
F-43	Houston Fire Station 50	Harris	9	9	High	9	9	High	9	9	High
F-47	Houston Fire Station 38	Harris	2	2	High	2	2	High	2	2	High
F-1	Dallas County Model[A]	Dallas	23	5	Low	23	5	Low	23	5	Low
F-2	Ferris FD	Ellis	6	1	Low	6	1	Low	6	1	Low
F-3	Palmer VFD	Ellis	9	4	Low	9	4	Low	9	4	Low
F-4	Ellis County ESD #6	Ellis	3	2	Localized	3	2	Localized	3	2	Localized
F-5	Garrett Area Rural VFD	Ellis	1	0	Low	1	0	Low	1	0	Low

Source: AECOM 2019

A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.

Table 3.16-19: Build Alternatives Construction Impacts on Fire Protection Services

Map Key	Fire Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
F-6	Ennis FD	Ellis	3	1	Low	3	1	Low	3	1	Low
F-7	Bardwell Area VFD	Ellis	9	6	Medium	9	5	Medium	9	5	Medium
F-8	Avalon VFD	Ellis	3	1	Low	3	1	Low	3	1	Low
F-9	Emhouse VFD	Navarro	4	2	Medium	3	1	Low	4	2	Medium
F-10	Barry VFD	Navarro	7	2	Low	7	4	Medium	7	2	Low
F-11	Retreat VFD	Navarro	No Impact to Service Area			3	1	Low	No Impact to Service Area		
F-12	Corbet-Oak Valley VFD	Navarro	6	3	Medium	9	7	Medium	6	3	Medium
F-13	Angus VFD	Navarro	No Impact to Service Area			2	0	Low	No Impact to Service Area		
F-14	Pursley VFD	Navarro	1	1	Localized	No Impact to Service Area			1	1	Localized
F-15	Streetman VFD	Navarro and Freestone	No Impact to Service Area			No Impact to Service Area			8	6	Medium
F-16	Richland VFD	Navarro	9	3	Low	9	2	Low	8	5	Medium
F-17	Wortham FD	Freestone	3	1	Low	3	1	Low	No Impact to Service Area		
F-18	Fairfield FD	Freestone	No Impact to Service Area			No Impact to Service Area			16	12	Medium
F-19	Kirvin FD	Freestone	5	3	Medium	5	3	Medium	0	0	Localized
F-20	Teague FD	Freestone	7	3	Low	7	3	Low	No Impact to Service Area		
F-21	Dew FD	Freestone	No Impact to Service Area			No Impact to Service Area			10	4	Low
F-23	Buffalo VFD	Leon and Freestone	No Impact to Service Area			No Impact to Service Area			10	8	Medium
F-24	E. Lake Limestone FD	Limestone	9	5	Medium	9	5	Medium	No Impact to Service Area		
F-25	Jewett VFD	Leon	7	4	Medium	7	4	Medium	No Impact to Service Area		
F-26	Centerville VFD	Leon	1	1	Localized	1	1	Localized	10	9	High
F-27	Marquez VFD	Leon	3	0	Low	3	0	Low	No Impact to Service Area		
F-28	Flynn VFD	Leon	3	2	Localized	3	2	Localized	No Impact to Service Area		
F-29	Leona VFD	Leon	0	0	Localized	0	0	Localized	3	3	High
F-30	Normangee VFD	Leon and Madison	7	3	Low	7	3	Low	No Impact to Service Area		
F-31	Madisonville FD	Madison	2	1	Localized	2	1	Localized	10	5	Medium
F-32	North Zulch FD	Madison	8	2	Low	8	2	Low	1	0	Localized

Source: AECOM 2019

A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.

Table 3.16-19: Build Alternatives Construction Impacts on Fire Protection Services

Map Key	Fire Service Area	County	Alternative A			Alternative B			Alternative C		
			Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response	Through Roads	Roads Affected by Const.	Potential to Affect Response
F-33	Bedias VFD	Grimes	7	3	Low	7	3	Low	7	3	Low
F-34	Iola VFD	Grimes	1	1	Localized	1	1	Localized	1	1	Localized
F-35	Shiro VFD	Grimes	5	3	Medium	5	3	Medium	5	3	Medium
F-36	Anderson VFD	Grimes	8	4	Medium	8	4	Medium	8	4	Medium
F-37	Plantersville VFD	Grimes	11	6	Medium	11	6	Medium	11	6	Medium
F-38	Tri County VFD	Waller and Harris	9	4	Low	9	4	Low	9	4	Low
F-39	Waller VFD	Waller	9	2	Low	9	2	Low	9	2	Low
F-40	Cy Fair VFD[A]	Harris	12	2	Low	12	2	Low	12	2	Low
F-41	Jersey Village Fire	Harris	4	2	Medium	4	2	Medium	4	2	Medium
F-42	Houston Fire Station 66	Harris	11	7	Medium	11	7	Medium	11	7	Medium
F-43	Houston Fire Station 50	Harris	9	9	High	9	9	High	9	9	High
F-47	Houston Fire Station 38	Harris	2	2	High	2	2	High	2	2	High

Source: AECOM 2019

A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.

In addition to construction of the Build Alternatives, the three Houston Terminal Station Options would have different potential impacts on emergency services during construction. All three Houston Terminal Station Options are part of the Houston EMS district. Due to the large area covered by Houston EMS and multiple ways in and out of the areas that would be affected by station construction, the potential for impact to this area is low under all three Houston Terminal Station Options. The potential impact to fire departments as a result of station-related road modifications for each of the Houston Terminal Station Options is described in **Table 3.16-20.** The combined effect of construction of Segment 5 and the Houston Terminal Station would result in high potential for impact to Houston Fire Station #38 under all three Houston Terminal Station Options.

Table 3.16-20: Houston Terminal Station Construction Impacts on Fire Protection Services

Map Key	Fire Service Area	County	Houston Terminal Station Option	Through Roads	Roads Affected by Construction	Potential to Affect Response
F-47	Houston Fire Station 38	Harris	Houston Industrial Site Terminal Station Option	4	1	Low [a]
F-47	Houston Fire Station 38	Harris	Houston Northwest Mall Terminal Station Option	3	1	Low [a]
F-46	Houston Fire Station Arson Division	Harris	Houston Northwest Mall Terminal Station Option	3	2	Localized
F-47	Houston Fire Station 38	Harris	Houston Northwest Transit Center Terminal Station Option	3	1	Low [a]

[a] The combined effect of construction of Segment 5 and the Houston Terminal Station would result in high potential for impact to Houston Fire Station #38 under all three Houston Terminal Station Options.

Potential impacts associated with station area construction would depend on the duration and extent to which the connecting roads may operate at a diminished level of service. **TR-MM#3: Transit Coordination** requires intersection improvements during station area construction. As a requirement of **TR-CM#2: Roadway Access Permit** and **TR-CM#3: Road Closure Permit**, local jurisdictions would have review and permitting authority over detailed construction plans that include roadway modifications and would be expected to ensure no adverse impacts to emergency response times during the construction period.

Emergency Response Service Levels during Operations

Permanent impacts to emergency response times would be limited to locations where the existing roadway network must be modified as a result of the Project but would not otherwise be affected by the presence of the HSR tracks. A fully dedicated, grade-separated system means that the corridor is not physically connected to the general railroad system and separated from public roadways. There are no highway-rail grade crossings, meaning a car would not have to wait for a trainset to pass and then drive over the tracks to the other side of the system. When on viaduct, the Project would allow for free movement underneath the rail.

The potential for impact to emergency response times due to modified road networks at or near crossing locations is dependent on the type and nature of each crossing modification. As detailed in **Section 3.13.3.3, Land Use, Methodology, Assessment,** and **Section 3.11.5.2, Transportation, Build Alternatives**, approximately 55 percent of the Project would be constructed on a rail viaduct, minimizing permanent impacts to public roads. Approximately 83 percent of the public road crossings for the Preferred Alternative would not include rerouting of the existing public road. Modifications to these

public roadways due to vertical changes would not impact travel or emergency response time after construction is complete. Where the Project requires acquisition of a private road, properties that rely on that road for emergency access would also be acquired, or an alternate access road would be constructed by TCRR as determined by future negotiations with affected landowners. Any reconstruction or rerouting of public roads must be coordinated with TxDOT and/or applicable local jurisdictions through the Road Closure Permit process as described in **TR-CM#3: Road Closure Permit**, **TR-MM#1: Traffic Control Plan**, and **SS-MM#1**: **Model Construction Impacts on Emergency Response Times**. **Table 3.16-21** summarizes transportation impacts only where they result in 1,000 feet or more in rerouted length on a public road that could result in potential changes to emergency responder travel times.

Many of these modifications would also represent a potential improvement for emergency response. Although travel times would slightly increase along some roads running perpendicular to the alignment, new shared access roads running parallel to the alignment would improve access and travel times for some movements across a service area. In compliance with **TR-CM#3: Road Closure Permit, TR-MM#1: Traffic Control Plan,** and **SS-MM#1: Model Construction Impacts on Emergency Response Times**, TCRR would coordinate with TxDOT and/or the appropriate local jurisdiction and any potentially affected emergency responders during final design to avoid any appreciable negative impact to emergency response times during operation of the HSR system.

3.16.6 Avoidance, Minimization and Mitigation

TCRR would use a combination of preventive design features, safety programs and adequate provisions for emergency access to reduce or eliminate potential safety and security impacts. The design and operation of the TCRR HSR is based on the Tokaido Shinkansen HSR system's safety features. The Shinkansen system employs a variety of safe operations and preventive maintenance protocols, physical barriers, intrusion prevention systems, weather and hazard censors, and signaling and communications systems that work together to detect and address potential issues before they occur.

The following design features and avoidance measures of the proposed TCRR system, specified either in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, FRA's NPRM, or as part of TCRR's rulemaking petition, are integral to the minimization or elimination of potential safety or security impacts and the assessment of Final EIS impacts, including:

- A fully dedicated ROW that is completely grade separated from freight, highway vehicle, and pedestrian traffic
- No bi-directional service on any single track
- Use of the JRC Tokaido Shinkansen ATC signaling system to control all operations and movements of the trainset, including those in stations and maintenance facilities, at all speeds
- Protective measures for the foundations of rail bridges against the impact of road vehicles
- Temporal separation of MOW activities
- Daily use of a sweeper vehicle
- Visual inspection of the track structure and ROW
- Security cameras and closed circuit television
- Private security department
- Station platform attendant to monitor passenger boarding and proper door functioning
- Special inspections of the track and ROW in the event of fire, flood, severe storm or temperature extremes

Table 3.16-21: Permanently Modified Roads Potentially Affecting Response Time

Segment	Crossing ID	Roadway Modification	Affected Fire District	Affected EMS District	Route Length Impact (feet)	Estimated Travel Time Impact [a]
1	CH-DS-010	Cleveland Road Reroute	Dallas County	Dallas County	2720	1 minute
1	CH-DS-006	Cornell Road Reroute	Dallas County	Dallas County	2470	Under 1 minute
2A	CH-EW-007	Getzendaner Road Reroute	Ennis	AMR	6490	2 minutes
2A	CH-EW-023	Ewing Road Reroute	Ferris	CareFlite	-1170	Reduction
2B	CH-EE-029	Epps Road Reroute	Palmer	AMR	1430	Under 1 minute
2B	CH-EE-036	Ewing Road Reroute	Ferris	CareFlite	-4200	Reduction
3A	CH-NW-005b	CR 2190 Reroute	Richland	Corsicana District 1	1850	Under 1 minute
3A	CH-NW-015	FM 1126 Reroute	Corbet-Oak Valley	Corsicana District 3	6880	3 minutes
3A	CH-NW-023	CR 1320 Reroute	Emhouse	Corsicana District 4	3580	1 minute
3B	CH-NE-013	CR 1140 Reroute	Retreat/Corbet-Oak Valley	Corsicana District 1	6230	2 minutes
3B	CH-NE-005	CR 2100 Reroute	Richland	Corsicana District 1	1270	Under 1 minute
3B	CH-NE-014	CR 5149/CR 1130/CR 1140 Reroute	Corbet-Oak Valley	Corsicana District 1	1710	Under 1 minute
3B	CH-NE-014a	Oak Valley Lane Reroute	Corbet-Oak Valley	Corsicana District 1	3470	1 minute
3B	CH-NE-015a	CR 1090/Liberty Drive Reroute	Corbet-Oak Valley	Corsicana District 1	1640	Under 1 minute
3B	CH-NE-18	FM 744 Road over Rail	Corbet-Oak Valley	Corsicana District 3	1870	Under 1 minute
3B	CH-NE-021	CR 1160 Reroute	Barry	Corsicana District 4	7780	3 minutes
3C	CH-IH-120	CR 40 Reroute	Richland	Corsicana District 1	4670	2 minutes
3C	CH-IH-112	CR 2348 Reroute	Richland	Corsicana District 2	3540	1 minute
3C	CH-IH-114	CR 2344 Reroute	Richland	Corsicana District 2	3250	1 minute
3C	CH-IH-24	Waldrip Road over Rail	Madisonville	Madison County	1160	Under 1 minute
3C	CH-IH-41	CR 477 Reroute	Centerville	Texas Medical Response	-1690	Reduction
3C	CH-IH-45	CR 318 Reroute	Centerville	Texas Medical Response	1880	Under 1 minute
3C	CH-IH-46	CR 317 Reroute	Centerville	Texas Medical Response	1560	Under 1 minute
3C	CH-IH-78	Wiley Road/Church Street Reroute	Fairfield	Fairfield	2470	Under 1 minute
4	CH-WT-029	FM 978 Reroute	Normangee	Madison County	3770	1 minute
4	CH-WT-030	Poteet Road Reroute	Normangee	Madison County	-1140	Reduction
4	CH-WT-016	Oxford Cemetery Road Reroute	North Zulch Road	Madison County	6040	2 minutes
4	CH-WT-067	CR 344 Reroute	Jewett	Jewett 2	4360	2 minutes
4	CH-WT-044	CR 408 Reroute	Flynn	Jewett	4530	2 minutes
5	CH-HN-131	CR 155 Reroute under Rail	Bedias	St. Jo	8280	3 minutes
5	CH-HN-092	Bronco Lane Reroute	Plantersville	St. Jo	8510	3 minutes
5	CH-HN-109	Rolling Hills Drive Reroute	Plantersville	St. Jo	11450	4 minutes
5	CH-HN-084	Joseph Road Reroute	Waller/Tri-County	Waller County	6496	2 minutes

Source: AECOM 2019

[a] Estimated travel times assume average speed of 30 mph. Impacts of individual route travel times upon a jurisdiction's emergency response times to be modeled as described in **SS-CM#1: Emergency Preparedness Plan**.

- Provision of emergency exit path markings and signage, emergency lighting, emergency access windows and roof access on every car
- In addition, the HSR ROW will have walkways along elevated and at-grade sections with vertical access provided for emergency medical access and emergency passenger egress

3.16.6.1 Compliance Measures

TCRR would be required to comply with the following Compliance Measures (CM).

SS-CM#1: Emergency Preparedness Plan. Under 49 C.F.R. 239, TCRR will be required to prepare an Emergency Preparedness Plan for review and approval by FRA. Under 49 C.F.R. 239.101, the plan shall include at minimum:

- On-board and control center communication protocols
- Emergency procedures involving operations on elevated structures and in electrified territory
- A program to provide training resources for all on-line emergency responders who could reasonably be expected to respond during an emergency situation, including communication protocols and participation in emergency situations
- Procedures for distribution of the Emergency Preparedness Plan, including material amendments, to emergency responders
- Employee emergency preparedness training, including a schedule for initial and periodic training within the first 180 days of passenger service and procedures for testing an individual who is employed by the railroad, under a contract or subcontract with the railroad, or employed by a contractor or subcontractor to the railroad for emergency preparedness qualifications
- An inventory and location of emergency equipment with schedule of maintenance for replacement of first-aid kits, on-board emergency equipment and on-board emergency lighting
- A program for passenger awareness of emergency procedures, to enable passengers to respond properly during an emergency
- Procedures regarding emergency egress or rescue of passengers with disabilities

SS-CM#2: System Safety Program. Under 49 C.F.R. 270, TCRR will be required to develop a System Safety Program. The purpose of the System Safety Program is to systematically evaluate safety hazards and manage risks through ongoing preventive and corrective actions, including a risk-based hazard management program and hazard analysis. Under 49 C.F.R. 270.103, the System Safety Program Plan will be required to reference or include, at a minimum:

- Safety philosophy, culture and program goals
- Safety roles and responsibilities within the organization, including the lines of authority used to manage safety issues
- System Safety Program implementation process and milestones
- System safety program training requirements for employees and contractors
- Description of TCRR's hazard management program (see **SS-CM #4: Perform Hazard Analysis**)

Under 49 C.F.R. 270.303, TCRR will be required to annually assess implementation of and compliance with the System Safety Program and report findings and improvement plans to FRA. Under 49 C.F.R. 270.103, TCRR will be responsible for ensuring employees who are responsible for implementing and supporting the system safety program, or utilizing or providing significant safety-related services, have received the proper training for their position, and documenting all required System Safety Program training events as part of its safety program. FRA may conduct audits of the system safety program for compliance with the approved system safety program plan, as provided under 49 C.F.R. 270.305.

SS-CM#3: Inspection, Testing, and Maintenance. In its rulemaking petition, TCRR proposed minimum standards and schedules for inspection, testing, and maintenance of vehicles, track and other critical infrastructure required for the prevention of mechanical failures. Upon approval of the Inspection, Testing and Maintenance Program by FRA, TCRR proposes to be responsible for performing the specified inspections, tests and maintenance tasks at the identified intervals.

SS-CM#4: Perform Hazard Analysis. As part of its System Safety Program requirements, under 49 C.F.R. 270.103(p)-(q), TCRR would need to establish a risk-based hazard management program and conduct hazard analyses. The hazard management program would establish the process used to identify and analyze hazards; methods for determining frequency, severity, and corresponding risk of identified hazards; procedures for identifying hazard controls or mitigating actions; and risk management roles and responsibilities within the organization.

SS-CM#5: Fire Safety. FRA proposes in the NPRM requirements regarding flammability and smoke emission characteristics, testing standards, and certification requirements for the interior of trainsets. In addition, FRA, through the NPRM, would require TCRR to complete a written fire safety analysis for the passenger equipment being procured. This analysis would identify and prioritize fire hazards inherent in the equipment; identify design steps or materials that would provide sufficient fire resistance; ensure ventilation systems would not contribute to the lethality of a fire; identify components that require overheat protection; identify locations (as necessary) for smoke detectors, automated fire suppression equipment, and fire extinguishers. As required by 49 C.F.R. 239.101, each passenger car is required to have a minimum of one portable fire extinguisher.

SS-CM#6: Liability Coverage. TCRR will be responsible for complying with applicable state and federal insurance requirements.

SS-CM#7: Compliant Facility Design. During final design, the design of stations, ERMSA structures, and maintenance facilities shall meet applicable emergency access/egress and structural requirements. This includes applicable OSHA and NFPA standards for emergency access and egress; ADA requirements, International Building Code standards adopted by Texas Local Government Code 214.216; and other structural design, fire life safety, and accessibility standards specified under local permitting requirements. Refer to **EH-CM#1: Compliance with ADA and TAS** in **Section 3.12.6.1, Elderly and Handicapped, Compliance Measures and Permitting**.

SS-CM#8: System Security Plan. Security of passenger rail is overseen by TSA. Prior to operations, and as stated in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** TCRR will prepare a System Security Plan that complies with applicable federal and state transportation security regulations, including Texas Senate Bill 975 and the TSA's RAILPAX-04-01 and RAILPAX-04-02. The System Security Plan will document processes for mitigating and/or eliminating security threats, vulnerabilities and risks. This plan will identify the controls that will be in place to safeguard the personal security of passengers and employees and to evaluate and improve the effectiveness of the security system. Given the sensitivity of the planning, design and implementation of the security program, the specific details of Texas Central's security plans will only be shared with law enforcement and designated security and emergency response personnel.

SS-CM#9: ROW Barrier Plan. In the NPRM, FRA proposes a requirement that TCRR develop, adopt and comply with a ROW Barrier Plan. The ROW Barrier Plan would address unauthorized access to the ROW, including intrusion detection and overhead shielding at overpasses.

Refer to **TR-CM#2: Roadway Access Permit** and **TR-CM#3: Road Closure Permit** discussed in **Section 3.11.6.1, Transportation, Compliance Measures**.

3.16.6.2 Mitigation Measures

TCRR would be required to implement the following Mitigation Measures (MM).

SS-MM#1: Model Construction Impacts on Emergency Response Times. Prior to construction, as an additional measure to mitigate impacts to emergency access or response times, TCRR shall evaluate its Traffic Control Plans using computer assisted dispatch software to determine the baseline and construction period response times within each jurisdiction based on construction phasing, duration of impacts, and location of nearest alternate route. TCRR will revise its construction plans if they produce delays that exceed standards negotiated with each permitting authority or more than 10 percent of baseline response times to a given area.

Refer to **TR-MM#1: Traffic Control Plan** and **TR-CM#4: ROW Barriers** discussed in **Section 3.11.6.1, Transportation, Compliance Measures**.

3.16.7 Build Alternatives Comparison

The impacts to safety and security would be applicable to all Build Alternatives. The primary difference among the Build Alternatives is the number of emergency responders potentially affected by construction, permanent road changes and the level of coordination necessary to avoid impacts. The total number of permanent road modifications resulting in 1 minute or more in travel time impact and the number of fire and EMS jurisdictions with high or localized construction activity are summarized by Build Alternative in **Table 3.16-22**.

Build Alternatives C and F would impact the fewest emergency service areas and present the lowest potential for construction effects and would therefore require the least coordination regarding temporary impacts. In addition, Build Alternatives C and F would provide the greatest increase in access road mileage compared to the other Build Alternatives.

Table 3.16-22: Summary of Impacts by Build Alternatives

Impact	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Permanent Road Modifications resulting in 1 minute or more in additional through travel time	12	13	9	11	12	8
Permanent Road Modifications reducing through travel time by 1 minute or more	0	0	0	1	1	1
Total fire and EMS service areas bisected by construction	56	57	51	56	57	51
Fire and EMS providers with high potential for construction effects	3	4	5	3	4	5
Fire and EMS providers with localized potential for construction effects	8	7	6	8	7	6

Source: AECOM 2019

3.17 Recreational Facilities

3.17.1 Introduction

This section includes an analysis of public parks, trails and other facilities that have a recreational use within a quarter-mile Study Area of the Project's LOD. This section provides background information on existing and planned recreational facilities, discusses potential impacts of the Project on recreational facilities and recommends mitigation measures to avoid or minimize potential adverse impacts. Potential impacts to recreational facilities that are protected under Section 4(f) of the USDOT Act and Section 6(f) of the Land and Water Conservation Fund Act resources are discussed in **Chapter 7.0, Section 4(f) and Section 6(f) Evaluation**.[1]

3.17.2 Regulatory Context

Federal

FRA's *Procedures for Considering Environmental Impacts* provide the following guidance for considering potential impacts related to recreational areas and opportunities:

> *Impacts of the alternatives on sites devoted to recreational activities should be assessed, including impacts on non-site-specific activities such as hiking and bicycling, and impacts on non-activity-specific sites such as designated "open space"*[2]

3.17.3 Methodology

The assessment of recreational resources included identifying recreational resources in the Study Area, determining potential impacts and developing compliance and mitigation measures to minimize potential impacts.

Public parks, trails and other recreational facilities, including designations of special use areas and parks that include historical areas, nature centers, golf courses, zoos, arenas and other types of recreational facilities within the Study Area, were identified and recorded. Data collection for recreational facilities analysis consisted of desktop research of GIS data from NCTCOG, City of Dallas, H-GAC, City of Houston, NPS, USACE and TPWD. Additional data collection sources included GoogleEarth comprehensive and other local plans and online secondary data sources. The data were supplemented with a field reconnaissance that included windshield surveys within select portions of the Study Area to verify desktop research and collect supplemental information. Data collection for planned or proposed recreational facilities came from direct communications with cities, counties and other agencies and stakeholders, as well as the review of local planning documents. A list of reviewed plans is shown in **Table 3.17-1**. Many trails are identified in a plan as unfunded and do not have information on specific alignments, space requirements or configuration. Therefore, only those trail resources that are funded are evaluated for impacts.

[1] In the Draft EIS, this section contained some information about whether some resources met the criteria for protection under Section 4(f). That has been removed from this section in this Final EIS and can be found in **Chapter 7.0, Section 4(f) and Section 6(f) Evaluation**.
[2] FRA, *Procedures for Considering Environmental Impacts*, Issued 1999, 64 C.F.R. 28545 et seq.

Table 3.17-1: Local Plans		
Jurisdiction	**Document**	**Adoption/Document Date**
City of Dallas	Downtown Parks Master Plan Update Downtown Parks Master Plan Dallas Parks and Recreation Comprehensive Plan Dallas Trail Network Plan Emerald Bracelet Report	2013 2004 2016 2008 2005
City of Lancaster	Comprehensive Plan – Parks, Recreation & Open Space	1997
City of Wilmer	Community Plan 2030	2009
City of Ferris	Park Master Plan	2013
City of Waxahachie	Parks Recreation & Open Space Plan (Chapter 9 of the Comprehensive Plan)	2007
City of Corsicana	The Open Space Plan (Chapter 9 of the Comprehensive Plan)	2007
City of Jersey Village	Comprehensive Plan – Parks, Recreation and Open Space	2016
City of Houston	2017 Houston Bike Plan 2015 Parks Master Plan	2017 2015

Source: AECOM 2019

The Study Area for recreational facilities is defined as a quarter-mile from the LOD (1,320 feet). The Study Area is based on the maximum distance anticipated for direct permanent impacts and temporary construction impacts. Direct permanent impacts could include a change of use, access or visual quality, or noise impacts to recreational facilities or parklands. Temporary construction impacts could include air quality (emissions from the use of heavy equipment), noise and vibration (from the use of heavy equipment), visual (changes in viewshed) and access (changes or reduced access) impacts. Noise and visual impacts represent the largest distances for potential impacts and are discussed as indirect impacts in this section. The distances for potential impacts are based on the following:

- **Noise (630 feet)**: As noted in **Section 3.4.5.2.1, Noise and Vibration**, **Construction Noise and Vibration Impacts,** daytime construction noise would extend 40 to 200 feet from the noise source and nighttime construction noise would extend 125 to 630 feet from the noise source. Operational noise associated with the system would be less than the construction noise.
- **Visual (quarter-mile or 1,320 feet)**: As described in **Section 3.10, Aesthetics and Scenic Resources,** the Project viewshed varies depending on topography, tree cover and built environment. To account for this variance, the viewshed is defined a quarter-mile buffer around the LOD in Dallas and Harris Counties and a half-mile buffer around the LOD for all other counties. FRA did not identify any recreational facilities beyond one quarter-mile and within one half-mile of the LOD in the rural counties. Therefore, a one-quarter mile Study Area is used to account for potential visual impacts to recreational facilities.

School recreation areas were included as recreational facilities if they are accessible and used by the adjacent or nearby communities. Direct communication with the school determined whether the general public was permitted to access recreational facilities on campus.

Private recreational facilities, such as driving ranges, mini-golf or go-cart tracks, were categorized as businesses and not included in this analysis.

FRA researched and documented, in coordination with land trusts operating in Texas or under TPWD, any conservation easements located within the Study Area. A conservation easement is a voluntary, written agreement to protect the natural, productive or cultural features of a property.[3] FRA evaluated

[3] Texas Land Trust Council, *What is a Conservation Easement?,* accessed November 2019, http://www.texaslandtrustcouncil.org/index.php/about/what-is-a-conservation-easement.

these lands to determine whether they contained potential recreational resources and whether those resources would be impacted. Public lands managed by the GLO and the USACE were researched and documented. Each resource was classified, quantified and mapped to assist in the assessment of impacts to these resources.

3.17.4 Affected Environment

This section identifies, by county, public parks and other resources that have recreational use within the Study Area. Resources identified are also depicted in **Appendix D, Community and Cultural Resources Mapbook**. Many public parks contain named recreational trails, which are listed as a park amenity. Recreational, off-street trails outside of public parks are documented separately within this section. On-street bikeways or bicycle facilities are transportation amenities and are discussed in **Section 3.11, Transportation**.

Some of the resources have limited information available due to the type of recreational facility, its use or status. For example, a "typical" park may only include the types of amenities available to the park user. Or a future trail may be part of a city's vision but has not moved beyond that phase of planning, so an actual route or easement is unknown at this time. Conversely, a resource that was designated or known could have fallen into disrepair due to lack of maintenance and no longer retains its value as a recreational resource. Where possible, this level of detail is included.

3.17.4.1 Dallas County

3.17.4.1.1 Parks

Thirteen parks (12 existing and 1 proposed) are located within the Study Area in Dallas County and are listed in **Table 3.17-2**. Any additional information regarding a park's features or amenities is included in descriptions following the table.

Table 3.17-2: Dallas County Parklands in the Study Area

Mapbook Page	Name	Location	Type	Owner	Total Acres	Acres within Study Area	Amenities
1	Pioneer Cemetery	1400 Marilla	Special Use Park[a] (cemetery)	City of Dallas Parks and Recreation	4.4	0.1	Historic gravesites
1	Pioneer Plaza	1428 Young Street	Special Use Park[a]	City of Dallas Parks and Recreation	4	0.5	Sculpture, native plants and trees, stream
1	Dallas Heritage Village at Old City Park	1717 Gano Street	Special Use Park[a] (Historical Park)	City of Dallas Parks and Recreation	17.8	6.1	Historic buildings and environment
1	Reunion Park	701 Sports Street	Temporary Park	Hunt Woodbine Realty Corp	1.1	2.0	Open green space
1	Emerald Bracelet	Downtown Dallas	Special Use Park[a] (proposed)	City of Dallas Parks and Recreation	N/A[b]	N/A[b]	Trails, open space, pavilions

Table 3.17-2: Dallas County Parklands in the Study Area							
Mapbook Page	**Name**	**Location**	**Type**	**Owner**	**Total Acres**	**Acres within Study Area**	**Amenities**
1	Trinity River Greenbelt	3700 Sylvan Avenue	Conservation	City of Dallas Parks and Recreation	3,653	41	Boat ramp, nature observation platform, parking, trails
1	Forest Park	2906 Parnell Street	Neighborhood	City of Dallas Parks and Recreation	2.4	2.4	Outdoor basketball court, picnic tables, playground, trails
1	Martin Luther King Median	1300 to 2300 Blocks Cedar Crest Boulevard	Special Use Park[a] (median)	City of Dallas Streets Department	0.3	0.3	Sculpture, landscaping
2-3	William Blair Jr. Park (formerly Rochester Park)	Dallas, TX	City Park	City of Dallas Parks and Recreation	983	76.6	Sports fields, pond, fishing, picnic areas, hiking trails
3	Honey Springs Cemetery	4001 Bulova Street	Special Use Park[a] (cemetery)	City of Dallas Parks and Recreation	4.1	4.1	Memorial areas
4	Fruitdale Park	4408 Vandervoort Drive	Neighborhood	City of Dallas Parks and Recreation	5.1	5.1	Outdoor basketball court, parking, picnic tables, playground, recreation center
4	Seaton Park	3200 Seaton Drive	Neighborhood	City of Dallas Parks and Recreation	4.2	3.0	Playground, softball field
5	J.J. Lemmon	6100 J.J. Lemmon Road	Community	City of Dallas Parks and Recreation	19.7	3.5	Grill, outdoor basketball court, parking, picnic tables, playground, softball field, tennis court, trails

Source: AECOM 2019

[a] The City of Dallas Parks Department classifies Special Use Parks for specialized or single-purpose recreation activities. These are defined as historical areas, nature centers, marinas, golf courses, zoos, conservatories, arboretums, arenas, amphitheaters, plazas or community squares. There are no specific standards for size or acreage to be designated special use and parks may carry both classifications.

[b] Acreage for this proposed resource was not available.

Pioneer Cemetery is a 4.4-acre historic cemetery located in downtown Dallas. The cemetery is a Recorded Texas Historic Landmark (RTHL) as awarded by THC. The site is home to early graveyards of fraternal organizations and founders of the town of Dallas from the 1800s. Pioneer Cemetery is outside of the LOD but falls within the Study Area for recreational facilities. This resource does not fall within the Study Area for cultural resources.

Pioneer Plaza is an approximately 4-acre park located adjacent to Pioneer Cemetery, outside the LOD. The park was dedicated to the City of Dallas in 1994 and features native plants and trees, a stream and a

large sculpture of cattle on early trails that made their way to Dallas. Pioneer Plaza is the largest public open space in the business district.[4]

Dallas Heritage Village at Old City Park is an approximately 17.8-acre park that houses a museum and historic buildings. The resource is within the Study Area but approximately 1,000 feet from the LOD.

Reunion Park is a 1.1-acre open space within the Study Area. The privately owned park is north of IH-30, south of Union Station. While the park is privately owned, it is accessible to the public and the open space is occasionally leased by the City of Dallas as special event space. The entirety of this park is located within the Study Area, but not within the LOD.

The Emerald Bracelet concept is a proposed "collection" of linear and pocket parks that would encircle downtown Dallas through a system of on-street bike lanes and sidewalks. This concept would link existing parks like Reunion Park to Pioneer Plaza to yet to be developed parks, creating a bracelet around the central business district. The emerald bracelet idea stems from the Downtown Parks Master Plan. The potential concept was clarified in the 2005 Emerald Bracelet Report; however, the plan is not finalized, and the design is still in the proposal stage. The City of Dallas has not identified nor requested an easement for this chain of pocket parks. Various properties making up the potential Emerald Bracelet would be located outside of the LOD and are currently owned by the City of Dallas, DART, TxDOT and various private owners.

Trinity River Greenbelt Park is located within the levee system and basin of the Trinity River. The majority of this park is outside the Study Area. The greenbelt includes two existing Trinity Levee Trails. The first trail (13.6 miles) travels along both banks of the Trinity River Greenbelt. The second trail (3.6 miles) links the proposed Grand Avenue Connection to the existing Santa Fe Trestle Trail. The Trinity Levee Trails run atop and within the Trinity River corridor. The trails connect to the Trinity Strand trail farther north and to the Santa Fe Trestle Trail to the south. Segments of both of these trails are within the LOD. In December 2018, the Trinity Park Conservancy published a vision plan for Harold Simmons Park within the Trinity River Greenbelt Park. Harold Simmons Park would be north of IH-30 and outside of the Study Area.

Forest Park is a community park located near the Cedars neighborhood. The park has an internal 2.4-mile trail of which 1.6 miles are located within the Study Area, but outside of the LOD.

Martin Luther King Median is an 1.8-acre park adjacent to Forest Park. The median functions as a gateway to the larger Forest Park. The median is within the Study Area, but outside of the LOD.

William Blair Jr. Park, formerly Rochester Park, is an approximately 983-acre park located on the southeast side of IH-45, within the Study Area, but outside of the LOD. Park facilities are primarily located over 1 mile east of the Study Area. William Blair Jr. Park is part of the larger ecological region of the Great Trinity Forest that is approximately 6,000 acres. The forest largely remains in its natural state; however, parts of the forest are home to amenities outside of the Study Area including the Trinity River Audubon Center, William Blair Jr. Park, portions of the proposed Trinity Forest Trails[5] and Texas Buckeye Trail.[6] A proposed 15-mile trail would be located along the Trinity River and into the forest. Seventy-six acres of William Blair Jr. Park are within the Study Area but not in the LOD.

[4] Texas Trees Foundation, Pioneer Plaza, accessed November 2019, https://www.texastrees.org/projects/pioneer-plaza/.
[5] USACE Fort Worth District, "DFE Trails Phase 2," October 18, 2019. Provided via file transfer on February 6, 2020. Trail location is depicted in **Appendix D, Community and Cultural Resources Mapbook.**
[6] City of Dallas, Trinity River Corridor Project, Great Trinity Forest, accessed November 2019, http://www.trinityrivercorridor.com/recreation/great-trinity-forest.

Honey Springs Cemetery is an existing City of Dallas designated special-use park located near IH-45. The cemetery contains a large stone memorial wall at its entrance, which has cultural significance. Although designated as a park, the site does not typically serve a recreational function. It is also known as Bulova Cemetery, Queen's Cemetery, Coming Home Cemetery and Homecoming Cemetery. Additional information on this cemetery is provided in **Section 3.19.5.2.1, Cultural Resources, Segment 1**.

Fruitdale Park is a 5.1-acre neighborhood park entirely within the Study Area but not in the LOD. The park has typical recreational facilities including basketball courts, picnic tables and a playground. A recreational center is available for public use.

Seaton Park is a 4.2-acre neighborhood park partially located in the Study Area, but not within the LOD. The park features playgrounds and a softball field.

J.J. Lemmon park is an approximately 19.7-acre community park that is partially located within the Study Area, but not in the LOD. The park offers a basketball court, parking, picnic tables, playground and a softball field.

3.17.4.1.2 Trails

Within the Study Area in Dallas County, one existing recreational trail located outside of a park and three proposed trails were identified, as shown in **Table 3.17-3.** Trail data described in the table were obtained from the City of Dallas's Enterprise GIS website[7] and are displayed in **Appendix D, Community and Cultural Resources Mapbook**.

Table 3.17-3: Dallas County Proposed and Existing Trails in the Study Area

Mapbook Page	Name	Location	Type	Surface	Width (feet)	Total Miles	Miles within Study Area	Status
1	Grand Avenue Connection	Al Lipscomb Way	Sidewalk/ Street	Concrete	N/A[a]	2.0	0.6	Proposed
1-2	Santa Fe Trestle Trail	Within Trinity River Levees	Major Linear	Concrete	12	0.9	0.2	Existing
4	Interurban Trail	John C Phelps Trail to Loop 12	Major Linear	Concrete	12	2.6	0.2	Proposed
4-5	Five Mile Creek Trail	Westmoreland Park to Joppa Preserve	Major Linear	Concrete	8-12	7.2	1.0	Proposed

Source: AECOM 2019

[a] Information for this proposed resource was not available.

The Grand Avenue Connection would operate on-street and off-street along Al Lipscomb Way from South Lamar Street to Fair Park in east Dallas in an urban setting. The proposed trail was identified in City of Dallas-provided GIS data. The trail crosses land owned by Dallas ISD and private entities. At its closest point the trail is approximately 125 feet from the LOD.

Santa Fe Trestle Trail is the first established off-road trail that crosses the Trinity River, near Corinth Street and Eighth Street. The DART- and City of Dallas-owned trail provides for both walking and bicycling. The trail is approximately 1 mile in length, while only 0.2-mile of the trail is within the Study

[7] City of Dallas, Dallas Enterprise GIS, accessed November 2019, https://gisservices-dallasgis.opendata.arcgis.com/.

Area. The trail is located within the floodway and strands of trees, and features artwork and transit access. At its closest point the trail is located approximately 750 feet from the LOD.

The Interurban Trail is a City of Dallas proposed trail that would operate along an existing utility corridor in the urban neighborhoods of South Dallas. The trail would extend from East Illinois Avenue to East Ledbetter Drive, across land currently owned by Texas Utilities Electric Company. At its closest point, the trail would be located approximately 980 feet from the LOD.

Five Mile Creek Trail is a proposed trail situated along Five Mile Creek in Dallas County. It would cross under IH-45 and connect to the Trinity River. The majority of the over 9-miles-long Five Mile Creek Trail is outside of the Study Area. However, the proposed alignment is a concept developed by the City of Dallas Parks and Recreation Department, and the final alignment has not been determined. The proposed trail would intersect land currently owned by the City of Dallas and private land entities. The parcels of land within and immediately adjacent to the LOD are privately owned and there is no known public easement or encumbrance for public access across the privately owned land in the Study Area.[8] The closest parcel of publicly owned land for this planned trail is 160 feet from the LOD.

3.17.4.2 Ellis County

There is one recreational facility within the Study Area for Ellis County, as shown in **Table 3.17-4**.

Table 3.17-4: Recreational Facilities in the Ellis County Study Area

Mapbook Page	Name	Location	Type	Owner	Total Acres	Acres within Study Area	Amenities
22-23, 38-39	Lake Bardwell	Ennis, Texas	Wildlife Management Area	USACE	2,917	229.4	Natural area with multi-use trails

Source: AECOM 2019

Lake Bardwell is a USACE-owned and operated lake and recreational facility. The USACE's mission for this lake is "to provide flood damage reduction to the Ellis County area and to offer some of the best fishing, camping and boating in Texas."[9] The facility includes 3,500 surface acres of water, five parks and a multi-use trail system. Lake Bardwell includes hunting during the months of September to March, and it includes multi-use trails for horseback riding, bicycling or hiking. The trailhead is located outside of the Study Area near the northernmost boat ramp at Waxahachie Creek Park.[10]

3.17.4.3 Navarro and Limestone Counties

There are no parks, recreational facilities or existing or planned trails within the Study Area in Navarro or Limestone Counties.

3.17.4.4 Freestone County

There are no parks or recreational facilities within the Study Area in Freestone County.

[8] June 29, 2017, phone conversation with Leong Lim, City of Dallas Parks and Recreation Department.
[9] USACE, Bardwell Lake, accessed November 2019, http://www.swf-wc.usace.army.mil/bardwell/.
[10] USACE, Bardwell Lake, accessed November 2019, http://www.swf-wc.usace.army.mil/bardwell/Recreation/Trails/Horse.asp.

3.17.4.4.1 Trails

There is one trail within Freestone County, which also intersects the Study Area in Leon and Madison Counties, as shown in **Table 3.17-5**.

Table 3.17-5: Freestone County Trails in the Study Area

Mapbook Page	Name	Location	Type	Surface	Width (feet)	Miles Total	Miles within Study Area	Status
116	El Camino Real de los Tejas National Historic Trail	Near Buffalo Creek, Freestone County	Natural trail	N/A [a]	N/A [a]	2,580	0.5	Existing

Source: AECOM, 2019

[a] Detailed Information for this resource could not be located.

El Camino Real de los Tejas National Historic Trail crosses the Study Area just north of the Freestone/Leon County line along Alligator Creek and Buffalo Creek. The trail is approximately 2,580 miles, spanning from the Rio Grande River near Eagle Pass and Laredo, Texas, to Natchitoches, Louisiana. The trail is a network of roads and Native American footpaths dating back to the late 1600s and beyond. El Camino Real de los Tejas trails were utilized by the Spanish and French during the early colonial years of Texas. Historically, remnants of the trail could be found in Freestone, Leon and Madison Counties.

The trail system is currently being managed by NPS. A comprehensive management plan was completed in 2006. Existing recreational facilities are provided at federal or state parks, although most facilities are not geared toward trail activities. Trail facility maintenance is dependent on local assistance and cooperation because the trail is managed by NPS in partnership with the Partnership for the National Trails System, THC, ADAI Caddo Indian Nation, Apache Pass and others.[11] The elements of the trail included in the Study Area have not been maintained, making it difficult for a user to access the trail.

3.17.4.5 Leon County

3.17.4.5.1 Parks

Table 3.17-6 shows two parks located within the Study Area for Leon County.

[11] NPS, *El Camino Real de los Tejas National Historic Trail Comprehensive Management Plan,* September 2011, accessed November 2019, http://parkplanning.nps.gov/elte0911.

Table 3.17-6: Leon County Recreational Facilities in the Study Area							
Mapbook Page	**Name**	**Location**	**Type**	**Owner**	**Total Acres**	**Acres within Study Area**	**Amenities**
117	Shelley Pate Memorial Park	1025 North Hill Street, Buffalo, TX	Public park	City of Buffalo	17.1	10.5	Pavilion, baseball field, basketball court, grills and picnic tables, playground and water spray ground, sand volleyball and tennis courts
133-135	Fort Boggy State Park	4994 Highway 75 South	State park	TPWD	1,847	713	Fishing, boat ramp, hiking, mountain biking, pavilion, hike-in-campsites

Source: AECOM 2019

Shelley Pate Memorial Park is an approximately 17.1-acre park adjacent to the northbound IH-45 frontage road. The park is partially within the Study Area, but is not within the LOD, and separated from the Project by IH-45. The park offers typical amenities such as a pavilion, baseball and basketball facilities, picnic areas and a playground.

Fort Boggy State Park is intersected by IH-45 approximately 4 miles south of Centerville on SH 75. The 1,847-acre park includes hiking trails, a 15-acre lake, a day use area, campsites and three cabins.[12] Fishing, hiking, mountain biking and swimming are allowed in the park. The lake is open to small boats, canoes and kayaks. Recreational activities are primarily located on the east side of IH-45. Parklands on the west side of IH-45 are undeveloped but can be used for hunting during the designated seasons with permission from TPWD. The fort for which the park is named fell into disrepair in the mid-1800s when it was no longer necessary for protection, and it is no longer on the property. The fort's original location was on the north side of Boggy Creek roughly 2 miles north of present-day Leona.[13]

3.17.4.5.2 Trails

Historically, a portion of the El Camino Real de los Tejas National Historic Trail traversed this area; however, no intact portions of this trail remain in the Study Area. See **Section 3.17.4.4, Freestone County,** for more information.

3.17.4.6 Madison County

No parks or recreational facilities are located within the Study Area. Historically, a portion of the El Camino Real de los Tejas National Historic Trail traversed this area; however, no intact portions of this trail remain in the Study Area. See **Section 3.17.4.4, Freestone County**, for more information.

3.17.4.7 Grimes and Waller Counties

No parks, recreational facilities or existing or planned trails are located within the Study Area in Grimes or Waller Counties.

[12] TPWD, *Fort Boggy State Park,* accessed November 2019, http://tpwd.texas.gov/state-parks/fort-boggy.
[13] SHA, Fort Boggy, accessed November 2019, https://tshaonline.org/handbook/online/articles/qbf04.

3.17.4.8 Harris County

3.17.4.8.1 Parks

Six recreational parklands were identified within the Study Area in Harris County, as shown in **Table 3.17-7**.

Mallard Crossing Neighborhood Park provides a playground, walking trail and covered facility for residents of Mallard Crossing. The park is approximately 0.03 acre and is entirely within the Study Area but not in the LOD.

Cypress Top Historic Park is a small urban park, adjacent to US 290, in Cypress of approximately 2.7 acres. The park is entirely within the Study Area but not in the LOD. The park is bounded by historic structures that have been made into a museum. Amenities include a small walking trail, pavilion and guided tours.

Table 3.17-7: Harris County Parklands in the Study Area

Mapbook Page	Name	Location	Type	Owner	Total Acres	Acres within Study Area	Amenities
239	Mallard Crossing Neighborhood Park	Mallard Crossing Drive, Hockley, TX	Neighborhood park	Neighborhood Association	0.03	0.03	Trail, playground, covered facility
244	Cypress Top Historic Park	26026 Hempstead Road, Cypress, TX	Historic park	Harris County	2.7	2.7	Guided tours, trails, pavilion, historical buildings
251	Pitner Park	8600 Block Pitner Road, Houston TX	Public	Harris County	1.2	0.8	Trails, playground, picnic tables, Barbecue grills
248	Jersey Meadow Golf Course	8502 Rio Grande St, Jersey Village, TX	Public	City of Jersey Village	130	2.9	Golf course, club house, driving range, restaurant
253-254	T.C. Jester Park	4205 T.C. Jester Boulevard, Houston, TX	City/Municipal	Harris County Flood Control District/City of Houston	124	6.2	Disc golf, trails, flag football field, softball field, recreational building, pool, dog park
251	Spring Spirit Sports and Education Complex	8526 Pitner Road, Houston, TX	Baseball, softball, soccer, education and community programs	Spring Branch Baseball Program Inc.	7.6	4.6	Baseball, softball, soccer, after school programs, community programs

Source: AECOM 2019

Pitner Park is an approximately 1.2-acre public park with playground, walking trail, picnic tables and barbecue grills. The park is partially within the Study Area but not in the LOD.

Jersey Meadow Golf Course is an approximately 124-acre recreational facility on the north side of US 290. The resource is publicly owned by the City of Jersey village, and offers a golf course, clubhouse, driving range and restaurant. The golf course is partially within the Study Area but not in the LOD.

T.C. Jester Park is a linear park system approximately 4,000 feet from the Houston Northwest Mall Terminal Station Option. The park is within the Study Area but not in the LOD. The linear park follows the White Oak Bayou, and offers trails, sports fields and other amenities.

Spring Spirit Sports and Education Complex is a private baseball complex, within the Study Area but not in the LOD, that serves members and member school programs, including after school programming for three local elementary schools – Hollibrook, Edgewood and Ridgecrest. Children are transported to and from the facility by the school. The complex also offers after school tutoring for children in Spring Branch ISD. Programs are educational and include utilization of the baseball facilities.

3.17.4.8.2 Trails

FRA identified 12 proposed trails to be located within the Study Area through the H-GAC bikeway database. Identified trails, shown in **Table 3.17-8**, are part of the H-GAC 2040 Regional Pedestrian and Bicycle Plan and the 2017 Houston Bike Plan.

Table 3.17-8: Harris County Proposed Trails within the Study Area

Mapbook Page	Name	Address	Type	Total Miles	Miles within Study Area
247-248	Jones Road/Rio Grande	Jones Road/Rio Grande to White Oak Bayou	Shared Use Path/Trail	4.4	0.5
248	Huffmeister/West Road	Huffmeister/West Road to Sunbury Lane	Shared Use Path/Trail	3.0	0.9
249-257	Hempstead Road	Hempstead Road to Spencer	Shared Use Path/Trail	8.9	8.9
245	Cypress Creek Greenway	Cypress Creek to Telge Road	Shared Use Path/Trail	15.3	1.0
249-250	Cole Creek/ Empire Central Drive	Cole Creek/Empire Central Drive to Fisher Road	Shared Use Path/Trail	1.2	0.7
249-250	Cole Creek	Cole Creek to Concord Park Drive	Shared Use Path/Trail	5.8	0.08
250-251	Fairbanks N Houston Road	Fairbanks N Houston Road to Campbell Road	Shared Use Path/Trail	0.6	0.58
255;257	Katy Road	Post Oak Road to Katy Freeway	Off-Street	1.7	0.58
252	CenterPoint Corridor	Blalock Road to West 34th Street	Off-Street	7.8	0.86
250	Drainage Corridor	Gessner Road to Windfern Road	Off-Street	0.5	0.14
253-257	Westview Connection	Westview Drive to West Loop N Freeway	Off-Street	0.2	0.21
253-257	West Loop N Freeway	West Loop N Freeway to Katy road	Off-Street/Shared On-Street	0.6	0.64

Source: AECOM 2019

Jones Road/Rio Grande is a proposed shared-use path/trail located north of US 290 and is within the Study Area but not the LOD.

Huffmeister/West Road is a proposed shared-use path/trail on both the south and north sides of US 290. The proposed shared-use path/trail would utilize drainage infrastructure to travel under US 290 and thereby intersect the LOD.

Hempstead Road is a proposed shared-use path/trail that would be off-street in the Hempstead Road ROW. The proposed shared-use path/trail would intersect the LOD.

The Cypress Creek Greenway is a proposed shared use path/trail that has recently completed its first segment at the Gourley Nature Trail approximately 10 miles northeast of the Study Area. The path does not intersect the LOD.

Cole Creek/Empire Central Drive is a proposed shared-use path/trail that generally follows Cole Creek intersecting Hempstead Road and the LOD.

Cole Creek is a proposed shared-use path/trail on the north side of Hempstead Road following the Cole Creek corridor. The resource is within the Study Area but does not intersect the LOD.

Fairbanks N Houston Road is a proposed shared-use path/trail that would generally follow the Fairbanks N Houston Road corridor and intersect the LOD travelling southwest.

Katy Road is a proposed off-street trail identified in the 2017 Houston Bike Plan as a future project. The proposed off-street trail would intersect the LOD near the Houston Northwest Transit Center Terminal Station Option.

CenterPoint Corridor is a proposed off-street trail identified in the 2017 Houston Bike Plan as a future project. The proposed off-street trail would generally follow a utility corridor and intersect the LOD at Hempstead Road.

Drainage Corridor is a proposed off-street trail identified in the 2017 Houston Bike Plan as a future project. The proposed off-street trail would generally follow a drainage corridor and intersect the LOD at Hempstead Road.

The Westview Connection and West Loop N Freeway bikeways are described as programmed projects in the 2017 Houston Bike Plan. The plan states that programmed projects are capital projects from the City of Houston CIP, Bayou, Greenways 202, Management District and Tax Increment Refinancing Zone CIPs and TxDOT that are funded and planned for completion in the next 5 years, or roughly 2021.[14] However, the plan does not include details regarding the design or configuration of the projects. Further engineering studies would be required by the City of Houston to determine feasibility.

The proposed trails identified in this section are in early planning stages and not enough information is known to describe the trail in terms of specific location or configuration.

3.17.4.9 School Recreational Facilities

As shown in **Table 3.17-9**, three schools within the Study Area have recreational amenities available to the general public, Cy-Fair High School, Cypress Falls High School and Housman Elementary. Cy-Fair High School and Cypress Falls High School allow the general public to use their athletic facilities. Housman

[14] City of Houston, *Houston Bike Plan*, February 2017, accessed November 2019, http://houstonbikeplan.org/wp-content/uploads/2017/07/HoustonBikePlan_Full.pdf.

Elementary has a public "pocket park" on the southeastern corner of the parcel. The park is available for public use.

Table 3.17-9: School Recreational Facilities

Mapbook Page	Recreational Facility	Address	Amenities
6	Wilmer-Hutchins High School	5520 Langdon Road, Dallas, TX 75241	Outside of Study Area
9	AIA Lancaster Elementary School	5520 Langdon Road, Dallas, TX 75241	Elementary playground not open to the Public
177	Leon ISD	12168 US Highway 79, Jewett, TX 75846	Outside of Study Area
246	Cy-Fair High School (includes Arnold Junior High School)	22602 Northwest Freeway, Cypress	Track and field, tennis courts
247	Cypress Falls High School	9811 Huffmeister Road, Houston	Track and field, tennis courts
250	Dean Middle School (includes Bane School)	14104 Reo Street, Houston, TX 77040	Outside of Study Area
253-257	Housman Elementary	6705 Housman, Houston	Playground area, soccer fields, pocket park
254	Awty International School (includes Early Learning Campus)	7455 Awty School Lane, Houston, TX 77055	Facilities not open to the public.

Source: AECOM 2019

3.17.4.10 Recreational Hunting

Build Alternatives C, D, E and F would cross public recreational resources that can be used for hunting during the designated seasons. These two resources are Lake Bardwell and Fort Boggy State Park.[15] Build Alternatives A and B do not intersect either resource.

All Build Alternatives would primarily cross privately owned land. A complete inventory of private lands that offer recreational hunting leases could not be identified. TPWD maintains an online database for private land owners and Texas hunters to advertise and connect; however, the database is not complete or widely adopted. Additionally, advertisement of private hunting leases can vary through numerous online repositories, and/or often leases are not advertised traditionally but rather spread through word-of-mouth or personal relationships.

A search of the online database from TPWD identified one hunting lease in Navarro, two hunting leases in Leon and one hunting lease in Grimes Counties,[16] but the specific properties associated with these hunting leases could not be located. Private lands throughout the Study Area could be host to recreational hunting, which could represent a potential economic value or source of personal income to the property owners.

3.17.5 Environmental Consequences

3.17.5.1 No Build Alternative

Under the No Build Alternative, the HSR system would not be constructed. Existing trends affecting recreational facilities and parklands would be expected to continue without the contribution of the

[15] August 16, 2018, E-mail correspondence with TPWD staff informed the project team that hunting was allowed on undeveloped portions of Fort Boggy State Park west of IH-45 during designated seasons.
[16] TPWD, *Hunt Texas Online Connection,* accessed November 2019, https://www2.tpwd.state.tx.us/huntwild/hunt/planning/hunt_lease/.

Project. Potential impacts could still occur under the No Build Alternative as new developments would continue due to natural growth in the area. This growth could result in impacts to recreation facilities or development of new recreation facilities such as parks and trails. Major projects in the area are summarized in **Section 4.4, Indirect Effects and Cumulative Impacts, Cumulative Impacts;** however, no major impacts to recreational facilities have been identified from these projects (see **Table 4-7**).

3.17.5.2 Build Alternatives

Of the 43 recreational facilities identified within the Study Area, 3 would be located in (or immediately adjacent to) the LOD and impacted by the Project: Honey Springs Cemetery (all Build Alternatives), Lake Bardwell (Build Alternatives D, E and F) and Fort Boggy State Park (Build Alternatives C and F). The other 40 facilities identified in **Section 3.17.4, Affected Environment,** are within the Study Area, but outside of the LOD and would not be directly or indirectly impacted by the Project. Potential impacts to recreational resources are described in the following sub-sections.

Resources within 630 feet of the LOD could experience temporary impacts during the construction phase of the Project. Potential impacts during construction could include air quality (emissions from the use of heavy equipment), noise and vibration (from use of heavy equipment), visual (changes in the viewshed) and access (changes or reduced access).

Operational impacts would be long-term and permanent. These would represent direct changes that would permanently alter the use, character or setting of the recreational facility. This would include full or partial acquisition of any public recreational facility and changes in access, use or the viewshed.

The following sections highlight resources from **Section 3.17.4, Affected Environment,** where potential impacts could occur. For each potentially impacted resource, additional information is provided regarding that recreational facility's type, character, setting and potential mitigation measures outlined for recreational facilities and potential impacts from other sections of the EIS.

3.17.5.2.1 Segment 1

Of the 14 parks (13 existing and 1 proposed) identified along Segment 1, 12 would be located outside of the LOD and therefore would not be directly impacted by the Project. One resource, William Blair Jr. Park, would be approximately 235 feet from the LOD and could be indirectly impacted by construction noise; however, the **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts,** analysis identified no sensitive receivers at that location; therefore, no noise and vibration impacts would be anticipated.

Honey Springs Cemetery is a NRHP-eligible historic property also designated as a special-use park by the City of Dallas. Honey Springs Cemetery is located west and adjacent to the LOD. At the entrance of the cemetery is a memorial wall. The Project would be constructed on viaduct on private property immediately adjacent to the cemetery. During construction, potential temporary impacts could include short-term noise and vibration impacts due to the operation of heavy equipment and localized air quality impacts due to dust and emissions caused by the movement of earth and heavy equipment. Additionally, proximity of the resource adjacent to the LOD could result in temporary restrictions in access to the facility. Mitigation for potential temporary impacts to access is discussed in **RF-MM#2: Honey Springs Cemetery Construction Impacts Mitigation**.

The Project would change the visual setting of Honey Springs Cemetery on its perimeter, as described in **Section 3.10.5.2.5, Aesthetics and Scenic Resources, Landscape Unit #3 South Dallas Residential (Dallas County),** and displayed on **Figures 3.10-43** and **3.10-44.** Segment 1 would include HSR track on viaduct located adjacent to the property and behind visitors viewing the memorial wall on the eastern

side of the property. As described in **Section 3.10.5.2.5, Aesthetics and Scenic Resources, Landscape Unit #3 South Dallas Residential (Dallas County)**, the scale and mass of the proposed Project would be visually intrusive on the Honey Springs Cemetery and would diminish integrity of design, setting, feeling and association. FRA and THC, as described in **Section 3.19.5.2.1, Cultural Resources, Segment 1**, have determined that introduction of the Project infrastructure would constitute an adverse visual impact to the site for cultural preservation purposes. Existing transportation infrastructure from the nearby IH-45 frontage road, overhead electrical transmission lines and the nearby UPRR ROW decrease sensitivity of viewers to the addition of the Project's infrastructure. Mitigation measures including aesthetic treatments will be developed under the Programmatic Agreement described in **Section 3.19.6.2, Cultural Resources, Programmatic Agreement.** For recreational use purposes, the site permanent access and use would be unchanged, and the visual changes would not affect the recreation use of the site.

Honey Springs Cemetery is also discussed in **Section 3.14.5.2.5, Socioeconomics and Community Facilities, Impacts to Community Facilities,** and **Section 3.18.5.3.11, Environmental Justice, Community Facilities.**

Fruitdale Park's perimeter would be approximately 100 feet from the LOD. The eastern boundary of the park is adjacent to the UPRR ROW, and the northern and southern boundaries are abutting residential homes. Construction of the Project would generate temporary noise due to the movement and operation of equipment. Construction activities would adhere to compliance measures outlined in **NV-CM#1: Compliance with Local Regulations,** and be further mitigated through **NV-MM#2: Construction Noise Control Plan.** For operational noise, **Section 3.4.5.4., Noise and Vibration, Operational Noise Impacts,** did not identify any severe or moderate impacts in this area; additionally, no vibration impacts would occur. In this location, the Project would be constructed on viaduct and visible above the park's perimeter tree-line. Overhead electrical transmission lines are already prominent in the view. Visual quality would remain moderate because existing views would not be limited or reduced in quality. **Section 3.10.5.2.5, Aesthetics and Scenic Resources, Landscape Unit #3 South Dallas Residential (Dallas County),** further describes potential impacts at Fruitdale Park.

All other parks described in **Table 3.17-2** would be over 630 feet from the LOD and therefore beyond the distances for anticipated construction impacts[17] and would not experience changes in access or use.

At its closest point, the Santa Fe Trestle Trail would be approximately 750 feet from the Project. The majority of this trail would not be directly or indirectly impacted by noise or vibration; however, about 100 feet of the trail could be impacted by construction noise. The Project would be crossing on viaduct north and east of the resource. Part of the Santa Fe Trestle Trail abuts a DART light rail line that runs parallel on a viaduct, and then the trail utilizes the Santa Fe Trestle bridge to cross the Trinity River. Transportation infrastructure, particularly viaduct, is common in this location and therefore no aesthetic or visual impacts would be anticipated due to the addition of the Project. Additionally, the use of and access to this trail would not change as a result of the Project; therefore, no impacts would be anticipated.

Three proposed, but unfunded, trails –Grand Avenue Connection, Interurban Trail and Five Mile Creek– intersect the Study Area. Construction and operation of the Project would not prohibit these trails from being constructed should funding for them become available. The HSR track would be grade separated

[17] As noted in **Section 3.4.5.2.1, Noise and Vibration**, **Construction Noise and Vibration Impacts**, daytime construction noise would extend 40 to 200 feet from the noise source and nighttime construction noise would extend 125 to 630 feet from the noise source.

from the proposed trails (i.e., the alignment would be on viaduct) and the proposed ROW required for the trails would be unaltered.

3.17.5.2.2 Segment 2A

The northwestern boundaries of Lake Bardwell would be located approximately 50 feet from new electrical utilities necessary for the operation of the HSR system and approximately 200 feet from the Project ROW. The LOD would not intersect the Lake Bardwell boundaries or recreational facilities; however, the Study Area would intersect land within the lake's flowage easement, as described in **Section 3.7.5.2.2, Waters of the U.S., Ellis County.** Temporary impacts related to the construction of the Build Alternatives A, B and C could result in noise impacts, localized air quality impacts, and visual impacts. However, no severe or moderate impacts were identified in this area in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts.** Potential compliance and mitigation measures for construction-related air quality impacts could include **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program,** and **AQ-MM#1: Dust Suppression Techniques; AQ-MM#2: Materials Transport; AQ-MM#3: Construction Off-road Vehicle Speed Limitations; AQ-MM#4: Road Surface Maintenance;** and **AQ-MM#5: Construction Equipment**. The LOD would be approximately a half-mile from equestrian trails and approximately 3 miles from boating areas, both of which would be outside of the distance for construction impacts, and recreational facilities would not experience change in access, use or viewshed; therefore, no potential impacts would be anticipated for Lake Bardwell recreational facilities.

3.17.5.2.3 Segment 2B

The Study Area of Segment 2B also includes Lake Bardwell. Build Alternatives D, E and F would be on viaduct when crossing Lake Bardwell, a USACE-owned and managed property, and would directly impact approximately 25.9 acres of Lake Bardwell's 2,917 acres (0.88 percent). Build Alternatives D, E and F would permanently impact fee owned land within Lake Bardwell, as described in **Section 3.7.5.2.2, Waters of the U.S., Ellis County**.

Temporary impacts related to the construction of Build Alternatives D, E and F could result in noise impacts and localized air quality impacts. However, no severe or moderate impacts were identified in this area in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts.** Potential compliance and mitigation measures for construction related air quality impacts could include **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program,** and **AQ-MM#1: Dust Suppression Techniques; AQ-MM#2: Materials Transport; AQ-MM#3: Construction Off-road Vehicle Speed Limitations; AQ-MM#4: Road Surface Maintenance;** and **AQ-MM#5: Construction Equipment**. Construction and maintenance of the ROW would include the clearing of trees and brush. As the area is used for seasonal hunting (September 1 to March 31), these construction activities could serve as a deterrent to wildlife, reducing the availability of small game and feral hogs in the area. Mitigation measures outlined in **Section 3.4.6.2, Natural Resources**, could include **NR-MM#1: Site Training; NR-MM#2: Field Delineation of Sensitive Habitat Areas; NR-MM#3: Aquatic Species; NR-MM#4: Minimize Disturbance in Sensitive Areas;** and **NR-MM#5: Minimize Nighttime Lighting.** Additionally, the multi-use trails located within the Lake Bardwell area could be temporarily impacted (temporary access reroute or closure) during construction. A site visit in July 2018 observed that trails were overgrown and did not appear to be maintained. Discernable paths leading from the trail head were difficult to discern and wayfinding signage was inadequate. Mitigation measures for Lake Bardwell are discussed in **RF-MM#1: Temporary Recreation Impacts to Lake Bardwell.**

Build Alternatives D, E and F would permanently acquire acreage necessary for the ROW of the Project. The HSR system would cross on viaduct and no trails would be permanently closed; however, they could be potentially rerouted. Potential noise impacts to wildlife would not be anticipated, as outlined in **Section 3.4.5.2.4, Noise and Vibration, Operational Noise Impacts**. The addition of the HSR system would not permanently impact seasonal recreational hunting. In the area where the Build Alternatives would cross Lake Bardwell, there is Getzendaner Road, a freight rail corridor and overhead electrical transmission lines. Noise impacts to wildlife would not be anticipated, as previously described, and the Project would be screened with mitigation measures described in **Section 3.17.6.2, Mitigation Measures**. Additionally, the Project would not change any regulations associated with recreational hunting in the area or in the State of Texas. With existing nearby transportation and utility infrastructure and applicable mitigation measures, no permanent impacts to recreational seasonal hunting would be anticipated.

Other recreational facilities, such as boating areas of Lake Bardwell, would be located roughly 2 miles from the LOD. Due to the distance, impacts as a result of Segment 2B would not be anticipated. The addition of the Project would change the visual quality of this resource and mitigation would be necessary as described in **AS-MM#3: Preserve Existing Vegetation and Feather Edges; AS-MM#6: Construction Lighting Plan;** and **AS-MM#7: Operational Lighting Plan.** Lake Bardwell is also discussed in **Section 3.7.5.2.2, Waters of the U.S., Ellis County; Section 3.8.5.2, Floodplains, Build Alternatives,** and **Section 3.18.5.3.13, Environmental Justice, Community Facilities**. Impacts to this recreational facility would be common to Build Alternatives D, E and F.

3.17.5.2.4 Segments 3A, 3B and 3C

Three resources were evaluated on Segments 3A, 3B and 3C. Shelly Pate Memorial Park would be located more than 600 feet from Build Alternatives C and F on the east side of IH-45. Construction noise could extend to distances of 200 feet (daytime) and 630 feet (nighttime) from its origin; however, the park would be on the other side of a major interstate and not be directly or indirectly impacted. As discussed in **Section 3.10.5.2.8, Aesthetics and Scenic Resources, Landscape Unit #6 Central Eastern Rural, Fairfield to Old San Antonio Road (Freestone, Limestone and Leon Counties)**, the park is set back from the IH-45 roadways and is screened by trees and buildings; visual quality would be unchanged with the addition of the Project.

A resource crossed by all three segments would be the El Camino Real de los Tejas Trail. Historically, this trail meandered through numerous areas within this part of Texas. The NPS has designated this resource as a national trail; however, the trail is no longer contiguous and has been segmented by development and agriculture, particularly within the Study Area. There are no recognized and maintained portions of the trail within the Study Area. There are numerous areas along the 2,580-mile trail where the resource is formally recognized, maintained and used. These areas are outside the boundaries of this Study Area, with the nearest interpretive center and historic site located at Mission Tejas State Park more than 47 miles from the Study Area. There is no evidence of the trail's integrity within this Study Area; therefore, there would be no impact.

Segment 3C would intersect parklands on the west side of Fort Boggy State Park primarily on viaduct and would require the acquisition of approximately 67 acres. Build Alternatives C and F would be constructed adjacent to the west side of IH-45 ROW and include reconstruction of the frontage road. This portion of the Fort Boggy State Park is undeveloped and not routinely accessible to park users due to locked gates. FRA was informed by TPWD that park property on the west side of IH-45 is accessible on an "…as-needed-basis, such as during public hunting events that only occur during legal hunting

seasons."[18] TPWD also informed FRA that potential plans for the further development and use of this western property of Fort Boggy are dependent on securing funding; therefore, nothing has been planned or programmed in the Study Area.

Although undeveloped, this portion of Fort Boggy State Park could experience impacts including loss of land and hunting area, visual impacts and noise and vibration impacts. Build Alternatives C and F would reduce (by 11 percent) the amount of Fort Boggy State Park land that is available for hunting on the property; however, the remaining property on the west side of IH-45 would remain as single, large landholding and available for hunting as the primary function of that portion of the property. For this reason, although use of a portion of the property would occur as a result of Build Alternatives C and F, no adverse effect on the features, attributes or activities would occur. For construction noise impacts, **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts,** analysis identified no sensitive receivers at that location. Also, the Fort Boggy State Park recreational areas and facilities are primarily located on the east side of IH-45, more than a quarter-mile from the Project and are therefore outside of the LOD and the Study Area. No potential impacts would be anticipated to recreational facilities east of IH-45 in Fort Boggy State Park. Visual quality for portions of Fort Boggy on the east side of IH-45 are described in **Section 3.10.5.2.8, Aesthetics and Scenic Resources, Landscape Unit #6 Central Eastern Rural, Fairfield to Old San Antonio Road (Freestone, Limestone and Leon Counties)**. As hunting is the only recreational activity at this time on the west side of Fort Boggy State Park, hunters would be the primary viewer. In this location, the Project would be on viaduct approximately 40 feet high. This height is almost equal to the height of the tallest trees in the park. The forest would remain dominant in user views during leaf-on or leaf-off conditions, although portions of the viaduct and trainset operations may be partially visible through the trees during leaf-off conditions. Visual quality for users of existing park facilities would remain moderately high to high, resulting in a neutral visual effect.

Fort Boggy State Park is further discussed in **Chapter 7.0, Section 4(f) and Section 6(f) Evaluation, Section 7.8.2.5, Segment 3; Section 7.10.1, Fort Boggy State Park; Section 7.11.2, Fort Boggy State Park and Section 7.12.2, Analysis and Results.**

3.17.5.2.5 Segment 4

There are no recreational facilities identified within the Study Area of Segment 4.

3.17.5.2.6 Segment 5

Six parklands and three public schools (Cy-Fair High School, Cypress Falls High School and Housman Elementary) were identified for Segment 5 within Harris County. The identified resources are described below.

Mallard Crossing Neighborhood Park would be over 600 feet from a portion of the LOD designated for utility improvements and over 1,000 feet from the track ROW. No construction impacts from noise and vibration would be anticipated, as resources are outside of construction noise and vibration distances described in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**. Construction and operation lighting impacts would be mitigated through **AS-MM#6: Construction Lighting Plan** and **AS-MM#7: Operational Lighting Plan.** With mitigation, visual and aesthetic impacts would not be anticipated at this resource as the Project would cross on embankment and could be potentially screened from view, as described in **AS-MM#3: Preserve Existing Vegetation and Feather Edges**. With mitigation previously described, no recreational facilities impacts would be anticipated.

[18]August 16, 2018, E-mail correspondence with TPWD staff informed the project team that hunting was allowed on undeveloped portions of Fort Boggy State Park west of IH-45 during designated seasons.

Cypress Top Historic Park would be approximately 300 feet from the LOD adjacent to Hempstead Road. Cypress Top Historic Park is outside the 200-foot screening distance for daytime construction noise impacts; for this reason, the property would not be impacted by construction noise. Additionally, the park and museum would be closed during evening hours, so no nighttime construction noise impacts would be anticipated. No severe or moderate operational impact was recorded at this facility as described in **Section 3.5.2.4, Noise and Vibration, Operational Noise Impacts**; additionally, no vibration impacts were recorded per **Section 3.5.2.5, Noise and Vibration, Operational Vibration Impacts.** Also, the location is adjacent to a major thoroughfare in an urban area where traffic noise is common. Construction activities and the HSR viaduct would be visible from the portions of Cypress Top Historic Park that front Hempstead Road. However, views of the HSR viaduct would be limited by the existing tree canopy within the park. Alignment of the viaduct along the existing utility, freight rail and highway corridors would reduce the visual impact of the new Project element.

Pitner Park would be approximately 1,000 feet from the LOD between multi-family residential structures and separated from the Project by large commercial structures No construction impacts from noise and vibration would be anticipated, as resources are outside of construction noise and vibration distances described in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**. Construction and operation lighting impacts would be mitigated through **AS-MM#6: Construction Lighting Plan** and **AS-MM#7: Operational Lighting Plan.** Visual quality at the park would be unchanged as viewers would be unlikely to see the Project due to the commercial structures located between the park and the Project. Additionally, transportation infrastructure is already present in this location and viewers would be less sensitive to the addition of the Project.

Jersey Meadows Golf Course is located on the north side of US 290, and would be over 1,000 feet from the LOD. As a result of the distance and physical separation of US 290 as a barrier, no anticipated impacts from construction or operation of the Project would be anticipated.

T.C. Jester Park would be located almost 1 mile from the Houston Northwest Mall Terminal Station Option. However, the resource is captured in the Study Area due to potential roadway improvements outlined in the LOD for T.C. Jester Boulevard. All roadway improvements would occur within existing road ROW. Potential impacts could occur from typical road work. Mitigation measures would be defined by **TR-MM#1: Traffic Control Plan.** No other impacts would be anticipated.

Spring Spirit Sports and Education Complex is south of Hempstead Road amongst commercial and residential structures. The resource would be approximately 800 feet from the LOD. No construction impacts from noise and vibration would be anticipated, as resources are outside of construction noise and vibration distances described in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**. Construction and operation lighting impacts would be mitigated through **AS-MM#6: Construction Lighting Plan** and **AS-MM#7: Operational Lighting Plan.** As described in **Section 3.10.5.2.14, Aesthetic and Scenic Resources, Landscape Unit #12 Hempstead Corridor, Sam Houston Parkway to TexTube (Harris County),** similar locations along Hempstead Road, no change in visual quality would be anticipated in this area. As a result, no recreational facilities impacts would be anticipated at this location.

The running track at Cypress Falls High School is used by the community. It would be located approximately 1,200 feet from the Project. Users of the track would be screened from the Project by the White Oak Falls Neighborhood. Due to sufficient distance and structures separating the track from the Project, no noise and vibration, or visual and aesthetic impacts would be anticipated. Additionally, no change in access or use would occur due to the Project.

A "pocket park" and soccer fields are located at Housman Elementary. These facilities would be approximately 1,200 to 1,500 feet from the Project and temporary construction and permanent operational impacts would not be anticipated.

Twelve trails have been identified intersecting the Study Area. Trails in the Houston-Galveston Area Council Regional 2040 Regional Pedestrian & Bicycle Plan include Jones Road/Rio Grande, Huffmeister/West Road, Hempstead Road, Cypress Creek Greenway, Cole Creek/Empire Central Drive, Cole Creek and Fairbanks North Houston Road. Trails identified in the 2017 Houston Bike Plan include Katy Road, CenterPoint Corridor, Drainage Corridor, Westview Connection, and West Loop N Freeway. Three trails are funded and evaluated: the Westview Connection, West Loop N Freeway off-street facilities and the Cypress Creek Greenway. Westview Connection and West Loop N Freeway off-street facilities are discussed in **Section 3.17.5.2.7, Houston Terminal Station Area**. The Cypress Creek Greenway is discussed in the next paragraph. The remaining trails are not funded and are not evaluated further.

The Cypress Creek Greenway is a proposed continuous linear greenbelt along Cypress Creek and Little Cypress Creek stretching west of US 290 to the east connecting to the Spring Creek Greenway. The Cypress Creek Greenway has been partially funded and an initial segment (the Gourley Nature Trail) would be located approximately 10 miles northeast of the Project has been completed. A proposed section of the Cypress Creek Greenway would intersect the Project at US 290 near Baker Cypress Road. However, the HSR system would be on viaduct and no impacts are anticipated. Should funding become available for the remaining trails and portions of the Cypress Creek Greenway, it is not anticipated that the Project would prohibit these trails from being constructed.

3.17.5.2.7 Houston Terminal Station Area

The identified off-street facilities are included in the 2017 Houston Bike Plan.[19] The Westview Connection and West Loop N Freeway bikeways are described in the plan as programmed trails.[20] Both trails would be located near the Houston Northwest Transit Center Terminal Station Option area and the Westview Connection would be directly intersected by the LOD. In this location, the Project would be approaching the Houston Northwest Transit Center Terminal Station Option on viaduct. The West Loop N Freeway off-street facility is located in the Project Study Area but would not be directly intersected by the LOD. As the Project would be grade separated (on viaduct) from the Westview Connection and would not intersect the West Loop N Freeway bikeway, impacts to this proposed facility would not be anticipated and the addition of the Project would not prohibit future construction of these facilities.

3.17.5.3 Potential Impacts to Recreational Hunting Business and Activities

Construction and operation of the Project would result in the acquisition of public and private property where recreational hunting activities may occur. The two public locations where hunting activities could occur are Lake Bardwell and Fort Boggy State Park. Both resources are discussed in the **Section 3.17.5, Environmental Consequences**. The identified Preferred Alternative, Build Alternative A and the Houston Northwest Mall Terminal Station Option, would not acquire property owned by either resource and no impacts would be anticipated to recreational hunting at these locations.

[19] The 2017 Houston Bike Plan states, "The facilities shown on the maps are recommendations for future facilities, representing corridors along which bicycle facilities should be considered along the corridor. Having a recommended facility in the Plan on a street does not mean the facility must be built on that street; nor does the Plan prohibit a facility from being built if the facility is not shown on a map in the Plan."

[20] The 2017 Houston Bike Plan states, "The network plan identifies programmed components that are funded and scheduled to be implemented as well as projects that have the potential to be implemented in a shorter, five year time frame if funding were available."

The Project would require the acquisition of private land that could host hunting activities. Potential impacts to natural resources can be found in **Section 3.6, Natural Ecological Systems and Protected Species**. Loss of revenues due to potential impact to recreational hunting activities would be determined throughout negotiations during the property acquisition process between TCRR and each individual property owner. Mitigation measures with regard to private property acquisition and loss of potential economic value can be found in **LU-MM#1: Temporary Conversion of Land, LU-MM#2: Agriculture and Livestock Management** and **LU-MM#3: Acquisition and Relocation Mitigation Plan**.

Additionally, the Project would not affect hunting or firearms regulations within the State of Texas. Therefore, no potential impacts to recreational hunting, public or private, would be anticipated.

3.17.6 Avoidance, Minimization and Mitigation

The Build Alternatives would be designed to avoid and minimize impacts to recreational facilities by locating HSR infrastructure adjacent to existing transportation infrastructure, utility corridors and other development to the greatest extent practicable to minimize direct impacts to recreational facilities such as Honey Springs Cemetery. Within the six end-to-end Build Alternatives, 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure. Other design features include maximizing the use of viaduct to minimize acquisitions and displacements. Approximately 55 percent of the Project would be on viaduct. Grade separation of the Build Alternatives minimizes impact to the Santa Fe Trestle trail in Dallas, as well as several proposed trails in Dallas and Harris Counties. These design features avoided or reduced impacts to most of the recreational facilities with the Study Area.

3.17.6.1 Compliance Measures

TCRR would be required to comply with the following Compliance Measures (CM).

RF-CM#1: USACE Coordination for Lake Bardwell. Prior to construction of Build Alternative D, E and F, TCRR shall coordinate with the USACE as required under Section 404 for impacts to waters of the U.S. and Section 408 for impacts to federal projects. Related compliance measures include **WQ-CM#1: Section 401 Water Quality Certification**, **WW-CM#4: CWA Section 404 Individual Permits, WW-CM#5: Waters of the U.S. Mitigation Plan** and **WW-CM#6: Section 408 Permission**.

3.17.6.2 Mitigation Measures

TCRR would be required to implement the following Mitigation Measures (MM). The identified Preferred Alternative, Build Alternative A and the Houston Northwest Mall Terminal Station Option, would only require mitigation for Honey Springs Cemetery, **RF-MM#2: Honey Springs Cemetery Construction Impacts Mitigation**.

RF-MM#1: Temporary Recreation Impacts to Lake Bardwell. The following mitigation measure applies only to Build Alternatives D, E and F. Prior to and during construction, TCRR shall coordinate with USACE and Lake Bardwell staff to temporarily reroute trails that cannot be avoided by Segment 2B of the Project. TCRR shall post reroute signage at parking and trail areas. After construction, TCRR shall return all trails and park property impacted during construction to their original or improved conditions, as determined by the USACE and/or Lake Bardwell staff. If trails cannot be returned to previous configurations, TCRR shall make rerouted trails permanent and constructed to the same or improved conditions of the previous trails.

For potential impacts to seasonal hunting at Lake Bardwell prior to construction, TCRR shall coordinate with the USACE and/or Lake Bardwell staff to minimize or avoid, where practicable, disruption to planned and programmed seasonal hunting. TCRR shall make public notice of temporary closure of hunting locations.

RF-MM#2: Honey Springs Cemetery Construction Impacts Mitigation. Honey Springs Cemetery would experience temporary construction impacts and permanent visual quality impacts. Prior to construction TCRR shall coordinate with City of Dallas Parks and Recreation Department to identify and minimize when Honey Springs Cemetery may be inaccessible during construction and provide public notice of temporary closure. Compliance and mitigation for temporary construction impacts shall include **NV-CM#1: Compliance with Local Regulations,** and be further mitigated through **NV-MM#2: Construction Noise Control Plan.** Mitigation for localized air quality impacts caused by construction shall include **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program,** and **AQ-MM#1: Dust Suppression Techniques; AQ-MM#2: Materials Transport; AQ-MM#3: Construction Off-road Vehicle Speed Limitations; AQ-MM#4: Road Surface Maintenance; and AQ-MM#5: Construction Equipment.** Additionally, construction lighting mitigation shall include **AS-MM#6: Construction Lighting Plan.** Temporary loss of access to the facility due to construction shall be mitigated through **TR-CM#3: Road Closure Permit, TR-MM#1: Traffic Control Plan** and **TR-MM#6: Private Access.** Permanent impacts to visual quality would be mitigated through measures that will be developed under the Programmatic Agreement described in **Section 3.19.6.2, Cultural Resources, Programmatic Agreement.** A Resolution of Adverse Effects would include a Menu of Standard Treatment Measures that would include aesthetic treatments to minimize visual quality impacts, or an MOA.

RF-MM#3: Fort Boggy State Park Recreational Facilities Mitigation. This mitigation measure applies only to Build Alternatives C and F. For potential impacts to seasonal hunting at Fort Boggy State Park, prior to construction TCRR shall coordinate with TPWD staff that minimize or avoid, where practicable, disruption to planned and programmed seasonal hunting events in public access areas on Fort Boggy State Park lands west of IH-45. TCRR, in coordination with TPWD, shall make public notice of hunting restrictions and temporary closure of hunting locations.

3.17.7 Build Alternatives Comparison

Table 3.17-10 provides a summary of permanent impacts to recreational facilities as identified in **Section 3.17.5, Environmental Consequences,** by Build Alternative and Houston Terminal Station Option. Temporary construction impacts outlined in this section would be mitigated through mitigation measures highlighted in **Section 3.17.6, Avoidance, Minimization and Mitigation,** and are therefore not included in **Table 3.17-10**.

Table 3.17-10: Summary of Recreational Impacts by Build Alternative

Resource Area	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Houston Terminal Station Options		
							Northwest Mall	Industrial Site	Northwest Transit Center
Parks	0	0	1	1	1	2	0	0	0
Trails	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**1**	**1**	**1**	**2**	**0**	**0**	**0**

Source: AECOM, 2019

Build Alternatives D, E and F would impact recreational facilities at Lake Bardwell by intersecting USACE lands. Build Alternatives C and F would impact seasonal hunting facilities at Fort Boggy State Park.

3.18 Environmental Justice[1]

3.18.1 Introduction

Environmental Justice (EJ) refers to the fair treatment of people regardless of race, color, national origin or income level when implementing any federal action. Pursuant to federal policy, agencies are required to identify and address minority and low-income populations that are affected by disproportionately high and adverse impacts by a federal action and to provide opportunities for meaningful participation throughout project development. This section evaluates the potential of the Project to adversely impact minority and/or low-income populations within the Study Area, describes the evaluation methodology, identifies populations that would be adversely affected and provides mitigation, based on public participation input, to avoid and/or minimize impacts to these populations.

3.18.2 Regulatory Context

Federal

This analysis was conducted in accordance with FRA's *Procedures for Considering Environmental Impacts* in order to identify the potential disproportionately high and adverse impacts to minority and low-income populations and address EJ considerations as required by Executive Order 12898, ''Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,'' and USDOT Order 5610.2(a) on Environmental Justice.[2]

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations." Disproportionate effects occur when:

- The severity of adverse impacts is greater for minority and/or low-income areas than non-minority and/or low-income areas.
- More adverse impacts occur in minority and/or low-income areas than non- minority and/or low-income areas.
- Project benefits do not impact minority and/or low-income areas to the same degree as non-minority and/or low-income areas.
- Proposed mitigation would not reduce significant impacts or reduce the number of negative impacts.

The EO was issued in 1994 and specifically addresses the importance of evaluating EJ under NEPA and emphasizes diligent public participation and engagement of minority and low-income populations throughout the decision-making process.

[1]This section has been reorganized and expanded since the publication of the Draft EIS. Therefore, text changes since the Draft EIS are not shaded in grey in **Section 3.18, Environmental Justice**.

[2] FRA, "Procedures for Considering Environmental Impacts," 64 Federal Register 28545 (May 26, 1999).

USDOT Order 5610.2(a)

The 1997 USDOT Order to address EJ in minority populations and low-income populations, Order 5610.2(a), describes the process for incorporating EJ principles outlined in EO 12898 into all USDOT programs, policies and activities. In addition to complying with EO 12898 and USDOT Order 5610.2, the USDOT is committed to Title VI of the Civil Rights Act, which provides that "no person in the United States shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance."

Uniform Relocation Assistance and Real Property Acquisition Polices Act of 1970

The Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)[3] ensures that persons displaced as a result of a project that receives federal financial assistance are treated fairly, consistently and equitably. Fair, consistent and equitable treatment includes ensuring the displaced persons are able to acquire decent, safe and sanitary housing within their financial means. The Uniform Act requires that appraisals be completed for any potentially acquired properties prior to the acquisition process. Property owners must be given a written offer of just compensation that clearly outlines what is being acquired. Relocation expenses may be included in the compensation. Property owners must also be given 90 days written notice to vacate the property prior to possession.[4]

3.18.3 Methodology

The following subsections discuss the methodology for the assessment of impacts to minority and/or low-income populations.

3.18.3.1 Definitions

For the purposes of this assessment, FRA has developed definitions specific to the EJ assessment. The following paragraphs provide definitions for terms used throughout the document.

Minority: This term has been applied to the assessment of USCB ACS 5-Year 2017 demographic information and is defined as any non-white race or Hispanic ethnicity and includes individuals of more than one race.[5]

Low-Income: This term is applied to USCB block groups that meet criteria in the assessment having an average median income of a family of four that falls below the poverty threshold, $24,944.[6,7]

Block Groups: Block groups are a statistical division of census tracts, and generally defined to contain between 600 and 3,000 people, and are used to present data, and control block numbering.[8]

Communities: A community, as defined in **Section 3.14.3.3, Socioeconomic and Community Facilities**, **Neighborhood Cohesion and Community Facilities,** is a group of people that share access and linkages, community facilities and local businesses (grocery stores, churches, parks, etc.) in the surrounding area that provide opportunities for residents to gather and interact. In urban and suburban areas, these tend

[3] 42 U.S.C. Chapter 61.
[4] TCRR would be obligated to comply with the Uniform Act for property acquisition if it receives federal financial assistance for the Project.
[5] FHWA, *Guidance on Environmental Justice and NEPA*, FHWA Environmental Review Toolkit, December 2011, accessed December 2019, https://www.environment.fhwa.dot.gov/env_topics/ej/guidance_ejustice-nepa.aspx.
[6] USCB, "Poverty Thresholds by Size of Family and Number of Children 2017," accessed October 2019, https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.
[7] USCB, "American Fact Finder Glossary, 'Poverty,'" accessed October 2019, https://factfinder.census.gov/help/en/index.htm#glossary.htm.
[8] USCB, "Block Groups," accessed December 2019, https://factfinder.census.gov/help/en/index.htm#glossary.htm.

to be smaller, more densely populated areas, often defined by neighborhood boundaries. In rural areas, communities are not as easily demarcated due to larger tracts of private property ownership and lack of community facilities. This does not mean that they are less cohesive, just less defined as belonging to a specific community.

3.18.3.2 Study Area

The Study Area for the EJ analysis was set at one-half mile in each direction from the centerline of the Project. In suburban, exurban and rural settings along the Project, block groups extended outside of the one-half mile Study Area. In urban setting, such as near the terminal stations, block groups while generally smaller but still extended outside of the Study Area. In these locations, community boundaries generally also extended outside of the one-half mile Study Area.

As the EJ section draws upon data from a variety of other resource areas, the Study Area width was set to be consistent with (or exceed) other sections in the EIS. Block groups that are partially but not completely within one-half mile of the centerline of the Build Alternatives are also included in the Study Area. Throughout the EJ analysis, the same methodology was applied consistently to all block groups regardless of whether they were fully or partially encompassed by the Study Area.

3.18.3.3 Criteria for Identifying Minority and/or Low-Income Block Groups and Communities

FRA identified minority and low-income populations based on guidance provided by the Federal Council on Environmental Quality and the EPA Office of Environmental Justice. The guidance states that, "… a minority population may be present if the minority population percentage of the affected area is 'meaningfully greater' than the minority population percentage in the general population or other 'appropriate unit of geographic analysis'."[9] The analysis examined demographic characteristics by assessing minority, ethnicity (non-white race or Hispanic origins) and income USCB data within each county intersected by the Project. A threshold defining "meaningfully greater" minority and/or low-income populations within block groups in the Study Area[10] was set at 1.25 times the relevant county percentage for each demographic characteristic. Therefore, if a block group's minority (including ethnicity) and/or low-income populations equaled or exceeded 1.25 times the county's minority (including ethnicity) and/or low-income population, then the block group was identified as minority and/or low-income. This metric was developed based on guidance from existing TxDOT documentation and professional judgement that a 25 percent difference was deemed "meaningfully greater." Additionally, based on CEQ guidance, if the minority (including ethnicity) and/or low-income population within a block group was less than 1.25 times the relevant county percentage but the proportion of minority (including ethnicity) and/or low-income individuals living in that block group is 50 percent or greater, then FRA identified that block group as minority and/or low-income.[11]

A block group with populations meeting the identified criteria was designated as minority or low-income. A block group with populations satisfying criteria for both categories was designated both minority and low-income. This was done as a conservative approach to identifying potential impacts within minority and/or low-income block groups because the data utilized in this analysis do not provide

[9] CEQ, *Environmental Justice: Guidance Under the National Environmental Policy Act,* Washington, D.C., December 10, 1997.
[10] TxDOT, *Guidebook for Identifying, Measuring and Mitigating Environmental Justice Impacts of Toll Roads,* TxDOT Research and Technology Implementation Office, September 2006, accessed December 2019, http://ctr.utexas.edu/wp-content/uploads/pubs/0_5208_P2.pdf.
[11] CEQ, *Environmental Justice: Guidance Under the National Environmental Policy Act*, Washington, D.C., December 10, 1997.

for specific geographic location or demographics that allow for the identification of overlaps within minority and/or low-income populations.

In addition to identifying USCB block groups that may have minority and/or low-income populations, for the purpose of analysis in this EIS, FRA established a definition of communities to assess the variety of urban and rural dense and dispersed communities along the approximate 240-mile corridors of the Project. Impacts to communities have the potential to change the uses, aesthetic or visual nature of an existing community.

3.18.3.4 Minority and/or Low-Income Assessment Process

The EJ assessment focused on potential resource-specific impacts of the Project and those impacts' severity, disparity or benefits to minority and/or low-income populations at both a block group level and within their respective communities. GIS was utilized to geolocate potential impacts. For the potential impacts identified, FRA used tabular analysis to calculate a ratio of the number of potential impacts within minority and/or low-income block groups versus the total number of potential impacts throughout the Project (all block groups). If the ratio found that potential impacts were predominantly borne by or located within minority and/or low-income identified block groups, the resource area was deemed to present disproportionately high and adverse impact to minority and/or low-income block groups. Strategies to avoid, minimize or mitigate impacts that would otherwise be disproportionately high and adverse are included in **Section 3.18.6.1, Mitigation Measures.**

In addition to the tabular assessment, FRA identified potential impacts in locations throughout the Project where a community may be present. If a community was identified to be in a minority and/or low-income block group, additional outreach was conducted to further assess potential impacts, including local conditions and community concerns. Feedback gathered from this outreach was utilized to develop appropriate mitigation measures that would minimize adverse impacts.

Potential impacts identified within the EJ assessment include both temporary construction-related impacts and long-term, or permanent operational impacts within, or in proximity to, minority and low-income populations throughout the Study Area**.** Compliance and mitigation measures are outlined in each respective resource area and referenced where applicable in **Section 3.18.5, Environmental Consequences**.

3.18.3.5 Data Collection

Data utilized to identify minority and low-income populations in the Draft EIS were primarily collected from the USCB ACS 2014 5-Year Estimates. In preparation of the Final EIS, USCB data were updated to the ACS 2017 5-Year Estimates. Census data included race, minority and income at the block group level. FRA selected the datasets due to their completeness, consistency and relative accuracy for all Build Alternatives.

In addition, aerial photography interpretation was utilized as part of the desktop analysis to examine potential impacts that would occur as a result of the Project.

FRA conducted public outreach to various minority and/or low-income communities to obtain information regarding community composition, relationships, concerns and specific needs. A discussion of public outreach conducted for the assessment is detailed in **Section 3.18.3.6, Outreach**. Information gathered from minority and/or low-income communities assisted in the development of mitigation measures specific to the needs of potentially impacted communities.

3.18.3.6 Outreach

The purpose of outreach is to bring awareness of the Project to communities or individuals, gather additional feedback on the potential impacts of the Project and identify appropriate mitigation.

FRA developed an outreach plan to connect with potentially impacted minority and low-income communities in Dallas, Harris, and Waller Counties.[12] FRA scheduled and hosted listening sessions in coordination with pre-existing community meetings where possible in order to better engage individuals potentially impacted by the Project.

FRA held an initial round of listening sessions prior to the release of the Draft EIS, including:

- July 28, 2016, at St. Philip's School and Community Center in Dallas County. FRA attended the July session of a monthly meeting with parents and other community leaders. Approximately half of the attendees were familiar with the Project.
- August 3, 2016, at First Metropolitan Church in Harris County. This was a specially arranged meeting through a local pastor. The majority of the attendees were familiar with the Project.
- August 4, 2016, at the Ennis Housing Authority in Ellis County. This was a specially arranged meeting through the Housing Authority. The majority of the attendees were from outside of the community and were familiar with the Project.
- August 17, 2016, at the Northwest Houston Police Department Substation in Harris County. This was a recurring monthly meeting, hosted in Spanish, for community members. A very small portion of the attendees were familiar with the Project. Translation services were provided for this meeting.

The above listening sessions were held in the communities at familiar locations and at convenient times for local residents. FRA worked with local community leaders in Dallas, Ellis and Harris Counties to identify appropriate venues and then subsequently invite the minority and/or low-income populations served by and/or living near those venues. Meeting displays featured a timeline, a list of the subjects covered in the EIS, maps and other boards to describe the Project and Build Alternatives. Information materials were available in Spanish and English, the identified languages of the minority and/or low-income populations. FRA made translation services available upon request or if needed, as determined by the meeting attendees. At each listening session, a short presentation was given and participants were invited to ask questions.

FRA did not host listening sessions in Freestone, Leon or Grimes Counties due to the rural nature of these counties, which includes large minority and/or low-income block groups, but less defined communities. In lieu of listening sessions, FRA developed a fact sheet, found in **Appendix C, Public and Agency Involvement Correspondence**, with frequently asked questions about the Project. **Table 9-7** in **Chapter 9.0, Public and Agency Involvement Correspondence,** lists the service agencies, including food banks, in Freestone and Leon Counties, FRA sent the fact sheet to, with a request to make it available to the populations they serve. FRA did not identify any service agencies in Grimes County, and therefore, mailed the fact sheet to property owners within minority and/or low-income block groups.

FRA did not host listening sessions or conduct specific outreach in Navarro, Limestone or Madison Counties during development of the Draft EIS because at this stage of the Project FRA did not identify minority and/or low-income block groups or communities that were intersected by the Study Area in

[12] No minority and/or low-income communities were identified within the Study Area of other counties.

those counties. Therefore, in lieu of hosting listening sessions FRA posted the meeting materials from the first round of listening session to the Project website.[13]

Following the release of the Draft EIS, FRA conducted a second round of listening sessions for minority and/or low-income communities identified in the Study Area. The primary purpose of the second round of listening sessions was to inform and discuss direct impacts to specific communities and explore potential mitigation measures. FRA sent mailers and surveys, printed in English, to the Hash Road and Nail Drive community in southern Dallas County and to a group of homes near Joseph and Hegar Roads in Waller County where residential homes would be impacted. FRA also conducted additional outreach at the following locations. A brief description of the additional meetings is provided.

- October 23, 2018, at St. Philip's Center in Dallas County for 'National Night Out.' AECOM as representatives of FRA had a table featuring information and providing surveys on the Project and EIS process. Attendees ranged from residents who lived in nearby neighborhoods to residents that lived 5 to 10 miles away.
- November 8, 2018, at Cummings Recreation Center for the Le May and Le Forge Neighborhood in Dallas County. Residents and property owners in the Le May and Le Forge neighborhood were notified of a listening session for their neighborhood via letter through direct mail from FRA. This was a standalone event for affected residents (including renters) and owners. AECOM, as representatives of FRA, gave an approximately 15-minute presentation describing the Project, and responded to and asked questions of the attendees. Spanish translation assistance was provided.
- November 29, 2018, at Trini Mendenhall Community Center during the scheduled Spring Branch East Neighborhood Meeting in Harris County Most attendees lived or worked in nearby neighborhoods and a couple owned businesses in the area.
- November 21, 2019, listening session at Ferris ISD Administration's Training Center for residents of the Hash Road and Nail Drive community. Property owners were notified of the listening session via direct mail. Approximately 14 people registered their attendance.
- November 19, 2019, at the Field Store Community Center in Waller County for residents of the Plantation Forest community. Property owners were notified of the listening session via direct mail. Approximately 11 people registered their attendance.

Additional information for listening sessions can be found in **Appendix C, Public and Agency Involvement Correspondence**.

3.18.4 Affected Environment

This section describes minority and/or low-income and non- minority and/or low-income block groups intersected by the Study Area of the Project. Block groups identified as minority and/or low-income have been identified to meet thresholds outlined in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**.

Tables within this section summarize each county's total population and the percentage of the population that is minority and/or low-income. Minority populations are further distinguished between minority (all races other than white) and those of Hispanic origin, therefore. Initially introduced in **Section 3.14, Socioeconomics and Community Facilities**, **Table 3.18-1** shows demographic characteristics by county.

[13] Originally posted to the Project website: http://www.fra.dot.gov/Page/P0700, which has since been redirected to https://railroads.fra.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/documents-maps-images.

Table 3.18-1: Demographic Characteristics of Population by County							
County	**2017 Population**	**Children under 18 years old (%)**	**Minority Population (%)**	**Hispanic Origin (%)**	**Low-Income (%)**	**Median Household Income**	**Limited English Proficiency Population (%)**
Dallas	2,618,148	26.4	33.1	40.2	14.8	$53,626	12
Ellis	173,620	26.9	14.5	26.3	8.5	$67,371	4
Navarro	48,701	26.2	18.6	27.3	16.9	$45,103	6
Freestone	19,625	23	20.1	15.4	16.1	$45,890	2
Limestone	23,527	22.8	21.4	22.4	19.1	$40,356	6
Leon	17,243	22.7	10.5	14.6	16.1	$44,875	4
Madison	14,222	21.1	24.4	23	18.3	$44,004	2
Grimes	28,082	22.6	19.1	24.4	18	$49,745	4
Waller	51,307	24.3	29.5	30.1	15.5	$53,506	6
Harris	4,652,980	26.9	30.2	43	15.9	$57,791	12

Source: USCB ACS 2017 5-year estimate; USCB Quick Facts, Accessed January 2019

The percentage of minority and Hispanic origin populations is comparatively higher in Dallas, Waller and Harris Counties than the other counties within the Study Area. Ellis County has the lowest percentage of low-income populations, the highest median household income and lowest percentage of minority populations in the Study Area. In most of the counties, low-income populations make up over 15 percent of the county populations. The average median household income for the Study Area counties is $50,227; there are six counties (Navarro, Freestone, Limestone, Leon, Madison and Grimes) with median household incomes below the average. Dallas and Harris Counties have the highest percentage of LEP residents.

There are 135 total block groups that intersect the Study Area. Of these block groups, 87 have been identified as minority and/or low-income block groups, representing approximately 65 percent of the total block groups. Sixty-three, or 72 percent, of the minority and/or low-income block groups are located in Dallas and Harris Counties. Maps of the minority and/or low-income block groups are provided in **Appendix D, Environmental Justice Mapbook**. Many of the block groups crossed by the Project, especially in rural areas where the population is sparse, extend beyond the Study Area. As a result, although the block group is identified as minority and/or low-income, there may not be minority and/or low-income populations within the Study Area.

3.18.4.1 Dallas County

As shown in **Table 3.18-2**, 27 of the 30 block groups within the Dallas County portion of the Study Area have minority and/or low-income populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. There are 6 block groups with minority populations, 1 block group with low-income populations and 20 block groups with both.[14] Additionally, three potentially impacted communities were identified within two minority and/or low-income block groups and one within a low-income block group, as shown in **Table 3.18-3**.

[14] Block groups satisfying both minority and/or low-income criteria for populations are designated as both minority and low-income, as described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**.

Table 3.18-2: Dallas County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/Low-income (%)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 2, Census Tract 31.01	N/A	207 (M) 148 (LI)	15 (M) 11 (LI)	A, B, C, D, E, F	3/1
Block Group 3, Census Tract 204	N/A	1,192 (M)	39 (M)	A, B, C, D, E, F	5/1
Block Group 1, Census Tract 100	Minority	4,066 (M)	50 (M)	A, B, C, D, E, F	1/1
Block Group 2, Census Tract 20	Minority Low-Income	505 (M) 420 (LI)	58 (M) 48 (LI)	A, B, C, D, E, F	2/1
Block Group 1, Census Tract 204	Minority Low-income	989 (H) 599 (LI)	50 (H) 31 (LI)	A, B, C, D, E, F	6/1
Block Group 2, Census Tract 34	Minority Low-income	431 (M) 276 (LI)	57 (M) 37 (LI)	A, B, C, D, E, F	10/1
Block Group 1, Census Tract 34	Minority	562 (M)	98 (M)	A, B, C, D, E, F	9/1
Block Group 2, Census Tract 41	Minority Low-income	347 (H) 194 (LI)	72 (H) 40 (LI)	A, B, C, D, E, F	4/1
Block Group 1, Census Tract 40	Minority Low-income	527 (M) 169 (LI)	92 (M) 29 (LI)	A, B, C, D, E, F	12/1-2
Block Group 1, Census Tract 89	Minority Low-income	414 (H) 338 (LI)	55 (H) 45 (LI)	A, B, C, D, E, F	8/1-2
Block Group 2, Census Tract 40	Minority Low-income	482 (M) 267 (LI)	85 (M) 47 (LI)	A, B, C, D, E, F	20/1-2
Block Group 3, Census Tract 115	Minority Low-Income	374 (M) 130 (LI)	82 (M) 28 (LI)	A, B, C, D, E, F	24/1-2
Block Group 1, Census Tract 86.03	Minority Low-income	552 (M) 296 (LI)	86 (M) 46 (LI)	A, B, C, D, E, F	16/1-2
Block Group 4, Census Tract 115	Minority	624 (M)	56 (M)	A, B, C, D, E, F	29/1-2
Block Group 2, Census Tract 86.04	Minority Low-income	1,047 (M) 873 (LI)	78 (M) 65 (LI)	A, B, C, D, E, F	17/2
Block Group 1, Census Tract 86.04	Minority Low-income	918 (M) 761 (LI)	58 (M) 48 (LI)	A, B, C, D, E, F	13/2
Block Group 1, Census Tract 87.01	Minority Low-income	1,456 (M) 908 (LI)	98 (M) 61 (LI)	A, B, C, D, E, F	15/2
Block Group 2, Census Tract 87.01	Minority Low-income	743 (M) 217 (LI)	99 (M) 30 (LI)	A, B, C, D, E, F	21/2-3
Block Group 1, Census Tract 202	Minority Low-income	574 (M) 173 (LI)	82 (M) 25 (LI)	A, B, C, D, E, F	27/2-3
Block Group 4, Census Tract 87.01	Minority	576 (M)	85 (M)	A, B, C, D, E, F	18/2-3
Block Group 5, Census Tract 87.01	Minority Low-income	1,225 (M) 636 (LI)	92 (M) 48 (LI)	A, B, C, D, E, F	19/2-3
Block Group 3, Census Tract 202	Minority Low-income	960 (M) 462 (LI)	72 (M) 37 (LI)	A, B, C, D, E, F	34/3-4
Block Group 1, Census Tract 169.02	N/A	1,516 (M) 279 (LI)	42 (M) 20 (LI)	A, B, C, D, E, F	37/3-4
Block Group 1, Census Tract 114.01	Minority Low-income	1,547 (M) 560 (LI)	97 (M) 39 (LI)	A, B, C, D, E, F	22/3
Block Group 2, Census Tract 202	Minority Low-Income	1,527 (M) 651 (LI)	84 (M) 36 (LI)	A, B, C, D, E, F	25/3

Table 3.18-2: Dallas County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/Low-income (%)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 2, Census Tract 169.02	Minority Low-Income	1,023 (H) 543 (LI)	64 (H) 36 (LI)	A, B, C, D, E, F	33/4
Block Group 3, Census Tract 169.03	Minority Low-Income	832 (H) 420 (LI)	46 (H) 26 (LI)	A, B, C, D, E, F	30/4-5
Block Group 1, Census Tract 167.03	Minority	782 (H)	78 (H)	A, B, C, D, E, F	26/4-5
Block Group 2, Census Tract 168.02	Minority	1,081 (M)	61 (M)	A, B, C, D, E, F	14/5-6
Block Group 5, Census Tract 169.03	Low-Income	177 (LI)	27 (LI)	A, B, C, D, E, F	41/5-6

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

Table 3.18-3: Dallas County Study Area Minority and/or Low-Income Communities			
Community Name	**EJ Block Group Type**	**Build Alternatives Affected**	**Mapbook Page**
Downtown Dallas	Minority/Low-Income	A, B, C, D, E, F	1
Le May and Le Forge	Minority/Low-Income	A, B, C, D, E, F	2
Hash Road and Nail Drive	Low-Income	A, B, C, D, E, F	6

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.2 Ellis County

As shown in **Table 3.18-4**, 9 out of 10 block groups, intersected by the Study Area, on Segments 2A and 2B have minority and/or low-income populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. There are eight block groups with minority populations and one block group with both minority and low-income populations. No potentially impacted communities were identified in minority and/or low-income block groups within Ellis County.

Table 3.18-4: Ellis County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/Low-income %)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 2, Census Tract 601.01	Minority	770 (H)	49 (H)	A, B, C, D, E, F	35/6-7,14-15
Block Group 1, Census Tract 601.01	Minority	985 (H)	35 (H)	A, B, C, D, E, F	28/6-7,15-16
Block Group 1, Census Tract 601.02	Minority	1,148 (H)	52 (H)	A, B, C, D, E, F	36/7-8,15-16
Block Group 3, Census Tract 601.02	Minority	1,056 (H)	35 (H)	A, B, C, D, E, F	38/8-9,16-17
Block Group 1, Census Tract 602.10	Minority	340 (M)	31 (M	A, B, C, D, E, F	23/9-10,17-18

Table 3.18-4: Ellis County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/Low-income %)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 2, Census Tract 613	Minority Low-income	736(H) 392 (LI)	39 (H) 21 (LI)	A, B, C, D, E, F	27/9-11,17-19
Block Group 1, Census Tract 611	N/A	142 (H) 98 (LI)	11 (H) 8 (LI)	A, B, C, D, E, F	7/12-13,20-21
Block Group 1, Census Tract 613	Minority	231 (H)	28 (H)	A, B, C, D, E, F	40/12,20
Block Group 1, Census Tract 612	Minority	248 (H)	35 (H)	A, B, C, D, E, F	11/13-14,21-22
Block Group 2, Census Tract 612	Minority	454 (H)	37 (H)	A, B, C, D, E, F	39/13-14,210-22

Source: USCB ACS 2017 5-year Estimates, AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.3 Navarro County

As shown in **Table 3.18-5**, four out of the five intersected block groups in Navarro County meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities,** to be identified as minority and/or low-income. Two block groups have minority populations and two have low-income populations. No potentially impacted communities were identified in minority and/or low-income block groups within Navarro County.

Table 3.18-5: Navarro County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/Low-income (%)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 1, Census Tract 9703	Minority	621 (H)	40 (H)	A, B, C, D, E, F	42/23-27,33-37,43-47
Block Group 3, Census Tract 9704	Low-income	238 (LI)	24 (LI)	A, B, C, D, E, F	34/23-24,33,43-44
Block Group 4, Census Tract 9709	Minority	992 (M)	40 (M)	A, B, C, D, E, F	44/26-27,36-37,46—47
Block Group 5, Census Tract 9709	N/A	438 (H) 116 (LI)	22 (H) 6 (LI)	A, B, C, D, E, F	45/27-28,37-38,47-48
Block Group 1, Census Tract 9710	Low-income	473 (LI)	25 (LI)	A, B, C, D, E, F	43/27-31,38-41,47-51

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.4 Freestone County

As shown in **Table 3.18-6**, two of the seven block groups within the Freestone County portion of the Study Area have minority and/or low-income populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. There is one block group with minority populations, and one block group with both minority and low-income populations. Both minority and/or low-income block groups are within Segment 3C. There are no identified minority and/or low-income block groups located within Segment 4 in Freestone County. No

potentially impacted communities were identified in minority and/or low-income block groups within Freestone County.

Table 3.18-6: Freestone County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 2, Census Tract 4	N/A	354 (M) 204 (LI)	17 (M) 10 (LI)	A, B, C, D, E, F	47/31,51
Block Group 2, Census Tract 1	N/A	672 (M) 521 (LI)	23 (M) 19 (LI)	C, F	52/52-53
Block Group 1, Census Tract 3	Minority Low-income	582 (M) 298 (LI)	45 (M) 24 (LI)	C, F	53/52-53
Block Group 1, Census Tract 1	N/A	354 (M) 204 (LI)	24 (M) 10 (LI)	C, F	59/53-54
Block Group 3, Census Tract 6	Minority	651 (M)	20 (M)	C, F	54/54-58
Block Group 2, Census Tract 6	N/A	40 (H) 46 (LI)	4 (H) 4 (LI)	A, B, D, E	--[a]
Block Group 1, Census Tract 6	N/A	36 (H) 62 (LI)	5 (H) 9 (LI)	A, B, D, E	49/67-68

[a] Some block groups that were not identified to be EJ per the analysis are not depicted in the Environmental Justice Mapbook.

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.5 Limestone County

As shown in **Table 3.18-7**, one of the two block groups within the Limestone County portion of the Study Area has a low-income population that meets criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. There is one block group with low-income populations. No potentially impacted communities were identified in minority and/or low-income block groups within Limestone County.

Table 3.18-7: Limestone County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 1, Census Tract 9707	Low-income	275 (LI)	28 (LI)	A, B, D, E	46/67-68
Block Group 2, Census Tract 9707	N/A	27 (H) 39 (LI)	3 (H) 5 (LI)	A, B, D, E	48/68-69

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.6 Leon County

As shown in **Table 3.18-8**, four of the eight block groups within the Leon County portion of the Study Area have minority and/or low-income populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. There is one block group with minority and low-income populations and one block group with minority populations

located within Segment 3C. Along Segment 4 there is one block group with low-income populations and one with minority populations. No potentially impacted communities were identified in minority and/or low-income block groups within Leon County.

Table 3.18-8: Leon County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 3, Census Tract 9501	Minority Low-income	515 (H) 534 (LI)	22 (H) 24 (LI)	C, F	57/58-60
Block Group 2, Census Tract 9503	N/A	63 (H) 219 (LI)	5 (H) 19 (LI)	C, F	61/59-61
Block Group 4, Census Tract 9503	N/A	191 (M) 261 (LI)	5 (M) 17 (LI)	C, F	75/61
Block Group 3, Census Tract 9503	Minority	367 (M)	26 (M)	C, F	65/61-64
Block Group 1, Census Tract 9502	Low-income	224 (LI)	35 (LI)	A, B, D, E	50/69-71
Block Group 2, Census Tract 9502	N/A	142 (H) 78 (LI)	11 (H) 6 (LI)	A, B, D, E	51/71
Block Group 3, Census Tract 9502	N/A	17 (M) 33 (LI)	2 (M) 4 (LI)	A, B, C, D, E, F	55/63,72
Block Group 5, Census Tract 9502	Minority	164 (M)	20 (M)	A, B, D, E	56/64,72-73

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.7 Madison County

There are no identified minority and/or low-income block groups located within the Study Area that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities,** in Madison County, as shown in **Table 3.18-9**. No potentially impacted communities were identified in minority and/or low-income block groups within Madison County.

Table 3.18-9: Madison County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 1, Census Tract 2	N/A	42 (H) 205 (LI)	4 (H) 17 (LI)	A, B, C, D, E, F	63/64-65,74
Block Group 1, Census Tract 3	N/A	201 (H) 111 (LI)	16 (H) 9 (LI)	A, B, C, D, E, F	60/65,73-74

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.8 Grimes County

As shown in **Table 3.18-10**, three of the seven block groups within the Grimes County portion of the Study Area have minority and/or low-income population that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. No

potentially impacted communities were identified in minority and/or low-income block groups within Grimes County.

Table 3.18-10: Grimes County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 1, Census Tract 1803.02	Low-income	511 (LI)	30 (LI)	A, B, C, D, E, F	64/65-66,74-75
Block Group 2, Census Tract 1803.01	N/A	73 (H) 101 (LI)	7 (H) 10 (LI)	A, B, C, D, E, F	58/65-66,74-75
Block Group 2, Census Tract 1803.02	N/A	266 (M) 241 (LI)	16 (M) 15 (LI)	A, B, C, D, E, F	70/66,75-80
Block Group 1, Census Tract 1803.01	Minority	408 (M)	29 (M)	A, B, C, D, E, F	62/76-81
Block Group 5, Census Tract 1802	Minority Low-income	626 (M) 585 (LI)	42 (M) 39 (LI)	A, B, C, D, E, F	69/80-83
Block Group 2, Census Tract 1801.02	N/A	275 (H) 321 (LI)	13 (H) 16 (LI)	A, B, C, D, E, F	66/83
Block Group 1, Census Tract 1801.02	N/A	156 (H) 195 (LI)	12 (H) 14 (LI)	A, B, C, D, E, F	68/84

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

3.18.4.9 Waller County

As shown in **Table 3.18-11**, one of two block groups within the Waller County portion of the Study Area have minority populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. Within the identified minority block group, one potentially impacted community was identified in Waller County, as shown in **Table 3.18-12**.

Table 3.18-11: Waller County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 1, Census Tract 6806	Minority	823 (H)	30 (H)	A, B, C, D, E, F	71/84-85
Block Group 2, Census Tract 6806	N/A	504 (H) 123 (LI)	20 (H) 5 (LI)	A, B, C, D, E, F	72/85-86

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

Table 3.18-12: Waller County Study Area Minority and/or Low-Income Communities

Community Name	EJ Block Group Type	Build Alternatives Affected	Mapbook ID/Page
Plantation Forest	Minority	A, B, C, D, E, F	84

3.18.4.10 Harris County

As shown in **Table 3.18-13**, 36 of the 62 block groups within the Harris County portion of the Study Area have minority and/or low-income populations that meet criteria described in **Section 3.18.3.3, Criteria for Identifying Minority and/or Low-Income Block Groups and Communities**. One potentially impacted community was identified within a minority and/or low-income block group in Harris County, as shown in **Table 3.18-14**.

3.18.5 Environmental Consequences

3.18.5.1 No Build Alternative

Under the No Build Alternative, the Build Alternatives would not be constructed; therefore, disproportionately high and adverse impacts to minority and low-income populations would not occur; however, these communities would not have access to an alternative mode of transportation from Dallas to Houston. Additionally, these communities would not benefit from short-term or long-term employment opportunities associated with the construction or operation of the Build Alternatives.

Other planned projects, such as the IH-35 East roadway improvement project in Dallas County, Waxahachie Line rail project in Dallas and Ellis Counties and Integrated Pipeline Project in Navarro and Ellis Counties would occur under the No Build Alternative. These projects could impact minority and/or low-income communities because of property acquisitions and displacements of residential and business populations, as well as stresses on locally provided utility services, such as the roadway network, water and electrical utilities.

The impacts of these projects are discussed further in **Table 4-9** in **Chapter 4.0, Indirect Effects and Cumulative Impacts**.

3.18.5.2 Build Alternatives

This section describes the impacts to minority and low-income populations during construction and operation activities and identifies any disproportionately high and adverse impacts.

3.18.5.3 Construction and Operational Impacts

This section does not attempt to reevaluate all impacts presented elsewhere in this EIS, but instead focuses on those impacts that could be determined to be predominantly borne by minority or low-income populations, adverse and/or beneficial based on their location, type or severity. The following discussions assess each applicable resource area in terms of the proportion of impacts across the Project and the potential for adverse impacts to minority and/or low-income communities.

3.18.5.3.1 Location of Construction Activities

Construction for the Project would occur throughout the entirety of the Study Area, affecting all populations and communities. Throughout the Study Area, temporary construction zones would be needed to provide storage and laydown space. These zones vary in size and are confined within the boundaries of the LOD. Additional information regarding the contents, characteristics and operations of the temporary construction zones can be found in **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**.

Table 3.18-13: Harris County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/ Low-income (%)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 1, Census Tract 5560	N/A	327 (M) 154 (LI)	34 (M) 16 (LI)	A, B, C, D, E, F	67/86-88
Block Group 2, Census Tract 5560	Minority	1,098 (H)	41 (H)	A, B, C, D, E, F	74/86-89
Block Group 1, Census Tract 5431	Minority	1,490 (H)	43 (H)	A, B, C, D, E, F	73/87-89
Block Group 1, Census Tract 5430.01	N/A	3,361 (M) 142 (LI)	34 (M) 1 (LI)	A, B, C, D, E, F	76/89
Block Group 1, Census Tract 5544.03	N/A	3,257 (M) 486 (LI)	28 (M) 24 (LI)	A, B, C, D, E, F	--[a]
Block Group 2, Census Tract 5544.02	N/A	2,017 (M) 432 (LI)	27 (M) 17 (LI)	A, B, C, D, E, F	--[a]
Block Group 2, Census Tract 5557.01	N/A	878 (H) 211 (LI)	17 (H) 4 (LI)	A, B, C, D, E, F	96/91
Block Group 2, Census Tract 5430.02	N/A	1,338 (M) 401 (LI)	36 (M) 11 (LI)	A, B, C, D, E, F	78/90
Block Group 1, Census Tract 5430.02	N/A	4524 (M) 287 (LI)	33 (M) 2 (LI)	A, B, C, D, E, F	77/90
Block Group 2, Census Tract 5544.01	N/A	1864 (H) 259 (LI)	17 (H) 2 (LI)	A, B, C, D, E, F	80/90
Block Group 2, Census Tract 5522	N/A	868 (H) 400 (LI)	36 (H) 17 (LI)	A, B, C, D, E, F	83/90-91
Block Group 2, Census Tract 5410.02	Minority	758 (M)	47 (M)	A, B, C, D, E, F	82/90
Block Group 1, Census Tract 5410.03	Minority	2,918 (M)	51 (M)	A, B, C, D, E, F	79/90
Block Group 1, Census Tract 5410.02	N/A	3279 (M) 437 (LI)	43 (M) 6 (LI)	A, B, C, D, E, F	81/90
Block Group 3, Census Tract 5522	N/A	1,229 (M) 356 (LI)	41 (M) 12 (LI)	A, B, C, D, E, F	84/90-91
Block Group 1, Census Tract 5521.03	N/A	1,110 (M) 13 (LI)	46 (M) 1 (LI)	A, B, C, D, E, F	87/90
Block Group 1, Census Tract 5410.01	N/A	4,027 (M) 850 (LI)	45 (M) 10 (LI)	A, B, C, D, E, F	85/90-91
Block Group 1, Census Tract 5521.01	N/A	1,709 (M) 282 (LI)	41 (M) 7 (LI)	A, B, C, D, E, F	88/90-91
Block Group 2, Census Tract 5409.02	Minority	1,110 (M)	46 (M)	A, B, C, D, E, F	86/91
Block Group 1, Census Tract 5520.02	N/A	574 (M) 65 (LI)	38 (M) 4 (LI)	A, B, C, D, E, F	89/91
Block Group 2, Census Tract 5408	Minority	1,381 (M)	51 (M)	A, B, C, D, E, F	90/91-92
Block Group 3, Census Tract 5520.01	Minority	1,194 (H)	41 (H)	A, B, C, D, E, F	91/91
Block Group 3, Census Tract 5519	Minority	1,318 (M)	60 (M)	A, B, C, D, E, F	94/91
Block Group 2, Census Tract 5519	N/A	1,190 (M) 489 (LI)	43 (M) 18 (LI)	A, B, C, D, E, F	95/91

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

[a] Some block groups that were not identified to be low-income and/or minority per the analysis are not depicted in **Appendix D, Environmental Justice Mapbook**.

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

Table 3.18-13: Harris County Study Area Block Groups

Census Geography	EJ Block Group Type	Minority and/Low-income Population	Minority/ Low-income (%)	Build Alternatives Affected	Mapbook ID/Page
Block Group 1, Census Tract 5519	Low-income	330 (M) 228 (LI)	37 (M) 26 (LI)	A, B, C, D, E, F	93/91
Block Group 6, Census Tract 5517.01	N/A	787 (M) 132 (LI)	33 (M) 6 (LI)	A, B, C, D, E, F	96/91
Block Group 1, Census Tract 5518	N/A	302 (H) 33 (LI)	13 (H) 1 (LI)	A, B, C, D, E, F	97/91-92
Block Group 3, Census Tract 5518	N/A	239 (H) 63 (LI)	26 (H) 7 (LI)	A, B, C, D, E, F	99/92
Block Group 1, Census Tract 5401	N/A	3,123 (M) 428 (LI)	41 (M) 6 (LI)	A, B, C, D, E, F	92/92
Block Group 1, Census Tract 5218	Minority	1,762 (M)	65 (M)	A, B, C, D, E, F	100/92-93
Block Group 3, Census Tract 5401	Minority	1,091 (H)	77 (H)	A, B, C, D, E, F	98/92
Block Group 1, Census Tract 5342.03	Minority	1,414 (H)	64 (M)	A, B, C, D, E, F	102/92
Block Group 4, Census Tract 5217	Minority Low-income	762 (M) 375 (LI)	58 (M) 29 (LI)	A, B, C, D, E, F	103/92-93
Block Group 2, Census Tract 5216	Minority Low-income	789 (M) 271 (LI)	72 (H) 25 (LI)	A, B, C, D, E, F	101/93
Block Group 1, Census Tract 5216	Minority	1,943 (H)	78 (H)	A, B, C, D, E, F	104/93
Block Group 2, Census Tract 5217	Minority Low-income	1,307 (M) 1,700 (H) 1,083 (LI)	55 (M) 72 (H) 46 (LI)	A, B, C, D, E, F	105/93
Block Group 3, Census Tract 5217	Minority Low-Income	1,220 (H) 751 (LI)	63 (H) 39 (LI)	A, B, C, D, E, F	107/93
Block Group 1, Census Tract 5217	Minority Low-Income	735 (H) 330 (LI)	60 (H) 27 (LI)	A, B, C, D, E, F	110/93
Block Group 3, Census Tract 5205	Minority	1,208 (H)	86 (H)	A, B, C, D, E, F	113/93-94
Block Group 1, Census Tract 5214	Minority	1,134 (H)	98 (H)	A, B, C, D, E, F	108/93
Block Group 2, Census Tract 5205	Minority Low-Income	3,714 (H) 1,218 (LI)	87 (H) 29 (LI)	A, B, C, D, E, F	117/93-94
Block Group 4, Census Tract 5215	Minority	1,296 (H)	56 (H)	A, B, C, D, E, F	106/93
Block Group 4, Census Tract 5214	Minority Low-income	1,298 (M) 1,605 (H) 846 (LI)	79 (M) 98 (H) 52 (LI)	A, B, C, D, E, F	109/93
Block Group 2, Census Tract 5214	Minority Low-income	1,523 (M) 2,731 (H) 1,294 (LI)	56 (M) 100 (H) 49 (LI)	A, B, C, D, E, F	112/93-94
Block Group 3, Census Tract 5214	Minority	1,409 (H)	84 (H)	A, B, C, D, E, F	111/93-94
Block Group 1, Census Tract 5206.01	Minority Low-income	1,909 (H) 1,220 (LI)	75 (H) 48 (LI)	A, B, C, D, E, F	114/94-95

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

[a] Some block groups that were not identified to be low-income and/or minority per the analysis are not depicted in **Appendix D, Environmental Justice Mapbook**.

Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

Table 3.18-13: Harris County Study Area Block Groups					
Census Geography	**EJ Block Group Type**	**Minority and/Low-income Population**	**Minority/ Low-income (%)**	**Build Alternatives Affected**	**Mapbook ID/Page**
Block Group 4, Census Tract 5205	Minority Low-Income	900 (M) 1,057 (H) 635 (LI)	49 (M) 57 (H) 34 (LI)	A, B, C, D, E, F	115/93-95
Block Group 1, Census Tract 5205	Minority Low-Income	1,094 (M) 1,777 (H) 640 (LI)	55 (M) 88 (H) 32 (LI)	A, B, C, D, E, F	121/93-95
Block Group 1, Census Tract 5204	Minority Low-income	770 (M) 1,027 (H) 535 (LI)	58 (M) 77 (H) 40 (LI)	A, B, C, D, E, F	118/93-96
Block Group 1, Census Tract 5206.02	Minority Low-income	951 (M) 980 (H) 324 (LI)	94 (M) 96 (H) 32 (LI)	A, B, C, D, E, F	116/94-96
Block Group 2, Census Tract 5204	Minority	1,055 (M) 1,338 (H)	54 (M) 69 (H)	A, B, C, D, E, F	119/93-96
Block Group 1, Census Tract 5301	Minority	880 (M) 1,161 (H)	66 (M) 86 (H)	A, B, C, D, E, F	123/94-96
Block Group 3, Census Tract 5301	Minority Low-Income	8118 (M) 919 (H) 267 (LI)	73 (M) 82 (H) 24 (LI)	A, B, C, D, E, F	127/94-96
Block Group 1, Census Tract 5203	Minority Low-income	1,695 (H) 538 (LI)	67 (H) 21 (LI)	A, B, C, D, E, F	120/94-96
Block Group 1, Census Tract 5201	Minority	914 (H)	43 (H)	Industrial Site and Northwest Transit Center Terminal Station Options	125/94-96
Block Group 5, Census Tract 4301	Low-income	269 (LI)	26 (LI)	Northwest Transit Center Terminal Station Option	124/96
Block Group 2, Census Tract 4301	N/A	191 (M) 0 (LI)	9 (M) 0 (LI)	Northwest Transit Center Terminal Station Option	122/96
Block Group 1, Census Tract 4301	N/A	169 (H) 122 (LI)	17 (H) 12 (LI)	Northwest Transit Center Terminal Station Option	126/96
Block Group 4, Census Tract 5108	N/A	253 (M) 0 (LI)	33 (M) 0 (LI)	Northwest Transit Center Terminal Station Option	129/96
Block Group 2, Census Tract 5109	N/A	1,012 (M) 76 (LI)	29 (M) 2 (LI)	All Houston Terminal Station Options	131/96
Block Group 2, Census Tract 5110.01	N/A	357 (H) 34 (LI)	26 (H) 2 (LI)	All Houston Terminal Station Options	128/94-96
Block Group 1, Census Tract 5110.01	N/A	382 (H) 65 (LI)	23 (H) 4 (LI)	Northwest Mall and Northwest Transit Center Terminal Station Options	130/94-96

Source: USCB ACS 2017 5-year Estimates; AECOM 2019

[a] Some block groups that were not identified to be low-income and/or minority per the analysis are not depicted in **Appendix D, Environmental Justice Mapbook**.
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

Table 3.18-14: Harris County Study Area Minority and/or Low-Income Communities			
Community Name	**EJ Block Group Type**	**Build Alternatives Affected**	**Mapbook ID/Page**
Houston Terminal Station Option Area *(Including Spring Branch Super Neighborhood)*	Minority Low-Income	A, B, C, D, E, F	94-96

Of all the Build Alternatives, Build Alternative A would require approximately 1,975 acres of temporary construction zone; approximately 835 (42 percent) of those acres would be in minority and/or low-income identified block groups. Build Alternative A would have the lowest percentage of temporary construction site acreage within minority and/or low-income block groups. Build Alternative F would have the most acreage of temporary construction sites within minority and/or low-income block groups (1,141 acres in minority and/or low-income block groups to 2,001 acres total, approximately 63 percent). Additional acreage for all Build Alternatives and Houston Terminal Station Options can be found in the **Appendix E, Environmental Justice Technical Memorandum, Table 13 Temporary Construction Sites and MOW by Build Alternative**. Overall, as the majority of temporary construction zones acreage would not be located in minority and/or low-income block groups, no disproportionately high and adverse impact to minority and low-income block groups would be anticipated.

Temporary construction zones would occur at station areas near identified minority and/or low-income communities in downtown Dallas and Houston Terminal Station Options. Communities within a quarter-mile of the station options in Dallas and Houston are generally more urban as further described in **Section 3.10.5.2.1, Aesthetics and Scenic Resources, Construction Impacts,** and **Section 3.14.5.2.2, Socioeconomics and Community Facilities, Impacts to Community Character and Cohesion**. Additionally, construction related congestion would be mitigated through **TR-MM#1: Traffic Control Plan** and **TR-MM#2: Intersection Improvements**. No other identified minority and/or low-income communities would be near temporary construction zones. With mitigation measures, no disproportionately high and adverse impacts would occur to identified minority and/or low-income communities.

3.18.5.3.2 Air Quality

Disproportionately high and adverse air quality impacts to minority and/or low-income communities along the alignment would primarily be caused by construction-related activities. Emissions during construction would be primarily caused by on- and off-road materials hauling, construction equipment generating NO_x, VOC and SO_2 and GHG emissions. As stated in **Section 3.2.5.2.3, Air Quality, Freight Rail Material Hauling Emissions**, there would be an increase in NO_x and VOC emissions during the construction period in the DFW and HGB nonattainment areas and an increase of SO_2 emissions in the Freestone County NAA as a result of the Project. Maximum annual direct (construction-related) NO_x, VOC and SO_2 emissions within the DFW and HGB ozone nonattainment areas and the FRE SO_2 nonattainment area during the 5-year construction period would be less than the respective GC *de minimis* threshold level. As minority and/or low-income communities in downtown Dallas and the Houston Terminal Station Options are within DFW and HGB NAAs, disproportionately high and adverse impacts would occur at these locations. However, none of the identified minority and/or low-income communities are in SO_2 NAA county (Freestone), and therefore no disproportionately high and adverse impact would be anticipated from SO_2. Compliance and mitigation measures identified to minimize impacts from emissions and dust that could impact localized air quality during construction are identified in **AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program, AQ-MM#1: Dust Suppression**

Techniques, AQ-MM#2: Materials Transport, AQ-MM#3: Construction Off-road Vehicle Speed Limitations, AQ-MM#4: Road Surface Maintenance, AQ-MM#5: Construction Equipment, AQ-MM#6: Ground Disturbing Activities and **AQ-MM#7: Construction Materials Transport**. While **Section 3.2, Air Quality,** does not specifically address localized air quality impacts on communities throughout the Project, the construction impact minimization techniques described in the previously mentioned section would minimize localized air quality impacts. Additionally, the Project would be constructed predominantly on viaduct adjacent to the identified minority and/or low-income communities, minimizing earthwork and potential localized air quality impacts.

Section 3.2.5.2.4, Air Quality, Operational Emissions, assessed the HSR system's potential energy use and emissions that would be produced to provide power to the Project during operations. In addition, the assessment evaluated the potential mode split that the Project would induce by removing passenger vehicles and their respective emissions from the roadway. Vehicle VMT reduction emissions were subtracted from the trainset operation emissions to calculate net emissions due to implementation of the Project. Overall, implementation of the Project would induce net reductions of the estimated criteria pollutants except SO_2. A net increase in SO_2 would occur because electric power generation from coal produces significantly more SO_2 than other forms of power generation, and passenger vehicles produce very little SO_2 due to the nature of the fuel, its refinement, and car emission controls. Per **Section 3.2.7, Air Quality, Build Alternatives Comparison,** a substantial net reduction in emissions would occur with implementation of any of the Build Alternatives; therefore, operation of the Project would not produce disproportionately high and adverse impact to minority and/or low-income communities and/or block groups. Additionally, as none of the identified minority and/or low-income communities are in SO_2 nonattainment area county (Freestone), no disproportionately high and adverse impact would be anticipated from SO_2.

3.18.5.3.3 Water Quality

Potential surface and ground water quality impacts during construction could include erosion, sedimentation, runoff and potential contaminants from petroleum and oil products used for fueling and maintenance. However, with appropriate compliance and mitigation measures, as outlined in **Section 3.3.6, Water Quality, Avoidance, Minimization and Mitigation**, potential impacts would be minimized. Drainage features, such as swales, culvert crossings, viaduct sections and detention basins, have been incorporated into the design of the Project to maintain water flow, provide natural filters for stormwater runoff and to ensure that off-site cross-drainage patterns would not be changed where practicable.[15] In addition, TCRR included design features to avoid and minimize potential impacts to water quality including placing approximately 55 percent of any of the Build Alternatives on viaduct in order to span waters of the U.S. Construction on viaduct would minimize the Project's need for pesticides and fertilizer as there would be no landscaping and/or ground cover to maintain on viaduct sections; therefore, potential influx of pesticides and fertilizers to nearby waterbodies would be minimized. For areas not on viaduct where landscaping and groundcover would be maintained and possibly treated with pesticides, the Project would manage potential runoff from Project areas through implementation of **WQ-CM#3: Stormwater Management/Stormwater Pollution Prevention Plan**. Overall, the Project would not adversely impact any drinking or water resources; therefore, there would be no disproportionately high and adverse impact to minority and/or low-income populations.

[15] Drainage design details for each crossing are included in **Appendix E, Waters of the U.S. Technical Memorandum** and the *Texas Central Partners Texas High Speed Rail Final Conceptual Engineering Report-FCERv2*," May 9, 2019.

3.18.5.3.4 Noise and Vibration

The Project would result in moderate to severe noise impacts throughout the Study Area. Depending on the Build Alternative, the results of the noise and vibration modeling identified 9 to 12 (Build Alternatives D and B, respectively) residential, commercial or retail sites that would experience severe noise impacts. There are between seven and nine (Build Alternatives D or F, and B, respectively) severe noise impacts that would occur within minority and/or low-income block groups in Ellis, Navarro, Waller and Harris Counties, as described below. All minority and/or low-income identified severe noise impacts and mitigation measures would occur at residential locations and are further described in the following paragraphs. A disproportionate number of severe noise impacts would occur within minority and/or low-income identified block groups. However, with mitigation measures potential impacts would be mitigated and no disproportionately high and adverse impact would be anticipated.

Severe noise impacts were identified at two residences on Segment 1 in Ellis County, one at a residence along Segment 2A in Ellis County, one at a residence on Segment 3B in Navarro County, and two residences on Segment 5 in Waller County would experience severe noise impacts. All residences would be located more than 50 feet from the Project; therefore, residences would not necessarily be displaced as described in **Section 3.13.3.3.4, Land Use, Structure Displacement and Land Acquisition**. As described in **NV-MM#1: Additional Noise and Vibration Assessments for Operation** and **NV-MM#3: Operational Noise Mitigation and Monitoring,** additional mitigation would be required to further identify and mitigate severe noise impacts to the identified residences. With mitigation measures, severe noise impacts would not occur at the discussed locations in minority and/or low-income block groups in Ellis, Navarro or Waller Counties.

Three severe noise impacts within minority and/or low-income populations would occur at residential properties in Harris County. All Build Alternatives would traverse the US 290 corridor, which includes industrial with some commercial, residential and institutional properties. These sites are adjacent to, or abutting US 290, which is classified as a state highway and produces increased levels of ambient noise due to automobile traffic. As described in **NV-MM#3: Operational Noise Mitigation and Monitoring**, mitigation strategies for the Project could include sound barriers and/or other measures that would mitigate noise impacts to these sites; therefore, no disproportionately high and adverse impacts to minority and/or low-incoming populations would occur within Harris County due to noise.

No severe noise impacts would occur in the identified minority and/or low-income communities, described in **Section 3.18.4, Affected Environment**. However, moderate noise impacts were identified at residences in the Hash Road and Nail Drive Community and the Plantation Forest Community. Mitigation measures outlined in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation,** address noise concerns raised by community members at listening sessions.

During construction, some activities may cause perceptible ground-borne vibration, most notably pile driving for structures and vibratory compaction for ground improvements. Screening distances for perceptible vibration impacts are described in **Section 3.4.5.2.1, Noise and Vibration, Construction Noise and Vibration Impacts**. However, additional assessment would be necessary to identify and mitigate specific impacts, as described in **NV-MM#1: Additional Noise and Vibration Assessments for Operation**. Additionally, no operational vibration impacts are identified in **Section 3.4.5.2.5, Noise and Vibration, Operational Vibration Impacts**. Therefore, no disproportionately high and adverse vibration impacts to minority and/or low-income populations would be anticipated.

3.18.5.3.5 Hazardous Materials

Section 3.5, Hazardous Materials, defines hazardous materials as a broad category of hazardous waste, hazardous substances and toxic chemicals that can negatively impact human health or the environment, if released. This section describes two potential impacts related to minority and/or low-income block groups and communities, which include the use and storage of hazardous materials in proximity to minority and/or low-income communities and site-specific hazardous sites that could be disturbed or displaced along the alignment.

The operation and maintenance of the Project would require the use and storage of hazardous materials at the TMFs and MOW facilities. The Project would require five stand-alone MOWs and two additional MOWs located within the TMF facilities for a total of seven. The Dallas TMF/MOW would be located in a minority and low-income block group, while the Houston TMF/MOW would not. Depending on Build Alternative, three to four (Build Alternatives A, B, D, E and C, F, respectively) of the seven MOWs required for the Project would be in minority and/or low-income block groups. However, no identified minority and/or low-income communities are located within a mile of any proposed MOW facilities. Hazardous materials generated at these sites would be controlled in accordance with applicable state and federal laws for storage, use and disposal and in accordance with **HM-MM#2: Hazardous Materials Management**. With mitigation measures no anticipated hazardous materials impacts as a result of the TMF/MOW facilities would be anticipated; therefore, disproportionately high and adverse impacts related to the release of hazardous materials that would affect minority and/or low-income populations would not be anticipated.

The analysis in **Section 3.5.4.1, Hazardous Materials, Affected Environment,** determined there are four high-risk sites, located on Segments 1, 2A and the Houston Industrial Site Terminal Station Option. All the identified high-risk sites are located in minority and/or low-income block groups; the Occidental Chemical Dallas Silicate Plant located in Dallas County (Segment 1), the Pencco Bardwell site located in Ellis County (Segment 2A) and the Lunsford Estate Property and Tex Tube site located at the Houston Industrial Site Terminal Station Option in Harris County.

The Occidental Chemical Dallas Silicate Plant would be adjacent to the southern side of the Project approximately a mile from the Dallas Terminal Station. The downtown Dallas community, adjacent to the Dallas Terminal Station would be nearest to the Occidental Chemical Dallas Silicate Plant. Required mitigation measures at the Occidental Plant are outlined in **HM-MM#1: Environmental Site Assessments**. Any remediation of the Occidental Chemical Silicate Plant site would be a beneficial impact to the minority and/or low-income community in the downtown Dallas area for all Build Alternatives.

The Pencco Bardwell Plant would be 970 feet northeast of Segment 2A in Ellis County. Per **HM-MM#1: Environmental Site Assessments,** this site would be assessed prior to construction. No identified minority and/or low-income communities would be in the Study Area near the site. Additionally, any remediation of the Pencco Bardwell Plant site would be a beneficial impact.

Two high-risk sites were identified at the Houston Industrial Site Terminal Station Option in Harris County. Those sites are the Lunsford Estate Property and Tex Tube. According to **Section 3.5.4.1.10, Hazardous Materials, Harris County (Segment 5),** both sites are currently undergoing environmental monitoring and mitigation. Due to the proximity of all Houston Terminal Station Options, minority and/or low-income communities identified near the Houston Terminal Station Options would be adjacent to the TexTube and Lunsford Estate Property sites. The disruption and further remediation of these high-risk sites would be a beneficial impact for nearby minority and low-income communities near the Houston Industrial Site Terminal Station Option. Information regarding the sites can be found in

Appendix E, Hazardous Materials Initial Site Assessment Report. Neither of the two high-risk sites would be displaced or disturbed by the Houston Northwest Mall Terminal Station Option or the Houston Northwest Transit Center Terminal Station Option.

3.18.5.3.6 Aesthetic and Scenic Resources

Temporary and permanent impacts to visual quality would occur throughout the Study Area, as described in **Section 3.10.5, Aesthetics and Scenic Resources, Environmental Consequences**. Visual impacts were measured by the degree to which viewers are sensitive to changes in the visual character of visual resources. For example, a rural, relatively flat landscape without existing transmission lines or roadways would undergo an adverse change in its viewshed with the construction of the HSR system. Conversely, a rural, relatively flat landscape with existing transmission lines or roadways would not undergo an adverse change in its viewshed with the construction of the HSR system. Sensitivity to impacts in combination with compatibility of the Project (e.g., open space versus infrastructure) was considered to determine a degree of impact (low to high). This resource is further discussed in **Section 3.10.4.4, Aesthetics and Scenic Resources, Visual Quality Impact Assessment**.

Construction impacts common to all Build Alternatives include increases in light levels and visual nuisances from construction equipment, vehicles and structures. For Build Alternative A, 835 acres of the total 1,975 acres of temporary construction areas would be located in minority and/or low-income block groups. Temporary construction sites would occur in identified minority and/or low-income communities of downtown Dallas and the Houston Terminal Station Options area. Additionally, no MOW facilities would be constructed within 1 mile of identified minority and/or low-income communities. Additional acreage for all Build Alternatives and Houston Terminal Station Options can be found in **Appendix E, Environmental Justice Technical Memorandum, Table 13-15 Temporary Construction Sites and MOW by Build Alternative.** Adverse temporary impacts and visual degradation due to construction activities would not be permanent and would not substantially alter the existing view quality. Overall, temporary construction laydown areas within rural areas would impact fewer people in terms of overall viewers or people who would see the laydown area during construction and, where practical, would be adjacent to major roadways and freight lines to reduce visual and traffic impacts from lighting and screening, as described in **AS-MM#8: Aesthetic and Visual Guidelines for Construction Security Fencing**. In addition, **AS-MM#6: Construction Lighting Plan** and **AS-MM#9: Public Involvement Plan,** outline specific mitigation to minimize impacts from temporary construction areas. Temporary aesthetic impacts due to construction would be common to communities throughout the Project and would not represent a disproportionately high and adverse visual impact to minority and/or low-income block groups.

Within the identified minority and/or low-income communities, visual impacts would occur during construction and operation at the Hash Road and Nail Drive community and the Plantation Drive community. Public input gathered from public listening sessions held in November 2019 focused on potential impacts from construction and permanent impacts due to the Project infrastructure crossing on embankment within 200 feet of homes. Aesthetic and visual impacts at these two communities would be an adverse impact and require mitigation as described in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation**. Aesthetic and visual impacts would not occur at the Le May and Le Forge neighborhood in Dallas County due to mitigation described in **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation.**

Permanent visual impacts would also be beneficial around some of the terminal station areas in urban areas, as the Project would replace structures of lesser visual quality with a station area that would complement the visual cohesion of the environment. Redevelopment of underutilized structures around

station areas in Dallas and Houston would add aesthetic value to the urban character of each city. This would represent a beneficial visual impact to minority and/or low-income populations near the Dallas Terminal Station and the Houston Northwest Mall Terminal Station Option.

3.18.5.3.7 Transportation

Transportation impacts would primarily be caused by permanent modifications to the existing public and private roadway network. These modifications would be implemented for operation of the HSR system in a grade-separated corridor and are described in more detail in **Section 3.11.5.2, Transportation, Build Alternatives.** Modifications would include road over rail, road under rail, relocation, rerouting or closure. Roads that would be relocated, rerouted or closed have been counted as permanent impacts. No public roadways would be closed as a result of the Project. Across the Build Alternatives, 102 to 157 (Build Alternatives C and E, respectively) public or private roads would be permanently impacted. Within minority and/or low-income block groups, Build Alternative C would impact the least number of roads (43) and Build Alternative E would impact the greatest number of roads (60). Relocated and rerouted roads would be shifted and reconnected to the existing roadway network. Closed roads for private drives would require coordination between TCRR and landowners to determine an alternative drive, as described in **TR-MM#8: Private Access**. During construction, detours would be provided for roadways needing to be rerouted, relocated or closed in accordance with emergency service requirements. Temporary road closures and detours could cause some delay for users; however, impacts would be temporary and would not be disproportionately high or adverse across the entire Project.

Permanent roadway impacts would occur throughout the Study Area. However, the Project has been designed to minimize and avoid potential roadway impacts using elevated viaduct and infrastructure improvements that include road over and under rail crossings. Approximately 55 percent of the Project has been designed to utilize viaduct to minimize potential roadway impacts. Based on the total number of roads permanently impacted throughout the Build Alternatives, roadway impacts located in minority and/or low-income block groups would not be disproportionate. Additionally, as no public roads would be closed no disproportionately high and adverse impacts would be anticipated.

Within the identified minority and/or low-income communities, the Hash Road and Nail Drive community would be the only community to receive roadway modifications. The Project would cross Hash Road via a cut configuration and Hash Road would be re-built in a road-over-rail configuration. As this configuration is not a relocation, reroute or closure, it would not be counted as a permanent impact. However, construction impacts for this community would be anticipated and mitigated as outlined in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation.** Additionally, roadway construction and changes would occur within the Downtown Dallas community and the Houston Terminal Station Options; however, impacts would be temporary and mitigated through **TR-MM#1: Traffic Control Plan** and **TR-MM#2: Intersection Improvements.** At the Plantation Forest community, no permanent roadway impacts would occur as the Project would be crossing adjacent to Plantation Drive and cross Riley Road in an elevated viaduct configuration. However, construction-related impacts would be anticipated due to the community's proximity to the LOD. Mitigation for this community is outlined in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation.** No transportation impacts would be anticipated for the Le May and Le Forge community as the entire community would be relocated. No private roads would be impacted within the identified minority and/or low-income communities.

Public transit is discussed in **Section 3.11.4**, **Transportation, Affected Environment; Section 3.11.5**, **Transportation**, **Environmental Consequences** and **Section 3.11.6, Transportation, Avoidance,**

Minimization and Mitigation. Public transit throughout the Study Area is served by a variety of agencies. Large agencies such as DART and METRO would serve the Dallas Station Area, connecting local Dallas communities and the north Texas region to the Project. At the Houston Terminal Station Options, transit would be primarily by METRO. Temporary potential impacts to public transit could occur at the Dallas Terminal Station due to construction. At the Houston Northwest Transit Center Terminal Station Option, METRO operates the Northwest Transit Center adjacent to the LOD. The Northwest Mall and the Houston Northwest Transit Center Terminal Station Options would necessitate roadway improvements on Post Oak Road and Old Katy Road that could temporarily cause increases in traffic. Potential transportation impacts would be mitigated by measures outlined in **TR-MM#1: Traffic Control Plan; TR-MM#2: Intersection Improvements** and **TR-MM#3: Transit Coordination**. The downtown Dallas and Houston Terminal Station Option identified minority and/or low-income communities could experience temporary impacts to transit around the station areas; however, with mitigation no disproportionately high and adverse impact would be anticipated.

Transit outside of urbanized areas is provided by rural transit agencies as described for each respective county in **Section 3.11.4, Transportation, Affected Environment**. These transit agencies generally operate demand response service for users in low population density locations. As the Project would not close any public roadways and temporary roadway impacts would be mitigated by **TR-MM#1: Traffic Control Plan**, no impacts to the identified minority and/or low-income communities would be anticipated.

3.18.5.3.8 Displacements, Acquisitions and Relocations

The Build Alternatives have been designed to minimize and avoid potential impacts. The Build Alternatives would displace between 279 and 321 (Build Alternatives A and F, respectively) total residential, commercial, and community facility structures; and of those, 111 to 135 (Build Alternatives A and F, respectively) would be located within minority and/or low-income block groups. **Table 3.18-15** shows the number of displaced structures within minority and/or low-income block groups and the total number of displaced structures both inside and outside of minority and/or low-income block groups by Build Alternative. Homes would be displaced within each of the five identified minority and/or low-income communities. No public housing would be impacted by the Project. Displaced structures would be subject to mitigation as described in **LU-MM#3: Acquisition and Relocation Mitigation Plan**.

Table 3.18-15: Displaced Structures by Build Alternative

Resource	Build Alternative						Houston Terminal Station Options		
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Industrial Site	Northwest Mall	Northwest Transit Center
Residential[a]	80	90	84	92	102	96	0	0	0
Commercial [a]	31	31	39	31	31	39	7	22	7
Community Facilities [a]	0	0	0	0	0	0	0	0	1
Total	111	121	123	123	133	135	7	22	8
Residential (Total)	235	255	239	249	269	253	0	0	0
Commercial (Total)	42	42	65	42	42	65	14	22	15
Community Facilities (Total)	2	2	3	2	2	3	0	0	1
Total	279	299	307	293	313	321	14	22	16

Source: AECOM 2019

[a] Displaced structures located in minority and/or low-income block groups.

Many of the identified minority and/or low-income block groups are located on common segments. In order to evaluate whether one Build Alternative would have a greater impact in minority and/or low-income block groups compared to another Build Alternative, FRA isolated the impacts associated with Segments 1 and 5 (common to all Build Alternatives). FRA further evaluated the remaining displacement impacts along Segments 2A, 2B, 3A, 3B, 3C and 4 to determine whether these impacts informed FRA's recommendation of a Preferred Alternative. **Table 3.18-16** summarizes FRA's findings.

Table 3.18-16: Displaced Structures by Build Alternative (Segments 2A, 2B, 3A, 3B, 3C and 4)

Resource	Build Alternative					
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
Residential [a]	16	26	20	28	38	32
Commercial [a]	0	0	7	0	0	7
Community Facilities [a]	0	0	0	0	0	0
Total	16	26	27	28	38	39
Residential (Total)	53	73	40	67	87	54
Commercial (Total)	0	0	23	0	0	19
Community Facilities (Total)	1	1	2	1	1	2
Total	54	74	65	68	88	75

Source: AECOM, 2019

[a] Displaced structures located in minority and/or low-income block groups.

Acquisitions would occur throughout the entirety of the Build Alternatives and would include structures that would not be located within the LOD, or within 50 feet of the LOD. **Table 3.18-17** summarize FRA's findings.

Table 3.18-17: Estimated Parcel and Structure Acquisitions by Build Alternative

Resource	Build Alternative						Houston Terminal Station Options		
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Industrial Site	Northwest Mall	Houston Transit Center
Parcel Acquisitions [a]									
Temporary Parcels (Minority and/or low-income)	202	209	210	203	210	211	3	1	0
Temporary Parcels (Total)	272	277	259	271	276	258	3	1	0
Permanent Parcels (Minority and/or low-income)	1,098	1,135	1,125	1,125	1,162	1,212	25	40	43
Permanent Parcels (Total)	1,731	1,814	1,789	1,764	1,847	1,822	25	40	43
Structure Acquisitions [b]									
Commercial (Minority and/or low-income)	4	4	7	4	4	7	--	1	0
Commercial (Total)	4	4	7	4	4	7	0	1	0
Community Facilities (Minority and/or low-income)	0	0	0	0	0	0	--	--	--
Community Facilities (Total)	0	0	0	0	0	0	--	--	--

Table 3.18-17: Estimated Parcel and Structure Acquisitions by Build Alternative

Resource	Build Alternative						Houston Terminal Station Options		
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Industrial Site	Northwest Mall	Houston Transit Center
Residential (Minority and/or low-income)	23	19	32	25	21	34	--	--	--
Residential (Total)	49	49	54	50	50	55	--	--	--

Source: AECOM, 2019

[a] Counts include acquisitions that may only acquire a portion of a parcel.

[b] Structure counts include structures identified as primary.

Per **Section 3.13.3.3.3.4, Land Use, Structure Displacement and Land Acquisition,** an acquired primary structure would satisfy conditions for acquisition of an entire parcel. Therefore, structure acquisitions presented in **Table 3.18-17** are already incorporated into parcel acquisitions. The data are presented for informational purposes.

For Build Alternative A, most structure displacements would not occur in minority and/or low-income block groups. However, over half of the parcel acquisitions would occur in minority and/or low-income block groups, which would present a disproportionately high and adverse impact. In locations where minority and/or low-income communities have been identified and where potential community cohesion impacts could occur as a result of displacement and acquisition, as outlined in **Section 3.18.5.3.9, Community Cohesion**, additional outreach and mitigation measures have been identified to minimize potential severity of impacts.

Additional information regarding displacements and acquisitions can be found in **Section 3.13, Land Use; Appendix E, Land Use Technical Memorandum** and **Appendix E, Environmental Justice Technical Memorandum.** TCRR would negotiate final acquisition and compensation with individual landowners prior to the construction of the Project.

3.18.5.3.9 Community Cohesion

As defined in **Section 3.14.5.2.2, Socioeconomics and Community Facilities, Impacts to Community Character and Cohesion**, cohesion is reflected in a neighborhood's ability to function and be recognized as a singular unit. Potential impacts to community cohesion could potentially bisect, cut through, displace or isolate a community or large numbers of residential units within a community. Cohesion is a function of density and can be a concern, particularly in urban and suburban areas where a project can create a localized barrier between a residential community and social or commercial resources. In rural areas that are less dense, there would be more flexibility to maintain connectivity, especially to community facilities.

Five neighborhoods or communities identified in minority and/or low-income block groups would be potentially impacted by the Project. Two other communities not identified in minority and/or low-income block groups are discussed in **Section 3.14, Socioeconomics and Community Facilities**. Identified locations would be on Segment 1 and Segment 5, common to all Build Alternatives.

The community character of the downtown Dallas area would be enhanced as older or abandoned industrial structures in the Cedars area are acquired or displaced by the Project. The location of the Dallas Terminal Station would be adjacent to various transportation infrastructure from IH-30 to the north and UPRR line to the east. The Dallas Terminal Station would be located in two minority and/or low-income block groups. Much of the area is considered industrial due to the scale and use of nearby

structures. Residential uses are located east of the Project. Development of the Dallas Terminal Station would directly create employment opportunities within the station such as concessions and ticketing. The Dallas Terminal Station would be a beneficial impact to community cohesion through the creation of jobs, aesthetic improvements through reuse or redevelopment of unused structures and by bringing additional transportation connectivity to the area.

In preparation of this Final EIS, FRA conducted a listening session at a St. Philip's Center church in proximity to the Dallas Terminal Station location. A total of 31 residents from nearby neighborhoods signed attendance sheets. Participants inquired about construction timelines, when the trainset would begin operating and fare cost. Common concerns were generally about increased traffic near the station area and fare cost. However, most attendees expressed support for the Project and expressed interest in additional travel modes between Dallas and Houston. Additional information about this listening session is provided in **Section 3.18.3.6, Outreach**.

The Le May and Le Forge community, located between Illinois Avenue and Loop 12 in Dallas County, would be directly impacted by the Project, as at least 14 homes would be displaced. The neighborhood is part of the larger Cedar Crest neighborhood, but it is isolated by utility and freight rail infrastructure. The Project would further isolate this minority and low-income neighborhood from the rest of the Cedar Crest community. Only 20 homes would remain, and a portion of Le May and Le Forge Avenues would be adjacent to the Project's viaduct infrastructure, creating an impact to the cohesive character of the remaining part of this neighborhood.

Following publication of the Draft EIS, FRA conducted additional neighborhood outreach for the Le May and Le Forge neighborhood, including a listening session, to better understand the neighborhood's composition, concerns and questions regarding the Project. The neighborhood primarily consists of elderly residents who have resided in the neighborhood for a long time, many close to 40 years or more. The neighborhood appears to be comprised of approximately 50 percent property owners and 50 percent long-term renters. Many are retired and/or on fixed-incomes. Residents have concerns regarding affordability of new homes and additional bills, moving expenses, advance notification time to vacate their properties and loss of support network from close friends and neighbors. Additionally, most listening session attendees considered their neighbors to be family. Residents expressed concern that they would prefer to be relocated to the same neighborhoods as many depended on each other for health, financial and mobility support. Information provided from residents has been incorporated into mitigation measures for the neighborhood. Additional information about this listening session is provided in **Section 3.18.3.6, Outreach**.

While the acquisition and displacement of these homes represents a potentially disproportionately high and adverse impact to the Le May and Le Forge neighborhood, relocation of displaced residents could occur within the Cedar Crest community. **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation**, outlines specific measures necessary to minimize impacts to this unique community.

A community of approximately 14 homes located at the intersection of Hash Road and Nail Drive in southern Dallas County would be impacted by Segment 1, which is common to all Build Alternatives. Community character is rural consisting of a mix of large lot homes and small lots with mobile homes. The nearest urbanized areas include the cities of Lancaster, Wilmer and Ferris at roughly 3 miles to the northwest, northeast and southeast, respectively. The community is located within a block group that has been identified as low-income. The Project would displace approximately eight homes in proximity and intersecting the LOD. Remaining homes on the east side of Nail Drive would have the Project crossing on the west side of Nail Drive via cut construction method under Hash Road and transitioning to embankment further southeast.

Following publication of the Draft EIS, FRA mailed EJ outreach surveys to potentially impacted property owners in the community. Five completed surveys from the community were received by FRA. The surveys identified concerns relating to the Project's proximity to homes and its relationship to property values, potential noise, soil conditions and requests to move the Project east where more open land is present.

A listening session for this community was held on November 21, 2019. Affected residents and property owners were notified via letter through direct mail. During the session, 14 people registered their attendance and stayed for the entire session. Residents' concerns primarily include impacts to water wells and water utilities, potential noise impacts, how the Project would interact with the nearby Loop 9 roadway project and next steps for the Project. Feedback from the listening session was incorporated into mitigation measures for the community. Additional information regarding public engagement efforts for this community can be found in **Appendix C, Public and Agency Involvement Correspondence**.

The Hash Road and Nail Drive community would experience disproportionately high and adverse impacts due to construction and operation of the Project. The Project would disrupt cohesion in this community through displacing residents. Displacement of a majority of homes in the location would constitute a disproportionately high and adverse impact to the community cohesion of this neighborhood. Mitigation measures for this community are described in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation**.

The Plantation Forest development is located in Waller County adjacent to the CenterPoint high-voltage transmission line. Approximately 12 homes on the west side of Plantation Drive would be displaced by Segment 5 of all Build Alternatives. The Project would intersect the community via embankment and transition to viaduct approaching Riley Road. Community cohesion impacts would occur through displacement of residents and relationships between neighbors.

A listening session was held on November 19, 2019, for this community. The purpose was to provide information about the Project and to gather feedback from the community regarding their concerns related to the Project. Property owners were notified of the listening session via letter through direct mail. Eleven people registered their attendance and stayed for the entire session. Four completed surveys from the community were received by FRA. Concerns from the community primarily included aesthetic and visual impacts, noise, construction traffic and personnel, financial concerns about replacement housing, localized flooding due to the Project and residents' previous interactions with TCRR regarding the sale of their homes. Many residents had been in the community for over 10 years. Meeting attendees and surveys described the neighborhood as close knit with friendships that have been in place for years. Additional information regarding public engagement efforts for this community can be found in **Appendix C, Public and Agency Involvement Correspondence**.

After construction of the Project, 14 homes would remain on the east side of Plantation Drive. Remaining homes would experience temporary impacts from construction activities and permanent potential impacts from noise and aesthetic impacts relating to screening of the Project. The Plantation Forest community would experience disproportionately high and adverse impacts due to construction and operation of the Project; additionally, the Project would disrupt cohesion in this community through displacing residents and long-time relationships. Mitigation measures for this community are described in **EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation**. The Plantation Forest neighborhood is also discussed in **Section 3.14, Socioeconomics and Community Facilities**.

The Houston Terminal Station Options are located in minority and/or low-income block groups in Harris County. No residential structures would be displaced by any of the Houston Terminal Station Options. However, the Preferred Alternative would utilize the Houston Northwest Mall Terminal Station Option, which would displace approximately 22 commercial structures. Following publication of the Draft EIS, FRA mailed minority and/or low-income community outreach surveys to potentially impacted businesses in the terminal station areas. Approximately 45 surveys and letters inviting businesses to an upcoming listening session were mailed; FRA received 3 completed surveys.

FRA held a listening session at a monthly community meeting of the Spring Branch Super Neighborhood. Information regarding the Project was provided by a frequently asked questions handout and community and business flyers and surveys were handed out. Attendees inquired about station locations, construction and operation timeline, frequency of trainsets, passenger capacity, adequate parking at terminal and fare pricing. A mix of approximately 20 community members and business owners were in attendance. Community concerns included increased traffic in the station area and pedestrian safety. Members of the Awty International School expressed concerns regarding their facilities adjacent to, and that would be displaced by, the Houston Northwest Transit Center Terminal Station Option. Pedestrian impacts at Awty International School are addressed in **Section 3.14.5.2.4, Socioeconomics and Community Facilities, Impacts to Children's Health and Safety,** and **SC-MM#9: Acquisition of the Awty International School Early Learning Campus**. A listening session summary can be found in **Appendix C, Public and Agency Involvement Correspondence**.

While Build Alternative A and the Houston Northwest Mall Terminal Station Option would displace commercial structures, it would not alter the community character and cohesion of this primarily industrial and commercial land use area. The Project would not create a new barrier and would be in similar character to extant transportation infrastructure in the corridor. Redevelopment of the Northwest Mall could produce beneficial impacts to regional and local connectivity, as the Project would increase multimodal options to connect the station to greater Houston. Mitigation for displaced structures would be in accordance with **LU-MM#3: Acquisition and Relocation Mitigation Plan**.

3.18.5.3.10 Population and Employment

Section 3.14.5.2, Socioeconomics and Community Facilities, Build Alternatives, describes economic and employment impacts as a result of the Project. The primary location of these businesses would be in Dallas and Harris Counties. However, the Project would create new temporary and permanent jobs in Dallas and Harris Counties due to the HSR system terminal stations and TMFs. Potential jobs include operation and maintenance of the HSR system as well as service-related occupations at the stations. Permanent jobs created as a result of the Project's operation would represent a net increase in new jobs over and above the current projected job growth for the Study Area. This net increase factors in jobs lost as a result of displacements**.** Jobs at both the Dallas and Houston Terminal Stations and TMFs would be accessible by the existing transit networks. Overall, effects from business displacements would be distributed throughout the Project and would not be predominantly borne by minority or low-income groups or specific communities. The Project would create a beneficial impact for employment opportunities to minority and/or low-income populations.

Cumulative impacts to economic and demographic conditions are discussed in detail in **Chapter 4.0, Indirect Effects and Cumulative Impacts**.

3.18.5.3.11 Community Facilities

There are 85 community facilities identified within the Study Area; 65 of these are within minority and/or low-income block groups; one, the Awty International School Early Learning Center in Harris County, would be displaced by the Houston Northwest Transit Center Terminal Station Option. Two community facilities in Dallas County, the Smith Family Cemetery and Honey Springs Cemetery, are located in minority and/or low-income block groups and would be adjacent to the Project. The three resources are discussed further in the following paragraphs.

The Smith Family Cemetery is a roughly 0.15-acre property currently abutting a parking facility associated with the Linfield Elementary School. Both the cemetery and the school are discussed in **Section 3.19, Cultural Resources**. A field visit in July 2018 observed that the elementary school is a vacant and derelict structure, and the cemetery was maintained with a chain-link fence in good condition and recently mowed grass; however, few headstones remain. The cemetery is currently bounded by a large boulevard to its immediate north, IH-45 to its east and a UPRR to its west.

During construction of the Project, a temporary construction site would occupy the parking lot and school parcel adjacent Smith Family Cemetery. Temporary impacts would occur from construction activities, including increased traffic, construction lighting, localized air quality impacts due to the movement of heavy equipment and potential temporary loss of access. Mitigation measures for these impacts can be found in **Section 3.2.6.2, Air Quality, Mitigation Measures; Section 3.4.6.2, Noise and Vibration, Mitigation Measures; Section 3.10, Aesthetics and Scenic Resources, Mitigation Measures; Section 3.11.6.2, Transportation, Mitigation Measures; Section 3.14.6.2, Socioeconomics and Community Facilities, Mitigation Measures** and **Section 3.19.6.2, Cultural Resources, Mitigation Measures**. Existing adjacent transportation infrastructure and unmaintained school building do not provide a meditative environment for visitors. After construction, the temporary construction area would be removed and only the Project viaduct would remain. While, the Smith Family Cemetery is south of the Le May and Le Forge community, discussions held during the FRA's listening session indicated no community tie to the Smith Family Cemetery. Additionally, the Le May and Le Forge community would be displaced by the Project as described in **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation**; therefore, no disproportionately high and adverse impacts would occur to identified minority and/or low-income populations. Additionally, while impacts would occur and be mitigated, anticipated impacts to this facility would not represent a disproportionately high and adverse impact to community facilities to minority and/or low-income block groups across the Project.

The Project would be adjacent to the eastern portion of Honey Springs Cemetery, which includes a memorial at the front gate. During construction of the Project, a temporary construction site would occupy parcels adjacent to Honey Springs Cemetery. Temporary impacts would occur from construction activities, including increased traffic, construction lighting, localized air quality impacts due to the movement of heavy equipment and potential temporary loss of access. A list of applicable construction-related impact mitigation measures is described in **Section 3.18.6.2, Mitigation Measures**. After construction, the temporary construction area would be removed and only the Project viaduct would remain. As stated in **Section 3.10.5.2.5, Aesthetics and Scenic Resources, Landscape Unit #3 South Dallas Residential (Dallas County)**, visitors at the cemetery would primarily be facing away from the HSR system viaduct; therefore, viewer exposure and sensitivity would be moderate. The cemetery's proximity to IH-45 does not create a meditative environment for visitors. This would remain unchanged with the addition of the HSR infrastructure, which would introduce intermittent noise to the already busy area. Given the height of the structure at this point (approximately 33 feet above ground level) and the parameters set forth in **Section 3.4, Noise and Vibration**, no severe noise or vibration impact would

be anticipated. Potential impacts at Honey Springs Cemetery by the Project would not be anticipated to impact any identified minority/and or low-income communities. While impacts would occur and be mitigated, anticipated impacts to this facility would not represent a disproportionately high and adverse impact to community facilities in minority and/or low-income block groups across the Project. Honey Springs Cemetery is a historic property and is also discussed in **Section 3.17.5.2, Recreational Facilities, Build Alternatives,** and **3.19.4.1, Cultural Resources, Cultural Resources Investigations**.

The Awty International School Early Learning Campus would be displaced by the Northwest Transit Center Terminal Station Option in Harris County. This resource was specifically mentioned by Awty International School staff as a concern during public listening sessions held in the Houston Terminal Station Options on November 29, 2018. The Houston Northwest Mall Terminal Station Option(preferred) would not impact the resource. However, mitigation measures are defined in **SC-MM#9: Acquisition of the Awty International School Early Learning Campus.**

3.18.5.3.12 Safety and Security

Temporary and permanent roadway modifications including traffic routing would have the potential to result in increased response times for emergency responders during construction throughout the entire Study Area. As noted in **Section 3.11.5, Transportation, Environmental Consequences**, roadway impacts would be borne by all populations in the Study Area, and minority and/or low-income populations would not experience a disproportionately high and adverse impact due to road rerouting, relocations or closure. Mitigation measures outlined in **SS-MM#1: Model Construction Impacts on Emergency Response Times**, would assess roadway impacts on emergency access and response times and revise construction plans if they produce delays that exceed standards negotiated with each permitting authority or more than ten percent of baseline response times to a given area.

3.18.5.3.13 Recreational Facilities

The Project would permanently impact two recreational facilities and temporarily impact one recreational facility. All are located within minority and/or low-income block groups – Honey Springs Cemetery (all Build Alternatives) and Lake Bardwell (Build Alternatives D, E and F), and Fort Boggy State Park (Build Alternatives C and F) – and are discussed in more detail in **Section 3.17.5.2, Recreational Facilities, Build Alternatives**. As none of the identified minority and/or low-income communities are within the Study Area surrounding the following recreational facilities, no disproportionately high and adverse recreational facilities impacts would be anticipated.

Honey Springs Cemetery on Segment 1 (all Build Alternatives) in Dallas County is noted as a special use park due to the memorial wall located at the front of the facility. The City of Dallas uses this special use designation for public parks, trail and other recreational facilities that include historic areas, nature centers, golf courses, zoos, arena and other types of facilities. The cemetery is located near IH-45 in an industrial area and is adjacent to a large boulevard on its northern edge. The current adjacent transportation infrastructure does not provide a meditative environment for visitors, and the addition of intermittent noise from the Project would not be considered an adverse impact. The primary use of this facility is as a cemetery, not recreation; therefore, construction and operation of the Project would not impact this facility's designation as a special use park. However, proximity of the resource adjacent to the LOD could result in temporary restrictions in access to the facility. Mitigation for potential temporary impacts to access is discussed in **RF-MM#2: Honey Springs Cemetery Construction Impacts Mitigation.** Visual impacts would be mitigated as described in **Section 3.17.5.2.1, Recreational Facilities, Segment 1**; therefore, potential impacts to minority and/or low-income populations would not be disproportionately high and adverse across the Project.

Build Alternatives D, E and F would be on viaduct when crossing Lake Bardwell, a USACE-owned and managed property, and would impact approximately 10.6 acres of Lake Bardwell's 2,917 acres (0.36 percent). Build Alternatives D, E and F would permanently impact a hunting area within the Lake Bardwell property. This area is located with a minority and/or low-income block group and would be subject to temporary construction-related air quality, noise and vibration and access impacts. These construction activities could serve as a deterrent to wildlife, reducing availability during the hunting season (September 1 to March 31) of small game and feral hogs in the area. Multi-use trails located within the Lake Bardwell area could be temporarily impacted (temporary access reroute or closure) during construction; however, no trails would be permanently impacted. More information on recreational impacts to Lake Bardwell can be found in **Section 3.17.5.2.2, Recreational Facilities, Segment 2A,** and **Section 3.17.5.2.3, Recreational Facilities, Segment 2B**.

Build Alternatives D, E and F would cause temporary and permanent impacts to the hunting area and multi-use trails, previously described, due to construction and operation; however, Lake Bardwell's recreational use would not be changed or prohibited. Construction of the Project would temporarily limit the use of the equestrian trails and hunting area to all communities. Therefore, impacts to recreational facilities at Lake Bardwell would not represent a disproportionately high or adverse impact to minority and/or low-income communities across all Build Alternatives.

For Segment 3C, Fort Boggy would be impacted by Build Alternatives C and F. However, no identified minority and/or low-income communities are within the Study Area near the recreational facilities, and potential impacts as described in **Section 3.17.5.2.4, Recreational Facilities, Segment 3A, 3B and 3C,** would not change use or access to the facilities, and aesthetic and visual impacts would be mitigated. Therefore, no disproportionately high and adverse impacts would be anticipated to identified minority and/or low-income communities.

3.18.6 Avoidance, Minimization and Mitigation

Design features were employed to avoid and minimize impacts to the natural, social, physical and cultural environment. In developing the Build Alternatives, TCRR identified co-location opportunities with existing transportation infrastructure, utility corridors and other development to avoid and minimize impacts to parcel and structure acquisition and land use conversion. Design features include maximizing the use of viaduct to minimize property access and parcel severance impacts. Approximately 55 percent of the Project would be on viaduct.

No compliance measures were identified for this section.

3.18.6.1 Mitigation Measures

Disproportionately high and adverse impacts to minority and/or low-income communities were identified through the analysis in **Section 3.18.5, Environmental Consequences**. Localized impacts to the Le May and Le Forge neighborhood, the Hash Road and Nail Drive neighborhood and the Plantation Forest neighborhood, necessitate additional mitigation. TCRR would be required to implement the following Mitigation Measures (MM):

EJ-MM#1: Le May and Le Forge Neighborhood Mitigation. The Project would displace approximately 41 percent of the homes in the neighborhood and represent an adverse impact to community cohesion. Remaining homes would be further isolated from nearby neighborhoods by the addition of the Project. Due to the large number of displacements and further isolation of the neighborhood, TCRR shall make offers to acquire each property and relocate each resident in the neighborhood.

Due to specific and unique concerns of this minority and low-income community, FRA identified the following measures to be undertaken and incorporated into TCRR's relocation mitigation plan for displaced residents of the Le May and Le Forge neighborhood:

- TCRR shall provide a notice to vacate to tenants and property owners through certified mail delivery a minimum of 120 days prior to the date by which they are required to vacate.
- TCRR shall offer each displaced tenant and property owner a personal relocation agent prior to issuing a notice to vacate. The role of the relocation agent is to serve as a single point of contact and to guide the displaced tenant or property owner throughout the relocation process. The relocation agent shall offer and explain the services below to the displaced tenant or property owner. The displaced tenant or property owner may decline to accept assistance from the relocation agent.
- TCRR shall coordinate with tenants and property owners through their assigned personal relocation agent to provide moving services. For elderly and mobility impaired residents, additional services shall be offered by TCRR to assist with the physical packing, relocation and unpacking of personal belongings.
- TCRR shall make financial planning and budgeting services available to tenants and/or property owners for 1 year following delivery of the notice to vacate.
- Upon request from a property owner or tenant, TCRR shall jointly relocate residents who desire to remain in proximity to each other, where possible.

EJ-MM#2: Hash Road and Nail Drive Community and Plantation Forest Community Mitigation. Due to specific and unique concerns of this minority and low-income community, FRA identified the following measures to be undertaken and incorporated into TCRR's relocation mitigation plan for displaced residents of the Hash Road and Nail Drive community and the Plantation Forest community:

- TCRR shall provide a notice to vacate to tenants and property owners through certified mail delivery a minimum of 120 days prior to date by which they are required to vacate.
- TCRR shall offer each displaced tenant and property owner a personal relocation agent prior to issuing a notice to vacate. The role of the relocation agent is to serve as a single point of contact and to guide the displaced tenant or property owner throughout the relocation process. The relocation agent shall offer and explain the services below to the displaced tenant or property owner. The displaced tenant or property owner may decline to accept assistance from the relocation agent. TCRR shall coordinate with tenants and property owners through their assigned personal relocation agent to provide moving services. For elderly and mobility impaired residents, additional services shall be offered by TCRR to assist with the physical packing, relocation and unpacking of personal belongings.
- TCRR shall make financial planning and budgeting services available to tenants and/or property owners for 1 year following delivery of the notice to vacate.
- TCRR shall mitigate potential aesthetic and visual impacts due to the rails proximity to the neighborhood as outlined in **AS-MM#1: Visual Screening** and **AS-MM#2: Design Stations to Adapt to Local Context.**

TCRR shall mitigate potential impacts to major utilities in each respective neighborhood as outlined in **EU-MM#1: Identification of Utilities, EU-MM#2: Relocation of Major Utilities, EU-MM#3: Protection and Encasement of Major Utilities,** and **EU-MM#4: Relocation of Minor Utilities**. TCRR shall communicate with the communities of any potential utility disruption, relocation, construction or any other change associated with impacted utilities.

TCRR shall mitigate potential moderate to severe noise impacts within the respective communities as outlined in **NV-MM#1: Additional Noise and Vibration Assessments for Operation** and **NV-MM#3 Operational Noise Mitigation**. In accordance with mitigation monitoring, TCRR shall continue monitoring noise and vibration levels in each respective neighborhood during the operations testing phase of the Project as outlined in **NV-MM#3: Operational Noise Mitigation and Monitoring**.

TCRR shall mitigate potential construction impacts in each respective community as outlined in **SC-MM#1: Construction Management Plan**. TCRR shall maintain vehicle access to residents throughout the construction period for each community. Additionally, TCRR shall not permit construction vehicle, equipment and personnel access to constructions areas via Nail Drive and Plantation Drive, in each respective community.

The following list is an aggregate of applicable compliance and mitigation measures that would mitigate potential construction and operation-related impacts from resources other than **Section 3.18, Environmental Justice**.

- AQ-CM#1: Texas Low Emission Diesel Fuel (TxLED) Program
- AQ-MM#1: Dust Suppression Techniques
- AQ-MM#2: Materials Transport
- AQ-MM#3: Construction Off-road Vehicle Speed Limitations
- AQ-MM#4: Road Surface Maintenance
- AQ-MM#5 Construction Equipment
- AS-MM#1: Visual Screening
- AS-MM#2: Design Stations to Adapt to Local Context
- AS-MM#3: Preserve Existing Vegetation and Feather Edges
- AS-MM#5: Landscaping Plan
- AS-MM#6: Construction Lighting Plan
- AS-MM#7: Operational Lighting Plan
- AS-MM#8: Aesthetic and Visual Guidelines for Construction Security Fencing
- AS-MM#9: Public Involvement Plan
- EU-MM#1: Identification of Utilities
- EU-MM#2: Relocation of Major Utilities
- EU-MM#3: Protection and Encasement of Major Utilities
- EU-MM#4: Relocation of Minor Utilities
- HM-CM#2: Best Management Practices
- HM-MM#1: Environmental Site Assessments
- HM-MM#2: Hazardous Materials Management
- HM-MM#3: Previously Unidentified Hazardous Materials
- HM-MM#4: Waste Management
- LU-CM#6: Uniform Relocation Assistance and Real Property Acquisition Policies Act
- LU-MM#1: Temporary Conversion of Land
- LU-MM#3: Acquisition and Relocation Mitigation Plan
- NV-CM#1: Compliance with Local Regulations
- NV-MM#1: Additional Noise and Vibration Assessments for Operation
- NV-MM#2: Construction Noise Control Plan
- NV-MM#3: Operational Noise Mitigation and Monitoring
- RF-MM#1: Temporary Recreation Impacts to Lake Bardwell
- RF-MM#2: Honey Springs Cemetery Construction Impacts Mitigation

- SC-MM#1: Construction Management Plan
- SC-MM#9: Acquisition of the Awty International School Early Learning Campus
- SS-MM#1: Model Construction Impacts on Emergency Response Times
- TR-MM#1: Traffic Control Plan
- TR-MM#2: Intersection Improvements
- WQ-CM#1: Section 401 Water Quality Certification
- WQ-CM#2: TPDES General Construction Permit (TXR150000) and Multi-Sector General Permit (TXR050000)
- WQ-CM#3: Stormwater Management/Stormwater Pollution Prevention Plan
- WQ-MM#4: Well Modifications

3.18.7 Build Alternatives Comparison

A summary of the impacts to minority and/or low-income areas in the Study Area is presented in **Table 3.18-18**. After implementation of the mitigation measures discussed in **Section 3.18.6, Avoidance, Minimization and Mitigation**, there would be no noted direct disproportionately high and adverse impacts to minority and/or low-income populations as a result of the Build Alternatives and Houston Terminal Station Options. Indirect impacts to minority and/or low-income populations are discussed in **Section 4.4.4.11, Indirect Effects and Cumulative Impacts**, **Environmental Justice**, and summarized in **Table 4-6**.

Table 3.18-18: Disproportionately High and Adverse Impact to Environmental Justice Communities by Build Alternative and Houston Terminal Station Options

Resource	Build Alternative						Houston Terminal Station Option		
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Industrial Site	Northwest Mall	Northwest Transit Center
Number of minority and/or low-income block groups intersected by the Study Area	80	80	81	80	80	81	5	7	6
Total block groups intersected by the Study Area	118	118	119	118	118	119	8	11	14
Identified Minority and/or Low-Income Communities	5	5	5	5	5	5	1	1	1
Disproportionately High and Adverse Impacts to Minority and/or Low-Income Communities	No	No	No	No	No	No	No	No	No
Acquisitions and Displacements	No	No	No	No	No	No	No	No	No
Community Cohesion and Facilities	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Population and Employment	No	No	No	No	No	No	No	No	No
Air Quality	No	No	No	No	No	No	No	No	No
Noise and Vibration	No	No	No	No	No	No	No	No	No
Water Quality	No	No	No	No	No	No	No	No	No
Hazardous Materials	No	No	No	No	No	No	No	No	No
Aesthetic and Scenic Resources	No	No	No	No	No	No	No	No	No
Safety and Security	No	No	No	No	No	No	No	No	No
Recreational Facilities	No	No	No	No	No	No	No	No	No
Transportation	No	No	No	No	No	No	No	No	No

Source: AECOM 2019

3.19 Cultural Resources

3.19.1 Introduction

This section details the approach, findings and assessment of potential impacts on cultural resources through investigations conducted to comply with NEPA and other applicable cultural resources laws and regulations coordinated with the NEPA process.

Cultural Resources, as defined by NEPA, is an inclusive term that encompasses a broad range of resources consisting of physical evidence of past human activity. The term includes any prehistoric or historic structures, buildings, objects, sites, districts (a collection of related structures, buildings, objects and/or sites), landscapes, natural features, TCPs and cemeteries. For assessment in this EIS, cultural resources have been divided into subsets of historic resources and archeological resources. These terms are defined as:

Cultural Resources: physical evidence of past human activity (e.g., structures, buildings, objects, sites, districts, landscapes, natural features, traditional cultural properties, and cemeteries)

Historic Resources: any structures, buildings, districts, and objects greater than 45 years old

Archeological Resources: remnants of prehistoric and historic sites, features, districts, and objects

Historic Properties: cultural resources that meet the definition outlined at 36 C.F.R. 800.16(l)(1)

- *Historic Resources* are structures, buildings, objects, sites and districts that are over 45 years old from the initial letting date for this Project, which was 2017 (resources constructed 1972 or earlier). While the Secretary of the Interior generally acknowledges 50 years of age or older, the State Historic Preservation Officer (SHPO), formally known in the State of Texas as the Texas Historical Commission (THC), prescribes a criterion of 45 years of age or older to allow for unexpected delays in project planning.
- *Archeological Resources* refers to prehistoric and historic sites, objects and districts where remnants of physical evidence, such as artifacts, features and ecological evidence of a past culture are present.

Cultural resources must meet specific criteria and possess sufficient historic integrity to qualify the resource as a *historic property*, as defined by the NHPA:[1]

- *Historic Property* means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to any Indian tribe or Native Hawaiian organization and that meet the NRHP criteria, which are provided in **Section 3.19.2, Regulatory Context**.

In the State of Texas, cultural resources may also merit designation as an RTLH and may also be designated as a State Antiquities Landmark (SAL). The criteria for RTHL and SAL designations are provided in **Section 3.19.2, Regulatory Context**.

[1] 36 C.F.R. 800.16(l)(1).

3.19.2 Regulatory Context

Federal

FRA Procedures for Considering Environmental Impacts

The FRA Procedures for Considering Environmental Impacts govern the agency's compliance with NEPA and related environmental and historic preservation laws and regulations.[2] FRA procedures require all EISs to identify historic properties that may be affected by the alternatives in accordance with Section 106 of the NHPA.[3] The EIS also describes consultation with the SHPO (for this Project, THC) and other consulting parties regarding the impacts of the proposed action on historic properties.

National Historic Preservation Act of 1966, as amended

The NHPA is the cornerstone of federal historic preservation law.[4] Section 106 of the NHPA and its implementing regulations (*Protection of Historic Properties*[5]), require that prior to issuing federal funding, partial funding, permitting, licensing, approval or taking other action, federal agencies must take into account the effects of their undertakings on historic properties (defined in **Section 3.19.1, Introduction**) and provide the Advisory Council of Historic Preservation (ACHP) an opportunity to comment on the undertaking.[6]

The criteria established for evaluating the NRHP eligibility of a resource are defined at 36 C.F.R. 60.4, which states:

"…the quality of significance in American history, architecture, archeology, engineering and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association and

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
(b) that are associated with the lives of persons significant in our past; or
(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(d) that have yielded, or may be likely to yield, information important in prehistory or history."

Certain types of resources are not usually considered for listing in the NRHP, including religious properties, birthplaces and graves of historical figures, cemeteries, reconstructed historic buildings, commemorative properties and resources achieving significance within the past 50 years. However, a resource that falls within one of those categories can be eligible for listing in the NRHP if it meets one of the following Criteria Considerations in conjunction with one or more of the four standard NRHP criteria listed above:

(a) "A religious property deriving primary significance from architectural or artistic distinction or historical importance; or
(b) a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or

[2] 64 Federal Register 28545, May 26, 1999, as updated in 78 Federal Register 2713 [January 14, 2013].
[3] 54 U.S.C. 306108.
[4] 54 U.S.C. 300101 et seq.
[5] 36 C.F.R. 800.
[6] 54 U.S.C. 306108.

(c) a birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his [or her] productive life; or
(d) a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
(e) a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
(f) a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or
(g) a property achieving significance within the past 50 years if it is of exceptional importance."

In general, the Section 106 process proceeds in four steps:

1. Establish the Undertaking and Initiate the Process, which involves defining the undertaking and identifying and initiating consultation with the appropriate SHPO and other consulting parties, including Tribal Historic Preservation Offices (THPOs), local governments, applicants for federal assistance, interested parties and the public.
2. Identify Historic Properties, which requires the federal agency, in consultation with the SHPO, to define the APE as defined at 36 C.F.R 800.16(d)[7] and carry forth the necessary level of effort to identify historic properties within the APE.
3. Assess Effect(s) the project may have on historic properties identified within the APE.
4. Resolve Adverse Effects to historic properties by exploring alternatives to avoid, minimize or mitigate those effects.

For projects with alternatives under consideration that consist of large land areas, or that have limited access to properties intersected by the project alignment, Section 106 regulations allow for a phased process for the identification and evaluation of historic properties[8] and a phased process in applying the criteria of adverse effect.[9] In situations where the project is complex or involves multiple undertakings, when effects on historic properties are similar and repetitive or multi-state or regional in scope, or when effects on historic properties cannot be fully determined prior to approval of an undertaking, a Programmatic Agreement (PA) can provide a tailored process for the development and implementation of phased identification, NRHP eligibility and effects evaluations, and treatment efforts, as applicable for a specific undertaking.[10]

Section 4(f), U.S. Department of Transportation

Section 4(f) of the USDOT Act of 1966 "…protects significant publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public and private historic sites."[11] Under Section 4(f), the Secretary of Transportation may approve a project that would use a protected property only if (a) there is no feasible and prudent alternative that avoids the use of the protected property and (b) the project includes all possible planning to minimize harm to the property.

[7] As defined at 36 C.F.R. 800.16(d), an APE is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."
[8] 36 C.F.R. 800.4(b)(2).
[9] 36 C.F.R. 800.5(a)(3).
[10] 36 C.F.R. 800.14(b).
[11] 49 U.S.C. 303.

Archeological Resources Protection Act of 1979

The Archeological Resources Protection Act of 1979 (ARPA) was enacted to "…secure, for the present and future benefit of the American people, the protection of archeological resources and sites which are on public and Indian lands," recognizing that archeological sites are irreplaceable.[12]

Native American Graves Protection and Repatriation Act

Enacted in 1990, the Native American Graves Protection and Repatriation Act (NAGPRA) requires the repatriation of ancestral Native American remains and cultural items such as funerary objects, sacred objects and objects of cultural patrimony found on federal lands or held in museums with federal funding.[13]

Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This executive order, enacted in 2000, is to "establish regular and meaningful consultation and collaboration with tribal officials" and to "strengthen the United States government-to-government relations with Indian tribes."

Public Law 111-212 Section 405(a)

Public Law 111-212 Section 405(a) states, "The Secretary of the Army shall not be required to make a determination under the National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.) for the project for flood control, Trinity River and tributaries, Texas, authorized by section 2 of the Act entitled ''An Act authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes"[14]

State

Antiquities Code of Texas (Texas Natural Resources Code Title 9, Chapter 191); Texas Administrative Code (Title 13, Part 2, Chapters 21 and 26)

While a majority of the Project is located on private property, various portions of the Project fall within non-federal public land, or land that is under the ownership or control of a political subdivision of the State of Texas. As a result, these areas are within the purview of the Antiquities Code of Texas (Texas Natural Resources Code Title 9, Chapter 191), and require the THC to review actions that have the potential to disturb prehistoric or historic sites within the public domain. The Antiquities Code of Texas declares:

"It is the public policy and in the public interest of the State of Texas to locate, protect, and preserve all sites, objects, buildings, and locations of historical, archeological, educational, or scientific interest, including but not limited to prehistoric and historical American Indian or aboriginal campsites, dwellings, and habitation sites, archeological sites of every character…and implements of culture in any way related to the inhabitants, pre-history, history, natural history, government, or culture in, on, or under any of the land in the State of Texas." Regulations pertaining to the code can be found within Texas Administrative Code (T.A.C.), Title 13 § 2, Chapter 26, *Practice and Procedure*.

Prior to any fieldwork on non-federal public land, an Antiquities Permit, which may be oriented toward specific types of investigation (e.g. Intensive Survey Permit, Alternative Mitigation Permit, Data Recovery Permit, Exhumation Permit, Monitoring Permit, Testing Permit, etc.), must be obtained from the THC.

[12] 16 U.S.C. Section 470 aa-470mm; Public Law 95-96.
[13] 43 C.F.R. 10.
[14] Approved March 2, 1945 [59 Stat. 18], as modified by Section 5141 of the Water Resources Development Act of 2007 [121 Stat. 1253].

The Antiquities Permit stipulates the conditions under which survey, discovery, excavation, demolition, restoration or scientific investigations can occur. An Antiquities Permit may be issued only to a professional archeologist who meets the definition for Principal Investigator as defined in T.A.C. 13 § 26.3.

The Antiquities Code of Texas allows for certain cultural resources to be designated and protected as an RTHL or a SAL.

The THC has adopted the following 10 criteria to govern the evaluation for RTHL designations (13 T.A.C. § 21.9):

1. Age: Structures eligible for the RTHL designation and marker must be at least 50 years old. Older structures may be awarded additional weight in evaluation and scoring.
2. Historical Significance/Architectural Significance: Architectural significance alone is not enough to qualify a structure for the RTHL designation. It must have an equally significant historical association, and that association can come from an event that occurred at the site; through individuals who owned or lived on the property; or, in the case of bridges, industrial plants, schoolhouses and other non-residential properties, through documented significance to the larger community. Structures deemed architecturally significant are outstanding examples of architectural history through design, materials, and structural type or construction methods. In all cases, eligible architectural properties must display integrity; that is, the structure should be in a good state of repair, maintain its appearance from its period of significance and be considered an exemplary model of preservation. Architectural significance is often best determined by the relevance of the property to broader contexts, including geography. Any changes over the years should be compatible with original design and reflect compliance with accepted preservation practices, e.g., the *Secretary of the Interior's Standards for Rehabilitation*.
3. State of Repair/Integrity: Structures not considered by the THC to be in a good state of repair are not eligible for RTHL designation. The THC reserves the sole right to make that determination relative to eligibility for RTHL markers. Subject marker topics placed at the appropriate site help maintain site integrity. Topics properly documented and understood by the public also help maintain a high degree of integrity.
4. Diversity of topic for addressing gaps in historical marker program. This criterion addresses the extent to which topic relates to an aspect or area of Texas history that has not been well represented by the marker program.
5. Value of topic as an undertold or untold aspect of Texas history. This criterion addresses the extent to which the property (RTHLs), site or story is in danger of being lost if its history and significance are not addressed through the marker program.
6. Endangerment level of property, site or topic. This criterion addresses the extent to which the property (RTHLs), site or story is in danger of being lost if its history and significance are not addressed through the marker program.
7. Available documentation and resources. This criterion addresses the quality and balance of the research and documentation for the application.
8. Diversity among this group of candidates. This criterion addresses the extent to which the topic represents an undertold story of Texas history among the applications received during that year's marker cycle.
9. Relevance to other THC programs. This criterion addresses the extent to which the topic coordinates with other significant programs and initiatives of the agency.
10. Relevance to the THC's current thematic priorities. This criterion addresses the extent to which the topic coordinates with the thematic priorities set by the THC each year (varies by year).

For a historic building to be eligible for designation as a SAL, it must be listed in the NRHP prior to being designated a SAL. The same prerequisite does not apply to archeological sites. Eligibility criteria for SAL designation for archeological sites are as follows (13 T.A.C. § 26.10):

- The site has the potential to contribute to a better understanding of the prehistory and/or history of Texas by the addition of new and important information.
- The site's archeological deposits and the artifacts within the site are preserved and intact, thereby supporting the research potential or preservation interests of the site.
- The site possesses unique or rare attributes concerning Texas prehistory and/or history;
- The study of the site offers the opportunity to test theories and methods of preservation, thereby contributing to new scientific knowledge.
- There is a high likelihood that vandalism and relic collecting has occurred or could occur, and official landmark designation is needed to ensure maximum legal protection, or alternatively, further investigations are needed to mitigate the effects of vandalism and relic collecting when the site cannot be protected.

Eligibility criteria for SAL designation for historic buildings, structures, cultural landscapes, objects, and districts are as follows (13 T.A.C. § 26.19):

- The property fits within at least one of the four NRHP eligibility criteria.
- The property retains integrity at the time of the nomination, as determined by the executive director of the THC.
- For buildings and structures only, the property must be listed in the NRHP, either individually, or as a contributing property within a historic district.

Texas Health and Safety Code (Title 8, Subtitle C, Chapter 711, General Provisions Relating to Cemeteries); Title 13, Part 2, Chapter 22 of the Texas Administrative Code; Penal Code of Texas Section 28.03[f]

Cemeteries in Texas are protected under Title 8, Subtitle C, Chapter 711 of the Texas Health and Safety Code; T.A.C. 13 § 2, Chapter 22, Rule 22.4(b) of the Texas Administrative Code – *Unknown and Abandoned Cemeteries*; Rule 22.5 of the Texas Administrative Code – *Removal of Remains from an Abandoned or Unknown Cemetery*; and Section 28.03(f) of the Penal Code of Texas. Under these regulations a cemetery is defined as a place that is used or intended to be used for interment, containing one or more graves, and prohibit the use of a cemetery property for non-cemetery purposes.

As stated in Section 711.035(d) of the Texas Health and Safety Code, "a railroad, street, road, alley, pipeline, telephone, telegraph, electric line, wind turbine, cellular telephone tower, or other public utility or thoroughfare may not be placed through, over, or across a part of a dedicated cemetery without the consent of: (1) the directors of the cemetery organization that owns or operates the cemetery; or (2) at least two-thirds of the owners of plots in the cemetery." Furthermore, Section 711.035(f) states "dedicated cemetery property shall be used exclusively for cemetery purposes until the dedication is removed by court order or until the maintenance of the cemetery is enjoined or abated as a nuisance under Section 711.007."

For any improvements that would disturb unmarked graves contained within an abandoned, unknown, or unverified cemetery, a justice of the peace acting as coroner or medical examiner under Chapter 49, Code of Criminal Procedure, or a person described by Section 711.0105(a) (cemetery keeper, licensed funeral director, medical examiner, coroner, or professional archeologist) may investigate or remove remains without written order of the state registrar or the state registrar's designee. A district court of the county may order the cemetery de-dedicated and removal of the human remains from the cemetery

to a perpetual care cemetery or a municipal or county cemetery. Additional investigations may be required, including but not limited to additional cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts.

As detailed in **Appendix L, Programmatic Agreement**, the intent of the Proponent is to avoid impacts to cemeteries, minimize impacts to cemeteries, or mitigate impacts to cemeteries, in that order. As determined in consultation between FRA and THC, cemeteries considered to be exposed to potential adverse impacts under NEPA, regardless of any designation or NRHP eligibility determination under Section 106, are those wholly or partially within the LOD (the construction footprint of the Project) or those with boundaries located within 150 feet or less of the LOD. This 150-foot buffer is afforded to cemeteries to avoid potential disturbance to unmarked burials located outside of a cemetery's modern boundary.

3.19.3 Methodology

As discussed in **Section 1.2, Introduction, Purpose of and Need for the Dallas to Houston High-Speed Rail Project**, FRA may issue an RPA (regulations that apply to a specific railroad or a specific type of operation), impose requirements or conditions by order(s) or waiver(s), or take other regulatory action(s) to ensure the Project is operated safely. This regulatory action(s) constitutes a major federal action and triggers the environmental review under NEPA and is subject to the NHPA Section 106 process.[15] In addition, TCRR has expressed an interest in pursuing financial assistance from the USDOT. As per 49 C.F.R. 1.81(a)(6), FRA will carry out the USDOT's responsibilities under Section 106 of the NHPA for this Project. FRA is coordinating compliance with the NHPA and NEPA as encouraged by the ACHP.[16] The cultural resources evaluation in this EIS was prepared in accordance with Section 106 of the NHPA and its implementing regulations.[17]

3.19.3.1 Consultation with Consulting Parties

3.19.3.1.1 State Historic Preservation Officer and Consulting Parties

As part of the Section 106 process, FRA initiated formal consultation with THC on February 23, 2015, concurrently with letters of invitation to other identified potential consulting parties. FRA contacted THC and other consulting parties to invite them to participate in the Section 106 process as consulting parties and for the purpose of seeking information from known, knowledgeable parties concerning cultural resources in proximity to the Project. FRA again sent invitations to consult and formally requested information from consulting parties in letters dated January 12, 2016; January 25, 2018; and May 14, 2018. FRA held the initial consulting party meeting on May 31, 2018, and a subsequent consulting party meeting on November 7, 2019.

A list of the organizations FRA invited to participate as consulting parties, and their respective responses is provided in **Table 3.19-1.** Copies of the correspondence with THC and consulting parties can be found in **Appendix E, Cultural Resources Technical Memorandum**.

Table 3.19-1: Consulting Parties Identified for Section 106 Consultation

Organization	Initial Invitation to Consult [a]	Organization Response	Status
Advisory Council on Historic Preservation	February 23, 2015	Accepted	Signatory

[15] 36 C.F.R. 800.16(y).
[16] 36 C.F.R. 800.8(a).
[17] 36 C.F.R. 800.

Table 3.19-1: Consulting Parties Identified for Section 106 Consultation

Organization	Initial Invitation to Consult [a]	Organization Response	Status
Texas Historical Commission	February 23, 2015	Accepted	Signatory
Texas Central Railroad	February 23, 2015	Accepted	Invited Signatory
USACE, Fort Worth District	February 23, 2015	Accepted	Invited Signatory
USACE, Galveston District	February 23, 2015	Accepted	Invited Signatory
Texas Department of Transportation	February 23, 2015	Accepted	Consulting Party
Preservation Texas	February 23, 2015	Accepted	Consulting Party
Historic Bridge Foundation	May 14, 2018	Declined	Not Participating
City of Dallas, HPO	February 23, 2015	No Response	No Response
City of Dallas, Dallas Park and Recreation	May 14, 2018	No Response	No Response
Dallas County Historical Commission	January 12, 2016	No Response	No Response
Preservation Dallas	January 25, 2018	Accepted	Consulting Party
Remembering Black Dallas	May 14, 2018	No Response	No Response
City of Lancaster	May 14, 2018	Accepted	Consulting Party
University of Texas at Arlington	May 14, 2018	Accepted	Consulting Party
Ellis County Historical Commission	February 23, 2015	Accepted	Consulting Party
Ennis Main Street Program	February 23, 2015	No Response	No Response
City of Ennis Economic Development District	February 23, 2015	Accepted	Consulting Party
City of Waxahachie	January 25, 2018	Accepted	Consulting Party
Boren Reagor Springs Historical Society	January 12, 2016	Accepted	Consulting Party
Navarro County Historical Commission	May 14, 2018	Accepted	Consulting Party
City of Corsicana, Main Street and Tourism	February 23, 2015	No Response	No Response
Freestone County Historical Commission	February 23, 2015	No Response	No Response
Limestone County Historical Commission	February 23, 2015	Accepted	Consulting Party
Leon County Historical Commission	February 23, 2015	Accepted	Consulting Party
Madison County Historical Commission	February 23, 2015	Accepted	Consulting Party
Grimes County Historical Commission	January 25, 2018	Accepted	Consulting Party
Waller County Historical Commission	February 23, 2015	No Response	No Response
Rick Welch	May 14, 2018	Accepted	Consulting Party
Harris County Historical Commission	February 23, 2015	Accepted: March 10, 2015 Retracted: March 10, 2015	No Response
City of Houston	May 14, 2018	Accepted	Consulting Party
Preservation Houston	May 14, 2018	Accepted	Consulting Party
Houston Mod	May 14, 2018	No Response	No Response

[a] For subsequent correspondence with the Consulting Parties, see **Appendix E, Cultural Resources Technical Memorandum**.

3.19.3.1.2 Federally Recognized Native American Tribes

FRA initiated government-to-government consultation with the federally recognized Native American tribal governments with a known interest in Texas, pursuant to 36 C.F.R. 800.2(c)(2)(ii), through letters dated February 19, 2015 and January 25, 2018. The letters requested consultation on concerns for locations of TCPs and significant cultural resources and an invitation to share information regarding these concerns. A list of the Native American tribal governments FRA contacted in February 2015 and January 2018 and their respective responses is provided in **Table 3.19-2.** Copies of the correspondence with the tribes are provided in **Appendix E, Cultural Resources Technical Memorandum.**

Table 3.19-2: Federally Recognized Native American Tribal Governments

Tribal Nation	Initial Invitation to Consult [a]	Tribal Response	Status
Absentee Shawnee Tribe of Oklahoma	January 25, 2018	No Response	No Response
Alabama-Coushatta Tribe of Texas	February 19, 2015	Declined	Notify if discovery in areas of concern
Alabama Quassarte Tribal Town	February 19, 2015	No Response	No Response
Apache Tribe of Oklahoma	February 19, 2015	No Response	No Response
Caddo Nation of Oklahoma	February 19, 2015	Declined	Notify if discovery in areas of concern
Cherokee Nation of Oklahoma	January 25, 2018	Declined	Notify if discovery in areas of concern
Choctaw Nation of Oklahoma	January 25, 2018	Declined	Declined
Comanche Nation of Oklahoma	February 19, 2015	Declined	Declined
Coushatta Tribe of Louisiana	February 19, 2015	No Response	No Response
The Delaware Nation	February 19, 2015	Declined	Declined
Jicarilla Apache Nation	January 25, 2018	No Response	No Response
Kialegee Tribal Town	January 25, 2018	No Response	No Response
Kickapoo Tribe of Oklahoma	January 25, 2018	No Response	No Response
Kickapoo Traditional Tribe of Texas	January 25, 2018	No Response	No Response
Kiowa Tribe of Oklahoma	February 19, 2015	Declined	Declined
Mescalero Apache Tribe	February 19, 2015	No Response	No Response
Muscogee (Creek) Nation	February 19, 2015	Declined	Declined
Osage Nation	January 25, 2018	No Response	No Response
Poarch Band of Creek Indians	January 25, 2018	No Response	No Response
Quapaw Tribe of Oklahoma	January 25, 2018	No Response	No Response
Seminole Nation of Oklahoma	January 25, 2018	No Response	No Response
Thlopthlocco Tribal Town	February 19, 2015	No Response	No Response
Tonkawa Tribe of Indians of Oklahoma	February 19, 2015	Declined	Notify if discovery in areas of concern
Tunica-Biloxi Tribe of Louisiana	January 25, 2018	No Response	No Response
United Keetoowah Band of Cherokee Indians	February 19, 2015	Declined	Declined
Wichita and Affiliated Tribes	February 19, 2015	No Response	No Response
Ysleta Del Sur Pueblo of Texas	January 25, 2018	No Response	No Response

[a] For subsequent correspondence with the federally recognized Native American Tribes, see **Appendix E, Cultural Resources Technical Memorandum**.

3.19.3.1.3 Public Involvement

Public participation is an important component of Section 106.[18] As noted above, FRA is coordinating public participation for Section 106 and NEPA and consultation remains ongoing. FRA sought and considered the view of the public regarding Section 106 for this Project through the NEPA process by holding public meetings that included Section 106 presentation boards and Cultural Resources Specialists. Public scoping meetings were held in all 10 counties crossed by the Project: six during October 2014 in Dallas, Corsicana, Teague, Bryan, Huntsville, and Houston; six during December 2014 in Jewett, Waxahachie, Waller, Madisonville, Tomball, and Navasota; and 11 public meetings related to the Draft EIS during January, February, and March 2018 in Dallas, Corsicana, Ennis, Jewett, Fairfield, Mexia, Cypress, Madisonville, Navasota, Waller, and Houston. Details of the public outreach process, specifically related to Section 106, can be found in **Section 9.4.2, Public and Agency Involvement, Section 106 Coordination**.

[18] 36 C.F.R. § 800.3(e).

In addition, pursuant to 36 C.F.R. 800.14(b), FRA has developed a draft PA in consultation with the THC, ACHP, TCRR, USACE, and consulting parties. The draft PA is appended to the Final EIS and is available for public review and comment (**Appendix L, Programmatic Agreement)**.

3.19.3.2 Phased Approach for Identification and Evaluation of Historic Properties

FRA met with THC on September 15, 2015, regarding the appropriate survey methods for historic and archeological resources. During this consultation, it was determined a phased process for compliance with Section 106, as provided for in 36 C.F.R. 800.4(b)(2) and 36 C.F.R. 800.5(a)(3), will be implemented due to the combined length and size of the Project and the anticipation of limited access to private property. The survey methodologies for historic and archeological resources were outlined and documented in separate research designs, one developed for historic resources and one developed for archeological resources, in consultation among FRA, THC, USACE Fort Worth District, USACE Galveston District, STB, and TxDOT. The research designs define the respective APEs and methods for conducting literature reviews, background research, field surveys, reporting and impact assessments for historic and archeological resources. The following sections provide details of the methods implemented for the ongoing phased process conducted in accordance with the approved research designs.

3.19.3.2.1 Research Designs

THC concurred on the final research designs for historic resources on November 18, 2015. THC concurred on the archeological research design, submitted to THC in conjunction with the Texas Antiquities Permit application, on November 24, 2015. The archeological investigation for the Project is being carried out under Texas Antiquities Permit #7497. Copies of both research designs and THC concurrence are provided in **Appendix E, Cultural Resources Technical Memorandum.** Upon receiving concurrence on the research designs, FRA initiated the phased process for the identification and evaluation of historic properties.

3.19.3.2.2 Area of Potential Effects/Limits of Disturbance

As defined at 36 C.F.R. 800.16(d), an APE is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." The term Limits of Disturbance (LOD) means the construction footprint of the Project, including any permanent and temporary easements, access roads, drainage swales, all locations of ancillary facilities (e.g., passenger stations, rail car and track maintenance facilities, electrical substations, maintenance roads, and signal houses), utility relocation areas, borrow areas, staging areas, Section 404 mitigation sites, drainage crossings, and any other Project-specific locations proposed by TCRR (see **Appendix F, TCRR Conceptual Engineering Design and Constructability Reports**). The historic resources APE and the archeological resources APE for the Project are different and are defined in the research designs and described below.

Historic Resources APE

The historic resources APE takes into account all effects resulting from construction and operation of the Project, which includes physical effects that may be associated with construction activities, as well as effects that may occur later in time, be further removed by distance (noise, vibration and visual effects), or be cumulative. The APE for historic resources varies throughout the Project area and is based on the typical conditions of the three general settings the Project would traverse. The three settings are defined as urban, suburban and rural. Each setting contains different typical conditions that influence

the potential for the Project to affect historic properties. The extent of the historic resources APE was measured from the LOD based on the criteria listed below.

- 350 feet beyond the LOD where the Project would be constructed in urban settings
- 700 feet beyond the LOD where the Project would be constructed in suburban settings
- 1,300 feet beyond the LOD where the Project would be constructed in rural settings

Review of modern aerial photographs was applied to determine the limits of the historic resources APE prior to any field survey. If the condition of an area appeared different in the field than was projected prior to fieldwork, the variable limits of the historic resources APE allowed for adjustments to be applied in the field as appropriate. Only historic resources more than 45 years old or older (constructed 1972 or earlier) located within the historic resources APE were documented. However, the architectural historian could extend the APE for the purpose of including an entire parcel containing multiple historic resources where only a portion of those historic resources are within the initial historic resources APE.

The Project in Dallas and Harris Counties traverses urban, suburban and rural settings, which are reflected in the historic resources APE limits applied in those two counties. The Project in the remaining eight counties traverses only rural settings, and the historic resources APE applied in those counties was 1,300 feet beyond the LOD.

Archeological Resources APE/Limits of Disturbance

The archeological resources APE, defined as the LOD, is three-dimensional and takes into consideration length, width, and depth. The archeological resources APE focuses on potential ground-disturbing activities associated with construction of the Project. Ground disturbing activities may include excavation, grading, cut-and-fill, easements, staging areas, utility relocation, or drilling. The depth of disturbance is dictated by the design and environmental conditions of a specific location. Although the archeological resources APE is the specified area for impact assessments of previously recorded and unknown archeological resources, a 1,000-meter (3,280.84-foot) Archeological Study Area from the limits of the Project's archeological resources APE is utilized to provide a general understanding of the distribution of archeological sites within the vicinity of the archeological resources APE of the Project. The Archeological Study Area is used in conjunction with the archeological resources APE throughout the literature review and background research efforts to aid in the identification and evaluation of historic properties.

3.19.3.2.3 Literature Review

As part of the phased process, comprehensive literature reviews were done prior to conducting fieldwork. The focus of the literature review was to identify all previously recorded and/or designated historic and archeological resources within the respective historic resources and archeological resources APEs, as well as known archeological sites and previously conducted cultural resources investigations within the 1,000-meter (3,280.84 feet) Archeological Study Area. Resources included NRHP-listed historic properties, NRHP-eligible historic properties, National Historic Landmarks (NHLs), SALs, RTHLs, Official Texas Historic Markers (OTHMs), Historic Texas Cemeteries (HTCs)[19] and recorded historic cemeteries with no HTC designation. Sources reviewed during this effort include the Texas Historic Sites Atlas, Texas Archeological Sites Atlas (TASA), NRHP database, TxDOT Historic Properties and Districts GIS layers and available previous cultural resources investigative reports. Reports reviewed during the literature review include:

[19] In 1998, THC developed the HTC program for the preservation of historic cemeteries (50 years old or older) that have a known significant historic association. However, designation as an HTC does not impose land use restrictions on land adjacent to the cemetery.

- 2012 – *Environmental Assessment: Dallas Horseshoe Project IH 30 and IH 35E, Dallas County*. Prepared by TxDOT and the USACE as a cooperating agency (CSJ: 0196-03-205, 0442-02-118, 0442-02-132, 1068-04-099, 1068-04-116, and 0009-11-226).
- 2009 - *Non-Archeological Historic-Age Resource Reconnaissance Survey Report Trinity Parkway: From IH 35E/SH 183 to US 175/SH 310, Dallas County*. Prepared for TxDOT Dallas District (CSJ: 0918-45-121). Prepared by Ecological Communications Corporation, Austin, Texas.
- 2008 - *Historic Resources Study of the US 290 Corridor-From FM 2920 to IH 610, Harris County, Texas.* Prepared for the TxDOT Environmental Affairs Division (CSJ: 0050-09-069). Prepared by Lopez Garcia Group, Dallas, Texas.
- 1990 – *Historic Resources of Dallas, Texas: Phase IV*. Prepared for the City of Dallas. Prepared by Hardy-Heck-Moore, Inc., Austin, Texas.
- 1989-90 - *Historic Resources Survey of Ellis County, Texas.* Prepared for Universities Research Association, Inc., Dallas, Texas. Prepared by Hardy-Heck-Moore, Inc., Austin, Texas.
- 1981 - *Waller County: Cultural Resources Inventory.* Prepared for the Houston Galveston Area Council and the Texas Historical Commission. Prepared by Ellen Beasley.

3.19.3.2.4 Background Research

Historic Resources

The background research phase of the investigation for historic resources included a comparative review of historic and modern aerial photographs and topographic maps, for the purpose of identifying previously undocumented historic resources within the historic resources APE. This effort also included research of archival materials for the development of a prehistoric and historic context.

The historic context is the framework for evaluating the significance of a resource and its eligibility for listing in the NRHP. The DOI's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation (V)* states, "Historic Contexts are those patterns or trends in history by which a specific occurrence, property or site is understood and its meaning (and ultimately its significance) within history or prehistory is made clear."[20]

Contextual information for evaluating the significance of historic resources within the historic resources APE was gathered through archival research conducted during and after fieldwork. Primary and secondary sources obtained from various county level repositories and research databases were reviewed and include, but are not limited to, *The Handbook of Texas Online*,[21] Library of Congress map collection, The University of Texas Perry-Castañeda Library map collection, Newspaper Archive (historic newspaper database), Texas General Land Office map collection, and *The Portal to Texas History.*[22]

The research gathered was compiled to identify significant historic themes relevant to the development of the prehistoric landscape and the built environment within the historic resources APE. Property information available from the County Appraisal Districts for each of the 10 counties crossed by the Project was also searched. The data contributed to the contextual understanding of the built environment and patterns of development, land use, spatial organization and cultural landscapes within the historic resources APE. The prehistoric and historic context of the region encompassed by the Project and prepared for this investigation can be found in **Appendix E, Cultural Resources Technical**

[20] National Register Bulletin: How to Apply the National Register Criteria for Evaluation, https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_5.htm.
[21] The Handbook of Texas Online, https://www.tshaonline.org/handbook.
[22] The Portal to Texas History, https://texashistory.unt.edu/.

Memorandum, and has been incorporated in the interim reports submitted to THC that are discussed further in **Section 3.19.4, Affected Environment**.

Archeological Resources

Prior to archeological fieldwork, the archeological resources APE, was divided into zones of High, Moderate and Low Archeological Potential (e.g., the likelihood for prehistoric sites to be present). This division was based upon extant site patterns across the landscape indicating where prehistoric sites are likely to be located within certain topographic settings (e.g., elevated areas with level ground or near loamy, well- drained soils near streams). This predictive modeling approach for locating prehistoric sites is often employed in compliance-based investigations. While it can be an effective tool for locating sites, it does not specifically consider the dynamic nature of geomorphic processes or the likelihood of different landscape areas to exhibit site integrity, which is a prerequisite for determining NRHP eligibility.

To account for site integrity potential, each zone of Archeological Potential was further subdivided into areas of High, Moderate and Low Integrity Potential (e.g., the likelihood that the natural conditions of an area are conducive to the burial and preservation of archeological materials). Integrity Potential was based on extant environmental conditions such as geomorphological and depositional setting, soil classifications and prior disturbances. As a result, nine evaluation mapping units (EMUs) were developed (EMU 1 through 9), with each EMU representing a unique set of cultural and environmental conditions requiring different levels of survey intensity (**Table 3.19.3**). The table indicates generally where these nine different areas exist on the landscape, the overall percentage that each EMU comprises within the archeological resources APE, and a generalized recommended approach on how the best survey each EMU (e.g., shovel testing, mechanical trenching).

Historic archeological site patterns typically differ from that of prehistoric sites, and, therefore, are not covered by this probability matrix. Historic archeological sites generally have greater surface visibility because they are usually not buried as deeply as prehistoric sites or are not buried at all. They are also often associated with surface features, such as wells and buildings, and commonly contain a higher density of artifacts. Historic sites often occur along old roads and are more frequent in upland settings than on floodplains. Therefore, in order to evaluate the probability for the presence of historic archeological sites, historic maps and aerial photographs of the archeological resources APE were examined prior to all fieldwork.

3.19.3.2.5 Field Survey

Historic Resources

Fieldwork for the historic resources survey of the Project was conducted by historians who meet the Secretary of the Interior's Professional Qualifications Standards, as defined at 36 C.F.R. 61. During the onsite field survey, historic resources were recorded with digital photography, noting the condition, materials, alterations and other features for evaluating significance and integrity. Field documentation of historic resources was conducted from the public ROW.

Table 3.19-3: Probability Matrix of Archeological and Integrity Potential of the Project Archeological Resources APE

Evaluating Mapping Units	Archeological Potential	Integrity Potential	Percent of APE	Is Shovel Testing Needed?	Is Mechanical Trenching Needed?
1 HAP-HIP	< 300 m from stream. High potential for sites.	High integrity potential due to rapid deposition, such as Holocene-age floodplains and terraces, valley shoulder- and toe-slopes, and eolian features.	11	Yes	Yes, if Holocene sediments >1 m deep
2 HAP-MIP	< 300 m from stream. High potential for sites.	Moderate integrity potential due to lack of significant disturbances. Includes smaller stream valleys that are either non-aggrading, or very slowly aggrading with possible thin overbank alluvial veneers but are not mapped as recent alluvium.	47	Yes	Yes, if Holocene sediments >1 m deep
3 HAP-LIP	< 300 m from stream. High potential for sites.	Low integrity potential due mainly to extensive impacts from erosion, exposed bedrock, construction, buried utilities, borrow pits, rutting, standing water, the presence of large-scale infrastructure, or other factors.	12	Not likely	Not likely
4 MAP-HIP	300 - 500 m from stream. Moderate potential for sites.	High integrity potential on scarps and older terrace edges in wide valleys, or in upland settings, where cultural materials may be buried on older geologic surfaces beneath recent (Holocene) overbank veneers, colluvial slopes, or eolian sandsheets.	1	Yes	Yes, if Holocene sediments >1 m deep
5 MAP-MIP	300 - 500 m from stream. Moderate potential for sites.	Moderate integrity potential due to lack of significant disturbances. Older (Pleistocene) stable, non-aggrading terrace surfaces, upland margins along wide stream valleys, interstream divides and shallow bioturbated sandsheets on uplands. Such areas are non-aggrading and are unlikely to exhibit the geologic conditions necessary for deep burial and preservation of cultural materials.	14	Yes	Yes, if Holocene sediments >1 m deep
6 MAP-LIP	300 - 500 m from stream. Moderate potential for sites.	Low integrity potential due mainly to extensive impacts from erosion, exposed bedrock, construction, buried utilities, borrow pits, rutting, standing water, the presence of large-scale infrastructure, or other factors.	3	Not likely	Not likely
7 LAP-HIP	> 500 m from stream or strongly sloping topography. Low potential for sites.	High integrity potential due to depositional processes associated with backswamp, swale, paleochannel, bog, marsh, playas, clayey oxbow channel fill settings, or eolian sandsheets.	0	Yes	Possibly, if archeological materials are identified in deep shovel tests
8 LAP-MIP	>500 m from a stream or strongly sloping topography. Low potential for sites.	Moderate integrity potential due to lack of significant disturbances. Typically includes undisturbed uplands and/or shallow bioturbated eolian sandsheets.	7	Yes	Possibly, if archeological materials are identified in deep shovel tests

Table 3.19-3: Probability Matrix of Archeological and Integrity Potential of the Project Archeological Resources APE

9 LAP-LIP	> 500 m from a stream or strongly sloping topography. Low potential for sites.	Low integrity potential due mainly to extensive impacts from erosion, exposed bedrock, construction, buried utilities, borrow pits, rutting, standing water, the presence of large-scale infrastructure, or other factors.	5	Not likely	Not likely

Source: AECOM, 2019; Notes: A – Archeological, H – High, I – Integrity, L – Low, M – Moderate, P – Potential

Not all historic resources identified during the literature review and background research, which has been ongoing to take into account design changes to the Project, were able to be recorded in the field either due to the lack of visibility from the public ROW, lack of right-of-entry or TCRR's refinements to the conceptual design post-fieldwork. The PA requires field documentation and evaluation of these historic resources be completed prior to construction by an architectural historian who meets the Secretary of Interior's Professional Qualification Standards. This work may occur following the completion of the EIS. The PA requires the results be submitted to THC as addenda, final, and/or supplemental reports to the interim reports and any effects to previously unidentified historic properties will be taken into account.

Archeological Resources

Intensive archeological fieldwork for the Project was based on available access to private property and was conducted in conformance with the approved research design and THC's *Archeological Survey Standards for Texas*. All archeological investigations were supervised by an archeologist who meets the Secretary of the Interior's Professional Qualifications Standards, as well as professional qualification requirements for Principal Investigator as defined at T.A.C. 13 § 26.2.

Components of the survey included pedestrian reconnaissance; shovel testing; and inspection of stream cut banks, animal burrows, historic road beds and animal paths. No mechanical trenching was conducted.

With consideration to the levels of field efforts outlined in the archeological probability matrix (see **Table 3.19-3**), shovel tests were excavated in settings that have potential for buried cultural materials, including those areas where a high probability for historic sites was indicated by historic map overlay review. All USACE permit areas are treated as high integrity/high probability and shovel testing and/or trenching is at appropriate intervals for high integrity/high probably areas. Shovel tests were excavated whenever ground surface visibility was less than 30 percent, except on slopes greater than 20 percent. Within linear areas of the archeological resources APE, a shovel test intensity of at least 16 shovel tests per mile was used. For areal portions of the archeological resources APE, THC Minimum Survey Standards were followed for Project Areas of 200 acres or Less (0-2 acres, 3 shovel tests per acre; 3-10 acres, 2 shovel tests per acre; 11-100 acres, 1 shovel test every 2 acres; and 101-200 acres, 1 shovel test every 3 acres).

Shovel tests measured 30 centimeters (11.8 inches) in diameter and were excavated to the bottom of Holocene deposits, if possible. Dug in 20-centimeter (7.8 inches) levels, all excavated soils were screened through 0.635-centimeter (one-quarter-inch) mesh, unless high clay or water content required that they be troweled through. Location, depth, soil strata and presence/absence of cultural materials were recorded for each shovel test. All shovel tests were backfilled upon completion.

An archeological site was defined either as a discrete cluster of five or more differing surface artifacts, or as a single cultural feature, such as a hearth or masonry structure. All masonry structures (e.g., stone fences, walls, etc.); standing structures; farm complexes that include windmills, water tanks, wells, or cisterns; and artifact scatters are assigned Smithsonian Institution Trinomial numbers. Other historic features, including isolated farm/ranch equipment items (e.g., oil well pump jacks or a single irrigation gate) are generally not considered sites and are classified as isolated finds (IFs). IFs were also designated when an archeological resources locality contained fewer than five non-diagnostic artifacts, or less than one tool and three non-diagnostic artifacts.

Once an archeological site was located, site boundaries were delineated on the basis of the surface distribution of artifacts and/or features. In areas where buried deposits were considered possible, site

boundaries were defined by a series of shovel tests along transects radiating in the four cardinal directions or, if more appropriate, along perceived major and minor axes until two negative shovel tests were encountered or if they extended beyond the archeological resources APE. Each shovel test was excavated as described above. The location of each site was recorded on a USGS topographic map or other appropriate field map or aerial photograph, and a sketch map was drawn. A temporary field designation was assigned to each site, and a TexSite form was completed and submitted to Texas Archeological Research Laboratory (TARL) for assignment of a permanent trinomial designation.

The PA requires locations, not already surveyed during fieldwork due to the lack of access to private property or TCRR's refinements to the conceptual design post-fieldwork, be investigated in the field prior to construction by an archeologist who meets the Secretary of Interior's Professional Qualification Standards. The PA also requires results be submitted to THC as addenda, final, and/or supplemental reports to the interim reports.

3.19.3.2.6 Reporting

Given the phased process implemented for the identification, evaluation and assessment of historic and archeological resources, FRA documented the survey results in interim reports submitted to THC for review and comment. The interim reports include the results of the literature reviews, background research, field survey and impact assessment. The content, methods, level of effort and documentation requirements for the survey reports follow federal and state guidelines and instructions, as outlined in the respective research designs.

The PA provides for identification and evaluation efforts to occur after the release of the EIS as part of the phased process. Any required survey work conducted prior to the start of construction to complete the identification, evaluation, and effects determinations of historic properties, and to continue consultation concerning measures to avoid, minimize, or mitigate any adverse impacts, will continue to be documented as addenda to the interim reports.

3.19.3.2.7 Evaluation of Historic Properties

To identify historic properties within the corresponding historic and archeological APEs, survey was conducted to record and evaluate cultural resources for NRHP eligibility. Evaluations of cultural resources are conducted by qualified archeological and historic professionals who apply the NRHP criteria presented in **Section 3.19.2.1, Regulatory Context, Federal**. The results of the surveys are documented within the separate archeological and historic resources interim reports and addenda that were submitted to THC for review and comment. Consultation with THC regarding identified historic properties is ongoing. The historic properties were categorized as NRHP-listed and NRHP-eligible, or NRHP-eligibility potential and were rated as having a high, moderate or low potential for NRHP-eligibility. Brief definitions for these categories are as follows:

- **NRHP-listed**: a resource listed in the NRHP.
- **NRHP-eligible**: a resource determined eligible for listing in the NRHP.
- **NRHP-eligibility Potential**: a resource with no known previous NRHP designation, and for which field verification and/or further research is still required, was rated as having a high, moderate or low potential for NRHP-eligibility. (High = resource demonstrates historical significance with minimal or no alterations and would most often qualify individually for the NRHP; Moderate = resource demonstrates historical significance but is a relatively common type or has been altered and may not qualify individually for the NRHP; Low = resource lacks demonstrated historical significance or has been substantially altered, and would most likely not qualify individually for the NRHP.) Detailed information on the historic resources located within the

historic resources APE is presented in tabular format in **Appendix E, Cultural Resources Technical Memorandum.**

3.19.3.2.8 Methodology for Assessment of Impacts

FRA assessed historic properties identified within the historic resources and archeological resources APEs for potential impacts the Project could have on these properties in accordance with 36 C.F.R. 800.5. The assessment of impacts for the Project is discussed in **Section 3.19.5, Environmental Consequences.**

Criteria of Adverse Effect (36 C.F.R. 800.5(a)(1))

- Alter, directly or indirectly, any of the NRHP qualifying characteristics of a historic property that diminish the integrity of location, design, setting, materials, workmanship, feeling or association
- May include reasonably foreseeable effects that may occur later in time, be farther removed in distance or be cumulative

Consistent with 36 C.F.R. 800.5(b) and (d)(1), FRA may determine that there is no adverse effect on historic properties within the APE for an undertaking when the effects of the undertaking do not meet the Criteria of Adverse Effect described in 36 C.F.R. 800.5(a)(1), the undertaking is modified to avoid adverse effects, or if avoidance, minimizing, or mitigating conditions agreed upon by THC are imposed, such as subsequent design review of plans by THC to ensure consistency with the *Secretary's Standards for the Treatment of Historic Properties*[23] and applicable guidelines, to avoid adverse effects.

3.19.4 Affected Environment

Fieldwork for cultural resources was conducted from January 15, 2016 through April 15, 2016; September 19, 2016 through October 7, 2016; January 14, 2019 through March 15, 2019; and on February 11, 2020. The fieldwork efforts for both historic and archeological resources focused on the identification, evaluation and assessment of effects on historic properties.

This section presents the results of the phased historic and archeological resources investigations, beginning with general overviews of the literature reviews, background research, fieldwork and reporting. Subsequent to the general overviews, detailed results are presented by county in **Section 3.19.4.2, Cultural Resources by County**.

3.19.4.1 Cultural Resources Investigations

3.19.4.1.1 Historic Resources

The historic resources literature review found 278 previously recorded and/or designated historic resources within the variable historic resources APE. Of these historic resources, 62 have one or more of the following designations determined through investigations conducted previous to this Project: two NRHP-listed; 22 NRHP-eligible; one RTHL; five OTHMs; 12 HTCs; 20 cemeteries with no designation; and one with a local designation by the Palmer Preservation Society (**Table 3.19-4**). Five of these historic resources are within the Project LOD, including Segment 1 (two historic resources); Segment 2A (one historic resource); Segment 2B (one historic resource); and Houston Industrial Site Option (one historic resource). Due to changes by TCRR to the conceptual design of the Project, the Corinth Street Viaduct (Dallas County), the Grady Cemetery (Ellis County), the Ward Cemetery (Navarro County), the Cotton Gin Cemetery (Freestone County) and the Unknown Graves/Cammack Cemetery (Madison County) are no longer within the historic resources APE and are no longer part of the analysis in this Final EIS.

[23](36 C.F.R. 68.

The remaining 216 previously recorded historic resources, concentrated within Dallas County (38 historic resources) and Harris County (178 historic resources), were previously evaluated by various agencies and determined not eligible for listing in the NRHP with concurrence from THC. All the previously recorded and/or designated historic resources are included as part of this investigation.

Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE

Segment	Resource Draft Interim Report Number	Resource Name	Resource Type	Designation	Within LOD
Dallas County					
Segment 1	DA.009	1214 Powhattan Street	Building	NRHP Eligible	No
Segment 1	DA.010	1300 Powhattan Street	Building	NRHP Eligible	No
Segment 1	DA.023	Cadiz Street Overpass and Underpass	Building	NRHP Eligible	Adjacent to LOD
Segment 1	DA.024a-b	Cadiz Pump Station	Complex	NRHP Eligible	No
Segment 1	DA.028	Dallas Coffin Company	Building	NRHP Listed; Local Designation (Contributing resource to City of Dallas: Sears Complex Historic District)	No
Segment 1	DA.029	Sears Dining Hall	Building	Local Designation (Contributing resource to City of Dallas: Sears Complex Historic District)	No
Segment 1	N/A	Sears Complex Historic District	Historic District	NRHP Eligible	No
Segment 1	DA.030	Sears Roebuck and Company Catalog Merchandise Distribution Center	Building	Local Designation (Contributing resource to City of Dallas: Sears Complex Historic District)	No
Segment 1	DA.048	Oak Cliff Box Company (1212 Riverfront Boulevard)	Building	NRHP Eligible	No
Segment 1	DA.056	Corinth Street Underpass and Overpass	Bridge	NRHP Eligible	No
Segment 1	DA.072	Dallas Floodway Historic District	Historic District	NRHP Eligible	Yes
Segment 1	DA.076a	Guiberson Corp. Machine Shop	Buildings	NRHP Eligible	Yes
Segment 1	DA.076b	Guiberson Corp. Residence and Office	Buildings	NRHP Eligible	No
Segment 1	DA.080a-e	Proctor and Gamble Complex	Buildings	NRHP Eligible	No
Segment 1	DA.082	Honey Springs/Bulova/ Homecoming/Queens City/Coming Home	Cemetery	No Designation	Within 150 feet

Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE

Segment	Resource Draft Interim Report Number	Resource Name	Resource Type	Designation	Within LOD
Segment 1	DA.110a	Smith Family Cemetery (Smith/Kinnard Family Cemetery)	Cemetery	HTC	Within 150 feet
Segment 1	DA.194	W. A. Strain House	Historic District	NRHP Listed; SAL	No
Ellis County					
Segment 2A	EL.040	Boren	Cemetery	HTC	No
Segment 2A Segment 2B	EL.016a	Geaslin	Cemetery	No Designation	Yes (2A)
Segment 2A Segment 2B	EL.020	Geaslin Homestead	Building	Local Designation (Palmer Preservation Society); ineligible for NRHP	Yes (2B)
Navarro County					
Segment 3A	NA.046	Anderson Family	Cemetery	HTC	No
Segment 3B	NA.050	Shelton Family	Cemetery	HTC	No
Freestone County					
Segment 3C	FR.034	Johnson African American	Cemetery	HTC	No
Segment 3C	FR.035	General Joseph Burton Johnson	Historic Marker	OTHM	No
Segment 3C	FR.035	J. B. Johnson	Cemetery	HTC	No
Segment 4	FR.001	Red	Cemetery	No Designation	No
Segment 4	FR.016	Furney Richardson School	Historic Marker	OTHM	No
Segment 4	FR.024	Asia	Cemetery	No Designation	No
Limestone County					
Segment 4	LI.005	Personville	Historic Marker	OTHM	No
Segment 4	LI.005	Personville/ Ebenezer	Cemetery	HTC	No
Segment 4	LI.011	Unknown (New Hope)	Cemetery	No Designation	No
Leon County					
Segment 3C	LE.033	Fred Graham	Cemetery	No Designation	No
Segment 3C	LE.034	Nettles	Cemetery	No Designation	Within 150 feet
Segment 3C	N/A	Fort Boggy	Historic Marker	OTHM	No
Segment 3C	LE.039	Liberty	Cemetery	No Designation	No
Segment 4	LE.001	Little Flock	Cemetery	HTC	No
Segment 4	LE.001	Little Flock	Historic Marker	OTHM	No
Segment 4	LE.051	Perry	Cemetery	No Designation	No
Madison County					
Segment 3C	MA.047	Sweet Home	Cemetery	No Designation	No
Segment 3C	MA.53a	Fellowship	Cemetery	No Designation	No
Segment 3C	MA.53b	Fellowship Church Grave	Cemetery	No Designation	No
Segment 4	MA.003	Randolph	Cemetery	NRHP Eligible	Within 150 feet

Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE

Segment	Resource Draft Interim Report Number	Resource Name	Resource Type	Designation	Within LOD
Segment 4	MA.010	Ten Mile	Cemetery	HTC	Within 150 feet
Segment 4	MA.019	Oxford	Cemetery	NRHP Eligible/HTC	No
Grimes County					
Segment 3C	GR.001	Bethel	Cemetery	HTC	No
Segment 5	GR.003	Pankey –Shiloh	Cemetery	No Designation	No
Segment 5	GR.006	Union Hill	Cemetery	No Designation	Within 150 feet
Segment 5	GR.024	Singleton	Cemetery	No Designation	No
Segment 5	GR.033	Ratliff	Cemetery	HTC	Within 150 feet
Segment 5	GR.034a	Old Oakland – Roans Prairie	Cemetery	No Designation	No
Segment 5	GR.034b	Oakland Baptist Church	Historic Marker	RTHL	No
Segment 5	GR.050	Mason	Cemetery	No Designation	No
Segment 5	GR.071	Stonehamville/Simmons Chapel	Cemetery	No Designation	No
Waller County					
None within the Waller County APE					
Harris County					
Segment 5	HA.024b	Humble Oil Gas Station	Building	NRHP Eligible	No
Segment 5	HA.074	Fairbanks	Cemetery	No Designation	No
Houston Industrial Site Station Option	HA.208	Tex-Tube	Building	NRHP Eligible	Yes
Houston Northwest Transit Center Station Option	HA.212	Beth Yeshurun-Post Oak	Cemetery	HTC	Within 150 feet

Source: AECOM 2019

During the historic resources investigation, parcels containing one or more historic resources were designated as sites, with their limits defined by county assessor boundaries. A unique identification number was assigned to each site that includes the first two letters of the county, followed by a number (i.e. site DA.001). Individual historic buildings, structures, and objects were defined as historic resources. The historic resources' investigation for this Project found a total of 874 sites (containing 1,362 historic resources) located within the historic resources APE through January 2019. Not all the historic resources identified through the literature review and background research phases of the survey, which took into account changes by TCRR to the conceptual design of the Project, could be recorded in the field either due to lack of visibility from the public ROW, lack of access to private property or additional design changes post-fieldwork. Of the total historic resources within the APE, 735 sites (containing 1,141 historic resources) were recorded in the field. Historic resources that still require field verification were identified as having high, moderate or low potential for NRHP eligibility (see **Section 3.19.3.2.7, Evaluation of Historic Properties**). Field documentation and NRHP evaluation of the remaining 139 sites and 221 historic resources will be completed during a subsequent phase of fieldwork and prior to construction. Procedures for continuing the identification, evaluation and assessment of effects to cultural resources through additional fieldwork are formalized in **Appendix L, Programmatic Agreement**.

Interim reports providing the results of the ongoing historic resources survey were prepared in 2017 for each of the 10 counties crossed by the Project. At that time, fieldwork for historic resources had been conducted in seven counties (Dallas, Ellis, Navarro, Freestone, Limestone, Leon and Harris). The interim reports prepared for these seven counties provide the results of the historic resources survey, including literature review, background research, fieldwork, NRHP evaluations for historic resources recorded during fieldwork, available information for historic resources to be recorded during a subsequent phase of fieldwork, and impact assessment for historic properties. The interim reports prepared for the three counties where fieldwork had not yet been conducted (Madison, Grimes and Waller) provide the results of the literature review and background research phases of this investigation, including available information for each identified historic resource.

Following additional fieldwork conducted for historic resources between January and March of 2019, addendum reports to the interim reports were prepared for nine counties (Dallas, Ellis, Navarro, Freestone, Leon, Madison, Grimes, Waller, and Harris). An addendum report was not prepared for Limestone County, since the remaining historic resource to be evaluated is not visible from the public ROW and right-of-entry has not being granted. One intensive level survey was conducted in June 2019 for Resource DA.082 and three intensive level surveys were also conducted between February and March 2020 for Resources DA.110a (Smith Family Cemetery), DA.110b (Linfield Elementary School), MA.003 (Randolph Cemetery) and HA.018a-c (House Estate).

Consultation with THC regarding the historic resources survey is ongoing, per the phased approach initiated for this effort. Interim historic resources reports and addenda for each county, as well as the three intensive level reports were submitted to THC. The dates of submittal to THC and dates of response from THC, as well as a summary of the response letters are listed in **Table 3.19-5**. The summary of the THC letters includes concurrence on methods, NRHP evaluations and impact assessments; comments providing recommendations on NRHP determinations; the need for intensive level surveys; concurrence on intensive level surveys and requests for additional impact assessment information. Copies of the correspondence from the THC are provided in **Appendix E, Cultural Resources Technical Memorandum.**

Table 3.19-5: Historic Resources Interim Report, Addenda and Intensive Submittals and THC Response

County	Date of FRA Submittal	Date of THC Response	THC Response
Dallas	Interim Report: July 2017	August 25, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 174 historic resources (two NRHP-listed, 24 NRHP-eligible, three undetermined [treated as NRHP-eligible] and 145 not eligible); and • Field verification and evaluation of remaining 64 historic resources to be submitted as an addendum to the interim report THC comments: • Recommend Resource DA.016, 1401 South Akard Street (KIXL Studios) be *treated as eligible,* but the Project will have no adverse effect; • Recommend Resource DA.020, 904 Cadiz Street (Good Luck Oil Company) be *eligible*, but the Project will have no adverse effect; • Recommend Resource DA.023 (Cadiz Street Underpass) is also *eligible* under Criterion A; • Recommend Resource DA.030, 1409 South Lamar Street (Sears Roebuck and Company Catalog Merchandise Distribution Center), DA.029, 1401 South Lamar Street (Sears Employee Dining Hall), and DA.031, 710 Belleview Street (Sears Roebuck and Company Furniture Warehouse Complex) be treated as an *NRHP eligible* historic district, but the Project will have no adverse effect; • Recommend Resource DA.072 (Dallas Floodway Historic District) Belleview Pressure Sewer, a contributing resource to the *eligible* district, be avoided; • Recommend National Register boundary for DA.076a/b that includes the buildings' footprints and their immediate surroundings, but not the entire parcel; • Recommend intensive-level field survey and archeological investigation be completed for Resource DA.082 (*NRHP-eligible* Honey Springs Cemetery) to determine if the Project will have adverse impacts to any unmarked graves; • Request intensive-level survey be conducted for Resource DA.110b, 3820 East Illinois Avenue (Linfield Elementary), to determine NRHP eligibility and potential impacts; • Request intensive-level survey be conducted for Resource DA.110a (Smith Family Cemetery), to determine potential historical relationship with Linfield Elementary; and • Request additional information on construction and operation prior to comment on potential effect to DA.194 (Strain Farm Historic District); request photographs from main house and fields towards HSR maintenance yard; request photograph simulations; request lighting and landscape plans
	Addendum: August 2019	September 16, 2019	THC concurrence on: • Eligibility determinations for 83 historic resources (all determined not eligible)

Table 3.19-5: Historic Resources Interim Report, Addenda and Intensive Submittals and THC Response

County	Date of FRA Submittal	Date of THC Response	THC Response
	Intensive: December 2019	December 4, 2019	THC concurrence on: • Recommendations for construction monitoring for elements of the Project that will impact the western extent of the study area adjacent to the eastern modern boundary of Honey Springs Cemetery not mechanically scraped.
	Intensive: March 2020	May 1, 2020	THC concurrence on: • Eligibility determination for Resource DA.110a (Smith Family Cemetery) as not eligible for listing in the NRHP and DA.110b (Linfield Elementary School) as eligible for listing in the NRHP under Criterion A for association with the Civil Rights and Desegregation Movement in Dallas County. The NRHP boundary for Resource DA.110b is the 6.3-acre parcel boundary, which encompasses Resource DA.110a as a non-contributing resource. • The Project will have an adverse effect on Resource DA.110b (Linfield Elementary School).
Ellis	Interim Report: May 2017	June 13, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 27 historic resources (all determined not eligible); and • Field verification and evaluation of remaining 86 historic resources to be submitted as an addendum to the interim report
	Addendum: July 2019	August 16, 2019	THC concurrence on: • Eligibility determinations for 30 historic resources (1 NRHP eligible [Boren-Reagor Springs Cemetery] and 29 determined not eligible) THC comments: • THC requests a simulated view of the proposed elevated structure and traction power substation as viewed from the entry gate of the cemetery before concurring with the proposed finding of no adverse effect.
Navarro	Interim Report: June 2017	June 14, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 82 historic resources (all determined not eligible); and • Field verification and evaluation of remaining 79 historic resources to be submitted as an addendum to the interim report
	Addendum: May 2019	May 24, 2019	THC concurrence on: • Eligibility determinations for 15 historic resources (all determined not eligible)

Table 3.19-5: Historic Resources Interim Report, Addenda and Intensive Submittals and THC Response

County	Date of FRA Submittal	Date of THC Response	THC Response
Freestone	Interim Report: May 2017	June 14, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 48 historic resources (one eligible and 47 not eligible); and • Field verification and evaluation of remaining 32 historic resources to be submitted as an addendum to the interim report THC comments: • Recommend Resource FR.034 (Johnson African American Cemetery) is *eligible,* but the Project will have no adverse effect; and • Request additional information on potential effects on Resources FR.016a-g (Furney Richardson School)
	Addendum: July 2019	August 16, 2019	THC concurrence on: • Eligibility determinations for 8 historic properties (all determined not eligible) THC comments: • Based on the information received, it appears the undertaking may have vibration and noise effects on the Furney Richardson School Complex. Efforts should be made to minimize these effects through shielding methods and placement of tract at a maximum feasible distance from the properties and their setting. To determine the likely effects on the historic properties, THC requests a thorough assessment of the possible effects on the Furney Richardson School Complex.
Limestone	Interim Report: July 2016	August 30, 2016	THC concurrence on: • Eligibility determinations for 24 historic resources (all determined not eligible); and • No effect on historic properties
Leon	Interim Report: May 2017	June 14, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 23 historic resources (all determined not eligible); and • Field verification and evaluation of remaining 42 historic resources to be submitted as an addendum to the interim report. THC comment: • Recommend Resource LE.001a (Little Flock Cemetery) is *eligible,* but the Project will have no adverse effect
	Addendum: July 2019	August 23, 2019	THC concurrence on: • Eligibility determinations for 15 historic resources (all determined not eligible).

Table 3.19-5: Historic Resources Interim Report, Addenda and Intensive Submittals and THC Response

County	Date of FRA Submittal	Date of THC Response	THC Response
Madison	Interim Report: June 2017	June 30, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Determination of eligibility for Resource MA.019 (Oxford Cemetery); • Field verification and evaluation of 118 historic resources to be submitted as an addendum to the interim report; and • Determination of no adverse effect on Resource MA.019 (Oxford Cemetery)
	Addendum: July 2019	August 23, 2019	THC concurrence on: • Eligibility determination for 32 historic resources (all determined not eligible); and • Field verification and evaluation of five resources during post-review efforts as required by the PA. THC comments: • Recommend Resource MA.003 (Randolph Cemetery) treated as *eligible,* request intensive evaluation to determine if cemetery or portion of cemetery are *eligible* for listing in NRHP, and assessment of any potential effects be completed.
	Intensive: March 2020	April 2, 2020	THC Concurrence on: • Eligibility determination for Resource MA.03 (Randolph Cemetery) as *eligible* for listing in NRHP under Criterion C and Criteria and Consideration D; • The Project will have an adverse visual effect on Randolph Cemetery. THC comments: • Archeological investigations may be necessary to determine if any unmarked burials are present outside the known boundary; • Direct effects on Randolph Cemetery cannot be determined at this time.
Grimes	Interim Report: May 2017	June 13, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; and • Field verification and evaluation of 142 historic resources to be submitted as an addendum to the interim report
	Addendum: June 2019	July 12, 2019	THC concurrence on: • Eligibility determination for 44 historic resources (all determined not eligible); and • Field verification and evaluation of 28 historic resources during post-review efforts as required by the PA; and • Six historic resources are now outside the Project APE and will not be evaluated.
Waller	Interim Report: May 2017	June 13, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; and • Field verification and evaluation of 12 historic resources to be submitted as an addendum to the interim report

Table 3.19-5: Historic Resources Interim Report, Addenda and Intensive Submittals and THC Response

County	Date of FRA Submittal	Date of THC Response	THC Response
	Addendum: June 2019	July 3, 2019	THC concurrence on: • Eligibility determination for 14 historic resources (all determined not eligible); and • Field verification and evaluation of one resource during post-review efforts as required by the PA.
Harris	Interim Report: July 2017	August 30, 2017	THC concurrence on: • APE limits; • Information presented in the literature review and background research; • Eligibility determinations for 256 historic resources; and • Field verification and evaluation of remaining 107 historic resources to be submitted as an addendum to the interim report THC comments: • Recommend intensive-level survey of Resource HA.004b, 29702 Castle Road, Waller vicinity, to verify NRHP-eligibility and NRHP boundary, if appropriate; • Recommend Resource HA.024b, 26110 Hempstead Road, Cypress (Humble Oil Station) is also *eligible* under Criterion A but the Project will have no adverse effect; • Recommend intensive-level survey of Resource HA.208 (NRHP-eligible), 1503 North Post Oak Road (Tex-Tube).
	Addendum: August 2019	September 20, 2019	THC concurrence on: • Eligibility determination for 108 historic resources (all determined not eligible); and • Field verification and evaluation of nine historic resources during post-review efforts as required by the PA. THC comments: • Recommend additional information to evaluate Resources HA.018a-c (House Estate) under Criterion B.
	Intensive: April 2020	May 1, 2020	THC Concurrence on: • Eligibility determination for Resources HA.018a-c (House Estate) as not eligible for listing in the NRHP

Source: AECOM, 2020

Of the total documented historic resources within the historic resources APE, 45 were identified as historic properties: 2 NRHP-listed and 43 NRHP-eligible. These historic resources are located in the historic resources APE for Segment 1, Segment 3C, Segment 4 and Segment 5. Detailed information is presented in the following sections by county (**Section 3.19.4.2)** and in tabular format in **Appendix E, Cultural Resources Technical Memorandum.**

3.19.4.1.2 Archeological Resources

A review of TASA indicates there are 261 previously recorded archeological sites within the Archeological Study Area (which extends 1,000 meters beyond the LOD of the Project) (**Table 3.19-6**). Of these sites, 122 are prehistoric, 104 are historic and 24 contain both historic and prehistoric components. No data were available for 11 sites that were identified as having unknown cultural and temporal affiliations. Fifty-six historic cemeteries were previously recorded within the Archeological Study Area.

Of the previously recorded prehistoric sites within the Archeological Study Area, 48 percent are lithic scatters, 27 percent are open campsites, 12 percent are burned rock middens and 11 percent are lithic procurement sites. The remaining 2 percent of the prehistoric sites are comprised of rock shelters, a burial, a hearthfield and a bedrock mortar complex.

The previously recorded historic sites consist of 36 percent farmstead or ranch-related sites, 30 percent historic dumps or artifact scatters, and 14 percent twentieth-century military-related components. The remaining 20 percent of historic sites include cemeteries, stone quarries, stone walls, labor camps, a lime kiln, a dam, a historic highway and a historic rail line. The presence of these sites indicates the potential for previously unrecorded prehistoric and historic sites within the archaeological resources APE.

Table 3.19-6: Previously Recorded Archeological Sites and Historic Cemeteries Within the Archeological Study Area

County	Prehistoric Sites	Historic Sites	Prehistoric and Historic Components	Unknown Period	Total Sites	Historic Cemeteries
Dallas	14	19	2	1	36	5
Ellis	6	10	1	3	20	2
Navarro	8	4	3	4	19	5
Freestone	17	16	1	0	34	7
Limestone	5	0	0	0	5	3
Leon	38	44	16	1	99	12
Madison	6	2	0	1	9	7
Grimes	21	5	0	1	27	9
Waller	4	0	0	0	4	0
Harris	3	4	1	0	8	6
Total Sites	122	104	24	11	261	56

Source: TASA 2019

Relatively few systematic surveys were previously conducted within the counties encompassing the Project; those previous surveys primarily occurred in the urban areas of Dallas and Houston. A review of the TASA indicates that 131 cultural resources investigations were performed within the Archeological Study Area. Previous archeological investigations consist of linear and areal cultural resources surveys, primarily associated with urban development, utility placement, oil and gas production and reservoir construction. These investigations cover a combined 935.8 acres of the Project (**Table 3.19-7**)**.**

Table 3.19-7: Previously Conducted Archeological Surveys Within the Archeological Study Area

County	Areal Surveys	Linear Surveys	Total Surveys	Total Acreage of Previously Surveyed Areas within Archeological Resources APE
Dallas	16	8	24	283.2
Ellis	8	5	13	29.7
Navarro	14	2	16	42.1
Freestone	8	2	10	159.4
Limestone	2	0	2	0
Leon	12	5	17	135.2
Madison	1	2	3	142.8
Grimes	10	2	12	85.2
Waller	3	0	3	0.9
Harris	24	7	31	57.3

Table 3.19-7: Previously Conducted Archeological Surveys Within the Archeological Study Area

County	Areal Surveys	Linear Surveys	Total Surveys	Total Acreage of Previously Surveyed Areas within Archeological Resources APE
Total Surveys	**98**	**33**	**131**	**935.8**

Source: TASA 2019

The following information is extracted from the Archeological Study Area and is limited to the 19 previously recorded archeological sites identified within the archeological resources APE of the Project. The previously recorded sites include five prehistoric campsites, three prehistoric artifact scatters, one unknown prehistoric site, four historic homesteads, one historic mining community, two historic bridges, one historic rail line, and two multi-component sites. Five of the sites have an unknown NRHP eligibility, while 14 of these sites were previously determined not eligible. No previously recorded archeological sites within the archeological resources APE have been determined eligible for the NRHP, although the five sites of unknown eligibility are treated as eligible until field verification and eligibility determinations are made in consultation with the THC (**Table 3.19-8**).

Table 3.19-8: Previously Recorded Archeological Sites Within the Archeological Resources APE

County/Segment	Site Number	Site Type	NRHP Status
Dallas County			
Segment 1	41DL218	Prehistoric and Historic; lithic scatter; glass and ceramic fragments	Not eligible
Segment 1	41DL219	Historic; house, bricks, glass, porcelain fragments	Not eligible
Ellis County			
Segment 1	No sites		
Segment 2A	41EL99	Unknown Prehistoric; lithic scatter	Not eligible
Segment 2B	41EL241	Historic; remains of wooden bridge	Not eligible
Segment 3A	No sites		
Segment 3B	No sites		
Navarro County			
Segment 3A, Segment 3C	41NV705	Prehistoric and Historic; debitage, glass, whiteware, brick lined well 20 m west	Not eligible
Segment 3A, Segment 3C	41NV658 / Redden Site	Unknown Prehistoric; campsite	Unknown
Segment 3B	41NV43	Unknown Prehistoric	Unknown
Segment 3B	41NV376	Historic Love Bridge	Unknown
Freestone County			
Segment 3C	41FT437	Prehistoric; Hell Gap point, bifaces, debitage	Not eligible
Segment 4	41FT510	Historic; farmstead	Not eligible
Limestone County			
Segment 4	No sites		
Leon County			
Segment 3C	41LN363	Unknown Prehistoric; campsite	Not eligible
Segment 3C	41LN364	Unknown Prehistoric; campsite	Not eligible
Segment 3C	41LN472	Historic; farmstead	Not eligible
Segment 4	41LN28	Historic; mining community	Not eligible

Table 3.19-8: Previously Recorded Archeological Sites Within the Archeological Resources APE

County/Segment	Site Number	Site Type	NRHP Status
Madison County			
Segment 3C	No sites		
Segment 4	41MA49	Unknown Prehistoric; campsite	Not eligible
Segment 4	41MA52	Unknown Prehistoric; lithic scatter	Not eligible
Grimes County			
Segment 3C	No sites		
Segment 4	No sites		
Segment 5	41GM460	Unknown Prehistoric; campsite	Unknown
Waller County			
Segment 5	41WL33	Unknown Prehistoric; lithic debitage, point base, pottery	Not eligible
Harris County			
Segment 5	41HR399	Historic; railroad	Unknown

Source: TASA 2019

Archeological fieldwork conducted to-date has been in conformance with the Archeological Research Design developed in consultation with the THC and has been supervised by a professional archeologist who meets the U.S. Secretary of the Interior's *Professional Qualification Standards for Archeology and Historic Preservation*, and professional qualification requirements for Principal Investigator (13 T.A.C. 26.4). The objectives of the archeological survey were to: identify and inventory archeological resources within accessible portions of the archeological resources APE; define archeological site boundaries; and make recommendations regarding the eligibility of any sites for inclusion in the NRHP and/or for designation as a SAL. As of March 15, 2019, fieldwork for the archeological investigations covered a total of 3,953.0 acres in the 10 counties crossed by the Project. Approximately 73 percent of the archeological resources APE remains unsurveyed for archeological materials due to: property access denials, access to parcels being rescinded, the inability to access parcels surrounded by restricted properties, and design changes to the Project post-fieldwork. The results of the ongoing historic and archeological surveys are discussed in **Section 3.19.4.2, Cultural Resources by County.**

The initial phases of the survey were focused on high probability areas designated as EMU 1, EMU 2 and EMU 3 (see **Table 3.19-3** for full definitions of EMU 1 through EMU 9) where right-of-entry to land areas was granted; this constitutes approximately 70.1 percent of the APE overall (**Table 3.19-9**). This focus targeted those areas designated as high probability have the highest potential for archeological sites to meet the NRHP criteria (see **Section 3.19.2)**. Pedestrian survey and shovel testing were also conducted in portions of the other EMUs, carried out in accordance with the methodology presented in the Archeological Research Design, provided in **Appendix E, Cultural Resources Technical Memorandum.** Components of the survey included reconnaissance, shovel testing, inspection of stream cut banks, animal burrows, historic road beds and animal paths.

EMU 1 designation denotes the highest overall potential for site presence and preservation and makes up approximately 11 percent of the archeological resources APE. The majority of EMU 1 is mapped along Holocene-age alluvial floodplain deposits, where the likelihood for deeply buried sites would typically necessitate mechanical trenching, a highly intensive level of field effort. Deeply buried archeological sites have an increased potential for in-tact archeological deposits, having a high probability for the sites to be NRHP eligible. The PA requires all field efforts conducted in areas designated for mechanical

trenching be completed prior to construction and submitted to the THC as an addendum or supplemental report. The reporting process is outlined in **Section 3.19.3.2.6, Reporting**.

Table 3.19-9: Fieldwork Conducted as of March 15, 2019 Within Evaluation Mapping Units of Archeological Resources APE

EMU	Total APE Miles	EMU % of APE	Miles Surveyed	% of APE Surveyed	% of EMU Surveyed
1 HAP-HIP	44.1	11.0	8.6	2.2	19.5
2 HAP-MIP	187.2	46.8	54.3	13.6	29.0
3 HAP-LIP	49.2	12.3	8.9	2.2	18.1
4 MAP-HIP	0.6	0.2	0.02	0.04	3.3
5 MAP-MIP	55.3	13.9	11.3	2.8	20.4
6 MAP-LIP	13.2	3.3	1.4	0.4	10.6
7 LAP-HIP	0.00	0	0.00	0.0	0.0
8 LAP-MIP	29.6	7.4	1.9	0.5	6.4
9 LAP-LIP	20.5	5.1	0.01	0.0004	0.009
Total	**399.70**	**100**	**86.6**	**-**	**-**

Source: AECOM, 2019

Notes: A – Archeological, H – High, I – Integrity, L – Low, M – Moderate, P – Potential

3.19.4.2 Cultural Resources by County

This section presents the results of the phased historic and archeological resources field investigations within the respective APEs. Resource numbers associated with cemeteries mentioned in the Archeological Resources discussions are located within the Historic Resources APE.

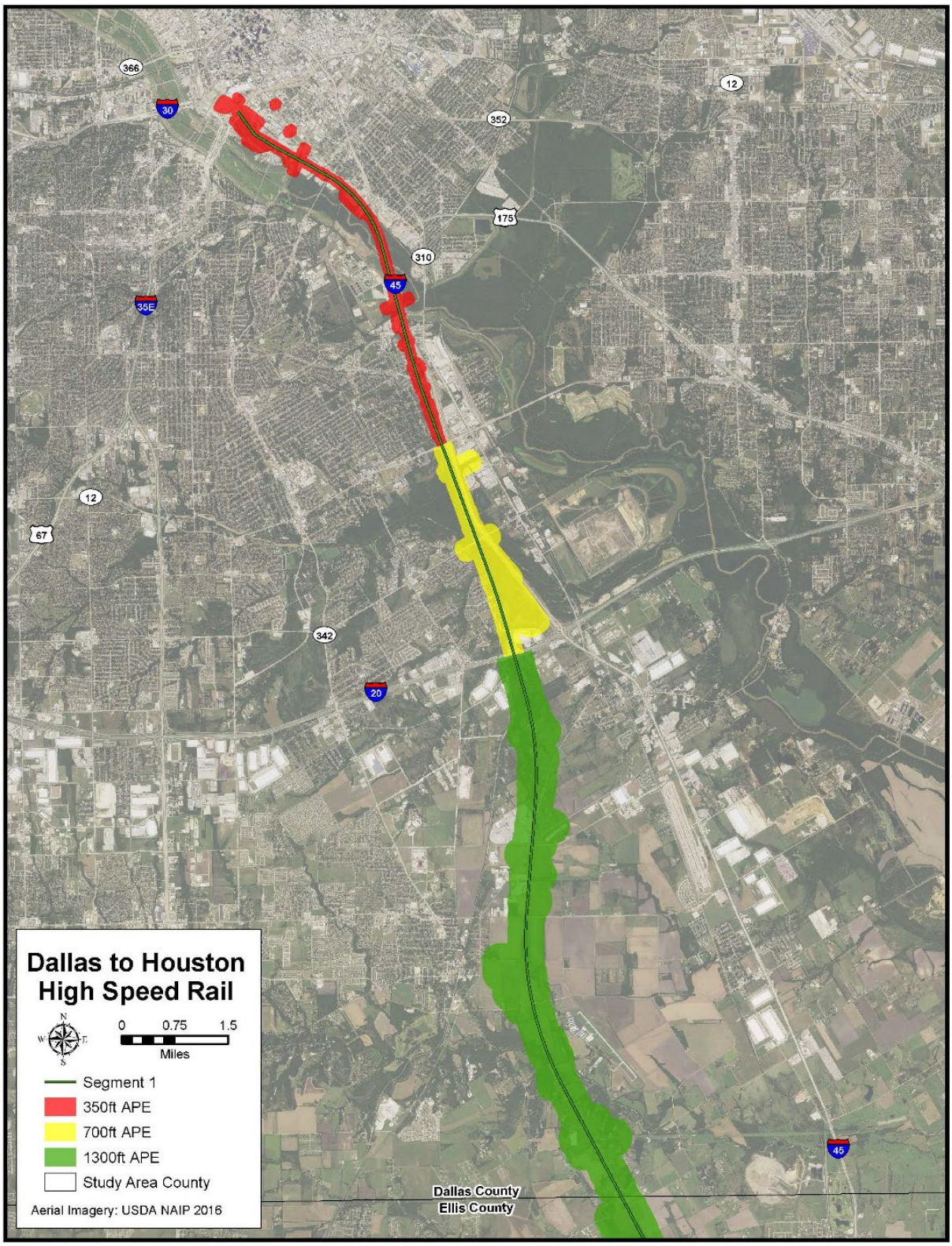
3.19.4.2.1 Dallas County

Historic Resources

The development along Segment 1 in Dallas County includes urban, suburban and rural settings, with an associated APE for historic resources that varies in width from 350 feet to 700 feet to 1,300 feet. **Figure 3.19-1** illustrates the variable APE within Dallas County. Survey conducted in 2016 and 2019 found a total of 269 historic resources (located on 217 sites) are within the historic resources APE in Dallas County. The historic resources include domestic, agricultural, industrial, transportation, government, educational, funerary, commercial and religious property types.

Following the field investigations in Dallas County, an interim report was submitted to the THC in July 2017 and an addendum to the interim report was submitted in August 2019. In March 2020 one intensive level report was also submitted to the THC. Of the historic resources within the Dallas County APE, 266 historic resources (located on 215 sites) were documented and evaluated for listing in the NRHP. The remaining three historic resources (located on two sites) were not evaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the three unevaluated historic resources were found to have a low potential for NRHP-eligibility.

Figure 3.19-1: Dallas County Variable Historic Resources APE



Source: AECOM 2019

Of the evaluated historic resources, two historic resources (located on two sites) are listed in the NRHP and 24 historic resources (located on 18 sites) were found to retain sufficient integrity to convey significance and to be considered historic properties eligible for the NRHP. The remaining 240 evaluated historic resources (located on 196 sites) were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. FRA, in consultation with the THC, determined these 240 historic resources were not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

As required by the PA, field verification of historic resources not recorded in the field will be conducted prior to construction. The results will be included as addenda to the interim report. Determinations for historic resources identified in Dallas County during these investigations are included in **Appendix E, Cultural Resources Technical Memorandum**. Brief descriptions of the 26 NRHP-listed and eligible historic properties are provided below.

DA.009 (Residence at 1300 Powhattan Street): ***NRHP-eligible***

Site DA.009 contains one domestic single-family dwelling constructed in 1906 with Queen Ann/Colonial Revival stylistic influence. The building is not present on the 1905 Sanborn Fire Insurance Map, but the *Worley's Dallas City Directory* from 1911 lists Julius Yonack at this property and his brother, Jacob, at the house next door (Site DA.010), which is still extant. Review of the *Dallas Morning News* archives found the brothers were local developers working under the firm name of Yonack Bros, and in 1906, the firm advertised the two dwellings (DA.009 and DA.010) as two newly constructed cottages for sale (*Dallas Morning News* July 15, 1906). At the time the historic resource was constructed, this area of Dallas was a part of the densely populated residential neighborhood known as the Cedars. Residential development in this area began as early as the 1870s and became an enclave for wealthy Jewish merchants of Dallas.[24] However, most of the dwellings were demolished between the 1920s and 1970 to make way for commercial and industrial properties, and private residential properties from the early 1900s are now uncommon in this area of Dallas.

The 1.5-story dwelling has a complex hipped and gabled roof with clipped gable ends and a hipped dormer. An interior brick chimney is visible near the center of the roof. The building is clad with horizontal wood siding. The façade exhibits a full-width porch with a shed roof that wraps around to the northeast elevation and is supported by seven full-height, fluted pillars with Ionic capitals. The porch shelters a recessed, centrally located primary entry consisting of a glazed wood door with transom and sidelights. A secondary entrance is located at the northeast side of the porch and contains a six-panel wood door with transom. Windows are 1/1 wood sash units. A circa 2007 two-car garage with a front-facing gable roof and overhead door is also located on the site. The historic resource retains integrity of location, design, materials, workmanship and feeling. Integrity of setting and association was diminished as a result of the loss of similar residential historic resources in the surrounding area.

Resource DA.009 was previously evaluated during a survey conducted for the City of Dallas and was determined eligible for listing in the NRHP under Criteria A and C for its association with community development in south Dallas and as a good example of a transitional Queen Ann style residential building. The THC concurred with the determination in September 1990. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary.

During the current investigation, Resource DA.009 was re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined

[24] Doty M. 2012, *Lost Dallas*. Acadia Publish, Charleston, South Carolina.

Resource DA.009 remains eligible for listing in the NRHP under Criteria A and C. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.010 (Residence at 1214 Powhattan Street): ***NRHP-eligible***

Site DA.010 contains one domestic single-family dwelling constructed in 1905 with Queen Ann/Colonial Revival stylistic influence. According to research, a dwelling was present at this location on the 1905 Sanborn Fire Insurance Map, and similar to Site DA.009, the *Worley's Dallas City Directory* from 1911 lists Jacob Yonack at this property and his brother, Julius Yonack, at the house next door. This was the second of two dwellings the brothers and local developers under the firm name of Yonack Bros, advertised for sale in 1906 (*Dallas Morning News* July 15, 1906). The property was part of the Cedars neighborhood, where private residential properties from the early 1900s are now uncommon in this part of Dallas.

The 1.5-story dwelling has a complex hipped and gable roof with clipped gable ends and a hipped dormer. Two interior brick chimneys are visible, one near the center of the roof and one to the northeast. The building is clad with horizontal wood siding. The façade exhibits a full-width porch with a shed roof that wraps around to the northeast elevation and is supported by seven full-height, fluted pillars with Ionic capitals. The porch shelters a recessed, centrally located primary entry consisting of a glazed wood door with transom and sidelights. A secondary entrance is located at northwest side of the porch and contains a six-panel wood door with transom. Windows are 1/1 wood sash units. The historic resource retains integrity of location, design, materials, workmanship and feeling. Integrity of setting and association was diminished as a result of the loss of similar residential historic resources in the surrounding area.

Resource DA.010 was previously evaluated during a survey conducted for the City of Dallas and was determined eligible for listing in the NRHP under Criteria A and C for its association with community development in south Dallas and as a good example of a transitional Queen Ann style residential building. The THC concurred with the determination in September 1990. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary.

During the current investigation, Resource DA.010 was re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource DA.010 remains eligible for listing in the NRHP under Criteria A and C. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.016 (former KIXL Studios): ***NRHP-eligibility Potential***

Site DA.016, located at 1401 South Akard Street., contains one commercial building constructed ca. 1945 (Resource DA.016). The building is the location of the former KIXL Studios, an AM/FM radio station that operated from 1947 to 1972 and is currently the Frederica Chase Dodd Life Development Center. Frederica Chase Dodd was the founder of the Dallas chapter of the African American sorority Delta Sigma Theta in 1926.

The historic resource, DA.016, is a one-story, brick clad, commercial building with a flat roof and a rectangular plan. Horizontal bands of brick detailing are present near the cornice. The façade exhibits an offset, recessed single door entry with a modern brick hood that tappers to the ground. Flanking the entry are modified window openings with paired fixed units. Cloth awnings top all of the façade windows. Decorative brickwork consisting of a square pattern is located below the window to the south of the entry. The northeast elevation exhibits two single door entries and enclosed window openings. The right side of the façade exhibits a pair of wood-frame, fixed-pane windows. The historic resource

retains integrity of location; however, integrity of design, materials, workmanship, setting, feeling and association has been diminished by modifications to the windows and doors, and changes to the surrounding landscape, including loss of adjacent buildings and modern construction.

Based on this investigation, FRA, in consultation with the THC, determined intensive-level research is needed to determine the NRHP eligibility of Resource DA.016. However, the Project would have no impact on this property, and it was determined the historic resource will be treated as potentially eligible for listing in the NRHP. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.022 (Chase Bag Company): ***NRHP-eligible***

Site DA.022, located at 1111 South Lamar Street, contains the Chase Bag Company building constructed in 1928 with Neo-Classical stylistic influence (Resource DA.022). The building façade faces South Lamar and the rear of the building faces Austin Street. At the time the historic resource was constructed this area of Dallas was in a period of transition, with commercial and industrial development moving south from the city center. Research conducted during this investigation found the building was designed and constructed by the Lindsley-Munn Construction Company of Dallas for the Chase Bag Company. The company was described as the "oldest concern of its kind in the country" and was expected to bring 150 new jobs to Dallas (*Dallas Morning News* March 23, 1928). Still visible on the building, although faded, is the company name, 'CHASE BAG COMPANY', near the top of the northwest elevation. Local architect, Clyde H. Griesenbeck, was contracted to design additions to the building in 1947, 1948 and 1950.[25] Review of Sanborn maps and historic aerials show the additions were constructed to the southeast elevation and did not alter the footprint of the primary building.

Resource DA.022 is a brick, two-part commercial block building with a flat roof and rectangular plan. The building is divided into two sections, including a two-story, five-bay wide and three-bay deep section facing northeast along South Lamar Street. The second section of the building is to the southwest and consists of a one-story with pop-up that is 3 bays wide and 10 bays deep, facing Austin Street. It appears the two-story section was used as office space and a café for employees, while the one-story with pop-up was used for manufacturing purposes.

The two-story façade, facing South. Lamar Street, is symmetrical and exhibits decorative brickwork and cast stone details that provide the building with minimal Neo-Classical stylistic influence. The five bays of the façade are separated by engaged pilasters. The roofline and pilasters are capped with cast stone coping. Each pilaster extends slightly above the roofline, providing a sense of a defensive parapet, and exhibit cast-stone corner blocks near the top and bottom. Brickwork at the top of each bay and between the two floors emphasizes the corner block pattern of the pilasters.

Windows at the façade are single, paired and ribbon (3 and 4 unit) 1/1 wood sash. The fenestration pattern at both the first and second floors is 2, 2, 4, 1, 3, 1, 4, 2, 2. Windows on the first floor are covered with corrugated plastic panels; however, the original windows appear to be intact beneath the covering. The central bay of the façade is flanked by paired pilasters that contain single door entries. The two entrances exhibit replacement doors, but it appears that the original wood-frame has been retained. Above each door is a single-light transom. The doors and transom are topped by round arches with cast stone keystones. The single window opening located at the second floor of each entry also exhibit cast stone keystones. Brick detailing with a basket weave pattern is present in the space above the arched entries and the single window openings. The northwest and southeast elevations of the two-

[25] Public Library, 2016 "Clyde H. Griesenbeck Architectural Drawings." Dallas Public Library, Dallas History & Archives. Electronic document, https://dallaslibrary2.org/dallashistory/archives/09402.php (accessed October 2016).

story section of the building exhibits three-part windows, three at each floor, consisting of 6/6 flanked by 8/8 steel sash units.

The one-story section with pop-up has a loading dock along the southeast elevation. Windows along the northwest and southeast elevations appear to be similar to the steel sash units of the two-story section. Windows also line the northwest and southeast elevations of the pop-up, which provide natural light into the manufacturing facility. Although some deterioration is evident and the doors at the façade were replaced, the historic resource retains integrity of location, as well as a good degree of design, materials and workmanship. A review of historic aerial photograph shows the building generally retains its original footprint. The original brick and cast stone details are intact, as well as the majority of original windows on all elevations of the building. Integrity of setting and feeling has also been mostly retained, as this area was and has been a developing commercial and industrial part of the city since the building's construction. Integrity of association was somewhat diminished by the building's change in use.

Based on the current investigation, Resource DA.022 retains sufficient integrity of location, design, setting, materials and feeling, to be recognizable to its period (1920s to 1930s) and original function as a light industrial manufacturing facility. Furthermore, commercial and industrial development in south Dallas during the early twentieth-century was important to the outward growth of Dallas, and the construction of the Chase Bag Company Building was significant to this theme during this time period.

FRA, in consultation with the THC, determined Resource DA.022 is eligible for listing in the NRHP under Criterion A for its association with the development of south Dallas as a light industrial and commercial center and Criterion C as a good example of an early twentieth-century light industrial manufacturing facility with minimal Neo-Classical detailing in south Dallas. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.023 (Cadiz Street Overpass and Underpass): ***NRHP-eligible***

Site DA.023 consists of the Cadiz Street Overpasses and Underpasses (Resource DA.023) located near the intersection of Cadiz Street and Austin Street. The structures were constructed by the Works Progress Administration (WPA) in the 1930s, and feature arches between the piers along the balustrade. The historic resource retains integrity of location design, setting, materials, workmanship, feeling and association.

Resource DA.023 was previously evaluated during a survey conducted by TxDOT in 2004, as part of the significance under Criterion C, for Engineering as a good example of a transportation property in Dallas constructed during the 1930s with the assistance of the WPA. The THC concurred with the determination in 2004.

During the current investigation, Resource DA.023 was re-evaluated. No new information was identified during the current survey to dispute the previous determination. Therefore, FRA determined Resource DA.023 remains eligible for listing in the NRHP under Criterion C, and is also eligible for listing in the NRHP under Criterion A. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC at the 30-60-90 percent design stages as requested by the THC in the concurrence letter dated August 25, 2017, **Appendix E, Cultural Resources Technical Memorandum**. The boundary for the historic property was determined to include both associated railroad bridges, stairways, retaining walls, guardrails and decorative elements. The historic resource is located within the LOD of Segment 1 in Dallas County.

DA.024a-b (Cadiz Pump Station): ***NRHP-eligible***

Located on Cadiz Street, the site consists of two buildings, one constructed in ca. 1915 (Resource DA.024a) and one constructed ca. 1930 (Resource DA.024b). The buildings are associated with the Cadiz Pump Station. Utility plants such as this were instrumental in handling growth and development as the population of Dallas increased and the city expanded.

Resource DA.024a is a two-story, brick clad building with Neo-Classical stylistic influence. The cornice exhibits a concrete band below the parapet. The main roof is topped with a rectangular hipped roof pop-up with a clerestory window. The northwest and southeast elevations exhibit arched window and overhead door openings on the first story. Located near the roofline are 10-light, wood sash windows with concrete lintels and sills. A smokestack rises from next to the northwest elevation of the building. The historic resource retains integrity of location, design, setting, materials, workmanship, feeling and association.

Resource DA.024b is a two-story building with an L-plan, a flat roof, red-brick cladding and concrete details. The building is set to the northwest of Resource DA.024a, and has a prominent central entry with a flat concrete door surround. The historic resource retains integrity of location, design, setting, materials, workmanship, feeling and association.

Resources DA.024a-b were previously evaluated during a survey conducted by TxDOT in 2004, as part of the Pegasus project. The historic resources were determined eligible for listing in the NRHP at the local level of significance under Criterion A as an event that is of civic importance in the development of Dallas. The historic resources were also determined eligible for listing in the NRHP under Criterion C for architecture, as two excellent examples of municipal buildings with Neo-Classical stylistic influence. The THC concurred with the determinations. The boundary for the NRHP-eligible properties was determined to be the legal parcel boundaries.

During the current investigation, Resources DA.024a-b were re-evaluated. No new information was identified during the current survey to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resources DA.024a-b remain eligible for listing in the NRHP under Criteria A and C. These historic resources are within the historic resources APE of Segment 1 in Dallas County, but are not located within the LOD.

DA.028 (Dallas Coffin Company): ***NRHP-listed (Contributing Resource to Local, City of Dallas Designated Sears Complex Historic District)***

Site DA.028 consists of the Dallas Coffin Company building constructed in 1911 (Resource DA.028). The five-story office building was designed by the prominent architectural firm C.W. Bulger and Son. The firm also designed Dallas' first skyscraper, the 1906 Praetorian Building. The Dallas Coffin Company ceased operation in June 1950, and the company's land and buildings were offered for sale. The Reserve Life Insurance Company leased the building from 1952 to 1958. In 1960, Sears purchased the building, renamed it the Annex Building, and used it to house the Supply Department. Sears ceased operations in the building ca. 1993, and in ca. 2010, the building was bought and converted to a boutique hotel.

The structural frame of the building is reinforced, poured-in-place concrete. The facade exhibits five bays separated by four projecting pilasters with the main entrance located on the first floor of the middle bay. The façade exhibits a parapet with a pediment-shaped mid-section. Decorative buff brick details and a partial row of red brick corbelling are exhibiting along the cornice. The entrance was altered with a black marble surround in the 1960s but was restored to its original configuration in 2012. It now exhibits three original arched openings with a center entry flanked by two windows. The entrance

consists of a replacement metal-frame double door and replacement 2-part fixed windows. All of the other windows on the façade and southeast and northwest elevations are replacement 6/6 vinyl sash units. The rear elevation is the only side of the building that exhibits original wood sash windows with 6/1 and 6/6 units. The historic resource retains integrity of location, design, setting, materials, workmanship, feeling, but does lack integrity of association due to the change in use.

Resource DA.028 was previously listed in the NRHP in May 2012 under Criteria A and C in the areas of industry as an intact example representing the development of a commercial center in the area south of the Dallas Central Business District in the early twentieth-century. The building is also listed under Criterion C in the area of Architecture as an excellent local example of the use of reinforced concrete in industrial construction and represents changing stylistic attitudes in commercial building design in the early twentieth-century. The building was also determined to be a contributing historic resource to the local, City of Dallas designated Sears Complex Historic District.

During the current investigation, Resource DA.028 was re-evaluated. No new information was identified to dispute the NRHP listing of the historic resource. Therefore, FRA, in consultation with the THC, determined Resource DA.028 remains eligible for listing in the NRHP under Criteria A and C. The historic resource and City of Dallas Historic District are within the historic resources APE of Segment 1 in Dallas County, but are not located within the LOD.

DA.029, DA.030 and DA.031 (Sears Roebuck and Company Catalog Merchandise Distribution Center Historic District): ***NRHP-eligible Historic District***

Sites DA.029, DA.030 and DA.031 are historically and functionally related through association with the development and operation of the Sears Roebuck and Company Catalog Merchandise Distribution Center in Dallas. The Dallas distribution center, which opened in ca. 1915, was the first such Sears operation located outside Chicago. The Sears Company discontinued its catalog business in 1993, and the Dallas location was sold.

FRA, in consultation with the THC, determined the district is eligible for listing in the NRHP at the local level of significance under Criterion A for its association with commerce and Criterion C for architecture. The district boundary includes the parcels on which Sites DA.029, DA.030 and DA.031 are located. Each of the three sites included in the historic district are discussed below, individually. The entire district is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.029 (Dining Hall): ***Individually NRHP-eligible and a Contributing Resource to Historic District***

Site DA.029, located at 1401 South Lamar Street, consists of the Dining Hall Building, located within the Sears Complex Historic District (Resource DA.029). Research indicates the historic resource was used as the Office Sales Department for Sears early after its construction. However, the Sanborn map from 1921 labels the building as the 'Employee Club House' and other sources refer to the building as the 'dining hall'.

Resource DA.029 is a 1.5-story building with stylistic details of the Prairie style of architecture. The building has a wide, low-pitched hipped-roof covered with composition shingles. Overhanging eaves have a geometric linear pattern on the underside. The exterior walls are clad with variegated brown brick and have cast stone accents. A thin horizontal band of cast stone runs along the cornice with a course positioned in a soldier row. The entry is recessed and contains a double, glazed wood door, and is sheltered within an integrated partial width porch. The porch is open to the street and is accessed by a steep flight of concrete stairs with brick entry piers capped with cast stone.

The mid-section of the façade is dominated by a horizontal row of single 1/1 windows on the first level. Characteristic horizontal decorative emphasis is exhibited by the contrast of thick buff-colored cast-stone window sills set against the dark brown brick. Engaged brown brick pilasters separate each unit and have a raised geometric brick detail near each center. The basement level exhibits horizontal emphasis through a row of paired, fixed windows with cast stone sills and a soldier course of brick at the lintel. The windows on the far-right side of the basement level appear to be enclosed or otherwise modified with brick that is not original.

The east elevation exhibits a design similar to the façade and contains a secondary entrance similar to the primary entrance flanked by solid cast stone brackets under the eave. The west elevation exhibits a wide, exterior brick chimney on the right side and a series of single 1/1 wood-frame windows. The historic resource retains integrity of location, design, materials and workmanship, but exhibits diminished integrity of setting, feeling and association due to loss of association with the Sears Catalog building (Resource DA.030) as an employee dining hall.

Resource DA.029 is a good, intact and rare example of an early twentieth-century Prairie style building in southeast Dallas. The historic resource exhibits minimal modifications and sufficient architectural design merit to qualify for NRHP eligibility under Criterion A for its association with commerce and Criterion C for architecture at the local level. The building was also previously determined a contributing historic resource to the local, City of Dallas designated Sears Complex Historic District.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource DA.029 is individually eligible for listing in the NRHP under Criteria A and C, and is a contributing historic resource to the NRHP-eligible Sears Roebuck and Company Catalog Merchandise Distribution Center Historic District. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center): ***Individually NRHP-eligible and Contributing Resource to Historic District***

Site 030 contains the Sears Roebuck and Company Catalog Merchandise Distribution Center constructed in 1915 (Resource DA.030). The Dallas warehouse and distribution center was the first such Sears operation located outside Chicago. Train tracks run along the rear of the parcel and were the means of shipping and transfer of goods for this operation. The Dallas plant was eventually so successful that Sears opened similar operations in Seattle, Philadelphia and Boston. The site consists of one commercial building set back on the site with a paved parking lot in the front. A 1916 addition is located to the left front of the site along the street.

The building was designed by the renowned Dallas architecture firm of Lang and Witchell. The firm was responsible for a large number of notable buildings built in Dallas during the early twentieth-century that are now listed in the NRHP. Examples of Lang and Witchell buildings in Dallas include the Dallas Power & Light Building, the Lone Star Gas Company Headquarters Building, the Sanger Brothers Department Store, the Fair Park Music Hall, the Southland Life Building, Conrad Hilton's first hotel and numerous homes in Highland Park and along Swiss Avenue.

The Sears Company discontinued its catalog business in 1993 and the building was sold. It is currently used as a multi-family residential condominium complex. The historic resource is the main building comprising the City of Dallas Landmark – Sears Complex Historic District. The brick clad building is nine-stories with a basement level exhibiting block massing and has an irregular plan and a flat roof. Construction of the building was completed in five stages with additions in 1916, 1925 and 1927. After the 1916 addition, the distribution center building was 1.5 million square feet in size encompassed

within an approximately 18-acre parcel. The original building had a plan that was generally rectangular with an asymmetrical façade. Overall, the building exhibits stylistic elements of the Prairie style such as strong horizontal lines with the geometric ornamentation reflecting the work of Louis Sullivan.

An eight-story addition is located on the left side of the building along the sidewalk and was designed by Lang and Witchell. Two of the floors were constructed in 1925 and the remaining 6-stories were added at a later date. The façade is symmetrical and contains a central entry flanked by five sets of window openings alternating between 12 brick pilasters. The entry opening contains two pairs of wood doors with full glass inserts topped by two, 5-light transoms. The entry is enframed by a concrete surround topped with a pediment. Historic photographs show the pediment once held lettered signage no longer extant. The entry is flanked by 3-part display windows topped with 3-part transoms.

Resource DA.030 retains a high degree of integrity of location, design, setting, materials and workmanship, but its integrity of feeling and association is somewhat diminished by the change from commercial to residential use. The building is still easily recognizable as an early twentieth-century commercial structure. Considering the monumental scale of the historic resource, there are few visible modifications to design, materials and workmanship. Visible modifications consist primarily of a small number of replacement windows on the first level of the façade and southeast elevation and several replacement doors along the first level of the west elevation. The current owners have maintained the building and it is in good physical condition.

Resource DA.030, the Sears Catalogue Merchandise Distribution Center, was a major commercial force in Dallas during the majority of the twentieth-century. The building served as a regional center for transfer of merchandise for one of the largest retailers in the country throughout its period of significance, from ca. 1915 to 1993, when the property was sold. The historic resource is significant as the location of Sears' first catalog and mail order operation outside the Chicago company headquarters, as well as the first location of a Sears retail store outside Chicago following the 1925 addition along Lamar Street. The selection of Dallas as the location of the second catalog and mail order outlet in the country allowed this important service to reach American consumers throughout Texas, as well as the south and southwest. A 1910 *Dallas Morning News* article quoted Dallas leader, George B. Dealey stating "…it means a great deal for Dallas to be selected as the logical point for such a concern. This structure is builded [*sic*] for years to come and indicates that those who have fostered the business of a great concern have faith in the continued prosperity and growth of Dallas" (*Dallas Morning News* 25 September 25, 1910). The eventual size and scale of the Sears operation in Dallas influenced the city at a local level and was a major economic presence, as well as a major Dallas employer for almost 100 years.

Resource DA.030 illustrates significance for its association with development of commerce in Dallas during the twentieth century and specifically for its importance in development of the catalog and mail order business throughout the southwest and qualifies for NRHP eligibility under Criterion A. The historic resource also retains architectural design merit, as a commercial building designed by the prominent Dallas architecture firm of Lang and Witchell and qualifies for NRHP eligibility under Criterion C. The building was also previously determined a contributing historic resource to the local, City of Dallas designated Sears Complex Historic District.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource DA.030 is individually eligible for listing in the NRHP under Criteria A and C, and is a contributing historic resource to the NRHP-eligible Sears Roebuck and Company Catalogue Merchandise Distribution Center Historic District. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.031 (Sears Roebuck and Company Furniture Warehouse Complex): ***NRHP-eligible as a Contributing Resource to Historic District***

Site DA.031, located at 710 Belleview Street, consists of one commercial historic resource (Resource DA.031). A 1948 *Dallas Morning News* article states the original building on the site was constructed as a 300,000 square foot warehouse for Sears to "…serve the retail and mail order units of the company" (*Dallas Morning News* April 25, 1948). The original portion of the building is located at the northwest end of the current building. The building was designed by prominent twentieth-century Dallas architect George Dahl who designed and oversaw the planning and construction of the structures at the 1936 Texas Centennial Exposition.

Resource DA.031 is part of the original red brick-clad warehouse building constructed ca. 1948 for the Sears Roebuck Company. The building has a flat roof and an irregular plan with 1- and 2-story sections. The roofline exhibits concrete coping and the exterior walls have minimal surface ornamentation. The southeast end of the building was partially demolished in ca. 1972, and a larger addition was constructed. The northeast elevation exhibits a row of 24 window openings along the first-story. The openings contain two-part, metal-frame units that may be replacements. These are followed by a second row of 15 square continuous window openings farther east. Units in these opening could not be observed. Aerial photographs show three additional rows of continuous, square windows extend east along the north elevation. The west elevation contains a loading dock with multiple garage bay openings with concrete surrounds painted white. The south elevation has a long, continuous row of 10-light, steel sash windows with a central hopper. A basement level exhibits a similar row of windows. The east end of this elevation appears to contain additional loading door areas and an additional row of steel-frame hopper windows. The ca. 1972 extension is 5-stories and dwarfs the older section of the building. The historic resource retains integrity of location, but lacks integrity of design, materials and workmanship due to the partial demolition of the original building and the construction of the ca. 1972 addition. Integrity of setting, feeling and association has also been somewhat diminished by the modifications.

Resource DA.031 does not retain sufficient integrity to individually convey association with significant events or pattern of development, nor does it retain sufficient architectural design merit to be individually significant for its architecture. Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource DA.031 is not individually eligible for listing in the NRHP under Criteria A through D, but collectively with Resources DA.029 and DA.030, Resource DA.031 is eligible for listing in the NRHP as a contributing historic resource to the NRHP-eligible Sears Roebuck and Company Catalogue Merchandise Distribution Center Historic District. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.041 (Sigel's Liquor Store): ***NRHP-eligible***

Site DA.041 consists of the former Sigel's Liquor Store building constructed in 1949 (Resource DA.041). The building is one-story with a flat roof and rectangular plan that exhibits Art Moderne stylistic elements. The building is four bays wide and three bays deep. The exterior walls are clad with buff brick. At the northwest bay of the façade the brick is laid in a dogtooth pattern. The asymmetrical façade exhibits a double, glass door entrance and ribbon of enframed metal store-front windows that wrap onto the southeast elevation. A secondary single door entrance with transom is exhibited on the south elevation but is boarded over. A metal cornice with a fluted pattern wraps around the façade and is topped by a metal awning that follows the curve of the building. Original fluorescent lights are extant beneath the soffit. Three square window openings with brick sills are located at the northwest bay of the façade and appear to be intact. A mid-height brick planter extends beneath the windows. The historic resource retains integrity of location, setting, design, workmanship and feeling, but its integrity

of materials and association is somewhat compromised due some material replacements and the historic resource's abandonment.

Although Resource DA.041 exhibits some material modifications, the historic resource retains sufficient integrity of location, design, setting, design, workmanship and feeling, to be recognizable to its period (1940s-1950s) and original function as a commercial business constructed in the Art Moderne style of architecture in south Dallas.

FRA, in consultation with the THC, determined Resource DA.041 is eligible for listing in the NRHP under Criterion C. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.048 (Oak Cliff Box Company): ***NRHP-eligible***

Site DA.048, located at 1212 Riverfront Boulevard, consists of an industrial property constructed in 1945 (Resource DA.048). Research conducted for this investigation found the building was constructed by the Blake Company and described as a "…gift manufacturing concern…" (*Dallas Morning News* July 24, 1949). In 1949, Kenneth Carter and his five brothers bought the Blake Company and founded Carter Craft Inc., making brass giftware. The Carters constructed the attached brick addition in 1950, and by 1951 they had the building for lease. By 1952, the company moved their operations to Plano, Texas, and leased the building to the Oak Cliff Box Company after their building at 1103 Riverfront burned in a fire in 1951 (*Dallas Morning News* September 2, 1951; *Dallas Morning News* October 17, 1951).

Resource DA.048 is a one-story building with a flat roof and irregular plan. The exterior walls of the original building exhibit smooth concrete blocks and elements of the Art Moderne style of architecture. The façade contains broad sections with a main entry opening on the southeast bay. The opening contains a single metal replacement door with a broad concrete surround with rounded concrete trim. Concrete steps with an undulating design lead from the sidewalk to a second set of square concrete steps, which terminate at the entry. Northwest of the entrance, a single bay projects from the façade and exhibits an original full-width, glass block window through the mid-section of the wall. The end bays also exhibit glass block windows. Southeast of the original building is a two-story addition with a flat roof that is clad with buff brick. The addition is recessed and exhibits a loading dock and driveway along the façade. The façade exhibits a single-entry door with a replacement flush unit and three overhead doors. The second story contains a row of 9-light, steel sash windows. A broad horizontal band of concrete blocks and rounded concrete coping is present at the cornice. The historic resource retains integrity of location as well as a good degree of design, materials, workmanship, setting, feeling and association.

Resource DA.048 was previously evaluated during a survey conducted by TxDOT in 2009, as part of the Trinity River Parkway Corridor project. The historic resource was determined eligible for listing in the NRHP under Criterion C for architecture at the local level of significance. The THC concurred with the determination. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary.

During the current investigation, Resource DA.048 was re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource DA.048 remains eligible for listing in the NRHP under Criterion C. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.056 (Corinth Street Underpass and Overpass): ***NRHP-eligible***

Site DA.056 is the Corinth Street Underpass and Overpass (Resource DA.056), which carries railroad traffic to allow the flow of traffic along Corinth Street. According to a plaque embedded in the concrete railing, the historic resource was constructed in 1932 and designed by engineers Rollins and Clinger and noted Texas bridge engineer, F.D. Hughes. The bridge was constructed of poured concrete and feature arches between the piers along the balustrade. The southern bridge carries nine tracks, while the tracks of the northern bridge were removed. Two lanes of traffic flow below the structure. Concrete stairs for pedestrian access are located at the north end of the bridge. The historic resource retains integrity of location design, setting, materials, workmanship, feeling and association.

Resource DA.056 was previously evaluated during a survey conducted by TxDOT in 2009, as part of the Trinity River Parkway Corridor project. The historic resource was determined eligible for listing in the NRHP at the local level of significance under Criterion A, for significance in community planning and development in Dallas during the 1930s, and under Criterion C as a good example of a transportation property in Dallas constructed during the 1930s. The THC concurred with the determination. The boundary for the NRHP-eligible property was determined to include both bridges, the stairways, retaining walls, guardrails and decorative elements.

During the current investigation, Resource DA.056 was re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource DA.056 remains eligible for listing in the NRHP under Criteria A and C. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC at the 30-60-90 percent design stages as requested by the THC in the concurrence letter dated August 25, 2017 located in **Appendix E, Cultural Resources Technical Memorandum**. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.072 (Dallas Floodway Historic District): ***NRHP-eligible***

Site DA.072 consists of the Dallas Floodway Historic District located along the Trinity River in Dallas (Resource DA.072). The district encompasses 3,554.20 acres and consists of essential physical features of the historic Trinity River Flood Control System, including levees, diversion channels, overbank areas and structures associated with flood control. The district was previously evaluated as part of the Trinity River Corridor Project EIS prepared for FHWA and TxDOT and determined eligible for listing in the NHRP under Criterion A for community development and planning. The THC concurred with this determination in a letter dated March 26, 2013.

During the current investigation, Resource DA.072 was re-evaluated, but has not been recorded in the field. The literature review and background research conducted for the historic resource did not identify new information to dispute the previous determination. Based on these results, FRA, in consultation with the THC determined the historic district remains eligible for listing in the NRHP under Criterion A. The majority of the district is located outside the historic resources APE of Segment 1 in Dallas County; however, less than one acre along the Santa Fe Railroad, as well as the Belleview Pressure Sewer (a contributing element to the Historic District), are within the LOD.

DA.076a-b (Guiberson Corporation): ***NRHP-eligible***

Site DA.076, located at 1000 Forest Avenue, consists of eight historic resources (Resources DA.076a-h) constructed from 1928 through 1988, including a former Machine Shop (Resource DA.076a) and one domestic dwelling (Resource DA.076b). The historic resources are located on the site of the Guiberson Corporation, an oil and gas industry machine tooling company founded in 1919 by Samuel Guiberson.

The company was bought by the Dresser Corporation, which is still in Dallas, but the site is operated currently by the Faubion Corporation.

Resource DA.076a is a one-story industrial building that was the former Machine Shop for the Guiberson Corporation. The building has a rounded roof and is of concrete block construction. The building exhibits angled roofs with clerestory windows. The historic resource retains sufficient integrity of location, design, feeling, setting, materials and workmanship to convey its association with the Guiberson Corporation.

Resource DA.076b is a two-story, free-standing building with an L-plan and flat roof. The façade is clad with red brick and cast stone accents. The symmetrical façade exhibits a central entry sheltered by a brick porte-cochere that projects from the center of the facade. The porte-cochere is flanked by four single rectangular window openings with decorative brick arches with keystones on the lower level. Similar windows are exhibited on all elevations. All window openings on the building were enclosed. The cornice exhibits a double cast stone band around the entire building and all corners exhibit cast stone quoins. The same cast stone details are exhibited on the porte-cochere, which also has a keystone over the front opening. Research indicates that this building served as Guiberson's residence, as well as the company office. The historic resource retains sufficient integrity of location, design, feeling, setting, materials and workmanship to convey its association with the Guiberson Corporation.

The remaining historic resources (Resources DA.076c-h) include several support buildings. These buildings were constructed between ca. 1920 and post-1965 that exhibit various plans and materials.

Resources DA.076a-h were previously evaluated during a survey conducted by TxDOT in 2009, as part of the Trinity River Parkway Corridor project. The site was determined significant for its association with the Guiberson Corporation from 1926 to 1956. Two of the historic resources were found to retain sufficient integrity to convey significance for association with the Guiberson Corporation (Resources DA.076a-b of this investigation) and were determined eligible for listing in the NRHP at the local level of significance under Criterion B. The remaining historic resources on the site were found to lack significance and/or integrity to meet the criteria for NRHP eligibility. The THC concurred with the determination. The boundary for the NRHP-eligible properties was determined to include the building footprints and immediate surrounding area of Resources DA.076a and DA.076b.

During the current investigation, Resources DA.076a-b were re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resources DA.076a-b remain eligible for listing in the NRHP under Criterion B. Resource DA.076a is located within the LOD of Segment 1 in Dallas County.

DA.080a-e (Proctor and Gamble Complex): ***NRHP-eligible***

Site DA.080, located at 3701 South Lamar Street, consists of five historic resources associated with the former Procter and Gamble manufacturing facility, which is now a Dallas Independent School District storage facility (Resources DA.080a-e). The majority of the historic resources appear on the 1952 aerial photograph (Resources DA.080a-e). Resources DA.080f-g first appear on the 1968 aerial photograph and DA.080h first appears on the 1972 aerial photograph. Based on research and onsite observation, the estimated dates of construction are 1920 for Resources DA.080a-e, ca. 1965 for Resources DA.080f-g and ca. 1970 for DA.080h.

Resource DA.080a is an industrial factory building clad with brick that is 36 bays wide and seven bays deep. The building has a flat roof with parapet and stone or concrete coping. Square brick pilasters separate the bays on all elevations. Windows are a mix of fixed, hung, casement and awning metal sash

units. Most of the windows are large and multi-lite, with stone sills and concrete fascia lintels. Some windows on the southeast and southwest elevations have metal awnings. Loading bays on the ground floor on the northeast and southwest elevations have a concrete dock and overhead, metal rolling doors. A two-bay-wide projection on the northeast elevation is seven-stories tall and exhibits a glazed metal double door entrance. Some of the windows and doors were infilled with modern cementitious or fiberglass panels. An addition has been removed from the northwest elevation. A non-historic metal carport/canopy addition is located on the north corner of the southwest elevation. The historic resource retains sufficient integrity of location, design, setting, materials, workmanship, feeling and association.

Resource DA.080b is a concrete pad that previously held multiple cylindrical storage tanks. The tanks and pad are visible in aerial photographs from 1952 to 1989, but by the 1995 aerial photograph, the tanks had been removed. The historic resource does not retain integrity of location, design, materials, workmanship, feeling and association. The historic resource retains integrity of setting.

Resource DA.080c is a two-story building, four bays wide by five bays deep. The flat roof has a parapet with stone or concrete coping. The exterior is clad with brick, with brick pilasters at each elevation. A large section of the northwest elevation has non-historic brick infill and metal-clad shed additions. Windows are similar to those on Resource DA.080a—fixed, casement, awning and/or hopper units and stone lintels. The historic resource retains sufficient integrity of location, design, setting, materials, workmanship, feeling and association.

Resource DA.080d is a two to three-story industrial building. The flat roof has a parapet with stone or concrete coping. The exterior is clad with brick with brick pilasters on all elevations. Most of the windows are enclosed with brick, modern cementitious material, or plywood. Extant windows are large, multi-lite units. The historic resource has lost integrity of design, materials and workmanship, but retains integrity of location, setting, feeling and association.

Resource DA.080e is a cylindrical tank, constructed of riveted metal panels. Historic aerial photographs from 1952 to 1979 indicate there were six tanks, oriented in a row from southeast to northwest. By the 1995 historic aerial photograph, this was the only tank still extant. A shed roof addition is located on the north; it appears to be constructed of concrete masonry units, with a corrugated metal roof.

Resource DA.080f is a one-story brick structure with a flat roof, brick cladding and brick pilasters on all elevations. A metal-clad addition is located on the roof. The structure does not have windows, and the doors are a mix of single-entry glazed metal units and rolling overhead metal doors at the loading bays. The historic resource retains integrity of location, setting, design, materials, workmanship, feeling and association.

Resource DA.080g is a one-story guard shack that is one bay wide and one bay deep. The building has a flat roof with a concrete parapet and is clad with brick. The full-width windows are multi-lite with metal casements and stone sills. The historic resource is located on the northwest corner of the lot, near Lenway Street. The historic resource retains integrity of location, setting, design, materials, workmanship, feeling and association.

Resource DA.080h is a one-story guard shack that is one bay wide and one bay deep. The building has a hipped roof with clay tiles. The full-width windows are plate glass, with a metal frame, and two horizontal sliding sash units. The historic resource retains integrity of location, setting, design, materials, workmanship, feeling and association.

Site DA.080 was previously evaluated during a survey conducted by TxDOT in 2009, as part of the Trinity River Parkway Corridor project. During that survey, it was found the period of significance for the property was 1920 to 1960. Resources constructed during that period retained sufficient integrity to

convey historic and architectural significance, and they were determined eligible for listing in the NRHP under Criterion A for community and economic development and Criterion C for architecture, both at the local level of significance. The THC concurred with the determination. The NRHP boundary for the property was determined to be the existing parcel boundary.

During the current investigation, the historic resources on Site DA.080 were re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resources DA.080a-e remain eligible for listing in the NRHP under Criteria A and C. Of the historic resources on Site DA.080, Resource DA.080a is located outside the APE, although the remaining historic resources are within the historic resources APE of Segment 1 in Dallas County, but are not located within the LOD.

DA.082 (Honey Springs Cemetery): ***NRHP-eligible***

Site DA.082 consists of the Honey Springs Cemetery (also known as Bulova Cemetery, Queen's Cemetery, Coming Home Cemetery and Homecoming Cemetery) located at Bulova Street and IH-45 (Resource DA.082). The cemetery is believed to contain burials of slaves associated with the William Brown Miller plantation, as well as the Overton plantation. Both families were prominent early settlers of Dallas and are known to have owned several slaves. Miller is believed to have brought some of the first slaves to Dallas in the mid-1800s, which included three slave couples named John and Lucy, Arch and Charlotte and Clayton and Bettye (*Dallas Morning News* July 9, 1983). After Emancipation, the descendants of those buried at the cemetery continued to use the cemetery. The cemetery is also known to have served the community of Joppa, an African American community developed by former slaves after Emancipation. However, many of the graves are unmarked. A memorial wall constructed in ca. 2003 lists the names of 57 persons known to be buried at the cemetery, although it is not believed to be a complete account of the burials. The memorial wall indicates the cemetery was founded in 1872 and the earliest known burial is dated 1891, but the name is only indicated by four Xs.

The original boundaries of the cemetery are not well known, and documentation to confirm the extent of burial locations has been limited. The current cemetery boundary, as defined by the Dallas County Appraisal District records is split into two parcels, one containing 1.9 acres and one containing 2.0 acres. Records at the THC indicate the cemetery could contain 500 to 1,000 burials, meaning there are potentially 443 to 943 gravesites that have not been identified. Archival research found the cemetery does not appear on historic or modern topographic maps or other known historic maps. Deed research did not identify a plat map for the location, but did find that in 1894, W. P. Overton transferred two acres of land to the Coming Home Community for church and burial purposes (Dallas County Clerk 1894: Deed Book 167:204). No other deeds associated with the transfer of land to a cemetery for this location have been identified. Physical evidence of burials is also lacking, as most of the headstones are missing or may not have existed, and many that do exist are broken or fragmented. Despite the lack of boundary information, the historic resource retains integrity of location, setting, feeling and association. Integrity of design, materials and workmanship has been somewhat diminished by the loss of headstones, but many of the graves may not have contained headstones.

Although the integrity of Resource DA.082 is somewhat diminished, as a cemetery that potentially dates to the mid-1800s, the historic resource retains sufficient integrity to convey its historic significance and association with the early settlement of Dallas and the community development of south Dallas after Emancipation to qualify for listing in the NRHP under Criterion A. The historic resource also has the potential to yield information important to history and qualifies for listing in the NRHP under Criterion D. Cemeteries are not usually considered for listing in the NRHP but can be eligible if they meet Criteria Consideration D in conjunction with one or more of the four standard NRHP criteria.

Based on the results of the investigations conducted as part of an interim survey and intensive survey, FRA, in consultation with the THC, determined Resource DA.082 is eligible for listing in the NRHP under Criteria Consideration D and Criteria A and D at the local level of significance. The boundary for the NRHP-eligible property is in question and requires further investigation through field verification, archival research and oral history, and consultation with the THC will continue, as required by the PA. The historic resource is located within 150 feet of the LOD of Segment 1 in Dallas County.

DA.104 (Railroad Bridge at East Illinois Avenue): ***NRHP-eligible***

Site DA.104 consists of a railroad bridge over East Illinois Avenue, constructed in 1940 (Resource DA.104). The substructure is composed of monolithic, cast-in-place concrete bents with a curve at the top corners of the bents, as well as ziggurat-stepped corners and the bent ends. There are visible board form lines from the formwork on the bents. The superstructure is a composed of 13 steel built-up I-beams with riveted connections. The steel sidewalk cantilevers out from the I-beam structure and has a decorative Art Deco metal hand railing. One of the steel I-beams has a plaque identifying the I-beams as "Built By Bethlehem Steel Company 1940."

While the deck has been replaced, the substructure and the superstructure, including the I-beams, the cantilevered sidewalks and the metal railings, are intact and the character-defining features are still extant. The historic resource retains integrity of location, design, setting, materials, workmanship, feeling, and association. Resource DA.104 is an excellent example of an Art Moderne style bridge constructed by the Austin Bridge Company with I-beams manufactured by Bethlehem Steel.

FRA, in consultation with the THC, determined Resource DA.104 is eligible for listing in the NRHP under Criterion C at the local level of significance. The NRHP boundary for the property includes the full length of the bridge, the approach spans, guardrails and decorative elements. The historic resource is within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.110a-b (Smith Family Cemetery [DA.110a]): ***Not NRHP-eligible****; Linfield Elementary School [DA.110b]):* ***NRHP-eligible***

Site DA.110, located at 3820 East Illinois Avenue, consists of the Smith Family Cemetery (Resource DA.110a) and the Linfield Elementary School (Resource DA.110b). The Smith Family Cemetery is also known as the Smith/Kinnard Family Cemetery. The cemetery contains three known burials (Thomas M. Smith, William Kinnard and Howard Kinnard), the earliest burial dates to 1866; however, it is presumed that several unmarked graves are also located within the cemetery. The Smith Family Cemetery was designated an HTC by the THC in 2016. The second historic resource on this site is the former Linfield Elementary School (Resource DA.110b).

Resource DA.110a is a family cemetery dating from the 1860s. Three headstones remain in the cemetery, but one has been modified with concrete, likely to stabilize the object, and one is a modern marker with the name of the cemetery. Resource DA.110a retains integrity of location, but integrity of design, setting, materials, workmanship and feeling was diminished by modifications and loss of headstones, as well as the change in the landscape. An intensive level survey was conducted for Resources DA.110a-b and coordinated with the THC in March 2020. Based on the results of the investigation, FRA, in consultation with the THC, has determined DA.110a is not eligible for listing in the NRHP.

Resource DA.110b is the Linfield Elementary School, which was constructed in 1950. The building is 1-story, has a flat roof, and an irregular plan. The exterior walls are clad with brick and windows are metal sash, louver windows. Doors include double, flush metal units. Between 1952 and 1968, a multiple bay

addition was constructed at the center of the southwest elevation. The property is no longer used as an elementary school and appears to be vacant.

Archival research of the Linfield Elementary School conducted for the intensive level investigation conducted in March 2020, confirmed the school is associated with the local civil rights and school desegregation movement in Dallas County. On September 8, 1954, a group of African American parents, led by the Dallas Chapter of the National Association for the Advancement of Colored People (NAACP), took their children to enroll in the all-white Linfield Elementary School. The incident was one of the earliest attempts to physically desegregate schools in Dallas County after the *Brown v. Board of Education* ruling just four months earlier. Although the group's children were denied and turned away by the school administration, the event demonstrates the local African American community's active desire to end segregation and demand the school district provide their children the same quality of education afforded to the white children of the community. The event is part of a historical trend and pattern of events that led to the eventual desegregation of schools in Dallas County.

Although the former Linfield Elementary School building is no longer used as a school and has undergone some physical modification, the building retains integrity of location, materials, and workmanship, as well as sufficient integrity of design, setting, feeling, and association to convey the resource's use as an educational facility and association with the local civil rights and school desegregation movement.

Based on the results of the intensive level investigation, FRA, in consultation with the THC, has determined Resource DA.110b is eligible for listing in the NRHP under Criterion A for association with the local civil rights and school desegregation movement in Dallas County. The NRHP boundary for the historic property is the 6.3-acre parcel boundary, which encompasses Resource DA.110a (Smith Family Cemetery) as a non-contributing resource. Resource DA.110b is within the LOD of Segment 1 in Dallas County.

DA.194 (W. A. Strain House Historic District): ***NRHP-listed Historic District; SAL***

Site DA.194 consists of the W. A. Strain House Historic District, which is an NRHP-listed property. The district consists of approximately 170 acres, containing the 1896 dwelling, three outbuildings, the terrace system, field configurations, trench silo, windmill/well site, ca. 1900 barn, wagon dump debris (archeological site) and chicken house/large shed (archeological site). The historic district was listed in the NRHP under Criterion A, as a well-preserved example of an early-to mid-twentieth century blackland prairie farm in Dallas County, Texas.

During the current investigation, Site DA.194 was re-evaluated, but has not been recorded in the field. The literature review and background research conducted for the historic resource did not identify new information to dispute the eligibility of the site to be listed in the NRHP. Based on these results, FRA, in consultation with the THC determined the historic district remains eligible for listing in the NRHP under Criterion A. Field verification of this site will be conducted as required by the PA. The results will be included as an addendum to the interim report. The site is partially within the historic resources APE of Segment 1 in Dallas County, but is not located within the LOD.

Archeological Resources

Segment 1 in Dallas County encompasses 828.9 acres along 16.8 miles of the Project. A review of the TASA indicates 24 previous cultural resources investigations were conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous investigations have consisted primarily of linear and areal surveys, with most being concentrated south of the northern terminus of the Project

and north of IH-20. Approximately 283.2 acres of the Segment 1 archeological resources APE in Dallas County has been previously surveyed as part of separate investigations by others.

The literature review and background research also identified 41 previously recorded archeological resources within the Archeological Study Area in Dallas County, including 36 archeological sites (14 prehistoric, 19 historic, two multi-component and one of unknown temporal association) and five historic cemeteries (see **Table 3.19-6**). Twenty-seven of the archeological sites were determined not eligible for listing in the NRHP, five sites have an unknown eligibility status and four sites were previously determined eligible for listing in the NRHP. A multi-component site (41DL218) and a historic homestead site (41DL219), both determined ineligible for the NRHP, are located within the archeological resources APE.

The five historic cemeteries within the Archeological Study Area in Dallas County include the Pioneer Cemetery (41DL390), Overton Cemetery, Smith Family Cemetery (DA.110a), Edgewood Cemetery and Honey Springs Cemetery (DA.082). Pioneer Cemetery has been previously determined eligible for the NRHP, while the Overton Cemetery and Smith Family Cemetery have HTC designations. The Smith Family Cemetery has been determined not eligible for listing in the NRHP. Honey Springs Cemetery has been determined eligible for listing in the NRHP. Both determinations were made as part of the historic resources' investigation conducted for the Project (see discussions of Resources DA.082 and DA.110a above). The remaining cemetery has no designation. The Smith Family Cemetery and Honey Springs Cemetery are within 150 feet of the archeological resources APE of Segment 1. Due to the historic cemeteries location relative to the archeological resources APE, additional consultation is necessary and will be conducted prior to construction, as required by the PA. Due to the proximity of the Smith Family Cemetery to the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemetery prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1, Compliance Measures**.

Based on the background review and the archeological probability matrix developed for this investigation, Segment 1 contains approximately 12 miles of High Archeological Potential (5.6 miles of EMU 1, 3.6 miles of EMU 2, and 2.8 miles of EMU 3). An additional 2.1 miles of Segment 1 are classified as having Moderate Archeological Potential, (1.5 miles of EMU 5 and 0.6 miles of EMU 6). The remaining 2.8 miles of Segment 1 are classified as having Low Archeological Potential (2.1 miles of EMU 8 and 0.7 mile of EMU 9).

Dallas County Archeological Survey Results

During the initial phase of investigations, the entire archeological resources APE was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Dallas County was conducted for 267.9 acres within Segment 1 of the Project in January 2019. This effort resulted in the identification of two newly discovered archeological sites (41DL545 and 41DL546). FRA has determined both of these historic farmstead sites are not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.2 Ellis County

Historic Resources

The development along Segments 1, 2A, 2B, 3A, 3B and 3C in Ellis County is rural; therefore, the APE for historic resources along these segments was determined to be 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 88 historic resources (located on 52 sites) are within the historic resources APE in Ellis County. The historic resources include domestic, agricultural and funerary property types.

Following the field investigations, an interim report was submitted to the THC in May 2017 and an addendum to the interim report was submitted in June 2019. Of the historic resources within the Ellis County APE, 84 historic resources (located on 48 sites) were documented and evaluated for listing in the NRHP and four historic resources (located on four sites) remain unevaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the four unevaluated historic resources were found to have a low potential for NRHP-eligibility.

Of the evaluated historic resources, one (Boren Cemetery EL.040) was found to retain sufficient integrity to convey significance and be considered a historic property eligible for the NRHP. The remaining 83 evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined Resource EL.040 is eligible for listing in the NRHP and the remaining 83 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for the remaining historic resources identified in Ellis County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. A brief description of the historic property is provided below.

EL.040 (Boren Cemetery): ***NRHP-eligible***

Site EL.040 is the Boren Cemetery, located in a rural area approximately 1.3 miles southeast of Reagor Springs (Resource EL.040). Michael and Mary Ann Boren, who are believed to be the first to settle in the area as slaveholders in 1847, donated land to the Antioch Church of Christ for the Boren Cemetery for the use of the communities of Reagor Springs and Bethel after the death of Michael's mother, Nancy Boren, in 1851. The Boren Cemetery is comprised of a 2.0-acre area that remained in use for a century and contains anywhere from 180 to 300 burials, with the last interment (Georgia Ann Shofner [born in 1864]) occurring in 1951. Boren Cemetery contains the graves of the earliest settlers of the area, as well as veterans of both the Civil War and the Spanish-American War and was designated as an HTC in 2005. The cemetery is an example of a typical lawn-style cemetery, but it does include a high concentration of ornately carved marble grave markers and obelisk, pedestal tomb with vaulted roof, pedestal tomb with urn, and pulpit marker monument types which typically are not found in such large quantities in rural community cemeteries in Ellis County. Therefore, the Boren-Reagor Springs Cemetery possesses distinctive design features and the necessary level of significance to be eligible for listing in the NRHP under Criterion Consideration D.

Based on the results of the field investigation, FRA determined Resource EL.040 is NRHP-eligible under Criterion Consideration D for its distinctive design features, including a high concentration of ornately

carved marble grave markers and obelisk, pedestal tomb with vaulted roof, pedestal tomb with urn, and pulpit marker monument types, which typically are not found in such large quantities in rural community cemeteries in Ellis County. The historic resource is within the historic resources APE of Segments 2A and 2B in Ellis County, but is not located within the LOD.

Archeological Resources

Segments 1, 2A, 2B, 3A, 3B and 3C in Ellis County encompass 2,185.9 acres along 54.2 miles of the Project. A review of the TASA indicates 13 previous cultural resources investigations were conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted primarily of linear and areal cultural resources surveys, with few being concentrated within the archeological resources APE of Segments 1, 2A, 2B, 3A and 3B. Approximately 29.7 acres of the combined archeological resources APE in Ellis County was surveyed as part of previous investigations by others, but no archeological sites were discovered.

The literature review and background research conducted for this investigation also identified 22 previously recorded archeological resources within the Archeological Study Area in Ellis County, including 20 archeological sites (6 prehistoric, 10 historic, 1 multi-component and 3 with unknown components or temporal association) and 2 historic cemeteries (see **Table 3.19-6**). Fifteen of the sites were determined not eligible for listing in the NRHP and 5 sites have unknown NRHP eligibility status. Two of the sites are within the archeological resources APE. One prehistoric campsite (41EL99) is within the archeological resources APE of Segment 2A and one historic site consisting of bridge remnants (41EL241) is within the archeological resources APE of Segment 2B. Both of these sites have been previously determined not eligible for listing in the NRHP. No previously recorded archeological sites were identified within the archeological resources APE of Segments 3A, 3B and 3C in Ellis County.

The two historic cemeteries within the Archeological Study Area in Ellis County include Boren Cemetery (EL.040) and Geaslin Cemetery (EL.016a). The Boren Cemetery has an HTC designation and has been determined eligible for listing in the NRHP. The Geaslin Cemetery is located within the archeological resources APE of Segment 2A. No cemeteries are within the archeological resources APE of Segments 2B, 3A, 3B and 3C in Ellis County. Due to a portion of the historic Geaslin Cemetery being within the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemetery prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**.

Based on background review and the archeological probability matrix developed for this investigation, the segments in Ellis County contain the following archeological potential:

- **Segment 1***:* contains approximately 0.6 mile of High Archeological Potential (EMU 2); 0.7 mile of Moderate Archeological Potential (EMU 5); and 0.2 mile of Low Archeological Potential (EMU 8).
- **Segment 2A***:* contains approximately 16.9 miles of High Archeological Potential (2.8 miles of EMU 1, 13.0 miles of EMU 2 and 1.1 mile of EMU 3). An additional 4.4 miles of Segment 2A are classified as having Moderate Archeological Potential (0.3 mile of EMU 4, 4.0 miles of EMU 5 and 0.1 mile of EMU 6). The remaining 2.3 miles of Segment 2A in Ellis County are classified as having Low Archeological Potential (EMU 8).
- **Segment 2B***:* contains approximately 16.4 miles of High Archeological Potential (2.6 miles of EMU 1, 12.5 miles of EMU 2 and 1.3 miles of EMU 3). An additional 4.2 miles of Segment 2B are classified as having Moderate Archeological Potential (0.1 miles of EMU 4, 3.7 miles of EMU 5 and 0.4 miles of EMU 6). The remaining 2.5 miles of Segment 2B are classified as having Low Archeological Potential (EMU 8).

- **Segments 3A, 3B and 3C***:* follow the same path for 1.1 miles and are adjacent for the final mile prior to crossing into Navarro County. Segments 3A, 3B and 3C contain approximately 0.5 miles of High Archeological Potential (EMU 2)). An additional 1.1 miles of each segment is classified as having Moderate Archeological Potential (EMU 5)). The remaining 0.6 mile of Segments 3A, 3B and 3C in Ellis County are classified as having Low Archeological Potential (EMU 8).

Ellis County Archeological Survey Results

The entire archeological resources APE in Ellis County was surveyed through the literature review and background research, as presented above. During the 2016 phase of field investigations, archeological fieldwork in Ellis County was conducted for 408.8 acres within Segment 2A of the Build Alternatives A, B, and C, and 192.5 acres within Segment 2B of the Build Alternatives D, E, and F. The 2016 effort resulted in the identification of three previously unrecorded archeological sites (41EL268, 41EL269 and 41EL270) within Segment 2B. Sites 41EL268 and 41EL269 are historic farmstead components, and site 41EL270 is a historic artifact scatter. One previously recorded historic cemetery (Geaslin Cemetery) and one IF (historic brick scatter) were recorded within the archeological resources APE of Segment 2A.

FRA, in consultation with the THC, determined Sites 41EL268 and 41EL269 are not eligible for the NRHP, as well as the portion of Site 41EL270 that falls within the archeological resources APE. An interim report for Ellis County was submitted to the THC in July 2016. The THC concurred with the determinations in a letter dated August 23, 2016. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.** Through refinements to the conceptual design, sites 41EL268 and 41EL270 are no longer within the archeological resources APE and will not be affected by the Project.

Archeological fieldwork in Ellis County was conducted for 170.9 acres within Segment 2A of the Build Alternatives A, B and C in a subsequent field effort in January 2019. This effort resulted in the identification of three newly discovered historic archeological sites (41EL278, 41EL279 and 41EL280) and 12 IFs (one prehistoric and 11 historic). Based on field investigations and archival research, the portions of these sites within the archeological resources APE are determined not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.3 Navarro County

Historic Resources

The development along Segment 3A, Segment 3B and Segment 3C in Navarro County is rural; therefore, the APE for historic resources along these segments is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 124 historic resources (located on 87 sites) are within the historic resources APE in Navarro County. The historic resources include domestic, agricultural and funerary property types.

Following the field investigations, an interim report was submitted to the THC in June 2017 and an addendum to the interim report was submitted in May 2019. Of the historic resources within the Navarro County APE, 79 historic resources (located on 53 sites) were documented and evaluated for listing in the NRHP and 45 historic resources (located on 34 sites) remain unevaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the 45 unevaluated historic resources were found to have a low potential for NRHP-eligibility.

All 79 of the evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under

NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined these 79 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Navarro County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological Resources

Segments 3A, 3B and 3C in Navarro County encompass 3,451.9 acres along 84.7 miles of the Project. Relatively few systematic surveys were previously conducted within archeological resources APE in Navarro County. A review of the TASA indicates 16 cultural resources investigations were conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations consist of linear and areal cultural resources surveys, with few being concentrated within the archeological resources APE of Segments 3A, 3B and 3C in Navarro County. Approximately 42.1 acres of the archeological resources APE in Navarro County was previously surveyed as part of separate investigations by others.

The literature review and background research also identified 24 previously recorded archeological resources within the Archeological Study Area in Navarro County, including 19 archeological sites and 5 historic cemeteries (see **Table 3.19-6**). Of the previously recorded archeological resources, 10 are within the Archeological Study Area of Segment 3A identified as 5 prehistoric sites, 1 historic site, 3 multi-component sites and 1 site of unknown temporal association. Six of the sites were determined not eligible for the NRHP and 4 sites have an unknown eligibility status. None of the previously recorded archeological sites within the Archeological Study Area of Segment 3A were determined eligible for listing in the NRHP in Navarro County. Two of these archeological sites are within the archeological resources APE of Segment 3A; they are an ineligible multi-component artifact scatter and brick-lined well (41NV705) and a prehistoric campsite with unknown eligibility (41NV658).

Within the Archeological Study Area of Segment 3B, a total of 9 previously recorded archeological sites were identified as 3 prehistoric sites, 3 historic sites, 1 multi-component site, and 2 sites that have unknown temporal association. All 9 of the sites were determined not eligible for the NRHP. Two of these sites are present within the archeological resources APE of Segment 3B; they are a historic concrete bridge (41NV376) and a site with unknown temporal association (41NV43).

Thirteen archeological sites were previously recorded within the Archeological Study Area of Segment 3C identified as seven prehistoric sites, 1 historic site, 3 multi-component sites and 2 sites with unknown temporal associations. Eight of the sites were determined ineligible for listing in the NRHP. The remaining 5 sites have an unknown NRHP status. Two of these sites are within the archeological resources APE of Segment 3C; they are an ineligible multi-component artifact scatter and brick-lined well (41NV705) and a prehistoric campsite with unknown eligibility (41NV658).

The five historic cemeteries within the Archeological Study Area of Segments 3A, 3B and 3C include the Anderson Family Cemetery (NA.046), Shelton Family Cemetery (NA.050), Marshall Cemetery, Hannon Cemetery and Resthaven Memorial Park. The Anderson Family Cemetery, Shelton Family Cemetery and Hannon Cemetery have HTC designations. The remaining two cemeteries have no designations. None of the cemeteries are located within the archeological resources APE of Segments 3A, 3B or 3C in Navarro County, or are in proximity to the archeological resources APE to warrant further investigation for unmarked burials beyond the modern boundaries.

Based on the background review and the probability matrix established for this investigation, the segments in Navarro County contain the following archeological potential:

- **Segment 3A***:* contains approximately 22.9 miles of High Archeological Potential (6.7 miles of EMU 1, 15.2 miles of EMU 2 and 1.0 miles of EMU 3). An additional 4.9 miles of Segment 3A are classified as having Moderate Archeological Potential (4.4 miles of EMU 5 and 0.5 miles of EMU 6). The remaining 0.9 miles of Segment 3A are classified as having Low Archeological Potential (0.8 miles of EMU 8 and 0.1 mile of EMU 9).
- **Segment 3B***:* contains approximately 18.1 miles of High Archeological Potential (1.6 miles of EMU 1, 14.8 miles of EMU 2 and 1.7 miles of EMU 3). An additional 6.1 miles of Segment 3B are classified as having Moderate Archeological Potential (5.1 miles of EMU 5 and 1.0 miles of EMU 6). The remaining 2.6 miles of Segment 3B are classified as having Low Archeological Potential (2.0 miles of EMU 8 and 0.6 miles of EMU 9).
- **Segment 3C***:* contains approximately 23.9 miles of High Archeological Potential (6.8 miles of EMU 1, 16.0 miles of EMU 2 and 1.1 miles of EMU 3). An additional 5.0 miles of Segment 3C are classified as having Moderate Archeological Potential (0.3 miles of EMU 4, 4.1 mile of EMU 5 and 0.6 miles of EMU 6). Segment 3C contains 0.2 acres of Low Archeological Potential (EMU 8).

Navarro County Archeological Survey Results

The entire archeological resources APE within Navarro County was surveyed through the literature review and background research, as presented above. During the 2016 phase of field investigations, archeological fieldwork in Navarro County was conducted for 272.5 acres within Segment 3A of the Project. Within Segment 3B, archeological fieldwork was conducted for 45.5 acres, and 188.8 acres within Segment 3C. No previously unrecorded sites were identified during the survey of the archeological resources APE of Segment 3C. The 2016 effort resulted in the discovery of one previously unrecorded site and one IF (historic brick scatter) within the archeological resources APE of Segment 3A. Site 41NV733 consists of a brick well clad with a concrete slip and a wood and barbed-wire corral. Due to site 41NV733 being just within the archeological resources APE, portions of the site may be located beyond what was initially surveyed. Since the entire site could not be accessed and evaluated, the NRHP eligibility of this site is undetermined.

The 2016 field effort also included the revisit of previously recorded Site 41NV658 within the archeological resources APE of Segment 3A. Site 41NV658 is believed to be a prehistoric campsite. No evidence of the site was located. Modern quarry activity has completely removed the area in which the site was reported. The THC had previously determined the site was not eligible for the NRHP. The site does not display any preserved and intact archeological deposits that would support any research potential or preservation interests of the site. Two additional previously recorded sites, 41NV17, an unknown prehistoric quarry with unknown NRHP eligibility, and site 41NV673, a historic artifact scatter and cistern previously determined to be not eligible for listing in the NRHP, are no longer within the archeological resources APE due to TCRR's refinements to the conceptual design. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Navarro County was conducted for 245.0 acres within Segment 3A of the Project in a subsequent field effort in January and February 2019. This effort resulted in the identification of three newly discovered historic archeological sites (41NV738, 41NV739 and 41NV740), 14 IFs (one prehistoric and 13 historic) and the revisit of previously recorded archeological site 41NV705, a multi-component prehistoric and historic site previously determined not eligible for listing in the

NRHP. No new information was identified during the current investigation to dispute the previous determination. Based on field investigations and archival research, the portions of these sites within the archeological resources APE are determined not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.4 Freestone County

Historic Resources

The development along Segment 3C and Segment 4 in Freestone County is rural; therefore, the APE for historic resources along these segments is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 81 historic resources (located on 55 sites) are within the historic resources APE in Freestone County. The historic resources include domestic, agricultural, educational, funerary, commercial and religious property types.

Following the field investigations an interim report was submitted to the THC in May 2017 and an addendum to the interim report was submitted in June 2019. Of the historic resources within the Freestone County APE, 55 historic resource (located on 35 sites) were documented and evaluated for listing in the NRHP and 26 historic resources (located on 20 sites) remain unevaluated due to the lack of visibility from the public ROW and lack of right-of-entry. Based on available information, the 26 unevaluated historic resource were found to have a low potential for NRHP-eligibility.

Of the evaluated historic resources, 8 (FR.016a-g [Furney Richardson School Historic District] and FR.034 [Johnson African American Cemetery]) were found to retain sufficient integrity to convey significance and to be considered historic properties eligible for the NRHP. The remaining 47 evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined Resources FR.016a-g and FR.034 are eligible for listing in the NRHP and the remaining 47 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for the remaining historic resources identified in Freestone County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. Brief descriptions of the eight historic properties are provided below.

FR.016a-g (Furney Richardson School Historic District): ***NRHP-eligible***

Site FR.016 contains a set of buildings and structures that once housed the Furney Richardson School (Resources FR.016a-g). An OTHM (THC Marker #14966) commemorating the school, is also located at the site. The Furney Richardson School, located east of the rural community of Grove Island, appears on the 1936 and 1960 Freestone County General Highway Maps, as well as the 1963 and 1982 USGS topographic maps. The topographic maps depict a total of four buildings at the school site.

The Furney Richardson School was established in 1933, for African American children in western Freestone County and served the towns of Busby and Grove Island. The school taught grades through high school, and was named for the first superintendent, Mr. Furney Richardson. Businesses opened near the school and a rural community developed as a result. In 1958, high school classes were transferred to Teague and attendance dwindled. However, the school building (Resource FR.016a) and site continue to be used as a community center. Although all seven historic resources associated with

the Furney Richardson School exhibit some degree of diminished integrity, as a group, the site retains integrity of location, design, setting, feeling and association. Integrity of materials and workmanship has been diminished due to deterioration or loss of buildings; however, the site continues to convey local historic significance as an ethnic rural school complex.

Resource FR.016a is a ca. 1933, one-story building originally used for school classrooms. The building is set back from the road, at the north end of the parcel, is surrounded by grassy lawn, and is accessed by a dirt driveway. Constructed with a rectangular plan, the building exhibits Craftsman stylistic influences, including a broad hipped roof and exposed rafter tails. The roof is covered with composition shingles. The exterior walls are clad with wood drop siding. The building is elevated approximately 3 feet on what is likely a pier and beam foundation, which is obscured by metal skirting. Windows include 1/1 wood sash units on the south elevation and two 4/4 wood sash units on the east elevation. Entries are located on the south and east elevations. Each of the entries consist of a double-glazed wood panel door with multi-light transom. The entries are sheltered by gable roof porches with knee brackets, post supports and brick stoops. The east porch is supported by square wood posts and the south porch has metal posts. At least one door on the eastern elevation appears to be a replacement unit. The east elevation also exhibits a non-historic wooden wheelchair ramp on the south side of the porch.

Resource FR.016a retains integrity of location, as well as a good degree of design, materials and workmanship, despite moderate modifications to doors and porches. The historic resource retains sufficient integrity of setting, feeling and association, and is recognizable to its time period (ca. 1930s) and original function as a rural school for African American children in western Freestone County, Texas. In addition, the historic resource exhibits a distinctive architectural style (Craftsman style) for a rural educational institution and is a good surviving example of its type.

Resource FR.016b is a wood building that was likely an outhouse. The building is located on the north side of the school building (Resource FR.016a) but is heavily obscured by vegetation. The exterior walls are constructed of horizontal wood boards. Although the historic resource retains integrity of location and setting, it retains poor integrity of design, materials and workmanship and is in a state of deterioration and partial collapse. However, the ruins contribute to the site's overall integrity of location, design, setting, feeling and association.

Resource FR.016c is one-story, wooden frame, four-sided structure in partial collapse. The type of original siding and roof cannot be determined from its current state. Corrugated metal covers the top of the structure. The original function is not clear. Although it retains integrity of location, setting and association, it does not retain a good degree of design, materials and workmanship. It is in a state of severe deterioration and partial collapse and has diminished integrity of feeling. However, the historic resource contributes to the site's overall integrity of location, design, setting, feeling and association.

Resource FR.016d is a set of brick stairs believed to be the partial ruins of a second classroom building associated with the Furney Richardson School. The building was located just east of the main school building (Resource FR.016a). The original building with which these ruins are believed to be associated had a T-plan formed by two hipped roof sections. The structure retains integrity of location, setting and association, but lacks integrity of design, materials and workmanship, and has diminished integrity of feeling, due to the loss of most of the building. However, the ruins contribute to the site's overall integrity of location, design, setting, feeling and association.

Resource FR.016e is the ruins of what is believed to be a secondary building located north of the main school building (Resource FR.016a). The ruins consist of a red brick structure that appears to be part of a staircase. The original building with which these ruins are believed to be associated had an irregular plan with projections to the south and east. The structure retains integrity of location, setting and

association, but lacks integrity of design, materials and workmanship, and has diminished integrity of feeling, due to the loss of most of the building. However, the ruins contribute to the site's overall integrity of location, design, setting, feeling and association.

Resource FR.016f is a structure consisting of a circular, below grade cistern or catch basin constructed of red brick. It is located on the north side of the main school building (Resource FR.016a). Some loss of bricks is evident around the top rim; however, the historic resource retains integrity of location and a good degree of design, materials, workmanship, setting, feeling and association. Furthermore, the historic resource contributes to the site's overall integrity of location, design, setting, feeling and association.

Resource FR.016g is a metal playground swing set dating to the mid-twentieth century located on the east side of the main school building (Resource FR.016a). The structure consists of a metal pipe frame. None of the swing seats are extant, but a few chains still hang from the top of the frame. The historic resource retains integrity of location, setting, feeling and association, but integrity of design, materials and workmanship is diminished due to missing original parts. However, the historic resource contributes to the site's overall integrity of location, design, setting, feeling and association.

Site FR.016 (Resources FR.016a-g) is a rare and relatively intact example of an early twentieth century rural African American school complex in Freestone County, Texas. Despite diminished integrity to the individual historic resources on the site, as a group, Resources FR.016a-g collectively retain sufficient integrity of location, design, setting, materials, workmanship, feeling and association to convey local significance as an early twentieth century rural school complex for African American students in Freestone County.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Site FR.016 is eligible for listing in the NRHP under Criterion A as a district, and Resources FR.016a-g are determined to be contributing features to the site. Furthermore, Resource FR.016a (the main school building) retains sufficient integrity and possesses sufficient significance to be individually eligible for listing in the NRHP under Criterion A for its association with the Furney Richardson School complex and Criterion C as a good example of a rural Craftsman style schoolhouse in Freestone County, Texas. Site FR.016 is located within the historic resources APE of Segment 4 in Freestone County but is not within the LOD.

FR.034 (Johnson African American Cemetery): ***NRHP-eligible***

Site FR.034 is the Johnson African American Cemetery (Resource FR.034), which is located in a rural setting in north-central Freestone County. The cemetery is listed as an HTC. Research indicates this cemetery was established by Edgar Johnson, who gave two acres of land for the purpose of establishing a church and cemetery for freed slaves in Freestone County. The site was named Long's Chapel for Dave Long, a former slave of Johnson's. Research did not reveal that the Long's Chapel Church is extant and during the survey no church structure was observed.

Resource FR.034 is located on a large, open, grassy parcel surrounded by a non-historic chain link fence. Headstones are mostly upright and rectangular markers clustered primarily towards the rear of the parcel. Several large mature trees are scattered among the gravesites. A non-historic canopy structure on the site has a curved metal roof with metal supports set on a concrete slab. Multiple wood pews are stacked under the canopy**.** The oldest headstone belongs to Bill Frazier and dates to ca. 1871. Research confirmed the location of this cemetery on the 1918 Soil Map of Freestone County, the Freestone County General Highway Maps of 1936 (rev. 1940) and 1957 (rev. 1961), and the USGS maps for the Stewards Mill quadrangle for 1966 and 1983. The historic resource retains integrity of location, setting

and feeling, but lacks integrity of design, materials, workmanship and association due to the removal of the associated church.

Although the integrity of Resource FR.034 is somewhat diminished, as a cemetery that potentially dates to the mid-1800s, the historic resource retains sufficient integrity to convey its historic significance and association with the ethnic history of Freestone County after Emancipation to qualify for listing in the NRHP under Criterion A. Cemeteries are not usually considered for listing in the NRHP, but can be eligible if they meet Criteria Consideration D in conjunction with one or more of the four standard NRHP criteria.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource FR.034 eligible for listing in the NRHP under Criterion A for ethnic history and Criteria Consideration D: Cemeteries for its association with the local community of freed slaves. The historic resource is located within the historic resources APE of Segment 3C in Freestone County but is not within the LOD.

Archeological Resources

Segments 3A, 3B, 3C and 4 in Freestone County encompass 2,302.7 acres along 52.8 miles of the Project. Systematic surveys within the archeological resources APE in Freestone County are concentrated in the southern portion of the county. A review of the TASA indicates 10 cultural resources investigations were previously conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted of linear and areal cultural resources surveys. Approximately 159.4 acres of the archeological resources APE in Freestone County were previously surveyed as part of separate investigations by others, resulting in the discovery of two archeological sites within the archeological resources APE, one within the archeological resources APE of Segment 3C and one within the archeological resources APE of Segment 4.

The literature review and background research also identified 41 previously recorded archeological resources within the Archeological Study Area of Freestone County, including 34 archeological sites and seven historic cemeteries (see **Table 3.19-6**). None of the previously recorded archeological sites or historic cemeteries are within the archeological resources APE of Segments 3A or 3B in Freestone County.

Of the previously recorded archeological sites, 27 are within the Archeological Study Area of Segment 3C identified as 11 prehistoric sites, 15 historic sites and one multi-component site. Twenty-five of the sites were determined not eligible for listing in the NRHP and two sites have an unknown eligibility status. None of the previously recorded archeological sites within the Archeological Study Area of Segment 3C were determined eligible for listing in the NRHP. One previously recorded archeological site is present within the archeological resources APE of Segment 3C (41FT437); it is a prehistoric campsite previously determined not eligible.

Nine of the previously recorded archeological sites are within the Archeological Study Area of Segment 4 identified as four prehistoric sites, four historic sites and one multi-component site. None of the previously recorded archeological sites within the Archeological Study Area of Segment 4 were determined eligible for listing in the NRHP. One previously recorded archeological site is present within the archeological resources APE (41FT510); it is a historic farmstead determined not eligible for the NRHP.

The six historic cemeteries within the Archeological Study Area in Freestone County include the Red Cemetery (FR.001), Asia Cemetery (FR.024), J. B. Johnson Cemetery (FR.035), Johnson African American

Cemetery (FR.034), Holly Grove Cemetery and Varnell Cemetery. Two of the cemeteries (J. B. Johnson Cemetery and Johnson African American Cemetery) have HTC designations. The Johnson African American Cemetery was also determined eligible for listing in the NRHP as part of the historic resources' investigation conducted for the Project (see discussion of Resource FR.034 above). The remaining five cemeteries have no designation. None of the cemeteries is located within the archeological resources APE of Segments 3A, 3B, 3C or 4 in Freestone County.

Based on the background review and the archeological probability matrix developed for this investigation, the segments in Freestone County contain the following archeological potential:

- **Segments 3A and 3B***:* contain approximately 0.02 miles of High Archeological Potential (EMU 2).
- **Segment 3C***:* contains 26.3 miles of High Archeological Potential (3.1 miles of EMU 1, 8.3 miles of EMU 2 and 14.9 miles of EMU 3). An additional 5.6 miles of Segment 3C are classified as having Moderate Archeological Potential (1.9 miles of EMU 5 and 3.7 miles of EMU 6). The remaining 2.2 miles of Segment 3C are classified as having Low Archeological Potential (1.8 miles of EMU 8 and 0.4 miles of EMU9).
- **Segment 4***:* contains approximately 14.5 miles of High Archeological Potential (2.7 miles of EMU 1, 10.4 miles of EMU 2 and 1.4 miles of EMU 3). An additional 3.4 miles of Segment 4 are classified as having Moderate Archeological Potential (3.1 miles of EMU 5 and 0.3 miles of EMU 6). The remaining 2.2 miles of Segment 4 are classified as having Low Archeological Potential (1.8 miles of EMU 8 and 0.4 miles of EMU 9).

Freestone County Archeological Survey Results

The entire archeological resources APE within Freestone County was surveyed through the literature review and background research, as presented above. During the 2016 phase of field investigations, archeological fieldwork in Freestone County was conducted for 280.9 acres within Segment 4 of the Project. Fieldwork in Freestone County resulted in the discovery of one newly recorded site within the archeological resources APE of Segment 4. Site 41FT644 is a collapsed historic brick and concrete well. Due to site 41FT644 being just within the archeological resources APE, portions of the site may be located beyond what was initially surveyed. Because the entire site could not be accessed and evaluated, the NRHP eligibility of this site is undetermined.

The 2016 field effort also included the revisit of previously recorded Site 41FT510, located within Segment 4. The site is a historic farmstead that includes two cisterns, a brick-lined well and several artifact scatters. The majority of the site is outside the archeological resources APE. Site 41FT510 was previously determined to be not eligible for the NRHP. No new information was identified during the current investigation to dispute the previous determination. The site does not display any archeological deposits that are preserved and intact thereby supporting any research potential or preservation interests of the site. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Freestone County was conducted for 163.8 acres within Segment 4 of the Project in a subsequent field effort in February 2019. This effort resulted in the identification of three newly discovered historic archeological sites (41FT647, 41FT648 and 41FT649) and three historic IFs. Based on field investigations and archival research, sites 41FT648 and 41FT649, and the portion of site 41FT647 within the archeological resources APE, are determined not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.5 Limestone County

Historic Resources

The development along Segment 4 in Limestone County is rural; therefore, the APE for historic resources is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 20 historic resources (located on 12 sites) are within the historic resources APE in Limestone County. The historic resources include domestic, agricultural and funerary property types.

Following the field investigations, an interim report was submitted to the THC in July 2016, but a report was not submitted in 2019. During the 2019 fieldwork, no additional historic resources could be documented from the public ROW and right-of-entry was not granted. Of the historic resources within the Limestone County revised APE after incorporating TCRR's refinements to the conceptual design, 19 historic resources (located on 11 sites) were documented and evaluated for listing in the NRHP and one historic resource (located on one site) remains unevaluated. Based on available information, the one unevaluated historic resource was found to have a low potential for NRHP-eligibility.

All 20 of the evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined these 20 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Limestone County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological Resources

Segment 4 in Limestone County encompasses 336.1 acres along 11.9 miles of the Project. A review of the TASA indicates two previous cultural resources investigations were conducted completely or partially within the Archeological Study Area, consisting of areal archeological surveys (see **Table 3.19-7**).

The literature review and background research also identified eight previously recorded archeological resources within the Archeological Study Area in Limestone County, including five archeological sites and three historic cemeteries (see **Table 3.19-6**). All of the archeological sites are prehistoric; two were determined not eligible for listing in the NRHP and three have an unknown eligibility status. No previously recorded archeological sites are located within the archeological resources APE of Segment 4 in Limestone County.

The three cemeteries within the Archeological Study Area in Limestone County include the Personville Cemetery (LI.005), which has an HTC designation, the New Hope Cemetery (LI.011), which has no designation, and the Pickett Cemetery, which has no designation. None of the cemeteries are located within the archeological resources APE of Segment 4.

Based on the background review and the archeological probability matrix established for this investigation, Segment 4 contains approximately 11.3 miles of High Archeological Potential, this can be subdivided into 1.4 miles of EMU 1, 8.4 miles of EMU 2 and 1.5 miles of EMU 3. An additional 0.6 miles of Segment 4 are classified as having Moderate Archeological Potential (0.5 miles of EMU 5 and 0.1

miles of EMU 6). Segment 4 through Limestone County has no Low Archeological Potential classifications.

Limestone County Archeological Survey Results

During the 2016 phase of investigations, the entire archeological resources APE within Limestone County was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Limestone County was conducted for 46.6 acres within Segment 4 of the Build Alternatives A, B, D, and E in January 2019. This effort resulted in the identification of one newly discovered historic archeological site (41LT488) and two IFs (one prehistoric and one historic). Based on field investigations and archival research, the portion of this site within the archeological resources APE is determined not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.6 Leon County

Historic Resources

The development along Segments 3C and 4 in Leon County is rural; therefore, the APE for historic resources is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 73 historic resources (located on 55 sites) are within the historic resources APE in Leon County. The historic resources include domestic, agricultural, funerary and religious property types.

Following the field investigations, an interim report was submitted to the THC in May 2017 and an addendum to the interim report was submitted in July 2019. Of the historic resources within the Leon County APE, 41 historic resources (located on 33 sites) were documented and evaluated for listing in the NRHP and 32 historic resources (located on 22 sites) remain unevaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the 32 unevaluated historic resources were found to have a low potential for NRHP-eligibility.

Of the evaluated historic resources, one historic cemetery (Little Flock Cemetery [LE.001a]) was found to retain sufficient integrity to be considered a historic property eligible for the NRHP. The historic cemetery is located within the historic resources APE of Segment 3C, but outside the LOD.

The remaining 40 evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to qualify for listing in the NRHP guidelines for significance under NRHP Criteria A through D. Based on the result of the investigation, FRA, in consultation with the THC, determined Resource LE.001a is eligible for listing in the NRHP and the remaining 40 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Additional details on the eligible historic resource are immediately below and determinations for historic resources identified in Leon County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. A brief description of the historic property is provided below.

LE.001a (Little Flock Cemetery): ***NRHP-eligible***

Site LE.001a**,** the Little Flock Cemetery (Resource LE.001a), contains approximately 400 graves dating from 1860 to the present. Early member names included Baldwin, Cothern, Hamlet, Lamb, Shipp, Steapleton and Thomas. Headstones are a mix of modern and historic and vary in size and shape. The Little Flock Cemetery is an HTC, and a historic marker is also located on the site. The historic resource retains integrity of location, setting, feeling and association, although design, materials and workmanship are diminished due to additions and modifications.

Resource LE.001a is located along FM 1512, approximately 8 miles from the US 79 intersection, northwest of the town of Jewett. The cemetery is associated with the Little Flock Baptist Church, established ca. 1854. In 1903, the property was officially deeded for use as a schoolhouse, church and graveyard by W. C. Jackson. Between 1907 and the early 1920s, new families were attracted to the area to work in the two coal mines operated by the Bear Grass Coal Company. Many families associated with the mines are buried at the Little Flock Cemetery, including miners of African American and Hispanic descent, which are buried in unmarked graves in the northwest portion of the cemetery. Other interments include veterans of the Civil War, World War I and World War II; religious leaders; pioneer families; and Tom Foley, a renowned fiddle player. The cemetery continues to be maintained by the cemetery association, and members hold an annual Memorial Day to reunite and honor area families. Research indicates a church building was constructed ca. 1918, which was also used as a school until 1939, when the school transferred to Jewett. The current church building was constructed ca. 1980.

Although the integrity of Resource LE.001a is somewhat diminished, as a cemetery that dates to the mid-1800s, the historic resource retains sufficient integrity to convey its historic significance and association with the development of the Bear Grass community of Leon County to qualify for listing in the NRHP under Criterion A. Cemeteries are not usually considered for listing in the NRHP, but can be eligible if it meets Criteria Consideration D in conjunction with one or more of the four standard NRHP criteria.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource LE.001a eligible for listing in the NRHP under Criterion A for community development and under Criteria Consideration D as one of the only remaining features of the Bear Grass community and for its association with the Bear Grass mine, including the remains of Mexican American and African American mine workers. The historic resource is located within the historic resources APE of Segment 4 in Leon County, but is not within the LOD.

Archeological Resources

Segments 3C and 4 in Leon County encompass 2,628.9 acres along 55.9 miles of the Project. Numerous systematic surveys previously conducted within the archeological resources APE in Leon County are concentrated in the southern portion of the county along Segment 3C and the northern portion of the county along Segment 4. A review of the TASA indicates 17 cultural resources investigations were previously conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations consisted of linear and areal cultural resources surveys, with 11 previous surveys intersecting the archeological resources APE of Segments 3C and 4 of the Project. Approximately 135.2 acres of the archeological resources APE in Leon County have been previously surveyed as part of separate investigations by others, resulting in the discovery of three prehistoric sites in 2011.

The literature review and background research also identified 112 previously recorded archeological resources within the Archeological Study Area in Leon County, including 99 archeological sites and 13 historic cemeteries (see **Table 3.19-6**).

Of the previously recorded archeological sites, 47 are within the Archeological Study Area of Segment 3C identified as 21 prehistoric sites, 16 historic sites and 10 multi-component sites. Thirty-seven of the sites were determined not eligible for listing in the NRHP, 2 sites have an unknown eligibility status and 8 of the previously recorded archeological sites were determined eligible for listing in the NRHP. Three previously recorded archeological sites are present within the archeological resources APE of Segment 3C; they are 2 prehistoric artifact scatters (41LN363 and 41LN364) and 1 historic farmstead (41LN472), all of which were determined not eligible.

Fifty-two of the previously recorded archeological sites are within the Archeological Study Area of Segment 4 identified as 25 prehistoric sites, 20 historic sites, 6 multi-component sites and 1 site of unknown temporal association. Of these 28 were determined ineligible for listing in the NRHP, 23 have an unknown eligibility status, and 1 site has been determined eligible, a historic Victorian home site. One site is present within the archeological resources APE; it is a historic site (41LN28) determined not eligible.

The 12 historic cemeteries within the Archeological Study Area in Leon County include the Little Flock Cemetery (LE.001a), Liberty Cemetery (LE.039), Fred Graham Cemetery (LE.033), Nettles Cemetery (LE.034), Sandhill Cemetery, Centerville Cemetery, Woodward Cemetery, Makamsom Cemetery, Concord Cemetery, Kesse Cemetery, Perry Cemetery (LE.051) and Rogers Cemetery. The Little Flock Cemetery was determined eligible for listing in the NRHP as part of the historic resources' investigation conducted for the Project (see discussion of Resource LE.001a above). The remaining 11 cemeteries have no designation. None of the cemeteries are located within the archeological resources APE of Segments 3C or 4 in Leon County. The Nettles Cemetery is located within 150 feet of the archeological resources APE of Segment 3C. Due to the proximity of the historic cemetery to the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**.

Based on the background review and the archeological probability matrix developed for this investigation, the segments in Leon County contain the following archeological potential:

- **Segment 3C***:* contains approximately 20.7 miles of High Archeological Potential (0.2 miles of EMU 1, 6.3 miles of EMU 2 and 14.2 miles of EMU 3). An additional 6.3 miles of Segment 3C are classified as having Moderate Archeological Potential (1.9 miles of EMU 5 and 4.4 miles of EMU 6). The remaining 1.3 miles of Segments 3C are classified as having Low Archeological Potential (0.5 miles of EMU 8 and 0.8 miles of EMU 9).
- **Segment 4***:* contains approximately 23.2 miles of High Archeological Potential (2.3 miles of EMU 1, 17.4 miles of EMU 2 and 3.5 miles of EMU 3). An additional 3.5 miles of Segment 4 are classified as having Moderate Archeological Potential (0.2 miles of EMU 4, 3.1 miles of EMU 5 and 0.2 miles of EMU 6). One previously recorded site (41LN28) is present within the APE of Segment 4.

Leon County Archeological Survey Results

The entire archeological resources APE within Leon County was surveyed through the literature review and background research, as presented above. During the 2016 phase of field investigations, archeological fieldwork in Leon County was conducted for 124.9 acres within Segment 4 of the Project.

No previously recorded sites were revisited, and no previously unrecorded sites were identified during fieldwork. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Leon County was conducted for 168.6 acres within Segment 4 of the Project in a subsequent field effort in January and February 2019. This effort resulted in the identification of no newly recorded archeological sites or IFs. Consultation with the THC remains ongoing.

3.19.4.2.7 Madison County

Historic Resources

The development along Segment 3C and Segment 4 in Madison County is rural; therefore, the APE for historic resources is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 120 historic resources (located on 59 sites) are within the historic resources APE in Madison County. The historic resources include domestic, agricultural, commercial, funerary and religious property types.

Following the field investigations, an interim report was submitted to the THC in June 2017 and an addendum to the interim report was submitted in July 2019. Of the historic resources within the Madison County APE, 62 historic resources (located on 38 sites) were documented and evaluated for listing in the NRHP and 58 historic resources (located on 21 sites) remain unevaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the 58 unevaluated historic resources were found to have a low potential for NRHP-eligibility.

Of the evaluated historic resources, one (Oxford Cemetery [MA.019]) was previously evaluated as part of a separate investigation and determined eligible for listing in the NRHP. The historic resource is located within the Segment 4 historic resources APE but is not within the LOD. Based on the results of the investigation, FRA, in consultation with the THC, determined Resource MA.019 remains eligible for listing in the NRHP. An additional evaluated historic resource (Randolph Cemetery [MA.003]), located on one site, was found to retain sufficient integrity to convey significance and to be considered a historic property eligible for the NRHP. The historic resource is located within the Segment 4 historic resources APE but is not within the LOD.

The remaining 60 evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined these 60 historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Madison County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. A brief description of the historic properties are provided below.

*MA.003 (Randolph Cemetery): **NRHP-eligible***

Site MA.003 is the Randolph Cemetery, located in a rural area in north-central Madison County, east of Normangee and west of Dawkins Road. The cemetery contains approximately 243 graves dating from 1851 to present. Randolph cemetery is associated with the settlement of Madison County, the defunct town of Rogers Prairie, and the nearby town of Normangee. Robert Rogers founded the town of Rogers

Prairie along the Old San Antonio Road approximately two miles east of present-day Normangee when the Texas Rangers built the Fort Boggy blockhouse in 1840. The earliest graves in Randolph Cemetery belong to Stephen Rogers (brother of Robert Rogers) and his wife Rebecca Tipton Rogers, who died in 1851 and 1853, respectively. Other interments include veterans of the Civil War, World War I, and World War II, religious leaders and pioneer families.

The cemetery is an example of a typical lawn-style cemetery and has an irregular shape, with burials arranged in rows oriented north to south, and landscaped with grass and mature trees. Visible markers include footstones constructed of marble, sandstone, and granite, as well as obelisks, tablets, pulpits, die-in-socket, die-on-base, and lawn types. Due to the age of the cemetery and the high concentration of monument types typically not found in such large quantities in rural community cemeteries in Madison County, Randolph Cemetery may possess sufficient distinctive design features necessary to be eligible for listing in the NRHP under Criterion Consideration D.

Based on the results of the current investigation, FRA, in consultation with the THC, has determined Resource MA.003 is eligible for listing in the NRHP. Resource MA.003 is within 150 feet of the LOD of Segment 4. Consultation with the THC will continue as required by the PA.

MA.019 (Oxford Cemetery): ***NRHP-eligible***

Site MA.019 is the Oxford Cemetery (Resource MA.019) and contains graves that date from 1872 to 2015. Located at the intersection of CR 429 and US 21, approximately 175 feet north of the LOD of Segment 4 of the Build Alternatives A, B, D, and E, the cemetery contains more than 400 interments. The THC designated Oxford Cemetery an HTC in December 2016.

Cemeteries are not usually considered for listing in the NRHP but can be eligible if they meet Criteria Consideration D in conjunction with one or more of the four standard NRHP criteria. The Oxford Cemetery was previously evaluated by TxDOT and determined eligible for listing in the NRHP at the local level of significance under Criteria Consideration D: Cemeteries and Criterion A for association with early community development in Madison County. The THC concurred with the determination.

During the current investigation, Resource MA.019 was re-evaluated. No new information was identified during the current survey to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource MA.019 remains eligible for listing in the NRHP under Criteria Consideration D and Criterion A. The historic resource is within the historic resources APE of Segment 4 in Madison County, but is not located within the LOD.

Archeological Resources

Segments 3C and 4 in Madison County encompass 1,228.7 acres along 32.9 miles of the Project. Relatively few systematic surveys were previously conducted within the archeological resources APE in Madison County. A review of the TASA indicates three cultural resources investigations were conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted of linear and areal cultural resources surveys. Approximately 142.8 acres within the archeological resources APE in Madison County were previously surveyed as part of separate investigations by others.

The literature review and background research also identified 16 previously recorded archeological resources with the Archeological Study Area in Madison County, including nine archeological sites and seven historic cemeteries (see **Table 3.19-6**). Two previously recorded archeological sites are present within the archeological resources APE of Segment 3C in Madison County (41MA49 and 41MA52), an ineligible prehistoric campsite and an ineligible prehistoric lithic scatter. The remaining seven previously

recorded archeological sites are within the Archeological Study Area of Segment 4 identified as five prehistoric sites and two historic sites. Six were determined ineligible for listing in the NRHP and one has an unknown eligibility status.

The seven cemeteries within the Archeological Study Area in Madison County include Randolph Cemetery (MA.003), Ten Mile Cemetery (MA.010), Oxford Cemetery (MA.019), Unknown Graves/Cammack Cemetery (MA.035), Sweet Home Cemetery (MA.047), Fellowship Cemetery (MA.053a) and Fellowship Church Grave (MA.053b). Of these, Ten Mile Cemetery has an HTC designation and both Randolph Cemetery and Oxford Cemetery were determined eligible for listing in the NRHP (see discussion of Resources MA.003 and MA.019 above). The remaining four cemeteries have no designation. None of the cemeteries are located within the archeological resources APE of Segments 3C and 4 in Madison County. The Randolph Cemetery and the Ten Mile Cemetery are both within 150 feet of the archeological resources APE of Segment 4. Due to the proximity of the NRHP-eligible Randolph Cemetery, additional consultation with the THC is necessary and will be conducted prior to construction, as required by the PA. Due to the proximity of the Ten Mile Cemetery to the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**.

Based on the background review and the archeological probability matrix developed for this investigation, the segments in Madison County contain the following archeological potential:

- **Segment 3C***:* contains approximately 14.8 miles of High Archeological Potential (3.1 miles of EMU 1, 9.6 miles of EMU 2 and 2.1 miles of EMU 3). An additional 2.7 miles of Segment 3C are classified as having Moderate Archeological Potential (2.3 miles of EMU 5 and 0.4 miles of EMU 6). The remaining 0.2 miles of Segment 3C are classified as having Low Archeological Potential (EMU 8).
- **Segment 4***:* contains approximately 13.0 miles of High Archeological Potential (1.7 miles of EMU 1, 10.5 miles of EMU 2 and 0.8 miles of EMU 3). An additional 1.8 miles of Segment 4 are classified as having Moderate Archeological Potential (1.5 miles of EMU 5 and 0.3 miles of EMU 6). The remaining 0.4 miles of Segment 4 are classified as having Low Archeological Potential (EMU 8).

Madison County Archeological Survey Results

During the initial phase of investigations, the entire archeological resources APE in Madison County was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Madison County was conducted for 237.4 acres within Segment 4 of the Project in February 2019. This effort resulted in the identification of four IFs (one prehistoric and three historic) and the revisit of previously recorded archeological site 41MA52, a prehistoric lithic scatter previously determined not eligible for listing in the NRHP. No new information was identified during the current investigation to dispute the previous determination. Consultation with the THC remains ongoing.

3.19.4.2.8 Grimes County

Historic Resources

The development along Segment 3C, Segment 4 and Segment 5 in Grimes County is rural; therefore, the APE for historic resources is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 153 historic resources (located on 71 sites) are within the historic resources APE in Grimes County. The historic resources include domestic, agricultural, funerary and religious property types.

Following the field investigations, an interim report was submitted to the THC in May 2017 and an addendum to the interim report was submitted in June 2019. Of the historic resources within the Grimes County APE, 115 historic resources (located on 45 sites) were documented and evaluated for listing in the NRHP and 38 historic resources (located on 26 sites) remain unevaluated due to the lack of visibility from the public ROW or lack of right-of-entry. Based on available information, the 38 unevaluated historic resources were found to have a low potential for NRHP-eligibility.

All 115 of the evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined these 115 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Grimes County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological Resources

Segments 3C, 4 and 5 in Grimes County encompass 1,709.31 acres along 45.6 miles of the Project. Relatively few systematic surveys were previously conducted throughout the archeological resources APE in Grimes County. A review of the TASA indicates 12 cultural resources investigations were conducted completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted of linear and areal cultural resources surveys, most concentrated within the northern portion of the county. Approximately 85.2 acres of the archeological resources APE in Grimes County has been previously surveyed as part of separate investigations by others, resulting in the discovery of one archeological site within the archeological resources APE of Segment 5.

The literature review and background research also identified 36 previously recorded archeological resources within the Archeological Study Area in Grimes County, including 24 archeological sites and nine historic cemeteries (see **Table 3.19-6**).

Two prehistoric sites were previously recorded within the Archeological Study Area of Segments 3C and 4. Both sites are prehistoric artifact scatters, determined ineligible for listing in the NRHP. No previously recorded archeological sites or cemeteries are within the archeological resources APE of Segments 3C and 4 in Grimes County.

The twenty-four archeological sites were previously recorded within the Archeological Study Area of Segment 5 consisting of 18 prehistoric sites, five historic sites and one site of unknown temporal association. Fifteen of the sites were determined ineligible for listing in the NRHP and 9 have an unknown eligibility status. None of the previously recorded archeological sites within the Archeological

Study Area of Segment 5 were determined eligible for listing in the NRHP. One site is present within the archeological resources APE; it is a prehistoric campsite with unknown eligibility (41GM460).

The nine historic cemeteries within the Archeological Study Area in Grimes County include the Bethel Cemetery (GR.001), Pankey-Shiloh Cemetery (GR.003), Union Hill Cemetery (GR.006), Singleton Cemetery (GR.024), Old Oakland Cemetery(GR.034a), Ratliff Cemetery (GR.033), Mason Cemetery (GR.050), Stonehamville Church/Cemetery(GR.071) and St. Joseph's Catholic Church Cemetery. Bethel Cemetery and Ratliff Cemetery have HTC designations. The remaining seven cemeteries have no designations. The Union Hill Cemetery and Ratliff Cemetery are within 150 feet of the archeological resources APE. Due to the proximity of the cemeteries to the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**.

Based on the background review and the archeological probability matrix developed for this investigation, the segments in Grimes County contain the following archeological potential:

- **Segment 3C***:* contains approximately 3.1 miles of High Archeological Potential (0.7 miles of EMU 1 and 2.4 miles of EMU 2). An additional 0.1 miles of Segment 3C are classified as having a Moderate Archeological Potential (EMU 5). There are no areas within Segment 3C with Low Archeological Potential (EMU 7-9).
- **Segment 4***:* contains approximately 3.2 miles of High Archeological Potential (1 mile of EMU 1 and 2.2 miles of EMU 2). An additional 0.1 miles of Segment 4 are classified as having Moderate Archeological Potential (EMU 5). There are no areas of Low Archeological Potential within Segment 4.
- **Segment 5***:* contains approximately 28.8 miles of High Archeological Potential (0.9 miles of EMU 1, 27.1 miles of EMU 2 and 0.8 miles of EMU 3). An additional 10.3 miles of Segment 5 are classified as having Moderate Archeological Potential (10.0 miles of EMU 5 and 0.3 miles of EMU 6). The remaining 0.02 miles of Segment 5 are classified as having Low Archeological Potential (EMU 8).

Grimes County Archeological Survey Results

During the initial phase of investigations, the entire archeological resources APE within Grimes County was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Grimes County was conducted for 386.1 acres within Segments 4 and 5 of the Project in February and March 2019. This effort resulted in the identification of two newly discovered historic archeological sites (41GM487 and 41GM488) and the revisit of previously recorded archeological site 41GM460, a prehistoric lithic debitage scatter with an undetermined NRHP eligibility status. No new information was identified during the current investigation to dispute the previous determination due to the disturbances caused by the transmission line and pipeline corridors. Based on field investigations and archival research, these sites within the archeological resources APE are determined not eligible for the NRHP. Consultation with the THC remains ongoing.

3.19.4.2.9 Waller County

Historic Resources

The development along Segment 5 in Waller County is rural; therefore, the APE for historic resources is 1,300 feet from the LOD. Survey conducted in 2016 and 2019 found a total of 15 historic resources (located on 10 sites) are within the historic resources APE in Waller County. The historic resources include domestic, agricultural and commercial property types.

Following the field investigations an interim report was submitted to the THC in May 2017 and an addendum to the interim report was submitted in May 2019. Of the historic resources within the Waller County APE, 14 historic resources (located on nine sites) were documented and evaluated for listing in the NRHP and one historic resource (located on one site) remains unevaluated due to the lack of visibility from the public ROW and lack of right-of-entry. Based on available information, the one unevaluated historic resource was found to have a low potential for NRHP-eligibility.

All 14 of the evaluated historic resources were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. Based on the results of the investigation, FRA, in consultation with the THC, determined these 14 evaluated historic resources are not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Navarro County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological Resources

Segment 5 in Waller County encompasses 332.1 acres along 8.8 miles of the Project. A review of the TASA indicates three cultural resources investigations were previously conducted completely or partially within the Archeological Study Area. These investigations have consisted of three areal cultural resources surveys. Approximately 0.9 acres within the Project archeological resources APE in Waller County was previously surveyed as part of separate investigations by others (see **Table 3.19-7**).

The literature review and background research also identified a total of four previously recorded archeological sites within the Archeological Study Area in Waller County (see **Table 3.19-6**). All four of the sites are prehistoric. No historic cemeteries were identified.

Of the previously recorded archeological sites, three were determined not eligible for the NRHP and one has an unknown eligibility status. One site is located within the archeological resources APE of Segment 5 (41WL33), a prehistoric campsite determined not eligible.

Based on the background review and the archeological probability matrix developed for this investigation, Segment 5 contains approximately 5.6 miles of High Archeological Potential (0.7 miles of EMU 1, 3.9 miles of EMU 2 and 1 mile of EMU 3). An additional 1.9 miles of Segment 5 are classified as having Moderate Archeological Potential (1.6 miles of EMU 5 and 0.3 miles of EMU 6). The remaining 1.4 miles of Segment 5 in Waller County are classified as having Low Archeological Potential (1.3 miles of EMU 8 and 0.1 miles of EMU 9).

Waller County Archeological Survey Results

During the initial phase of investigations, the entire archeological resources APE within Waller County was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Waller County was conducted for 72.7 acres within Segment 5 of the Project in February and March 2019. This effort resulted in the identification of no newly discovered archeological sites or IFs. Consultation with the THC remains ongoing.

3.19.4.2.10 Harris County

Historic Resources

The development along Segment 5 in Harris County varies from urban, suburban and rural, with an associated APE for historic resources that varies from 1,300 feet, 700 feet and 350 feet. **Figure 3.19-2** illustrates the variable APE within Harris County.

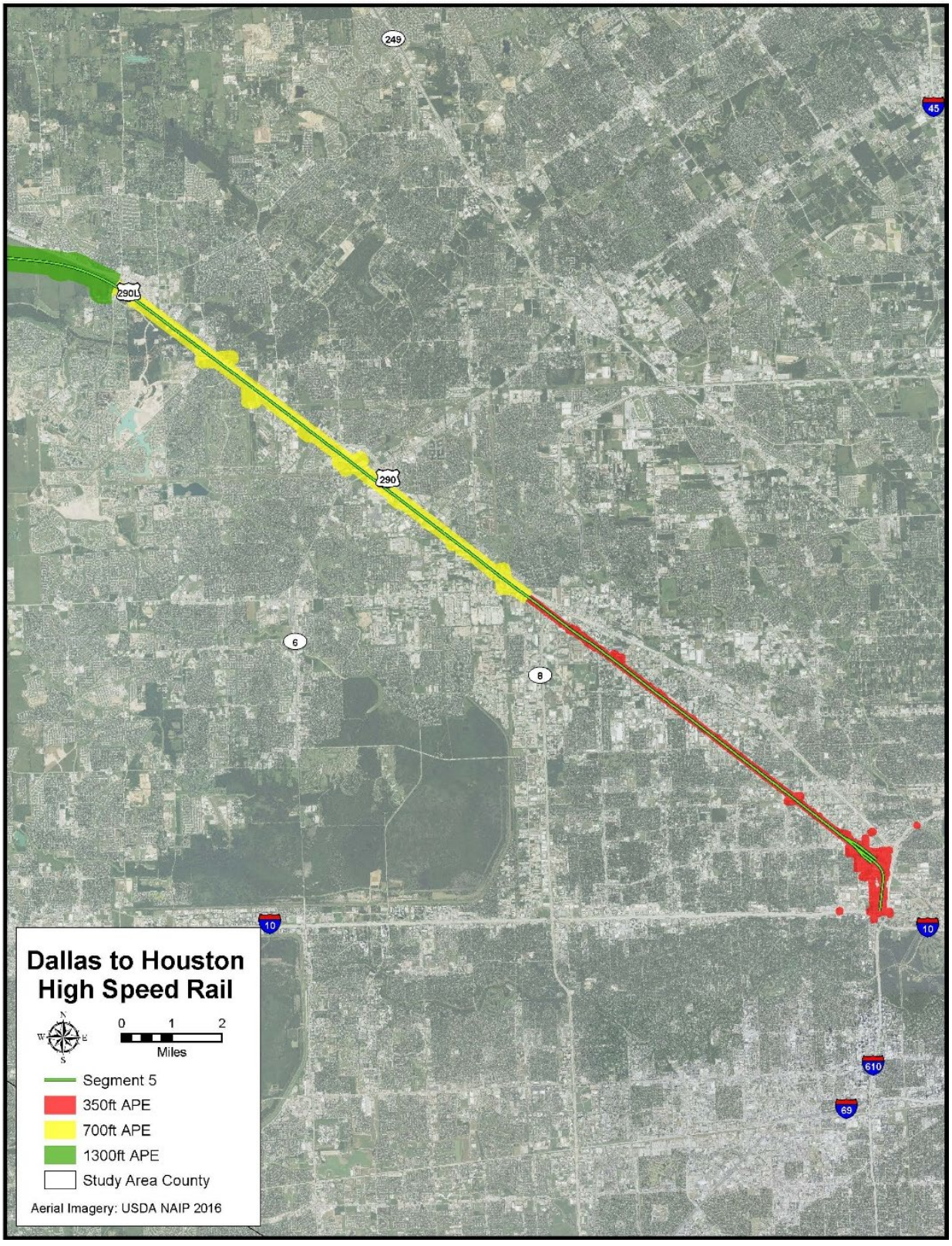
Survey conducted in 2016 and 2019 found a total 419 historic resources (located on 256 sites) are within the historic resources APE in Harris County. The historic resources include domestic, agricultural, industrial, transportation, government, educational, funerary, commercial and religious property types.

Following the field investigations an interim report was submitted to the THC in July 2017 and an addendum to the interim report was submitted in August 2019. Of the historic resources within the Harris County APE, 406 historic resources (located on 248 sites) were documented and evaluated for listing in the NRHP and 13 historic resources (located on eight sites) remain unevaluated due to the lack of visibility form the public ROW or lack of right-of-entry. Based on available information, the 13 unevaluated historic resources were found to have a low potential for NRHP-eligibility.

Of the evaluated historic resources, three (located on three sites) were found to retain sufficient integrity to convey significance and to be considered historic properties eligible for the NRHP. The remaining 403 evaluated historic resources (located on 245 sites) were found to lack integrity and/or do not possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under NRHP Criteria A through D. FRA, in consultation with the THC, determined these 403 historic resources were not eligible for listing in the NRHP. The THC concurrence letters are provided in **Appendix E, Cultural Resources Technical Memorandum**.

FRA, in consultation with the THC, determined field verification of historic resources not recorded in the field will be conducted prior to construction, as required by the PA. The results will be included as addenda to the interim report. Determinations for historic resources identified in Harris County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. Brief descriptions of the three historic properties are provided below.

Figure 3.19-2: Harris County Variable Historic Resources APE



Source: AECOM, 2019

HA.004a (Residence at 29702 Castle Road, Waller): ***NRHP-eligible***

Site HA.004 is located in northwest Harris County, south of the Harris and Waller county line and near the intersection of Castle and Binford roads. Historic and modern aerial photographs and topographic maps show the site contains one domestic historic resource (Resource HA.004a) and three agricultural historic resources (Resources HA.004b-d). The domestic historic resource, a single-family dwelling and one outbuilding (Resource HA.004d) were located at the site as early as 1944. By 1958, the site contained an additional four outbuildings, two of which are no longer extant. One non-historic shed is also located on the site.

Resource HA.004a is a 1.5-story Craftsman style single-family dwelling constructed ca. 1920. The building has a rectangular plan and is three bays wide and three bays deep. It appears the building is elevated approximately 2.5 feet above grade on a concrete perimeter wall. The jerkinhead roof is clad with replacement standing seam metal and has moderate eaves, exposed rafters and gable end brackets. One interior brick chimney is located at the northwest quarter of the building. Front-facing gable dormers are located at the center of the façade and north elevation. The exterior walls are clad with wood lap siding. Windows throughout the building are either single or paired 1/1 wood sash units. The façade exhibits a centrally located single glazed wood panel door flanked by two window units. An integral roof porch supported by battered wood posts on stuccoed piers extends the width of the façade's central bay. Although the roof covering has been replaced, the historic resource continues to convey its character-defining features of the Craftsman style, including roof form, exposed rafters, gable end brackets and battered porch supports. Therefore, the historic resource retains integrity of location, design, setting, materials, workmanship, feeling and association.

The remaining three historic resources (Resources HA.004b-d) are wood frame barns constructed between ca. 1920 and ca. 1950. The historic resources were found to lack historical significance and were constructed in a common style. Resources HA.004b and HA.004d also exhibit diminished integrity design, materials and workmanship, due to material replacements and modifications.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource HA.004a is eligible for listing in the NRHP under Criterion C at the local level of significance as a good example of a rural Craftsman style domestic dwelling in Harris County. The boundary for the NRHP-eligible property was determined to be the legal parcel boundary. The historic resource is within the historic resources APE of Segment 5 in Harris County, but is not located within the LOD.

HA.024b (Humble Oil Gas Station): ***NRHP-eligible***

Site HA.024, located at 26110 Hempstead Road, Cypress, consists of a ca. 1956 Humble Oil Gas Station (Resource HA.024b) currently located in the Cypress Top Historic Park, which consists of a collection of nine historic architectural resources (Resources HA.024a-i). Many of the historic resources were moved to this location after their period of significance. The Cypress Top Historical Park was officially opened in 2008.

Resource HA.024b is one of the few historic resources in its original location. The building is a 1,360 square-foot Humble Oil service station constructed in 1956. The building has a rectangular form with two garage/service bays and a sales area. Each service bay has an overhead garage door and there is a canted display window and single entry in the sales area. The roof over the sales area is a low-gable roof and extends into a canopy, which is supported by triangular metal posts. The gas pumps are missing. There is a metal saltbox roof over the service bays. The building exterior walls are clad with metal siding. A sign underneath the canopy and over the display window reads "Humble." Although the surrounding area has changed, including the addition of relocated buildings and the construction of a shopping

center northeast of the property in ca. 2004, the historic resource retains integrity of location, design, materials, workmanship and association.

All of the historic resources within Site HA.024 were previously evaluated for NRHP eligibility in a survey completed by TxDOT for the US 290 Corridor project conducted in 2008. Resource HA.024b is the only historic resource at this site to retain sufficient significance and integrity to be determined eligible for listing in the NRHP, under Criteria C for architecture. The THC concurred with the determination in 2009.

During the current investigation, Resource HA.024b was re-evaluated. No new information was identified during the current survey to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource HA.024b remains eligible for listing in the NRHP under Criterion C. The historic resource is within the historic resources APE of Segment 5 in Harris County, but is not located within the LOD.

HA.208 (Tex-Tube Complex): ***NRHP-eligible***

Site HA.208 is the Tex-Tube complex that consists of a ca. 1955 office building and associated warehouses and designed landscape features. The site is a light industrial property credited for its association with the development of Hempstead Road as a light industrial corridor that promoted the outward growth of the city of Houston.

The main office building was constructed in the International style and is one to two stories with brick cladding. The multiform roof has wide eaves and is composed of a flat roof on a low-sloped gable. Ribbon windows are located on the north, south and west elevations. The façade, which faces west, exhibits a convex plate glass window and a double-entry glass door with transom. A designed landscape surrounds the south, west and east elevations. An interior courtyard is also visible from aerial views. The east elevation is attached to an L-shaped industrial building warehouse oriented east-west and has three parallel gable roofs. At the west end of the building, one gable turns to the north to create the L-shape. The warehouse has several garage bays located on the north and south elevations. One side of the roof extends up and forms a clerestory with multiple vents on two of the gables. There are several additions located on the north and south sides of the building, including canopies for covered parking. Windows are awning units. The building is in good condition and retains integrity of location, design, materials, workmanship, feeling and association.

Site HA.208 was previously evaluated by TxDOT for the US 290 Corridor project in 2008. The site was determined eligible for listing in the NRHP under Criteria A and C for its association with the development of outer Houston as a light industrial center and for its architectural and landscape design. The THC concurred with the determination in 2009. The boundary for the NRHP eligible property was determined to be the legal parcel boundary and includes the main office, its formal landscaping and warehouses.

During the current investigation, Site HA.208 was re-evaluated. No new information was identified during the current survey to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Site HA.208 remains eligible for listing in the NRHP under Criteria A and C. The historic resource is within the LOD of Segment 5 in Harris County.

Archeological Resources

Segment 5 in Harris County encompasses 1,304.3 acres along 36.2 miles of the Project. Numerous systematic surveys were previously conducted throughout the archeological resources APE in Harris County. A review of the TASA indicates 31 cultural resources investigations were performed completely or partially within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations

consist of linear and areal cultural resources survey. Approximately 57.3 acres within the archeological resources APE in Harris County have been previously surveyed as part of separate investigations by others.

The literature review and background research also identified 15 previously recorded archeological resources with the Archeological Study Area in Harris County, including 8 archeological sites and 7 historic cemeteries (see **Table 3.19-6**). Of the eight previously recorded archeological sites, two are prehistoric, five are historic and one has both prehistoric and historic components. Two of the sites were determined not eligible for the NRHP and six sites have unknown eligibility status. One previously recorded archeological site (41HR399), a historic rail line with unknown eligibility, is located within the archeological resources APE of Segment 5 in Harris County.

The six cemeteries within the Archeological Study Area in Harris County include the Dolen Cemetery, Mueller Cemetery, Fairbanks Cemetery (HA.074), Beth Israel Memorial Garden Cemetery, Woodlawn Cemetery and Beth Yeshurun-Post Oak/Beth Cemetery (HA.212). The Beth Yeshurun-Post Oak/Beth Cemetery has an HTC designation. The remaining four cemeteries have no designations. The Beth Yeshurun-Post Oak/Beth Cemetery is within 150 feet of the Segment 5 archeological resources APE at the Houston Northwest Transit Center Terminal Option. Due to the proximity of the historic cemetery to the archeological resources APE, TCRR will consult with the THC to assess potential impacts to the cemetery prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**.

Based on the background review and the archeological probability matrix developed for this investigation, Segment 5 contains approximately 3.9 miles of High Archeological Potential (0.2 miles of EMU 1, 3.6 miles of EMU 2 and 0.1 miles of EMU 3). An additional 2.2 miles of Segment 5 are classified as having a Moderate Archeological Potential (EMU 5). The remaining 30.0 miles of Segment 5 in Harris County have a Low Archeological Potential (12.8 miles of EMU 8 and 17.2 miles of EMU 9).

Harris County Archeological Survey Results

During the initial phase of investigations, the entire archeological resources APE within Harris County was surveyed through the literature review and background research, as presented above. The results were compiled in the archeological resources interim report covering all 10 counties crossed by the Project. The report was submitted to the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Archeological fieldwork in Harris County was conducted for 22.1 acres within Segment 5 of the Project in March 2019. This effort resulted in the revisit of 1.2 acres of the previously recorded archeological site 41HR399, a 9-mile length of the Houston & Texas Central Railroad with an undetermined NRHP eligibility status. No new information was identified during the current investigation to dispute the previous determination. Consultation with the THC remains ongoing.

3.19.5 Environmental Consequences

This section provides the effects of the Project on cultural resources, which as previously defined includes structures, buildings, objects, sites, districts, landscapes, natural features, traditional cultural properties, and cemeteries. Cultural resources were then evaluated to determine if they met specific criteria and possessed sufficient historic integrity to qualify the resource as a *historic property* as required by the NHPA and pursuant to 36 C.F.R. § 800.16(l)(1)). As defined at 36 C.F.R. § 800.5(a)(1), "an adverse effect is found when an undertaking may alter any of the characteristics of a historic property that qualify the property for the National Register in a manner that would diminish the integrity of the

property's location, design, setting, materials, workmanship, feeling, or association." For those historic properties within the historic resources APE or the archaeological resources APE, effects may be physical effects that result from activities associated with the construction of the Project or they may occur later in time, be farther removed by distance, or be cumulative.

In addition to historic properties considered under Section 106, the Project has the potential to affect cemeteries. Cemeteries, which are not usually considered for listing in the NRHP, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; (Title 13, § 2, Chapter 22 of the TAC;), and in Section 28.03(f) of the Penal Code of Texas. The Health and Safety Code prohibits use of cemetery property for non-cemetery purposes. As determined in consultation between the FRA and THC, cemeteries considered to be exposed to potential adverse impacts under NEPA, regardless of any designation or NRHP eligibility determination under Section 106, are those wholly or partially within the LOD or those with boundaries within 150 feet of the LOD.

3.19.5.1 No Build Alternative

Under the No Build Alternative, the Project would not be constructed or operated. No new impacts or adverse effects to historic properties from construction and operation of the Project would occur. Travelers and commuters would use existing and planned roadways from the central business district of Dallas to the central business district of Houston. However, potential impacts to historic properties could still occur under the No Build Alternative, as new developments would continue, particularly in suburban and rural settings, such as the Trinity Parkway Project in Dallas County, the North-Houston Highway Improvement Project in Harris County, and the Waxahachie Line in Dallas and Ellis counties. The impacts of these projects are discussed in **Section 4.4, Indirect and Cumulative Impacts, Cumulative Impacts**.

3.19.5.2 Build Alternatives Impact Assessment

The criteria a cultural resource must meet to be considered a historic property is discussed in **Section 3.19.2 Regulatory Context**. Each cultural resource identified within the APEs for historic and archeological resources was evaluated by applying these criteria. Based on the archeological investigations conducted in 2017 and 2019 for the Project, there are no previously recorded or newly identified archeological sites within the archeological resources APE that are eligible for the NRHP. Therefore, none of the historic properties discussed are archeological. Although these impacts only represent those identified to date and additional impacts are anticipated as Section 106 efforts continue.

Based on the historic resources' investigation of the Project, 44 historic resources are identified as historic properties. These historic resources fall within one of three categories (NRHP-listed, NRHP-eligible or NRHP-eligibility Potential), as described in **Section 3.19.3.2.7**.

In addition to historic properties, the impacts on cemeteries within 150 feet of the LOD must be considered, regardless of NRHP designation. Of the cemeteries identified during this investigation, nine fall within those limits, including one that is NRHP-eligible and two that are NRHP-eligibility Potential.

The 44 historic properties and six cemeteries with no NRHP designation located within the historic resources APE were evaluated for potential impacts the construction and operation of the Project could have on these historic resources. The distribution of these historic resources is quantified by segment, location in relation to the LOD and adverse impact in **Table 3.19.10**.

Table 3.19-10: Historic Properties and Cemeteries by Segment, Proximity to LOD, and Impacts

Segment	# of Historic Properties & Cemeteries	# Within LOD	# Outside LOD	# Adversely Impacted
Segment 1	27	3	24	7
Segment 2A	2	1	1	2
Segment 2B	-	-	-	-
Segment 3A	-	-	-	-
Segment 3B	-	-	-	-
Segment 3C	2	-	2	1
Segment 4	11	-	11	2
Segment 5	4	-	4	3
Houston Industrial Site Terminal Station Option	1	1	-	1
Houston Northwest Transit Center Terminal Station Option	1	-	1	1
Northwest Mall Terminal Station Option	-	-	-	-
TOTALS	**48**	**5**	**43**	**17**

Source: AECOM, 2019

The 41 historic properties (NRHP-listed, NRHP-eligible and NRHP-eligibility Potential) assessed for potential impacts are located along Segment 1 in Dallas County, Segment 2A in Ellis County, Segment 3C in Freestone County, Segment 4 in Freestone, Leon and Madison counties and Segment 5 in Harris County. The seven cemeteries with no NRHP designation that were assessed for potential impacts under the Texas Health and Safety Code are located either within the LOD or within 150 feet of the LOD. These historic resources are along Segment 1 in Dallas County, Segment 2A in Ellis County, Segment 3C in Leon County, Segment 4 in Freestone and Madison counties and Segment 5 in Grimes and Harris counties. The impact assessments of the historic properties (NRHP-listed, NRHP-eligible and NRHP-eligibility Potential) and seven cemeteries are described below by segment and summarized in **Table 3.19-11**.

3.19.5.2.1 Segment 1

A total of 27 historic resources were included in the impact assessment for Segment 1, all of which are located within Dallas County. The historic resources include two NRHP-listed, 23 NRHP-eligible buildings one NRHP-eligible cemetery and one cemetery that is an HTC but is not NRHP eligible. All of these historic resources are located on a common alignment and the potential impacts would be the same for all Build Alternatives. A summary of the impact assessment is presented below, by historic resource.

DA.009 (Residence at 1300 Powhattan Street, Dallas): No Adverse Impact

Resource DA.009 is a domestic-single family dwelling constructed in 1906 that is determined eligible for listing in the NRHP under Criterion C as a good example of the Queen Anne style of architecture. The historic resource is approximately 277 feet from the LOD, where road improvements at the intersection of Belleview Street and South Akard Street would be constructed. Due to no anticipated changes in the viewshed at this location and the distance of the historic resource from the LOD, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.009. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.010 (Residence at 1214 Powhattan Street, Dallas): No Adverse Impact

Resource DA.010 is a domestic-single family dwelling constructed in 1905 that is determined eligible for listing in the NRHP under Criterion C as a good example of the Queen Anne style of architecture. The historic resource is approximately 302 feet from the LOD, where road improvements at the intersection of Belleview Street and South Akard Street would be constructed. Due to no anticipated changes in the viewshed and the distance of the historic resource from the LOD, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.010. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.016 (former KIXL Studios at 1401 South Akard Street, Dallas): No Adverse Impact

Resource DA.016 is a commercial building constructed ca. 1945 that has undetermined NRHP eligibility but is being treated as eligible for listing in the NRHP, as determined in consultation between FRA and the THC. The historic resource is adjacent to the LOD, where road improvements at the intersection of Belleview Street and South Akard Street would be constructed. Due to no anticipated changes in the viewshed and the distance of the historic resource from the LOD, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.016. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.022 (Chase Bag Company at 1111 South Lamar Street, Dallas): No Adverse Impact

Resource DA.022 is the Chase Bag Company building constructed in 1922 that is determined eligible for listing in the NRHP under Criterion A for community development and Criterion C as a good example of a commercial building constructed with minimal Neo-Classical stylistic influence. The rear of the building facing Austin Street is approximately 36 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 332 feet from the LOD. Station construction near the historic resource would include a bus drop off location at grade, pedestrian bridge and multi-level parking structure. Due to the current urban setting in which the historic resource is located, as well as the façade facing away from the station, the new station would not affect the property's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.022. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.023 (Cadiz Street Overpass and Underpass, Dallas): Adverse Impact

Resource DA.023 is the Cadiz Street Overpass and Underpass structure constructed in 1930 that is determined eligible for listing in the NRHP under Criterion C for engineering. The historic resource is partially within the LOD, where station construction would include roadway improvements, a pedestrian bridge and the station building. Based on preliminary plans, the pedestrian bridge would connect to the historic resource, which would affect the historic resource's integrity of setting, feeling, design and potentially materials and workmanship. Furthermore, a comparison of a current view and a simulated view of this location shows the construction of the station could change the surrounding viewshed (see **Section 3.10 Aesthetic and Scenic Resources, Figures 3.10-32** and **3.10-33**). However, as a historic transportation resource that has historically been located in a commercial and industrial setting, the visual impact would not affect the historic resource's integrity. FRA determined the Build Alternatives A, B, C, D, E and F would have an **adverse effect** on Resource DA.023. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC at the 30-60-90

percent design stages as requested by the THC in the concurrence letter dated August 25, 2017 located in **Appendix E, Cultural Resources Technical Memorandum**.

DA.024a (Cadiz Pump Station at 411 Cadiz Street, Dallas): No Adverse Impact

Resource DA.024a is the Cadiz Street Pump Station constructed in ca. 1915 that is determined eligible for listing in the NRHP under Criterion A for community development and commerce and Criterion C for architecture. The historic resource is located approximately 96 feet from the LOD, where station construction would include roadway improvements, a multi-level parking structure and the station building. The historic resource is currently located in an urban setting that has undergone several changes since its construction, including the construction and demolition of industrial and commercial properties. Based on preliminary plans, the station and parking buildings would dominate the landscape; however, due to the historic use of the surrounding area and distance of the historic resource from the LOD, the new station would have minimal effect on the historic resource's integrity of setting and feeling. Furthermore, integrity of location, design, materials and workmanship would not be affected. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.024a. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.024b (Cadiz Pump Station at 411 Cadiz Street, Dallas): No Adverse Impact

Resource DA.024b is the Cadiz Street Pump Station constructed in ca. 1930 that is determined eligible for listing in the NRHP under Criterion A for community development and commerce and Criterion C for architecture. The historic resource is located approximately 211 feet from the LOD, where station construction would include roadway improvements, a multi-level parking structure and the station building. The historic resource is currently located in an urban setting that has undergone several changes since its construction, including the construction and demolition of industrial and commercial properties. Based on preliminary plans, the station and parking structure would dominate the landscape; however, due to the historic use of the surrounding area and distance of the historic resource from the LOD, the new HSR facilities would have minimal effect on the historic resource's integrity of setting and feeling. Furthermore, integrity of location, design, materials and workmanship would not be affected. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.024b. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.028 (Dallas Coffin Company at 1325 South Lamar Street, Dallas): No Adverse Impact

Resource DA.028 is the Dallas Coffin Company building constructed in 1911 that is listed in the NRHP under Criterion A for community development and commerce and Criterion C for architecture. The rear of the building facing Austin Street is approximately 180 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 329 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the historic resource is located, as well as the façade facing away from the construction, the new parking structure would not affect the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.028. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.029 (Dining Hall at 1401 South Lamar Street, Dallas): No Adverse Impact

Resource DA.029 is the Sears Dinning Hall building constructed in 1915 that is determined eligible for listing in the NRHP under Criterion C for architecture. The northwest elevation of the building facing Belleview Street is approximately 245 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 347 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the historic resource is located, as well as the façade facing away from the construction, the new parking structure would not affect the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.029. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center at 1409 South Lamar Street, Dallas): No Adverse Impact

Resource DA.030 is the Sears Roebuck and Company Catalog Merchandise Distribution Center building constructed in 1915 that is determined eligible for listing in the NRHP under Criterion A for community development and commerce and Criterion C for architecture. The rear and northwest elevation of the building facing Austin and Belleview streets are approximately 73 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 253 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the historic resource is located, as well as the façade facing away from the construction, the new parking structure would not affect the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.030. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.031 (Sears Roebuck and Company Furniture Warehouse Complex at 710 Belleview Street, Dallas): No Adverse Impact

Resource DA.031 is the Sears Roebuck and Company Furniture Warehouse Complex constructed in 1948, with a 5-story addition constructed in 1972, is determined eligible for listing in the NRHP as a contributing historic resource to the NRHP-eligible Sears Roebuck and Company Catalogue Merchandise Distribution Center Historic District under Criterion A for community development and commerce and Criterion C for architecture. The historic resource is approximately 56 feet from the LOD along the northwest facade facing Belleview Street. Station construction would include a multi-level parking structure. Due to the current urban setting in which the historic resource is located, the new parking structure would not affect the historic resource. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.031. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.041 (Sigel's Liquor Store at 2021 Cockrell Avenue, Dallas): No Adverse Impact

Resource DA.041 is a commercial building constructed in 1949 that is determined eligible for listing in the NRHP under Criterion C as a good example of the Art Moderne style of architecture. The historic resource is approximately 94 feet from the LOD, where road improvements at the intersection of South Lamar Street and Corinth Street would be constructed. Due to no anticipated changes in the viewshed and the distance of the historic resource from the LOD, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F

would have no adverse effect on Resource DA.041. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.048 (Oak Cliff Box Company at 1212 South Riverfront Boulevard, Dallas): No Adverse Impact

Resource DA.048 is the Oak Cliff Box Company building constructed in 1945 that is determined eligible for listing in the NRHP under Criterion C for architecture. The rear of the building faces the project and is approximately 192 feet from the LOD, while the façade of the building facing South Riverfront Street is approximately 267 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the historic resource is located, as well as the façade facing away from the construction, the new parking structure would not affect the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.048. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.056 (Corinth Street Underpass and Overpass, Dallas): Adverse Impact

Resource DA.056 is the Corinth Street Underpass and Overpass constructed in 1932 that is determined eligible for listing in the NRHP under Criterion A for community development and commerce and Criterion C for engineering. The historic resource is approximately 61 feet from the LOD, where track on viaduct would be constructed. Based on preliminary plans, the viaduct would partially obstruct view of the historic resource from the southwest side. However, as a historic transportation resource, the effect on the historic resource's integrity of setting, feeling and design would be minimal. Furthermore, the historic resource's integrity of materials, workmanship and association would not be affected. FRA determined the Build Alternatives A, B, C, D, E and F have the potential to cause an **adverse effect** on Resource DA.056. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC at the 30-60-90 percent design stages as requested by the THC in the concurrence letter dated August 25, 2017 and included in **Appendix E, Cultural Resources Technical Memorandum**.

DA.072 (Dallas Floodway Historic District, Dallas): No Adverse Impact

Resource DA.072 is the Dallas Floodway Historic District that encompasses 3,554.20 acres along the Trinity River. The historic resource is determined eligible for listing in the NRHP under Criterion A for community development. A narrow portion (approximately 140 feet wide) at the south end of the district crosses the LOD of Segment 1 in Dallas County, at the Santa Fe Railroad tracks. Previous consultation between the USACE and the THC determined that due to the type of historic resource, some changes in the setting of the historic district must be expected and it is anticipated the construction of additional bridges across the floodway would not adversely affect the historic property if the Belleview Pressure Sewer will not be affected (THC Letter dated December 30, 2011). FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.072. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.076a (Guiberson Corporation Machine Shop at 1000 Forest Avenue, Dallas): Adverse Impact

Resource DA.076a is the Guiberson Corporation Machine Shop constructed in 1928 that is determined eligible for listing in the NRHP under Criterion B for association with the Guiberson Family. The historic resource is mostly within the LOD, where track on viaduct would be constructed. Due to the location of the historic resource being within the LOD, it would most likely require demolition. Therefore, the

historic resource would be impacted and all aspects of its integrity would be lost. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have an **adverse effect** on Resource DA.076a. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.076b (Guiberson Corporation Family Residence and Office at 1000 Forest Avenue, Dallas): Adverse Impact

Resource DA.076b is the Guiberson Corporation Residence constructed in 1928 that is determined eligible for listing in the NRHP under Criterion B for association with the Guiberson Family. The historic resource is approximately 50 feet from the LOD, where track on viaduct would be constructed. Due to the distance from the LOD, the viaduct would not affect the historic resource's integrity of location, materials, or workmanship. However, the impacts to the associated building (DA.076a) would impact the historic resources integrity of setting, feeling, design and association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have an **adverse effect** on Resource DA.076b. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.080a-e (Proctor and Gamble Complex at 3701 South Lamar Street, Dallas): No Adverse Impact

Resources DA.080a-e are the Procter and Gamble Manufacturing Facility constructed in 1920 that is determined eligible for listing in the NRHP under Criterion A for community development and Criterion C for architecture. The historic resources are currently located in an urban industrial setting and the nearest historic resource to the LOD is approximately 170 feet, where track on viaduct would be constructed. Due to the urban landscape and the distance of the historic resources, the viaduct would not affect the facility's integrity of location, design, setting, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resources DA.080a-e. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.082 (Honey Springs Cemetery at 4001 Bulova Street, Dallas): Adverse Impact

Resource DA.082 is the Honey Springs Cemetery dating to the mid-1800s. The cemetery was determined eligible for listing in the NRHP under Criteria Consideration D, and Criterion A for its association with early settlement and community development in Dallas and Criterion D for its potential to yield information important to history. The historic resource parcel boundary is within 150 feet of the LOD, where track on viaduct would be constructed. The current setting around the cemetery is urban with a mix of commercial, industrial and residential development. However, vegetation within and surrounding the site, including mature trees and brush, as well as the memorial wall at the entrance, provide the cemetery with a serene setting.

Based on preliminary plans, as well as a comparison of a current view and simulated view of the location, the construction and operation of the HSR system would change the viewshed and obstruct the serene setting (see **Section 3.10 Aesthetic and Scenic Resources, Figures 3.10-40** and **3.10-41).** Due to the visual obstruction, the Build Alternatives A, B, C, D, E and F would affect the historic resource's integrity of design, setting, feeling and association. FRA, in consultation with the THC, determined the Project would have an **adverse effect** on Resource DA.082.

The historic boundaries of the cemetery are not well defined and not all of the burial locations are known; therefore, the construction and operation of the HSR system has the potential to disturb unmarked burials outside the modern cemetery boundary along the eastern edge. Cemeteries in Texas,

such as Honey Springs Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA, in consultation with the THC, determined Build Alternatives A, B, C, D, E and F could have an **adverse effect** on Resource DA.082. Additional archeological investigations, which included, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts within the LOD adjacent to the modern cemetery boundary, was conducted to verify the modern cemetery boundary is accurate. Ongoing consultation with the THC to assess potential impacts to the cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and required by the PA. The THC concurrence letters dated August 25, 2017 and December 4, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.104 (Railroad Bridge at East Illinois Avenue, Dallas): No Adverse Impact

Resource DA.104 is a railroad bridge over East Illinois Avenue, constructed in 1940 that is determined eligible for listing in the NRHP under Criterion C for architecture. The historic resource is approximately 189 feet from the LOD, where track on viaduct would be constructed, and approximately 35 feet from temporary construction staging area. Due to the historic resource being a historic transportation resource, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.104. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.110a (Smith Family Cemetery at 3820 East Illinois Avenue, Dallas): Adverse Impact

Resource DA.110a is the Smith Family Cemetery dating to the 1860s. The cemetery is within 150 feet of the LOD of Build Alternatives A, B, C, D, E and F. The cemetery was determined not eligible for listing in the NRHP; however, due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials. Cemeteries in Texas, such as the Smith Family Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA, in consultation with the THC, determined Build Alternatives A, B, C, D, E and F could have an **adverse effect** on Resource DA.110a. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate. Ongoing consultation with the THC to assess potential impacts to the cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and the PA. The THC concurrence letter dated May 1, 2020, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.110b (Linfield Elementary School at 3820 East Illinois Avenue, Dallas): Adverse Impact

Resource DA.110b is an educational building constructed in 1950 that has been determined NRHP eligible under Criterion A for association with the civil rights and desegregation movement in Dallas County. The historic resource is located within the LOD, where track on viaduct would be constructed. Due to the historic resource's location, the construction and operation of the HSR system would impact Resource DA.110b, likely by demolition. Therefore, FRA, in consultation with the THC, has determined the Build Alternatives A, B, C, D, E and F would have an **adverse effect** on Resource DA.110b. The THC concurrence letter dated May 1, 2020, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.194 (W. A. Strain House Historic District at 400 South Hutchins Road, Lancaster): No Adverse Impact

Resource DA.194 is the W. A. Strain House Historic District. The district consists of approximately 170 acres, containing the 1896 dwelling, 3 outbuildings, the terrace system, field configurations, trench silo, windmill/well site, ca. 1900 barn, wagon dump debris (archeological site) and chicken house/large shed (archeological site). The historic district was listed in the NRHP under Criterion A, as a well-preserved example of an early-to mid-twentieth century blackland prairie farm in Dallas County, Texas. The historic resource is partially located within the APE. The portion within the APE includes an agricultural field, which abuts the LOD, where temporary construction of a maintenance facility is expected. The nearest permanent construction to the historic district is approximately 1,700 feet from where track on embankment would be constructed. Due to the historic resource being located outside the LOD and the distance of the historic resource from any permanent construction, the construction and operation of the HSR system would not impact the viewshed or the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource DA.194. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC to provide additional photographs taken from the main house and agricultural fields looking towards the proposed maintenance yard, including photographic simulations showing the proposed development; and additional design plans for lighting, landscape and building design as requested by the THC. The results will be included as an addendum to the interim report. The THC letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.2 Segments 2A and 2B

Two historic resources were included in the impact assessment for Segments 2A and 2B in Ellis County. The historic resources are one cemetery with no designation within the LOD of Segment 2A, and one NRHP-eligible cemetery within the historic resources APE of Segments 2A and 2B. The impact assessment for the historic resources are presented below.

EL.016a (Geaslin Cemetery on Epps Road, Palmer): Adverse Impact

Resource EL.016a is the Geaslin Cemetery established in the late nineteenth century. The historic resource is partially within the LOD of Segment 2A and approximately 400 feet from the LOD of Segment 2B, where track on viaduct would be constructed. The cemetery was determined not eligible for listing in the NRHP; however, because the cemetery is within the LOD of Segment 2A, the construction and operation of the HSR system has the potential to disturb unmarked burials. Cemeteries in Texas, such as the Geaslin Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined the Build Alternatives A, B, and C could have an **adverse impact** on Resource EL.016a. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, may be required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities. TCRR will consult with the THC to assess potential impacts to the cemetery prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**. The THC concurrence letter dated June 13, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

EL.040 (Boren Cemetery): Adverse Impact

Resource EL.040 is the Boren Cemetery, located in a rural area approximately 1.3 miles southeast of Reagor Springs. The historic resource is outside of the LOD of Segment 2A (approximately 250 ft), where track on viaduct would be constructed and Segment 2B (approximately 1,167 feet), where utility work would be conducted. The cemetery was determined eligible for listing in the NRHP under Criterion Consideration D for its distinctive design features, including a high concentration of ornately carved marble grave markers and obelisk, pedestal tomb with vaulted roof, pedestal tomb with urn, and pulpit marker monument types which typically are not found in such large quantities in rural community cemeteries in Ellis County. The cemetery is not near the LOD to warrant further investigations for unmarked burials beyond the modern boundaries under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas. However, FRA, in consultation with the THC, determined the Build Alternatives A, B, and C could have an **adverse effect** on Resource EL.040, but further research in needed. The THC concurrence letter dated August 16, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.3 Segment 3C

Two historic resources were included in the impact assessment for Segment 3C in Freestone and Leon counties. These historic resources are both cemeteries within the historic resources APE. Resource FR.034 was determined NRHP-eligible and has an HTC designation. The impact assessments for the historic resources are presented below.

FR.034 (Johnson African American Cemetery, FM 1365, Teague): No Adverse Impact

Resource FR.034 is the Johnson African American Cemetery established in ca. 1871. The historic resource was determined eligible for listing in the NRHP under Criteria Consideration D and Criterion A for ethnic history and its association with the local community of freed slaves. The historic resource is approximately 0.25 miles from the LOD, separated by the IH-45 ROW. The current setting in which the historic resource is located is rural. Due to the setting and the distance of the historic resource to the LOD, the Build Alternatives C and F would not affect the property's integrity of location, setting or feeling. Furthermore, the cemetery is not near the LOD to warrant further investigations for unmarked burials beyond the modern boundaries under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas. Therefore, FRA, in consultation with the THC, determined the Build Alternatives C and F would have no adverse effect on Resource FR.034. The THC concurrence letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

LN.034 (Nettles Cemetery, IH-45 South Frontage Road, Buffalo): Adverse Impact

Resource LE.034 is the Nettles Cemetery established in ca.1887 for European Americans. The historic resource is within 150 feet of the LOD of Build Alternatives C and F within Segment 3C. Based on the background research and literature review, the Nettles Cemetery demonstrates a lack of historical significance and would most likely not qualify for listing in the NRHP. However, due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside the modern cemetery boundary. Cemeteries in Texas, such as the Nettles Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined the construction and operation of the Project could have an **adverse impact** on Resource LN.034. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral

interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**. The THC concurrence letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.4 Segment 4

A total of eleven historic resources were included in the impact assessment for Segment 4, which are located within Freestone and Madison counties. The historic resources include: nine NRHP-eligible historic resources and two cemeteries with no designation. The impact assessments for these historic resources are presented below.

FR.016a-g (Furney Richardson School Historic District, FM 1365, Teague): No Adverse Impact

Site FR.016 consists of seven historic resources associated with the Furney Richardson School, established in 1933 for African American children living in western Freestone County. Site FR.016 is determined eligible for listing in the NRHP as a district under Criterion A. Furthermore, Resource FR.016a (the main school building) is individually eligible for listing in the NRHP under Criterion A for its association with the Furney Richardson School complex and Criterion C as a good example of a rural Craftsman style schoolhouse in Freestone County, Texas. Site FR.016 is located approximately 705 feet east of the LOD, where track on viaduct would be constructed. The height of the viaduct would be approximately 70 feet. A modern transmission line corridor with lattice towers is located between the LOD and Site FR.016, approximately 175 feet east of the LOD and approximately 430 feet west of Site FR.016. The transmission line towers have a height of approximately 170 feet and a width of approximately 100 feet.

A simulated view from the location of Site FR.016 is available in the Freestone County 2019 addendum. Based on the simulated view, exposure would be limited by tree coverage and the height of the viaduct would be below the height of the transmission towers. Based on the visual analysis of a similar location to that of Site FR.016, the visual quality would remain moderate.

Based on the noise and vibration analysis conducted for the Project, at its upper range of speed during operation, the measurable vibration decibel level of the train is projected to be 85 VdB at 50 feet away from the source. This is significantly lower than the level identified as the threshold at which damage to fragile buildings becomes an issue, 100 VdB. During construction, however, the analysis found there is some potential for vibration annoyance at locations of up to 500 feet from certain construction activities. Site FR.016 is located beyond 50 feet (operational impacts) and 650 feet (construction impacts) from the LOD and vibration impacts would not be an issue during operation or construction of the HSR system.

Due to the current setting in which the historic resource is located, as well as distance from the LOD, the FRA determined the Build Alternatives A, B, D and E would not affect the historic resource's integrity of location, setting, design, feeling, materials, workmanship, or association. Therefore, FRA determined the Project would have no adverse effect to the historic resources on Site FR.016. As per Stipulation III.A.3 in the PA developed for the Project, TCRR will engage in additional consultation with the THC to provide additional information regarding FRA's impact determination for Site FR.016 due to the request from the THC for additional information on the potential effects of the railroad and the vibratory effects to the school during construction and operation. The THC letter dated August 16, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

LE.001a (Little Flock Cemetery, 20190 FM 1512, Jewett): No Adverse Impact

Resource LE.001a is the Little Flock Cemetery established in ca. 1860 that is determined eligible for listing in the NRHP under Criteria Consideration D and Criterion A for community development and its association with the Bear Grass mining community and the remains of Mexican-American and African-American mine workers. The historic resource is approximately 690 feet west of the LOD, surrounded by a non-historic church, transmission lines and oil well pads. Due to the distance of the historic resource to the LOD, the Build Alternatives A, B, D and E would not affect the property's integrity of location, setting, feeling or association. Furthermore, the cemetery is not near the LOD to warrant further investigations for unmarked burials beyond the modern boundaries under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas. Therefore, FRA, in consultation with the THC, determined the Project would have no adverse effect on Resource LE.001a. The THC concurrence letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

MA.003 (Randolph Cemetery, 5577 Dawkins Road, Normangee): Adverse Impact

Resource MA.003 is the Randolph Cemetery established in 1851. The historic resource is within 150 feet of the LOD and is eligible for the NRHP as determined in consultation between FRA and the THC. However, due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside the modern cemetery boundary. Cemeteries in Texas, such as the Randolph Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA, in consultation with the THC, determined the Build Alternatives A, B, D and E could have an **adverse effect** to Resource MA.003. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities. Ongoing consultation with the THC to assess potential impacts to the cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and the PA. The THC letters dated August 23, 2019 and April 2, 2020 are provided in **Appendix E, Cultural Resources Technical Memorandum**.

MA.010 (Ten Mile Cemetery, FM 2289, Normangee): Adverse Impact

Resource MA.010 is the Ten Mile Cemetery established in 1890. The historic resource is within 150 feet of the LOD, where track on viaduct would be constructed. Based on the background research and literature review, the Ten Mile Cemetery demonstrates a lack of historical significance and has been determined not eligible for listing in the NRHP. However, due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside the modern cemetery boundary. Cemeteries in Texas, such as the Ten Mile Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined Build Alternatives A, B, D and E could have an **adverse impact** on Resource MA.010. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities. TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and

Compliance Measures stated in **Section 3.19.6.1**. The THC letters dated June 30, 2017 and August 23, 2019 are provided in **Appendix E, Cultural Resources Technical Memorandum**.

MA.019 (Oxford Cemetery, 8150 Highway 21, Madisonville): No Adverse Impact

Resource MA.019 is the Oxford Cemetery established in 1872. The cemetery was determined eligible for listing in the NRHP under Criteria Consideration D and Criterion A for association with early community development in Madison County. The historic resource is approximately 175 feet from the LOD, where track on viaduct would be constructed. The current setting in which the historic resource is located is rural, where approximately 111 feet to the east the landscape has been previously obstructed by the construction of a transmission line. Due to previous disturbance to the setting and the distance of the historic resource to the LOD, the construction and operation of the HSR system would not affect the property's integrity of location, design, setting, feeling, materials, workmanship, or association. Furthermore, the cemetery is not in proximity to the LOD to warrant further investigation for unmarked burials beyond the modern boundaries under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas. FRA, in consultation with the THC, determined the Build Alternatives A, B, D and E would have no adverse effect on Resource MA.019. The THC concurrence letter dated June 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.5 Segment 5

A total of four historic resources were included in the impact assessment for Segment 5, two of which are in Grimes County and two are in Harris County. In Grimes County, the historic resources include two cemeteries with no designation. In Harris County, the historic resources include two NRHP-eligible properties. All of these historic resources are located on a common alignment and the potential impacts to these historic resources would be the same for all Build Alternatives. The impact assessment for these historic resources is presented below.

GR.006 (Union Hill Cemetery, CR 150, Bedias): Adverse Impact

Resource GR.006 is the Union Hill Cemetery established in 1859. The historic resource is within 150 feet of the LOD, where the track at this location would be viaduct. Based on the background research and literature review, the Union Hill Cemetery demonstrates a lack of historical significance and would most likely not qualify for listing in the NRHP. However, the THC requires field verification and additional information be provided prior to an official determination of eligibility. Due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside the modern cemetery boundary. Cemeteries in Texas, such as the Union Hill Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined the Build Alternatives A, B, C, D, E and F could have an **adverse impact** on Resource GR.006. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities. TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**. The THC letter dated July 12, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

GR.033 (Ratliff Cemetery, US 90, Roans Prairie): Adverse Impact

Resource GR.033 is the Ratliff Cemetery dating to 1837. The historic resource is within 150 feet of the LOD, where the track at this location would be cut below grade. Based on the background research and literature review, the Ratliff Cemetery demonstrates a lack of historical significance and would most likely not qualify for listing in the NRHP. However, the THC requires field verification and additional information be provided prior to an official determination of eligibility. Due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside the modern cemetery boundary. Cemeteries in Texas, such as the Ratliff Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined the Build Alternatives A, B, C, D, E and F could have an **adverse impact** on Resource GR.033. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground-disturbing activities. TCRR will consult with the THC to assess potential impacts to the cemeteries prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**. The THC letter dated July 12, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

HA.004a (Domestic Dwelling, 29702 Castle Road, Waller): Adverse Impact

Resource HA.004a is a domestic-single family dwelling constructed in 1920 that is determined eligible for listing in the NRHP under Criterion C as a good example of the Craftsman style of architecture. The historic resource was previously within the LOD and is currently approximately 340 feet from the LOD, where the track at this location would be cut below grade. The LOD represents the area required for construction as defined by the conceptual engineering design. This includes provision for the cut section, drainage swales, access road and construction access. The specific depth of the cut, as well as the location of the design elements, would vary depending on the surrounding grade and site conditions. Resource HA.004a was previously within an area identified for road construction, which would have required the building to be removed. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have an **adverse effect** on Resource HA.004a prior to incorporating TCRR's refinements to the conceptual design, although the construction and operation of the HSR system would change the viewshed of the historic resource, resulting in an **adverse effect**. The THC had not concurred with the finding of adverse effect at the time of this Final EIS. Consultation with THC is ongoing. The THC concurrence letter dated August 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

HA.024b (Humble Oil Gas Station, 26114 Hempstead Road, Cypress): No Adverse Impact

Resource HA.024b is a 1956 Humble Oil service station that is determined eligible for listing in the NRHP under Criterion C for architecture. The historic resource is approximately 235 feet from the LOD, where the track at this location would be on viaduct. The LOD represents the area required for construction as defined by the conceptual engineering design. This includes provision for the cut section, drainage swales, access road and construction access. The area of the LOD nearest to the historic resource is identified as drainage. Due to the distance of the historic resource from the LOD and its association with transportation, the integrity of the property would not be diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse effect on Resource

HA.024b. The THC concurrence letter dated August 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.6 Houston Industrial Site Terminal Station Option

One historic resource was included in the impact assessment for the Houston Industrial Site Terminal Station Option in Harris County. The historic resources include the NRHP-eligible Tex-Tube Complex. This historic resource is located on a common alignment and the potential impacts to the historic resources would be the same for all Build Alternatives. The impact assessment for this historic resource is presented below.

HA.208 (Tex-Tube Complex, 1503 North Post Oak Road, Houston): Adverse Impact

Site HA.208 is the Tex-Tube property constructed in ca. 1955 that is determined eligible for listing in the NRHP under Criteria A and C for its architectural and landscape design and for its association with the development of the outer Houston as a light industrial center. The historic resource is within the LOD, where the Houston Industrial Site Terminal Station Option would be constructed. The boundary for the NRHP eligible property is the legal parcel boundary and includes the main office, its formal landscaping and warehouses. The property is in good condition and retains integrity of location, design, materials, workmanship, feeling and association. The LOD at this location represents design elements for the station including the station building, parking areas, roads, track, platform, pedestrian bridge and historic buildings and sites that would be redeveloped to complement the historic character and use of the historic property. Although the main office building associated with the historic property would not be impacted, the landscape and other associated historic buildings that contribute to the property's significance would be affected by construction of the Houston Industrial Site Terminal Station Option. As a result, the overall integrity of the complex would be diminished. FRA, in consultation with the THC, determined the Houston Industrial Site Terminal Station Option would have an **adverse effect** on Site HA.208. The THC concurrence letter dated August 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

3.19.5.2.7 Houston Northwest Transit Center Terminal Station Option

One historic resource was included in the impact assessment for the Houston Northwest Transit Center Terminal Station Option, which is in Harris County. The historic resource, HA.212, is the historic Beth Yeshurun-Post Oak Cemetery. This historic resource is located on a common alignment and the potential impacts to the historic resource would be the same for all Build Alternatives. The impact assessment for this historic resource is presented below.

HA.212 (Beth Yeshurun-Post Oak/Beth Cemetery, 1017 North Post Oak Road, Houston) Adverse Impact

Resource HA.212 is the Beth Yeshurun-Post Oak Cemetery, designated an HTC in 2006, established in the early 1920's. The historic resource is within 150 feet of the LOD of the Houston Northwest Transit Center Terminal Station Option at the terminus of Segment 5, a common line for Build Alternatives A, B, C, D, E and F in Harris County. Based on the background research and literature review, the Beth Yeshurun-Post Oak/Beth Cemetery demonstrates a lack of historical significance and would most likely not qualify for listing in the NRHP. However, the THC requires additional information be provided prior to an official determination of eligibility. Due to the proximity of the cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked graves located outside the modern cemetery boundary. Cemeteries in Texas, such as the Beth Yeshurun-Post Oak Cemetery, are protected under provisions of the Texas Health and Safety Code in Chapters 711-715;

Title 13, § 2, Chapter 22 of the TAC; and in Section 28.03(f) of the Penal Code of Texas, which prohibits the use of a cemetery property for non-cemetery purposes. Therefore, FRA determined the Project could have an **adverse impact** to Resource HA.212. Additional archeological investigations, which may include, but are not limited to, cemetery archival research, oral interviews and ground scraping to locate unmarked burial grave shafts, are required to verify the modern cemetery boundary is accurate within the area of ground disturbing activities. TCRR will consult with the THC to assess potential impacts to the cemetery prior to construction, as required by the Texas Health and Safety Code and Compliance Measures stated in **Section 3.19.6.1**. The THC concurrence letter dated September 20, 2019, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Table 3.19-11: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible, NRHP-eligibility Potential and Historic Cemeteries Within the Historic Resources APE)

Resource ID	Address	Property Type	NRHP Recommendation	NRHP Criteria	Segment	Alternative	Within LOD	Potential Impact
Dallas County								
DA.009 (Residence at 1300 Powhattan St.)	1300 Powhattan St., Dallas, TX	Domestic-single family	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	None
DA.010 (Residence at 1214 Powhattan St.)	1214 Powhattan St., Dallas, TX	Domestic-single family	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	None
DA.016 (KIXL Studios)	1401 South Akard St., Dallas, TX	Commerce/trade	Undetermined; treated as Eligible	N/A	1	A, B, C, D, E, F	No	None
DA.022 (Chase Bag Company)	1111 S. Lamar St., Dallas, TX	Commerce/trade	Eligible	A and C (Event; Architecture)	1	A, B, C, D, E, F	No	None
DA.023 (Cadiz Street Overpass and Underpass)	Cadiz Street, Dallas, TX	Transportation-rail related	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	Adverse
DA.024a-b (Cadiz Street Pump Station)	411 Cadiz St., Dallas, TX	Government-public works	Eligible	A and C (Community Development and Commerce; Architecture)	1	A, B, C, D, E, F	No	None
DA.028 (Dallas Coffin Company)	1325 S. Lamar St., Dallas, TX	Commerce/trade	Listed	A and C (Community Development; Commerce; and Architecture)	1	A, B, C, D, E, F	No	None
DA.029 (Dining Hall)	1401 S. Lamar St., Dallas, TX	Commerce/trade	Eligible as a Contributing Resource to HD	C (Architecture)	1	A, B, C, D, E, F	No	None
DA.030 (Sear Roebuck and Company Catalog Merchandise Distribution Center)	1409 S. Lamar St., Dallas, TX	Commerce/trade-business	Eligible as a Contributing Resource to HD	A and C (Community Development; Commerce; and Architecture)	1	A, B, C, D, E, F	No	None
DA.031 (Sears Roebuck and Company Furniture Warehouse Complex)	710 Belleview St., Dallas, TX	Commerce/trade	Eligible as Contributing Resource to HD	A and C (Community Development and Commerce; and Architecture)	1	A, B, C, D, E, F	No	None
DA.041 (Sigel's Liquor Store)	2021 Cockrell Ave, Dallas, TX	Commerce/trade	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	None
DA.048 (Oak Cliff Box Company)	1212 S. Riverfront Boulevard, Dallas, TX	Commerce/trade-business	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	None

Table 3.19-11: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible, NRHP-eligibility Potential and Historic Cemeteries Within the Historic Resources APE)

Resource ID	Address	Property Type	NRHP Recommendation	NRHP Criteria	Segment	Alternative	Within LOD	Potential Impact
DA.056 (Corinth Street Underpass and Overpass)	Corinth Street and Railroad	Transportation-rail related	Eligible	A and C (Community Development and Commerce; Architecture)	1	A, B, C, D, E, F	No	Adverse
DA.072 (Dallas Floodway Historic District)	ATSF Railroad and Santa Fe Trestle Trail	Government-public works	Eligible	A (Community Planning and Development)	1	A, B, C, D, E, F	Yes	None
DA.076a (Guiberson Corporation) Machine Shop	1000 Forest Ave., Dallas, TX	Industry/processing-manufacturing facility	Eligible	B (Association with Samuel A. Guiberson Jr.)	1	A, B, C, D, E, F	Yes	Adverse
DA.076b (Guiberson Corporation) Family Residence and Office	1000 Forest Ave., Dallas, TX	Domestic-single family	Eligible	B (Association with Samuel A. Guiberson Jr.)	1	A, B, C, D, E, F	No	Adverse
DA.080a-e (Proctor and Gamble Complex)	3701 S. Lamar St., Dallas, TX	Industry/processing-manufacturing facility	Eligible	A and C (Community Development and Architecture)	1	A, B, C, D, E, F	No	None
DA.082 (Honey Springs Cemetery)	4001 Bulova St., Dallas, TX	Funerary-cemetery	Eligible	A (Community Development) and Criterion Consideration D	1	A, B, C, D, E, F	Within 150 feet	Adverse
DA.104 (Railroad Bridge)	Railroad Bridge at E. Illinois Ave., Dallas, TX	Transportation-rail related	Eligible	C (Architecture)	1	A, B, C, D, E, F	No	None
DA.110a (Smith Family Cemetery)	3820 E. Illinois Ave., Dallas, TX	Funerary-cemetery	Not Eligible	N/A	1	A, B, C, D, E, F	Within 150 feet	Adverse
DA.110b (Linfield Elementary School)	3820 E. Illinois Ave., Dallas, TX	Educational	Eligible	A (Community Development)	1	A, B, C, D, E, F	Yes	Adverse
DA.194 (W. A. Strain House Historic District)	400 S. Lancaster Hutchins Rd., Lancaster TX	Domestic/Agricultural Complex	Listed	A (Community Development)	1	A, B, C, D, E, F	No	None
Ellis County								
EL.016a (Geaslin Cemetery)	Epps Rd., Palmer, TX	Funerary-cemetery	Not Eligible	N/A	2A; 2B	A, B, C, D, E, F	Yes	Adverse (2A)

Table 3.19-11: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible, NRHP-eligibility Potential and Historic Cemeteries Within the Historic Resources APE)

Resource ID	Address	Property Type	NRHP Recommendation	NRHP Criteria	Segment	Alternative	Within LOD	Potential Impact
EL.040 (Boren Cemetery)	Boren Dr., Reagor Springs, TX	Funerary-cemetery	Eligible	Consideration D (distinctive design features)	2A; 2B	A, B, C, D, E, F	No	Adverse (2A)
Freestone County								
FR.034 (Johnson African American Cemetery)	CR 1131, Fairfield, TX	Funerary-cemetery	Eligible	A (Ethnic History) Consideration D (local community of freed slaves)	3C	C, F	No	None
FR.016a-g (Furney Richardson School)	FM 1365, Teague, TX	Educational	Eligible	A (Community Development)	4	A, B, D, E	No	None
Leon County								
LE.036 (Nettles Cemetery)	IH-45 South Frontage Road, Buffalo, TX	Funerary-cemetery	Not Eligible	N/A	3C	C, F	Within 150 feet of LOD	Adverse
LE.001a (Little Flock Cemetery)	20190 FM 1512, Jewett, TX	Funerary-cemetery	Eligible	A (Community Development) Consideration D (local community of Bear Grass)	4	A, B, D, E	No	None
Madison County								
MA.003 (Randolph Cemetery)	5577 Dawkins Rd., Normangee, TX	Funerary-cemetery	Eligible	N/A	4	A, B, D, E	Within 150 feet of LOD	Adverse
MA.010 (Ten Mile Cemetery)	FM 2289, Normangee, TX	Funerary-cemetery	Not Eligible	N/A	4	A, B, D, E	Within 150 feet of LOD	Adverse
MA.019 (Oxford Cemetery)	8150 Highway 21 W., Madisonville, TX	Funerary-cemetery	Eligible	A; Criterion Consideration D (Community Development)	4	A, B, D, E	No	None
Grimes County								
GR.006 (Union Hill Cemetery)	CR 150, Bedias, TX	Funerary-cemetery	Not Eligible	N/A	5	A, B, C, D, E, F	Within 150 feet of LOD	Adverse
GR.033 (Ratliff Cemetery)	US 90, Roans Prairie, TX	Funerary-cemetery	Not Eligible	N/A	5	A, B, C, D, E, F	Within 150 feet of LOD	Adverse

Table 3.19-11: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible, NRHP-eligibility Potential and Historic Cemeteries Within the Historic Resources APE)

Resource ID	Address	Property Type	NRHP Recommendation	NRHP Criteria	Segment	Alternative	Within LOD	Potential Impact
Harris County								
HA.004a (Domestic Dwelling)	29702 Castle Rd., Waller, TX	Domestic-single family	Eligible	C (Architecture)	5	A, B, C, D, E, F	No	Adverse
HA.024b (Humble Service Station)	26114 Hempstead Rd., Cypress, TX	Commerce/trade-business	Eligible	A and C (Commercial; Transportation)	5	A, B, C, D, E, F	No	None
HA.208 (Tex Tube)	1503 N Post Oak Rd., Houston, TX	Industry/processing-manufacturing facility	Eligible	A and C (History; Architecture)	N/A	Houston Industrial Terminal Station Option	Yes	Adverse
HA.212 (Beth Yeshurun-Post Oak Cemetery)	1017 North Post Oak Rd., Houston, TX	Funerary-cemetery	Not Eligible	N/A	N/A	Houston Northwest Transit Center Terminal Station Option	Within 150 feet	Adverse

Source: AECOM, 2019

3.19.6 Avoidance, Minimization and Mitigation

As part of their initial engineering efforts, TCRR completed a desktop analysis to identify known cultural resource sites within the Project area to inform their conceptual design. Where possible, these cultural resources sites were avoided altogether. FRA identified additional sites based on TCRR's draft conceptual design through early consultation with local historical societies and agencies. TCRR refined or employed design features to avoid or minimize the impacts to known, identified sites.

These design features include co-location opportunities with existing transportation and utility corridors to avoid and/or minimize impacts to known cultural resources sites. Within the six Build Alternatives, 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure. Other design features include maximizing the use of viaducts to minimize cultural resources impacts. Approximately 55 percent of the Project would be on viaduct.

In order to avoid or minimize impacts to cultural resources, TCRR has implemented several design refinements in the conceptual design, located in **Appendix F, TCRR Conceptual Engineering Design Report** and described below:

- Honey Springs Cemetery Dallas County: Although no realignment options were available, a 2.5-acre facility location was removed and the alignment was redesigned as a viaduct span to the adjoining parcel to the east.
- Corinth Street Viaduct, Dallas, County: An intersection reconfiguration at Corinth Street and Riverfront Boulevard was eliminated from the LOD, removing the viaduct from the historic resources APE.
- Geaslin Cemetery, Ellis County: Although no realignment options were available, the LOD was reduced by 100 feet and viaduct supports were redesigned to span the historic resource to avoid burials during construction and operation.
- Grady Cemetery, Ellis County: The reduction of the LOD along the road alignment along Hodge Road was reduced by 950 feet to the west, eliminating the cemetery from the historic resources APE.
- Ward Cemetery, Navarro County: The LOD was realigned approximately 3,175 feet northeast, eliminating the cemetery from the historic resources APE.
- Asia Cemetery, Freestone County: An approximate 16-acre, permanent road realignment encompassing the majority of the cemetery was removed from the Project at this location, thus eliminating an adverse impact to the cemetery. The LOD is now 275 feet to the east.
- Cotton Gin Cemetery, Freestone County: An approximate 8.9-acre, 1,600-foot permanent road alignment was removed, eliminating the cemetery from the historic resources APE.
- Personville/Ebenezer Cemetery, Limestone County: An approximate 20-acre, permanent road realignment encompassing the majority of the cemetery was removed from the Project at this location, thus eliminating an adverse impact to the cemetery. The LOD is now 545 feet to the east.
- Ten Mile Cemetery, Madison County: An approximate 15-acre, permanent road realignment was removed from the Project at this location, eliminating a physical impact to the cemetery. However, the cemetery remains adjacent to the LOD and will require additional consultation with the THC.
- Oxford Cemetery (NRHP-eligible), Madison County: An approximate 21-acre, permanent road realignment was removed from the Project at this location, thus eliminating an adverse impact to the cemetery.

- Unknown Graves/Cammack Cemetery, Madison County: An approximate 1,550-foot permanent road extension was removed from the Project at this location, thus removing the cemetery from the historic resources APE.
- Ratliff Cemetery, Grimes County: The LOD was shifted approximately 65 feet east to eliminate a physical impact to the cemetery. However, the cemetery still remains adjacent to the LOD and will require additional consultation with the THC.
- Singleton Cemetery, Grimes County: An approximate 4.5-acre, 1,000-foot permanent road extension was removed from the Project at this location, thus removing the cemetery from the historic resources APE.

As part of continued consultation with FRA, THC and consulting parties under the PA, TCRR will identify additional opportunities to refine the LOD to further avoid or minimize impacts to cultural resources. These refinements, where feasible, may include changing track infrastructure (i.e., going from at-grade or embankment to viaduct) that still supports the curvature and operating speed constraints of the Project.

3.19.6.1 Compliance Measures

The following Compliance Measure (CM) would be required.

CR-CM#1: THC Consultation for Cemeteries. All cemeteries in Texas are protected under provisions of the Texas Health and Safety Code in Chapters 711-715; Title 13 § 2, Chapter 22, Rule 22.4(b) of the Texas Administrative Code – *Unknown and Abandoned Cemeteries*, and Rule 22.5 of the Texas Administrative Code – *Removal of Remains from an Abandoned or Unknown Cemetery*; and in Section 28.03(f) of the Penal Code of Texas which prohibits the use of cemetery property for non-cemetery purposes without consent. Prior to construction, TCRR shall consult as required under Section 711.035(d) and Section 711.035(f) for impacts of the Project to cemeteries which are not covered under Section 106 of the NHPA and thus not addressed by the PA (**Appendix L, Programmatic Agreement**). This would include all cemeteries that have been identified to date as well as and all other unknown cemeteries identified during survey and/or construction.

3.19.6.2 Programmatic Agreement

To ensure the appropriate measures to minimize harm for potential impacts to historic properties subject to Section 106 of the NHPA, FRA, in consultation with the THC, determined it is appropriate to develop and implement a PA for the Project because FRA will not be able to fully determine effects to historic properties prior to approving the undertaking (36 C.F.R. 800.14 (b)(1)(ii)-(iii)).

The PA establishes the process that governs the FRA's compliance with Section 106 after approval of the undertaking. FRA has developed the draft PA in consultation with the THC, ACHP, USACE, TCRR and other consulting parties. FRA has provided consulting parties with an opportunity to review and comment on the draft PA prior to the release of the Final EIS and is providing the public an opportunity to review the draft PA by appending the draft PA to the Final EIS.

The PA follows a standard format that includes four sections; the *Title*, *Preamble, Stipulations* and *Signature Block*. These sections will, in general, provide the following information:

- ***Title*** – Identifies the federal undertaking and lists the signatories to the agreement.
- ***Preamble*** – Provides relevant background facts regarding the undertaking at the time the agreement document was executed including: statutory authorities; identification of Signatories and Consulting Parties; a summary of the Section 106 consultation process to date; and any

other contextual information that may be necessary for a reader to understand the intent and purpose of the agreement.

- ***Stipulations*** – Describes the agreed-upon avoidance, minimization, or mitigation measures that will be implemented to address effects to historic properties. In addition, the stipulations define the roles and responsibilities of Signatories and Consulting parties; establish review processes to complete the identification of and assessment of effects to historic properties; and establishes a methodology for resolving adverse effects. Two methodologies to resolve adverse effects are defined: 1) an abbreviated consultation process utilizing pre-negotiated standard treatment measures, or 2) the development of a Memorandum of Agreement (MOA) through continued negotiation. Besides these substantive stipulations, this section also provides detailed procedures for administrative actions, including but not limited to, changes or modifications to the Project, dispute resolution, unanticipated discovery of historic properties, public involvement, monitoring and reporting, provisions for amendments to the agreement and duration of the agreement. In the Stipulations, it clearly states that it is the responsibility of FRA as the lead federal agency to ensure the terms of the PA are carried out, even when other parties are assigned responsibility for certain actions.
- ***Signature Block*** – Formalizes the commitment of the agency and other parties to the terms of the agreement.

The stipulations in the PA define the following actions to be taken to complete the Section 106 process (**Appendix L, Programmatic Agreement**):

- **General/Professional Qualification Standards.** Stipulations I and II of the PA define the applicability of the PA; the timeframes and methods of notifications to the parties of the PA; the roles and responsibilities of the parties; and the professional qualifications standards of those carrying out the actions prescribed by the PA.
- **Completion of the Phased Archeological and Historic Surveys.** Stipulation III of the PA requires that, prior to the start of construction, TCRR, in coordination with FRA, will continue to conduct identification and evaluation of historic properties and apply the criteria of adverse effect in a phased manner in accordance with 36 C.F.R. § 800.4(b)(2) and 800.5(a)(3). Survey work will be conducted by or under the direction of Secretary of the Interior-qualified cultural resources professionals and shall continue to follow the research designs previously prepared by FRA and concurred upon by the THC.
- **Resolution of Adverse Effects.** Stipulation IV of the PA addresses the consultation processes to be followed when the Project adversely affects a historic property and defines the roles of the various parties in that resolution. Also included in the stipulation is an Expedited Consultation Process to Resolve Adverse Effects utilizing Standard Treatment Measures or the option to resolve adverse effects through the development of a Property-Specific MOA. Standard Treatment Measures include recordation; design review; cultural resource protection plans; NRHP and/or NHL nominations; public interpretation; oral history documentation; aesthetic treatments; preservation-in-place of NRHP-listed or eligible archeological sites and sites eligible for SAL designation; and data recovery plans. Standard Treatment Measures can be implemented alone or in combination to resolve adverse effects. Due to the phased approach allowed for in the PA, various Section 106 compliance actions can be implemented simultaneously, and aren't required to be done in a strict sequential manner. For example, treatment measures for known adverse effects to historic properties identified in this EIS can be implemented prior to the future identification and evaluation of all historic properties. Additionally, various compliance measures may occur prior to construction, during construction,

or post construction. For example, the completion of recordation of a historic property or data recovery of an archeological site must be completed prior to construction, but the finalization of an oral history documentation could occur after construction.

- **Process for Commencement of Ground Disturbing Activities.** Stipulation V of the PA requires that prior to the start of construction, TCRR will ensure that Section 106 actions are complete in areas scheduled for ground disturbing activities. TCRR will not commence construction within a Section 408 permission area or USACE permit area prior to documenting compliance with Section 106.
- **Curation.** As stated in Stipulation VI, curation will be done in accordance with Title 13, § 2, Chapter 26, Subchapter C, Rule 26.17 of the Texas Administrative Code – *Principal Investigator's Responsibilities for Disposition of Archeological Artifacts and Data*; and the Texas Natural Resources Code, Title 9, Chapter 191, as well as 36. C.F.R. § 79 as applicable. If the archeological materials are determined to be of Native American origin, curation will be conducted in accordance with the provisions of 43 C.F.R. § 10 as applicable.
- **Unanticipated and Post-Review Discoveries.** Pursuant to 36 C.F.R. § 800.13(a)(1-2) and elaborated in Stipulation VII of the PA, measures would be taken to implement identification, assessment and/or resolution of any adverse effects for unanticipated effects to or unanticipated discoveries of historic properties. Secretary of the Interior qualified cultural resources professionals will aid TCRR in compliance with these steps in the event of any discovery.
- **Unanticipated Discovery Plan**. The Unanticipated Discovery Plan shall be implemented should new or additional cultural resources, including human remains, be found after construction has begun on the Project; or the undertaking affects a previously unidentified historic property, which may be eligible for the NRHP; or the undertaking affects a known historic property in an unanticipated manner. Federally recognized Native American tribes, identified in **Section 3.19.3.1.2**, will be notified of unanticipated discoveries within their identified areas of interest or in the case of an inadvertent discovery of Native American human remains, in accordance with 36 C.F.R. § 800.2(c)(2) and may request to consult on the discovery. Basic training and copies of the Unanticipated Discovery Plan shall be made available to all construction crew and field personnel on site in order to have a basic understanding of, and sensitivity to, the possibility of discovering cultural resources and/or human remains. The training shall include the basis for cultural resource compliance and to provide an overview of the general cultural history of the region and instruction to comply with the following procedures:
    - Construction activities shall be suspended within a 150-foot radius buffer zone of the discovery;
    - Special attention shall be given to the possible extension of the discovery beyond the LOD, and this buffer zone shall be secured through the installation of protective fencing;
    - Within 24 hours, the THC, FRA, and consulting parties should be notified of the unanticipated discovery, and the applicable County Coroner and Sheriff should be notified if human remains are present;
    - Specific FRA and THC instructions shall be followed on a case-by-case basis, although, at a minimum, sufficient archeological work will be performed on the unanticipated discovery location to stabilize deposits and protect deposits from scavengers and looters;
    - TCRR shall have seven calendar days following notification to determine National Register eligibility of the discovery in consultation with FRA, THC and other consulting parties;
    - Human remains shall not be removed without a Disinterment Permit from the State Registrar and a Notice of Existence of Cemetery form must be filed with the county within

10 days and comply with Texas Health and Safety Code Chapter 711. Additional procedures shall be required if avoidance is not possible, and removal and reinternment is necessary; and

- Construction activities shall remain suspended until FRA and THC indicate to TCRR that it may proceed in the area of a specific unanticipated or post-review discovery.

- **Reporting.** As stated in Stipulation VIII, Quarterly Progress Reports will be prepared by TCRR from the effective date of the PA until it expires or is terminated. The progress reports will include a summary of activities completed to comply with the terms of the PA; any scheduling changes proposed; any problems encountered; any disputes or objections received in carrying out the terms of this PA; and maps illustrating the progress of the Project as sections are cleared for construction or constructed.
- **Confidentiality.** Stipulation IX of the PA emphasizes the confidential nature of archeological sites, specified historic properties, and properties of religious and cultural significance to Native American tribes. These locations are protected from public disclosure in accordance with 36 C.F.R. § 800.11(c), Section 304 of the NHPA, Section 9 of the ARPA of 1979, and Executive Order No. 13007 on Indian Sacred Sites dated May 24, 1996.
- **Amendments.** As per Stipulations X of the PA, any proposed amendments to the executed PA will be done in consultation amongst the Signatories and Consulting Parties and Native American tribes, as appropriate.
- **Dispute Resolution.** As per Stipulation XI of the PA, any objections raised regarding any proposed action(s) or the manner in which the terms of this PA are implemented, will be resolved through consultation with the objecting party. FRA may seek comment from the Signatories and/or the ACHP regarding resolution.
- **Termination and Withdrawal.** Stipulation XII of the PA states that if a Signatory wishes to terminate or withdraw from the executed PA, consultation with the other Signatories will occur in order to amend the agreement pursuant to Stipulation X, and Stipulation XI. As provided in 36 C.F.R. § 800.14(b), a new PA may be executed or comments from the ACHP pursuant to 36 C.F.R. § 800.7 may be pursued.
- **Effective Date/Duration.** As per Stipulations XIII and XIV, the effective date of the PA will be the date all Signatories have signed the document. The PA will remain in effect for a period of 10 years.
- **Principal Contacts.** Stipulation XV states the principal contacts for the PA are located in an appendix to the PA and any updates to the contacts can be done without an amendment to the PA.
- **Execution and Implementation.** The final clause in the PA, Stipulation XVI, FRA has taken into account the effects of this undertaking on historic properties, has afforded the ACHP a reasonable opportunity to comment, and has satisfied its responsibilities under Section 106 of the NHPA and its implementing regulations.

3.19.7 Build Alternatives Comparison

All Build Alternatives would have adverse impacts on historic properties and cemeteries within the LOD or within 150 feet of the LOD, as shown in **Table 3.19-12**. Of the six Build Alternatives, Build Alternatives A and B have the greatest impact to cultural resources and Build Alternative F has the least impact to cultural resources. The Industrial Site Terminal Station Option in Harris County would have an adverse impact on a historic property (Site HA.208: Tex-Tube Complex). The remaining two Terminal Station Options in Harris County would have no impact on historic properties. Although, under the Texas Health

and Safety Code, the Houston Northwest Transit Center Terminal Station Option, if chosen, could have an adverse impact on a historic cemetery with no NRHP designation (Site HA.212: Beth Yeshurun-Post Oak Cemetery/Beth Cemetery). To date, no archeological sites within the Project LOD have been listed or determined eligible for listing in the NRHP.

Table 3.19-12: Cultural Resources (Historic Properties and Cemeteries) Impacts by Build Alternative and Houston Station Option

	Build Alternatives						Houston Terminal Station Option		
	ALT A	ALT B	ALT C	ALT D	ALT E	ALT F	Industrial Site	Northwest Mall	Northwest Transit Center
Adverse Impacts	14	14	13	12	12	11	1	0	1

Source: AECOM, 2019

3.20 Soils and Geology

3.20.1 Introduction

This section identifies the existing soil and geological conditions along the Project and provides the soil and geological setting necessary to plan safe and cost-effective construction practices, as well as structurally sound facilities. Specifically, this section evaluates soils, including designated prime farmland, geology, seismicity, mineral resources and surface mines. Pipelines and oil and gas wells are discussed in **Section 3.9, Utilities and Energy**.

This section also describes the environmental consequences of implementation of the Project in comparison to the No Build Alternative and identifies mitigation measures. It also describes the potential soil and geological resources that may require preservation measures.

3.20.2 Regulatory Context

Federal

Farmland Protection Policy Act of 1981

For federal projects, the Farmland Protection Policy Act of 1981 requires federal agencies to (1) identify and take into account the adverse effects of their programs on the preservation of farmland; (2) consider alternative actions, as appropriate, to lessen adverse effects; and (3) ensure that programs, to the extent practicable, are compatible with state and units of local government and private programs and policies to protect farmland.[1] According to the Farmland Protection Policy Act, USDA is the department primarily responsible for the implementation of federal policy with respect to U.S. farmland. USDA granted NRCS the authority to determine the criteria used to designate particular soil units as prime farmland and the responsibility to maintain a prime and unique farmland inventory.[2] Under 7 C.F.R. 657, NRCS identifies and defines the soil units that quality as Farmland Protection Policy Act protected farmland.[3] Form NRCS-CPA-106, Farmland Conversion Impact Rating for Corridor Type Projects, would be required to determine whether farmland impacts warrant consideration of farmland protection measures. The form utilizes two scoring systems, which evaluate both the quality of the soils and the surrounding land use context. Scores from the two systems are combined for a possible total of 260 points. According to NRCS, evaluated sites whose total scores fall below 160 points need not be given further consideration for protection and no alternative sites need to be considered as part of an environmental evaluation. Protection and/or mitigation should be contemplated for sites that receive total scores over 160.[4]

Prime farmland is defined as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. Prime farmlands have the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. Additional potential prime farmlands are those soils that meet most of the requirements of

[1] Farmland Protection Policy Act, 7 C.F.R. 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf (accessed December 2019).
[2] Ibid.
[3] Prime and Unique Farmlands, 7 C.F.R. 657, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part657.pdf (accessed December 2019).
[4] Farmland Protection Policy Act, 7 C.F.R. 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf (accessed December 2019).

prime farmland but fail because they lack the installation of water management facilities or they lack sufficient natural moisture. USDA would consider these soils prime farmland if these practices were installed.[5]

State

State Mineral Rights

Exploration and production of minerals are a big part of the Texas economy. Other than oil and gas, important minerals in Texas include base and precious metals; industrial minerals, such as gypsum, sulphur, talc, etc.; coal and lignite; construction materials such as granite, limestone, rhyolite and other rock that may be quarried for dimension stone or crushed for aggregate; or sand, gravel, caliche, clay and borrow material. Regulations for the exploration and development of minerals other than oil and gas are outlined in the Texas Administrative Code Title 31, Part 1, Chapter 10.[6] The State designates certain lands for mineral exploration. These lands include Texas Permanent School Fund lands, Public University Fund lands, land trade lands, Relinquishment Act lands and state agency lands. Relinquishment Act lands are defined as any public free school or asylum lands, whether surveyed or not surveyed, sold with a mineral classification or reservation between September 1, 1895, and August 21, 1931.

The Texas Permanent School Fund was established in the Texas Constitution of 1876. These lands or the profits from the sale or lease of these lands benefit Texas schools. Lands may be leased for petroleum or nonpetroleum resources. GLO manages state lands and mineral rights totaling 13 million acres across Texas. GLO maintains a database of the Permanent School Fund land types and definitions including information on mineral rights.

Local

Various local public agencies have regulatory authority over construction and operation. These agencies include the incorporated cities of Dallas, Hutchins, Wilmer, Lancaster, Ferris, Palmer, Ennis, Oak Valley, Richland, Fairfield, Buffalo, Centerville, Leona, Jersey Village and Houston. During the final design and permitting, these incorporated cities would have authority to review design plans and reports for conformance with geotechnical codes and regulations. TCRR would comply with any local city requirements.

3.20.3 Methodology

The Study Area[7] for soils and geology encompasses the LOD for each of the six Build Alternatives and is depicted in **Appendix D**, **Mineral and Utility Resources Mapbook**. An investigation of soils and geological features within the Study Area was undertaken to:

- Identify and document the underlying soils and geological features proximal to the Build Alternatives
- Identify and evaluate any related concerns that could impact, or be impacted by, the Build Alternatives

[5] Farmland Protection Policy Act, 7 C.F.R. 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf.
[6] Exploration and Development of State Minerals Other Than Oil And Gas, Texas Administrative Code, Title 31, Part 1, Chapter 10, https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=31&pt=1&ch=10&rl=1 (accessed December 2019)..
[7] The Soils and Geology Study Area does not include the 25-foot setback used in Land Use for prime farmland. The acreage within the 25-foot setback would not be converted or otherwise impacted.

- Compare the potential impacts of each Build Alternative to the No Build Alternative

The evaluation methodologies for soils, geology, seismicity, mineral resources, and surface mines are detailed in the following sections.

3.20.3.1 Soils

A desktop analysis using publicly available data was conducted to determine the existing soils and characteristics within the Study Area. Data reviewed included information from the Digital General Soils Map of the U.S., also referred to as STATSGO2, to determine soil associations,[8] which are taxonomic soil units occurring together in individual and characteristic patterns within the same geographical area. In addition, NRCS Soil Surveys were reviewed for each county within the Study Area to determine shrink-swell potential, erosion potential, corrosion potential, and the existence of prime and unique farmlands.[9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]

Shrink-Swell Potential: The shrink-swell potential of a soil is defined as the extent a soil shrinks as it dries out or swells as it gets wet. The shrink-swell potential classes are based on the change in length of a clump of a particular soil as the moisture content is increased.[20] These classes are defined as follows:

- **Low:** change of less than 3 percent
- **Moderate:** change of between 3 and 6 percent
- **High:** change of between 6 and 9 percent
- **Very High:** change greater than or equal to 9 percent

Soils that are classified as having a moderate to very high shrink-swell potential have a greater potential to cause damage to lines, buildings, roads and other structures constructed on these soils.

Erosion Potential: Soil erodibility is determined by measuring the susceptibility of soil particles to detach and be transported by rainfall and runoff. The soil erodibility factor, also known as the k-factor, is a

[8] USDA NRCS, "U.S. General Soil Map (STATSGO2) by State," 2006, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[9] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX, 2017, accessed December 2019, http://websoilsurvey.nrcs.usda.gov.
[10] USDA SCS, "Soil Survey of Dallas County, Texas," February 1980, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX113/0/dallas.pdf.
[11] USDA SCS, "Soil Survey of Ellis County, Texas." August 1964, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX139/ellisTX1964.pdf.
[12] USDA SCS, "Soil Survey of Navarro County, Texas." December 1974, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/navarroTX1974/navarroTX1974.pdf.
[13] USDA NRCS, "Soil Survey of Freestone County, Texas," 2002, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX161/0/Freestone.pdf.
[14] USDA NRCS, "Soil Survey of Limestone County, Texas." September 1997, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX293/0/Limestone.pdf.
[15] USDA SCS, "Soil Survey of Leon County, Texas." July 1989, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX289/0/leon.pdf.
[16] USDA SCS, "Soil Survey of Madison County, Texas." June 1994, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX313/0/madison.pdf.
[17] USDA NRCS, "Soil Survey of Grimes County, Texas." January 1996, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/grimesTX1996/grimesTX1996.pdf.
[18] USDA SCS, "Soil Survey of Austin and Waller Counties, Texas." March 1984, accessed December 2018, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX600/0/austin.pdf.
[19] USDA SCS, "Soil Survey of Harris County, Texas." August 1976, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/harrisTX1976/harris.pdf.
[20] USDA NRCS, "Soil Survey of Freestone County, Texas," 2002, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX161/0/Freestone.pdf.

quantitative description of the erodibility of a particular soil.[21] The k-factors range from 0.02 to 0.64 with the erosion potential classes defined as follows:

- **Low:** k-factor of less than 0.25
- **Moderate:** k-factor of between 0.25 and 0.40
- **High:** k-factor of greater than 0.40

A soil characterized by a moderate to high k-factor indicates a higher susceptibility for the soil to erode. These soils are easily detached, tend to crust and produce high rates of runoff.

Corrosion Potential: Soil corrosion is a geological hazard that affects buried metals that are in direct contact with soil or bedrock. It affects materials on both the surface and within the soil at varying degrees. Soils with corrosive properties can greatly shorten the lifespan of certain materials. NRCS soil surveys provide corrosion potential ratings of low, moderate or high for uncoated steel and these ratings were reviewed for the soil units within the Study Area. The corrosion potential ratings are based on soil characteristic factors including moisture, texture, acidity and soluble salts.[22] Corrosion review also included information from the Texas Bureau of Economic Geology, USGS and the Texas Railroad Commission.

Prime and Unique Farmlands: NRCS-mapped soil data were collected for the Study Area and evaluated to identify actions under the Project that would potentially convert the prime and unique farmlands (including farmland of statewide importance and prime farmland, if drained) to nonagricultural uses. "Prime farmland, if drained" refers to prime farmland that could be used for agricultural purposes if this farmland were drained. Areas of potential conversion were then quantified by acreage and discussed in the impact analysis. To calculate the direct permanent conversion of these prime and unique farmlands to a nonagricultural use, the acreage for each Build Alternative was quantified. Potential conversion of prime and unique farmlands is also discussed in **Section 3.13.4.2.3, Land Use, Affected Environment, Special Status Farmlands and Agricultural Conservation Easements,** where a 25-foot buffer was added to the LOD to account for indirect loss of productive farmland from farm and ranch equipment use, wind and changes in irrigation. The 25-foot distance is a conservative approximation of limitations on the operation of farm equipment and irrigation to operate at the edge of a property line or boundary (such as the Project). The same 25-foot buffer is not included in the evaluation of impacts to soils and geology because the buffer represents the change in use but would not represent a change in existing soils and geology within the buffer.

3.20.3.2 Geology

A desktop analysis using publicly available data was conducted to determine the existing geological conditions and characteristics within the Study Area. Data reviewed included information from the Texas Bureau of Economic Geology, USGS, and the Texas Railroad Commission. Information was obtained on the geological factors that may influence stability of structures such as geological composition and characteristics, restrictive layers, karst features, and potential hazards such as seismicity (see **Section 3.20.3.3, Seismicity**).[23] Information on potential hazards was obtained from USGS, the Texas State Historical Association (TSHA), and other scientific reports referenced in this analysis.

[21] Ibid.
[22] Gary B. Muckel (ed.), "Understanding Soil Risks and Hazards," USDA NRCS, 2004, accessed December 2019, http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052508.pdf.
[23] USGS, "Search Earthquake Archives," accessed December 15, 2018, http://earthquake.usgs.gov/earthquakes/search/.

3.20.3.3 Seismicity

Seismicity refers to the geographic and historical distribution of earthquakes, which are typically measured using magnitude and intensity. Earthquakes occur on faults, which are fractures along which the blocks of crust have moved on either side relative to one another.[24] The energy released during earthquakes is measured in magnitude. Generally, earthquakes with a magnitude of 2.5 or less cannot be felt and pose a low risk, whereas earthquakes with a magnitude greater than 6.1 pose a high risk. The intensity of the earthquake, or effect it has on the earth's surface, is typically measured using the Modified Mercalli Intensity (MMI) scale. The MMI scale consists of 12 values of increasing intensity. Generally, earthquakes with an intensity of I, II or III cannot be felt and pose little to no hazard. Earthquakes with intensities of IV or V are felt by nearly everyone with possible damage to dishes and windows and overturned objects. Intensities of VI and above are felt by everyone. Effects from earthquakes include some slight damage, such as fallen plaster, at an intensity of VI; negligible damage to well-constructed buildings and considerable damage to poorly-built structures at an intensity of VII; slight damage to well-constructed buildings, considerable damage to ordinary structures and great damage to poorly-built structures at an intensity of VIII and considerable damage to all structures, including buildings shifting off their foundations, at an intensity of IX. Rails may be bent at an intensity of X and would be bent greatly at an intensity of XI. Massive damage, including distorted visibility and propelled objects, would occur at an intensity of XII.[25]

Seismic-hazard maps, including the Texas Seismic Hazard Map and Tectonic Map of Texas, were reviewed to determine the annual probability of seismic hazards occurring in the Study Area.[26, 27] These maps present the probability of an earthquake exceeding a certain percentage of the acceleration of gravity, or change in velocity of ground movement, for an area. The acceleration of an earthquake is closely related to intensity, so a higher acceleration indicates a higher intensity earthquake and higher potential hazards.[28] Generally, the relationship between intensity and acceleration is as follows:

- **I:** peak acceleration of less than 0.17 percent of gravity
- **II-III:** peak acceleration between 0.17 and 1.4 percent of gravity
- **IV:** peak acceleration between 1.4 and 3.9 percent of gravity
- **V:** peak acceleration between 3.9 and 9.2 percent of gravity
- **VI:** peak acceleration between 9.2 and 18 percent of gravity
- **VII:** peak acceleration between 18 and 34 percent of gravity
- **VIII and higher:** peak acceleration greater than 34 percent of gravity

3.20.3.4 Mineral Resources and Surface Mines

GLO and Texas Railroad Commission databases were reviewed to determine the mineral holdings for energy and mineral development.[29] Locations of oil and gas pipelines, wells and surface mines were identified within the Study Area (see **Section 3.9, Utilities and Energy**). NRCS, USGS, and Texas Railroad

[24] USGS, "Earthquake Glossary," last updated April 7, 2016, accessed December 2018, http://earthquake.usgs.gov/learn/glossary/.
[25] USGS, "The Severity of an Earthquake," General Interest Publications of the U.S. Geological Survey, Denver: 1989.
[26] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014" USGS, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[27] Ibid
[28] USGS, "ShakeMap Scientific Background," accessed December 15, 2018, http://earthquake.usgs.gov/earthquakes/shakemap/background.php.
[29] Railroad Commission of Texas, "Mining Zones," accessed December 15, 2018, www.rrc.state.tx.us/mining-exploration/historica-coal-mining/mining-zones.

Commission databases were also reviewed to determine locations of active open-pit mines, gravel, sand, clay or borrow pits, mine tunnels, cave entrances, mine shafts and mine dumps within the Study Area. The locations of these resources were mapped and evaluated against current design details of the Project to assess potential impacts.

3.20.4 Affected Environment

The Study Area contains unique geological features, soils, and mineral resources across 10 Texas counties. Summaries of the existing soils, geology, seismicity, and mineral resources and surface mines within the Study Area by county and segment are provided in the following sections. Details of the data collection efforts for this section are provided in **Appendix E, Soils and Geology Technical Memorandum**.

3.20.4.1 Dallas County

3.20.4.1.1 Soils

The soil characteristics that comprise the Dallas County Study Area are depicted in **Table 3.20-1**.[30]

Table 3.20-1: Soil Characteristics within the Study Area – Dallas County

Soil Description [a]	Soils in Segment 1 (%)
Prime and unique farmland	31
Somewhat poorly drained	3
Moderately well drained	45
Well drained	37
Rarely flooded	2
Frequently or occasionally flooded	27
Low shrink-swell potential	21
Moderate shrink-swell potential	18
High shrink-swell potential	7
Very high shrink-swell potential	44
Low potential for erosion	24
Moderate potential for erosion	68
Low corrosion potential	<1
Moderate corrosion potential	24
High corrosion potential	69

Source: NRCS 2016

[a] Individual soil units within the Dallas County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum**.

The soils underlying the Study Area in Dallas County contain predominantly moderately well-drained and well-drained clays with moderate erosion potential, high to very high shrink-swell potential and high to very high corrosion potential.

3.20.4.1.2 Geology

The Study Area within Dallas County is located within the Blackland Prairies in the Gulf Coastal Plains physiographic region of Texas. Appearing topographically as low rolling terrain, this region is underlain by bedrock of chalks and marls whose geological structure tilts south and east while elevations descend

[30] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

from 1,000 to 450 feet. The Study Area ranges in elevation from 372 to 573 feet above mean sea level (AMSL).[31]

The Study Area within Dallas County is predominantly underlain by various geological formations including Austin Chalk (482.7 acres [58.7 percent]), Alluvium and Ozan (1.6 percent), as described in detail in **Appendix E, Soils and Geology Technical Memorandum**. The Ozan Formation is located at the southern end of Segment 1 in Dallas County. The Study Area was not identified as a karst region.[32]

3.20.4.1.3 Seismicity

The Study Area in Dallas County lies in the regional tectonic setting of the East Texas Basin.[33] There are no known faults within the Dallas County area;[34] however, ground movement has been measured. Fourteen recorded earthquakes equaled or exceeded a magnitude of 3.0 in Dallas County between 2008 and 2015, with a maximum magnitude of 3.6. The nearest documented earthquake was a magnitude 3.3 located 6.7 miles northwest of the Study Area in 2014.[35] Of the 14 that have occurred since 2008, one occurred in 2008 and 2009, two occurred in 2012, one occurred in 2013 and 2014, and eight occurred in 2015. The earthquake peak horizontal acceleration that has a 2 percent chance of being exceeded in 50 years has a value between 4 and 6 percent of gravity, which means there is a 2 percent chance of experiencing an earthquake with an intensity of V or higher in the next 50 years.[36] Dallas County is the only county in the Study Area that would be affected by induced earthquakes, or earthquakes linked to fracking.[37] Localized probability of earthquakes is higher in some areas. There may be a 1 percent chance of earthquakes with an acceleration of 8 to 12 percent of gravity in areas of fracking, typically northwest of the Study Area. The highest intensity predicted for the Study Area in Dallas County is VI on the MMI scale.[38] At this intensity, an earthquake may be felt and move some objects, but damage would be minimal. Minimal damage could include fallen plaster and broken glass, but structural damage would not be likely.[39]

3.20.4.1.4 Mineral Resources and Surface Mines

Although several surface mines, including sand and gravel, clay and sulfur, stone and cement, are located in Dallas County, no surface mines are located within the Study Area.[40] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[41]

[31] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, accessed December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[32] Texas Speleological Survey, "Karst Regions of Texas," July 2014, Accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php,
[33] Bureau of Economic Geology, The University of Texas at Austin, "Tectonic Map of Texas," 1997, accessed December 2018, http://www.lib.utexas.edu/geo/pics/tectonic2.jpg.
[34] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, 2007.
[35] USGS, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014, accessed December 2019, https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.
[36] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," USGS, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[37] Manoochehr Shirzaei, William L. Ellsworth, Kristy F. Tiampo, Pablo J. Gonzalez, and Michael Manga. "Surface uplift and time-dependend seismic hazard due to fluid injection in eastern Texas," Science, 2016, accessed December 2019, http://science.sciencemag.org/content/353/6306/1416.full.
[38] Mark D. Petersen, Charles S. Mueller, Morgan P. Moschetti, Susan M. Hoover, Andrea L. Llenos, William L. Ellsworth, Andrew J. Michael, Justin L. Rubenstein, Arthur F. MacGarr and Kenneth S. Rukstales, "One-year seismic hazard forecast for the Central and Eastern United States from induced and natural earthquakes," USGS, 2016, accessed December 2019, http://dx.doi.org/10.3133/ofr20161035.
[39] USGS, The Severity of an Earthquake, General Interest Publications of the U.S. Geological Survey, Denver: 1989.
[40] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[41] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.

3.20.4.2 Ellis County

3.20.4.2.1 Soils

The soil characteristics that comprise the Study Area within Ellis County are depicted in **Table 3.20-2.**[42]

Table 3.20-2: Soil Characteristics within the Study Area – Ellis County

Soil Description [a]	Soils in Segment 1 (%)	Soils in Segment 2A (%)	Soils in Segment 2B (%)	Soils in Segment 3A (%)	Soils in Segment 3B (%)	Soils in Segment 3C (%)
Prime and unique farmland	90	79	72	84	95	84
Moderately well drained	91	65	59	53	50	53
Well drained	9	33	39	43	48	43
Frequently or occasionally flooded	1	5	5	--	--	--
Low shrink-swell potential	--	--	--	--	--	--
Moderate shrink-swell potential	--	<1	<1	<1	--	<1
High shrink-swell potential	--	9	9	47	44	47
Very high shrink-swell potential	100	91	91	52	56	52
Low potential for erosion	15	18	25	--	--	--
Moderate potential for erosion	85	82	75	99	99	99
High potential for erosion	--	--	--	1	1	1
Moderate corrosion potential	--	--	--	<1	--	<1
High corrosion potential	100	100	100	100	100	100

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Ellis County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum**.

The soils underlying the Study Area in Ellis County contain predominantly moderately well-drained and well-drained clays with moderate erosion potential, and high to very high shrink-swell potential and corrosion potential.

3.20.4.2.2 Geology

The Study Area in Ellis County is located in the Blackland Prairies physiographic province of the Gulf Coastal Plain region of Texas, as described in **Section 3.20.4.1, Dallas County**.[43] The Study Area ranges in elevation from 393 to 532 feet AMSL.

Segment 1 is underlain by the Ozan Formation. Segments 2A and 2B are predominately underlain by the Ozan Formation (860.4 acres [90.3 percent] and 874.3 acres [89.0 percent], respectively), as described in **Appendix E, Soils and Geology Technical Memorandum**. Segments 3A/3B and 3C are predominantly underlain by the Wolfe City Formation as described in **Appendix E, Soils and Geology Technical Memorandum**.[44] In Ellis County, the Study Area is not identified as a karst region.[45]

[42] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[43] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[44] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[45] Texas Speleological Survey, "Karst Regions of Texas," July 2014, Accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.

3.20.4.2.3 Seismicity

Several faults occur within Ellis County, but do not intersect with the Study Area.[46] Eight earthquakes were documented in Ellis County with a magnitude greater than or equal to 2.5 between 2009 and 2013, with one equaling a magnitude of 3.0. The nearest documented earthquake was recorded 8.5 miles west of Segment 1 in 2013.[47] There is a 2 percent chance that an earthquake will occur in the next 50 years with a peak horizontal acceleration of 2 to 6 percent of gravity or higher. While earthquakes have been recorded within 10 miles of the Study Area in Ellis County, the annual probability for seismic hazards or earthquakes to occur is low.[48] In addition, the highest intensity predicted for the Study Area in Ellis County is V on the MMI scale.[49] At this intensity, an earthquake may be felt and move some objects, but structural damage would not be likely.[50]

3.20.4.2.4 Mineral Resources

Overall, Ellis County does not have many mineral resources or prospect mines across the county.[51] The nearest surface mine, the Midlothian Quarry and Plant, is located approximately one-half mile west of Segment 2A. Commodities produced include cement, crushed stone, clay and shale.[52] Aerial imagery and parcel data indicate the entire quarry and plant are located west of the Study Area. No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[53]

3.20.4.3 Navarro County

3.20.4.3.1 Soils

The soil characteristics that comprise the Study Area within Navarro County are depicted in **Table 3.20-3.**[54]

Table 3.20-3: Soil Characteristics within the Study Area – Navarro County

Soil Description [a]	Soils in Segment 3A (%)	Soils in Segment 3B (%)	Soils in Segment 3C (%)
Prime and unique farmland	71	77	66
Moderately well drained	89	88	84
Well drained	11	12	16
Frequently or occasionally flooded	13	6	11
Low shrink-swell potential	2	1	2
Moderate shrink-swell potential	3	3	1
High shrink-swell potential	32	43	24

[46] M. P. A. Jackson, "Fault Tectonics of the East Texas Basin," Bureau of Economic Geology, The University of Texas at Austin, 1982.
[47] USGS, "Search Earthquake Archives," accessed December 15, 2018, http://earthquake.usgs.gov/earthquakes/search/.
[48] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," USGS, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[49] Mark D. Petersen, Charles S. Mueller, Morgan P. Moschetti, Susan M. Hoover, Andrea L. Llenos, William L. Ellsworth, Andrew J. Michael, Justin L. Rubenstein, Arthur F. MacGarr and Kenneth S. Rukstales. "One-year seismic hazard forecast for the Central and Eastern United States from induced and natural earthquakes," USGS, 2016, accessed December 2019, http://dx.doi.org/10.3133/ofr20161035.
[50] USGS, The Severity of an Earthquake, General Interest Publications of the U.S. Geological Survey, Denver: 1989.
[51] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/.
[52] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[53] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.
[54] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Table 3.20-3: Soil Characteristics within the Study Area – Navarro County			
Soil Description [a]	**Soils in Segment 3A (%)**	**Soils in Segment 3B (%)**	**Soils in Segment 3C (%)**
Very high shrink-swell potential	64	52	72
Low potential for erosion	17	13	18
Moderate potential for erosion	46	49	46
High potential for erosion	37	37	36
Low corrosion potential	--	1	--
Moderate corrosion potential	5	3	4
High corrosion potential	95	95	96

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Navarro County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum.**

The soils underlying the Study Area in Navarro County contain predominantly moderately well-drained clays with moderate to high erosion potential, high to very high shrink-swell potential and high corrosion potential.

3.20.4.3.2 Geology

The northern portion of the Study Area in Navarro County begins in the Blackland Prairies and transitions to the Interior Coastal province. Appearing topographically as parallel ridges and valleys, the Interior Coastal province is underlain by bedrock of unconsolidated sands and muds whose geological structure tilts towards the Gulf of Mexico, while elevations descend from 800 to 300 feet AMSL.[55] The Study Area ranges in elevation from 318 to 525 feet AMSL.

Eight, eight and six geological formations underlie Segments 3A, 3B and 3C, respectively. The Neylandville and Marlbrook Marl undivided Formation (363.4 acres [34.6 percent] and 363.4 acres [31.8 percent], respectively) and the Wills Point Formation (305.2 acres [28.7 percent]) and 420.9 acres [36.4 percent], respectively) are predominant for Segments 3A and 3C, as described in **Appendix E, Soils and Geology Technical Memorandum**.[56] Neylandville and Marlbrook Mark undivided Formation (471.1 acres [38.6 percent]), Nacotoch Formation (263.7 acres [21.6 percent]) and Wills Point Formation (307.1 acres [25.2 percent]). The Study Area in Navarro County is not identified as a karst region.[57]

3.20.4.3.3 Seismicity

The Mexia-Talco Fault Zone underlies the Study Area in Navarro County. Individual faults intersect Segment 3A at five locations, Segment 3B at six locations, and Segment 3C at three locations. Although faults exist in Navarro County, no earthquakes have been documented in recorded history dating back to 1900.[58] There is a 2 percent chance that an earthquake will occur in the next 50 years with a peak horizontal acceleration between 2 and 4 percent of gravity. Therefore, the annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[59] The highest intensity

[55] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, accessed December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.

[56] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.

[57] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.

[58] USGS, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014, accessed December 2019, https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.

[59] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014" U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.

predicted for the Study Area in Navarro County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.3.4 Mineral Resources

Although a few sand and gravel mines exist, Navarro County does not have many mineral resources or prospect mines across the county.[60, 61] No surface mines are located within the Study Area in Navarro County.[62] No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area in Navarro County.[63]

3.20.4.4 Freestone County

3.20.4.4.1 Soils

The soil characteristics that comprise the Study Area within Freestone County are depicted in **Table 3.20-4.**[64]

Table 3.20-4: Soil Characteristics within the Study Area – Freestone County

Soil Description [a]	Soils in Segment 3A (%)	Soils in Segment 3B (%)	Soils in Segment 3C (%)	Soils in Segment 4 (%)
Prime and unique farmland	100	100	47	63
Poorly drained	--	--	<1	<1
Somewhat poorly drained	--	--	6	2
Moderately well drained	100	100	22	49
Well drained	--	--	69	40
Frequently or occasionally flooded	--	--	8	7
Low shrink-swell potential	--	--	24	19
Moderate shrink-swell potential	--	--	8	8
High shrink-swell potential	--	--	45	28
Very high shrink-swell potential	100	100	24	45
Low potential for erosion	--	--	10	9
Moderate potential for erosion	--	--	41	35
High potential for erosion	100	100	49	55
Low corrosion potential	--	--	<1	2
Moderate corrosion potential	--	--	68	40
High corrosion potential	100	100	32	58

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Freestone County Study Area are provided in Appendix E, Soils and Geology Technical Memorandum.

The soils underlying the Study Area in Freestone County contain predominantly moderately well-drained and well-drained clays with moderate to high erosion potential, high shrink-swell.

[60] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2019, http://igor.beg.utexas.edu/txmineralresources/.
[61] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[62] Ibid.
[63] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.
[64] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

3.20.4.4.2 Geology

Freestone County is located in the Interior Coastal physiographic province.[65] The Study Area generally ranges in elevation from 290 to 529 feet AMSL.

The Wills Point Formation, as described in **Appendix E, Soils and Geology Technical Memorandum**, underlies Segments 3A and 3B. Segment 3C is predominantly underlain by the Calvert Bluff Formation (596.9 acres [42.4 percent]) and Hooper Formation (489.7 acres [34.8 percent]). The Hooper Formation is the most abundant geological formation underlying Segment 4 (387.4 acres [43.3 percent]) followed by the Wills Point Formation (331.1 acres [37.0 percent]).[66] The geological formations are described in **Appendix E, Soils and Geology Technical Memorandum.** The Study Area within Freestone County is not identified as a karst region.[67]

3.20.4.4.3 Seismicity

No faults intersect the Study Area for Segments 3C and 4 in Freestone County.[68] Although faults were identified in the western corner of Freestone County, no earthquakes have been documented in recorded history dating back to 1900.[69] Freestone County is included in the gulf-margin group of the Gulf Coast faults, which are a belt of mostly seaward-facing normal faults bordering the northern Gulf of Mexico. Many faults in this group are combined into smaller groups for compiling descriptive information. As a result, numerous faults are unmapped. Therefore, unmapped faults may be present in the Study Area for Segments 3C and 4 in Freestone County. These gulf-margin faults are assigned as Class B structures due to their low seismicity and they may be separated from underlying crust, making it uncertain whether they can generate enough seismic ruptures to result in damaging ground motion. [70] The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low. The highest intensity predicted for the Study Area in Freestone County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.4.4 Mineral Resources

Freestone County has a few stone mines, but not many other mineral resources or prospect mines.[71, 72] No surface mines were identified within the Study Area in Freestone County.[73] No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[74]

[65] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[66] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[67] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[68] Ibid.
[69] USGS, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014, accessed December 2019, https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.
[70] USGS, "Quarternary Fault and Fold Database of the United States," July 1999, accessed May 2019, https://earthquake.usgs.gov/cfusion/qfault/show_report_AB_archive.cfm?fault_id=924&section_id=.
[71] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/.
[72] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[73] Railroad Commission of Texas, "Mining Zones," accessed December 2018, www.rrc.state.tx.us/mining-exploration/historical-coal-mining/mining-zones.
[74] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.

3.20.4.5 Limestone County

3.20.4.5.1 Soils

The soil characteristics for the Study Area in Limestone County are depicted in **Table 3.20-5**.[75]

Table 3.20-5: Soil Characteristics within the Study Area – Limestone County

Soil Description [a]	Soils in Segment 4 (%)
Prime and unique farmland	46
Somewhat poorly drained	2
Moderately well drained	37
Well drained	57
Frequently or occasionally flooded	6
Low shrink-swell potential	53
Moderate shrink-swell potential	7
High shrink-swell potential	37
Very high shrink-swell potential	3
Low potential for erosion	29
Moderate potential for erosion	35
High potential for erosion	36
Moderate corrosion potential	83
High corrosion potential	17

Source: NRCS 2016

[a] Individual soil units within the Limestone County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum**.

The soils underlying the Study Area in Limestone County contain predominantly moderately well-drained and well-drained clays with low to high erosion potential, low to high shrink-swell potential and moderate corrosion potential.

3.20.4.5.2 Geology

In Limestone County, the Study Area is located within the Interior Coastal province.[76] The Study Area generally ranges in elevation from 360 to 461 feet AMSL.

The geological formations underlying Segment 4 in Limestone County are predominately composed of the Calvert Bluff Formation (325.7 acres [96.9 percent]).[77] The geological formations are described in **Appendix E, Soils and Geology Technical Memorandum**. The Study Area within Limestone County is not identified as a karst region.[78]

3.20.4.5.3 Seismicity

While surface faults forming the Mexia-Talco Fault Zone are prevalent from northeast to southwest Limestone County, no faults have been identified in the Study Area in Limestone County.[79, 80] Limestone County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. No earthquakes have been documented in Limestone County since 1900. The percent chance that an

[75] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[76] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[77] USGS, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[78] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[79] Ibid.
[80] M. P. A. Jackson, *Fault Tectonics of the East Texas Basin,* Geological Circular Volume 82-4, BEG, Austin: University of Texas at Austin. BEG, 1982.

earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low. The highest intensity predicted for the Study Area in Limestone County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.5.4 Mineral Resources

Limestone County has several plants and mines for minerals such as stone, lignite and limestone; however, no surface mines have been identified in the Study Area in Limestone County.[81,82] No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[83]

3.20.4.6 Leon County

3.20.4.6.1 Soils

The soil characteristics for the Study Area in Leon County are depicted in **Table 3.20-6.**

Table 3.20-6: Soil Characteristics within the Study Area – Leon County

Soil Description [a]	Soils in Segment 3C (%)	Soils in Segment 4 (%)
Prime and unique farmland	21	35
Moderately well drained	10	16
Well drained	70	75
Somewhat excessively drained	2	3
Excessively drained	3	--
Frequently or occasionally flooded	6	3
Low shrink-swell potential	60	52
Moderate shrink-swell potential	28	29
High shrink-swell potential	11	15
Very high shrink-swell potential	1	3
Low potential for erosion	39	19
Moderate potential for erosion	56	66
High potential for erosion	5	14
Low corrosion potential	5	3
Moderate corrosion potential	57	50
High corrosion potential	38	47

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Leon County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum**.

The soils underlying the Study Area in Leon County contain predominantly well-drained clays with low to moderate erosion potential, low to moderate shrink-swell potential and moderate to high corrosion potential.

3.20.4.6.2 Geology

Within Leon County, the Study Area is located within the Interior Coastal province.[84] The Study Area generally ranges in elevation from 266 to 591 feet AMSL.

[81] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/

[82] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

[83] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.

[84] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.

Segments 3C and 4 are predominantly underlain by the Queen City Sand Formation (632.1 acres [45.2 percent] and 463.7 acres [38.5 percent], respectively), Cook Mountain Formation (265.3 acres [19.0 percent] and 180.1 acres [15.0 percent], respectively) and Sparta Sand (259.6 acres [18.6 percent] and 191.2 acres [15.9 percent], respectively), as described in **Appendix E, Soils and Geology Technical Memorandum**.[85] The Study Area within Leon County is not identified as a karst region.[86]

3.20.4.6.3 Seismicity

No faults occur within the Study Area for Segment 3C in Leon County.[87] Leon County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. Two faults intersect the Study Area for Segment 4 in Leon County.[88] No earthquakes have been documented in Leon County since 1900. The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[89] The highest intensity predicted for the Study Area in Leon County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.6.4 Mineral Resources

Overall, Leon County has few mineral resources and prospect mines and no surface mines are located within the Study Area.[90, 91] A parcel of Permanent School Fund land is located approximately 0.79 mile from the Study Area; however, no state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[92]

3.20.4.7 Madison County

3.20.4.7.1 Soils

The soil characteristics for the Study Area in Madison County are depicted in **Table 3.20-7**.[93]

Table 3.20-7: Soil Characteristics within the Study Area – Madison County

Soil Description [a]	Soils in Segment 3C (%)	Soils in Segment 4 (%)
Prime and unique farmland	54	65
Poorly drained	2	--
Somewhat poorly drained	3	11
Moderately well drained	63	68
Well drained	14	9
Somewhat excessively drained	1	--

[85] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[86] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[87] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[88] Ibid.
[89] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[90] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/.
[91] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[92] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.
[93] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Table 3.20-7: Soil Characteristics within the Study Area – Madison County		
Soil Description [a]	**Soils in Segment 3C (%)**	**Soils in Segment 4 (%)**
Frequently or occasionally flooded	10	10
Low shrink-swell potential	10	1
Moderate shrink-swell potential	16	18
High shrink-swell potential	66	71
Very high shrink-swell potential	8	9
Low potential for erosion	1	1
Moderate potential for erosion	38	20
High potential for erosion	61	78
Low corrosion potential	1	--
Moderate corrosion potential	38	33
High corrosion potential	61	66

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Madison County Study Area are provided in Appendix E, Soils and Geology Technical Memorandum.

The soils underlying the Study Area in Madison County contain predominantly moderately well-drained clays with moderate to high erosion potential, high shrink-swell potential and moderate to high corrosion potential.

3.20.4.7.2 Geology

The Study Area within Madison County is located within the Interior Coastal province.[94] The Study Area generally ranges in elevation from 230 to 382 feet AMSL.

Segments 3C and 4 are predominantly underlain by the Yegua Formation (390.8 acres [63.9 percent] and 404.6 acres [67.8 percent], respectively) and the Cook Mountain Formation (171.9 acres [28.1 percent] and 156.1 acres [26.2 percent], respectively), as described in **Appendix E, Soils and Geology Technical Memorandum**.[95] The Study Area within Madison County is not identified as a karst region.[96]

3.20.4.7.3 Seismicity

No faults or earthquakes have been documented within the Study Area in Madison County since 1900.[97] Madison County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[98] The highest intensity predicted for the Study Area in Madison County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

[94] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, accessed December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[95] UUSGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[96] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[97] Ibid.
[98] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales. "Seismic-hazard maps for the Conterminous United States, 2014," U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.

3.20.4.7.4 Mineral Resources

Overall, Madison County has few mineral resources and prospect mines; however, some salt domes are present.[99, 100] No surface mines have been identified in the Study Area in Madison County.[101] In addition, no state agency-owned lands or Permanent School Fund lands have been identified in the Study Area for Madison County.[102]

3.20.4.8 Grimes County

3.20.4.8.1 Soils

The soil characteristics in the Study Area for Grimes County are depicted in **Table 3.20-8**.[103]

Table 3.20-8: Soil Characteristics within the Study Area – Grimes County

Soil Description [a]	Soils in Segment 3C (%)	Soils in Segment 4 (%)	Soils in Segment 5 (%)
Prime and unique farmland	16	5	47
Poorly drained	--	--	2
Somewhat poorly drained	14	5	12
Moderately well drained	75	88	58
Well drained	--	2	21
Frequently or occasionally flooded	12	31	6
Low shrink-swell potential	--	--	26
Moderate shrink-swell potential	35	57	9
High shrink-swell potential	65	43	50
Very high shrink-swell potential	--	--	15
Low potential for erosion	--	--	35
Moderate potential for erosion	12	31	54
High potential for erosion	88	69	11
Moderate corrosion potential	8	--	33
High corrosion potential	92	100	66

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Grimes County Study Area are provided in Appendix E, Soils and Geology Technical Memorandum.

The soils underlying the Study Area in Grimes County are predominantly moderately well-drained clays with moderate to high erosion potential, moderate to high shrink-swell potential and moderate to high corrosion potential.

3.20.4.8.2 Geology

Within Grimes County, the Study Area is located within the Interior Coastal province. The Study Area generally ranges in elevation from 241 to 424 feet AMSL. The Yegua Formation is the most prevalent

[99] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/.
[100] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[101] Ibid.
[102] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.
[103] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

geological formation in Segments 3C and 4, underlying approximately 102.4 acres (100 percent) and 61.3 acres (89.2 percent), respectively. [104, 105]

The predominant geological formations within Segment 5 consist of the Willis Formation (437.5 acres [28.7 percent]), Fleming Formation (341.1 acres [22.4 percent]) and Manning Formation (296.3 acres [19.4 percent]). The geological formations are described in **Appendix E, Soils and Geology Technical Memorandum**.[106]

3.20.4.8.3 Seismicity

No faults occur within the Study Area and no earthquakes have been documented in Grimes County since 1900.[107] Grimes County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[108] The highest intensity predicted for the Study Area in Grimes County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.8.4 Mineral Resources

Overall, few mineral resources or prospect mines exist in Grimes County; however, some sand and gravel and stone sites are present.[109, 110] In addition, bediasites, a form of tektites that are natural glass formed by the impact of meteorites or comets, are known to be found at the Brazos River K-T Boundary site near Bedias, Texas, approximately 2.7 miles east of Segment 5 in Grimes County. These tektites were strewn from a point of impact beneath Chesapeake Bay.[111] No surface mines have been identified within or near the Study Area in Grimes County.[112] In addition, no state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[113]

3.20.4.9 Waller County

3.20.4.9.1 Soils

The soil characteristics in the Study Area for Waller County are depicted in **Table 3.20-9.**[114]

[104] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[105] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[106] Ibid.
[107] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[108] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[109] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/.
[110] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[111] Texas State Historical Association, Virgil E. Barnes, "Tektites," June 2010, accessed July 2019, http://www.tshaonline.org/handbook/online/articles/gpt01.
[112] ibid.
[113] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.
[114] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Table 3.20-9: Soil Characteristics within the Study Area – Waller County	
Soil Description [a]	**Soils in Segment 5 (%)**
Prime and unique farmland	47
Poorly drained	20
Somewhat poorly drained	33
Moderately well drained	27
Well drained	4
Frequently or occasionally flooded	2
Low shrink-swell potential	77
Moderate shrink-swell potential	17
High shrink-swell potential	6
Very high shrink-swell potential	<1
Low potential for erosion	30
Moderate potential for erosion	27
High potential for erosion	44
Moderate corrosion potential	5
High corrosion potential	95

Source: NRCS 2016

[a] Individual soil units within the Waller County Study Area are provided in **Appendix E, Soils and Geology Technical Memorandum**.

The soils underlying Waller County are predominantly somewhat poorly drained and moderately well-drained clays with moderate to high erosion potential, low and high shrink-swell potential and high corrosion potential.

3.20.4.9.2 Geology

In Waller County, the Study Area is located within the transition from the Interior Coastal province to the Coastal Prairies physiographic province. Appearing topographically as nearly flat prairie, the Coastal Prairies province is underlain by bedrock of deltaic sand and muds on nearly flat strata. Sloping less than 1 foot per mile, the province's elevations descend from 300 to 0 feet AMSL as it meets gulf waters. The Study Area generally ranges in elevation from 242 to 313 feet AMSL.

The Willis Formation (303.7 acres [91.5 percent]) is the predominant geological formation that underlies the Study Area in Waller County, as described in **Appendix E, Soils and Geology Technical Memorandum**. [115, 116] The Study Area in Waller County is not identified as a karst region.[117]

3.20.4.9.3 Seismicity

No faults occur within the Study Area in Waller County.[118] Waller County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. No earthquakes have been documented in Waller County since 1900. The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[119] The highest intensity predicted for the Study Area in Waller County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

[115] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[116] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[117] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[118] Ibid.
[119] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen,

3.20.4.9.4 Mineral Resources

Overall, Waller County has few mineral resources or prospect mines across the county and no surface mines are located within the Study Area.[120, 121] No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area.[122]

3.20.4.10 Harris County

3.20.4.10.1 Soils

The soil characteristics in the Study Area for Harris County are depicted in **Table 3.20-10**.[123]

Table 3.20-10: Soil Characteristics within the Study Area – Harris County

Soil Description [a]	Soils in Segment 5 (%)	Industrial Site Terminal Option (%)	Northwest Mall Terminal Option (%)	Northwest Transit Center Terminal Option (%)
Prime and unique farmland	78	--	--	--
Poorly drained	22	8	3	47
Somewhat poorly drained	61	--	--	--
Moderately well drained	5	--	--	--
Frequently or occasionally flooded	<1	--	--	--
Low shrink-swell potential	61	--	--	--
Moderate shrink-swell potential	38	3	16	5
High shrink-swell potential	--	--	--	--
Low potential for erosion	--	--	--	--
Moderate potential for erosion	23	8	3	47
High potential for erosion	76	3	16	5
High corrosion potential	100	11	19	51

Source: NRCS 2016

'—' Not Present

[a] Individual soil units within the Harris County Study Area are provided in Appendix E, Soils and Geology Technical Memorandum.

Soils underlying Harris County are typically poorly drained and somewhat poorly drained, loamy or sandy soils with moderate to high erosion potential, low to high shrink-swell potential and high corrosion potential. The three Houston Terminal Station Options would be comprised of the same two soil classifications; therefore, the soil composition is not a differentiating factor between these terminal options.

3.20.4.10.2 Geology

Within Harris County, the Study Area is located in the Coastal Prairies physiographic province. The Study Area generally ranges in elevation from 62 to 282 feet AMSL.

The Willis Formation and Lissie Formation underlie Segment 5 (730.2 acres [57.7 percent] and 534.4 acres [42.3 percent], respectively). The Lissie Formation is the predominant geological formation

and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.

[120] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed December 15, 2018, http://igor.beg.utexas.edu/txmineralresources/

[121] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

[122] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.

[123] USDA NRCS, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2017, accessed December 2019, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

within the Industrial Site Terminal Option (92.2 acres [99.9 percent]) and the Northwest Mall Terminal Option (93.9 acres [90.4 percent]). The Beaumont Formation is the predominant geological formation within the Northwest Transit Center Terminal Option (66.5 acres [67.1 percent]). The geological formations are described in **Appendix E, Soils and Geology Technical Memorandum**.[124, 125] The Study Area within Harris County is not identified as a karst region.[126]

3.20.4.10.3 Seismicity

Salt tectonics, which is the deformation of structures as a result of the deformation and movement of salt, and fault systems contribute to fault activity in Harris County. From north to south, the three main active fault systems in the Study Area in Harris County are the Hockley-Conroe Fault System, Addicks Fault System and Long Point-Eureka Heights Fault System.[127] No individual faults were identified intersecting the Study Area in Harris County. Harris County is included in the gulf-margin group of the Gulf Coast faults as described in **Section 3.20.4.4.3**. No earthquakes have been documented in Harris County since 1900. The percent chance that an earthquake will occur in the next 50 years is the same as identified for the Study Area in Navarro County, as described in **Section 3.20.4.3.3**. Annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[128, 129, 130] The highest intensity predicted for the Study Area in Harris County is the same as identified for the Study Area in Ellis County, as described in **Section 3.20.4.2.3**.

3.20.4.10.4 Mineral Resources

Although several mines, including, tektites, salt, perlite, vermiculite, barite, stone, antimony, phosphate, sand and gravel, clay and sulfur, are located in Harris County, no surface mines are located within the Study Area in Harris County.[131] No state agency-owned lands or Permanent School Fund lands have been identified in the Study Area in Harris County.[132]

3.20.5 Environmental Consequences

3.20.5.1 No Build Alternative

Under the No Build Alternative, the Build Alternatives would not be constructed; therefore, direct or indirect impacts to soil and geological conditions would not occur. It is anticipated that transportation infrastructure would be constructed within the vicinity of the Build Alternatives to accommodate the anticipated increase in population. Therefore, the entities responsible for potential future projects would consider the same soil and geological conditions described within this section. Potential impacts

[124] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996, accessed December 2018, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[125] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[126] Texas Speleological Survey, "Karst Regions of Texas," July 2014, accessed December 2018, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[127] Richard M. Engelkemeir and Shuhab D. Khan, "Lidar mapping of faults in Houston, Texas, USA," *Geoshpere* (Geological Society of America) 4, no. 1 (February 2008): 170 to 182.
[128] Mark D. Petersen, Morgan P. Moschetti, Peter M. Powers, Charles S. Mueller, Kathleen M. Haller, Arthur D. Frankel, Yuehua Zeng, Sanaz Rezaeian, Stephen C. Harmsen, Oliver S. Boyd, Edward H. Field, Rui Chen, Nicolas Luco, Russell L. Wheeler, Robert A. Williams, Anna H. Olsen, and Kenneth S. Rukstales, "Seismic-hazard maps for the Conterminous United States, 2014," U.S. Geological Survey, 2015, accessed December 2018, http://pubs.usgs.gov/sim/3325/.
[129] USGS, "Geologic Database of Texas, 1:250,000 scale data," Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[130] M.D. Petersen, C.S. Mueller, M.P. Moschetti, S.M. Hoover, R.L. Wheeler, A.L Llenos, Michael A.J. William, J.L.,Rubenstein, A.F. MacGarr, and K.S. Rukstales, *One-year seismic hazard forecast for the Central and Eastern United States from induced and natural earthquakes*: U.S. Geological Survey Open-File Report 2016–1035, 52 p., accessed December 2019, http://dx.doi.org/10.3133/ofr20161035.
[131] USGS, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[132] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, accessed December 2019, http://gisweb.glo.texas.gov/glomap/index.html.

could still occur under the No Build Alternative as new developments would continue due to natural growth in the area that would generate direct and indirect impacts to soil and geological conditions in the Study Area. However, the No Build Alternative would not contribute to this impact.

3.20.5.2 Build Alternatives

Soil and geologic conditions are highly variable throughout the Study Area; however, potential impacts are similar across all alternatives. Therefore, the following sections are discussed for all Build Alternatives rather than by segment and/or county. Potential risk factors and impacts in regard to soils and geology for each Study Area county are discussed in the following sections.

3.20.5.2.1 Soils

Risk factors that should be considered in the design of the Project as a result of soil conditions include unstable soils, highly expansive soils, low soil bearing strength, corrosive soils, slope failures and settlement. These conditions would present a lower risk to the Project with the incorporation of standard engineering design features such as avoiding deep slopes to the maximum extent practicable, stockpiling topsoil for reclamation, and incorporating lime stabilization. The ultimate design of the Project includes structure types such as HSR bridges, roadway bridges, crash walls, retaining walls, noise walls, fences and utilities. In addition, some portions of the Project would require the construction of embankments, which includes cutting, excavation and grading into existing subsurface materials at varying depths, as well as vegetation removal. As stated in **Appendix F, Final TCRR Conceptual Engineering Design and Constructability Reports**, all structures, embankments and cut slopes would incorporate engineering design features to minimize short- and long-term impacts to Project in accordance with AASHTO's Load and Resistance Factor specifications,[133] FWHA-Soil Slopes and Embankment Design, and FHWA-Soil and Foundation Reference Manual during more advanced design.[134]

Potential impacts to the Project as a result of soil erosion could occur during construction and post construction in areas that require grading and vegetation removal until these areas are reclaimed through implementation of long-term soil stabilization such as with revegetation or other ground covering. In addition, unstable soils could cause impacts during operations due to the potential for failures as a result of exposure to groundwater creep or heavy precipitation events, which are typically more likely to occur in proximity to water resources and other areas containing loose or soft deposits of sand, silts and clays.

In areas where construction activities would occur along slopes that vary in height and steepness, localized failures of these slopes could occur with increasing risk as the slope steepness and height increases. Construction of the Project on soft or loose soils may result in slope failures at water resources crossings, instability of cut and fill slopes or collapse of retaining structures. Slope failures could also cause increased load to structures or blockage in the pathway of the slope failure. In addition to slope failures, settlement could occur during construction and operation if underlying materials become compressed under large loads, with placement of new fill material and groundwater withdrawal in areas where high groundwater exists. Settlement is more likely to occur in areas of soft deposits of silty or clay soils that have not been previously compressed by loads of similar size. Portions of the

[133] AASHTO LRFD Bridge Design Specification, 8th edition September 2017, Publication Code: LRFD-8, ISBN 978-1-56051-654-5
[134] FHWA, 2006 Soils and Foundations Reference Manuals, Volumes I and II, FHWA-NHI-06-008 and FHWA-06-089. Available: https://www.fhwa.dot.gov/engineering/geotech/library_sub.cfm?sortheader=FHWA_PubNo&keyword=019

Project that would be at higher risk of impacts as a result of settlement during operation include approach fills for viaducts, embankments and other areas where retained fill are planned.

Soils with high shrink-swell potential shrink during dry conditions and expand when wet. Impacts as a result of a high shrink-swell potential would be greater in areas along the Project that are at-grade, such as facilities and structures, rather than elevated structures on deep foundation, retained fill or retained cuts. Loads associated with at-grade construction may not be sufficient to handle the shrink-swell variability of those soils resulting in movement of structures or track sections if design measures, such as minimizing moisture content changes or soil improvement, are not incorporated.

While there are a few soils within the Project with low corrosion potential, predominantly soils along the Project have a moderate to very high potential to corrode uncoated steel. This potential represents a significant risk to the long-term operation of the HSR system. Impacts associated with corrosion include loss of structural capacity of buried steel components if design measures are not incorporated to improve or replace the soils that exhibit those characteristics along the Project where there would be buried, uncoated steel.

The dominant soil characteristic and associated potential for erosion, shrink-swell, and corrosion shown in **Tables 3.20-1** through **3.20.10** must be taken into account in the design of the Project. The estimated acres of prime and unique farmlands that may be converted to nonagricultural use must also be considered as part of design. **Table 3.20-11** shows the acres of prime farmland soils for each county and segment of the Build Alternatives.

Table 3.20-11: Prime Farmland Soils for Each County and Segment

County	Segment	Prime Farmland (acres)
Dallas County	Segment 1	256
Ellis County	Segment 1	62
	Segment 2A	750
	Segment 2B	705
	Segment 3A	48
	Segment 3B	56
	Segment 3C	48
Navarro County	Segment 3A	742
	Segment 3B	943
	Segment 3C	759
Freestone County	Segment 3A	<1
	Segment 3B	1
	Segment 3C	659
	Segment 4	564
Limestone County	Segment 4	153
Leon County	Segment 3C	294
	Segment 4	420
Madison County	Segment 3C	330
	Segment 4	386
Grimes County	Segment 3C	17
	Segment 4	4
	Segment 5	718
Waller County	Segment 5	155
Harris County	Segment 5	986

Source: NRCS 2016

No prime and unique farmland soils occur within the Houston Station Terminal Options.

3.20.5.2.2 Geology

During construction of the Project, impacts to geology would include ground-disturbing activities, such as cutting and grading, which would permanently modify the local topography. The Project would be designed to follow local topography, where practicable, in order to minimize impacts.

3.20.5.2.3 Seismicity

Seismicity impacts typically include injuries and infrastructure damage as a result of earthquakes. Because earthquakes occur on faults, fault zones are typically associated with a higher probability of earthquakes. However, faults have a variable level of activity and areas with faults present may still have a low susceptibility to earthquakes. Although faults exist in the Study Area, the probability of seismic hazards is low.

Dallas County

Although no faults exist within the Study Area in Dallas County, recent studies show increased risk of seismic activity around the City of Dallas. This is believed to be a result of wastewater disposal from fracking. Recent projections show the potential for higher intensity earthquakes (level VI intensity) in Dallas County than historical measurements (level V intensity). If earthquakes were to occur at the projected intensities or rates, they would be felt, but would cause minimal to no structural damage to the HSR system and would not pose a risk of injury to passengers.

Since 2008, 14 earthquakes have been recorded between 6.8 and 14.3 miles from the Study Area at or exceeding a magnitude of 3.0, which is not severe enough to physically move an object the size of a Shinkansen trainset or its infrastructure. Although none of the earthquakes occurring since 2008 have been strong enough or within proximity to the Project to pose a significant risk, the increasing frequency of low to medium magnitude earthquakes in the last few years (eight in 2015) may warrant additional monitoring in the Dallas and Ellis County areas. The Project would employ early detection sensors, if warranted, in appropriate locations as determined by the Hazard Assessment and as approved by the RPA.

Ellis County

No faults underline the Study Area in Ellis County. Based on the fault locations and the nine recorded earthquakes in Ellis County between 2009 and 2013, the Project would be subject to occasional, low intensity seismic activity. The annual probability of this seismic activity being felt is low and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury to passengers.

Navarro County

Faults from the Mexia-Fault Zone intersect the Study Area in Navarro County including Segment 3A at five locations, Segment 3B at six locations, and Segment 3C at three locations. While faults may not actively cause seismic activity, studies show pumping fracking wastewater into the ground could induce movements along faults. [135] Segment 3B (Build Alternatives B and E) would be affected more by induced seismic activity than the other segments because these segments are intersected by the greatest number of faults. There are no documented earthquakes in Navarro County; therefore, annual probabilities for seismic hazards being felt is low and any potential earthquakes would likely be low

[135] Manoochehr Shirzaei, William L. Ellsworth, Kristy F. Tiampo, Pablo J. Gonzalez, and Michael Manga, "Surface uplift and time-dependend seismic hazard due to fluid injection in eastern Texas," *Science*, 2016, accessed December 2019, http://science.sciencemag.org/content/353/6306/1416.full.

intensity and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury to passengers.

Freestone County

No faults underlie the Study Area in Freestone County and no earthquakes have been documented; therefore, no impacts would be anticipated. Faults from the Mexia-Fault Zone would be in close proximity to Segment 4 (Build Alternatives A, B, D and E) in Freestone County. Similar to faults in Navarro County, these areas would be affected more by induced seismic activity than the other Build Alternatives. The annual probabilities of seismic hazards being felt would be low and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury to passengers.

Limestone, Leon, Madison, Grimes, Waller, and Harris Counties

No faults or earthquakes have been documented within the Study Area in Limestone, Leon, Madison, Grimes, Waller, or Harris Counties; therefore, no impacts are anticipated within these counties. The annual probability of seismic hazards would be low and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury to passengers.

3.20.5.2.4 Mineral Resources and Surface Mines

No state agency-owned lands, Permanent School Fund lands, or surface mines were identified in the Study Area; therefore, there would be no impacts as a result of the Project. The Midlothian Quarry and Plant was identified approximately one-half mile west of Segment 2A. Based on aerial imagery and parcel data, the entire plant and quarry are located outside the Study Area. TCRR would conduct field verification to confirm that this quarry is not located in the Study Area. If it is determined the surface mine is in the Study Area, construction of Segment 2A would preclude this area from future mining. Bediasites, a form of tektites, are known to be in and around Bedias, Texas, approximately 2.7 miles east of Segment 5 in Grimes County. Tektite monitoring would be conducted during construction to identify and mitigate potential impacts to these mineral resources. Potential impacts to oil and gas resources are described in **Section 3.9, Utilities and Energy**.

3.20.6 Avoidance, Minimization, and Mitigation

Approximately 55 percent of the Project would be constructed on viaduct. In accordance with professional engineering standards (American Society for Testing and Materials), TCRR shall conduct extensive geotechnical and foundation analysis prior to construction to develop the optimum design features as a result of soil and geological conditions. To minimize loss of soils, TCRR shall minimize the amount of disturbed ground area at any one time, minimize the duration of time that disturbed soil is laid bare and implement sedimentation and erosion control measures.

In areas along the Project where high groundwater exists and where retained cut or other structures would be located, TCRR shall avoid or minimize the amount of groundwater withdrawal or use alternate foundations to offset the potential for settlement. For additional groundwater data, refer to **Section 3.3, Water Quality**. Potential impacts to soil and geological conditions from the Project would be avoided, minimized and mitigated with the implementation of standard engineering design measures.

3.20.6.1 Mitigation Measures

TCRR would be required to implement the following Mitigation Measures (MM).

SG-MM#1: Erodibility, Shrink-swell Potential, Corrosion, and Settlement. During final design, TCRR shall incorporate stabilization techniques and BMPs, such as lime stabilization and outside fill, into the design of the Project to improve unstable and settlement-prone soils to minimize and mitigate the hazards of soil conditions throughout the Project alignment as a result of erodibility, shrink-swell potential, corrosion potential, settlement and slope failures.

SG-MM#2: Pre-construction Site Inspections. During final design, TCRR shall conduct site geotechnical inspections and slope monitoring of the Project alignment to identify concerns and determine whether unstable locations are in need of improvement so that mitigation measures, such as additional site stabilization, can be incorporated in the final design.

SG-MM#3: Field Verification of Midlothian Quarry and Plant in Ellis County. During final design, TCRR shall field verify the boundaries of the Midlothian Quarry and Plant, located approximately one-half mile west of Segment 2A (Build Alternatives A, B and C) in Ellis County. Aerial imagery and parcel data indicate the entire quarry and plant are located west of the Study Area. If field verification confirms the entire quarry is outside the LOD, no impacts would be anticipated, and no further action shall be required. If field verification identifies quarry land within the LOD, TCRR would either alter the design plans to avoid the quarry or coordinate with the landowner regarding acquisition. TCRR intends to acquire mineral rights not already severed from the surface unless specifically requested by the landowner.

See also **WQ-MM#1: Maintenance and Inspection of Temporary Erosion and Sediment Controls, WQ-MM#2: Crew Training** and **WQ-MM#6: Total Suspended Solids/Stormwater Runoff Control (Permanent)** discussed in **Section 3.3.6.2, Water Quality**, **Avoidance, Minimization and Mitigation** and **LU-MM#2: Agriculture and Livestock Management** discussed in **Section 3.13.7.2, Land Use**, **Avoidance, Minimization and Mitigation**.

3.20.7 Build Alternative Comparison

As noted in **Table 3.20-12**, the soil and geological impacts across the Build Alternatives would be comparable. The only exception would be impacts to prime farmland soils. Based on combined acreage conversion of soils, Build Alternative F would have the least impacts to prime farmland soils (5,050 acres) and Build Alternative B would have the greatest impacts (5,518 acres). Impacts to prime farmland from Build Alternatives A, C, D and E would be comparable. While this comparison considers the impact to areas that are ideal for farmland use, the types of impacts to existing farmland, such as fragmentation, conversion, or whether existing farmland will be temporarily or permanently impacted, are discussed in **Section 3.13.4.2.3, Land Use, Affected Environment, Special Status Farmlands and Agricultural Conservation Easements**.

Table 3.20-12 provides a summary of total area of soils based on relevant characteristics, including erosion, shrink/swell potential and corrosion and surface mines for the Build Alternatives. The three Houston Terminal Station Options would be comprised of the same two soil classifications; therefore, the soil composition is not a differentiating factor among the Houston Terminal Station Options.

Table 3.20-12: Soil Characteristics and Area of Potential Impacts of Each Build Alternative

Characteristic		Area of Potential Impacts (acres)					
		ALT A	ALT B	ALT C	ALT D	ALT E	ALT F
LOD Area		9,173.4	9,347.1	9,689.0	9,202.8	9,376.4	9,718.4
Shrink-Swell Potential	Low	2,593.6	2,585.8	2,848.3	2,593.6	2,585.8	2,848.3
	Moderate	1,458.4	1,465.1	1,485.0	1,456.9	1,463.7	1,483.6
	High	2,284.0	2,477.1	2,471.2	2,289.2	2,482.4	2,476.4
	Very High	2,727.9	2,697.5	2,781.8	2,752.8	2,722.4	2,806.7
Erosion Potential	Low	1,611.6	1,591.3	1,914.1	1,679.3	1,659.1	1,981.9
	Moderate	4,511.2	4,619.9	4,786.6	4,472.1	4,580.9	4,747.6
	High	2,963.5	3,036.8	2,907.9	2,963.5	3,036.8	2,907.9
Corrosion Potential	Low	55.3	71.8	81.4	55.3	71.8	81.4
	Moderate	2,204.8	2,182.0	2,761.1	2,204.8	2,182.0	2,761.1
	High	6,824.5	6,992.5	6,764.5	6,853.2	7,021.2	6,793.2
Prime Farmland Soils		5,245.3	5,454.7	5,033.2	5,202.9	5,412.3	4,990.8
Surface Mines		0 [a]	0 [a]	0 [a]	0	0	0

Source: NRCS 2016

[a] The Midlothian Quarry and Plant in Ellis County was identified at approximately one-half-mile west of Segment 2A. Exact limits would need to be field-verified to confirm or discount presence in the Study Area.

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3.21 Greenhouse Gas Emissions

3.21.1 Introduction

This section describes potential climate change effects of the Project through an analysis of transportation GHG emissions. The purpose of this assessment is to identify potential climate change impacts resulting from construction and operation of the Project, as compared to the No Build Alternative for NEPA analysis purposes. Resilience of Project and features to potential climate change impacts is also discussed. Because GHG emissions are most often analyzed and reported at the state or national level, the GHG impacts analysis aggregates emissions on a Project basis instead of analyzing impacts at a county level.

The principal GHGs generated by human activities are CO_2 and CH_4, but also includes N_2O and various compounds such as hydrochlorinated fluorocarbons (HCFC) and perfluorinated compounds (PFC). GHGs alter the opacity of the atmosphere to infrared light radiated back to space from the Earth, which results in heating of the atmosphere. According to NOAA, data show global average temperature has increased 1.4°F since the early 20th Century.[1] The 20 warmest years in the recorded data have all occurred since 1981, with the 10 warmest occurring since 2006.[2] Some GHGs, such as CO_2 and CH_4, are emitted to the atmosphere through both natural processes and human activities. Other GHGs, such as fluorinated gases, are solely man-made. GHGs differ in their ability to trap heat. To account for this, a weighting factor called the Global Warming Potential (GWP) is defined for a gas relative to the heat-trapping ability of the same mass of CO_2, and emissions are normally expressed in terms of CO_2 equivalents (CO_2e). For example, the GWP of CO_2 is 1, whereas the GWP of N_2O is 310.

3.21.2 Regulatory Context

Currently, there are no applicable federal or state regulations, or executive orders, specifically requiring GHG emissions or resiliency of project features to climate change be determined for federal projects.

3.21.3 Methodology

The methodologies used to assess existing conditions and potential impacts to GHG emissions and climate change in the GHG Study Area are discussed below. The Study Area chosen for comparison of the results of GHG emission estimates in context to climate change is the State of Texas since GHG emissions are most often reported at the state level.

GHG impacts would be due to direct emissions from construction of the Build Alternatives and indirect emissions from power generation for the trainset, stations and maintenance facilities. Total GHG emissions would be offset by the potential reduced GHG emissions of passenger vehicles as commuters would no longer drive between Dallas and Houston along IH-45. Therefore, the estimate for vehicle emission reductions is focused on the travel length of this highway.

Construction emission sources include non-road equipment used during construction, on-road vehicles including worker trips and material hauling trucks and diesel locomotives used for material delivery. The emissions estimate focused on the LOD, including assumed locations of material delivery. Construction GHG emissions were estimated for Build Alternative C because it would have the longest track distance and could be used as a proxy to estimate construction emissions for all Build Alternatives.

[1] NOAA, *Global Climate Change Indicators*, 2016, accessed December 2019, https://www.ncdc.noaa.gov/sotc/global/201613.
[2] Ibid.

Construction period GHG emissions were quantitatively estimated for the earthwork and major civil construction activities of the Project as listed in **Section 3.2.3.1, Air Quality, Construction Emissions Methodology**. Non-road GHG emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained-fill rail segments, TPSS, industrial buildings at the TMFs, MOW facilities and HSR stations, including parking garages and platform facilities, were calculated using emission factors derived from the MOVES2014b emissions model. The analysis assumed that the non-road track construction equipment (mobile, portable and stationary fuel-burning equipment) would be spread out evenly along the Project and that equipment would be used based on a 50-hour work week over the entire 60-month construction period.

Station construction emissions were determined assuming one terminal station located at each end of the Build Alternatives and one midpoint station, a TMF located at each end of the Build Alternatives and five stand-alone MOW facilities. All stations and the TMF and MOW facilities would be constructed between 2020 and 2024, with 2022 and 2023 being the year(s) in which construction activity would be highest in terms of emissions.

On-road vehicles would be used during all aspects of construction and result in emissions of GHGs. Calculations of GHG emissions from these vehicles during the construction period were quantified using VMT estimates for on-road vehicles and MOVES2014b emission factors. The equipment for the Project that would be used "on-road" would include passenger trucks, light commercial trucks and single-unit short-haul and long-haul diesel trucks. Truck CO_2e emission factors are provided in **Section 3.2, Air Quality, Table 3.2-2**. For each scenario, the maximum material hauled in 1 year or maximum annual mileage for on-road trucks was used to estimate emissions. Emissions from the remaining on-road construction vehicles consisting of light duty commercial trucks, fuel and water trucks and passenger vehicles, including worker vehicles, were determined by multiplying the vehicle class emission factor by the distance traveled. This is detailed in **Appendix E, Air Quality Technical Memorandum**.

In addition to truck hauling, diesel locomotives would also be used to transport construction materials. Total GHG emissions from locomotive hauling were determined using Tier 2 emissions factors applicable for line-haul diesel locomotives, and EPA conversion factors. Total annual material quantities were determined and allocated to each rail connection precast and storage yard. Rail distances to the rail connection precast and storage yards within the GHG Study Area were then determined and included in the emissions analysis.

Power generation is interconnected at a near-statewide level (ERCOT) and therefore identifying a specific set of power plants supplying the power is not practical, as explained in **Section 3.2.5.2.6, Air Quality, Compliance with the GC Rule**. Therefore, the GHG emissions estimate for power station emitters is focused on the ERCOT Power Control Area. With regard to HSR electric power consumption, differences in estimates provided by TCRR of power consumed between Build Alternatives would not vary with track length, but by other variations of station, TMF and signaling configuration. Build Alternative A would have the highest power consumption, although it would only vary by 1 percent compared to the lowest consuming Build Alternatives. Therefore, for the trainset portion of operational emissions, the estimate of emissions was based on Build Alternative A. For the vehicle emissions reduction portion of operational emissions, differences in the Build Alternatives would not affect the assumption of reducing vehicle travel along IH-45 or the assumed trip length along IH-45. Therefore, the estimate of vehicle emissions reduction is equally applicable to all the Build Alternatives.

To estimate GHG impacts of the alternatives, emissions using factors derived from either air quality models or EPA Tier 2 diesel locomotive emission standards were calculated. Estimates of power

consumption by the HSR trainsets, stations and TMFs is summarized below, and described in more detail in **Section 3.2.3.2.1, Air Quality, Trainset Operation Emissions**.

Trainset operation emissions were estimated using power consumption information provided by TCRR for trainset operation (e.g., traction, onboard lights), stations, TMFs and other minor facilities (e.g., signaling). Daily and yearly operation power demands were calculated using the Project operational assumptions (i.e., operating hours/schedule). Available emissions factors from EPA's eGRID, which included GHG, were used for power plant generation in ERCOT, and were used in conjunction with the calculated annual power consumption to calculate the trainset operation GHGs. The GHG emissions factor for vehicles derived from MOVES2014b was used to calculate annual GHG emissions using the VMT estimated to be reduced during operation of the HSR system. The specific methods and assumptions for obtaining factors from eGRID and MOVES2014b are described in **Section 3.2.3.2, Air Quality, Operational Emissions Methodology**. Vehicle emissions reductions from travel mode shift from cars to HSR were calculated using the EPA's MOVES2014b model and ridership information from **Appendix F**, **TCRR Final Conceptual Engineering Design and Constructability Reports**. The ridership estimates and assumptions in this report were derived from an independent HSR ridership study for the Dallas-Houston travel corridor, discussed in more detail in **Section 3.2.3.2.2, Air Quality, Operational Emissions Methodology, Vehicle Emissions Reduction**. This report contained projected annual passengers and vehicle occupancy information that was used in conjunction with IH-45 trip distances between Dallas and Houston to estimate annual vehicles and VMT for trips that would have been made in the absence of the Project. The MOVES2014b model was used to derive emissions factors, including GHG, for the year 2040 corresponding to the future service level, using national default data for the DFW and HGB nonattainment counties. Emissions avoided for travel by bus and plane were not calculated as they represent a relatively minor portion of the projected travel mode shift, as discussed in **Section 3.2.3.2.4, Air Quality, General Conformity Emissions Methodology.**

Net GHG operational impacts were then determined by adding the trainset operation emissions and vehicle emissions reduction.

Climate change impact from GHG is a global-scale phenomenon with modeling most often conducted at hemispheric, continental or national scales, and at best, at regional scales (with respect to continent or national).

In general, assessment of the climate change impacts on alternatives and their resilience was conducted using the spatial information in the U.S. National Climate Assessment and Texas A&M Wildfire Risk Assessment Portal (TxWRAP) maps in combination with geospatial data of the alternatives. The spatial resolution of National Climate Assessment data are relatively coarse, while TxWRAP data resolution is higher. A 5-mile buffer around the alternatives was chosen to assess potential climate change impacts to accommodate both resolutions.

3.21.4 Affected Environment

Climate change prediction data from the most recent version of the National Climate Assessment were reviewed to assess potential impacts.[3] This section includes predictions of various measures of climate change under low and high global GHG emissions scenarios during the future period of 2041-2070 for the U.S, which is the period of predicted change available from the National Climate Assessment. Though the long-term operable year used in planning the Project is 2040, for the purposes of this analysis, and considering the resolution of climate change forecasting, the predictions for 2041-2070

[3] Jerry M. Melillo, Terese (T.C.) Richmond and Gary W. Yohe, "Climate Change Impacts in the United States: The Third National Climate Assessment," U.S. Global Change Research Program, United States of America, 2014.

were deemed appropriate to describe impacts for the future year 2040. The following discusses the potential events, their relevancy to the alternatives and the GHG Study Area, and any of the Project components that make it resilient or not to the potential climate change effect.

3.21.4.1 Precipitation

According to the National Climate Assessment, there would be little change over the period 2041-2070 in the number of annual heavy precipitation days (defined as the seven wettest days of the year) for the GHG Study Area, with the change predicted to be between 0 and 0.6 day (or between 0 and 8 percent) under both low and high emissions scenarios.[4] This does not indicate that projected climate change would adversely impact current flooding risk within the GHG Study Area.

3.21.4.2 Temperature

According to the National Climate Assessment, the change in number of the annual hottest days (defined as the hottest 2 percent of days of the year [about 7 days] from the 1971-2000 historical data) would effectively double or quadruple depending on the emissions scenario and location within the GHG Study Area.[5] The annual hottest days from the 1971-2000 historical data generally range from 95°F to 105°F in Texas. The change under the low GHG emissions scenario varies from 13 to 16 extra hottest days from Dallas southward to approximately two-thirds of the length through the GHG Study Area and varies from 16 to 19 extra hottest days in the last third of the GHG Study Area closest to Houston. The change under the high GHG emissions scenario varies from 16 to 19 extra hottest days from Dallas southward to approximately halfway through the GHG Study Area, 22 to 25 extra days in the next quarter of the GHG Study Area, and 25 to 28 extra hottest days through the last quarter of the GHG Study Area, closest to Houston.

3.21.4.3 Drought and Wildfire

An increase in extreme heat events would generally be expected to increase drought and wildfire risk. For some regions, prolonged periods of high temperatures associated with droughts contribute to conditions that lead to larger wildfires and longer wildfire seasons.[6] Droughts occur during prolonged periods of no precipitation that are part of the multi-decadal weather pattern, such as the drought of record in the state in 2011 through 2012, which has been attributed to the cooler-than-normal water temperatures in the Pacific Ocean or La Niña.[7]

The most relevant climate change measure is the projected change in consecutive dry days.[8] This change is summarized in **Table 3.21-1**. For the GHG Study Area, during the period 2041-2070, a relatively small change in the number of consecutive dry days is projected except for around Dallas. Under the low emissions scenario, zero to two extra consecutive dry days are projected for most of the GHG Study Area and two to three extra consecutive dry days in the area approaching Dallas, representing an approximate change of 0 to 12 percent over the 20 to 25 consecutive dry-day historical average. Around Dallas, three to four extra consecutive dry days are projected, while greater than four extra consecutive dry days are projected for the Dallas area, an approximate change of 10 to 16 percent or greater over the 25 to 30 consecutive dry-day historical average. Under the high emissions scenario, zero to two day

[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] NOAA, “Texas heat wave of 2011 largely caused by drought, ocean temperatures, says NOAA-led study,” November 15, 2012.
[8] Jerry M, Melillo, Terese (T.C.) Richmond and Gary W. Yohe, "Climate Change Impacts in the United States: The Third National Climate Assessment," U.S. Global Change Research Program, United States of America, 2014.

extra consecutive dry days are still projected for much of the GHG Study Area, but the zone approaching Dallas projected for two to three extra consecutive dry days extends closer to Houston. Under the high emissions scenario, the area projected to have greater than four extra consecutive dry days encompasses a larger area around Dallas, making the approximate change potentially greater than 20 percent.

Table 3.21-1: National Climate Assessment Projections for Project Area Annual Consecutive Dry Days (2041-2070)

TCRR Project Area Description	Projected Extra Dry Days	Change
Low Emissions Scenario		
Dallas	3-4	10%-16% and greater from existing 25-30 consecutive days
Approaching Dallas	2-3	10%-12% from existing 20-25 consecutive days
South of Dallas to Houston	0-2	0%-10% from existing 20-25 consecutive days
High Emissions Scenario		
Dallas – extent bigger than low emissions scenario	>4	Potentially >20% from existing 25-30 consecutive days
Approaching Dallas – extent bigger than low emissions scenario	2-3	10%-12% from existing 20-25 consecutive days
South of Dallas to Houston	0-2	0%-10% from existing 20-25 consecutive days

Source: Melillo 2014

In addition to climate, wildfire risk and size depend on many factors such as fire fuel availability, land use and management practices and firefighting response and capabilities. Given this, whether an increase in climate change-induced drought would directly lead to increased wildfires for the GHG Study Area is difficult to discern. All other such factors being equal, any increase in risk for wildfire caused by this change would be greater for the GHG Study Area around Dallas than in the rest of the GHG Study Area. Though the drought risk might be greater in and around Dallas, general land cover is dominated by urban development and cropland or pasture, where risk would be from surface fires (i.e., from grasses and low herbaceous groundcover) rather than crown fires that are more difficult to contain and associated with forest cover.

TxWRAP data maps and assesses various landscape and climatic factors that impact the intensity and risk of wildfire occurrence, such as vegetation, fuel type, topography, weather and historical fire occurrence.[9] The aggregate wildfire threat through most of the GHG Study Area is low (1 to 2 out of a relative maximum score of 7) with minor areas of moderate and only approximately one-fifth of the Study Area involving an area of moderate to high (3 to 6) fire threat. This portion of moderate to high fire threat extends from north Leon County through Freestone and Limestone Counties to north Navarro County. The area of projected three to four extra consecutive dry days and greater than four extra consecutive dry days does not overlap the moderate to high fire threat portion of the GHG Study Area under the low emissions scenario but does overlap the portion of the GHG Study Area under the high emissions scenario.

Fire occurrence data from 2000 to 2009 assessed in TxWRAP indicates no large fires (>500 acres) were located in the higher threat portion of the GHG Study Area. The only large fires recorded in the GHG Study Area were in Ellis County, in areas of low to moderate fire threat. Indicators used in the threat classification, such as expected characteristic flame length, fire intensity scale and extreme fire type

[9] Texas A&M Forest Service, *Texas A&M Forest Service Wildfire Risk Assessment Portal (TxWRAP)*, 2016, accessed January 20, 2016, https://www.texaswildfirerisk.com/.

(e.g., surface vs. canopy) indicate lower risk scores throughout Ellis County and the rest of the GHG Study Area. Wildfire ignition density, which factors in how many ignition locations have been identified from the recorded fires, is very high in Ellis County. The high ignition density combined with the lack of large fires in Ellis County would indicate many small fires that are contained and are unlikely to spread, suggesting that either fire response is sufficiently quick to contain them, or landscape factors do not result in large fires.

The worst drought and wildfire season in state history occurred during 2011, with fires occurring in every region of the state, and numerous large fires throughout the year, many over 1,000 acres. According to wildfire mapping from the 2011 wildfire season, only two large fires greater than 1,000 acres were adjacent to the GHG Study Area in Madison and Navarro Counties, and those inside of the Study Area were smaller than 1,000 acres.[10] This would corroborate that landscape factors and fire response tend to limit wildfire size, considering the extreme nature of the 2011 wildfire season. The density of all fires and large fires during 2011 in the GHG Study Area was commensurate with the rest of the eastern part of the state.[11] Considering the fire threat data, fire history in drought and non-drought years and projected extra dry days, it appears that increase of the risk by climate change would be limited through most of the GHG Study Area. Where the fire threat is high, a higher increase in wildfire risk from the climate change would be expected only in the high emissions scenario. However, the fire size history indicates landscape and response factors may limit the severity.

3.21.4.4 Sea Level Rise

Due to the far inland location of the GHG Study Area, elevations (above mean sea level) range from approximately 105 feet in Houston to approximately 430 feet in Dallas; therefore, sea level rise is not projected to affect the GHG Study Area.

3.21.5 Environmental Consequences

3.21.5.1 No Build Alternative

Nationally, estimated GHG emissions decreased by 13.4 percent between 2005 and 2016, while in Texas GHG emissions increased by 7.5 percent.[12] Many factors affect the increase or decrease of GHG emissions, including population and industry growth, economic downturns and changes in regional power generation. Under the No Build Alternative, there would be no increase in construction emissions over those that would occur from other projects and development during the projected construction period of 2020 to 2024. However, following 2024, there would also be no shift in travel from passenger vehicles to HSR for travel between Dallas and Houston; therefore, outside of technological advances, there would be no potential long-term net reductions in GHG emissions. The potential annual net reduction is displayed in **Table 3.21-6**. Over the long-term, greater GHG emissions would be expected to occur. The net reduction of 0.17 million metric tons annually would be a small percentage (0.02 percent) of the most current state-wide estimated emissions estimate of 654 million metric tons annually.[13]

[10] Justice Jones, April Saginor and Brad Smith, "2011 Texas Wildfires Common Denominators of Home Destruction," *Texas A&M Forest Service,* undated, accessed January 20, 2016, http://tfsweb.tamu.edu/uploadedFiles/FRP/New_-_Mitigation/Protect_Your_Home/2011%20Texas%20Wildfires.pdf.
[11] Ibid.
[12] EIA, *Energy-Related Carbon Dioxide Emissions at the State Level 2005-2016*, accessed November 9, 2019, http://www.eia.gov/environment/emissions/state/analysis/.
[13] Ibid.

3.21.5.2 Build Alternatives

This section presents quantitative impacts of the Project to GHG emissions, which were estimated as part of the air quality emissions analysis discussed in **Section 3.2, Air Quality**. This section also assesses the resilience of the Project to climate change impacts.

3.21.5.2.1 Construction Emissions

The maximum annual non-road construction period GHG emissions (in million metric tons) for the Project are shown in **Table 3.21-2.** The emissions shown are the maximum emissions during any given year for the construction period. The specific construction equipment, including the rated horsepower, average load factor, utilization and total number of equipment for each major construction activity, are shown in **Appendix E, Air Quality Technical Memorandum**.

Table 3.21-2: Maximum Annual Non-Road Construction GHG Emissions[a]

Construction Activity	CO_2e (million metric tons)
Track[b]	0.01104
Stations[c]	0.0046
TMFs[d]	0.0050
MOWs[e]	0.0073
Total	**0.0279**

Source: AECOM, 2020

[a] The construction GHG emissions were estimated for the Build Alternative C, which is used as a proxy to estimate construction emissions for all other Build Alternatives. Total construction GHG emissions from all other Build Alternatives would be lower and are estimated to differ from Build Alternative C by less than 1.9 percent. Totals shown differ from total emissions shown in **Appendix E, Air Quality Technical Memorandum,** due to rounding.

[b] Total includes demolition activities and construction of track (elevated, at-grade, retained fill) and roadway crossings.

[c] Assumes construction of one terminal station in Dallas, one terminal station in Houston and an intermediate station.

[d] Assumes construction of one TMF in Dallas and one TMF in Houston.

[e] Assumes construction of five stand-alone MOW facilities.

3.21.5.2.2 On-Road Vehicle and Material Hauling Emissions

In addition to the non-road construction equipment, on-road vehicles would be used during all aspects of Project construction and result in emissions of GHGs. Total annual CO_2e emissions in millions of metric tons resulting from on-road construction-related vehicle operations for the Project are shown in **Table 3.21-3**.

Table 3.21-3: Maximum Annual On-Road Construction-Related Vehicle GHG Emissions

Construction Activity	CO_2e (million metric tons)
Truck Hauling	0.0121
On-Road Vehicles - Track	0.0413
On-Road Vehicles - Station	0.0048
On-Road Vehicles - TMF	0.0017
On-Road Vehicles - MOW	0.0040
Total	**0.0639**

Source: AECOM 2020

Notes: The construction GHG emissions were estimated for Build Alternative C, which is used as a proxy to estimate construction emissions for all other Build Alternatives. Total construction GHG emissions from all other alternatives would be lower and are estimated to differ from Build Alternative C by less than 1.9 percent. Totals shown differ from total emissions shown in **Appendix E, Air Quality Technical Memorandum,** due to rounding.

3.21.5.2.3 Freight Rail Material Hauling Emissions

Table 3.21-4 shows the annual locomotive line-haul GHG emissions. Emissions were calculated for the maximum amount of material hauled during any given year and using existing Tier 2 emission factors. Year 2020 would be the first year that ballast and aggregate materials would be required for the project, and existing Tier 2 emission factors would be the most conservative within the construction schedule because future emissions would be expected to decrease each year as rail vehicle technology improves. The detailed results from the locomotive emission calculations are shown in **Appendix E, Air Quality Technical Memorandum**.

Table 3.21-4: Annual Locomotive Line-Haul GHG Emissions from Construction Activities

Construction Activity	CO_2e (million metric tons)
Material Hauling	0.0087

Source: AECOM 2019

Notes: The construction GHG emissions were estimated for Build Alternative C, which is used as a proxy to estimate construction emissions for all other Build Alternatives. Total construction GHG emissions from all other Build Alternatives would be lower and are estimated to differ from Build Alternative C by less than 1.9 percent. Totals shown differ from total emissions shown in **Appendix E, Air Quality Technical Memorandum,** due to rounding.

Table 3.21-5 shows a summary of GHG emissions for the Project. Maximum annual emissions from off-road construction equipment, on-road construction vehicles and locomotive hauling are included. Detailed analysis of the construction GHG emissions can be found in **Appendix E, Air Quality Technical Memorandum.**

Table 3.21-5: Maximum Annual Construction Period Emissions

Construction Activity	CO_2e (million metric tons)
Off-Road Construction Equipment	0.0279
On-Road Construction Vehicles	0.0639
Locomotive Hauling	0.0087
Total	**0.1005**

Source: AECOM 2020

Notes: The construction GHG emissions were estimated for the HSR Alternative C, which is used as a proxy to estimate construction emissions for all other alternatives. Total construction GHG emissions from all other alternatives would be lower and are estimated to differ from Alternative C by less than 1.9 percent. Totals shown differ from total emissions shown in **Appendix E, Air Quality Technical Memorandum,** due to rounding.

As shown in **Table 3.21-5**, GHG emissions from the construction period were quantified. According to EIA, the total annual CO_2 emissions in Texas during 2016 were 654 million metric tons; [14] therefore, the maximum annual project-related GHG construction emissions would be approximately 0.02 percent of the total annual statewide GHG emissions, which would be a negligible percentage.

The maximum annual GHG construction emissions for Build Alternative C would represent 0.02 percent of total annual CO_2 emissions in Texas. The construction activity producing these emissions enable the HSR operation, which would result in long-term net reductions of GHG emissions, as described in the following section. In addition, total construction-related GHG emissions would be offset within less than 4 years of HSR operations by year 2040, as shown in **Table 3.21-5** and **Table 3.21-6**. When considering the negligible percentage of state-wide GHG emissions that would be generated by the Project and the

[14] EIA, *Energy-Related Carbon Dioxide Emissions at the State Level 2005-2016,* accessed November 9, 2019, http://www.eia.gov/environment/emissions/state/analysis/.

offset by operational reductions of GHG, the construction would not have substantial adverse impacts on GHG emissions.

3.21.5.2.4 GHG Emissions from Operations

Long-term induced activities that would contribute to GHG emissions for the Project would be vehicle and bus travel on roadways, air travel between Dallas and Houston and power generation for the electricity consumed by the HSR trainsets, stations and TMFs. For vehicle and bus travel, GHG emissions would be generated by passengers traveling to and from the stations but would be reduced by those passengers using electric trainsets instead of cars and buses to travel between Dallas and Houston. The magnitude of GHG emissions reduced by this change in mode of travel would be expected to be greater than that generated by the trainset and station power consumption and passenger travel to and from stations.

Power plant GHG emission factors reflect current and historical data, and not future year emissions that account for more stringent standards and improvements in emissions controls, as vehicle emissions reduction modeling would; therefore, the emission factors were adjusted. Future year power plant emissions factors were projected using trends in the historical eGRID data that indicated downward trends in the emission rates of pollutants, including GHG, and historical EIA data indicating an increasing percentage of power generated by non-combustion sources in Texas. The same data sources and procedures described under **Section 3.2.3.2**, **Air Quality, Operational Emissions Methodology, Future Year Trainset Emissions Adjustment**, were used to project the future year GHG emissions factor. The future year GHG emissions factor and power consumption were used to calculate annual GHG emissions in the year 2040, the year of the highest rate of HSR operation. Total VMT reductions and 2040 GHG vehicle emissions factor were used to calculate vehicle emissions reductions of GHG for the year 2040.

The net GHG emissions were then determined by adding the trainset operation emissions and vehicle emissions reduction. **Table 3.21-6** provides the result. As shown, the net impact would be a reduction of 0.174 million metric tons annually. Compared to the most current (2016) state-level GHG annual emissions estimate of 654 million metric tons, the reduction would be a small percentage. However, this would be a long-term reduction. Therefore, the Project would have a small, but long-term positive effect on GHG emissions. Though the impact is small compared to state annual emissions, the net reduction of 0.174 million metric tons per year is greater than the maximum annual construction emissions of 0.1249 million metric tons. Therefore, the total construction emissions over 5 years at a maximum of 0.1249 million metric tons per year would be offset by operational net reductions of 0.174 million metric tons per year within less than 4 years at full operation.

Table 3.21-6: Year 2040 Operational Emissions of GHG

GHG Emissions Source	CO_2e Emissions (million metric tons per year)
Trainset operation emissions	0.122
Vehicle emissions reduction	−0.296
Net impact	−0.174

Source: AECOM 2020

The emissions avoided for travel by bus and aircraft were not calculated as they represent a relatively minor part of the projected travel mode shift. However, the shift would be expected to result in further net reductions of GHG emissions. A study of life cycle emissions for public transportation comparing various travel modes found that the passenger rail travel mode (mode characterized by electric, high

speed operation) had significantly fewer GHG emissions compared to the transit bus mode.[15] The national average for transit buses was 0.643 pounds CO_2 per passenger-mile (CO_2/passenger-mile), while the heavy rail national average was 0.224 pounds CO_2/passenger-mile, or an average 65 percent reduction in GHG emissions from the transit bus mode. The Project would be expected to have similar reductions per passenger-mile from these other travel modes, since they would be electric trainsets. Overall, net reductions to shifting from the bus transit mode would be small for the Project due to the small percentage (2 percent) that the existing mode share for bus represents, according to the travel mode share data discussed in **Section 3.2.3.2.2, Air Quality, Operational Emissions Methodology, Vehicle Emissions Reduction**.

Besides these modes of travel, HSR use between Dallas and Houston would also be expected to replace some air travel between the two cities. A life-cycle environmental assessment of U.S. passenger transit systems estimated that on a per passenger-mile traveled (PMT) basis, mid-size aircraft travel produced more GHG operationally than the California HSR system.[16] Under a 90 percent occupancy scenario, the 737 midsize aircraft (the most common model in Dallas-Houston routes) was estimated to produce approximately 125 grams (gm) CO_2e/PMT, while the California HSR system was estimated to produce approximately 60 gm CO_2e/PMT. Under a 10 percent occupancy scenario, midsize aircraft was estimated to produce approximately 250 gm CO_2e/PMT, while the California HSR system was estimated to produce approximately 275 gm CO_2e/PMT. However, for the median occupancy case, midsize aircraft was estimated to produce approximately 175 gm CO_2e/PMT, while the California HSR system was estimated to produce approximately 90 gm CO_2e/PMT. On average, this would be approximately a 50 percent reduction when changing travel mode from aircraft to HSR. Overall, net reductions to shifting from the aircraft mode would be small for the Project due to the minor percentage (9 percent) that the existing mode share for aircraft between Dallas and Houston, according to the travel mode share data discussed in **Section 3.2.3.2.2, Air Quality, Operational Emissions Methodology, Vehicle Emissions Reduction**.

The Project operation emissions would result in a long-term net reduction of GHG that would offset the construction emissions within 3.6 years at full operation and continue to achieve net reduction of GHG for the life of the HSR system. Considering the net reduction and offset, the long-term impact of the Project would be beneficial and not adverse.

3.21.5.2.5 Climate Change Impact and Resilience

Climate change has the potential to impact the GHG Study Area generally, through the increased severity or frequency of weather events, as described below.

3.21.5.2.6 Precipitation

Increased extreme precipitation events could increase the flood proneness of the Project infrastructure where inundation and flood flows can result in crossing or embankment washout, bridge scour, placement of rail bed or ballast material, or service disruption. The Build Alternatives' routes were designed to avoid major river crossings except over the Trinity River near Dallas. The Build Alternatives primarily cross minor creeks and streams, most of them intermittent, as described in **Section 3.8.5.2.1, Floodplains, Floodplains**. Most of the routes' length would traverse areas mapped by FEMA as Zone X, which are areas determined to be outside of the 0.2 percent annual chance (500-year) floodplain, except where they would cross creeks and streams. The large majority of these crossings would involve

[15] T. Hodges, "Public Transportation's Role in Responding to Climate Change," FTA, USDOT, Washington D.C., 2010.
[16] Mikhail V. Chester, *Life-cycle Environmental Inventory of Passenger Transportation in the United States,* Dissertation, Berkeley, CA: Institute of Transportation Studies, University of California, Berkeley, 2008.

narrow floodplains mapped as Zone A, which are areas subject to inundation by the 1-percent-annual-chance (100-year) flood event, but where the flood elevation has not been determined. The widest floodplain areas at route crossings would be in Navarro and Ellis Counties. Most of these would primarily be associated with areas where numerous intermittent streams converge, rather than major streams.

Most of the GHG Study Area would not be subject to inundation except in the most extreme events (>500-year). At crossings, the Project would be subject to inundation by infrequent events (i.e., 100-year), mainly at small streams and creeks that would not be anticipated to be subject to prolonged flooding given their stream and floodplain size but would be more subject to flash flooding. Given the small change of less than one extra annual heavy precipitation day event expected over the period 2041-2070, the climate change impact to the Project from flooding would be limited and would not be significantly greater than those experienced in flood-prone areas within the current floodplain described in **Section 3.8.5.2.1, Floodplains, Floodplains**.

As discussed in detail in **Section 3.8.5.2.1, Floodplains, Floodplains**, the elevation of crossings for the Build Alternatives would be designed to have a minimum of 3 feet of freeboard above the 100-year base flood elevation (if Zone AE) or above the modeled water surface elevation to be completed during final design (if Zone A). Given the design to the base flood elevation, impacts from flooding to HSR service would be expected only to occur infrequently, and only with extreme (i.e., >500-year) flood events or flash flooding. Current track safety standards applicable to the general railroad system under 49 C.F.R. Part 213, Subpart F require special inspections following severe weather, including floods and storms, with the potential to damage tracks. Although 49 C.F.R. Part 213 does not specifically apply to this Project, FRA is proposing a similar special inspection requirement in its RPA. Along with this special inspection, FRA is also proposing other visual and automated track inspections to monitor the condition of the track structure. The proposed HSR system inspections would include on track visual inspections of the rail that would employ instrumented trainsets to inspect rail condition. The RPA would prohibit operation on track that is not in compliance with the track safety standards outlined in the rule. The HSR system would not be operated on track that had been flooded or otherwise impaired until it was inspected and cleared for operation. If damage is observed, TCRR would be required to implement repairs, potentially including bridge integrity, displaced ties or ballast and other structural elements, before HSR service could resume. Both the design (approximately 55 percent on viaduct) and inspection are elements that would provide resiliency against climate change induced severe flood events. Nonetheless, the predicted change in annual heavy precipitation days of less than a day in the GHG Study Area would not be expected to meaningfully increase climate change vulnerability of the Project.

3.21.5.2.7 Temperature

The impact of increasing temperatures could have implications for the infrastructure performance of the Project because temperatures within the GHG Study Area are projected to double or quadruple the number of annual hottest days. The design of the Project involves continuously welded rail, which is track designed to expand and contract with changes in ambient temperature and solar radiation, the conditions that subject the rail to compression or tension. Excessive compression can contribute to buckling that can severely warp tracks, and excessive tension may cause rail to fracture or pull apart, both of which increase the risk of derailment. The temperature at which the rail is neither in compression or tension is the rail neutral temperature (RNT), a key design quantity for managing and maintaining the track against this risk. Because of its continuous, gapless nature, continuously welded rail is designed with a focus, among other things, on monitoring and accounting for changes in temperature. The primary method to manage this risk is to determine a design neutral temperature where the rail structure would tolerate the compression and tension from the expected regional

temperature extremes, then use mechanical force or heat to adjust the rail to the dimension associated with the design neutral temperature and affix it at this dimension during installation. A second feature that accommodates thermal expansion/contraction, are expansion joints. The same type of expansion joint previously used on the Shinkansen HSR would be employed for the Dallas to Houston HSR as discussed in **Appendix F, TCRR Final Conceptual Engineering Design Report** (**Section 3.27, Track Structure and Components)**.

Because of the warming trend predicted in the National Climate Assessment for the GHG Study Area, the climate change impact on rail infrastructure from increased extreme cold events would not be expected. Increased frequency of extreme heat events due to climate change is being identified as a potential impact that may raise the risk of buckling occurring under the Project.[17,18, 19] However, temperature is one of the most important factors.[20]

Because continuously welded rail is designed, constructed, and installed with attention on managing thermal risk, resiliency to increased temperature risk from climate change would be provided in the life cycle of the operation and maintenance of continuously welded rail. Resiliency could be bolstered by considering and adjusting the design RNT, or the actual in-place RNT, in response to the increasing ambient temperature.[21, 22] Maintenance and inspection requirements of continuously welded rail for the HSR system would require periodic preventive maintenance and adjustment of rail for the thermal risk, and extreme hot weather inspections. Because these requirements are temperature-driven, they should respond to the gradual temperature increases predicted, and would provide resiliency to this climate change impact.

Besides inspections, wayside (i.e., at the track) ambient and rail temperature monitors can more accurately assess local conditions for increased buckling risk. The Project would implement the design and maintenance inspections previously described to minimize potentially increased risk to resiliency against temperature increases. The remotely monitored ambient weather monitoring system discussed earlier would include temperature to assess exceedance of the set rail neutral temperature, and that rail neutral temperature would be set so that exceedance would be highly unlikely at regional temperature extremes.[23]

Besides temperature, numerous factors can affect track buckling, such as dynamic forces from loaded, moving trainsets, proper maintenance, rail installation, anchoring and ballast conditions. Other measures implemented by railroads to manage buckling risk include ambient temperature monitoring and operational restriction such as slower speed (slow order policies) during temperature extremes. The HSR operation would include two temperature zones for the purpose of setting slow order policy temperature requirements. Another impact of the increasing temperature is overhead power line sag, which can also occur due to thermal expansion. Similar to continuously welded rail, design, inspection

[17] Anne Choate, Philip Groth, Cassandra Snow, Erik Johanson, Thuy Phung and Joe Casola, *A Vulnerability and Risk Assessment of SEPTA's Regional Rail: A Transit Climate Change Adaptation Assessment Pilot,* Technical report, FTA, Springfield, VA 22161: National Technical Information Service (NTIS), 2013.

[18] Warren S. Meyers, "Rail Transportation Vulnerability and Resiliency to Impacts of Climate Change and Recommendations for Objective Measurement Methods," *American Public Transportation Association (APTA) 2013 Rail Conference,* Philadelphia, 2012.

[19] Françoise Nemry and Hande Demirel, "Impacts of Climate Change on Transport: A focus on road and rail transport infrastructures," Technical report, Institute for Prospective Technological Studies, European Commission, Joint Research Centre, 2012.

[20] FRA, "Development of Rail Neutral Temperature Monitoring Device," Technical Report, Office of Railroad Policy and Development, USDOT, Washington D.C., 2008.

[21] Anne Choate, Philip Groth, Cassandra Snow, Erik Johanson, Thuy Phung and Joe Casola, *A Vulnerability and Risk Assessment of SEPTA's Regional Rail: A Transit Climate Change Adaptation Assessment Pilot,* Technical report, FTA, Springfield, VA 22161: National Technical Information Service (NTIS), 2013.

[22] Peter Adams. "Incorporating Resilience into Port Authority Infrastructure Design," *FRA Rail Program Delivery Meeting*, Washington D.C., 2015.

[23] Personal communication, Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.

and maintenance of the wire to manage tension against sag would be conducted. The HSR system is proposed to be designed to use a counterweight-balanced constant tension pantograph, which is the contact structure system on top of the trainset that connects to the overhead catenary system (see **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**). This is the same auto-tensioned catenary system used by the Shinkansen HSR that employs counterweights designed to maintain constant tension in the wire despite any sag. The inspection programs would be modeled after those for the Shinkansen HSR, and would include training of staff by Central Japan Railway Company staff.[24] Because several of the design aspects for managing sag are temperature-driven, they would be expected to respond to the gradual temperature increases predicted, providing resiliency. These tensioning systems would be used during design to maintain proper contact independent of temperature and could also be adjusted in the future to maintain constant contact to counter sag.

3.21.5.2.8 Drought and Wildfire

As discussed in **Section 3.21.4.3, Drought and Wildfire,** the area of greatest increase in consecutive dry days does not coincide with the portion where fire threat would be high within the GHG Study Area, except under the high emissions scenario. The relatively small change in extra consecutive dry days for most of the GHG Study Area, coupled with the lower threat of fire, would limit the impact for most of the Build Alternatives' length under both scenarios. The more substantial increase in wildfire risk from climate change would be expected under the high emissions scenario for the portion of high fire threat from north Leon County to north Navarro County. However, the fire size history indicates landscape and response factors would limit the severity.

Since weather would be monitored for track buckling risk, it would be expected that wildfire advisories would be part of the information received and monitored during operation of the HSR system. Service would be altered during actual wildfire occurrences within the vicinity of the HSR infrastructure, should they occur. Using news reports of IH-45 road closures, which occurred in Walker and Madison Counties during the extreme wildfire season of 2011, closures would be expected to last hours to a day.[25] For resiliency, the extreme weather inspections required for continuously welded rail operations and maintenance plans would require post-incident inspection. If risks were to increase from current levels, the same elements of track inspection for buckling would address post-wildfire inspection, since fire presents a thermal risk and could affect other parts of the structure. Vegetation maintenance in the HSR ROW for track clearance and proper overhead line maintenance would help keep dry vegetation that could serve as wildfire fuel out of the direct trainset path and maintain the fire break capacity of the railway.

3.21.6 Avoidance, Minimization and Mitigation

As there are no long-term increases in GHG emissions as a result of the Project, there would be no long-term impacts to avoid or minimize. Moreover, the Project would likely reduce GHG emissions by shifting the modes of travel. However, avoidance and minimization actions discussed in **Section 3.2.6, Air Quality, Avoidance, Minimization and Mitigation**, would also be effective towards minimizing GHG.

As discussed throughout this section, the HSR system would employ similar climate measuring and monitoring systems and standards as those in Japan to avoid and minimize impacts to the HSR system caused by the natural environment. As detailed in **Section 3.21.5.2, Build Alternatives** these systems would include the implementation of HSR track neutral temperature design, rail and weather

[24] Ibid.
[25] Sonia Azad, *Wildfire North of Huntsville Prompts Evacuations*, 2011, accessed January 25, 2016, http://abc13.com/archive/8199999/.

monitoring, slow orders and required extreme hot weather inspections for continuous welded rail, auto-tensioned catenary system to minimize sag. Additionally, inspection programs would be modeled after those for the Shinkansen HSR and would include training of staff by Central Japan Railway Company staff.[26]

3.21.7 Build Alternatives Comparison

The lengths of Build Alternatives A-F would vary by 4.69 miles at most. Therefore, the differences in GHG emissions produced from power consumption to propel HSR trainsets those extra distances would not be substantial. The relatively minor variance in stations and facility configuration among the Build Alternatives would also not result in substantial differences in emissions from facility power consumption. Calculation of total power operational consumption described in **Section 3.21.5.1, GHG Emissions from Operations,** was also done for the lowest power consuming Build Alternative E. The daily power consumption only varied by 1 percent from the highest consuming Build Alternative A. Therefore, GHG emissions would be similar among the Build Alternatives. In addition, the minor variations in distance would not noticeably change ridership. The travel time differences at HSR speeds would be on the order of 1.5 to 2 minutes, which would be negligible to an approximate 90-minute trip time envisioned for the Project. Given the negligible travel time differences and ridership, GHG reductions from travel mode shift would be similar amongst the Build Alternatives. All the Build Alternatives would have similar impacts on GHG emissions.

All the Build Alternatives would extend from Dallas to Houston and cross features subject to the long-term potentially adverse effects of climate change, as discussed in **Section 3.21.4, Affected Environment**. The Build Alternatives would not appreciably differ in terms of the amount of area potentially subjected to higher average annual precipitation, an increased risk of wildfire or higher ambient temperatures. Resilience to climate change impacts would be similar amongst the Build Alternatives. The design, construction, maintenance and inspection actions proposed for the HSR system would provide management of risks introduced from climate change. The potential climate change impacts and the resilient features or limiting factor associated with the Build Alternatives are summarized in **Table 3.21-7**.

Table 3.21-7: Summary of Impact of Climate Change Resilience

Climate Change	Expected Occurrence in Project Area Considering National Climate Assessment?	Resilient Features or Limiting Factors
High temperature	Potentially. More so at southern end of GHG Study Area.	Rail neutral temperature design, rail and weather monitoring, slow orders and required extreme hot weather inspections for continuous welded rail. Power line construction, design, tensioning and inspection for sag.
Precipitation	Not expected given small change in extra annual heavy precipitation days.	Stream crossings in mapped flood zones designed to elevate above 100-year base flood elevation. Limited major stream crossings.
Drought and Wildfire	Potentially. More so in Leon and Navarro Counties.	Landscape and response factors in high risk area would limit wildfire size. Area of greatest change in dry days is in urban Dallas, also limiting wildfire risk. Resilient features for temperature. Vegetation maintenance in HSR ROW.
Sea level rise	Not expected.	Too far inland.

Source: AECOM 2016

[26] Personal communication, Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.

4.0 INDIRECT EFFECTS AND CUMULATIVE IMPACTS[1]

4.1 Regulatory Context

FRA's responsibility to address and consider indirect effects and cumulative impacts in the NEPA process was established in the CEQ's NEPA implementing regulations.[2] According to the CEQ, indirect effects are "caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[3]

Cumulative impacts analyses, on the other hand, are more resource-focused and, by definition, consider a range of impact-causing activities beyond the scope of the Preferred Alternative. Cumulative impacts are "the impacts on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[4] Cumulative impacts are those that result from past, present and reasonably foreseeable future actions, combined with the potential direct and indirect impacts of the Project.

4.2 Methodology

4.2.1 Indirect Effects

Due to the linear nature of this transportation infrastructure project and considering that the Project would be wholly located in Texas, several guidance documents were reviewed to develop an indirect effects methodology for this Project, including TxDOT's Guidance on Indirect Impact Analysis[5] and the 2002 National Cooperative Highway Research Program (NCHRP) Report entitled "NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects."[6] Additional guidance resources include the AASHTO Practitioner's Handbook,[7] which assists in the assessment of indirect effects.

The NCHRP guidance identifies three broad categories of indirect effects:

- Project-influenced development effects (i.e., the land use effect)
- Effects related to project-influenced development (i.e., effects of the change in land use on the human and natural environment)

[1] This chapter has been reorganized and expanded since the publication of the Draft EIS. Therefore, text changes since the Draft EIS are not shaded in grey in **Chapter 4.0, Indirect Effects and Cumulative Impacts**.
[2] 40 C.F.R. 1500-1508.
[3] 40 C.F.R. 1508.8.
[4] 40 C.F.R. 1508.7.
[5] TxDOT Environmental Affairs Division, "Guidance Indirect Impact Analysis," Version 1, July 2016.
[6] Transportation Research Board, National Research Council, "National Cooperative Highway Research Program Report 466 Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects," 2002.
[7] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.

- Encroachment-alteration impacts (i.e., alteration of the behavior and functioning of the affected environment caused by project encroachment)[8]

Project-influenced development effects and effects related to project-influenced development are closely tied and are discussed together as development-related impacts. The methodology for development-related impacts is discussed in **Section 4.2.1.1**, **Development-Related Impacts**.

Encroachment-alteration impacts are physical, chemical, or biological changes in the environment that occur as a result of the project but are removed in time or distance from the direct effects. As described in the AASHTO Practitioner's Handbook,[9] encroachment-alteration impacts are sometimes categorized as direct effects rather than indirect effects. Therefore, with the exception of impacts related to new electrical transmission lines required for the Project, encroachment-alteration impacts are discussed throughout **Chapter 3.0, Affected Environment and Environmental Consequences,** along with the direct effects for each resource.

Encroachment-alteration effects of new electrical transmission lines are discussed in this chapter as these new electrical transmission lines will require a separate environmental review process that would occur later in time than the ROD for this Project. The methodology for analyzing the potential impacts of the new electrical transmission lines is discussed in **Section 4.2.1.2, New Electrical Transmission Lines**.

4.2.1.1 Development-Related Impacts (Project-influenced Development Effects and Effects Related to Project-influenced Development)

Project-influenced development often increases an area's attractiveness for development and can cause additional changes to the natural or human environment. Project-influenced development would not be expected between the stations as there would be no access to the system. Therefore, FRA evaluated the potential for Project-influenced development around the Dallas Terminal Station, the Brazos Valley Intermediate Station, and the Houston Terminal Station. The analysis indicates potential for Project-influenced development around the Houston and Dallas Terminal Stations. As discussed further in **Section 4.3.1.3, Houston Terminal Station**, due to the proximity of the Houston Terminal Station Options to each other, it is anticipated that the impacts associated with Project-influenced development would be similar**.** However, as discussed in more detail in **Section 4.3.1.2, Brazos Valley Intermediate Station**, Project-influenced development around the Brazos Valley Intermediate Station is not reasonably foreseeable.

FRA evaluated Project-influenced development effects by reviewing current land use trends, patterns and plans. An inventory of land use plans and policies and the Project's compatibility with those plans is included in **Section 3.13.3, Land Use, Methodology**. FRA then analyzed the effects related to Project-influenced development by assessing the potential for impacts to each resource from Project-influenced development, as shown in **Table 4-5**. Because development around the Brazos Valley Intermediate Station is not reasonably foreseeable as described in **Section 4.3.1.2, Brazos Valley Intermediate Station**, FRA analyzed the effects related to Project-influenced development around the Houston and Dallas Terminal Stations. The anticipated Project-influenced development and the effects related to Project-influenced development are discussed together in **Section 4.3.1, Development-related Impacts**.

[8] Transportation Research Board, National Research Council, "National Cooperative Highway Research Program Report 466 Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects," 2002

[9] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.

4.2.1.2 New Electrical Transmission Lines

Section 3.9, Utilities and Energy, describes new utilities or utility modifications required for the Project, with the exception of the new electrical transmission lines. Because electric utility providers are ultimately responsible for the environmental clearance process, the impacts of the new electric transmission line connections are considered as indirect impacts in this Final EIS. The Draft EIS identified the need for the new electrical utility line connections and included a general discussion of associated indirect impacts because no design information was available at the time.

Since publication of the Draft EIS, TCRR identified the potential ROW, specifically the locations and impact areas, for new electrical transmission lines. While these areas are included in the Project LOD as defined in **Section 3.1.2.3, Introduction, Limits of Disturbance**, impacts associated with portions of the LOD associated with the new electrical transmission line ROW are not included in **Chapter 3.0, Affected Resources and Environmental Consequences,** and are included in this chapter. As detailed within **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports**, TCRR developed the ROW for each new transmission line through coordination with the two primary electric utilities expected to serve the Project, Oncor and CenterPoint Energy. Oncor and CenterPoint Energy confirmed that the potential routes TCRR identified for new electric transmission lines to power the Project were reasonable.[10,11] FRA added the permanent and temporary impact area for the transmission lines to the LOD for the Project. The new electrical transmission lines would connect existing 138 kV electrical transmission lines to proposed TPSSs for the Project. In general, each TPSS would be located adjacent to or within 1 mile of existing 138-kV transmission lines. There were instances, however, where the electrical transmission line connection would be greater than 1 mile. The ROW for the electrical transmission line includes the permanent easement and construction areas.

As the owner of the electrical utilities, Oncor and CenterPoint Energy would ultimately be responsible for the new electrical connections to TCRR's infrastructure and would manage and lead the environmental process through the PUCT. The PUCT environmental process may include obtaining a Certificate of Convenience and Necessity (CCN), which requires a routing analysis, environmental assessment and public involvement program. Findings from the CCN process may result in changes to the electrical transmission lines and connections currently mapped as the ROW for the Project. Consistent with PUCT Substantive Rule 25.101(b)(3)(B), electrical transmission line facilities should prioritize utilizing or paralleling compatible ROW (such as roadways or other utility easements) or paralleling property lines or other natural or cultural features.

TCRR would be responsible for obtaining the necessary authorization from each provider to provide electrical service to the HSR system. Potential locations of the new electrical transmission connections are reflected in the ROW for the Project; however, the electrical utility providers would ultimately determine the final location. Before initiating the PUCT environmental process, the electric utility providers will assess their existing infrastructure against their own expansion or growth plans in concert with TCRR's needs to maximize the overall benefit to their system. The electrical utility provider may choose to include the new connections in existing plans to modify their system infrastructure or combine those new connections with other actions. For example, if Oncor plans to implement a new electrical transmission line, they may incorporate TCRR's power needs into the overall service plan of

[10] Meeting held June 26, 2018, between FRA and Oncor Electric to discuss FRA's NEPA process, ongoing Oncor and TCRR coordination and potential impacts on Oncor infrastructure.

[11] Meeting held June 27, 2018, between FRA and CenterPoint to discuss FRA's NEPA process, ongoing CenterPoint and TCRR coordination and potential impacts on CenterPoint infrastructure.

that new line. If no new plans are proposed, the utility provider would complete the environmental assessment and PUCT approval process to solely address TCRR's needs.

FRA inventoried resources within the ROW for the new electrical transmission lines required for the Preferred Alternative (Build Alternative A and the Houston Northwest Mall Terminal Station Option) to determine the likelihood for impacts and the results are shown in **Table 4-5**. The electrical transmission line impacts for Build Alternative A are similar to those of the other Build Alternatives, as shown in **Table 4-3**. No additional electrical transmission line connections are needed for any Houston Terminal Station options.

4.2.2 Cumulative Effects

Based in part on the recommended steps from the AASHTO's Practitioner's Handbook,[12] the cumulative impacts analysis for this Project includes the following five steps to adequately consider the cumulative impacts:

1. Research the resource Study Area, conditions and trends
2. Assess direct and indirect effects on each resource from the Project, assuming implementation of mitigation measures previously identified for the respective resource
3. Research other actions–past, present and reasonably foreseeable–and assess their effect on each resource
4. Evaluate overall effects of the Project combined with other actions
5. Mitigate cumulative impacts, if necessary

To analyze cumulative impacts, the CEQ recommends focusing on key resource issues of national, regional or local significance.[13] Factors were considered for resources that are:

- Protected by legislation or resource management plans
- Ecologically important
- Culturally important
- Economically important
- Important to the well-being of a human community

In order to only focus on those resources that may experience impacts based on cumulative impacts from the implementation of the Project, AASHTO recommends, "If a project will not cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on that resource."[14] Therefore, the cumulative impacts analysis in this chapter focuses on the resources that will be directly or indirectly impacted by the Project.

4.3 Indirect Project Effects

Direct impacts and indirect effects are summarized at the end of this section in **Table 4-5**.

4.3.1 Development-related Impacts

Development-related impacts include project-influenced development effects and effects related to Project-influenced development. Project-influenced development would not be expected between the stations as there would be no access to the system. FRA evaluated the potential for indirect Project-

[12] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.
[13] Council on Environmental Quality, "Considering Cumulative Effects Under the National Environmental Policy Act," January 1997.
[14] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.

influenced development around the Dallas Terminal Station, the Brazos Valley Intermediate Station, and the Houston Terminal Station. The results of the evaluation for the Dallas and Houston Terminal Stations are summarized by resource in **Table 4-5**. The table describes potential impacts for each resource. Land use and transportation impacts are discussed in more detail because these impacts would be the most notable. Land use and transportation impacts around stations are complex and their descriptions cannot be succinctly described in a table. Utility impacts are also discussed in more detail to describe the process for utility approvals.. FRA determined that Project-influenced development around the Brazos Valley Intermediate Station is not reasonably foreseeable, as discussed in **Section 4.3.1.2, Brazos Valley Intermediate Station**.

Conclusions summarized in **Table 4-5** are based in part on EPA's report regarding the impacts of compact development around transportation infrastructure.[15] The report, entitled *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, states that development decisions have both direct and indirect effects on the environment and that growth can be accommodated in ways that better protect the environment and human health. Strategies that minimize negative environmental impacts include directing development away from sensitive natural areas and onto infill, brownfield, and greyfield sites while locating jobs, homes, and services near transit. Strategies also include focusing on more compact, mixed-use development that uses green building techniques and makes walking and biking convenient and enjoyable. Used in combination, these practices can significantly reduce impacts to habitat, ecosystems, and watersheds and can reduce vehicle travel and energy use, which in turn reduces emissions that cause local, regional and global air quality concerns.

Specific analysis from the report includes the following:

- **Transportation**. The report indicates that increasing average regional density by 50 percent, directing development to infill locations, mixing land uses and coordinating transportation investments could reduce VMT 17 percent below current trends between 2007 and 2050.
- **Habitat and Ecosystems**. Development that reuses and repurposes already-developed land takes development pressure off sensitive and critical habitats such as wetlands and forests.
- **Water Quality**. Water quality can be improved by minimizing impervious surfaces through more compact, mixed-use development and using green infrastructure to manage stormwater where it falls.
- **Air Quality**. There is significant evidence that compact, mixed-use development focused around transit can reduce vehicle travel and air pollution from motor vehicles. Infill development, including redevelopment of brownfields, often provides better access to transit services, which would reduce vehicle travel compared with development on the edge of the metropolitan area. In addition, designing roads to accommodate walkers and bikers safely and comfortably can encourage people to travel short distances without a car.
- **Greenhouse Gas Emissions**. Development that is more compact can reduce GHG and other air pollution emissions, not just by reducing travel, but also by reducing the amount of infrastructure needed. Smaller, more compact buildings use less energy for heating and cooling. A study compared the GHG emissions associated with a high-density residential area in downtown Toronto with a low-density suburb. The study included emissions associated with transportation, infrastructure construction, and building operations. It found that the low-

[15] EPA, *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, 2nd Edition, EPA 231-K-13-001, June 2013.

density neighborhood was between 2 and 2.5 times more energy intensive per capita than the high-density neighborhood.

4.3.1.1 Dallas Terminal Station

4.3.1.1.1 Land Use

Over the last several years the area surrounding the proposed Dallas Terminal Station in downtown Dallas, known as The Cedars, has experienced major development via the conversion of existing commercial and industrial land uses to new commercial or residential land uses. This land use conversion has resulted in the restoration of historic industrial buildings to mixed-use facilities and the construction and operation of an independent-chain movie theater, a boutique hotel and new, low-rise housing. The construction of the Dallas Terminal Station would be anticipated to result in a short-term acceleration of new development, meaning that currently planned development would occur sooner in time than under No Build conditions. The Dallas Terminal Station would incorporate passenger amenities such as retail and access to ground transportation (taxi, bus, rental car, etc.).

Long-term, construction of the Dallas Terminal Station has the potential to increase land use densities in proximity to the terminal and accelerate the development of TOD in downtown Dallas, which would be consistent with local plans and policies, specifically the Downtown Dallas 360 plan. The Dallas Terminal Station is located within an area identified in the Dallas 360 plan for catalytic transformation to transit-oriented, high-density development, comparable to the recent transition in the Dallas Uptown area. The Dallas 360 Plan states, "In order to maximize the benefit of such a neighborhood for the city and in order to create a neighborhood that maximizes the livability and transit-oriented nature desired, it is important to establish a development framework that can guide development in an appropriate way, regardless of the final outcome of high speed rail." [16]

Since the Downtown Dallas 360 plan was updated in 2017, the City of Dallas initiated planning for the area. The City of Dallas released an RFQ for the KBHCCD Master Plan on September 18, 2019.[17] The RFQ requests further study on the feasibility of a multimodal transit station that would connect to the Dallas High Speed Rail Terminal Station, connect to light rail, commuter rail, Amtrak, and streetcar, and include regional and local bus service, rideshare service, pedestrian/bicycle connections, and a vertiport for vertical take-off and landing vehicles.[18]

Development in the Dallas Terminal Station Area is being planned and is reasonably foreseeable with or without the Dallas High Speed Rail Terminal Station. However, the Project, including the Dallas Terminal Station, would accelerate this development.

4.3.1.1.2 Transportation

The HSR system would introduce a new mode of transportation that would alter the transportation network within the 10-county Study Area by introducing a beneficial access-alteration impact for travel between Dallas and Houston. The HSR system would improve mobility and travel times between Dallas and Houston and could affect development potential. However, the HSR system would operate in a "closed system," which would restrict indirect transportation impacts to the station areas. Direct

[16] City of Dallas, "The 360 Plan," Updated 2017, accessed December 2019, https://downtowndallas360.com/.
[17] City of Dallas, "Request for Qualifications for Professional Services for the Kay Bailey Hutchison Convention Center Dallas (KBHCCD) Master Plan, Solicitation Number CIZ 1862," released September 18, 2019.
[18] City of Dallas, "High Speed Rail Update," October 8, 2018, accessed December 2019, https://dallascityhall.com/projects/high-speed-rail/DCH%20Documents/2018-10-8%20MSIS%20High%20Speed%20Rail%20-%20Final.pdf.

impacts to existing traffic patterns near the Dallas Terminal Station are discussed in **Section 3.11.5, Transportation, Environmental Consequences**.

FRA qualitatively evaluated the potential for the introduction of new transportation services, an increase and/or redistribution of existing transit services, enhanced connectivity with existing and proposed transportation services and increased traffic congestion near the terminal station. As noted in **Section 3.11.3.6, Transportation, Traffic Forecasting for Horizon Year 2040**, a maximum growth rate of peak hour traffic volumes was set at 4.0 percent for Dallas based on historical growth rates. Development could further increase traffic congestion within the vicinity of the Dallas Terminal Station.

As noted in **Section 3.11.5.2.1, Transportation, Environmental Consequences, Dallas County**, ingress and egress points along major roadways would be reconfigured and changes to traffic would occur. While the Project would alter the access and mobility within the station area, it would not create new access points to previously inaccessible land.

The HSR system could potentially contribute to an increase and/or redistribution of existing and proposed transit services in Dallas. The Dallas Terminal Station would be located adjacent to the Dallas Convention Center and DART currently provides rail and bus service to the Convention Center area. DART could expand rail and bus services to the Convention Center area to accommodate increased ridership from HSR passengers by adding additional buses or trainsets or making adjustments in service in response to demand. Increases in rail/bus service could indirectly impact traffic operations within the vicinity of the station. If transit were given priority at signals, it could increase delay for automobiles. An increase in the number of busses operating on roads near the station could also decrease operating speeds on the roads for automobiles.

There are no current plans to extend the RE track, a commuter line owned and operated by Trinity Metro and DART, but the operation of the Dallas Terminal Station could lead to expanded operation of the TRE system to complement transit connectivity and provide enhanced commuter benefits. The TRE system operates between downtown Union Station in Dallas (northwest of the proposed Dallas Terminal Station) and downtown Fort Worth. The TRE system could be extended south to the Intermodal Hub being planned by the City of Dallas. If extended south to the new Intermodal Hub, the at-grade TRE service could impact at least three main streets (South Houston Street, Jefferson Boulevard Viaduct/South Market Street and Memorial Drive) before connecting to the Dallas Terminal Station by decreasing capacity or increasing delay for automobiles.

NCTCOG has included high speed or express passenger rail corridors in its long-range regional transportation plan *Mobility 2045.* One of these corridors is between Dallas and Fort Worth, for which NCTCOG is currently initiating a study and potentially an EIS. The study is evaluating improved intercity commuter rail, HSR and potential hyperloop technologies, and connectivity to the planned Intermodal Hub in downtown Dallas.[19] To date, there are no available detailed plans of NCTCOG's Dallas to Fort Worth service; however, indirect impacts to traffic patterns as a result of such further transit system developments would be anticipated and assumed to be limited to the Dallas Terminal Station.

4.3.1.1.3 Utilities

Project-influenced development around the Dallas Terminal Station could result in indirect impacts to utilities. New commercial, residential, or other development would increase demand for electricity,

[19] NCTCOG, "Request for Proposals - ALTERNATIVE ANALYSIS, PRELIMINARY ENGINEERING, AND NEPA DOCUMENTATION FOR HIGH-SPEED TRANSPORTATION SERVICE BETWEEN DALLAS AND FORT WORTH, TEXAS," October 18, 2019, https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Fund/RFP/D-FW-High-Speed-TR-Study-Full-RFP.pdf.

water, and wastewater utility services. Oncor is the electric utility provider in the Dallas area, and Dallas Water Utilities provides water and wastewater services. Developers would be required to coordinate with the applicable utility providers to complete development reviews prior to construction and determine the utility needs of the development and available capacity.

4.3.1.2 Brazos Valley Intermediate Station

The Brazos Valley Intermediate Station would require conversion of agriculture and rural land to transportation uses; however, development beyond the station is not reasonably foreseeable.

The Brazos Valley Intermediate Station would primarily serve as an intermediate stop for Texas A&M University, Sam Houston State University and the surrounding communities. The Brazos Valley Intermediate Station would be 25.6 miles east of Bryan-College Station, Texas (the location of Texas A&M University) and 26.5 miles west of Huntsville, Texas (the location of Sam Houston State University), the largest two cities near the station location. While Brazos Transit District may develop regularly scheduled bus service between Bryan-College Station and the Brazos Valley Intermediate Station, including direct shuttle service to Texas A&M University, additional traffic generated at this station would not be expected to generate enough traffic movement to support development beyond the station. Any new bus service would operate on existing roads and therefore there would be no further transportation impacts from the new service.

There are currently no plans for development within the parcels adjacent to or otherwise in the vicinity of the station. Amenities such as restaurants, rental car facilities, and convenience stores would be included in the Brazos Valley Intermediate Station. The unincorporated community of Roans Prairie in Grimes County is located approximately a half mile east of the station at SH 90 and SH 30. There is a Valero gas station (serving both unleaded and diesel fuel) and a Dollar General convenience store in Roans Prairie that could serve vehicles traveling to/from the Brazos Valley Intermediate Station. Therefore, FRA determined that development beyond the station is not reasonably foreseeable.

4.3.1.3 Houston Terminal Station

Due to their similar design and proximity, anticipated development or the effects of the development among the Houston Terminal Station Options are anticipated to be comparable.

4.3.1.3.1 Land Use

The Houston Terminal Station Options would incorporate passenger amenities such as retail and access to ground transportation (taxi, bus, rental car, etc.). There would be little difference in the development potential or type of development among the Houston Terminal Station Option sites due to their proximity to one another. The Houston Northwest Mall Terminal Station Option is located near highly travelled freeways and active freight infrastructure. Over the last several years, development in northwest Houston has varied, with development near the Houston Northwest Mall Terminal Station Option having slowed. While the City of Houston does not have zoning and the city codes do not address land use,[20] the City of Houston has created is first general plan to coordinate and guide future development.[21] While there are no specific plans for development in the Houston Terminal Station Option area, it is reasonably foreseeable that the Houston Northwest Mall Terminal Station Option could potentially accelerate development and increase land use densities in proximity to the station.

[20] City of Houston, "Official City of Houston Zoning Letter," January 1, 2020, http://www.houstontx.gov/planning/Forms/devregs/Houston_Letterhead_Planning_2020_final.pdf.

[21] City of Houston, "Plan Houston," September 30, 2015, accessed December 2019, http://www.houstontx.gov/planhouston/.

4.3.1.3.2 Transportation

The HSR system would introduce a new mode of transportation that would alter the transportation network within the 10-county Study Area by introducing a beneficial access-alteration impact for travel between Dallas and Houston. The HSR system would improve mobility and travel times between Dallas and Houston and could affect development potential. The direct impacts to existing traffic patterns near the stations are discussed in **Section 3.11.5, Transportation, Environmental Consequences**.

FRA evaluated how changes in development would impact traffic circulation in and around the station area. As noted in **Section 3.11.3.6, Transportation, Traffic Forecasting for Horizon Year 2040**, a maximum growth rate of peak hour traffic volumes was set at 2.2 for Houston based on historical growth rates. In addition to the growth rate used to forecast traffic, development could further increase traffic congestion within the vicinity of the Houston Northwest Mall Terminal Station Option. As noted in **Section 3.11.5.2.10, Transportation, Environmental Consequences, Harris County** the construction of the Houston Northwest Mall Terminal Station Option would impact 26 intersections, requiring improvements or other forms of mitigation in order to maintain or improve the existing levels of service at intersections. Ingress and egress points along major roadways would be reconfigured and changes to traffic would occur. While the Project would alter the access and mobility within the station area, it would not create new access points to previously inaccessible land or the need for additional capacity on existing roadways

METRO bus service is currently available to the Houston Northwest Mall Terminal Station Option and METRO could increase or add new bus services to the station to accommodate HSR passengers. Additionally, METRO light rail service, which currently operates in the downtown and medical center areas, could be extended to connect transit access from the Houston Northwest Mall Terminal Station Option to existing service areas. If transit were given priority at signals, it could increase delay for automobiles. An increase in the number of busses operating on roads near the station could also decrease operating speeds on the roads for automobiles.

4.3.1.3.3 Utilities

Project-influenced development around the Houston Northwest Mall Terminal Station Option could result in indirect impacts to utilities. New commercial, residential, or other development near the station would increase demand for electricity, water, and wastewater utility services. CenterPoint Energy is the electric utility provider in the Houston area and the City of Houston provides water and wastewater services. Developers would be required to coordinate with the applicable utility providers to complete development reviews prior to construction to determine the utility needs of the development and available capacity. No new electrical transmission line connections are required for the Houston Northwest Mall Terminal Station Option.

4.3.2 New Electrical Transmission Lines

The Project requires the construction of new electrical transmission line connections to power train operations. Construction of the transmission lines would require ground-disturbing activities, excavation at utility pole locations, and tree and vegetation clearing within the transmission line ROW.

Table 4-1 shows the length and area of the potential new electrical utility connections by Project segment based on TCRR's coordination efforts with Oncor and CenterPoint Energy. New electrical transmission lines would vary in length from 0.1 to 4.4 miles. Seven of the 13 proposed connections would be less than 1.0 mile in length. Approximately 9.3 miles of new electrical transmission lines are

necessary, based on the potential routes, to service the Project. **Table 4-2** shows the total number of potential new electrical utility connections by Build Alternative.

Table 4-1: Anticipated New Electrical Transmission Lines to Support the Project by Segment

County/Segment	Number	Length (miles)	Area (acres)
Dallas County			
Segment 1	2	0.7	6.5
Ellis County			
Segment 2A	1	0.4	3.9
Segment 3A	--	--	--
Navarro County			
Segment 3A	2	1.5	13.4
Freestone County			
Segment 3A	--	--	--
Segment 4	1	0.3	2.9
Leon County			
Segment 4	2	1.2	12.6
Madison County			
Segment 4	1	0.2	2.5
Grimes County			
Segment 5	2	0.5	11.8
Waller County			
Segment 5	--	--	--
Harris County			
Segment 5	2	4.5	40.8
Segment 5: Houston Terminal Station Option	--	--	--
Total	**13**	**9.3**	**94.4**

Source: Appendix F, TCRR Final Conceptual Engineering Design Report; AECOM, 2019

Table 4-2: Electric Transmission Lines Required by Build Alternative

	Alt A (Preferred Alternative)	Alt B	Alt C	Alt D	Alt E	Alt F
New Electric TPSS Connections	13	12	13	13	12	13

Source: AECOM 2019

Table 4-3 summarizes resources within the ROW of the electrical transmission lines for the Preferred Alternative along with direct impacts and other indirect impacts. Resources within the ROW for electrical utility lines that are mapped and quantifiable are shown for all Build Alternatives in **Table 4-3**. **Table 4-3** shows that the impacts across Build Alternatives are similar. There are no electrical transmission lines needed for the Houston Terminal Station Options.

The acres within the ROW of the electrical transmission lines shown in **Tables 4-1** and **4-3** do not reflect actual impacts because transmission lines span over farmland, waterbodies, streams, wetlands, floodplains and protected species habitat. Impacts to these resources are generally limited to footings for pole foundations. As discussed in **Section 3.19, Cultural Resources**, archeological resources will be surveyed as outlined in **Appendix L, Programmatic Agreement**.

Where detailed quantifiable data are available, they are presented below. A summary of all resources areas is presented in **Table 4-5**.

Table 4-3: Resources within ROW for Electrical Transmission Lines

	Alt A (Preferred Alternative)	Alt B	Alt C	Alt D	Alt E	Alt F
Impaired Waterbodies	0	0	0	0	0	0
Protected Species Habitat	Less than 13 acres	Less than 13.1 acres	Less than 14.4 acres	Less than 13.1 acres	Less than 13.1 acres	Less than 14.4 acres
Houston Toad/ *Anaxyrus houstonensis*	Less than 4.6 acres	Less than 4.6 acres	Less than 0.01 acres	Less than 4.6 acres	Less than 4.6 acres	Less than 0.01 acres
Large-fruited Sand Verbena/ *Abronia macrocarpa*	Less than 3.5 acres	Less than 3.5 acres	Less than 0.01 acres	Less than 3.5 acres	Less than 3.5 acres	Less than 0.01 acres
Navasota Ladies'-tresses/ *Spiranthes parksii*	Less than 4.9 acres	Less than 5.0 acres	Less than 14.4 acres	Less than 5.0 acres	Less than 5.0 acres	Less than 14.4 aces
Stream Crossings	Less than 1707 feet	Less than 1,864 feet	Less than 2,793 feet	Less than 1,789 feet	Less than 1,948 feet	Less than 2,877 feet
Wetlands	Less than 1.1 acres	Less than 2.7 acres	Less than 1.3 acres	Less than 1.1 acres	Less than 2.6 acres	Less than 1.2 acres
Waterbodies	Less than 0.4 acres	Less than 0.41 acres	Less than 0.78 acres	Less than 0.27 acres	Less than 0.33 acres	Less than 0.7 acres
Floodplains	Less than 7.0 acres	Less than 7.0 acres	Less than 7.0 acres	Less than 6.5 acres	Less than 9.5 acres	Less than 6.5 acres
Land Use Type						
Agriculture	69.65	67.33	73.88	66.17	63.85	70.4
Commercial	6.15	6.15	6.15	6.15	6.15	6.15
Park	0	0	0	0	0	0
Residential	0.89	2.63	1.15	4.11	5.85	4.37
Rural	8.73	8.73	5.85	9.18	9.18	6.3
Transportation	6.86	7.16	6.55	6.86	7.16	6.55
Unclassified	0.28	0.28	0	0.28	0.28	0
Vacant	1.97	1.97	1.97	1.97	1.97	1.97
Parcel Acquisitions or Easements	187	198	154	181	192	148
Historic Properties (known archeological sites eligible or listed in the NRHP)	0	0	0	0	0	0

Source: **Appendix F, TCRR Final Conceptual Engineering Design Report**; AECOM, 2019

4.3.2.1 Vegetation

The vegetation types and acreages within the ROW are summarized in **Table 4-4**. Ground disturbing activities associated with construction of new transmission lines would temporarily disturb vegetation within the ROW. Disturbance would be limited to specific areas within the ROW required for construction activities or access. Vegetation would be removed permanently for transmission line pole foundations and access roads. Most of the vegetation within the ROW consists of prairie and grassland vegetation communities. Grassland species within the transmission line ROW that are temporarily disturbed during construction, and are not required for permanent transmission facilities, would be revegetated and allowed to regrow following construction. Woodland species within the ROW would be cleared and regularly maintained to allow for safe maintenance and operation of the line. The ROW would be maintained cleared of woody vegetation (i.e., shrubs and trees) after construction.

Table 4-4: Vegetation Types within ROW for Electrical Transmission Lines						
Vegetation Type	**Alt A (Preferred Alternative)**	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**
Barren	0.73	0	0.73	0.73	0	0.73
Blackland Prairie: Disturbance or Tame Grassland	14.86	11.71	14.86	14.75	11.6	14.75
Central Texas: Floodplain Hardwood/Evergreen Forest	0.02	0.02	0.02	0.02	0.02	0.02
Central Texas: Floodplain Hardwood Forest	5.34	9.42	5.34	4.91	8.99	4.91
Central Texas: Floodplain Herbaceous Vegetation	3.39	1.18	3.39	3.25	1.04	3.25
Central Texas: Riparian Hardwood Forest	0.47	0.47	0	0.76	0.76	0.29
Central Texas: Riparian Herbaceous Vegetation	0.77	0.77	0.77	0.63	0.63	0.63
Edwards Plateau: Oak/Hardwood Motte and Woodland	1.59	1.59	1.59	1.59	1.59	1.59
Edwards Plateau: Savanna Grassland	0.59	0.59	0.59	0.59	0.59	0.59
Gulf Coast: Coastal Prairie	30.71	30.71	30.71	30.71	30.71	30.71
Native Invasive: Deciduous Woodland	0.26	0.32	0.26	0.66	0.72	0.66
Native Invasive: Huisache Woodland or Shrubland	0.14	0.14	0.14	0.14	0.14	0.14
Native Invasive: Mesquite Shrubland	0.14	0.14	0.14	0.45	0.45	0.45
Pineywoods: Small Stream and Riparian Temporarily Flooded Hardwood Forest	0	0	1.26	0	0	1.26
Pineywoods: Small Stream and Riparian Wet Prairie	0	0	1.22	0	0	1.22
Post Oak Savanna: Post Oak Motte and Woodland	9.95	11.05	2.66	9.95	11.05	2.66
Post Oak Savanna: Savanna Grassland	14.53	13.37	21.38	14.53	13.37	21.38
Row Crops	7.03	8.82	7.03	7.03	8.82	7.03
Urban High Intensity	1.85	1.85	1.85	1.85	1.85	1.85
Urban Low Intensity	2.03	1.98	1.52	2.03	1.98	1.52

Source: **Appendix F, TCRR Final Conceptual Engineering Design Report**; AECOM, 2019

4.3.2.2 Federally Protected Species and Wildlife

Five federally listed species were evaluated by FRA during formal consultation with the USFWS. Two species, the interior least tern (*Sterna antillarum*) and whooping crane (*Grus americana*), may occur within the Project area. A determination of May Affect, Not Likely To Adversely Affect was made by FRA for these two species. The other three federally listed species – Houston toad (*Anaxyrus houstonensis*), large-fruited sand verbena (*Abronia macrocarpa*) and Navasota ladies'-tresses (*Spiranthes parksii*) – were found to have potential habitat within the Project area. A determination of May Affect, Likely to Adversely Affect was made by FRA for the large-fruited sand verbena and Navasota ladies' tresses. The Houston toad determination is May Affect, Not Likely to Adversely Affect based on extensive multi-year surveys. These determinations are documented in **Appendix K, Biological Assessment**, which does not include the ROW for the electrical transmission lines.

Table 4-3 summarizes the amount of potential occupied protected habitat within the ROW. The acreages in **Table 4-3** listed for threatened and endangered species include habitat for species with mapped habitat that the Project may impact, as discussed in **Section 3.6, Natural Ecological Systems and Protected Species**. These include the Houston toad, large-fruited sand verbena and Navasota ladies'-tresses. The electrical transmission lines could result in the removal of up to 13 acres of habitat for federally protected species. The habitat could be removed for pole foundations or access roads. Threatened and endangered species in the Study Area that may be impacted but do not have mapped habitat include the interior least tern and the whooping crane. Impacts to federally protected species from the Build Alternatives and Houston Terminal Station Options are assessed under the current Section 7 consultation process with the USFWS.

Impacts to protected species and wildlife from the electrical transmission lines would be evaluated under a separate PUCT environmental process. The electrical utility providers would coordinate with the USFWS and TPWD during the PUCT approval process to identify impacts (i.e., bird collisions or habitat loss) to protected species and to determine appropriate mitigation (i.e., pole design, line markers, or additional field surveys) to reduce or even eliminate potential adverse impacts.

4.3.2.3 Land Use

Land use impacts would mainly be in the form of new ROW easements for electrical transmission lines. The categories of land use and the acreages of each land use type within the ROW for the Project are detailed in **Table 4-4**.

Overhead transmission lines would minimally impact agricultural and most other land uses. Impacts to agricultural land uses within transmission line ROW easements would be minimal, because agricultural activities (e.g., livestock grazing, cropland management) could be allowed to resume following construction of the transmission line depending on specific utility policies and terms of the easement agreement between the utilities and landowners. Only the small footprint of the transmission line pole foundations would be permanently removed from agricultural production as the remainder of the easement would consist of aerial transmission line infrastructure.

4.3.2.4 Waters of the U.S. and Floodplains

It is anticipated that the new transmission lines would span most of these waters of the U.S. (including streams, wetlands, and waterbodies), and transmission line poles would be placed outside of streambanks and floodplains, thus avoiding direct impacts. Waters of the U.S. and floodplains within the ROW for the Preferred Alternative are summarized in **Tables 4-5**.

A more precise quantification of impacts to streams, wetlands, waterbodies, and floodplains would be determined by the utility providers during routing and design of the ultimate transmission line connections. If permanent impacts to waters of the U.S. are required, the utility providers would be responsible for obtaining the required permits pursuant to the CWA.

4.3.2.5 Water Quality

Water quality in streams and waterbodies within the ROW could be temporarily impacted due to ground-disturbing activities during construction. These potential impacts may include a temporary increase in storm water runoff contributing to erosion and sedimentation in areas where ground-disturbance from construction activities occurs. Utility providers would implement mitigation measures to reduce potential impacts to water quality, including the implementation of BMPs for controlling erosion, sedimentation and TSS. With the implementation of BMPs, indirect impacts to water quality are

anticipated to be minimal and not adversely affect water quality. There are no impaired waterbodies in the ROW of the electrical transmission lines for the Build Alternatives.

4.4 Cumulative Impacts

Cumulative impact analyses consider the combined results of past, current and future activities, in addition to the Project, and measure their cumulative impact on the environment. This cumulative analysis also considers the indirect impacts already discussed in **Section 4.3, Indirect Project Effects**. The examination of the current health and historical context of each resource is necessary to establish a baseline for determining the impacts of the Preferred Alternative and other reasonably foreseeable actions on the resource. For each resource, special concerns identified from the direct and indirect impacts analyses and the resource's present abundance and quality were evaluated. The impacts of historical activities, the resource's response to those activities, the continuing stresses imposed on the resource and the resource's resilience to these stresses were considered.

Table 4-6 summarizes impacts for each proposed project resource category, whether the resource is in poor or declining health (i.e., diminishing air quality conditions) or at risk (i.e., protected species habitat), whether the resource is included in the cumulative analysis, and the reason a resource is or is not eliminated from the cumulative analysis. The following is a list of resource areas analyzed for cumulative impacts:

- Air Quality
- Natural Resources
    - Threatened and Endangered Species (Federally Protected Species)
    - Vegetation and Wildlife Habitat
- Waters of the U.S.
- Utilities and Energy
- Transportation
- Land Use
- Socioeconomics and Community Facilities

Table 4-5: Direct and Indirect Impacts of the Preferred Alternative

Resource	Measure	Direct Impacts			Indirect Impacts	
		Build Alternative A	Northwest Mall Station	Total Direct Impacts	New Electrical Transmission Lines	Development-Related Impacts Around Dallas and Houston Terminal Stations
Air Quality (Section 3.2)						
Air Quality Impacts	N/A	Net emissions benefit for permanent operations, temporary construction impacts.			No impacts for operations, temporary construction impacts.	More compact development patterns around stations could increase vehicle emissions locally; however, this development is not anticipated to increase emissions at a regional level
Water Quality (Section 3.3)						
Impaired Waterbodies – 303(d) List	Feet	344.7	0	344.7	None within ROW; in addition, transmission lines can span sensitive resources	No impacts anticipated over the No Build Alternative because development would occur in already-developed areas around stations in Houston and Dallas
Impaired Waterbodies Total	Feet	830	0	830	None within ROW; in addition, transmission lines can span sensitive resources	
Groundwater Wells	Count	9	0	9	Minimal impact because transmission lines can span	
Noise and Vibration (Section 3.4)						
Severe Noise Impacts to Residences	Count	10	0	10	Transmission lines generate minimal noise	Development around stations could increase noise levels and noise receptors; however, developers would comply with local noise regulations
Moderate Noise Impacts to Residences	Count	280	0	280		
Moderate Noise Impacts to Institutions	Count	1	0	1		
Hazardous Materials and Solid Waste (Section 3.5)						
Low-Risk Hazardous Material Sites	Count	297	0	297	Minimal impact because transmission lines can span	No impacts anticipated because developers would comply with hazardous waste laws
Moderate-Risk Hazardous Material Sites	Count	155	3	158		
High-Risk Hazardous Material Sites	Count	4	0	4		
Natural Ecological Systems and Protected Species (Section 3.6) [a]						
Protected Species Habitat – Temporary	Acres	328	0	328	Minimal (less than 13.0 acres) because transmission lines can span	No impacts anticipated over the No Build Alternative because development would occur in already-developed areas around stations in Houston and Dallas and the Project Study Areas for Dallas and Harris counties do not contain potential suitable habitat for federally listed species evaluated by FRA
Protected Species Habitat – Permanent	Acres	1,058	0	1,058		
Waters of the U.S. (Section 3.7)						
Stream Crossings – Temporary	Feet	83,459	0	83,459	Minimal (less than 1,707.4 acres) because transmission lines can span	No impacts anticipated over the No Build Alternative because development would occur in already-developed areas around stations in Houston and Dallas
Stream Crossings – Permanent	Feet	38,898	0	38,898		
Wetlands – Temporary	Acres	59.5	0	59.5	Minimal (less than 1.1 acres) because transmission lines can span	
Wetlands – Permanent	Acres	50.0	0	50.0		
Waterbodies – Temporary	Acres	33.5	0	33.5	Minimal (less than 0.4 acres) because transmission lines can span	
Waterbodies – Permanent	Acres	27.6	0	27.5		
Floodplains (Section 3.8)						
Impacts to 100-Year Floodplain	Acres	616	0	616	Minimal (less than 7.0 acres) because transmission lines can span floodplains	No impacts anticipated over the No Build Alternative because development would occur in already-developed areas around stations in Houston and Dallas
Impacts to 500-Year Floodplain	Acres	132	0	132		
Permanent Impacts to 100-Year and 500-Year Floodplains	Acres	529	0	529		
Temporary Impacts to 100-Year and 500-Year Floodplains	Acres	219	0	219		
Total Acres of Impacted Floodplain	Acres	748	0	748		
Utilities and Energy (Section 3.9)						
New Electric TPSS Connections	Count	13	0	13	NA	The acceleration of new development around stations could require more utilities than under the No Build Alternative condition; however, denser development patterns create efficiencies in delivering utilities
Electric Utility Pole Adjustments	Count	85	0	85	Electrical providers would assess	
Total Electric Connections and Adjustment	Count	98	0	98	NA	

[a] Threatened and Endangered Species acreages include habitat for species with modeled habitat (as detailed in **Section 3.6, Natural Ecological Systems and Protected Species**) that may be impacted, including Houston toad, large-fruited sand verbena, and Navasota ladies'-tresses. Threatened and endangered species in the Study Area that may be impacted but that do not have modeled habitat include the interior least tern and the whooping crane.

[b] A single landscape unit is shared between Segment 5 and the Houston Terminal Station Options; therefore, the total number of beneficial landscape units is the same as Build Alternative A.

[c] Road modifications reflect the number of reroutes, road adjustments, or road over rail constructions that would occur. Some roads are affected by multiple modifications (such as IH-45). Modifications do not reflect total number of roads but total number of road construction sites.

[d] Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

[e] Indirect impacts to special status farmland in **Section 3.13, Land Use,** are defined as a 25-foot setback added to the LOD to account for indirect loss of productive farmland to accommodate the use of farm and ranch equipment or impacts such as induced wind and changes in irrigation.

[f] The "Community Facilities" category in **Section 3.14, Socioeconomics and Community Facilities**, encompasses categories of affected structures and facilities that are broken down into more defined categories within **Section 3.13, Land Use**; therefore, values between the two sections are not identical. Refer to the section for a complete definition of each category.

[g] Children's health and safety impacts are the result of temporary construction effects. These impacts will no longer exist once construction has ended.

Table 4-5: Direct and Indirect Impacts of the Preferred Alternative

Resource	Measure	Direct Impacts			Indirect Impacts	
		Build Alternative A	Northwest Mall Station	Total Direct Impacts	New Electrical Transmission Lines	Development-Related Impacts Around Dallas and Houston Terminal Stations
Abandoned Oil and Gas Wells	Count	37	0	37	Minimal impact because transmission lines would span	
Aesthetics and Scenic Resources (Section 3.10)						
Total Number of Beneficial Landscape Units[b]	Count	2	0	2	Transmission lines would impact visual resources and aesthetics; however specific tower type and height is not known at this time and will be determined during the electrical utility provider permitting process	Denser development pattern could result in taller, more compact buildings around stations in Dallas and Houston; changing the skyline and viewpoints in those areas; however, specific locations and heights not known; development would comply with local regulations
Total Number of Neutral Landscape Units	Count	8	0	8		
Total Number of Adverse Landscape Units	Count	2	0	2		
Total Number of Adverse Visual Resource Impacts	Count	11	0	11		
Transportation (Section 3.11)						
Road Modifications - Public and Private[c]	Count	138	0	138	Minimal impacts because transmission lines can span roads	Denser development pattern could shift passenger vehicle use to walking, biking, and transit including an increase of intersections with LOS E or F; any changes to roads and access points would be evaluated through development permits
Road Modifications - Public Only [d]	Count	59	0	59		
Length added to Public Roads	Miles	16.8	0	16.8		
Length removed from Public Roads	Miles	5.1	0	5.1		
Impacts to Airports	Count	0	0	0		
Number of Intersections at LOS E or F	Count	NA	24	24		
Elderly and Handicapped (Section 3.12)						
Elderly and Handicapped Impacts	NA	No impacts			No impacts anticipated	No impacts anticipated as development would be required to comply with ADA
Land Use (Section 3.13)						
Existing Land Use Conversion – Temporary	Acres	2,553.4	27.4	2,580.8	Approximately 94.4 acres of land would be located under the transmission lines that could be converted to an easement	Development would occur in already-developed areas around stations in Houston and Dallas Displacements are not applicable for accelerated development around stations as additional development would occur between private developers with fair and negotiated transactions
Existing Land Use Conversion – Permanent	Acres	6,619.8	75.8	6,695.6		
Special Status Farmland – Temporary	Acres	1,710.8	0	1,710.8	up to 61.8	
Special Status Farmland – Permanent	Acres	3,534.5	0	3,534.5		
Special Status Farmland – Indirect [e]	Acres	847.5	0	847.5		
Displacement – Commercial (primary)	Count	42	22	64	0	
Displacement – Residence (primary)	Count	235	0	235		
Displacement – Community Facilities (primary) [f]	Count	2	0	2		
Estimated Permanent Parcel Acquisitions	Count	1,731	40	1,771	up to 187	
Estimated Temporary Parcel Acquisitions	Count	272	1	273		
Estimated Structure Acquisitions – Agriculture	Count	196	0	196	0	
Estimated Structure Acquisitions – Commercial	Count	12	1	13	0	
Estimated Structure Acquisitions – Community Facilities	Count	0	0	0	0	
Estimated Structure Acquisitions – Cultural/Civic Resources	Count	2	0	2	0	
Estimated Structure Acquisitions – Oil and Gas	Count	12	0	12	0	
Estimated Structure Acquisitions – Residence	Count	49	0	49	0	
Estimated Structure Acquisitions – Transportation and Utilities	Count	0	0	0	0	

[a] Threatened and Endangered Species acreages include habitat for species with modeled habitat (as detailed in **Section 3.6, Natural Ecological Systems and Protected Species**) that may be impacted, including Houston toad, large-fruited sand verbena, and Navasota ladies'-tresses. Threatened and endangered species in the Study Area that may be impacted but that do not have modeled habitat include the interior least tern and the whooping crane.

[b] A single landscape unit is shared between Segment 5 and the Houston Terminal Station Options; therefore, the total number of beneficial landscape units is the same as Build Alternative A.

[c] Road modifications reflect the number of reroutes, road adjustments, or road over rail constructions that would occur. Some roads are affected by multiple modifications (such as IH-45). Modifications do not reflect total number of roads but total number of road construction sites.

[d] Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

[e] Indirect impacts to special status farmland in **Section 3.13, Land Use,** are defined as a 25-foot setback added to the LOD to account for indirect loss of productive farmland to accommodate the use of farm and ranch equipment or impacts such as induced wind and changes in irrigation.

[f] The "Community Facilities" category in **Section 3.14, Socioeconomics and Community Facilities**, encompasses categories of affected structures and facilities that are broken down into more defined categories within **Section 3.13, Land Use**; therefore, values between the two sections are not identical. Refer to the section for a complete definition of each category.

[g] Children's health and safety impacts are the result of temporary construction effects. These impacts will no longer exist once construction has ended.

Table 4-5: Direct and Indirect Impacts of the Preferred Alternative

Resource	Measure	Direct Impacts			Indirect Impacts	
		Build Alternative A	Northwest Mall Station	Total Direct Impacts	New Electrical Transmission Lines	Development-Related Impacts Around Dallas and Houston Terminal Stations
Socioeconomics and Community Facilities (Section 3.14)						
Communities with Disrupted Character and Cohesion	Count	4	0	4	Construction of the new line would result in temporary employment and earnings revenue; transmission lines would not cross neighborhoods or community facilities	Accelerated development around stations could increase economic activity, jobs, property values, and tax revenue, increasing prices for rental units and homes and decreasing affordability for lower income populations; more compact development around stations could increase the need for community services
Economic Impacts	NA	Positive				
Employment	Job Years	317,207				
Earnings	2019 billions	$14.50				
Tax Revenue	NA	Positive				
Children's Health and Safety [g]	Count	0	0	0		
Community Facilities [f]	Count	5	0	5		
Electromagnetic Fields (Section 3.15)						
EMF Impacts	NA	No EMI or adverse EMF exposure would occur from the Project			No EMI or adverse EMF exposure would occur	No impacts anticipated
Public Safety and Security (Section 3.16)						
Permanent Road Modifications resulting in 1 minute or more in additional through travel time	Count	12	0	12	Temporary construction impacts but no permanent impacts anticipated because transmission lines can span roads	Development would comply with local development permit process
Total fire and EMS service areas bisected by construction	Count	56	0	56		
Fire and EMS providers with high potential for construction effects	Count	3	0	3		
Fire and EMS providers with localized potential for construction effects	Count	8	0	8		
Recreational Facilities (Section 3.17)						
Parks	Count	0	0	0	0	Development would comply with local open space requirements
Environmental Justice (Section 3.18)						
Number of Minority and/or Low-Income block groups intersected by the Study Area	Count	80	7	87	Transmission lines do not intersect any Minority and/or Low-Income communities	Development around stations may increase property values, rental prices and tax burden in communities around Dallas and Houston Terminal Stations
Number of all block groups intersected by the Study Area	Count	118	11	129		
Identified Minority and/or Low-Income Communities	Count	5	1	5		
Disproportionately High and Adverse Impact to Minority and/or Low-Income Communities	NA	No	No	No		
Cultural Resources (Section 3.19)						
Adverse Impacts to Historic Properties	Count	14	0	14	0	None anticipated because City of Houston and City of Dallas permitting process requires preservation of historic properties
Soils and Geology (Section 3.20)						
Soils and Geology impacts	NA	No adverse impacts			No impacts anticipated	No impacts anticipated
Green House Gas Emissions (Section 3.21)						
Green House Gas Emissions	NA	No impacts			No impacts anticipated	No additional greenhouse gas emissions anticipated over the No Build Alternative conditions

[a] Threatened and Endangered Species acreages include habitat for species with modeled habitat (as detailed in **Section 3.6, Natural Ecological Systems and Protected Species**) that may be impacted, including Houston toad, large-fruited sand verbena, and Navasota ladies'-tresses. Threatened and endangered species in the Study Area that may be impacted but that do not have modeled habitat include the interior least tern and the whooping crane.

[b] A single landscape unit is shared between Segment 5 and the Houston Terminal Station Options; therefore, the total number of beneficial landscape units is the same as Build Alternative A.

[c] Road modifications reflect the number of reroutes, road adjustments, or road over rail constructions that would occur. Some roads are affected by multiple modifications (such as IH-45). Modifications do not reflect total number of roads but total number of road construction sites.

[d] Shared access roads are included in roadway modification lengths. Shared access roads will be developed to provide for maintenance, emergency response access and private property access with a corresponding reduction in the number of new public roads to decrease burden on roadway authorities. Shared access roads would be constructed and maintained by TCRR.

[e] Indirect impacts to special status farmland in **Section 3.13, Land Use,** are defined as a 25-foot setback added to the LOD to account for indirect loss of productive farmland to accommodate the use of farm and ranch equipment or impacts such as induced wind and changes in irrigation.

[f] The "Community Facilities" category in **Section 3.14, Socioeconomics and Community Facilities**, encompasses categories of affected structures and facilities that are broken down into more defined categories within **Section 3.13, Land Use**; therefore, values between the two sections are not identical. Refer to the section for a complete definition of each category.

[g] Children's health and safety impacts are the result of temporary construction effects. These impacts will no longer exist once construction has ended.

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Table 4-6: Cumulative Analysis of Resources				
Subject Considered for Direct and Indirect Impacts	**Cumulative Impact Assessment Criteria**		**Included for Cumulative Impact Analysis?**	**Explanation for Including or Excluding the Subject from Cumulative Impact Analysis**
	Would the Project result in adverse impacts to the resource?	**Is the subject a scarce resource or in poor or declining health?**		
Air Quality (Section 3.2)	No	Yes	Yes	Included because of prevailing non-attainment conditions.
Water Quality (Section 3.3)	No	Yes	No	Excluded because direct impacts from this Project and other projects would be required to adhere to current water quality regulations and standards.
Noise and Vibration (Section 3.4)	Yes	No	Yes	Included because the Project will have noise impacts.
Hazardous Materials (Section 3.5)	No	No	No	Excluded because the Project would comply with hazardous waste disposal requirements. Although hazardous materials sites were detected within the LOD, no adverse impacts were identified.
Natural Ecological Systems and Protected Species (Section 3.6)	Yes	Yes	Yes	Included due to the potential presence of federally protected species, the potential for this Project and other projects to directly impact vegetation and habitat, and the potential for this Project and other projects to create fragmented habitat.
Waters of the U.S. (Section 3.7)	Yes	Yes	Yes	Included, due to the potential for this Project and other projects to directly impact wetlands, streams, and waterbodies. Impacts would be mitigated through the USACE Individual Permit.
Floodplains (Section 3.8)	No	Yes	No	Excluded because the Project would not increase the base floodplain elevation that would violate applicable floodplain regulations and TCRR is required to obtain floodplain development permits from local floodplain administrators/directors.
Utilities and Energy (Section 3.9)	Yes	No	Yes	Included because the Project would result in the relocation and/or raising of existing utilities by associated utility providers and the construction of new utility connections.
Aesthetics and Scenic Resources (Section 3.10)	Yes	No	Yes	Included because two landscape units would be adversely impacted. The overall design and visual impact of the new transmission lines would not be determined until further design and routing analysis is determined by the utility provider.
Transportation (Section 3.11)	Yes	No	Yes	Included because the Project would cause short- and long-term changes to access and travel times.
Elderly and Handicapped (Section 3.12)	No	No	No	Excluded impacts to the community are already avoided, minimized, or mitigated.

Table 4-6: Cumulative Analysis of Resources				
Subject Considered for Direct and Indirect Impacts	**Cumulative Impact Assessment Criteria**		**Included for Cumulative Impact Analysis?**	**Explanation for Including or Excluding the Subject from Cumulative Impact Analysis**
	Would the Project result in adverse impacts to the resource?	**Is the subject a scarce resource or in poor or declining health?**		
Land Use (Section 3.13)	Yes	No	Yes	Included because this Project and other projects in the 10-county area could convert land, including farmland, to other uses.
Socioeconomics and Community Facilities (Section 3.14)	Yes	No	Yes	Included due to impacts to property values and the agricultural economy caused by additional projects within the 10-county Study Area as well as potential development near the station areas. Displacements and relocations excluded because the adverse impacts would be limited to residences and business directly displaced by the Project and mitigated through compensation.
Electromagnetic Fields (Section 3.15)	No	No	No	Excluded because there are no EMF impacts.
Safety and Security (Section 3.16)	No	No	Yes	Included to assess the potential for a cumulatively large impact to emergency response times from multiple minor delays from this and other projects.
Recreational Facilities (Section 3.17)	No	No	No	Excluded because the Project would not adversely affect this resource.
Environmental Justice (Section 3.18)	Yes	N/A	Yes	Included because development around stations may increase property values, rental prices and tax burden for communities around Dallas and Houston Terminal Stations.
Cultural Resources (Section 3.19)	Yes	No	Yes	Included to assess the potential for cumulative impacts to historic properties.
Soils and Geology (Section 3.20)	No	No	No	Excluded because the Project would not adversely impact this resource.
Greenhouse Gases (Section 3.21)	No	No	No	Excluded because operation of the Project would generally reduce regional criteria and GHG pollutants.

4.4.1 Resource Study Areas, Conditions and Trends

Cumulative impacts were considered within a spatial geographic area or Study Area and were determined based on the environmental resources that were selected for this analysis.

4.4.1.1 Temporal Boundaries

The temporal boundary for this analysis extends from year 2000 through year 2040 for all resources. Year 2000 was selected to account for previous large-scale capital investment actions that may have occurred in the Study Area, such as roadway or electrical transmission line work. Year 2040 was selected because the Preferred Alternative would be anticipated to reach the final operating scenario by that time.

4.4.1.2 Study Areas

The following sections describe the study area for resources analyzed for cumulative impacts.

4.4.1.2.1 Air Quality

The Study Area for air quality includes the air basins that encompass the 10-county Study Area (Dallas, Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes, Waller and Harris). Construction emissions would be short-term and temporary and operational emissions would be long-term.

4.4.1.2.2 Noise

The Study Area for noise impact analysis is 1,300 feet. These distances from the FRA guidance manual[22] are based on assumptions for the HSR operations and existing environment and are meant to provide a distance within which any potential impacts from HSR operations would be identified. Beyond these distances, no impacts would occur.

4.4.1.2.3 Natural Ecological Systems and Protected Species– Threatened and Endangered Species (Federally Protected)

The Study Area for vegetation and wildlife habitat consists of the areas that are within the 10-county LOD.

The Study Area for federally protected threatened and endangered species varies by species. The species are described in **Appendix K, Biological Assessment**.

Houston Toad: The Study Area for the cumulative analysis for the Houston toad is the potential habitat delineated based on the habitat suitability model previously discussed in **Section 3.6**, **Natural Ecological Systems and Protected Species**.

Navasota ladies'-tresses: The Study Area for the cumulative analysis for the Navasota ladies-tresses includes potential habitat delineated based on the habitat suitability model discussed in **Section 3.6, Natural Ecological Systems and Protected Species**. This includes EORs within 5 miles of the Study Area in Freestone County, one within 5 miles in Leon County, one within 5 miles in Madison County, as well as one within the Study Area, two within 1 mile of the Study Area and four within 5 miles of the Study Area in Grimes County.

[22] FRA, High-Speed Ground Transportation Noise and Vibration Impact Assessment, Final Report DOT/FRA/ORD-12/15, September 2012.

Large-fruited sand verbena: The Study Area for the cumulative analysis for the large-fruited sand verbena is the LOD within the species range including Freestone and Leon Counties.

Interior least tern: The Study Area for the cumulative analysis for the interior least tern includes two EORs within 5 miles of the Study Area in Dallas County, two within 5 miles in Freestone County, and one within 1 mile in Leon County.

Whooping crane: The Study Area for the cumulative analysis for the whooping crane is potential stopover habitat in emergent wetlands and other stopover habitats found within the LOD.

4.4.1.2.4 Waters of the U.S.

The Study Area for waters of the U.S. consists of the watersheds within the 10-county area.

4.4.1.2.5 Utilities and Energy

The Study Area for the cumulative analysis of utilities and energy is the 10 counties in which the Preferred Alternative would be located.

4.4.1.2.6 Aesthetics and Scenic Resources

The Study Area for aesthetics and scenic resources is defined as the LOD with a quarter-mile buffer around the alignment and stations in Dallas and Harris Counties and a half-mile buffer around the alignment and station for all other counties.

4.4.1.2.7 Transportation

Due to the linear nature of the Project and its "closed system," the Study Area would include the LOD and a quarter-mile buffer around the station areas.

4.4.1.2.8 Land Use- Farmland

The Study Area for land use and farmland is the 10 counties the Preferred Alternative would traverse.

4.4.1.2.9 Socioeconomic

The economic, demographic and social data from the 10 counties were used in determining the Study Area for socioeconomics. The Study Area for the demographic analysis and the community impact assessment is defined as a quarter-mile buffer from the LOD.

4.4.1.2.10 Safety and Security

The entire 10-county area is used as the Study Area for public safety.

4.4.1.2.11 Environmental Justice

The Study Area for the Environmental Justice analysis was set at one-half mile in each direction from the centerline of the Project.

4.4.1.2.12 Cultural Resources

The extent of the historic resources APE was measured from the LOD based on the criteria listed below.

- 350 feet beyond the LOD where the Project would be constructed in urban settings

- 700 feet beyond the LOD where the Project would be constructed in suburban settings
- 1,300 feet beyond the LOD where the Project would be constructed in rural settings

4.4.2 Direct and Indirect Effects on each Resource from the Project

The analysis of cumulative impacts must consider the direct and indirect impacts of the Project within each resource Study Area. The direct and indirect impacts of the Project are discussed in detail in **Chapter 3.0, Affected Environment and Environmental Consequences,** and **Section 4.3, Indirect Project Effects**, respectively. The cumulative impacts of the Project and other past, present and reasonably foreseeable future projects would be similar across the six Build Alternatives and across the three Houston Terminal Station Options. Therefore, the Preferred Alternative (Build Alternative A and Houston Northwest Mall Terminal Station Option) is used as the representative alternative for the cumulative impact analysis, with the exception of impacts to Fort Boggy State Park. The cumulative impacts would vary for Build Alternatives C and F as hunting activities at Fort Boggy would be impacted. Expansion of IH-45 in Leon County (as shown in **Table 4-7**) could further impact hunting or other recreational activities at Fort Boggy State Park. Therefore, though not the Preferred Alternative, under Build Alternative C or F, FRA would coordinate with TPWD to identify appropriate mitigation for cumulative impacts to Fort Boggy State Park.

Table 4-7: Projects Considered for Cumulative Impact Analysis

County	Project Description
Dallas County	Construct four managed lanes and widen freeway from 8 to 13 lanes from Kimball Avenue to SH 121 East
Dallas County	IH-30 Eastbound – Remove HOV lanes and construct operational improvements by widening from 8 to 10 lanes from IH-820 to President George Bush Turnpike
Dallas County	IH-30 Westbound – Operational improvements and/or widen from 6 to 10 lanes from IH-45 to President George Bush Turnpike to SH 161
Dallas County	IH-30/US 80 – Feasibility study to assess operational improvements, toll capacity or additional modes, technologies or alignments
Dallas County	IH-35 East – Widen from 10 to 12 lanes from SH 183 to Dallas North Tollway
Dallas County	IH-20 – Cap/Main bottleneck and safety improvements
Dallas County	SH 183 – Widen from 6 to 8 lanes and add managed lanes from Loop 12 to SH 114
Dallas County	Loop 12 – Construct two reversible managed lanes from IH-35 East to IH-20
Dallas County	SH 114 – Various lane widening and managed lane construction from SH 121 to SH 183
Dallas County	SH 161 – Construction of two main lanes in each direction, resulting in four-lanes in each direction from Conflans Road to Belt Line Road
Dallas County	Loop 9 – Construction of 10 miles of a new 6-lane highway
Dallas County	Dallas Streetcar 723 Bishop Arts service – Bishop Arts circulator service
Dallas County	DART Blue Line – Extension to University of North Texas at Dallas of 3 miles with two new stations
Dallas County	DART D2 Subway in Downtown Dallas
Dallas County	100 Resilient Cities – This program to improve resilience in the face of chronic shocks (e.g., natural disasters, disease outbreaks) and chronic stressors (e.g., persistent income inequality). The City of Dallas is expected to take steps to address these challenges through potential citywide infrastructure upgrades and other measures
Dallas County	Dallas Floodway Project – The USACE is currently planning this project within the existing Dallas Floodway. This includes a Modified Dallas Floodway Project (federal project) and a Balanced Vision Plan and Interior Drainage Plan (which may be constructed by the City of Dallas as a Section 408). These projects involve levee remediation, interior drainage plans, ecosystem restoration, storm water wetlands construction, and recreation enhancements
Dallas County	Dallas Floodway Extension Project – This USACE project includes construction of wetlands, levees, recreation, and mitigation features
Ellis County	FM 664 – Conversion of 3 miles of existing 2-lane roadway to a 6-lane divided urban roadway.
Navarro County	SH 31 Relief Route – Construction of 18 miles of a new 2-lane rural arterial roadway

Table 4-7: Projects Considered for Cumulative Impact Analysis	
County	**Project Description**
Freestone County	Tehuacana Reservoir - Construction of a water supply reservoir with an approximately 14,938-acre conservation pool and connecting channel between the Tehuacana Reservoir and the Richland-Chambers Reservoir.
Freestone County	IH-45 - expansion from 4 to 6 lanes
Freestone County	IH-45 – conversion of frontage roads
Limestone County	IH-45 -- conversion of 32 miles of freeway from 4 to 6 lanes
Limestone County	FM 39 – Construction of shoulders along 9 miles of an existing rural highway
Limestone County	SH 164 – Addition of passing lanes to 31 miles of an existing highway
Limestone County	US 84 – Addition of wider shoulders and passing lanes to an existing two-lane rural highway
Limestone County	US 84 – Conversion of 1.05 mile of an existing 2-lane rural highway to 4-lane divided highway with continuous left turn lane
Leon County	IH-45 -- conversion of 17 miles of freeway from 4 to 6 lanes
Leon County	US 79 – Addition of 2 lanes to 10 miles of an existing 2-lane divided highway
Madison, Grimes, and Waller Counties	Bedias Reservoir –construction of water supply reservoir with an approximately 10,000-acre conservation pool and associated conveyance facilities to divert water into the West Fork of the San Jacinto River. Expected total storage capacity for the reservoir would be 192,700 acre-feet
Madison County	SH 21/US 190 – Addition of 2 lanes to 11 miles of an existing divided highway from the Navasota River to Madisonville
Madison County	SH 21 Relief Route – feasibility study has been completed for a relief road around downtown Madisonville to connect to IH-45
Madison County	IH-45 – Roadway improvements on existing 19 miles of four-lane freeway
Madison County	Gulf Coast Strategic Highway (US 190/I-10)- U.S. Congress designated part of US 190 as IH-14, a new interstate highway intended for both military and civilian use. The plan is a “Ports to Forts” interstate highway connecting the Port of Beaumont and Port of Corpus Christi to Fort Polk, Louisiana, Fort Hood, Texas and Fort Bliss, Texas. Existing highways would be widened and designated as IH-14. Several options for the main route of the potential future IH-14 and extensions are under consideration, as well as designations of several highways as feeders/connectors
Grimes County	Brazos Valley Connection, 1 58.8 miles electric transmission line that will run from Grimes County to Harris County to address future infrastructure improvements
Grimes County	Mid-South Synergy Solar Power Generation Field on FM 1696–1.2-megawatt direct current community solar project aimed at providing green energy to Mid-South Synergy customers in rural parts of Grimes, Walker, Madison, Montgomery, Brazos and Waller Counties
Grimes County	SH 249 – Construction of 10 miles of a new 4-lane tollway in Montgomery and Grimes Counties
Grimes County	SH 105 – Addition of 2 lanes to 13 miles of an existing freeway
Grimes County	SH 30 – Addition of 2 lanes to 15 miles of an existing freeway
Waller County	IH-10 – Addition of 2 lanes to 5.3 miles of an existing divided highway
Waller County	FM 1774 – Addition of 2 lanes to 1.6 miles of an existing divided rural roadway
Waller County	James Muse Parkway – Addition of 2 lanes to 1.5 miles of a rural roadway
Harris County	FM 2920 - Addition of 2 lanes to 14 miles of existing roadway
Harris County	US 290 – Addition of six main lanes and two frontage roads (with two lanes each) to 6 miles of an existing four-lane freeway
Harris County	IH-610 – Addition of 4 managed (toll) lanes, 2 frontage roads (with 2 lanes each), and an interchange to 1 mile of an existing 4-lane freeway
Harris County	Hempstead Toll Road – Addition of 4 managed (toll) lanes and 2 frontage roads (with two lanes each) to 15 total miles of an existing 4-lane freeway
Harris County	Southeast Rail Extension – 2.3-mile southeast rail extension from Lincoln to Ridge Gate Parkway
Harris County	Inner Katy Corridor Extension – Construction of 7 miles of high capacity transit
Harris County	Uptown-Galleria Line Extension to Hempstead Intermodal Terminal (Houston Terminal Station) – construction of 0.5 mile of high capacity transit
Harris County	US 290/Hempstead Corridor Commuter Rail – the Gulf Coast Rail District has prepared feasibility reports, study materials and workshop materials to determine the feasibility of a 44-mile corridor to operate commuter rail.

Table 4-7: Projects Considered for Cumulative Impact Analysis	
County	**Project Description**
Harris County	Houston Metro University Line – 10 miles of light rail east from the Hillcroft Transit Center to the Eastwood Transit Center
Harris County	Uptown (Post Oak) Boulevard – 4.5-mile BRT project on Post Oak Boulevard operating from Westpark to the Northwest Transit Center
Harris County	East End Line or Green Line – 4-mile light rail line traveling from Magnolia to Downtown Houston
Harris County	Surface Water Supply Project (formerly Second Source Project) - Construction of a water supply pipeline 8 feet in diameter and approximately 39 miles in length, and two large pump stations to supply water from Lake Houston via the City of Houston's Northeast Water Purification Plant

Source: AECOM 2020

4.4.3 Past, Present and Reasonably Foreseeable Actions

The cumulative impacts analysis includes activities within the resource Study Areas that occurred in the past that are planned and/or programmed for construction within the time frame of this analysis or are reasonably foreseeable. Activities that have been proposed and evaluated but that are not likely to proceed in the foreseeable future are not included in the analysis. **Table 4-8** lists the activities with quantitative data that have been considered in the cumulative impact analysis.

Projects described in **Table 4-8** included quantitative data related to their impacts. This cumulative assessment also considered qualitative data when quantitative data were not available. **Table 4-7** includes additional projects that may occur within the Study Areas and have limited available data related to potential impacts. These projects were included in the qualitative cumulative impact analysis.

4.4.4 The Overall Effects of the Preferred Alternative Combined with other Actions

The effects and impacts of the projects listed above were evaluated in combination with the environmental impacts with the Preferred Alternative. The analysis by resource area is provided the following sections, beginning with a summary of the direct and indirect impacts, followed by a discussion of any additional cumulative impacts associated with other projects.

4.4.4.1 Air Quality

FRA determined that the Preferred Alternative would not result in adverse impacts to air quality within the Study Area. However, air quality in Dallas, Houston and their surrounding areas is regulated as non-attainment, which indicates that air quality conditions could deteriorate without continued management of the resource; therefore, FRA included air quality as part of the cumulative analysis.

A portion of the Air Quality Study Area is a nonattainment area for ozone. Dallas and Ellis Counties are in the DFW ozone nonattainment area, and Waller and Harris Counties are in the HGB ozone nonattainment area. Freestone County is in the Freestone and Anderson nonattainment area for SO_2 emissions.

Table 4-8: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis				
County	**Description**	**Status**	**Overlap with planned Project construction Schedule?**	**Impacts**
Surface Roadway				
Dallas County	Dallas-Fort Worth Connector SH 121 – Widen various sections from FM 2499 to Hall Johnson Road from 8 to 12 lanes	Currently in construction	Yes	• 16 business displacements • Loss of approximately 350 parking spaces • Excess traffic noise at 2 receivers • Approximately 13 hazardous materials sites may be impacted • 4.5 acres of riparian vegetation impacted (minor in nature and only avoidance measures are proposed) • Beneficial pedestrian and aesthetic impacts
Dallas County & Tarrant County	IH-30 – Improvements from Cooper Street to SH 161; includes interchange construction with SH 360. Located in both Tarrant and Dallas Counties.	Final EA issued in August 2015	Yes	• No community, Environmental Justice, wetland, floodplain, or visual impacts • 14.4 acres land use impacts for new ROW • Positive transportation impacts • Improvement to bicycle pedestrian facilities • No historic or archeological impacts • Section 4(f) *de minimis* impact • Waters of the U.S.: Permanent impacts at 4 water crossings. Each would affect >0.5 acre • 9.5 acres of riparian forest and 0.6 acre of upland woodland habitat impacted • Noise impacts at 13 receivers
Dallas County	IH-35 East – Construct additional concurrent managed lanes from US 380 to IH-635	Phase 1 construction completed. Phase 2 development is ongoing.	Yes	• Traffic noise impacts • 318 displacements • 106 acres land use conversion to transportation use (north segment only) • Section 4(f) impacts (central segment only) • Minor water resource impacts (>5 acres) • Minor biological habitat impacts • Traffic noise impacts • No air quality impacts

Table 4-8: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis				
County	**Description**	**Status**	**Overlap with planned Project construction Schedule?**	**Impacts**
Dallas County	IH-35 East/US 67 – Construction of 11 miles of improvements	Currently in construction	Yes	• 3.63 acres of additional ROW • 1.56 acres for drainage • No impacts to federally threatened, endangered or candidate species or critical habitat • 1.67 acres of riparian habitat impacted • 0.53 acres of disturbed prairie habitat impacted • 0.004 acre of permanent fill impacts • 34 traffic noise barriers are proposed • No impacts to groundwater, wetlands, prime farmlands, floodplains or air quality • No impacts to archaeological or historic resources • Improved bicycle and pedestrian facilities • Improved vehicular mobility and connectivity
Dallas County	Dallas multimodal transit station located in downtown Dallas	Early planning phase	No	• Under feasibility study
Uptown Bus Rapid Transit	Exclusive bus lanes	Construction expected to be complete Spring 2020	No	• 11 residential noise impacts • Low impact to business access • Moderate construction impacts • Low impacts to vegetation and waters of the U.S. • Low impacts to cultural resources
Harris County	North Houston Highway Improvement Project – Study of three segments of IH-45 in north Houston between Sam Houston Tollway and US 59 just south of downtown Houston	Final EIS expected to be released in early 2020	Potentially	• An estimated 331 commercial, 168 single-family residential, and 1,067 multi-family residential displacements • 34 billboards, 4 places of worship, and two schools would be displaced. • 4 historic resources and two parks would be affected
Rail				
Dallas, Collin, Tarrant Counties	DART Silver Rail Line	Record of Decision in 2018	Potentially	• Located primarily within an existing rail ROW • Minimal impacts to the natural environment, some vegetation removal
Dallas County	NCTCOG's Dallas to Fort Worth High Speed Rail– 30-mile rail line between downtown Fort Worth ITC and downtown Dallas	Planning phase	No	• Corridor to be selected in environmental phase • Potential to improved air quality and provide faster and safer transit

Table 4-8: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis				
County	**Description**	**Status**	**Overlap with planned Project construction Schedule?**	**Impacts**
Dallas and Ellis Counties	Waxahachie Line – Construction of a 31-mile commuter rail with 11 stations and 42-minute end-to-end travel time	Planning phase	No	Conceptual Engineering Study phase; assumed impacts would be: • Increased bicycle and pedestrian facilities (21 additional miles) • Impacts to cultural resources (203 known in the Study Area), parks and recreation (86 within the Study Area), and noise impacts (10.9 percent of noise sensitive land use along corridor). • Impacts to water quality, waters of the U.S., and biological resources
Infrastructure				
Navarro and Ellis Counties	Integrated Pipeline Project - The Tarrant Regional Water District/City of Dallas Water Utilities project would construct a 150-mile pipeline and associated pump stations from Lake Palestine to Lake Benbrook, (and connections including Cedar Creek and Richland-Chambers Reservoirs)	Under construction, anticipated completion in 2021	Yes	• No significant environmental impacts per the environmental determination memorandum (2015) • Minor impacts to floodplains, biological resources, waters of the U.S. • Avoidance of cultural resources
Grimes County	Tenaska Power Plant Expansion– Tenaska is evaluating a site near the Tenaska Frontier Generating Station in Shiro, Texas for a natural gas-fueled electric generating facility.	Planning phase	Potential	• Impacts have not been identified as the project is still early in the planning phase but minor impacts to air quality could be anticipated based on the type of project and the TCEQ permit application.
Land Development				
Dallas County	International Inland Port of Dallas – Growing intermodal hub that includes warehouses, logistics companies and other businesses such as an Amazon fulfillment center. Located near the intersection of IH-20 and IH-45, between IH-35 East and IH-45, with railroad service proved by BNSF and UPRR.	On hold	Potential	• Project may be on hold, no publicly available current information
Dallas County	Dallas Logistics Hub – part of the International Inland Port of Dallas.	Development ongoing	Potential	• Part of the above project

Table 4-8: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis				
County	**Description**	**Status**	**Overlap with planned Project construction Schedule?**	**Impacts**
Harris County	Mickey Leland International Terminal at George Bush Intercontinental Airport – $1.5 billion airport terminal expansion.	Opening date TBD	Yes	• No significant environmental impacts • Short-term and minor impacts to air quality and construction noise impacts • Estimated increased demand for energy and natural resources for construction

Source: AECOM 2019

Implementation of the HSR system would potentially improve air quality because it would reduce regional emissions of criteria pollutants, except SO_2, by shifting passenger vehicle traffic to the electric-powered HSR system. A net increase in SO_2 would occur because electric power generation from coal produces significantly more SO_2 than other forms of power generation, and passenger vehicles produce very little SO_2 due to the nature of the fuel, its refinement and car emission controls. The net increase in SO_2 emissions would be relatively small and below the *de minimis* level for the nonattainment area in Freestone County. For the other emissions, NO_X, VOC and CO, the net reductions in the initial year (2024) would be greater than the net reductions in 2040 due to improvements in car emissions. However, as ridership on the HSR system increases, the net change would still increase.

Construction of the Preferred Alternative would increase local and regional emissions of particulate matter (fugitive dust) and pollutant emissions from fuel combustion (diesel PM, CO, CO_2, NO_x, VOCs and sulfur compounds). Maximum annual direct (construction-related) NO_x, VOC and SO_2 emissions within the DFW and HGB ozone nonattainment areas and the FRE SO_2 nonattainment area during the 5-year construction period would be less than the respective general conformity *de minimis* level. Therefore, a formal conformity determination would not be necessary for construction-related or operational NO_x or VOC emissions within the DFW and HGB nonattainment areas and SO_2 emissions within the FRE nonattainment area for the Project and no additional NO_x, VOC and SO_2 analyses would be required as discussed in **Section 3.2.5.2.6, Air Quality, Compliance with the GC Rule**. Impacts during construction would be short-term and would be offset by the long-term net emissions reduction by shifting riders from passenger vehicles to the HSR system.

To evaluate air quality impacts of the Project, quantitative estimates of emissions from construction and operational sources were developed for the Preferred Alternative using standard modeling platforms, emissions data and spreadsheet calculations. The modeling takes into account the impact of all 10 counties as well as the nonattainment regional areas of Dallas and Houston. This level of assessment, with a broader Study Area, results in an evaluation of emissions and reductions across the entire region.

The operation of the train propulsion technology used by the Preferred Alternative would not have combustion emissions and thus direct MSAT emissions would not occur during operation. As stated in **Section 3.2.5.2.5, Air Quality, Mobile Source Air Toxics**, the Preferred Alternative would decrease overall VMT from passenger vehicles compared to the No Build Alternative, thereby decreasing regional MSAT emissions generated by passenger vehicles, and consequently having a beneficial impact on regional MSAT emissions. Similarly, as shown in **Table 3.21-6**, the Preferred Alternative operation emissions would result in a long-term net reduction of GHG emissions that offset the construction emissions within less than 2 years at full operation and continue to achieve net reduction of GHG for the life of the HSR system.

Past, present and reasonably foreseeable projects have been and would be regulated by EPA under the Clean Air Act of 1970 and Clean Air Act Amendments of 1990, meaning that any new projects would also need to minimize or mitigate impacts to air quality, particularly in nonattainment areas within Dallas, Freestone and Harris Counties. As noted in **Table 4-8**, TxDOT's IH-35 East from US 380 to IH-635 project, IH-35 East/US 67, both in Dallas County, would not adversely impact air quality. In Grimes County, the Tenaska Power Plant Expansion project, which is currently in the planning phase, would be expected to have minor impacts to air quality. In Harris County, terminal expansions at George Bush Intercontinental Airport currently in pre-design/construction would be expected to result in short-term and minor impacts to air quality. Due to the net benefit of the Project and the minor adverse impacts noted by the four projects discussed above, FRA does not anticipate an overall adverse cumulative impact to air quality.

4.4.4.2 Noise

The operation of the Project will severely impact 10 residences and moderately impact 280 residences and 1 institution (the Christian Family Church in Harris County). Impacts are due, in part, to low existing noise levels along the corridor, as described in detail in **Table 3.4-14**. The impacts are also distributed along the corridor in the urban area and rural areas. Impacts are also shown on **Table 3.4-14.** Traffic volumes from the roadway projects shown in **Table 4-7** and **Table 4-8** would increase noise levels in most of the counties along the Project. Together with planned transportation projects in downtown Dallas, including highways and several rail projects, the Project would contribute to a cumulative increase in noise levels in Dallas County.

Construction of the Project in conjunction with other past, present, and reasonably foreseeable projects would result in noise impacts that would be limited in duration. Several projects could be under construction at the same time as the HSR Project, including SH 121, IH-30, and IH-35 in downtown Dallas. In addition, it is possible that the projects listed in **Table 4-7** and **Table 4-8** could be under construction at the same time as the HSR Project.

4.4.4.3 Natural Ecological Systems and Protected Species

Impacts to the vegetation types by the Preferred Alternative are summarized in **Table 3.6-22** from **Section 3.6, Natural Ecological Resources and Protected Species**. **Table 3.6-23** from **Section 3.6, Natural Ecological Systems and Protected Species,** presents acreages of temporary and permanent impacts to potential habitat of the federally listed species with potential to occur in the Study Area.

Several past, present and reasonably foreseeable projects, primarily in Dallas County, an urban and well-developed county within the Study Area, would impact vegetation and wildlife habitat. The Dallas-Fort Worth Connection SH 121 project currently under construction would impact 4.5 acres of riparian vegetation. The IH-30 improvements from Cooper Street to SH 121 near Arlington, Texas would impact 9.5 acres of riparian forest. And the IH-35 East/US 67 improvements in Dallas County would impact 1.67 acres of riparian habitat. Within Dallas County, the Project would impact approximately 80 acres of vegetation compared to the projects noted above. These transportation projects would be constructed primarily within established transportation ROW. Even with the addition of the Project, FRA would not anticipate an overall adverse cumulative impact to vegetation due to the remaining habitat in Dallas County, primarily the 6,000 acres of the Great Trinity Forest.

The Preferred Alternative would result in the direct loss of wildlife habitat, increase habitat fragmentation and contribute to impediments of the movement of wildlife across the landscape. Impacts to wildlife would be minimized by locating the HSR infrastructure adjacent to existing transportation infrastructure, utility corridors and other development. Fragmented habitat areas would be created between the Preferred Alternative and existing infrastructure, creating areas of less value to wildlife. There is a potential for cumulative impacts via habitat degradation and fragmentation when taking into account past, present and future infrastructure projects. Additionally, the TxDOT SH 249 project, which would traverse Grimes County from west to east, would also have the potential to impact habitat. These projects are in the planning stages, so specific levels of impacts are not known; however, the TxDOT SH 249 project will impact different sections of Grimes County potentially causing fragmentation of habitat in addition to the fragmentation caused by the HSR Project. FRA would anticipate an overall cumulative impact to wildlife habitat in Grimes County; however, FRA has identified potential locations for wildlife crossings to minimize the effects of fragmentation across the entire corridor. And any additional projects that would impact vegetation and habitat would require coordination with the USFWS to identify appropriate avoidance, minimization and mitigation measures.

FRA determined that implementation of the Preferred Alternative may affect, but would not likely adversely affect the Houston toad, interior least tern and whooping crane based on the utilization of various avoidance and mitigation measures described in **Section 3.6.6, Natural Ecological Systems and Protected Species, Avoidance, Minimization and Mitigation**. Although the Preferred Alternative would not likely adversely affect the Houston toad, interior least tern and whooping crane, there is a potential for cumulative impacts to these three federally listed species via habitat degradation and fragmentation when taking into account past, present and future infrastructure projects.

FRA also determined that implementation of the Preferred Alternative may affect, and is likely to adversely affect, the large-fruited sand verbena and Navasota ladies'-tresses. The Preferred Alterative could result in take of individual large-fruited sand verbena and Navasota ladies'-tresses on 116 and 570 acres, respectively, of potentially suitable habitat, which were not surveyed during 3 years of presence/absence monitoring surveys due to access limitations. Impacts to these two federally listed species include population decline from take of individuals located in the LOD, as well as habitat degradation, fragmentation and removal of suitable habitat.

The Study Area contains areas of potential habitat for federally listed species and the construction of the projects could result in the degradation or complete removal of suitable habitat. However, through coordination with the USFWS, as required under Section 7 of the ESA, any loss in federally protected species habitat would be replaced.

Present and reasonably foreseeable projects would be coordinated with the USFWS to determine appropriate avoidance, minimization and mitigation measures, which could include species surveys, compliance monitoring during construction, relocation of species and permitting to preserve and/or minimize habitat fragmentation. FRA has conducted 3 years of protected species presence/absence surveys in accordance with USFWS approved methods for the endangered Houston toad, large-fruited sand verbena and Navasota ladies' tresses. These surveys resulted in no Houston toads within 3.1 miles (5 km) of the LOD, no large-fruited sand verbena within the surveyed portion of the LOD, and 30 Navasota ladies'-tresses within the surveyed portions of the LOD. Surveys have been limited to potential federally listed target species habitat and properties for which right-of-entry has been obtained. FRA will continue to coordinate with the USFWS under Section 7 of the ESA on appropriate mitigation measures to avoid or minimize impacts to protected species habitat.

Where practicable, the Preferred Alternative would align with existing transportation and utility corridors to avoid and minimize potential cumulative impacts to federally listed species. Habitat fragmentation would be reduced by utilizing previously disturbed land. Additionally, approximately 55 percent of the Preferred Alternative would be constructed on viaduct. TCRR shall implement mitigation measures for protected species in compliance with applicable regulations as detailed in **Section 3.6.2, Natural Ecological Systems and Protect Species, Regulatory Context**.

4.4.4.4 Waters of the U.S.

Impacts to the waters of the U.S. by the Preferred Alternative are summarized in **Tables 3.7-82** to **3.7-84** from **Section 3.7, Waters of the U.S**. These tables summarize temporary and permanent impacts to streams, waterbodies and wetlands within the LOD.

Several past, present and reasonably foreseeable projects would impact waters of the U.S. The IH-30 improvements between Cooper Street and SH 161 in Tarrant and Dallas counties resulted in waters of the U.S. impacts at four crossings. The Waxahachie Line, a commuter rail line that would operate between Dallas and Ellis Counties and is estimated to open in 2035, would have minor impacts to waters of the U.S. In Navarro and Ellis Counties, the Integrated Pipeline Project, which is currently under

construction, would have minor impacts to waters of the U.S. Additionally, the TxDOT SH 249 project, which would traverse Grimes County from west to east, would also have the potential to impact waters of the U.S. There is a potential for cumulative impacts to waters of the U.S., including a reduction in the function and quality downstream, of nearby wetlands, and potential degradation of riparian habitat. These impacts would be minimized by locating the HSR infrastructure adjacent to existing transportation infrastructure, utility corridors and other development.

Additional transportation, transmission and reservoir projects in the Study Area (noted in **Table 4-8**) could impact waters of the U.S. Any unavoidable impacts to waters of the U.S. would require USACE permits. The magnitude of impacts associated with these planning projects is unknown at this time and would be identified through permitting. All impacts associated with these projects would be mitigated through USACE permitting.

4.4.4.5 Utilities and Energy

Utility providers located within the 10-county Study Area would be responsible for undertaking any potential utility relocations, pole adjustments and/or new connections. According to **Section 3.9, Utilities and Energy,** the number of transmission line relocations, adjustments and/or new connections needed to support the power demand of the Preferred Alternative would include approximately 85 electricity utility pole adjustments and 13 new electric connections. A total of 37 oil and gas wells would be impacted by the Preferred Alternative. Underground utilities would be relocated or protected through coordination with the utility owner for past, present and reasonably foreseeable projects. Impacted oil and gas wells would be subject to purchase, capping and closure.

As previously discussed, electrical transmission line extensions and connections will be necessary to provide power for HSR operation. While the precise routing of these transmission line routes cannot be determined at this time, TCRR has undertaken an analysis in coordination with Oncor and CenterPoint Energy to determine reasonable locations of transmission line extensions and connections within the LOD. However, the impacts of these separate utility projects would be determined and mitigated by the utility providers and evaluated through an independent environmental clearance process coordinated through the PUCT. If other past, present or reasonably foreseeable projects impact existing utility transmission lines or require new connections to an existing system, those projects would also be reviewed, assessed and planned by the utility provider.

In addition to the electrical utility connections required to power the system, the Project would require energy to power the HSR trainsets, stations, TMFs and MOW facilities. ERCOT is projected to increase the system through year 2029 to account for projected increases in power demands across the state. The daily HSR power consumption of the trainset would represent 0.3 percent of the net added capacity. Additionally, ERCOT establishes a net reserve to account for planned and future projects. Ongoing coordination with utility providers, as well as ERCOT, would account for the energy needs of the HSR Project as well as past, present and reasonably foreseeable projects.

4.4.4.6 Aesthetics and Scenic Resources

All Build Alternatives would have the same number of beneficial (two) and adverse (two) impacts. Beneficial impacts would occur in the landscape units (Landscape Units #1 and #13) with terminal stations in Dallas and Houston, as shown in **Table 3.10-70**. There is negligible difference among the impacts of the three terminal station options in Houston. All three Houston Terminal Station Options would replace under-utilized or industrial land uses with a modern station and station area improvements. The Project would adversely impact aesthetic and visual resources in Landscape Units #8

(Grimes and Madison Counties) and #10 (northern Harris County), specifically impacting 10 (Build Alternatives C and F) or 11 (Build Alternatives A, B, D and E) visual resources.

As shown on **Table 4-7** and **Table 4-8**, reasonably foreseeable projects in Grimes and Madison Counties include the Tenaska Power Plant Expansion, Bedias Reservoir, a transmission line, a solar power generation field, and several highway and rural roadway projects. Reasonably foreseeable projects in northern Harris County include highway and roadway expansion projects. The cumulative impact of these projects in addition to this Project could degrade adversely impacted visual resources or the overall aesthetic and scenic resources further in Landscape Units #8 and #10. In Grimes County, the Tenaska Power Plant is about 2 miles east of the proposed Brazos Valley Intermediate Station. Views of the power plant are not prominent near the Brazos Valley Intermediate Station. However, the viewers between the Tenaska Power Plant and the HSR Project would have adverse visual impacts. In Harris County, the North Houston Highway Improvement and George Bush terminal projects are east of the HSR Project and would not be seen from the project area. Outside of these two landscape units there is also the potential for cumulative impacts to visual resources. Visual resources are listed in a series of tables for each landscape unit in **Section 3.10.5.2, Aesthetics and Scenic Resources, Build Alternatives.**

4.4.4.7 Transportation

As detailed in **Table 3.11-61** in **Section 3.11, Transportation**, the Preferred Alternative would impact 27 freight rail crossings and upwards of 138 public and private roads and have no impact on airports. During construction, there would be disruption to traffic on roadways, transit services, freight or commuter rail services or pedestrian/bicycle facilities. The traffic modeling completed for the evaluation of the Project around the station areas estimates future traffic volumes with and without (No Build Alternative) the Project. Implementation of the Preferred Alternative would result in indirect impacts at the station areas, requiring master planning and reroutes to update the traffic patterns or roads not directly impacted by the construction of the stations. Mitigation measures discussed in **Section 3.11.6, Transportation, Avoidance, Minimization and Mitigation**, including station intersection improvements, would improve the LOS in the station areas.

The HSR Project would introduce an alternative mode of transportation between Dallas and Houston, reducing the level of vehicular passenger traffic on IH-45. Additional roadway and transit improvements are expected in Dallas, Grimes and Harris Counties such as DART's second downtown light rail alignment in Dallas, the proposed Loop 9 in southern Dallas County, the TxDOT SH 249 project in Grimes County and several future projects in Harris County including tolling Hempstead Road, potential rail expansion along US 290, general modifications or expansions to IH-610. Overall, these projects will address growth in travel demand and may improve existing levels of service. FRA does not anticipate long-term adverse cumulative impacts to transportation due to the ongoing coordination with transit agencies, tolling authorities, TxDOT, cities, counties and other local entities, that will occur as a result of the Project.

If the construction of these projects overlaps during the construction of the HSR Project, as shown in **Table 4-8**, the station areas could experience short-term cumulative impacts such as added delays on local roadways impacted by construction. Projects that could overlap with construction of this Project in the station areas include IH-30 in Dallas and IH-45 in Houston. These types of delays would be managed through coordination with TxDOT.

4.4.4.8 Land Use

The impacts to land use are detailed in **Section 3.13, Land Use**. The land use most affected by the Preferred Alternative for temporary (85 percent) and permanent (80 percent) land use conversion

would be agricultural. Commercial, residential, rural, transportation and vacant land represent about 3 to 4 percent each of the remaining land that the Preferred Alternative would impact. Conversion of land uses would be similar for the Build Alternatives.

The acreage of special status farmlands permanently converted to a non-agricultural use under the Preferred Alternative would be approximately 3,500 acres. Within the 10-county Study Area, there is nearly 2.2 million acres of special status farmlands. The permanent loss of 3,500 acres of special status farmland represents approximately 0.29 percent of all special status farmland within the 10-county Study Area. As shown in **Table 3.13-13**, it was assumed that farmland within 25 feet of the Project would be indirectly affected. The 25-foot setback, which would indirectly impact an additional 825 acres of special status farmland, assumes that farm equipment would not be able to operate within 25 feet of the edge of the LOD.

In addition, the TxDOT SH 249 project located in Grimes County could result in additional losses in farmland.

4.4.4.9 Socioeconomics

Section 3.14.5.2.3, Socioeconomic and Community Facilities, Economic Impacts, discussed the direct and indirect impacts of the Project. This assessment included multiple Study Areas: all counties within the Study Area, Dallas County, Harris County, the intermediate counties between Dallas and Harris, and the State of Texas. These multiple Study Areas account for direct, indirect and cumulative impacts. **Table 4-8** notes two projects that would require a large number of displacements. The TxDOT IH-35 East from US 380 to IH-635 would displace 318 residences, business or other structures. This project is more than 10 miles from the Dallas Terminal Station. The North Houston Highway Improvement Project along IH-45, approximately 5 miles from the Houston Terminal Station site, would result in an estimated 331 commercial, 168 single-family residential and 1,067 multi-family residential displacements. The HSR Project would displace approximately 209 homes and businesses in both Dallas and Harris Counties. FRA does not anticipate long-term cumulative impacts based on displacements. Each of the Dallas and Houston metropolitan areas contain approximately 7 million people. Adequate housing and commercial stock would be available to accommodate displaced residences and businesses.

Additional cumulative impacts focus on development around the station areas and the long-term impacts to agriculture production and property value. Development around the station areas, particularly the terminal stations in Dallas and Houston would be expected to generate additional tax revenue for both cities. The area around the Dallas Terminal Station is currently undergoing mixed use redevelopment unrelated to the HSR Project, but the addition of the HSR station could create additional economic benefit to the city and county.

FRA estimated that within a half-mile of the proposed terminal stations, property assessment values would increase between $62.8 million and $149.4 million as a result of the HSR Project (see **Table 3.14-22**). The Houston Northwest Mall Terminal Station is not currently being redeveloped, but the construction of the station would generate additional economic benefit. The Houston Northwest Mall Terminal Station area currently consists of a mostly abandoned mall with little to no activity. The demolition of this site and construction and operation of a station would also be a net benefit in tax value to the city and county.

Other large-scale projects, like SH 249 in Grimes County have the potential to further impact agricultural production and result in additional losses of production or pastureland. Given the relatively small ROW required for both projects, they would be estimated to impact approximately 0.2 percent of all special

status farmland within the 10-county Study Area. With more than 2.1 million acres of farmland in the Study Area, impacts to special status farmland are not anticipated to constitute a cumulative impact.

4.4.4.10 Safety and Security

FRA assessed the potential for a cumulatively large impact to emergency response times from multiple minor delays from this and other projects during construction.

TCRR would coordinate with TxDOT and/or the appropriate local jurisdiction and any potentially affected emergency responders during final design to avoid any appreciable negative impact to emergency response times during operation of the HSR system. As detailed in **Section 3.13.3.3, Land Use, Assessment,** and **Section 3.11.5.2, Transportation, Build Alternatives**, approximately 55 percent of the Project across all Build Alternatives would be constructed on viaduct, minimizing permanent impacts to public roads. Approximately 83 percent of the public road crossings would be either rail over roadway or roadway over rail and would not include rerouting of the existing public road. Modifications to these public roadways due to vertical changes would not impact travel or emergency response time after construction is complete.

This Project and other projects may increase response times during construction. **Table 4-8** lists other projects that could be under construction during the construction period for this Project, including several transportation projects in Dallas County and one in Harris County.

4.4.4.11 Environmental Justice

As an indirect impact, the HSR Project may increase property values, rental prices and tax burden for communities around Dallas and Houston Terminal Stations. As shown in **Table 4-8**, no past, present, or reasonably foreseeable future projects would also increase property values around the Houston Terminal Station. However, several projects in downtown Dallas could increase property values, rental prices and tax burden in addition to the HSR Project, including the Dallas multimodal transit station and the DART Silver Rail Line.

Of the five neighborhoods or communities identified in minority and/or low-income block groups that would be potentially impacted by the Project, two are in downtown Dallas. As described in **EJ-MM#1: Le May and Le Forge Neighborhood Mitigation**, FRA is requiring TCRR to relocate the entire Le May and Le Forge neighborhood, so this neighborhood would not experience cumulative impacts.

The other community located in minority and/or low-income block groups is referred to as downtown Dallas in **Section 3.18, Environmental Justice.** The Dallas Terminal Station would be located in this area, also referred to as The Cedars. Much of the area is considered industrial due to the scale and use of nearby structures. Residential uses are located east of the Project.

Over the last several years the area has experienced major development via the conversion of existing commercial and industrial land uses to new commercial or residential land uses. The Dallas Terminal Station could indirectly lead to increased land use densities in proximity to the terminal station and accelerate the development of transit-oriented development. In general, the Project would enhance the community character of the downtown Dallas area as older or abandoned industrial structures in the Cedars area are acquired or displaced. However, this enhancement, in addition to City of Dallas planning efforts and ongoing redevelopment in the area, could increase property values, rental prices and tax burden for the downtown Dallas community.

4.4.4.12 Cultural Resources

The area of influence for other reasonably foreseeable projects would not directly or indirectly affect the 17 historic resources within the Study Area.

4.4.5 Avoidance, Minimization and Mitigation

4.4.5.1 Air Quality

Projects that would affect air quality have been and would be regulated by EPA under the Clean Air Act of 1970 and Clean Air Act Amendments of 1990, meaning that any new projects would also need to minimize or mitigate impacts to air quality, particularly in nonattainment areas within Dallas, Freestone and Harris Counties. No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.2, Air Quality**.

4.4.5.2 Natural Ecological Systems and Protect Species

Federal and state projects impacting vegetation, wildlife habitat and/or protected species would be coordinated with TPWD and/or the USFWS to identify appropriate mitigation measures. No additional cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.6, Natural Ecological Systems and Protected Species,** and in **Appendix K, Biological Assessment**. Mitigation developed in the Biological Assessment considers impacts of this Project and the cumulative impacts of other reasonably foreseeable projects.

4.4.5.3 Noise

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.4, Noise and Vibration.**

4.4.5.4 Waters of the U.S.

Projects that would affect federally regulated waters of the U.S. would be coordinated with the USACE to identify appropriate mitigation measures and request necessary permissions. Mitigation would be required for permanent impacts exceeding district thresholds, 0.1 acre or 300 linear feet of waters of the U.S. at each single and complete crossing. No additional cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.7, Waters of the U.S**.

4.4.5.5 Utilities and Energy

Projected, reasonable routes for electrical transmission line extensions necessary to provide power for HSR operation have been identified by TCRR in coordination with Oncor and CenterPoint Energy. These routes are anticipated to be modified to some extent through the PUCT CCN and permitting processes and as utility providers assess other future infrastructure needs. The utility providers will complete a separate environmental evaluation as part of their process to provide new or additional connections from their systems to the HSR Project.

No additional cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.9, Utilities and Energy**.

4.4.5.6 Aesthetics and Scenic Resources

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.10, Aesthetics and Scenic Resources.**

4.4.5.7 Transportation

Projects that would require use of state or federal ROW would be coordinated with TxDOT and/or FHWA to request necessary permits. No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.11, Transportation**.

4.4.5.8 Land Use

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.13, Land Use**.

4.4.5.9 Socioeconomic

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.14, Socioeconomics and Community Facilities**.

4.4.5.10 Safety and Security

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.16, Safety and Security**.

4.4.5.11 Environmental Justice

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.18, Environmental Justice**.

4.4.5.12 Cultural Resources

No cumulative impacts would arise to necessitate additional avoidance, minimization or mitigation beyond what is provided in **Section 3.19, Cultural Resources**.

5.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The construction and operation of the Project would require short- and long-term uses of land and other natural and social resources. This section examines the relationship of local short-term impacts and use of resources with the long-term productivity of maintenance and enhancement activities.

5.1 Regulatory Context

NEPA[1] requires federal agencies to evaluate

> *…the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.*

Additionally, CEQ guidelines on implementing NEPA,[2] and FRA's Environmental Procedures Section (14)(n)(22) and (p) both stipulate that an EIS should identify and assess the impacts of construction and the relationship between local short-term uses of the environment affected by the alternatives and the maintenance and enhancement of long-term productivity in that environment. This analysis qualitatively discusses the relationship between short-term impacts to and use of resources and the long-term benefits and productivity of the environment.

5.2 Short-Term Uses

The six Build Alternatives and three Houston Station Terminal options would have similar short-term impacts. For this analysis, short-term refers to the estimated 5-year construction period. As detailed throughout **Chapter 3.0, Affected Environment and Environmental Consequences**, short-term impacts and use of resources resulting from any of the six Build Alternatives and three Houston Station Terminal options would include the following:

- Temporary disruption of normal traffic patterns with increased traffic delays and detours for cars, buses, emergency response vehicles, bicyclists and pedestrians
- Temporary disruption and change in how properties would be accessed during construction
- Temporary loss of income to some businesses due to temporary alterations of business accessibility and/or increases in traffic congestion during construction
- Temporary increases in local and regional emissions of particulate matter (fugitive dust) and pollutant emissions from fuel combustion (diesel PM, CO, CO_2, NO_x, VOCs and sulfur compounds)
- Temporary increases in noise from construction activities
- Temporary visual impacts from construction fencing, lighting and clearing of trees

Construction of the Project would require materials, labor and energy to create the HSR system. This investment of materials would include natural resources, such as rock and aggregate (e.g., for facility foundations), steel (e.g., for rail and catenary structures), other building materials and various structural components of the HSR system. Fossil fuels would also be consumed by construction equipment.

[1] 42 U.S.C. 4332(C)(iv).
[2] 40 C.F.R. 1502.16.

In addition, the Project would require conversion of land to accommodate the HSR system. In many cases, the land required is already in use as economically productive rangeland, farmland, rural and urban structures (including homes and businesses) and local roads and state highways. The detailed consequences of these land conversions are described in **Sections 3.11, Transportation,** and **3.13, Land Use**.

The short-term creation of jobs and employment opportunities, use of materials to construct the Project and the purchase of goods and services during construction would also create a short-term benefit to the local and regional economies. For more information on economic effects, see **Section 3.14, Socioeconomics and Community Facilities**.

5.3 Long-Term Productivity

All the Build Alternatives would support long-term productivity by providing a long-term transportation alternative between Dallas and Houston. As detailed in **Chapter 1.0, Introduction**, the primary benefit of the HSR system would be improved travel times between Dallas and Houston. The Project would also expand passenger rail linkages to a number of existing bus, light rail and commuter rail services for intercity travelers to other parts of the state and outside of Texas.

Providing transportation infrastructure to support economic development and improved accessibility would benefit long-term productivity in the metropolitan areas. The Project would directly and indirectly support economic growth and provide short- and long-term employment benefits. The Project would improve accessibility to labor and customer markets and induce regional job growth by improving connectivity between the state's two largest metropolitan areas. A more detailed discussion of these long-term, beneficial impacts is provided in **Section 3.14, Socioeconomics and Community Facilities**.

The Project would impact agricultural production within the Study Area through land use conversion. As noted in **Section 3.11, Land Use**, approximately 76 percent of land use within the 10 county Study Area is agricultural; however, only about 24 percent of this land is being used for crop production. FRA determined there would be adequate availability of agricultural land outside of the Study Area, but within the Study Area counties, to offset any long-term crop production losses.

The Project would convert approximately 0.2 percent of special-status farmland (e.g., prime farmland, unique, statewide or locally important farmland) within the 10 counties to a transportation use. Special-status farmland is a subset of the overall agricultural lands previously discussed. These lands are a vital part of the Texas landscape and their potential conversion to nonagricultural uses represents a fundamental change that would be irreversible. NRCS provided Farmland Conversion Impact Rating scores ranging from 78 to 125. The NRCS considers a Farmland Conversion Impact Rating score of greater than 160 to be a conversion that causes adverse effects.

Short-term inconveniences to residents, motorists and business owners would be offset by the improved transportation network if construction of the Project were to be completed. The Project would provide long-term transportation benefits and a reliable alternative over the anticipated greater than 100-year lifespan of the HSR system.

The No Build Alternative would not involve the short-term uses described for the Project but would also not support the long-term productivity in the two metropolitan areas as well as the Project would. The No Build Alternative would involve increased traffic delays due to increasing traffic volumes and operational deficiencies of the existing facilities without the transportation alternative provided by the Project.

6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Project would require the commitment of material and energy for construction and operation and the commitment of land for the new infrastructure. This chapter examines the irreversible and irretrievable commitment of natural, physical, human and fiscal resources.

6.1 Regulatory Context

NEPA[1] and the CEQ's NEPA implementing regulations[2] require that environmental analyses include identification of "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Additionally, FRA's Environmental Procedures Section (14)(n)(10), (11) and (22) stipulate that an EIS should identify and assess the impacts from production and consumption of energy and the use of natural resources other than energy, such as water, minerals or timber.

An irreversible or irretrievable commitment of resources results in the permanent loss of a resource for future uses (or alternative purposes) as they cannot be replaced or recovered. Irreversible commitments involve the use or destruction of a specific resource (e.g., waters of the U.S., including wetlands) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments could also involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or disturbance of a cultural site).

6.2 Irreversible and Irretrievable Commitment of Resources

As described in **Chapter 3.0, Affected Environment and Environmental Consequences**, any of the Build Alternatives would involve the commitment of natural, human, physical and fiscal resources.

6.2.1 Physical Setting

Construction of the Project would permanently alter topography in the LOD or Project footprint. In some areas, existing topography would need to be regraded (cut and fill) to accommodate the vertical alignment of the Project. Construction activities would irreversibly affect soils classified as unsuitable for construction that would need to be removed and replaced with suitable material to support the HSR system. Large cut slopes for construction could have a high potential for erosion, but these effects would be minimized through immediate revegetation and stabilization following construction.

6.2.2 Land Use

The Project would require the conversion of land, including agricultural or undeveloped land, to accommodate the HSR system. Use of these lands is considered an irreversible commitment during the time period that the land is used for permanent operation and would preclude the use of this corridor from other uses such as additional transportation options or other linear infrastructure uses. Construction activities would require temporary use of land for laydown and work areas, which

[1] 42 U.S.C. 4332(C)(v).
[2] 40 C.F.R. 1502.16.

represent a temporary, yet reversible, use of the land. As described in **Section 3.13.6, Land Use, Avoidance, Minimization and Mitigation**, TCRR employed design features to avoid and minimize the irreversible commitments of land use. In developing the Build Alternatives, TCRR identified co-location opportunities with transportation and utility corridors to minimize impacts to parcel and structure acquisition and land use conversion. Within the six end-to-end Build Alternatives, 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure.

As discussed in **Section 3.13, Land Use**, the average acreage of special status farmlands being permanently converted to a nonagricultural use for the Build Alternatives would range from approximately 3,483 acres (Build Alternative C) to 3,764 acres (Build Alternative B) depending on the Build Alternative. Within the 10 counties, there are nearly 2.2 million acres of special status farmlands. The average loss of 3,600 acres of special status farmland represents approximately 0.2 percent of all special status farmland within the 10 counties. To account for the indirect conversion of special status farmlands, a 25-foot setback was added to the permanent LOD as an additional easement to accommodate the use of farm and ranch equipment or indirect impacts such as induced wind and changes in irrigation. The average acreage of indirect impact, accounted for by the 25-foot setback, would be on average an additional 814 acres of special status farmland.

The permanent conversion of grazing lands would range from approximately 2,944 acres (Build Alternative F) to 3,118 acres (Build Alternative B). Impacts to grazing would be minimized to a certain extent when the Build Alternatives would be on viaduct, allowing the passage of livestock underneath the infrastructure. Permanent conversion of agricultural lands would range from approximately 5,076 acres (Build Alternative F) to 5,375 acres (Build Alternative B).

Land to be acquired in the implementation of the Project would irreversibly commit these resources for the foreseeable future while the land is in use for the HSR system.

6.2.3 Waters of the U.S., including Wetlands

Impacts to wetlands and other waters of the U.S. would be minimized by the use of viaduct that would span these features to a reasonable and practicable extent. Approximately 55 percent of the Project would be on viaduct. The Build Alternatives would require the conversion of approximately 47 to 64 acres of wetlands, and 21 to 29 acres of open waters to uplands for transportation use. The permanent conversion of wetlands would represent an irreversible rather than an irretrievable commitment of wetland resources because the conversion of wetlands under the Build Alternatives would be permanent. Additionally, any loss of wetland function, if wetlands adjacent to the ROW would be affected during construction of the Build Alternatives, would be an irretrievable loss if the wetlands were not restored to full function. Site-specific mitigation would be stipulated and enforced through Clean Water Act Section 404 permitting, as determined by the USACE.

6.2.4 Wildlife Habitat

The Project would involve the loss in value of protected wildlife habitat that supports threatened and endangered species. Resource-specific surveys would be completed prior to the start of construction to identify those protected resources. Based on the site-specific evaluations discussed in further detail in **Section 3.6.5.2.3, Natural Ecological Systems and Protected Species**, **Protected Species,** FRA determined that protected species are present and likely to be adversely affected by the Project. FRA has developed avoidance and mitigation measures through Section 7 consultation with the USFWS, as required by the Endangered Species Act, and formulated in the Biological Assessment (BA) submitted to

the USFWS on November 14, 2019. A copy of the BA is provided in **Appendix K, Agency Specific Reports**. These measures will also be detailed in a BO issued by USFWS.

6.2.5 Cultural Resources

The Project would involve the significant loss in value (demolition) of two protected cultural resources – DA.076a (Guiberson Corporation Machine Shop) and DA.110b (Linfield Elementary School). All the Build Alternatives would impact these two resources in Dallas County. As detailed in **Section 3.19.6.2, Cultural Resources, Programmatic Agreement**, FRA is developing a PA in consultation with THC, ACHP, USACE, TCRR and other consulting parties to establish the process that will govern the FRA's environmental compliance responsibilities under Section 106. FRA will complete additional coordination with TCRR to determine whether engineering refinements could avoid or minimize impacts to the resources. If impacts cannot be avoided, FRA, through Section 106 consultation, will coordinate with THC, affected Native American tribes and consulting parties on the mitigation for these resources. Furthermore, FRA will engage the consulting parties to determine appropriate avoidance, minimization and mitigation measures for other adverse effects to historic properties in accordance with Section 106. A copy of the Draft PA is provided in **Appendix L, Programmatic Agreement**.

6.2.6 Other Resources

Sub-ballast would be available at most rock quarries in the Study Area. Quarries north of Round Rock, Texas, are capable of producing the sub-ballast material in the quality and quantity needed for the Project.

Fossil fuels, primarily diesel fuel, would be consumed during construction of the Project. Construction would require the commitment of various types of construction materials, including steel, aggregate, cement, asphalt (bituminous materials), electrical supplies, piping and other raw materials such as metal, stone, sand and fill material. Large amounts of labor and other natural resources would be committed to the fabrication and preparation of these construction materials. These resources are considered to be irreversibly committed to the Project. At this time, these resources are not in short supply and are considered readily available. As a result, the use of these resources would not be expected to result in an adverse impact on their continued availability.

The initial construction of the Project would result in a slight increase in energy consumption—using approximately 58,043 MMBTUs of energy from all energy sources. However, the Project would result in a long-term decrease in energy consumption through increased travel efficiencies – a net savings of 2,730,849 MMBTU of energy annually.

Construction would occur in phases and be performed by professional utility contractors to identify any potential conflicts and prevent (or limit) interruptions in utility service. Temporary disruptions in service could occur depending on the utilities network, but are anticipated to be minimized as utility providers would have the ability to reroute affected circuits. Additionally, the relocation of transmission poles is expected to be minimal and associated with the limited area of the utility crossings.

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7.0 SECTION 4(F) AND SECTION 6(F) EVALUATION[1]

7.1 Introduction

This evaluation has been prepared to comply with the provisions of Section 4(f) of the Department of Transportation Act,[2] hereinafter referred to as "Section 4(f)," and the Land and Water Conservation Fund (LWCF) Act of 1965,[3] hereinafter referred to as "Section 6(f)." The FRA's *Procedures for Considering Environmental Impacts*[4] outline the Section 4(f) process for FRA environmental documents. FRA obtained additional guidance from the regulations regarding Section 4(f) for highway and transit projects[5] and the revised FHWA Section 4(f) Policy Paper published in July 2012.[6]

This chapter identifies the requirements of Section 4(f) and Section 6(f), the presence of properties protected by these regulations in defined areas of study, the potential for use or conversion of these properties, feasible and prudent alternatives that would avoid or minimize the use of the properties, measures to minimize harm and applicable mitigation measures. FRA will make its final Section 4(f) determination as part of the ROD for the Preferred Alternative.

FRA is coordinating with the officials with jurisdiction over the protected properties as described in **Section 7.10, Coordination**. Among the officials with jurisdiction is THC, with whom FRA is consulting under Section 106 of the NHPA. Through the Section 106 process, determinations of historic property significance are made. Properties determined to be significant through Section 106 are protected under Section 4(f).[7]

FRA's Section 4(f) determinations are based on coordination with the officials with jurisdiction over the respective properties, as described in **Section 7.10, Coordination**. FRA circulated this Section 4(f) evaluation to DOI and shared it with the officials with jurisdiction for the Section 4(f) properties described in this chapter.

7.2 Regulatory Context

7.2.1 Section 4(f)

Section 4(f) of the USDOT Act of 1966[8] declares that it is national policy to make a special effort to preserve the natural beauty of the countryside; publicly owned parks; recreation areas; wildlife or waterfowl refuges; or historic sites of national, state or local significance. Section 4(f) specifies that USDOT agencies may not approve a project that requires the use of a Section 4(f) property unless the agency determines the following:

[1] This chapter has been reorganized and expanded since the publication of the Draft EIS. Therefore, text changes since the Draft EIS are not shaded in grey in **Chapter 7.0, Section 4(f) and Section 6(f) Evaluation.**.
[2] 49 U.S.C. 303.
[3] 54 U.S.C. 200305.
[4] 64 Federal Register 28545, Section 12, May 26, 1999 as updated by 78 FR 2713, January 14, 2013.
[5] FRA made the regulations at 23 CFR 774 its Section 4(f) implementing regulations through a final rule that was effective November 28, 2018. Because the Notice of Intent (NOI) for the Project was published prior to the effective date of the final rule, FRA refers to the part 774 regulations as guidance for this Project.
[6] USDOT FHWA. *Section 4(f) Policy Paper*, September 2016, https://www.environment.fhwa.dot.gov/4f/4fpolicy.asp.
[7] FHWA, 2012 Section 4(f) Policy Paper, Question 2A.
[8] 49 U.S.C. 303(a).

- There is no feasible or prudent alternative to such use and a project includes all possible planning to minimize harm to the property resulting from such use or
- A finding can be made that a project, including any measure(s) to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures), has a *de minimis*, or minimal, impact on the Section 4(f) property. A *de minimis* impact is defined as:
    - For parks, recreation areas, and wildlife and waterfowl refuges, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f).
    - For historic sites, *de minimis* impact means that FRA has determined, in accordance with 36 C.F.R. 800 that no historic property is affected by a project or a project would have "no adverse effect" on the property in question.

A *use* of Section 4(f) property occurs:

- When land is permanently incorporated into a transportation facility
- When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose
- When the land is not permanently incorporated or temporarily occupied but the proximity impacts of a project are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired and there is a constructive use of the Section 4(f) property

Several exceptions to Section 4(f) are available. For example, temporary occupancy of land is not a Section 4(f) use if all the following conditions exist:

- The duration of the occupancy of a Section 4(f) property must be less than the time needed for the construction of a project and there must not be a change in ownership of the property.
- Both the nature and magnitude of the changes to the Section 4(f) property are minimal.
- There are no anticipated permanent adverse physical impacts nor interference with the protected activities, features or attributes of the property on a temporary or permanent basis.
- The land is fully restored to the same or better condition.
- There is a documented agreement of the appropriate federal, state or local official(s) with jurisdiction over the property regarding the above conditions.

Parks, recreation areas, and wildlife and waterfowl refuges are protected under Section 4(f) when the property is publicly owned; the property has been officially designated as a park, recreation area, or wildlife and waterfowl refuge by a federal, state, or local agency; the primary purpose, as determined by the official(s) with jurisdiction, is as a park, recreation area or refuge; the property is considered significant by the official(s) with jurisdiction; and the property is open to the public.

While the Section 4(f) statute uses the term "historic site"[9] in its definition of what is protected by Section 4(f), the implementing regulations of the Act and related guidance documents use the words "historic site" and "historic property" interchangeably. These guidance documents include FRA's *Procedures for Considering Environmental Impacts,* and the revised FHWA Section 4(f) Policy Paper published in July 2012. For this reason, the term "Section 4(f) property" or "Section 4(f) historic property" is used in this evaluation to refer to historic sites that are protected by Section 4(f).

[9] The singular form of each quoted term in this paragraph is presented for clarity; however, the explanation is meant to also apply to plural forms of each term.

For the purposes of Section 4(f), a historic site is defined as a historic property (district, site, building, structure or object) that is listed in, or eligible for listing in the NRHP. Only archeological sites that warrant preservation in place are protected by the Section 4(f) statute. Section 4(f) does not apply if FRA, after consultation with the State Historic Preservation Office (SHPO) and/or the Tribal Historic Preservation Office (THPO), determines that the archeological site is important chiefly because of what can be learned by data recovery, and has minimal value for preservation in place.

7.2.2 Section 6(f)

Section 6(f) of the LWCF Act prohibits property acquired and improved with LWCF assistance from being converted to uses other than public outdoor recreation without the approval of the U.S. National Park Service (NPS).[10]

If a project requires land within the Section 6(f) boundary of a property be converted for non-recreation activities and/or results in activities that impact the public outdoor recreation utility of an area, it may trigger a "conversion." NPS may only approve conversion of 6(f) properties if several requirements are met, including but not limited to: an evaluation of all practical alternatives to the proposed conversion; establishment of fair market value of the property; confirmation that the proposed substitute property is at least of equal value, and that the proposed replacement property is of reasonably equivalent usefulness and location; and completion of required coordination.[11]

7.3 Study Area

The Section 4(f) evaluation and Section 6(f) evaluation examine the potential for Project impacts within several, specifically defined geographic areas. These include a Study Area for parks, recreation areas and wildlife and waterfowl refuges that are protected under Sections 4(f) and 6(f), described in **Section 7.3.1, Section 4(f) Public Parks and Recreation Lands; Wildlife and Waterfowl Refuges**, and an APE for historic sites described in **Section 7.3.2, Section 4(f) Historic Properties.**

7.3.1 Section 4(f) Public Parks and Recreation Lands; Wildlife and Waterfowl Refuges

The Study Area for Section 4(f) and Section 6(f)-protected public parks and recreation lands, and wildlife and waterfowl refuges is defined as one-quarter mile from the outer limit of the Project's LOD as used in **Section 3.17, Recreational Facilities**. The LOD is the construction footprint of each Build Alternative, including all construction and permanent facilities related to the proposed Project.[12]

7.3.2 Section 4(f) Historic Properties

This Project is a federal undertaking under Section 106 of the NHPA.[13] Federal regulations implementing Section 106[14] require federal agencies to establish an APE for the evaluation of potential effect to historic properties. The APE is "…the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic resources, if any such resources exist.

[10] 36 U.S.C. 59.3.
[11] 36 C.F.R. 59.3.
[12] The LOD is comprised of the construction footprint of the Project including any permanent and temporary easements, access roads, drainage swales, locations of ancillary facilities (e.g., passenger stations, rail car and track maintenance facilities, electrical substations, maintenance roads and signal houses), and other Project-specific locations designated by the design.
[13] 54 U.S.C. 306108.
[14] 36 C.F.R. 800.

The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." The APE was defined during the Section 106 consultation process and includes an area in which both direct and indirect impacts could occur. As described in **Section 3.19, Cultural Resources**, FRA developed the APEs for historic and archeological properties in consultation with the THC. **Section 3.19, Cultural Resources**, also includes a detailed discussion of the agency coordination and concurrence on the APEs. Additionally, consultation and coordination letters are located in **Appendix E, Cultural Resources Technical Memorandum.**

Cultural Resources: physical evidence of past human activity (e.g., structures, buildings, objects, sites, districts, landscapes, natural features, traditional cultural properties, and cemeteries)

Archeological Resources: remnants of prehistoric and historic sites, features, districts, and objects

Historic Properties: cultural resources that meet the definition outlined at 36 C.F.R. 800.16(l)(1)

As discussed in **Section 3.19, Cultural Resources**, the APEs for identifying Section 106 historic and archeological properties are different. For historic properties, the APE is variable and is based on the typical conditions of the three general settings the Project is likely to cross. Thus, the APE for historic properties was defined as:

- 350 feet beyond the ROW[15] where the Project would be constructed in urban settings
- 700 feet beyond the ROW where the Project would be constructed in suburban settings
- 1,300 feet beyond the ROW where the Project would be constructed in rural settings

The archeological APE (defined as the LOD) considers physical effects of the Project. The archeological APE focuses on potential ground-disturbing activities associated with construction of the Project. Ground-disturbing activities may include excavation, grading, cut and fill, easements, staging areas, utility relocation or drilling. The depth of disturbance is dictated by the Project design and environmental conditions at a specific location.

7.4 Purpose and Need

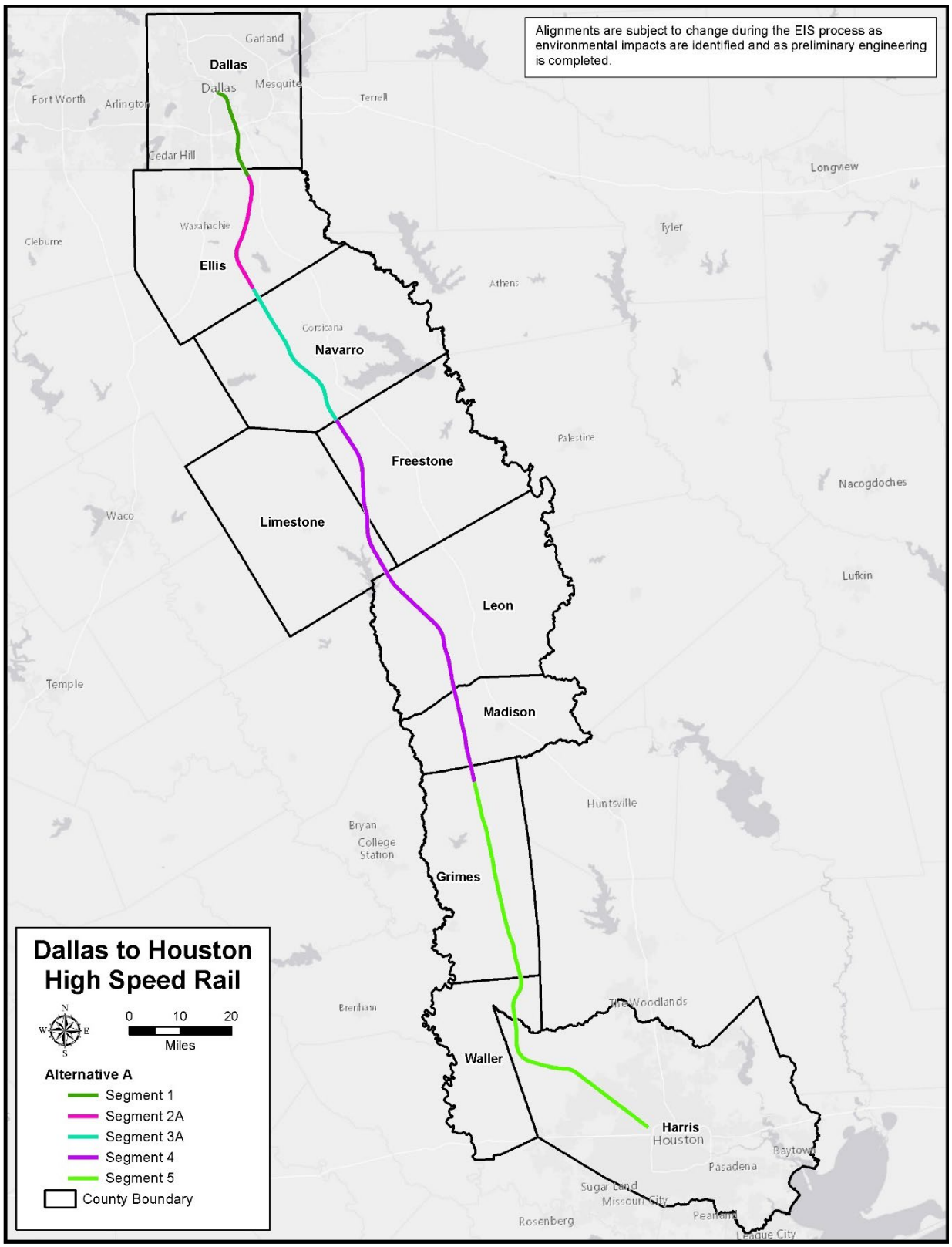
Refer to **Section 1.2, Introduction, Purpose of and Need for the Dallas to Houston High-Speed Rail Project,** for the purpose of the Project.

7.5 Build Alternatives

There are six Build Alternatives considered, Alternatives A through F. For analytical purposes, potential alignment segments were developed and the Build Alternatives were formed by combining the various segments. Each Build Alternative is shown on **Figure 7-1** through **Figure 7-6**. **Table 7-1** illustrates which segments create each alternative.

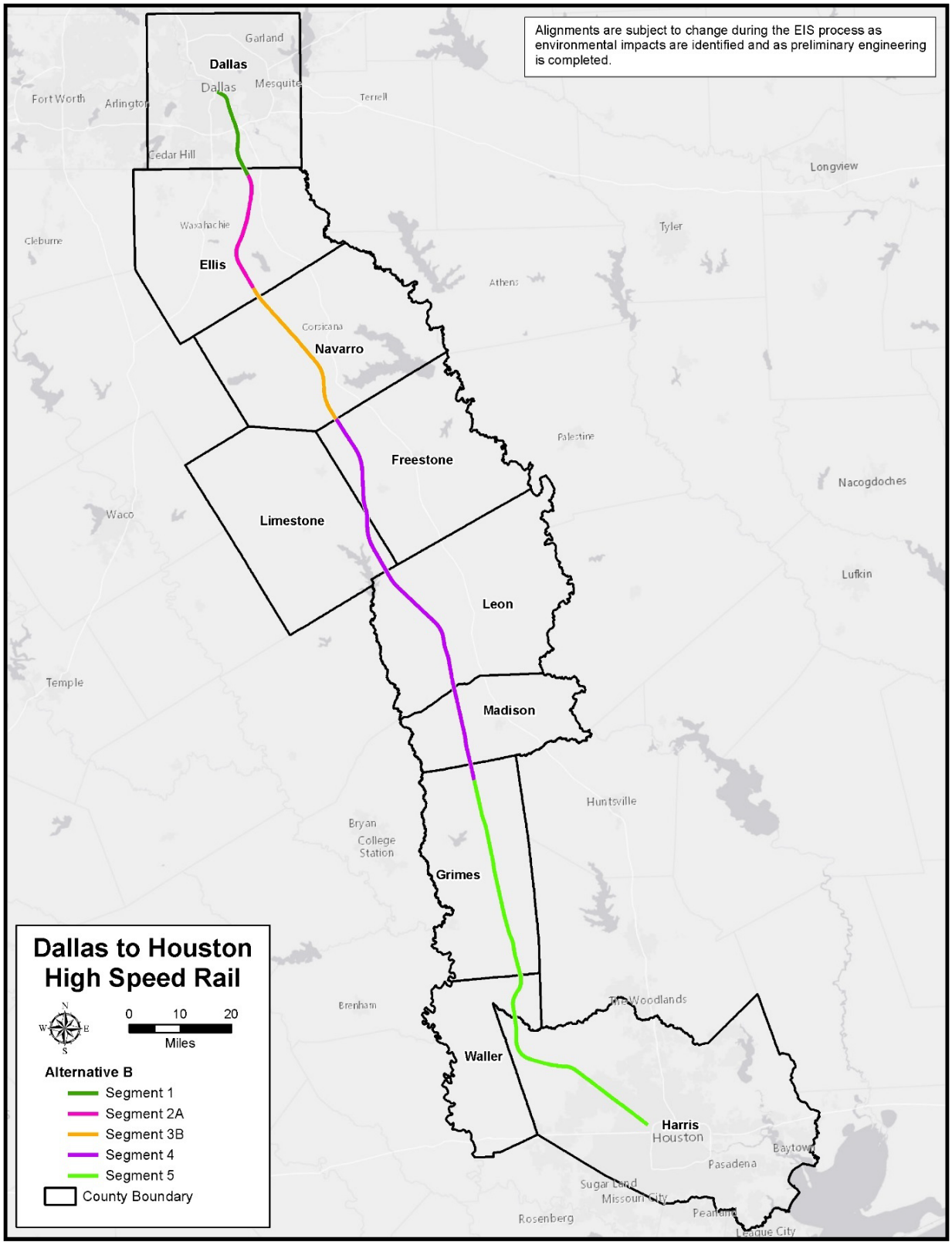
[15] ROW is the geographic area or areas within the LOD that will be acquired—including permanent easements—and that would remain and be used during operation of the Project. These areas would be permanently incorporated into a transportation feature (Section 4[f]) or "converted" from a recreational purpose (Section 6[f]).

Figure 7-1: EIS End-to-End Alignment Build Alternative A



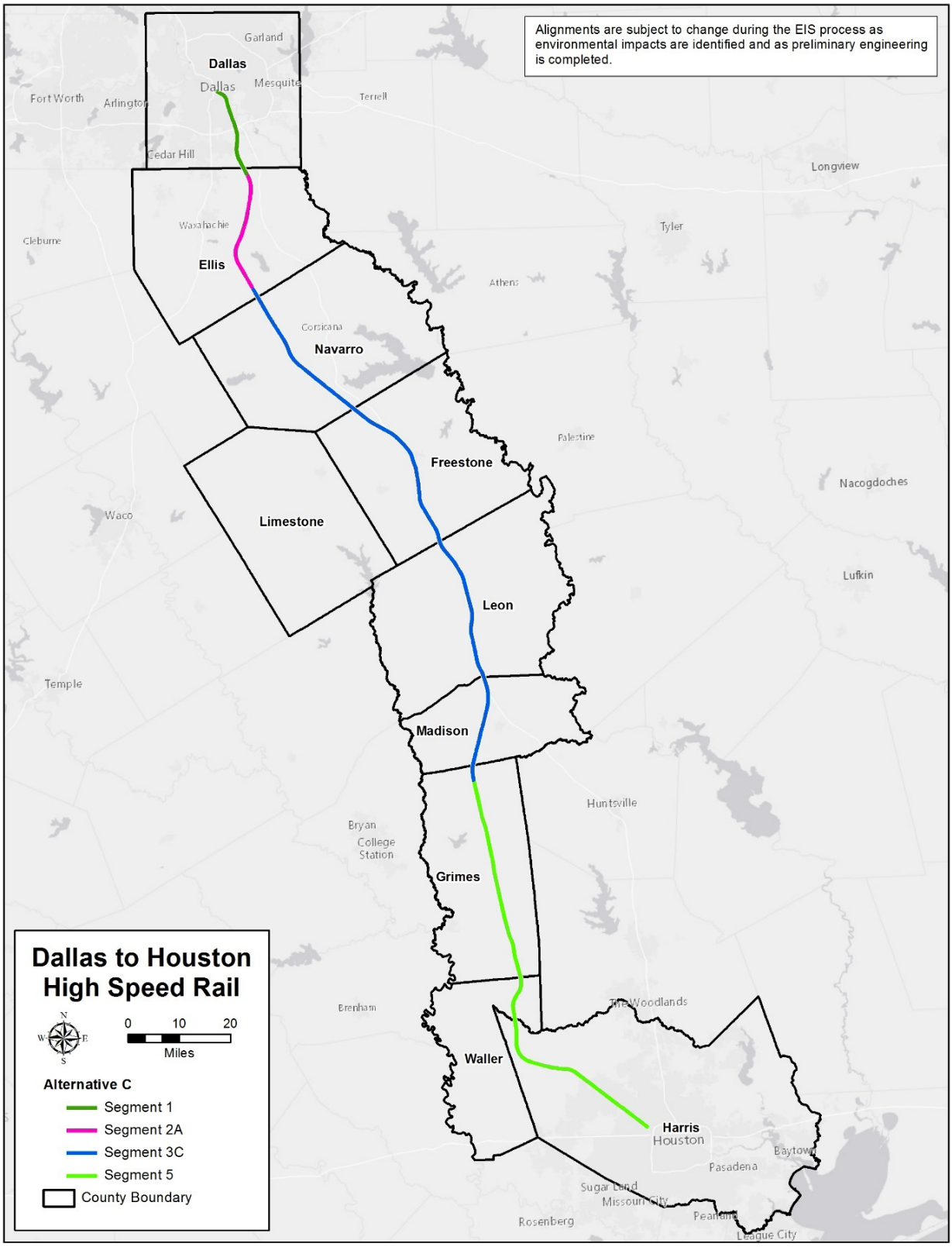
Source: AECOM, 2019

Figure 7-2: EIS End-to-End Alignment Build Alternative B



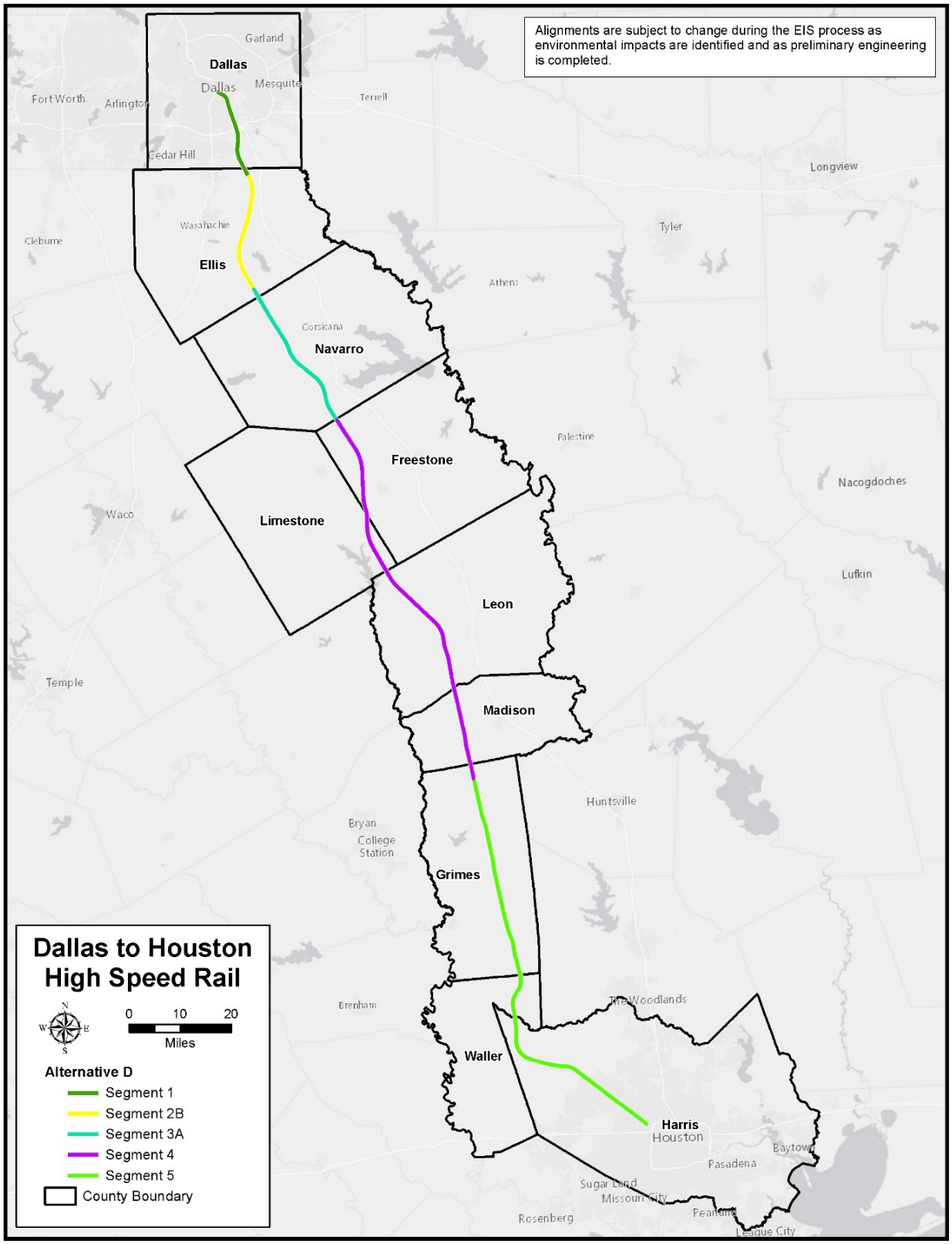
Source: AECOM, 2019

Figure 7-3: EIS End-to-End Alignment Build Alternative C



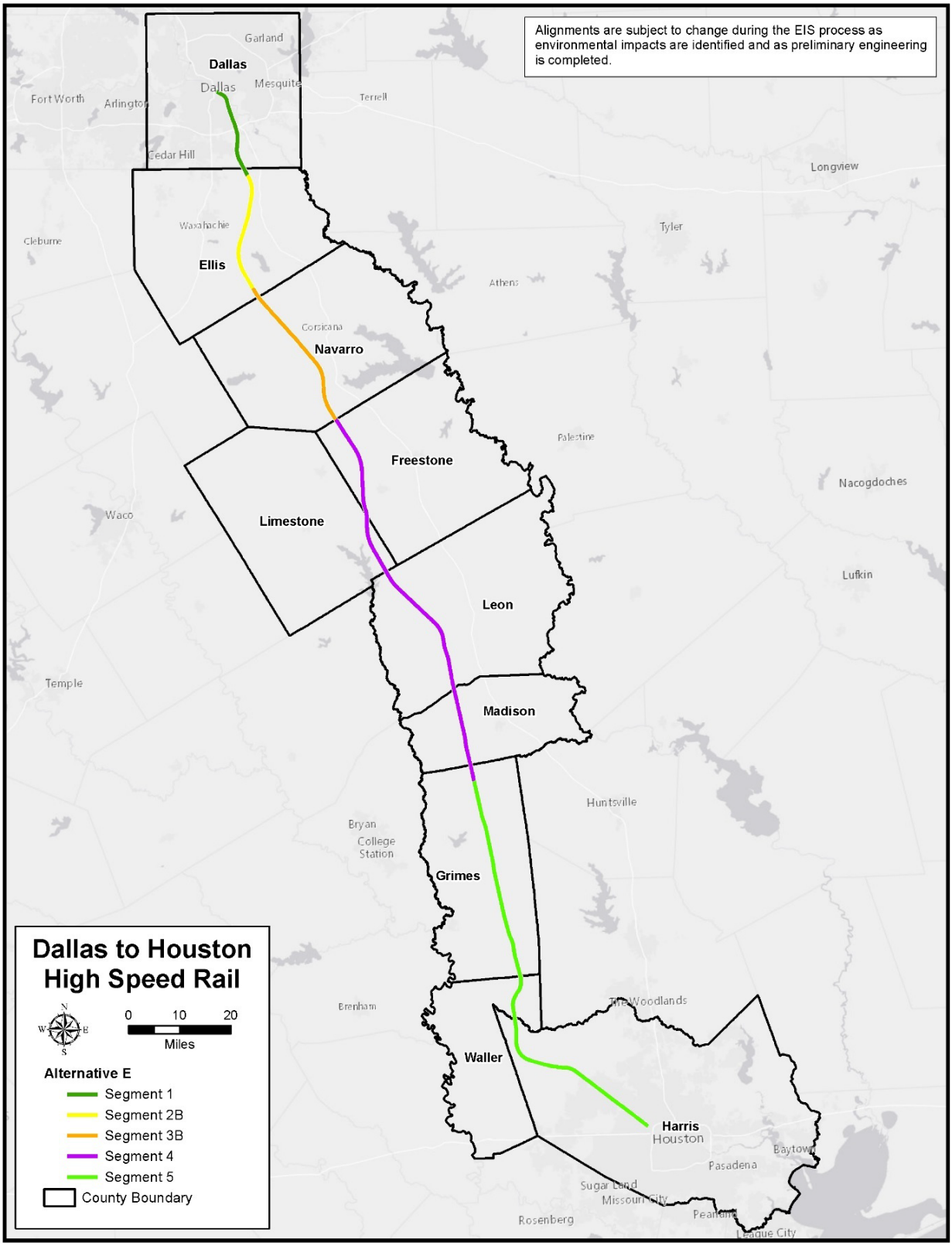
Source: AECOM, 2019

Figure 7-4: EIS End-to-End Alignment Build Alternative D



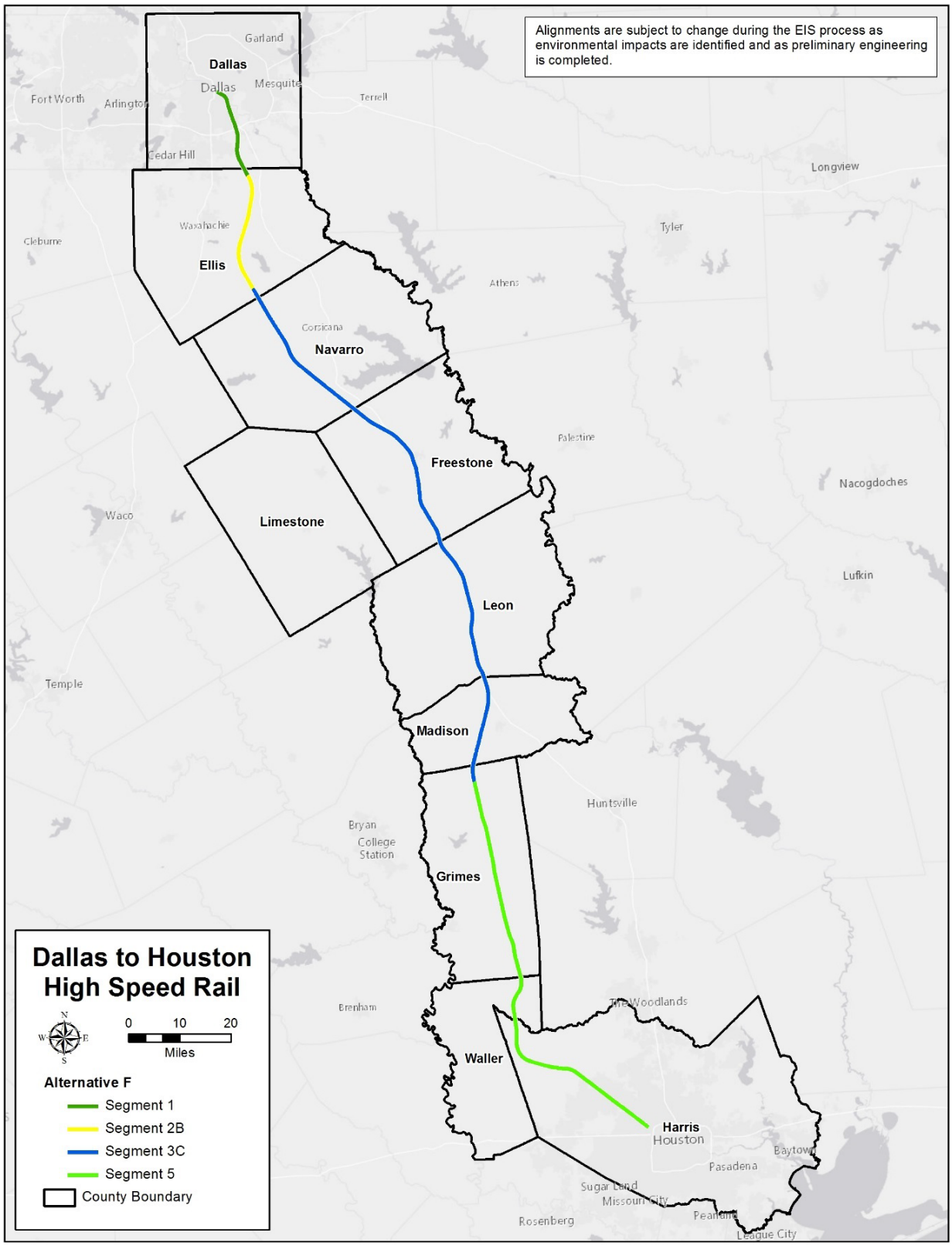
Source: AECOM, 2019

Figure 7-5: EIS End-to-End Alignment Build Alternative E



Source: AECOM, 2019

Figure 7-6: EIS End-to-End Alignment Build Alternative F



Source: AECOM, 2019

Table 7-1: Build Alternatives A through F	
Alignment Alternatives	**Segments**
Alternative A	1, 2A, 3A, 4, 5
Alternative B	1, 2A, 3B, 4, 5
Alternative C (IH-45A)	1, 2A, 3C, 5
Alternative D	1, 2B, 3A, 4, 5
Alternative E	1, 2B, 3B, 4, 5
Alternative F (IH-45B)	1, 2B, 3C, 5

Source: AECOM 2019

One alternative is proposed at the Dallas Terminal Station and one intermediate station is proposed in Grimes County. Both the Dallas Terminal Station and the intermediate station in Grimes County are common to all six Build Alternatives. The Dallas Terminal Station is included in the LOD for Segment 1 and the Brazos Valley Intermediate Station in Grimes County is included in the LOD for Segment 5.

A Houston Terminal Station would be in northwest Houston within the vicinity of US 290, IH-10 and IH-610. There are three alternatives for the Houston Terminal Station – the Houston Industrial Site Terminal Station Option, the Houston Northwest Mall Terminal Station Option, and the Houston Northwest Transit Center Terminal Station Option.

A full description of the Build Alternatives, including the Preferred Alternative, is presented in **Chapter 2.0, Alternatives Considered**. FRA has identified Build Alternative A and the Houston Northwest Mall Terminal Station Option as the Preferred Alternative.

7.6 Section 4(f) Properties

Section 4(f) public parks and recreation facilities, and historic properties within the Study Area are described in the following sections. Based on coordination with TPWD, review of the Texas Natural Diversity database and RTEST data, and site visits, there are no wildlife and waterfowl refuges located in the Study Area.

7.6.1 Methodology for Identifying Section 4(f) Properties

Section 4(f) properties were identified within the areas of study defined in **Section 7.3, Study Area,** using the following sources:

- Review of data compiled for **Section 3.17, Recreational Facilities**
- Review of data compiled for **Section 3.19, Cultural Resources**
- Review of conceptual engineering plans, profiles and temporary easements for the Project[16]
- County and city general plans, specific plans, parks and recreation plans, and master plans
- GIS data, including USGS Geographic Names Information System and county parcel data (to determine public ownership)
- Information from officials with jurisdiction over the Section 4(f) properties, including meetings and direct correspondence
- Site visits

[16] **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details**.

FRA assessed the significance of each property by examining available documentation about the origin and designation of each property and through coordination with the officials with jurisdiction. Properties included in the Section 4(f) evaluation include the following:

- Parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public
- Historic sites of national, state, or local significance in public or private ownership regardless of whether they are open to the public.

Historic sites are protected by Section 4(f) if they are listed in or eligible for listing in the NRHP. Properties that do not meet these criteria are not protected by Section 4(f) and are not assessed in this Section 4(f) evaluation.

7.6.2 Section 4(f) Public Parks/Recreation Areas

Parks and recreation properties in the Study Area were identified and a determination was made whether each is eligible for Section 4(f) protection. Eighteen public park and recreation properties qualify for protection under Section 4(f), including one trail. Other Study Area parks and recreation areas are not protected by Section 4(f) because they do not meet the Section 4(f) criteria for protection. More detail regarding these determinations is provided in the following subsections.

These properties are also discussed further in **Section 3.17, Recreational Facilities**.

7.6.2.1 Existing and Planned Public Parks and Recreation Areas

Existing and planned parks and recreation areas are discussed in this section and are presented by county and then by segment. **Table 7-2** lists the existing and planned public parks and recreation areas in the Study Area that are protected by Section 4(f) and includes information to support the applicability of Section 4(f) to each property. **Figure 7-7** through **Figure 7-11** show the Section 4(f) parks and recreation properties that have been identified within the Study Area.

7.6.2.1.1 Dallas County (Segment 1)

All Build Alternatives within Dallas County include Segment 1. There are 13 park and recreation properties within the Study Area in Dallas County. Eleven parks and recreation properties are protected by Section 4(f) within the Study Area in Dallas County: Pioneer Plaza Pioneer Cemetery, Dallas Heritage Village at Old City Park, Trinity River Greenbelt, Forest Park, Martin Luther King Median, Honey Springs Cemetery, William Blair Jr. Park, Fruitdale Recreation Center, Seaton Park and J.J. Lemmon Park.

Pioneer Plaza is considered a recreational area by the City of Dallas; it is in downtown Dallas adjacent to the northern portion of the Kay Bailey Hutchison Convention Center. The park is owned and managed by the City of Dallas Park and Recreation Department. Pioneer Plaza includes sculptures, water features and a walking path. Pioneer Plaza is a 4-acre park located adjacent to Pioneer Cemetery, which includes Recorded Texas Historic Landmarks (RTHLs) awarded by the THC; however, Pioneer Plaza is approximately 1,000 feet from the LOD.

Dallas Heritage Village at Old City Park is a 17.8-acre park located south of IH-30. It includes historic-aged buildings that were relocated to the property, which was the City of Dallas' first park. The park is owned by the City of Dallas and managed by the Dallas County Heritage Society. The park is approximately 1,000 feet from the LOD.

Table 7-2: Existing and Planned Section 4(f) Public Parks and Recreational Facilities							
Name	**Location**	**Ownership**	**Park Features**	**Total Acres[a] / Acres in Study Area**	**Segment**	**Build Alternative(s)**	**Approximate Distance from LOD[b]**
Dallas County							
Pioneer Plaza	1428 Young Street	City of Dallas Parks and Recreation	Sculptures, walking trails, water features	4 0.5	1	A, B, C, D, E, F	1,000 feet
Pioneer Cemetery	1400 Marilla	City of Dallas Parks and Recreation	Recorded Texas Historic Landmark, historic gravesites	4.4 0.1	1	A, B, C, D, E, F	1,000 feet
Dallas Heritage Village at Old City Park	1717 Gano Street	City of Dallas	Historic Park and historic buildings	17.8 6.1	1	A, B, C, D, E, F	1,000 feet
Trinity River Greenbelt	3700 Sylvan	City of Dallas	Boat ramp, nature observation platform, parking, trails	3,653 41	1	A, B, C, D, E, F	900 feet
Forest Park	2906 Parnell	City of Dallas	Outdoor basketball court, picnic tables, trails	2.4 2.4	1	A, B, C, D, E, F	948 feet
Martin Luther King Median	1300 to 2300 Blocks Cedar Crest Boulevard	City of Dallas (Streets)	Sculpture, landscaping	0.3 0.3	1	A, B, C, D, E, F	955 feet
Honey Springs Cemetery[c]	4001 Bulova Road	City of Dallas	Cemetery with memorial area	4.1 4.1	1	A, B, C, D, E, F	Within 150 feet
William Blair Jr. Park	Southern Dallas	City of Dallas	Audubon Center, multiple parks, trails	6,000 76.6	1	A, B, C, D, E, F	235 feet
Fruitdale Recreation Center	4408 Vandervoort Drive	City of Dallas	Outdoor basketball court, picnic tables, playground, recreation center, parking	5.1 5.1	1	A, B, C, D, E, F	220 feet
Seaton Park	3200 Seaton Drive	City of Dallas	Playground, softball field	4.2 3.0	1	A, B, C, D, E, F	1,140 feet
J.J. Lemmon Park	6100 J.J. Lemmon	City of Dallas	Outdoor basketball court, picnic tables, playground, softball field, tennis court, trails, grill, parking	19.7 3.5	1	A, B, C, D, E, F	1,000 feet
Ellis County							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Ellis County.							
Navarro							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Navarro County.							

Source: City of Dallas 2016; AECOM 2019

[a] Total acres of the property followed by the number of acres that fall within the Study Area.

[b] The approximate distance from the LOD was measured to the approximate boundary of the parks, recreation areas and trails.

[c] This property was not considered Section 4(f) eligible as a park or recreational facility because there is no recreational use. However, this property is protected by Section 4(f) due to its eligibility for listing on the NRHP as further described in **Section 7.6.3**.

Table 7-2: Existing and Planned Section 4(f) Public Parks and Recreational Facilities							
Name	**Location**	**Ownership**	**Park Features**	**Total Acres[a] / Acres in Study Area**	**Segment**	**Build Alternative(s)**	**Approximate Distance from LOD[b]**
Freestone							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Freestone County.							
Limestone							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Limestone County.							
Leon County							
Shelley Pate Memorial Park	1025 North Hill Street, Buffalo	City of Buffalo	Pavilion, baseball field, basketball court and grills	17.1 10.5	3C	C, F	420 feet
Fort Boggy State Park	4994 Highway 75 South	Texas Parks and Wildlife Department	Fishing, boat ramp, hiking, mountain biking, pavilion and overnight campsites	1,847 713.0	3C	C, F	Within LOD
Madison							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Madison County.							
Grimes							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Grimes County.							
Waller							
There are no existing or planned public parks or recreational properties protected by Section 4(f) in the Study Area in Waller County.							
Harris County							
Cypress Top Historic Park	26026 Hempstead Road, Cypress	Harris County	Historic park, guided tours, trails pavilion, historical buildings	2.7 2.7	5	A, B, C, D, E, F	300 feet
Pitner Park	8600 Block Pitner Road, Houston	Harris County	Trails, playground, picnic tables, BBQ grills	1.2 0.8	5	A, B, C, D, E, F	1,000 feet
Cy-Fair High School	22602 Northwest Freeway, Cypress	Cypress-Fairbanks Independent School District (ISD)	Track and field, tennis courts	45 3.9	5	A, B, C, D, E, F	940 feet
Cypress Falls High School	9811 Huffmeister Road, Houston	Cypress-Fairbanks Independent School District (ISD)	Track and field, tennis courts, baseball diamonds	15.3 2.2	5	A, B, C, D, E, F	600 feet

Source: City of Dallas 2016; AECOM 2019

[a] Total acres of the property followed by the number of acres that fall within the Study Area.

[b] The approximate distance from the LOD was measured to the approximate boundary of the parks, recreation areas and trails.

[c] This property was not considered Section 4(f) eligible as a park or recreational facility because there is no recreational use. However, this property is protected by Section 4(f) due to its eligibility for listing on the NRHP as further described in **Section 7.6.3**.

Table 7-2: Existing and Planned Section 4(f) Public Parks and Recreational Facilities							
Name	**Location**	**Ownership**	**Park Features**	**Total Acres[a] / Acres in Study Area**	**Segment**	**Build Alternative(s)**	**Approximate Distance from LOD[b]**
Housman Elementary	6705 Housman, Houston	Spring Branch ISD	Playground, soccer fields	10.31 0.63	5	A, B, C, D, E, F	1,260
Jersey Meadow Golf Course	8502 Rio Grande St, Jersey Village	City of Jersey Village	Golf course, club house, driving range, restaurant	130 2.9	5	A, B, C, D, E, F	1,080 feet

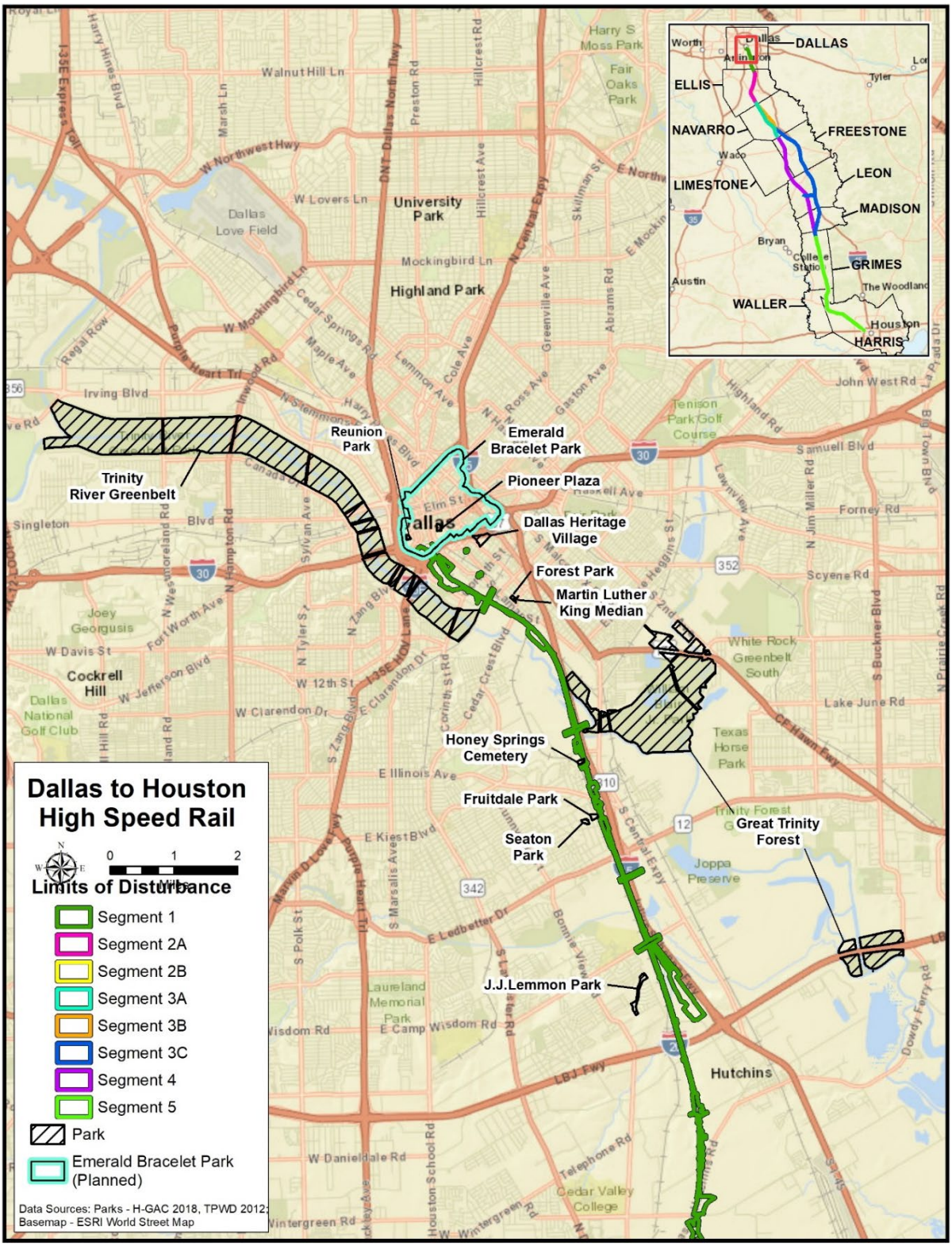
Source: City of Dallas 2016; AECOM 2019

[a] Total acres of the property followed by the number of acres that fall within the Study Area.

[b] The approximate distance from the LOD was measured to the approximate boundary of the parks, recreation areas and trails.

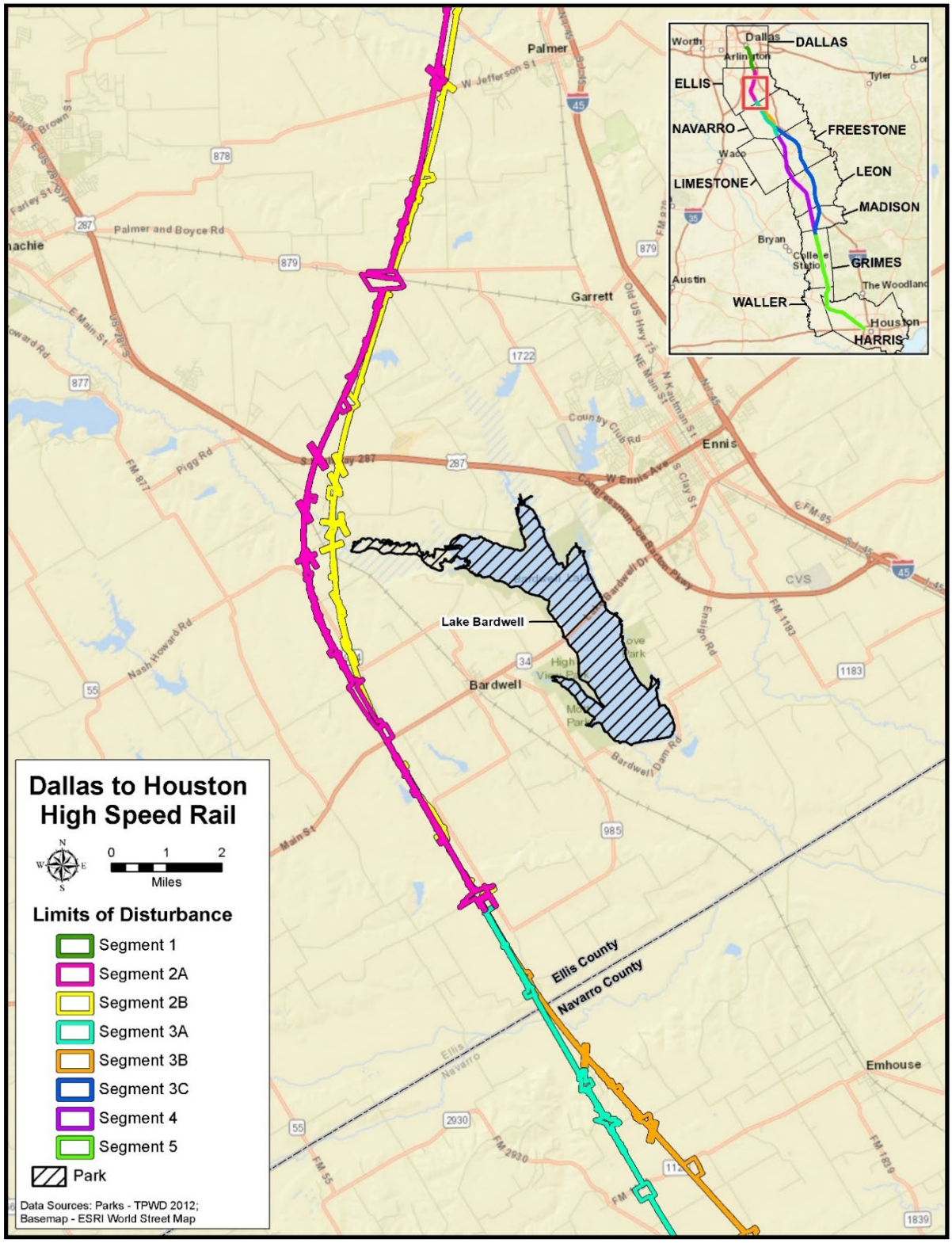
[c] This property was not considered Section 4(f) eligible as a park or recreational facility because there is no recreational use. However, this property is protected by Section 4(f) due to its eligibility for listing on the NRHP as further described in **Section 7.6.3**.

Figure 7-7: Section 4(f) Existing and Planned Public Parks and Recreation Areas, Segment 1



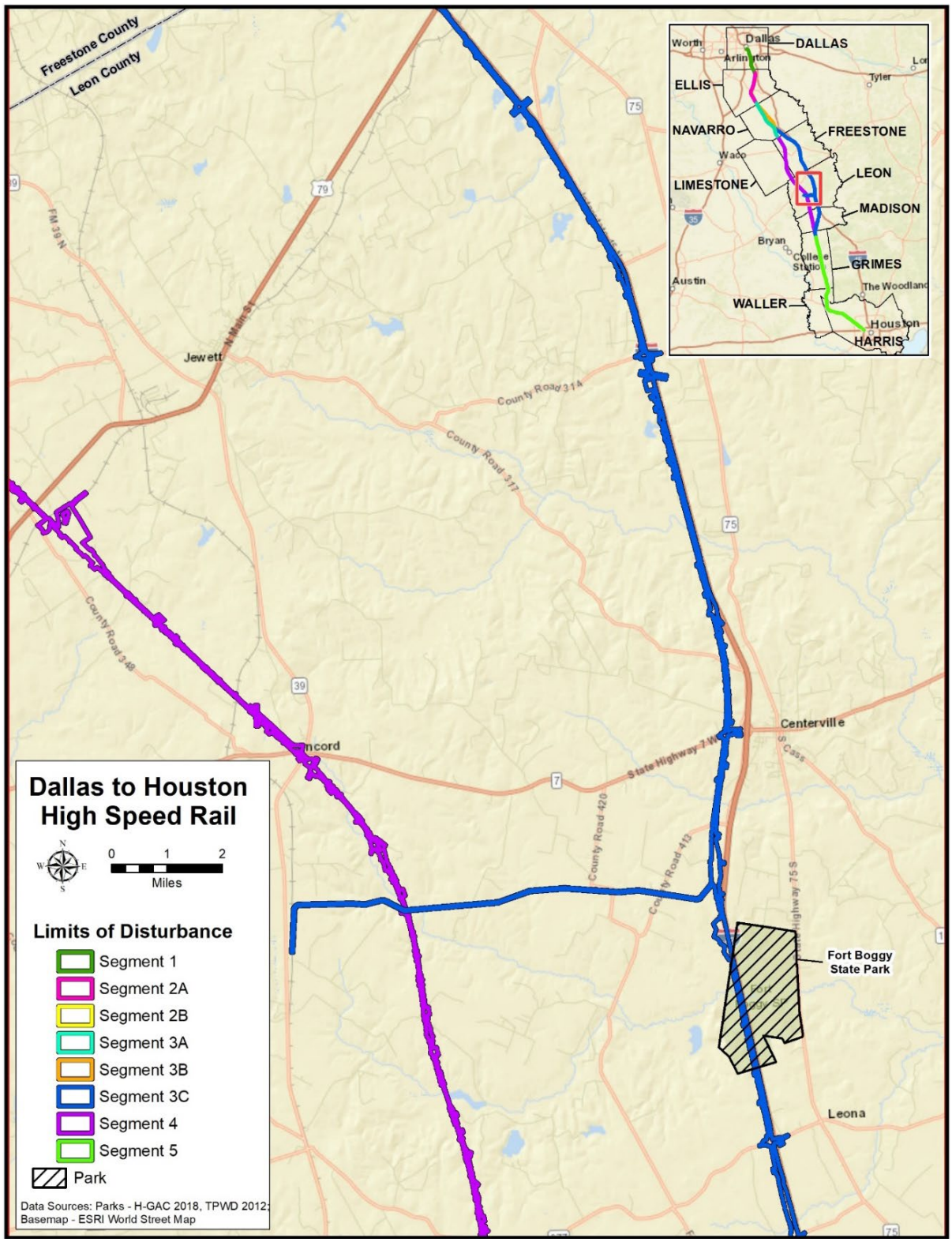
Source: AECOM, 2019

Figure 7-8: Section 4(f) Existing and Planned Public Parks and Recreation Areas, Segments 2A and 2B



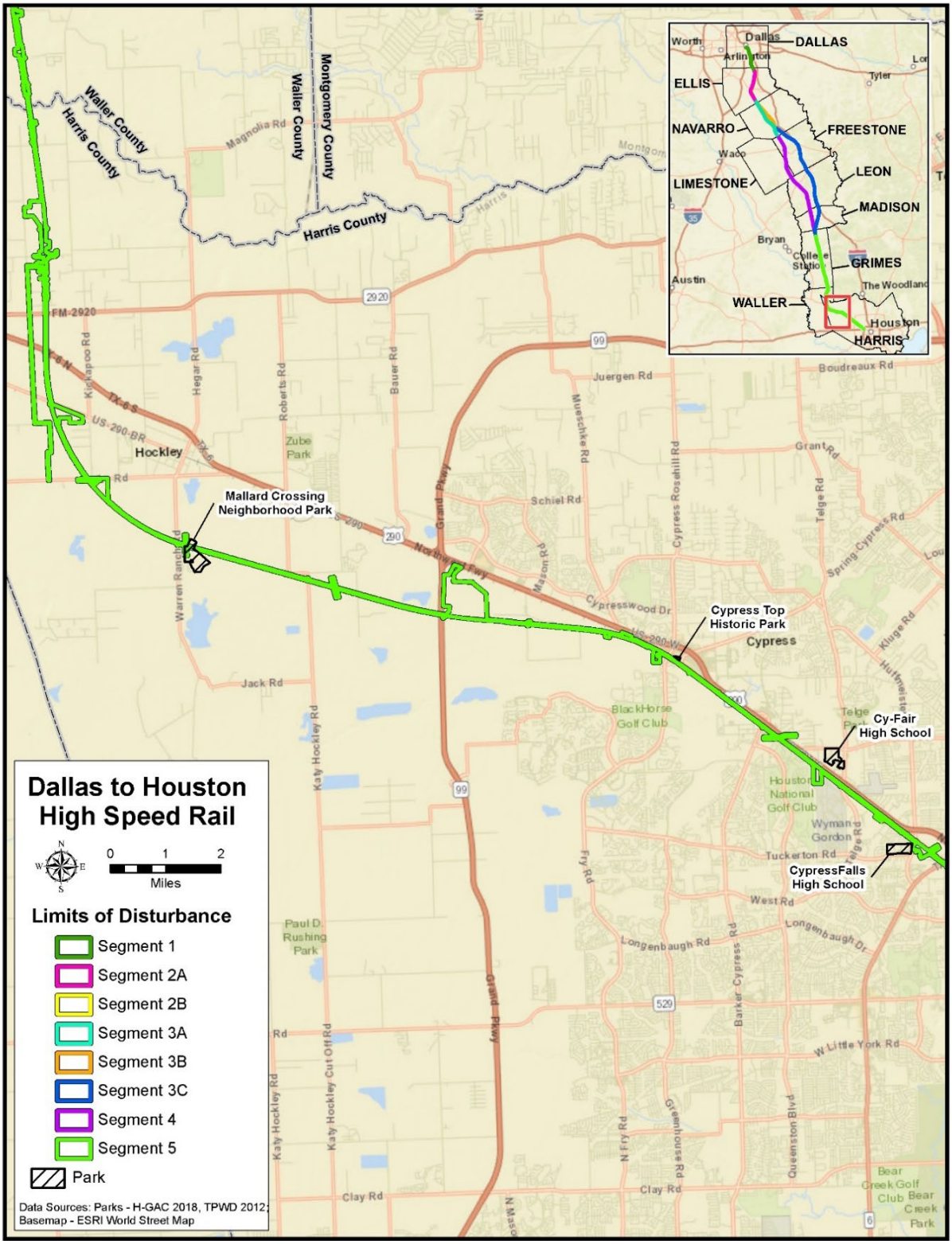
Source: AECOM, 2019

Figure 7-9: Section 4(f) Existing and Planned Public Parks and Recreation Areas, Segment 3C



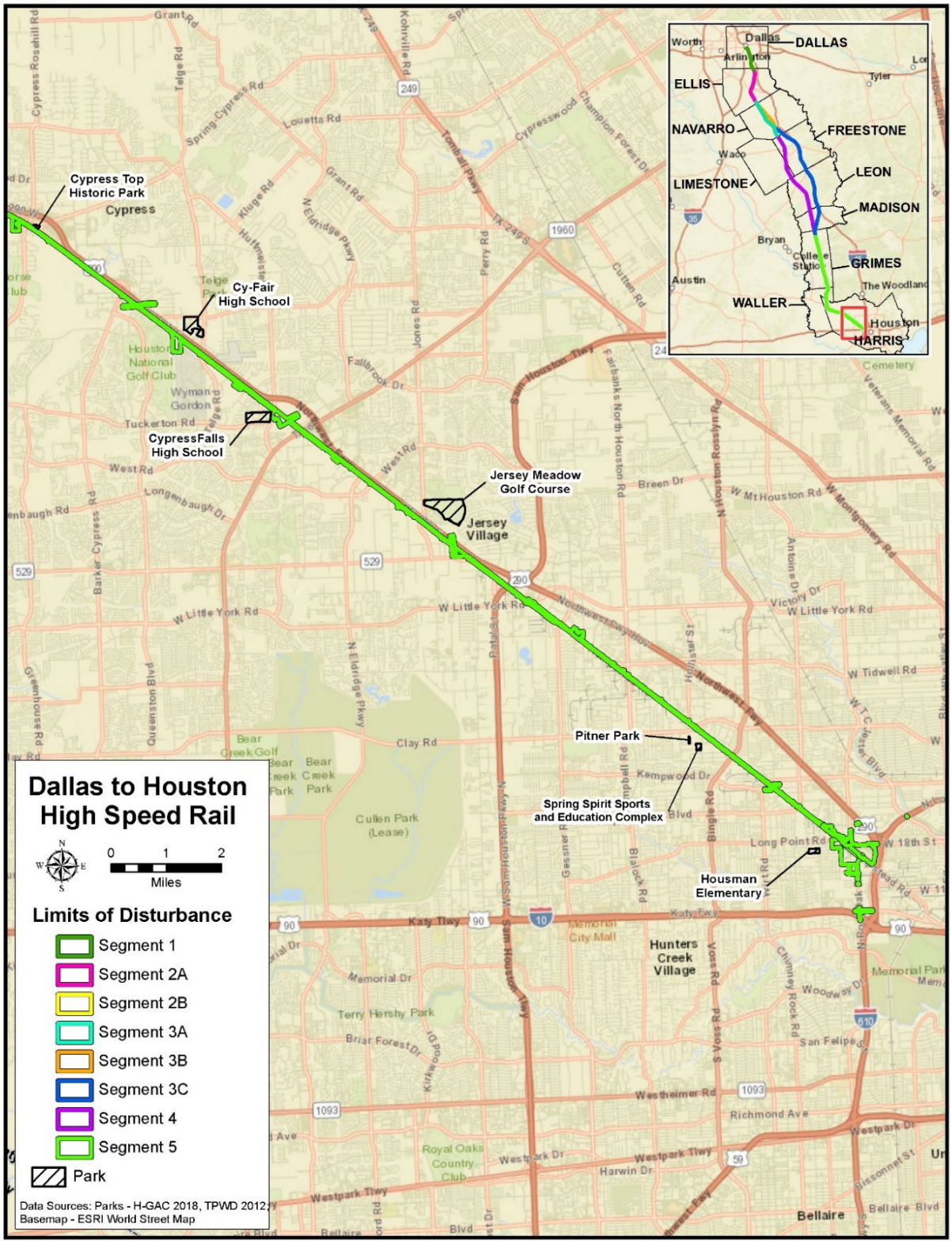
Source: AECOM, 2019

Figure 7-10: Section 4(f) Existing and Planned Public Parks and Recreation Areas, Segment 5



Source: AECOM, 2019

Figure 7-11: Section 4(f) Existing and Planned Public Parks and Recreation Areas, Segment 5 and Houston Terminal Station Options



Source: AECOM, 2019

Trinity River Greenbelt Park is an existing 3,653-acre park located in the basin of the Trinity River within a levee. The park is owned and managed by the City of Dallas Parks and Recreation Department. At its closest point, the park is approximately 900 feet from the LOD. Park amenities include trails, water features and an observation platform.[17]

Forest Park is an existing City of Dallas-owned 2.4-acre park located on the southwest side of IH-45, directly west of the Trinity River. The park is owned and managed by the City of Dallas Parks and Recreation Department. This neighborhood park is approximately 948 feet from the LOD. Amenities include trails, a basketball court, picnic tables and playground equipment.[18]

Martin Luther King Median is an existing 0.3-acre park located within the median between Parnell Street and Gould Street. The park is on land owned and managed by the City of Dallas Parks and Recreation Department. This park, which displays a monument commemorating Martin Luther King, Jr., is approximately 1,000 feet from the LOD.

William Blair Jr. Park is an approximately 983-acre park located on the southeast side of IH-45, within the Study Area, but outside of the LOD. Park facilities are primarily located over 1 mile east of the Study Area. William Blair Jr. Park is part of the larger ecological region of the City of Dallas-owned park Great Trinity Forest that is approximately 6,000 acres. This park is approximately 235 feet from the LOD. Amenities consist of the Trinity River Audubon Center, William Blair Jr. Park, portions of the proposed Trinity Forest Trails[19] and the Texas Buckeye Trail.[20]

Honey Springs Cemetery is an existing City of Dallas designated special use park located near IH-45. The cemetery contains a large stone memorial wall at its entrance, which has cultural significance. Although designated as a park, the site does not typically serve a recreational function.

Fruitdale Recreation Center was established in 1964 and is located south of East Illinois Avenue. This neighborhood park encompasses 5.1 acres. The park is located on the western side of an existing railroad. The park is owned and managed by the City of Dallas Parks and Recreation Department. This park is located approximately 220 feet from the LOD.

Seaton Park is owned and managed by the City of Dallas Park and Recreation Department and is approximately 1,140 feet from the LOD. The park is directly south of South Illinois Avenue and east of IH-45. Seaton Park, overall, is a 4.2-acre neighborhood park that includes playground and softball amenities.[21]

J.J. Lemmon Park is a 19.7-acre park located west of IH-45 and directly south of Simpson Stuart Road. The park is owned and managed by the City of Dallas Park and Recreation Department and includes playing fields, playgrounds, and picnic facilities. There are 3.5 acres of the park located within the Study Area and it is located approximately 1,000 feet from the LOD.

Two additional properties in Dallas County were evaluated by FRA and determined to not be protected by Section 4(f), and are not included in the assessment of use in **Section 7.7, Assessment of Use of Section 4(f) Properties**:

[17] Dallas Parks and Recreation, Facilities, accessed May 2020, https://www.dallasparks.org/Facilities/Facility/Details/Trinity-River-Greenbelt-683.

[18] Ibid.

[19] USACE Fort Worth District, "DFE Trails Phase 2," October 18, 2019. Provided via file transfer on February 6, 2020. Trail location is depicted in **Appendix D, Community and Cultural Resources Mapbook**.

[20] City of Dallas, Trinity River Corridor Project, Great Trinity Forest, accessed March 2016, http://www.trinityrivercorridor.com/recreation/great-trinity-forest.

[21] www.dallasparks.org.

- Reunion Park is privately owned. Although it is occasionally leased by the City of Dallas as a special event space; these leases are short-term for individual events and do not constitute long term recreational use of the park. Therefore, Reunion Park is not considered a Section 4(f) property.
- Through communication with the City of Dallas Park and Recreation Department, FRA confirmed that Emerald Bracelet Park is an illustrative concept and no park or trail is planned to be formally adopted by the City of Dallas; therefore, it is not considered a Section 4(f) park or recreational property.

7.6.2.1.2 Ellis County (Segments 2A, 2B, 3A, 3B and 3C)

The Build Alternatives within Ellis County include Segments 2A, 2B, 3A, 3B and 3C. There is one park or recreation property within the Study Area in Ellis County. There are no parks or recreation properties protected by Section 4(f) within the Study Area in Ellis County.

Lake Bardwell was evaluated and determined to not be protected by Section 4(f). It is a USACE-owned and operated lake in the City of Ennis. The facility includes 2,917 acres of water. A portion of the property (approximately 230 acres) identified by the USACE as a limited use area is within the Study Area, within which fishing, camping, boating, hunting, hiking and walking on multi-use trails are permitted. Hunting is allowed on the property from September to March. The USACE has specifically identified that the primary purpose of Lake Bardwell is flood control and water management.[22] Recreational activities are secondary to this primary purpose. For these reasons, FRA has determined that Lake Bardwell is not protected by Section 4(f) and is not included in the assessment of use in **Section 7.7, Assessment of Use of Section 4(f) Properties**. For more information on this recreational facility, refer to **Section 3.17, Recreational Facilities**.

7.6.2.1.3 Navarro County (Segments 3A, 3B, 3C and 4)

The Build Alternatives within Navarro County include Segments 3A, 3B, 3C and 4. There are no parks or recreation properties within the Study Area in Navarro County.

7.6.2.1.4 Limestone County (Segment 4)

The Build Alternatives within Limestone County include Segment 4. There are no parks or recreation properties within the Study Area in Limestone County.

7.6.2.1.5 Freestone County (Segments 3A, 3B, 3C, and 4)

The Build Alternatives within Freestone County include Segments 3A, 3B, 3C, and 4. There are no parks or recreation properties within the Study Area in Freestone County.

7.6.2.1.6 Leon County (Segments 3C and 4)

The Build Alternatives within Leon County include Segments 3C and 4. There are no parks or recreation properties within the Study Area of Segment 4 in Leon County.

There are two parks located within the Study Area for Segment 3C within Leon County: Shelley Pate Memorial Park and the Fort Boggy State Park. Both are protected by Section 4(f).

Shelley Pate Memorial Park is located east of IH-45 in Buffalo, Texas and is owned and managed by the City of Buffalo. Park amenities include ballfields, tennis and basketball courts, playground equipment, a

[22] USACE, Bardwell Lake, May 2016, http://www.swf-wc.usace.army.mil/bardwell/.

jogging trail, a pavilion and restrooms, and a splashpad. The park is approximately 420 feet from the LOD.

Fort Boggy State Park is located along IH-45 approximately 4 miles south of Centerville. The 1,847-acre park is owned and managed by TPWD and includes hiking trails, a 15-acre lake, a day use area, five primitive (hike-in) campsites, and five cabins. Of the 1,847 acres, 713 acres are within the Study Area. Most recreational activities are located on the east side of IH-45. Parklands on the west side of IH-45 (where Segment 3C is proposed) are undeveloped but can be accessed for hunting during the designated seasons with permission from TPWD.[23] The portion of the park west of IH-45 is designated a Natural Zone and the only planned recreational use is future trail expansion.[24]

7.6.2.1.7 Madison County (Segments 3C and 4)

The Build Alternatives within Madison County include Segments 3C and 4. There are no parks or recreation properties within the Study Area in Madison County.

7.6.2.1.8 Grimes County (Segments 3C, 4 and 5)

The Build Alternatives within Grimes County include Segments 3C, 4 and 5. There are no parks or recreational properties within the Study Area in Grimes County.

7.6.2.1.9 Waller County (Segment 5)

All Build Alternatives within Waller County include Segment 5. There are no parks or recreational properties within the Study Area in Waller County.

7.6.2.1.10 Harris County (Segment 5)

All Build Alternatives within Harris County include Segment 5. The Houston Terminal Station Options are also part of the Study Area in Harris County. There are eight parks and recreational facilities within the Study Area in Harris County. Six are protected by Section 4(f): Cypress Top Historic Park, Pitner Park, Cy-Fair High School, Cypress Falls High School, Housman Elementary School and Jersey Meadow Golf Course.

Cypress Top Historic Park is owned by Harris County and is located on 2.7 acres along Hempstead Road. The park includes trails, a pavilion, historical buildings and offers guided tours. The property is approximately 300 feet from the LOD.

Pitner Park is owned and operated by Harris County. This is a 1.2-acre park located west of US 290 and north of Pitner Road. The park is located approximately 1,000 feet from the LOD and offers trails, picnic tables and a playground.

Cy-Fair High School is located northeast of the LOD along Northwest Freeway. School recreational amenities open to the general public for recreational sports leagues include track and field and tennis courts. At its closest point, these facilities are approximately 940 feet from the LOD.

Cypress Falls High School is located south of US 290 and directly west of Huffmeister Road. The recreation facilities (track and field, tennis courts, and baseball diamonds) at Cypress Falls High School are located on approximately 15.3 acres, at approximately 600 feet from the LOD. The facilities at this

[23] August 16, 2018 E-mail correspondence with TPWD staff informed the Project team that hunting was allowed on undeveloped portions of Fort Boggy State Park west of IH-45 during designated seasons.

[24] TPWD, Fort Boggy State Park, accessed October 2018, http://tpwd.texas.gov/state-parks/fort-boggy.

location are owned by Cypress-Fairbanks ISD, and open to the public for recreational sports leagues during non-school hours.[25]

Housman Elementary School is located south of the LOD along Housman Road and Silber Road. Housman Elementary has a public "pocket park" on the southeastern corner of the parcel; amenities include a playground, jogging trail, and soccer fields. At its closest point, these facilities are located approximately 1,260 feet from the LOD. The park facilities at this location are open to the public from 8:00 am to dusk, and the soccer fields are open to the public during non-school hours.

Jersey Meadow Golf Course is located northeast of the LOD along Rio Grande Street. It is owned by the City of Jersey Village and is open to the public. At its closest point, the golf course is approximately 1,080 feet from the LOD.

The following properties are also within the Study Area in Harris County, but are not protected by Section 4(f):

- Mallard Crossing Neighborhood Park: This privately-owned park is available for use by residents of the Mallard Crossing Neighborhood and is not publicly accessible. For this reason, the park is not protected by Section 4(f) and is not included in the assessment of use in **Section 7.7, Assessment of Use of Section 4(f) Properties.**
- Spring Spirit and Education Complex: This privately owned facility is available for use by members of the facility and is not publicly accessible. For this reason, the facility is not protected by Section 4(f) and is not included in the assessment of use in **Section 7.7, Assessment of Use of Section 4(f) Properties.**

7.6.2.2 Existing and Planned Public Trails

This section identifies existing and planned publicly owned recreational trails in the Study Area that are protected by Section 4(f). Planned trails are protected by Section 4(f) when the land for such trails is publicly owned and the trail is formally designated for the purpose of a recreational trail by the official with jurisdiction in an adopted Master Plan. Existing trails are protected if the land is publicly owned and used primarily for recreation. Trails on private lands or trails on publicly owned lands with the primary purpose of transportation, such as an on-street bikeway in a roadway ROW, are not protected by Section 4(f). National Historic Trails are specifically excluded from Section 4(f) protection unless deemed significant under Section 106 of the NHPA. Additionally, this section does not include trails that are identified as ancillary amenities or included features occurring within a park property described previously in **Section 7.6.2.1, Existing and Planned Public Parks and Recreation Areas**. County appraisal districts were used to determine whether parcels that were intersected by the trails and trail alignments along the Study Area were privately or publicly owned.

Table 7-3 lists existing and planned Section 4(f) public trails. FRA identified one trail in the Study Area that is protected by Section 4(f): the Santa Fe Trestle Trail in Dallas County. This section describes the trail and identifies other trails in the Study Area that are not protected under Section 4(f) and the reasons for those determinations.

[25] June 27, 2016 phone conversation with Jennifer Young, Cypress Fall High School, and AECOM.

Table 7-3: Existing and Planned Section 4(f) Public Trails										
Name	**Location**	**Type/ Status**	**Surface**	**Width (Feet)**	**Miles[1] Total/ Study Area**	**Seg.**	**Build Alternative(s)**	**Ownership**	**Approximate Distance from LOD (Feet)**	**Section 4(f)[2]**
Dallas County										
Santa Fe Trestle Trail	Within Trinity River Levees	Major Linear (existing)	Concrete	12	0.9 0.2	1	A, B, C, D, E, F	DART, City of Dallas	550	Yes
Ellis County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Ellis County.										
Navarro County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Navarro County.										
Freestone County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Navarro County.										
Limestone County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Limestone County.										
Leon County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Leon County.										
Grimes County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Grimes County.										
Waller County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Waller County.										
Harris County										
There are no existing or planned public trails protected by Section 4(f) in the Study Area in Harris County.										

Sources: City of Dallas, 2016; AECOM, 2019; City of Houston. Houston Bike Plan. Accessed July 2019. http://houstonbikeplan.org/wp-content/uploads/2017/07/HoustonBikePlan_Full.pdf

1 Displays total length of the properties followed by the number of miles that fall within the Study Area
2 Section 4(f) eligibility only pertains to portions that are on publicly owned land. Land within and immediately adjacent to (within 0 feet of) the Project that is privately owned is not Section 4(f) eligible.

The location of the Santa Fe Trestle Trail is shown on **Figure 7-12**. **Santa Fe Trestle Trail** is the first established off-road trail that crosses the Trinity River, near Corinth Street and Eighth Street. The DART- and City of Dallas-owned trail provides for both walking and bicycling. The trail is approximately 1 mile in length and 0.2 mile of the trail is within the Study Area.[26] The trail is located within the floodway and strands of trees, and features artwork and transit access. At its closest point the trail is approximately 550 feet from the LOD.

Seventeen existing and planned trails are located within the Study Area and described in **Section 3.17, Recreation Facilities**, but are not protected by Section 4(f):

The El Camino Real de los Tejas National Historic Trail is a designated National Historic Trail that commemorates the route established during the Spanish colonial period to connection settlements, missions and presidios across 2,500 miles in East Texas and Louisiana. The trail is managed by NPS. Although trail facilities have been developed along portions of the route, the Study Area contains no public land for a recreational trail. No portion of the trail in the Study Area is recognized as historically significant under the NHPA (**Section 3.19, Cultural Resources**).

- Twelve planned trails are in the City of Houston Bike Plan, including Jones Road/Rio Grande, Cole Creek, Huffmeister/West Road, Hempstead Road, Cypress Creek Greenway, Cole Creek/Empire Central Drive, Fairbanks N. Houston Road, Katy Road, Center Point Corridor, Drainage Corridor, Westview Connection, and West Loop N Freeway.[27] However, the trails are in early planning stages and not enough information is known to describe the trail in terms of specific location or configuration. Thus, none of the 12 planned trails is protected by Section 4(f). These 12 trails are not included in the assessment of use in **Section 7.7, Assessment of Use of Section 4(f) Properties**.
- GIS data from the City of Dallas show three planned trails: the Grand Avenue Connection, Interurban Trail, and Five Mile Creek Trail. However, not enough information is known to describe the trail in terms of specific location or configuration. Thus, none of these three planned trails are protected by Section 4(f).

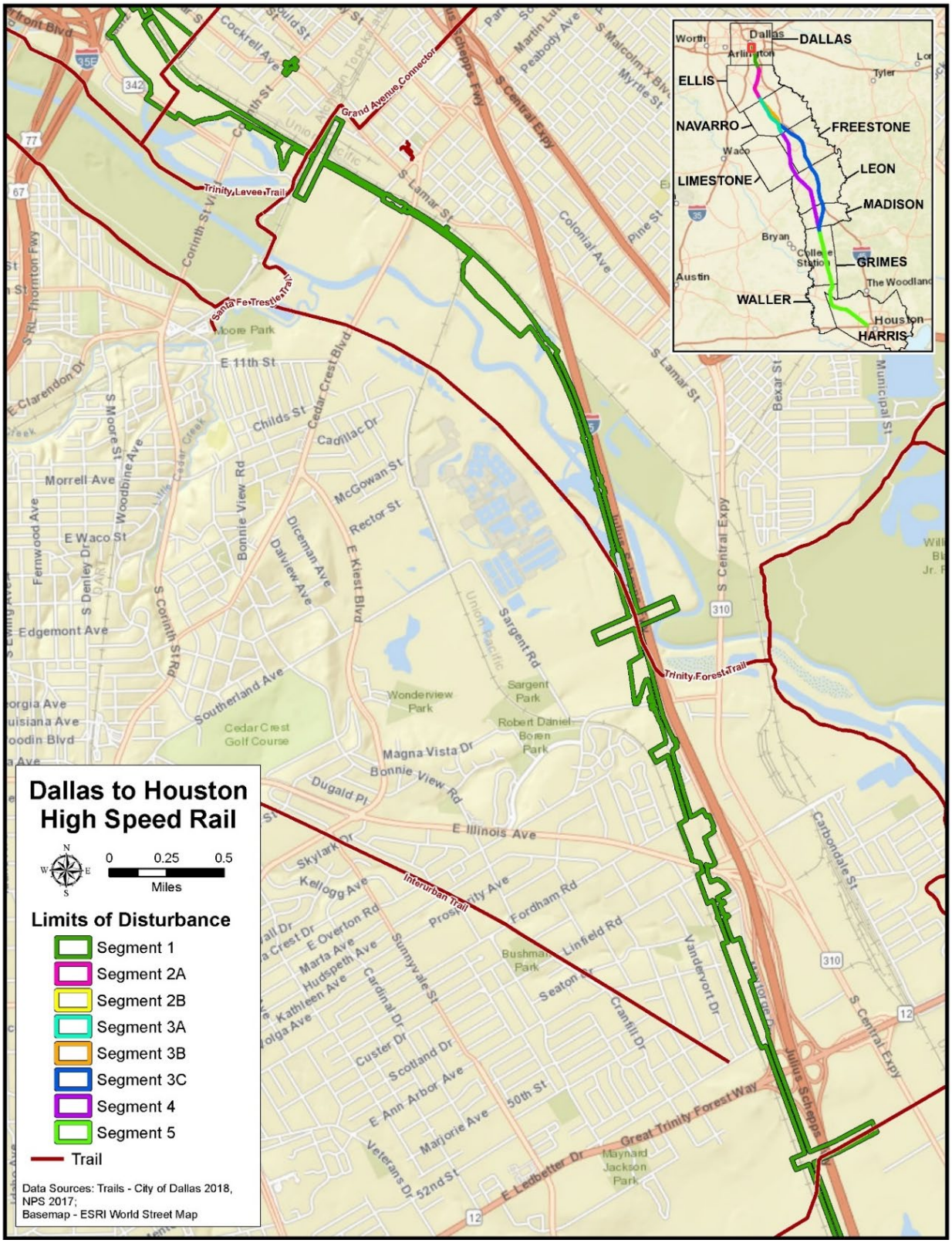
7.6.3 Section 4(f) Historic Properties

The identification of historic properties within the APEs is ongoing through the Section 106 process. Background records of the Texas Historical Sites Atlas, Texas Archeological Sites Atlas, NRHP database, TxDOT historic properties database and available previous reports were reviewed to identify previously recorded and/or designated historic and archeological properties—including NRHP-listed historic properties, NRHP-eligible historic properties, NHLs, State Antiquities Landmarks (SALs), RTHLs, Historic Texas Cemeteries, and recorded cemeteries with no designation.

Nine properties that were included in the Draft EIS Section 4(f) Evaluation are not included in this report. Four of the nine properties that were discussed in the Draft EIS are now outside the APE boundary, which was revised due to refinements to the Project since the Draft EIS, and are no longer part of the Section 4(f) evaluation. The additional five properties have been determined since the Draft EIS to not be eligible for listing on the NRHP and, therefore, are not protected by Section 4(f). The nine properties that are no longer part of the Section 4(f) evaluation are listed in **Table 7-4**.

[26] City of Dallas GIS, 2015.
[27] City of Houston, *Houston Bike Plan*, February 2017, accessed November 2019, http://houstonbikeplan.org/wp-content/uploads/2017/07/HoustonBikePlan_Full.pdf.

Figure 7-12: Section 4(f) Existing Trails



Source: AECOM 2019

Table 7-4: Properties No Longer Discussed in Final EIS			
Resource ID	**Address**	**Draft EIS NRHP Eligibility**	**Reason for Removal**
DA.020	Good Luck Oil Company 904 Cadiz St. Dallas, TX	Criterion C - Architecture	No Longer within the APE due to design changes.
DA.070	Corinth Street Viaduct Dallas, TX	Criteria A (community planning and development) and C – (1930s transportation property)	No longer within the APE due to design changes.
EL.031a-c	717 Slovacek Rd. Ennis, TX	Potentially NRHP-eligible	After further evaluation, the resource was determined not eligible for the NRHP based on consultation with SHPO.
EL.062	3160 FM 985, Ennis, TX	Potentially NRHP-eligible	No longer within the APE due to design changes.
NA.078	7145 NW CR 1200, Barry, TX	Potentially NRHP-eligible	Further evaluation found the resource lacks demonstrated historical significance and has been altered; therefore, the resource has a low potential for NRHP eligibility.
LE.048	CR 416, Leona, TX	Potentially NRHP-eligible	Further evaluation found the resource lacks demonstrated historical significance and has been altered; therefore, the resource has a low potential for NRHP eligibility.
MA.031a-n	FM 1372, Valley View, TX	Potentially NRHP-eligible	After further evaluation, the resource was determined not eligible for the NRHP based on consultation with SHPO.
GR.001	Bethel Cemetery Bedias, TX	Potentially NRHP-eligible	No longer within the APE due to design changes.
GR.004a	FM 1696, Bedias, TX	Potentially NRHP-eligible	After further evaluation, the resource was determined not eligible for the NRHP based on consultation with the SHPO.

As described in **Section 7.3, Cultural Resources**, the identification of historic properties is being completed through a phased approach. Known NRHP-eligible and NRHP-listed historic properties within the APE are protected by Section 4(f) and are presented in **Table 7-5**; each property is summarized in the following section. Properties that are not protected under Section 4(f) (e.g., historic sites that are not listed or eligible for listing in the NRHP) are not evaluated in this chapter; refer to **Section 3.19, Cultural Resources**, and **Appendix E, Cultural Resources Technical Memorandum,** for additional information including descriptions of, and potential impacts to, these properties. Archeological sites are protected by Section 4(f) if they are eligible for listing in the NRHP and warrant preservation in place. These types of sites may occur in areas of high archeological sensitivity; however, if such sites exist, their significance may be for the information that can be learned from data recovery rather than preservation in place. The presence and significance of archeological sites will be confirmed during the Section 106 process. As of the date of this Final EIS, no archeological sites within the APE have been determined eligible for listing in the NRHP or are listed in the NRHP and, therefore, are not protected by Section 4(f) and are not assessed in this chapter.

Table 7-5: Known Section 4(f) Historic Sites within the APE						
Field ID/Property Name	**Property Type**	**NRHP status; Criteria**	**Segment**	**Build Alternative(s)**	**In LOD**	**Approximate Distance from Segment(s) LOD (Feet)**
Dallas County						
DA.009 (Julius Yonnack House)	Domestic Single-Family Dwelling	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	268
DA.010 (Jacob Yonnack House)	Domestic Single-Family Dwelling	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	309
DA.016 (former KIXL Studios)	Building	NRHP Eligible[a]; A & C	Segment 1	A, B, C, D, E, F	No	0 (Adjacent to LOD)
DA.022 (Chase Bag Company)	Building	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	52
DA.023 (Cadiz Street Overpass and Underpass)	Building	NRHP Eligible; C	Segment 1	A, B, C, D, E, F	Yes	Within LOD
DA.024a-b (Cadiz Pump Station)	Complex	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	97
DA.028 (Dallas Coffin Company)	Building	NRHP Listed; A & C	Segment 1	A, B, C, D, E, F	No	186
DA.029 (Dining Hall)	Building	NRHP Eligible; C	Segment 1	A, B, C, D, E, F	No	257
DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center)	Building	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	69
DA.031 (Sears Roebuck and Company Furniture Warehouse Complex)	Historic District	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	69
DA.041 (Sigel's Liquor Store)	Building	NRHP Eligible; C	Segment 1	A, B, C, D, E, F	No	104
DA.048 (Oak Cliff Box Company)	Building	NRHP Eligible; C	Segment 1	A, B, C, D, E, F	No	189
DA.056 (Corinth Street Underpass and Overpass)	Bridge	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	60
DA.072 (Dallas Floodway Historic District)	Historic District	NRHP Eligible; A	Segment 1	A, B, C, D, E, F	Yes	Within LOD
DA.076a (Guiberson Corporation Machine Shop)	Building	NRHP Eligible; B	Segment 1	A, B, C, D, E, F	Yes	Within LOD
DA.076b (Guiberson Corporation Residence)	Building	NRHP Eligible; B	Segment 1	A, B, C, D, E, F	No	50
DA.080a-e (Proctor and Gamble Complex)	Building	NRHP Eligible; A & C	Segment 1	A, B, C, D, E, F	No	177
DA.082 (Honey Springs Cemetery)	Cemetery	NRHP Eligible; A & D	Segment 1	A, B, C, D, E, F	No	Within 150 feet
DA.104 (Railroad Bridge at E. Illinois Avenue)	Bridge	NRHP Eligible; C	Segment 1	A, B, C, D, E, F	No	199
DA.110b (Linfield Elementary School)	Building	NRHP Eligible A	Segment 1	A, B, C, D, E, F	Yes	Within LOD
DA.194 (W. A. Strain Historic District)	Domestic Single-Family Dwelling	NRHP Listed; A	Segment 1	A, B, C, D, E, F	No	1,774
Ellis County						
EL.040 (Boren-Reagor Cemetery)	Cemetery	NRHP Eligible; D	Segment 2A	A, B, C	No	1,162
Navarro County						
Within the Navarro County APE, no properties are NRHP-listed or NRHP eligible and, therefore, no properties are protected under Section 4(f).						

Table 7-5: Known Section 4(f) Historic Sites within the APE						
Field ID/Property Name	**Property Type**	**NRHP status; Criteria**	**Segment**	**Build Alternative(s)**	**In LOD**	**Approximate Distance from Segment(s) LOD (Feet)**
Freestone						
FR.016a (Furney Richardson School)	Historic Building	NRHP Eligible; A	Segment 4	A, B, D, E	No	705
FR.034 (Johnson African American Cemetery)	Cemetery	NRHP Eligible; A & D	Segment 3C	C, F	No	648
Limestone County						
Within the Limestone County APE, no properties are NRHP-listed or NRHP eligible and, therefore, no properties are protected under Section 4(f).						
Leon County						
LE.001a (Little Flock Cemetery)	Cemetery	NRHP Eligible; A & D	Segment 4	A, B, D, E	No	685
Madison County						
MA.003 (Randolph Cemetery)	Cemetery	NRHP Eligible; A & D	Segment 4	A, B, D, E	No	Within 150 feet
MA.019 (Oxford Cemetery)	Cemetery	NRHP Eligible; A & D	Segment 4	A, B, D, E	No	182
Grimes County						
Within the Grimes County APE, no properties are NRHP-listed or NRHP eligible and, therefore, no properties are protected under Section 4(f).						
Waller County						
Within the Waller County APE, no properties are NRHP-listed or NRHP eligible and, therefore, no properties are protected under Section 4(f).						
Harris County						
HA.004a (Residence at 29702 Castle Road)	Domestic Single-Family Dwelling	NRHP Eligible; C	Segment 5	A, B, C, D, E, F	No	350
HA.024b (Humble Oil Gas Station)	Building	NRHP Eligible; C	Segment 5	A, B, C, D, E, F	No	208
HA.208 (Tex-Tube Complex)	Building	NRHP Eligible; A & C	Segment 5	A, B, C, D, E, F	Yes	Within LOD

Source: AECOM 2019

[a] Property requires additional research and/or survey to be fully evaluated; considering eligible for the purposes of this analysis.

7.6.3.1 Dallas County (Segment 1)

Within the Dallas County APE there are 27 historic properties, which are buildings, structures, objects, or historic districts that are listed in, or eligible for listing in, the NRHP. These historic properties are protected under Section 4(f). Some historic properties included more than one resource, so they were identified with a textual character following the resource ID. The NRHP eligibility of the historic properties identified in Dallas County is included in **Appendix E, Cultural Resources Technical Memorandum**. For additional information about and descriptions of historic properties, refer to **Section 3.19, Cultural Resources**.

Three Section 4(f) historic properties have been identified within the APE and the LOD in Dallas County:

- DA.072 (Dallas Floodway Historic District): NRHP-eligible district (Criterion A)
- DA.076a (Guiberson Corporation Machine Shop): NRHP-eligible buildings (Criterion B)
- DA.110b (Linfield Elementary School): NRHP-eligible building (Criterion A)

The remaining 23 properties are located within the APE, but outside of the LOD. Two of these properties are listed in the NRHP—the Dallas Coffin Company (185 feet from the LOD) and W. A. Strain Historic District (650 feet from the LOD), and 21 have been determined eligible for listing on the NRHP (ranging from 10 feet to 470 feet from the LOD):

- DA.009: NRHP-eligible (Criteria A and C)
- DA.010: NRHP-eligible (Criteria A and C)
- DA.016 (former KIXL Studios): NRHP-eligible (Criteria A and C)
- DA.022 (Chase Bag Company): NRHP-eligible (Criteria A and C)
- DA.023 (Cadiz Street Overpass and Underpass): NRHP-eligible bridge (Criteria A and C)
- DA.024a-b (Cadiz Pump Station): NRHP-eligible (Criteria A and C)
- DA.028 (Dallas Coffin Company): NRHP listed; (Criteria A and C)
- DA.029 (Dining Hall): NRHP-eligible (Criterion C)
- DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center): NRHP-eligible (Criteria A and C)
- DA.031 (Sears Roebuck and Company Furniture Warehouse Complex): NRHP-eligible (Criteria A and C)
- DA.041 (Sigel's Liquor Store): NRHP-eligible (Criterion C)
- DA.048 (Oak Cliff Box Company): NRHP-eligible (Criterion C)
- DA.056 (Corinth Street Underpass and Overpass): NRHP-eligible (Criteria A and C)
- DA.076b (Guiberson Corporation Residence): NRHP-eligible buildings (Criterion B)
- DA.080a-e (Proctor and Gamble Complex): NRHP-eligible (Criteria A and C)
- DA.082 (Honey Springs): NRHP-eligible Cemetery (Criteria A and D)
- DA.104 (Railroad Bridge at E. Illinois Avenue): NRHP-eligible (Criterion C)
- DA.194 (W. A. Strain Historic District): NRHP listed (Criterion A)

7.6.3.2 Ellis County

Within the Ellis County Segment 2A APE, one property is eligible for listing in the NRHP and, therefore, is protected under Section 4(f). No historic properties have been identified within the APE of Segment 2B, 3A, 3B, or 3C in Ellis County. For additional information and descriptions on historic properties identified in Ellis County refer to **Section 3.19, Cultural Resources,** and **Appendix E, Cultural Resources Technical Memorandum.**

7.6.3.2.1 Segment 2A

There is one Section 4(f) historic property within the APE, but outside the LOD in Segment 2A. This property is located approximately 260 feet from the LOD, EL.040 (Boren Cemetery): NRHP-eligible (Criterion D).

7.6.3.2.2 Segment 2B

No potential Section 4(f) historic properties have been identified within the APE of Segment 2B.

7.6.3.2.3 Segment 3A

No potential Section 4(f) historic properties have been identified within the APE of Segment 3A.

7.6.3.2.4 Segment 3B

No potential Section 4(f) historic properties have been identified within the APE of Segment 3B.

7.6.3.2.5 Segment 3C

No potential Section 4(f) historic properties have been identified within the APE of Segment 3C.

7.6.3.3 Navarro County

Within the Navarro County segment APEs, no properties are listed or eligible for listing in the NRHP. Therefore, none is protected under Section 4(f).

7.6.3.4 Freestone County

Within the Freestone County Segment 3C and 4 APEs, two properties (FR.034 and FR.016a) are listed in or eligible for listing in the NRHP and, therefore, are protected under Section 4(f). Both properties are outside of the LOD. For additional information and descriptions on historic properties identified in Freestone County refer to **Section 3.19, Cultural Resources,** and **Appendix E, Cultural Resources Technical Memorandum.**

7.6.3.4.1 Segment 3C

There are no Section 4(f) historic properties within the LOD of Segment 3C in Freestone County. However, one historic property has been identified within the APE, but outside the LOD: FR.034 (Johnson African American Cemetery): NRHP-eligible (Criteria A and D). This historic property is located approximately 1,260 feet from the LOD.

7.6.3.4.2 Segment 4

There are no Section 4(f) historic properties within the LOD of Segment 4 in Freestone County. However, one historic property has been identified within the APE, but outside the LOD: FR.016a (Furney Richardson School): NRHP-eligible (Criterion A). This historic property is located approximately 790 feet from the LOD.

7.6.3.5 Limestone County

Within the Limestone County segment APE's, no properties are listed in or eligible for listing in the NRHP. Therefore, no such properties are protected under Section 4(f).

7.6.3.6 Leon County

Within the Leon County APE, one property is listed in or eligible for listing in the NRHP and, therefore, is protected under Section 4(f). This historic property has been identified within the APE of Segment 4 but outside of the LOD within Leon County. For additional information and descriptions on historic properties identified in Leon County refer to **Section 3.19, Cultural Resources,** and **Appendix E, Cultural Resources Technical Memorandum.**

7.6.3.6.1 Segment 3C

There are no Section 4(f) historic properties within the APE of Segment 3C in Leon County.

7.6.3.6.2 Segment 4

There is one Section 4(f) historic property within the APE of Segment 4 in Leon County, but outside of the LOD: LE.001a (Little Flock Cemetery): NRHP-eligible (Criteria A and D). This historic property is located approximately 1,170 feet from the LOD.

7.6.3.7 Madison County

There are no Section 4(f) historic properties within the Madison County Segment 3C APE. Within the Madison County Segment 4 APE, two properties are listed in or eligible for listing in the NRHP and, therefore, are protected under Section 4(f). No Section 4(f) historic properties have been identified within the LOD of Segment 3C or Segment 4 in Madison County**.** For additional information and descriptions on historic properties identified in Madison County refer to **Section 3.19, Cultural Resources,** and **Appendix E, Cultural Resources Technical Memorandum.**

7.6.3.7.1 Segment 3C

There are no Section 4(f) historic properties within the APE of Segment 3C in Madison County.

7.6.3.7.2 Segment 4

Two Section 4(f) historic properties have been identified within the APE, but outside of the LOD: Property MA.003 (Randolph Cemetery), NRHP-eligible (Criteria A and D) is located within 150 feet of the LOD of Segment 4. Property MA.019 (Oxford Cemetery), NRHP-eligible (Criteria A and D), is located approximately 415 feet from the LOD of Segment 4.

7.6.3.8 Grimes County

Within the Grimes County APE, no properties are listed in or eligible for listing in the NRHP and, therefore, none is protected under Section 4(f).

7.6.3.9 Waller County

Within the Waller County APE, no properties are listed in or eligible for listing in the NRHP and, therefore, none is protected under Section 4(f).

7.6.3.10 Harris County

Within the Harris County Segment 5 APE, two properties are listed in or eligible for listing in the NRHP and, therefore, are protected under Section 4(f), and one resource is within the APE of the Houston Industrial Site Terminal Station Option. For additional information and descriptions on historic

properties identified in Harris County refer to **Section 3.19, Cultural Resources,** and **Appendix E, Cultural Resources Technical Memorandum.**

7.6.3.10.1 Segment 5

There are two Section 4(f) historic properties within the APE of Segment 5, one is within the LOD and the other is outside of the LOD: HA.004a: NRHP-eligible residential building (Criterion C) is within the LOD of Segment 5; and HA.024b (Humble Oil Gas Station), NRHP-eligible building (Criterion C), is located approximately 205 feet from the LOD of Segment 5.

7.6.3.10.2 Houston Industrial Site Terminal Station Option

There is one Section 4(f) historic property within the LOD of the Houston Industrial Site Terminal Station Option: HA.208 (Tex-Tube Complex): NRHP-eligible complex (Criteria A and C).

7.7 Assessment of Use of Section 4(f) Properties

This section summarizes the potential for each Build Alternative to use Section 4(f) properties.

7.7.1 Public Parks/Recreation Areas

The evaluation of the public parks and recreation properties listed in **Table 7-2** considered the location of each property in relation to the Project LOD. Only one property, Fort Boggy State Park in Leon County (Segment 3C), is located within the LOD and was evaluated to determine whether the Project would permanently incorporate the property into the proposed transportation use and, therefore, constitute a permanent use of the property under Section 4(f). FRA's evaluation is described in the following subsection. None of the other parks and recreation properties listed in **Table 7-2** would be permanently incorporated into the Project. Therefore, the Project would not result in a permanent use of the other parks and recreation properties.

Public parks and recreation properties within the Study Area, but outside the LOD, were evaluated to determine whether a constructive use would occur as a result of substantial impairment of the property's significance due to proximity effects (such as operational noise and visual impacts).

7.7.1.1 Noise and Vibration

The analyses in **Section 3.4, Noise and Vibration,** identify maximum distances from the proposed track and stations within which an operational noise or vibration impact to a property could occur. The noise impact distance is based on a combination of variables, including the operating characteristics of the Project (speed, viaduct, or station, for example), the difference between the existing, measured noise level and the noise impact level (as determined by the noise analysis), and the type of terrain and land use between the Project and the property. The vibration impact distance is also based on a combination of variables, including the operating characteristics of the Project (speed, frequency of trains, viaduct, or station, for example), and soil characteristics between the Project and the property. The maximum impact distances for noise and vibration range from 225 feet at stations, to approximately 502 feet along the HSR rail based on estimates determined for representative residential and institutional sites and reported in Tables 3.4-12 and 3.4-13 in **Section 3.4, Noise and Vibration**:

- <225 feet between Dallas Station and IH-20 (Table 3.4-12)
- <348 feet between Dallas Station and IH-20 (Table 3.4-12)
- <322 feet between Freestone Line and CR 3051 (Table 3.4-12)

- <500 feet between TX 7 and FM 977 (Table 3.4-12)
- <502 feet between Grand Parkway and TX 6 (Table 3.4-12)
- <451 at Fairbanks Methodist Church (Table 3.4-13)

Table 7-6 identifies the distance of each property from the Project, the distance within which a noise or vibration impact could occur using the results of the noise and vibration analysis, and a determination whether the property is within the noise or vibration impact area. Properties listed in **Table 7-6** beyond the noise and vibration impact distances would not be impacted by noise and vibration.

For properties within the Study Area but farther away from the Project than the noise and vibration impact distance, no impact would occur that substantially impairs the activities, features or attributes of the properties that qualify them for protection under Section 4(f). Such properties are shaded gray in the table. No permanent or constructive use (related to noise or vibration) of the shaded properties would occur as a result of the Project.

Properties that are not shaded gray in the table would experience a noise and/or vibration impact: Honey Springs Cemetery and William Blair, Jr. Park in Dallas County (Segment 1), Fruitdale Recreation Center (Segment 1) and Cypress Top Historic Park in Harris County (Segment 5). The potential for a constructive use related to noise and vibration is assessed for each of these properties in the following subsections. Although noise and vibration impacts are identified for a portion of Fort Boggy State Park, no constructive use assessment was undertaken as constructive use only applies if there is no permanent incorporation of a protected property into the Project.

7.7.1.2 Visual

The visual assessment determined the distance of each Section 4(f) property from the nearest primary Project element (station or track) in each Build Alternative and qualitatively assessed the potential for a visual change to occur at the property. Considerations in this assessment included the primary purpose of and activities on each Section 4(f) property. **Table 7-7** summarizes the visual assessment findings for each park and recreation property. The potential exists for a Project element to be visible from each property because each property is within the Study Area for visual impacts; however, the visual context of each property is not integral to the primary purpose of the property. FRA assessed that although a visual change could occur, the Project would not cause a visual impact that would result in a substantial impairment of the activities, features or attributes that qualify each property for protection under Section 4(f) and, therefore, no constructive use of the properties in **Table 7-7** would occur.

Table 7-6: Parks and Recreation Areas – Summary of Noise and Vibration Impacts							
Name	**Location (Segment)**	**Park Features**	**Build Alternative(s)**	**Nearest Project Track or Station**	**Approximate Distance of Property from Project Element (Feet)**	**Impact Distance from Project Element (Feet) (Section 3.4)[a]**	**Property Within Maximum Noise and Vibration Impact Distance?**
Pioneer Plaza and Pioneer Cemetery	1428 Young Street / 1400 Marilla (1)	Recorded Texas Historic Landmark, historic gravesites	A, B, C, D, E, F	Station	1,000	<225 (stations)[b]	No
Dallas Heritage Village at Old City Park	1717 Gano Street (1)	Historic Park and historic buildings	A, B, C, D, E, F	Station	1,026	<225 (stations) [b]	No
Trinity River Greenbelt	3700 Sylvan (1)	Boat ramp, nature observation platform, parking, trails	A, B, C, D, E, F	Track	1,500	<225 (Dallas Station to IH-20) [c]	No
Forest Park	2906 Parnell (1)	Outdoor basketball court, picnic tables, trails	A, B, C, D, E, F	Track	948	<225 (Dallas Station to IH-20) [c]	No
Martin Luther King Median	1300 to 2300 Blocks Cedar Crest Boulevard (1)	Sculpture, landscaping	A, B, C, D, E, F	Track	955	<225 (Dallas Station to IH-20) [c]	No
Honey Springs Cemetery	4001 Bulova Road (1)	Cemetery with memorial area	A, B, C, D, E, F	Track	Within 150 feet	<348 (Dallas Station to IH-20) [c]	Yes
William Blair Jr. Park	Southern Dallas (1)	Audubon Center, multiple parks, trails	A, B, C, D, E, F	Track	235	<225 (Dallas Station to IH-20) [c]	Yes
Fruitdale Recreation Center	4408 Vandervoort Drive (1)	Outdoor basketball court, picnic tables, playground, recreation center, parking	A, B, C, D, E, F	Track	225	<225 (Dallas Station to IH-20) [c]	Yes
Seaton Park	3200 Seaton Drive (1)	Playground, softball field	A, B, C, D, E, F	Track	1075	<348 (Dallas Station to IH-20) [c]	No
J.J. Lemmon Park	6100 J.J. Lemmon (1)	Outdoor basketball court, picnic tables, playground, softball field, tennis court, trails, grill, parking	A, B, C, D, E, F	Track	958	<348 (Dallas Station to IH-20) [c]	No

Table 7-6: Parks and Recreation Areas – Summary of Noise and Vibration Impacts							
Name	**Location (Segment)**	**Park Features**	**Build Alternative(s)**	**Nearest Project Track or Station**	**Approximate Distance of Property from Project Element (Feet)**	**Impact Distance from Project Element (Feet) (Section 3.4)[a]**	**Property Within Maximum Noise and Vibration Impact Distance?**
Shelley Pate Memorial Park	1025 North Hill Street, Buffalo (3C)	Pavilion, baseball field, basketball court and grills	C, F	Track	552	<322 (Freestone Line to CR 3051) [c]	No
Fort Boggy State Park	4994 Highway 75 South (3C)	Fishing, boat ramp, hiking, mountain biking, pavilion	C, F	Track	0 (adjacent to LOD)	<500 (TX 7 to FM 977) [c]	Yes
Cypress Top Historic Park	26026 Hempstead Road, Cypress (5)	Historic park, guided tours, trails pavilion, historical buildings	A, B, C, D, E, F	Track	207	<502 (Grand Parkway to TX 6) [c]	Yes
Pitner Park	8600 Block Pitner Road, Houston (5)	Trails, playground, picnic tables, BBQ grills	A, B, C, D, E, F	Track	949	<451 (Fairbanks Methodist Church) [b]	No
Cy-Fair High School	22602 Northwest Freeway, Cypress (5)	Track and field, tennis courts	A, B, C, D, E, F	Track	833	<502 (Grand Parkway to TX 6) [c]	No
Cypress Falls High School	9811 Huffmeister Road, Houston (5)	Track and field, tennis courts, baseball diamonds	A, B, C, D, E, F	Track	1,166	<502 (Grand Parkway to TX 6) [c]	No
Housman Elementary	6705 Housman, Houston (5)	Playground, soccer fields	A, B, C, D, E, F	Station	1,204	<225 (stations) [b]	No
Jersey Meadow Golf Course	8502 Rio Grande St, Jersey Village (5)	Golf course, club house, driving range, restaurant	A, B, C, D, E, F	Track	1356	<451 (Fairbanks Methodist Church) [b]	No

Grey shading indicates no noise impact would occur.

[a] Distances are from locations analyzed and presented in **Section 3.4, Noise and Vibration**.

[b] Representative institutional sites (Table 3.4-13); institutional sites include parks.

[c] Representative residential sites (Table 3.4-12); results for residential sites are more conservative than institutional sites because noise sensitivity is higher at residential sites.

Table 7-7: Parks and Recreation Areas – Summary of Visual Impacts					
Name	**Location**	**Primary Purpose/Park Features**	**Build Alternative(s)**	**Approximate Property Distance from LOD**	**Visual Assessment**
Pioneer Plaza	11428 Young Street	Public open space /Sculptures, walking trails, water features; historic Area	A, B, C, D, E, F	1,000 feet	The proposed station may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a public open space. Surrounding visual context is not integral to the visitor experience. Park users are focused on the features of the park (i.e., sculptures, water features) in the park and the surrounding context is not integral to the visitor experience. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Pioneer Cemetery	400 Marilla	Special Use Park /Recorded Texas Historic Landmark, historic gravesites	A, B, C, D, E, F	1,000 feet	A visual change would occur because of Project proximity. However, visual context is not integral to the primary purpose of the property as a memorial area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Dallas Heritage Village at Old City Park	1717 Gano Street	Special Use Park (Historical Park)/historic buildings	A, B, C, D, E, F	1,000 feet	The proposed station may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a preserved historic area. Structures associated with this park were relocated to this site and are therefore not in their original context. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Trinity River Greenbelt	3700 Sylvan	Recreation/Boat ramp, nature observation platform, parking, trails	A, B, C, D, E, F	900 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. Sylvan Avenue crosses through the area on elevated structure. As such, the proposed track would not be out of character with existing elements. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

Table 7-7: Parks and Recreation Areas – Summary of Visual Impacts					
Name	**Location**	**Primary Purpose/Park Features**	**Build Alternative(s)**	**Approximate Property Distance from LOD**	**Visual Assessment**
Forest Park	2906 Parnell	Recreation/Outdoor basketball court, picnic tables, trails	A, B, C, D, E, F	948 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The park is situated within a developed area with surrounding structures and transportation elements (roadway, railroad) The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Martin Luther King Median	1300 to 2300 Blocks Cedar Crest Boulevard	Landscaping/Sculpture, landscaping	A, B, C, D, E, F	955 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a landscaped area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Honey Springs Cemetery	4001 Bulova Road	Memorial/Cemetery with memorial area	A, B, C, D, E, F	Within 150 feet	A visual change would occur because of Project proximity. However, visual context is not integral to the primary purpose of the property as a memorial area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
William Blair Jr. Park	Southern Dallas	Recreation/Audubon Center, multiple parks, trails	A, B, C, D, E, F	360 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Fruitdale Recreation Center	4408 Vandervoort Drive	Recreation/Outdoor basketball court, picnic tables, playground, recreation center, parking	A, B, C, D, E, F	220 feet	A visual change would occur because of Project proximity. However, visual context is not integral to the primary purpose of the property as a recreation area No substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Seaton Park	3200 Seaton Drive	Recreation/Playground, softball field	A, B, C, D, E, F	1,140 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

Table 7-7: Parks and Recreation Areas – Summary of Visual Impacts					
Name	**Location**	**Primary Purpose/Park Features**	**Build Alternative(s)**	**Approximate Property Distance from LOD**	**Visual Assessment**
J.J. Lemmon Park	6100 J.J. Lemmon	Recreation/Outdoor basketball court, picnic tables, playground, softball field, tennis court, trails, grill, parking	A, B, C, D, E, F	1,000 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Shelley Pate Memorial Park	1025 North Hill Street, Buffalo	Recreation/Pavilion, baseball field, basketball court and grills	C, F	420 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Fort Boggy State Park	4994 Highway 75 South	Recreation/Fishing, boat ramp, hiking, mountain biking, pavilion	C, F	Within LOD	The proposed track may be visible from the east side property in the distance. However, the forested context of the property would provide the primary visual context for east side users. The Project would cause no substantial impairment to the east side property's activities, features or attributes that qualify the property for protection under Section 4(f). The proposed track would permanently use a portion of the west side property. An assessment of potential for constructive use of the west side property due to visual change does not apply.
Cypress Top Historic Park	26026 Hempstead Road, Cypress	Recreation Area/ guided tours, community center, picnic table pavilion, vintage buildings[28]	A, B, C, D, E, F	300 feet	A visual change would occur because of Project proximity to the property. However, resources were moved to this site and are not in their original setting and therefore visual context is not integral to the primary purpose of the property as a preserved historic area. No substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Pitner Park	8600 Block Pitner Road, Houston	Recreation/Trails, playground, picnic tables, BBQ grills	A, B, C, D, E, F	1,000 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

[28] Cypress Top Historic Park contains one historic property, Humble Oil Gas Station, which is discussed in **Section 7.7.2**, **Section 6(f).**

Table 7-7: Parks and Recreation Areas – Summary of Visual Impacts					
Name	**Location**	**Primary Purpose/Park Features**	**Build Alternative(s)**	**Approximate Property Distance from LOD**	**Visual Assessment**
Cy-Fair High School	22602 Northwest Freeway, Cypress	Recreation/Track and field, tennis courts	A, B, C, D, E, F	940 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Cypress Falls High School	9811 Huffmeister Road, Houston	Recreation/Track and field, tennis courts, baseball diamonds	A, B, C, D, E, F	600 feet	A visual change would occur because of Project proximity to the property. However, visual context is not integral to the primary purpose of the property as a recreation area. No substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Housman Elementary	6705 Housman, Houston	Recreation/Playground, soccer fields	A, B, C, D, E, F	1,260	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
Jersey Meadow Golf Course	8502 Rio Grande St, Jersey Village	Recreation/Golf course, club house, driving range, restaurant	A, B, C, D, E, F	1,080 feet	The proposed track may be visible from the property in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

7.7.1.3 Dallas County (Segment 1)

7.7.1.3.1 Honey Springs Cemetery

The Honey Springs Cemetery (also known as Bulova Cemetery and Homecoming Cemetery) is located at 4001 Bulova Street in Dallas (**Figure 7-16**). The cemetery is associated with the slaves of the William Brown Miller plantation, which was owned by a prominent family associated with the early settlement of Dallas. After Emancipation, the descendants of the Miller slaves continued to be buried in the cemetery. Many of the graves are unmarked, but a memorial wall constructed circa 2003 lists the names of those known to be interred on the property. Honey Springs Cemetery is protected by Section 4(f) as a public park because the memorial wall serves as a publicly accessible place for remembering the early settlement and heritage of Dallas. None of the Build Alternatives would permanently incorporate any portion of the existing property or change access to the property; therefore, no permanent use of Honey Springs Cemetery would occur.

FRA's assessment of the potential for constructive use of the property determined that the Project would cause a noise impact to Honey Springs Cemetery, but not a visual impact (**Tables 7-6** and **7-7**). However, FRA assessed that serenity and quiet are not significant attributes that qualify the property for protection under Section 4(f), and Honey Springs Cemetery would continue to serve its primary purpose as a publicly accessible place for remembering the early settlement and heritage of Dallas. Therefore, the Project would not substantially impair the activities, features or attributes that qualify the property for protection under Section 4(f). The Project would not result in a constructive use of the Honey Springs Cemetery.

7.7.1.3.2 William Blair, Jr. Park

William Blair Jr. Park, formerly Rochester Park, is an approximately 983-acre park located on the southeast side of IH-45, outside of the LOD. Park facilities are primarily located over 1 mile east of the Study Area. William Blair Jr. Park is part of the larger ecological region of the Great Trinity Forest that is approximately 6,000 acres. The forest largely remains in its natural state; however, parts of the forest are home to amenities outside of the Study Area, including the Trinity River Audubon Center, William Blair Jr. Park and the Texas Buckeye Trail.[29] A proposed 15-mile trail would be located along the Trinity River and into the forest. Seventy-six acres of William Blair Jr. Park are within the Study Area but not in the LOD. None of the Build Alternatives would permanently incorporate any portion of the existing property or change access to the property; therefore, no permanent use of William Blair Jr. Park would occur.

FRA's assessment of the potential for constructive use of the property identified that a portion of the park is within the area of potential noise and vibration impact (within 200 feet of the LOD) identified in **Section 3.4, Noise and Vibration** analysis. However, that portion of the park property contains no developed amenities or park activities. For this reason, FRA assessed that no noise or vibration impacts would occur to William Blair Jr. Park. In considering the potential for a visual impact of the Project to William Blair Jr. Park, FRA assessed that the proposed track may be visible from the portions of the property with developed amenities and activities in the distance. However, visual context is not integral to the primary purpose of the property as a recreation area. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

[29] City of Dallas, Trinity River Corridor Project, Great Trinity Forest, accessed November 2019, http://www.trinityrivercorridor.com/recreation/great-trinity-forest.

7.7.1.3.3 Fruitdale Recreation Center

Fruitdale Recreation Center was established in 1964 and is located south of East Illinois Avenue. This neighborhood park encompasses 5.1 acres. The park is located on the western side of corridors containing large transmission towers and an existing railroad. At its closest point, the LOD of Segment 1 would be approximately 220 feet east of the property and east of the transmission towers and railroad on a viaduct. None of the Build Alternatives would permanently incorporate any portion of the existing property or change access to the property; therefore, no permanent use of Fruitdale Recreation Center would occur.

FRA's assessment of the potential for constructive use of the property determined that the Project could cause a noise impact to Fruitdale Recreation Center, but not a visual impact (**Tables 7-6** and **7-7**). However, FRA assessed that serenity and quiet are not significant attributes that qualify the property for protection under Section 4(f), and Fruitdale Recreation Center would continue to serve its primary purpose as a recreation area. Therefore, the Project would not substantially impair the activities, features or attributes that qualify the property for protection under Section 4(f). The Project would not result in a constructive use of the Fruitdale Recreation Center.

7.7.1.4 Leon County (Segment 3C)

7.7.1.4.1 Fort Boggy State Park

Fort Boggy State Park is located on either side of IH-45, a four-lane divided highway, approximately 4 miles south of Centerville (**Figure 7-13**). The 1,847-acre park is owned and managed by TPWD. Coordination between FRA and TPWD identified the primary purpose of Fort Boggy State Park as recreation (camping, picnicking, hiking, mountain biking, swimming, small boating, fishing, hunting, and ranger-led programs):

- The portion of the property on the west side of IH-45 (approximately one-third of the park or 600 acres according to TPWD) is undeveloped with forest and wetlands; it can be used for hunting during the designated seasons with permission from TPWD.[30] The west side of the park is not routinely accessible to park users due to locked gates with "No Trespassing" signs (five along the boundary with IH-45). In 2018, TPWD indicated that future planning for the west portion of the property could include trails and an equestrian area; however, realization of such a plan would depend on the ability of TPWD to secure funding for a permanent access center, driveway, parking and supporting staff. Therefore, for the foreseeable future, activities on the west property are limited to seasonal hunting.
- The portion of the property on the east side of IH-45 (approximately two-thirds of the park or 1,247 acres) contains developed and undeveloped areas. The developed area includes a 15-acre lake, a day use area, campsites and five cabins. The lake is open to small boats, canoes and kayaks. The undeveloped areas are forested with hiking trails. The nearest of the east side amenities to the LOD is a trail that is more than a quarter-mile from the LOD. Access to the east side of the park is from Highway 75.

The LODs of Build Alternatives A, B, D and E are approximately 7 miles west of the property. Build Alternatives A, B, D and E would not permanently incorporate any portion Fort Boggy State Park and no change in access to the park would occur. Because of the distance between the LODs and the park, no constructive use of Fort Boggy State Park would occur as a result of those alternatives. Therefore, Build

[30] August 16, 2018, E-mail correspondence with TPWD staff informed the Project team that hunting was allowed on undeveloped portions of Fort Boggy State Park west of IH-45 during designated seasons.

Alternatives A, B, D, and E would not adversely affect the features, attributes or activities that qualify the property for protection under Section 4(f).

TPWD identified concerns regarding potential for Project impacts to Fort Boggy State Park, including loss of property, and impacts on park activities related to changes in access, noise, vibration and visual impacts associated with Build Alternatives C and F. FRA assessed each of these concerns as they relate to potential for adverse effects to the features, attributes or activities on the property.

Loss of property: The proposed viaduct of Build Alternatives C and F (Segment 3C) would be aligned on the west side of IH-45, primarily within the existing highway ROW. However, the existing ROW is insufficiently wide to accommodate the existing highway, reconstruction of the existing frontage road and the proposed LOD and drainage improvements. Therefore, permanent incorporation of a portion of the west side of Fort Boggy State Park into the proposed transportation use would be required. Specifically, permanent incorporation of approximately 67 acres (3.6 percent) of the overall park property (including east and west side properties) would occur in the form of a strip of land the length of the property along the west side of IH-45.

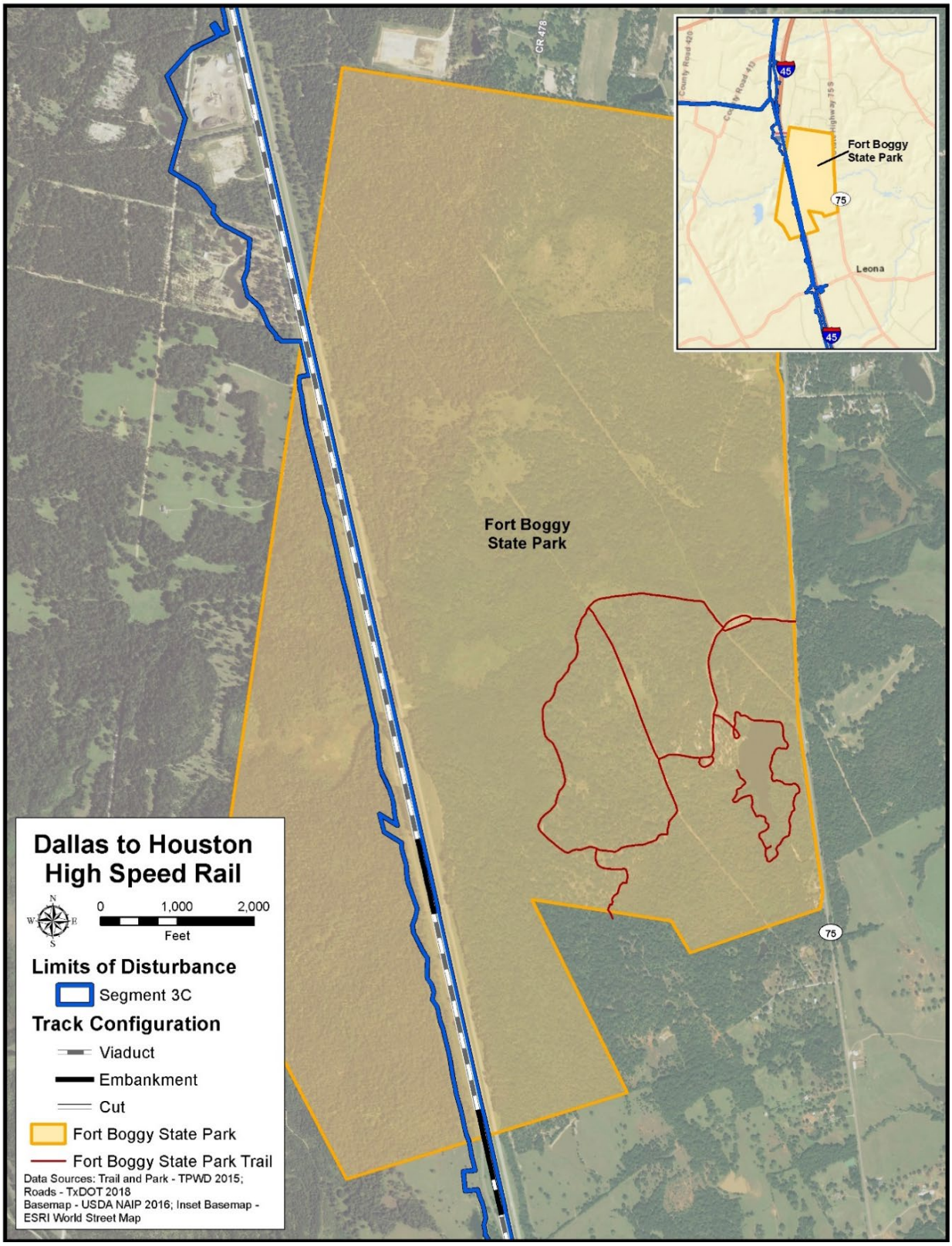
Incorporation of a portion of the property by Segment 3C in Build Alternatives C and F would reduce the seasonal hunting area on the west side of the park by approximately 11 percent. Although Build Alternatives C and F would reduce the amount of land that is available for hunting on the property, approximately 89 percent of the property on the west side of IH-45 would remain as a single, large landholding and available for the hunting as the primary function of that portion of the property.

Changes in Access: As previously described, the area that would be permanently incorporated into Segment 3C is currently undeveloped, forested land on the west side property that does not contain developed recreational features. (**Figure 7-13**). The viaduct would enable Build Alternatives C and F to provide for continued access under the structure to the west side property during Project operations.

During construction of Build Alternatives C or F, one or more access gates to the west side property of Fort Boggy State Park along IH-45 may be temporarily blocked by construction equipment and activities; at the end of construction, obstructions to gates would be removed and access to the gates would be restored. However, existing gates along the north, west and south sides of the property would not be affected by the Project; thus, public access to the property from these other gates would be unchanged. As stated in **RF-MM#3, Fort Boggy State Park Recreational Facilities Mitigation**, TCRR would coordinate with TPWD during final design and construction planning regarding providing access to the west side property from gates along IH-45. For example, TCRR would consider restricting construction activities in the area of Fort Boggy State Park during the time period(s) when TPWD enables hunting access to the west side property. By restricting construction activities, TCRR would minimize or avoid, where practicable, disruption of public access to the west side property of Fort Boggy State Park. TCRR, in coordination with TPWD, would make public notice of hunting restrictions and temporary closure of gates along IH-45 during Project construction.

Noise Impacts: Recreational areas and facilities of Fort Boggy State Park, which are located on the east side property, are 1,320 feet from the LOD, which is greater than the distance in which a noise impact could occur.

Figure 7-13: Potential Section 4(f) Use of Fort Boggy State Park



Source: AECOM, 2019.

To assess the potential for noise impacts to the west side of Fort Boggy State Park, where property would be permanently incorporated into the Project, FRA considered the noise analysis for a nearby residential property. The Final EIS noise analysis in **Section 3.4, Noise and Vibration,** predicted noise levels at representative locations along the Project. Although the analysis did not specifically analyze Fort Boggy State Park, the analysis of Segment 3C in Build Alternatives C and F included a residential location approximately 4,000 feet north of the park, on the west side of IH-45 (known at LT-13). The residence is adjacent to (0 feet from) the existing frontage road with the home structure approximately 50 feet from the rear property line, a boundary shared with the IH-45 ROW line. The analysis at this residential location is helpful for understanding potential noise impacts at Fort Boggy State Park because the residence is adjacent to the IH-45 ROW, as is also the case with the west portion of the park property. In addition, the noise analysis for the residential property used a unit of measurement that considers daytime and nighttime noise exposure of the property, which is known as the equivalent, day-night sound level (Ldn). This unit of measure is applicable to the park property because TPWD permits daytime as well as nighttime uses on the property. The noise analysis for LT-13 determined that the existing Ldn Project sound level is 62 decibels (**Table 3.4-7**). The noise impact analysis provides a Project noise level of 58 Ldn (**Table 3.4-12**). Using FTA's noise impact methodology and noise impact criteria graph (**Figure 3.4-3**), a Project noise level of 58 decibels Ldn is below the 59 decibels Ldn threshold for impact. Thus, no operational noise impact would occur at the residence or at Fort Boggy State Park.

Vibration Impacts: The vibration analysis in **Section 3.4, Noise and Vibration,** concluded that HSR operations would cause no damage to structures. The LODs of Build Alternatives A, B, D and E are approximately 7 miles west of the property. Build Alternatives A, B, D and E would not permanently incorporate any portion Fort Boggy State Park and no vibration impacts to the park would occur.

Although the analysis did not specifically analyze Fort Boggy State Park, the analysis of Segment 3C in Build Alternatives C and F assessed potential for vibration impacts to residences. The residential land use category included the same residence (LT-13). The analysis at this residential location is helpful for understanding potential vibration impacts at Fort Boggy State Park because the residence is adjacent to the IH-45 ROW, as is also the case with the park property. The vibration analysis for LT-13 determined that no operational vibration impacts would occur within 500 feet of the LOD. Since the developed areas of Fort Boggy State Park are more than 500 feet from the LOD, Build Alternatives C and F would have no vibration impact to those developed areas. Vibration impacts could occur on the portion of the west side property that is within 500 feet of the LOD. However, as described in **Section 3.4, Noise and Vibration,** for Build Alternatives C or F, TCRR would conduct additional vibration assessment during final design of the viaduct. The purpose of the assessment would be to determine if a vibration impact to the west side property could occur, evaluate specific final design measures (such as track ballast and track fastener types) to reduce or eliminate the potential for vibration to occur on the west side property, identify additional feasible and reasonable mitigation measures, if needed, to address vibration impacts, and incorporate all vibration-reducing and mitigation measures into the final project design.

Visual Impacts: The LODs of Build Alternatives A, B, D and E are approximately 7 miles west of the property. Build Alternatives A, B, D and E would not be visible to or cause a visual impact to the park. Because of the distance between the LODs and the park, no constructive use of Fort Boggy State Park would occur as a result of those alternatives. No adverse effect on the features, attributes, or activities would occur under Build Alternatives A, B, D or E that qualify the property for protection under Section 4(f).

In Build Alternatives C and F, the HSR viaduct has the potential to be visible from areas of the east side of the park that are actively managed for recreational activities (see **Figures 3.10-62** and **3.10-63** in **Section 3.10, Aesthetics and Scenic Resources**). The viaduct would be elevated above the existing

ground approximately 40 feet to the top of the rail. This height is almost to the height of the tallest trees on the property, which would act to shield views of the viaduct from users of the property at ground-level. The forested condition of the property dominates foreground, middleground and background views of east side park users during leaf-on as well as leaf-off seasons. The forest would remain dominant in user views during leaf-on or leaf-off conditions, although portions of the viaduct and train operations may be partially visible through the trees during leaf-off conditions.

Hunters' views in forested areas of the park that are closer to the viaduct (east and west sides of the park) are also dominated by the forest in leaf-on and leaf-off conditions, but the existing IH-45 infrastructure and traffic are also visible depending on the user location and the type and density of the vegetation between the user and the highway. Under the same conditions, the viaduct in Segment 3C may also be part of hunters' views through the forest.

FRA concludes that Build Alternatives A, B, D, and E would have no visual impact on Fort Boggy State Park; no substantial impairment of the activities, features or attributes (public recreational facilities) that qualify the property for protection under Section 4(f). With regard to Build Alternatives C and F, although the viaduct may be visible to park users, the visual change would not substantially impair the activities, features or attributes (public recreational facilities) that qualify the property for protection under Section 4(f).

Section 7.9, All Possible Planning to Minimize Harm, describes measures to minimize harm to Fort Boggy State Park.

FRA's assessment in the Draft EIS was that Build Alternatives C and F, including all measures to minimize harm (such as any avoidance, minimization, mitigation or enhancement measures), would have a *de minimis* impact on Fort Boggy State Park because the Project would not adversely affect the activities, features, or attributes that qualify Fort Boggy State Park for protection under Section 4(f). The public had an opportunity to review and comment on FRA's proposed *de minimis* determination as part of the Draft EIS comment period (December 22, 2017 to March 9, 2018). Of the approximately 25,000 comments received, 3 were specifically about potential impacts and/or closure of Fort Boggy State Park. During the Draft EIS comment period, TPWD disagreed with the proposed *de minimis* determination. FRA continued coordination with TPWD about impacts to Fort Boggy State Park after the close of the Draft EIS comment period, and obtained updated information from TPWD on park programming to better inform the Final EIS. Written concurrence from TPWD is required for FRA to finalize a *de minimis* impact determination for Build Alternatives C or F. Therefore, on February 12, 2020, FRA sent a letter to TPWD indicating intent to make a *de minimis* impact finding for Build Alternatives C and F as described in **Section 7.12, Section 4(f) Conclusion,** and seeking concurrence from TPWD. On March 13, 2020, TPWD responded by letter to FRA disagreeing with the proposed *de minimis* impact determination (see **Appendix C, Public and Agency Involvement Correspondence)**. TPWD asserts that incorporation of land from the park into the proposed Project in Build Alternatives C and F would adversely affect the activities, features, and attributes that qualify Fort Boggy State Park for protection under Section 4(f).

Based on TPWD's opinion that Build Alternatives C and F would adversely affect the activities, features, and attributes that qualify Fort Boggy State Park for protection, FRA has determined that Build Alternatives C and F would result in a Section 4(f) use of Fort Boggy State Park.

7.7.1.5 Harris County (Segment 5)

7.7.1.5.1 Cypress Top Historic Park

Cypress Top Historic Park is owned by Harris County and is located along Hempstead Road. The park includes trails, a pavilion, historical buildings and offers guided tours. The property is approximately 300 feet northeast from the LOD.

None of the Build Alternatives would permanently incorporate the property into the transportation use or change access to the park. Therefore, no permanent use of land from Cypress Top Historic Park would occur as a result of the Project.

FRA's assessment of the potential for constructive use of the property considered the distance from the LOD to Cypress Top Historic Park (300 feet). FRA's assessment of the potential for operation noise impacts to Cypress Top Historic Park identified that an operational noise impact could occur because noise effects could extend as far as 502 feet from the track. However, recreational activities within that portion of the property are not noise sensitive (community center, picnic table pavilion, and tours of vintage buildings) because the recreation area is in a developed setting along an existing four-lane highway and freight rail line. The noise impacts due to the Project would not substantially impair the activities, features or attributes of the property that qualify it for protection under Section 4(f). Therefore, the Project would not result in a constructive use of the Cypress Top Historic Park.

7.7.2 Historic Properties

As described in **Section 7.6.3, Section 4(f) Historic Properties**, historic properties have been identified within the APE through the Section 106 process. FRA assessed the potential for the Project to use each of these historic properties, which is presented in this section. The NHPA Section 106 effect determinations, in **Section 3.19, Cultural Resources, Table 3.19-9**, informed FRA's Section 4(f) use assessments for historic properties.

For each Section 4(f) property, FRA assessed whether the Project would use the property. Where permanent incorporation of a historic property would occur, there would be a permanent use of the property under Section 4(f). Where no permanent incorporation land from a historic property would occur, no permanent use of the property would occur under Section 4(f). For properties where no permanent use would occur, FRA assessed whether the Project would cause a constructive use of the property. In this assessment, FRA considered that no constructive use occurs when the Project is determined under Section 106 to have "no adverse effect" on a historic site. **Table 7-8** summarizes FRA's Section 4(f) use determinations for each property within the APE. More detail on FRA's Section 106 determinations may be found in **Section 3.19, Cultural Resources.** Explanations of the potential for use of Section 4(f) properties, as well as FRA's determinations under Section 4(f), are provided in the subsections that follow **Table 7-8**.

Table 7-8: Summary of Use Analysis – Section 4(f) Historic Sites							
Section 4(f) Property	Segment	Distance from LOD (Feet) (Project)	Section 106 Effect Determination	Section 4(f) Use Determination			
				No Use	De minimis Use	Constructive Use	Use
Dallas County							
DA.009 (Julius Yonnack House)	Segment 1	268	No Adverse Effect	•			
DA.010 (Jacob Yonnack House)	Segment 1	309	No Adverse Effect	•			
DA.016 (former KIXL Studios)	Segment 1	0 (Adjacent to LOD)	No Adverse Effect	•			
DA.022 (Chase Bag Company)	Segment 1	52	No Adverse Effect	•			
DA.023 (Cadiz Street Underpass and Overpass)	Segment 1	Within LOD	Adverse Effect*				•
DA.024a-b (Cadiz Street Pump Station)	Segment 1	97	No Adverse Effect	•			
DA.028 (Dallas Coffin Company)	Segment 1	186	No Adverse Effect	•			
DA.029 (Dining Hall)	Segment 1	257	No Adverse Effect	•			
DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center)	Segment 1	69	No Adverse Effect	•			
DA.031 (Sears Roebuck and Company Furniture Warehouse Complex)	Segment 1	69	No Adverse Effect	•			
DA.041 (Sigel's Liquor Store)	Segment 1	104	No Adverse Effect	•			
DA.048 (Oak Cliff Box Company)	Segment 1	189	No Adverse Effect	•			
DA.056 (Corinth Street Underpass and Overpass)	Segment 1	0 (Adjacent to LOD)	Adverse Effect*	•			
DA.072 (Dallas Floodway Historic District)	Segment 1	Within LOD	No Adverse Effect	•			
DA.076a (Guiberson Corporation, machine shop)	Segment 1	Within LOD	Adverse Effect				•
DA.076b (Guiberson Corporation, Family Residence and Office)	Segment 1	50	Adverse Effect	•			
DA.080a-e (Proctor and Gamble Complex)	Segment 1	177	No Adverse Effect	•			
DA.082 (Honey Springs Cemetery)	Segment 1	Within 150 feet	Adverse Effect*	•			
DA.104 (Railroad Bridge at E. Illinois Avenue)	Segment 1	199	No Adverse Effect*	•			

Table 7-8: Summary of Use Analysis – Section 4(f) Historic Sites							
Section 4(f) Property	**Segment**	**Distance from LOD (Feet) (Project)**	**Section 106 Effect Determination**	**Section 4(f) Use Determination**			
				No Use	**De minimis Use**	**Constructive Use**	**Use**
DA.110b (Linfield Elementary School)	Segment 1	Within LOD	Adverse Effect				•
DA.194 (W. A. Strain Historic District)	Segment 1	1,774	No Adverse Effect*	•			
Ellis County							
EL.040 (Boren-Reagor Cemetery)	Segment 2A	1,162	No Adverse Effect	•			
Freestone County							
FR.016a (Furney Richardson School)	Segment 4	705 (A, B, D, E)	No Adverse Effect*	•			
FR.034 (Johnson African American Cemetery)	Segment 3C	648 (C, F)	No Adverse Effect	•			
Leon County							
LE.001a (Little Flock Cemetery)	Segment 4	685 (A, B, D, E)	No Adverse Effect	•			
Madison County							
MA.003 (Randolph Cemetery)	Segment 4	Within 150 feet (A, B, D, E)	Adverse Effect*	•			
MA.019 (Oxford Cemetery)	Segment 4	182 (A, B, D, E)	No Adverse Effect*	•			
Harris County							
HA.004a (Residence at 29702 Castle Road)	Segment 5	340 (C)	Adverse Effect*	•			
HA.024b (Humble Oil and Gas Station)	Segment 5	208	No Adverse Effect	•			
Houston Industrial Site Terminal Station Option							
HA.208 (Tex-Tube Complex)	Houston Industrial Site Terminal Station Option	Within LOD	Adverse Effect* (Houston Industrial Site Terminal Station Option)				•

Source: AECOM 2019.

Note: THC concurred with Section 106 determination unless indicated by "*", in which cases THC consultation is ongoing.

7.7.2.1 Noise and Vibration

The analyses in **Section 3.4, Noise and Vibration,** identify distances from the proposed track and stations within which an operational noise or vibration impact to a historic property could occur. The noise distance is based on a combination of variables, including the operating characteristics of the Project (speed, viaduct, or station, for example), the difference between the existing, measured noise level and the noise impact level (as determined by the noise analysis), and the type of terrain and land use between the Project and the property. The vibration distance is also based on a combination of

variables, including the operating characteristics of the Project (speed, frequency of trains, viaduct, or station, for example), and soil characteristics between the Project and the property.

Table 7-9 lists the historic properties for which an "adverse effect" determination has been made under Section 106 regarding the Project. In the table, the distance of each property from the Project is identified, as well as the distance within which a noise or vibration impact would occur using the results of the noise analysis, and a determination whether the property is within the noise or vibration impact area. For properties within the APE but farther away from the Project than the noise and vibration impact distances, no impact would occur that substantially impairs the activities, features or attributes of the properties that qualify them for protection under Section 4(f). Such properties are shaded gray in the table. No permanent or constructive use (related to noise or vibration) of the shaded properties would occur as a result of the Project. Properties that are not shaded gray in the table would experience a noise or vibration impact: DA.056 (Corinth Street Underpass and Overpass), DA.076b (Guiberson Corporation Dwelling), and DA.082 (Honey Springs Cemetery) in Dallas County (Segment 1); and MA.003 (Randolph Cemetery) in Madison County (Segment 4). The potential for a constructive use related to noise is assessed for each of these properties.

Although a noise and vibration impact is identified for the following properties within the LOD (DA.023 (Cadiz Street Overpass and Underpass), DA.076a (Guiberson Corporation Machine Shop) in Dallas County (Segment 1); and HA.208 (Tex-Tube Corporation) in Harris County), no constructive use assessment was undertaken; constructive use only applies if there is no permanent incorporation of a protected property.

7.7.2.2 Visual

The visual assessment determined the distance of each Section 4(f) property from the nearest primary Project element (station or track) in each Build Alternative and qualitatively assessed the potential for a visual change to occur at the property. Considerations in this assessment included the primary purpose of and activities on each Section 4(f) property, and the existing visual context of each property (such as terrain, vegetation, and urban or suburban development surrounding the property). Visual assessment findings are provided in the discussions of each historic property. In each case, the potential exists for a Project element to be visible from each property; however, the visual setting of each property is not integral to the primary purpose of the property. FRA assessed that although a visual change could occur, the value of each property is not derived in substantial part by its setting. As a result, FRA assessed that the visual impact of any of the Build Alternatives would not cause a substantial impairment of the activities, features or attributes that qualify each property for protection under Section 4(f); no constructive use of the properties would occur because of the Project. **Table 7-10** summarizes the visual assessment findings for historic properties.

Table 7-9: Historic Properties – Summary of Noise and Vibration Impacts							
Field ID/Property Name	**Address (Segment)**	**Property Type/Purpose and Significance[a]**	**Build Alternative(s)**	**Nearest Project Track or Station**	**Approximate Distance of Property from Project Element (Feet)**	**Impact Distance from Project Element (Feet) (Section 3.4)[b]**	**Property Within Maximum Noise and Vibration Impact Distance Area?**
DA.056 (Corinth Street Underpass and Overpass)	Corinth Street and Railroad, Dallas (1)	Bridge/A – Community development, commerce, C – Architecture and design	A, B, C, D, E, F	Track	0 (adjacent to LOD)	<225 (Dallas Station to IH-20)*	Yes
DA.076b (Guiberson Corporation)	1000 Forest Avenue, Dallas (1)	Building/B – Association with Samuel A. Guiberson	A, B, C, D, E, F	Track	0 (adjacent to LOD)	<225 (Dallas Station to IH-20)*	Yes
DA.082 (Honey Springs Cemetery)	4001 Bulova Street, Dallas (1)	Cemetery/A – Early settlement, ethnic heritage, D – Potential for important information	A, B, C, D, E, F	Track	Within 150 feet	<348 (Dallas Station to IH-20)*	Yes
MA.003 (Randolph Cemetery)	5577 Dawkins Road, Normangee (4)	Cemetery/A – History, D – Potential for important information	A, B, D, E	Track	Within 150 feet	<338 (FM 977 to FM 2289)*	Yes
HA.004a (Residence at 29702 Castle Road)	29702 Castle Road, Waller (5)	Dwelling/C - Architecture	A, B, C, D, E, F	Track	508	<210 (Old Highway 290 to Grand Parkway)*	No

Gray shading indicates no noise or vibration impact would occur.

[a] The Section 106 criteria for significance are used to identify purpose and significance under Section 4(f); Letter designations are the Section 106 criteria designations.

[b] Distances are from locations analyzed and presented in **Section 3.4, Noise and Vibration**. Locations with an "*" are representative residential sites (Table 3.4-12); results for residential sites are more conservative than institutional sites because noise sensitivity is higher at residential sites.

Table 7-10: Historic Properties – Summary of Visual Impacts				
Field ID/ Property Name	**Primary Purpose/ Property Type**	**Build Alternative(s)**	**Approximate Distance from Segment(s) LOD (Feet)**	**Visual Assessment**
DA.056 (Corinth Street Underpass and Overpass)	Historic Interpretation/ Bridge	A, B, C, D, E, F	0 (Adjacent to LOD)	The proposed track on viaduct would be visible from the property because of proximity. However, the property derives its value as a historic property from its association with the history of community development and commerce as well as engineering; the property does not derive its value in substantial part from its setting. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
DA.076b (Guiberson Corporation)	Historic Interpretation/ Building	A, B, C, D, E, F	50	The proposed track on viaduct would be visible from the property because of proximity. However, the property derives its value from its association with the Guiberson family and corporation. Although removal of DA.076a would diminish the association, the dwelling would be able to continue to serve its purpose of interpreting its history as the Guiberson family home. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
DA.082 (Honey Springs Cemetery)	Historic Interpretation/ Cemetery	A, B, C, D, E, F	0 Within 150 feet	The proposed track on viaduct would be visible from the property because of proximity. However, the property derives its value from its association with early settlement of Dallas and community development of South Dallas after Emancipation and potential to yield information important to history; the property does not derive its value in substantial part from its setting. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
MA.003 (Randolph Cemetery)	Historic Interpretation/ Cemetery	A, B, D, E	Within 150 feet	The proposed track on viaduct would be visible from the property because of proximity. However, the Randolph Cemetery derives its value from its potential to yield important information; the property does not derive its value in substantial part from its setting. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).
HA.004a (Residence at 29702 Castle Road)	Historic Interpretation/ Domestic Single-Family Dwelling	A, B, C, D, E, F	340	The proposed track on viaduct would be visible from the property because of proximity. However, the property derives its value from its architecture; the property does not derive its value in substantial part from its setting. The Project would cause no substantial impairment to the property's activities, features or attributes that qualify the property for protection under Section 4(f).

7.7.2.2.1 Dallas County

FRA's evaluations of use for Section 4(f) historic properties in Segment 1 of the Project within Dallas County are described below.

Site DA.023 (Cadiz Street Underpass and Overpass)

The Cadiz Street Underpass and Overpass are transportation features constructed by the Works Progress Administration in the 1930s along Cadiz Street, near its intersection with Austin Street, in Dallas (**Figure 7-14**). The property consists of arches between the piers along the balusters of Cadiz Street. FRA determined DA.023 to be eligible for listing in the NRHP at the local level of significance under Criterion A for community development and Criterion C for architecture and design. The existing property setting is an urban mix of non-historic and historic buildings, structures, and objects, including empty lots where buildings have been removed.

This property is located adjacent to (0 feet from) the LOD of Segment 1, near the location of the Dallas Terminal Station. The proposed station would include roadway improvements, the station building, parking and circulation elements including pedestrian bridges over existing transportation facilities. Based on **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details,** the proposed pedestrian bridge would cross over Cadiz Street perpendicularly and would include a physical connection to the property. The pedestrian connection would be physically and permanently attached to a portion of the property, requiring permanent incorporation of a portion of the property into the Dallas Terminal Station. The details regarding materials, design and specific location of the pedestrian bridge connection would be determined during final design.

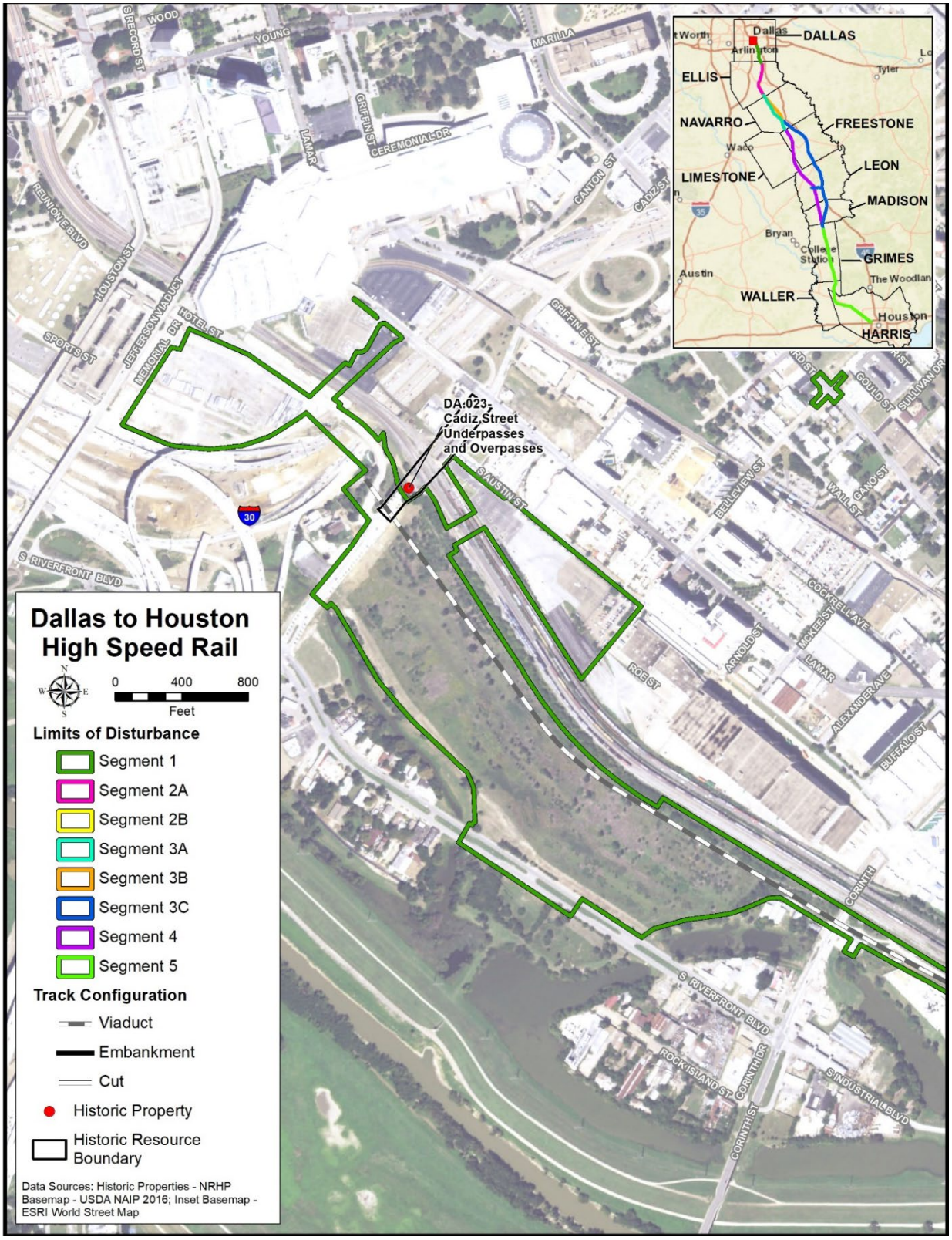
Under Section 106, FRA assessed that the Dallas Terminal Station in any Build Alternative would result in an adverse effect to the property because the pedestrian bridge connection, as well as the proximity of the proposed station to the property, would diminish the property's integrity of setting, feeling, design, and potentially materials and workmanship. Under Section 4(f), the pedestrian bridge connection would be a permanent use of a portion of the Cadiz Underpass and Overpass property.

Site DA.056 (Corinth Street Underpass and Overpass)

FRA determined through Section 106 that the Corinth Street Underpass and Overpass, constructed in 1915, is eligible for listing in the NRHP under Criterion A for community development and commerce and Criterion C for engineering. The property carries railroad traffic, allowing the flow of traffic along Corinth Street. The proposed track would be on viaduct adjacent to the property. None of the Build Alternatives would remove or cause physical destruction of the property, nor would any Build Alternative permanently incorporate Corinth Street Underpass and Overpass into the transportation use.

FRA's assessment of the potential for a constructive use of the Corinth Street Underpass and Overpass under Section 4(f) considered the finding under Section 106,as detailed **in Section 3.19.5.2.1, Cultural Resources, Segment 1,** that any Build Alternative would have an adverse effect on the property because the Project would partially obstruct views of the property from the southwest side. Under Section 106, this change would diminish the property's integrity of setting, feeling, and design.

Figure 7-14: Dallas County (Segment 1) Section 4(f) Properties



Source: AECOM 2019

Under Section 4(f), FRA also considered the potential for visual impacts, assessing that the Project would be visible from the property because the viaduct would be visible from areas adjacent to the LOD. Although a visual change would occur, the property derives its value from its association with the history of community development and commerce as well as engineering; the property does not derive its value in substantial part from its setting. Thus, FRA has assessed that, whereas the visual impact of the Project would potentially diminish the property's integrity under Section 106, the visual impact of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

FRA considered the potential for operational noise impacts and annoyance[31] effects from vibration of Project operations on the property. As indicated in **Section 3.4, Noise and Vibration**, operational vibration levels would be well below the threshold for damage to structures. The analysis assessed that noise impacts and annoyance vibration effects from the Project could extend as far as 225 feet from the track, potentially impacting the property. Although a potential for noise and annoyance vibration impacts could occur, the Corinth Street Underpass and Overpass does not derive its value from its setting. Thus, FRA assessed that the noise and annoyance vibration impacts of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

Therefore, the Project would not result in a constructive use of the Corinth Street Underpass and Overpass under Section 4(f).

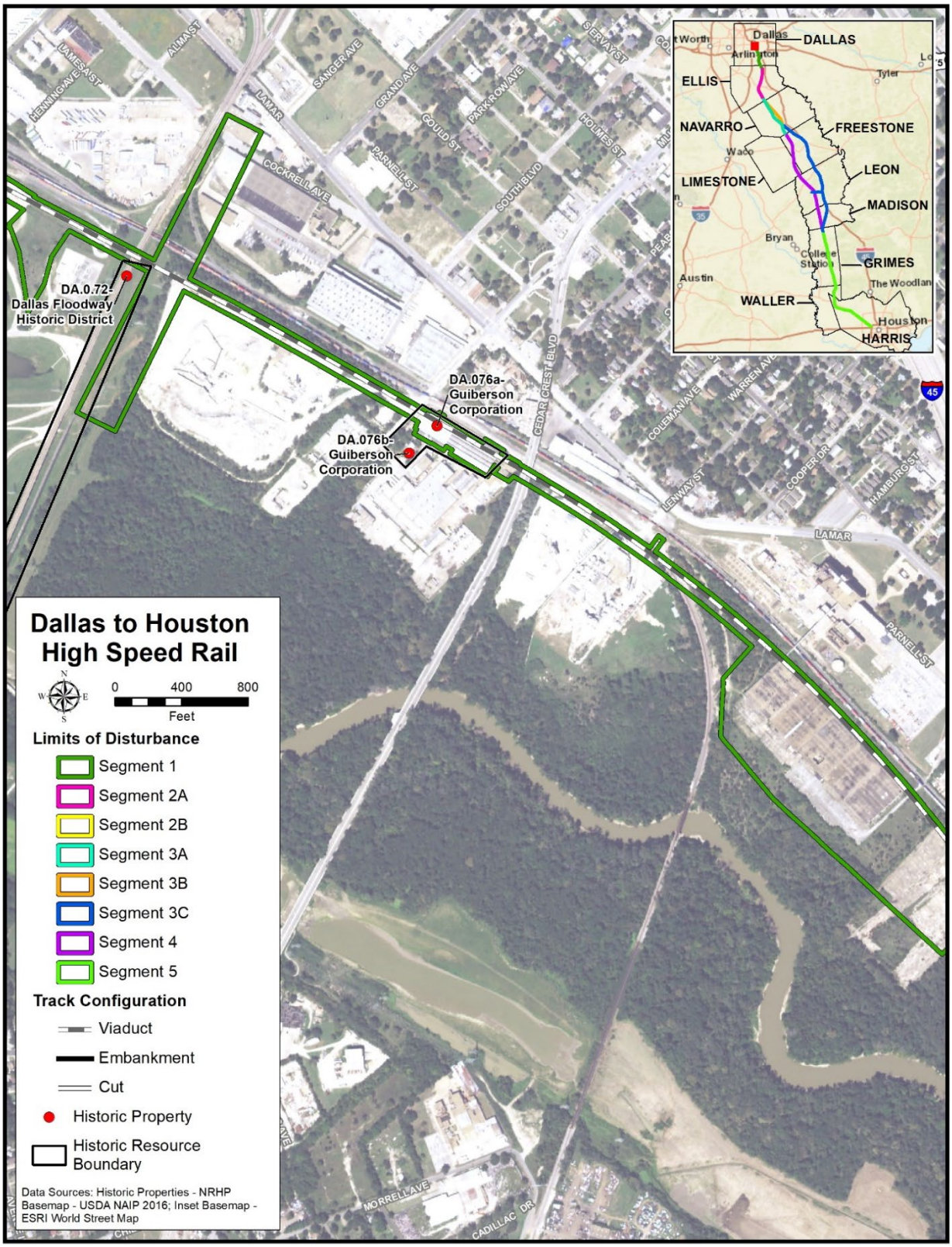
Site DA.076a (Guiberson Corporation Machine Shop)

The Guiberson Corporation consists of nine historic resources on a property located at 1000 Forest Avenue in Dallas (**Figure 7-15**). The property was previously determined to be significant under Section 106 for its association with the Guiberson Corporation from 1926 to 1956. Two of the resources (DA.076a and DA.076b) were found to retain enough integrity to convey their historic significance and were determined eligible for listing in the NRHP at the local level of significance under Criterion B for association with Samuel A. Guiberson. The Guiberson Corporation Machine Shop is a one-story industrial building. FRA, in consultation with the THC, determined the remaining resources on the property to be not eligible for listing in the NRHP because they either lack integrity or were constructed after the period of significance.

The Guiberson Corporation Machine Shop is located within the LOD of Segment 1 in Dallas County. The building is approximately 500 feet long by 150 feet wide with its long edge parallel with the LOD. Each Build Alternative would demolish the building and provide track on a viaduct in place of the building and the proposed Emergency Response and Maintenance Staging Area in the southwest corner of the building footprint.

[31] Annoyance is associated with human perception.

Figure 7-15: Dallas County (Segment 1) Section 4(f) Properties



Source: AECOM 2019.

TCRR considered design refinements to avoid impacting the building, including moving the staging area out of the building footprint and crossing over the building with a viaduct without impacting the building. While moving the staging area is feasible and reasonable, spanning over the building is not. To span the building, a viaduct would have to be greater than 500 feet long. As described in the avoidance analysis in **Section 7.8.2.4**, **Alignment Shifts and Design Refinements**, span distances greater than approximately 400 feet in length require special design elements to support the viaduct structure and special construction techniques because construction equipment and personnel cannot directly access the construction area from below. These factors would substantially increase the cost of this portion of the viaduct compared to the viaduct construction and cost assumptions for other sections of the Project. In addition, there is a high risk of damaging the historic building (diminishing its integrity) during construction because of its location under the work area. Based on these findings, FRA assessed that while spanning the building may be feasible, it is not reasonable because of the combination of engineering, cost, and risk to the historic structure. Under Section 4(f), any Build Alternative would permanently incorporate the Guiberson Corporation Machine Shop into the proposed transportation facility, resulting in a permanent use of the property.

Under Section 106, FRA determined that any Build Alternative would have an adverse effect to the Guiberson Corporation Machine Shop as the existing historic structure would be removed, resulting in loss of integrity of that resource.

Site DA.076b (Guiberson Corporation Family Residence and Office)

The Guiberson Corporation Family Residence and Office is a two-story domestic-single family building associated with the Guiberson Corporation property at 1000 Forest Avenue in Dallas (**Figure 7-15**). The property was previously determined to be significant under Section 106 for its association with the Guiberson Corporation from 1926 to 1956. DA.076b was found to retain enough integrity to convey their historic significance and were determined eligible for listing in the NRHP at the local level of significance under Criterion B for association with Samuel A. Guiberson. The building was constructed circa 1920. The historic property boundary for the Guiberson Corporation Family Residence and Office is the building footprint.

The Guiberson Corporation Family Residence and Office is located outside of and within 50 feet of the LOD of Segment 1 in Dallas County and would not be permanently incorporated into the Project. No permanent use of the Guiberson Corporation Family Residence and Office would occur under Section 4(f); the structure would be preserved by each Build Alternative and there would be no permanent incorporation of building into the Project.

FRA's assessment of the potential for a constructive use of the Guiberson Corporation Family Residence and Office under Section 4(f) considered the finding under Section 106 that any Build Alternative would have an adverse effect on the property because the Project would remove the associated building, DA.076a (Guiberson Corporation Machine Shop). Under Section 106, this change has the potential to diminish the integrity of the property's setting, feeling, design and association.

Under Section 4(f), FRA also considered the potential for visual impacts, assessing that the Project would be visible from the property and the Project would remove the associated industrial building. Although a visual change would occur, the property derives its value from its association with the Guiberson family and corporation. The loss of the associated industrial building, and new Project elements (viaduct and staging area) would change the visual context of the Guiberson Corporation Family Residence and Office, resulting in diminishment in the significance and association of the dwelling with the Guiberson Corporation. However, although diminished, the dwelling would be able to continue to serve its purpose

of interpreting its history as the Guiberson family home. For this reason, FRA assessed that the visual and associative impacts of the Project to the Guiberson Corporation Family Residence and Office would not result in a substantial impairment to the activities, features or attributes that qualify the property for protection under Section 4(f).

FRA considered the potential for operational noise impacts and annoyance effects from vibration from Project operations on the property. As indicated in **Section 3.4, Noise and Vibration**, operational vibration levels would be well below the threshold for damage to structures. The analysis assessed that the property is adjacent to the LOD and that noise and annoyance vibration impacts from Project operations could extend as far as 225 feet from the track. Although a potential for noise and annoyance vibration impacts could occur, the Guiberson Corporation Family Residence and Office does not derive its value from its noise and vibration setting Thus, FRA assessed that noise and annoyance vibration impacts due to Project operations would not substantially impair the activities, features or attributes of the property that qualify it for protection under Section 4(f).

Therefore, the visual, associative, noise and annoyance vibration impacts of the Project would not result in a constructive use of the Guiberson Corporation Family Residence and Office.

Site DA.082 (Honey Springs Cemetery)

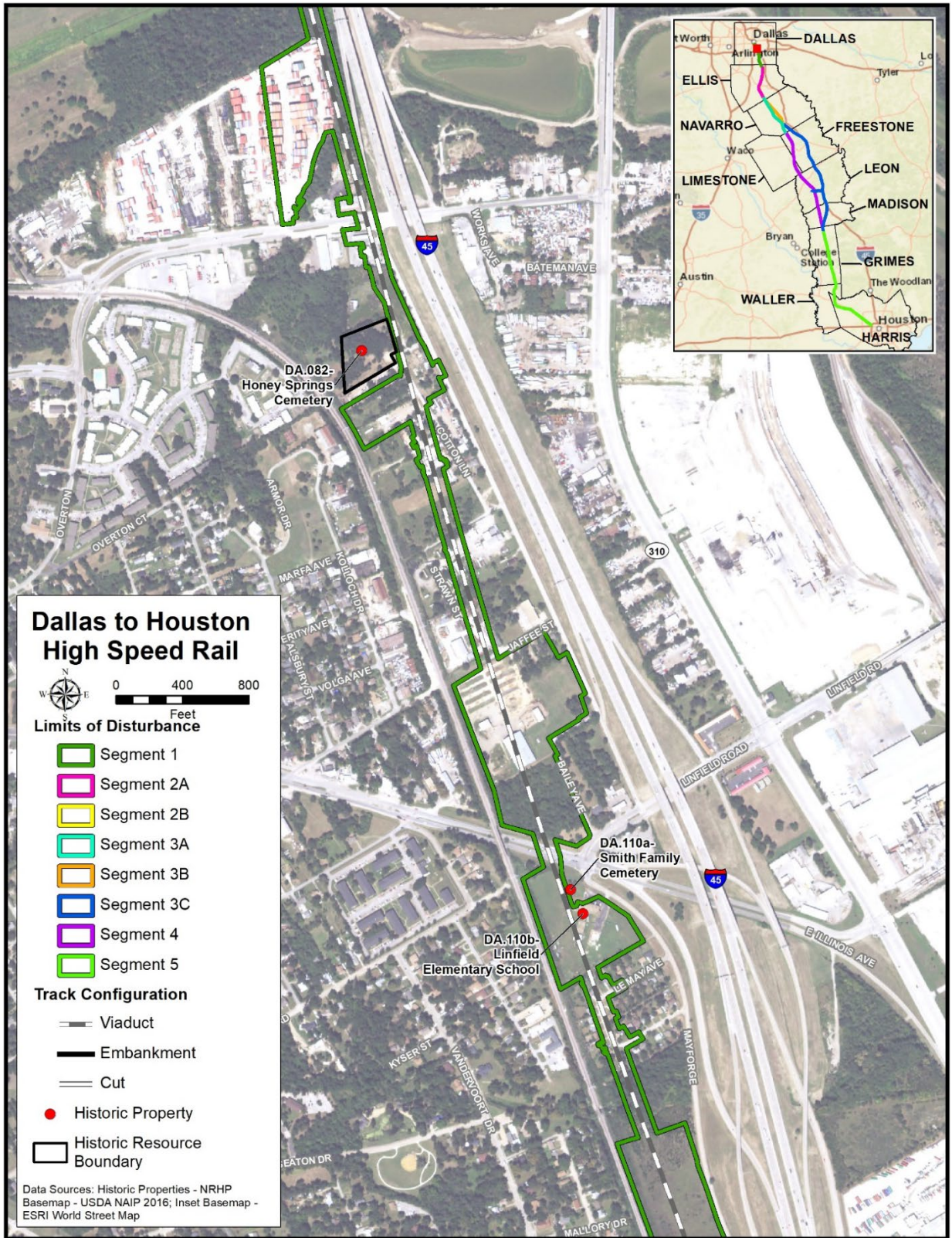
The Honey Springs Cemetery (also known as Bulova Cemetery and Homecoming Cemetery) is located at 4001 Bulova Street in Dallas (**Figure 7-16**). The cemetery is associated with the slaves of the William Brown Miller plantation, which was owned by a prominent family associated with the early settlement of Dallas. After Emancipation, the descendants of the Miller slaves continued to be buried in the cemetery. Many of the graves are unmarked, but a memorial wall constructed circa 2003 lists the names of those known to be interred on the property. Under Section 106, the cemetery retains enough integrity to convey its historic significance and association with the early development of south Dallas. The property is determined eligible for listing in the NRHP at the local level of significance under Criterion A for its association with early settlement and ethnic heritage and Criterion D for its potential to yield important information.

The property is located along Bulova Street, which intersects the Julius Schepps Service Road east of the property. In addition, the property is currently 165 feet from the noise generating transportation corridors of IH-45 on the east and adjacent to (0 feet from) the BNSF railroad on the west. This property is located within 150 feet of the LOD of Segment 1. At this location, Segment 1 would include HSR track on viaduct located adjacent to the property and behind visitors viewing the memorial wall on the eastern side of the property.

None of the Build Alternatives would permanently incorporate the property into the transportation use; thus, no permanent use of Honey Springs Cemetery would occur.

FRA's assessment of the potential for a constructive use of the Honey Springs Cemetery under Section 4(f) considered the finding under Section 106 that any Build Alternative would have an adverse effect on the property because as detailed **in Section 3.19.5.2.1, Cultural Resources, Segment 1**, the Project would change the visual context of the property and obstruct the serene setting of the property. Under Section 106, this change has the potential to diminish the property's integrity of setting, feeling, and design.

Figure 7-16: Dallas County (Segment 1) Section 4(f) Properties



Source: AECOM 2019

Under Section 4(f), FRA also considered the potential for visual impacts, assessing that the Project would be visible from the property because the viaduct would be visible from areas adjacent to the LOD. Although a visual change would occur, the property derives its value from its association with early settlement of Dallas and community development of South Dallas after Emancipation (Criterion A) as well as the potential to yield information important to history (Criterion D). The property does not derive its value in substantial part from its setting. Thus, FRA has assessed that, whereas the visual impact of the Project would potentially diminish the property's integrity under Section 106, the visual impact of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

FRA considered the potential for operational noise impacts and annoyance effects from vibration of Project operations on the property. As indicated in **Section 3.4, Noise and Vibration**, operational vibration levels would be well below the threshold for damage to structures. The analysis assessed that noise impacts and annoyance vibration effects from the Project could extend as far as 348 feet from the track in the property location, potentially impacting the property. However, FRA's assessment of the potential for operational noise and annoyance impacts could occur, the Honey Springs Cemetery does not derive its value from its setting. Thus, FRA assessed that the noise and annoyance vibration impacts of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

Therefore, the Project would not result in a constructive use of the Honey Springs Cemetery.

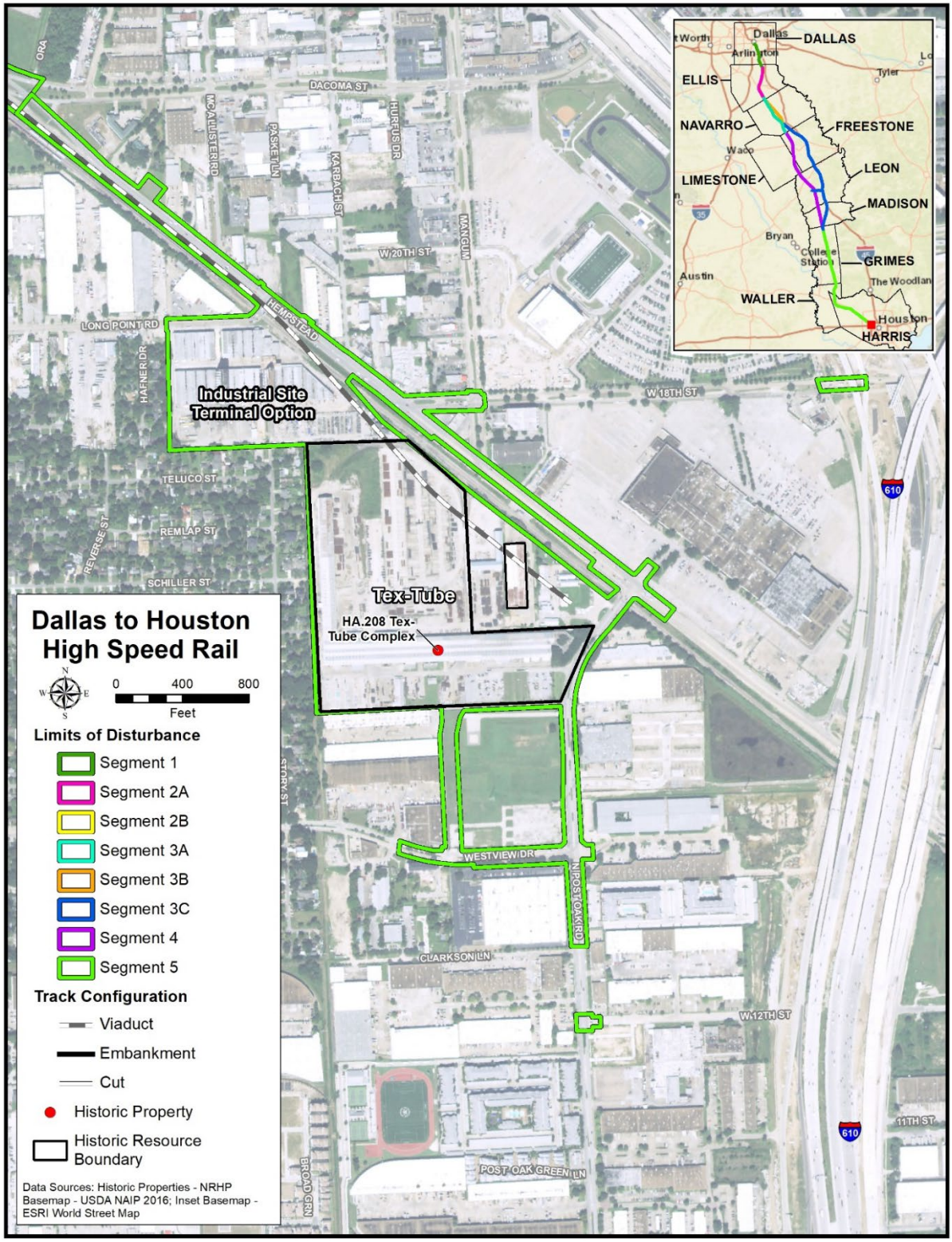
Site DA.110b (Linfield Elementary School)

The Linfield Elementary School is located at 3820 E. Illinois Avenue in Dallas, TX (**Figure 7-16).** The one-story school, which dates to the early 1950s, has a flat roof, and an irregular plan. Between 1952 and 1968, a multiple bay addition was constructed at the center of the southwest elevation. In the early 1950s, four months after the Supreme Court's ruling of in Brown v. Board of Education of Topeka, more than 100 African American parents, led by the Dallas Chapter of the National Association for the Advancement of Colored People, brought their children to enroll at the previously all-white Linfield Elementary School, only to be denied. The structure is used as a business and is no longer used as a school.

Under Section 106, FRA's determination is that the Linfield Elementary School is eligible for listing in the NRHP under Criterion A for association with the civil rights and desegregation movement in Dallas County. The school was previously located on the same parcel as the Smith/Kinnard Family Cemetery (DA.110a) but is now on its own parcel. The boundary of the historic school property includes both parcels. The cemetery dates to an earlier period than the Linfield Elementary School; FRA determined under Section 106 that the cemetery is not eligible for listing in the NRHP. Therefore, the cemetery is not protected by Section 4(f). However, the Texas Health and Safety Code applies to the cemetery and archeological investigations may be necessary in the Project APE to determine whether any unmarked burials are present outside the known cemetery boundary.

The approximately 6.3-acre school parcel is located at 3820 East Illinois Avenue, which is wholly within the LOD. At this location, TCRR would demolish the school building and provide the track on a viaduct in place of the building. The Project LOD is outside the known boundaries of the Smith/Kinnard Family Cemetery and would not impact the cemetery within its known boundaries. The Linfield Elementary School would be demolished and a permanent incorporation of the property into the proposed transportation use would occur; therefore, a permanent use of the Linfield Elementary School would occur under Section 4(f).

Figure 7-17: Harris County (Houston Industrial Site Terminal Station Option) Section 4(f) Properties



Source: AECOM 2019.

Under Section 106, FRA determined that any Build Alternative would have an adverse effect to the Linfield Elementary School as the existing historic structure would be removed, resulting in loss of integrity of that property.

7.7.2.2.2 Madison County

FRA's evaluations and determinations of use of Section 4(f) historic properties in Segment 4 of the Build Alternatives within Madison County are described below.

MA.003 (Randolph Cemetery), Normangee, Madison County

The Randolph Cemetery was established in 1851; its features include a high concentration of obelisks, tablets, pulpits, grave markers with die in sockets, die on bases, lawn types, and footstones, which typically are not found in such large quantities in rural community cemeteries in Madison County. The cemetery retains integrity of location and function as a local burying ground. FRA determined that Randolph Cemetery is eligible for the NRHP under Criteria A for association with local history and D for potential to yield important information.

The LOD of Build Alternatives C and F would be approximately 7 miles east of Randolph Cemetery. Build Alternatives C and F would not permanently incorporate any portion of the property; thus, no permanent use of Randolph Cemetery would occur. Because of the distance between the LODs and the property, no constructive use would occur as a result of those alternatives.

The LOD of Build Alternatives A, B, D and E (Segment 4) would be within 150 feet from the existing property boundary. No permanent incorporation of the cemetery property and no permanent use of the property would occur if all burials are within the current boundary. For Build Alternatives A, B, D or E, TCRR would be required to conduct additional archeological investigation to determine if unmarked burials are present outside the modern cemetery boundary. Ongoing consultation with the THC to assess potential impacts to the cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and Stipulation IV of the PA. FRA's assessment of the potential for a constructive use of the Randolph Cemetery under Section 4(f) considered the finding under Section 106 that any Build Alternative could have an adverse effect on the property because unmarked burials outside the property boundary could be impacted by the Project. As detailed **in Section 3.19.5.2.4, Cultural Resources, Segment 4**, under Section 106, impacting burials would diminish the integrity of the Randolph Cemetery.

Under Section 4(f), FRA also considered the potential for visual impacts, assessing that the Project would be visible from the property because the viaduct would be visible from areas adjacent to the LOD. Although a visual change would occur, the Randolph Cemetery derives its value from its potential to yield important information (Criterion D); the property does not derive its value in substantial part from its setting. Thus, FRA has assessed that, whereas the visual impact of the Project would potentially diminish the property's integrity under Section 106, the visual impact of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

FRA considered the potential for operational noise impacts and annoyance effects from vibration of Project operations on the property. As indicated in **Section 3.4, Noise and Vibration**, operational vibration levels would be well below the threshold for damage to structures. The analysis assessed that noise impacts and annoyance vibration effects from the Project could extend as far as 338 feet from the track in this location. Although a potential for noise and annoyance vibration impacts could occur, Randolph Cemetery does not derive its value from its setting. Thus, FRA assessed that the noise and

annoyance vibration impacts of the Project would not substantially impair the activities, features or attributes of the property that qualify it for protection under Section 4(f).

Therefore, Build Alternatives A, B, D and E would not result in a constructive use of the Randolph Cemetery.

Under Section 106, Build Alternatives A, B, D and E would visually impact the Randolph Cemetery because of the proximity of the track on embankment to the cemetery, diminishing the integrity of design, setting (rural setting), feeling and association.

Therefore, the Project would not result in a constructive use of the Randolph Cemetery under Section 4(f).

7.7.2.2.3 Harris County

FRA's evaluations and determinations of use for Section 4(f) historic properties in Segment 5 of the Build Alternatives within Harris County are described below.

Site HA.004a Residence at 29702 Castle Road

FRA determined through Section 106 that Site HA.004a Residence at 29702 Castle Road, constructed circa 1920, is eligible for listing on the NRHP under Criterion C for architecture. The building is a Craftsman style single-family dwelling constructed circa 1920. The boundary of the property is the footprint of the dwelling. The property is approximately 508 feet west of the proposed track embankment and 340 feet to the nearest point of the proposed LOD. The Project elements within the LOD include the embankment, stormwater management, a facility support structure and a portion of Castle Road that would be raised to cross over the tracks. None of the Build Alternatives would remove or cause physical destruction of the property, nor would any of the Build Alternatives permanently incorporate the Residence at 29702 Castle Road into the proposed transportation use.

FRA's assessment of the potential for a constructive use of the Residence at 29702 Castle Road under Section 4(f) considered the finding under Section 106 that any Build Alternative would diminish the rural setting of the structure because of the proximity of the Project elements to the property. FRA's preliminary determination of effect under Section 106 is an adverse effect.

Under Section 4(f), FRA also considered the potential for visual impacts, assessing that the Project elements would be close enough to the property to be visible from the property. Although a visual change would occur, the property derives its value from its architecture; the property does not derive its value in substantial part from its setting. Thus, FRA has assessed that, whereas the visual impact of the Project would potentially diminish the property's integrity under Section 106, the visual impact of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

FRA considered the potential for operational noise impacts and annoyance[32] effects from vibration of Project operations on the property. As indicated in **Section 3.4, Noise and Vibration**, operational vibration levels would be well below the threshold for damage to structures. The analysis assessed that noise impacts and annoyance vibration effects from the Project could extend as far as 210 feet from the track, potentially impacting the property. Although a potential for noise and annoyance vibration impacts could occur, the Residence at 29702 Castle Road does not derive its value from its setting. Thus,

[32] Annoyance is associated with human perception.

FRA assessed that the noise and annoyance vibration impacts of the Project would not substantially impair the activities, features or attributes of the property that make it significant under Section 4(f).

Therefore, the Project would not result in a constructive use of the Residence at 29702 Castle Road under Section 4(f).

7.7.2.2.4 Houston Terminal Station Options

Three options are being considered by FRA for the Houston Terminal Station, the Houston Industrial Site Terminal Station Option, the Houston Northwest Mall Terminal Station Option, and the Houston Northwest Transit Center Terminal Station Option. Historic properties in the APE that have been identified through the Section 106 process include one Section 4(f) historic property, HA.208 (Tex-Tube Complex). The Industrial Site Terminal Station Option would incorporate land from the Tex-Tube Complex. The latter two options would not incorporate any historic property into the transportation use, and therefore, no permanent use of Section 4(f) historic properties would occur. FRA's evaluation and determinations for the Tex-Tube Complex is provided below.

Site HA.208 (Tex-Tube Complex)

The Tex-Tube Complex, located at 1503 N. Post Oak Road in Houston, is a circa 1955 office building and associated warehouses and designed landscape features. FRA determined that the complex, which includes five historic features, is eligible for listing in the NRHP under Criterion A for association with the development of outer Houston as a light industrial center, and Criterion C for architectural and landscape design.

The Tex-Tube Complex is within the LOD of the Houston Industrial Site Terminal Station Option, as shown in **Figure 7-17**. The entire 38.95-acre property would be acquired by TCRR and incorporated into the proposed transportation facility as the Industrial Site Terminal Station option. Elements of the option include the station building, parking, pedestrian circulation, transportation alterations and landscaping. TCRR would demolish three warehouses and the historic landscape that comprise the Tex-Tube Complex; the main office building would not be demolished. Because of the loss of most buildings on the property, the Industrial Site Terminal Station Option would have an adverse effect on the Tex-Tube Complex property under Section 106.

Under Section 4(f), the Industrial Site Terminal Station Option would permanently incorporate property from the Tex-Tube Complex into the transportation use, resulting in a permanent use of the property.

7.8 Avoidance Alternatives

An avoidance alternative is one that would not incorporate a Section 4(f) property into a transportation use. In this section, FRA examined the potential alternatives to avoid Section 4(f) properties. FRA's analysis considered alternatives to the Build Alternatives as described in **Section 7.8.2, Avoidance Analysis – Build Alternatives**, and **Section 7.8.3, Avoidance Analysis – Houston Terminal Station Options,**- and assessed whether there are feasible and prudent alternatives to avoid a use of Section 4(f) properties.

7.8.1 Introduction

Section 4(f) prohibits the use of a Section 4(f) property if there is a feasible and prudent alternative that avoids use of a Section 4(f) property. FRA considers an alternative to be not feasible if cannot be built as a matter of sound engineering judgment. FRA considers an alternative not prudent if:

- It compromises a project to a degree that it is unreasonable to proceed considering a project's stated need and purpose (i.e., the alternative does not address the need and purpose of a project).
- It results in unacceptable safety or operational problems.
- After reasonable mitigation, it still causes severe social, economic, or environmental impacts; severe disruption to established communities; severe or disproportionate impacts to minority or low-income populations; or severe impacts to environmental properties protected under other federal statutes.
- It results in additional construction, maintenance, or operational costs of extraordinary magnitude.
- It causes other unique problems or unusual factors.
- It involves multiple factors as outlined above that, while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude.

For those properties that would incur a *de minimis* impact, evaluation of avoidance alternatives is not required.

7.8.2 Avoidance Analysis – Build Alternatives

This section evaluates alternatives for the potential to avoid the use of Section 4(f) properties and applies the feasible and prudent criteria listed above.

Tables 7-5 and **7-6** list the Section 4(f) properties that would be used by each Build Alternative, including the Preferred Alternative.[33] Because some segments are common to each Build Alternative, each of the Build Alternatives would use the same Section 4(f) properties, with the exception of Build Alternatives C and F, which would also require the use of land from Fort Boggy State Park. For these reasons, none of the Build Alternatives is an avoidance alternative.

Because the Preferred Alternative and each Build Alternative would use one or more Section 4(f) properties, FRA worked with the Project Sponsor to determine whether a true avoidance alternative was possible for the Project. As described in the following subsections, FRA evaluated the No Build Alternative and the following types of Project Alternatives as potential avoidance alternatives:

- **Location Alternatives:** A location alternative refers to the rerouting of the Project along a different alignment.
- **Alternative Actions:** An alternative action is one that does not require construction or that consists of a different mode of transportation.
- **Alignment Shifts and Design Changes:** An alignment shift and/or design change is the rerouting of a portion of the Project to a different alignment to avoid a specific property or a modification of the proposed design in a manner that would avoid impacts.

7.8.2.1 No Build Alternative

The No Build Alternative includes all planned and programmed transportation improvements, discussed in **Section 3.11, Transportation**. However, the Project would not be built. Under the No Build Alternative, FRA would not issue an RPA or take other regulatory action necessary for the implementation of HSR technology within the U.S. Therefore, TCRR would not construct or be able to operate the proposed HSR system and associated facilities. Travel between Dallas and Houston would

[33] FRA has identified Build Alternative A and the Houston Northwest Mall Terminal Station Option as the Preferred Alternative.

continue via existing highway (IH-45) and airport (DFW, DAL, IAH and HOU) infrastructure. The No Build Alternative would avoid use of Section 4(f) properties.

While the No Build Alternative may be feasible, it is not prudent. By not implementing HSR technology, the No Build Alternative would not address the Project purpose and need, which is to provide the public with reliable and safe high-speed passenger rail transportation between Dallas and Houston.

7.8.2.2 Location Alternatives

7.8.2.2.1 Corridors and Alignments

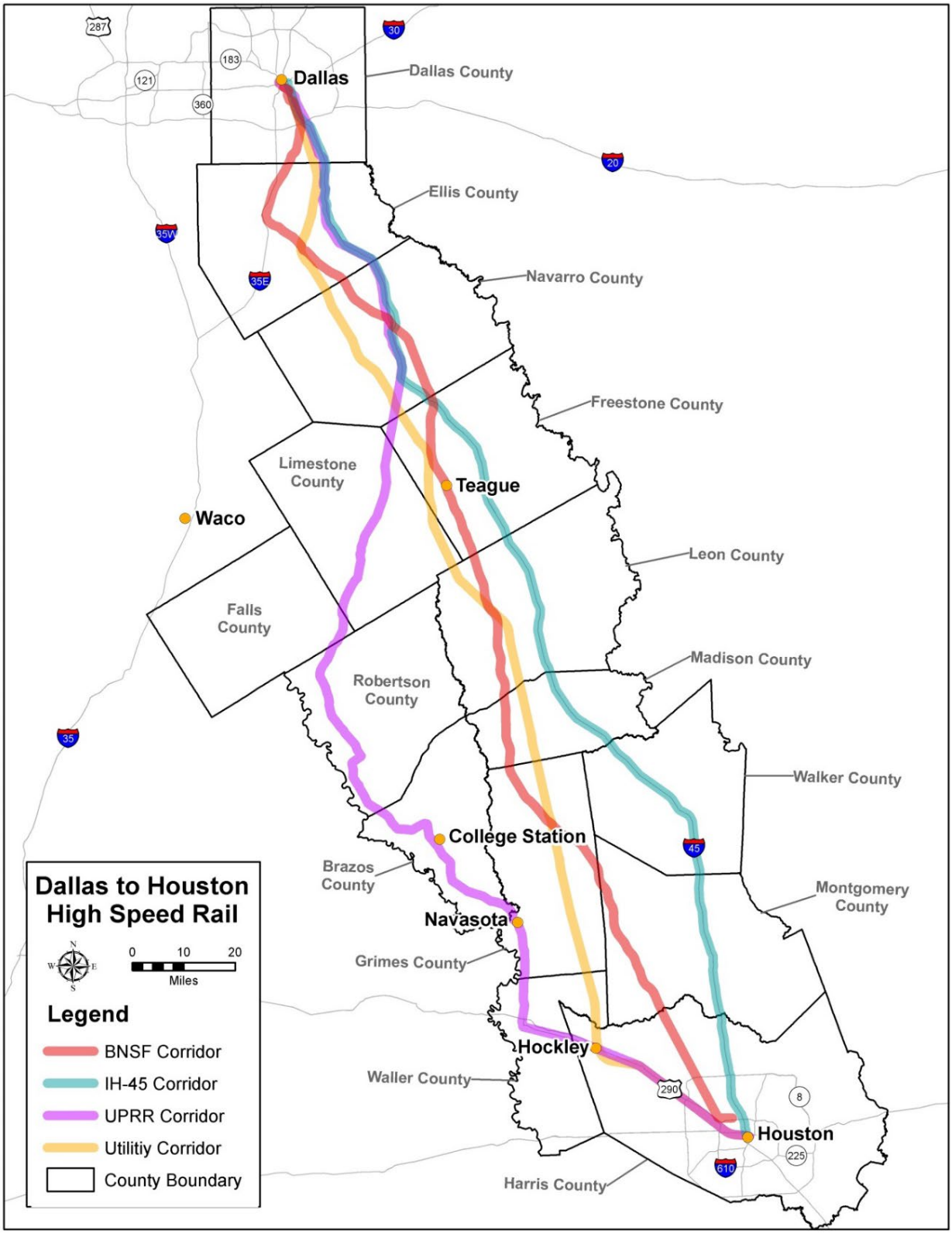
Using TxDOT's *Texas Rail Plan* as a framework for considering potential corridors for the Project, TCRR identified four general corridors (**Figure 7-18**) that would have the potential to avoid or minimize environmental impacts: BNSF Railway, IH-45, UPRR and the Oncor Electric Delivery (Utility) corridor. In accordance with 40 C.F.R. 1502.14, FRA independently evaluated and assessed those alternatives developed and presented by TCRR. These corridors were developed and evaluated during the initial alternatives analysis screening, the findings for which are reported in FRA's 2015 *Dallas to Houston High-Speed Rail Project, Corridor Alternatives Analysis Technical Report.* [34] All four corridors would use Section 4(f) properties.

BNSF operates a freight line from downtown Dallas to downtown Houston in a corridor that passes through Temple, Somerville and Sealy. The IH-45 Corridor would extend from the vicinity of Dallas Union Station in downtown Dallas and would generally follow the IH-45 through southern Waller County. In this vicinity, the corridor would generally follow the UPRR Hardy Subdivision to reach downtown Houston. The UPRR Corridor would extend from the vicinity of Dallas Union Station in downtown Dallas south through College Station, Navasota and Hockley to the Houston Amtrak Station in downtown Houston. It would generally follow the UPRR freight rail line. The Utility Corridor would predominately follow the CenterPoint Energy and Oncor high-voltage electrical transmission lines (345 to 500 kV).

Several factors led to the elimination of the BNSF and UPRR freight rail corridors as a consideration for the project. Operating within the BNSF or UPRR freight rail ROW would require consent of the host railroad(s). BNSF and UPRR declined consent for TCRR to use their ROW for most of the distance between Dallas and Houston. Running immediately adjacent to the BNSF and UPRR corridors would require a cost prohibitive barrier wall along the 240-mile length of the corridor to comply with industry standards. Additionally, the curvature of the existing freight rail line would not be suitable for high-speed operations. To address curvature constraints and the need for a barrier wall, these alternatives would need to be located farther from the existing freight rail infrastructure and would result in greater property impacts.

[34] FRA, *Dallas to Houston High-Speed Rail Project, Corridor Alternatives Analysis Technical Report*, 2015.

Figure 7-18: Potential HSR Corridors



Source: AECOM 2016

The IH-45 Corridor was designed for automobile travel and the curves are sharper than the operations of a high-speed train can safely allow. To roughly parallel IH-45, train operations would have to run at lower speeds around curves and therefore it would not meet travel time criteria set for the project. Moving away from the corridor to address curvature would result in greater property impacts. Additionally, there are numerous roadway interchanges and roadway bridges spanning the interstate. This is not compatible for HSR operations which are required to operate in a fully sealed, grade-separate corridor. This corridor also had the potential to result in permanent impacts the transportation system by resulting in permanent road closures or substantial re-routing of the roadway, also resulting in greater property impacts. The IH-45 corridor was also the only corridor alternative that would physically impact the Sam Houston National Forest, resulting in impacts to recreation resources and managed habitat.

The Utility Corridor was retained for further study because of the existing, relatively straight, long, linear infrastructure easements between Dallas and Houston, and as a way to minimize impacts to private property from the development of a new transportation corridor compared with the other corridors considered.

Based on FRA's identification of the Utility Corridor, TCRR developed 21 potential alignment alternatives for FRA consideration in a two-part screening process, the details for which are reported in a 2015 FRA *Corridor Alternatives Analysis Technical Report*.[35] The alternatives were evaluated according to specific engineering and environmental criteria, including the potential to impact Section 4(f) properties (specifically, parks and historic sites). The outcome of the screening was that none of the alignments would avoid using one or more Section 4(f) properties.

FRA advanced six alignment alternatives (A through F) into the NEPA process as a result of the second phase screening. TCRR made refinements to each alignment alternative with the goals of avoiding or minimizing environmental impacts and addressing public and agency concerns as identified through scoping and the public outreach process undertaken during NEPA. In the Section 4(f) Evaluation published with the Draft EIS, FRA disclosed that each of the six alignment alternatives would use one or more Section 4(f) properties. Specifically, and as summarized in **Section 7.7, Assessment of Use of Section 4(f) Properties**, the properties the Preferred Alternative would use are located on common segments of Build Alternatives A through F. As a result, the Section 4(f) Evaluation in the Draft EIS concluded that none of the six alignment alternatives (A through F) is a Section 4(f) avoidance alternative.

FRA's Final EIS, including this Section 4(f) Evaluation, examined Build Alternatives A through F after further refinement of Project elements to reduce or eliminate environmental impacts. As described in **Section 7.7, Assessment of Use of Section 4(f) Properties**, each Build Alternative would use one or more Section 4(f) properties. For this reason, none of the Build Alternatives is a Section 4(f) avoidance alternative.

In summary, there is no location alternative that can avoid the use of Section 4(f) properties.

[35] FRA, 2015, *Dallas to Houston High-Speed Rail Project, Corridor Alternatives Analysis Technical Report*.

7.8.2.2.2 Tunneling

TCRR examined the potential for tunneling portions of the Project to avoid use of Section 4(f) properties in the City of Dallas and at Fort Boggy State Park in Segment 3C.

During early studies of potential HSR alignments in the City of Dallas in 2013, TCRR examined tunnel options, undertook a desktop geotechnical study of the area, examined station excavation options, and prepared preliminary cost estimates for tunneling.[36] This study is relevant to each of the Build Alternatives A through F because each alternative shares portions of common alignment where the Section 4(f) historic properties occur. Because the design criteria for HSR systems requires gradual changes in grade over long distances, TCRR's analysis assumed that the Project would begin in tunnel and maintain an underground condition for the length of the Project in the City of Dallas. It would not be feasible to transition between aboveground and tunnel to avoid individual properties because rapid changes in grade over short distances would be required. Tunneling would avoid impacts to Section 4(f) properties in the City of Dallas as well as other properties and infrastructure in an urban context, the Trinity River, and other resources.

Other tunnel projects in the Dallas area, such as DART, encountered construction challenges involving tunnel boring machine damage from hard rock and clogging from mucky conditions, groundwater contamination from existing development, and methane and other gases. To overcome these challenges, which add to construction cost and risk, TCRR considered building a tunnel using the cut-and-cover technique, which involves excavating the tunnel from the ground surface. However, cut-and-cover tunnel construction challenges in the City of Dallas, as evidenced by previous tunnel projects, include excavation stabilization to prevent risks from rock falls and slides. Cut-and-cover construction also requires removing structures in the path of the tunnel and disturbing the ground surface. Thus, cut-and-cover is not a construction technique for avoiding property impacts. For this reason, the TCRR study assumed deep tunnel construction with a tunnel boring machine in solid rock for as long a distance as possible.

The 2013 study identified the following risks related to tunneling:

- Ground movement and settlement affecting existing structures and levee above the tunnel
- Existing groundwater and soil contamination and hazardous materials from overlying industrial properties
- Naturally occurring toxic natural gases and explosion hazard
- Dewatering of wetlands and water resources

The 2013 study identifies an approximate cost comparison between tunneling with a tunnel boring machine and viaduct construction types. The tunneling cost alone was estimated to be approximately $260 million per mile. Viaduct cost would be approximately $65 million per mile in 2013. It is reasonable to assume that the two costs would be higher today, but the tunneling cost would be approximately four times higher than the viaduct cost.

The 2013 study revealed that tunneling in solid rock with tunnel boring machine technology would be feasible despite the risks. However, the additional cost of such tunnel construction would be extraordinarily high compared to the cost for viaduct.

[36] TCRR, *Dallas Segment Tunnel Feasibility Report,* 2013.

TCRR considered tunneling as an alternative to the proposed aboveground alignment of Build Alternatives C and F at Fort Boggy State Park. The distance from the north to the south boundaries of the park along IH-45 is approximately 3 miles. TCRR's tunnel study[37] identified the need for ventilation shafts for the exchange of fresh air to be located approximately every mile along a tunnel alignment. The ventilation shaft would consist of one or more 12-foot diameter pipes with fans and related control equipment housed in an aboveground structure. Tunnel access is typically incorporated into the structure. Potentially one structure would house ventilation pipes for northbound and southbound tunnels, if two tunnels are present. The dimensions of each ventilation structure depend on the size and number of pipes and could comprise an acre or more and be several stories tall. Because of ventilation requirements along the portion of Segment 3C that crosses Fort Boggy State Park, two or possibly three ventilation structures would be required. The dimensional requirements of the structures would require additional ROW from the park as the existing highway ROW is insufficient in size to accommodate the structures. For these reasons, tunneling under Fort Boggy State Park would require use of a portion of the protected property.

TCRR also considered the potential for tunneling as a method of avoiding impacts to Section 4(f) properties. For the same reasons as described in **Section 7.8.2.4.1, Segment 1 (Dallas County**), tunneling would be feasible but would not be prudent because of an extraordinarily high per mile cost compared to viaduct and embankment construction costs, and would have similar, multiple risk factors.

7.8.2.3 Alternative Actions

During NEPA, FRA evaluated different forms of transportation and non-construction solutions to achieve the Project purpose and need:

- **Higher-Speed and Conventional Rail Service:** HSR service at the Project's proposed speeds would require a grade-separated ROW and two new tracks for passenger rail service. Higher-speed (90 to 150 mph) and conventional speed (up to 90 mph) rail service potentially could be implemented along the BNSF line or the UPRR line and could operate through at-grade railroad crossings at passenger train speeds up to 125 mph.[38] As described in **Section 7.8.2.2**, **Location Alternatives**, an alternative along the BNSF or UPRR corridor would use portions of Section 4(f) properties; therefore, higher-speed conventional rail service is not an avoidance alternative.
- **Direct Bus Service:** Direct bus service operated by Greyhound, MegaBus and Vonlane uses IH-45 to travel between the two metropolitan regions and the trip takes approximately 4 hours depending on traffic and road conditions. This alternative proposes construction of a new dedicated bus lane to maintain the existing automobile travel lane capacity. Using direct bus service along existing roadways may or may not impact Section 4(f) properties. Assuming that such properties can be avoided, the prudent and feasible criteria were applied. The purpose and need of the Project prescribes high-speed ground transportation. The Project Sponsor identifies the following operational requirement for the Project: approximate 90-minute travel time between Dallas and Houston. Travel time at a rate of 70 mph over a distance of 247 miles between the two cities is approximately 3 hours and 31 minutes, 134 percent longer than TCRR's operational requirement of 90 minutes to achieve the Project purpose and need. FRA determined that, while direct bus service may be feasible, it is not prudent. By not achieving the operational speed requirement, direct bus service would not address the Project purpose and

[37] TCRR, *Dallas Segment Tunnel Feasibility Report,* 2013.

[38] In addition, FRA approval is required for train operations through highway-rail crossings at speeds between 110 and 125 mph. See 49 C.F.R. 213.347.

need, which is to provide the public with reliable and safe high-speed passenger rail transportation between Dallas and Houston. Thus, direct bus service would compromise the Project to a degree that it would be unreasonable to proceed in light of the Project's stated purpose and need.

- **IH-45 Expansion:** Congestion on IH-45 is increasing and is projected to further increase automobile travel times between Dallas and Houston. To offset congestion, TxDOT is in the process of widening IH-45 from four to six travel lanes along approximately 21.1 miles from Corsicana to south of Richland in Navarro County. TxDOT is also planning to widen IH-45 from four to six travel lanes for 6.25 miles from north Huntsville to south Huntsville and another 12.4 miles from south Huntsville to the Montgomery County Line. Using expanded IH-45 may not impact Section 4(f) properties. Assuming that such properties can be avoided, the prudent and feasible criteria were applied. The purpose and need of the Project prescribes high-speed ground transportation. Travel time at a rate of 70 mph over a distance of approximately 247 miles between the two cities is approximately 3 hours and 31 minutes during the nonpeak period, 134 percent longer than TCRR's operational requirement of 90 minutes to achieve the Project purpose and need. FRA determined that, while using expanded IH-45 may be feasible, it is not prudent. By not achieving the operational speed requirement, using expanded IH-45 would not address the Project purpose and need, which is to provide the public with reliable and safe high-speed passenger rail transportation between Dallas and Houston. Thus, using expanded IH-45 would compromise the Project to a degree that it would be unreasonable to proceed in light of the Project's stated purpose and need.

7.8.2.4 Alignment Shifts and Design Refinements

During the NEPA process, FRA coordinated with TCRR to examine the potential to shift portions of the Project to avoid Section 4(f) properties. TCRR also examined the potential to modify portions of the design of the alternatives to avoid or minimize impacts to Section 4(f) properties and to preserve the activities, features, or attributes of each property that qualify it for protection under Section 4(f).[39] In this analysis, TCRR focused on Segments 1, 3 and 5 where uses of Section 4(f) properties are identified.

7.8.2.4.1 Segment 1 (Dallas County)

In Segment 1, each Build Alternative would operate east of the UPRR corridor for approximately 2.3 miles at a distance of approximately 155 feet. In addition, each Build Alternative would operate west of IH-45 for approximately 4.25 miles at a distance of approximately 160 feet. Each Build Alternative would also cross the Trinity River in this segment. The Project alignment in these locations is constrained by the UPRR and IH-45 infrastructure and the HSR system's curvature requirements. In addition, the location where the Project alignment would cross the Trinity River was established through TCRR's coordination activity with the City of Dallas and the USACE as the least impactful location based on their concerns. During that coordination, alternative alignments were considered by TCRR and assessed as feasible. However, compared to Segment 1 alignment, significant problems with each alternative alignment were identified, including constructability concerns and comparatively greater impacts to existing railroads, businesses, a power substation, wetlands, difficulty in providing mitigation, and the expectation that the USACE would not approve Section 404 and 408 permits for such alignments. The proposed Trinity River crossing location addresses the constructability concerns, and would have fewer impacts and the impacts could be mitigated. Therefore, it is not feasible and reasonable to shift the

[39] **Appendix F, TCRR Final Conceptual Engineering Design and Constructability Reports,** and **Appendix G, TCRR Final Conceptual Engineering Plans and Details.**

Segment 1 alignment to avoid the existing transportation infrastructure, avoid all Section 4(f) properties and retain the Trinity River crossing location, while also achieving the HSR design requirements.

FRA and TCRR evaluated the following design refinements to avoid impacts to individual Section 4(f) properties:

- **Site DA.023 (Cadiz Street Underpass and Overpass), Dallas County**: TCRR considered providing the pedestrian bridge without a connection to Cadiz Street. This could be accomplished by the bridge crossing over Cadiz Street. Pedestrians would have to descend from the terminal station platform to ground level and access Cadiz Street from the street level. While this would a feasible way to avoid use of the Cadiz Street Underpass and Overpass, it would be awkward, time-consuming, and less safe for pedestrians compared with the proposed connection. Safety is an issue because pedestrians would be crossing Cadiz Street and the station driveway in the vicinity of the viaduct and the Cadiz Street Underpasses and Overpasses where traffic and pedestrian movements potentially could conflict during peak traffic conditions. Without the pedestrian bridge, connections to South Austin and Horner Streets would require increased walking time to and from the station for pedestrians. This increased walking time would be greater than walking to ground level to access Cadiz Street. Thus, pedestrians without a pedestrian bridge connection to Cadiz Street would be likely to use the ground level route. Given the awkward pedestrian movements, safety concerns and extra walking time, eliminating the proposed pedestrian connection to the Cadiz Street Underpass and Overpass was determined to be unreasonable.
- **Site DA.076a (Guiberson Corporation Machine Shop), Dallas County**: TCRR analyzed the potential to cross over the DA.076a (Guiberson Corporation Machine Shop) building with the viaduct without impacting the building. The building is approximately 500 feet long by 150 feet wide with its long edge parallel with the LOD. Each Build Alternative would demolish the building and provide track on a viaduct in place of the building and the proposed Emergency Response and Maintenance Staging Area in the southwest corner of the building footprint. TCRR considered design refinements to avoid impacting the building, including moving the staging area out of the building footprint and crossing over the building with a viaduct without impacting the building. While moving the staging area is feasible and reasonable, spanning over the building is not. The viaduct span would have to be greater than 500 feet long. Span distances greater than approximately 400 feet in length require special design elements to support the viaduct structure and special construction techniques because construction equipment and personnel cannot directly access the construction area from below. These factors, which are typical of bridge construction over water, would substantially increase the cost of this portion of the viaduct compared to the viaduct construction and cost assumptions for other sections of the Project. In addition, there is a high risk of damaging the historic building (diminishing its integrity) during construction because of its location under the work area. On the basis of these findings, FRA assessed that while spanning the building may be feasible, it is not reasonable because of the combination of engineering, cost and risk to the historic structure. TCRR also considered whether the viaduct alignment could be shifted to avoid a use of DA.076a. The viaduct alignment is constrained through the City of Dallas by HSR curve requirements, the existing rail line to the north of the Guiberson property, the floodplain of the Trinity River to the south of the property, and existing businesses around the property. A shift to the north would require the viaduct to be over the existing rail line; a shift to the south would impact most businesses along the length of the segment through Dallas because of HSR curve

requirements. TCRR determined that while shifting the alignment to may be feasible, it is not reasonable because of the impacts to businesses and the existing rail line.

7.8.2.4.2 Segment 3C (Leon County)

Within Segment 3C (Build Alternatives C and F) would incorporate Section 4(f) property into the proposed transportation use (**Figure 7-13**). FRA and TCRR evaluated the following design refinements to avoid impacts to individual Section 4(f) properties in Segment 3C:

- **Fort Boggy State Park, Leon County**: In Segment 3C, Build Alternatives C and F would be aligned on the west side of IH-45. Although Segment 4 avoids incorporating Fort Boggy State Park into the transportation use in Leon County, the potential to shift the alignment of Segment 3C to avoid the property was still evaluated. Shifting the alignment to avoid Fort Boggy State Park would result in two options, a new alignment that is west of the park or a new alignment that is east of the park. However, neither option would avoid the use of all Section 4(f) properties. Because of the design criteria for HSR operations, track curves are gradual and require long distances to achieve a change in direction.
- **West of Fort Boggy State Park:** The curve to the west of IH-45 would begin north of Centerville, pass to the west of the park property, and continue in a southwesterly direction to join Segment 4 north of the point of juncture provided in Build Alternatives C and F. The path of the west alignment would be primarily through rural, agricultural properties and would require acquisition of portions of many such properties. Other impacts of a west alignment would include loss of agricultural lands and noise and vibration impacts to rural residences. It may be feasible to achieve HSR criteria with a west alignment and avoid Fort Boggy State Park. However, the alignment has the potential to impact two cemeteries that are potentially eligible for the NRHP and protected by Section 4(f): Evans Chapel Cemetery and Chapel Hill Cemetery. Impacts to one or both cemeteries would result in a use of one or both properties.
- **East of Fort Boggy State Park:** The curve to the east of IH-45 would begin north of Centerville with a viaduct crossing over the highway and a turn south to pass through Centerville along or near Highway 75, then through Leona, and south to join Segment 3C below Leona. The path of the east alignment would be primarily through the developed areas of Centerville and Leona, requiring acquisition of residential and business properties that are clustered in these communities. Other impacts of an east alignment would include visual, noise and vibration impacts to remaining residents and businesses in Centerville and Leona. It may be feasible to achieve HSR criteria with an east alignment and avoid Fort Boggy State Park. However, the east alignment would impact one NRHP-listed historic district (Leon County Courthouse and Jail Historic District) and one NRHP-eligible property (Mustang Creek Bridge). In addition, the east alignment has the potential to impact six properties that area potentially eligible for the NRHP: Centerville Cemetery, Centerville Community Cemetery, Culton Cemetery, Leon City Cemetery, Makamsom Cemetery, and Rogers Cemetery. Impacts to these eight properties would result in in a use of a minimum of two properties protected by Section 4(f), and possibly use of eight properties overall, depending on the outcome of Section 106 consultation on the six potential properties.

7.8.3 Avoidance Analysis – Houston Terminal Station Options

This section evaluates the Houston Terminal Station Options for the potential to avoid the use of Section 4(f) properties.

Table 7-11 identifies that the Houston Industrial Site Terminal Station Option would use the Tex-Tube Complex property, while the Houston Northwest Mall Terminal Station Option and Houston Northwest Transit Center Option would avoid use of Section 4(f) properties.[40] TCRR evaluated whether the Houston Industrial Site Terminal Station Option could be built as an underground station so as to avoid use of the Tex-Tube Complex property. However, the large area required for the terminal would necessitate a cut-and-cover construction technique, involving excavation of the entire construction site and a physical impact to the property. For this reason, an underground station would not avoid use of the Tex-Tube Corporation property. As discussed in **Section 2.7.3, Alternatives Considered, Comparison of Houston Terminal Station Options**, the Houston Northwest Mall Terminal Station Option (Preferred) and the Houston Northwest Transit Center Station Option do not present challenges that would question the feasibility of construction or operations or introduce severe impacts, additional costs, or other unique problems. Therefore, both are feasible and prudent alternatives to avoiding the use of the Tex-Tube Complex property.

Table 7-11: Summary of Section 4(f) Use – Houston Terminal Station Options

Section 4(f) Property	Industrial Site	Northwest Mall (Preferred Alternative)	Northwest Transit Center
HA.208 (Tex-Tube Complex)	Use	No Use	No Use

Source: AECOM 2019.

7.9 All Possible Planning to Minimize Harm

The proposed action must include all possible planning to minimize harm to the Section 4(f) property that would result from the action. All possible planning means that all reasonable measures to minimize harm or to mitigate for adverse impacts and effects must be included in the action. This section describes all planning to minimize harm resulting from the Preferred Alternative. Sources of the minimization and mitigation measures discussed in this section are the Project commitments identified in the Final EIS and the outcomes of Section 4(f) coordination FRA has undertaken with the officials with jurisdiction. With regard to historic properties, the Section 106 PA between FRA, TCRR, THC and other consulting parties under Section 106 outlines the process, mitigation strategies, and stipulations for implementing Project commitments made through the Section 106 process.

Throughout alternatives development and the NEPA process, FRA and TCRR applied the following strategies to avoid or minimize impacts to Section 4(f) properties:

- Coordinating with officials with jurisdiction, including TPWD, County, the SHPO (THC) and consulting parties under Section 106 to identify Section 4(f) properties early in alternatives development, determine plans for the properties by officials with jurisdiction and discuss the potential for Project impacts on those properties.
- Seeking input from interested parties and the public regarding the effects of the Project on Section 4(f) properties and other properties.
- Co-locating alignment with existing transportation and utility corridors as much as reasonably feasible to keep additional ROW needs to a minimum. Approximately 48 percent of the LOD, on average, would be located adjacent to existing road, rail or utility infrastructure.
- Using viaducts to minimize the physical impact of the Project on Section 4(f) properties to the extent reasonably feasible. Approximately 55 percent of the Build Alternatives would be on viaduct.

[40] FRA has identified Build Alternative A and the Houston Northwest Mall Terminal Station Option as the Preferred Alternative.

- Avoiding or reducing impacts to Section 4(f) properties using design refinements, for example:
    - *Site DA.072 (Dallas Floodway Historic District), Dallas County*: The track support was modified from embankment to viaduct to enable the tracks to span the property, resulting in no permanent incorporation of the property into the transportation use.
    - *Site DA.082 (Honey Springs Cemetery), Dallas County*: The LOD (track alignment and proposed facility) was refined to be within 150 feet from the cemetery such that no physical impact to the DA.082 Honey Springs Cemetery would occur. The Project would preserve the historic activities, features, or attributes of the property, which make it significant under Section 4(f): association with the early settlement of Dallas and the community development of south Dallas after Emancipation.
    - *Site MA.019 (Oxford Cemetery), Madison County*: The LOD was refined to be within 150 feet from the cemetery property such that no impacts to the MA.019 Oxford Cemetery would occur. The Project would preserve the historic activities, features, or attributes of MA.019, which make it significant under Section 4(f): historic cemetery.
    - *Site HA.004a (Residence at 29702 Castle Road), Harris County*: The LOD was shifted to the east, away from the property, to provide additional distance for Castle Road to be raised to cross over the track. The shifted alignment would result in no physical impacts to the property, thereby preserving the historic activities, features, or attributes that make it significant under Section 4(f): architecture.

As required by Section 4(f), FRA and TCRR identified the following commitments to minimize harm to Section 4(f) properties. These commitments are integral to the Project.

- *Fort Boggy State Park, Leon County*: Build Alternatives C and F would use viaduct along most of the property to minimize the area of use and impacts. For Build Alternatives C or F, TCRR would be required to implement commitments made to minimize harm in coordination with TPWD as well as BMPs outlined in **Section 3.2, Air Quality; Section 3.4, Noise and Vibration; Section 3.6, Natural Ecological Systems and Protected Species; Section 3.8, Waters of the U.S.;** and **Section 3.10, Aesthetics and Scenic Resources**.

FRA, in further consultation with THC, the official with jurisdiction for historic properties, and other consulting parties developed a PA in accordance with Section 106 (**Appendix L, Programmatic Agreement**). The PA specifies the processes and responsible parties for developing and implementing additional studies regarding historic and archeological sites, identifies a menu of potential mitigation strategies to address impacts to those sites, and specifies other procedures for undertaking and completing consultation under Section 106. From the list of potential strategies, FRA, THC and other consulting parties will, through the Section 106 consultation process, identify specific mitigation measures to preserve and/or interpret the historic integrity of each historic property that is adversely impacted by the Project, and to address the specific effects to each property. The parties will consider the elements that make each property significant, the criteria for significance, the nature and extent of the Project effect on the property's significance, and the suitability and effectiveness of each mitigation strategy (or combination of mitigation strategies) to address the Project effect. Because the historic properties occur along portions of alignment that are common to each of the six Build Alternatives, the PA is applicable to Build Alternatives A through F, including the Preferred Alternative. As outlined in the PA, the following is the menu of potential mitigation strategies:

- **Digital Photography Package**: a comprehensive collection of photographs of both interior and exterior views showing representative spaces and details of significant architectural features and typical building materials.

- **Historic American Building Survey (HABS), Historic American Engineering Record (HAER), and/or Historic American Landscapes Survey (HALS) Level III Equivalent Documentation**: The documentation shall be prepared to modify HABS/HAER/HALS standards as defined in the Secretary of the Interior Standards and Guidelines for Archeology and Historic Preservation for Architectural and Engineering Documentation, and further described in the NPS guidelines. Modified HABS/HAER/HALS Level III documentation shall include:
    - Archival quality prints of 35mm black and white photographs documenting the property's appearance and major structural or decorative details
    - Written report following the outline format provided for by NPS
    - Sketch plan of the property and site
    - Reproductions of supplementary documentation including field notes and historic images
- **Design Review**: requires the drafting of architectural and engineering plans and specifications that will, to the greatest extent feasible, preserve the basic character of building with regard to the design, scale, massing, and materials of the original building and/or the eligible or listed National Register Historic District following the Secretary of the Interior Standards for the Treatment of Historic Properties.
- **Resource Protection Plan**: a resource protection plan may include one of the following or a combination of both.
    - The drafting of a protection plan to avoid construction-related damage to a historic property(ies) within close proximity to Project ground disturbing and/or construction activities. The plan may focus on the property as a whole and/or its character defining features. The protection plan will describe the construction procedures in the vicinity of the historic property and measures that will be taken to avoid construction impacts to the property.
    - For character-defining features of a historic property that will be affected by the Project, or historic properties that are part of the National Register eligible or listed multiple-property listing or historic district, protection plans may propose preservation measures for those properties. The protection plan will describe the measures that will be taken to preserve the property(ies) according to the Secretary of the Interior Standards for the Treatment of Historic Properties.
- **National Register of Historic Places and National Historic Landmark Nominations**: documentation shall be prepared to NPS standards for NRHP and NHL nominations.
- **Public Interpretation**: may include historic markers, displays, educational pamphlets (brochure or booklet), posters, websites, workshops, public lectures or other similar mechanisms to educate the public on historic properties within the local community, state, or region.
- **Oral History Documentation**: of agreed upon topics and list of interview candidates.
- **Aesthetic Treatments**: may include aesthetic camouflaging treatments such as use of veneers, paints, texture compounds and other surface treatments and/or use of sympathetic infill panels and landscaping features per the review and approval of a Secretary of the Interior qualified Historic Architect.
- **Preservation-in-Place of Archeological Sites Listed or Eligible for the NRHP or State Antiquities Landmark Designation**: may be applied by establishing a preservation easement, preventative monitoring program, or SAL designation.
- **Archeology Data Recovery Plan**: of historic properties that would be destroyed by ground disturbing and/or construction activities directly related to the Project.

In addition to these standard treatment measures, FRA and TCRR will be subject to Title 8, Subtitle C, Chapter 711 of the Texas Health and Safety Code regarding cemeteries. Prior to construction, coordination between FRA, TCRR and THC will be undertaken under Section 711.035(d) and Section 711.035(f) for impacts a dedicated cemetery.

7.10 Coordination

FRA has coordinated with TPWD and THC, the officials with jurisdiction over Section 4(f) properties described in this chapter. A summary of coordination activities with each official with jurisdiction is provided in the following subsections.

7.10.1 Fort Boggy State Park

In the case of public parks, recreation areas, and wildlife and waterfowl refuges, the official with jurisdiction is the agency that owns or administers the property. Fort Boggy State Park is owned and administered by TPWD; thus, TPWD is the official with jurisdiction over Fort Boggy State Park.

TPWD was invited by FRA to participate in the NEPA process; TPWD participated in various meetings and provided comments to inform FRA's understanding of the TPWD's mission for Fort Boggy State Park; the park's activities, attributes and features of the park that make it significant, the potential for Project impacts to the park, and processes for developing mitigation if the Project impacts the park.

FRA and TCRR considered the input received from the TPWD in the development and evaluation of the Project, particularly the fact that four of the six Build Alternatives and two terminal station options would avoid a use of the property.

On February 12, 2020,, FRA sent a letter to TPWD indicating intent to make a *de minimis* impact finding for Build Alternatives C and F as described in **Section 7.12, Section 4(f) Conclusion,** and seeking concurrence from TPWD according to the requirements of Section 4(f). On March 13, 2020, TPWD responded by letter to FRA disagreeing with FRA's proposed *de minimis* impact finding for Build Alternatives C and F. Based on TPWD's opinion that Build Alternatives C and F would adversely affect the activities, features, and attributes that qualify Fort Boggy State Park for protection, FRA has determined that Build Alternatives C and F would result in a Section 4(f) use of Fort Boggy State Park.

7.10.2 Historic Properties

The official with jurisdiction over the historic properties considered in this Section 4(f) evaluation are the SHPO and the Advisory Council on Historic Preservation (ACHP). The THC is the SHPO. ACHP is an independent federal agency established by the NHPA that promotes the preservation, enhancement, and productive use of historic properties. Section 106 empowers the ACHP to participate in consultation when the agency deems that the *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*[41] is met.

FRA coordinated with THC on the eligibility and effect determinations for historic properties, seeking THC concurrence on FRA's determinations (**Table 7-12**). In addition, FRA notified THC of the agency's intent to make Section 4(f) findings based on the eligibility and effect determinations.

[41] 36 CFR 800, Appendix A.

Table 7-12: Summary of Consultation Regarding Historic Properties		
Date	**Attendees**	**Comments**
2/23/2015	Section 106 Initiation letter to THC and consulting parties	None
3/20/2015	ACHP invitation acceptance letter	ACHP will participate in Section 106 consultation
4/19/2018	FRA letter to ACHP	FRA intends to prepare a programmatic agreement (PA)
5/31/2018	FRA, ACHP, THC, other consulting parties, TCRR	Consulting Parties Meeting 1 – General discussion of the Section 106 process
6/30/2017	THC concurrence letter	MA.019 Oxford Cemetery is eligible; no adverse effect
8/25/2017 5/1/2020	THC concurrence letter and emails	Eligible properties: • DA.023 Cadiz Street Underpass is eligible; adverse effect • DA.072 Dallas Floodway Historic District is eligible; no adverse effect • DA.076b Guiberson Machine Shop is eligible; adverse effect • DA.076a Guiberson Residence is eligible; indirect adverse effect • DA.110b Linfield Elementary School Ineligible properties: • DA.110a Smith/Kinnard Family Cemetery
8/30/2017	THC concurrence letter	Eligible properties: • HA.004b Residence is eligible; adverse effect if demolition or relocation is undertaken • HA. 208 Tex-Tube Property is eligible: adverse effect
10/12/2017	THC concurrence letter	Eligible properties: • DL-C168 Honey Springs Cemetery is eligible
4/2/2020	THC concurrence email	Eligible properties: • MA.003 Randolph Cemetery is eligible: indirect adverse effect, require further studies for direct effect
5/31/2018 4/9/2019 6/13/2019 6/26/2019 7/9/2019 11/7/2019	PA Meetings among FRA, THC and other consulting parties	Development of PA language and stipulations

Source: AECOM 2020.

7.11 Least Overall Harm Analysis

When multiple alternatives that would use a Section 4(f) property are under consideration, FRA conducts an evaluation to identify the alternative that causes the least overall harm in light of the preservation purpose of Section 4(f). In the avoidance analysis described in **Section 7.8, Avoidance Alternatives**), FRA determined that none of the Build Alternatives is a feasible and prudent avoidance alternative. As a result, FRA evaluated Build Alternatives A through F to identify the alternative with the least overall harm as described in **Section 7.11.2, Analysis and Results**.

7.11.1 Methodology

FRA's least overall harm analysis requires a balancing of seven factors when determining which alternative and options would cause the least overall harm.

- **Factor 1 – Ability to mitigate adverse impacts on each Section 4(f) property**: The ability to mitigate impacts on Section 4(f) properties was assessed by considering the types of proposed uses the alternatives would have and making a relative comparison among the alternatives.

- **Factor 2 – Relative severity of the remaining harm, after mitigation**: The relative severity of the remaining harm after mitigation was assessed by considering the residual impacts of the alternatives and making a relative comparison among the alternative and options.
- **Factor 3 – Relative significance of each Section 4(f) property**: FRA considers each Section 4(f) property to be equally significant in this evaluation; none of the properties has been determined through this evaluation or through coordination with official(s) with jurisdiction to be of different value.
- **Factor 4 – Views of the official(s) with jurisdiction over each Section 4(f) property**: FRA is coordinating with official(s) with jurisdiction over properties that are protected by Section 4(f) and where a potential use would occur. The purposes of coordination are to discuss the alternatives, obtain views about potential uses, examine the potential to avoid or minimize harm, and identify appropriate measures to minimize harm, when applicable.
- **Factor 5 – Degree to which each alternative meets the purpose and need for the Project**: The alternatives are assessed according to each element of the Project purpose and need to determine how well each alternative achieves each element. The findings for each alternative are compared.
- **Factor 6 – The magnitude of adverse impacts on properties not protected by Section 4(f)**: The Draft and Final EIS examines other natural and human environment factors besides Section 4(f). The negative impacts of the alternatives to these other factors are considered and compared among the alternatives.
- **Factor 7 – Substantial differences in costs among the alternatives**: The Draft and Final EIS examines and compares the preliminary cost estimates of each alternative.

7.11.2 Analysis and Results

This section provides FRA's least overall harm analysis for the Project.

Factor 1 – Ability to Mitigate Adverse Impacts on Each Section 4(f) Property

As described in **Section 7.7**, **Assessment of Use of Section 4(f) Properties,** all impacted Section 4(f) properties with the exception of Fort Boggy State Park are located on common segments and would be impacted equally by all Build Alternatives. Proposed minimization and mitigation measures could be applied to equal effect to any Build Alternative. Among the Build Alternatives, C and F would result in greater impacts to Section 4(f) properties because of the additional use of Fort Boggy State Park.

Among the Houston Terminal Station Options, the Houston Northwest Mall Terminal Station Option and the Houston Northwest Transit Center Terminal Station Option would not use Section 4(f) properties. However, the Houston Industrial Site Terminal Station Option would use one property, resulting in the removal of the property. In this case, a complete loss of the features, attributes and activities that qualify the property for protection under Section 4(f) would occur. For this reason, the ability to mitigate the adverse impacts caused by the Houston Industrial Site Terminal Station Option would be limited.

Factor 2 – Relative Severity of the Remaining Harm After Mitigation

As mitigation for the impacts to the Section 4(f) properties on common segments would be the same among all Build Alternatives, the severity of the remaining harm after mitigation would be the same. FRA's individual use finding regarding Fort Boggy State Park for Build Alternatives C and F would potentially increase the relative severity of harm to Section 4(f) properties resulting from those Build Alternatives.

Factor 3 – Relative Significance of Each Section 4(f) Property

FRA considers each Section 4(f) property in this evaluation to have equal significance.

Factor 4 – Views of the Officials with Jurisdiction Over Each Section 4(f) Property

As summarized in **Section 7.10**, FRA coordinated with THC and TPWD, the officials with jurisdiction over the Section 4(f) properties that were evaluated. FRA and THC are consulting under Section 106, which has resulted in THC concurrence with FRA's determinations of effect on historic properties. FRA, THC and other consulting parties developed and commit to implementing a PA that stipulates studies and mitigation required to satisfy the requirements of Section 106.

FRA and TPWD coordinated regarding Fort Boggy State Park. The TPWD expressed concerns regarding the impacts of Build Alternatives C and F as described in **Section 7.10.1, Fort Boggy State Park**. However, TPWD supports Build Alternatives A, B, D and E as none of these alternatives would impact the park.

Factor 5 – Degree to Which Each Alternative Meets the Purpose and Need for the HSR Project

Build Alternatives A, B, D, E and F, as well as the Houston Terminal Station Options, each achieve the Project purpose and need to an equal degree because each would provide the public with reliable and safe high-speed passenger rail transportation between Dallas and Houston. Each of these Build Alternatives would address the Project need to overcome deficiencies of the existing and proposed transportation infrastructure in a manner that accommodates growing travel demand between Dallas and Houston and provide a safe and reliable transportation mode. Build Alternative C would achieve the Project purpose and need to a lesser degree than the other Build Alternatives because of safety concerns related to the long distance the alignment would be adjacent to IH-45 and the requirement for crash barriers as a safety provision.

Factor 6 – The Magnitude of Adverse Impacts on Properties Not Protected by Section 4(f)

Differences in impacts among the six Build Alternatives are described in detail in **Section 2.7, Alternatives Considered, Preferred Alternative**. The key difference among the Build Alternatives is that Segment 2B of Build Alternatives D, E and F would require crossing fee land associated with the Lake Bardwell flowage easement. The crossing would require a Section 408 authorization from the USACE. FRA coordination with the USACE determined that, per the USACE National Non-Recreation Outgrant Policy, the proposal for Segment 2B to cross fee land would be denied because there are viable Build Alternatives that would not cross federal property.

Build Alternatives A, B and C do not have this constraint. A comparison of the impacts of Build Alternatives A, B and C identified differences that distinguish the alternatives in the areas of socioeconomic, natural, physical and historic properties. **Table 2-14** in the Final EIS details these differences; **Table 7-13** summarizes the key distinguishing factors among Build Alternatives A, B and C. Examining the criteria for which there are differences in impacts among the alternatives indicates that Build Alternative A would have the fewest impacts on most resources, while Build Alternative B would have more impacts, including the most impacts in the areas of noise, numbers of stream crossings, road modifications, and residential displacements. Build Alternative C would have comparatively more impacts than Build Alternatives A or B, including the highest impacts in the areas of commercial and community facility displacements, structure acquisitions, construction effects on fire and EMS providers, and parks.

Table 7-13: Comparison of Build Alternatives A, B and C[a]				
Evaluation Criteria	**Measure**	**Alt A**	**Alt B**	**Alt C**
Severe Noise Impacts to Residences	Count	10	12	10
Moderate Noise Impacts to Residences	Count	280	290	275
Stream Crossings – Permanent	Feet	38,898	45,631	35,096
Road Modifications[b] (*Public and Private*)	Count	138	150	102
Displacement – Commercial (primary structures)	Count	42	42	65
Displacement – Residence (primary structures)	Count	235	255	239
Displacement – Community Facilities (primary structures)	Count	2	2	3
Estimated Temporary Parcel Acquisitions	Count	272	277	259
Estimated Structure Acquisitions – Agriculture	Count	196	223	196
Estimated Structure Acquisitions – Oil and Gas	Count	12	12	17
Estimated Structure Acquisitions – Residence	Count	49	50	51
Estimated Structure Acquisitions – Transportation and Utilities	Count	0	0	1
Fire and EMS providers with high potential for construction effects	Count	3	4	5
Parks	Count	0	0	1

Source: AECOM 2019.

Notes: Green shading indicates fewest impacts; orange shading indicates most impacts.

[a] Table reflects only those evaluation criteria that differ between the Build Alternatives.

[b] Road modifications reflect the number of reroutes, road adjustments, or road over rail constructions that would occur. Some roads are affected by multiple modifications (such as IH-45). Modifications do not reflect total number of roads but total number of road construction sites.

The Houston Terminal Station Options distinguish themselves in terms of adverse impacts to properties not protected by Section 4(f) as shown in **Table 7-14**. Examining the criteria for which there are differences in impacts among the options indicates that the Houston Northwest Mall Terminal Station Option would have the fewest impacts to non-Section 4(f) resources, while the Houston Northwest Transit Center Station Option and the Houston Industrial Site Terminal Station Option would have more impacts to non-Section 4(f) resources.

Table 7-14: Comparison of Houston Terminal Station Options[a]				
Evaluation Criteria	**Measure**	**Northwest Mall**	**Northwest Transit Center**	**Industrial Site**
Intersections at LOS E or F	Count	24	22	24
Commercial displacements	Count	22	15	14
Moderate risk hazardous materials sites	Count	3	8	3
High risk hazardous materials sites	Count	0	0	2
Temporary wetlands impacts	Acres	0	1.6	0
Temporary waterbody impacts	Acres	0	0.10	0
Community facility impacts	Count	0	1	0
Historic property impacts	Count	0	1	1

Source: AECOM 2019.

Notes: Green shading indicates fewest impacts; orange shading indicates most impacts.

[a] Table reflects only those evaluation criteria that differ between the build alternatives.

Factor 7 – Substantial Differences in Costs Among the Alternatives

Each of the six Build Alternatives would have a similar cost because there are no elements among the Build Alternatives that would cause the overall cost of each to substantially differ. There is no substantial cost difference among the Houston Terminal Station Options.

7.11.3 Conclusion

In consideration of the foregoing factors, Build Alternative A and the Houston Northwest Mall Terminal Station Option is the alternative with the least overall harm for the following reasons:

- **Factors 1 through 4**: Each of the Build Alternatives A, B, D and E would perform the same with regard to Factors 1, 2, 3, and 4. Build Alternative C or F would not be the alternative with the least overall harm because Build Alternative C or F would use an additional property, Fort Boggy State Park.
- Among the Houston Terminal Station Options, the Houston Northwest Mall Terminal Station Option and the Northwest Transit Center Terminal Station Option would perform the same. However, the Houston Industrial Site Terminal Station Option would use one Section 4(f) property. As such, the Houston Industrial Site Terminal Station Option is not the option with the least overall harm to Section 4(f) properties.
- **Factor 5**: Each Build Alternative and Houston Terminal Station Option addresses the Project purpose and need to a similar degree.
- **Factor 6**: Build Alternatives A, B and C would not have the constraint of the Section 408 acquisition. Build Alternative A would have the fewest adverse impacts on properties not protected by Section 4(f). The Houston Northwest Mall Terminal Station Option would have the fewest impacts on other, non-Section 4(f) resources.
- **Factor 7**: No substantial differences in cost are identified among the Build Alternatives.

7.12 Section 4(f) Conclusion

7.12.1 Build Alternatives

FRA examined six Build Alternatives, A through F, and three Houston Terminal Station Options for the Project. Each of the six Build Alternatives, including the Preferred Alternative, would use three properties protected by Section 4(f) because the properties are on segments that are common to each Build Alternative:

- DA.023 (Cadiz Street Underpass and Overpass), Dallas
- DA.076a (Guiberson Corporation), Dallas
- DA.110b (Linfield Elementary School)

Build Alternatives C and F, not the Preferred Alternative, would permanently require the use of an additional Section 4(f)l property, Fort Boggy State Park.

Among the Houston Terminal Station Options, the Houston Industrial Site Terminal Station Option, not the Preferred Alternative, would require the use of one Section 4(f) property (HA.208 Tex-Tube Complex).

None of the Build Alternatives would avoid a use of all Section 4(f) properties (**Section 7.8, Avoidance Alternatives**). In this task, FRA examined location alternatives, alternative actions, alignment shifts and design changes, and determined that none is a feasible and prudent avoidance alternative as defined by Section 4(f). As a result, this Section 4(f) evaluation considers all six Build Alternatives.

FRA consulted with THC and TPWD, the officials with jurisdiction over the Section 4(f) properties in this evaluation. Consultation enabled FRA to understand the purpose and significance of each property and the concerns of officials with jurisdiction regarding Project impacts on each property. More importantly, consultation with officials with jurisdiction has enabled the Project design to be refined to reduce or

eliminate use of Section 4(f) properties where reasonably feasible (**Section 7.9, All Possible Planning to Minimize Harm**). Ongoing consultation activities will include identifying and making commitments to specific minimization and mitigation measures and concurring with FRA's determinations of effect and least overall harm in the Final Section 4(f) Evaluation (**Section 7.10, Coordination**).

In this Section 4(f) Evaluation, FRA has identified Build Alternative A and the Houston Northwest Mall Terminal Station Option as the alternative with the least overall harm to Section 4(f) properties (**Section 7.11.2, Analysis and Results**). This is based on Build Alternative A having the same or fewer uses of Section 4(f) properties compared to the other Build Alternatives but having fewer impacts to other resources that are not protected by Section 4(f). The Houston Northwest Mall Terminal Station Option would not use Section 4(f) properties.

This Section 4(f) Evaluation will be subject to review and comment by the DOI. Concurrent with the DOI's review will be continuing consultation under Section 106 to finalize the PA. FRA will consider the DOI's comments and Section 106 consultation prior to making a final Section 4(f) determination, which will be included in the ROD for the Project.

7.13 Section 6(f) Resources

Section 6(f) of the LWCF Act prohibits property acquired and improved with LWCF assistance from being converted to uses other than public outdoor recreation without the approval of NPS. Therefore, the Study Area for Section 6(f)-protected resources is limited to the LOD.

7.14 Assessment of Conversion of Section 6(f) Properties

There are no resources within the Section 6(f) Study Area protected under Section 6(f). Therefore, no conversion of 6(f) properties would occur as a result of implementation of the Project.

8.0 APPLICABLE FEDERAL, STATE AND LOCAL PERMITS AND APPROVALS

Several permits, approvals, authorizations and compliance with federal, state and local regulations are required for developing the Project. As the federal lead agency, FRA is mandated to evaluate compliance under federal laws and regulations relevant to the Project. In addition, TCRR is responsible to fulfill requirements of applicable statutes, regulations and policies associated with Project construction and operation. These permits and authorizations will be obtained concurrent with the ROD or prior to operations. **Table 8-1** provides an overview of the permits, approvals and authorizations; the agency responsible for the permit and/or approval; the permit, compliance or review required; and the relevant laws and regulations. The table provides an overview of permits and approvals required for major projects in Texas with a federal action; it is not intended to be an exhaustive list.

Table 8-1: Applicable Laws, Permits and Authorizations

Issue	Action Requiring Permit, Approval or Review	Agency	Permit, License, Compliance or Review	Relevant Laws and Regulations
Railroad Safety	Review of HSR system to ensure safe operation	FRA	Grant a Rule of Particular Applicability, Waiver or series of Waivers, or other safety approval	49 U.S.C. 20101 et seq.
Security of Mass Transit Systems	Review of HSR system security plan	TSA	Evaluate for compliance	49 C.F.R. 1850; 49 C.F.R. 1520; Texas SB 975 and TSA RAILPAX-04-01 and RAILPAX-04-02
Section 4(f)	Review Project for use of parkland, recreational areas, wildlife refuges and significant historic sites	FRA, Department of Interior	Review for compliance with Section 4(f); for example, demonstrate all planning to minimize harm to Section 4(f) resources	49 U.S.C. 3030, Section 4(f) of the U.S. DOT Act of 1966
Section 6(f)	Review Project for permanent conversion of recreational property acquired with Land and Water Conservation Fund (LWCF) monies	FRA	Review for compliance with Section 6(f)	Section 6(f) of the LWCF Act of 1965
Biological Resources	Protection of threatened and endangered species and their habitat that could be impacted by Project construction	USFWS	Section 7 Consultation in compliance with Endangered Species Act (ESA) including the preparation of a BA and USFWS issuance of a Biological Opinion	ESA of 1973 as amended (16 U.S.C. 1531 et seq.)
Biological Resources	Protection of migratory birds	USFWS	Evaluate for compliance	Migratory Bird Treaty Act of 1918, 16 U.S.C. 703-712; 50 C.F.R. 1
	Protection of bald and golden eagles	USFWS	Evaluate for compliance	Bald and Golden Eagle Protection Act of 1972 (16 U.S.C. 668)

Table 8-1: Applicable Laws, Permits and Authorizations				
Issue	**Action Requiring Permit, Approval or Review**	**Agency**	**Permit, License, Compliance or Review**	**Relevant Laws and Regulations**
Ground Disturbance and Water Quality Degradation	Construction sites with greater than 5 acres of land disturbance	EPA and TCEQ	Section 402 National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Construction Activities; TPDES General Construction Permit (TXR150000)	Clean Water Act (33 U.S.C. 1342); Chapter 26 of the Texas Water Code
	Wastewater discharge to stormwater or waters of the State during operation	TCEQ	Industrial Wastewater Discharge permit (TPDES)	40 C.F.R. 400-471; Texas Water Code, Chapters 5 and 26
	Potential discharge into Municipal Separate Storm Sewer System (MS4)	MS4 Operator (Cities of Dallas and Houston)	EPA Permit programs under Section 402 NPDES	40 C.F.R. 122
	Potential pollutant discharge during construction, operation and maintenance	EPA	Spill Prevention, Control and Countermeasure (SPCC) Plan	Oil Pollution Act of 1990 (40 C.F.R. 112)
	Potential discharge into waters of the state (including wetlands)	TCEQ	Section 401 Permit	Clean Water Act (33 U.S.C. 1344)
	Construction in jurisdictional floodplain	Local floodplain administrators	Floodplain development permits	Local floodplain regulations
	Construction in or modification of floodplains	FRA	Review for compliance with Executive Order, which requires avoiding floodplains unless there is no practicable alternative and to include measures to minimize harm	42 U.S.C. 4321 Executive Order 11988, Floodplain Management
	Construction in or modification of wetlands	FRA	Review for compliance with Executive Order, which requires avoiding wetlands unless there is no practicable alternative and to include measures to minimize harm	42 U.S.C. 4321 Executive Order 11990, Protection of Wetlands
	Construction in or across navigable waters of the U.S	EPA and USACE	Section 10 permit and/or Section 404 permit	Clean Water Act (33 U.S.C. 1344)
	Discharge of dredge or fill material into waters of the U.S.	EPA and USACE	Section 404 Permit	Clean Water Act (33 U.S.C. 1344)
	Alteration or occupation or use of USACE civil works projects	USACE	408 Permission and/or Real Estate Instrument	Section 14 of the Rivers and Harbors Act of 1899; 33 U.S.C. 408
	Crossing of state lands (state-owned riverbed crossings)	Texas General Land Office	Rights of Way / Miscellaneous Easement	Texas Natural Resources Code (TNRC) 51.291
Ground Disturbance and Water Quality Degradation	Construction or modification of a bridge or causeway crossing a navigable waterway of the U.S.	USCG	Bridge permit	Section 9 of the Rivers and Harbors Act of 1899; General Bridge Act of 1946 (33 C.F.R. 114 and 115; 33 C.F.R. 2.36)

Table 8-1: Applicable Laws, Permits and Authorizations				
Issue	**Action Requiring Permit, Approval or Review**	**Agency**	**Permit, License, Compliance or Review**	**Relevant Laws and Regulations**
Cultural Resources	Disturbance of historic properties	FRA, SHPO/THC, Advisory Council on Historic Preservation	Section 106 Consultation	National Historic Preservation Act of 1966 (16 U.S.C. 470) (36 C.F.R. 800)
	Impacts due to spanning over, or across, a part of the dedicated cemetery	SHPO/THC	Section 711.035(d) and Section 711.035(f) review	Title 8, Subtitle C, Chapter 711 of the Texas Health and Safety Code
	Potential conflicts with freedom to practice traditional American religions	FRA	Consultation with affected American Indians	American Indian Religious Freedom Act (42 U.S.C. 1996)
	Disturbance of graves, associated funerary objects, sacred objects and items of cultural patrimony	FRA	Consultation with affected American Indians	Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-3002)
Air Quality	Project impacts to air quality	EPA, TCEQ	Conformity review; applicable Air Pollution Control Permits	Transportation Conformity Requirements (40 C.F.R. 51)
Transportation	Road crossings; construction within ROW	FHWA, TxDOT, Texas Transportation Commission and/or local jurisdictions	Right-of-Way Use Agreements; Road Crossing Permits	
	Temporary access driveways, construction detours and temporary signage	TxDOT and/or local jurisdictions	Encroachment Permits Traffic Management Plan	
Land Use	Land use and zoning permits/approvals	Local jurisdictions	Conditional use permits, zoning waivers and site development permits	
	Conversion of prime farmland	NRCS	Review and coordination of Project; however, no permit is anticipated	Farmland Protection Policy Act (7 U.S.C. 4202(b), Chapter 73)

Source: AECOM 2019

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9.0 PUBLIC AND AGENCY INVOLVEMENT

NEPA requires public involvement during the environmental review process to facilitate open communication between affected resource agencies and the public, and to promote better decision-making. In preparation of this EIS, FRA engaged government agencies, key stakeholders, Environmental Justice communities and the public.

This chapter describes the public and agency involvement efforts FRA conducted in preparing this EIS, including the following:

- Preparation and distribution of informational materials (e.g., fact sheets and newsletters) and reports
- Public scoping meetings
- Agency scoping meetings, meetings with agency representatives and other resource agency consultation
- Environmental Justice outreach
- Notification and circulation of the Draft EIS, followed by public hearings

CEQ NEPA regulations (40 C.F.R. 1501.7) provide for five major aspects of public participation in conjunction with preparation of an EIS:

- Issuing a Notice of Intent
- Scoping
- Establishing a public review and comment period for the Draft EIS
- Convening a public hearing on the Draft EIS
- Releasing the Final EIS to the public, accompanied by a 30-day public review period

FRA recorded and considered all comments received as of the date this Final EIS was issued and will continue to consider all comments received until FRA issues a ROD.

9.1 Public Communication

9.1.1 Project Website

FRA created a website for the Project (https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail) and continues to update the site regularly.[1] The site contains announcements of upcoming events, a Project history, graphics and maps, the Project newsletter and details on public involvement activities.

9.1.2 Newsletters

FRA created a Project newsletter, *On Track,* to communicate with the public about the Project. Newsletters were distributed mainly through email to identified stakeholders and interested parties. Interested parties submitted a request to FRA or through the Project website to be added to the mailing list. The Project mailing list was continuously updated throughout the development of the EIS and supporting documents based on requests received from individuals to be added to the list. As undeliverable notices have been received by FRA via email or U.S. Postal Service, invalid addresses have been removed from the mailing list. As of the Final EIS there are approximately 3,750 individuals, federal, state or local agencies and/or officials, elected officials and Native American tribes included on the mailing list. Mailing method includes email and/or U.S. Postal Service depending on address provided (postal addresses, email addresses or both).

[1] The previous Project-specific websites, www.dallashoustonhsr.com and http://www.fra.dot.gov/Page/P0700, have been redirected to FRA's current website.

To date, four newsletters have been published:

- The first edition of the newsletter was published in October 2014. It described the Project, the EIS process and the public scoping process. The newsletter was distributed in hardcopy during the public scoping meetings and uploaded to the Project website.
- A second newsletter was uploaded to the Project website on September 14, 2015, and emailed to the Project mailing list. This newsletter announced the completion of the corridor alternatives analysis and availability of the Scoping Summary Report.
- A third newsletter was emailed to the Project mailing list on November 9, 2015, and uploaded to the Project website. The newsletter announced the completion of the Alignment Alternatives Assessment Report.
- A fourth newsletter was emailed to the Project mailing list on January 16, 2018, and uploaded to the Project website on January 25, 2018. The newsletter announced the availability of the Draft EIS, dates and locations of the public hearings (including updated venue information) and the extension of the public comment period through March 9, 2018.

Other newsletters are planned for the release of the Final EIS and the ROD. Copies of the newsletters can be found on the Project website at https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/documents-maps-images.

9.2 Stakeholder Communication

Throughout the NEPA process, FRA project staff have conducted informal outreach with landowners, organizations, businesses and other stakeholders directly through email and telephone. FRA has considered the information obtained through this outreach in the preparation of the EIS.

In response to comments received during the Draft EIS Comment Period (see **Section 9.6.2, Draft EIS Comment Period**), the FRA met with the following stakeholders:

- **June 26, 2018:** FRA met with Oncor Electric to discuss FRA's NEPA process, ongoing Oncor and TCRR coordination and potential impacts on Oncor infrastructure.
- **June 27, 2018:** FRA met with CenterPoint to discuss FRA's NEPA process, ongoing CenterPoint and TCRR coordination and potential impacts on CenterPoint infrastructure.
- **June 29, 2018:** FRA met with UPRR to discuss FRA's NEPA process, ongoing UPRR and TCRR coordination, and potential impacts on UPRR infrastructure.

On November 16, 2018, FRA mailed 115 letters to landowners impacted by TCRR Project refinements (see **Section 2.5.4, Alternatives Considered, Engineering Refinements,** for more details). The letter informed landowners that TCRR had made minor adjustments to the Project alignment in response to public and stakeholder feedback and provided contact information to learn more about the Project and FRA's NEPA process. This letter and the three meetings can be found in **Appendix C, Public and Agency Involvement Correspondence**.

Separate from FRA's outreach under 40 C.F.R. 1501.7, TCRR also conducted public outreach throughout the Project development with various stakeholders, including federal, state and local agencies, elected officials, landowners and other interested parties. A summary of these activities is included in **Appendix I, TCRR Plans and Public Outreach**.

9.3 Public Scoping

Per 40 C.F.R. 1501.7 and in fulfillment of the first requirement of public involvement, FRA published an NOI for the Project in the *Federal Register* on June 25, 2014.[2] In addition to announcing the FRA's intent to prepare an EIS and the beginning of the scoping period, the NOI provided a brief background on the Project and explained the contents of the EIS including the planned analyses and identified contact information. The NOI also established the preliminary contents of the EIS, the required approvals by the federal government, details for scoping and procedures expected for coordination and public involvement based on NEPA requirements.

In response to public concerns and requests, FRA extended the scoping period an additional 108 days through January 9, 2015. Notification of the extended scoping period included an email to the Project mailing list, letters to elected officials, FRA media advisory and a notice on FRA's Project website can be found in the Scoping Report published in April 2015, which can be reviewed online at https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.[3]

9.3.1 Public Scoping Meetings

The Project included 12 public scoping meetings. The first round of public scoping meetings (six) was held in October 2014. In response to public input, the second round of public scoping meetings (six) was held in December 2014. A total of 1,943 individuals, including 118 elected officials, attended 12 public scoping meetings. Meeting dates/times, locations and attendance numbers are summarized in **Table 9-1**. Additional details on these public scoping meetings may be found at https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

The meetings served as a forum for disseminating information about the Project and obtaining public input on topics to be addressed in the EIS. Specifically, these scoping meetings gave the community an opportunity to review and comment on the draft Purpose and Need, the range of preliminary corridor alternatives and other Project information. Each meeting began with an open house session during which project team members interacted with meeting participants to answer questions and listened to participants' concerns about the Project. The materials distributed at these meetings generally consisted of a Project newsletter and comment forms.

During the open house portion of the meeting, Project team members encouraged participants to visit a series of informational stations containing exhibit boards where they could ask questions about the NEPA process, the EIS format and contents, Purpose and Need for the Project, public involvement activities, the Section 106 process, and the corridor alternatives, as well as review maps of the corridor alternatives. In addition, TCRR had a station where meeting participants could learn more about the proposed technology and planned operations.

The open house portion of the meeting was followed by a presentation and comment session. The public had an opportunity to provide comments verbally and in writing at the open house. Written comments were also accepted through the end of the extended scoping period (January 9, 2015). These comments were addressed in the Scoping Report published in April 2015, which can be viewed online at

[2] 79 Federal Register 36123, Pages 36123 -36124, FR Doc. 2014-14771, June 24, 2014, https://federalregister.gov/a/2014-14771.
[3] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.[4]

Table 9-1: Scoping Meeting Dates and Locations

Date	Venue	Number in Attendance	Number of Verbal Commenters
Tuesday, Oct 21, 2014 4:30 – 8 p.m.	Dallas Infomart 1950 N. Stemmons Fwy. Dallas, TX	Elected: 6 News Media: 1 Public: 116	11
Wednesday, Oct 22, 2014 4:30 – 8 p.m.	IOOF Event Center 601 N 45th St. Corsicana, TX	Elected: 2 News media: 0 Public: 76	5
Thursday, Oct 23, 2014 4:30 – 8 p.m.	Teague Community Center 511 Main St. Teague, TX	Elected: 5 News media: 0 Public: 141	21
Monday, Oct 27, 2014 4:30 – 8 p.m.	Brazos Center 3232 Briarcrest Dr. Bryan, TX	Elected: 12 News media: 2 Public: 130	8
Tuesday, Oct 28, 2014 4:30 – 8 p.m.	Veterans Conference Center 455 SH75N Huntsville, TX	Elected: 20 News media: 0 Public: 157	24
Wednesday, Oct 29, 2014 4:30 – 8 p.m.	NRG Center/Second Floor 1 Reliant Parkway Houston, TX	Elected: 12 News media: 1 Public: 178	26
Monday, Dec 1, 2014 4:30 – 8 p.m.	Jewett Civic Center 111 North Robinson Jewett, TX	Elected: 11 News Media: 5 Public: 141	19
Monday, Dec 1, 2014 4:30 – 8 p.m.	Waxahachie Civic Center 2000 Civic Center Lane Waxahachie, TX	Elected: 13 News media: 0 Public: 124	13
Tuesday, Dec 2, 2014 4:30 – 8 p.m.	Waller High School Auditorium 20950 Fields Store Rd Waller, TX	Elected: 15 Media: 2 Public: 173	20
Tuesday, Dec 2, 2014 4:30 – 8 p.m.	Truman Kimbro Convention Center 111 West Trinity Madisonville, TX	Elected: 4 News Media: 1 Public: 61	5
Wednesday, Dec 3, 2014 4:30 – 8 p.m.	Lone Star College – Tomball 30555 Tomball Parkway Tomball, TX	Elected: 6 News Media: 3 Public: 140	16
Thursday, Dec 4, 2014 4:30 – 8 p.m.	Grimes County Expo Center 5220 F.M. 3455 Navasota, TX 77868	Elected: 12 News Media: 3 Public: 370	44
TOTAL	**Public and Elected**	**1,943**	**212**

Source: AECOM 2016

Public notification of the scoping meetings included the following methods:

- Newspaper ads
- Direct mailers (postcards) for the October meetings only
- Website notices
- Email to mailing list
- Emails and letters to elected officials

[4] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

A newspaper display ad (in English and Spanish) announcing the October 2014 scoping meetings ran in 14 newspapers in or near the towns and cities where meetings were scheduled. A similar display ad for the December 2014 scoping meetings ran in 28 newspapers throughout the Project area. A copy of each ad and the run dates for all ads are located in the Scoping Report, which can be viewed at https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.[5]

For the October scoping meetings, TxDOT sent postcards (in English and Spanish) announcing the first round of scoping meetings to residents who lived near the meeting locations. **Table 9-2** contains a summary of the number of postcards sent for each scoping meeting location. A copy of the postcard is provided in the Scoping Report, which can be reviewed at https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.[6]

Table 9-2: Postcards Mailed for October Scoping Meetings

Targeted Area for Postcard	Number of Postcards Sent
Dallas	1,451
Corsicana	5,722
Teague	1,681
Bryan	15,029
Huntsville	6,709
Houston	2,200

Source: AECOM 2016

FRA announced the scoping meetings on the FRA Project website,[7] as well as on the original Project-specific website,[8] approximately two weeks before each set of meetings. **Table 9-3** lists the newspapers in which scoping meeting ads were run. The Project mailing list was created during the first round of scoping meetings. An email was sent to this mailing list on Friday, November 21, 2014, announcing the second round of public scoping meetings.

Table 9-3: Newspapers in Which Scoping Meeting Ads Were Run

Newspaper	County of Distribution[a]	First Publishing Date (2014)	Second Publishing Date (2014)
October Meetings			
Houston Chronicle	Harris	October 7	October 28
La Voz	Harris	October 12	October 26
Corsicana Daily Sun	Brazos and Grimes	October 7	October 21
The Eagle	Brazos	October 7	No second run
The Huntsville Item	Walker	October 7	October 27
The Dallas Morning News	Dallas and Ellis	October 8	No second run
Al Dia	Dallas and Ellis	October 8	No second run
The Conroe Courier	Montgomery	October 7	October 27
Waxahachie Daily Light	Ellis	October 8	October 21
The Teague Chronicle	Freestone	October 9	October 23
The Buffalo Press	Leon	October 6	October 20
The Madisonville Meteor	Madison	October 8	October 22

[5] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

[6] Ibid.

[7] FRA, "Dallas to Houston High-Speed Rail – Passenger Service from Houston to Dallas," https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail.

[8] The previous Project-specific websites, www.dallashoustonhsr.com and http://www.fra.dot.gov/Page/P0700, have been redirected to FRA's website, https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail.

Table 9-3: Newspapers in Which Scoping Meeting Ads Were Run			
Newspaper	**County of Distribution[a]**	**First Publishing Date (2014)**	**Second Publishing Date (2014)**
Navasota Examiner	Grimes	October 8	October 27
Ennis Daily News	Ellis	October 7	October 21
December Meetings			
The Houston Chronicle	Harris	November 18	No second run for round 2 ads
La Voz de Houston	Harris	November 23	No second run for round 2 ads
Corsicana Daily Sun	Brazos and Grimes	November 18	No second run for round 2 ads
The Eagle	Brazos	November 19	No second run for round 2 ads
The Huntsville Item	Walker	November 17	No second run for round 2 ads
The Dallas Morning News	Dallas and Ellis	November 17	No second run for round 2 ads
Al Dia	Dallas and Ellis	November 19	No second run for round 2 ads
The Conroe Courier	Montgomery	November 19	No second run for round 2 ads
Waxahachie Daily Light	Ellis	November 18	No second run for round 2 ads
The Teague Chronicle	Freestone	November 27	No second run for round 2 ads
The Buffalo Press	Leon	November 18	No second run for round 2 ads
The Madisonville Meteor	Madison	November 19	No second run for round 2 ads
Navasota Examiner	Grimes	November 19	No second run for round 2 ads
Ennis Daily News	Ellis	November 18	No second run for round 2 ads
Normangee Star	Leon and Madison	November 19	No second run for round 2 ads
Jewett Messenger	Leon	November 19	No second run for round 2 ads
Centerville News	Leon	November 19	No second run for round 2 ads
Buffalo Express	Leon	November 17	No second run for round 2 ads
The Freestone County Times	Freestone	November 19	No second run for round 2 ads
Fairfield Recorder	Freestone	November 27	No second run for round 2 ads
Groesbeck Journal	Limestone	November 19	No second run for round 2 ads
Mexia News	Montgomery	November 20	No second run for round 2 ads
Montgomery County News	Montgomery	November 19	No second run for round 2 ads
Waller County News-Citizen	Waller	November 20	No second run for round 2 ads
The Waller Times	Waller	November 19	No second run for round 2 ads
Times Tribune	Waller	November 20	No second run for round 2 ads
Hot Line	Waller	November 19	No second run for round 2 ads
Katy Times	Waller and Harris	November 20	No second run for round 2 ads

Source: AECOM, 2016

[a] Represents the primary county/counties in the Project Area that the newspaper serves. Other counties/regions may also receive the newspaper.

Elected and local officials were contacted via telephone on Tuesday, October 14, 2014, to notify them about the meetings and confirm their contact information. Approximately 85 percent of their offices were reached. The scoping meeting invitation was mailed on Wednesday, October 15, 2014, to approximately 500 elected and local officials. The scoping meeting invitation was also emailed to these same individuals on Thursday, October 16, 2014. Copies of the invitation letters and mailing list are provided in the Scoping Report, which can be viewed at https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/documents-maps-images.[9]

For the second round of public scoping meetings (December 2014), approximately 560 letters were mailed to elected and appointed officials (state, county and local elected and government officials) on Friday, November 21, 2014, and an email with the invitation was also sent on November 21, 2014.

[9] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

9.3.2 Public Scoping Comments

FRA received 4,388 comments from 1,467 commenters during the public scoping period that extended from June 25, 2014, to January 9, 2015. Comments were received via letters, comment cards, email, the Project website and the public scoping meetings. Many of the commenters requested information about the potential impacts of the Project. Comment topics are summarized in **Table 9-4** and all comments can be found in Appendix E of the Scoping Report, which can be viewed at https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-eis-appendix-e-scoping-comments.[10]

Table 9-4: Public Scoping Comment Summary

Comment Topic	Number of Comments
Alternatives	551
Economic Impact/Property Value	518
Land Use/Community Impact	501
Noise and Vibration Impacts	403
Eminent Domain/Acquisitions and Displacements	263
Public Involvement	229
Safety and Security	226
Project Costs/Project Viability	222
Natural Resources Impacts	203
Visual and Aesthetic Impacts	155
Cultural, Historic and Archeological Resources	129
Transportation	116
Access	112
TCRR	96
Traffic	96
Indirect and Cumulative Impacts	73
Water Resources Impacts	70
Not Germane/related to NEPA	72
Purpose and Need	68
NEPA Process	64
Air Quality Impacts	52
Operations	49
Energy	29
Health Effects	23
Other	22
Utilities	11
Environmental Justice	8
EMF	7
Engineering/Technical	6
Construction	4
Soils and Geology	4
Hazardous Materials	3
Public Parkland	2
GHG	1
TOTAL	**4,388**

Source: AECOM 2016

[10] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

9.4 Agency Communication and Coordination

9.4.1 Government Scoping Meetings

Agency coordination for the Project began in June 2014 when FRA sent letters to representatives at federal agencies and tribal governments, inviting them to participate in the scoping process for the Project. More detailed information on the agency scoping process and meetings can be found in the Scoping Report[11] and in **Appendix C, Public and Agency Involvement Correspondence**.

The initial agency scoping meeting was held on June 25, 2014, with the following agencies invited to participate:

- Federal
  - EPA
  - USACE Fort Worth and Galveston Districts
  - USFWS
  - FAA
  - FHWA
  - FTA
  - STB
  - Department of Homeland Security
  - USFS
  - FEMA
  - U.S. Coast Guard
  - HUD
- State
  - SHPO, formally known in Texas as the Texas Historical Commission (THC)
  - TPWD
  - TCEQ
- Native American tribes
  - Wichita and Affiliated Tribes

FRA invited these agencies and Native American tribes to attend the June 2014 meeting and submit written comments on the Project's potential impacts or issues to be evaluated in the EIS, as well as considerations for mitigation measures. The agencies and Native American tribes were also asked to notify FRA of their applicable permits and environmental review requirements, and the scope and content of the environmental information as it relates to their statutory responsibilities in connection with the Project.[12]

Seventeen representatives from four agencies (TxDOT, TPWD, USFWS and FHWA), FRA, TCRR and the Project team participated in the June 2014 meeting. During the meeting, individuals representing these agencies provided comments and asked questions regarding the following topics:

[11] FRA, *Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report*, April 29, 2015, https://railroads.dot.gov/elibrary/dallas-houston-high-speed-rail-environmental-impact-statement-scoping-report.

[12] In additional to scoping, and as summarized in **Section 3.19.3.1.2, Cultural Resources, Federally Recognized Native American Tribes**, additional government to government consultation was initiated by FRA with 14 Native American tribes in the Study Area pursuant to 36 C.F.R. 800.2(c)(2)(ii). Copies of the correspondence with the Native American tribes are provided in **Appendix E, Cultural Resources Technical Memorandum**.

- Funding sources
- Potential use of eminent domain
- Project schedule
- Potential impacts to state parks, wildlife crossings, wetlands and threatened and endangered species
- HSR operations: noise, trainset capacity

On October 7, 2014, FRA consulted with THC to introduce the Project and to specifically discuss compliance with Section 106.

On October 8, 2014, FRA hosted an agency scoping workshop that included 21 agency representatives from FHWA, FTA, HUD, THC, TPWD, TxDOT, USACE (Fort Worth and Galveston Districts) and USFWS. FRA provided the agencies an update on the Project since the June 25, 2014, agency scoping meeting, as well as the information planned for presentation at the public scoping meetings. Agency representatives received information on the Project's draft Purpose and Need, potential corridor alternatives, environmental methodology and constraints, and public scoping activities. Agency representatives asked questions or provided comments on the following topics:

- Permit requirements
- Purpose and Need
- Official document review schedule
- CWA Section 404(b)(1)
- Environmental methodology and data
- Section 106 consultation
- Corridor alternatives and screening procedure
- Expected level of analysis

9.4.2 Section 106 Coordination

Potential consulting parties were identified as part of Section 106 coordination. These included the THC, THPOs, local governments, county historical societies interested parties and the public. Consulting parties identified for Section 106 consultation are summarized in **Section 3.19.3.1, Cultural Resources, Consultation with Consulting Parties,** and listed in **Table 3.19-1**.

As detailed in **Section 3.19.3.1, Cultural Resources**, a total of 109 consulting party invitation letters were mailed to tribal representatives and historic preservation and related organizations as part of Section 106 public involvement. Letters were sent on October 15, 2014, and November 21, 2014, prior to both series of public scoping meetings, detailed in **Section 9.3.1, Public Scoping Meetings.** Copies of correspondence and meeting minutes related to Section 106, including Native American tribes, are included in **Appendix E, Cultural Resources Technical Memorandum.**

FRA initially sent formal invitation letters to potential Section 106 consulting parties on February 23, 2015, and a second letter on January 12, 2016. These letters requested information concerning significant cultural resources within the Study Area and invited participation in the Section 106 process for the Project. The information provided by the recipients was reviewed during the assessment of impacts documented in the Draft EIS. FRA sent another letter to request information from the consulting parties on January 25, 2018, following the publication of the Draft EIS Notice of Availability

(NOA). During the development of both the Draft and Final EIS, FRA continued to hold meetings with PA signatories[13] and consulting parties, including the following:

- **October 12, 2017:** Met with USACE Fort Worth and Galveston Districts to discuss Section 106 processes conducted by all agencies.
- **April 5, 2018:** Met with USACE Fort Worth and Galveston Districts to continue discussions on the Section 106 processes conducted by all agencies.
- **May 31, 2018:** Met with consulting parties in the first of three consulting party meetings to provide a status update on the Project and the Draft PA.
- **July 31, 2018:** Met with invited signatories of the PA including ACHP, TCRR and THC to discuss the status and development of the Draft PA under Section 106.
- **November 20, 2018:** Met with USACE Fort Worth and Galveston Districts to continue discussions on the Section 106 processes conducted by all agencies.
- **April 9, 2019:** Met with invited signatories of the PA, including ACHP, TCRR, THC and USACE Fort Worth and Galveston Districts to discuss the status and development of the Draft PA under Section 106.
- **November 7, 2019:** Met with consulting parties in the second of three consulting party meetings to provide a status update on the Project and discuss review of the Draft PA by the consulting parties.

On December 7, 2018, and April 9, 2019, the USACE Fort Worth and Galveston Districts (respectively) designated the FRA as the lead federal agency responsible for compliance with Section 106 for the Project.

9.4.3 Environmental Resource Agency Meetings

As a result of the scoping process, on September 10, 2014, FRA invited agencies with federal oversight responsibilities to officially cooperate during EIS development. All seven invited agencies agreed to be cooperating agencies, as summarized in **Table 9-5**.

Table 9-5: Cooperating Agencies

Agency Name	Responsibilities
EPA	Review and comment on possible effects to air quality, water quality and Environmental Justice
STB	General EIS review
FTA	General EIS review
FHWA	General EIS review
USACE Fort Worth District	CWA Section 404 permit jurisdiction and Section 408 Permission under the Rivers and Harbors Act
USACE Galveston District	CWA Section 404 permit jurisdiction
USFWS	Wildlife, habitat and threatened and endangered species, including Section 7 of the Endangered Species Act permit jurisdiction

Source: AECOM 2016

FRA requested that each cooperating agency review the draft Purpose and Need and the environmental methodology documents. FHWA, FTA, STB, TxDOT, and USACE (Galveston and Fort Worth Districts) provided comments on the draft Purpose and Need in October 2014.

[13] Signatories (FRA, TCRR, USACE Fort Worth District, USACE Galveston District, SHPO and ACHP) agree that the Project would be covered by the PA in order to consider the effect of each element of the Project on historic properties and that these stipulations will govern compliance of the Project with Section 106 of the NHPA.

In October 2015, FHWA, STB, USACE (Galveston and Fort Worth Districts) reviewed and provided comments on the Alignments Alternatives Analysis Report. That same month, FHWA, STB and TxDOT provided comments on the updated environmental methodology.

Additional agency review meetings were held throughout the development of the Draft and Final EIS, in September 2015, October and November 2016, May through August 2017, March 2018, October 2019 and December 2019. They included:

- **September 17, 2015:** FRA hosted a webinar with EPA, FHWA, FTA, STB, USACE and USFWS to discuss the status of the alternatives analysis.
- **October 18, 2016:** FRA hosted a Project update webinar with cooperating agencies to discuss the status of the Project since the Alternatives Analysis Assessment.
- **May 4, 2017:** FRA hosted a Project update webinar with cooperating agencies to discuss the status of the Project, including the TMF Alternatives Analysis and upcoming cooperating agency review of the Administrative Draft EIS.
- **July 17, 2017:** FRA hosted a Draft EIS webinar with cooperating agencies to discuss the general organization of the Administrative Draft EIS, how to access the site to download and upload documents and the upcoming schedule of additional webinars and the review deadlines.
- **July 18, 2017:** EPA representatives were unavailable on July 17, 2017. FRA hosted a second meeting to discuss the general organization of the Administrative Draft EIS, how to access the site to download and upload documents and the upcoming schedule of additional webinars and the review deadline.
- **August 8, 2017:** FRA hosted a natural resources-specific webinar with the USFWS to discuss any preliminary concerns or questions on the Administrative Draft EIS.
- **August 8, 2017:** FRA hosted a webinar with the USACE to discuss any preliminary concerns or questions on the Administrative Draft EIS.
- **March 26, 2018:** FRA hosted a Project update call with the cooperating agencies to discuss the status of the Project since the release of the Draft EIS and the close of the public comment period.
- **September 30, 2019:** FRA hosted a Project update call with the cooperating agencies to discuss the status of the Administrative Draft EIS.
- **December 11, 2019:** All the cooperating agencies were invited to participate in a Final EIS webinar to discuss the general organization of the Administrative Final EIS, how to access the site to download and upload documents, and the upcoming schedule of additional webinars and the review deadlines.

In addition, FRA continued to schedule one-on-one or small group meetings with the cooperating agencies and other agencies, including: FHWA, THC, TPWD, and USFWS and THC. Detailed meeting documentation may be found in **Appendix C, Public and Agency Involvement Correspondence**.

9.4.4 Local Government and Agency Meetings

After the conclusion of the Draft EIS Comment Period (**Section 9.6.2, Draft EIS Comment Period**), FRA invited the County Judges in Dallas, Ellis, Navarro, Freestone, Limestone, Grimes, Waller, and Harris Counties to meet with FRA, TCRR, and TxDOT to discuss the Project, public comments, and potential Project refinements. FRA subsequently met with representatives of several counties, including the following:

- **May 29, 2019:** FRA met with Waller County and EPA via teleconference.

- **June 25, 2018:** FRA met with Dallas County, City of Dallas, City of Lancaster, NTCOG, TxDOT and TCRR to facilitate discussion regarding plans and projects within Dallas County and concerns brought forth during the Draft EIS public comment period.
- **June 25, 2018:** FRA met with Ellis County, City of Ennis, TxDOT and TCRR to facilitate discussion regarding plans and projects within Ellis County and concerns brought forth during the public comment period.
- **June 29, 2018:** FRA met with Harris County (including the engineering department and commissioner's court), TxDOT and TCRR to facilitate discussion regarding plans and projects within Harris County and concerns brought forth during the Draft EIS public comment period.

In addition, AECOM on the behalf of FRA met with local agencies, including the following:

- **May 2, 2018:** AECOM, on behalf of FRA, held a meeting with DART to discuss TCRR coordination with DART and potential impacts on DART infrastructure.
- **May 15, 2018:** AECOM, on behalf of FRA, held a meeting with the City of Dallas to discuss the City of Dallas's review of the Draft EIS.
- **June 5, 2018:** AECOM, on behalf of FRA, facilitated a meeting between Houston Metro (METRO) and TCRR to discuss plans and projects at the Northwest Transit Center, in the Hempstead Corridor and in the general SH 290 area in Houston, Texas.
- **June 5, 2018:** AECOM, on behalf of FRA, facilitated a meeting among the City of Houston, UPRR and TCRR to discuss plans and projects at the Transit Center, in the Hempstead Corridor area in Houston, Texas.
- **June 6, 2018:** AECOM, on behalf of FRA, facilitated a meeting between the City of Houston, Gulf Coast Rail and TCRR to discuss plans and projects in the Hempstead Corridor area in Houston, Texas.
- **June 7, 2018:** AECOM, on behalf of FRA, facilitated a meeting between the Brazos Valley MPO and TCRR to discuss plans and projects ongoing and planned within the Brazos Valley area.

Meeting documentation for all of these meetings may be found in **Appendix C, Public and Agency Involvement Correspondence.**

9.5 Environmental Justice Outreach

In accordance with EO 12898 and USDOT Order 5610.2(a), FRA is required to identify and address minority and low-income populations that are affected by disproportionately high and adverse impacts by a federal action and to provide opportunities for meaningful participation throughout Project development. As part of the preparation of this EIS, persons who have a potential interest in the Project, including minority and low-income, have been invited to participate in the environmental review process.

FRA conducted specific outreach efforts to connect with potentially impacted minority and low-income populations in the Project Study Area. The purpose of this outreach was to bring awareness of the Project to communities or individuals; gather additional feedback on the potential impacts of the Project and identify appropriate mitigation for minority and low-income populations.

Minority and/or low-income populations were identified based on data from the USCB American Community Survey data. Block groups were identified to be potentially minority and/or low-income based on demographic characteristics, outreach, and desktop research. More detailed information about the process used to define these potentially impacted minority and low-income populations, as well as an in-depth description of each community, is found in **Section 3.18, Environmental Justice**.

Potential impacts are identified in **Section 3.18.5, Environmental Justice, Environmental Consequences**, and additional public outreach was conducted in preparation of the Final EIS to develop and refine potential mitigation measures for impacted communities.

As detailed in **Section 3.18.3.3, Environmental Justice**, FRA distributed informational materials (e.g., fact sheets, residential surveys, and business surveys) through direct contact with potential minority and/or low-income communities at community meetings, or through mailings and/or social service/community facilities. In addition, listening sessions were held in these communities either in conjunction with previously scheduled community organization meetings or as stand-alone meetings. The purpose of these sessions was to explain the Project and solicit information about specific impacts and concerns of each minority and/or low-income community. Near the Houston Terminal Station Options, resident and business surveys were both mailed to impacts landowners.

As shown in **Table 9-6**, nine listening sessions were held in the communities at familiar locations and at convenient times for local residents. Four of these were held prior to the release of the Draft EIS and a second round of five listening sessions was held after the Draft EIS release.

Table 9-6: Environmental Justice Listening Sessions

Location	County	Date	Attendees[a]	Publicity
St. Philips School and Community Center	Dallas	July 28, 2016	29	Invitation sent via email to Community Center director to place in monthly newsletter
First Metropolitan Church	Harris	August 3, 2016	32	Invitation sent via email to local pastors
Ennis Housing Authority Community Center	Ellis	August 4, 2016	67	Invitation sent via email to representative of "Unity in the Community"
Spring Branch Family Development Center	Harris	August 17, 2016	33	Invitation sent via email to local coordinating police officer
St. Philip's School and Community Center	Dallas	October 23, 2018	31*	Invitation sent via mail to residents and property owners, and advertised as part of scheduled neighborhood event
Cummings Recreation Center	Dallas	November 8, 2018	8	Invitation sent via mail to residents and property owners
Trini Mendenhall Community Center	Harris	November 29, 2018	20	Invitation sent via mail to residents and property owners, and businesses; and advertised as agenda item for regular Neighborhood Meeting
Field Store Community Center	Waller	November 19, 2019	TBD	Invitation was sent via mail to Plantation Forest neighborhood residents
Ferris ISD Administration Building's Training Center	Dallas and Ellis	November 21, 2019	TBD	Invitation was sent via mail to Hash and Nail Road community residents

Source: AECOM 2019

[a] This count represents the number of attendees that voluntarily signed into FRA's table. It is estimated that approximately 150 neighborhood residents attended the event.

Invitations to listening sessions were publicized through direct communication methods that took into account the communication preferences of each community, as described in **Table 9-6**. Meeting displays featured a timeline, a list of the subjects covered in the EIS, maps and other boards to describe the Project, Build Alternatives and Houston Terminal Station Options. Information materials were available in Spanish and English, the identified languages of the minority and/or low-income communities.

Translation services were provided if requested. At each listening session, a short presentation was given, and participants were invited to ask questions. All input from these listening sessions was documented in the Administrative Record for consideration in developing this EIS. Meeting summaries can be found in **Appendix C, Public and Agency Involvement Correspondence**.

Listening session were conducted in locations where minority/low-income communities could be identified. Due to the rural nature and less defined communities in Freestone, Leon and Grimes Counties, a different approach was employed. For Freestone and Leon Counties, FRA mailed Project "Frequently Asked Questions" to several service agencies for distribution to the populations they serve. For Grimes County, because no service agency could be identified, fact sheets were mailed to individual landowners with the minority/low-income block group. These outreach materials (translated in English and Spanish) were posted on FRA's Project website and distributed to individuals, local social service agencies and pertinent community organizations in October 2016. Over 1,300 fact sheets in English and Spanish were sent to the entities listed in **Table 9-7**. A copy of the material mailed can be found in **Appendix C, Public and Agency Involvement Correspondence**.

Table 9-7: Environmental Justice Outreach Before Draft EIS Release

County	Organization	Address
Dallas	First Baptist Church of Hutchins	204 W Athens Street, Hutchins, TX 75141
Freestone	Fairfield Head Start	920 S Bateman Road, Fairfield, TX 75840
Freestone	WIC Fairfield	742 W Commerce Street, Fairfield, TX 75840
Leon	The Lord's Pantry Buffalo	PO Box 584, Buffalo, TX 75831
Leon	Roberta Bourne Memorial Library	318 S Austin Street, Marquez, TX 77865
Leon	WIC Centerville	230 Commerce Street, Centerville, TX 75833
Leon	The Lord's Pantry Leona	PO Box 101, Leona, TX 75850
Grimes	N/A	Individual landowners in a minority/low income area in Grimes County

Source: AECOM 2019

9.6 Draft EIS

FRA signed the Draft EIS on December 15, 2017, and EPA published an NOA for the Project in the Federal Register on December 22, 2017 (82 FR 60723). The Draft EIS analyzed six end-to-end Build Alternatives (Alternatives A through F) and three Houston Terminal Station Options, as well as the No Build Alternative. The Build Alternatives included a terminal station in Dallas and an intermediate station in Grimes County. The Draft EIS identified Build Alternative A as the Preferred Alternative. The Draft EIS also evaluated three Houston Terminal Station Options: the Houston Industrial Site Station Terminal, the Houston Northwest Mall Terminal Station, and the Houston Northwest Transit Center Terminal Station. The FRA circulated the Draft EIS to affected local jurisdictions, state and federal agencies, tribes, community organizations and other interested groups, interested individuals and the public. The Draft EIS was available for public review in hardcopy at the locations listed in **Appendix B, Distribution List**. The Draft EIS was also posted on the FRA Project website https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail-draft. The public comment period on the Draft EIS closed on March 9, 2018.

9.6.1 Public Hearings

FRA held 11 public hearings to accept agency and public comments on the Draft EIS during the comment period. Originally, 10 public hearings were scheduled, one in each of the 10 affected counties. An additional public hearing was later added near the Houston Terminal Station Options in Houston in

response to public requests. **Table 9-8** lists the newspapers and publishing dates for the public hearing ads. A total of 2,971 individuals, including 84 elected officials, attended the 11 public hearings. A summary of the hearing dates/times, locations and attendance numbers is included in **Table 9-9**.

Table 9-8: Newspaper Ads for Public Hearings

Newspaper	County of Distribution [a]	First Publishing Date	Second Publishing Date	March Meeting Notice
The Eagle	Brazos	12/27/2017	Not run	2/26/2018
The Dallas Morning News	Dallas and Ellis	12/27/2017	Not run	2/25/2018
Al Dia	Dallas and Ellis	12/30/2017	Not run	2/28/2018
Waxahachie Daily Light	Ellis	12/29/2017	Not run	2/25/2018
Ennis Daily News	Ellis	12/27/2017	Not run	2/25/2018
Ennis County Trading Post	Ellis	1/4/2018	Not run	Not run
The Teague Chronicle	Freestone	12/28/2017	Not run	3/1/2018
The Freestone County Times	Freestone	12/27/2017	Not run	2/28/2018
Fairfield Recorder	Freestone	12/26/2017	Not run	Not run
Navasota Examiner	Grimes	1/3/2018	1/10/2017	2/28/2018
Houston Chronicle	Harris	12/29/2017	Not run	2/26/2018
La Voz	Harris	1/7/2018	Not run	3/4/2018
Katy Times	Harris and Waller	12/28/2017	Not run	3/1/2018
The Buffalo Press	Leon	1/9/2018	Not run	2/27/2018
Buffalo Express	Leon	1/1/2018	Not run	2/27/2018
Normangee Star	Leon and Madison	1/3/2018	Not run	2/28/2018
Jewett Messenger	Leon	1/3/2018	Not run	2/28/2018
Centerville News	Leon	12/27/2018	Not run	2/28/2018
Groesbeck Journal	Limestone	12/28/2017	Not run	3/1/2018
Mexia News	Montgomery	12/28/2017	Not run	2/27/2018
The Madisonville Meteor	Madison	1/3/2018	1/17/2018	2/28/2018
The Conroe Courier	Montgomery	1/3/2018	Not run	2/25/2018
Montgomery County News	Montgomery	12/27/2017	Not run	Not run
Corsicana Daily Sun	Brazos and Grimes	12/29/2017	Not run	2/24/2018
The Huntsville Item	Walker	12/27/2017	Not run	2/27/2018
The Waller Times	Waller	1/3/2018	Not run	2/28/2018
The Hotline	Waller	1/3/2018	Not run	2/28/2018
Times Tribune	Waller	12/28/17	Not run	3/1/2018

Source: AECOM, 2019

[a] Represents the primary county/counties in the Study Area that the newspaper serves. Other counties/regions may also receive the newspaper.

Table 9-9: Public Hearing Dates and Locations

Date	Venue	Number in Attendance	Number of Verbal Commenters
Monday, January 29, 2018 5:00 pm – 9:00 pm	Wilmer-Hutchins High School 5520 Langdon Rd. Dallas, TX 75241	Elected: 8 News Media: 4 Public: 227	27
Monday, January 29, 2018 5:00 pm – 9:00 pm	Corsicana Middle School 4101 FM 744 Corsicana, TX 75110	Elected: 10 News media: 6 Public: 197	51
Tuesday, January 30, 2018 5:00 pm – 9:00 pm	Ennis High School 2301 Ensign Rd. Ennis, TX 75119	Elected: 8 News media: 1 Public: 241	45

Table 9-9: Public Hearing Dates and Locations			
Date	**Venue**	**Number in Attendance**	**Number of Verbal Commenters**
Tuesday, January 30, 2018 5:00 pm – 9:00 pm	Leon High School 12168 US 79 Jewett, TX 75846	Elected: 10 News media: 6 Public: 238	36
Wednesday, January 31, 2018 5:00 pm – 9:00 pm	Fairfield High School 631 Post Oak Rd. Fairfield, TX 75840	Elected: 8 News media: 3 Public: 108	21
Wednesday, January 31, 2018 5:00 pm – 9:00 pm	Mexia High School 1120 N. Ross Ave. Mexia, TX 76667	Elected: 6 News media: 1 Public: 84	22
Monday, February 5, 2018 6:00 pm – 10:00 pm	Woodard Elementary School 17501 Cypress North Houston Rd. Cypress, TX 77433	Elected: 6 News media: 6 Public: 413	59
Monday, February 5, 2018 5:00 pm – 9:00 pm	Truman Kimbro Convention Center 111 W. Trinity St. Madisonville, TX 77864	Elected: 9 News media: 4 Public: 310	39
Tuesday, February 6, 2018 5:00 pm – 9:00 pm	Navasota Junior High School 9038 TX-90 Navasota, TX 77868	Elected: 8 News media: 8 Public: 375	41
Tuesday, February 6, 2018 6:00 pm – 10:00 pm	Waller High School 20950 Fields Store Rd. Waller, TX 77484	Elected: 5 News media: 2 Public: 448	53
Monday, March 5, 2018 5:00 pm – 9:00 pm	Sheraton Houston Brookhollow Hotel 300 North Loop West Houston, TX 77092	Elected: 6 News media: 5 Public: 200	62
TOTAL		**2971**	**456**

Source: AECOM 2019

9.6.1.1 Public Notification

Public notification of the public hearings included the following methods:

- Newspaper ads
- Direct mailers (letters)
- Website notices
- Email to mailing list
- Emails and letters to elected officials

Newspaper display ads (in English and Spanish) announcing the January and February 2018 public hearings ran in 27 newspapers throughout the Project area. A similar display ad for the additional March 2018 public hearing ran in 25 newspapers throughout the Project area, including at least 1 newspaper in each of the Project area counties. **Table 9-8** lists the newspapers and publishing dates for the public hearing ads.

FRA announced the NOA for the Draft EIS, the 24 repository locations of the Draft EIS and the dates and locations for the initial 10 public hearings on the FRA Project website[14] approximately 4 weeks before the public hearings. Letters containing the same information were mailed by U.S. Postal Service to 2,722 individuals, landowners and organizations on the Project mailing list on December 22, 2017, and an

[14] FRA, "Dallas to Houston High-Speed Rail – Passenger Service from Houston to Dallas," https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail.

email was also sent to the Project mailing list on December 21, 2017. Also, on December 22, 2017, 40 hardcopies of the Draft EIS were mailed to the 24 repositories and NEPA cooperating agencies, while electronic copies of the Draft EIS were provided on compact discs.

Due to location conflicts, updates to the venue for the public hearings in Madisonville, Navasota and Fairfield were also updated on the FRA Project website,[15] emailed on January 16, 2018, with the release of the January 2018 issue of FRA's Project newsletter (*On Track*) and republished in the two local newspapers as indicated in **Table 9-8**.

For notification of the public comment period extension and the additional public hearing in Houston, 946 postcards were mailed to elected and appointed officials (state, county and local) on February 24, 2018. An email regarding the public comment period extension and the additional public hearing was also sent on February 23, 2018, to the Project mailing list.

Copies of all notification letters associated with the Draft EIS, public hearings and comment period, as well as the Project mailing list, are provided in **Appendix C, Public and Agency Involvement Correspondence**.

9.6.1.2 Hearing Format

FRA held 11 public hearings to accept agency and public comments on the Draft EIS during the comment period. A summary of the hearing dates/times, locations and attendance numbers is included in **Table 9-9**.

The public hearings served as a forum for disseminating information about the Project and obtaining public comments on topics addressed in the Draft EIS. Specifically, these public hearings gave the community an opportunity to review and comment on Project Alternatives, environmental resources, and other Project information. The public hearings for the Draft EIS consisted of two parts: an open house and a formal hearing with a public comment session.

During the open house portion of the hearing, Project team members encouraged participants to visit a series of informational stations containing exhibit boards where they could ask questions about the NEPA process, the EIS format and contents, Purpose and Need for the Project, public involvement activities, the Section 106 process, and the corridor alternatives, as well as review maps of the corridor alternatives. In addition, TCRR had a station where meeting participants could learn more about the proposed technology, planned operations, and where the proposed alignments were in relation to their property. Project team members interacted with hearing attendees to answer questions and listen to concerns about the Project.

The open house portion of the hearing was followed by FRA's formal presentation and then by the public comment session. The public had an opportunity to provide comments verbally during the formal comment session, individually to a court reporter or in writing at the hearing. Two court reporters were in attendance to record verbal comments during both the open house period and the formal public comment session.

The materials distributed at the hearings consisted of the January 2018 Project newsletter, a list of frequently asked questions, and comment forms for attendees to fill out. Materials presented by the FRA at the public hearings are available at https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/documents-maps-images.

[15] Ibid.

Additional written questions or comments were also accepted online, by U.S. mail, or by email during the public extended public comment period (December 22, 2017 to March 9, 2018). A summary of comments is in **Section 9.6.2, Draft EIS Comment Period**, and all comments and FRA responses to comments can be found in **Appendix H, Response to Draft EIS Comments**.

9.6.2 Draft EIS Comment Period

FRA received a total of 20,848 submissions from approximately 6,000 individuals, agencies, elected officials, businesses and/or organizations[16] during the public comment period that extended from December 22, 2017, to March 9, 2018. Submissions were categorized by comment topic, which resulted in some submissions being split into multiple comments. A total of 25,309 comments were received and categorized as summarized in **Table 9-10.** Comments were accepted via email to the Project email address (DallasHoustonHSR@urs.com), email directly to FRA, online using the link provided on FRA's Project website [17] or by U.S. postal mail to FRA. The majority of comments were submitted online (62 percent) or by email (26 percent), with the remainder of comments being submitted by handwritten notes or letters (9 percent) and oral at public hearings (2 percent). All comments received during the public comment period (December 22, 2017 to March 9, 2018) and FRA responses to those comments can be found in **Appendix H, Response to Draft EIS Comments.**

Table 9-10: Draft EIS Public Comment Categories

Comment Topic	Number of Comments
Build Alternatives	8,897
Support	4,775
Land Use	1,574
Oppose	1,229
Project Viability	831
Safety and Security	757
Transportation	644
Socioeconomic and Community	605
NEPA	521
Noise and Vibration	490
Threatened and Endangered	429
Other	421
Station Locations	365
Eminent Domain	365
Property Value	333
Utilities and Energy	327
Public Involvement	311
Cultural Resources	306
Purpose and Need	288
Not Germane to NEPA	193
Waters of the U.S.	181
TCRR	174
Floodplains	172
Indirect and Cumulative	160
Water Quality	151
Recreation	138

[16] Approximately 1,445 individuals, businesses and/or organizations made two or more submissions during the public comment period. For instance, one individual made 1,712 distinct submittals. Additionally, some organizations compiled comments from an unknown number of individuals. Each distinct submission was counted separately, regardless of whether it was a repeated comment.

[17] Currently https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail; but during the public comment period the website was https://www.fra.dot.gov/Page/P0779.

Table 9-10: Draft EIS Public Comment Categories	
Comment Topic	**Number of Comments**
Aesthetics and Visual	95
Air Quality	93
Engineering Design	91
Soils and Geology	84
Unclassified	83
Technology	53
Environmental Justice	43
Hazardous Materials	43
Electromagnetic Fields	32
Operations	28
GHG	15
Handicapped and Elderly	9
Maintenance	3
TOTAL	**25,309**

Source: AECOM 2019

Comments received since the close of the comment period have been documented in the Project's Administrative Record. These comments, as they relate to the Project, have helped to inform the development of this Final EIS. All comments received prior to the ROD will be considered and included as part of the Administrative Record.

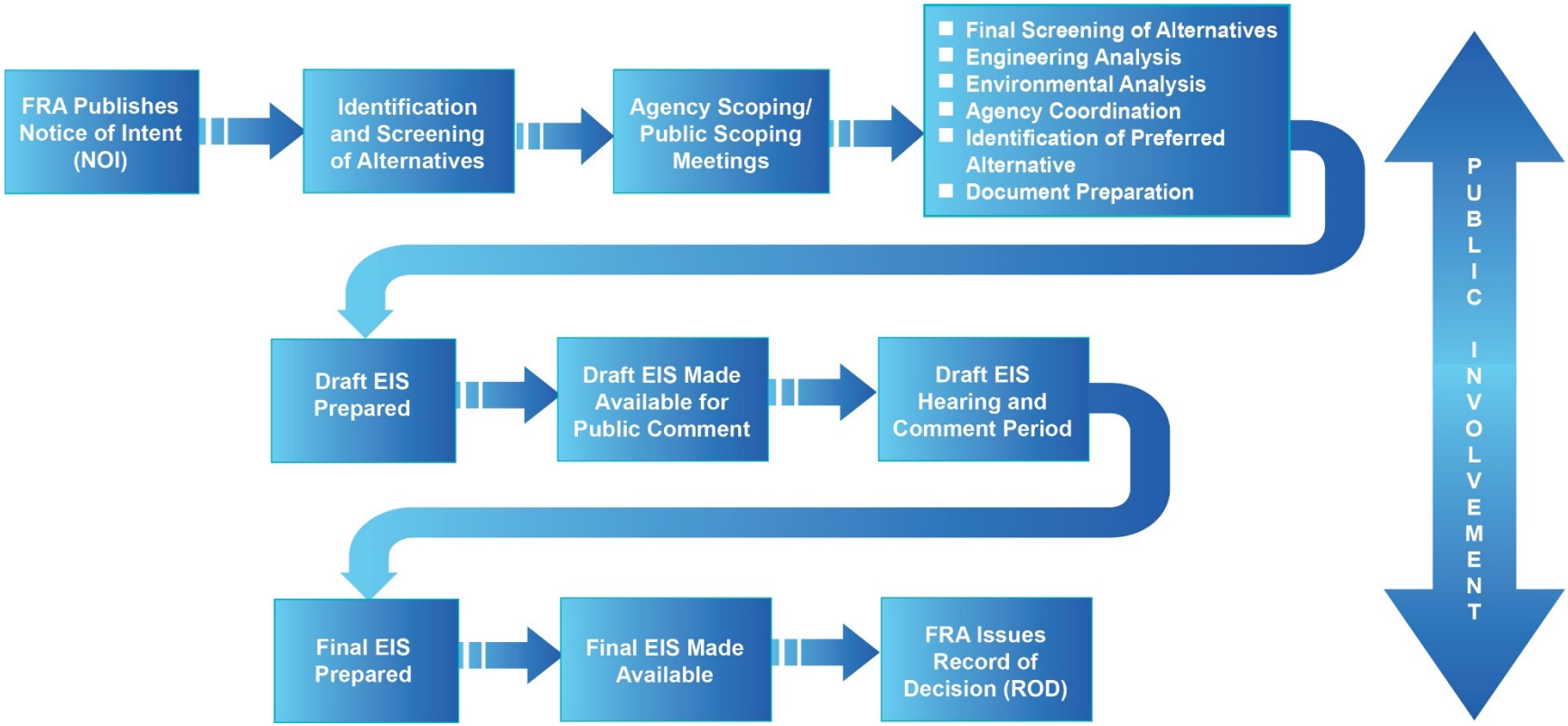
9.7 Next Steps

Figure 9-1 summarizes the steps of the NEPA environmental process for this EIS, which includes public involvement milestones. The current step in the process is the issuance of the Final EIS. The Final EIS is available in hardcopy at the locations listed in **Appendix B, Distribution List**. The Final EIS is also posted on the FRA Project website https://railroads.dot.gov/current-environmental-reviews/dallas-houston-high-speed-rail/dallas-houston-high-speed-rail.

CEQ regulations require FRA to wait 30 days after the Final EIS is made available before releasing a ROD.[18] The ROD documents FRA's decision, the alternatives considered in the EIS, the environmentally preferable alternative, and the required mitigation measures.

[18] 40 C.F.R. 1506.10.

Figure 9-1: NEPA EIS Process with Public Involvement Opportunities



Source: AECOM 2019

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