# 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 Build Alternatives and what impacts to the existing transportation network would occur.

Because the Build Alternatives 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, 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.

## 3.11.3 Methodology

The following sections present the approach to data collection, assumptions regarding design elements of the Build Alternatives, and the evaluation of potential impacts. The existing transportation system conditions were documented by collecting existing 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 one-mile buffer of the track of the Build Alternatives and the vicinity around the Dallas and Houston Terminal Stations options to account for local traffic.

Local (city or county) public works departments govern roads not under TxDOT jurisdiction. The cities of Dallas and Houston have traffic impact analysis guidelines which are used to help determine the traffic impacts and mitigation. Additionally, MPOs (NCTCOG and H-GAC) maintain multimodal transportation plans for their regions.

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64 C.F.R. 28545 et seq.

### 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**. The following 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, 2016 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 (TMMP), September 2006 (NCTCOG) | The TMMP addresses statewide initiative 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, multimodal blueprint for transportation systems and services in the DFW Metropolitan Area. The TMMP 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 2040, March 2016 (NCTCOG) | Mobility 2040 guides the implementation of multimodal transportation improvements, policies and programs in the 12-county DFW Metropolitan Planning Area through 2040. The plan was adopted March 2016 by the Regional Transportation Council. *Mobility 2040* recognizes four high-speed passenger rail 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 high-speed rail 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 and 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 (COA) effort to identify efficiencies, improvements and to build ridership. Phase Two will evaluate longer-term projects and programs, integrate the COA bus recommendations and identify regional expansion opportunities. |
| D2: Dallas Central Business District (CBD) 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. |

| Table 3.11-1: Regional and Local Transportation Plans and Policies | |
|---|---|
| **Plan or Policy** | **Summary** |
| *Ellis County* | |
| Ellis County Thoroughfare Plan | 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 developed its most recent Thoroughfare Plan in 2007. 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 any specific recommendations on transit besides suggesting that the county continue to participate in regional transit discussions. |
| EnVision Midlothian 2025 (2007) | 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 2007 Comprehensive Plan update | 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* | |
| 2006 Coordinated Regional Public Transportation Plan (HOTCOG) | This 2006 report projects a population increase of 24 percent from 2004 to 2030. The transit system for the region outside Waco is defined as "generally a demand response service." Future rail 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 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 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. High-speed rail is not specifically mentioned in this plan. |
| 2016 Future Bike Plan (H-GAC) | This report covers bikeways in the Houston area network. The existing network has 258 miles of dedicated and shared bikeways, on-road and off-road. The future network would contain 1,232 miles of on-street and off-street facilities. |

Source: AECOM, 2016

### 3.11.3.2 Freight Rail Facilities

All Build Alternatives would cross existing freight rail lines. Portions of the Build Alternatives 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 Build Alternatives 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 Build Alternatives was inventoried and existing operations and geometric conditions were collected. In conjunction with other data, such as surrounding development, 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

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.

#### *3.11.3.3.1 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 design criteria would be used.[2]
- The basis for all roadway design would use the TxDOT functional classification and comply with the TxDOT Roadway Design Manual.[3] 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.

For additional information about TCRR's design, please review **Appendix F, TCRR Conceptual Engineering Design Report** and **Appendix G, TCRR Conceptural Engineering Plans and Details**.

[2] AASHTO, "Roadside Design Guide (RDG) 4th edition," October 2011.
[3] TxDOT, "Roadway Design Manual," Revised October 2014, available: http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf.

Existing and planned roadways that intersect the Study Area were compiled and classified as the following types of facilities:[4]

- **Interstate**–Interstates are the highest classification of arterials. Roadways in this functional classification category are officially designated as interstates by the DOT
- **Principal Arterial**–Principal arterials serve major centers of metropolitan areas, provide a high degree of mobility and can also 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 Build Alternatives (see **Appendix F, TCRR Conceptual Engineering Design Report**). 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
- **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
- **Closure**—Roadway on either side of the railway would be closed and traffic would be required to use existing alternate routes
- **Acquisition**—Through property acquisition, the existing private road would no longer be required

#### *3.11.3.3.2 Roadway Traffic Operations Standards*

Traffic analysis of roadways and intersections is based on the *Highway Capacity Manual* (HCM).[5] 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.

[4] FHWA, *Highway Functional Classification Concepts*, 2013.
[5] Transportation Research Board, "Fifth Edition Highway Capacity Manual," 2010.

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 | 0 to 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

Satisfactory LOS is defined using the applicable standards based on the jurisdiction of the roads in question. For streets in urban areas, such as Dallas and Houston, mitigation is required to achieve LOS D or better. Similarly, TxDOT considers LOS E and F unacceptable.

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**.

**Table 3.11-3: Intersection LOS Criteria**

| Level of Service | Control Delay* (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
*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.

The Project could have a substantial impact on a roadway or intersection if:

(a) It would worsen segment or intersection LOS (in either peak period) from D or better to E or F; or
(b) At a signalized intersection with a peak period LOS of E or F, it would increase average delay by at least four seconds; or
(c) At an unsignalized intersection with a peak LOS of E or F, it would increase delay by five 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 one 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 determined three scenarios – No Build Alternative, Build Alternatives and the Build Alternatives with modifications. FRA compared the No Build to the Build Alternatives without modifications to identify where modifications and/or mitigation would be needed to bring the LOS to a level of service 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.

#### *3.11.3.3.3 Traffic Forecasting for Horizon Year 2040*

Future 2040 No Build and Build Alternatives 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 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.[6]

#### *3.11.3.3.4 Station Area Analysis*

In order to determine traffic effects around Terminal Station options, 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.

In order to analyze the existing conditions of the local roadway network in proximity to the Terminal Station Options, peak hour turning movement counts were collected at 54 intersections. Also, 24-hour

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

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).[7] The traffic counts were entered into Synchro to establish existing LOS.

### 3.11.3.4 Multimodal Facilities

#### *3.11.3.4.1 Transit Facilities*

Transit operations and ridership data were collected from DART, METRO and the Brazos Transit District. Existing and planned transit lines that would be crossed by the Build Alternatives and/or would serve the 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

#### *3.11.3.4.2 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**.

#### *3.11.3.4.3 Aviation Facilities*

Commercial and general aviation airports were identified through airport lists maintained by FAA.[8] Private airports were identified through aerial photography. Where airports where located within the Study Area, a Runway Protection Zone analysis (based on the FAA Advisory Circular No. 150/5300-13) was conducted to ensure that the Build Alternatives would not create any approach or take-off hazards. This analysis assesses the height of the potential HSR system in the vicinity of the airports and their respective Runway Protection Zones, as calculated by the FAA Advisory Circular No. 150/5300-13.

## 3.11.4 Affected Environment

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

### 3.11.4.1 Dallas County

#### *3.11.4.1.1 Rail Network*

While BNSF, UPRR, TUEX and TEXU all operate within Dallas County, only BNSF, UPRR and DART 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 Build Alternatives would cross existing railroad tracks (freight or transit). Each location is identified by rail operator, rail type (main or spur line)

[7] Traffic counts were conducted in October 2015. The Northwest Mall Terminal Option and 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 Northwest Transit Terminal Option. Therefore, data is anticipated to be similar for these locations.
[8] FAA, "Airport Data & Contact Information," Current 05/26/2016, available http://www.faa.gov/airports/airport_safety/airportdata_5010/.

and if that line is in active status. The location of existing freight rail is noted in the **Appendix D, Project Footprint Mapbook**.

**Table 3.11-4: Railroad Crossings in Dallas County**

| Mapbook Page | Segment | Build Alternative | Railroad Company | Line Type | Line Status |
|---|---|---|---|---|---|
| 2 | 1 | A, B, C, D, E and F | DART | Business Lead | Pulled |
| 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 |
| 3 | 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 |

Source: AECOM, 2017

### *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 roadway crossings in Dallas County. Roadway crossings are also identified in **Appendix D**, **Project Footprint Mapbook**.

**Table 3.11-5: Roadway Crossings in Dallas County**

| Mapbook Page | Street Name | Classification | # Lanes | Segment | Build Alternative |
|---|---|---|---|---|---|
| 1 | Cadiz St | Local Road | 2 | 1 | A, B, C, D, E and F |
| 1 | Hotel St | Major Collector | 2 | 1 | A, B, C, D, E and F |
| 1 | Bellview St | Major Collector | 2 | 1 | A, B, C, D, E and F |
| 2 | Corinth St | Principal Arterial | 4 | 1 | A, B, C, D, E and F |
| 2 | Forest St | Local Road | 2 | 1 | A, B, C, D, E and F |
| 3 | Cedar Crest Blvd | Minor Arterial | 6 | 1 | A, B, C, D, E and F |
| 3 | Lenway St | Local Road | 2 | 1 | A, B, C, D, E and F |
| 3 | Private Plant Maint. Rd | Local Road | 1 | 1 | A, B, C, D, E and F |
| 3 | Maintenance Rd | Local Road | 1 | 1 | A, B, C, D, E and F |
| 3 | WWTP Maintenance Rd | Local Road | 1 | 1 | A, B, C, D, E and F |
| 6 | Overton Rd | Major Collector | 6 | 1 | A, B, C, D, E and F |
| 6 | Bulova St | Local Road | 2 | 1 | A, B, C, D, E and F |
| 6 | Cotton Ln | Local Road | 2 | 1 | A, B, C, D, E and F |
| 6 | Shindoll St | Local Road | 2 | 1 | A, B, C, D, E and F |
| 6 | Overton Ct | Local Road | 2 | 1 | A, B, C, D, E and F |
| 7 | Illinois Ave | Principal Arterial | 6* | 1 | A, B, C, D, E and F |
| 7 | LeMay Dr | Local Road | 2 | 1 | A, B, C, D, E and F |
| 7 | LeForge Dr | Local Road | 2 | 1 | A, B, C, D, E and F |
| 8 | Mayforge Dr | Local Road | 2 | 1 | A, B, C, D, E and F |
| 8 | IH-45 | Off-Ramp | 1 | 1 | A, B, C, D, E and F |
| 8 | Loop 12 | On-Ramp | 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 | Off-Ramp | 1 | 1 | A, B, C, D, E and F |
| 8 | IH-45 | On-Ramp | 1 | 1 | A, B, C, D, E and F |
| 10 | Simpson Stuart Rd | Principal Arterial | 3 | 1 | A, B, C, D, E and F |
| 11 | JJ Lemmons Rd | Major Collector | 4 | 1 | A, B, C, D, E and F |
| 12 | IH-20 | Interstate (WB) | 2 | 1 | A, B, C, D, E and F |

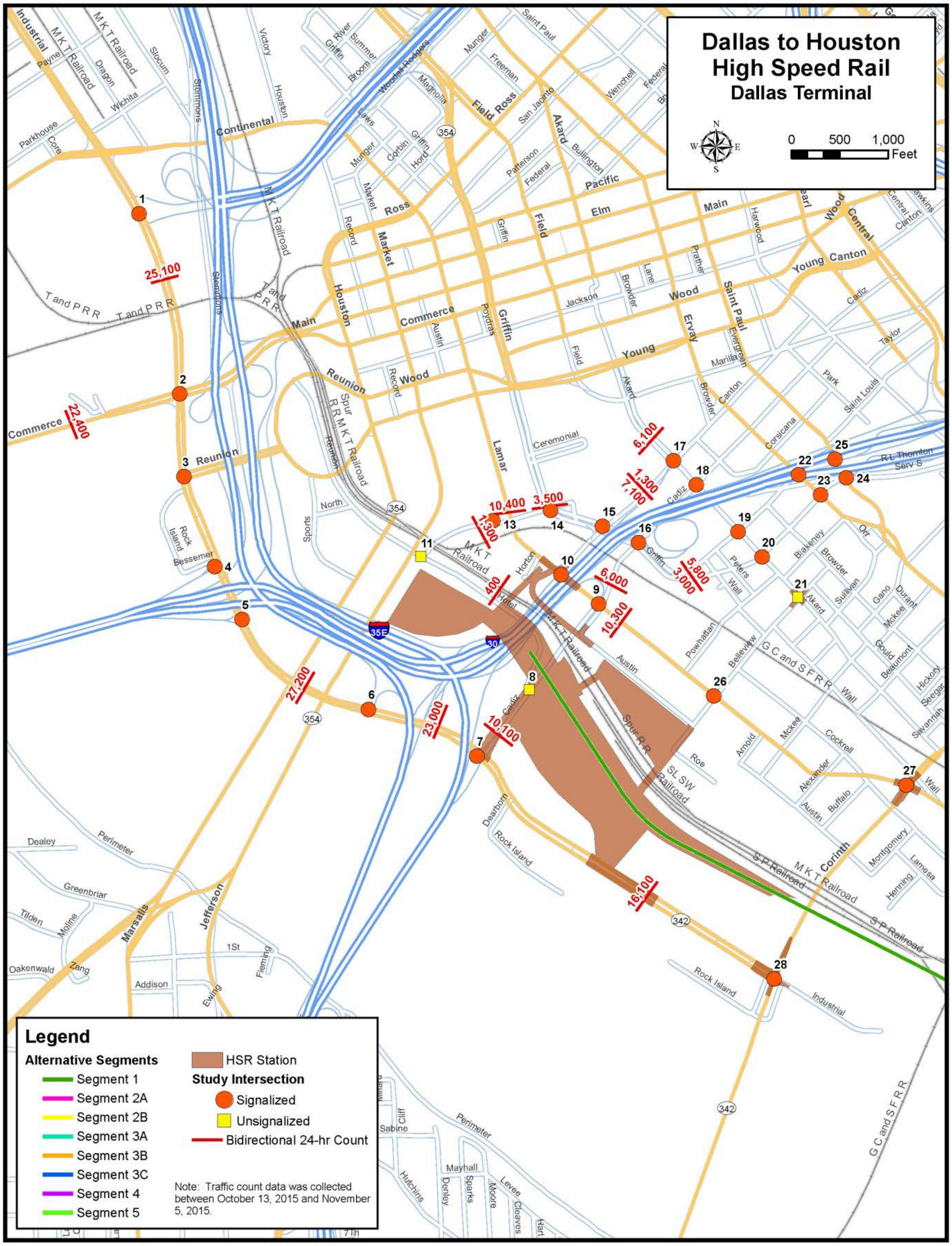
| Table 3.11-5: Roadway Crossings in Dallas County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **# Lanes** | **Segment** | **Build Alternative** |
| 12 | IH-20 | Interstate (WB) | 4 | 1 | A, B, C, D, E and F |
| 12 | IH-20 | Interstate (EB) | 4 | 1 | A, B, C, D, E and F |
| 12 | IH-20 | Interstate (EB) | 2 | 1 | A, B, C, D, E and F |
| 12 | Langdon Rd | Major Collector | 2 | 1 | A, B, C, D, E and F |
| 13 | Cleveland Rd | Major Collector | 1 | 1 | A, B, C, D, E and F |
| 14 | Private Drive | Local Road | 1 | 1 | A, B, C, D, E and F |
| 15 | Blanco Rd | Major Collector | 1 | 1 | A, B, C, D, E and F |
| 15 | Lancaster-Hutchins Rd | Minor Arterial | 2 | 1 | A, B, C, D, E and F |
| 16 | Wintergreen Rd | Minor Arterial | 2 | 1 | A, B, C, D, E and F |
| 20 | Rail Access Rd | Local Road | 1 | 1 | A, B, C, D, E and F |
| 21 | Watermill Rd | Local Road | 2 | 1 | A, B, C, D, E and F |
| 21 | Hash Rd | Local Road | 2 | 1 | A, B, C, D, E and F |
| 22 | Lake Trail Dr | Local Road | 2 | 1 | A, B, C, D, E and F |
| 22 | Raintree Dr | Local Road | 2 | 1 | A, B, C, D, E and F |
| 22 | Proposed Loop 9 | Principal Arterial | 2 | 1 | A, B, C, D, E and F |

Source: AECOM, 2016

#### *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 one mile of the Dallas Terminal Station option. The peak hour volumes are included in **Appendix E**. Existing LOS at the proposed Dallas Terminal intersections were calculated using the Synchro 7 model and were based on existing roadway geometry, AM/PM 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**.

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




Source: AECOM, 2016

| Table 3.11-6: Dallas Terminal Intersections Existing LOS (Delay in Seconds per Vehicle) | | | |
|---|---|---|---|
| Map ID | Intersection | AM | PM |
| | | Existing | Existing |
| 1 | Woodall Rodgers Fwy/Riverfront Blvd | C (33) | D (37) |
| 2 | Riverfront Blvd/Commerce St | D (40) | D (46) |
| 3 | Reunion Blvd/Riverfront Blvd | A (8) | A (8) |
| 4 | WB IH-30/Riverfront Blvd | A (8) | B (11) |
| 5 | EB IH-30/Riverfront Blvd | B (17) | C (23) |
| 6 | IH-35E/Riverfront Blvd | A (6) | A (10) |
| 7 | Riverfront Blvd/Cadiz St | D (53) | C (34) |
| 8 | Cadiz St/Hotel St (unsignalized) | A (1) | A (1) |
| 9 | Cadiz St/Lamar St | B (15) | B (15) |
| 10 | Canton St/Lamar St | B (12) | B (12) |
| 11 | Hotel St/Memorial Dr (unsignalized) | A (4) | A (4) |
| 13 | Lamar St/Memorial Dr | B (12) | B (13) |
| 14 | Griffin St/Memorial Dr | C (24) | B (19) |
| 15 | Canton St/Griffin St | A (9) | B (12) |
| 16 | Cadiz St/Griffin St | B (14) | A (8) |
| 17 | Canton St/Akard St | B (12) | B (17) |
| 18 | Cadiz St/Akard St | B (13) | B (11) |
| 19 | Griffin St W/Akard St | B (11) | B (13) |
| 20 | Griffin St E/Akard St | B (12) | B (12) |
| 21 | Belleview St/Akard St (unsignalized) | A (3) | A (10) |
| 22 | Griffin St W/Ervay St | A (5) | A (6) |
| 23 | Griffin St E /Ervay St | B (12) | C (20) |
| 24 | Griffin St E/St Paul St | A (8) | A (7) |
| 25 | Griffin St W/St Paul St | B (10) | C (20) |
| 26 | Lamar St/Belleview St | B (13) | B (11) |
| 27 | Lamar St/Corinth St | C (21) | B (20) |
| 28 | Corinth St/Riverfront Blvd | C (21) | D (53) |

Source: AECOM, 2016
*Intersection 12 was removed from the analysis.

### *3.11.4.1.4 Transit Services*

The Dallas Terminal 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 144 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.[9]

DART operates 27 local bus routes that serve downtown Dallas. Some of these link the suburbs with downtown Dallas. Nine 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.

[9] DART, "DART Reference Book," March 2015.

Fifteen suburban routes link suburban neighborhoods to transit centers. Fifty feeder bus routes start or end at existing rail stations.

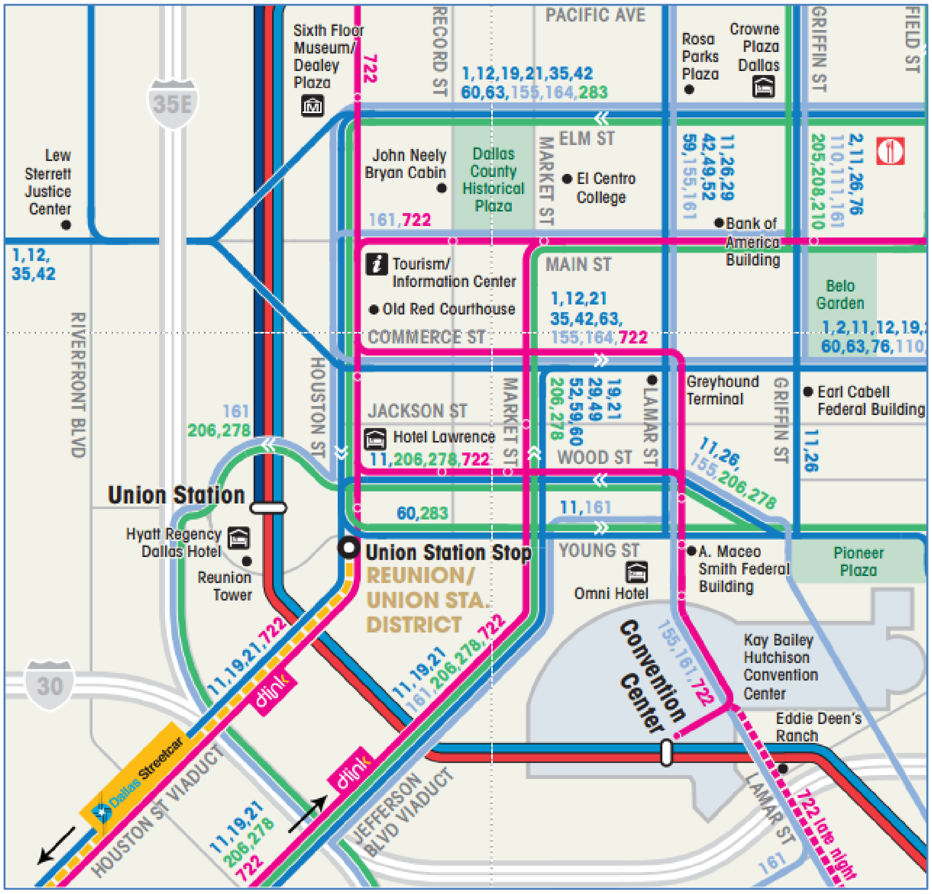
DART offers special, destination service to major employers, tourist attractions, commercial centers and airports. DART also offers FLEX, shuttles and on-call services.

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 90 miles of light rail. The Dallas Terminal Station option 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 option 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 option 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 the Fort Worth Transportation Authority, provides 6-day service between Dallas Union Station and Fort Worth T&P Station.

**Figure 3.11-2: DART Service around Union Station**




Source: DART, 2016

### *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 option, Lamar Street (located to the south) is categorized as an on-street bicycle route according to the City of Dallas' 2011 Bike Plan.

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

**Table 3.11-7: On-Road Pedestrian and Bicycle Facilities in Dallas County**

| Name | Length within Study Area (miles) |
|---|---|
| Bicycle corridor* (divided*) on Elam | 0.23 |
| Bicycle corridor (undivided) on Belleview | 0.07 |
| Bicycle corridor on Cedar Crest | 0.52 |
| Bicycle corridor (undivided) on Cedardale | 0.52 |
| Bicycle corridor (divided) on Corinth | 0.41 |
| Bicycle corridor (divided) on Corinth | 0.10 |
| Bicycle corridor (divided) on Illinois | 0.61 |
| Bicycle corridor (divided) on Riverfront | 0.85 |
| Bicycle corridor (divided) on Riverfront | 2.48 |
| Bicycle corridor (undivided) on JJ Lemmon | 0.73 |
| Bicycle corridor (undivided) on JJ Lemmon | 0.80 |
| Bicycle corridor (undivided) on Lamar St | 0.45 |

| Table 3.11-7: On-Road Pedestrian and Bicycle Facilities in Dallas County | |
|---|---|
| Name | Length within Study Area (miles) |
| Bicycle corridor (divided) on Lamar St | 1.23 |
| Bicycle corridor (divided) on Ledbetter | 0.50 |
| Bicycle corridor (divided) on Overton | 0.50 |
| Bicycle corridor (undivided) on Pennsylvania | 0.17 |
| Bicycle corridor (undivided) on Unnamed SE3 | 1.1 |
| Bicycle corridor (undivided) on Wheatland | 0.09 |
| Bicycle corridor (undivided) on Youngblood | 0.48 |
| Bicycle corridor (divided) on Hatcher | 0.26 |
| Bicycle corridor (divided) on Camp Wisdom | 0.51 |
| Bicycle corridor (divided) on Cleveland | 0.50 |
| Bicycle corridor (undivided) on Lamar | 0.18 |
| Bicycle corridor (undivided) on Al Lipscomb Way | 0.06 |
| Bellview Connector | 0.61 |
| Grand Avenue Connection | 0.40 |

Source: AECOM, 2016
*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.

#### *3.11.4.1.6 Aviation*

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

#### *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 | | | | | | |
|---|---|---|---|---|---|---|
| Project | Mode | Lanes Before/ After | Classification | Year Complete | Length (miles) | Cost ($M) |
| IH 20 | Roadway | 8/8 (freeway)<br>6/6 (frontage) | Freeway | 2017-2040 | 20 | $276 |
| Trinity Parkway | Roadway | 0/10<br>(6 toll/4 frontage) | Freeway | 2019-28 | 9 | $1,850 |
| Loop 9 | Roadway | 0/6 | Freeway | 2029-35 | 10 | $358 |
| Waxahachie Commuter Rail | Regional Rail | N/A | Regional Rail | 2028-2037 | 31 | $1,488 |

Source: TxDOT, 2016
N/A = not applicable

### 3.11.4.2 Ellis County

#### *3.11.4.2.1 Rail Network*

BNSF and UPRR operate within the Study Area. **Table 3.11-9** identifies the locations in Ellis County where the Build Alternatives would cross existing railroad tracks (freight or transit). Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **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 |
| 45 | 2A | A, B, and C | BNSF | Main Line | Active |
| 78 | 2B | D, E and F | BNSF | Main Line | Active |
| 39 | 2A | A, B, and C | UPRR | Main Line | Active |
| 71 | 2B | D, E and F | UPRR | Main Line | Active |

Source: AECOM, 2017

### *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** is a list of all roadway crossings within the Study Area.

| Table 3.11-10: Roadway Crossings in Ellis County | | | | | |
|---|---|---|---|---|---|
| Mapbook Page | Street Name | Classification | # Lanes | Segment | Build Alternative |
| 23 | Stainback Rd | 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 Rd | Local Road | 2 | 1 | A, B, C, D, E and F |
| 25 | Private Drive | Local Road | 1 | 2A & 2B | A, B, C, D, E and F |
| 25, 57 | FM 983 | Minor Collector | 2 | 2A & 2B | A, B, C, D, E and F |
| 26 | Maintenance Rd | Local Road | 2 | 2A | A, B, and C |
| 27, 59 | Wester Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 27 | Private Drive | Local Road | 2 | 2A | A, B, and C |
| 29, 61 | Risinger Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 30, 62 | Palmyra Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 31, 63 | Epps Rd | 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 |
| 66 | FM 878 | Local Road | 2 | 2B | D, E and F |
| 35, 67 | Ebenezer Rd | 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 |
| 39 | Shared Rail Access Road | Local Road | 2 | 2A | A, B, and C |
| 39 | Rail Access Road | Major Collector | 2 | 2A | A, B, and C |
| 40 | Private Drive | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 41 | Old Boyce Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 42 | Mustang Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 42 | Old Church Rd | Local Road | 2 | 2A | A, B, and C |
| 44 | US 287 (EB) | Principal Arterial | 4 | 2A & 2B | A, B, C, D, E and F |
| 44 | US 287 (WB) | Principal Arterial | 4 | 2A & 2B | A, B, C, D, E and F |
| 44 | Old Waxahachie Rd | Local Road | 2 | 2A | A, B, and C |
| 46 | Getzendaner Rd | Local Road | 2 | 2A | A, B, and C |
| 47 | FM 984 | Minor Collector | 2 | 2A | A, B, and C |
| 47 | Rail Access Road | Local Road | 1 | 2B | D, E and F |
| 47, 78 | Walker Rd | Local Road | 2 | 2A & 2B | A, B, C, D, E and F |
| 51 | SH 34 | Minor Arterial | 2 | 2B | D, E and F |

Source: AECOM, 2017

#### *3.11.4.2.3 Transit Services*

Community Transit Service, Inc. (CTS) provides on-demand bus and van transit service in Ellis County.

#### *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 from Segment 1, as depicted on the **Community and Cultural Resources Mapbook** located in **Appendix D**.

#### *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**

| Project | Mode | Lanes Before/After | Classification | Year Complete | Length (miles) | Cost ($M) |
|---|---|---|---|---|---|---|
| FM 664 | Roadway | 2/6 | Divided Urban | 2017 (bid date) | 3 | $35 |

Source: TxDOT, 2016

### 3.11.4.3 Navarro County

#### *3.11.4.3.1 Rail Network*

BNSF, UPRR and TUEX operate within the Study Area. **Table 3-11.12** identifies the locations in Navarro County where the Build Alternatives would cross existing railroad tracks (freight or transit). Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **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 |
| 162 | 3B | B and E | UPRR | Main Line | Active |
| 195 | 3C | C and F | UPRR | Main Line | Active |

Source: AECOM, 2016

#### *3.11.4.3.2 Roadway Network*

The primary agencies responsible for roadway crossings are TxDOT Dallas District and Navarro County. **Table 3.11-13** is a list of all roadway crossings within the Study Area.

**Table 3.11-13: Roadway Crossings in Navarro County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 132 | FM 1126 | Major Collector | 2 | 3B | B and E |
| 96, 133, 174 | County Rd 1230/1145 | Local Road | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 98, 136, 176 | SH 22 | Minor Arterial | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 105, 143, 183 | SH 31 | Principal Arterial | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 149 | County Rd 30 | Local Road | 2 | 3B | B and E |

| Table 3.11-13: Roadway Crossings in Navarro County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **Lane** | **Segment** | **Build Alternative** |
| 149 | Private Drive | Local Road | 1 | 3A & 3C | A, C, D and F |
| 150 | County Rd 5159 | Local Road | 2 | 3B | B and E |
| 150 | County Rd 30 | Local Road | 2 | 3B | B and E |
| 154 | County Rd 30 | Local Road | 2 | 3B | B and E |
| 117, 156, 193 | FM 1394 | Major Collector | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 119, 159 | County Rd 2190 | Local Road | 2 | 3A & 3B | A, B, D and E |
| 118 | County Rd 2110 | Local Road | 2 | 3A | A & D |
| 121, 161 | FM 641 | Minor Collector | 2 | 3A & 3B | A, B, D and E |
| 121, 122, 161, 162, 195 | SH 14 | Minor Arterial | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 123, 163, | County Rd 2380 | Local Road | 2 | 3A & 3B | A, B, D and E |
| 124, 164 | County Rd 2420 | Local Road | 2 | 3A & 3B | A, B, D and E |
| 98, 176 | County Rd 2070 | Local Road | 2 | 3A & 3C | A, C, D and F |
| 105, 143, 183 | SH 31 | Principal Arterial | 2 | 3A & 3B & 3C | A, B, C, D, E and F |
| 184 | County Road 3030 | Minor Collector | 2 | 3A and 3C | A, C, D and F |
| 184 | Maintenance Rd | Local Road | 1 | 3A & 3C | A, C, D and F |
| 186 | County Rd 3110 | Local Road | 2 | 3A & 3C | A, C, D and F |
| 187 | County Rd 3120 | Minor Collector | 2 | 3C | C and F |
| 189 | FM 709 | Major Collector | 2 | 3C | C and F |
| 193 | FM 1394 | Major Collector | 2 | 3C | C and F |
| 194 | County Rd 2120 | Local Road | 2 | 3C | C and F |
| 194 | County Rd 2130 | Local Road | 2 | 3C | C and F |
| 195 | Rail Access Rd | Local Road | 1 | 3C | C and F |

Source: AECOM, 2017

### *3.11.4.3.3 Transit Services*

CTS provides on-demand bus and van transit service. The service is available throughout Navarro County.

### *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 | | | | | | |
|---|---|---|---|---|---|---|
| **Project** | **Mode** | **Lanes Before/After** | **Classification** | **Year Complete** | **Length (miles)** | **Cost ($M)** |
| SH 31 Relief Route | Roadway | 0/8 | Rural Arterial Roadway | 2018 | 14 | $106 |

Source: TxDOT, 2016

### 3.11.4.4 Freestone County

#### *3.11.4.4.1 Rail Network*

BNSF, UPRR and TUEX operate within the Study Area. **Table 3-11.15** identifies the locations in Freestone County where the Build Alternatives would cross existing railroad tracks. Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **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 |
|---|---|---|---|---|---|
| 203 | 3C | C and F | BNSF | Main Line | Active |
| 211 | 3C | C and F | TUEX | Main Line | Active |
| 317 | 4 | A, B, D and E | TUEX | Main Line | Active |

Source: AECOM, 2016

#### *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** is a list of all roadway crossings within the Study Area.

**Table 3.11-16: Roadway Crossings in Freestone County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 203 | Burlington Northern Santa Fe | Local Road | 1 | 3C | C and F |
| 203 | Maintenance Road | Local Road | 1 | 3C | C and F |
| 203 | County Rd 1051 | Local Road | 1 | 3C | C and F |
| 205 | FM 80 | Minor Collector | 2 | 3C | C and F |
| 209 | IH-45 Frontage Road | Major Collector | 2 | 3C | C and F |
| 209 | County Rd 1090 | Local Road | 2 | 3C | C and F |
| 210 | IH-45 Frontage Road | Major Collector | 2 | 3C | C and F |
| 211 | IH-45 Frontage Road | Major Collector | 2 | 3C | C and F |
| 211 | County Rd 1080 | Local Road | 2 | 3C | C and F |
| 211 | IH-45 Frontage Road | Major Collector | 2 | 3C | C and F |
| 214 | Private Drive | Local Road | 1 | 3C | C and F |
| 215 | Private Drive | Local Road | 1 | 3C | C and F |
| 215 | IH-45 Frontage Road | Major Collector | 2 | 3C | C and F |
| 215 | IH-45 | Off Ramp | 1 | 3C | C and F |
| 215, 321 | FM 27 | Minor Collector | 2 | 3C & 4 | A, B, C, D, E and F |
| 215 | IH-45 | On Ramp | 1 | 3C | C and F |
| 215 | IH-45 | Off Ramp | 1 | 3C | C and F |
| 216, 217 | US 84 | Principle Arterial | 4 | 3C | C and F |
| 217 | IH-45 | On Ramp | 1 | 3C | C and F |
| 217 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 228 | SH 179 | Minor Arterial | 2 | 3C | C and F |
| 228 | County Rd 675 | Local Road | 2 | 3C | C and F |
| 229 | Private Drive | Local Road | 1 | 3C | C and F |
| 229 | FM 489 | Minor Collector | 2 | 3C | C and F |
| 229 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 236 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 237 | County Rd 691 | Local Road | 2 | 3C | C and F |

| Table 3.11-16: Roadway Crossings in Freestone County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **Lane** | **Segment** | **Build Alternative** |
| 317 | FM 246 | Minor Collector | 2 | 4 | A, B, D and E |
| 318 | County Rd 995 | Local Road | 2 | 4 | A, B, D and E |
| 326 | County Rd 964 | Local Road | 2 | 4 | A, B, D and E |
| 335 | FM 1365 | Minor Collector | 2 | 4 | A, B, D and E |
| 336 | County Rd 890 | Local Road | 2 | 4 | A, B, D and E |
| 338 | County Rd 844 | Local Road | 2 | 4 | A, B, D and E |
| 342 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 342 | Private Drive | Local Road | 1 | 4 | A, B, D and E |

Source: AECOM, 2017
*Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads.

#### *3.11.4.4.3 Transit Services*

Demand-response 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 | | | | | | |
|---|---|---|---|---|---|---|
| **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, 2016

### 3.11.4.5 Limestone County

#### *3.11.4.5.1 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 the **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** lists all roadway crossings within the Study Area.

**Table 3.11-18: Roadway Crossings in Limestone County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 344 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 344 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 346 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 346 | FM 39 | Major Collector | 2 | 4 | A, B, D and E |
| 346 | SH 164 | Major Collector | 2 | 4 | A, B, D and E |
| 346 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 346 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 353 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 355 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 355 | County Road 884 | Local Road | 2 | 4 | A, B, D and E |
| 356 | FM 1512 | Minor Collector | 2 | 4 | A, B, D and E |
| 356 | County Road 879 | Local Road | 2 | 4 | A, B, D and E |
| 356 | Private Drive | Local Road | 1 | 4 | A, B, D and E |

Source: AECOM, 2017

### *3.11.4.5.3 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, 2016

### 3.11.4.6 Leon County

#### *3.11.4.6.1 Rail Network*

BNSF and UPRR operate within the Study Area. **Table 3.11-20** identifies the locations in Leon County where the Build Alternatives would cross existing railroad tracks. Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **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 |
|---|---|---|---|---|---|
| 242 | 3C | C and F | UPRR | Main Line | Active |
| 365 | 4 | A, B, D and E | UPRR | Main Line | Active |
| 371 | 4 | A, B, D and E | BNSF | Main Line | Active |

Source: AECOM, 2016

#### *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** is a list of all roadway crossings within the Study Area.

**Table 3.11-21: Roadway Crossings in Leon County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 237 | Private Drive | Local Road | 1 | 3C | C and F |
| 237 | Private Drive | Local Road | 1 | 3C | C and F |
| 240 | SH 164 | Major Collector | 2 | 3C | C and F |
| 241 | IH-45 | Frontage Road | 1 | 3C | C and F |
| 242 | IH-45 | Off-Ramp | 1 | 3C | C and F |
| 242 | US 79 | Principal Arterial | 2 | 3C | C and F |
| 242 | US 79 | Principal Arterial | 3* | 3C | C and F |
| 242 | US 79 | Principal Arterial | 2 | 3C | C and F |
| 242 | IH-45 | On-Ramp | 1 | 3C | C and F |
| 242 | S Craig Dr | Major Collector | 2 | 3C | C and F |
| 242 | County Road 306 | Local Road | 2 | 3C | C and F |
| 243 | Private Drive | Local Road | 1 | 3C | C and F |
| 245 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 247 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 262 | Local Dirt Rd | Local Road | 2 | 3C | C and F |
| 262,263 | County Road 413 | Local Road | 2 | 3C | C and F |
| 274 | IH-45 | Frontage Road | 2 | 3C | C and F |
| 286, 392 | SH-OSR | Local Road | 2 | 3C & 4 | A, B, C, D, E and F |
| 360 | FM 1512 | Minor Collector | 2 | 4 | A, B, D and E |
| 362 | FM 1469 | Minor Collector | 2 | 4 | A, B, D and E |
| 363 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 366 | US 79 | Principal Arterial | 2 | 4 | A, B, D and E |
| 368 | County Road 347 | Local Road | 2 | 4 | A, B, D and E |
| 371 | County Road 391 | Local Road | 2 | 4 | A, B, D and E |
| 372 | County Road 392 | Local Road | 2 | 4 | A, B, D and E |
| 373 | SH 7 | Minor Arterial | 2 | 4 | A, B, D and E |
| 373 | FM 39 | Major Collector | 2 | 4 | A, B, D and E |

| Table 3.11-21: Roadway Crossings in Leon County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **Lane** | **Segment** | **Build Alternative** |
| 376 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 383 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 383 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 390 | Private Drive | Local Road | 1 | 4 | A, B, D and E |

Source: AECOM, 2017
*Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads.

#### *3.11.4.6.3 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 | | | | | | |
|---|---|---|---|---|---|---|
| **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, 2016

### 3.11.4.7 Madison County

#### *3.11.4.7.1 Rail Network*

BNSF operates within the county, but there are no railroad tracks within the Study Area. The location of existing freight rail is noted in the **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** is a list of all roadway crossings within the Study Area.

| Table 3.11-23: Roadway Crossings in Madison County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **Lane** | **Segment** | **Build Alternative** |
| 290 | Greenbriar Rd | Local Road | 2 | 3C | C and F |
| 297 | Private Drive | Local Road | 2 | 3C | C and F |
| 297 | Private Drive | Local Road | 2 | 3C | C and F |
| 297 | FM 978 | Minor Collector | 2 | 3C | C and F |
| 302 | Private Drive | Local Road | 1 | 3C | C and F |
| 303, 407 | US 190 | Principal Arterial | 2 | 3C & 4 | A, B, C, D, E and F |

| Table 3.11-23: Roadway Crossings in Madison County | | | | | |
|---|---|---|---|---|---|
| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
| 303 | Cottonwood Rd | Local Road | 2 | 3C | C and F |
| 306 | Private Drive | Local Road | 1 | 3C | C and F |
| 307 | FM 1372 | Minor Collector | 2 | 3C | C and F |
| 309 | Bethel Cemetery Road | Local Road | 2 | 3C | C and F |
| 396 | Dawkins Rd | Local Road | 2 | 4 | A, B, D and E |
| 398 | FM 2289 | Minor Collector | 2 | 4 | A, B, D and E |
| 405 | FM 1452 | Minor Collector | 2 | 4 | A, B, D and E |
| 408 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 408 | Clark Rd | Local Road | 2 | 4 | A, B, D and E |
| 408 | Moss Ln | Local Road | 2 | 4 | A, B, D and E |
| 409 | Strawther Rd | Local Road | 2 | 4 | A, B, D and E |
| 412 | Maintenance Road | Local Road | 1 | 4 | A, B, D and E |
| 412 | Private Rd | Local Road | 1 | 4 | A, B, D and E |

Source: AECOM, 2017

#### *3.11.4.7.3 Transit Services*

The Brazos Transit District, headquartered in Bryan, offers fixed-route bus service in Bryan-College Station and demand-response service (i.e., no fixed routes) 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 | | | | | | |
|---|---|---|---|---|---|---|
| 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, Navasota River to Madisonville | Roadway | 2/4 | Divided Highway | To be determined | 9 | $50 |

Source: TxDOT, 2016

### 3.11.4.8 Grimes County

#### *3.11.4.8.1 Rail Network*

The BNSF, UPRR and the Texas Municipal Power Agency (TMPX) operate within the Study Area. **Table 3.11-25** identifies the locations in Grimes County where the Build Alternatives would cross existing railroad tracks. Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **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** |
| 432 | 5 | A, B, C, D, E and F | BNSF | Main Line | Active |
| 463 | 5 | A, B, C, D, E and F | UPRR | Main Line | Active |
| 463 | 5 | A, B, C, D, E and F | BNSF | Main Line | Active |

Source: AECOM, 2016

### *3.11.4.8.2 Roadway Network*

The primary agencies responsible for roadway crossings are the TxDOT Bryan District and Grimes County. **Table 3.11-26** is a list of all roadway crossings within the Study Area.

| Table 3.11-26: Roadway Crossings in Grimes County | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Street Name** | **Classification** | **Lane** | **Segment** | **Build Alternative** |
| 415 | Maintenance Rd | Local Road | 1 | 3C | C and F |
| 415 | County Rd 119 | Local Road | 2 | 3C | C and F |
| 415 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 415 | Maintenance Rd | Local Road | 1 | 4 | A, B, D and E |
| 415 | Private Drive | Local Road | 1 | 4 | A, B, D and E |
| 417 | County Rd 114 | Local Road | 2 | 4 | A, B, D and E |
| 419, 420 | FM 1696 | Major Collector | 2 | 5 | A, B, C, D, E and F |
| 422 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 429 | County Rd 150 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 432 | Rail Access Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 432 | FM 39 | Major Collector | 2 | 5 | A, B, C, D, E and F |
| 433 | County Rd 178 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 435 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 439 | SH 30 | Minor Arterial | 3 | 5 | A, B, C, D, E and F |
| 440 | SH 90 | Minor Arterial | 2 | 5 | A, B, C, D, E and F |
| 442 | County Rd 219 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 443 | County Rd 220 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 451 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 452 | County Rd 215 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 452 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 463 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 456 | FM 2445 | Minor Collector | 2 | 5 | A, B, C, D, E and F |
| 462 | County Rd 311 | Local Road | 2 | 5 | A, B, C, D, E and F |
| 463 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 463 | SH 105 | Principal Arterial | 2 | 5 | A, B, C, D, E and F |
| 463 | Rail Access Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 466 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 471 | Clark Rd | Local Road | 2 | 5 | A, B, C, D, E and F |

Source: AECOM, 2017

### *3.11.4.8.3 Station Area*

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

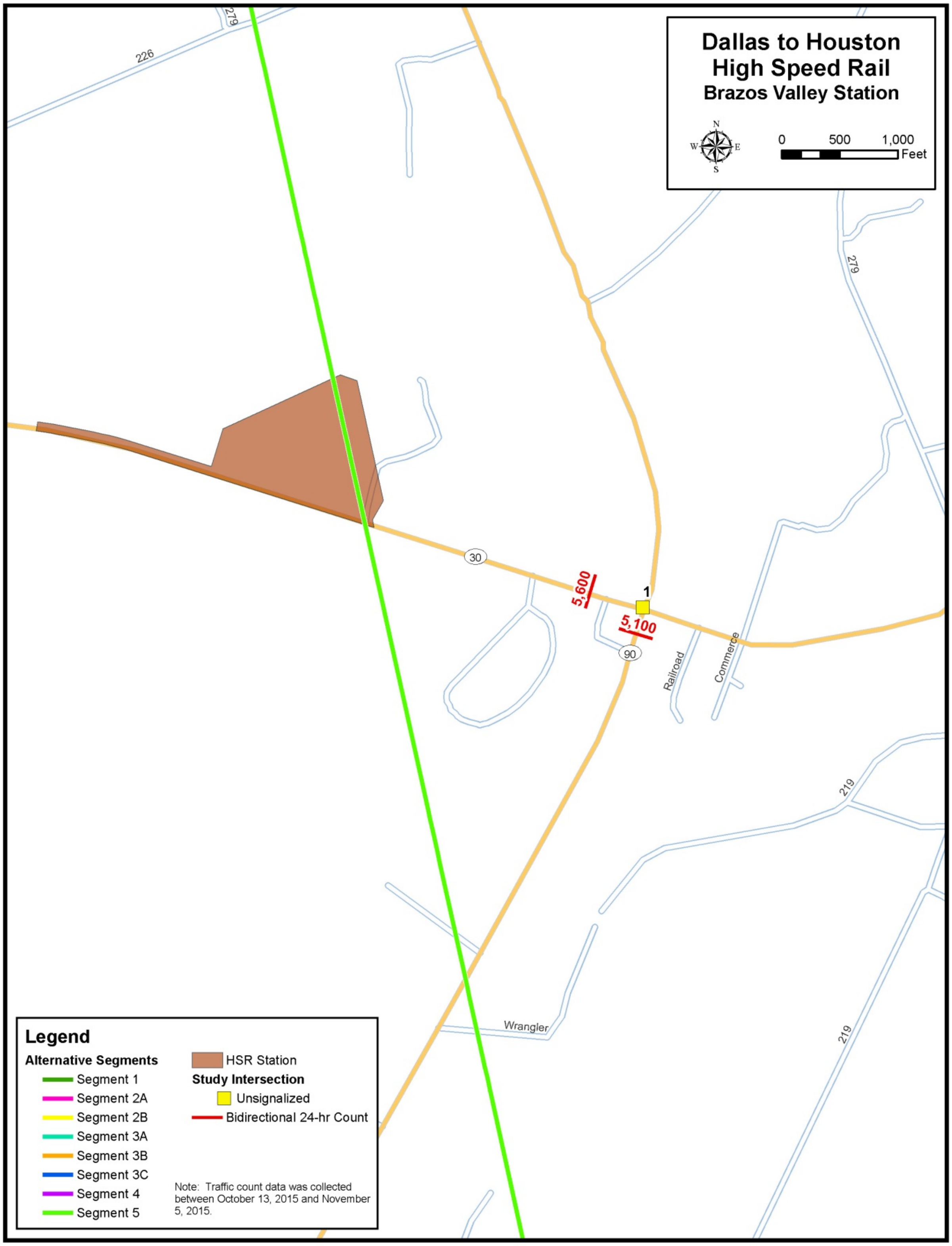
The intersection of the two rural highways, SH 30 and SH 90, is a four-way stop and the existing LOS is shown in **Table 3.11-27**. The intersection is in a rural location and does not experience substantial congestion.

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

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

Source: AECOM, 2016

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




Source: AECOM, 2016

*3.11.4.8.4 Transit Services*

The Brazos Transit District, headquartered in Bryan, offers fixed-route bus service in Bryan-College Station and demand-response service (i.e., no fixed routes) 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.

**Table 3.11-28: Planned Transportation Projects in Grimes County**

| 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 | 2019 | 10 | $87 |
| 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, 2016

### 3.11.4.9 Waller County

*3.11.4.9.1 Rail Network*

UPRR operates in Grimes County, but there are no rail lines within the Study Area. The location of existing freight rail is noted in the **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** is a list of all roadway crossings within the Study Area.

**Table 3.11-29: Roadway Crossings in Waller County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 479 | Murphy Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 480 | Bowler Rd | Minor Collector | 2 | 5 | A, B, C, D, E and F |
| 480 | FM 1488 | Major Collector | 2 | 5 | A, B, C, D, E and F |
| 481 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |

Source: AECOM, 2017

*3.11.4.9.3 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 Rail Network*

BNSF and UPRR operate within the Study Area. **Table 3.11-30** identifies the locations in Harris County where the Build Alternatives would cross existing railroad tracks. Each location is identified by rail operator, rail type (main or spur line) and if that line is in active status. The location of existing freight rail is noted in the **Appendix D, Project Footprint Mapbook**. Amtrak's *Sunset Limited* serves Houston three times a week per direction as it travels between New Orleans and Los Angeles.

**Table 3.11-30: Railroad Crossings in Harris County**

| Mapbook Page | Segment | Build Alternative | Railroad Company | Line Type | Line Status |
|---|---|---|---|---|---|
| 492 | 5 | A, B, C, D, E and F | UPRR | Main Line | Active |
| 499 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Pulled |
| 511 | 5 | A, B, C, D, E and F | Private | Local Spur Line | Active |
| 515 | 5 | A, B, C, D, E and F | Private | Local Spur Line | Active |
| 518 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 519 | 5 | A, B, C, D, E and F | Private | Local Spur Line | Pulled |
| 520 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 520 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 522 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 522 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 522 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 534 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |
| 535 | 5 | A, B, C, D, E and F | UPRR | Main Line | Active |
| 536 | 5 | A, B, C, D, E and F | Private | Local Spur Line | Pulled |
| 536 | 5 | A, B, C, D, E and F | Private | Local Spur Line | Pulled |
| 536 | 5 | A, B, C, D, E and F | UPRR | Spur Line | Active |

Source: AECOM, 2017

#### *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** lists roadway crossings within the Study Area.

**Table 3.11-31: Roadway Crossings in Harris County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 488 | Waller Spring Creek Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 489 | Jaime Ln | Local Road | 2 | 5 | A, B, C, D, E and F |
| 490 | FM 2920 | Major Collector | 2 | 5 | A, B, C, D, E and F |
| 490 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 491 | US 290 | Principal Arterial | 2 | 5 | A, B, C, D, E and F |
| 491 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 492 | Hempstead Hwy | Principal Arterial | 2 | 5 | A, B, C, D, E and F |
| 492 | Old Washington Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 493 | Burton Cemetery Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 500 | House Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 501 | SH 99 | Principal Arterial | 6 | 5 | A, B, C, D, E and F |
| 501 | SH 99 | Principal Arterial | 6 | 5 | A, B, C, D, E and F |
| 501 | SH 99 | Principal Arterial | 6 | 5 | A, B, C, D, E and F |
| 501 | SH 99 | Principal Arterial | 6 | 5 | A, B, C, D, E and F |
| 504 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 507 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 507 | House Hahl Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 507 | Fry Rd | Minor Arterial | 6* | 5 | A, B, C, D, E and F |
| 507 | Josey Ranch Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 509 | Barker Cypress Rd | Major Arterial | 5* | 5 | A, B, C, D, E and F |
| 511 | Spur Track Maintenance Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 511 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 511 | Telge Rd | Major Arterial | 4 | 5 | A, B, C, D, E and F |
| 512 | Berwick Dr | Local Road | 2 | 5 | A, B, C, D, E and F |
| 512 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 513 | Huffmeister Rd | Major Arterial | 5* | 5 | A, B, C, D, E and F |
| 514 | SH 6 | Principal Arterial | 6 | 5 | A, B, C, D, E and F |
| 514 | Access Road | Local Road | 1 | 5 | A, B, C, D, E and F |
| 515 | Daniel Dr | Local Road | 2 | 5 | A, B, C, D, E and F |
| 515 | Eldridge Pkwy | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 515 | Eldridge Pkwy | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 515 | West Rd | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 515 | West Rd | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 516 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 517 | Jones Rd | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 517, 518 | Maintenance Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 517, 518 | Spur Track Maintenance Rd | Local Road | 1 | 5 | A, B, C, D, E and F |
| 518 | FM 529 | Principal Arterial | 5 | 5 | A, B, C, D, E and F |
| 518 | Britmoore Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 518 | Senate Ave | Local Road | 4 | 5 | A, B, C, D, E and F |
| 519 | Little York Rd | Principal Arterial | 5* | 5 | A, B, C, D, E and F |
| 520 | Gessner Rd | Principal Arterial | 5* | 5 | A, B, C, D, E and F |
| 521 | Private Drive | Local Road | 1 | 5 | A, B, C, D, E and F |
| 521 | Campbell Rd | Minor Arterial | 2 | 5 | A, B, C, D, E and F |
| 522 | Blalock Rd/Fairbanks N Houston Rd | Major Arterial | 5* | 5 | A, B, C, D, E and F |
| 522, 523 | Pinemont Dr | Minor Arterial | 3* | 5 | A, B, C, D, E and F |
| 523, 524 | Clay Rd/43Rd St | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 524 | Rayson Rd | Local Road | 2 | 5 | A, B, C, D, E and F |
| 524 | Bingle Rd | Principal Arterial | 6* | 5 | A, B, C, D, E and F |

**Table 3.11-31: Roadway Crossings in Harris County**

| Mapbook Page | Street Name | Classification | Lane | Segment | Build Alternative |
|---|---|---|---|---|---|
| 525 | Kempwood Dr/34th St | Minor Arterial | 6* | 5 | A, B, C, D, E and F |
| 526 | Central Coast Crest/Wirtcrest Ln | Local Road | 2 | 5 | A, B, C, D, E and F |
| 526 | Antoine Dr | Minor Arterial | 6* | 5 | A, B, C, D, E and F |
| 527 | Long Point Rd | Minor Arterial | 4* | 5 | A, B, C, D, E and F |
| 529 | Post Oak Rd | Minor Arterial | 5* | 5 | A, B, C, D, E and F |
| 532 | Hempstead Rd | Principal Arterial | 6* | 5 | A, B, C, D, E and F |
| 535 | 12th St | Major Collector | 2 | 5 | A, B, C, D, E and F |
| 527, 531, 533 | Houston Station Internal St | Minor Collector | 4* | 5 | A, B, C, D, E and F |

Source: AECOM, 2017
*Interstate crossings shown as collectors or arterials are freeway ramps or frontage roads.

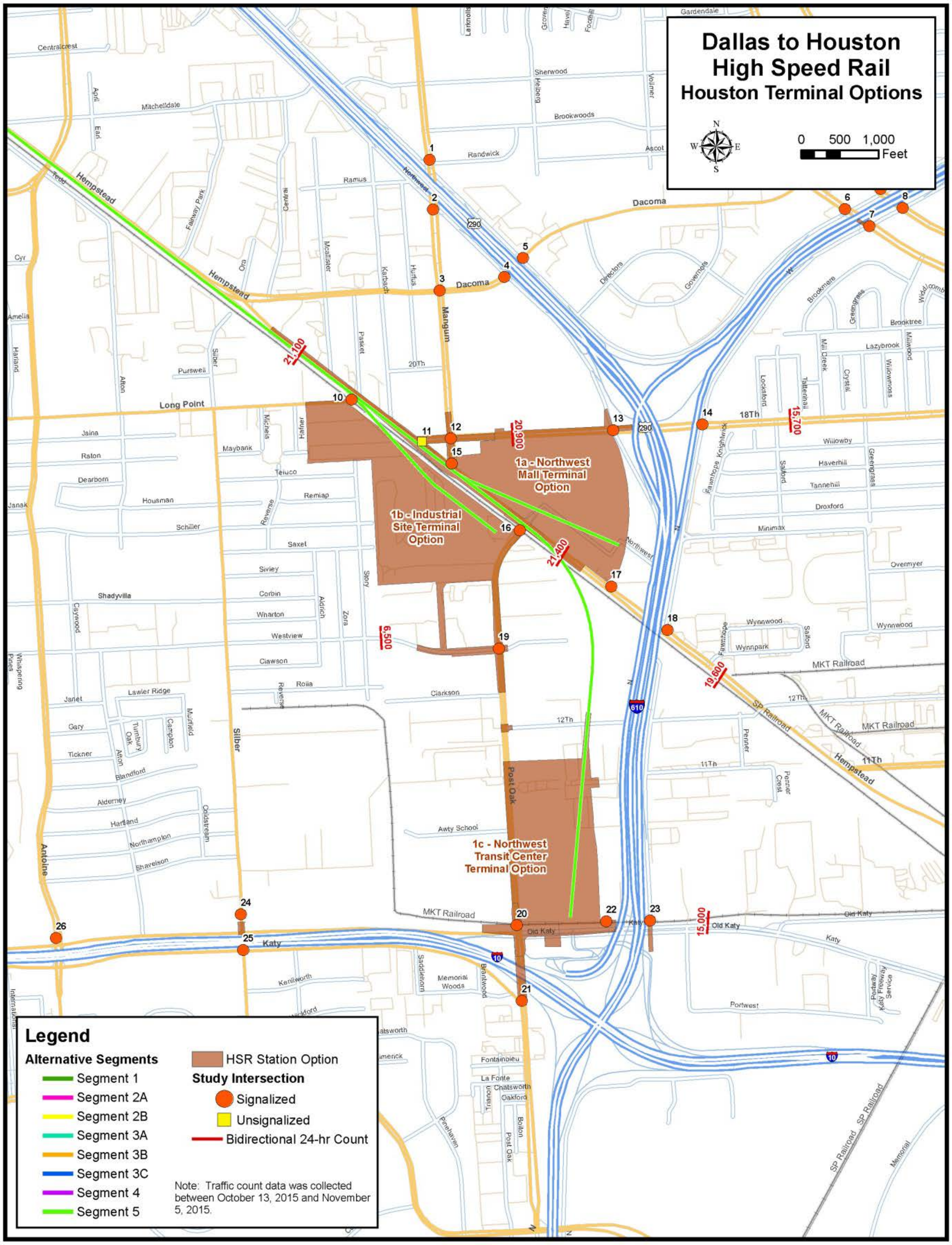
### *3.11.4.10.3 Station Area*

**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 Data Collection Plan and Traffic Operation Technical Memo.**

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** 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.

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




Source: AECOM, 2016

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

| Intersection | AM | PM |
|---|---|---|
| | Existing | Existing |
| NB US 290/Mangum Rd | C (29) | C (25) |
| SB US 290/Mangum Rd | C (33) | C (34) |
| Mangum Rd/Dacoma St | C (33) | C (29) |
| SB US 290/Dacoma St | C (32) | C (29) |
| NB US 290/Dacoma St | C (25) | C (33) |
| WB IH-610/TC Jester Blvd | **E** (73) | D (40) |
| EB IH-610/TC Jester Blvd | D (48) | D (46) |
| EB IH-610/E TC Jester Blvd | D (39) | D (37) |
| WB IH-610/E TC Jester Blvd | **F (91)** | C (29) |
| Long Point Rd/Hempstead Rd | B (17) | B (18) |
| 18th St/Hempstead Rd (unsignalized) | A (2) | A (2) |
| Mangum Rd/18th St | C (26) | C (34) |
| SB IH-610/18th St | C (28) | D (43) |
| NB IH-610/18th St | D (38) | C (35) |
| Mangum Rd/Hempstead Rd | C (25) | C (29) |
| Post Oak Rd/Hempstead Rd | C (27) | C (29) |
| SB IH-610/Hempstead Rd | C (29) | C (31) |
| NB IH-610/Hempstead Rd | B (12) | B (16) |
| Post Oak Rd/Westview Dr | B (19) | C (31) |
| Post Oak Rd/Old Katy Rd | D (46) | **F** (98) |
| Post Oak Rd/EB IH-10 | C (24) | B (17) |
| SB IH-610/Old Katy Rd | C (24) | **E** (59) |
| NB IH-610/Old Katy Rd | C (23) | D (52) |
| WB IH-10/Silber Rd | C (25) | C (28) |
| EB IH-10/Silber Rd | C (24) | D (47) |
| WB IH-10/Antoine Dr | C (31) | C (26) |

Source: AECOM, 2016
Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

### *3.11.4.10.4 Transit Services*

METRO provides transit to 15 cities in the Houston area by both bus and rail. METRO has 113 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.

One of the Houston Terminal Station options would directly serve the Northwest Transit Center. **Table 3.11-33** details bus routes that service that center.

**Table 3.11-33: Northwest Transit Center Bus Routes**

| Number | Route Name | Frequency (min) | From | To | Daily Ridership |
|---|---|---|---|---|---|
| 33 | Post Oak | 15 | Hempstead TC | Bellaire TC | 3,810 |
| 39 | Katy Freeway | 30-60 | Northwest TC | Upland Dr | 460 |
| 47 | Hillcroft | 15-30 | Northwest TC | Airport Blvd | 1,580 |
| 49 | Chimney Rock/S Post Oak | 15-30 | Northwest TC | Ridgemont | 1,380 |
| 58 | Hammerly | 30-60 | Northwest TC | West Belt | 830 |
| 70 | Memorial | 30-60 | Northwest TC | Britmoore | 410 |

| Table 3.11-33: Northwest Transit Center Bus Routes | | | | | |
|---|---|---|---|---|---|
| **Number** | **Route Name** | **Frequency (min)** | **From** | **To** | **Daily Ridership** |
| 72 | Westview | 30-60 | Northwest TC | Britmoore | 660 |
| 84 | Buffalo Speedway | 15-30 | Northwest TC | W. Bellfort St | 1,620 |
| 85 | Antoine/Washington | 15-30 | Downtown TC | Greenspoint TC | 5,100 |
| 160 | Memorial City Express | 15 | Downtown TC | Memorial City | 80 |
| 161 | Wilcrest Express | 15 | Downtown TC | W Bellfort P&R | 2,610 |
| 162 | Memorial Express | 15 | Downtown TC | Addicks P&R | 1,310 |

Source: METRO, 2016
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**).

| Table 3.11-34: On-Road Pedestrian and Bicycle Facilities in Harris County | |
|---|---|
| **Name** | **Length Near Project (miles)** |
| Bike lane projects (N-0420-20) | 2.43 |
| Bike lane projects (N-0420-12) | 0.90 |
| Bike lane projects (N-0420-10) | 0.76 |
| Bikeway needs on Long Point Rd | 0.37 |
| Bikeway needs on Telge Rd | 0.71 |
| Bikeway needs on Katy Hockley Rd | 0.53 |
| Bikeway needs on Old Katy Rd | 0.04 |
| Bikeway needs on N IH-610 W | 1.25 |
| Existing bike lane on W 43rd St | 0.27 |
| Existing bike lane on W Clay Rd | 0.33 |
| Existing bike lane on Antoine Dr | 0.58 |
| Existing bike lane on Hammerly Blvd | 0.24 |
| Existing bike lane on Kempwood Dr | 0.16 |
| Existing bike lane on Wirt Rd | 0.14 |
| Existing bike lane on N Post Oak Rd | 0.85 |
| Existing bike lane on Westview Dr | 0.02 |
| Existing bike lane on FM 529 | 0.48 |
| Existing signed shared roadway on W 12th St | 0.09 |
| Existing signed shoulder bike route on FM 2920 | 0.50 |
| Existing bike lane on Pinemont Dr | 0.67 |
| Existing signed shoulder bike route on FM 1488 | 0.50 |
| Existing signed shared roadway on N Post Oak Rd/N Post Oak Ln | 0.02 |
| Existing signed shared roadway on W 12th St | 0.29 |
| Existing bike lane on W Loop N | 0.36 |
| Proposed bike lane on US 290 | 12.44 |
| Proposed shared use path/trail on Old Katy Rd/Washington Ave | 0.37 |

Source: AECOM, 2016

### *3.11.4.10.6 Aviation*

Weiser Air Park is a privately owned, general aviation facility located adjacent to US 290. It is approximately 0.08 mile from the Study Area (see **Appendix D**, **Community and Cultural Resources Mapbook**).

#### *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**

| Project | Mode | Lanes Before/After | Classification | Year Complete | Length (miles) | Cost ($M) |
|---|---|---|---|---|---|---|
| US 290 Widening | Roadway | 4/10 (6 main lanes, 2 2-lane frontage roads) | Freeway | 2017 | 6 | $59 |
| Hempstead Road Toll | Roadway | 4/8 (4 managed lanes, 2 2-lane frontage road) | Freeway | 2035 | 5 | $429 |
| Hempstead Road Toll | Roadway | | Freeway | 2035 | 3 | $446 |
| Hempstead Road Toll | Roadway | | Freeway | 2035 | 3 | $347 |
| Hempstead Road Toll | Roadway | | Freeway | 2035 | 4 | $310 |
| IH-610 | Roadway | 4/8 (inter-change, 4 managed lanes, 2 2-lane frontage roads | Freeway | 2035 | 1 | $352 |
| Inner Katy Corridor Light Rail Extension | Rail | N/A | N/A | 2026 | 7 | $420 |
| Uptown-Galleria Line Extension to Hempstead Intermodal Terminal | Rail | N/A | N/A | To be determined | 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, 2016
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 to 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 **Chapter 1.0, Purpose and Need**, 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; however, the overall trip duration when considering pre-arrival time more than doubles. Additionally, flights are sensitive to inclement weather and other delay-causing events from inside and outside of Texas.

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. The local roadway networks would remain unchanged.

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 cities are addressing much needed infrastructure improvements. Intercity and intracity transportation infrastructure would require significant expansion and maintenance in the future, but it is critical to provide alternative multimodal options to alleviate the congestion on the existing infrastructure.

### 3.11.5.2 Build Alternatives

Introducing 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 Build Alternatives would result in a long-term shift in how people travel, particularly between Dallas - Fort Worth and Houston. An independent ridership and revenue forecast conducted by TCRR, and summarized in **Appendix F, TCRR Conceptual Engineering Design Report**, projected that the HSR system would transport between 5 million and 6 million passengers annually by 2043. TCRR's data determined that cars made up 89 percent of all travel modes in 2013 and 73 percent in 2043 (a 16 percent decrease of the total travel mode), while the HSR went from 0 percent in 2013 to 21 percent in 2043, 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 | 2013 Market | 2043 Market |
|---|---|---|
| Car | 89% | 73% |
| HSR | - | 21% |
| Air | 9% | 3% |
| Bus | 2% | 2% |

Source: TCRR, 2016
Note: Due to projection rounding in the TCRR's design concept engineering report, percentages may not add up to 100%.

In relative terms of just the cars, the percent of the car travel deferred to HSR is decrease of the mode (cars at 16 percent) divided by the 2013 market data (89 percent), resulting in an 18 percent shift. 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.

As detailed below by county, the Build Alternatives would intersect numerous freight rail and public and private roads. Regardless of Build Alternative, there would be 41 rail crossings by the HSR system. All Build Alternatives would cross (on viaduct) existing freight railroads and light rail transit lines. Impacts to these modes of transportation would be limited to temporary disruption of service during construction. As a result of **TR-CM #1**, 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, crash barriers would be constructed to protect the viaduct support columns.

Implementation of the Build Alternatives would result in direct and indirect impacts to the existing transportation network within the Study Area. As detailed within the following counties, the number of roads that would be crossed varies from 212 (Build Alternative E) to 226 (Build Alternative C). Approximately 50 percent of the road crossings would be located beneath the elevated structure of the HSR system (viaduct). Of those crossings approximately 69 percent would require limited road modifications due to the height of the viaduct. As detailed in **Section 3.11.3.3.1**, 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. Therefore, the number of roads impacted would vary from 144 (Build Alternative F) to 242 (Build Alternative E). Road crossings that would require modification – through relocation, reroute, closure or changes to the existing roads horizontal or vertical alignment – are discussed in detail by County. Reroutes to existing roads would result in the addition of approximately 17 miles (Build Alternative A) to 47.6 miles (Alternative C) of public roads. Additionally, roads around the 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 the Build Alternative, all roads within the Study Area would experience a temporary disruption of service during construction. Construction activities would result in increased construction traffic on nearby and adjacent roads. Construction activities would also result in traffic delays and temporary road closures on roads crossed by the Build Alternatives. As detailed **in Section 3.11.6 Avoidance, Minimization and Mitigation**, compliance and mitigation measures would mitigate direct impacts and delays to traffic.

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

#### *3.11.5.2.1 Dallas County*

**Roadway Network**
**Table 3.11-37** identifies 10 roads (public and private) in Dallas County that would be permanently impacted by the Build Alternatives.

**Table 3.11-37: 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 | Access would still remain to Jaffee Street, which would have access to IH 45 Frontage Road to the east and Illinois Avenue to the west. | - | - |
| 1 | A, B, C, D, E and F | Cleveland Road | Reroute | 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 |
| 1 | A, B, C, D, E and F | Private Drive | Reroute | All Build Alternatives would require the closure of the existing Private Drive. Access would be provided underneath viaduct approximately 470 feet north. | - | - |
| 1 | A, B, C, D, E and F | Private Drive | Reroute | All Build Alternatives would require the closure of the existing Private Drive. Access would be provided underneath viaduct approximately 720 feet north. | - | - |
| 1 | A, B, C, D, E and F | Private Drive | Closure | Private driveway could connect to Access Road located east of the Build Alternatives. | - | - |

**Table 3.11-37: 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 | Private Drive could connect to Access Road located east of the Build Alternatives. | - | - |
| 1 | A, B, C, D, E and F | Cornell Road | Reroute | The portion of Cornell Road that would cross the Build Alternatives would be closed. Cornell Road would be replaced by access road to the west of the Build Alternatives. | 3,240 | 2,200 |
| 1 | A, B, C, D, E and F | Pleasant Run Road | Road Over Rail | Approximately 2,700 feet of Pleasant Run Road would be reconstructed over the Build Alternatives. | - | - |
| 1 | A, B, C, D, E and F | Greene Road | Road Over Rail | Approximately 2,500 feet of Greene Road would be reconstructed over the Build Alternatives. | - | - |
| 1 | A, B, C, D, E and F | Beltline Road | Road Over Rail | Approximately 2,800 feet of Beltline Road would be reconstructed over the Build Alternatives. | - | - |

Source: AECOM, 2017

**Traffic Impacts at the Dallas Terminal Station**

Approximately 81 percent of the trips to the Dallas Terminal Station option would be by motor vehicle. These trips were allocated to the local roadway network and the route assignment by mode and direction. **Table 3.11-38** summarizes the trip direction and mode of the motor vehicles arriving and departing the Dallas Terminal. The modeling data are found in **Appendix E, Traffic Data Collection Plan and Traffic Operation Technical Memo**.

**Table 3.11-38: Dallas Terminal Trip Direction and Mode**

| | % of Total | Drive and Park | Rental Car | Pick-up/ Drop-off | Taxi and Bus | Total |
|---|---|---|---|---|---|---|
| North (IH-35) | 41 | 98 | 54 | 249 | 179 | 580 |
| West (IH-30) | 15 | 36 | 20 | 91 | 65 | 212 |
| South (IH-35) | 11 | 26 | 15 | 67 | 48 | 156 |
| East (IH-30) | 18 | 43 | 24 | 109 | 79 | 255 |
| Riverfront Blvd | 5 | 12 | 7 | 30 | 22 | 71 |
| Oak Cliff (via Corinth St) | 1 | 2 | 1 | 7 | 4 | 14 |
| South Dallas (Lamar St) | 3 | 7 | 4 | 18 | 13 | 42 |
| Downtown (Hotel St) | 0.5 | 1 | 1 | 3 | 2 | 7 |
| Downtown (Lamar St) | 5.5 | 13 | 7 | 34 | 24 | 78 |
| **Total** | **100** | **238** | **133** | **608** | **436** | **1,415** |

Source: TCRR, 2017

Traffic conditions on the local network were analyzed for the No Build and Build Alternatives with no changes to the current intersection configuration. The Build Alternative, however, would make intersection improvements at several intersections near the station to improve traffic flow. **Table 3.11-39** summarizes the Build Alternatives' intersection improvements.

| Table 3.11-39: Dallas Terminal 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 one right-turn bay to provide dual right turns for southwest bound approach.<br>• Add one left-turn bay to northeast approach to provide dual left-turn bays. |
| Lamar Street/ Cadiz Street | • Add one right-turn bay to southwest bound approach (IH-30 exit ramp).<br>• Add right-turn bay to southeast bound approach. |
| Canton Street/Akard Street | • Add a protected left phase and signal head for northwest bound approach. |
| Belleview Street/South Akard Street | • Provide stop control on both approaches of Akard Street to make the intersection four-way stop-controlled. |

Source: AECOM, 2016

**Table 3.11-40** lists the 2040 peak period intersection conditions under the No Build, Build Alternatives and modified conditions. The table also identifies intersections that would experience an adverse impact (i.e., LOS E or F) from the traffic generated by the Dallas Terminal for the modified intersections condition (Table 3.11-39). 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 four percent per year from existing volumes. This results in projected 2040 No Build conditions that would be congested and yield LOS of E or F at some intersections. The proposed intersection modifications would improve the LOS in the Build Alternatives 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, five intersections would operate at LOS E or F for both the AM and PM peak periods, one intersection would operate at LOS 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 Alternatives and the majority would show improvement or no change over the No Build scenario.

While some intersections would operate at LOS E or F under the modified intersection conditions, this is mostly due to the projected growth under No Build conditions, rather than a direct impact of the project. However, for the purposes of this review, where intersections would operate at LOS E or F under the No Build condition and the modified intersection condition, it is still considered an adverse effect of the Build Alternatives.

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

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| Woodall Rodgers Fwy/Riverfront Blvd | **F (119)** | D (48) | **F (128)** | **E (76)** | **F (128)** | **E (76)** | **Y** |
| Riverfront Blvd/Commerce St | **F (90)** | **F (98)** | **F (155)** | **F (100)** | **F (116)** | **F (100)** | **N** |
| Reunion Blvd/Riverfront Blvd | C (25) | B (17) | C (28) | B (17) | C (28) | B (17) | N |
| WB IH-30/Riverfront Blvd | A (9) | B (13) | A (9) | C (20) | A (9) | C (20) | N |
| EB IH-30/Riverfront Blvd | C (28) | C (23) | C (35) | D (35) | C (35) | D (35) | N |
| IH-35E/Riverfront Blvd | A (8) | B (13) | B (14) | B (15) | B (14) | B (15) | N |
| Riverfront Blvd/Cadiz St | **F (175)** | **F (127)** | **F (412)** | **F (303)** | **F (259)** | **F (210)** | **N** |
| Cadiz St/Hotel St (unsignalized) | A (1) | A (3) | A (1) | A (3) | A (1) | A (3) | N |
| Cadiz St/Lamar St | **E (61)** | **F (90)** | **F (85)** | **F (151)** | D (52) | **F (88)** | **Y** |
| Canton St/Lamar St | B (13) | B (15) | B (13) | B (15) | B (13) | B (15) | N |

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

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| Hotel St/Memorial Dr (unsignalized) | A (4) | A (4) | A (9) | B (10) | A (9) | B (10) | N |
| Lamar St/Memorial Dr | B (16) | B (14) | B (17) | B (15) | B (17) | B (15) | N |
| Griffin St/Memorial Dr | D (53) | C (28) | C (27) | C (30) | C (27) | C (30) | N |
| Canton St/Griffin St | A (10) | C (21) | B (16) | C (22) | B (16) | C (22) | N |
| Cadiz St/Griffin St | B (15) | B (13) | C (27) | C (25) | C (26) | C (25) | N |
| Canton St/Akard St | C (26) | **E (66)** | C (32) | **F (107)** | B (16) | C (24) | **N** |
| Cadiz St/Akard St | C (29) | B (14) | D (36) | C (25) | D (36) | C (29) | N |
| Griffin St W/Akard St | B (15) | B (11) | C (26) | B (17) | C (26) | B (17) | N |
| Griffin St E/Akard St | B (15) | C (21) | B (11) | C (32) | B (11) | C (32) | N |
| Belleview St/Akard St (unsignalized) | **E (47)** | **F (1710)** | **F (95)** | **F (1897)** | **F (73)** | **F (69)** | **Y** |
| Griffin St W/Ervay St | B (16) | A (6) | C (25) | A (4) | C (25) | A (4) | N |
| Griffin St E/Ervay St | B (15) | B (12) | C (29) | B (15) | C (29) | B (15) | N |
| Griffin St E/St Paul St | A (7) | D (42) | A (8) | D (47) | A (8) | D (47) | N |
| Griffin St W/St Paul St | B (18) | B (15) | B (15) | C (28) | B (15) | C (28) | N |
| Lamar St/Belleview St | B (19) | B (16) | **F (145)** | D (48) | **F (145)** | D (48) | Y |
| Lamar St/Corinth St | D (35) | **E (56)** | D (45) | **E (62)** | D (45) | **E (62)** | N |
| Corinth St/Riverfront Blvd | **F (189)** | **F (189)** | **F (214)** | **F (193)** | **F (214)** | **F (193)** | **N** |

Source: AECOM, 2017
Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

**Transit Services**
As stated above, the Build Alternatives 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, light rail headways 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. It would be anticipated that 19 percent of access to the Dallas Terminal Station option would occur via non-motorized modes (walk-up which may include transfer from local transit).

Should a Build Alternative be selected, DART and the T, the two agencies who co-manage the TRE, could extend the TRE commuter rail line from Union Station to the Dallas Terminal Station option. 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 multimodal 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.

**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 Build Alternatives. The Project would be outside of FAA-regulated Runway Protection Zones. There would be no temporary or permanent impacts to this facility as a result of the Build Alternatives.

### 3.11.5.2.2 Ellis County

**Roadway Network**

**Table 3.11-41**, on the following page, identifies 27 roads (public and private)in Ellis County that would be permanently impacted by the Build Alternatives.

**Table 3.11-41: Ellis County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 2A | A, B, and C | Ewing Rd | Reroute | Approximately 5,000 feet of Ewing Road that would cross under Segment 2A would be closed. Ewing Road would be rerouted approximately 4,000 feet to extend under Segment 2A. | 4,000 | 5,000 |
| 2A | A, B, and C | Private Drive | Reroute | Approximately 800 feet of access road would provide Private Drive access to Palmyra Road to the north. | - | - |
| 2A | A, B, and C | Dirt Road | Reroute | Approximately 2,300 feet of additional road would provide driveway access. | - | - |
| 2A | A, B, and C | FM 878 | Road over Rail | Approximately 3,800 feet of FM 878 would be reconstructed over Segment 2A. | - | - |
| 2A | A, B, and C | Wilson Road | Road over Rail | Approximately 2,500 feet of Wilson Road would be reconstructed over Segment 2A. Private driveways would require realignments to provide access. | - | 900 |
| 2A | A, B, and C | Bacak Road | Road over Rail | Approximately 2,400 feet of Bacak Road would be reconstructed over Segment 2A. Private driveway access would require realignment. Approximately 500 feet would be new road. Private driveways would require realignments to provide access. | 500 | 780 |
| 2A | A, B, and C | E B Lane | Reroute | The portion of E B Lane that would cross Segment 2A would be closed (1,800 feet). A new public road would be constructed along the west side of Segment 2A to connect to Bacak Road, located north approximately 3,600 feet. | 3,600 | 1,800 |
| 2A | A, B, and C | SH 34 | Road over Rail | Approximately 4,500 feet of SH 34 would be reconstructed over Segment 2A. Private driveways would require realignments to provide access. | 1,000 | 1,380 |
| 2A | A, B, and C | Private Drive | Closure | The portion of the Private Drive that would cross Segment 2A would be closed. | - | - |
| 2A | A, B, and C | Farmer Road | Reroute | Approximately 3,500 feet of Farmer Road would be closed. Approximately 2,100 feet of Farmer Rd would be rerouted and reconstructed to provide access to SH 34. | 2,100 | 3,500 |
| 2A | A, B, and C | Dirt Road | Reroute | Access to this dirt road would be blocked by Segment 2A. Approximately 900 feet of HSR MOW access road would provide access to rear of property. | - | - |
| 2A | A, B, and C | Hodge Road | Road over Rail | Modified road alignment would straighten road to travel between viaduct support piers. Approximately 2,400 feet of Hodge Road would be realigned over Segment 2A. | 2,400 | 1,800 |
| 3A | A and D | FM 985 | Road over Rail | The portion of FM 985 that would cross Segment 3A would be closed. Approximately 2,600 feet of FM 985 Road would be reconstructed over Segment 3A. | 2,600 | - |

**Table 3.11-41: Ellis County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 3A | A and D | Sullivan Road | Road over Rail | Approximately 2,000 feet of Sullivan Road that would cross Segment 3A would be closed. Approximately 3,600 feet of Sullivan Road would be reconstructed over Segment 3A. | 3,000 | 2,000 |
| 2B | D, E and F | Ewing Road | Road over Rail | Approximately 5,100 feet of Ewing Road that would cross Segment 2B would be closed. Approximately 4,500 feet of Ewing Road would be reconstructed over Segment 2B. | 4,500 | 5,100 |
| 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 | Almand Road | Road under rail | Approximately 1,000 feet of Almand Road would need to be depressed under Segment 2B. | - | - |
| 2B | D, E and F | Wilson Road | Road over Rail | Approximately 1,800 feet of Wilson Road that would cross under Segment 2B would be closed. Approximately 2,000 feet of Wilson Road would be reconstructed over Segment 2B. Private driveway access would require approximately 400 feet of new public road. | 400 | 1,800 |
| 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. | - | - |
| 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. | - | - |
| 2B | D, E and F | Old Boyce Road | Reroute | Approximately 600 feet of Old Boyce Road that would cross under Segment 2B would be closed. Old Boyce Road would be rerouted Old Church Road, approximately 2,700 feet to the south. Private driveway would require new public road to provide access. | 5,500 | 600 |
| 2B | D, E and F | Old Church Road | Road over Rail | Approximately 2,100 feet of Old Church Road would be rerouted and reconstructed over Segment 2B. | 2,600 | - |
| 2B | D, E and F | Old Waxahac hie Rd/Getze ndander Road | Road over Rail | Approximately 1,200 feet of Old Waxahachie Road and 350 feet of Getzendander Road that would cross Segment 2B would be closed. Approximately 3,000 feet of Old Waxahachie Road would be rerouted and reconstructed over Segment 2B. | 2,580 | 1,550 |
| 2B | D, E and F | FM 984 | Road over Rail | The portion of FM 984 that would cross Segment 2B would be closed. Approximately 3,200 feet of FM 984 would be reconstructed over Segment 2B. | - | - |
| 2B | D, E and F | FM 984 | Road over Rail | Approximately 2,300 feet of FM 984 would be reconstructed over Segment 2B. | - | - |
| 3B | B and E | FM 985 | Road over Rail | The portion of FM 985 that would cross Segment 3B would be closed. Approximately 3,000 feet of FM 985 would be reconstructed over Segment 3B. | 3,600 | - |
| 3B | B and E | Sullivan Road | Road over Rail | Approximately 1,400 feet of Sullivan Road that would cross Segment 3B would be closed. Approximately 3,000 feet of Sullivan Road would be reconstructed over Segment 3B. | 3,000 | 1,400 |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.3 Navarro County*

**Roadway Network**

**Table 3.11-42** identifies 45 roads (public and private) in Navarro County that would be permanently impacted by the Build Alternatives.

**Table 3.11-42: Navarro County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 3A | A and D | County Road 1320 | Reroute | The portion of CR 1320 that would cross Segment 3A would be closed. Approximately 600 feet would be removed. Access would be provided by approximately 3,500 feet of new access road extending north from CR 1300 on the east side of Segment 3A. | 3,500 | 600 |
| 3A | A and D | Dirt Road | Closure | The portion of Dirt Road that would cross Segment 3A would be closed. | - | - |
| 3A | A and D | County Road 1340 | Reroute | Segment 3A would create insufficient vertical clearance on existing CR 1340 Road. Approximately 700 feet of CR 1340 under Segment 3A would be closed. CR 1340 would be rerouted on a new access road extending approximately 3,500 feet to the north from CR 1300 on the east side of Segment 3A (see County Road 1320) | - | 700 |
| 3A | A and D | Dirt Road | Reroute | The portion of Dirt Road that would cross Segment 3A would be closed. Approximately 2,000 feet of access road would be provided. | - | - |
| 3A | A and D | County Road 1300 | Road over Rail | Approximately 1,620 feet of CR 1300 that would cross Segment 3A would be closed. Approximately 2,200 feet of CR 1300 would be rerouted and reconstructed over Segment 3A. | 1,400 | 1,620 |
| 3A | A and D | FM 1126 | Road over Rail | Approximately 3,300 feet of FM 1126 would be reconstructed over Segment 3A. | - | - |
| 3A | A and D | County Road 1220 | Road over Rail | The portion of CR 1220 that would cross Segment 3A would be closed. Approximately 2,600 feet of CR 1220 would be rerouted and reconstructed over Segment 3A. | - | - |
| 3A | A and D | County Road 2080 | Reroute | The portion of CR 2080 that would cross Segment 3Awould be closed. The terminus of CR 2080 would be impacted and approximately 180 feet would be closed. | - | 180 |
| 3A | A and D | FM 744 | Road over Rail | Approximately 3,200 feet of FM 744 would be reconstructed over Segment 3A. | - | - |
| 3A | A and D | FM 1126 | Reroute | Approximately 1,600 feet of FM 1126 would be closed under Segment 3A, and would be rerouted to CR 2112 on the west side of Segment 3A. Approximately 6,200 feet of new access road on the east side of the Project would be constructed to FM 744 to the north. CR 2112 would no longer be able to go south. | 6,200 | 1,600 |
| 3A | A and D | Private Drive | Closure | The portion of Private Drive that would cross Segment 3A would be closed. Approximately 1,500 feet would be removed. | - | - |
| 3A | A and D | County Road 5127 | Road over Rail | Approximately 2,000 feet of CR 5127 would be rerouted and reconstructed over Segment 3A. | - | - |

**Table 3.11-42: Navarro County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 3A | A and D | Dirt Road | Reroute | The portion of Dirt Road that would cross Segment 3A will be closed. Access is provided by approximately 600 feet of MOW access road, along east side of Segment 3A. | - | - |
| 3A | A and D | FM 709 | Road over Rail | Approximately 780 feet of FM 709 that would cross Segment 3A would be closed. Approximately 1,650 feet of FM 709 would be rerouted and reconstructed over Segment 3A. | 1,500 | 780 |
| 3A | A and D | County Road 2010 | Reroute | Segment 3A would require construction of a bridge to span a water feature, which would close approximately 1,600 feet of the existing CR 2010. The road would be rerouted to cross Segment 3A approximately 1,900 feet to the south. This would extend the road by approximately 2,900 feet to FM 3194. | 2,900 | 1,600 |
| 3A | A and D | Private Drive | Reroute | The portion of Private Drive that would cross Segment 3A would be closed. Access would be provided by 300 feet of new private road, located in the rear of the property. | - | - |
| 3A | A and D | FM 3194 | Road over Rail | Approximately 2,400 feet of FM 3194 would be rerouted and reconstructed over Segment 3A. | - | - |
| 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 5134 | Road over Rail | Approximately 2,600 feet of CR 5134 would be rerouted and reconstructed over Segment 3B. Approximately 5,200 feet of a new access round would connect to County Road 1090. | 5,200 | - |
| 3B | B and E | County Road 4856 | Reroute | SH22 and CR4862 would provide access to properties. CR5134 crossing would be approximately 4,000 feet to the north. A new 24-foot county road would be provided on the west side of the rail from this crossing to access this area and would tie back in with CR 4856. The shared access road would be more economical and would limit the impact to residential properties as compared to a bridge structure. | - | 600 |
| 3B | B and E | County Road 4865 | Road over Rail | Approximately 4,500 feet of CR 4865 would be removed and 4,100 feet would be reconstructed and realigned over Segment 3B. | 3,400 | 4,500 |
| 3B | B and E | FM 744 | Road over Rail | Over 3,000 feet of FM 744 would be reconstructed over Segment 3B. | - | - |
| 3B | B and E | County Road 1090 | Reroute | Approximately 300 feet of CR 1090 that would cross Segment 3B would be close and approximately 1,800 feet of new access road would be constructed on the west side of Segment 3B, connecting to Red Oak Lane. An additional 600 feet of new public road would be constructed on the east side of Segment 3B. | 600 | 300 |
| 3B | B and E | Red Oak Lane | Road over Rail | Red Oak would be extended 2,500 feet in a new alignment across Segment 3B. This would be a new portion of the public road. | - | - |

| Table 3.11-42: Navarro County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 3B | B and E | Oak Valley Lane | Reroute | Approximately 720 feet of Oak Valley Lane would be closed. A new approximately 3,000 feet public access road would be constructed on the east side of Segment 3B north to Red Oak Lane. | 3,000 | 720 |
| 3B | B and E | County Road 1130 | Road over Rail | The portion of CR 1130 that would cross Segment 3B, approximately 900 feet would be closed. Access for CR 1130 will be maintained by CR 5149. CR 5149 is being reconstructed to go over Segment 3B. | - | 900 |
| 3B | B and E | County Road 5149 | Road over Rail | The portion of CR 5149 that would cross Segment 3B would be closed. 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 1140. The closed portion of CR 1130 would connect to CR 5149 using this new road. | 2,100 | - |
| 3B | B and E | County Road 1140 | Reroute | Approximately 1,900 feet of CR 1140 would be closed within the Segment 3B ROW. Approximately 5,500 feet of new public road would be constructed on the east side of Segment 3B to CR 1140. An additional 2,200 feet of new public road would be constructed on west side of Segment 3B . | 7,700 | 1,900 |
| 3B | B and E | Private Road | Closure | The portion of Private Road that would cross Segment 3B would be closed. | - | - |
| 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 | Access would be provided by the construction of approximately 1,000 feet of Private Road. | - | - |
| 3B | B and E | Private Road | Reroute | Access would be provided by the construction of approximately 300 feet of Private Road. | - | - |
| 3B | B and E | Private Road | Reroute | The portion of Private Road that would intersect Segment 3B would be closed. Access would be provided by the construction of approximately 300 feet of access road, located on the east side of Segment 3B. | - | - |
| 3B | B and E | Private Road | Reroute | The portion of Private Road that would cross Segment 3B would be closed. Access is provided by approximately 1,300 feet of access road, located on the east side of Segment 3B. | - | - |
| 3B | B and E | Private Road | Reroute | The portion of Private Road that would cross Segment 3B would be closed. Access is provided north to CR 30 by approximately 2,700 feet of access road, located on the east side of Segment 3B. | - | - |
| 3B | B and E | Private Road | Closure | Approximately 300 feet of Private Road would be closed. | - | - |
| 3B | B and E | Private Road | Reroute | The portion of Private Road that would cross Segment 3B would be closed. Approximately 1,800 feet of access road would be provided along the east side of Segment 3B. | - | - |

| Table 3.11-42: Navarro County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 3B | B and E | County Road 2110 | Road over Rail | The portion of CR 2110 that would cross Segment 3B would be closed. Approximately 2,300 feet of CR 2110 would be reconstructed over Segment 3B. | - | - |
| 3B | B and E | County Road 2100 | Reroute | Approximately 200 feet would be closed and access to CR 2100 from FM 744 would be moved approximately 900 feet to the west. | 900 | 200 |
| 3B | B and E | County Road 2210 | Reroute | The portion of CR 2210 that would cross Segment 3B would be closed. Public road alignment of approximately 1,100 feet would provide access around the turn. | 800 | 1,100 |
| 3C | C and F | County Road 40 | Reroute | The portion of CR 40 that would cross Segment 3C would be closed. Approximately 600 feet of CR 40 would be removed. Public road alignment of approximately 5,200 feet would provide access. | 5,200 | 600 |
| 3C | C and F | County Road 30 | Reroute | The portion of CR 30 that would cross Segment 3C would be closed. CR 30 will be realigned slightly to avoid crossing Segment 3C. Approximately 780 feet of CR 30 will be removed and approximately 1,000 feet will be constructed to bypass Segment 3C. | 1,000 | 780 |
| 3C | C and F | County Road 2344 | Reroute | The portion of CR 2344 that would cross Segment 3C would be closed. Approximately 420 feet of CR 2344 would be closed. Access would be provided along approximately 3,600 new access road, located to the east of Segment 3C. | 3,600 | 420 |
| 3C | C and F | County Road 2348 | Reroute | The portion of CR 2348 that would Segment 3C would be closed. Approximately 800 feet of CR 2348 would be removed. Approximately 2,400 of new access road would provide access north. | 2,400 | 800 |
| 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. | - | - |

AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

**Aviation**
The Anxiety Aerodrome is a privately owned, private use, turf aviation facility on  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 3.11-43** identifies 40 roads (public and private) in Freestone County that would be permanently impacted by the Build Alternatives.

| Table 3.11-43: Freestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 3C | C and F | FM 246 | Road over Rail | The portion of FM 246 crossing Segment 3C would be closed. Approximately 2,500 feet of FM 246 would be reconstructed over Segment 3C. | - | - |

**Table 3.11-43: Freestone County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 3C | C and F | County Road 1041 | Road over Rail | The portion of CR 1041 crossing Segment 3C would be closed Approximately 1,700 feet of CR 1041 would be reconstructed over Segment 3C. | - | - |
| 3C | C and F | Private Drive | Closure | The portion of the Private Drive that crosses Segment 3C would be closed. Approximately 400 feet of road would be closed. Property is also being acquired. | - | - |
| 3C | C and F | County Road 1100 | Road over Rail | The portion of CR 1100 crossing Segment 3C would be closed. Approximately 2,200 feet of CR 1100 would be reconstructed over Segment 3C. | - | - |
| 3C | C and F | County Road 1101 | Road under Rail | The portion of CR 1101 that would cross Segment 3C would be closed. Approximately 1,100 feet of CR 1101 would need to be depressed. | - | - |
| 3C | C and F | FM 833W | Road under Rail | The portion of CR 833W that would cross Segment 3C would be closed. Approximately 2,500 feet of CR 833W would need to be depressed. | - | - |
| 3C | C and F | IH-45 Frontag e 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 | Private Drive | Reroute | Private Drive would be rerouted to the south to connect to neighboring private drive. | - | - |
| 3C | C and F | Private Drive | Reroute | Private Drive would be rerouted to the south to connect to neighboring private drive. | - | - |
| 3C | C and F | Church Street | Road over Rail | Project would create insufficient vertical clearance on existing Church Street The portion of Church Street that crosses Segment 3C would be closed. Church Street would be rerouted on a new public road extending Wiley Road approximately 2,900 feet over IH-45 | 2,900 | 1,020 |
| 3C | C and F | County Road 660 | Road over Rail | The portion of CR 660 that would cross Segment 3C would be closed. Approximately 2,400 feet of CR 660 would be reconstructed over Segment 3C. | - | - |
| 4 | A, B, D and E | Private Road | Reroute | Approximately 3,000 feet of access road on west side of Segment 4 would connect to FM 246 to the south. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used dirt road. Property will be used for maintenance facility. Due to proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail. Shared access road to be provided on west side of Segment 4. East side accessible from County Road 995. Due to proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail. Shared access road to be provided on west side of Segment 4. The east side would be accessible from County Road 995. Due to the proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail. Shared access road to be provided on west side of Segment 4. The east side would be accessible form County Road 1071. Due to the proposed property acquisition, the existing private road would no longer be required. | - | - |

| Table 3.11-43: Freestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 4 | A, B, D and E | Private Road | Closure | This road leads to a private property that would be acquired by Segment 4. Due to the proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | FM 27 | Road Over Rail | The portion of FM 27 that would cross Segment 4 would be closed. Approximately 4,200 feet of FM 27 would be rerouted and reconstructed over Segment 4. | - | 210 |
| 4 | A, B, D and E | FM 1366 | Road Over Rail | Approximately 950 feet of FM 1366 that would cross the Project would be closed. Approximately 3,600 feet of FM 1366 would be rerouted and reconstructed over Segment 4. | - | 950 |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used dirt road. Property would be used for maintenance facility. Due to proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | County Road 960 | Road Over Rail | The portion of CR 960 crossing Segment 4would be closed (540’). Approximately 2,700 feet of CR 960 would be reconstructed over Segment 4. | 460 | 540 |
| 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. The east side would be accessible from County Road 995. Due to the proposed property acquisition, the existing private road would no longer be required. | - | - |
| 4 | A, B, D and E | County Road 961 | Road Over Rail | Approximately 3,500 feet of CR 961 would be reconstructed over Segment 4. | - | - |
| 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. The east side would be accessible from County Road 995. Due to the proposed property acquisition, the existing Private Road would no longer be required. | - | - |
| 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. The east side would be accessible from County Road 1071. Due to the proposed property acquisition, the existing Private Road would no longer be required. | - | - |
| 4 | A, B, D and E | County Road 930 | Road Over Rail | The portion of CR 930 crossing Segment 4would be closed. Approximately 3,500 feet of CR 930 would be reconstructed over Segment 4. | - | - |
| 4 | A, B, D and E | US 84 | Road Over Rail | The portion of US 84 crossing Segment 4 would be closed. Approximately 4,500 feet of US 84 would be reconstructed over Segment 4. | - | - |
| 4 | A, B, D and E | FM 2777 | Reroute | Approximately 3,500 feet of FM 277 would be relocated approximately 100 feet to the west. 5,400 feet of new road would be constructed. | 5,400 | 3,500 |
| 4 | A, B, D and E | Private Road | Closure | This road connects to a private property that would be acquired by the Project. Due to the proposed property acquisition, the existing Private Road would no longer be required. | - | - |
| 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. | - | - |
| 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. | - | - |

| Table 3.11-43: Freestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| **Segment** | **Build Alternative** | **Road Name** | **Impact** | **Modification** | **New[1] (feet)** | **Removed[1] (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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.5 Limestone County*

**Roadway Network**
**Table 3.11-44** identifies 23 roads (public and private) in Limestone County that would be permanently impacted by the Build Alternatives.

| Table 3.11-44: Limestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| **Segment** | **Build Alternative** | **Road Name** | **Impact** | **Modification** | **New[1] (feet)** | **Removed[1] (feet)** |
| 4 | A, B, D and E | Private Road | Closure | Oil field service road. This would propose to close the private road. | - | - |
| 4 | A, B, D and E | Private Road | Closure | Oil field service road. Wells would still be accessible from SH 164. | - | - |
| 4 | A, B, D and E | Private Road | Closure | Oil field service road. Wells would still be accessible from SH 164. | - | - |
| 4 | A, B, D and E | County Road 882 | Road over Rail | The portion of CR 882 that would cross Segment 4would be closed. Approximately 2,600 feet of CR 882 would be reconstructed over Segment 4. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |

| Table 3.11-44: Limestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| **Segment** | **Build Alternative** | **Road Name** | **Impact** | **Modification** | **New[1] (feet)** | **Removed[1] (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 Road 828 and SH 164. Wells on east side of Segment 4 would be accessible from Texaco Service Road through to County Road 828. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | County Road 828 | Road over rail | The portion of CR 828 that would cross Segment 4would be closed. Approximately 3,200 feet of CR 828 would be reconstructed over Segment 4. | - | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This private road leads to an oil pad that would be acquired by the Segment 4. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This private road leads to an oil pad that would be acquired by the Segment 4. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used road between oil pads and alternative access would be available. | - | - |

| Table 3.11-44: Limestone County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used road between oil pads and alternative access would be available. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used road between oil pads and alternative access would be available. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a lightly used road between oil pads and alternative access would be available. | - | - |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.6 Leon County*

**Roadway Network**
**Table 3.11-45** identifies 47 roads (public and private) in Leon County that would be permanently impacted by the Build Alternatives.

| Table 3.11-45: Leon County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (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 | Industrial | Relocation | The driveway would be relocated on frontage road. | 450 | 435 |
| 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 3,500 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 | The portion of CR 317 that would cross Segment 3Cwould be closed. Approximately 400 feet of CR 317 would be closed. Approximately 7,500 feet of access road would be provided to connection to SH 7 in the south and approximately 1 mile of access road would provide access to IH-45 frontage road. | 12,780 | 400 |
| 3C | C and F | County Road 318 | Reroute | The portion of CR 318 that would cross Segment 3Cwould be closed. Approximately 300 feet of CR 318 would be closed. Approximately 2,600 feet of access road would be provided to connect to SH 7. | 2,600 | 300 |
| 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. | - | - |

**Table 3.11-45: Leon County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 3C | C and F | County Road 477 | Reroute | The portion of CR 477 that would cross Segment 3Cwould be closed. Approximately 1,200 feet of CR 477 would be closed. An access road, approximately 5,000 feet in length, would provide access to IH-45 to the south; the access road, approximately 2 miles in length, would provide access to SH 7 to the north. | 16,240 | 1,200 |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This road leads to an oil pad that would still be accessible from FM 1512. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This road leads to an oil pad that would be acquired by Segment 4. | - | - |
| 4 | A, B, D and E | FM 1512 | Road over Rail | The portion of FM 1512 that would cross Segment 4 would be closed. 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 | Closure | This road leads to oil pads that would be provided alternative access through a shared access road to FM 1469. | - | - |
| 4 | A, B, D and E | Private Road | Reroute | The portion of the Private Road that would cross Segment 4 would be closed. Approximately 480 feet would be removed. Access would be provided along access road on the west side of the project. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This road leads to an oil pad that would be acquired. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This road leads to an oil pad that would be acquired. | - | - |

| Table 3.11-45: Leon County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| **Segment** | **Build Alternative** | **Road Name** | **Impact** | **Modification** | **New[1] (feet)** | **Removed[1] (feet)** |
| 4 | A, B, D and E | County Road 344 | Reroute | Crossing would be provided 2,000 feet south at US 79. Access to County Road 344 would be provided through County Roads 346 and 350. Shared access road would also be provided on southwest side of Segment 4. | 2,000 | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road | Closure | Oil field service road. Well pad would still accessible from County Road 347. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail. Shared access road would provide on west side of Segment 4. East side would be accessible from County Road 347. | - | - |
| 4 | A, B, D and E | Private Road | Reroute | Private road or trail. Private road would tie into access road on Segment 4. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road 4255 | Closure | This is a minor private road or trail. Shared access road would be provided on west side of Segment 4. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | County Road 408 | Reroute | County Road 408 would be rerouted to provide access north to FM 977. The new public road would be approximately 6,000 feet in length and would run along the western edge of Segment 4. | 6,000 | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail. Shared access road would be provided on west side of Segment 4. | - | - |
| 4 | A, B, D and E | County Road 408 | Reroute | The portion of the road that would cross Segment 4would be closed. Access would be provided on an access road on the east side of Segment 4. | 2,600 | 550 |
| 4 | A, B, D and E | Private Road | Closure | Private road would tie into access road that would access to OSR and FM 977. | - | - |
| 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 rail. West side would be accessible from County Road 408. | - | - |
| 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 the Project. West side would be accessible from County Road 408. | - | - |
| 4 | A, B, D and E | Private Road | Reroute | Private Road would connect to County Line Road through approximately 2,500 feet of new shared access road. Approximately 1,200 feet of Private Road will be removed. | - | - |

| Table 3.11-45: Leon County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 4 | A, B, D and E | County Line Road | Road over Rail | The portion of County Line Road that would cross the Segment 4 would be closed. Approximately 5,200 feet of road would be constructed over Segment 4. | - | - |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.7 Madison County*

**Roadway Network**

**Table 3.11-46** identifies 37 roads(public and private) in Madison County that would be permanently impacted by the Build Alternatives.

| Table 3.11-46: Madison County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 3C | C and F | Hendrix Lane | Road over Rail | The portion of Hendrix Lane that would cross Segment 3C would be closed. Approximately 2,100 feet of Waldrip Road would be rerouted and reconstructed over the Project. | - | - |
| 3C | C and F | IH-45 | Relocati on | 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 3Cwould be closed. Property will have access via FM 1372 to the north. | - | - |
| 3C | C and F | Private Dirt Road | Closure | The portion of the Private Dirt Road that would cross Segment 3Cwould be closed. Property will have access via FM 1372 to the east. | - | - |
| 3C | C and F | Dirt Road | Reroute | The portion of the Dirt Road that would cross Segment 3Cwould be closed. Access could be maintained through Cottonwood Road, approximately 960 feet to the north. | - | - |
| 3C | C and F | FM 1452 | Road over Rail | The portion of FM 1452 that would cross Segment 3Cwould be closed. Approximately 3,000 feet of FM 1452 would be constructed over Segment 3C. | - | - |
| 3C | C and F | Private Dirt Road | Closure | The portion of Private Dirt Road that would cross Segment 3Cwould be closed. Access is provided, however, along approximately 1,700 feet of rail access road. | - | - |
| 3C | C and F | Private Drive | Reroute | Segment 3Cwould impede access to IH 45 Frontage Road. Approximately 1,600 feet of access road would allow access north to Waldrip Drive and IH 45. | - | - |
| 3C | C and F | Private Drive | Closure | The portion of the Private Road that would cross Segment 3Cwould be closed. Approximately 400 feet would be removed. | - | - |
| 3C | C and F | Waldrip Road | Road over Rail | The portion of Waldrip Road that would cross Segment 3C would be closed. Approximately 2,700 feet of Waldrip Road would be rerouted and reconstructed over Segment 3C. Approximately 1,500 of Waldrip Road would be removed. | 1,200 | 1,500 |

**Table 3.11-46: Madison County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 4 | A, B, D and E | Skains Road | Reroute | Skains Road would tie into shared access road providing circulation to OSR crossing. Approximately 500 feet of Skains road would be closed and approximately 2,200 feet of access road would connect to SH OSR County Line Road. | - | 500 |
| 4 | A, B, D and E | Metzler Lane | Reroute | Metzler Road would tie into a shared access road providing circulation to Dawkins crossing. Approximately 900 feet of Metzler Road would be closed. | - | 900 |
| 4 | A, B, D and E | FM 1372 | Road over Rail | The portion of FM 1372 that would cross would be closed. Approximately 3,300 feet of FM 978 would be reconstructed over Segment 4. | - | - |
| 4 | A, B, D and E | Dawkins Road | Road over Rail | The portion of Dawkins Road that would cross Segment 4 would be closed. Approximately 900 feet of Dawkins Road would be closed and relocated approximately 1,000 feet to the south. The one mile of realigned Dawkins Road would be reconstructed over Segment 4. | - | 900 |
| 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. West side would be accessible from Poteet Road. | - | - |
| 4 | A, B, D and E | Poteet Road | Road over Rail | The portion of Poteet Road that would cross Segment 4 would be closed. Approximately 700 feet would of Poteet Road would be removed. Access would be provided along approximately 4,000 feet of access road, located on the east side of Segment 4. | 4,000 | 700 |
| 4 | A, B, D and E | Private Road | Closure | Approximately 360 feet of the Private Road would be closed. | - | - |
| 4 | A, B, D and E | Poteet Road | Reroute | Approximately 780 feet of Poteet Road that would cross Segment 4 would be closed. Alignment would tie into shared access road providing circulation to FM 978. | - | 780 |
| 4 | A, B, D and E | FM 978 | Road over Rail | The portion of FM 978 that would cross Segment 4 would be closed. Approximately 4,600 feet of FM 978 would be rerouted and reconstructed over Segment 4. Approximately 2,400 feet of FM 978 would be closed. | 2,000 | 2,400 |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road | Closure | The private driveway to residence would be acquired. | - | - |
| 4 | A, B, D and E | Private Road | Closure | The private driveway to residence would be acquired. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail that would be acquired. | - | - |

| Table 3.11-46: Madison County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 4 | A, B, D and E | Private Road | Closure | This is an oil field service road. This road would be tied into shared access road providing circulation to FM 1452. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Oxford Cemeter y Road | Reroute | Approximately 800 feet of Oxford Cemetery Road would be removed and the road would be relocated slightly west to avoid Segment 4. Access on the east side of the Project would be provided on a new access road to FM 1452 to the north (5,500 feet). | 740 | 800 |
| 4 | A, B, D and E | Oxford Cemeter y Road | Reroute | Approximately 1,200 feet of Oxford Cemetery Road would be removed and the road would be relocated slightly west to avoid Segment 4. Access on the east side of Segment 4 would be provided on a new access road to FM 1452 to the north (5,500 feet). | 2,000 | 1,200 |
| 4 | A, B, D and E | Private Road | Reroute | This is a private driveway that would tie into access road providing circulation to US 190. | - | - |
| 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. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail, located approximately 800 feet south of FM 1372 that would be acquired. | - | - |
| 4 | A, B, D and E | Producti on Road (Private) | Closure | The portion of Production Road (Private) that would cross Segment 4 would be closed. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail that would be acquired. Shared access road would be provided on east side of Segment 4. West side accessible via FM 1372. | - | - |
| 4 | A, B, D and E | Private Road | Closure | The portion of the Private Road that would cross Segment 4 would be closed. Approximately 600 feet of the Private Road would be removed. | - | - |
| 4 | A, B, D and E | Private Road | Closure | This is a minor private road or trail that would be acquired. Shared access road would be provided on east side of Segment 4. West side would be accessible via FM 1372. | - | - |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.8 Grimes County*

**Roadway Network**
**Table 3.11-47** identifies 46 roads (public and private) in Grimes County that would be permanently impacted by the Build Alternatives.

| Table 3.11-47: Grimes County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Remove d[1] (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. | - | - |

**Table 3.11-47: Grimes County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 5 | A, B, C, D, E and F | County Road 123 | Road over rail | The portion of CR 123 that would cross Segment 5 would be closed. Approximately 3,750 feet of CR 123 would be rerouted and reconstructed over Segment 5. | - | - |
| 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 (6,000 feet north). | - | - |
| 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 (10,000 feet north). | - | - |
| 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 (13,300 feet north). | - | - |
| 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). | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Closure | The portion of the road that would cross Segment 5 would be closed. | - | - |
| 5 | A, B, C, D, E and F | Neff Road | Closure | The portion of the private road that would cross Segment 5 would be closed. | - | 180 |
| 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 closed. Access would be provided on an approximately 5,200 foot 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 | Driveway | Reroute | Driveway would connect into access road. | - | - |
| 5 | A, B, C, D, E and F | County Road 176 | Road over Rail | Approximately 600 feet of CR 176 that would cross Segment 5 would be closed, and approximately 2,200 feet would be realigned and reconstructed over Segment 5. | 1,800 | 1,800 |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the Dirt Road that would cross Segment 5 would be closed. Access would be maintained along approximately 2,800 feet of access road south to Luthe Rd. | - | - |
| 5 | A, B, C, D, E and F | High Star Lane | Reroute | Approximately 180 feet of High Star Lane that would cross Segment 5 would be closed. Access would be provided on an access road on the west side of Segment 5 to Luthe Road. | 870 | 180 |
| 5 | A, B, C, D, E and F | Luthe Road | Road over Rail | The portion of Luthe Road that would cross Segment 5 would be closed. Approximately 3,000 feet of Luthe Road would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | County Rd 279 | Relocation | Approximately 1,500 feet of CR 279 would be closed. The road would be relocated approximately 500 feet west on CR 226, connecting to Luthe Road. A new public road of approximately 1,300 feet would connect CR 279 to CR 226. | 1,300 | 1,500 |
| 5 | A, B, C, D, E and F | County Rd 226 | Reroute | Approximately 300 feet of CR 226 that would cross Segment 5would be closed. Access would be provided on a new access road on the west side of Segment 5to SH 90 (4,500 feet to the south) and Luthe Road (4,000 feet to the north). | - | 300 |

| Table 3.11-47: Grimes County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 5 | A, B, C, D, E and F | Private Drive | Reroute | The portion of the Private Drive that would cross Segment 5 would be closed. Access would be provided on a new public road on the west side of Segment 5 to CR 219 or SH 90. | - | - |
| 5 | A, B, C, D, E and F | Driveway | Reroute | The driveway would connect to access road. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The road would connect to access road. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The road would connect to access road. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The road would connect to access road. | - | - |
| 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 a new public road on the west side of the Project to CR 220 or CR 219. | - | - |
| 5 | A, B, C, D, E and F | County Road 220 | Reroute | Approximately 2,500 feet of CR 220 that would cross the Project would be closed, and would be realigned and reconstructed under Segment 5. | 2,500 | 2,500 |
| 5 | A, B, C, D, E and F | Private Road | Closure | The portion of the Private Road that would intersect Segment 5 would be closed. | - | - |
| 5 | A, B, C, D, E and F | Private Road | Reroute | The portion of the Private Road that would intersect Segment 5 would be closed. The access road, located along the eastern edge of Segment 5, would allow access. | - | - |
| 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 | FM 2819 | Road over Rail | The portion of FM 2819 that would cross the Project would be closed. Approximately 4,000 feet of FM 2819 would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the road that would cross Segment 5would be closed. Access would be provided on an access road on the east side of Segment 5 to FM 1774 or FM 2819. | - | - |
| 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 FM 1774 or FM 2819. | - | - |
| 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 FM 1774 or FM 2819. | - | - |
| 5 | A, B, C, D, E and F | FM 1774 | Road over Rail | The portion of CR 1774 that would cross Segment 5 would be closed. Approximately 2,400 feet of CR 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 |

| Table 3.11-47: Grimes County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 5 | A, B, C, D, E and F | Lizard Drive | Reroute | Segment 5would create insufficient vertical clearance on existing Izard Road. Approximately 2,300 feet of Izard Drive would be closed. Lizard Drive would be rerouted to FM 2445 on new access roads on either side of Segment 5 extending approximately 2,000 feet to the south. | 2,000 | 2,000 |
| 5 | A, B, C, D, E and F | Dirt Road | Closure | 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 313 on the south and FM 2445 to the north. | - | - |
| 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 CR 313. | - | - |
| 5 | A, B, C, D, E and F | CR 313 | Road over Rail | The portion of CR 313 that would cross Segment 5 would be closed. Approximately 2,000 feet of CR 313 would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | High Oaks Drive | Reroute | Access can be provided via access roads between County Roads 311 and 313. | - | - |
| 5 | A, B, C, D, E and F | Rail Access Road | Reroute | Approximately 800 feet of access road will be provided. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the Dirt Road that would intersect Segment 5would be closed. Approximately 800 feet of access road is provided to provide access to CR 344. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the Dirt Road that would cross Segment 5 would be closed. Access road along the east side of Segment 5 provides access. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the Dirt Road that would cross Segment 5 would be closed. Access road along the east side of Segment 5 provides access. | - | - |
| 5 | A, B, C, D, E and F | Dirt Road | Reroute | The portion of the Dirt Road that would cross Segment 5 would be closed. Access road along the east side of Segment 5 provides access. | - | - |
| 5 | A, B, C, D, E and F | Pavlock Rd | Reroute | Approximately 180 feet of Pavlock Road that would cross Segment 5 would be closed. Access would be provided on new public access roads to the north on both sides of Segment 5. | 3,600 | 180 |
| 5 | A, B, C, D, E and F | Dirt Road | Closure | 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. | - | - |
| 5 | A, B, C, D, E and F | County Road 302 | Road over Rail | The portion of CR 302 that would cross Segment 5 would be closed. Approximately 2,600 feet of CR 302 would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Bronco Lane | Reroute | Approximately 480 feet of Bronco Road that would cross Segment 5 would be closed. Access would be provided using Plantation Drive to Riley Road, approximately 3,500 feet to the south. | - | 480 |

Source: AECOM, 2017
[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 Brazos Valley Station

The Brazos Valley 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

Station would be 15 percent of the 2,280 peak hour ridership of the Houston Station, or 342. 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 3.11-48**. 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 would not be expected.

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.

**Table 3.11-48: Brazos Valley Station Trip Direction and Mode**

| | Pct. of Total | Drive and Park | Rental Car | Pick-up/ Drop-off | Taxi and Bus | Total |
|---|---|---|---|---|---|---|
| **North (SH 90)** | 10% | 10 | 1 | 3 | 3 | 17 |
| **South (SH 90)** | 10% | 10 | 2 | 3 | 2 | 17 |
| **West (SH 30)** | 60% | 60 | 8 | 17 | 14 | 99 |
| **East (SH 30)** | 20% | 20 | 3 | 5 | 5 | 33 |
| **Total** | **100%** | **100** | **14** | **28** | **24** | **166** |

Source: TRCC, 2017

Traffic conditions on the local network were analyzed for the No Build and Build Alternatives with no changes to the current intersection configuration. The Build Alternatives, however, would require intersection improvements at the SH 30/SH 90 intersection by adding eastbound and westbound left turn bays on SH 30.

**Table 3.11-49** lists 2040 peak period intersection conditions under the No Build, Build and modified conditions. The table also identifies intersections that would experience an impact (i.e., LOS E or F) from the traffic generated by the Brazos Valley Station for the modified intersection condition. In comparing the No Build with the Build Alternatives with intersection improvements, the AM LOS would decrease from LOS D for No Build to LOS E for the modified Build Alternatives. However, the delay would increase by only five seconds with the intersection improvements. The PM LOS would remain essentially the same. Without the intersection improvements the intersection would operate at LOS F for the Build Alternatives during both the AM and PM peaks.

While some/most intersections would operate at LOS E or F under the modified intersection conditions, this is mostly due to the projected growth under No Build condition, rather than a direct impact of the project. However, for the purposes of this review, where intersections would operate at LOS E or F under the No Build condition and the modified intersection condition, it is still considered an adverse effect of the project.

**Table 3.11-49: Brazos Valley Terminal Impacts**
**2040 LOS (Delay in Seconds per Vehicle)**

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| SH 30/SH 90 | D (52) | D (33) | **F (63)** | **F (50)** | **E (45)** | D (27) | **Y** |

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

**Transit Services**
The Brazos Valley Station would be located in a rural and squarely populated area along SH 30. The Brazos Valley Station would expect to experience less than 4 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 Station. At this time, the Brazos Transit District does not have consistent service to this proposed station, but the agency is currently developing a service plan. As noted in **Section 4.3.3.2, Indirect and Cumulative Impacts,** the Brazos Valley 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 forseable action given the relatively close proximity between the university and station site.

### *3.11.5.2.9 Waller County*

**Roadway Network**
**Table 3.11-50** identifies 10 roads (public and private) in Waller County that would be permanently impacted by the Build Alternatives.

**Table 3.11-50: Waller County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 5 | A, B, C, D, E and F | Riley Road | Road over Rail | The portion of Riley Road that would cross Segment 5 would be closed. Approximately 3,000 feet of Riley Road would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Foxwood Drive | Closure | 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 FM 1488, approximately 2 miles south. | - | - |
| 5 | A, B, C, D, E and F | Bowler Road | Road under Rail | Approximately 400 feet of Bowler Road that would cross Segment 5 would be closed and relocated slightly west to go under Segment 5. | 1,000 | 400 |
| 5 | A, B, C, D, E and F | Hegar Road | Reroute | Segment 5 would create insufficient vertical clearance on existing Hegar Road. Approximately 2,100 feet of Hegar Road would be closed. Hegar Road would be rerouted to FM1488 on new access roads on either side of Segment 5 extending approximately 1,300 feet to the north. | - | 2,100 |
| 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 closed. Joseph Road would be rerouted to FM1488 on new access roads on either side of Segment 5 extending approximately 3,000 feet to the north. | - | 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. | - | - |

| Table 3.11-50: Waller County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (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. | - | - |
| 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. | - | - |
| 5 | A, B, C, D, E and F | Farmland connector | Reroute | The portion of the drive that would cross Segment 5 would be closed. Access would be provided on an access road on the west side of Segment 5 to Castle Road approximately 1.5 miles south. | - | - |

Source: AECOM, 2017
[1] Only public roads were measured for new or removed roads. Private driveways and roads are not included in the summation in these columns.

### *3.11.5.2.10 Harris County*

**Roadway Network**
**Table 3.11-51** identifies 31 roads (public and private) in Harris County that would be permanently impacted by the Build Alternatives.

| Table 3.11-51: Harris County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 5 | A, B, C, D, E and F | Castle Road | Road over Rail | The portion of Castle Road that would cross Segment 5 would be closed. Approximately 2,400 feet of Castle Road would be reconstructed over the Project. | - | - |
| 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 the Project to Castle Road approximately 4,000 feet north. | - | - |
| 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 to Castle Road approximately one mile north. | - | - |
| 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 to Privet drive, approximately 2,000 feet south. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of the Private Dirt 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 Privet drive, 1,000 feet south. | - | - |
| 5 | A, B, C, D, E and F | St. Nicholas Dr. (Private) | Reroute | The portion of St. Nicholas Drive (Private) that would cross Segment 5 would be closed. Access would be provided on approximately 720 south to Waller Spring Creek Road. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of the Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the west side of Segment 5 to Betka Road approximately 3,500 feet south. | - | - |

| Table 3.11-51: Harris County Roadway Modifications | | | | | | |
|---|---|---|---|---|---|---|
| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
| 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. | - | - |
| 5 | A, B, C, D, E and F | Private Drive | Closure | The portion of Private Drive that would cross Segment 5 would be closed. Approximately 180 feet of Private Drive would be removed. | - | - |
| 5 | A, B, C, D, E and F | Betka Road | Road over Rail | The portion of Betka Road that would cross Segment 5 would be closed. Betka Rd would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of the Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the south side of Segment 5 to Betka approximately 2,500 feet west. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of the Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the south side of Segment 5 to Betka approximately 3,500 feet west. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the south side of Segment 5 to Warren Ranch Road approximately 7,000 feet east. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the south side of Segment 5 to Warren Ranch Road approximately 3,000 feet east. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | Approximately 540 feet of Private Dirt Road would be closed. Access would be provided on an approximately 3,600 feet of access road along the southern side of Segment 5 that would provide access to Warren Ranch Road. | - | - |
| 5 | A, B, C, D, E and F | Warren Ranch Road | Road over Rail | The portion of Warren Ranch Road that would cross Segment 5 would be closed. Approximately 3,100 feet of Warren Ranch Road would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the north side of Segment 5 to Warren Ranch Road approximately 4,500 feet west. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. Access would be provided on an access road on the north side of Segment 5 to Warren Ranch Road approximately one mile west | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. Access would be available at Katy Hockley Road, approximately 2,000 feet east. Access would be also provided on an access road on the north side of Segment 5 to Warren Ranch Road approximately 2 miles west. | - | - |

**Table 3.11-51: Harris County Roadway Modifications**

| Segment | Build Alternative | Road Name | Impact | Modification | New[1] (feet) | Removed[1] (feet) |
|---|---|---|---|---|---|---|
| 5 | A, B, C, D, E and F | Katy Hockley Road | Road over Rail | The portion of Katy Hockley Road that would cross Segment 5 would be closed. Approximately 2,700 feet of Katy Hockley Road would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Private Dirt Road | Reroute | The portion of Private Dirt Road that would cross Segment 5 would be closed. The Road would have access along MOW access road. | - | - |
| 5 | A, B, C, D, E and F | County Dirt Road | Road over Rail | The portion of County Dirt Road that would cross Segment 5 would be closed. Approximately 2,500 feet of the road would be reconstructed over Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Dirt Drive | Reroute | The portion of Dirt Drive that would cross Segment 5 would be closed. The MOW access road provides north-south access. | - | - |
| 5 | A, B, C, D, E and F | Private Drive | Reroute | The portion of Private Drive that would Segment 5 would be closed. Access is provided by the MOW access road, to the east of Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Spring Boulevar d | Reroute | The portion of Spring Boulevard that would cross Segment 5 would be closed. Approximately 700 feet of Spring Boulevard, the road would be rerouted to the west of Segment 5 and would follow the MOW access road. | 700 | - |
| 5 | A, B, C, D, E and F | Private Driveway | Reroute | An access road would be parallel to Segment 5. Approximately 700 feet of MOW would allow access to Berwick Drive, to the north. | - | - |
| 5 | A, B, C, D, E and F | Private Internal Road | Reroute | An access road would be parallel to Segment 5. Approximately 2,340 feet of MOW would allow access to Daniel Drive, to the south. | - | - |
| 5 | A, B, C, D, E and F | Taylor / Wright Road | Reroute | Taylor/Wright Roads would be relocated approximately 50 feet west under Segment 5. | - | - |
| 5 | A, B, C, D, E and F | Private Drive | Closure | The portion of Private Drive that would cross Segment 5 would be closed. | - | - |
| 5 | A, B, C, D, E and F | Spencer Road | Reroute | The portion of Spencer Rd that would cross Segment 5 would be closed. Spencer Rd would tie in the Rail Access Road. | - | - |
| 5 | A, B, C, D, E and F | Perimete r Park Drive | Reroute | Segment 5 would create insufficient vertical clearance on existing Perimeter Park Drive. Approximately 250 feet of Perimeter Park Drive would be closed. Perimeter Park Drive would be rerouted to West Little York Road on a new access road extending approximately 2,500 feet to the south. | - | 250 |

Source: AECOM, 2017
[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 Industrial Site Terminal Station Option

The 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 3.11-52**. 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**. Modes other than motor vehicles are not included in the table, but are expected to account for less than 4 percent of HSR access.

**Table 3.11-52: Industrial Site Terminal Trip Direction and Mode**

| | Pct. of Total | Drive and Park | Rental Car | Pickup/ Drop-off | Taxi and Bus | Total |
|---|---|---|---|---|---|---|
| North and Northeast (IH-610) | 14% | 43 | 17 | 82 | 51 | 193 |
| Inner North (via Mangum Rd) | 3% | 9 | 4 | 18 | 11 | 42 |
| Northwest (US 290) | 11% | 33 | 14 | 65 | 40 | 152 |
| West (IH-10) | 19% | 58 | 23 | 111 | 70 | 262 |
| Near west and SW (via Westview Dr) | 8% | 24 | 10 | 47 | 29 | 110 |
| Hempstead Rd (NW) | 3% | 9 | 4 | 18 | 11 | 42 |
| Post Oak Rd | 2% | 6 | 2 | 12 | 8 | 28 |
| South (IH-610) | 16% | 49 | 19 | 94 | 59 | 221 |
| East (IH-10) | 20% | 61 | 25 | 117 | 73 | 276 |
| Inner SW (via Hempstead Rd) | 3% | 9 | 4 | 18 | 10 | 41 |
| Inner NW (via 18th St) | 1% | 3 | 1 | 6 | 4 | 14 |
| **Total** | **100%** | **304** | **123** | **588** | **366** | **1,381** |

Source: TCRR, 2017

Traffic conditions on the local network were analyzed for the No Build and Build Alternatives with no changes to the current intersection configuration. The Build Alternative, however, would require intersection improvements near the station to improve traffic flow. **Table 3.11-53** summarizes the proposed Build Alternatives' intersection improvements.

**Table 3.11-53: Industrial Site Terminal Station Intersection Design Modifications**

| Intersection | Improvement |
|---|---|
| Mangum Road/US 290 NBFR | • Add one left-turn bay to northbound approach.<br>• Add one through lane to southbound approach. |
| Mangum Road/Dacoma Street | • Add one right-turn bay to northbound approach.<br>• Convert the left turns of all approaches to protected then permissive. |
| Dacoma Street/US 290 SBFR | • Add one left-turn bay to the southeast bound approach and right-turn bay to the northeast bound approaches. |
| Hempstead Road/Long Point Road | • Prohibit left-turns for southeast bound approach. |
| W 18th Street/Hempstead Road | • Prohibit left turns at westbound approach. |
| Mangum Road/18th Street | • Add one right-turn bay to westbound and northbound approaches.<br>• Convert the left turns of all approaches to protected then permissive. |
| W 18th Street/IH-610 SBFR | • Add one right-turn bay and one through lane to eastbound approach. |
| W 18th Street/IH-610 NBFR | • Add one through lane to westbound approach. |
| Hempstead Road/ Mangum Road | • Add one right-turn bay to northwest bound approach on Hempstead Road. |
| Post Oak Road/ Hempstead Road | • Add one right-turn bay to southeast bound approach.<br>• Add one left-turn bay to northwest bound approach.<br>• Convert southwest bound approach center left/through lane to through lane.<br>• Add one lane to northeast bound approach and convert to dual lefts, one through/right and one right-turn lane. |
| Hempstead Road/IH-610 SBFR | • Add one through lane to northwest bound approach to provide three through lanes. |
| Hempstead Road/IH-610 NBFR | • 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.<br>• Add one right-turn bay to eastbound approach to provide two right-turn bays. |
| Post Oak Road/Old Katy Road | • Add one right-turn bay and one left-turn bay to northbound approach.<br>• Add one right-turn bay to the southbound, eastbound and westbound approaches. |
| Post Oak Road/IH-10 EBFR | • Add one through lane to northbound approach. |
| Old Katy Road/IH-610 NBFR | • Convert northbound approach center lane from through lane to shared through/left-turn lane. |
| Silber Road/IH-10 WBFR | • Convert northbound approach center lane from a shared through/left-turn lane to a through-only lane.<br>• Convert southbound approach to two through lanes and one right-turn lane. |
| Silber Road/IH-10 EBFR | • Convert eastbound approach shared through/left to through-only lane. |
| Antoine Drive/IH-10 WBFR | • Convert westbound approach shared through/left lane to through-only lane.<br>• Add one right-turn bay to southbound approach. |

Source: AECOM, 2017

**Table 3.11-54** lists 2040 peak period intersection conditions under the No Build, Build and modified conditions. The table also identifies intersections that would experience an adverse impact (i.e., LOS E or F) from the traffic generated by the Industrial Site Terminal option for the modified intersections condition. 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 four percent per year from existing volumes. This results in projected 2040 No Build conditions that would be congested and yield LOS of E or F at some intersections. The proposed intersection modifications would improve the LOS in the Build Alternatives 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 Alternatives with no intersection improvements, all but two of the intersections would operate at LOS E or F for both AM and PM peak periods and the remaining two 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.

While some intersections would operate at LOS E or F under the modified intersection conditions, this is mostly due to the projected growth under No Build conditions, rather than a direct impact of the project. However, for the purposes of this review, where intersections would operate at LOS E or F under the No Build condition and the modified intersection condition, it is still considered an adverse effect of the Build Alternatives.

**Table 3.11-54: Industrial Site Terminal Station Option Impacts**

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| NB US 290/Mangum Rd | D (43) | **E (76)** | **E (70)** | **F (88)** | **E (57)** | D (40) | **Y** |
| SB US 290/Mangum Rd | D (39) | D (54) | **E (69)** | **E (78)** | **E (61)** | **E (79)** | y |
| Mangum Rd/Dacoma St | D (46) | **E (62)** | **E (73)** | **F (114)** | **E (56)** | **E (60)** | **Y** |
| SB US 290/Dacoma St | **F (141)** | **F (104)** | **F (174)** | **F (132)** | **F (107)** | **F (147)** | **Y** |
| NB US 290/Dacoma St | **F (89)** | **F (97)** | **F (116)** | D (52) | **E (76)** | **F (162)** | **Y** |
| WB IH-610/TC Jester Blvd | **F (329)** | **F (188)** | **F (220)** | **F (165)** | **F (220)** | **F (182)** | **Y** |
| EB IH-610/TC Jester Blvd | **F (110)** | **F (202)** | **F (109)** | **F (177)** | **F (109)** | **F (239)** | **Y** |
| EB IH-610/E TC Jester Blvd | **F (122)** | **F (121)** | **F (144)** | **F (89)** | **F (144)** | **E (67)** | **Y** |
| WB IH-610/E TC Jester Blvd | **F (315)** | **F (128)** | **F (393)** | **F (186)** | **F (393)** | **F (144)** | **Y** |
| Long Point Rd/Hempstead Rd | **F (81)** | **F (92)** | **F (93)** | **F (87)** | **E (79)** | **F (87)** | **Y** |
| 18th St/Hempstead Rd (unsignalized) | **F (61)** | **F (184)** | **F (107)** | **F (283)** | **F (84)** | **F (251)** | **Y** |
| Mangum Rd/18th St | D (41) | **E (67)** | **F (88)** | **F (153)** | **E (62)** | **E (64)** | **Y** |
| SB IH-610/18th St | D (52) | **F (124)** | **F (104)** | **F (179)** | D (46) | **F (109)** | **Y** |
| NB IH-610/18th St | **E (67)** | **F (106)** | **F (136)** | **F (88)** | D (50) | **E (65)** | **Y** |
| Mangum Rd/Hempstead Rd | C (24) | C (32) | D (45) | **E (65)** | C (28) | D (37) | N |
| Post Oak Rd/Hempstead Rd | **F (96)** | **F (102)** | **F (346)** | **F (290)** | **F (118)** | **F (118)** | **Y** |
| SB IH-610/Hempstead Rd | **E (63)** | **F (99)** | **F (108)** | **F (124)** | **F (115)** | **E (79)** | **Y** |
| NB IH-610/Hempstead Rd | C (27) | **F (107)** | D (42) | **F (84)** | **E (73)** | **E (70)** | **Y** |
| Post Oak Rd/Westview Dr | **F (92)** | **E (77)** | **F (148)** | **F (146)** | **F (118)** | **F (113)** | **Y** |
| Post Oak Rd/Old Katy Rd | **F (179)** | **F (354)** | **F (313)** | **F (479)** | **F (145)** | **F (213)** | **Y** |
| Post Oak Rd/EB IH-10 | **F (123)** | **F (95)** | **E (75)** | **E (70)** | **E (76)** | D (42) | **Y** |
| SB IH-610/Old Katy Rd | D (35) | **F (145)** | **E (62)** | **F (157)** | D (46) | **F (126)** | **Y** |
| NB IH-610/Old Katy Rd | **E (56)** | **F (143)** | **F (91)** | **F (212)** | D (52) | **F (149)** | **Y** |
| WB IH-10/Silber Rd | D (51) | **F (132)** | **F (86)** | **E (78)** | **E (73)** | **E (73)** | **Y** |
| EB IH-10/Silber Rd | **E (74)** | **F (253)** | **F (114)** | **F (242)** | **F (86)** | **F (241)** | **Y** |
| WB IH-10/Antoine Dr | **F (119)** | **F (83)** | **F (125)** | **F (89)** | **E (74)** | **F (106)** | **Y** |

Source: AECOM, 2017
Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

### Traffic Impacts at the Northwest Mall Terminal Station Option

The 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 3.11-55**. 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**. 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 3.11-55: Northwest Mall 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) | 14% | 43 | 17 | 82 | 51 | 193 |
| Inner North (via Mangum Rd) | 3% | 9 | 4 | 18 | 11 | 42 |
| Northwest (US 290) | 11% | 33 | 14 | 65 | 40 | 152 |
| West (IH-10) | 19% | 58 | 23 | 111 | 70 | 262 |
| Near west and SW (via Westview Dr) | 8% | 24 | 10 | 47 | 29 | 110 |
| Hempstead Rd (NW) | 3% | 9 | 4 | 18 | 11 | 42 |
| Post Oak Rd | 2% | 6 | 2 | 12 | 8 | 28 |
| South (IH-610) | 16% | 49 | 19 | 94 | 59 | 221 |
| East (IH-10) | 20% | 61 | 25 | 117 | 73 | 276 |
| Inner SW (via Hempstead Rd) | 3% | 9 | 4 | 18 | 10 | 41 |
| Inner NW (via 18th St) | 1% | 3 | 1 | 6 | 4 | 14 |
| **Total** | **100%** | **304** | **123** | **588** | **366** | **1,381** |

Source: AECOM, 2017

Traffic conditions on the local network were analyzed for the No Build and Build Alternatives with no changes to the current intersection configuration. The Build Alternative, however, would require intersection improvements near the station to improve traffic flow. **Table 3.11-56** summarizes the proposed Build Alternatives' intersection improvements.

| Table 3.11-56: Northwest Mall Terminal Station Option Intersection Design Modifications | |
|---|---|
| **Intersection** | **Improvement** |
| Mangum Road/US 290 NBFR | • Add one left-turn bay to northbound approach to provide dual left-turn bays.<br>• Add one through lane to southbound approach. |
| Mangum Road/US 290 SBFR | • Add one through lane to northbound approach. |
| Mangum Road/Dacoma Street | • Add one right-turn bay to northbound approach.<br>• Convert the left turns at all approaches to protected then permissive. |
| Dacoma Street/US 290 SBFR | • Add a one right-turn bay to the northeast bound and southeast bound approaches. |
| E T C Jester Boulevard/ IH-610 EBFR | • Convert the center lane of the southeast bound approach from a through lane to a shared through and left-turn lane. |
| Hempstead Road/Long Point Road | • Prohibit left turns at southeast bound approach. |
| W 18th Street/ Hempstead Road | • Prohibit left turns at westbound approach. |
| Mangum Road/18th Street | • Add one right-turn bay to westbound approach.<br>• Convert the left turns at all approaches to protected then permissive. |
| W 18th Street/IH-610 SBFR | • Add two right-turn bays and one through lane on the eastbound approach. |
| W 18th Street/IH-610 NBFR | • Add one right-turn bay and one through lane to westbound approach.<br>• Add one right-turn bay to northbound approach. |
| Post Oak Road/Hempstead Road | • Add one right-turn bay to southeast bound approach.<br>• Convert southwest bound approach center left-through lane to through lane.<br>• Add one lane to northeast bound approach and convert to dual lefts, one through/right and one right-turn lane. |
| Post Oak Road/ Westview Drive | • Add one right-turn bay to southbound approach.<br>• Convert the left turns at all approaches to protected then permissive. |
| Post Oak Road/Old Katy Road | • Add one right-turn bay to the northbound and eastbound approaches. |
| Post Oak Road/IH-10 EBFR | • Add one through lane to northbound approach. |

**Table 3.11-56: Northwest Mall Terminal Station Option Intersection Design Modifications**

| Intersection | Improvement |
|---|---|
| Silber Road/IH-10 WBFR | • Convert the northbound approach center through/left-turn lane to a through-only lane.<br>• Convert southbound approach to two through lanes and one right-turn lane. |
| Antoine Drive/IH-10 WBFR | • Convert the westbound approach shared through/left-turn lane to a through-only lane. |

Source: AECOM, 2016

**Table 3.11-57** lists 2040 peak period intersection conditions under the No Build, Build and modified conditions. The table also identifies intersections that would experience an impact (i.e., LOS E or F) from the traffic generated by the Northwest Mall Terminal Station option for the modified intersections condition. 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 four percent per year from existing volumes. This results in projected 2040 No Build conditions that would be congested and yield LOS of E or F at some intersections. The proposed intersection modifications would improve the LOS in the Build Alternatives to No Build conditions or better including the severely congested intersections. 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.

Under the Build Alternatives with no intersection improvements, all intersections would experience an increase in delay with 23 of the 26 intersections operating at LOS E or F during both the AM and PM peak periods and two 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. With the intersection improvements, all of the intersections would operate at essentially the same LOS as the No Build Alternatives, considering the anticipated increase rise in population and traffic congestion.

While some intersections would operate at LOS E or F under the modified intersection conditions, this is mostly due to the projected growth under No Build conditions, rather than a direct impact of the project. However, for the purposes of this review, where intersections would operate at LOS E or F under the No Build condition and the modified intersection condition, it is still considered an adverse effect of the Build Alternatives.

**Table 3.11-57: Northwest Mall Terminal Impacts**

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| NB US 290/Mangum Rd | D (43) | **E (76)** | **E (70)** | **F (118)** | D (43) | D (41) | **Y** |
| SB US 290/Mangum Rd | D (39) | D (54) | **E (73)** | **F (82)** | D (47) | **E (78)** | **Y** |
| Mangum Rd/Dacoma St | D (46) | **E (62)** | **E (64)** | **F (98)** | D (44) | **E (59)** | **Y** |
| SB US 290/Dacoma St | **F (141)** | **F (104)** | **F (161)** | **F (147)** | **F (161)** | **F (96)** | **Y** |
| NB US 290/Dacoma St | **F (89)** | **F (97)** | **F (107)** | **F (142)** | **F (107)** | D (51) | **Y** |
| WB IH-610/TC Jester Blvd | **F (329)** | **F (188)** | **F (220)** | **F (165)** | **F (220)** | **F (181)** | **Y** |
| EB IH-610/TC Jester Blvd | **F (110)** | **F (202)** | **F (109)** | **F (177)** | **F (109)** | **F (239)** | **Y** |
| EB IH-610/E TC Jester Blvd | **F (122)** | **F (121)** | **F (144)** | **F (89)** | **F (144)** | **E (73)** | **Y** |
| WB IH-610/E TC Jester Blvd | **F (315)** | **F (128)** | **F (393)** | **F (188)** | **F (393)** | **F (141)** | **Y** |

| Table 3.11-57: Northwest Mall Terminal Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Adverse Impact (Y/N) |
| Long Point Rd/Hempstead Rd | **F (81)** | **F (92)** | **F (85)** | **F (88)** | **E (78)** | **F (88)** | **Y** |
| 18th St/Hempstead Rd (unsignalized) | **F (61)** | **F (184)** | **F (67)** | **F (192)** | **F (54)** | **F (175)** | **Y** |
| Mangum Rd/18th St | D (41) | **E (67)** | **E (57)** | **F (93)** | D (42) | D (52) | **N** |
| SB IH-610/18th St | D (52) | **F (124)** | **F (134)** | **F (257)** | **F (81)** | **F (124)** | **Y** |
| NB IH-610/18th St | **E (67)** | **F (106)** | **F (120)** | **F (203)** | **E (70)** | **F (81)** | **Y** |
| Mangum Rd/Hempstead Rd | C (24) | C (32) | C (24) | C (34) | C (27) | D (36) | **N** |
| Post Oak Rd/Hempstead Rd | **F (96)** | **F (102)** | **F (216)** | **F (248)** | **F (118)** | **F (163)** | **Y** |
| SB IH-610/Hempstead Rd | **E (63)** | **F (99)** | **E (80)** | **F (134)** | **E (80)** | **F (134)** | **Y** |
| NB IH-610/Hempstead Rd | C (27) | **F (107)** | D (36) | **F (87)** | D (36) | **F (87)** | **Y** |
| Post Oak Rd/Westview Dr | **F (92)** | **E (77)** | **F (119)** | **F (153)** | **E (65)** | **E (68)** | **Y** |
| Post Oak Rd/Old Katy Rd | **F (179)** | **F (354)** | **F (245)** | **F (399)** | **F (186)** | **F (280)** | **Y** |
| Post Oak Rd/EB IH-10 | **F (117)** | **F (95)** | **E (70)** | **E (64)** | **E (69)** | D (38) | **Y** |
| SB IH-610/Old Katy Rd | D (35) | **F (145)** | D (48) | **F (132)** | D (48) | **F (133)** | **Y** |
| NB IH-610/Old Katy Rd | **E (56)** | **F (143)** | D (51) | **F (154)** | D (51) | **F (154)** | **Y** |
| WB IH-10/Silber Rd | D (51) | **F (132)** | **F (83)** | **E (74)** | **F (81)** | **E (72)** | **Y** |
| EB IH-10/Silber Rd | **E (74)** | **F (253)** | **F (107)** | **F (235)** | **F (94)** | **F (259)** | **Y** |
| WB IH-10/Antoine Dr | **F (119)** | **F (83)** | **F (125)** | **F (89)** | **F (114)** | **F (87)** | **Y** |

Source: AECOM, 2017
Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

**Traffic Impacts at the Northwest Transit Center Terminal Station Option**
The 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 3.11-58**. 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**. 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 3.11-58: Northwest Transit Center 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) | 14% | 43 | 17 | 82 | 51 | 193 |
| Inner North (via TC Jester Blvd) | 3% | 9 | 4 | 18 | 11 | 42 |
| Northwest (US 290) | 11% | 33 | 14 | 65 | 40 | 152 |
| West (IH-10) | 19% | 58 | 23 | 111 | 70 | 262 |
| Near west and SW (via Westview Dr) | 8% | 24 | 10 | 47 | 29 | 110 |
| Hempstead Rd | 3% | 9 | 4 | 18 | 11 | 42 |
| Post Oak Rd | 2% | 6 | 2 | 12 | 8 | 28 |
| South (IH-610) | 16% | 49 | 19 | 94 | 59 | 221 |
| East (IH-10) | 20% | 61 | 25 | 117 | 73 | 276 |
| Inner SW (via Katy Rd) | 3% | 9 | 4 | 18 | 10 | 41 |
| Inner NW (via 18th St) | 1% | 3 | 1 | 6 | 4 | 14 |
| **Total** | **100%** | **304** | **123** | **588** | **366** | **1,381** |

Source: AECOM, 2017

Traffic conditions on the local network were analyzed for the No Build and Build Alternatives with no changes to the current intersection configuration. The Build Alternatives, however, would require intersection improvements near the station to improve traffic flow. **Table 3.11-59** summarizes the proposed Build Alternatives' intersection improvements.

**Table 3.11-59: Northwest Transit Center Terminal Station Option Intersection Design Modifications**

| Intersection | Improvement |
|---|---|
| Mangum Road/US 290 NBFR | • Add one left-turn bay to northbound approach.<br>• Add one through lane to southbound approach. |
| Mangum Road/US 290 SBFR | • Add one through lane to northbound approach. |
| West T C Jester Boulevard/IH-610 Eastbound FR | • Convert northeast bound shared through/left-turn lane to through-only lane. |
| Jester Boulevard/IH-610 EBFR | • Convert southeast bound center lane from through to shared through/left. |
| Hempstead Road/Long Point Road | • Prohibit left turns from southeast bound approach. |
| W 18th Street/Hempstead Road | • Prohibit left turns at westbound approach. |
| Mangum Road/18th Street | • Add one right-turn bay to westbound approach.<br>• Convert the left turns at all approaches to protected then permissive. |
| W 18th Street/IH-610 SBFR | • Add one right-turn bay to eastbound approach. |
| Post Oak Road/Hempstead Road | • Add one right-turn bay to northeast bound approach.<br>• Convert northwest bound approach to dual left-turn bays, a shared through and right-turn lane and one right-turn bay.<br>• Convert southeast bound approach outside through lane to a shared through/right-turn lane, providing two lanes permitting right-turns. |
| Post Oak Road/Westview Drive | • Add one right-turn bay to southbound approach.<br>• Convert the left turns at all approaches to protected then permissive. |
| Post Oak Road/Old Katy Road | • Add one right-turn bay to each approach.<br>• Add one left-turn bay to the northbound and southbound approaches. |
| Post Oak Road/IH-10 EBFR | • Add one through lane to northbound approach. |
| Old Katy Road/IH-610 SBFR | • Convert southbound approach shared through/left-turn lane to through-only.<br>• Add one left-turn bay to southbound approach.<br>• Add one through lane to the westbound approach. |
| Old Katy Road/IH-610 NBFR | • Convert northbound approach to dual left-turn bays and a shared through/right-turn lane.<br>• Add one through lane to westbound approach.<br>• Add one left-turn bay to eastbound approach. |
| Silber Road/IH-10 WBFR | • Convert southbound approach to two through lanes and one right-turn lane. |
| Silber Road at IH-10 EBFR | • Convert eastbound approach shared through/left-turn lane to a through-only lane. |
| Antoine Drive at IH-10 WBFR | • Convert westbound approach shared through/left-turn lane to a through-only lane.<br>• Add one right-turn bay to southbound approach. |

Source: AECOM, 2016

**Table 3.11-60** lists 2040 peak period intersection conditions in the No Build, Build Alternatives and modified conditions. This table also identifies intersections that would experience an impact (i.e., LOS E or F) from the traffic generated by the Northwest Transit Center Terminal option for the modified intersections condition. 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 four percent per year from existing volumes. This results in projected 2040 No Build conditions that would be congested and yield LOS of E or F at some intersections. The proposed intersection modifications would improve the LOS in the Build Alternatives to No Build conditions or better including the severely congested intersections. 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.

Under the Build Alternatives with no intersection improvements, all intersections would experience an increase in delay with 22 of the 26 intersections operating at LOS E or F during both the AM and PM peak periods and three 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. With the intersection improvements all of the intersections going back to operating as well or better than the No Build Alternatives, with four intersections operating at acceptable LOS for both AM and PM peak hours. All of the intersections would show improvement in the overall amount of delay.

While some intersections would operate at LOS E or F under the modified intersection conditions, this is mostly due to the projected growth under No Build conditions, rather than a direct impact of the project. However, for the purposes of this review, where intersections would operate at LOS E or F under the No Build condition and the modified intersection condition, it is still considered an adverse effect of the Build Alternatives.

**Table 3.11-60: Northwest Transit Center Terminal Station Option Impacts**

| Intersection | AM NB | PM NB | AM Build | PM Build | AM Modified | PM Modified | Impact (Y/N) |
|---|---|---|---|---|---|---|---|
| NB US 290/Mangum Rd | D (43) | **E (76)** | D (47) | **F (117)** | D (45) | D (52) | **N** |
| SB US 290/Mangum Rd | D (39) | D (54) | **E (60)** | **E (76)** | D (45) | D (51) | **N** |
| Mangum Rd/Dacoma St | D (46) | **E (62)** | D (53) | **F (83)** | D (53) | **F (80)** | **Y** |
| SB US 290/Dacoma St | **F (141)** | **F (104)** | **F (154)** | **F (146)** | **F (154)** | **F (139)** | **Y** |
| NB US 290/Dacoma St | **F (89)** | **F (97)** | **F (98)** | **F (123)** | **F (98)** | **F (134)** | **Y** |
| WB IH-610/TC Jester Blvd | **F (329)** | **F (188)** | **F (201)** | **F (181)** | **F (196)** | **F (167)** | **Y** |
| EB IH-610/TC Jester Blvd | **F (110)** | **F (202)** | **F (107)** | **F (191)** | **F (97)** | **F (177)** | **Y** |
| EB IH-610/E TC Jester Blvd | **F (122)** | **F (121)** | **F (153)** | **E (74)** | **F (112)** | **E (69)** | **Y** |
| WB IH-610/E TC Jester Blvd | **F (315)** | **F (128)** | **F (367)** | **F (137)** | **F (367)** | **F (132)** | **Y** |
| Long Point Rd/Hempstead Rd | **F (81)** | **F (92)** | **F (85)** | **F (86)** | **E (78)** | **F (88)** | **Y** |
| 18th St/Hempstead Rd (unsignalized) | **F (61)** | **F (184)** | **F (67)** | **F (192)** | **F (54)** | **F (175)** | **Y** |
| Mangum Rd/18th St | D (41) | **E (67)** | D (53) | **F (92)** | D (41) | D (52) | **N** |
| SB IH-610/18th St | D (52) | **F (124)** | **E (63)** | **F (148)** | **F (86)** | **F (106)** | **Y** |
| NB IH-610/18th St | **E (67)** | **F (106)** | **F (81)** | **F (142)** | **F (108)** | **F (130)** | **Y** |
| Mangum Rd/Hempstead Rd | C (24) | C (32) | C (30) | D (45) | C (31) | D (48) | **Y** |
| Post Oak Rd/Hempstead Rd | **F (96)** | **F (102)** | **F (190)** | **F (170)** | **F (119)** | **F (148)** | **Y** |
| SB IH-610/Hempstead Rd | **E (63)** | **F (99)** | **E (55)** | **F (112)** | **E (55)** | **F (114)** | **Y** |
| NB IH-610/Hempstead Rd | C (27) | **F (107)** | C (27) | **F (83)** | C (27) | **F (74)** | **Y** |
| Post Oak Rd/Westview Dr | **F (92)** | **E (77)** | **F (137)** | **F (119)** | **F (109)** | **E (63)** | **Y** |
| Post Oak Rd/Old Katy Rd | **F (179)** | **F (354)** | **F (351)** | **F (490)** | **F (261)** | **F (388)** | **Y** |
| Post Oak Rd/EB IH-10 | **F (117)** | **F (95)** | **F (92)** | **E (67)** | **F (85)** | D (47) | **Y** |
| SB IH-610/Old Katy Rd | D (35) | **F (145)** | **E (70)** | **F (161)** | D (48) | **F (107)** | **Y** |
| NB IH-610/Old Katy Rd | **E (56)** | **F (143)** | **F (117)** | **F (252)** | D (52) | **F (139)** | **Y** |
| WB IH-10/Silber Rd | D (51) | **F (132)** | **F (83)** | **F (87)** | **E (71)** | **E (65)** | **Y** |
| EB IH-10/Silber Rd | **E (74)** | **F (253)** | **F (111)** | **F (250)** | **F (83)** | **F (197)** | **Y** |
| WB IH-10/Antoine Dr | **F (119)** | **F (83)** | **F (125)** | **F (91)** | **E (74)** | **F (106)** | **Y** |

Source: AECOM, 2017
Note: LOS **E** and **F** (in bold) are below TXDOT's acceptable standard of D or better.

### Transit Services

The Houston Terminal Station options would be expected to experience less than 4 percent non-motorized access due to the lack of a high-capacity transit network in the vicinity of the stations.

It would be anticipated that METRO's bus service would be increased or rerouted to provide better access to the selected terminal station.

The Build Alternatives 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 approximately one third of the parking lot for two TPSS. 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 FCA would be required.

**Rail Network**

There would be no permanent or operational impacts associated with any of these crossings as the Build Alternatives would be fully grade separated at a clearance distance above all existing tracks as coordinated with each individual rail operator.

**On-Road Pedestrian and Bicycle Facilities**

The Build Alternatives would have no impact on any pedestrian or bicycle facilities within the Study Area.

**Aviation**

Weiser Air Park is located directly north of US Highway 290 at Gentry Road in Harris County. It would be located within the one-half mile buffer of Segment 5 of the Build Alternatives. While US 290 would be located between Weiser Air Park and the Build Alternatives, the Build Alternatives would be elevated above US 290. Based on preliminary analysis, the Build Alternatives would affect the clearance zones for aviation activities the air park.

A runway protection zone (RPZ) is designed to protect people and property around the airport and dictate the safe approach and departure slopes required by the FAA. These regulations require a runway zone of at least 10,000 feet and maximum structure height of 200 feet in this zone. In order to span the intersection of US 290 and Telge Road, the height of the HSR infrastructure would reach 235 feet. This would exceed the FAA RPZ maximum requirements of 200 feet at this site. The HSR infrastructure would be located approximately 2,300 feet from the western edge of the runway, and due to its height would intersect the 2,500-foot visibility zone. Due to the height of the HSR system, approaches and departures from the air park would be potentially impeded. Additional coordination would be required with the FAA to confirm impacts to the Air Park due to impedance on the RPZ.

## 3.11.6 Avoidance, Minimization and Mitigation

Design features were employed to avoid and minimize impacts to the natural, social, physical and cultural environment. As detailed within the following counties, the number of roads that would be crossed varies from 231 (Build Alternatives B and E) to 237 (Build Alternatives A and D). Approximately 50 percent of the roads would be crossed are in locations where the HSR system would be on viaduct, which would be elevated such that limited road modifications would be required to approximately 64 percent of roads crossed. As detailed in Section 3.11.3.3.1, 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. Therefore, the number of roads impacted would vary from 147 (Build Alternative F) to 246 (Build Alternative B).

### 3.11.6.1 Compliance Measures

The following Compliance Measures (CM) and permits for changes in land use would be required for Build Alternatives A through F.

**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 municipalities 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.

### 3.11.6.2 Mitigation Measures

The following Mitigation Measures (MM) would be implemented to lessen the impact of Build Alternatives A through F.

**TR-MM#1: Traffic Control Plan.** As part of the Road Closure Permit, TCRR shall develop a traffic control plan that details the sequence of construction, the detour plan temporary signing, striping of pavement marking and contract provisions. The traffic control plan shall also include provisions for safe and efficient operation of all modes of transportation during construction and safety of construction workers and inspection personnel. TRCC, or its contractors, shall put Manual on Uniform Traffic Control Devices compliant traffic controls in place prior to construction, including signage, barricades, flaggers and other traffic safety devices.

Prior to construction, all road or lane closures or delays in traffic would be coordinated by TCRR with the TxDOT, local governments, emergency personnel, local businesses and the general public. Advanced notice would be provided via direct mailings and/or door-to-door fliers and local news media. Access to all businesses and residences would be maintained throughout construction with appropriate signing directing drivers to access points.

The following measures would be implemented to minimize impacts to traffic impacts:

- TCRR shall communicate traffic control measures with the public, local officials and the media prior to and during construction activities. Communication may include, but shall not be limited to, 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 2 weeks 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.
- With the exception of temporary closures during non-business hours or for periods of less than one 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 shall notify the public a minimum of 48 hours in advance of any road closures.
- TCRR shall notify the public and business owners of temporary access changes during construction at least 7 calendar days in advance of the change.
- 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.

**TR-MM#1: Railroad crash barriers.** Where the HSR System would run parallel to freight railroads, TCRR shall construct crash barriers to protect the viaduct support columns.

**TR-MM#2: Dallas Terminal Station Intersection Improvements.** As detailed in **Table 3.11-39**, TCRR shall implement intersection improvements during construction at five intersections to mitigate for LOS impacts from the construction of the HSR system at the following locations:

**TR-MM#3: Brazos Valley Station Intersection Improvements.** TCRR shall implement intersection improvements during construction to mitigate for LOS impacts from the construction of the HSR system at the SH 30/SH 90 intersection by adding eastbound and westbound left turn bays on SH 90.

**TR-MM#4: Houston Industrial Site Terminal Station Option Intersection Improvements.** As detailed in **Table3.11-53**, TCRR shall implement intersection improvements during construction at 19 intersections to mitigate for LOS impacts from the construction of the HSR system.

**TR-MM#5: Houston Northwest Mall Terminal Station Option Intersection Improvements.** As detailed in **Table 3.11-56**, TCRR shall implement intersection improvements during construction at 16 intersections to mitigate for LOS impacts from the construction of the HSR system.

**TR-MM#6: Houston Northwest Transit Center Terminal Station Option Intersection Improvements.** As detailed in **Table 3.11-59**, TCRR shall implement intersection improvements during construction at 18 intersections to mitigate for LOS impacts from the construction of the HSR system.

**TR-MM#7: 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.

**TR-MM#8: Weiser Air Park.** Prior to construction, TCRR shall conduct appropriate negotiations and compensation with the airport owner to minimize and mitigate for RPZ impairments. Possible negotiations may include acquisition and closure of the entire air park by TCRR.

### 3.11.7 Build Alternatives Comparison

**Table 3.11-61** summarizes the impacts for each Build Alternatives 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 Build Alternatives would result in direct and indirect impacts to the existing transportation network within the Study Area. The total number of roads permanently impacted vary from 147 (Build Alternative F) to 248 (Build Alternative B). Reroutes to existing roads would result in the addition of approximately 18 miles (Build Alternative A) to 49.3 miles (Alternative F) of public roads.

Alternatives B and E would require the acquisition and closure or relocation of the Anxiety Aerodrome in Navarro County. All alternatives could impact the Weiser Air Park which would be located on common segment (Segment 5).

**Table 3.11-61: Summary of Transportation Impacts by Build Alternative**

| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F |
|---|---|---|---|---|---|---|
| Freight Rail Crossings | 34 | 34 | 34 | 34 | 34 | 34 |
| 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. | | | | | |
| Roads Permanently Impacted | 240 | 246 | 148 | 239 | 245 | 147 |
| Length added to Public Roads (miles) | 18.0 | 20.0 | 47.9 | 19.0 | 21.4 | 49.3 |
| Length removed from Public Roads (miles) | 11.0 | 11.1 | 26.9 | 9.7 | 11.1 | 25.9 |
| 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 | 1 | 2 | 1 | 1 | 2 | 1 |

Source: AECOM, 2017

**Table 3.11-62** summarizes the traffic impacts for the three Houston Terminal Station options. With the inclusion of the proposed design modifications, all of the Build Alternatives would result in a small improvement in intersection operations over the No Build Alternative. The Northwest Transit Center Terminal Station option would have the fewest (22) intersections at LOS E or F, and the Industrial Site Terminal Station option would have the most (25). There were no differences in the intersection traffic impacts at the proposed Dallas Terminal Station option between the Build Alternatives.

**Table 3.11-62: 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, 2017

# 3.12 Elderly and Handicapped

## 3.12.1 Introduction

This section assesses potential accessibility concerns for mobility-impaired individuals, including seniors, handicapped and disabled individuals. This evaluation identifies accessibility issues and current best practices for avoiding and minimizing these accessibility issues, and then analyzes the elements of the Build Alternatives to determine if accessibility issues could occur on the train, at the terminal stations (Dallas and Harris counties) and at the Brazos Valley Station in Grimes County. This section also recommends mitigation measures that would avoid or minimize the identified accessibility concerns to ensure that no individual is excluded from using the HSR system. This section does not discuss station or on train emergency protocols related to elderly and handicapped passengers; see **Section 3.16, Safety and Security**, for information related to emergency train and station evacuations.

## 3.12.2 Regulatory Context

### Federal

FRA's updated *Procedures for Considering Environmental Impacts* states that this EIS shall assess impacts of the Build Alternatives on the transportation and general mobility of the elderly and handicapped.[1] Specifically, the procedures identify possible barriers to the elderly and the handicapped and removed outdated information contained in the previous procedures and eliminated inconsistencies between the procedures and the CEQ NEPA Implementing Regulations.[2]

#### *Transportation Services for Individuals with Disabilities (49 CFR 37)*

The purpose of 49 CFR 37 is to implement transportation provisions of the Americans with Disabilities Act of 1990 (ADA). Key areas of the regulation that pertain to passenger rail accessibility for the elderly and handicapped include:

- 37.5 Nondiscrimination – ensures that no individual with disabilities would be discriminated
- 37.7 Standards for accessible vehicles – ensures that an individual with disabilities can easily access and navigate through each rail vehicle
- 37.9 Standards for accessible transportation facilities – requires all transportation facilities to comply with the 2010 *ADA Standards for Accessible Design*[3]
- 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 disabled passengers can easily locate appropriate ingress and egress points on the station platform or train
- 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
- 37.55 Intercity rail station accessibility – requires all intercity rail stations to be readily accessible by individuals with disabilities

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64 C.F.R. 28545 et seq.
[2] CEQ, "CEQ Regulations for Implementing the Procedural Provisions of NEPA," 1970, 40 C.F.R. 1500.
[3] USDOJ, *2010 ADA Standards for Accessible Design*. [Washington, D.C.]: Dept. of Justice, 2010.

- 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 CFR 38)*

The purpose of 49 CFR 38 is to provide minimum guidelines and requirements for the accessibility standards in Part 37 of this title for transportation vehicles required to be accessible by ADA (42 U.S.C. 1201 et seq.). 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.

## 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 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 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: USDOJ, 2010

## 3.12.4 Affected Environment

According to the U.S. Census Bureau, approximately 19 percent of the U.S. population reports having a disability. [5] Of those individuals with a disability, 23 percent require some sort of specialized assistance or equipment to travel outside their home.[6] In addition, 12 percent of these individuals have difficulty

[4] USDOJ, *2010 ADA Standards for Accessible Design*. [Washington, D.C.]: Dept. of Justice, 2010.
[5] USDOT, "Bureau of Transportation Statistics", 2002, National Transportation Availability and Use Survey. http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/freedom_to_travel/html/data_analysis.html
[6] Ibid.

obtaining the necessary specialized transportation.[7] Data presented in **Table 3.12-2**, uses these statistics to estimate the number of individuals in Dallas, Grimes and Harris counties[8] that could require some sort of specialized assistance or equipment to travel outside their homes, as well as the number of individuals who have difficulty obtaining the transportation they need.

While not all elderly persons are disabled, they may have special needs related to accessibility. The elderly population (over 65 years) is estimated to be 9.7 percent of the total Dallas County population, 16.0 percent of Grimes County and 9.2 percent of Harris County.[9] **Table 3.12-2** also includes the estimated elderly population for the Build Alternative station counties.

**Table 3.12-2: Handicapped and Elderly Populations**

| Counties | Disabled Population | Total Disabled Population Requiring Specialized Assistance | Disabled Population with Specialized Assistance requiring proper Transportation | Elderly Population |
|---|---|---|---|---|
| Dallas County | 485,143 | 111,583 | 58,217 | 247,678 |
| Grimes County | 5,227 | 1,202 | 627 | 4,402 |
| Harris County | 862,225 | 198,312 | 103,467 | 417,499 |

Source: Estimated from USCB, 2016
Note: Data above does not differentiate between those individuals who are both elderly and disabled

## 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 CFR 37 and 38, and in compliance with ADA accessibility standards. Additionally, electronic, ADA-compliant passenger information displays would be implemented to communicate real-time train status, general boarding announcements and security messages in both visual and audible formats.

#### *3.12.5.2.1 Dallas Terminal Station*

Per TCRR's *Draft Conceptual Engineering Report* (see **Appendix F, TCRR Conceptual Engineering Design Report**), parking demand at the Dallas Terminal was calculated using ridership projections and mode split analyses. This data supports the planning for parking needs of 5,500. This analysis accounts for

[7] Ibid.
[8] United States Census Bureau, " Quick Facts, Population Estimates Program, by County for 2015," 2016, https://www.census.gov/quickfacts/table/PST045214/48113
[9] United States Census Bureau, " Quick Facts, Population Estimates Program, by County for 2015," 2016, https://www.census.gov/quickfacts/table/PST045214/48113

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.[10] Therefore, all of the Build Alternatives would provide 65 accessible parking spaces. The Dallas Station parking facility would include specified parking spaces and corresponding signage, curb ramps and detectable warnings.

#### *3.12.5.2.2 Brazos Valley Station*

Per TCRR's *Draft Conceptual Engineering Report,* 1,200 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 of the Build Alternatives provide 22 accessible parking spaces. The Brazos Valley 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 *Draft Conceptual Engineering Report*, parking needs at the all three Houston Terminal options would 6,500. This analysis accounts for rental car facility parking needs. This would require that the Build Alternatives provide 75 accessible parking spaces. The Houston 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 N700 series Shinkansen 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 Build Alternatives.

**Table 3.12-3: Vehicle ADA Compliant Specifications**

| Vehicle Specifications | Measurement/Specifications |
|---|---|
| Doorway | 32 inches wide<br>2 foot candles of illumination measures on the door threshold |
| Vestibules<br>- Train cars | <br>42 inches wide |
| Boarding Platforms<br>- Maximum vertical gap<br>- Maximum horizontal gap | <br>5/8 inches<br>3 inches |
| Seating<br>- Wheelchair locations | Minimum of at least 1 mobility aid seating location in each car<br>48 by 30 inches (mobility aid spaces) |
| Interior circulation<br>-Passageway<br>- Vestibule Width | <br>32 inches<br>42 inches |
| Restrooms<br>-ADA accessible in every other car | 35 inches by 60 inches (clear floor area)<br>• Permanently installed fixtures may overlap this area a maximum of 6 inches, if the lowest portion of the fixture is a minimum of 9 inches above the floor, and may overlap a maximum of 19 inches, if the lowest portion of the fixture is a minimum of 29 inches above the floor. |

[10] U.S. Department of Justice, *2010 ADA Standards for Accessible Design*. [Washington, D.C.]: Dept. of Justice, 2010.

| Table 3.12-3: Vehicle ADA Compliant Specifications | |
|---|---|
| **Vehicle Specifications** | **Measurement/Specifications** |
| | Water closet shall be 17 inches to 19 inches measured to the top of the toilet seat.<br>24 inches long (grab bar located behind water closet)<br>40 inches long (horizontal grab bar on at least one side wall)<br>40 inches above the floor (flush valves)<br>32 inches (passageway) |

Source: USDOJ 49 CFR 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 CFR 37 and 38. In addition, the Build Alternatives would implement level boarding at all stations, thereby eliminating the concern of uneven boarding and height variations between the station platform and the HSR train.

## 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.*

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, planning your trip, navigating throughout the stations, boarding and exiting the train, navigating on the train, emergency procedures and additional procedures passengers should adhere to while on and off the HSR train.

### 3.12.6.1 Compliance Measures and Permitting

The following Compliance Measures (CM) for impaired individuals, including seniors, handicapped and disabled individuals would be required for the Build Alternatives.

**EH-CM#1: ADA Safety Standards.** As specified in the Rule of Particular Applicability, FRA shall require TCRR to incorporate the following ADA standards into the design and construction of each station to support safety:

- Tactile areas around walking signs and platform edges
- Steps without open risers to minimize tripping hazards

**EH-CM#2: ADA Accessibility Standards.** As specified in the Rule of Particular Applicability, FRA shall require TCRR to incorporate the following ADA standards into the design and construction of each station, parking and pedestrian facilities to support accessibility:

- Shelters and seats, especially in weather-exposed areas outside the HSR station
- At least one barrier-free access route into buildings and platforms (no stairs, obstacles, or vendors)
- Simple layout and clear navigation to platforms
- Station furniture and facilities (such as kiosks, vending machines, seating and trash receptacles) designed to minimize obstruction to the main pedestrian flows

- Access to ticket counters, toilets, kiosks and other facilities in and around the platform area

**EH-CM#3: ADA Reliability Standards.** As specified in the Rule of Particular Applicability, FRA shall require TCRR to incorporate the following ADA standards into the design and construction of each station to support reliability:

- ADA-compliant passenger information displays with real time information on service changes or delays available in visual and audible formats
- Trained staff available to provide assistance, where needed
- Accessible walkway between station and surrounding footways

## 3.12.7 Build Alternatives Comparison

The Build Alternatives and station options would all be designed, constructed and operated in compliance with 49 CFR 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.

# 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 Build Alternatives 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 Build Alternatives to local land use controls, comprehensive regional planning and development within the affected environment.[1]

#### *Farmland Protection Policy Act of 1981 (7 U.S.C. 73; 7 C.F.R. 658)*

The Farmland Protection Policy Act 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 the NRCS. To initiate coordination and receive a rating from a 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 (also known as the Farm Bill) (House Resolution 2642; Public Law 113–79)*

The Act is the primary agricultural and food policy tool of the federal government and addresses both agriculture and all other affairs under the purview of the 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 the TPWD (see **Section 3.13.2.2** for additional information). Under the program, the NRCS and the TPWD help landowners protect working agricultural lands and limit non-agricultural uses of the land from

[1] FRA, "Procedures for Considering Environmental Impacts. Notice of Updated Environmental Assessment Procedures," May 1999.

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 (42 U.S.C. Chapter 61)*

The Act 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. This includes their ability to acquire decent, safe and sanitary housing within their financial means. This helps to ensure persons will not suffer disproportionate injuries as a result of an action designed for the benefit of the public as a whole. The 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. DOT approval of financial assistance to TCRR through DOT 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.

### State

*Texas Farm and Ranch Lands Conservation Program (Texas Parks and Wildlife Code, Title 5, Subtitle E, Chapter 84)*

The Texas Farm and Ranch Lands Conservation Program 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 established under this subchapter is to enable and facilitate the purchase and donation of agricultural conservation easements.

*Texas Parks and Wildlife Department (Texas Parks and Wildlife Code, Title 2, Chapter 11, Subchapter H)*

Pursuant to the authority contained in the above-named subchapter of the Texas Parks and Wildlife Code, 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.[2]

*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

[2] TPWD, "Land and Water Resources Conservation and Recreation Plan," January 2015.

eminent domain process under the State of Texas, TCRR would also be required to comply with the Texas Property Code and Texas Administrative Code.

### *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. DOT approval of financial assistance to TCRR through its credit programs would supersede the state property code, and the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act would apply.

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

Similar to the federal Uniform Relocation Assistance and Real Property Acquisition Policies 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. DOT approval of TCRR's application through the RRIF credit assistance program would supersede the state administrative code, and the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act would apply.

## Local Government

While none of 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** provides an overview of the local plans and ordinances in the Study Area.

**Table 3.13-1: Local Plans and Ordinances**

| County/City/Town | Plan/Regulation | Section | Guidance |
|---|---|---|---|
| **North Central Texas Council of Governments** | Mobility 2040 and Vision North Texas | TRE-013 | 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. |

| Table 3.13-1: Local Plans and Ordinances | | | |
|---|---|---|---|
| **County/City/Town** | **Plan/Regulation** | **Section** | **Guidance** |
| **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. |
| **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, 2016

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.[3] This plan does not specifically reference HSR or a station.

[3] City of Dallas, "Forward Dallas! Comprehensive Plan," June 2006.

### *Downtown Dallas 360 (2011)*

Downtown Dallas 360 has served as the guiding plan for Downtown since 2011. Authored as a public-private partnership between 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.[4]

### *City of Lancaster Comprehensive Plan (2002)*

The 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.[5] The plan does not specifically reference HSR.

### *City of Wilmer Community Plan (2009)*

This 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.[6] 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.[7] The plan does not specifically reference HSR.

### *City of Waxahachie Comprehensive Plan (Draft 2016)*

The Plan documents the physical and socioeconomic (demographic) characteristics unique to Waxahachie and the surrounding area.[8] 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.[9] The plan does not specifically reference HSR.

### *City of Jersey Village Comprehensive Plan (2016)*

The 2016 Plan is a guide to achieve 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.[10]

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[4] Downtown Dallas, "Downtown Dallas 360: A Pathway to the Future," 2011
[5] City of Lancaster, "Comprehensive Plan," February 2002.
[6] City of Wilmer, "Community Plan," June 2009.
[7] City of Ferris, "Draft Comprehensive Plan," September 2013.
[8] City of Waxahachie, "Comprehensive Plan Addendum," 2016.
[9] City of Corsicana, "Comprehensive Plan," June 2007.
[10] City of Jersey Village, "Comprehensive Plan," February 2016.

*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.[11] The plan does not reference 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 track, the Study Area for land use conversion is a quarter-mile from the HSR track centerline for the Build Alternatives and includes the LOD or footprint of the track and ancillary facilities. For stations, the Study area for land use conversion is a half-mile radius from the HSR platform, which created a one 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.

1. Agriculture–active farmed cropland and specialty crop production
2. Civic–city- or state-owned land for public use
3. Commercial–retail facilities
4. Forested Areas–mixed hardwood and evergreen forests, forests planted primarily for timber harvest and fruit/nut tree orchards
5. Industrial–utility stations, manufacturing or industrial plants, landfills, mines and quarries
6. Parks/Recreation–designated open space areas for the enjoyment of the public
7. Residential–rural and developed residential property including single- and multiple-family dwellings
8. Rural–low-density residential or commercial property on lots larger than five acres
9. Transportation–roads and railroads that are crossed by the Project LOD
10. Unclassified–no category assigned by the county appraisal district
11. Utilities–ROW owned by utility companies for conveyance of utilities, including electricity, water and energy products

[11] City of Houston, "Plan Houston: Opportunity. Diversity. Community. Home," 2015.

12. Vacant–non-developed land
13. Water Features–lakes, ponds and major waterbodies

Additional data was obtained from the City of Dallas, NCTCOG, H-GAC and TPWD to correctly identify land use classifications of properties with non-descript state land use codes. Study Area soil data was obtained from the 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 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 four 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 Build Alternatives.

#### *3.13.3.3.1 Existing Land Use*

Specific land use information within a half-mile wide area (a quarter-mile on either side of the HSR track centerlines) 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 Build Alternatives. 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 Build Alternatives. 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 the 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 the TPWD.

NRCS mapped soil data was 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. Should compliance with the Agricultural Act of 2014 apply, NRCS would use this data to determine if the Study Area contains and would potentially convert prime, unique, statewide or locally important farmland.

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 or impacts such as induced wind 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. The 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. FRA received a prime farmland report from NRCS on September 9, 2016 (included in **Appendix C, Agency Correspondence**) with county scores ranging from 67 to 153; therefore, no further coordination with NRCS regarding prime farmland is required.[12]

[12] U.S. Department of Agriculture/Natural Resources Conservation Service. (September 9, 2016)

In addition, farmland parcels bisected by the Build Alternatives 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 Build Alternatives, 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 a number of factors including the displacement of structures in or within proximity of the LOD, percentage of the overall parcel impacted by the LOD, lack of or 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 purpose of this analysis, structures were identified through aerial photography as distinct rooftops and then given one of seven general classifications. These were then identified as primary or secondary features.

- Primary structures:
    1. commercial
    2. community facilities
    3. cultural resources
    4. residences
    5. transportation/utility infrastructure
    6. oil/gas wells
- Secondary structures:
    7. barns/sheds

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

Displacement
A displacement occurred when a structure was directly impacted by the LOD or within 50 feet of the LOD. Both primary and secondary structures could be deemed displaced. If a primary structure was deemed a displacement, the parcel would be deemed a take, as outlined in the parcel acquisition scenarios in **Table 3.13-2**. An exception to this rule, however, was made for primary businesses located along Hempstead Road in Harris County because the proposed LOD is located within existing ROW. If a secondary structure was deemed displaced, it would not automatically react in a full acquisition of the parcel.

Acquisition
An acquisition occurred when a structure is more than 50 feet from the LOD, but located on a parcel that would be deemed a take, as outlined in the parcel acquisition scenarios in **Table 3.13-2**. Both primary and secondary structures could be deemed an acquisition.

**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 is estimated at the parcel level. A remnant is defined as a parcel bisected by the Build Alternatives 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 remain.

Land/parcel acquisition was also classified as either permanent or temporary acquisition (i.e., leased) depending on the duration of impact. Permanent acquisition would occur for parcels within the HSR ROW, while parcels within temporary construction areas would be leased or temporarily acquired. There are four categories of anticipated property 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

Details on these four categories are included in **Appendix E, Land Use Technical Memorandum.**

**Table 3.13-2** illustrates the scenarios that define a land/parcel acquisition (or take):

<table>
<tr><th colspan="2">Table 3.13-2: Land Acquisition Scenarios</th></tr>
<tr><td>Full take. Any primary structure (see red circle in accompanying image) located within the LOD, or within a standard 50-foot setback of the LOD, was classified as a potential acquisition of the entire parcel, regardless of size.<br><br>A 50-foot setback is generally used as a distance between the front of a residence and a road.</td><td><br>Primary Structure is within LOD<br><br>Primary Structure is within 50 feet of LOD</td></tr>
</table>

| Table 3.13-2: Land Acquisition Scenarios | |
|---|---|
| **Full take.** If the LOD would impact more than 30 percent of a parcel through a permanent LOD, temporary LOD, or both, it was classified as a potential acquisition of the entire parcel, regardless of size |  Permanent impact >30%. No structure affected. |
| **Partial Take.** If access to a parcel or a remnant would be blocked or impassable because the Build Alternatives would not be on viaduct in that location, the portion of the parcel without access would be classified as a potential acquisition |  Parcels are blocked by non-viaduct LOD. Access to majority of parcel is impeded. |
| **Full take.** If the cumulative impact from the LOD and remnant parcel would be greater than 30 percent, it was classified as a potential acquisition of the entire parcel |  LOD creates remnant parcel causing >30% of parcel to be inaccessible and dedicated to LOD. |

| Table 3.13-2: Land Acquisition Scenarios | |
|---|---|
| **Partial Take.** If the LOD impacted less than 30 percent of a parcel, potential acquisition was limited to the impacted area, and classified as a partial take |  Less than 30% of parcel is impacted. Partial take. |
| If LOD activity is confined to the existing right-of-way (i.e., US 290 in Harris County). This would not be a take and would be no impact to neighboring parcels. |  |

To be conservative and to avoid underestimating acquisitions and relocations, all residences and businesses on partially acquired parcels, including those that may ultimately be temporarily affected by construction, are counted as full acquisitions requiring relocation. This assumption allows for a worst-case assessment of potential property acquisition impacts. One exception includes mobile homes: if the parcel was large enough for the structure to be moved without being impeded by the LOD, the parcel was not deemed a full take.

It should be noted that potential land acquisition and easements would be subject to ROW negotiation by TCRR with the property owner. As a result of these negotiations, TCRR may acquire property beyond the LOD. These areas of acquisition cannot be identified at this time. The analysis of estimated potential land acquisition in this Draft 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 Build Alternatives and the surrounding area is depicted in **Appendix D, Land Use Mapbook**. **Table 3.13-3** below summarizes the land ownership that would be crossed by the Build Alternative segments. The majority of the Build Alternatives would cross private land. Lands under local/state or federal jurisdictions would be minimal. These lands are typically owned or managed by TxDOT, TPWD or local governments (city or county). Notable amounts of local/state land associated with Fort Boggy State Park would be crossed by Build Alternatives C and F in Leon County. Federally owned land would be limited to approximately 3,500 feet of USACE property (Bardwell Lake) on Segment 2B in Ellis County.

**Table 3.13-3: Summary of Land Ownership Crossed**

| County/Segment | Percent of Total Length | | | |
|---|---|---|---|---|
| | Private | Local/State | Federal | Total |
| **Dallas** | | | | |
| Segment 1 | 98.0% | 2.0% | - | **100%** |
| **Ellis** | | | | |
| Segment 1 | 100.0% | - | - | **100%** |
| Segment 2A | 98.9% | 1.1% | - | **100%** |
| Segment 2B | 98.9% | 1.1% | - | **100%** |
| Segment 3A | 99.5% | .5% | - | **100%** |
| Segment 3B | 99.1% | .9% | - | **100%** |
| Segment 3C | 99.5% | .5% | - | **100%** |
| **Navarro** | | | | |
| Segment 3A | 99.2% | 0.8% | - | **100%** |
| Segment 3B | 99.2% | 0.8% | - | **100%** |
| Segment 3C | 99.2% | 0.8% | - | **100%** |
| **Freestone** | | | | |
| Segment 3C | 48.3% | 50.7% | - | **100%** |
| Segment 4 | 99.3% | 0.7% | - | **100%** |
| **Limestone** | | | | |
| Segment 4 | 99.2% | 0.8% | - | **100%** |
| **Leon** | | | | |
| Segment 3C | 37.0% | 63.0% | - | **100%** |
| Segment 4 | 99.3% | 0.7% | - | **100%** |
| **Madison** | | | | |
| Segment 3C | 90.4% | 9.6% | - | **100%** |
| Segment 4 | 98.9% | 1.1% | - | **100%** |
| **Grimes** | | | | |
| Segment 3C | 99.7% | .3% | - | **100%** |
| Segment 4 | 99.7% | 0.3% | - | **100%** |
| Segment 5 | 99.3% | 0.7% | - | **100%** |
| **Waller** | | | | |
| Segment 5 | 99.3% | 0.7% | - | **100%** |
| **Harris** | | | | |
| Segment 5 | 82.0% | 18.0% | - | **100%** |
| **Houston Terminal Options** | | | | |
| Industrial Site | 44.0% | 56.0% | - | **100%** |
| Northwest Mall | 33.6% | 66.4% | - | **100%** |
| Northwest Transit Center | 45.5% | 54.5% | - | **100%** |

Source: TxDOT 2015, Freestone CAD 2016, Madison CAD 2011, Harris CAD 2015, CLS 2017

**Table 3.13-4** 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 3.13.4.1**. Of the nearly 130,000 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.

**Table 3.13-4: Existing Land Use within One-Half Mile Study Area in Acres**

| County/ Segment | Agriculture | Commercial | Industrial | Residential | Rural | Transportation | Civic | Parks/Recreation | Utilities | Forested Areas | Water Features | Vacant | Unclassified | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dallas** | | | | | | | | | | | | | | |
| Segment 1* | 1,517.8 | 1,951.7 | 239.8 | 298.7 | 205.7 | 760.2 | 29.9 | 147.5 | 94.4 | - | 75.2 | 107.9 | 5.8 | **5,434.5** |
| **Ellis** | | | | | | | | | | | | | | |
| Segment 1 | 343.7 | 0.7 | - | 79.5 | 33.9 | 10.1 | - | 3.8 | - | - | - | 5.4 | - | **477.1** |
| Segment 2A | 6,634.2 | 9.0 | - | 398.7 | 264.0 | 64.1 | 5.2 | 29.1 | - | - | - | 67.0 | - | **7,471.4** |
| Segment 2B | 6,330.2 | 13.4 | - | 388.2 | 180.0 | 61.7 | - | 217.7 | - | - | - | 72.0 | - | **7,263.2** |
| Segment 3A | 684.9 | - | - | - | - | 1.3 | - | - | - | - | - | - | - | **686.2** |
| Segment 3B | 683.1 | - | - | - | - | 1.5 | - | - | - | - | - | - | - | **684.6** |
| Segment 3C | 684.9 | - | - | - | - | 1.3 | - | - | - | - | - | - | - | **686.2** |
| **Navarro** | | | | | | | | | | | | | | |
| Segment 3A | 8,968.6 | - | - | 7.5 | - | 184.3 | 1.0 | - | - | - | - | - | 7.9 | **9,169.3** |
| Segment 3B | 8,826.5 | - | - | 193.9 | - | 181.1 | 13.4 | - | - | - | - | 59.0 | - | **9,273.9** |
| Segment 3C | 9,151.7 | 0.2 | - | 39.8 | - | 151.4 | 1.0 | - | 16.5 | - | - | - | 6.5 | **9,367.1** |
| **Freestone** | | | | | | | | | | | | | | |
| Segment 3A | 8.0 | - | - | - | - | - | - | - | - | - | - | - | - | **8.0** |
| Segment 3B | 8.0 | - | - | - | - | - | - | - | - | - | - | - | - | **8.0** |
| Segment 3C | 8,273.9 | 222.2 | 71.2 | 101.4 | - | 1,,669.9 | 21.6 | - | 4.5 | - | - | 62.6 | - | **10,427.2** |
| Segment 4 | 6,241.9 | 2.1 | - | 18.2 | - | 91.7 | 6.8 | - | 76.8 | - | - | 2.1 | 6.4 | **6,446.1** |
| **Limestone** | | | | | | | | | | | | | | |
| Segment 4 | 3,490.9 | - | - | 274.2 | 7.1 | 0.9 | - | - | 0.4 | - | 14.8 | - | 9.3 | **3,797.5** |
| **Leon** | | | | | | | | | | | | | | |
| Segment 3C | 4,548.5 | 103.2 | - | 422.3 | 144.3 | 1,702.8 | - | 493.5 | 2.0 | 215.4 | - | 438.8 | 1030.3 | **9,101.1** |
| Segment 4 | 6,559.3 | - | - | 161.5 | 725.8 | 92.3 | - | - | - | 103.8 | - | 737.1 | 457.6 | **8,837.3** |
| **Madison** | | | | | | | | | | | | | | |
| Segment 3C | 5,145.9 | 3.4 | - | 75.7 | 132.4 | 241.0 | - | - | - | - | - | 56.7 | 0.2 | **5,655.4** |
| Segment 4 | 4,497.9 | - | - | 49.1 | 118.0 | 105.9 | - | - | - | - | - | 95.6 | - | **4,866.4** |
| **Grimes** | | | | | | | | | | | | | | |
| Segment 3C | 1,026.2 | - | - | - | - | 2.0 | 7.6 | - | - | - | - | - | - | **1,035.8** |
| Segment 4* | 1,021.1 | - | - | - | - | 2.1 | - | - | - | - | - | - | - | **1,023.3** |
| Segment 5 | 1,0857.8 | 1.0 | 8.2 | 296.1 | 549.1 | 262.7 | 6.9 | - | 0.7 | 1.9 | 563.3 | - | - | **12,547.6** |
| **Waller** | | | | | | | | | | | | | | |
| Segment 5 | 2,150.6 | 19.6 | - | 283.1 | 110.9 | 58.8 | 2.0 | - | 12.4 | 106.8 | - | 67.7 | 1.4 | **2,813.2** |

**Table 3.13-4: Existing Land Use within One-Half Mile Study Area in Acres**

| County/ Segment | Agriculture | Commercial | Industrial | Residential | Rural | Transportation | Civic | Parks/Recreation | Utilities | Forested Areas | Water Features | Vacant | Unclassified | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Harris** | | | | | | | | | | | | | | |
| Segment 5* | 5,459.5 | 2,363.1 | 302.0 | 695.9 | - | 1,541.2 | 424.6 | 7.7 | 51.4 | - | - | 732.3 | 13.4 | **11,591.0** |
| **Total** | **103,099.1** | **4,689.6** | **621.2** | **3,783.8** | **2,471.2** | **7,188.3** | **520** | **899.3** | **259.1** | **427.9** | **653.3** | **2,504.2** | **1,538.8** | |

Source: Dallas CAD 2016, Ellis CAD 2016, Navarro CAD 2016, Freestone CAD 2016, Limestone CAD 2016, Leon CAD 2016, Madison CAD 2011, Grimes CAD 2016, Waller CAD 2016, Harris CAD 2011, CLS 2017

* Includes a portion of the Dallas and Brazos Valley station area acreage; Houston Terminal option land use is described in Table 3.13-3

#### *3.13.4.1.1 Station Area Land Use*

**Table 3.13-5** summarizes the land use classifications within one-half mile of a center point for each station option.

**Table 3.13-5: Existing Land Use within One-Half Mile of Station in Acres**

| Stations | Agriculture | Commercial | Industrial | Residential | Civic | Rural | Transportation | Water Features | Parks/Recreation | Utilities | Vacant | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dallas Terminal Station* | 2.5 | 183.7 | 4.3 | 8.5 | 59.0 | - | 164.0 | 19.7 | 56.5 | 4.0 | 0.27 | 502.6 |
| Brazos Valley Station* | 444.2 | - | - | 4.1 | - | 41.0 | 12.0 | - | - | - | 1.3 | 502.6 |
| Houston Terminal Options | | | | | | | | | | | | |
| Industrial Site | -- | 188.5 | 51.1 | 86.7 | 55.7 | - | 80.0 | - | - | - | 40.6 | 502.6 |
| Northwest Mall | -- | 153.0 | 53.3 | 25.2 | 73.4 | - | 137.4 | - | - | 0.6 | 59.6 | 502.6 |
| Northwest Transit Center | - | 183.9 | 21.7 | 25.6 | 94.5 | - | 128.0 | - | - | - | 48.9 | 502.6 |

Source: Dallas CAD 2016, Grimes CAD 2016, Harris CAD 2015, CLS 2017
*Acreages for these stations are included as part of the respective segment within Table 3.13-2

**Dallas Terminal Station Option**

The area surrounding the Dallas Terminal Station option is loosely organized around a northwest/southeast street grid. The terminal site 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.

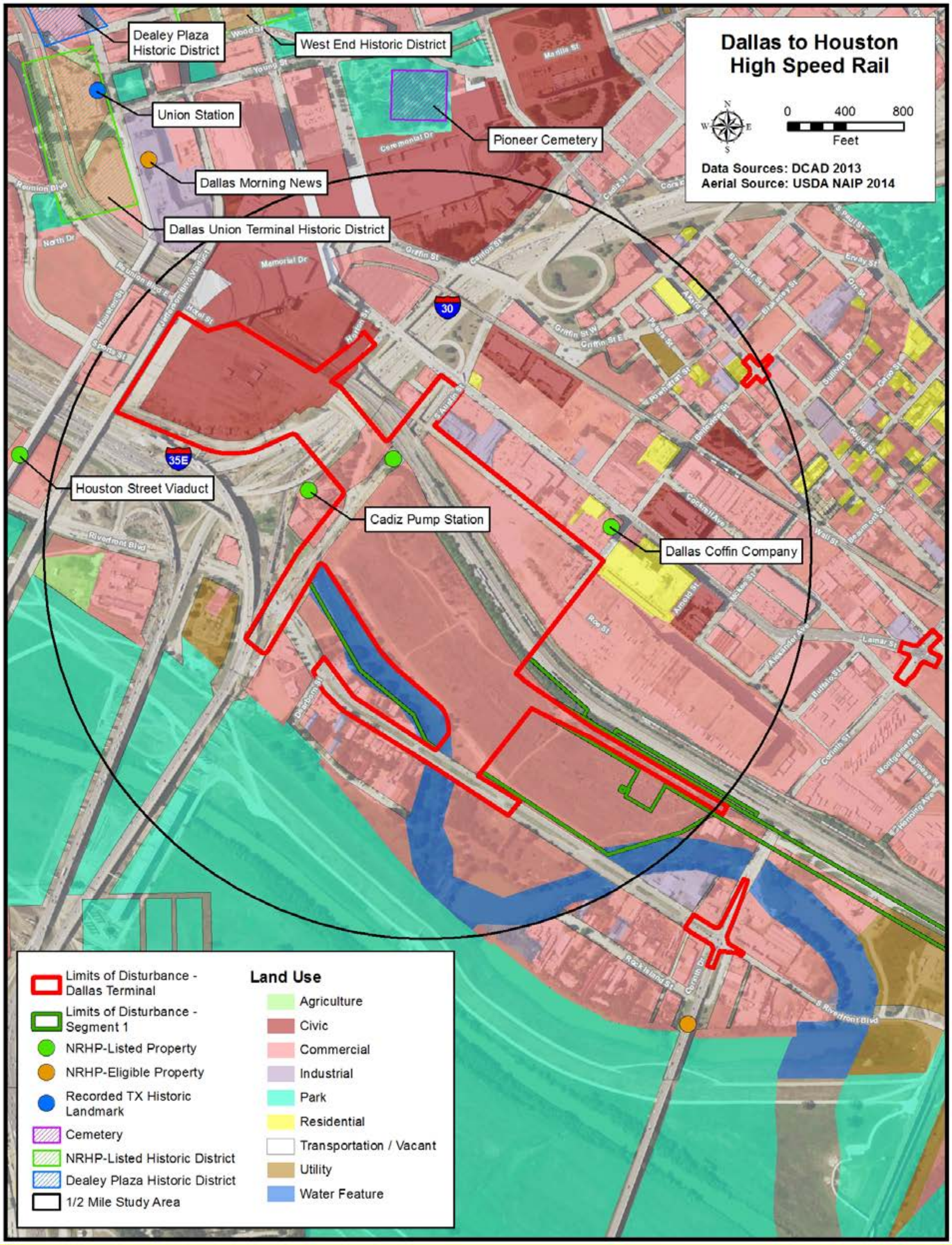
As shown in **Table 3.13-3**, existing land use within one-half mile of the Dallas Terminal Station option primarily consists of a mix of residential, commercial and transportation uses. The character of the existing site is vacant/open space, while the character of the surrounding area can generally 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 Study Area. See **Figure 3.13-1** for a depiction of the existing land uses around the Dallas Terminal.

Zoning at and around the Dallas Terminal 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, but is to the south of the LOD for the proposed Dallas Terminal. 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."[13] 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.[14] See **Figure 3.13-2** for a depiction of the existing zoning around the Dallas Terminal.

There are two special purpose districts within the Study Area. The Cedars Area Special Purpose District is north of the Dallas Terminal 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.[15] The Trinity River Corridor Special Purpose District is south of the Dallas Terminal and has been designated to guide land use and development in the corridor through form-based zoning.[16]This District was approved by Ordinance Number 27331 on September 24, 2008.[17] See **Figure 3.13-2** for a depiction of the existing special purpose districts around the Dallas Terminal.

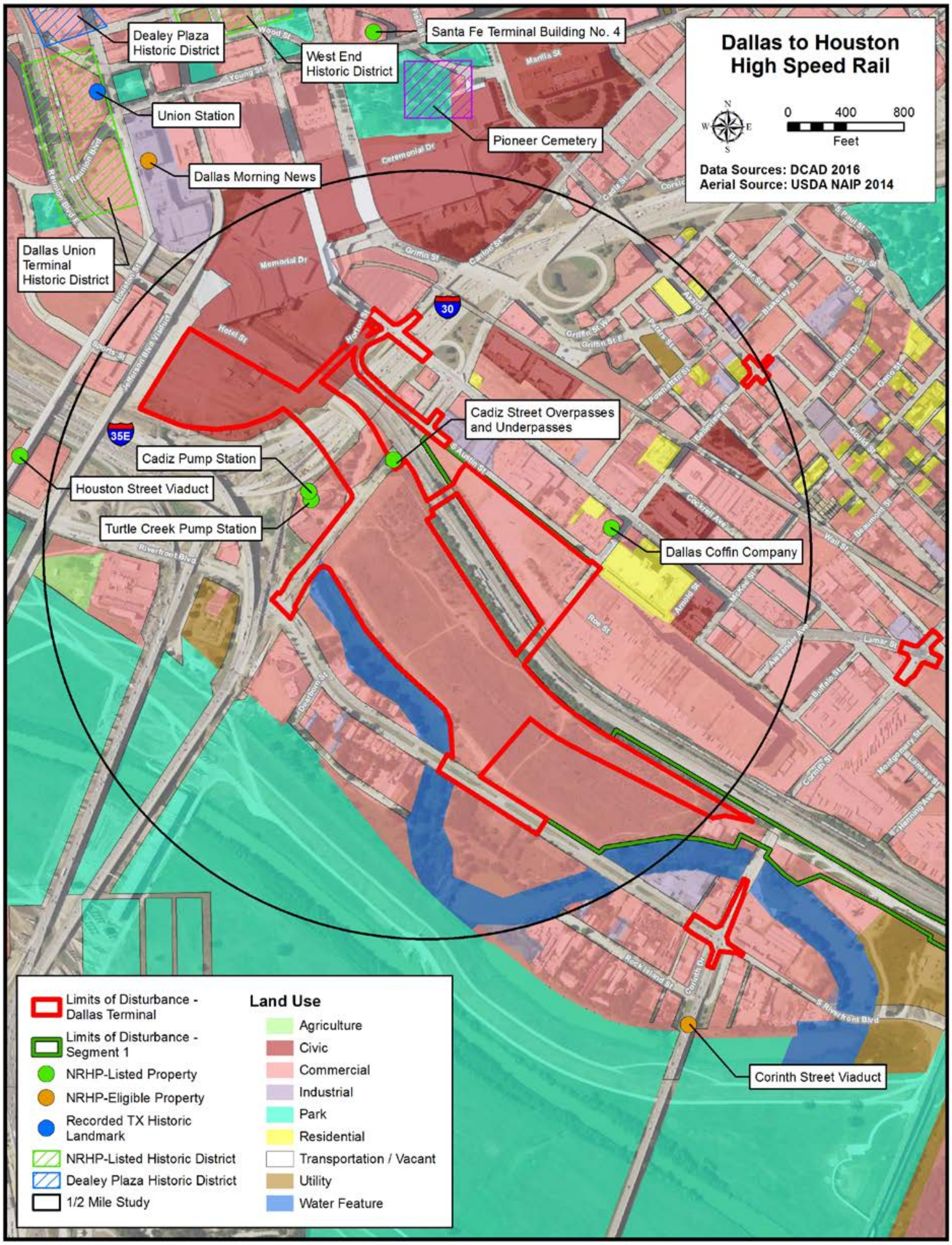
[13] City of Dallas Planned Development, Article 800, SEC. 51P-800.108. MAIN USES PERMITTED, October 22, 2008.
[14] City of Dallas, Dallas Development Code, Ordinance No. 10962. Article 4 Zoning Regulations. Division 51-4.100, June 12 2013.
[15] City of Dallas, Dallas Development Code, Ordinance No. 20395. Article 317, PD 317, Cedars Area Special Purpose District, July 26 1989.
[16] 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/
[17] City of Dallas, Dallas Development Code, Ordinance No. 27331. Article 784, PD 784, Trinity River Corridor Special Purpose District, 2008.

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




Source: AECOM, 2017

**Figure 3.13-2: Dallas Terminal Area Zoning**

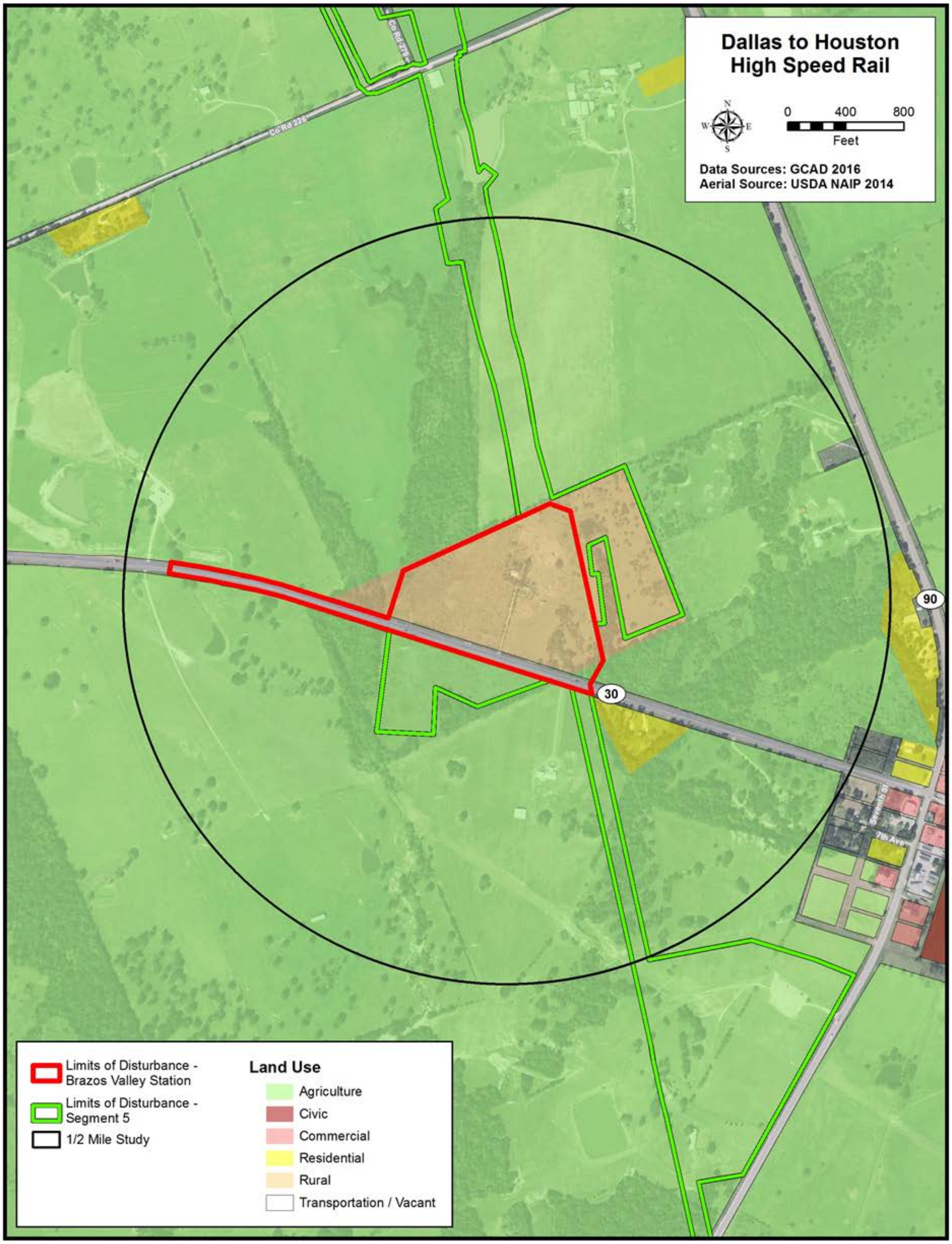



Source: AECOM, 2017

### Brazos Valley Station

The area surrounding the Brazos Valley Station is mainly agricultural, with a small amount of rural land use near the unincorporated community of Roans Prairie. **Table 3.13-3** provides a breakdown of the existing land uses around the Brazos Valley 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. **Figure 3.13-3** depicts existing land uses around the Brazos Valley Station.

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




Source: AECOM, 2017

**Houston Terminal Station Options**

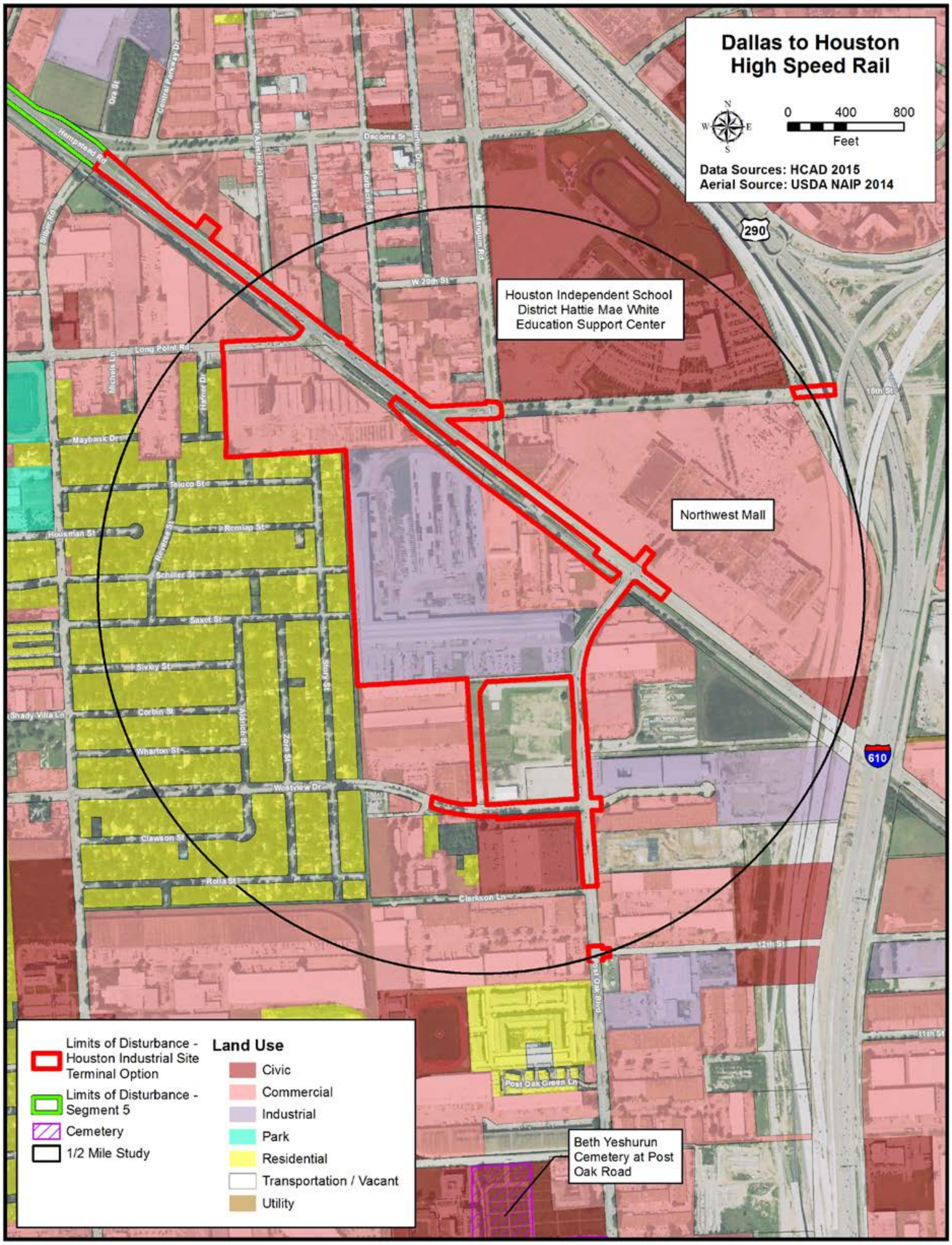
Houston does not use zoning to regulate development, but rather site development plan codes. These are utilized to check for compliance with regulations that include property subdivision, parking, tree and shrub requirements, setbacks and access. The site development plan codes outlined in Chapter 42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

**Houston Industrial Site Terminal Station Option**—The area surrounding the Houston Industrial Site Terminal 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 eight miles northwest of downtown Houston. **Table 3.13-3** provides a breakdown of the existing land uses around the Houston Industrial Site Terminal 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 Option.

**Houston Northwest Mall Terminal Station Option**—The area surrounding the Houston Northwest Mall Terminal 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 eight miles northwest of downtown Houston. **Table 3.13-3** provides a breakdown of the existing land uses around the Houston Northwest Mall Terminal 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 Option.

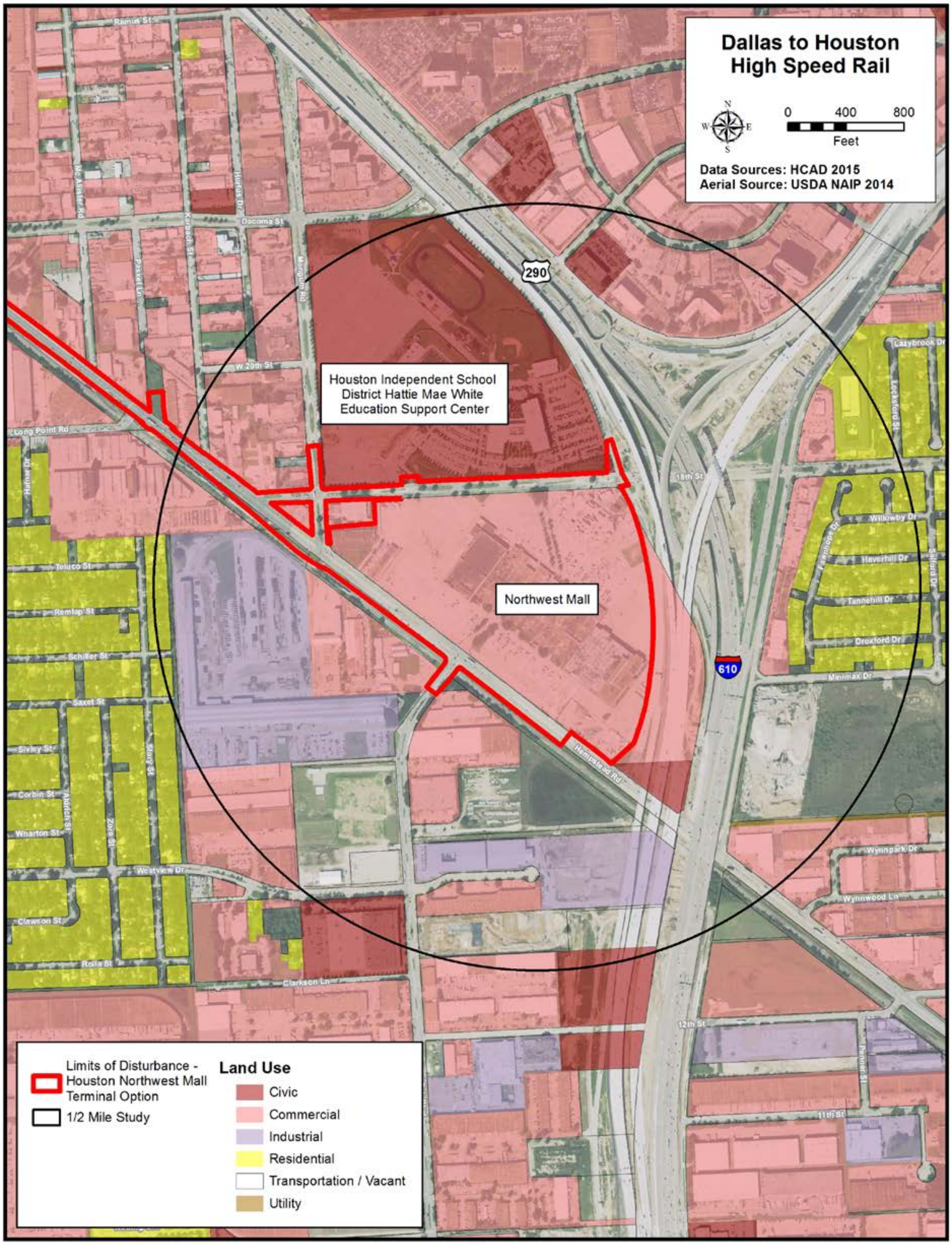
**Houston Northwest Transit Center Terminal Station Option**—The area surrounding the Houston Northwest Transit Center Terminal Option is also loosely organized around a north/south street grid. The terminal site would be bound by Post Oak Road on the west, West 12th Street on the north, IH-610 on the east and IH-10 and the Northwest Transit Center to the south. The terminal area would be approximately eight miles northwest of downtown Houston. **Table 3.13-3** provides a breakdown of the existing land uses around the Houston Northwest Transit Center Terminal Option. Existing land use within the Study Area primarily consists of a mix of commercial, transportation and civic uses. The character of the terminal option 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 Option.

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



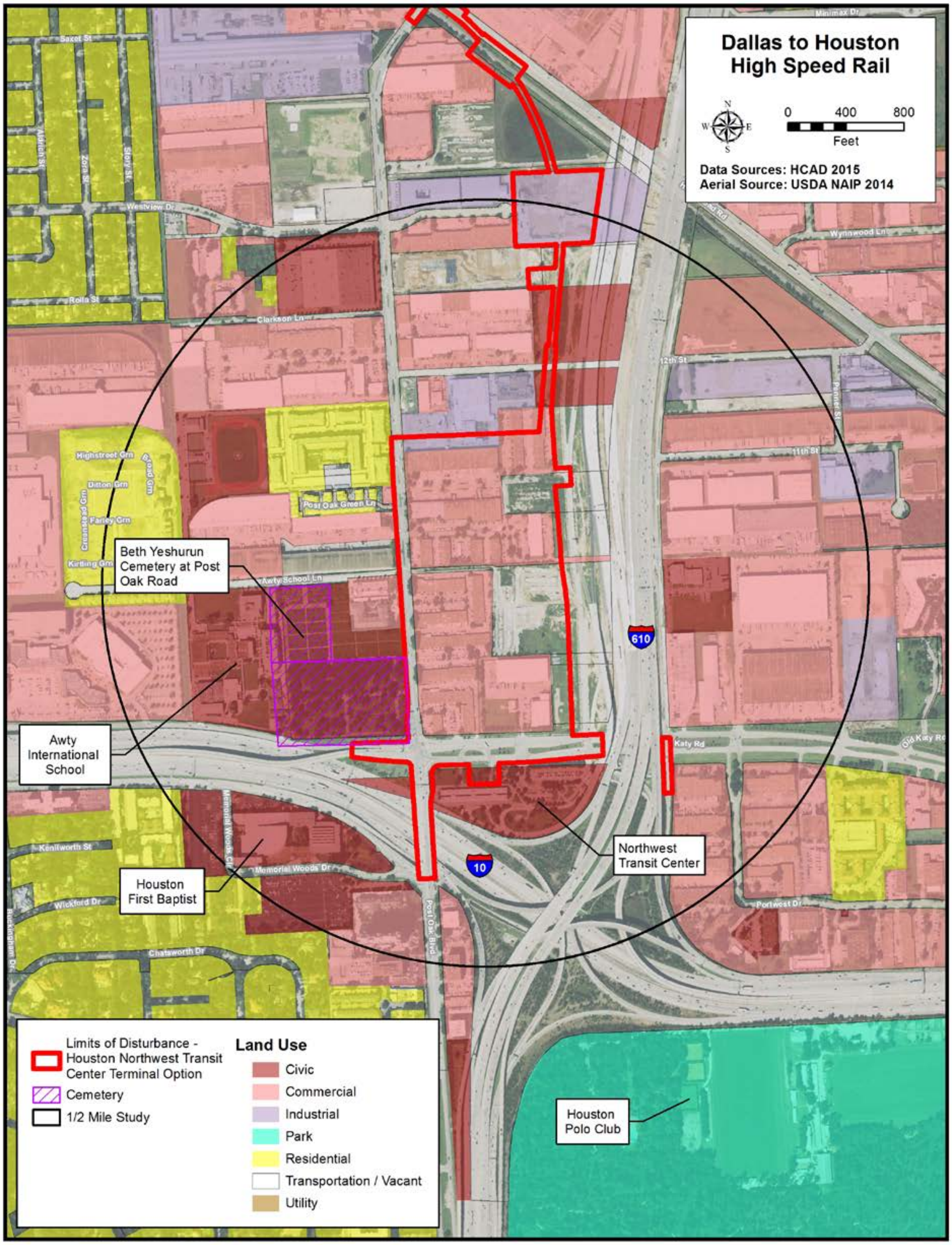

Source: AECOM, 2017

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




Source: AECOM, 2017

## Figure 3.13-6: NW Transit Center Terminal Station Option Area Existing Land Use




Source: AECOM, 2017

### 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 2012, the Texas population increased from 19 million to 26 million residents, an increase of 36 percent or nearly 500,000 new residents annually. The majority (87 percent) 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 16-year period led to a net loss of approximately 1.1 million acres of agricultural lands in Texas that were converted to non-agricultural uses. The rate of conversion slowed from 2007 to 2012, most likely due to the economic recession that occurred during this period. However, during the same 16-year period, Texas gained about 1,400 new working farms/ranches annually, but the average ownership size declined from 581 acres in 1997 to 521 acres in 2012.[18]

#### *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 2012 Texas Census of Agriculture, there were nearly 250,000 farms spread over 130 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 2012 was over $25 billion, with crops accounting for $7 billion and livestock accounting for $18 billion. The top five commodities in 2012 were cattle, grains/oilseeds/dry beans/dry peas, chickens, milk and cotton.[19]

The counties in the Study Area were also substantial agricultural producers in 2012, as seen in the Texas Census of Agriculture. **Table 3.13-6** provides additional details regarding agriculture statistics in Texas and in the 10 counties in the Study Area.

[18] Texas A&M University, "Texas Land Trends, Status Update and Trends of Texas Rural Working Lands," Institute of Renewable Natural Resources. October 2014.

[19] USDA, "2012 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: 2012 and 2007. May 2014.

**Table 3.13-6: 2012 Agricultural Statistics**

| | Total Farms [1] | Land in Farms (acres) [1] | Average Size (acres) [1] | Percent Cropland (of land in farms) [1] | Percent Pastureland (of land in farms) [1] | Estimated Market Value of Land & Buildings (per acre) [1] | Total Cropland (acres) [1] | Top Crop [1] | Market Value of Crops Sold ($000s) [1] | Top Livestock [1] | Market Value of Livestock Sold ($000s) [1] | County Rank within Texas (of 254 Counties) [2] | Land Enrolled in Conservation (acres) [1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Texas | 248,809 | 130,153,438 | 523 | 22.4 | 69.4 | $1,676 | 29,147,537 | Cotton | $7,366,993 | Beef Cows | $18,008,588 | N/A | 3,203,342 |
| Dallas | 839 | 83,754 | 100 | 42.9 | 43.9 | $4,611 | 35,936 | Wheat | $38,198 | Beef Cows | $6,292 | 134 | 2,511 |
| Ellis | 2,264 | 473,860 | 209 | 47.4 | 46.9 | $3,181 | 224,446 | Corn | $67,356 | Beef Cows | $24,034 | 60 | 3,297 |
| Navarro | 2,573 | 558,096 | 217 | 26.2 | 61.6 | $2,053 | 146,074 | Sunflower Seed | $31,422 | Beef Cows | $34,955 | 93 | 4,298 |
| Freestone | 1,517 | 421,303 | 278 | 11.2 | 65.3 | $2,100 | 47,139 | Forage | $5,769 | Beef Cows | $38,313 | 135 | 355 |
| Limestone | 1,526 | 486,787 | 319 | 16.6 | 67.9 | $1,891 | 80,867 | Corn | $12,346 | Beef Cows | $35,938 | 119 | 1,345 |
| Leon | 1,962 | 594,393 | 303 | 12.5 | 54.9 | $2,506 | 74,011 | Forage | $9,970 | Chickens | $138,770 | 30 | N/A |
| Madison | 970 | 291,350 | 300 | 12.1 | 68.7 | $2,799 | 35,322 | Forage | N/A | Chickens | N/A | 69 | N/A |
| Grimes | 1,683 | 417,142 | 248 | 13.6 | 65.9 | $3,865 | 56,734 | Forage | $11,057 | Chickens | $36,996 | 120 | N/A |
| Waller | 1,927 | 314,981 | 163 | 25.4 | 61.0 | $6,245 | 79,906 | Corn | $70,397 | Beef Cows | $21,280 | 59 | 202 |
| Harris | 2,207 | 236,402 | 107 | 25.3 | 59.5 | $5,342 | 59,879 | Forage | $47,426 | Beef Cows | $17,763 | 96 | 2,618 |

Source:
1. USDA "2012 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: 2012 and 2007. May 2014.
2. USDA "2012 Census of Agriculture County Profile Sheets" for Dallas, Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes, Waller and Harris counties.

Notes:
N/A – not available
Forage – land used for all hay and all haylage, grass silage and greenchop

Based on the 2012 data, detailed in **Table 3.13-6**, the total acreage of farms in the 10-county Study Area is almost 3.8M, which is approximately three percent of the total acres of farms in Texas. The average farm size in the Study Area is 224 acres, which is less than half the size of the average Texas farm at 523 acres. The total market value of crops sold in the 10-county Study Area was approximately $294M, which represents approximately 4 percent of the total market value of crops sold in Texas, which was $7.4B.

The contribution of the Study Area 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 in the Study Area rank in the top 25 percent of all Texas counties in agricultural production value. The highest-ranking county in the Study Area in terms of agricultural production is Leon County, which ranked 30 of all 254 Texas counties, while the lowest-ranking county in the Study Area was Freestone at 135.

#### *3.13.4.2.2 <u>Livestock</u>*

Livestock are animals kept or raised for use or profit, and are common throughout the Study Area, particularly in the rural counties. As previously shown in **Table 3.13-6**, 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-county Study Area in 2012 was $354M, which represents approximately 2 percent of the total market value of livestock sold in Texas, which was $18B. The contribution of the Study Area to the livestock production of Texas as a whole is small in comparison to the remainder of the state.

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 found to exist. However, chicken farms are known to be located within the Study Area.

#### *3.13.4.2.3 <u>Special-Status Farmlands and Agricultural Conservation Easements</u>*

As defined in the methodology, special status farmlands include prime farmland, unique, statewide or locally important farmland. **Table 3.13-7** 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 62,000 acres of special-status farmland in the Study Area, while there are more than 2.3 million acres in the 10 counties in the Study Area. There are a total of nearly 35,100 acres of prime farmland and about 25,700 acres of farmland of statewide importance in the Study Area. This compares against nearly 1.28 million acres of prime farmland and about 983,600 acres of farmland of statewide importance within all 10 counties in the Study Area.

As detailed in **Table 3.13-6**, land enrolled in agricultural conservation easements totaled 14,626 acres within all 10 counties in the Study Area.[20] As previously noted in **Section 3.13.2.1**, 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.[21] Easements can range from permanent to term-limited and include specific limitations, such as development restrictions, as agreed

[20] USDA, "2012 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: 2012 and 2007. May 2014.
[21] USDA, NRCS, Agricultural Conservation Easement Program, March 2014.

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 Build Alternatives, which is located in Harris County. The half-mile study area intersects approximately 22 acres of this conservation easement, as shown in **Figure 3.13-7**.

**Table 3.13-7: Special-Status Farmland within a Quarter Mile of Project Build Alternative Centerlines in Acres**

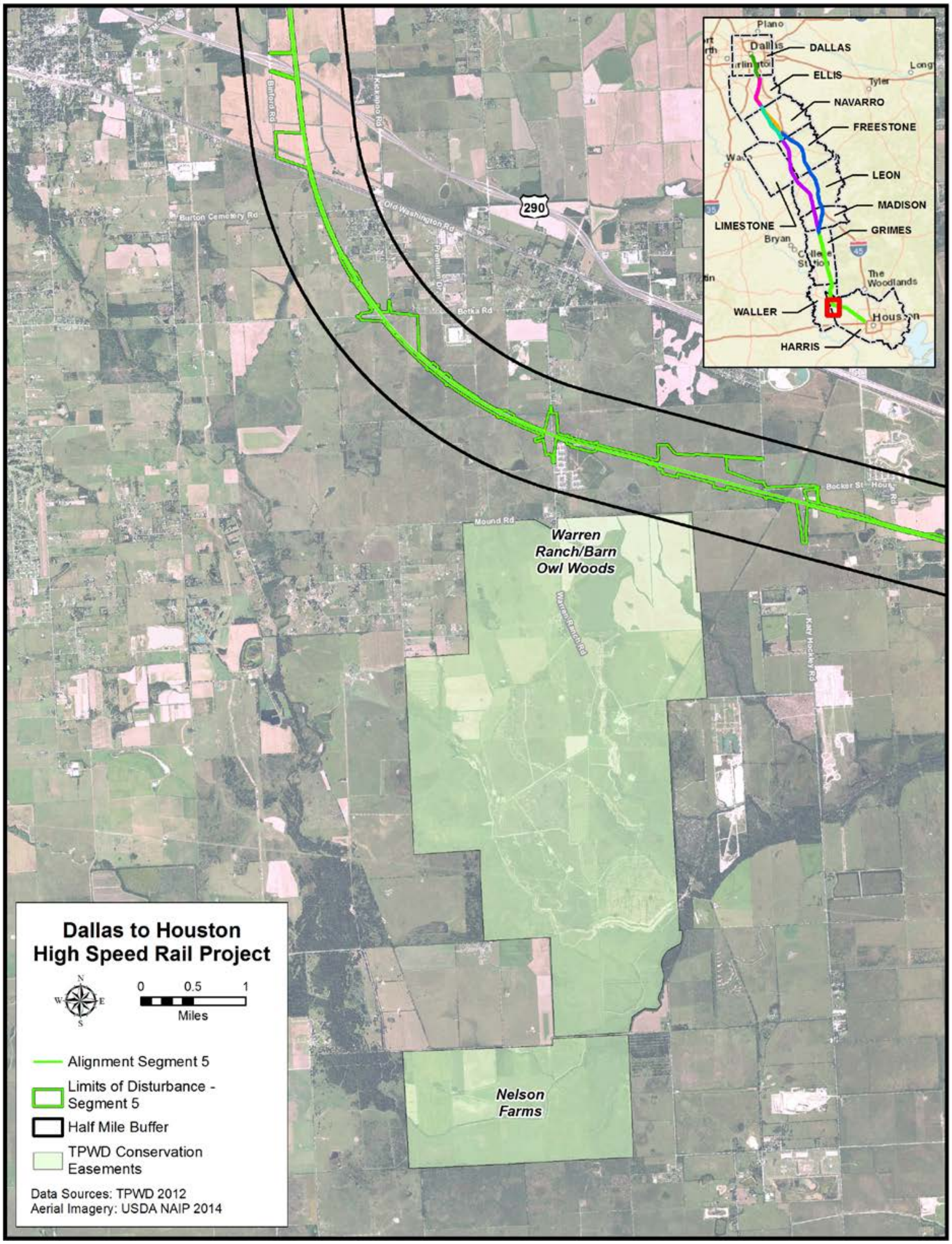
| County/Segment | Prime Farmland | Farmland of Statewide Importance | Prime Farmland if Drained | Total Special-Status Farmland |
|---|---|---|---|---|
| **Dallas** | | | | |
| Countywide | 89,118.7 | 31,424.4 | - | **120,543.2** |
| Segment 1 | 1,110.9 | 219.4 | - | **1,330.2** |
| **Ellis** | | | | |
| Countywide | 210,561.1 | 69,305.0 | - | **279,866.1** |
| Segment 2A | 4,860.2 | 23.9 | - | **4,884.1** |
| Segment 2B | 4,491.4 | 36.2 | - | **4,527.6** |
| Segment 3A | 600.6 | 27.6 | - | **628.2** |
| Segment 3B | 607.6 | 22.2 | - | **629.8** |
| Segment 3C | 600.6 | 27.6 | - | **628.2** |
| **Navarro** | | | | |
| Countywide | 118,090.5 | 257,451.8 | - | **375,542.3** |
| Segment 3A | 2,196.6 | 3,368.3 | - | **5,564.9** |
| Segment 3B | 2,530.9 | 3,903.1 | - | **6,433.9** |
| Segment 3C | 2,110.6 | 2,921.0 | - | **5,031.5** |
| Segment 4 | - | 0.4 | - | **0.4** |
| **Freestone** | | | | |
| Countywide | 51,198.3 | 126,871.3 | - | **178,069.6** |
| Segment 3A | - | 0.8 | - | **0.8** |
| Segment 3B | - | 0.8 | - | **0.8** |
| Segment 3C | 785.3 | 3,381.2 | - | **4,166.5** |
| Segment 4 | 548.1 | 2,826.2 | - | **3,374.2** |
| **Limestone** | | | | |
| Countywide | 113,313.1 | 202,703.8 | - | **316,016.9** |
| Segment 4 | 1,213.8 | 385.2 | - | **1,599.1** |
| **Leon** | | | | |
| Countywide | 93,052.2 | 41,093.4 | 2,169.8 | **136,315.4** |
| Segment 3C | 1,096.0 | 721.1 | - | **1,817.1** |
| Segment 4 | 2,088.5 | 717.8 | - | **2,806.3** |
| **Madison** | | | | |
| Countywide | 71,003.1 | 58,585.9 | - | **129,588.9** |
| Segment 3C | 1,478.0 | 1,187.9 | - | **2,666.0** |
| Segment 4 | 1,434.0 | 1,452.7 | - | **2,886.7** |
| **Grimes** | | | | |
| Countywide | 381,938.3 | 65,823.9 | 52.8 | **447,815.0** |
| Segment 3C | 10.4 | 109.8 | - | **120.1** |
| Segment 4 | 22.3 | 64.8 | - | **87.1** |
| Segment 5 | 1,470.0 | 3,240.7 | 9.7 | **4,720.5** |
| **Waller** | | | | |
| Countywide | 175,671.5 | 49,955.1 | 8,451.0 | **234,077.5** |
| Segment 5 | 995.7 | 157.7 | - | **1,153.4** |

**Table 3.13-7: 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 |
|---|---|---|---|---|
| **Harris** | | | | |
| Countywide | 65,675.2 | 111,024.5 | 56,896.3 | **233,596.0** |
| Segment 5 | 4,561.9 | 933.6 | 1,171.5 | **6,667.0** |
| **Total Counties** | **1,280,503.3** | **982,814.3** | **59,118.8** | **2,322,436.4** |
| **Total within Study Area** | **35,129.8** | **25,730.0** | **1,181.2** | **62,071.0** |
| Houston Terminal 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, 2013; Ellis, and Limestone Counties: NRCS, 2015

**Figure 3.13-7: Agricultural Conservation Easement Land Area**




Source: AECOM, 2016

### 3.13.4.3 Structures and Land

**Table 3.13-8** identifies the number and type of structures within 200 feet of the LOD. As described in **Section 3.13.4.2, Methodology**, 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.

**Table 3.13-8: Structures within 200 Feet of LOD**

| County/Segment | Agriculture | Commercial | Community Facilities | Civic | Cultural Resources | Oil/Gas | Residential | Transportation /Utilities | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Dallas** | | | | | | | | | |
| Segment 1 | 72 | 116 | 3 | 3 | - | - | 73 | 4 | **271** |
| **Ellis** | | | | | | | | | |
| Segment 1 | 10 | - | - | - | - | - | 18 | - | **28** |
| Segment 2A | 71 | 4 | - | - | - | - | 54 | - | **129** |
| Segment 2B | 67 | 1 | - | - | - | 1 | 48 | 2 | **119** |
| Segment 3A | 1 | - | - | - | - | - | 3 | - | **4** |
| Segment 3B | 3 | - | - | - | - | - | 4 | - | **7** |
| Segment 3C | 1 | - | - | - | - | - | 3 | - | **4** |
| **Navarro** | | | | | | | | | |
| Segment 3A | 56 | - | 2 | - | - | - | 29 | 1 | **88** |
| Segment 3B | 104 | - | - | 3 | - | 1 | 82 | - | **190** |
| Segment 3C | 55 | - | 2 | - | - | - | 32 | 1 | **90** |
| **Freestone** | | | | | | | | | |
| Segment 3C | 29 | 40 | 3 | - | - | 22 | 24 | 2 | **120** |
| Segment 4 | 40 | - | - | - | 1 | 1 | 19 | - | **61** |
| **Limestone** | | | | | | | | | |
| Segment 4 | 27 | - | - | - | - | 19 | 11 | - | **57** |
| **Leon** | | | | | | | | | |
| Segment 3C | 45 | 21 | 1 | - | - | 2 | 40 | 5 | **114** |
| Segment 4 | 54 | - | - | - | - | 14 | 26 | - | **94** |
| **Madison** | | | | | | | | | |
| Segment 3C | 23 | 4 | - | - | - | 5 | 12 | - | **44** |
| Segment 4 | 53 | - | 1 | - | 1 | 8 | 38 | 2 | **103** |
| **Grimes** | | | | | | | | | |
| Segment 3C | 1 | - | - | - | - | - | 1 | - | **2** |
| Segment 4 | - | - | - | - | - | | 1 | - | **1** |
| Segment 5 | 134 | 6 | - | - | - | 2 | 85 | 1 | **228** |
| **Waller** | | | | | | | | | |
| Segment 5 | 47 | 2 | 1 | - | - | - | 72 | 4 | **126** |
| **Harris** | | | | | | | | | |
| Segment 5 | 53 | 334 | 13 | 5 | - | 2 | 278 | 2 | **687** |
| **Total** | **946** | **528** | **26** | **11** | **2** | **77** | **953** | **24** | **2,567** |
| **Houston Terminal Options** | | | | | | | | | |
| Industrial Site | 7 | 60 | - | 1 | - | - | 30 | 1 | **99** |
| Northwest Mall | - | 44 | 1 | - | - | - | - | - | **45** |
| Northwest Transit Center | - | 71 | - | - | 1 | - | 7 | 1 | **80** |

Source: AECOM 2017

**Table 3.13-9** identifies the number of parcels within the LOD. It should be noted that 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 would be 3,447 parcels that would be within the Study Area. Each Build Alternative would be comprised of approximately 2,280 parcels.

**Table 3.13-9: Parcels within LOD**

| 344County/Segment | Parcels | |
|---|---|---|
| | Count | Acres |
| **Dallas** | | |
| Segment 1 | 310 | 984.8 |
| **Ellis** | | |
| Segment 1 | 17 | 23.5 |
| Segment 2A | 194 | 985.1 |
| Segment 2B | 169 | 966.4 |
| Segment 3A | 19 | 123.9 |
| Segment 3B | 17 | 127.0 |
| Segment 3C | 19 | 123.9 |
| **Navarro** | | |
| Segment 3A | 193 | 1,155.9 |
| Segment 3B | 262 | 1,241.0 |
| Segment 3C | 189 | 1,156.3 |
| **Freestone** | | |
| Segment 3A | 1 | 0.4 |
| Segment 3B | 1 | 0.4 |
| Segment 3C | 243 | 1,352.4 |
| Segment 4 | 157 | 996.7 |
| **Limestone** | | |
| Segment 4 | 77 | 361.3 |
| **Leon** | | |
| Segment 3C | 155 | 1,382.9 |
| Segment 4 | 163 | 1,152.5 |
| **Madison** | | |
| Segment 3C | 94 | 602.0 |
| Segment 4 | 112 | 730.7 |
| **Grimes** | | |
| Segment 3C | 11 | 91.3 |
| Segment 4 | 13 | 80.0 |
| Segment 5 | 462 | 1,865.0 |
| **Waller** | | |
| Segment 5 | 134 | 305.6 |
| **Harris** | | |
| Segment 5 | 435 | 1,478.7 |
| **Total** | **3,447** | **17,287.8** |
| Northwest Transit Center | 69 | 101.1 |
| Industrial Site | 62 | 106.7 |
| Northwest Mall | 35 | 93.2 |

Source: Dallas CAD 2016, Ellis CAD 2016, Navarro CAD 2016, Freestone CAD 2016, Limestone CAD 2016, Leon CAD 2016, Madison CAD 2011, Grimes CAD 2016, Waller CAD 2016, Harris CAD 2015, CLS 2017

## 3.13.5 Environmental Consequences

As described in **Section 3.1**, 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 Build Alternatives. 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 2040* 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) to include intercity rail. The No Build Alternative would not meet this plan. While the *2016 Texas Rail Plan Update* 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 would not occur. Existing land use conditions would be subject to anticipated population and economic growth patterns. As such, induced development would not occur at any of the terminal station areas and the Brazos Valley Station area would remain agricultural in use.

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. TxDOT has planned and programmed transportation improvements along the IH-45 corridor, as well as current construction projects to expand the four-lane highway.

### 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. The Build Alternatives would comply with the NCTCOG's *2040 Mobility Plan* and the 2016 *Texas Rail Plan*, which identify HSR as a potential mobility solution. The Build Alternatives would not conflict with other regional plans, such as the Heart of Texas Council of Governments *Coordinated Regional Public Transportation Plan,* Brazos Valley Council of Governments *Here to There Coordinated Regional Public Transportation Plan* and Houston-Galveston Area Council *Bridging Our Communities 2040 Regional Transportation Plan*, 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. Linear projects, such as the Build Alternatives, have a narrow footprint and typically do not substantially change the pattern, intensity and character of land use. The Project would operate in a fully sealed system, which means that there would be no crossing of any kind along the track alignment. Given this "closed" system and relatively narrow footprint, indirect land use conversion along the track of the Build Alternatives 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 Build Alternatives 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 impacts also account for additional temporary construction workspace areas, such as contractor yards, and improvements required for construction period access roads, as well as maintenance facilities. **Table 3.13-10** shows the anticipated temporary and permanent land use conversion impacts during construction and operation.

The land use most affected by the Build Alternatives 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.

The counties with the most temporary land use conversion would be Grimes (422 acres), Harris (405 acres) and Dallas (376 acres). The county with the least amount of temporary land use conversion would be Waller (five acres). The county with the most permanent land use conversion as a result of the Build Alternatives would be Grimes (1,607 acres), while Waller (300 acres) and Limestone (345 acres) counties would have the fewest.

As shown in **Table 3.13-11**, land use conversions would vary depending on the Build Alternative. Regardless of the Build Alternative, the total permanent and temporary land conversion would range from approximately 10,117 to 10,252 acres. Build Alternatives A and D would have the least total permanent land use conversion (approximately 7,957 acres and 7,958 respectively), while Build Alternatives F and C would have the most (approximately 8,218 acres and 8,217 respectively). 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** and **Section 3.17.5.2, Recreational Facilities**. 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 3.13-10**, this easement would convert approximately 11.2 acres of existing recreational land to a transportation use. This action, on a federal property, would require a Section 408 permit from the USACE. This permit is discussed in more detail in **Section 3.7.4.2, Waters of the U.S.** 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**.

**Table 3.13-10: Temporary and Permanent Land Use Conversions within LOD in Acres by County and Segment**

| County/Segment | Agriculture | | Commercial | | Industrial | | Residential | | Rural | | Transportation | | Civic | | Parks/ Recreation | | Utilities | | Forested Areas | | Water Features | | Vacant | | Unclassified | | 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 | 261.8 | 255.5 | 83.1 | 218.2 | 12.2 | 19.9 | 13.0 | 14.8 | - | 23.5 | 1.5 | 49.5 | - | 12.0 | 4.1 | 7.6 | 0.4 | 3.2 | - | - | 0.1 | 3.0 | 0.2 | 5.0 | - | 0.8 | **376.2** | **612.8** |
| Ellis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 1 | - | 17.6 | - | - | - | - | - | 3.0 | - | 2.1 | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | 0.2 | - | - | **-** | **23.4** |
| Segment 2A | 222.7 | 673.5 | - | - | - | - | 1.9 | 43.1 | 0.4 | 9.6 | - | 17.3 | - | - | - | - | - | - | - | - | - | - | 0.3 | 6.6 | - | - | **225.3** | **750.0** |
| Segment 2B | 207.5 | 683.1 | - | - | - | - | - | 32.8 | - | 9.7 | - | 7.2 | - | - | 0.3 | 11.2 | - | - | - | - | - | - | - | 6.5 | - | - | **207.8** | **750.4** |
| Segment 3A | - | 117.2 | - | - | - | - | - | - | - | - | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **118.7** |
| Segment 3B | - | 119.7 | - | - | - | - | - | - | - | - | - | 1.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **121.7** |
| Segment 3C | - | 117.2 | - | - | - | - | - | - | - | - | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **118.7** |
| Navarro | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 3A | 219.3 | 876.0 | - | - | - | - | - | - | - | - | 3.9 | 45.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | **223.2** | **922.1** |
| Segment 3B | 214.1 | 908.5 | - | - | - | - | - | 27.2 | - | - | 4.6 | 52.8 | 13.4 | - | - | - | - | - | - | - | - | - | - | 15.3 | - | - | **232.2** | **1,003.8** |
| Segment 3C | 219.7 | 883.9 | - | 0.1 | - | - | - | 8.9 | - | - | 3.4 | 35.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.5 | **223.2** | **928.3** |
| Freestone | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 3A | - | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **0.4** |
| Segment 3B | - | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **0.4** |
| Segment 3C | 290.0 | 674.2 | - | 18.4 | - | 2.9 | - | 7.4 | - | - | - | 366.8 | - | 3.6 | - | - | - | - | - | - | - | - | - | 1.1 | - | - | **290.7** | **1074.4** |
| Segment 4 | 169.6 | 778.8 | - | - | - | - | 0.1 | 1.9 | - | - | - | 39.7 | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | - | **169.7** | **822.3** |
| Limestone | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 4 | 12.6 | 317.4 | - | - | - | - | 0.3 | 27.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.5 | **12.9** | **345.2** |
| Leon | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 3C | 5.9 | 684.0 | 11.7 | 7.1 | - | - | - | 24.2 | - | 8.7 | 9.8 | 479.3 | - | - | - | 13.7 | - | 1.3 | - | 40.6 | - | - | 59.6 | 24.1 | - | 1.8 | **87.0** | **1,284.7** |
| Segment 4 | 150.3 | 749.5 | - | - | - | - | 0.7 | 21.2 | 1.1 | 76.0 | 1.8 | 24.2 | - | - | - | - | - | - | - | 6.1 | - | - | 0.5 | 86.4 | 31.9 | 6.7 | **186.3** | **970.2** |
| Madison | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 3C | 0.2 | 506.7 | - | 0.3 | - | - | - | 8.5 | - | 17.8 | - | 66.1 | - | - | - | - | - | - | - | - | - | - | - | 1.0 | - | - | **.2** | **600.6** |
| Segment 4 | 147.2 | 507.4 | - | - | - | - | - | 4.9 | 0.4 | 20.9 | 2.2 | 34.0 | - | - | - | - | - | - | - | - | - | - | 0.4 | 10.4 | - | - | **150.2** | **577.6** |
| Grimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 3C | - | 88.9 | - | - | - | - | - | - | - | - | - | 1.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **89.9** |
| Segment 4 | - | 79.6 | - | - | - | - | - | - | - | - | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **-** | **79.8** |
| Segment 5 | 390.9 | 1,209.3 | - | 0.2 | - | 0.9 | - | 26.9 | 31.0 | 69.4 | 1.0 | 68.3 | - | - | - | - | - | - | - | - | - | - | - | 62.8 | - | - | **422.9** | **1,437.7** |
| Waller | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 5 | 5.1 | 218.5 | - | 0.1 | - | - | - | 49.8 | - | 11.9 | 0.1 | 14.2 | - | - | - | - | - | 1.1 | - | 2.4 | - | - | - | 3.0 | - | - | **5.2** | **300.9** |
| Harris | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Segment 5 | 385.7 | 724.9 | 0.1 | 68.2 | - | 16.8 | - | 12.5 | - | - | 4.0 | 116.5 | 13.9 | 9.7 | - | - | - | 0.8 | - | - | - | - | 1.1 | 46.2 | - | 0.8 | **404.8** | **996.3** |
| **Total** | **2,902.5** | **11,191.8** | **94.9** | **312.5** | **12.2** | **40.4** | **16.0** | **314.2** | **32.8** | **249.6** | **33.1** | **1,423.0** | **27.3** | **25.3** | **4.4** | **32.5** | **0.4** | **8.3** | **-** | **49.1** | **0.1** | **3.0** | **62.0** | **268.3** | **31.9** | **11.8** | **3,217.6** | **13,929.3** |
| Houston Terminal Options | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Industrial Site* | - | - | - | 27.9 | - | 39.0 | - | - | - | - | - | 27.1 | - | 0.6 | - | - | - | - | - | - | - | - | - | 2.4 | - | - | **-** | **96.9** |
| Northwest Mall* | - | - | - | 36.9 | - | 2.0 | - | - | - | - | - | 26.9 | - | 1.7 | - | - | - | - | - | - | - | - | - | 13.7 | - | - | **-** | **81.2** |
| Northwest Transit Ctr* | - | - | - | 36.9 | 6 | 2.0 | - | - | - | - | - | 26.9 | - | 1.7 | - | - | - | | - | - | - | | - | 13.7 | - | - | **6** | **81.2** |

Source: Dallas CAD 2016, Ellis CAD 2016, Navarro CAD 2016, Freestone CAD 2016, Limestone CAD 2016, Leon CAD 2016, Madison CAD 2011, Grimes CAD 2016, Waller CAD 2016, Harris CAD 2015, CLS 2017
* 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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**Table 3.13-11: 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 | 1,965.2 | 1,960.0 | 1,782.0 | 1,950.0 | 1,944.8 | 1,766.7 |
| | Perm | 6,525.4 | 6,560.5 | 6,054.0 | 6,535.0 | 6,570.1 | 6,063.6 |
| Commercial | Temp | 83.2 | 83.2 | 94.9 | 83.2 | 83.2 | 94.9 |
| | Perm | 286.6 | 286.6 | 312.5 | 286.6 | 286.6 | 312.5 |
| Industrial | Temp | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 |
| | Perm | 37.5 | 37.5 | 40.4 | 37.5 | 37.5 | 40.4 |
| Residential | Temp | 15.9 | 16.0 | 14.9 | 14.0 | 14.1 | 13.0 |
| | Perm | 205.3 | 232.5 | 198.9 | 195.0 | 222.2 | 188.7 |
| Rural | Temp | 32.8 | 32.8 | 31.3 | 32.4 | 32.4 | 31.0 |
| | Perm | 213.5 | 213.5 | 143.0 | 213.6 | 213.6 | 143.2 |
| Transportation | Temp | 14.5 | 15.2 | 20.6 | 14.5 | 15.2 | 20.6 |
| | Perm | 411.3 | 419.2 | 1,216.0 | 401.2 | 409.1 | 1,205.8 |
| Civic | Temp | 13.9 | 27.3 | 13.9 | 13.9 | 27.3 | 13.9 |
| | Perm | 21.7 | 21.7 | 25.3 | 21.7 | 21.7 | 25.3 |
| Parks/ Recreation | Temp | 4.1 | 4.1 | 4.1 | 4.4 | 4.4 | 4.4 |
| | Perm | 7.6 | 7.6 | 21.3 | 18.8 | 18.8 | 32.5 |
| Utilities | Temp | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| | Perm | 7.0 | 7.0 | 6.3 | 7.0 | 7.0 | 6.3 |
| Forested Areas | Temp | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Perm | 8.5 | 8.5 | 43.0 | 8.5 | 8.5 | 43.0 |
| Water Features | Temp | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| | Perm | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Vacant | Temp | 2.4 | 2.4 | 61.2 | 2.1 | 2.1 | 60.9 |
| | Perm | 220.5 | 235.8 | 149.8 | 220.3 | 235.6 | 149.7 |
| Unclassified | Temp | 31.9 | 31.9 | 0.0 | 31.9 | 31.9 | 0.0 |
| | Perm | 9.5 | 8.7 | 3.8 | 9.5 | 8.7 | 3.8 |
| Total | Temp | 2,176.6 | 2,185.4 | 2,035.4 | 2,159.0 | 2,168.1 | 2,017.9 |
| | Perm | 7,957.4 | 8,042.1 | 8,217.3 | 7,957.7 | 8,042.4 | 8,217.8 |

Source: Dallas CAD 2016, Ellis CAD 2016, Navarro CAD 2016, Freestone CAD 2016, Limestone CAD 2016, Leon CAD 2016, Madison CAD 2011, Grimes CAD 2016, Waller CAD 2016, Harris CAD 2015, CLS 2017
* 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.

### *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**–stations would house 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 train, such as custodial equipment, loading dock and yard, kitchen areas (for trains), 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 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 include parking areas. Of the total square footage, approximately 268,000 square feet would include non-parking uses. These uses would include approximately 74,000 square feet for public areas, nearly 137,000 square feet for ticketed areas and approximately 57,000 square feet for facilities, security areas and staff welfare areas (see **Appendix F, TCRR Conceptual Engineering Design Report**).

**Dallas Terminal Station Option**

The Dallas Terminal Station Option 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). Construction and operation of the Dallas Terminal Station Option would not substantially change the pattern and intensity of land use in the area and would be compatible with adjacent land uses. The Dallas Terminal Station Option could indirectly lead to increased land use densities in proximity to the terminal and facilitate the development of transit-oriented development (TOD) in downtown Dallas, which would be consistent with local plans and policies and existing redevelopment efforts in the area. Due to the existing pattern, intensity and character of land use within the terminal station area, the conversion of land use to transportation would not adversely impact the area.

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 all 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 Option.

**Brazos Valley Station Option**

Construction and operation of the Brazos Valley Station would change the pattern and intensity, as well as the character of land use in the area. There are no adopted land use regulations for the site. The unincorporated community of Roans Prairie does not have zoning, nor does it have a site development plan code. The Brazos Valley Station would convert approximately 24 acres of agricultural and rural land to a transportation use. This would include the conversion of special-status farmland. The remaining six 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 introduction of the Brazos Valley 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.

The construction and operation of the Brazos Valley Station would bring additional traffic to the area (see **Section 3.11.5.2, Transportation**).

**Houston Terminal Station Options**

As previously stated, Houston does not have zoning, but site development plan codes are checked for compliance with regulations that include property subdivision, parking, tree and shrub requirements, setbacks and access. The Houston Terminal Station, regardless of the option, would have to comply with all relevant regulations. Prior to construction, a development permit from the City of Houston would be required for the Houston Terminal Station. During the permitting and construction process, TCRR would coordinate with the City of Houston to ensure compliance with all relevant site development regulations.

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. 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 104 acres of primarily industrial, commercial and vacant 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 95 acres of predominately 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 Northwest Mall is currently vacant and any redevelopment of the site would be a benefit to the City of Houston. The station would be compatible with adjacent commercial land uses. The development of the vacant site and the associated land use conversion would represent a beneficial change to the character of the area.

*Houston Northwest Transit Center Terminal Station Option*

The Houston Northwest Transit Center Terminal Station Option would convert about 85 acres of commercial and vacant 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. In fact, the proximity to the Northwest Transit Center would enhance regional connectivity. The character of the area would not substantially change due to the land use conversion from commercial and industrial to transportation.

Transportation projects can result in transit-oriented development (TOD) around and near station areas. **Chapter 4.0, Indirect and Cumulative Impacts** addresses the potential for this Project to influence development around the station areas.

### *3.13.5.2.4 Agriculture, Special-Status Farmland and Agricultural Conservation Easements*

**Agriculture**

Impacts of the Build Alternatives 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 would revert to their previous agricultural use. Permanently disturbed agricultural land within the LOD would not be returned to agricultural use.

As shown in **Table 3.13-11**, permanent conversion of agricultural lands would range from approximately 6,054 acres under Build Alternative C to 6,570 acres under Build Alternative E, while temporary conversion would range from 1,766 acres to 1,950 acres. Build Alternative F would have the lowest conversion of agricultural lands (permanent and temporary) at 7,830 acres. Build Alternative B would have the highest conversion of agricultural lands at 8,520 acres. Based on **Table 3.13-6**, crop lands represent approximately 23 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 1,275 acres under Build Alternative F to 1,370 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 $317 per acre and is further discussed in **Section 3.14.5.2.3, Socioeconomic and Community Facilities.** Given that 80 percent of land within the Study Area is agricultural, and that an average of only 23 percent of this land is being used for crop production, there would be adequate availability of agricultural land outside of the Study Area, but within the Study Area counties, to offset any crop production losses. 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. Agreements between landowners and TCRR would be completed before construction begins and may include compensation for impacts to remnant parcels.

**Pastureland**

As shown in **Table 3.13-11**, pastures (i.e., grazing lands) represent approximately 60 percent of all agricultural lands within the Study Area counties. The permanent conversion of grazing lands would range from approximately 2,945 acres under Build Alternative F to 3,280 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, Socioeconomic and Community Facilities**.

Impacts of the Build Alternatives on livestock would include fragmentation of pasturelands and a possible barrier to herd movement. Approximately 60 percent of the Build Alternatives 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 compensation for impacts to livestock, which would include the management of livestock on the remaining property, such as access to water resources and herd sizes relative to pasture size and herd movement. Sections of existing fencing could require relocation pending property acquisition. TCRR would coordinate with landowners to relocate livestock during the construction period. Agreements between landowners and TCRR would be completed before construction begins. Impacts to livestock would not be significant.

**Special-Status Farmland and Agricultural Conservation Easements**

The Build Alternatives 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 3.13-12** 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 6,135 acres under Build Alternative F to 6,909 under Build Alternative B. **Table 3.13-13** 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 Build Alternatives would be approximately 4,200 acres. Within the Study Area, there is nearly 2.3 million acres of special-status farmlands. The permanent loss of 4,200 acres of special-status farmland represents approximately 0.2 percent of all special-status farmland within the 10 counties. On average, approximately 1,500 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 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 877 acres of special-status farmland, regardless of the Build Alternative.

**Table 3.13-12: 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 | 234.41 | 223.89 | 32.4 | 22.36 | 5.87 | 2.8 | - | - | - | 256.77 | 229.76 | **35.2** |
| Ellis | | | | | | | | | | | | |
| Segment 1 | - | 15.73 | 6.3 | - | - | - | | | | 0 | 15.73 | **6.3** |
| Segment 2A | 224.58 | 550.29 | 120.8 | - | 2.67 | 0.8 | - | - | - | 224.58 | 552.96 | **121.5** |
| Segment 2B | 205.57 | 538.86 | 110.6 | - | 2.03 | 0.7 | - | - | - | 205.57 | 540.89 | **111.3** |
| Segment 3A | - | 111.59 | 17.9 | - | 4.04 | 0.8 | - | - | - | 0 | 115.63 | **18.7** |
| Segment 3B | - | 111.29 | 17.9 | - | 5.74 | 1.1 | - | - | - | 0 | 117.03 | **19.0** |
| Segment 3C | - | 111.59 | 17.9 | - | 4.04 | 0.8 | - | - | - | 0 | 115.63 | **18.7** |
| Navarro | | | | | | | | | | | | |
| Segment 3A | 49.08 | 322.54 | 57.3 | 100.84 | 308.54 | 79.1 | - | - | - | 149.92 | 631.08 | **136.4** |
| Segment 3B | 86.17 | 296.5 | 64.8 | 61.49 | 445.28 | 99.7 | - | - | - | 147.66 | 741.78 | **164.5** |
| Segment 3C | 68.08 | 317.67 | 55.3 | 93.76 | 253.06 | 63.8 | - | - | - | 161.84 | 570.73 | **119.1** |
| Freestone | | | | | | | | | | | | |
| Segment 3A | - | - | - | - | 0.36 | 0.2 | - | - | - | 0 | 0.36 | **0.2** |
| Segment 3B | - | - | - | - | 0.37 | 0.2 | - | - | - | 0 | 0.37 | **0.2** |
| Segment 3C | 19.23 | 100.97 | 21.4 | 79.02 | 441.82 | 85.0 | - | - | - | 98.25 | 542.79 | **106.5** |
| Segment 4 | 2.68 | 77.89 | 13.6 | 118.89 | 406.77 | 75.4 | - | - | - | 121.57 | 484.66 | **88.9** |
| Limestone | | | | | | | | | | | | |
| Segment 4 | 6.96 | 117.97 | 29.4 | 5.57 | 49.29 | 8.1 | - | - | - | 12.53 | 167.26 | **37.5** |
| Leon | | | | | | | | | | | | |
| Segment 3C | - | 200.87 | 37.1 | 8.43 | 84.17 | 18.3 | - | - | - | 8.43 | 285.04 | **55.4** |
| Segment 4 | 111.11 | 240.89 | 52.1 | 0.3 | 95.39 | 21.6 | - | - | - | 111.41 | 336.28 | **73.6** |
| Madison | | | | | | | | | | | | |
| Segment 3C | 0.24 | 177.75 | 35.5 | - | 132.3 | 26.5 | - | - | - | 0.24 | 310.05 | **62.1** |
| Segment 4 | 15.81 | 165.9 | 38.6 | 116.88 | 191.03 | 39.9 | - | - | - | 132.69 | 356.93 | **78.6** |
| Grimes | | | | | | | | | | | | |
| Segment 3C | - | - | - | - | 7.8 | 2.9 | - | - | - | 0 | 7.8 | **2.9** |
| Segment 4 | - | - | - | - | 4.18 | 1.5 | - | - | - | 0 | 4.18 | **1.5** |

**Table 3.13-12: 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** |
| Segment 5 | 11.07 | 208.37 | 39.1 | 96.99 | 397.36 | 83.5 | | | | 108.06 | 605.73 | **122.7** |
| Waller | | | | | | | | | | | | |
| Segment 5 | 0.07 | 126.37 | 20.2 | - | 14.17 | 4.2 | - | - | - | 0.07 | 140.54 | **24.3** |
| Harris | | | | | | | | | | | | |
| Segment 5 | 380.08 | 591.19 | 110.6 | 17.39 | 29.15 | 18.9 | 6.77 | 48.76 | 21.7 | 397.47 | 620.34 | **151.2** |
| Total | **1,415.14** | **4,608.12** | **898.8** | **721.92** | **2,885.43** | **635.8** | **6.77** | **48.76** | **21.7** | **2,137.06** | **7,493.55** | **1,556.3** |
| Houston Terminal Options | | | | | | | | | | | | |
| Industrial Site | - | - | - | - | - | - | - | - | - | - | - | - |
| Northwest Mall | - | - | - | - | - | - | - | - | - | - | - | - |
| Northwest Transit Center | - | - | - | - | - | - | - | - | - | - | - | - |

Source:
Dallas, Freestone, Grimes, Harris, Leon, Madison, Navarro, and Waller Counties: NRCS, 2013; Ellis, and Limestone Counties: NRCS, 2015. TPWD, 2012.
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 3.13-13: Special-Status Farmland Conversion by Build Alternative**

| | | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F |
|---|---|---|---|---|---|---|---|
| **Prime Farmland** | **Temp** | 1,035.9 | 1,072.9 | 937.8 | 1,016.8 | 1,053.9 | 918.8 |
| | **Perm** | 2,752.6 | 2,726.9 | 2,624.7 | 2,741.2 | 2,714.9 | 2,613.3 |
| | **25-Foot Setback** | 538.2 | 545.7 | 496.6 | 528.0 | 535.6 | 486.5 |
| **Farmland of Statewide Importance** | **Temp** | 479.2 | 439.9 | 318.0 | 479.2 | 439.9 | 318.0 |
| | **Perm** | 1,508.8 | 1,647.3 | 1,372.4 | 1508.8 | 1646.6 | 1371.8 |
| | **25-Foot Setback** | 336.6 | 357.5 | 307.5 | 336.5 | 357.4 | 307.4 |
| **Prime Farmland, if Drained** | **Temp** | 6.8 | 6.8 | 6.8 | 6.8 | 6.8 | 6.8 |
| | **Perm** | 48.8 | 48.8 | 48.8 | 48.8 | 48.8 | 48.8 |
| | **25-Foot Setback** | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 |
| **Total Special-Status Farmland** | **Temp** | 1,563.8 | 1,561.6 | 1,546.1 | 1,544.8 | 1,542.6 | 1,285.5 |
| | **Perm** | 4,268.2 | 4,380.4 | 4,003.9 | 4,394.6 | 3,145 | 3,991.8 |
| | **25-Foot Setback** | 896.5 | 924.9 | 825.8 | 886.2 | 914.7 | 815.6 |

Source: AECOM, 2017

### *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 be conservative and to avoid underestimating displacements and relocations, all residences and businesses on partially acquired parcels, including those that may ultimately be temporarily affected by construction activities are counted as full displacements requiring relocation. This assumption allows for a worst-case assessment of potential property acquisition impacts. The final full and partial parcel acquisition decisions would ultimately be determined on a case-by-case basis prior to construction.

As previously detailed in **Table 3.13-8**, there are approximately 2,800 structures (primary and secondary) within 200 feet of the LOD for all Build Alternatives. **Table 3.13-14** details those primary structures (businesses, community facilities, cultural resources, residences and transportation/utility infrastructure) 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. No cultural or utility primary structures would be displaced by the Build Alternatives. For the purpose of determining displacements in **Table 3.13-14**, field investigation and detailed site aerial photography analysis (and in some cases interviews with property management) was 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. The community facility, Honey Springs Cemetery, would be located within the LOD but is not included in **Table 3.13-14** as a displacement because the Build Alternatives would span this feature. More information on this facility can be found in **Section 3.14.5.2, Socioeconomics and Community Facilities** and **Section 3.19.4.3.1, Cultural Resources**.

**Table 3.13-14 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 | **23** | 9 | 40 | 5 | **-** | - | **63** | **14** |
| **Ellis** | | | | | | | | |
| Segment 1 | **-** | - | 7 | 2 | **-** | - | **7** | **2** |
| Segment 2A | **-** | 2 | 18 | 5 | **-** | - | **18** | **7** |
| Segment 2B | **-** | - | 23 | 6 | **-** | - | **23** | **6** |
| Segment 3A | **-** | - | 1 | - | **-** | - | **1** | **0** |
| Segment 3B | **-** | - | - | - | **-** | - | **0** | **0** |
| Segment 3C | **-** | - | 1 | - | **-** | - | **1** | **0** |
| **Navarro** | | | | | | | | |
| Segment 3A | **-** | - | 18 | 3 | **-** | - | **18** | **3** |
| Segment 3B | **-** | - | 29 | 10 | **-** | - | **29** | **10** |
| Segment 3C | **-** | - | 19 | 2 | **-** | - | **19** | **2** |
| **Freestone** | | | | | | | | |
| Segment 3A | - | - | - | - | - | - | **0** | **0** |
| Segment 3B | - | - | - | - | - | - | **0** | **0** |
| Segment 3C | 10 | 13 | 6 | 4 | 1 | 2 | **17** | **19** |
| Segment 4 | - | - | 6 | 2 | - | - | **6** | **2** |
| **Limestone** | | | | | | | | |
| Segment 4 | - | - | 6 | - | - | - | **6** | **0** |
| **Leon** | | | | | | | | |
| Segment 3C | 9 | 4 | 17 | 11 | 1 | - | **27** | **15** |
| Segment 4 | - | | 12 | 8 | - | - | **12** | **8** |
| **Madison** | | | | | | | | |
| Segment 3C | - | - | 5 | 2 | - | - | **5** | **2** |
| Segment 4 | - | - | 16 | 6 | 1 | - | **17** | **6** |
| **Grimes** | | | | | | | | |
| Segment 3C | - | - | - | - | - | - | **0** | **0** |
| Segment 4 | - | - | - | - | - | - | **0** | **0** |
| Segment 5 | 1 | - | 38 | 16 | - | - | **28** | **16** |
| **Waller** | | | | | | | | |
| Segment 5 | - | - | 35 | 3 | - | - | **35** | **3** |
| **Harris** | | | | | | | | |
| Segment 5 | 25 | 21 | 86 | 4 | - | - | **73** | **25** |
| **TOTAL** | **68** | **49** | **383** | **89** | **3** | **2** | **405** | **140** |
| **Houston Terminal Options** | | | | | | | | |
| Industrial Site* | 9 | 4 | - | - | - | - | **9** | **4** |
| Northwest Mall* | 9 | - | - | - | - | - | **9** | **0** |
| Northwest Transit Center* | 16 | 12 | 1 | - | - | - | **16** | **12** |

Source: AECOM, 2017
* 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.
Note: No cultural or utility primary structures would be displaced by the Build Alternatives, as the project would be temporarily located around the resources.

Depending on the Build Alternative the estimated primary structure displacement of businesses would range from 49 under Build Alternatives A, B, D, and E to 68 under Build Alternatives C and F. The displacement of primary structure displacements of residences would range from 272 under Build

Alternative C to 298 under Build Alternative E. Displacement of secondary structures, such as sheds and detached garages would range from 54 under Alternatives A and C to 62 under Build Alternative E. Displacement of secondary commercial structures would range from 30 under Build Alternatives D and E to 47 under Build Alternative F.

**Table 3.13-15** 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 the **Land Use Technical Memorandum** in **Appendix E.** It is anticipated that total permanent acquisition would range from 1,955 parcels under Build Alternative D to 2,025 parcels under Build Alternative B, while the temporary use of parcels would range from 154 under Build Alternative F to 200 under Build Alternative B.

Construction staging and access areas would be temporary impacts and properties would be returned to 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** and **Section 3.4.5.2.1, Noise and Vibration**. Access to properties could also be restricted during construction and is further discussed in **Section 3.11.5.2.1, Transportation**.

**Table 3.13-15: Estimated Parcel Acquisition (No. of Parcels)**

| | Partial Take | Full Take | Temporary Partial Take | Temporary Take | Total |
|---|---|---|---|---|---|
| **Dallas** | | | | | |
| Segment 1 | 128 | 137 | 21 | 14 | **300** |
| **Ellis** | | | | | |
| Segment 1 | 6 | 8 | - | - | **14** |
| Segment 2A | 136 | 24 | 36 | 4 | **200** |
| Segment 2B | 109 | 36 | 22 | 3 | **170** |
| Segment 3A | 12 | 2 | - | - | **14** |
| Segment 3B | 11 | 2 | - | - | **13** |
| Segment 3C | 12 | 2 | - | - | **14** |
| **Navarro** | | | | | |
| Segment 3A | 122 | 47 | 12 | 3 | **184** |
| Segment 3B | 161 | 64 | 15 | 9 | **249** |
| Segment 3C | 125 | 38 | 23 | 6 | **192** |
| Segment 4 | 2 | - | - | - | **2** |
| **Freestone** | | | | | |
| Segment 3C | 175 | 54 | 18 | 5 | **252** |
| Segment 4 | 120 | 18 | 14 | 3 | **155** |
| **Limestone** | | | | | |
| Segment 4 | 60 | 7 | 5 | - | **72** |
| **Leon** | | | | | |
| Segment 3C | 107 | 42 | 5 | 1 | **155** |
| Segment 4 | 108 | 31 | 19 | 4 | **162** |
| **Madison** | | | | | |
| Segment 3C | 66 | 16 | 1 | - | **83** |
| Segment 4 | 69 | 25 | 20 | 1 | **115** |

| Table 3.13-15: Estimated Parcel Acquisition (No. of Parcels) | | | | | |
|---|---|---|---|---|---|
| | **Partial Take** | **Full Take** | **Temporary Partial Take** | **Temporary Take** | **Total** |
| **Grimes** | | | | | |
| Segment 3C | 9 | - | - | - | **9** |
| Segment 4 | 11 | - | - | - | **11** |
| Segment 5 | 219 | 189 | 11 | 7 | **426** |
| **Waller** | | | | | |
| Segment 5 | 69 | 55 | 4 | 1 | **129** |
| **Harris** | | | | | |
| Segment 5 | 211 | 154 | 10 | 2 | **377** |
| **Total** | **2,048** | **951** | **236** | **63** | **3,298** |
| **Houston Terminal Options** | | | | | |
| Industrial Site* | 31 | 9 | 3 | - | **43** |
| Northwest Mall* | 7 | 8 | 3 | - | **18** |
| Northwest Transit Center* | 29 | 19 | 6 | 1 | **55** |

Source: AECOM, 2017
* 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.

**Table 3.13-16** shows the estimated number of all primary (e.g., residential, business, oil/gas, etc.) and secondary structures (e.g., barn/shed) that could be potentially displaced as a result of parcel acquisition. Parcel acquisition would be negotiated between the landowner and TCRR. The final structure and acquisition decisions would be determined by TCRR and the property owner on a case-by-case basis during the ROW acquisition. TCRR would communicate its intent to the owners and tenants of affected structures and parcels. Agreements between affected owners and TCRR would be completed before construction begins. No public housing would be impacted by the Build Alternatives; therefore, rental assistance for low-income tenants would not be required.

| Table 3.13-16: Estimated Structure Acquisition (No. of Primary and Secondary Structures) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **County/Segment** | **Agriculture** | | **Commercial** | | **Community Facilities** | | **Cultural/Civic Resources** | | **Oil/Gas** | | **Residential** | | **Transportation / Utilities** | | **Total** | |
| | P* | S** | P | S | P | S | P | S | P | S | P | S | P | S | **P** | S |
| Dallas | | | | | | | | | | | | | | | | |
| Segment 1 | - | 20 | 1 | 1 | - | - | - | - | - | - | 18 | 1 | - | - | **0** | **22** |
| Ellis | | | | | | | | | | | | | | | | |
| Segment 1 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **2** |
| Segment 2A | - | 9 | - | - | - | - | - | - | - | - | 2 | 2 | - | - | **2** | **11** |
| Segment 2B | - | 10 | - | - | - | - | - | - | 1 | - | 6 | 1 | - | - | **7** | **11** |
| Segment 3A | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **1** |
| Segment 3B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **0** |
| Segment 3C | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **1** |
| **Navarro** | | | | | | | | | | | | | | | | |

**Table 3.13-16: Estimated Structure Acquisition (No. of Primary and Secondary Structures)**

| County/Segment | Agriculture | | Commercial | | Community Facilities | | Cultural/Civic Resources | | Oil/Gas | | Residential | | Transportation / Utilities | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P* | S** | P | S | P | S | P | S | P | S | P | S | P | S | **P** | S |
| Segment 3A | - | 21 | - | - | - | - | - | - | - | - | 3 | - | - | - | **3** | **21** |
| Segment 3B | - | 28 | - | - | - | - | - | - | - | - | 6 | 1 | - | - | **6** | **29** |
| Segment 3C | - | 12 | - | - | - | - | - | - | - | - | 2 | - | - | - | **2** | **12** |
| Freestone | | | | | | | | | | | | | | | | |
| Segment 3C | - | 17 | - | 1 | - | - | - | - | 3 | - | 3 | - | - | - | **6** | **18** |
| Segment 4 | - | 6 | - | - | - | - | - | - | - | - | 3 | - | - | - | **3** | **6** |
| Limestone | | | | | | | | | | | | | | | | |
| Segment 4 | - | 3 | - | - | - | - | - | - | - | - | 2 | - | - | - | **2** | **3** |
| Leon | | | | | | | | | | | | | | | | |
| Segment 3C | - | 4 | 2 | 1 | - | - | - | - | 1 | - | - | 1 | - | - | **3** | **6** |
| Segment 4 | 1 | 13 | - | - | - | - | - | - | - | - | 2 | - | - | - | **3** | **13** |
| Madison | | | | | | | | | | | | | | | | |
| Segment 3C | - | 5 | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **5** |
| Segment 4 | - | 10 | - | - | - | - | 1 | - | - | - | 4 | 1 | - | 1 | **4** | **12** |
| Grimes | | | | | | | | | | | | | | | | |
| Segment 3C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **0** |
| Segment 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **0** | **0** |
| Segment 5 | - | 21 | - | - | - | - | - | - | - | - | 4 | 2 | - | - | **4** | **23** |
| Waller | | | | | | | | | | | | | | | | |
| Segment 5 | - | 10 | - | - | 1 | - | - | - | - | - | 6 | 1 | - | - | **7** | **11** |
| Harris | | | | | | | | | | | | | | | | |
| Segment 5 | - | 16 | 4 | 2 | 1 | - | - | - | - | - | 14 | - | - | - | **19** | **18** |
| **Total** | **1** | **209** | **7** | **5** | **2** | **0** | **1** | **0** | **5** | **0** | **75** | **10** | **-** | **1** | **71** | **225** |
| **Houston Terminal Options** | | | | | | | | | | | | | | | | |
| Industrial Site * | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | **-** | **1** |
| Northwest Mall * | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | **1** | **1** |
| Northwest Transit Center * | - | - | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | **1** | **2** |

Source: AECOM 2017
* **P** = Primary Structure; ** S = Secondary Structure
*** 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.

The Build Alternatives would displace 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 8 under Build Alternatives A, B, D, and E to 12 under Build Alternatives C and F. The Build Alternatives 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 residences would range from 56 under Build Alternative C to 72 under Build Alternative E. 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 Build Alternatives. In each case, adequate replacement properties would be available,[22, 23] as detailed within the **Land Use Technical Memorandum** in **Appendix E**.

As detailed in **Table 3.13-16**, the majority of structure acquisitions are secondary. The majority of secondary structures are also agricultural buildings, such as barns/sheds. The majority of primary structures are residential.

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

As detailed in **Table 3.13-14**, 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**, 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) and the associated Tenmile Cemetery (which is also a cultural resource and detailed in **Section 3.19, Cultural Resources**) – impacted by Build Alternatives A, B, D and E
- The Science of the Soul Study Center (Waller County) – impacted by all of the Build Alternatives

Additionally, two facilities common to all of the Build Alternatives would require the acquisition of an easement to span the facilities. The easement would not result in a change in use of the facilities.

- Smith Family Cemetery (Dallas County) – spanned by all of the Build Alternatives, but does result in a conversion of land use
- Honey Springs Cemetery (Dallas County) – spanned by all of the Build Alternatives, but does result in a conversion of land use

Upon selection of a preferred Build Alternative, an inventory of impacted parcels that would include, if available, a county appraisal district ID number would be included in the **Land Use Technical Memorandum** of the Final EIS.

### 3.13.6 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 colocation 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, 52 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 described in TCRR's Draft

.[22] LoopNet, "Commercial Real Estate Search," Accessed: http://www.loopnet.com/
[23] Zillow, "Homes for Sale, Homes for Rent and Apartments for Rent Search," Accessed: http://www.zillow.com/

Conceptual Engineering Plan,[24] 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 60 percent of the Build Alternatives would be on viaduct.

### 3.13.6.1 Compliance Measures and Permitting

The following Compliance Measures (CM) and permits for changes in land use would be required for Build Alternatives A through F.

**LU-CM#1: Temporary and Permanent Land Use Conversion and Structure Displacement**. Prior to construction, TCRR shall coordinate with individual landowners to compensate for temporary use or permanent take of land, and/or permanent displacement of primary structures and/or relocation of secondary structures. TCRR and the affected landowner shall negotiate the compensation and/or terms on a case-by-case basis. Compensation shall be determined by an administrative judge in accordance with applicable state laws (4 TAC § 21and 10 TAC § Chapter 2206, Subchapter E).

**LU-CM#2: Permanent Land Use Acquisition Permits.** Prior to construction, TCRR shall coordinate with individual landowners and local jurisdictions to obtain necessary permits for the acquisition of property through eminent domain.

**LU-CM#3: Permanent ROW Agreements.** Prior to construction, TCRR shall coordinate with the Texas Transportation Commission, TxDOT and FHWA to obtain approval and necessary agreements for the use of state-owned ROW.

**LU-CM#4: 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 option complies with all relevant zoning and special purpose district regulations.

**LU-CM#5: Houston Terminal Station Development Plan Code Compliance**. Regardless of the terminal option, 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 all relevant site development regulations.

**LU-CM#6: Houston Terminal Station Site Development Related Permits**. Regardless of the terminal options, 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 all relevant permits.

The following Compliance Measure (CM) would be required for Build Alternatives A through F only if TCRR receives Federal financial assistance

[24] TCRR, "*Texas Central Partners Texas High Speed Rail Final Draft Conceptual Engineering Report-FDCDv7*," September 15, 2017.

**LU-CM#7: Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The Uniform Relocation Assistance and Real Property Acquisition Policies Act provides benefits to owner occupants of residential and business properties as well as to tenants of either residential or business properties. If TCRR receives DOT 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. In order to acquire property, TCRR would complete an appraisal of the potentially acquired property and provide the owner with a written offer of just compensation that clearly outlines what is being acquired. Relocation expenses may be included in the compensation. TCR will also give a landowner 90 days written notice to vacate the property prior to possession.

Additional compliance measures are documented under the following resources:

**NV-CM#1: Compliance with Local Noise and Vibration Ordinances** as discussed in more detail in **Section 3.4.2.3, Noise and Vibration.**

### 3.13.6.2 Mitigation Measures

The following Mitigation Measures (MM) would be implemented to lessen the impact of Build Alternatives A through F.

**LU-MM#1: Temporary Conversion of Land:** After construction, TCRR shall return temporarily impacted land to its pre-Project condition following the completion of construction activities in that area.

**LU-MM#2: Agriculture and Livestock Management**. Prior to the start of construction, TCRR shall coordinate with individual landowners 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. These management needs shall be negotiated on a case-by-case basis between TCRR and the affected landowner and shall be incorporated in to the TCRR/Landowner agreement.

## 3.13.7 Build Alternatives Comparison

The summary of land use impacts 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 7,950 acres), while Build Alternative C and F would have the most (approximately 8,200 acres). This illustrates that the overall total land use conversion would not vary significantly between the Build Alternatives. Build Alternative E would have the lowest conversion of agricultural lands (permanent and temporary) at 4,687 acres. Build Alternative B would have the highest conversion of agricultural lands at 5,942 acres.

It is anticipated that total permanent parcel acquisition would range from 1,955 parcels under Build Alternative C to 2,025 parcels under Build Alternative B, while the temporary use of parcels would range from 154 parcels under Build Alternative F to 200 parcels under Build Alternative B. Depending on the Build Alternative, the estimated structure acquisition would range from approximately 191 structures under Build Alternative C to 225 structures under Build Alternative E. Depending on the Build Alternative, the estimated total structure acquisition (primary and secondary) of businesses would range from 8 businesses under Build Alternatives A,B,D and E to 12 businesses under Build Alternatives C and F. Depending on the Build Alternative, the estimated total structure acquisition (permanent and secondary) of residences would range from 56 residences under Build Alternative C to 72 residences under Build Alternative E.

Primary displacements – structures located directly within the proposed LOD or within 50 feet of the LOD – vary based on the Build Alternative. Build Alternative C would displace the least amount of residences with a total of 272, while Build Alternative E would displace the most residences with 298. Commercial displacements range from 49 with Build Alternatives A, B, D, and E to 68 with Build Alternatives C and F.

Land Use impacts are relatively comparable across all of the Build Alternatives and do not indicate a preferred Build Alternative based solely on land use impacts.

| 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 | 2,176.6 | 2,185.6 | 2,035.6 | 2,159.1 | 2,168.1 | 2,018.1 |
| | Perm | 7,957.4 | 8,042.1 | 8,217.3 | 7,957.7 | 8,042.4 | 8,217.8 |
| Special-Status Farmland Conversion (acres) | Temp | 1,563.8 | 1,561.6 | 1,546.1 | 1,544.8 | 1,542.6 | 1,285.5 |
| | Perm | 4,268.2 | 4,380.4 | 4,003.9 | 4,394.6 | 3,145 | 3.991.8 |
| | Indirect | 896.5 | 924.9 | 825.8 | 886.2 | 914.7 | 815.6 |
| Primary Structure Displacements (within LOD and 50’) | Commercial | 49 | 49 | 68 | 49 | 49 | 68 |
| | Residence | 283 | 293 | 272 | 288 | 298 | 277 |
| | Community Facilities | 1 | 1 | 2 | 1 | 1 | 2 |
| Estimated Permanent Parcel Acquisitions | | 1,970 | 2,025 | 1,980 | 1,955 | 2,010 | 1,965 |
| Estimated Temporary Parcel Acquisitions | | 191 | 200 | 169 | 176 | 185 | 154 |
| Estimated Total Structure Acquisitions* | Agriculture | 133 | 139 | 117 | 134 | 140 | 118 |
| | Commercial | 8 | 8 | 12 | 8 | 8 | 12 |
| | Community Facilities | 2 | 2 | 2 | 2 | 2 | 2 |
| | Cultural/Civic Resources | 1 | 1 | 0 | 1 | 1 | 0 |
| | Oil and Gas | 0 | 0 | 4 | 1 | 1 | 5 |
| | Residence | 65 | 69 | 56 | 68 | 72 | 59 |
| | Transportation and Utilities | 1 | 1 | 0 | 1 | 1 | 0 |
| | **TOTAL** | 210 | 220 | 191 | 215 | 225 | 196 |

Source: AECOM, 2017.
* includes primary and secondary structures

While the Northwest Transit Center Terminal Station option would have the smallest footprint, it would have the largest acquisition of parcels and the largest displacement of businesses. The Northwest Mall Terminal Station option would have the greatest amount of structure displacements (16) and permanent parcel acquisitions (30).

**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 | - | - | 6.0 |
| | Perm | 101.2 | 91.5 | 79.6 |
| Structure Displacements (Business) | | 9 | 9 | 16 |
| Estimated Permanent Parcel Acquisitions | | 14 | 10 | 30 |
| Estimated Temporary Parcel Acquisitions | | 0 | 0 | 0 |
| Estimated Total Structure Acquisitions (Business)* | | 1 | 2 | 2 |

Source: AECOM, 2017
*Includes Primary and Secondary Structures
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.

# 3.14 Socioeconomics and Community Facilities

## 3.14.1 Introduction

This section describes the existing socioeconomic setting and demographics (populations and households). 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 Build Alternatives. Minority and low-income populations are more specifically discussed in **Section 3.18, Environmental Justice**.

This section provides a demographic and economic profile for the ten counties in the Study Area as well as multiple, smaller study areas within the 10 counties. The economic effects of the Build Alternatives are further reported for urban county, regional and state-wide Economic Analysis Areas in order to fully capture the ripple effects of this investment to the larger economy. These study areas are discussed further in **Section 3.14.3**.This section also describes the community facilities, community services and neighborhoods within a quarter mile buffer around the LOD.

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.

## 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 Build Alternatives 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

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64 C.F.R. 28545 et seq.

- 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. This act protects people from disproportionate impacts as a result of a project designed to benefit the public as a whole. DOT approval of financial assistance to TCRR through DOT 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.
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires federal agencies to identify and assess disproportionate environmental health and safety risks to children when promulgating certain substantive rules. Health and safety risks are defined as any product or substance a child is likely to come in contact with or ingest.[2]

## 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) 2014 5-year estimate data for percent minority and percent Hispanic, median household incomes and poverty levels. A total of 132 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 is intended to provide an overview of the Study Area. Detailed demographic data is available within **Appendix E**, **Socioeconomic and Community Facilities Technical Memorandum.**

Household population projections were derived from the ACS 2014 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 2014 data. These data show the number of employees and number of establishments 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.[3]

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 Study Areas to understand the broader impacts of the Build Alternatives on certain counties, groups of counties and for the entire state. Evaluating different Economic Analysis Study Areas provided the flexibility to understand the varying

[2] Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* 62 Fed. Reg. 19885 (April 23, 1997).
[3] USCB ACS. Accessed June 2016, https://www.census.gov/programs-surveys/acs/

impacts of the Build Alternatives 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 are assessed using the following Study Areas:

- All counties within the Study Area (Dallas, Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes, Waller and Harris)
- Dallas County only
- Harris County only
- All of the intermediate counties (Ellis, Navarro, Freestone, Limestone, Leon, Madison, Grimes and Waller)
- State of Texas

Several components of the economic analysis (detailed below) rely on 2013 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 Build Alternatives 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 defined above.

The 2013 RIMSII Model multipliers, and all other data sources used for the economic analysis, were inflation-adjusted to 2016 dollar values for consistency in reporting. All conversions were based on the U.S. Office of Management and Budget chained price estimates.[4]

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 2016 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 uses the Final Draft Conceptual Engineering Design Documentation-FDCEv5 Transmittal for Capital Cost Estimate and Construction Schedule, as documented in **Appendix E**, **Socioeconomic and Community Facilities Technical Memorandum,** 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 21 times or once a year for 21 years over the study time period. Although impacts associated with earlier acquisition may start sooner, this analysis conservatively assumes all tax effects of acquisitions happening concurrently, immediately preceding construction.
- Property taxes associated with built assets and use taxes on purchased equipment would start in 2023 and recur once a year over 18 years during the study time period.

[4] Office of Management and Budget, https://www.govinfo.gov/content/pkg/BUDGET-2017-TAB/pdf/BUDGET-2017-TAB.pdf, Chained Price Estimates Table 10.1 Accessed October 2017.

- Impacts associated with service provision (sales tax associated with ticket sales and the employment, earnings, and induced sales tax associated with increased permanent employment) would start in 2024 and recur once a year for 17 years during the study time period.
- Property premiums around station areas are assumed for the last 10 years of rail operation. 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 high-level cost estimates from TCRR. Capital Investment would lead to temporary construction industry jobs and indirect job growth in supporting and service industries. Employment growth, as well as associated earnings and induced spending and sales tax, were calculated based on the initial capital investment using RIMSII multipliers. Due to the differences between construction and service industries, it is to allocate costs in order to apply different growth multipliers. This analysis assumed an estimated 85 percent of the mean capital investment for each Build Alternative would be applied toward construction and 15 percent would be applied to professional services. Additionally, the capital costs associated with systems or rolling stock, which would be sourced from outside the state, would not contribute to induced spending in the state, but were used to calculate use taxes based on a proportional allocation among Study Area jurisdictions and the existing tax rates.

The Build Alternatives represent a corridor of investment rather than a single point. It would require labor and materials in each county to construct and operate the Build Alternatives. In order to determine the economic impact of the Build Alternatives on a particular area, assumptions were made about the proportion of the initial investment that would occur within each area. **Table 3.14-1** documents the allocation of construction and professional services costs for each Economic Analysis Study Area.

**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, 2016

#### *3.14.3.2.2 Employment, Earnings, and Sales and Use Tax*

FRA's analysis utilized TCRR's Conceptual Engineering Report (see **Appendix F, TCRR Conceptual Engineering Design Report**) for estimates of direct operational employment by occupational category. Employment reported for each station area was assigned to the county in which the station would be located. Other unspecified employees were not assigned to any county as these may include administrative or management positions that may or may not be filled from within any of the defined Economic Analysis Study Areas.

The Bureau of Labor Statistic (BLS) Occupational Employment Statistics by occupation sector were used to calculate estimated earnings resulting from the projected employment. If projected employment or earnings represented more than one percent of the total employment or earnings in a county, it was considered a meaningful economic impact. In addition, if projected employment represented ten percent or more of existing unemployment in a county, this was also considered a meaningful impact on a county's economy. Estimated employment would be consistent across all Build Alternatives and Terminal Station options; therefore, employment and earnings impacts were not distinguished by Build Alternative.

RIMS II multipliers were used to determine annual employment, earnings and consumption tax revenues in each Economic Analysis Area occurring as a direct, indirect or induced effect of annual operating investment.

Ticket sales for travel on the HSR system would generate some additional sales tax revenue on an annual basis while the HSR system would be in operation. For the purposes of this analysis, low- and high-end estimates of sales tax impacts were calculated based on an estimated annual ridership between 5,000,000 and 7,200,000 passengers and an HSR fare that would be competitive with average airfare prices. Airfare is dynamic, and it is assumed that HSR fares would also change according to demand and timing of purchase. Airfare and HSR fares were based on the average Dallas to Houston ticket airfare of $199.[5] Potential gains in sales tax revenue from HSR ticket sales would be offset by the potential loss of sales tax revenue for ticketed air or bus travel and gas taxes generated through auto travel, based on TCRR's estimated mode share (see **Appendix F, TCRR Conceptual Engineering Design Report**). Although the full costs of driving include insurance and maintenance costs, gasoline is the only expense that would directly drive tax revenues on a per-trip basis. While gasoline is taxed on a per gallon basis, this analysis does not calculate the costs of driving, but determined tax impacts directly based on mileage and average fuel economy.

#### *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 2016 property values. 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.[6]

This analysis used existing 2016 property values within a quarter-mile and between a quarter-mile and half-mile of the Dallas Terminal Station option, Brazos Valley Station, and the three Houston Terminal Station options. This property data was derived from Dallas, Grimes and Harris county tax assessors. Establishing buffers for properties at varying distances from the proposed stations allowed the analysis

[5] U.S. Department of Transportation Domestic Airline Consumer Airfare Report, 2016 Q3. https://www.transportation.gov/policy/aviation-policy/domestic-airline-consumer-airfare-report (accessed May 2017).
[6] Center for Transit-Oriented Development, "Capturing the Value of Transit", November 2008, http://www.reconnectingamerica.org/assets/Uploads/ctodvalcapture110508v2.pdf (accessed October 2016).

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 Build Alternatives and do not account for the value of new investment that may occur as a result of the Build Alternatives. For this reason, station areas surrounded by vacant or low density parcels, such as the Brazos Valley 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**. 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 $317 per acre, based on the average market value of crops sold within the Land Use Study Area.[7] 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 Build Alternatives. The full and partial permanent acquisitions that would be required under each of the Build Alternatives 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 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. Waller County has a more suburban land distribution and was approximated using a weighted blend of data from Ellis County.

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 2016 tax rate for each taxing jurisdiction the parcel was located within, including county, school district, city and special districts. Harris County tax rates were only available for 2015 at the time of the analysis. As no special notices to change the effective tax rates have been published to date in 2016, this analysis assumes the 2015 rates in Harris County would still apply. All assessment and appraisal values were either reported in 2016 dollars or escalated from 2015 dollars using a growth rate of 3.55 percent, which corresponds to the

[7] Madison County was excluded from this analysis because USDA withheld market value of crops in this county to avoid disclosing data for individual operations.

average annual property value growth rate for all properties in the State of Texas between 2010 and 2013.[8]

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 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 + agricultural productivity, both proportional to the unimpacted parcel acreage
    - Assumes that none of the structure(s) would be impacted, therefore 100 percent of the improvement value would remain on the market.
    - 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 + agricultural productivity, both proportional to the unimpacted parcel acreage
    - Assumes that the entire structure or all structures would be impacted and none of the improvement value would remain on the market.

- Taxable value for partial acquisitions under Probabilistic impact scenario:
    - Total assessed land value proportional to impacted parcel acreage
    - Assessed value of non-agricultural land + 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 percent of the parcel land that is taken
    - Homestead, Over-65, and Disability deductions applied to unimpacted portion of parcel

[8] Exhibit 5. Texas Comptroller Biennial Property Tax Report. https://www.comptroller.texas.gov/taxes/property-tax/docs/96-1728-12-13.pdf

The facility and fixed guideway improvements constructed under the Build Alternatives 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.[9] As station costs were reported in 2003 dollars, they were inflated to 2016 dollars for the analysis using the U.S. Office of Management and Budget chained price estimates.[10]

Based on available information about the proposed TCRR stations, the Dallas and Houston 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 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. Although the assessed value of the property may deteriorate somewhat over time through depreciation, this is still considered a conservative estimate, as the property tax estimates exclude other improvements and assets, such as rolling stock, trackwork or maintenance facilities. To determine the total tax impact of the station improvements, it was assumed that the Dallas Terminal Station option would be located within the City of Dallas, Dallas County, Dallas County Community College and Dallas ISD taxing jurisdictions for a total property tax rate of $2.45 per $100 in value. The Brazos Valley Station was assumed to generate tax revenue for Grimes County and the Navasota ISD with a combined rate of $1.69 per $100. All three Houston Terminal Station options were assumed to have the same value and located within the City of Houston, Harris County, Houston Community College and Houston ISD taxing jurisdictions for a total combined tax rate of $2.32 per $100 valuation.

To determine the property tax impact of the station area land value premium, a similar tax structure as described above 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; direct communications with cities, counties, members of the public, other agencies, and stakeholders; and field reconnaissance. 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.

[9] 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.
[10] Office of Management and Budget, https://www.govinfo.gov/content/pkg/BUDGET-2017-TAB/pdf/BUDGET-2017-TAB.pdf, Chained Price Estimates Table 10.1 Accessed October 2017.

Schools and community facilities were field-verified within the Study Area to identify areas where children may gather. The school profiles were acquired from the individual schools and universities, and community services and facilities were identified from affected cities.

FRA conducted an assessment of communities impacted by the Build Alternatives based on their geographic location in relation to the Build Alternatives. 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.

Direct impacts, including physical acquisition, displacement or a relocation of community facilities, are evaluated in this section. Indirect impacts occur when other resource areas, such as noise and vibration, visual and aesthetics, transportation or air quality, create a perceived impact to neighborhood character or community facilities. These indirect impacts are discussed in **Chapter 4.0, Indirect and Cumulative Impacts**.

## 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 3.14.4.1.1** can be found in **Appendix E, Socioeconomic and Community Facilities Technical Memorandum**.

#### *3.14.4.1.1* *Community Character*

**Dallas County**
The neighborhoods 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 Build Alternatives 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.

**Ellis County**

Neighborhoods 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.

**Navarro County**

The communities 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.

**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.

**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.

**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.

**Madison County**
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.

**Grimes County**
Grimes County lies approximately 40 miles northwest of Houston. 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.

**Waller County**
The communities 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.

**Harris County**
The communities 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 multifamily 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 multifamily apartments.

#### *3.14.4.1.2 Key Jurisdictional Boundaries*

As shown **Table 3.14-2**, boundaries include a list of cities, ISDs and emergency service districts.

| Table 3.14-2: Key Jurisdictional Boundaries | | | |
|---|---|---|---|
| **County** | **Cities** | **Independent School Districts** | **Emergency Service Districts** |
| **Dallas** | Dallas, Ferris, Hutchins, Lancaster and Wilmer | Dallas ISD, Ferris ISD and Lancaster ISD | Employs a closest-unit model that dispatches the nearest available fire or EMS vehicle to an incident regardless of jurisdictional boundaries. |
| **Ellis** | Ennis<br>Ferris<br>Palmer | Avalon ISD, Ennis ISD, Ferris ISD, Palmer ISD and Waxahachie ISD | Emergency service districts #6 |
| **Navarro** | Corsicana<br>Oak Valley<br>Richland | Blooming Grove ISD, Corsicana ISD, Dawson ISD, Fairfield ISD, and Wortham ISD | One emergency service district |
| **Freestone** | Fairfield<br>Teague | Buffalo ISD, Dew ISD<br>Fairfield ISD, Teague ISD and Wortham ISD | None |
| **Limestone** | No incorporated areas | Groesbeck ISD and Mexia ISD | Emergency service district 2 West |
| **Leon** | Buffalo, Centerville and Leona | Buffalo ISD, Centerville ISD, Leon ISD, Normangee ISD and Oakwood ISD | None |
| **Madison** | No incorporated areas | Madisonville Consolidated ISD, Normangee ISD and<br>North Zulch ISD | None |
| **Grimes** | No incorporated areas | Anderson-Shiro ISD, Iola ISD, Navasota ISD and Madisonville Consolidated ISD | One emergency service district |
| **Waller** | No incorporated areas | Waller ISD | Waller Harris emergency service districts 200<br>• Tri-County Volunteer Fire Department<br>• Waller Volunteer Fire Department |
| **Harris** | Jersey Village and Houston | Cypress-Fairbanks ISD, Houston ISD, Spring Branch ISD and Waller ISD | Waller Harris emergency service district 200<br>• Tri-County Volunteer Fire Department<br>• Waller Volunteer Fire Department<br>Harris County emergency service district 9 |

Source: AECOM, 2016

#### *3.14.4.1.3 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, Socioeconomic and Community Facilities Technical Memorandum**. **Table 3.14-3** provides 2014 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 ten-county Study Area.

| Table 3.14-3: Demographic Characteristics of Population by County | | | | | | | |
|---|---|---|---|---|---|---|---|
| County | 2014 Population | Percent Children under 18 years old | Percent Minority Population | Percent Hispanic Origin | Percent Low Income | Median Household Income | Percent LEP Population |
| Dallas | 2,448,943 | 27.1% | 41.1% | 38.8% | 19.3% | $49,925 | 11% |
| Ellis | 154,447 | 27.9% | 17.9% | 24.3% | 12.0% | $61,898 | 4% |
| Navarro | 48,073 | 26.2% | 22.5% | 23.8% | 21.8% | $40,976 | 7% |
| Freestone | 19,661 | 23.4% | 19.9% | 14.2% | 17.0% | $44,072 | 4% |
| Limestone | 23,531 | 22.8% | 21.8% | 20.1% | 22.3% | $39,484 | 7% |
| Leon | 16,784 | 22.6% | 13.7% | 13.8% | 13.5% | $48,763 | 3% |
| Madison | 13,771 | 21.7% | 25.3% | 21.0% | 23.6% | $40,879 | 2% |
| Grimes | 26,812 | 22.3% | 25.4% | 22.1% | 18.8% | $46,652 | 4% |
| Waller | 44,825 | 23.7% | 30.3% | 29.4% | 19.3% | $50,939 | 5% |
| Harris | 4,269,608 | 27.5% | 37.2% | 41.4% | 18.4% | $53,822 | 12% |

Source: USCB ACS 2014 5-year estimate; USCB Quick Facts, 2015

Collectively, the percent of minority, Hispanic origin and low-income populations (i.e., individuals below poverty level) are comparatively higher in Dallas and Harris counties than the majority of other counties within the Study Area. Dallas County has almost twice as many minorities than the other counties. Block group level demographic information was used to identify areas that qualified as EJ communities; EJ communities are further discussed in **Section 3.18, Environmental Justice**. Harris County has the highest percentage of residents of Hispanic origin and the highest percentage of LEP residents. Ellis County has the highest median income and one of the lowest minority populations and poverty rates within the Study Area. Navarro, Limestone and Madison counties have the highest percentage of low income populations in the Study Area.

**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 percent 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 | 868,717 | 91% | 2.78 | 7.3% |
| Ellis County | 51,814 | 93% | 2.95 | 3.3% |
| Navarro County | 17,660 | 87% | 2.67 | 8.0% |
| Freestone County | 7,351 | 79% | 2.47 | 4.3% |
| Limestone County | 8,183 | 78% | 2.73 | 6.7% |
| Leon County | 6,170 | 64% | 2.70 | 3.9% |
| Madison County | 3,839 | 75% | 2.56 | 7.9% |
| Grimes County | 9,001 | 82% | 2.61 | 6.3% |
| Waller County | 13,655 | 86% | 2.99 | 6.1% |
| Harris County | 1,462,002 | 89% | 2.89 | 6.9% |

Source: ACS, 2014 5-year estimates

### 3.14.4.2 Economic Setting

#### *3.14.4.2.1 Employment*

The majority of the employment along the Build Alternatives is located within Dallas and Harris counties, with 1.3 million and 1.9 million jobs, respectively. More importantly, there is a great deal of job diversity within these two counties. While there are fewer jobs in the rural counties of the Study Area, there is also a smaller population. **Table 3.14-6** shows employment for the top three sectors by county.

Some information in the table is not shown, specifically to avoid disclosing data of individual companies where only a small number of establishments exist in a county. In these cases, a range of employee numbers is shown parenthetically and payroll figures are withheld. The totals for each county are derived using actual numbers of employees and payroll information.

**Table 3.14-6: Total County Employment (2014)**

| County | Total Employment | Annual Payroll ($1,000) | Top 3 Sectors |
|---|---|---|---|
| Dallas | 1,361,547 | $79,352,522 | • Health Care and Social Assistance<br>• Professional, Scientific and Technology Services<br>• Retail Trade |
| Ellis | 37,683 | $1,395,101 | • Manufacturing<br>• Retail Trade<br>• Accommodation and Food Service |
| Navarro | 14,004 | $468,778 | • Manufacturing<br>• Health Care and Social Assistance<br>• Retail Trade |
| Freestone | 3,829 | $172,732 | • Health Care and Social Assistance<br>• Accommodation and Food Services<br>• Retail Trade |
| Limestone | 5,204 | $177,380 | • Health Care and Social Assistance<br>• Retail Trade |

**Table 3.14-6: Total County Employment (2014)**

| County | Total Employment | Annual Payroll ($1,000) | Top 3 Sectors |
|---|---|---|---|
| | | | • Manufacturing |
| Leon | 4,335 | $260,007 | • Manufacturing<br>• Construction<br>• Retail Trade |
| Madison | 2,940 | $98,039 | • Retail Trade<br>• Mining Quarrying, and Oil and Gas Extraction<br>• Accommodation and Food Service |
| Grimes | 5,937 | $283,390 | • Manufacturing<br>• Retail Trade<br>• Wholesale Trade |
| Waller | 11,289 | $541,284 | • Manufacturing<br>• Health Care and Social Assistance<br>• Retail Trade |
| Harris | 2,012,118 | $131,332,400 | • Health Care and Social Assistance<br>• Retail Trade<br>• Accommodation and Food Services |

Source: USCB ACS 2014 5-year estimate; USCB Quick Facts, 2015

### *3.14.4.2.2 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 and use 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 is dependent on property tax revenues. Property tax rates for counties within the Study Area range from $0.2431 in Dallas County to $0.6882 in Limestone County per $100 in valuation. Property tax rates for school districts range from $1.0598 in Leon ISD to $1.5539 in Waxahachie ISD. Property taxes for cities and special districts only apply within designated areas, but can add from $0.3435 in the City of Centerville to $0.8675 in the City of Lancaster. The total effective rate for all taxing jurisdictions can get as high as $2.65 per $100 valuation within Dallas County's Flood Control Division #1.[11]

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 properties within the LOD in intermediate counties involved some kind of agricultural use. 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 homes assessed value from the

[11] Texas State Comptroller, "Tax Rates and Levies," https://www.comptroller.texas.gov/taxes/property-tax/rates/index.php (accessed September 2016).

taxable value. The highest percentage of properties within the LOD qualifying for a homestead exemption occurs in the suburban county of Ellis.

**Table 3.14-7: Tax Exemption Status within the LOD**

| County | Agricultural Properties | Exempt Properties | Homestead Properties |
|---|---|---|---|
| Dallas | 23% | 16% | 18% |
| Ellis | 73% | 0% | 32% |
| Navarro | 78% | 0% | 12% |
| Freestone | 68% | 1% | 9% |
| Limestone | 90% | 0% | 11% |
| *Leon* | *Detailed exemption data not available* | | |
| Madison | 78% | 6% | 1% |
| Grimes | 45% | 0% | 15% |
| *Waller* | *Detailed exemption data not available* | | |
| Harris | 15% | 9% | 14% |

Source: County Appraisal Tax Rolls, AECOM, 2016
Approximate percentages based on average of Segment Alternatives within a county.

#### *3.14.4.2.3 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, Land Use**, 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 $647 million, representing about 2.5 percent of agricultural production within the state.

### 3.14.4.3 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 | | | |
| 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 |

| Table 3.14-8: Dallas County Community Facilities | | | |
|---|---|---|---|
| **Mapbook Page** | **Name** | **Address** | **Segment** |
| 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 | Barbabas Missionary Baptist | 4431 Hedgdon 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 |
| 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 |
| 9 | Liberty Ministries International Worship Center | 700 N. Lancaster Hutchins Road, Lancaster, TX 75146 | 1 |
| Community Centers | | | |
| 4 | Fruitdale Recreation Center | 4408 Vandervort Drive, Dallas, TX 75216 | 1 |
| 6 | Turnkey Community Center | Tioga Street, Dallas, TX 75241 | 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, 2016

| Table 3.14-9: Ellis County Community Facilities | | | |
|---|---|---|---|
| **Mapbook page** | **Name** | **Address** | **Segment** |
| Cemeteries* | | | |
| 22 | Boren Cemetery | 950 Boren Drive, Waxahachie, TX 75165 | 2A |
| 27, 44 | Grady Cemetery (aka, Hodge Cemetery) | Ennis, TX 76626 | 2A, 2B |

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2016
*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 |
|---|---|---|---|
| Churches | | | |
| 52, 90 | Community Baptist Church | SW 3040 Corsicana, TX 75110 | 3A, 3C |
| Cemeteries | | | |
| 55 | Ward Cemetery | 8289 FM 709, Richland, TX 76681 | 3A |
| 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, 2016

**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 |
| 160 | Unknown (Cotton Gin) | Cotton Gin, TX | 4 |
| 164 | Unknown Cemetery (S of Asia) | CR 844, Mexia, TX 7667 | 4 |

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2016

**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, 2016

| 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 | | | |
| 118 | Sand Hill Cemetery | CR 306, Buffalo, TX 75831 | 3C |
| 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 |
| 187 | Unnamed Cemetery | CR 408, Normangee, TX 77871 | 4 |

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2016

| 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 |
| 198 | Grace Baptist Church | FM 1372, North Zulch, TX 77872 | 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, 2016

| Table 3.14-15: Grimes County Community Facilities | | | |
|---|---|---|---|
| **Mapbook page** | **Name** | **Address** | **Segment** |
| Churches | | | |
| 152, 202 | Shiloh Church | FM 1696, Bedias, TX 77831 | 5 |
| 212 | Oakland Baptist Church (Historic) | Church Road, Roans Prairie, TX | 5 |
| 223 | Zion Church | Navasota, TX 77868 | 5 |
| Cemeteries | | | |
| 151 | Grimes County Bethel Cemetery | FM 410B, Madisonville, TX 77831 | 5 |

**Table 3.14-15: Grimes County Community Facilities**

| Mapbook page | Name | Address | Segment |
|---|---|---|---|
| 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 |
| 212 | Old Oakland | 3796 CR 219, Anderson, TX 77830 | 5 |
| 216 | Mason | CR 222, Anderson, TX 77830 | 5 |
| 223 | Stonehamville/Simmons | Navasota, TX 77868 | 5 |

Sources: ESRI, 2015; Texas Historical Commission, 2016; AECOM, 2016

**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, 2016

**Table 3.14-17: Harris County Community Facilities**

| Mapbook page | Name | Address | Segment |
|---|---|---|---|
| Schools | | | |
| 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 |
| 254 | Awty International School | 7455 Awty School Lane, Houston, TX 77055 | 5 |
| 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 | First United Methodist Korean Church | 14184 Reo Street, Houston, TX 77040 | 5 |
| 250 | Fairbanks Baptist Church | 14210 Aston Street, Houston, TX 77040 | 5 |
| 251 | From The Heart Christian Ministries of Houston | 5249 Dow Road, 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 | Westview Baptist Church | 6735 Long Point Road, Houston, TX 77055 | 5 |

| Table 3.14-17: Harris County Community Facilities | | | |
|---|---|---|---|
| **Mapbook page** | **Name** | **Address** | **Segment** |
| 253 | Templo El Buen Samaritano | 6640 Long Point Road, Houston, TX 77055 | 5 |
| Community Centers | | | |
| 246 | Veterans of Foreign Wars | 21902 Northwest Freeway, Cypress, TX 77429 | 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 |
| Cemeteries | | | |
| 250 | Fairbanks | Stonington Street, Houston, TX 77040 | 5 |
| 254 | Beth Yeshurum-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, 2016

## 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. 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 Build Alternatives 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 Build Alternatives.

Without the Build Alternatives, 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 Build Alternatives would include ground clearing, placement of fill material for track; staging areas; new, replaced or extended culverts and bridges; and access road development. These activities support construction and would occur in the Study Area for all Build Alternatives. During construction, there would be short-term impacts to local communities from increased noise, dust and vehicular congestion resulting from road closures and detours. These are further discussed in **Section 3.2, Air Quality; Section 3.4, Noise and Vibration;** and **Section 3.11, Transportation**.

**Operational Impacts**
Localized changes in demographics would result from the Build Alternatives' 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.

### *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 Build Alternatives, 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 Build Alternatives 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 Build Alternatives' track configuration (i.e., at-grade, embankment or viaduct), density of the community and location of and access to community facilities.

The Build Alternatives' track configuration would be a critical component to maintaining community connectivity. In some locations, the Build Alternatives could create a barrier to community services. To avoid this impact, approximately 60 percent of the alignment of each Build Alternative 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. It should be noted that acquisitions and displacements would be subject to negotiation by TCRR with the property owner. Also, if TCRR receives DOT 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.

**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 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.

LeMay and LeForge 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 Build Alternatives. This neighborhood is also discussed in **Section 3.18.5.4.8, Environmental Justice**. Two streets, LeMay and LeForge 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 the UPRR railroad on the west. Located to the west of the UPRR railroad, 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 the UPRR and pass on viaduct to the east of the greater Cedar Crest community and cut through the western edge of the LeMay and LeForge 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 LeMay and LeForge neighborhood would be impacted. Only 20 homes would remain, and a portion of LeMay and LeForge Avenues would be adjacent to the viaduct infrastructure.

Full acquisition of the LeMay and LeForge neighborhood (34 homes) and relocation of residents may be appropriate to mitigate community cohesion impacts to the neighborhood. It may be possible to relocate residents of the LeMay and LeForge neighborhood within the Cedar Crest Community. Estimated value for these single-family homes averages $20,311.[12] Based on a search of available houses for sale in the Cedar Crest community, there are 43 homes valued at $45,000-$80,000. Additionally, there are 78 lots for sale valued at $5,000-$65,000. Although ample replacement housing is available within 3 miles of the neighborhood, it may not be accessible to those with a home valued under $45,000. In addition, the available housing may not replicate the existing community connection. 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. Mitigation for these impacts may include relocating neighbors so that they remain together or increasing the compensation for relocation to include the services that would be required (healthcare, childcare). Outreach efforts to this community to understand the existing connections between residents will be documented in the Final EIS.

**Segments 2A, 2B, 3A, 3B, 3C and 4**

FRA did not identify any adverse impacts to community character and cohesion along Segments 2A, 2B, 3A, 3B, 3C and 4 of the Build Alternatives.

**Segment 5**

Saddle Creek Forest Development—This new, custom-home development, is located along the Grimes and Waller County line on Riley Road and Saddle Creek Forest Parkway. Lot sizes range from 1.5 to 5 acres and the community has seven miles of riding trails and several small lakes.[13] While the

[12] Dallas County Appraisal District, Accessed June 2016, http://www.dallascad.org/searchaddr.aspx.
[13] Saddle Creek Forest POA, Accessed June 2016, https://community.associawebsites.com/sites/SaddleCreekForestPOA/Pages/AcwDefault.aspx

development's infrastructure is in place, a majority (approximately 86 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 480 lots in the development. There are 22 homes and manufactured homes for sale within a three mile radius[14] of Saddle Creek Forest. Among the 22 homes for sale, 6 of those homes are located within the Saddle Creek Forest development. The homes are valued at $69,000 to $725,000. There are 42 lots for sale within a 3-mile radius of Saddle Creek Forest development. These undeveloped lots are valued $25,000 to $225,000. 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 Build Alternatives would not adversely impact the community character and cohesion of this development.

<u>Plantation Forest Development</u>—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 not located within an EJ block group. The character in this area is a semi-rural single-family residential development with lots typically one 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. Segment 5 would be constructed on embankment through the Plantation Forest Development. The Project would directly impact and displace 19 of the homes on the west and east side of Plantation Drive as the alignment crosses the road. The remaining seven 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. Riley Road, which intersects Plantation Drive, would be reconfigured to bypass the Build Alternatives and the remaining homes would retain their access via Plantation Drive. This means that the neighborhood would not be isolated or further bisected by the Project. According to the **Section 3.4, Noise and Vibration** analysis, moderate noise impacts would occur at homes that are not displaced by the LOD. Additionally, remaining homes would experience an impact to the aesthetic and visual environment due to the introduction of the Build Alternatives' infrastructure.

<u>White Oak Falls Neighborhood</u> —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 40 homes (5.3 percent), adjacent to the existing UPRR ROW, would be displaced by Segment 5. Homes adjacent to the UPRR ROW range from approximately $110,000 to $200,000 in appraised value with the average home value being approximately $164,427. The neighborhood is not located within an EJ 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 (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

[14] Radius from the intersection of Saddle Creek Forest Parkway and Riley Road

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**; however, noise impacts would not be significant. Visual and aesthetic impacts as a result of the Build Alternatives 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. To mitigate visual impacts, TCRR in coordination with local land owners would evaluate the need for a vegetative barrier similar to what currently exists or sound wall to mitigate visual and noise impacts. Additional mitigation measures are detailed in **Section 3.10.7.1, Aesthetic and Scenic Resources**.

**Houston Terminus 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 Industrial Station Option; therefore, construction and operation of the Houston Industrial Site Terminal 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 Awty International School is approximately a quarter-mile from the station option. 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 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 Build Alternatives. 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.[15] 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 $6.5 billion to $7.0 billion 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 Build Alternatives. 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 Build Alternatives.

**Temporary Impacts: Capital Investment**

TCRR estimates capital costs for the HSR system between $15 billion and $18 billion ($2017). This estimate includes construction labor, materials, indirect costs, and approximately $2.5 billion for systems and rolling stock. Of these costs, only direct construction costs and professional services (such as engineering and environmental review, and administration) would generate induced spending within the local economy. Systems and rolling stock, which would likely be purchased from outside the state would contribute to the economy through use taxes where in the local jurisdictions where they are stored or used. ROW acquisition costs offset the loss of existing economic uses and do not create new economic value other than real through estate transaction fees, which are not included in this analysis.

TCRR also provided an estimate of total direct capital investment in the economy by Build Alternative, which was compared to total capital costs in order to estimate costs by category of spending for each alternative, as shown in **Table 3.14-18.** All estimates are reflected in 2016 dollar value for consistency.

**Table 3.14-18: Capital Expenditures by Build Alternative**

| Build Alternative | Capital Investment [1] | Construction Estimate ($2016) | Professional Services Estimate ($ 2016) | Systems and Rolling Stock Estimate ($2016) |
|---|---|---|---|---|
| A | $11 B | $9.35 B | $1.65 B | $2.46 B |
| B | $11 B | $9.35 B | $1.65 B | $2.46 B |
| C | $12 B | $10.20 B | $1.80 B | $2.46 B |
| D | $11 B | $9.35 B | $1.65 B | $2.46 B |
| E | $11 B | $9.35 B | $1.65 B | $2.46 B |
| F | $12 B | $10.20 B | $1.80 B | $2.46 B |

Source: ARUP, Economic Analysis Input for EIS, Technical Memorandum. April, 2016, HSR Construction Cost Estimate, May 2017.
Note: [1] Capital cost estimates exclude Systems, ROW 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 $8.3 billion in the State of Texas. The impact of each Build Alternative is shown in **Table 3.14-19** for each Economic Impact Area. 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 temporary, annual impacts accrued over

[15] Texas Central Railway, www.TexasCentralRail.com/Facts (accessed June, 2016) $2.46 B

the pre-operational period. For example, a single temporary construction worker employed for three years would be counted as three annual construction positions.

| Table 3.14-19: One-time Capital Investment Impacts | | | | | |
|---|---|---|---|---|---|
| **Economic Impact Area** | **Build Alternatives** | **Total Earnings ($2016 millions)** | **Employment (job years)** | **Local Sales Tax ($2016 millions)** | **State Sales Tax ($2016 millions)** |
| All Project Counties | A,B,D,E | $4,568 | 94,062 | $32 | $141 |
| | C,F | $4,983 | 102,613 | $35 | $154 |
| Dallas County | A,B,D,E | $1,226 | 25,048 | $10 | $41 |
| | C,F | $1,338 | 27,325 | $11 | $45 |
| Harris County | A,B,D,E | $1,697 | 34,949 | $12 | $47 |
| | C,F | $1,851 | 38,126 | $13 | $52 |
| Intermediate Counties | A,B,D,E | $978 | 20,056 | $7 | $32 |
| | C,F | $1,067 | 21,879 | $8 | $35 |
| State of Texas | A,B,D,E | $7,593 | 163,755 | $54 | $246 |
| | C,F | $8,283 | 178,642 | $58 | $269 |

Source: AECOM, 2017

**Temporary Impacts: Construction**
Construction of the Build Alternatives 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 90,000 annual employment positions and $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. However, any negative impacts would be temporary and likely offset by the increased spending of temporary construction workers. Therefore, any negative impacts to individual businesses would be not be adverse to the regional economy.

**Permanent Impacts: Employment, Earnings, and Sales and Use Tax**
The Build Alternatives would create new permanent HSR jobs to operate and maintain the HSR system. 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 would be jobs created by the HSR system directly and would 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: Direct Employment and Earnings Impacts | | | | | | |
|---|---|---|---|---|---|---|
| **County** | **Staff Location** | **Employment Estimate[16]** | **Percent of Existing Employment** | **Percent of Existing Unemployment** | **Earnings Est. ($FY16)** | **Percent of Existing** |
| Dallas County | Urban Station, TMF, and (1) MOW Facility | 476 | < 0.1% | 0.8% | $25.9 M | < 0.1% |
| Harris County | Urban Station, TMF, and (1) MOW Facility | 476 | < 0.1% | 0.5% | $25.9 M | < 0.1% |
| Grimes County | Rural Station | 124 | 2.1% | 36.6% | $5.6 M | 2.2% |
| Intermediate County Total | Rural Station, TMF, and (5) MOW Facilities | 224 | 0.3% | | $11.6 M | 0.3% |
| **Total** | | **1,176** | **< 0.1%** | | **$63.7 M** | **<0.1%** |

Source: TCRR, 2016; BEA, 2015

**Table 3.14-20** also describes the net increase in HSR jobs compared to the existing job base in each county to determine whether these would be large or small job gains for these economies. The anticipated growth in each county would represent a fractional increase in the employment base, less than half a percentage point, everywhere except Grimes County. Those shares would likely be smaller in the future as the employment base would be anticipated to grow.

In Grimes County, the net new 124 full-time positions would represent just over 2 percent of the existing job base. The 124 net new HSR jobs would be equivalent to about 37 percent of the county's unemployment base. These jobs would primarily be in service and support industries that could be filled from within the county. This would represent an increase for the county's employment rate and an expansion of economic opportunity. The estimated annual earnings in 2016 dollars, based on BLS Occupational Employment Statistics, would be greatest in Dallas and Harris counties. However, the greatest percent change compared to existing conditions would occur in Grimes County, where annual HSR earnings of $5.6 million would represent 2.2 percent of the county's 2013 earnings adjusted for inflation.

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 2 to 4 jobs in supporting industries based on Economic Impact 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 28 to 35 percent, a state sales tax rate of 6.25 percent and local sales tax rates between 1.8 and 2.0 percent, these earnings result in approximately $5 million annual sales tax revenue for the state, and an additional $1 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.

[16] Staffing assumptions were developed for purposes of estimating water demand and do not represent final employment projections.

**Table 3.14-21: Permanent Employment Impacts**

| Region | Earnings ($2016) | Employment (annual) | Local Sales Tax ($2016) | State Sales Tax ($2016) | Local Use Tax* ($2016) | State Use Tax* ($2016) |
|---|---|---|---|---|---|---|
| All Project Counties | $144,722,448 | 4,068 | $1,019,916 | $4,461,417 | $48,431,827 | $153,500,088 |
| Dallas County | $58,018,195 | 1,711 | $488,966 | $1,931,811 | $2,040,864 | $6,377,701 |
| Harris County | $54,465,215 | 1,557 | $379,610 | $1,515,600 | $4,841,148 | $15,128,587 |
| Intermediate Counties | $17,348,029 | 476 | $122,258 | $562,914 | $38,014,214 | $131,993,800 |
| State of Texas | $154,048,086 | 4,574 | $1,085,638 | $4,998,596 | $48,431,827 | $153,500,088 |

Source: AECOM, 2017
*Use tax would decrease with asset depreciation.
Note: Employment, earnings and tax estimates do not include potential losses for businesses displaced by the project that are unable to relocate within the study area.

The systems and rolling stock procured for operation of the Build Alternatives would also be subject to a use tax. The estimated year 1 use tax shown in **Table 3.14-21** was determined by allocating systems costs proportionally by track mile and applying the effective county tax rate. This tax would recur annually starting in 2022 (when the bulk of systems installation and early vehicle procurement is scheduled to occur) and would decrease approximately 2.5 percent per year with asset depreciation.

Additional sales tax revenue would result from the sale of tickets for travel on the new HSR system on an annual basis while it is in operation. As shown in **Table 3.14-22**, HSR ticket sales could generate between $15 billion and $39 billion in sales tax for the state plus $5 billion to $12 billion in local tax revenue. Local sales tax is assumed to be collected at the point of sale, roughly split between Dallas and Houston jurisdictions.[17] Tax revenue for ticket sales would be identical for all Build Alternatives.

**Table 3.14-22: Annual Ticket Revenue Impacts for all Build Alternatives**

| Mode | HSR | Car* | Air* | Bus | All Modes |
|---|---|---|---|---|---|
| Build Market Share | 21% | 73% | 3% | 2% | 100% |
| No-Build Market Share | 0% | 89% | 9% | 2% | 100% |
| Average Trip Price (2016$) | $199 | *** | $199 | $25 | |
| High Impact Assessment based on 7.2 million annual HSR travel demand | | | | | |
| Ridership Impact | 7,200,000 | (5,300,000) | (1,900,000) | - | |
| Federal Tax Impact (2016$)** | $0 | $(8,971,840) | $0 | $0 | $(8,971,840) |
| State Tax Impact (2016$) | $89,550,000 | $(9,752,000) | $(23,631,250) | $0 | $56,166,750 |
| Local Tax Impact (2016$) | $28,656,000 | $0 | $(7,562,000) | $0 | $21,094,000 |
| | | | | **Net Impact** | **$68,288,910** |

[17] Available travel demand model does not include ridership estimates at the Brazos Valley Station at this time. Estimates of ticket revenue will be conservative as a result.

**Table 3.14-22: Annual Ticket Revenue Impacts for all Build Alternatives**

| Mode | HSR | Car* | Air* | Bus | All Modes |
|---|---|---|---|---|---|
| Low Impact Assessment based on 5 million annual HSR travel demand | | | | | |
| Ridership Impact | 5,000,000 | (3,700,000) | (1,300,000) | 0 | |
| Federal Tax Impact (2016$) | $0 | $(6,263,360) | $0 | $0 | $(6,263,360) |
| State Tax Impact (2016$) | $62,187,500 | $(6,808,000) | $(16,168,750) | $0 | $39,210,750 |
| Local Tax Impact (2016$) | $19,900,000 | $0 | $(5,174,000) | $0 | $14,726,000 |
| | | | | **Net Impact** | **$47,673,390** |

Source: TCRR, 2016, USDOT, Greyhound.
Notes: *Negative values for car and air travel are a result of fewer trips on these modes with expected shift to HSR travel
** Federal gas tax impacts are not included in any of the Economic Impact Area level summaries.
*** Tax impact of lower vehicle trips is based on mileage, average fuel economy and applicable tax/gallon.

The net new employment and earnings projected to be generated by the Build Alternatives would result in positive impacts in all Economic Analysis Areas. Indirect job growth would account for approximately two percent of total unemployment or less, and would not be likely to require additional labor or population growth in any of the Economic Analysis Area geographies. 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.

Sales and Use tax impacts from induced spending, systems and rolling stack storage, and HSR ticket sales could be as much as $205 million a year for the state of Texas. Sales taxes would be highest in the Dallas County and Harris County Economic Analysis Areas, while use taxes would be highest in the Intermediate County Economic Analysis Area. All Economic Analysis Areas would experience positive sales and use tax growth for all Build Alternatives.

**Permanent Impacts: Property Premiums**

Operation and maintenance of the Build Alternatives could also lead to induced development and changes to property values around station areas. Economies of agglomeration would result from improved transportation efficiency between the Dallas Terminal Station option, the Brazos Valley 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 in Washington D.C., Atlanta, New York City, San Francisco, Boston, Los Angeles, Philadelphia, Santa Clara County, Portland and San Diego. Rapid/commuter rail systems had a wider sphere of influence for positive land premiums around stations than light rail transit. This is attributed to higher speeds and greater regional access.[18] 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 station areas would have a similar positive impact.

[18] Parsons Brinkerhoff, The Effect of Rail Transit on Property Values: A Summary of Studies. https://drcog.org/documents/The_effect_of_Rail_Transit_on_Property_Values_Summary_of_Studies1.pdf (accessed April 2016).

Data is 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. However, 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[19] 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 3.4.6.5, Noise and Vibration Mitigation**, 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 could 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 3.14-23.** This estimate does not include any new development or large scale redevelopment projects. The property premium would likely take effect one year before the opening of the service, when construction would be nearing completion.

**Table 3.14-23 Range of Property Premium Impacts by Station Area, $2016 (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 | | $703.8 | $739.7 | $28.2 | $56.3 | $14.8 | $29.6 | $42.9 | $85.9 |
| Brazos Valley Station | | $3.8 | $5.7 | $0.2 | $0.3 | $0.1 | $0.2 | $0.3 | $0.5 |
| Houston Terminal Station | Option 1 | $462.4 | $942.0 | $18.5 | $37.0 | $18.8 | $37.7 | $37.3 | $74.7 |
| | Option 2 | $350.0 | $707.6 | $14.0 | $28.0 | $14.2 | $28.3 | $28.2 | $56.3 |
| | Option 3 | $482.1 | $553.4 | $19.3 | $38.6 | $11.1 | $22.1 | $30.4 | $60.7 |
| **Total Premium in the 1/2 Mile Buffer** | | | | | | | | **Low** | **High** |
| **Dallas, Brazos Valley and Houston (Option 1)** | | | | | | | | **$80.5** | **$161.1** |
| **Dallas, Brazos Valley and Houston (Option 2)** | | | | | | | | **$71.4** | **$142.7** |
| **Dallas, Brazos Valley and Houston (Option 3)** | | | | | | | | **$73.6** | **$147.1** |

Source: AECOM, 2017.
Note: Option 1 refers to the Northwest Transit Center Terminal; Option 2 to the Northwest Mall Terminal; and Option 3 to the Industrial Site Terminal.

[19] Parsons Brinkerhoff, The Effect of Rail Transit on Property Values: A Summary of Studies. https://drcog.org/documents/The_effect_of_Rail_Transit_on_Property_Values_Summary_of_Studies1.pdf (accessed April 2016).

It was estimated that within a half-mile of the proposed stations, property assessment values would increase between $71.4 million and $161.1 million. Property assessment values around the Dallas Terminal Station option (Dallas County) would be expected to increase between $42.9 million and $85.9 million. Properties around Brazos Valley Station (Grimes County) would be expected to increase between $264,904 and $529,808 prior to any potential private investment that could occur as a result of the Build Alternatives. Of the three Houston Terminal Station options in Harris County considering only the low end property premium), the Northwest Mall Terminal Station option(Option 2) would have the lowest property premium of $28.2 million, while the Northwest Transit Center Terminal Station option (Option 1) would have the highest premium of $37.3 million. It should be noted that 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 property premiums on overall tax revenues is discussed in the following sections.

**Permanent Impacts: Business Displacements**
As documented in **Section 3.13, Land Use,** and detailed in the **Appendix E, Land Use Technical Memorandum**, as many as 74 (Build Alternatives C or F, Northwest Transit Center Terminal Station Option) individual businesses could be displaced. **Table 3.14-24** 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 Build Alternatives 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 3.14-24: Number of Business Displacements by Build Alternative**

| County | Alt A | Alt B | Alt C | Alt D | Alt E | Alt F |
|---|---|---|---|---|---|---|
| Dallas | 20 | 20 | 20 | 20 | 20 | 20 |
| Ellis | 0 | 0 | 0 | 0 | 0 | 0 |
| Freestone | 0 | 0 | 9 | 0 | 0 | 9 |
| Leon | 0 | 0 | 8 | 0 | 0 | 8 |
| Madison | 0 | 0 | 0 | 0 | 0 | 0 |
| Grimes | 1 | 1 | 1 | 1 | 1 | 1 |
| Harris<br>(track only) | 22 | 22 | 22 | 22 | 22 | 22 |
| Houston Station Options<br>IND<br>NWTC<br>NWM | <br>1<br>14<br>2 | <br>1<br>14<br>2 | <br>1<br>14<br>2 | <br>1<br>14<br>2 | <br>1<br>14<br>2 | <br>1<br>14<br>2 |
| **Total** | **44-57** | **44-57** | **61-74** | **44-57** | **44-57** | **61-74** |

Source: AECOM, 2017

**Permanent Impacts: Agricultural Displacements**

Construction of the Build Alternatives 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 $317 per acre. Therefore, the average loss of crop income across all Build Alternatives would range from $560,043 (Alternative F) to $622,964 (Alternative A) annually. This would represent an approximately one percent loss in the average annual market value of crops across all counties within the Study Area. Given that 80 percent of the Study Area is agricultural, and that an average of only 23 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. Impacts to non-special-status farmland would be not be adverse.

Additionally, pastures (i.e., grazing lands) represent approximately 60 percent of all agricultural lands within the Study Area counties. The permanent conversion of grazing lands would range from approximately 2,945 acres under Build Alternative F to 3,280 acres under Build Alternative B. Unlike crop land, the permanent conversion of pastureland would not directly result in the loss of livestock revenue.

**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 3.14-25** summarizes the high, low and probabilistic property tax impacts due to the acquisition of real property in each county by segment and the Houston Terminal Station options.

**Table 3.14-25: Net Change in Property Tax Revenue for Acquired Property $2016 (thousands)**

| County and Segment | High Impact Scenario | Low Impact Scenario | Probabilistic Impact Scenario |
|---|---|---|---|
| **Dallas County** | | | |
| Segment 1 | $ 1,205.76 | $ 335.08 | $ 1,169.95 |
| **Ellis County** | | | |
| Segment 1 | $ 2.21 | $ (1.27) | $ 1.51 |
| Segment 2A | $ 43.33 | $ (23.51) | $ 34.72 |
| Segment 2B | $ 22.82 | $ (31.63) | $ 16.67 |
| Segment 3A | $ 4.18 | $ 1.86 | $ 3.71 |
| Segment 3B | $ 3.21 | $ 0.81 | $ 2.90 |
| Segment 3C | $ 4.13 | $ 1.82 | $ 3.67 |
| **Navarro County** | | | |
| Segment 3A | $ 49.23 | $ 18.18 | $ 46.45 |
| Segment 3B | $ 41.40 | $ (19.98) | $ 35.07 |
| Segment 3C | $ 37.20 | $ 15.63 | $ 35.39 |
| Segment 4 | $ - | $ - | $ - |
| **Freestone County** | | | |
| Segment 3C | $ 2.66 | $ (75.34) | $ (5.58) |
| Segment 4 | $ 38.03 | $ 4.52 | $ 35.68 |
| **Limestone County** | | | |
| Segment 4 | $ (3.54) | $ (16.44) | $ (4.58) |
| **Leon County*** | | | |
| *Segment 3C* | *$ 70.07* | *$ (1.19)* | *$ 62.41* |
| *Segment 4* | *$ 54.71* | *$ (0.93)* | *$ 48.73* |
| **Madison County** | | | |
| Segment 3C | $ 29.68 | $ (50.91) | $ 21.87 |
| Segment 4 | $ 58.23 | $ 26.23 | $ 53.74 |
| **Grimes County** | | | |
| Segment 3C | $ 6.08 | $ 5.81 | $ 6.07 |
| Segment 4 | $ 5.14 | $ 4.87 | $ 5.14 |
| Segment 5 | $ 233.14 | $ 79.01 | $ 213.60 |
| **Waller County**** | | | |
| *Segment 5* | *$ 10.13* | *$ (6.58)* | *$ 8.01* |
| **Harris County** | | | |
| Segment 5 | $ (2,540.49) | $ (5,271.34) | $ (2,733.70) |
| Segment 5: Industrial Site Terminal Option | $ (22.80) | $ (163.15) | $ (24.31) |
| Segment 5: Northwest Mall Terminal Option | $ (40.10) | $ (51.85) | $ (40.14) |
| Segment 5: Northwest Transit Center Terminal Option | $ (498.91) | $ (1,580.89) | $ (504.43) |

Source: AECOM, 2017

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.

** Waller County tax impacts are based on weighted blend of taxable values per acre for all segments in Ellis County.

In addition to impacts from land acquisitions, the improvements constructed under the Build Alternatives 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 3.14-26**. Because these property taxes are based on built improvements, they would be subject to depreciation as the assets age. Figures in the table below would reflect the first year of operation (2023), with annual depreciation as noted.

**Table 3.14-26: Estimated Property Tax Revenue from HSR Improvements. $2016 (M)**

| Asset | Estimated Cost | 2023 Tax Revenue (all local jurisdictions) | Annual Depreciation |
|---|---|---|---|
| Dallas Terminal Station | $153.59 | $3.76 | $0.07 |
| Brazos Valley Station | $12.03 | $0.20 | $0.01 |
| Houston Station | $153.59 | $3.56 | $0.06 |
| Dallas TMF & MOW | $489.5 | $11.78 | $0.22 |
| Ellis MOW | $132.8 | $2.39 | $0.04 |
| Freestone MOW | $132.8 | $2.40 | $0.04 |
| Leon MOW | $132.8 | $0.61 | $0.01 |
| Grimes MOW | $132.8 | $2.32 | $0.04 |
| Waller MOW | $132.8 | $3.40 | $0.06 |
| Harris TMF & MOW | $489.5 | $9.47 | $0.18 |
| Track | By alternative | $128-$130 | $3.37-$3.42 |
| **Total** | | **$167-$169** | **$4.11-$4.16** |

Source: AECOM, 2017

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 3.14-27,** 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 Stations would apply to all Build Alternatives.

**Table 3.14-27: Estimated Tax Revenue from Property Premium. $2016 (M)**

| Station | Total Premium (Low) | Tax Revenue (Low) | Total Premium (High) | Tax Revenue (High) |
|---|---|---|---|---|
| Dallas Terminal Station | $42.95 | $1.04 | $85.89 | $2.09 |
| Brazos Valley Station | $0.26 | $0.00 | $0.53 | $0.01 |
| Industrial Site Terminal Option | $37.34 | $0.86 | $74.67 | $1.72 |
| Northwest Mall Terminal Option | $28.15 | $0.65 | $56.30 | $1.30 |
| NWTC Terminal Option | $30.35 | $0.70 | $60.70 | $1.40 |

Source: AECOM, 2017

The combined effect of property acquisition, capital investment, and station area premiums on property tax revenues across the ten-County Economic Analysis Study Area would be positive for each of the Build Alternatives, with a total property tax impact along the corridor that could range between $2.3

billion and $2.4 billion by the year 2040, as shown in **Table 3.14-28**. 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 3.14-28: Net Property Tax Impact of Acquisitions, Improvements and Station Area Premiums through 2040 ($2016 M)**

| Geography | Low | High |
|---|---|---|
| All | $2,273.40 | $2,443.15 |
| Dallas | $380.53 | $411.34 |
| Harris | $334.40 | $439.51 |
| Rural | $1,558.47 | $1,592.30 |
| Texas | $2,273.40 | $2,443.15 |

Source: AECOM, 2017

### *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, a water or soil contamination that could impact school children or heavily congested roadways and pedestrian access that represent safety concerns. FRA identified the number of schools within the Study Area and assessed the likelihood of that school and its children experiencing any adverse impact due to the construction or operation of the Project.

Five schools within the Study Area would be adjacent or within 1,000 feet of the LOD. All of the schools 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. The five schools identified are detailed below.

The Wilmer-Hutchins School in Dallas County would be located adjacent to the LOD. This area of the LOD would be a designated temporary construction zone used for storage or laydown space for materials and equipment. The Wilmer-Hutchins School main building is separated from the LOD by Langdon Road and approximately 380 feet, however the parking lot associated with the school would be approximately 50 feet from the LOD. Additionally, playground and sports facilities on school grounds would be located more than 500 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 Build Alternatives and increased traffic on Langdon Road. Implementation of standard procedures for reducing fugitive dust emissions would be addressed in the construction safety plan developed prior to construction, as described in **Section 3.2.6, Air Quality**. All hazardous materials would be handled and stored in accordance with state and federal regulations, as described in **Section 3.5.6, Hazardous Materials**. 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 **Section 3.11.6, Transportation**.

The AIA Lancaster Elementary School in Dallas County would be located approximately 630 feet from a temporary construction zone of the LOD. In many cases, temporary construction zones would be used for storage and laydown space for materials and equipment, however this area of the LOD would eventually be established as a MOW facility. Temporary construction impacts could include localized air quality impacts. Air quality impacts would be mitigated through BMPs outlined in **Section 3.2.6, Air Quality**.

Additionally, the MOW facility in Dallas County would represent a permanent impact to children's health and safety due to the utilization of hazardous chemicals for the maintenance and operation of the HSR system. However, all hazardous materials would be handled and stored in accordance with state and federal regulations, as described in **Section 3.5.6, Hazardous Materials**. Increased traffic as a result of the construction of the Build Alternatives would be mitigated through traffic control plans, as outlined in **Section 3.11.6, Transportation**.

Leon ISD in Leon County would be located approximately 400 feet from a temporary construction zone used for storage or laydown space for materials and equipment. The school's outdoor sports facilities would be located more than 1,800 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 Build Alternatives and increased traffic on US-79. 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**.

Cypress Falls High School located 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 Build Alternatives and increased traffic on Huffmeister Road. Air quality and hazardous materials impacts would be handled through BMPs and mitigation measures outlined in **Section 3.2.6, Air Quality and Section 3.5.6, Hazardous Materials**. Increased traffic congestion due to the construction of the Build Alternatives around Cypress Falls High School would be mitigated through a traffic control plan established before construction. 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.

The Awty International School in Harris County would be located approximately 1,000 feet from North West Transit Terminal Station Option. 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 and hazardous materials impacts would be handled through BMPs and mitigation measures outlined in **Section 3.2.6, Air Quality and Section 3.5.6, Hazardous Materials**. Construction and operation of the Northwest Transit Center Terminal Station Option would produce increased traffic located approximately 1,000 feet from the Awty International School on Post Oak Boulevard. Congestion as a result of the Build Alternatives would be mitigated through infrastructure improvements on Post Oak Boulevard. Additionally, children walking to school would not likely encounter the station area due to the route and geographic locations of residential units in the area.

#### *3.14.5.2.5 Impacts to Community Facilities*

**Tables 3.14-8** through **3.14-17** identified 93 community facilities within the Study Area across all of the Build Alternatives. Of those 93, 6 facilities would be directly impacted, depending on the Build Alternative chosen.

**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 18 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 Build Alternatives.

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, Cultural Resources**. FRA reviewed the Dallas County Appraisal District data to determine that the Southern Dallas Development Corporation owns the land. The old elementary school now houses the Imperial Institute of America, a for profit trade school operating in Dallas County. The Build Alternatives would displace the Imperial Institute of America and the parcel would result in a full take. The Build Alternatives 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 infrastructure project 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, Noise and Vibration** (within 40 feet to the rail), no adverse noise impact would be anticipated. Additional information regarding the Smith Family Cemetery can be found in **Section 3.19, Cultural Resources**.

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, Cultural Resources**, 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, Noise and Vibration** (within 40 feet to the rail), no adverse noise impact would be anticipated.

**Ellis County**
Two community facilities along Segment 2A were identified as described in **Table 3.14-9**, but would be located more than 300 feet from of the LOD and would not experience adverse impacts from the construction or operation of the Build Alternatives. As noted in **Section 3.4.5.2.1, Noise and Vibration**,

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. The origin source of the construction noise would be within the LOD of the Project, which contains construction laydown areas. Therefore, there would be no impact to the facilities along Segment 2A. Additionally, operational noise associated with the HSR System would be less than the construction noise.

**Navarro County**

Four community facilities, including a regional hospital were identified in Navarro County as described in **Table 3.14-10**. The Community Baptist Church would be approximately 100 feet from the LOD. The portion of the LOD adjacent to the church would be a temporary construction zone which may be used for the storage of equipment and laydown space during the construction of the Build Alternatives. Additionally, while the ROW of the Build Alternatives would be located approximately 1,900 feet from the Community Baptist Church, construction noise could be perceptible during daytime hours due to movements of heavy equipment. In rural areas construction would only occur in daytime hours so no nighttime noise impacts would occur. Therefore, construction noise impacts to Community Baptist Church would not be adverse. BMPs would be used to mitigate impacts from construction lighting, noise and dust, as outlined in **Section 3.2, Air Quality; Section 3.4, Noise and Vibration, and Section, 3.10 Aesthetic and Scenic Resources**.

The three remaining resources would all be located over 750 feet from the LOD and would not experience adverse impacts from the construction or operation of the Build Alternatives.

**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 Build Alternatives.

Along Segment 4, four community facilities were identified, as shown in **Table 3.14-11.**The boundaries of the Unknown (Cotton Gin) Cemetery would be located approximately 100 feet from the LOD. In this location, the Build Alternatives would be on embankment and the portion of the LOD nearest to the cemetery would be designated for roadway improvements to County Road 930. Temporary noise impacts related to construction would be close enough to be perceptible during daytime hours, and construction of roadway improvements could disturb the meditative environment of the Unknown (Cotton Gin) Cemetery. However, with BMPs and mitigation measures outlined in **Section 3.4, Noise and Vibration** the temporary impacts would not be adverse.

The remaining three facilities would all be located more than 700 feet from the LOD and would not experience adverse impacts from construction or operation of the Build Alternatives.

**Limestone County**

All three community facilities, as described in **Table 3.14-12**, would located over 530 feet from the LOD and would not experience adverse impacts from the construction or operation of the Build Alternatives.

**Leon County**

Six 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 **Table 3.13-2** in **Section 3.13, Land Use,** 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 the Build Alternatives. In this location, the Build Alternatives 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 **Section 3.10, Aesthetic and Scenic Resources**. Temporary impacts to the Nettles Cemetery would be due to construction of the Build Alternatives. 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 Build Alternatives as new transportation infrastructure would not adversely alter the existing environment for visitors of the cemetery; therefore no adverse impacts would occur.

The remaining four 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 the construction or operation of the Build Alternatives.

Five community facilities, as described in **Table 3.14-13**, were identified along Segment 4. Leon ISD would be located approximately 200 feet from the LOD where a temporary construction zone would be located. The school and the temporary construction zone would also be separated by US 79. Noise impacts related to construction of the Build Alternatives would not be adverse considering the distance from the source and receivers, as well as the existing transportation infrastructure. The main ROW for the Build Alternatives would be approximately 900 feet from the school. Permanent aesthetic and visual impacts would be caused by the Build Alternatives crossing nearby on viaduct. However, as outlined in **Section 3.10, Aesthetic and Scenic Resources**, impacts would not be adverse.

The remaining four facilities would be located more than 500 feet from the LOD and would not experience adverse impacts from construction or operation of the Build Alternatives.

**Madison County**

Eight 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 Build Alternatives would be crossing on viaduct. Construction of the Build Alternatives 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 **Section 3.2, Air Quality; Section 3.4, Noise & Vibration; Section 3.10, Aesthetic and Scenic Resources; Section 3.11, Transportation.** Additional information regarding Ten Mile Cemetery can be found in **Section 3.19, Cultural Resources**.

Another facility, Randolph Cemetery would be located within 75 feet of the LOD. **Section 3.4, Noise and Vibration**, 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 **Section 3.10, Aesthetic and Scenic Resources**.

The remaining five 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 Build Alternatives.

**Grimes County**
Eleven community facilities were identified along Segment 5, as described in **Table 3.14-15**. The northwest corner of the Singleton Cemetery in Grimes County would be abutting the LOD. In this location, the LOD would be designated for roadway improvements to County Road 176 that would be necessary for the operation of the Build Alternatives. Temporary impacts from construction would include localized impacts to air quality from the movement of vehicles and generation of dust and disrupted ingress and egress. Implementation of BMPs for reducing fugitive dust emissions would be addressed in the construction safety plan developed prior to construction, as described in **Section 3.2.6, Air Quality**. Traffic control plans, as described in **Section 3.11.6, Transportation** would include procedures for any temporary road closures to prevent impacts to pedestrians and vehicle traffic.

The Ratliff Cemetery would be located within 50 feet of the LOD. **Section 3.4, Noise and Vibration**, 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 **Section 3.10, Aesthetic and Scenic Resources**. Additional information regarding the Ratliff Cemetery can be found in **Section 3.19, Cultural Resources**.

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, Noise and Vibration** 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 Build Alternatives 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, Cultural Resources**.

The remaining eight 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 Build Alternatives.

**Waller County**
The Science of the Soul Study Center is a spiritual and religious center, and the only community facility identified in Waller County, as described in **Table 3.13-16.** At least 30 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 3.13.6, Land Use**, the buildings and entire parcel would be acquired and potentially relocated, should the landowner decide to do so.

**Harris County**
Twenty-five community facilities were identified in Harris County 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 corridor, the Build Alternatives would be constructed within the existing ROW. Therefore, the majority of community facilities in Harris County are separated from the Build Alternatives by transportation infrastructure or other buildings. **Section 3.4, Noise and Vibration** noted severe and moderate noise impacts along US 290 due to the Build Alternatives, but none would be located near community facilities. Additionally, transportation impacts as a result of construction would be mitigated through BMPs outlined in **Section 3.11, Transportation.** These twenty-three facilities would not experience adverse impacts from the construction or operation of the Build Alternatives.

The two remaining facilities would be the Cypress Falls Senior High School and the Beth Yeshurum-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 **Section 3.2, Air Quality and Section 3.11, Transportation**.

The Beth Yeshurum-Post Oak Cemetery would be abutting roadway improvements along North Post Oak Boulevard that would be made for the Northwest Transit Center Terminal 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 HSR System terminal station 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 identified co-location opportunities with transportation and utility corridors to minimize impacts to known community resources. Within the six end-to-end Build Alternatives, 53 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 60 percent of the Build Alternatives would be on viaduct.

### 3.14.6.1 Compliance Measures

The following socioeconomic compliance measure would apply to Build Alternatives A through F only if TCRR receives Federal financial assistance for the project:

S**C-CM#1: Compliance with Uniform Relocation Assistance and Real Property Acquisition Act.** The Uniform Relocation Assistance and Real Property Acquisition Policies Act provides benefits to owner occupants of residential and business properties as well as to tenants of either residential or business properties. If TCRR receives DOT 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. In order to acquire property, TCRR shall complete an appraisal of the potentially acquired property and provide the owner with a written offer of just compensation that clearly outlines what is being acquired. Relocation expenses may be included in the compensation. TCR shall also give a landowner 90 days written notice to vacate the property prior to possession.

### 3.14.6.2 Mitigation Measures

The following socioeconomic mitigation measures would lessen the impacts of the Build Alternatives and would apply to Build Alternatives A though F:

**SC-MM#1: Construction Management Plan.** Prior to the start of construction, TCRR and its construction contractor shall prepare a construction management plan to be reviewed by FRA. This plan shall address:

- Community facility impacts – maintain access during construction
- Visual quality protection – construction lighting and signage
- Air quality – protecting/containing debris from construction work areas
- Safety and noise controls – local ordinance limits for daytime and/or nighttime construction
- Traffic controls – temporary reroutes or crossings to minimize impacts to property owners and businesses, residences, community facilities and emergency services

The construction management plan would be provided to local (city and/or county) jurisdictions, as well as emergency responders and school districts.

**SC-MM#2: Acquisition of LeMay and LeForge Neighborhood**. Additional outreach to this community is necessary to understand the existing connections between these residents and the greater Cedar Crest community. FRA would conduct public outreach to the LeMay and LeForge community during the Draft EIS public outreach phase of the project. The 34 homes within the LeMay and LeForge Neighborhood, part of the larger Cedar Crest Community, would be displaced by all of the Build Alternatives. TCRR shall mitigate the permanent impacts to this neighborhood through compensation and relocation. Terms of relocation would be subject to one-on-one negotiation with the owner and TCRR.

**SC-MM#3: Acquisition of Homes on Plantation Forest**. Nineteen (19) residences along Plantation Drive would be displaced by all of the Build Alternatives. TCRR shall mitigate the permanent impacts to this neighborhood through compensation and relocation. Terms of relocation would be subject to one-on-one negotiation with the owner and TCRR. Seven homes remaining would be on the east side of Plantation Drive. These homes would be facing the Build Alternatives which would be crossing at-grade on embankment. Mitigation strategies would include screening the HSR System through native vegetation, walls, berms, natural looking constructed land forms or visual barriers where possible.

**SC-MM#4: Acquisition of Homes in White Oak Falls**. Forty (40) homes in the White Oak Falls subdivision would be displaced by all of the Build Alternatives. TCRR shall mitigate the permanent impacts to this neighborhood through compensation and relocation. Terms of relocation would be subject to one-on-one negotiation with the owner and TCRR. The remaining homes would be on the south west side of the Build Alternatives. Many of these homes would be facing the Build Alternatives which would be crossing nearby via viaduct. The anticipated height of the HSR system in this location would be approximately 45 feet; therefore screening options may be limited.

**SC-MM#5: Relocation of Mount Zion Missionary Baptist Church.** Mount Zion Missionary Baptist Church would be displaced by Segment 3C to reroute the IH-45 frontage road. TCRR shall mitigate the permanent impacts to this community facility through compensation and potential relocation. Terms of relocation or displacement would be subject to one-on-one negotiation with the owner and TCRR.

**SC-MM#6: Relocation of Hopewell Church.** The Hopewell Church parcel would be acquired by Segment 3C. TCRR shall mitigate the permanent impacts to this community facility through compensation and potential relocation. Terms of relocation or displacement would be subject to one on one negotiation with the owner and TCRR.

**SC-MM#7: Relocation of Union Church.** Union Church would be displaced by Segment 4. TCRR shall mitigate the permanent impacts to this community facility through compensation and potential relocation. Terms of relocation or displacement would be subject to one on one negotiation with the owner and TCRR.

**SC-MM#8: Acquisition of Science of the Soul Study Center.** The Science of the Soul Study Center parcel would be acquired by all of the Build Alternatives. TCRR shall mitigate the permanent impacts to this facility through compensation and potential relocation. Terms of relocation or displacement would be subject to one on one negotiation with the owner and TCRR.

**SC-MM#9: Acquisition of The Connection School of Houston.** The Connection School would be displaced by all of the Build Alternatives. TCRR shall mitigate the permanent impacts to this facility through compensation and potential relocation. Terms of relocation or displacement would be subject to one on one negotiation with the owner and TCRR.

See also **AQ-MM#1: Dust suppression techniques to minimize short-term air quality impacts due to construction**, as discussed in more detail in **Section 3.2.6, Air Quality**.

See also **NV-CM#1: Compliance with local regulations to minimize short-term noise impacts due to construction**, as discussed in more detail in **Section 3.4.6, Noise and Vibration**.

See also **TR-MM#1: Traffic Control Plan to minimize short-term access or thoroughfare impacts during construction**, as discussed in more detail in **Section 3.11.6, Transportation**.

See also **LU-CM#1: Temporary and Permanent Land Use Conversion and Structure Displacement regarding acquisitions, displacements and relocations**, as discussed in more detail in **Section 3.13.7, Land Use**.

See also **EJ-MM#1: LeMay and LeForge Neighborhood Outreach**, as discussed in more detail in **Section 3.18.6, Environmental Justice**.

See also Avoidance Measures described in **Section 3.4.6.2, Noise and Vibration, Mitigation, Operational Noise**.

### 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 of 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 |
|---|---|---|---|---|---|---|
| Community Character and Cohesion | 5 | 5 | 5 | 5 | 5 | 5 |
| Economic Impacts* | Positive | Positive | Positive | Positive | Positive | Positive |
| Employment (job years) | 241,513 | 241,513 | 256,400 | 241,513 | 241,513 | 256,400 |
| Earnings (2016 billions) | $10.2 | $10.2 | $10.9 | $10.2 | $10.2 | $10.9 |
| Tax Revenue | Positive | Positive | Positive | Positive | Positive | Positive |
| Children's Health and Safety** | 0 | 0 | 0 | 0 | 0 | 0 |
| Community Facilities | 4 | 4 | 5 | 4 | 4 | 5 |

Sources: AECOM, 2017
Note: *All economic impacts include the total of one time construction impacts plus 17 years of operating impacts from 2023 to 2040.
**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 five neighborhoods on all Build Alternatives: Downtown Dallas, LeMay and LeForge Neighborhood, Saddle Creek Forest Development, Plantation Forest Development and the White Oak Falls Neighborhood. Terms of residential displacements and relocations would be subject to one on one negotiation with private owners and TCRR.

Three community facilities are located on common segments and would therefore be impacted by all of the Build Alternatives: Smith Family Cemetery, Honey Springs Cemetery and The Science of Soul Study Center. 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.

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# 3.15 Electromagnetic Fields

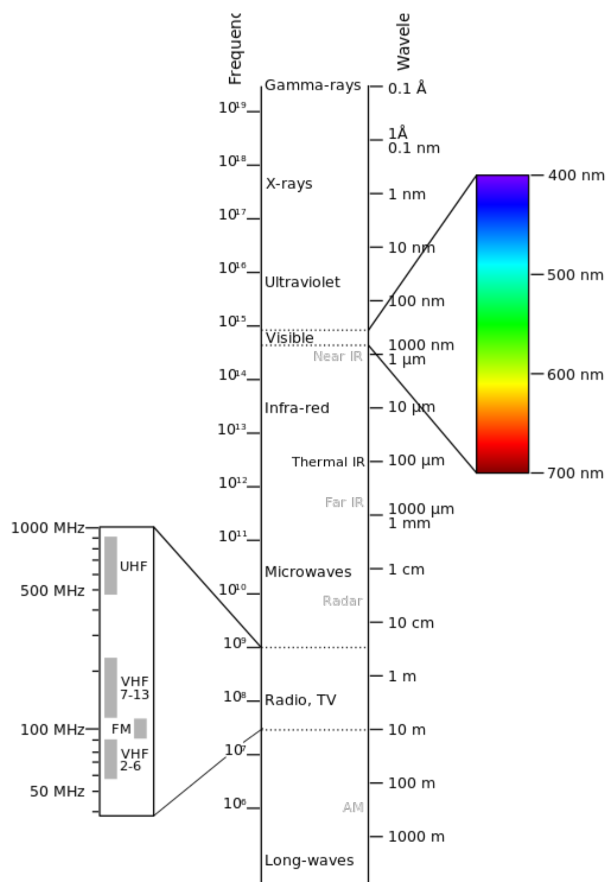
## 3.15.1 Introduction

This section provides information about electromagnetic fields (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 that would be 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, non-ionizing, low-frequency 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

**Figure 3.15-1: The Electromagnetic Spectrum**




Source: Wikimedia Commons, Electromagnetic-Spectrum.svg, https://commons.wikimedia.org/wiki/File:Electromagnetic-Spectrum.svg.

frequency of 60 Hertz (Hz). Electric power system components are sources of EMFs, operating at a frequency of 60 Hz. The electromagnetic (EM) spectrum is illustrated in **Figure 3.15-1**.[1] 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 |

EM radiation is classified based on either the wavelength, measured in meters, or the frequency, measured in Hertz. Visible light is one part of the entire EM spectrum. Humans also use other forms of EM radiation, such as radio waves for communication, infrared waves for night-vision goggles and microwaves for cooking food.

### 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. The International Commission on Non-Ionizing Radiation Protection 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, the International Commission on Non-Ionizing Radiation Protection developed guidelines for human exposure to low-frequency EMF. The International Commission on Non-Ionizing Radiation Protection states that “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, the International Commission on Non-Ionizing Radiation Protection 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 low-frequency EMF exposure.”[2] Additionally, the International Commission on Non-Ionizing Radiation Protection concluded that insufficient reliable research exists to determine if a link is possible between the adverse health effects and long-term, elevated EMF exposure. The International Commission on Non-Ionizing Radiation Protection stated that more research is necessary in these areas.[3]

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.[4,5,6] The National Institute of Environmental Health Sciences concluded that for most health outcomes, no evidence is present that EMF exposure has adverse health effects.

[1] Wikimedia Commons, Electromagnetic-Spectrum.svg, October 2012. Courtesy of Victor Blacus. https://commons.wikimedia.org/wiki/File:Electromagnetic-Spectrum.svg.
[2] International Commission on Non-Ionizing Radiation Protection, “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields, ICNIRP Guidelines,” *Health Physics Society*, April, 1998, 74(4), p494-522.
[3] International Commission on Non-Ionizing Radiation Protection, “Review of the Epidemiologic Literature on EMF and Health,” *Environmental Health Perspectives*. December, 2001, Vol. 109, Issue 6, pp. 911-933.
[4] National Institute of Environmental Health Sciences , “Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields,” *NIH Publication* No. 99-4493, May 4, 1999, available at http://www.niehs.nih.gov./health/assets/docs_f_o/niehs_report_on_health_effects_from_exposure_to_powerline_frequency_electric_and_magnetic_fields_508.pdf.

Many everyday electrical objects emit relatively high EMFs when functioning; however, the International Commission on Non-Ionizing Radiation Protection has determined that these items do not cause health problems.[7] While some of these levels exceed the International Commission on Non-Ionizing Radiation Protection 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 3.15-1** illustrates the magnitude that some common electrical devices are capable of outputting.[8] Note that the values in **Table 3.15-1** are instantaneous values, while the International Commission on Non-Ionizing Radiation Protection limit is time averaged over 30 minutes for the public.

**Table 3.15-1: 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

### 3.15.3 Regulatory Context

From a regulatory standpoint, the Federal Communications Commission (FCC) and the Occupational Safety and Health Administration (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

[5] Moulder, J.E., “The Electric and Magnetic Fields Research and Public Information Dissemination (EMF-RAPID) Program,” *Radiation Resources*, 2000, 153(5 pt 2), p613-616, available at http://ntp.niehs.nih.gov/about/presscenter/frndocs/ 1997/62fr65814/index.html. .

[6] National Institute of Environmental Health Sciences, “EMF: Electric and Magnetic Fields associated with the Use of Electric Power, Questions & Answers,” June, 2002, available at https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf.

[7] International Commission on Non-Ionizing Radiation Protection, “Review of the Epidemiologic Literature on EMF and Health,” *Environmental Health Perspectives*. December, 2001, Vol. 109, Issue 6, pp. 911-933.

[8] National Institute of Environmental Health Sciences, “EMF: Electric and Magnetic Fields associated with the Use of Electric Power, Questions & Answers,” June, 2002, available at https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf.

- 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. Part 15, the FCC provides rules and regulations for licensed and unlicensed radio frequency 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 trains.

The FCC provides guidance for evaluating whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to radio frequency fields.[9] The FCC limits are partially based on the Institute of Electrical and Electronics Engineers C95.1 standard.[10]

OSHA 29 C.F.R., Sub Part G, §1910.97[11] contains safety standards for occupational exposure to non-ionizing electromagnetic radiation. **Table 3.15-2** summarizes OSHA standards.

The FCC 47 C.F.R. 1.1310 is based on the 1992 version of the American National Standards Institute/Institute of Electrical and Electronics Engineers C95.1 safety standard.[12] **Table 3.15-2** shows Maximum Permissible Exposures contained in the American National Standards Institute/Institute of Electrical and Electronics Engineers 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 Maximum Permissible Exposures 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 3.15-2**, the differences between the American National Standards Institute/Institute of Electrical and Electronics Engineers C95.1 and FCC MPEs are negligible.[13]

[9] FCC Office of Engineering and Technology Bulletin 65, "*Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,"* Edition 97-01, August, 1999, available at https://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf.

[10] 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.

[11] OSHA, Occupational and Environmental control: Non-Ionizing Radiation, 29 C.F.R. 1910.97, 2013, https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9745.

[12] 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.

[13] 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 3.15-2: Radio Frequency 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
Notes:
ANSI/IEEE = American National Standards Institute/Institute of Electrical and Electronics Engineers
$mW/cm^2$ = milliwatts per square centimeter

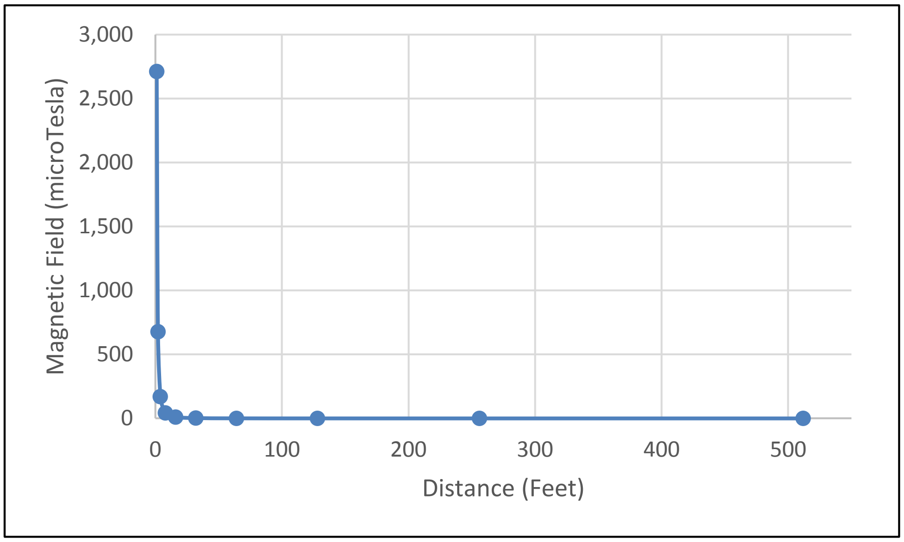
### Regional and Local

EMF ordinances exist within Texas, including the City of Houston. The City of Houston Airport Land Use Regulations, Article VI, Section 9-360,[14] prohibits 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.

## 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.

**Figure 3.15-2: Magnetic field strength as a function of distance**




Source: AECOM, 2016

[14] City of Houston, Airport Land Use Regulations, Article VI, Section 9-360, Available at http://system.gocampaign.com/file/511295.

As described above, EMF strength falls off rapidly with distance. Assuming a worst-case magnetic field of 2,710 µT, which is the Institute of Electrical and Electronics Engineers occupational exposure limit, the magnetic field would drop off following the inverse-square law to below 1 µT within 60 feet, as illustrated in **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 Build Alternatives. 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.

### 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 Tokaido Shinkansen complies with the International Commission on Non-Ionizing Radiation Protection EMF exposure levels for the general public.[15] The discussion below is divided into national/international, state and regional guidance.

#### *3.15.4.1.1 National/International*

The International Commission on Non-Ionizing Radiation Protection has adopted EMF exposure guidelines and standards in the extremely low frequency and radiofrequency bands of the EM spectrum. The International Commission on Non-Ionizing Radiation Protection 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 International Commission on Non-Ionizing Radiation Protection recommendations are based on the epidemiological data available from verifiable research studies.[16] Based on the International Commission on Non-Ionizing Radiation Protection's work, the European Union has adopted these same standards for EMF exposure.[17] **Table 3.15-3** summarizes these standards. While the guidelines are voluntary, the levels are designed to prevent potential health risks associated with EMF exposure.

**Table 3.15-3 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 | 100 (1,000 mG) |
| Public: 60 Hz | 5,000 | 200 (2,000 mG) |

V/m = volts per meter, µT = microTesla, f = frequency

[15] Central Japan Railway Company, "Environmental Report. 2010," *Global Environmental Committee*, http://jr-central.co.jp.
[16] International Commission on Non-Ionizing Radiation Protection (ICNIRP), "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields*," ICNIRP Guidelines, Health Physics Society*, April, 1998, 74(4), p494-522.
[17] 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.

The Institute of Electrical and Electronics Engineers Standard C95.6, Institute of Electrical and Electronics Engineers *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 the American National Standards Institute. The Institute of Electrical and Electronics Engineers standard specifies Maximum Potential Exposures for the general public and for occupational exposure to extremely low frequency EMFs, which have frequencies of 0 to 3 kHz. **Tables 3.15-4** and **3.15-5** present Institute of Electrical and Electronics Engineers Standard C95.6 exposure levels, with the 60 Hz levels highlighted for comparison.[18] Note that the Institute of Electrical and Electronics Engineers exposure levels are guidelines only, not regulations.

**Table 3.15-4: 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
Notes:
/f = divide by the frequency
mG = milligauss

**Table 3.15-5: 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
Notes:
/f = divide by the frequency
Hz = hertz
IEEE = Institute of Electrical and Electronics Engineers
MPE = maximum permissible exposure
V/m = volts per meter

In 2006, the American National Standards Institute adopted Institute of Electrical and Electronics Engineers Standard C95.1, as its standard for safe human exposure to EMF in the radio frequency portion of the EM spectrum.[19] The HSR control and communications systems would use radio signals within the range covered by this standard. The C95.1 Standard specifies Maximum Potential Exposure levels for whole and partial body exposure to electromagnetic energy.

[18] Institute of Electrical and Electronics Engineers (IEEE), "IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz," *IEEE Standard* C95.6-2002, October, 2002.
[19] 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.

Both the Institute of Electrical and Electronics Engineers 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 safety levels are intended to protect all 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.[20]

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 papers, 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*,[21] 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[22] concluded, "Staff has determined that the large body of scientific research reveals no definite or proven biological effects from exposure to low-level [radio frequency] signals."

### *3.15.4.1.3 Regional*

Within the State of Texas, ordinances related to EMFs include the following: (a) The City of Houston Airport Land Use Regulations, Article VI, Section 9-360,[23] prohibits 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; (b) City of Taylor, Texas. Zoning Ordinance 2009, Part III, Article 14 Section 9; (c) City of Weatherford, Texas. Zoning Ordinance, Chapter 5, Section 12-5-8(6); (d) 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 (a) The City of Houston Land Use Regulations.

[20] 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..
[21] Available at http://www.centerpointenergy.com/en-us/Documents/PUCT_Health_Effects_of_Exposure_to_Powerline_Frequency_EMF.pdf.
[22] Available at http://www.silverspringnet.com/wp-content/uploads/smartmeterrfemfhealth12-14-2012.pdf.
[23] City of Houston, Airport Land Use Regulations, Article VI, Section 9-360, Available at 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 trains from around the world, including the United Kingdom, China, Japan, Switzerland, Germany and Russia. The study concluded that all values measured as a part of the study were "far lower" than the International Commission on Non-Ionizing Radiation Protection recommended levels, which are summarized in **Table 3.15-6** below.[24]

JRC notes that their N700 Tokaido Shinkansen train abides by all environmental laws. Further, the document states that JRC conducted EMF testing of both the interior and exterior of their N700 Tokaido Shinkansen train. The EMF inside the train and along the tracks is approximately one third of the International Commission on Non-Ionizing Radiation Protection guidelines and is safe for persons with medical pacemakers. The JRC has been able to achieve these low values through the implementation of high performance magnetic shields on the trains.[25]

A study of high speed trains 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.[26]

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.[27]

Finally, Muc conducted a study in 2013 of EMFs associated with the Shinkansen train systems, including the N700 Shinkansen. The study found that EMF field levels varied based on position within the train compartment, with a maximum of 250 µT reported.[28]

**Table 3.15-6** summarizes the results of these reports and compares the reported values to the International Commission on Non-Ionizing Radiation Protection limit for general public exposure, which is used as a standard in Europe, and the Institute of Electrical and Electronics Engineers 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 Institute of Electrical and Electronics Engineers standards.

[24] Halgamuge, M.; Abeyrathne, C. D.; Mendis, P., "Measurement and Analysis of Electromagnetic Fields from Trams, Trains and Hybrid Cars," *Radiation Protection Dosimetry*, 2010, Vol. 141 Issue 3, p. 255-268.

[25] Central Japan Railway Company, "Environmental Report. 2010," *Global Environmental Committee*, http://jr-central.co.jp.

[26] Banko, F. P.; Xue, J. H., "Pioneering the Application of High Speed Rail Express Trainsets in the United States," Parsons Brinckerhoff, 2010 William Barclay Parsons Fellowship, 2013, *Parsons Brinckerhoff Group, Monograph 26*.

[27] Italian High Speed Railway Lines (IHSRL), "The MI-TO Project. Multidisciplinary Project Final Report," https://workstory.s3.amazonaws.com/assets/890279/ASP_Report.pdf, 2006.

[28] Muc, A.M., "Electromagnetic Fields Associated with Transportation Systems," *Radiation Health Safety Consulting, Health Canada*, 2001.

**Table 3.15-6: EMFs and High Speed Trains**

| 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 |

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).[29]

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 Build Alternatives could potentially interfere with sensitive electronics, such as emergency (police and fire) stations, hospitals, airports and research institutions, schools and parks. **Table 3.15-7** presents the sensitive receptors within the EMF Study Area.

**Table 3.15-7: Potential EMF Sensitive Receptors**

| County | Sensitive Receptor Name | Type | Community & Cultural Resources Mapbook | Distance (feet)* |
|---|---|---|---|---|
| Dallas | Fruitdale Park | Park | 4 | 280 |
| Dallas | Trinity River Greenbelt Park | Park | 1 & 2 | Adjacent |
| Harris | Northern Cypress Medical Center | Hospital | 243 | 450 |
| Harris | The Panda Path School | School | 249 | 450 |
| Harris | Weiser Airport | Airport | 242 | 450 |

Source: AECOM, 2017
* 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, please 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 Build Alternatives and its traction power system, including the TPSSs and on-train electric motors. The 25kV power lines supplying electricity to the traction

[29] National Geophysical Data Center (NGDC), "Estimated Values of Magnetic Field Properties," http://www.ngdc.noaa.gov/geomag-web/#igrfgrid, 2015.

system and the flow of currents providing power to the HSR trains would produce the 60 Hz fields. Along the tracks, the flow of propulsion currents to the trains in the rails would produce the fields.

- Extremely low frequency harmonic fields from train vehicles: Depending on the design of power equipment in the HSR trains, 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 trains and move along the track as the trains 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).
- Radio Frequency: The HSR System would use a variety of communications, data transmission and monitoring systems—both on and off vehicles—operating in the radio frequency portion of the spectrum.

#### 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 Build Alternatives 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 the 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 Build Alternatives would not be significant.

##### *3.15.5.2.2 Operational Impacts*

During operation, the Build Alternatives 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 International Commission on Non-Ionizing Radiation Protection guidelines;[30] therefore, passengers on the train, waiting at the platform or beyond the external security fencing of the HSR ROW would not be exposed to EMF levels above the International Commission on Non-Ionizing Radiation Protection guidelines. Additionally, HSR equipment would comply with FCC requirements and not adversely interfere with other electric or electronic equipment.

[30] Central Japan Railway Company, "Environmental Report. 2010," *Global Environmental Committee*, http://jr-central.co.jp.

#### *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.

#### *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. These induced currents and shock hazards can be minimized by grounding all metallic structures. Therefore, all 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.

#### *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 pace-makers 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 train passes by. Additionally, the exposure level would be lower than a high-voltage transmission line, as the Shinkansen website states that the train reportedly complies with the International Commission on Non-Ionizing Radiation Protection standards. As previously stated, The EMF inside the train and along the tracks is approximately one third of the International Commission on Non-Ionizing Radiation Protection 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 3.15-7**. 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 EM frequency. 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.

#### *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 Build Alternatives.

#### *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 all 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 Build Alternatives would comply with all federal regulations, as summarized in **Table 3.15-2**.

## 3.15.6 Avoidance, Minimization and Mitigation

Project design features, such as high performance magnetic shields on the trainsets would be implemented to avoid and minimize impacts to the social and physical environment. The following Compliance Measures (CM) for EMF would be required for the Build Alternatives.

**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. This would avoid or minimize any corrosion. If, for example, the external metal fencing corrodes, it would no longer be effectively grounded and electric shock could become an issue of concern for people or animals.

## 3.15.7 Build Alternatives Comparison

No EMI or adverse EMF exposure would occur from any of the Build Alternatives.

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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 or criminal acts that would have the potential to affect the HSR system and the ability for emergency services to respond. This section also provides details on safety issues for construction and operation of the Build Alternatives, including the measures and regulations currently in place, or that would be implemented to protect communities through which the Build Alternatives would pass.

The safety and security within and adjacent to HSR vehicles and facilities is discussed for the Build Alternatives 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 a variety of human and environmental hazards. To address the range of these hazards, different Study Areas were defined for each resource topic, as described in **Section 3.16.3**.

## 3.16.2 Regulatory Context

### Federal

#### *Security Directives RAILPAX-04-01 and RAILPAX-04-02*

On May 24, 2004, the Transportation Security Administration (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. Specifically, 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 the TSA, among other requirements.

#### *U.S. Department of Transportation, 2012 Emergency Response Guidebook*

This guidebook documents procedures and considerations for responding to a hazardous materials transportation incident. It provides a reference for hazardous materials placards and reference numbers used to denote the presence of a hazardous material in a truck, railcar or pipeline. Separate guidance documents are included to provide unique procedures for different types of hazards.

### State

#### *Texas Emergency Management Plan, 2015 Update*

The Texas Emergency Management Plan 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 14 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. 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, 2013 Update*

The Texas Hazard Mitigation Plan was amended in 2013 and is maintained in compliance with Public Law 106-390, the Disaster Mitigation Act of 2000. 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 Framework**

*Dallas County Emergency Management Plan*

The Dallas County Emergency Management Plan (EMP) includes a hazard and risk assessment for the county which 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 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 five years.

*Navarro County Hazard Mitigation Action Plan*

The Navarro County HAZMAP was approved by FEMA (pending local jurisdiction adoption) 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 five years.

*Madison County Hazard Mitigation Plan Update, Mitigating Risk: Protecting Madison County from All Hazards, 2013 – 2018*

The Navarro 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 six 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 the Brazos Valley Council of Governments of any needed changes in the plan based upon their monitoring activities. This mitigation action plan is formally reviewed and updated every five 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 the Brazos Valley Council of Governments of any needed changes in the plan based upon their monitoring activities. This mitigation action plan is formally reviewed and updated every five 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.

*Houston-Galveston Area Council –Regional Hazard Mitigation Plan 2011 Update*

The H-GAC in collaboration with 85 local governments developed a Regional Hazard Mitigation Plan (initially approved in 2006) to coordinate hazard mitigation planning for its member jurisdictions, including Waller and Harris counties. The plan includes hazard identification and analysis, a vulnerability assessment, capability assessment and mitigation strategy. It identifies over 300 specific mitigation projects including education programs, planning activities, maintenance and replacement projects and capital investments for member jurisdictions. FEMA approved the 2011 Hazard Mitigation Plan Update for local adoption on October 11, 2012.

*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 five 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 train 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 Build Alternatives. 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 emergency medical services (EMS) are generally organized into districts that provide seamless service coverage across a county. The geographic analysis identifies all fire or emergency medical services (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 Build Alternatives 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 Build Alternatives 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 Build Alternatives were identified.

### 3.16.3.2 Assessment

The three-step process for identifying potential impacts to safety or security included:

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; and
3. Determining the potential to impede hazard response or mitigation in areas surrounding the Build Alternatives 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 the 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 or flood events were evaluated using data from the National Oceanic Atmospheric Association (NOAA).

The historical frequency of events is described in terms of the number of events recorded within a specific timeframe and classified as:

- **Low**–probable occurrence in a timeframe exceeding five years or not at all
- **Medium**–probable occurrence within five years
- **High**–probable occurrence within one year

The severity is described in terms of average recorded property damage, loss of life and injuries per event and is classified as:

- **Low**–No loss of life or injury with minimal property damage

- **Medium**–occasional but infrequent death or injury or average property damage between $100,000 and $1 million
- **High**–multiple deaths or injuries or average property damage exceeding $1 million

#### *3.16.3.2.2 Criminal Activity*

Potential on-board and station security hazards were measured using 2014 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 train. 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 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 University of Maryland's Global Terrorism Database which logs terrorist activity occurring between 1970 and 2014. An activity was categorized as terrorism if it met criteria established by the National Consortium for the Study of Terrorism and Responses to Terrorism:[1]

- 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 Build Alternatives, an inventory of roads providing connections between both sides of the Build Alternatives 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.

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:

[1] University of Maryland, National Consortium for the Study of Terrorism and Responses to Terrorism (START), Global Terrorism Database. Accessed March 2016, https://www.start.umd.edu/gtd/about/.

- **Low**–Less than 50 percent of through roads show Project construction impacts
- **Medium**–Construction of the Project affects 50 percent or more of through roads, but at least two through roads remain unaffected
- **High**–Project construction leaves one or no through roads unaffected
- **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.

### 3.16.4.1 Natural Hazards

The potential for natural disasters including earthquakes, floods, tornadoes or hurricanes is highly variable from the northern portion of the Study Area to the southern portion. Hurricanes and tropical storms are limited to the Gulf Coast. The potential for earthquakes is limited to Dallas and Ellis counties as discussed in **Section 3.20.4.1.3 and Section 3.20.4.2.2, Soils and Geology**, while flooding can occur throughout the Study Area as discussed in **Section 3.8.4.3.1, Floodplains**.

Tornadoes are a more common occurrence within the northern half of the Study Area including Dallas, Ellis, Navarro and Limestone counties.[2] The majority of cyclonic activity is classified as weak (category F1 or lower) with wind speeds below 112 mph. At this intensity, storms can knock over shallow rooted vegetation, snap branches or push objects along the ground causing light to moderate property damage. Category F2 tornadoes have wind speeds between 113 and 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 tornadoes have wind speeds up to 206 mph and can overturn trains, uproot large trees or lift cars from the ground. Potential for cyclonic activity within each county is documented below.

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.[3] 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. Casualties and property damage recorded by NOAA as a result of extreme weather conditions, including hurricanes, tornadoes, flooding and flash flooding, are documented below for each county in **Table 3.16-3**.[4] Flooding is described in detail in **Section 3.8.4.3.1, Floodplains**.

[2] NOAA, Storm Events Database (2000 to 2015). Accessed March, 2016, http://www.ncdc.noaa.gov/stormevents/ftp.jsp.
[3] NOAA, Storm Surge Archives, Accessed March, 2016, http://www.nhc.noaa.gov/gis/
[4] NOAA, Storm Events Database (2000 to 2015). Accessed March 2016, https://www.ncdc.noaa.gov/stormevents/

#### 3.16.4.2 Criminal Activity

The incidence of criminal activities around station areas represents a security hazard. FBI Uniform Crime rates for Dallas, Houston and Grimes counties are shown in **Table 3.16-1**. Among violent crimes, Houston had the highest rates for murder, robbery and assault. The incidence of rape was highest in the City of Dallas.[5]

**Table 3.16-1: Reported Crime Rates for 2014 per 10,000 Residents**

| Location | Murder | Rape | Robbery | Aggravated Assault | Burglary | Larceny-Theft | Vehicle Theft |
|---|---|---|---|---|---|---|---|
| City of Dallas | 0.9 | 6.1 | 30.3 | 29.1 | 91.8 | 211.7 | 55.4 |
| City of Houston | 1.1 | 3.7 | 45.9 | 48.5 | 97.4 | 306.9 | 65.1 |
| Grimes County | 0.0 | 0.0 | 0.7 | 9.7 | 26.1 | 45.8 | 0.0 |
| Texas | 0.4 | 4.2 | 11.6 | 24.4 | 62.8 | 213.7 | 25.4 |
| National | 0.4 | 3.7 | 10.2 | 23.2 | 54.3 | 183.7 | 21.6 |

Source: FBI, Uniform Crime Reports January to June 2014

In Dallas, the DART system also publishes statistics for crime that occurs on transit vehicles or at facilities.[6] Total crimes reported for 2014 and 2015 by DART Police are presented in **Table 3.16-2**. Non-violent larceny-theft is the most common offense with 418 incidents reported in 2014 and 443 in 2015. This corresponds to a rate of approximately 15 incidents per 10,000 average weekday riders. Similar data is not publicly available for the Houston Metro transit system.

**Table 3.16-2: Total Reported DART Crimes for 2014-2015**

| Year | Murder | Rape | Robbery | Aggravated Assault | Burglary | Larceny-Theft | Vehicle Theft |
|---|---|---|---|---|---|---|---|
| 2014 | 0 | 1 | 96 | 23 | 2 | 418 | 25 |
| 2015 | 0 | 1 | 92 | 27 | 0 | 443 | 28 |

Source: DART Police Statistic Reports January to December 2014-2015

The University of Maryland's Global Terrorism Database identified nine terrorist activities in Texas occurring between 2000 and 2014.[7] Adjusting for the large size of the state, Texas ranks lower than the national average for number of terrorist activities occurring per square mile. Between 2000 and 2014, terrorist activities in Texas directly affected 60 individuals, including 14 fatalities and 46 injuries.[8] Within the State of Texas, none of the incidents occurring between 2000 and 2014 took place within 20 miles of a proposed station location. The most violent incidents of terrorism have been concentrated around the State Capitol in Austin and the Fort Hood military instillation near Killeen. These two locations, both over 50 miles from the Project, account for 100 percent of all reported casualties occurring during the study period.[9]

[5] FBI 2014 Uniform Crime Reports. Accessed March 2016, https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2014/crime-in-the-u.s.-2014/tables

[6] DART Police Statistic Reports January to December 2014-2015. Accessed March 2016, https://www.dart.org/about/dartpolice/dartpolicestats.asp

[7] University of Maryland, National Consortium for the Study of Terrorism and Responses to Terrorism (START), Global Terrorism Database. Accessed March 2016, https://www.start.umd.edu/gtd/about/

[8] Fatalities and injuries exclude those who committed the terrorist activity

[9] Data does not include the more recent shooting events at the Curtis Culwell Center in Garland, TX which resulted in the non-fatal injury of one security officer and the death of both armed perpetrators or the 2016 Dallas, Texas shooting targeting law enforcement officers which resulted in multiple injuries and fatalities.

No incidents of terrorism directed at rail stations or infrastructure have been reported in the state. At the national level only 3 out of 287 events (one percent) were directed at passenger or freight rail 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. The third incident resulted in minor property damage and no injury when the wheel assembly of a Kansas City, Missouri rail car was cut with a blow torch. Military installations, places of worship, schools, and government buildings were all several times more likely to be targeted than transportation infrastructure.

**Table 3.16-3** documents county-specific safety and security hazards and the frequency and severity of each hazard type as described in **Section 3.16.3.2**. Natural hazards not listed for a particular county did not occur during the 15-year timeframe and are assumed to have a frequency category of Low. Security hazards are only evaluated for the proposed station areas.

**Table 3.16-3: Safety and Security Hazards Inventory**

| County | Frequency Description | Frequency Category | Severity Description | Severity Category |
|---|---|---|---|---|
| **Dallas County** | | | | |
| Earthquake | 55 (2000-2015) | High | Imperceptible to minor (up to magnitude 3.6) | Low |
| Tornado | 9 (2000-2015) | High | Minor/Moderate (up to Category F4); Average of $47.8M property damage, 53 injuries and 1 death per event | High |
| Flood | 14 (2000-2015) | High | Average of $2.6M property damage and <1 death per event | Med |
| Flash Flood | 71 (2000-2015) | High | Average of $333k property damage and <1 death per event | Med |
| Crime | Persistent | High | More crime per capita than national or state average, approximate 12% violent crime rate | High |
| Terrorism | 0 (2000-2014) | Med* | State total of 60 injuries and fatalities over 9 events | High |
| **Ellis County** | | | | |
| Earthquake | 8 (2000-2015) | High | Imperceptible to minor (up to magnitude 3.0) | Low |
| Tornado | 4 (2000-2015) | Med | Minor/Moderate (Category F3); Average of $2.4M property damage and 12 injuries per event | High |
| Flood | 6 (2000-2015) | Med | Average of $20k property damage per event | Low |
| Flash Flood | 37 (2000-2015) | High | Average of $171k property damage and <1 death per event | Med |
| **Navarro County** | | | | |
| Tornado | 4 (2000-2015) | Med | Minor/Moderate (up to Category F2); Average of $335k property damage and 1 injury per event | Med |
| Flood | 9 (2000-2015) | High | Average of $2k property damage per event | Low |
| Flash Flood | 36 (2000-2015) | High | Average of $28M property damage and <1 death per event | High |
| **Freestone County** | | | | |
| Flood | 7 (2000-2015) | Med | Minor crop damage only | Low |
| Flash Flood | 20 (2000-2015) | High | Average of $97k property damage and <1 death per event | Med |
| **Limestone County** | | | | |
| Tornado | 2 (2000-2015) | Low | Minor/Moderate (up to Category F2); Average of $200k property damage per event | Med |
| Flood | 8 (2000-2015) | High | Average of $1k property damage per event | Low |

**Table 3.16-3: Safety and Security Hazards Inventory**

| | | | | |
|---|---|---|---|---|
| Flash Flood | 35 (2000-2015) | High | Average of $40k property damage per event | Low |
| **Leon County** | | | | |
| Tropical Storm | 1 (2000-2015) | Low | Average $150k property damage per event | Med |
| Flood | 3 (2000-2015) | Med | Average of $33k property damage per event | Low |
| Flash Flood | 16 (2000-2015) | High | Average of $24k property damage per event | Low |
| **Madison County** | | | | |
| Tropical Storm | 1 (2000-2015) | Low | Average $7.0M property damage per event | Low |
| Tornado | 1 (2000-2015) | Low | Minor (Category F1); $55k property damage and 2 injuries | Med |
| Flood | 1 (2000-2015) | Low | No damage | Low |
| Flash Flood | 12 (2000-2015) | High | Average of $20k property damage per event | Low |
| **Grimes County** | | | | |
| Tropical Storm | 3 (2000-2015) | Med | Average $4.0M property damage per event | High |
| Tornado | 1 (2000-2015) | Low | Minor (Category F1); $200k property damage | Med |
| Flash Flood | 26 (2000-2015) | High | Average of $22k property damage per event | Low |
| Crime | Persistent | High | Less crime per capita than national or state average, approximate 6% violent crime rate | High |
| Terrorism | 0 (2000-2014) | Low | State total of 60 injuries and fatalities over 9 events | High |
| **Waller County** | | | | |
| Tropical Storm | 2 (2000-2015) | Med | Average $5.5M property damage per event | Med |
| Flash Flood | 11 (2000-2015) | High | Average of $40k property damage per event | Low |
| **Harris County** | | | | |
| Hurricane/Typhoon | 2 (2000-2015) | Med | Average $45M property damage per event | High |
| Tropical Storm | 3 (2000-2015) | Med | Average $1.7B property damage and 7 deaths per event | High |
| Tornado | 10 (2000-2015) | High | Minor/Moderate (up to Category F3); Average of $1.9M property damage and 1 injury per event | Med |
| Flood | 2 (2000-2015) | Med | Average of $2.9M property damage per event | Med |
| Flash Flood | 74 (2000-2015) | High | Average of $834k property damage and <1 death per event | Med |
| Crime | Persistent | High | More crime per capita than national or state average, approximate 15% violent crime rate | High |
| Terrorism | 0 (2000-2014) | Low | State total of 60 injuries and fatalities over 9 events | High |

Source: NOAA, Storm Events Database (2000 to 2015), USGS, Earthquake Hazards Program (2000-2015), FBI Uniform Crime Reports (2014), Global Terrorism Database (2000-2014)
*Terrorism events in in Garland, Texas in 2015 and Dallas Texas, in 2016 (more recent than the available data) resulted in a terrorism risk of Medium for Dallas County.

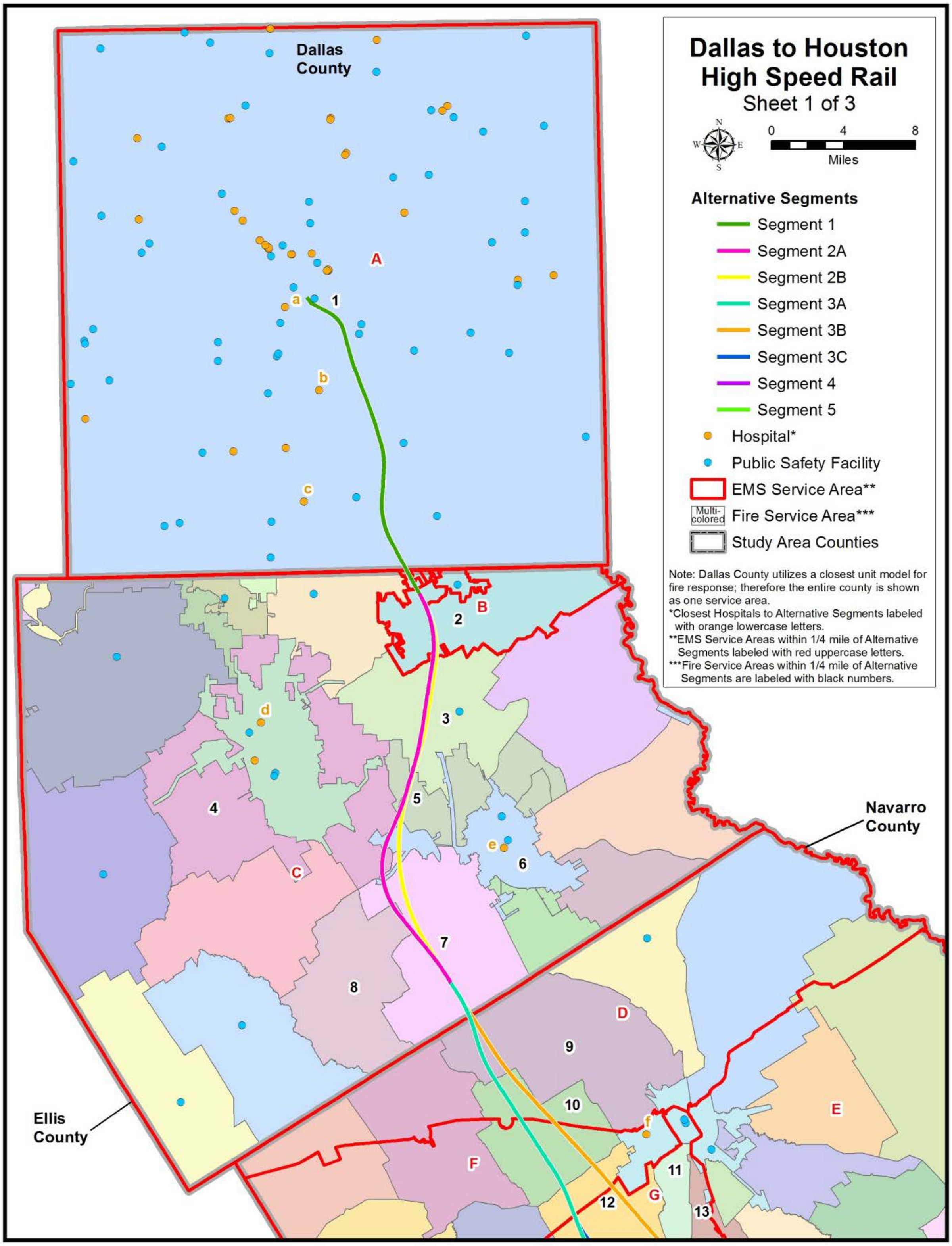
### 3.16.4.3 Emergency Services

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 are labeled with numbers, EMS districts with capital letters, and hospitals are labeled with lower case letters.

Law enforcement is provided in overlapping layers from state to county to local jurisdictions. 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 department, 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.

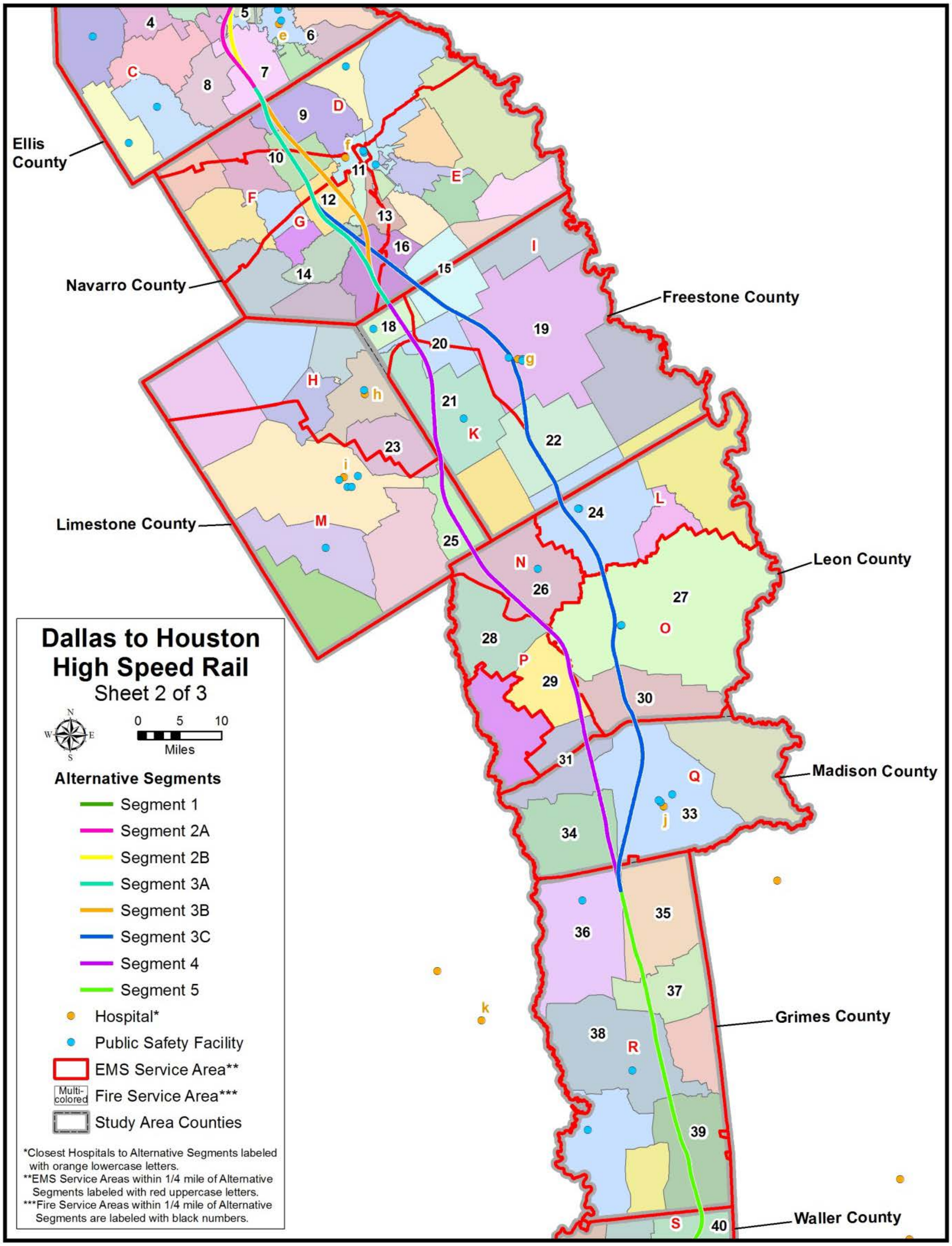
Fire and EMS districts, which include part of the LOD or which come within a quarter-mile of the Build Alternatives, as described in the methodology, are documented by county in **Tables 3.16-5** through **3.16-14** along with all law enforcement agencies and the nearest hospital facilities.

**Figure 3.16-1: Emergency Service Providers, Dallas and Ellis Counties**



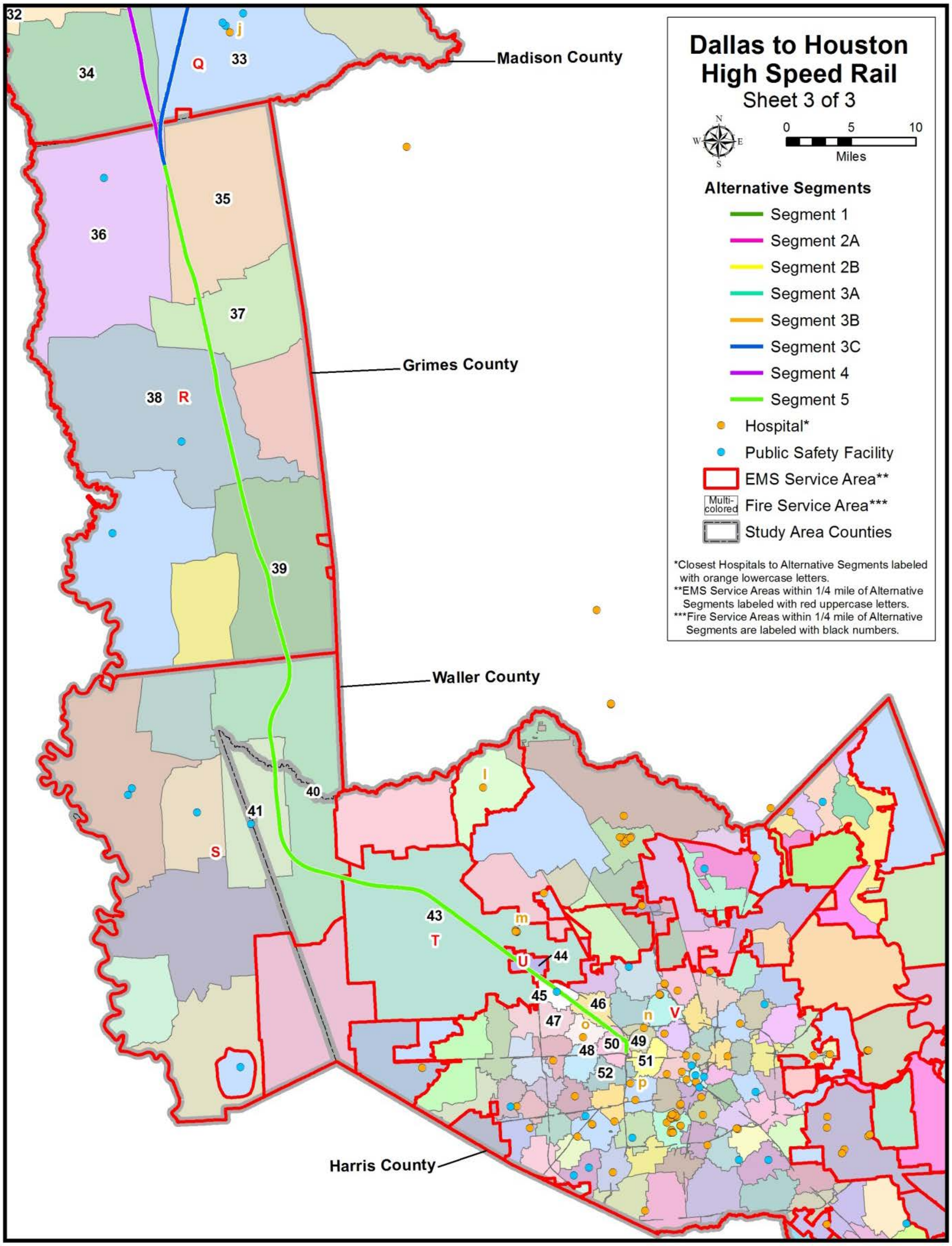

Source: AECOM, 2017

**Figure 3.16-2: Emergency Service Providers, Rural Counties**




Source: AECOM, 2017

**Figure 3.16-3: Emergency Service Providers, Waller and Harris Counties**




Source: AECOM, 2017

### 3.16.4.3.1 Dallas County

Twenty-four law enforcement agencies provide police protection in Dallas County, as shown in **Table 3.16-4**. 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.

**Table 3.16-4: Dallas County Existing Emergency Service Providers**

| Law Enforcement Agency | Geography | |
|---|---|---|
| Dallas Police Department Sector 150 and Beat 151 | 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 | Dallas County | |
| Balch Springs Police Department | Dallas County | |
| Cedar Hill Police Department | Dallas County | |
| Coppell Police Department | Dallas County | |
| DeSoto City Police Department | Dallas County | |
| Duncanville Police Department | Dallas County | |
| Farmers Branch Police Department | Dallas County | |
| Garland Police Department (Multiple Facilities) | Dallas County | |
| Glen Heights Police Department | Dallas County | |
| Grand Prairie Police Department (Multiple Facilities) | Dallas County | |
| Highland Park Police Department | Dallas County | |
| Irving Police Department (Multiple Facilities) | Dallas County | |
| Mesquite Police Department (Multiple Facilities) | Dallas County | |
| Richardson | Dallas County | |
| Rowlett | Dallas County | |
| Seagoville Police Department | Dallas County | |
| University Park City Police | Dallas County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Dallas County Fire (Uses Closest Unit Model*) | Segment 1 | 1 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Dallas County EMS (Uses Closest Unit Model*) | Segment 1 | A |
| Methodist Medical Center | Segment 1 | a |
| Dallas VA Medical Center | Segment 1 | b |
| Medical Center at Lancaster | Segment 1 | c |

Source: AECOM, 2016
* Closest Unit Model for emergency services in Dallas County will dispatch the nearest fire or medical unit regardless of jurisdiction.

### 3.16.4.3.2 Ellis County

Eight law enforcement agencies provide police protection in Ellis County, as shown in **Table 3.16-5**. Six fire districts provide service to Segments 2A and 2B and the Avalon Fire Department provides additional service for Segment 2A only. EMS service in Ellis County is contracted through two separate private providers, CareFlite and American Medical Response. Two hospitals serve Segments 2A and 2B.

| Table 3.16-5: Ellis County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| 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 | Ellis County | |
| Maypearl Police Department | Ellis County | |
| Milford Police Department | Ellis County | |
| Midlothian Police Department | Ellis County | |
| Red Oak Police Department | Ellis County | |
| Waxahachie Police Department | Ellis County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Ferris Fire Department | Segment 2A/2B | 2 |
| Palmer Volunteer Fire Department | Segment 2A/2B | 3 |
| Ellis County ESD #6 | Segment 2A/2B | 4 |
| Garrett Area Rural Volunteer Fire Department | Segment 2A/2B | 5 |
| Ennis Fire Department | Segment 2A/2B | 6 |
| Bardwell Area Volunteer Fire Department | Segment 2A/2B | 7 |
| Avalon Volunteer Fire Department | Segment 2A | 8 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| AMR | Segment 2A/2B | B |
| CareFlite | Segment 2A/2B | C |
| Baylor Scott & White – Waxahachie | Segment 2A/2B | d |
| Ennis Regional Medical Center | Segment 2A/2B | e |

Source: AECOM, 2016

### *3.16.4.3.3 Navarro County*

Four law enforcement agencies provide police protection in Navarro County, as shown in **Table 3.16-6**. In addition, 5 fire districts, 4 EMS districts and 1 hospital serve Segments 3A, 3B and 3C. Two additional fire districts are within the Study Area for Segment 2B, and the Streetman Volunteer Fire Department serves the Study Area for Segment 3C.

| Table 3.16-6: Navarro County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| 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 | |
| Rice Police Department | Navarro County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Emhouse Volunteer Fire Department | Segment 3A/3B/3C | 9 |
| Barry Volunteer Fire Department | Segment 3A/3B/3C | 10 |
| Retreat Volunteer Fire Department | Segment 3B | 11 |
| Corbet-Oak Valley Volunteer Fire Department | Segment 3A/3B/3C | 12 |
| Angus Volunteer Fire Department | Segment 3B | 13 |
| Pursley Volunteer Fire Department | Segment 3A/3B/3C | 14 |
| Streetman Volunteer Fire Department | Segment 3C | 15 |

| Table 3.16-6: Navarro County Existing Emergency Service Providers | | |
|---|---|---|
| Richland Volunteer Fire Department | Segment 3A/3B/3C | 16 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Navarro County EMS District 4 | Segment 3A/3B/3C | D |
| Navarro County EMS District 2 | Segment 3A/3B/3C | E |
| Navarro County EMS District 3 | Segment 3A/3B/3C | F |
| Navarro County EMS District 1 | Segment 3A/3B/3C | G |
| Navarro Regional Hospital | Segment 3A/3B/3C | f |
| Parkview Regional Hospital (Limestone County) | Segment 3A/3B/3C | h |

Source: AECOM, 2016

### 3.16.4.3.4 Freestone County

Five law enforcement agencies provide police protection in Freestone County, as shown in **Table 3.16-7**. In addition, Segment 3C is served by 5 fire districts, 3 EMS districts and 2 emergency medical facilities. Segment 4 is served by 3 fire districts, 3 EMS districts and 2 hospitals.

| Table 3.16-7: Freestone County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| 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 | Freestone County | |
| Wortham Police Department | Freestone County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Streetman Fire Department | Segment 3C | 17 |
| Wortham Fire Department | Segment 4 | 18 |
| Fairfield Fire Department | Segment 3C | 19 |
| Kirvin Fire Department | Segment 3C/4 | 20 |
| Teague Fire Department | Segment 4 | 21 |
| Dew Fire Department | Segment 3C | 22 |
| Buffalo Volunteer Fire Department | Segment 3C | 24 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Mexia EMS | Segment 4 | H |
| Fairfield EMS | Segment 3C | I |
| Teague EMS | Segment 3C/4 | K |
| East Texas Medical Center – Fairfield | Segment 3C/4 | g |
| Parkview Regional Hospital (Limestone County) | Segment 4 | h |

Source: AECOM, 2016

### 3.16.4.3.5 Limestone County

Five law enforcement agencies provide police protection in Limestone County, as shown in **Table 3.16-8**. In addition, Segment 4 is served by 2 fire districts, 2 EMS districts and 2 hospitals.

| Table 3.16-8: Limestone County Existing Emergency Service Providers | |
|---|---|
| **Law Enforcement Agency** | **Geography** |
| Texas Department of Public Safety, Region 6C | Segment 4 |
| Limestone County Sheriff's Office | Segment 4 |
| City of Mexia Police Department | Limestone County |
| Groesbeck Police Department | Limestone County |

| Table 3.16-8: Limestone County Existing Emergency Service Providers | | |
|---|---|---|
| Teague Police Department | Limestone County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Shiloh Fire Department | Segment 4 | 23 |
| Lake Limestone Fire Department | Segment 4 | 25 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Mexia EMS | Segment 4 | J |
| Limestone EMS | Segment 4 | M |
| Parkview Regional Hospital | Segment 4 | h |
| Limestone Medical Center | Segment 4 | i |

Source: AECOM, 2016

### *3.16.4.3.6 Leon County*

Five law enforcement agencies provide police protection in Leon County, as shown in **Table 3.16-9**. Segment 3C is served by 3 fire districts and 2 EMS districts while Segment 4 is served by 6 fire districts and 3 EMS districts. The nearest hospitals serving the Leon County segments are located in Limestone, Freestone and Madison counties and documented in tables for both counties.

| Table 3.16-9: Leon County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| Texas Department of Public Safety, Region 2D | Segment 3C/4 | |
| Leon County Sheriff's Office | Segment 3C/4 | |
| Buffalo City Police Department | Segment 3C | |
| Jewett Police Department | Leon County | |
| Normangee Police Department | Leon County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Buffalo Volunteer Fire Department | Segment 3C | 24 |
| Jewett Volunteer Fire Department | Segment 4 | 26 |
| Centerville Volunteer Fire Department | Segment 3C/4 | 27 |
| Marquez Volunteer Fire Department | Segment 4 | 28 |
| Flynn Volunteer Fire Department | Segment 4 | 29 |
| Leona Volunteer Fire Department | Segment 3C/4 | 30 |
| Normangee Volunteer Fire Department | Segment 4 | 31 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Allegiance EMS | Segment 3C | L |
| Jewett EMS 2 | Segment 4 | N |
| Texas Medical Response | Segment 3C/4 | O |
| Jewett EMS | Segment 4 | P |
| Limestone Medical Center (Limestone County) | Segment 4 | i |
| East Texas Medical Center – Fairfield (Freestone County) | Segment 3C | g |
| Madison Saint Joseph Health Center (Madison County) | Segment 3C/4 | j |

Source: AECOM, 2016

### *3.16.4.3.7 Madison County*

Three law enforcement agencies provide police protection in Madison County, as shown in **Table 3.16-10**. In addition, Segment 3C is served by 2 fire districts, 1 EMS district and 1 hospital. Segment 4 is served by 3 fire districts, 1 EMS district and 1 hospital.

| Table 3.16-10: Madison County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| 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** | **Geography** | **Map Key** |
| Normangee Fire Department | Segment 4 | 32 |
| Madisonville Fire Department | Segment 3C/4 | 33 |
| North Zulch Fire Department | Segment 3C/4 | 34 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Madison County EMS | Segment 3C/4 | Q |
| Madison Saint Joseph Health Center | Segment 3C/4 | j |

Source: AECOM, 2016

### *3.16.4.3.8 Grimes County*

Eight law enforcement agencies provide police protection in Grimes County, as shown in **Table 3.16-11**. In addition, Segment 5 is served by 5 fire districts, 1 EMS district and 2 hospitals. Segments 3C and 4 are served by 2 fire districts, 1 EMS district and 2 hospitals. The nearest hospitals serving the Grimes County portions of Segments 3C, 4 and 5 are located in Madison County (documented above) and Brazos County. Although Brazos County is not considered part of the Study Area for this analysis, the College Station Medical Center is documented in this analysis because it represents the nearest emergency room for parts of Grimes County.

| Table 3.16-11: Grimes County Existing Emergency Service Providers | | |
|---|---|---|
| **Law Enforcement Agency** | **Geography** | |
| 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 | |
| Navasota Police Department | Grimes County | |
| Shiro Police Department | Grimes County | |
| Richards Police Department | Grimes County | |
| Anderson Police Department | Grimes County | |
| Plantersville Police Department | Grimes County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Bedias Volunteer Fire Department | Segment 3C/4/5 | 35 |
| Iola Volunteer Fire Department | Segment 3C/4/5 | 36 |
| Shiro Volunteer Fire Department | Segment 5 | 37 |
| Anderson Volunteer Fire Department | Segment 5 | 38 |
| Plantersville Volunteer Fire Department | Segment 5 | 39 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| St. Jo EMS | Segment 3C/4/5 | R |
| Madison Saint Joseph Health Center (Madison County) | Segment 3C/4/5 | j |
| College Station Medical Center (Brazos County) | Segment 5 | k |

Source: AECOM, 2016

### 3.16.4.3.9 Waller County

Seven law enforcement agencies provide police protection in Waller County, as shown in **Table 3.16-12**. In addition, Segment 5 in Waller County is served by two fire districts and the Waller/Harris County EMS district. The nearest hospital to the Waller County portion of Segment 5 is the Tomball Regional Health Center in northwest Harris County, and is documented in tables for both counties.

**Table 3.16-12: Waller County Existing Emergency Service Providers**

| Law Enforcement Agency | Geography | |
|---|---|---|
| Texas Department of Public Safety, Region 2C | Segment 5 | |
| Waller County Sheriff's Office | Segment 5 | |
| Waller Police Department | Segment 5 | |
| Hempstead Police Department | Waller County | |
| Prairie View Police Department | Waller County | |
| Waller Police Department | Waller County | |
| Brookshire Police Department | Waller County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Tri County Volunteer Fire Department | Segment 5 | 40 |
| Waller Volunteer Fire Department | Segment 5 | 41 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Waller County EMS | Segment 5 | S |
| Tomball Regional Hospital (Harris County) | Segment 5 | I |

Source: AECOM, 2016

### 3.16.4.3.10 Harris County

Seven law enforcement agencies provide police protection in Harris County, as shown in **Table 3.16-13**. In addition, Segment 5 is served by 2 fire districts, 1 EMS district and 1 hospital. Segment 4 is served by 12 fire districts, 4 EMS districts, and 5 hospitals.

**Table 3.16-13: Harris County Existing Emergency Service Providers**

| Law Enforcement Agency | Geography | |
|---|---|---|
| Houston Police Department's Northwest Division, Districts 4 and 5 and Beat 5F10 | Station Area | |
| Texas Department of Public Safety, Region 2A | Segment 5 | |
| Harris County Sheriff's Office | Segment 5 | |
| Houston Police Department | Segment 5 | |
| Katy Police Department | Harris County | |
| Klein Police Department | Harris County | |
| Tomball Police Department | Harris County | |
| **Fire Protection Services** | **Geography** | **Map Key** |
| Waller Volunteer Fire Department | Segment 5 | 41 |
| Tri County Volunteer Fire Department | Segment 5 | 42 |
| Cy-Fair Volunteer Fire Department | Segment 5 | 43 |
| Jersey Village Fire Department | Segment 5 | 44 |
| Houston Fire – Station 50 | Segment 5 | 45 |
| Houston Fire Department – Station 50 | Segment 5 | 46 |
| Houston Fire Department – Station 77 | Segment 5 | 47 |
| Houston Fire Department – Station 5 | Segment 5 | 48 |
| Houston Fire Department – Arson Division | Segment 5 | 49 |
| Houston Fire Department – Station 38 | Segment 5 | 50 |

**Table 3.16-13: Harris County Existing Emergency Service Providers**

| | | |
|---|---|---|
| Houston Fire Department – Station 11 | Segment 5 | 51 |
| Houston Fire Department – Station 2 | Segment 5 | 52 |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Waller/Harris County EMS | Segment 5 | S |
| Cy-Fair EMS | Segment 5 | T |
| Jersey Village EMS | Segment 5 | U |
| **Emergency Medical Services** | **Geography** | **Map Key** |
| Houston EMS | Segment 5 | V |
| Tomball Regional Hospital | Segment 5 | l |
| Cypress Fairbanks Medical Center | Segment 5 | m |
| Spring Branch Memorial Hospital | Segment 5 | o |
| Memorial Hermann Northwest | Segment 5 | n |
| Saint Jude’s Children’s Hospital | Segment 5 | p |

Source: AECOM, 2016

## 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 would exist as those documented in **Section 3.16.5**. The No Build Alternative assumes that the frequency and severity of some safety and security hazards could increase relative to existing conditions as a result of 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 proportionately with population
- 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 demand for law enforcement, fire protection and emergency medical services would increase with population and business growth

### 3.16.5.2 Build Alternatives

The organization of this section (Environmental Consequences for Safety and Security) differs from other sections within this Draft EIS. To evaluate the potential safety and security impacts, this section analyzes the impact of crime, trespass, and natural hazards on the HSR system, and then assesses new hazards introduced to the Study Area as a result of the implementation of the Build Alternatives, most notably the potential for impact to emergency response times within a community.

#### *3.16.5.2.1 Impacts on the HSR System*

The Build Alternatives 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.

As discussed in **Section 3.20.4.1.3** and **3.20.4.1.2, Soils and Geology**, seismic activity in the Study Area has not exceeded a magnitude of 3.6, which is not severe enough to physically move an object the size of a Shinkansen trainset or its infrastructure. Although current earthquake activity in the Study Area is not substantial enough to pose a risk to the HSR infrastructure, the number of earthquakes over magnitude 3.0 has increased in recent years in Dallas and Ellis counties[10] warranting additional monitoring. The HSR system technology can detect seismic activity and halt operations when ground movement exceeds a preset limit. Following a seismic event, inspections of track, structures, bridges, and other system elements would be a priority; and the necessary repairs and operational precautions, such as service suspension or speed restrictions, would be implemented as necessary and prudent. The likelihood of seismic activity adversely impacting the operations of the Build Alternatives is low.[11]

Tornadoes would need to reach approximately category F3 (wind speeds of 158 to 206) or higher to physically dislodge a trainset, should a train be running. A category F3 tornado has only occurred in the 10-county Study Area 4 times in the last 15 years.[12] The likelihood of a tornado of that magnitude touching down precisely at a given train's location, given the large Study Area considered, would be extremely rare. The risk of derailment would be further eliminated through suspension of service during severe weather. Smaller tornadoes and other severe storms may produce enough wind to blow large debris onto the tracks. The likelihood of tornadoes (or high winds) adversely impacting the active operation of a HSR trainset of the Build Alternatives is low. The probability of a tornado crossing the HSR infrastructure is comparable to other linear infrastructure, such as overhead transmission lines. The HSR system's intrusion detection system, embedded throughout the HSR rail corridor, would detect debris and suspend HSR service until the tracks could be inspected and cleared. Therefore, HSR trains would not come into contact with debris or other hazards on the tracks.

Hurricanes and tropical storms are typically large and slow moving and can be detected in advance before reaching the rail corridor. TCRR would suspend rail service well before an approaching storm to avoid any potential impacts to passenger safety. After a disaster, service would remain suspended until such time as the tracks could be inspected and any debris or other hazards could be removed from the HSR tracks before service would be resumed. The likelihood of hurricanes or tropical storms adversely impacting the active operations of the Build Alternatives is low. The probability of a hurricane or tropical storm crossing the HSR infrastructure is comparable to other linear infrastructure. The HSR system's intrusion detection system, embedded throughout the HSR rail corridor, would detect debris and/or flooded track, which would subsequently be inspected and, if needed, repaired, prior to reinitiating operations.

Adequate drainage along the Build Alternatives 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 stormwater mitigation measures, constructing retention/detention ponds and minimizing fill in sensitive areas, as described in **Section 3.8.6.2, Floodplains**. As a result of implementing these strategies, any flooding-related safety impacts would not be significant. Additionally, the HSR system's detection system, embedded throughout the HSR rail

[10] USGS, Accessed July 2016, http://earthquake.usgs.gov/research/induced/

[11] High-speed trains operate in highly seismic areas of Japan and Taiwan. Since HSTs have been built in those countries, substantial efforts have gone into the design and implementation of dynamic rolling stock and structures to prevent catastrophic accidents during seismic events (Kumagai 2008; Cheng et al. 2011).

[12] NOAA, Storm Events Database (2000 to 2015). Accessed March, 2016, http://www.ncdc.noaa.gov/stormevents/ftp.jsp.

corridor, would detect flooded track, which would subsequently be inspected and, if needed, repaired, prior to reinitiating operations.

As stipulated by TCRR in the proposed Rule of Particular Applicability, TCRR would be required to prepare a Hazards Assessment that would account for climate differences in Texas and address extreme weather conditions, safety and security and emergency response. The assessment and implementation plan would be reviewed and approved by FRA before FRA would approve operation of the HSR system. It would specify the conditions under which the system would operate, including the conditions under which service would be suspended, such as during or in preparation for extreme weather events. Therefore, no significant impact from extreme weather events would be expected to occur.

#### *3.16.5.2.2 Impacts as a Result of the HSR System*

Implementation of the Build Alternatives could temporarily or permanently impact EMS routes and response times during construction and operation. Fire, emergency medical conditions, or criminal activity on-board an HSR train or at station facilities could represent a potential impact to passenger and public safety and security. Criminal or terrorist activity at maintenance or traction power facilities or tampering with the rolling stock would also represent a security threat with the potential to impact the integrity of the previously described safety systems.

**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, Air Quality**. If not properly operated, secured, and maintained, construction equipment could also create a risk to the physical safety of employees, contractors or other individuals authorized to be 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. Potential construction safety impacts shall be mitigated through a Construction Safety and Health Plan (as described in **SS-MM#2** below) and a Traffic Control Plan (as described in **Section 3.11.6.2, Transportation Mitigation Measures**).

**Emergency Response Service Levels During Construction**

Temporary and permanent road closures and modified traffic routing would occur during the construction period. At these sites, lane closures and detours could potentially create a distraction to automobile drivers, pedestrians, and cyclists. 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. As noted in **Section 3.11.6.2, Transportation**, mitigation measure TR-MM#1 calls for a traffic control plan that establishes procedures for temporary road closures 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. This plan requires coordination with emergency service providers prior to any temporary lane closures, which would help to minimize the potential for service delays.

The Build Alternatives would require construction on roadways that provide access across emergency response and fire protection jurisdictions, as shown in **Tables 3.16-14 and 3.16-15**, respectively. The number of through roads, or roads which would connect both sides of a service area crossed by a Build Alternative, are documented, as well as the number of those through roads potentially affected during the construction period. The likelihood of construction activities to adversely impact emergency response times is shown in the tables as low, medium, high or localized, based on the criteria established in **Section 3.16.4.2.3**. High potential for impact, highlighted in red, is shown for any service area in which all or all but one existing through roads would in some way be modified during construction, and in which ten percent or more of the service area would lie across the Study Area. A designation of high potential does not necessarily indicate that service levels would be adversely affected, but would indicate a need for careful staging and communication to ensure construction on multiple roadways would not limit emergency response.

Localized potential for impact, highlighted yellow in the table, is shown for service areas where only 10 percent or less of the service area would be cut off from the main facility by the Build Alternatives. This designation is used to represent areas where there would be no through roads, or areas that would otherwise meet the criteria for high potential but would not affect a substantial portion of the service area.

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 would have review and permitting authority over detailed construction plans that include roadway modifications. Through this process, local jurisdictions would be expected to ensure no adverse impacts to emergency response times during the construction phase. Special care would be taken to coordinate the staging of multiple transportation projects to ensure emergency responders have adequate access to all parts of their service area throughout the construction phase. With implementation of mitigation measures described in **Section 3.16.6.2** and approval by the local jurisdictions and service providers, impacts to emergency response times would not be anticipated to be significant.

| Table 3.16-14: Build Alternatives Construction Impacts on EMS Areas | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Alternative A | | | Alternative B | | | Alternative C | | |
| Map Key | EMS Service Area | County | 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 |
| A | Dallas County | Dallas | 23 | 6 | Low | 23 | 6 | Low | 23 | 6 | Low |
| B | Careflite | Ellis | 6 | 1 | Low | 6 | 1 | Low | 6 | 1 | Low |
| C | AMR | Ellis | 23 | 9 | Low | 23 | 9 | Low | 23 | 9 | Low |
| D | Corsicana - District 4 | Navarro | 3 | 3 | High | 4 | 3 | High | 3 | 3 | High |
| E | Corsicana - District 2 | Navarro | 3 | 0 | Low | 3 | 0 | Low | 4 | 3 | Localized |
| F | Corsicana - District 3 | Navarro | 5 | 3 | Medium | 3 | 2 | Localized | 5 | 3 | Medium |
| G | Corsicana - District 1 | Navarro | 10 | 4 | Low | 11 | 6 | Medium | 8 | 1 | Low |
| H | Mexia EMS | Freestone and Limestone | 4 | 1 | Low | 4 | 1 | Low | No Impact to Service Area | | |
| I | Fairfield EMS | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 18 | 9 | Medium |
| K | Teague EMS | Freestone | 9 | 5 | Medium | 9 | 5 | Medium | 4 | 0 | Low |
| L | Allegiance | Leon | No Impact to Service Area | | | No Impact to Service Area | | | 7 | 3 | Low |
| M | Limestone EMS | Limestone | 7 | 2 | Low | 7 | 2 | Low | No Impact to Service Area | | |
| N | Jewett EMS 2 | Leon | 9 | 5 | Medium | 9 | 5 | Medium | No Impact to Service Area | | |
| O | Texas Medical Response | Leon | 1 | 1 | Localized | 1 | 1 | Localized | 11 | 9 | Medium |
| P | Jewett EMS | Leon | 8 | 4 | Medium | 8 | 4 | Medium | No Impact to Service Area | | |
| Q | Madison County EMS | Maddison | 11 | 5 | Low | 11 | 5 | Low | 10 | 4 | Low |
| R | St Jo EMS | Grimes | 30 | 14 | Low | 30 | 14 | Low | 30 | 14 | Low |
| S | Waller County EMS | Waller and Harris | 14 | 5 | Low | 14 | 5 | Low | 14 | 5 | Low |
| T | Cy Fair EMS | Harris | 11 | 1 | Low | 11 | 1 | Low | 11 | 1 | Low |
| U | Jersey Village EMS | Harris | 4 | 0 | Low | 4 | 0 | Low | 4 | 0 | Low |
| V | Houston EMS | Harris | 13 | 0 | Low | 13 | 0 | Low | 13 | 0 | Low |

**Table 3.16-14: Build Alternatives Construction Impacts on EMS Areas (cont.)**

| | | Segment | Alternative D | | | Alternative E | | | Alternative F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Map Key | EMS Service Area | County | 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 |
| A | Dallas County | Dallas | 23 | 6 | Low | 23 | 6 | Low | 23 | 6 | Low |
| B | Careflite | Ellis | 6 | 1 | Low | 6 | 1 | Low | 6 | 1 | Low |
| C | AMR | Ellis | 21 | 11 | Medium | 21 | 11 | Medium | 21 | 11 | Medium |
| D | Corsicana - District 4 | Navarro | 3 | 3 | High | 4 | 3 | High | 3 | 3 | High |
| E | Corsicana - District 2 | Navarro | 3 | 0 | Low | 3 | 0 | Low | 4 | 3 | Localized |
| F | Corsicana - District 3 | Navarro | 5 | 3 | Medium | 3 | 2 | High | 5 | 3 | Medium |
| G | Corsicana - District 1 | Navarro | 10 | 4 | Low | 11 | 6 | Medium | 8 | 1 | Low |
| H | Mexia EMS | Freestone and Limestone | 43 | 1 | Low | 4 | 1 | Low | No Impact to Service Area | | |
| I | Fairfield EMS | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 18 | 10 | Medium |
| K | Teague EMS | Freestone | 9 | 5 | Medium | 9 | 5 | Medium | 4 | 0 | Low |
| L | Allegiance | Leon | No Impact to Service Area | | | No Impact to Service Area | | | 7 | 3 | Low |
| M | Limestone EMS | Limestone | 7 | 2 | Low | 7 | 2 | Low | No Impact to Service Area | | |
| N | Jewett EMS 2 | Leon | 9 | 5 | Medium | 9 | 5 | Medium | No Impact to Service Area | | |
| O | Texas Medical Response | Leon | 1 | 1 | Localized | 1 | 1 | Localized | 11 | 9 | Medium |
| P | Jewett EMS | Leon | 8 | 4 | Medium | 8 | 4 | Medium | No Impact to Service Area | | |
| Q | Madison County EMS | Maddison | 11 | 5 | Low | 11 | 5 | Low | 10 | 4 | Low |
| R | St Jo EMS | Grimes | 30 | 14 | Low | 30 | 14 | Low | 30 | 14 | Low |
| S | Waller County EMS | Waller and Harris | 14 | 5 | Low | 14 | 5 | Low | 14 | 5 | Low |
| T | Cy Fair EMS | Harris | 11 | 1 | Low | 11 | 1 | Low | 11 | 1 | Low |
| U | Jersey Village EMS | Harris | 4 | 0 | Low | 4 | 0 | Low | 4 | 0 | Low |
| V | Houston EMS | Harris | 13 | 0 | Low | 13 | 0 | Low | 13 | 0 | Low |

Source: AECOM, 2016

**Table 3.16-15: Build Alternatives Construction Impacts on Fire Protection Services**

| | | | Alternative A | | | Alternative B | | | Alternative C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Map Key | Fire Service Area | County | 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 |
| 1 | Dallas County Model[A] | Dallas | 23 | 6 | Low | 23 | 6 | Low | 23 | 6 | Low |
| 2 | Ferris FD | Ellis | 6 | 1 | Low | 6 | 1 | Low | 6 | 1 | Low |
| 3 | Palmer VFD | Ellis | 7 | 2 | Low | 7 | 2 | Low | 7 | 2 | Low |
| 4 | Ellis County ESD #6[B] | Ellis | 4 | 0 | Low | 4 | 0 | Low | 4 | 0 | Low |
| 5 | Garrett Area Rural VFD[C] | Ellis | 1 | 1 | High | 1 | 1 | High | 1 | 1 | High |
| 6 | Ennis FD[B] | Ellis | 3 | 0 | Low | 3 | 0 | Low | 3 | 0 | Low |
| 7 | Bardwell Area VFD | Ellis | 8 | 6 | Medium | 8 | 6 | Medium | 8 | 6 | Medium |
| 8 | Avalon VFD | Ellis | 1 | 1 | Localized | 1 | 1 | Localized | 1 | 1 | Localized |
| 9 | Emhouse VFD | Navarro | 4 | 3 | Localized | 2 | 1 | High | 4 | 3 | Localized |
| 10 | Barry VFD | Navarro | 7 | 4 | Medium | 7 | 4 | Medium | 7 | 4 | Medium |
| 11 | Retreat VFD | Navarro | No Impact to Service Area | | | 3 | 1 | Low | No Impact to Service Area | | |
| 12 | Corbet-Oak Valley VFD | Navarro | 4 | 3 | High | 7 | 6 | High | 4 | 2 | Medium |
| 13 | Angus VFD | Navarro | No Impact to Service Area | | | 1 | 0 | Low | No Impact to Service Area | | |
| 14 | Pursley VFD | Navarro | 2 | 2 | High | No Impact to Service Area | | | 1 | 0 | Low |
| 15&17 | Streetman VFD | Navarro and Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 8 | 6 | Medium |
| 16 | Richland VFD | Navarro | 8 | 1 | Low | 6 | 3 | Medium | 8 | 1 | Low |
| 18 | Wortham FD | Freestone | 2 | 0 | Low | 2 | 0 | Low | No Impact to Service Area | | |
| 19 | Fairfield FD | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 11 | 6 | Medium |
| 20 | Kirvin FD | Freestone | 5 | 4 | High | 5 | 4 | High | 0 | 0 | Localized |
| 21 | Teague FD | Freestone | 5 | 2 | Low | 5 | 2 | Low | No Impact to Service Area | | |
| 22 | Dew FD | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 5 | 1 | Low |
| 24 | Buffalo VFD | Leon and Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 7 | 3 | Low |
| 25 | E. Lake Limestone FD | Limestone | 6 | 2 | Low | 6 | 2 | Low | No Impact to Service Area | | |
| 26 | Jewett VFD | Leon | 9 | 4 | Low | 9 | 4 | Low | No Impact to Service Area | | |
| 27 | Centerville VFD | Leon | 0 | 0 | Localized | 0 | 0 | Localized | 6 | 4 | High |
| 28 | Marquez VFD | Leon | 3 | 0 | Localized | 3 | 0 | Localized | No Impact to Service Area | | |
| 29 | Flynn VFD | Leon | 4 | 3 | Localized | 4 | 3 | Localized | No Impact to Service Area | | |
| 30 | Leona VFD | Leon | 0 | 0 | Localized | 0 | 0 | Localized | 3 | 2 | High |
| 31 | Normangee VFD | Leon and Madison | 5 | 3 | Medium | 5 | 3 | Medium | No Impact to Service Area | | |
| 33 | Madisonville FD | Madison | 1 | 1 | Localized | 1 | 1 | Localized | 9 | 4 | Low |
| 34 | North Zulch FD | Madison | 5 | 2 | Medium | 5 | 2 | Medium | 1 | 0 | Low |

**Table 3.16-15: Build Alternatives Construction Impacts on Fire Protection Services**

| | | | Alternative A | | | Alternative B | | | Alternative C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Map Key | Fire Service Area | County | 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 |
| 35 | Bedias VFD | Grimes | 7 | 3 | Low | 7 | 3 | Low | 7 | 3 | Low |
| 36 | Iola VFD | Grimes | 2 | 0 | Low | 2 | 0 | Low | 2 | 0 | Low |
| 37 | Shiro VFD | Grimes | 3 | 3 | High | 3 | 3 | High | 3 | 3 | High |
| 38 | Anderson VFD | Grimes | 8 | 4 | Medium | 8 | 4 | Medium | 8 | 4 | Medium |
| 39 | Plantersville VFD | Grimes | 12 | 7 | Medium | 12 | 7 | Medium | 12 | 7 | Medium |
| 40 | Tri County VFD | Waller and Harris | 6 | 4 | Medium | 6 | 4 | Medium | 6 | 4 | Medium |
| 41 | Waller VFD | Waller | 8 | 2 | Low | 8 | 2 | Low | 8 | 2 | Low |
| 43 | Cy Fair VFD[A] | Harris | 11 | 2 | Low | 11 | 2 | Low | 11 | 2 | Low |
| 44 | Jersey Village Fire | Harris | 3 | 0 | Low | 3 | 0 | Low | 3 | 0 | Low |
| 45 | Houston Fire Station 66 | Harris | 7 | 1 | Low | 7 | 1 | Low | 7 | 1 | Low |
| 46 | Houston Fire Station 50 | Harris | 6 | 0 | Low | 6 | 0 | Low | 6 | 0 | Low |
| 50 | Houston Fire Station 38 | Harris | 2 | 0 | Low | 2 | 0 | Low | 2 | 0 | Low |

Source: AECOM, 2016
A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.
B: Localized impacts are limited to areas that would be potentially difficult to access even under the no build scenario due to the irregular boundary between ESD #6 and Ennis FD along power lines.
C: Although no reconfiguration of through roads would occur, a construction staging area off 879 may lead to traffic impacts and is included in the LOD.

| Table 3.16-15 Build Alternatives Construction Impacts on Fire Protection Services (cont.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Segment | Alternative D | | | Alternative E | | | Alternative F | | |
| Map Key | Fire Service Area | County | 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 |
| 1 | Dallas County Model[A] | Dallas | 23 | 6 | Low | 23 | 6 | Low | 23 | 6 | Low |
| 2 | Ferris FD | Ellis | 6 | 1 | Low | 6 | 1 | Low | 6 | 1 | Low |
| 3 | Palmer VFD | Ellis | 8 | 3 | Low | 8 | 3 | Low | 8 | 3 | Low |
| 4 | Ellis County ESD #6[B] | Ellis | 2 | 2 | Localized | 2 | 2 | Localized | 2 | 2 | Localized |
| 5 | Garrett Area Rural VFD[C] | Ellis | 1 | 1 | High | 1 | 1 | High | 1 | 1 | High |
| 6 | Ennis FD[B] | Ellis | 4 | 3 | Localized | 4 | 3 | Localized | 4 | 3 | Localized |
| 7 | Bardwell Area VFD | Ellis | 7 | 6 | High | 7 | 6 | High | 7 | 6 | High |
| 8 | Avalon VFD | Ellis | No Impact to Service Area | | | No Impact to Service Area | | | No Impact to Service Area | | |
| 9 | Emhouse VFD | Navarro | 4 | 3 | Localized | 2 | 1 | High | 4 | 3 | Localized |
| 10 | Barry VFD | Navarro | 7 | 4 | Medium | 7 | 4 | Medium | 7 | 4 | Medium |
| 11 | Retreat VFD | Navarro | No Impact to Service Area | | | 3 | 1 | Low | No Impact to Service Area | | |
| 12 | Corbet-Oak Valley VFD | Navarro | 4 | 3 | High | 7 | 6 | High | 4 | 2 | Medium |
| 13 | Angus VFD | Navarro | No Impact to Service Area | | | 1 | 0 | Low | No Impact to Service Area | | |
| 14 | Pursley VFD | Navarro | 2 | 2 | High | No Impact to Service Area | | | 1 | 0 | Low |
| 15&17 | Streetman VFD | Navarro and Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 8 | 6 | Medium |
| 16 | Richland VFD | Navarro | 8 | 1 | Low | 9 | 2 | Low | 7 | 3 | Low |
| 18 | Wortham FD | Freestone | 2 | 0 | Low | 2 | 0 | Low | No Impact to Service Area | | |
| 19 | Fairfield FD | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 11 | 5 | Medium |
| 20 | Kirvin FD | Freestone | 4 | 4 | High | 4 | 4 | High | 2 | 1 | Localized |
| 21 | Teague FD | Freestone | 5 | 2 | Medium | 5 | 2 | Medium | No Impact to Service Area | | |
| 22 | Dew FD | Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 5 | 1 | Low |
| 24 | Buffalo VFD | Leon and Freestone | No Impact to Service Area | | | No Impact to Service Area | | | 7 | 3 | Low |
| 25 | E. Lake Limestone FD | Limestone | 6 | 2 | Low | 6 | 2 | Low | No Impact to Service Area | | |
| 26 | Jewett VFD | Leon | 9 | 4 | Low | 9 | 4 | Low | No Impact to Service Area | | |
| 27 | Centerville VFD | Leon | 0 | 0 | Localized | 0 | 0 | Localized | 6 | 4 | Medium |
| 28 | Marquez VFD | Leon | 3 | 0 | Low | 3 | 0 | Low | No Impact to Service Area | | |
| 29 | Flynn VFD | Leon | 4 | 3 | Localized | 4 | 3 | Localized | No Impact to Service Area | | |
| 30 | Leona VFD | Leon | 0 | 0 | Localized | 0 | 0 | Localized | 3 | 2 | High |
| 31&32 | Normangee VFD | Leon and Madison | 7 | 6 | High | 7 | 6 | High | No Impact to Service Area | | |
| 33 | Madisonville FD | Madison | 1 | 1 | Localized | 1 | 1 | Localized | 9 | 4 | Low |

**Table 3.16-15 Build Alternatives Construction Impacts on Fire Protection Services (cont.)**

| | | Segment | Alternative D | | | Alternative E | | | Alternative F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Map Key | Fire Service Area | County | 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 |
| 34 | North Zulch FD | Madison | 5 | 2 | Low | 5 | 2 | Low | 1 | 0 | Low |
| 35 | Bedias VFD | Grimes | 5 | 2 | Low | 5 | 2 | Low | 5 | 2 | Low |
| 36 | Iola VFD | Grimes | 2 | 0 | Low | 2 | 0 | Low | 2 | 0 | Localized |
| 37 | Shiro VFD | Grimes | 3 | 3 | High | 3 | 3 | High | 3 | 3 | High |
| 38 | Anderson VFD | Grimes | 8 | 4 | Medium | 8 | 4 | Medium | 8 | 4 | Medium |
| 39 | Plantersville VFD | Grimes | 8 | 4 | Medium | 8 | 4 | Medium | 8 | 4 | Medium |
| 40&42 | Tri County VFD | Waller and Harris | 6 | 4 | Medium | 6 | 4 | Medium | 6 | 4 | Medium |
| 41 | Waller VFD | Waller | 8 | 2 | Low | 8 | 2 | Low | 8 | 2 | Low |
| 43 | Cy Fair VFD[A] | Harris | 11 | 2 | Low | 11 | 2 | Low | 11 | 2 | Low |
| 44 | Jersey Village Fire | Harris | 3 | 0 | Low | 3 | 0 | Low | 3 | 0 | Low |
| 45 | Houston Fire Station 66 | Harris | 7 | 1 | Low | 7 | 1 | Low | 7 | 1 | Low |
| 46 | Houston Fire Station 50 | Harris | 6 | 0 | Low | 6 | 0 | Low | 6 | 0 | Low |
| 50 | Houston Fire Station 38 | Harris | 2 | 0 | Low | 2 | 0 | Low | 2 | 0 | Low |

Source: AECOM, 2016

A: Multiple fire houses in a single district allow for resources on both sides of the Build Alternatives.

B: Localized impacts are limited to areas that would be potentially difficult to access even under the no build scenario due to the irregular boundary between ESD #6 and Ennis FD along power lines.

C: Although no reconfiguration of through roads would occur, a construction staging area off 879 may lead to traffic impacts and is included in the LOD.

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 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 Houston Industrial Station option LOD includes Post Oak Road, which is one of two ways across IH-10 to access the southern portion, approximately 24 percent (840 acres), of the Houston Fire Station #38 service area. Any closures on Post Oak road would result in a high potential for impact. Detailed construction plans are not available at this time, but would be coordinated with emergency responders to avoid impacts.

The Northwest Mall Terminal Station option would sit on the boundary between the Houston Fire Department – Arson Division and Houston Fire Station #38. The station LOD includes W 18th Street, one of 3 roads providing access to the western 50 acres of the Houston Fire Department – Arson Division's service area. The potential to impact would be localized to no more than 2 percent of the service area. Therefore, station construction would not impact travel around the service area for Houston Fire Station #38.

The Northwest Transit Center Terminal Station option LOD includes Westview Drive which could impact a small area on the east edge of the area served by Houston Fire Station #38. Any potential for impacted response times would be localized to 40 acres or about 1 percent of the district.

All 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. 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. As a result of this approval process and the mitigation measures described in **Section 3.16.6.2**, impacts to emergency response times are not anticipated to be significant.

**Emergency Response Service Levels During Operations**

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 3.11.5.2, Transportation** Build Alternatives, approximately half of all crossings involve a rail viaduct over existing roads, minimizing permanent impacts. Private road acquisitions would correspond with acquisition of the affected properties, and, therefore, would not be significant in regards to emergency response. The majority of closures also would involve the acquisition of affected property or affect only private roads that would not contribute to emergency response times. **Table 3.16-16** summarizes transportation impacts only where they result in 1,000 feet or more in route length on a public road that could result in potential changes to emergency responder travel times.

**Table 3.16-16: Effects of Permanent Road Modifications**

| County | Segment | Build Alternative | Transportation Impact | Route Impact (feet) | Travel Time Impact[13] |
|---|---|---|---|---|---|
| Dallas | 1 | A, B, C, D, E and F | Reroute: Cleveland Rd. | 2,900 | 2 min. |
| Dallas | 1 | A, B, C, D, E and F | Reroute: Cornell Rd. | 1,040 | <1 min. |
| Ellis | 2A | A, B, and C | Reroute: East B Ln. | 1,800 | 1 min. |
| Ellis | 3A | A and D | Rd. Over Rail: FM 985 | 2600 | 2 min. |
| Ellis | 3A | A and D | Rd .Over Rail: Sullivan Rd. | 1,000 | <1 min. |
| Ellis | 2B | D, E and F | Reroute: Old Boyce Rd. | 4,900 | 3 min. |
| Ellis | 2B | D, E and F | Rd. Over Rail: Old Waxahachie Rd. /Getzendander Rd. | 1,030 | <1 min. |
| Ellis | 3B | B and E | Sullivan Road | 1,600 | 1 min. |
| Navarro | 3A | A and D | Reroute: CR 1320/CR 1340 | 2,800 | 2 min. |
| Navarro | 3A | A and D | Reroute: FM 1126 | 4,600 | 3 min. |
| Navarro | 3A | A and D | Reroute: CR2010 | 1,300 | <1 min. |
| Navarro | 3B | B and E | Reroute: CR 1090 | 1,500 | 1 min. |
| Navarro | 3B | B and E | Reroute: Oak Valley Ln. | 2,280 | 2 min. |
| Navarro | 3B | B and E | Road Over Rail: CR 1130/ CR 5149 | 1,200 | <1 min. |
| Navarro | 3B | B and E | Reroute: CR 1140 | 3,600 | 2 min. |
| Navarro | 3B | B and E | Rd. Over Rail: FM 709 | 2,640 | 2 min. |
| Navarro | 3C | C and F | Reroute: CR 40 | 4,600 | 3 min |
| Navarro | 3C | C and F | Reroute: CR 2344 | 3,180 | 2 min |
| Navarro | 3C | C and F | Reroute: CR 2348 | 1,600 | 1 min. |
| Freestone | 3C | C and F | Rd. Over Rail: Church St. | 1,880 | 1 min. |
| Freestone | 4 | A, B, D and E | Reroute: FM 2777 | 1,900 | 1 min. |
| Leon | 3C | C and F | Reroute: CR 317 | 12,380 | 8 min. |
| Leon | 3C | C and F | Reroute: CR 318 | 2,300 | 2 min. |
| Leon | 3C | C and F | Reroute: CR 477 | 3,800 - 9,400 | 2 min. - 6 min. |
| Leon | 4 | A, B, D and E | Rd Over Rail: FM 1512 | 1,200 | <1 min. |
| Leon | 4 | A, B, D and E | Reroute: CR 408 | 2,050 | 1 min. |
| Madison | 3C | C and F | Rd. Over Rail: Waldrip Rd. | 1,200 | <1 min. |
| Madison | 4 | A, B, D and E | Reroute: Skains Rd. | 1,700 | 1 min. |
| Madison | 4 | A, B, D and E | Rd. Over Rail: Poteet Rd. | 3,300 | 2 min. |
| Grimes | 5 | A, B, C, D, E and F | Reroute: CR 155 | 4,100 | 3 min |
| Grimes | 5 | A, B, C, D, E and F | Rd. Over Rail: CR 176 | 1,600 | 1 min. |
| Grimes | 5 | A, B, C, D, E and F | Reroute: CR 226 | 4,000 | 3 min. |
| Grimes | 5 | A, B, C, D, E and F | Reroute: Rolling Hills Rd. | 5,350 | 4 min |
| Grimes | 5 | A, B, C, D, E and F | Reroute: Pavlock Rd. | 3,420 | 2 min |
| Grimes | 5 | A, B, C, D, E and F | Reroute: Bronco Ln. | 3,500 | 2 min. |
| Waller | 5 | A, B, C, D, E and F | Reroute: Hegar Road | 1,300 | <1 min |
| Waller | 5 | A, B, C, D, E and F | Reroute: Joseph Road | 3,000 | 2 min |
| Harris | 5 | A, B, C, D, E and F | Reroute: Perimeter Park Dr. | 2,500 | 2 min |

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 access roads running parallel to the alignment would improve access and travel times for some north-south movements across a service area. As stated in **Section 3.11, Transportation**, TCRR would coordinate with TxDOT or the appropriate local jurisdiction and any potentially affected emergency responders during final design to avoid any appreciable negative impact to emergency response times.

[13] Assumes an average travel speed of 17 mph, or 1 minute of impact per 1,500 feet.

**Operational Safety**

There are two aspects of operational safety – the potential for derailment and the potential for rail collisions. A derailment of the HSR train would represent an impact primarily to passenger safety. 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. 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 HSR system would be an electric-powered passenger train, so there would be no safety hazards from cargo or fuel.

Train derailments occur most commonly as a result of broken rails or rail welds. Other causes include mechanical failure of vehicle components, improper operation of control switches, improper train handling along curved or speed-restricted sections of track, and buckling of track due to excessive heat.[14] TCRR's Automatic Train Control system would control train movements at switches and speed-restricted areas, eliminating the potential for significant train-to-train collisions and mitigating, if not eliminating, the possibility of certain accidents resulting from operator error and excessive speed. Regular inspection and maintenance of vehicles, track, and switch locations would help prevent mechanical failures. Sweeper vehicles would operate daily before the start of passenger service to clear tracks of any debris and ensure tracks would be in safe working order.

The hazard to adjacent properties would be defined by the length of travel beyond the operational corridor and into physical structures based on the train speed. Communities located adjacent to the Build Alternatives include:

- Medium and high-density development in Dallas County
- Medium and high-density development in Harris County
- Neighborhood developments
    - Near Ferris and north of Palmer in Ellis County
    - West of Corsicana in Navarro County
    - Near Fairfield in Freestone County
    - West of Centerville in Leon County

Because the Shinkansen Tokaido N-700 HSR System is designed to contain trainsets within the operational corridor even in the event of a derailment, and because the train would not contain cargo or fuel that would result in a fire or explosion, the Build Alternatives would not substantially increase hazards to nearby residents.

Approval of the Build Alternatives and the proposed Rule of Particular Applicability by FRA is based on TCRR importing the Tokaido Shinkansen HSR system from Japan and employing its accident and crash 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

[14] Liu, Saat, and Barkan, Analysis of Causes of Major Train Derailment and their Effect on Accident Rates: Transportation Research Record 2289, Accessed May 2016.

(detailed as avoidance measures in **Section 3.16.7**) that would eliminate the risk of train-to-motor vehicle collisions and significant train-to-train collisions. Therefore, potential for rail collisions during operation of the Build Alternatives would be negligible.

**Station and Facility Safety**
HSR stations and maintenance facilities would be constructed to include automatic sprinkler systems, alternative automatic extinguishing systems, a fire alarm system, emergency ventilation and emergency power systems, in accordance with National Fire Protection Association standards,[15] as with all major structures in Texas. In compliance with federal OSHA standards, and any FRA requirements, station areas would include emergency access and egress plans designed to increase the effectiveness and timeliness of emergency response.

Pedestrian, bike, and vehicle safety at station areas is protected through direct connections within the station itself. Similar to local airports, all station options would include parking and car rental facilities within the station building, or 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. Where possible, connections to other rail transit services would be provided within the station building. TCRR would work with the cities of Dallas and Houston and 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.

All modified public roadways would receive traffic control devices meeting applicable local or TxDOT standards. 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.

As discussed in **Section 3.11, Transportation**, construction of the Build Alternatives has the potential to result in short-term, temporary impacts to vehicle and pedestrian safety. TCRR would coordinate with TxDOT and local authorities to minimize potential negative effects of construction on roadway and pedestrian safety.

**Passenger Safety**
The need for emergency services to access the HSR ROW would consist primarily of non-preventable incidents such as a passenger medical emergency. Emergency access to HSR trainsets would be provided at station areas, TMFs, MOWs and at vertical access points placed periodically along elevated track, at an interval to be determined by TCRR and consistent with the requirements of the Rule of Particular Applicability (see **Appendix F, TCRR Conceptual Engineering Design Report**). The HSR system would also include locations of “safe harbors” along the ROW that the train can reach quickly to address any system issues or onboard emergencies. Train protective switches would allow the electricity to be disconnected if a section of the track is being accessed during an emergency.

Criminal activity, such as theft and violence, could occur on trains and at station facilities. TCRR would employ controlled access and security monitoring systems that would deter criminal activity and facilitate early detection. As part of operations, TCRR would create and staff a private police department to lead their safety and security at the stations and in the HSR trains, as well as coordinate with local

[15] NFPA Codes and Standards, Accessed July, 2016, www.nfpa.org/codes-and-standards

city/county law enforcement. As a result of these precautions, the impacts to passenger safety on-board the train during operations would not be significant.

Terrorists could target the stations, tracks, or trains for the potential to inflict mass casualties and disrupt transportation infrastructure. The HSR system features would include sensors on perimeter fencing, closed circuit television and security lighting, where appropriate, that could deter or facilitate early detection of targeted attacks. These features would also help to prevent suicide attempts.

Project design features would minimize the potential for train accidents; therefore, local response to accidents would most likely not be required, because any incident would be extremely rare. Notwithstanding, TCRR would collaborate with local responders to develop a Passenger Train Emergency Preparedness Plan, as discussed in **Section 3.16.7.1**, to facilitate emergency response in case of inclement weather, power outages, medical or other emergencies. Emergency services in Dallas and Harris counties would be able to respond to onboard and facility safety and security situations. For the other counties, TCRR and the local jurisdiction would need to determine the equipment or training that would be needed to supplement their current level of readiness.

## 3.16.6 Avoidance, Minimization and Mitigation

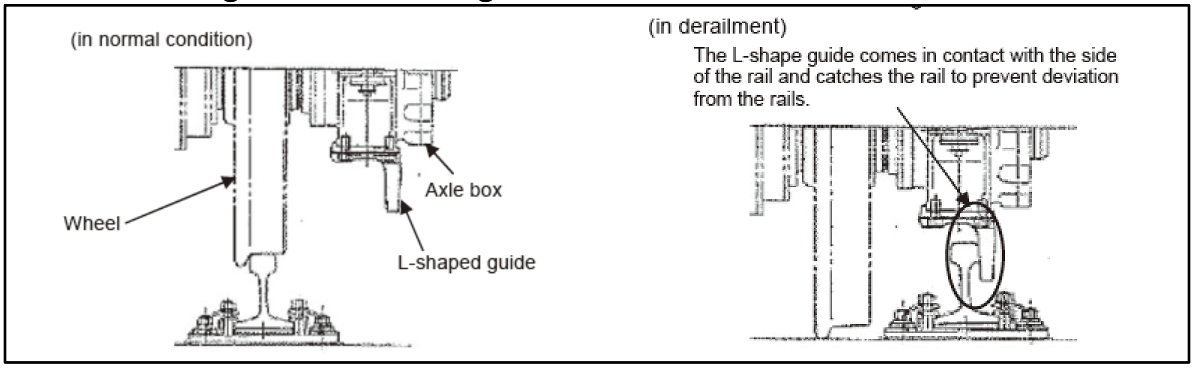
TCRR would use a combination of preventative design features, safety programs and adequate provisions for emergency access to reduce or eliminate potential safety and security impacts. The HSR system employs several avoidance and minimization tools, such as rain and temperature gauges, anemometers, seismic activity monitors and detention sensors that routinely send readings to the command center. Before extreme weather conditions could threaten the system, operations would halt and not resume until the system had been inspected and, if needed, repaired. The HSR system's intrusion detection system, embedded throughout the HSR rail corridor, would detect debris and suspend HSR service until the tracks could be inspected and cleared, eliminating the ability for the HSR trains to come into contact with debris or other hazards on the tracks.

The following crash avoidance design features of the HSR system are integral to the minimization or elimination of potential safety or security impacts:

- dedicated ROW that is completely grade separated from freight, automobile and pedestrian traffic
- no bi-directional service on any segment
- security fencing, physical barriers, and an intrusion detection system to secure the entire ROW
- signaling and communications system with signal houses located every 25 miles or less
- Automatic Train Control system to control train speeds and movement through switch areas

Additionally, the HSR system requirements, as proposed by TCRR in its Rule of Particular Applicability, would contain trainsets within the operational corridor by installing derailment prevention guards parallel to the inner side of the rails, which would prevent the wheels from moving from side to side and leaving the track. Also, deviation prevention guards, as shown in **Figure 3.16-4**, are L-shaped guides located interior to the wheels which would come in contact with the rails, preventing the train cars from leaving the operational corridor.

**Figure 3.16-4: Configuration of Deviation Prevention Guard**




Source: Kajitani, Yasushi, Hiroyuki Kato and Koji Asano, "Development of an L-Shaped Guide to Prevent Deviation from Rails," Advanced Railway System Development Center, Research and Development Center of JR East Group, JR EAST Technical Review-No.15.

The Build Alternatives would implement a signaling and communications system with signal houses located every 25 miles or less, and additional signal houses in proximity to each controlled switching location (such as stations and maintenance facilities). An Automatic Train Control system would control train speeds and movement through switch areas to mitigate, if not eliminate, the possibility of certain accidents resulting from operator error and ensure appropriate speeds and distances would be maintained in compliance with the standards set in final engineering. Crash walls would be installed in locations identified through final design to prevent the possibility of freight rail vehicles operating on nearby track from leaving the freight corridor and colliding with HSR vehicles.

The Build Alternatives would prevent unauthorized access or intrusions onto the railway property by vehicles, individuals or livestock by completely separating the operational corridor along viaducts or through security fencing. The HSR system security fencing would use security cameras, intrusion detection sensors and warning devices to prevent unauthorized access and secure the entire HSR ROW. All MOW activities would be scheduled when trains are not operating to eliminate the potential for roadway worker injury or fatality from incidents with the trainsets. The daily use of sweeper vehicles would help ensure that no hazards would be present on the tracks. To further prevent incidents and ensure reliable operations, TCRR's proposed Rule of Particular Applicability requires a formalized System Safety Program, which would cover all aspects of system inspection, testing and maintenance. This program would be developed by TCRR and approved by FRA before operations commence, and it would be implemented by TCRR and overseen by FRA.

### 3.16.6.1 Compliance Measures

TCRR would comply with all inspection, maintenance, training and other safety procedures as developed through the Rule of Particular Applicability, order(s) or waiver(s), or other regulatory action(s) taken by FRA to ensure the system is operated safely. The following Compliance Measures (CM) are necessary results of HSR fulfilment of legal or permitting requirements and would serve to further reduce the potential for safety impacts. They are applicable to Build Alternatives A through F.

**SS-CM#1: Emergency Preparedness Plan.** The proposed Rule of Particular Applicability requires TCRR to prepare an Emergency Preparedness Plan for review and approval by FRA. The plan shall include at minimum:

- On-board and control center communication protocol
- 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
- Procedures involving operations on elevated structures and in electrified territory
- Program for communication and training for any local emergency responders who could reasonably be expected to respond during an emergency situation. This program shall include participation in emergency simulations and distribution of the Emergency Preparedness plan;
- 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
- Program for passenger awareness of emergency procedures, to enable passengers to respond properly during an emergency
- Procedures regarding passengers with disabilities

**SS-CM#2: Early Detection Sensors.** The HSR system would employ early detection sensors if warranted in appropriate locations as determined by the Hazard Assessment and as approved under the Rule of Particular Applicability. The HSR system would include a requirement to periodically analyze seismic activity in the area and incorporate additional sensors if necessary.

**SS-CM#3: Conduct Regular Inspection and Maintenance.** As part of the proposed Rule of Particular Applicability, TCRR proposed minimum standards and schedules for inspection and maintenance of vehicles, track and switch locations, and other critical infrastructure required for the prevention of mechanical failures. TCRR shall be responsible for adhering to those standards and documenting inspection and maintenance records, as required by FRA. This program shall include daily use of sweeper vehicles prior to initiating daily passenger service to ensure no hazards on the tracks and confirm the safety of the HSR ROW.

**SS-CM#4 Perform Hazard Assessment and Threat and Vulnerability Assessments.** Prior to operations, TCRR shall prepare a Preliminary Hazard Assessment for review and approval by FRA. It shall:

- Identify all potential hazards and unintended events that may lead to an accident
- Rank the identified accidental events according to their severity
- Identify required hazard controls and follow-up actions

The Preliminary Hazard Assessment shall also determine the need and ideal location for early detection and warning systems as well as additional prevention measures. The Preliminary Hazard Assessment shall specify a schedule for reevaluating hazardous conditions, which may change over time, such as those related to facility conditions or seismic activity in Dallas and Ellis Counties. Threat and vulnerability assessments shall establish provisions for the deterrence and detection of, as well as the response to, criminal and terrorist acts for rail facilities and system operations.

**SS-CM#5: Develop Fire Protection Program.** Prior to operations, the proposed Rule of Particular Applicability requires TCRR to implement a Fire Protection Program that meets FRA safety requirements. This program shall address the safety of passengers and employees, including the needs of persons with disabilities, during emergency response. TCRR shall develop its Fire Protection Program in coordination with FRA, TxDOT, and local emergency responders to provide them with an understanding of, and solicit feedback regarding, the rail system, facilities, operations, evacuation routes and emergency procedures. In support of its Fire Protection Program, TCRR outlines a Fire Life Safety Plan that would comply with 2014 National Fire Protection Association (NFPA) 130 Standard for Fixed Guideway Transit and Passenger Rail Systems for passenger stations and infrastructure. NFPA 130 standards shall be applied to TCRR vehicles and facilities, including but not limited to:

- Fire detection and suppression systems, such as sprinklers and fire extinguishers
- Specifications for flame- and shatter-resistant materials
- Location and spacing of vertical access points to elevated track and “safe harbors” locations for emergency stops during operation
- Emergency ventilation and emergency power systems in accordance with National Fire Protection Association standards
- Notification systems and emergency exits, including exterior emergency door panels for emergency responders needing to access vehicle
- ROW access for emergency responders and emergency access and egress plans

**SS-CM#6: Develop operating procedures, safety programs, and employee training.** Prior to operations, the Rule of Particular Applicability requires TCRR to develop a System Safety Program and an Emergency Preparedness Plan. TCRR shall develop for FRA review and approval System Safety Program and Emergency Preparedness Plans. The plans shall address standard operating procedures and emergency situations to maintain the safety of employees, passengers, and the public, and shall include industry best practices, such as those specified by the FRA-mandated Roadway Worker Protection Program. Emergency operating procedures shall include explicit evacuation and operational shut-down procedures and any other requirements specified in the proposed Rule of Particular Applicability.

TCRR shall develop a comprehensive safety program for FRA review and approval, including a full suite of safety policies, procedures, training requirements, and inspection and maintenance schedules consistent with safety measures identified here and in compliance with the Rule of Particular Applicability, Preliminary Hazard Assessment, Fire Protection Program, and Construction Safety and Health Plan. TCRR shall be responsible for ensuring employees have received the appropriate level of training for their position and documenting all required safety training events as part of its safety program.

**SS-CM#7: Compliant Facility Design.** During final design the design of stations, the operational corridor and maintenance facilities shall meet all applicable federal emergency preparedness requirements. This includes providing access to the operational corridor and providing walkways on both sides of the tracks for both elevated and at-grade sections for necessary railroad inspections and for facilitating emergency response. Ground access shall be available from elevated tracks at prescribed intervals. All stations and facilities shall meet applicable OSHA and National Fire Protection Association standards for emergency access and egress in addition to meeting federal emergency preparedness safety standards developed through the Rule of Particular Applicability.

**SS-CM#8: System Security Plan.** In compliance with federal regulations, TCRR will prepare a System Security Plan (SSP) that will document processes for mitigating and/or eliminating the security threats, vulnerabilities, and risks identified through TCRR’s Preliminary Hazards Analysis and Final Hazards Analysis. 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: Private Security Department.** Prior to and during operations, TCRR shall 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. This service shall be increased proportionately with increased ridership.

See also **TR-CM#5: Develop Construction Transportation Plan** and **TR-CM#4: Coordinate Traffic Construction and Permanent Impacts with Local EMS** discussed in **Section 3.11.6.1**.

### 3.16.6.2 Mitigation Measures

The following Mitigation Measures (MM) would serve to further reduce the potential for safety impacts. They are applicable to Build Alternatives A through F.

**SS-MM#1: Model Construction Impacts on Emergency Response Times.** Prior to construction, as an additional measure to ensure no significant impact to emergency access or response times, TCRR and/or its construction contractor shall evaluate its Construction Transportation Plan using Computer Assisted Dispatch software to determine the baseline and construction period response times within a jurisdiction based on construction phasing, duration of impacts, and location of nearest alternate route. Construction plans shall be revised if they produce delays of more than ten percent of baseline response times to a given area, or as separately negotiated with individual responders.

See also **TR-MM#1: Traffic Control Plan** discussed in **Section 3.11.6.1**.

## 3.16.7 Build Alternatives Comparison

The impacts to safety and security would be applicable to all Build Alternatives. The primary difference amongst the Build Alternatives is the number of emergency responders potentially affected by construction and permanent road changes and the level of coordination necessary to avoid impacts. Total affected responders and the fire and EMS jurisdictions with high or localized potential for impact are summarized by Build Alternative in **Table 3.16-17**.

**Table 3.16-17: Summary of Impacts by Build Alternatives**

| Impact | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F |
|---|---|---|---|---|---|---|
| Permanent Road Modifications resulting in potential for delay in localized areas (Delay of 2 min. or more) | 12 | 12 | 13 | 13 | 13 | 14 |
| Permanent Road Modifications resulting in potential for delay in localized areas (Delay of 1 min. or less) | 9 | 11 | 7 | 9 | 11 | 7 |
| Total fire and EMS service areas bisected by construction | 56 | 57 | 51 | 54 | 55 | 49 |
| Fire and EMS providers with high potential for construction effects | 6 | 6 | 5 | 8 | 9 | 6 |
| Fire and EMS providers with high localized potential for construction effects | 8 | 8 | 4 | 6 | 7 | 6 |

Source: AECOM, 2016

All Build Alternatives are required to avoid negative impacts to emergency response times. 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.

# 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 Build Alternatives. This section provides background information on existing and planned recreational facilities, discusses potential impacts of the Build Alternatives on recreational facilities and recommends mitigation measures to avoid or minimize potential adverse impacts. Potential impacts to recreational facilities that are also identified as Section 4(f) and Section 6(f) resources are discussed in **Chapter 7.0, Section 4(f)/6(f) Evaluation**.

## 3.17.2 Regulatory Context

### Federal

FRA's *Procedures for Considering Environmental Impacts* provides 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"*[1]

### State

The Texas Parks and Wildlife Code, Title 3: Parks, Chapter 26, ensures that "any department, agency, political subdivision, county or municipality of the state may not approve any program or project that requires the use or taking of any public land designated and used prior to the arrangement of the program or project as a park recreation area, scientific area, wildlife refuge or historic site, unless the department, agency, political subdivision, county or municipality, acting through its duly authorized governing body or officer, determines that:

1) There is no feasible and prudent alternative to the use or taking of such land; and
2) The program or project includes all reasonable planning to minimize harm to the land, as a park, recreation area, scientific area, wildlife refuge or historic site, resulting from the use or taking."

Findings may only be made after a Notice of Hearing is filed with the person, organization, department or agency that has supervision of the land proposed to be used or taken. Governing bodies or officers shall consider local preferences. Provisions in Chapter 26 do not constitute a mandatory prohibition against the use of the area if the findings are made that justify the approval of a program or project.

## 3.17.3 Methodology

The Project has the potential to directly and/or indirectly impact recreational facilities and parklands. Direct impacts include a change of use, access or visual quality, or noise impacts to recreational facilities or parklands located within the LOD. Temporary impacts to recreational facilities or parklands could occur to resources located within the LOD during construction and could include air quality (emissions from the use of heavy equipment), noise and vibration (from the use of heavy equipment), visual

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64 C.F.R. 28545 et seq

(changes in viewshed) and access (changes or reduced access) impacts. Additionally, FRA evaluated the potential for indirect, temporary or permanent, impacts to occur to recreational facilities and parklands located outside of the LOD. These types of impacts could be related to construction and/or operation of the Project. As noted in **Section 3.4.5.2.1, Noise and Vibration**, 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. Additionally, the operational noise associated with the system would be less than the construction noise. To account for the potential noise impact, the Study Area for recreation extends a quarter-mile beyond the LOD of the Build Alternatives.

All 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 facilities within the Study Area were identified and recorded. Data collection for the recreation resources analysis consisted of desktop research of GIS data from NCTCOG, City of Dallas, City of Houston, USACE and TPWD. Additional data collection sources included Google Earth,™ comprehensive and other local plans and online secondary data sources. The data was 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 comprehensive plans.

School recreation areas were included as recreational facilities if they are accessible and used by the community. Direct communication with the school determined if the general public was allowed to use any recreational facility.

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 Build Alternatives. Conservation easements are a voluntary, written agreement to protect the natural, productive or culture features of a property.[2] FRA evaluated these lands to determine if they contained potential recreational resources and if those resources would be impacted. Public lands managed by the GLO and USACE were researched and documented. Each facility was classified, quantified and mapped to assist in the assessment of impacts to these resources.

Each recreational facility or parkland was evaluated to determine if a change in use, noise or access would occur as a direct result of the Build Alternatives. A change in use would occur if a recreation resource was acquired or displaced. Additionally, an indirect impact due to short-term construction noise or vibration may occur within the Study Area and is also discussed. Local Plans
The local plans that were reviewed as part of the data collection are listed in **Table 3.17-1**.

**Table 3.17-1: Local Plans**

| Jurisdiction | Document | Adoption/Document Date |
|---|---|---|
| City of Dallas | Downtown Parks Master Plan Update<br>Downtown Parks Master Plan | 2013<br>2004 |

[2] Texas Land Trust Council. *What is a Conservation Easement?* Accessed October 2017 http://www.texaslandtrustcouncil.org/index.php/about/what-is-a-conservation-easement.

| Table 3.17-1: Local Plans | | |
|---|---|---|
| **Jurisdiction** | **Document** | **Adoption/Document Date** |
| | Dallas Parks and Recreation Comprehensive Plan<br>Dallas Trail Network Plan<br>Emerald Bracelet Report | 2016<br>2008<br>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 | 2015 Parks Master Plan | 2015 |

Source: AECOM, 2016

## 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.

In addition to identifying the recreational resources within the Study Area to determine the potential impacts of the Build Alternatives, FRA also determined the potential eligibility for Section 4(f) protection. It is important to note that a property’s Section 4(f) status is determined not by its name, but by the criteria that define it. The criteria used to evaluate whether Section 4(f) applies to a property is defined and discussed in **Chapter 7, Section 4(f) and 6(f) Evaluation**.

### 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 relevant information about the park resources noted in the table above is included in the following descriptions. If no additional relevant information was noted, the resource is not further discussed until **Section 3.17.5**.

| 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** (cemetery) | City of Dallas Parks and Recreation | 4.4 | 0.8 | Historic gravesites |
| 1 | Pioneer Plaza | 1428 Young Street | Special Use Park** | City Of Dallas Parks and Recreation | 4 | 0.9 | Sculpture, native plants and trees, stream |
| 1 | Dallas Heritage Village at Old City Park | 1717 Gano Street | Special Use Park** Historical Park | City of Dallas Parks and Recreation | 17.8 | 4.8 | Historic buildings and environment |
| 1 | Reunion Park | 701 Sports Street | Temporary Park | Hunt Woodbine Realty Corp | 1.1 | 0.9 | Open green space |
| 1 | Emerald Bracelet | Downtown Dallas | Special Use Park** (proposed) | City of Dallas Parks and Recreation | N/A*** | N/A*** | Trails, open space, pavilions |
| 1 | Trinity River Greenbelt | 3700 Sylvan Avenue | Conservation | City of Dallas Parks and Recreation | 2,286 | 88.4 | 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** (Median) | City of Dallas Streets Department | 0.3 | 0.3 | Sculpture, landscaping |
| 2-3 | Great Trinity Forest | Dallas, TX | Regional, natural park | City of Dallas Parks and Recreation | 6,000 | 63.4 | Audubon Center, multiple parks and trails |
| 3 | Honey Springs Cemetery | 5119 Bulova Road | Special Use Park** (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 | 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, 2016
** 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.
*** 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 as awarded by the Texas Historical Commission. The site is home to early graveyards from fraternal organizations and the founders of the town of Dallas from the 1800's. The Pioneer Cemetery is well outside of the LOD, but falls within the Study Area. It is important to note that this resource does not fall within the Study Area of cultural resources.

Pioneer Plaza is a 4 acre park located adjacent to Pioneer Cemetery. The park was established in 1990 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 featured on the Kay Bailey Hutchison Convention Center website as a public amenity and is marketed towards visitors of the City of Dallas.[3]

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, Dallas Area Rapid Transit, 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 not within 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 further north and to the Santa Fe Trestle Trail to the south. Segments of both of these trails are within the LOD.

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 existing 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.

The Great Trinity Forest 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.[4] The Great Trinity Forest includes a proposed 15-mile trail that would be located along the Trinity River and into the forest. Fifty acres of the Great Trinity Forest are located with the Study Area, but outside of the LOD.

[3] Dallas Convention Center. Pioneer Plaza. Accessed October 2017. http://www.dallasconventioncenter.com/contact-us/pioneer-plaza/
[4] City of Dallas, Trinity River Corridor Project. *Great Trinity Forest.* Accessed March 2016. 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, Cultural Resources**.

#### *3.17.4.1.2 Trails*

Within the Study Area in Dallas County, one existing recreational trail located outside of a park and four proposed trails were identified, as shown in **Table 3.17-3.**

**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** | 2.0 | 0.41 | Proposed |
| 1 | Santa Fe Trestle Trail | Within Trinity River Levees | Major Linear | Concrete | 12 | 0.9 | 0.3 | Existing |
| 4 | Interurban Trail | John C Phelps Trail to Loop 12 | Major Linear | Concrete | 12 | 2.6 | 0.16 | Proposed |
| 4 | Five Mile Creek Trail | Westmoreland Park to Joppa Preserve | Major Linear | Concrete | 8-12 | 7.2 | 0.7 | Proposed |

Source: AECOM, 2016
** Information for this proposed resource was not available

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 one mile in length and has 0.3-mile-long of the trail within the Study Area.[5] 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 1,500 feet from the LOD.

The Grand Avenue Connector 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.

The Interurban Trail is a City of Dallas proposed trail which would operate along an existing utility corridor in the urban neighborhoods of South Dallas.[6] 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 would be approximately 980 feet from the LOD.

Five Mile Creek Trail is a proposed trail situated along the Five Mile Creek in Dallas County. It would cross under IH-45 and connect to the Trinity River.[7] The majority of the over 9-miles-long Five Mile

[5] City of Dallas GIS, 2015
[6] Ibid.
[7] Ibid.

Creek Trail is outside of the Study Area. However, the proposed alignment is a concept developed by the City of Dallas Park 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], therefore, the Five Mile Creek Trail is not considered a Section 4(f) property. The closest parcel of publicly owned land of 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, 40 | Lake Bardwell | Ennis, Texas | Wildlife Management Area | USACE | 2,917 | 297.8 | Natural area with multiuse trails |

Source: AECOM, 2016

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.

#### *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**.

[8] An October 3, 2017 phone conversation with Leong Lim, City of Dallas Parks and Recreation Department
[9] USACE. *Bardwell Lake.* Accessed January 2016. http://www.swf-wc.usace.army.mil/bardwell/.
[10] USACE. *Bardwell Lake.* Accessed January 2016. http://www.swf-wc.usace.army.mil/bardwell/Recreation/Trails/Horse.asp

| 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** |
| 117 | El Camino Real de los Tejas National Historic Trail | Near Buffalo Creek, Freestone County | Natural trail | N/A** | N/A** | 2,580 | 0.5 | Existing |

Source: AECOM, 2016
** 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 the National Park Service (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 the NPS in partnership with the Partnership for the National Trails System, Texas Historical Foundation, 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.

| 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** |
| 118 | Shelley Pate Memorial Park | 1025 North Hill Street, Buffalo, TX | Public park | USACE | 17.1 | 10.5 | Pavilion, baseball field, basketball court, grills and picnic tables, playground and water spray ground, sand volleyball and tennis courts |
| 134-136 | Fort Boggy State Park | 4994 Highway 75 South | State park | USACE | 1,847 | 713 | Fishing, boat ramp, hiking, mountain biking, pavilion |

Source: AECOM, 2016

[11] NPS. *El Camino Real de los Tejas National Historic Trail Comprehensive Management Plan.* Accessed May 2016. http://parkplanning.nps.gov/elte0911

Fort Boggy State Park is located east of IH-45 approximately four miles south of Centerville on SH 75. The 1,847-acre park includes hiking trails, a 15-acre lake, a day use area 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. There is no entrance fee to enter the park, and it is open only for day use. 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 two 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** 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** 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.

### 3.17.4.8 Harris County

#### *3.17.4.8.1 Parks*

Four recreational parklands were identified within Study Area in Harris County, as shown in **Table 3.17-7**.

**Table 3.17-7: Harris County Parklands in the Study Area**

| Mapbook Page | Name | Location | Type | Owner | Total Acres | Acres within Study Area | Amenities |
|---|---|---|---|---|---|---|---|
| 240 | Mallard Crossing Neighborhood Park | Mallard Crossing Drive, Hockley, TX | Neighborhood park | Neighborhood Association | 0.03 | 0.03 | Trail, playground, covered facility |
| 245 | Cypress Top Historic Park | 26026 Hempstead Road, Cypress, TX | Historic park | Harris County | 2.7 | 2.7 | Guided tours, trails, pavilion, historical buildings |
| 249 | Pitner Park | 8600 Block Pitner Road, Houston TX | Public | Harris County | 1.2 | 0.8 | Trails, playground, picnic tables, BBQ grills |

[12] TPWD. *Fort Boggy State Park.* Accessed January 2016. http://tpwd.texas.gov/state-parks/fort-boggy
[13] SHA. *Fort Boggy. Accessed June 2016. https://tshaonline.org/handbook/online/articles/gbf04*

| Table 3.17-7: Harris County Parklands in the Study Area | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mapbook Page** | **Name** | **Location** | **Type** | **Owner** | **Total Acres** | **Acres within Study Area** | **Amenities** |
| 253 | 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, 2016

Cypress Top Historic Park is located along Hempstead Road and located within the Study Area. This park provides restroom facilities, picnic areas, pavilions and historic markers.

Spring Spirit Sports Education Complex is a private baseball complex 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 seven proposed trails to be located within the Study Area through the H-GAC bikeway database to be located within the Study Area. All identified trails, shown in **Table 3.17-8**, are part of the H-GAC 2040 Regional Pedestrian and Bicycle Plan.

| Table 3.17-8: Harris County Proposed Trails within the Study Area | | | | | |
|---|---|---|---|---|---|
| **Mapbook Page** | **Name** | **Address** | **Type** | **Total Miles** | **Miles within Study Area** |
| 249 | Jones Road/Rio Grande | Jones Road/Rio Grande to White Oak Bayou | Shared Use Path/Trail | 4.4 | 0.5 |
| 249 | Huffmeister/West Road | Huffmeister/West Road to Sunbury Lane | Shared Use Path/Trail | 3.0 | 0.9 |
| 250-259 | Hempstead Road | Hempstead Road to Spencer | Shared Use Path/Trail | 8.9 | 8.9 |
| 247 | Cypress Creek Greenway | Cypress Creek to Telge Road | Shared Use Path/Trail | 15.3 | 1.0 |
| 251 | Cole Creek/ Empire Central Drive | Cole Creek/Empire Central Drive to Fisher Road | Shared Use Path/Trail | 1.2 | 0.7 |
| 252 | Cole Creek | Cole Creek to Concord Park Drive | Shared Use Path/Trail | 5.8 | 0.08 |
| 252 | Fairbanks N Houston Road | Fairbanks N Houston Road to Campbell Road | Shared Use Path/Trail | 0.6 | 0.58 |

Source: AECOM, 2016

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 Build Alternatives. The remaining resources are also proposed as shared use path/trails. However, due to the early planning stages for these trails, not enough information is known to describe each trail in detail. In March 2017, the City of Houston adopted its Bike Plan. The plan provides more detail for programmed or funded projects within the City of Houston, but none were identified to be within the Study Area.

#### *3.17.4.8.3 School Park Facilities*

As shown in **Table 3.17-9**, two schools within the Study Area have recreational amenities available to the general public, Cypress Falls High School and Housman Elementary. Cypress Falls High School allows the general public to use their athletic facilities. Housman Elementary has a public "pocket park" on the southeastern corner of the parcel. The park is available for public use.

**Table 3.17-9: Harris County Schools with Park Facilities in the Study Area**

| Mapbook Page | Recreational Facility | Address | Amenities |
|---|---|---|---|
| 248 | Cypress Falls High School | 9811 Huffmeister Road, Houston | Track and field, tennis courts |
| 253-257 | Housman Elementary | 6705 Housman, Houston | Playground area, soccer fields |

Source: AECOM, 2016

## 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 recreational facilities and parklands would not be disturbed because no construction activities would occur. Access or use of parklands and trails would not be affected from the construction or operation of the Build Alternatives. Potential impacts could still occur under the No Build Alternative as new developments would continue due to natural growth in the area, particularly in the urban and suburban counties. However, the No Build Alternative would not contribute to this growth.

### 3.17.5.2 Build Alternatives

Of the 34 recreational facilities identified within the Study Area, 2 would be located in the LOD and directly impacted by the Build Alternatives: Honey Springs Cemetery (all Build Alternatives) and Lake Bardwell (Build Alternatives D, E and F). The other 32 facilities identified in **Section 3.17.4** are within the Study Area, but outside of the LOD and would not be directly or indirectly impacted by the Build Alternatives. The recreational resources are described in more detail in the following sub-sections.

Potential impacts to recreational facilities during construction of the Build Alternatives would be short-term and 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). Construction impacts to recreational facilities would be short-term and the use, character of setting of the recreational facilities would be returned to its pre-construction condition. Each of these short-term impacts is discussed in these respective sections: (see **Section 3.2, Air Quality, Section 3.4, Noise and Vibration, and Section 3.10, Aesthetics and Scenic Resources)**.

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 acquisition of a portion of any public recreational facility, changes in access, use or the viewshed.

#### *3.17.5.2.1 Segment 1*

Of the 13 parks (12 existing and 1 proposed) identified along Segment 1, 11 would be located outside of the LOD and therefore would not be directly impacted by the Build Alternatives. One resource, the Great Trinity Forest, would be within 200 feet of the LOD and could be indirectly impacted by construction noise, however the **Section 3.4, Noise and Vibration** analysis identified no sensitive receivers in the location; therefore, no noise and vibration impacts would be anticipated.

The Honey Springs Cemetery, an NRHP-eligible historic property, is located within the LOD. It includes a memorial wall at the entrance of the cemetery, which the City of Dallas designates as a special-use park. Segment 1 would be constructed on viaduct and would span a portion of the cemetery that includes a 75-foot buffer, but would not impact the wall or the City of Dallas designation as a special-use park. The formal boundaries of the cemetery are unknown. In consultation with THC, FRA added a 75-foot buffer to the assumed boundaries to account for potentially unmarked graves. The Build Alternatives span the cemetery buffer, directly impacting the cemetery. FRA will conduct an intensive site survey of this resource to officially mark the boundaries of the cemetery prior to construction of the Project.

During construction, the resource would be subject to short-term noise and vibration impacts due to the operation of heavy equipment. The use of and access to the memorial wall would be maintained during construction. Due to the location of this facility, surrounded by industrial land use and adjacent to IH-45, the recreational use of this City of Dallas special-use park would not be impacted by the operation of the Build Alternatives. Additionally, Honey Springs Cemetery is discussed in **Section 3.10, Aesthetic and Scenic Resources; Section 3.13, Land Use; Section 3.14, Socioeconomic and Community Facilities; Section 3.18.5.4, Environmental Justice;** and **Section 3.19.4.1, Cultural Resources**.

FRA determined that Honey Springs cemetery would not meet the criteria for Section 4(f) protection as a recreation resource, but would meet the criteria for a historic and archeological resource. FRA's Section 4(f) evaluation is further discussed in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**.

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 Build Alternatives would generate temporary noise due to the movement and operation of equipment. However, **Section 3.4, Noise and Vibration** did not identify any severe or moderate impacts in this area. With adjacent transportation and mitigation measures noise impacts would be negligible. Aesthetic and visual impacts caused due to the addition of the HSR system infrastructure would not be significant, as utility infrastructure is already present within the views from the park, as well as transportation infrastructure from the UPRR ROW. **Section 3.10, Aesthetic and Scenic Resources** further described potential impacts to Fruitdale Park.

All other parks, as described in **Table 3.17-2**, would be over 900 feet from the LOD and not directly or indirectly impacted.

The Santa Fe Trestle Trail would be approximately 550 feet from the Build Alternatives and would not be directly or indirectly impacted by noise. Additionally, the use of and access to this trail would not change as a result of the Build Alternatives.

Three proposed, but unfunded, trails –Grand Avenue Connector, Interurban Trail and File Mile Creek intersect the Study Area. Should funding become available, it is not anticipated that the Build

Alternatives would prohibit these trails from being constructed. The Build Alternatives would be grade separated from the proposed trails (i.e. the alignment would be on viaduct) and the ROW required for the trails would be preserved.

FRA determined that the Santa Fe Trestle Trail and the two proposed trails would meet the criteria for Section 4(f) protection as a recreation resource on public lands. FRA's Section 4(f) evaluation is further discussed in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**.

#### *3.17.5.2.2 Segment 2A*

The northwestern area of Lake Bardwell would be located approximately 270 feet from the LOD. 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.** Temporary impacts related to the construction of the Build Alternatives could result in noise impacts, localized air quality impacts, and visual impacts due to fencing and lighting. However, no severe or moderate impacts were identified in this area in **Section 3.4, Noise and Vibration.** Impacts to air quality would be mitigated through BMPs outlined in **Section 3.2, Air Quality**. Additionally, construction in rural areas would only occur during daytime hours, therefore construction lighting would not be present. The LOD would be approximately a half-mile from equestrian trails and approximately three miles from boating areas. Impacts to recreational facilities at Lake Bardwell caused by the construction or operation of the Build Alternatives would be negligible with mitigation measures and due to the distance from the LOD.

The USACE identifies flood control as the primary function of Lake Bardwell. As noted in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**, FRA determined that Lake Bardwell would not meet the criteria for Section 4(f) protection, but will continue to coordinate with the USACE on the Section 4(f) eligibility of the resource. FRA will also continue to coordinate with the USACE through the 408 permission process in regard to this resource and any potential impacts.

#### *3.17.5.2.3 Segment 2B*

The Study Area of Segment 2B also includes Lake Bardwell. The Build Alternatives 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). The Build Alternatives would permanently impact fee owned land within Lake Bardwell, as described in **Section 3.7.5.2.2, Waters of the U.S**. Additionally, this area would also be subject to temporary construction-related air quality, noise and vibration and access impacts. The Build Alternatives would permanently acquire acreage necessary for the ROW of the Project. Construction and maintenance of the ROW would include the clearing of trees and brush. As the area is used for seasonal hunting (September 1 – March 31), these construction activities could serve as a deterrent to wildlife, reducing availability of small game and feral hogs in the area. Additionally, the multi-use trails located within the Lake Bardwell area could be temporarily impacted (temporary access reroute or closure) during construction; however, the Build Alternatives would be crossing on viaduct and no trails would be permanently closed or impacted. Boating areas of Lake Bardwell would be located roughly 2 miles from the LOD. Due to the distance, indirect construction or operational impacts as a result of Segment 2B would be negligible. This resource is also discussed in **Section 3.7, Waters of the U.S.**, **Section 3.8, Floodplains, Section 3.13, Land Use,** and **Section 3.18, Environmental Justice**. The impact to this recreational facility would be common to Build Alternatives D, E and F.

The USACE identifies flood control as the primary function of Lake Bardwell. As noted in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**, FRA determined that Lake Bardwell would not meet the criteria for Section 4(f) protection, but will continue to coordinate with the USACE on the Section 4(f) eligibility of the resource. FRA will also continue to coordinate with the USACE through the 408 permission process in regard to this resource and any potential impacts.

#### *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 and separated from the Build Alternatives. 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. Aesthetic and visual impacts would be minor, as the Build Alternatives would be screened by the existing IH-45 infrastructure.

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 not directly impact the recreational facilities within Fort Boggy State Park. While the Build Alternatives would be on park lands adjacent to the west side of IH-45 ROW (between the highway and frontage road) and reconstruction of the frontage road and construction of the Build Alternatives would directly impact Fort Boggy State Park property, this portion of the park is undeveloped and not accessible to park users. Roughly 88 percent of the track that crosses Fort Boggy State Park would be on viaduct. The Fort Boggy State Park recreational areas are located on the east side of IH-45, more than a quarter-mile from the Build Alternative and therefore outside of the LOD and the Study Area for indirect impacts. Because the Build Alternatives would require acquisition of public lands, coordination with TPWD would be necessary and is further discussed in **Chapter 7.0, Section 4(f)/6(f) Evaluation**. Additional resource areas that discuss Fort Boggy State Park include **Section 3.10, Aesthetic and Scenic Resources**.

FRA determined that the Shelly Pate Memorial Park and El Camino Real de los Tejas Trail would not meet the criteria for Section 4(f) protection as a recreation resource, but Fort Boggy State Park would meet the criteria. FRA’s Section 4(f) evaluation is further discussed in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**.

#### *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*

Four parklands and two schools (Cypress Falls High School and Housman Elementary) were identified in Segment 5 within Harris County, but all would be located outside of the LOD. There would be no direct impacts to these resources. The track at Cypress Falls High School is used by the community. It would be located approximately 1,500 feet from the Build Alternatives and would not be indirectly impacted due to construction noise, which extends to distances of 200 feet (daytime) and 630 feet (nighttime) from its origin. A "pocket park" and soccer fields are located at Housman Elementary. These facilities are approximately 1,200 – 1,500 feet from the Build Alternatives and would not be indirectly impacted due to construction noise.

Seven trails intersect the Study Area; six trails are proposed and unfunded. Six of them include Cole Creek Trail, Jones Road/Rio Grande Trail, Huffmeister/West Road Trail, Hempstead Road Trail, Cole Creek/Empire Central Drive Trail and Fairbanks North Houston Road Trail.

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 has completed an initial segment (the Gourley Nature Trail) approximately 10 miles northeast of the project. A proposed section of the Cypress Creek Greenway would intersect the Build Alternatives at US 290 near Baker Cypress Road. However, the HSR system would be grade separated and impacts would not be significant.

Should funding become available for the remaining trails and portions of the Cypress Creek Greenway, it is not anticipated that the Build Alternatives would prohibit these trails from being constructed. The Build Alternatives would be grade separated from the proposed trails (i.e. the alignment would be on viaduct) and the ROW required for the trails would be preserved.

FRA determined that the Cypress Creek Greenway would not meet the criteria for Section 4(f) protection as a recreation resource on public lands. FRA's Section 4(f) evaluation is further discussed in **Chapter 7.0, Section 4(f) and 6(f) Evaluation**.

## 3.17.6 Avoidance, Minimization and Mitigation

Design features were employed to avoid and minimize impacts to recreational facilities. In developing the Build Alternatives, TCRR identified collocation opportunities with transportation and utility corridors to minimize direct impacts to recreational facilities such as Honey Springs Cemetery. Although no realignment options were available, TCRR relocated a 2.5-acre facility that would support the operation of the system to another location and the LOD was redesigned to span the northeast portion of the cemetery on viaduct. Within the 6 end-to-end Build Alternatives, 53 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. Grade Separation of the Build Alternatives minimizes impact to the Santa Fe Trestle trail in Dallas, as well as serval proposed trails in Dallas and Harris counties. Approximately 60 percent of the Build Alternatives would be on viaduct. These design features avoided or reduced impacts to most of the recreational facilities with the Study Area.

### 3.17.6.1 Compliance Measures

The following Compliance Measure (CM) would be required for Build Alternatives D, E and F.

**RF-CM#1: USACE Coordination for Lake Bardwell**. Prior to construction, coordination between TCRR and the USACE will be 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: Individual Permits, WW-CM#5: Mitigation Plan** and **WW-CM#6: Section 408 Compliance**.

### 3.17.6.2 Mitigation Measures

The following Mitigation Measure (MM) would minimize the recreational impacts of Build Alternatives D, E and F.

**RF-MM#1: Temporary Recreation Impacts to Lake Bardwell.** During construction, TCRR shall coordinate with USACE to temporarily reroute trails that cannot be avoided by Segment 2B (Build Alternatives D, E, and F). TCRR shall post reroute signage at parking and trail areas. TCRR shall return all trails and park property impacted during construction to their original or improved conditions, as determined by USACE.

## 3.17.7 Build Alternatives Comparison

**Table 3.17-10** provides a summary of the recreational impacts by Build Alternative.

**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 |
|---|---|---|---|---|---|---|
| Parks | 0 | 0 | 0 | 1 | 1 | 1 |
| Trails | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **1** | **1** | **1** |

Source: AECOM, 2016

Build Alternatives A, B and C would not significantly impact recreational facilities. Build Alternatives D, E and F would impact recreational amenities, specifically trails and hunting areas west of Lake Bardwell.

# 3.18 Environmental Justice

## 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 Build Alternatives to adversely impact minority and 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 the DOT Order 5610.2(a) on Environmental Justice.[1]

#### *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 EJ areas than non-EJ areas
- More adverse impacts occur in EJ areas than non-EJ areas
- Project benefits do not impact EJ areas to the same degree as non-EJ 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 environmental justice under NEPA and emphasizes diligent public participation and engagement of minority and low-income populations throughout the decision making process.

#### *DOT Order 5610.2(a)*

The 1997 DOT 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 DOT programs, policies and activities. In addition to complying with EO 12898 and DOT Order 5610.2, the

[1] FRA, "Procedures for Considering Environmental Impacts," Issued 1999, 64 C.F.R. 28545 et seq

DOT 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."

### 3.18.3 Methodology

FRA established definitions of minority and low-income areas 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'."[2] The analysis utilized each county within the Study Area as a baseline geographic unit for comparison of demographic characteristics within each block group. Therefore, the threshold for defining meaningfully greater populations, within block groups in the Study Area, was set at 1.25 times the relevant county percentage for each demographic characteristic.

FRA determined EJ communities (i.e., Census block groups) identified within this EIS based on the following thresholds:

- Racial or ethnic minority communities (minority is defined as any non-white race or Hispanic ethnicity, and includes individuals of more than one race)
  - The combined proportion of minority individuals living in a study-area Census block equals 50 percent or greater, or
  - The combined proportion of minority individuals living in a study-area Census block equals twice (or greater) the proportion of minority individuals in the county
- Low-income communities
  - The combined proportion of individuals at or below the USCB's poverty threshold living in a Study Area census block group equals 50 percent or greater, or
  - The combined proportion of individuals at or below the USCB's poverty threshold living in a Study Area Census block group equals twice (or greater) the proportion of low-income individuals in the county

For the purpose of this analysis, low-income block groups are identified where the average median income falls below $24,300 (poverty threshold for a family of four as determined by the USCB).[3] This analysis used USCB American Community Survey 2014 5-year estimates, block groups data.[4]

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, these tend 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.

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[2] CEQ, "Environmental Justice: Guidance Under the National Environmental Policy Act." Washington, D.C. December 10, 1997.
[3] "Poverty Thresholds" *United States Census Bureau* Accessed March 2016. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html
[4] USCB ACS, Accessed June 2016, https://www.census.gov/programs-surveys/acs/

The Study Area for EJ is one-half mile in each direction from the centerline of the Build Alternatives, which creates a one-mile Study Area. Smaller block groups in urban areas are mostly or fully within the one-half mile study area. For larger rural block groups, the Study Area often intersects, but does not always encompass the entirety of the block groups; therefore if the Study Area intersected a block group the entire block group was counted in the analysis. The selection of block groups took a conservative approach of capturing more geographies than would potentially be impacted by the Build Alternatives. Each resource area was reviewed to determine the nature and magnitude of potential impacts on EJ populations – either positively or adversely.

### 3.18.3.1 Data Collection

Data utilized in the EJ determination and analysis was primarily collected from the USCB American Community Survey 2014 5-Year Estimates.[5] 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. FRA examined available datasets that offered finer levels of geography and determined them to be largely incomplete or unreliable, especially in many of the rural counties crossed by the Build Alternatives. Therefore, FRA selected a conservative approach of consistent and complete datasets with a larger geography for the analysis.

In addition, various imagery data was utilized as part of the desktop analysis to examine potential impacts that would occur as a result of the Build Alternatives.

### 3.18.3.2 Assessment

The EJ assessment focused on potential impacts as a result of the Build Alternatives in each topic area of the EIS and those impacts' severity, disparity or benefits to EJ block groups in their respective locations. GIS was utilized to geographically reference block groups in conjunction with alignments of the Build Alternatives, parks and recreational data, noise and vibration, hazardous materials, transportation, socioeconomic and land use analyses. FRA used tabular analysis to calculate a ratio of the number of potential impacts within EJ block groups versus the total number of potential impacts throughout the Build Alternatives (all block groups). If the ratio found that a clear majority of impacts were located within EJ identified block groups; the topic area was deemed to present disproportionately high or adverse impact to EJ block groups. Topic areas with disproportionately high or adverse impacts will be subject to additional investigation before the publication of the Final EIS. In some cases the impacts were deemed adverse and specific avoidance, minimization, or mitigation strategies were included in **Section 3.18.6.**

The Build Alternatives have been designed to minimize and mitigate potential impacts to all communities. However, additional mitigation strategies have been outlined in each topic area, as well as **Section 3.18.6.**

### 3.18.3.3 Outreach

A required component of the public outreach process, as described in **Chapter 9.0, Public and Agency Involvement**, includes the opportunity for minority and low-income populations to participate and comment on the Project. The purpose of this outreach is to bring awareness of the Project to

[5] USCB ACS, Accessed June 2016, https://www.census.gov/programs-surveys/acs/

communities or individuals, gather additional feedback on the potential impacts of the Build Alternatives and identify appropriate mitigation, if required.

FRA developed a multi-step outreach plan to connect with minority and low-income populations in Dallas, Ellis, Freestone, Leon, Grimes and Harris counties. Counties not listed had no identified EJ block groups that were intersected by the EJ Study Area. FRA scheduled and hosted listening sessions in coordination with pre-existing community meetings when possible in order to better engage the appropriate individuals potentially impacted by the Build Alternatives.

Listening sessions were held in the communities at familiar locations and at convenient times for local residents. They included:

- July 28, 2016 at St. Philip's School and Community Center in Dallas County. This was a recurring 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.

FRA worked with local community leaders in Dallas, Ellis and Harris counties to identify appropriate venues and then subsequently invite the environmental justice 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 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 EJ block groups, but less defined communities. In lieu of listening session, FRA developed a fact sheet with frequently asked questions about the Project. Per **Table 9-7** in **Chapter 9.0, Public and Agency Involvement**, FRA sent the fact sheet to several service agencies, including food banks in Freestone and Leon Counties. FRA did not identify any service agencies in Grimes County, but did mail the fact sheet to individual landowners within the EJ block group. FRA did not host listening session in Navarro, Limestone, Madison or Waller because FRA did not identify EJ block groups that were intersected by the EJ Study Area in those counties. Extensive coordination and research was conducted to identify regularly scheduled community meetings that would primarily be attended by minority and low-income populations. This outreach included one-on-one discussions with community leaders and field visits to verify EJ populations and identify potential facilities. Because no specific meetings were identified in these geographic areas, FRA posted the meeting materials from the first round of listening session to the Project website[6] in lieu of hosting a listening session.

[6] http://www.fra.dot.gov/Page/P0700

FRA will conduct a second round of listening sessions with minority and low-income populations within the Study Area in conjunction with the release of this Draft EIS. The primary purpose of the second round of listening sessions is to identify and discuss direct impacts to these populations and explore potential mitigation, if appropriate. FRA will also conduct additional coordination for the LeMay and LeForge neighborhood in Dallas County as discussed in **Section 3.18.5.4.8.**

## 3.18.4 Affected Environment

This section describes existing EJ block groups in relation to the Build Alternatives. Tables within this section summarize each county's total population and the percent of the population that are minority or low-income. Minority populations are further distinguished between minority (all races other than white) and those of Hispanic origin. Initially introduced in **Section 3.14, Socioeconomic and Community Facilities**, **Table 3.18-1** shows demographic characteristics by county.

**Table 3.18-1: Demographic Characteristics of Population by County**

| County | 2014 Population | Percent Children under 18 years old | Percent Minority Population | Percent Hispanic Origin | Percent Low Income | Median Household Income | Percent Limited English Proficiency Population |
|---|---|---|---|---|---|---|---|
| Dallas | 2,448,943 | 27.1% | 41.1% | 38.8% | 19.3% | $49,925 | 11% |
| Ellis | 154,447 | 27.9% | 17.9% | 24.3% | 12.0% | $61,898 | 4% |
| Navarro | 48,073 | 26.2% | 22.5% | 23.8% | 21.8% | $40,976 | 7% |
| Freestone | 19,661 | 23.4% | 19.9% | 14.2% | 17.0% | $44,072 | 4% |
| Limestone | 23,531 | 22.8% | 21.8% | 20.1% | 22.3% | $39,484 | 7% |
| Leon | 16,784 | 22.6% | 13.7% | 13.8% | 13.5% | $48,763 | 3% |
| Madison | 13,771 | 21.7% | 25.3% | 21.0% | 23.6% | $40,879 | 2% |
| Grimes | 26,812 | 22.3% | 25.4% | 22.1% | 18.8% | $46,652 | 4% |
| Waller | 44,825 | 23.7% | 30.3% | 29.4% | 19.3% | $50,939 | 5% |
| Harris | 4,269,608 | 27.5% | 37.2% | 41.4% | 18.4% | $53,822 | 12% |

Source: USCB ACS 2014 5-year estimate; USCB Quick Facts, 2015

The percent of minority and Hispanic origin populations are comparatively higher in Dallas, Waller and Harris counties than the other counties within the Study Area. Within the Study Area, Ellis and Leon counties have a significantly lower percentage of low-income residents. The average median household income for the Study Area counties is $47,741; there are five counties (Navarro, Freestone, Limestone, Madison and Grimes) with median household incomes below the average. Dallas, Navarro, Limestone and Harris counties have the highest percentage of Limited English Proficiency (LEP) residents. Ellis County has the highest median income and one of the lowest minority populations within the Study Area.

There are 132 total block groups which intersect the Study Area. Of these block groups, 68 have been identified as EJ block groups, representing 52 percent of the total block groups. Seventy-eight percent of these EJ block groups are located in Dallas and Harris counties. Maps of the EJ areas are provided in **Appendix D, Environmental Justice Mapbook**. It is important to note that many of the block groups, especially in the rural areas where the population is sparse, have areas which extend beyond the Study Area. As a result, some parts of the EJ areas within the Study Area may not include minority or low-income populations. For purposes of this analysis, however, it is assumed that an EJ population could be impacted.

### 3.18.4.1 Dallas County

As shown in **Table 3.18-2**, 25 of the 29 block groups within the Dallas County portion of the Study Area contain minority and/or low-income populations. There are 3 minority EJ block groups, 2 low-income block groups and 20 minority and low-income block groups.

**Table 3.18-2: Dallas County Environmental Justice Block Groups**

| Census Geography | EJ Type | EJ Population | Percent Minority/ Low-income | Build Alternatives Affected | Mapbook ID/Page |
|---|---|---|---|---|---|
| Block Group 3, Census Tract 204 | Minority | 1,219 (M) | 55 (M) | Common | 1/1 |
| Block Group 1, Census Tract 204 | Low-income | 458 (LI) | 34 (LI) | Common | 57/1 |
| Block Group 2, Census Tract 34 | Minority<br>Low-income | 493 (M)<br>328 (LI) | 68 (M)<br>46 (LI) | Common | 2/1 |
| Block Group 1, Census Tract 34 | Minority<br>Low-Income | 606 (M)<br>210 (LI) | 93 (M)<br>33 (LI) | Common | 3/1 |
| Block Group 2, Census Tract 41 | Minority<br>Low-income | 295 (M)<br>295 (LI) | 55 (M)<br>55 (LI) | Common | 4/1 |
| Block Group 1, Census Tract 40 | Minority<br>Low-income | 288 (M)<br>209 (LI) | 73 (M)<br>53 (LI) | Common | 5/1 |
| Block Group 1, Census Tract 89 | Minority<br>Low-income | 744 (M)<br>553 (LI) | 59 (M)<br>44 (LI) | Common | 6/1 |
| Block Group 2, Census Tract 40 | Minority<br>Low-income | 510 (M)<br>262 (LI) | 87 (M)<br>45 (LI) | Common | 7/1-2 |
| Block Group 3, Census Tract 115 | Minority<br>Low-Income | 149 (H)<br>81 (LI) | 65 (H)<br>36 (LI) | Common | 8/1 |
| Block Group 1, Census Tract 86.03 | Minority<br>Low-income | 669 (M)<br>495 (LI) | 73 (M)<br>54 (LI) | Common | 9/1-2 |
| Block Group 4, Census Tract 115 | Minority<br>Low-income | 450 (H)<br>322 (LI) | 57 (H)<br>41 (LI) | Common | 10/1-2 |
| Block Group 2, Census Tract 86.04 | Minority<br>Low-income | 1,210 (M)<br>870 (LI) | 91 (M)<br>65 (LI) | Common | 11/2 |
| Block Group 1, Census Tract 86.04 | Minority<br>Low-income | 1,118 (M)<br>785 (LI) | 67 (M)<br>47 (LI) | Common | 12/2 |
| Block Group 1, Census Tract 87.01 | Minority<br>Low-income | 1,192 (M)<br>972 (LI) | 100 (M)<br>82 (LI) | Common | 13/2 |
| Block Group 2, Census Tract 87.01 | Minority<br>Low-income | 697 (M)<br>305 (LI) | 96 (M)<br>42 (LI) | Common | 14/2-3 |
| Block Group 1, Census Tract 202 | Minority<br>Low-income | 433 (M)<br>174 (LI) | 100 (M)<br>40 (LI) | Common | 15/2-3 |
| Block Group 4, Census Tract 87.01 | Minority | 501 (M) | 100 (M) | Common | 16/2-3 |
| Block Group 5, Census Tract 87.01 | Minority<br>Low-income | 1,052 (M)<br>521 (LI) | 97 (M)<br>50 (LI) | Common | 17/2-3 |

| Table 3.18-2: Dallas County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Build Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 3, Census Tract 202 | Minority<br>Low-income | 1,136 (M)<br>667 (LI) | 80 (M)<br>49 (LI) | Common | 18/3-4 |
| Block Group 1, Census Tract 114.01 | Minority<br>Low-income | 1,596 (M)<br>842 (LI) | 90 (M)<br>50 (LI) | Common | 19/3 |
| Block Group 2, Census Tract 202 | Minority<br>Low-Income | 2,157 (M)<br>744 (LI) | 99 (M)<br>34 (LI) | Common | 20/3 |
| Block Group 2, Census Tract 169.02 | Minority<br>Low-Income | 1,119 (H)<br>607 (LI) | 57 (H)<br>32 (LI) | Common | 21/4 |
| Block Group 3, Census Tract 169.02 | Low-Income | 287 (LI) | 26 (LI) | Common | 58/4-5 |
| Block Group 1, Census Tract 167.03 | Minority | 648 (H) | 59 (H) | Common | 22/4 |
| Block Group 2, Census Tract 168.02 | Minority | 323 (H) | 65 (H) | Common | 71/5-6 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

### 3.18.4.2 Ellis County

As shown in **Table 3.18-3**, 7 out of 10 block groups in Segments 2A and 2B contain minority and low-income populations. There are 5 minority block groups, 1 low-income block group and 1 block group that has minority and low-income populations.

| Table 3.18-3: Ellis County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 2, Census Tract 601.01 | Minority | 516 (M) | 37 (M)<br>38 (H) | A, B, C, D, E, F | 25/6-7,14-15 |
| Block Group 1, Census Tract 601.02 | Minority | 889 (M) | 67 (M) | A, B, C, D, E, F | 26/6-8,14-16 |
| Block Group 3, Census Tract 601.02 | Minority | 652 (M) | 21 (M) | A, B, C, D, E, F | 59/8-9,16-17 |
| Block Group 2, Census Tract 613 | Minority<br>Low-income | 589(H)<br>449 (LI) | 39 (H)<br>30 (LI) | A, B, C, D, E, F | 27/9-11,17-19 |
| Block Group 1, Census Tract 613 | Low-Income | 150 (LI) | 16 (LI) | A, B, C, D, E, F | 60/11,19 |

| Table 3.18-3: Ellis County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 1, Census Tract 612 | Minority | 235 (H) | 31 (H) | A, B, C, D, E, F | 62/12-13,20-22 |
| Block Group 2 Census Tract 612 | Minority | 461 (H) | 38 (H) | A, B, C, D, E, F | 61/12-13,20-22 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

### 3.18.4.3 Navarro County

There are no EJ block groups located within Segments 3A, 3B or 3C in Navarro County.

### 3.18.4.4 Freestone County

Of the 4 block groups within Segment 3C, 2 are minority block group, as shown in **Table 3.18-4**. There are no EJ block groups located within Segment 4 in Freestone County.

| Table 3.18-4: Freestone County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 1, Census Tract 3 | Minority | 423 (M) | 41 (M) | C, F | 28/27 |
| Block Group 1, Census Tract 1 | Minority | 522 (M) | 24 (M) | C,F | 63/28-29 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

### 3.18.4.5 Limestone County

There are no EJ block groups located within the Study Area in Limestone County.

### 3.18.4.6 Leon County

There are 2 EJ block groups located within Segment 3C in Leon County, and 3 EJ block groups within Segment 4. **Table 3.18-5** identifies the EJ block group.

| Table 3.18-5: Leon County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population)** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 3, Census Tract 9501 | Minority | 534 (H) | 20 (H) | C, F | 64/30-33 |
| Block Group 1, Census Tract 9502 | Minority<br>Low-income | 186 (H)<br>173 (LI) | 31 (H)<br>29 (LI) | A, B, D, E | 29/38-40 |

| Table 3.18-5: Leon County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population)** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 2, Census Tract 9502 | Low-income | 130 (LI) | 18 (LI) | A, B, D, E | 66/40-42 |
| Block Group 3, Census Tract 9503 | Minority | 252 (M) | 22 (M) | C, F | 65/34-37 |
| Block Group 5, Census Tract 9502 | Minority | 222 (M) | 20 (M) | A, B, D, E | 67/43-44 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

### 3.18.4.7 Madison County

There are no EJ block groups located within the Study Area in Madison County.

### 3.18.4.8 Grimes County

There is one EJ block group located within Segment 5 in Grimes County. **Table 3.18-6** identifies the EJ Block Group

| Table 3.18-6: Grimes County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group , Census Tract | Low-Income | 1,788 (LI) | 27 (LI) | Common | 70/45 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

### 3.18.4.9 Waller County

There are no EJ block groups located within the Study Area in Waller County.

### 3.18.4.10 Harris County

There are a total of 60 block groups within the Study Area in Harris County. Of these, there are 29 EJ block groups. **Table 3.18-7** identifies the EJ block groups.

| Table 3.18-7: Harris County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 1, Census Tract 5410.03 | Minority | 2,544 (M) | 52 (M) | Common | 31/46 |
| Block Group 3, Census Tract 5522 | Minority<br>Low-Income | 1,555 (M)<br>678 (LI) | 64 (M)<br>28 (LI) | Common | 30/46-47 |
| Block Group 1, Census Tract 5521 | Minority | 1,795 (M) | 47 (M) | Common | 68/46-47 |

| Table 3.18-7: Harris County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 3, Census Tract 5520.01 | Minority | 1,250 (H) | 50 (H) | Common | 32/47 |
| Block Group 3, Census Tract 5519 | Minority<br>Low-Income | 1,382 (M)<br>769 (LI) | 49 (M)<br>27 (LI) | Common | 69/47 |
| Block Group 2, Census Tract 5519 | Minority | 1,340 (M) | 58 (M) | Common | 33/47 |
| Block Group 3, Census Tract 5401 | Minority | 1,355 (H) | 82 (H) | Common | 35/48 |
| Block Group 1, Census Tract 5342.03 | Minority | 970 (M) | 55 (M) | Common | 34/48-49 |
| Block Group 4, Census Tract 5217 | Minority | 810 (M) | 58 (M) | Common | 36/48-49 |
| Block Group 2, Census Tract 5216 | Minority | 780 (H) | 66 (H) | Common | 37/48-49 |
| Block Group 1, Census Tract 5216 | Minority | 1,918 (H) | 80 (H) | Common | 41/48-49 |
| Block Group 2, Census Tract 5217 | Minority<br>Low-income | 1,327 (M)<br>1,388 (H)<br>1,274 (LI) | 56 (M)<br>58 (H)<br>53 (LI) | Common | 38/48-49 |
| Block Group 3, Census Tract 5217 | Minority<br>Low-Income | 1.098 (H)<br>669 (LI) | 60 (H)<br>37 (LI) | Common | 39/49 |
| Block Group 1, Census Tract 5217 | Minority<br>Low-Income | 1,017 (H)<br>445 (LI) | 72 (H)<br>31 (LI) | Common | 40/49 |
| Block Group 3, Census Tract 5205 | Minority<br>Low-Income | 1,394 (H)<br>469 (LI) | 82 (H)<br>28 (LI) | Common | 42/49-50 |
| Block Group 2, Census Tract 5205 | Minority<br>Low-Income | 2,502 (H)<br>1098 (LI) | 72 (H)<br>32 (LI) | Common | 43/49-50 |
| Block Group 4, Census Tract 5215 | Minority | 1,106 (H) | 50 (H) | Common | 47/49 |
| Block Group 1, Census Tract 5214 | Minority<br>Low-Income | 888 (M)<br>1,179 (H)<br>297 (LI) | 74 (M)<br>98 (H)<br>25 (LI) | Common | 44/49 |
| Block Group 2, Census Tract 5214 | Minority<br>Low-income | 1,165 (M)<br>1,523 (H)<br>782 (LI) | 74 (M)<br>97 (H)<br>52 (LI) | Common | 45/49-50 |
| Block Group 4, Census Tract 5214 | Minority<br>Low-income | 1,737 (M)<br>2,658 (H)<br>1,186 (LI) | 64 (M)<br>97 (H)<br>44 (LI) | Common | 48/49 |
| Block Group 3, Census Tract 5214 | Minority<br>Low-Income | 1,370 (H)494 (LI) | 83 (H)<br>30 (LI) | Common | 49/49-50 |
| Block Group 4, Census Tract 5205 | Minority<br>Low-Income | 1,078 (M)<br>408 (LI) | 62 (H)<br>24 (LI) | Common | 46/49-50 |
| Block Group 1, Census Tract 5206.01 | Minority<br>Low-income | 1,986 (H)<br>989 (LI) | 85 (H)<br>42 (LI) | Common | 50/49-52 |
| Block Group 1, Census Tract 5205 | Minority<br>Low-Income | 1,251 (H)<br>343 (LI) | 87 (H)<br>24 (LI) | Common | 51/49-52 |
| Block Group 1, Census Tract 5204 | Minority<br>Low-income | 1,146 (H)<br>651 (LI) | 83 (H)<br>48 (LI) | Common | 52/50-52 |

| Table 3.18-7: Harris County Environmental Justice Block Groups | | | | | |
|---|---|---|---|---|---|
| **Census Geography** | **EJ Type** | **EJ Population** | **Percent Minority/ Low-income** | **Alternatives Affected** | **Mapbook ID/Page** |
| Block Group 1, Census Tract 5206.02 | Minority<br>Low-income | 1,024 (H)<br>558 (LI) | 100 (H)<br>54 (LI) | Common | 53/50-52 |
| Block Group 3, Census Tract 5301 | Minority<br>Low-Income | 653 (H)<br>230 (LI) | 80 (H)<br>28 (LI) | Common | 54/50-52 |
| Block Group 2, Census Tract 5204 | Minority<br>Low-income | 1,569 (H)<br>818 (LI) | 73 (H)<br>38 (LI) | Common | 55/50-52 |
| Block Group 1, Census Tract 5203 | Minority | 1,727 (H) | 76 (H) | Common | 56/50-52 |

Source: USCB ACS 2014 5-year Estimates
Notes: (M) – minority; (H) – Hispanic; (LI) – Low-income

## 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 another safe, reliable and efficient mode of transportation. Additionally, these communities would not benefit from short-term or long-term employment opportunities associated with the construction or operation of the Build Alternatives.

### 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 Location of Construction Activities

Construction for the Build Alternatives would occur throughout the entirety of the Study Area affecting all populations and communities. Additionally, throughout the Study Area, temporary construction zones would be needed to provide storage and laydown space. These zones are generally large, but confined within the boundaries of the LOD. Depending on the Build Alternative selected, temporary construction zones would require between approximately 1,985 acres for Build Alternative F and 2,154 acres for Build Alternative B. Comparatively, temporary construction zones identified to be in EJ block groups would require between 538 acres for Build Alternative F and 641 acres for Build Alternatives A and B. Therefore, temporary construction zones would not be disproportionately located in EJ block groups. Overall, construction related impacts such as heavy equipment emissions and/or noise and vibration and traffic reroutes would not constitute a disproportionately high or adverse impact borne by EJ populations.

Detailed descriptions of the potential impacts of construction activities, can be found in: **Section 3.2, Air Quality; Section 3.3, Water Quality; Section 3.4, Noise and Vibration; Section 3.5, Hazardous Materials; Section 3.10, Aesthetics and Scenic Resources; Section 3.11, Transportation; Section 3.13, Land Use; Section 3.14, Socioeconomics and Community Facilities; Section 3.16, Public Safety and Security;** and **Section 3.17, Recreational Facilities**.

### 3.18.5.4 Operations

This section does not attempt to reevaluate all of the impacts presented elsewhere in this EIS, but instead focuses on those effects that could be beneficial or potentially adverse, and evaluates those on the basis of whether they would be predominantly borne by minority or low-income populations in comparison to those effects on the overall population within the Study Area. Each of these resource areas are discussed in the paragraphs below.

#### *3.18.5.4.1 Air Quality*

Across all Build Alternatives, there would be no disproportionate air quality impacts to EJ populations. There are 29 total block groups intersected by the Study Area in Dallas County; 25 of the block groups have been identified minority and/or low-income populations. Additionally, there are 60 total block groups intersected by the Study Area in Harris County; 29 block groups have been identified as minority and/or low-income populations. Dallas and Harris counties represent non-attainment zones for air quality impacts.

Construction may temporarily impact localized locations of air quality in EJ areas along the Build Alternatives. However, BMPs and mitigation measures outlined in **Section 3.2, Air Quality** would mitigate the impacts. Therefore, air quality impacts would not be disproportionately high or adverse to minority and/or low-income populations.

Additionally, the Build Alternatives would provide another option for intercity travel between Dallas and Houston that would emit air pollutants, including MSATs, into the atmosphere. However, the Build Alternatives would decrease overall VMT from passenger vehicles compared to the No Build Alternative, thereby decreasing regional MSAT emissions generated by passenger vehicles and consequently have a beneficial impact on regional MSAT emissions.

#### *3.18.5.4.2 Water Quality*

Impacts relating to surface and ground water quality, with appropriate mitigation measures, would be considered not significant. The Build Alternatives would implement BMPs throughout each phase to minimize and avoid impacts. Overall, the Build Alternatives would not adversely impact any drinking or water resources; therefore, across all Build Alternatives there would be no disproportionately high and adverse impact to minority and/or low-income populations.

#### *3.18.5.4.3 Noise and Vibration*

The Build Alternatives would result in moderate to severe noise impacts throughout the Study Area. The results of the noise and vibration modeling identified 15 to 19 residential, commercial or retail sites that would experience severe noise impacts across the Build Alternatives. There are between 11 to 12 severe noise impacts would occur within EJ block groups in Ellis, Leon, Grimes and Harris counties, as described below.

Two severe noise impacts would occur at residences on Segment 1 in Ellis County, one severe noise impact would occur on Segment 4 in Leon County, and one severe noise impact would occur on Segment 5 in Grimes County. All residences would be located more than 50 feet from the Build Alternatives, and portions of the properties would be acquired. Residences located more than 50 feet from the LOD would require mitigation if property owners choose to remain. During final design and upon completion of the parcel acquisition process, if homeowners are located where a severe noise impact would occur and choose to remain, TCRR would need to complete additional noise assessments prior to operation to refine the noise impact and determine appropriate mitigation strategies in coordination with the property owner. General noise mitigation measures are discussed in **Section 3.4.6.2, Noise and Vibration.** With mitigation measures, severe noise impacts would not occur in minority and/or low-income populations in Ellis or Leon counties.

The remaining 8 severe noise impacts within minority and/or low-income populations would occur in Harris County. All Build Alternatives would traverse the US 290 corridor, which includes industrial with some commercial, residential and institutional uses. The modeled severe noise impacts would occur at residential areas, hotels and motels. 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 **Section 3.4, Noise and Vibration**, mitigation strategies for the Build Alternatives would include sound barriers and 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. Severe noise impacts would be disproportionately borne by EJ block groups; however, severe noise impacts would be mitigated as outlined in **Section 3.4, Noise and Vibration**. After mitigation measures noise impacts would not be disproportionately high or adverse.

There would be no vibration impacts for any of the Build Alternatives. Therefore, there would be no disproportionately high or adverse vibration impacts to minority and/or low-income populations.

##### *3.18.5.4.4 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.

The operation and maintenance of the Build Alternatives would require the use and storage of hazardous materials at the TMFs and MOW facilities. The Dallas TMF would be located in an EJ community while the Houston TMF would not. Depending on the selected Build Alternative, between 11 to 9 MOW facilities would be required; 3 of the 11 or 9 MOW facilities would be located in minority and/or low-income population areas. Hazardous materials generated at these sites would be controlled in accordance with state and federal laws. Therefore, across the Build Alternatives, there would be no disproportionately high and adverse impacts related to the release of hazardous materials that would affect minority and/or low-income populations.

The analysis in **Section 3.5.4.1, Hazardous Materials** determined there are 6 high-risk sites, located on Segments 1, 2A and 5. Four of the 6 high-risk sites are located in minority and/or low-income block groups; the Metro Cost Plus Site, the Occidental Chemical Dallas Silicate Plant and Stericycle Environmental Solutions Site are located in Dallas County (Segment 1) and the fourth, the Pencco Bardwell site is located in Ellis County (Segment 2A).

Metro Cost Plus is an active gas station that is adjacent to the LOD. Construction activities near the site could require remediation that would result in a beneficial impact for the EJ community.

The Occidental Chemical Dallas Silicate Plant would be adjacent to the Build Alternatives. Prior to construction, an environmental investigation of soil and groundwater would determine any levels of contamination and if further assessments (Phase I and/or Phase II ESAs) would be required. If a Phase II is necessary, it will be coordinated with TCEQ. If the assessments indicate the presence of contaminated soil and/or groundwater that cannot be avoided, site-specific remedial actions shall be implemented to minimize the impacts. A contingency plan would be required for release of any unforeseen contaminants from the site during construction and in coordination with TCEQ. Remediation of the Occidental Chemical Silicate Plant site would be a beneficial impact to the EJ community across all Build Alternatives.

The Stericycle Environmental Solutions site is an active regulated waste management solutions company. The site would be located adjacent to a temporary construction site and a TMF. Like the Occidental Chemical site, an environmental investigation of soil and groundwater would be conducted and any additional assessments and remediation would be completed prior to construction and in coordination with TCEQ.

The fourth site in an EJ community is the Pencco Bardwell Plant on Segment 2A. There are indications that this site, which would be displaced by Build Alternatives A, B, and C, could have hazardous materials contamination and would require further analysis, including environmental investigations. Any remediation of the Pencco Bardwell Plant site would be a beneficial impact to the EJ community.

There would be no disproportionately high and adverse impacts to minority and/or low-income populations related to the release of hazardous materials.

##### *3.18.5.4.5 Aesthetic and Scenic Resources*

Temporary and permanent impacts to visual quality would occur within the Study Area, as described in **Section 3.10.5, Aesthetics and Scenic Resources**. 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. Subsequently, 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, Visual Quality Impact Assessment.**

Construction impacts common to all Build Alternatives include increases in light levels, and noise levels and visual nuisances from construction equipment, vehicles and structures. Adverse temporary impacts and visual degradation due to construction activities would not be permanent, and would not substantially alter the existing view quality. The temporary construction laydown areas within rural communities would impact fewer people in terms of overall viewers or people who would see the laydown area during construction, and where possible, would be co-located with existing transmission lines to reduce visual impacts. Construction impacts common to all Build Alternatives would not represent a disproportionately high or adverse visual impact to minority and/or low-income populations.

Visual impacts would also be beneficial around some of the Build Alternatives’ terminal station areas, as the Build Alternatives 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 and the Northwest Mall Terminal Option.

Urban areas of Dallas and Harris counties have the highest numbers of identified EJ block groups, 25 and 29 respectively; however, urban viewsheds are less sensitive to changes in transportation infrastructure. Changes to the visual character of rural areas would be more sensitive to transportation infrastructure, and more likely to cause a more severe impact. Due to the dispersed nature of the rural counties and large areas of the identified EJ block groups, along with the reduced number of viewers; impacts due to the construction and operation of the Build Alternatives would not represent a disproportionately high or adverse visual impact to minority and/or low-income populations.

#### *3.18.5.4.6 Transportation*

Transportation impacts would primarily be caused by permanent modifications to the existing public and private roadway network. These modifications, described in more detail in **Section 3.11.5.2, Transportation**, would include road over rail, road under rail, relocation, rerouting or closure. Roads that would be modified to be relocated, rerouted or closed have been counted as permanent impacts. Across the Build Alternatives, 110 to 198 public or private roads would be permanently impacted. Within EJ block groups, Build Alternative F would impact the least number of roads (19) and Build Alternatives A and B would impact the greatest number of roads (36). Relocated and rerouted roads would be shifted and reconnected to the existing roadway network. Closed roads would be limited to private drives. Coordination between TCRR and landowners would be required to determine an alternative drive. 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 in nature.

Roadway impacts would occur throughout the Study Area. However, the Build Alternatives have been designed to minimize and avoid potential roadway impacts through the use of elevated viaduct and infrastructure improvements that include road over and under rail crossings. Approximately 60 percent of the Build Alternatives has been designed to utilize viaduct to minimize potential roadway impacts. Based on the total number of roads permanently impacted throughout all Build Alternatives, there would be no disproportionately high and adverse roadway impacts to minority and/or low-income populations.

#### *3.18.5.4.7 Displacements, Acquisitions and Relocations*

The Build Alternatives have been designed to minimize and avoid potential impacts. Depending on the Build Alternative selected, the Build Alternatives would displace between 333 to 348 total residential, commercial, and community facility structures; however, 101 to 111 would be located within EJ block groups. **Table 3.18-8** shows the number of displaced structures within EJ block groups and the total number of displaced structures both inside and outside of EJ block groups by Build Alternative**.** Additionally, no public housing would be impacted by the Build Alternatives; therefore, rental assistance for low-income tenants would not be required. All displaced structures would be subject to mitigation strategies discussed in **Section 3.13, Land Use.**

| Table 3.18-8: Displaced Structures by Build Alternative | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Resource | Build Alternative | | | | | | Houston Terminal Options | | |
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site | Northwest Mall | Northwest Transit Center |
| Residential (EJ) | 75 | 74 | 78 | 82 | 81 | 85 | 0 | 0 | 0 |
| Commercial (EJ) | 27 | 27 | 33 | 27 | 27 | 33 | 3 | 9 | 4 |
| Community Features (EJ) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 102 | 101 | 111 | 109 | 108 | 118 | 3 | 9 | 4 |
| Residential (Total) | 283 | 293 | 272 | 288 | 298 | 277 | 0 | 0 | 1 |
| Commercial (Total) | 49 | 49 | 68 | 49 | 49 | 68 | 9 | 9 | 16 |
| Community Features (Total) | 1 | 1 | 2 | 1 | 1 | 2 | 0 | 0 | 0 |
| **Total** | 333 | 343 | 342 | 338 | 348 | 347 | 18 | 19 | 23 |

Source: AECOM, 2017

It is important to note that many of these EJ block groups are located on common segments. In order to evaluate if one Build Alternative would have a greater impact on an EJ community 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 EJ impacts along Segments 2A, 2B, 3A, 3B, 3C and 4 to determine if these impacts informed FRA's recommendation of a preferred alternative. **Table 3.18-9** summarizes FRA's findings.

| Table 3.18-9: Displaced Structures by Build Alternative (Segments 2A, 2B, 3A, 3B, 3C and 4) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Resource | Build Alternative | | | | | | Houston Terminal Options | | |
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site | Northwest Mall | Northwest Transit Center |
| Residential (EJ) | 25 | 24 | 28 | 32 | 31 | 35 | -- | -- | -- |
| Commercial (EJ) | 0 | 0 | 6 | 0 | 0 | 6 | -- | -- | -- |
| Community Features (EJ) | 0 | 0 | 0 | 0 | 0 | 0 | -- | -- | -- |
| **Total** | 25 | 24 | 34 | 32 | 31 | 41 | -- | -- | -- |
| Residential (Total) | 77 | 87 | 66 | 82 | 92 | 71 | -- | -- | -- |
| Commercial (Total) | 0 | 0 | 19 | 0 | 0 | 19 | -- | -- | -- |
| Community Features (Total) | 1 | 1 | 2 | 1 | 1 | 2 | -- | -- | -- |
| **Total** | 78 | 88 | 87 | 83 | 93 | 92 | -- | -- | -- |

Source: AECOM, 2017

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 3.18-10** summarize FRA's findings.

**Table 3.18-10: Estimated Parcel and Structure Acquisitions by Build Alternative**

| Resource | Build Alternative | | | | | | Houston Terminal Options | | |
|---|---|---|---|---|---|---|---|---|---|
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site | Northwest Mall | Northwest Transit Center |
| **Parcel Acquisitions*** | | | | | | | | | |
| Temporary Parcels (EJ) | 77 | 77 | 63 | 64 | 64 | 50 | 3 | 3 | 3 |
| Temporary Parcels (Total) | 191 | 200 | 169 | 176 | 185 | 154 | 1 | 2 | 2 |
| Permanent Parcels (EJ) | 680 | 678 | 670 | 676 | 674 | 666 | 11 | 14 | 10 |
| Permanent Parcels (Total) | 1,970 | 2,025 | 1,980 | 1,955 | 2,010 | 1,965 | 14 | 10 | 30 |
| **Structure Acquisitions**** | | | | | | | | | |
| Commercial (EJ) | 3 | 3 | 5 | 3 | 3 | 5 | | 1 | 1 |
| Commercial (Total) | 5 | 5 | 7 | 5 | 5 | 7 | 0 | 1 | 1 |
| Community Facilities (EJ) | 0 | 0 | 0 | 0 | 0 | 0 | -- | -- | -- |
| Community Facilities (Total) | 1 | 1 | 1 | 1 | 1 | 1 | -- | -- | -- |
| Residential (EJ) | 18 | 18 | 18 | 22 | 22 | 22 | -- | -- | -- |
| Residential (Total) | 58 | 61 | 49 | 62 | 65 | 53 | -- | -- | -- |

Source: AECOM, 2017
*Counts include acquisitions which may only acquire a portion of a parcel.
**Structure counts include structures identified as primary.

Based on these findings, FRA determined that the Project's acquisitions and displacements would not result in disproportionately high and adverse impacts to minority and/or low-income populations.

Detailed 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 and individual landowners would need to negotiate and agree to terms of compensation prior to the construction of the Project.

### *3.18.5.4.8 Community Cohesion*

**Section 3.14.4, Socioeconomic and Community Facilities** describes impacts to community cohesion and community facilities. As defined in **Section 3.14.5.2.2, Socioeconomic and Community Facilities**, cohesion is reflected in a 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 project 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.

There are six neighborhoods or communities which would be potentially impacted by the Build Alternatives. Two of these would be located in EJ areas and are both in Dallas County. All six neighborhoods or communities would be impacted in a similar manner. Therefore, this would not result in a disproportionately high and adverse impact to minority and/or low-income populations.

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 Build Alternatives. 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 EJ block groups, one minority, and one low-income. Much of the area is considered industrial due to the scale and use of nearby structures. Residential uses are located east of the Build Alternatives. Development of the Dallas Terminal Station would directly create employment opportunities within the station such as concessions and ticketing. A small parking lot north of the station is located in an EJ community and would be converted to a parking garage. The functionality of this parcel within the EJ community would not change, and as a result would not result in a disproportionately high and adverse impact.

The LeMay and LeForge neighborhood, located between Illinois Avenue and Loop 12 in Dallas County, would be directly impacted by the Build Alternatives, as at least 14 homes would be displaced. This neighborhood is isolated from the larger Cedar Crest neighborhood, and is considered a minority and low-income community. Only 20 homes would remain and a portion of LeMay and LeForge Avenues would be adjacent to the Build Alternatives' viaduct infrastructure, creating an impact to the cohesive character of the remaining part of this neighborhood. The Build Alternatives would further isolate this neighborhood from the rest of the Cedar Crest community; therefore, it is recommended that all 34 residences be acquired. Additional outreach to this community would be completed by FRA during the release of the Draft EIS to understand existing connections between these residents. For example, an elderly resident may receive care from a neighbor or another resident may 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 and would need to be factored into the relocation arrangement between the property owner and TCRR. Strategies may include relocating neighbors so that they remain together or increasing the compensation for relocation to include the services that would be required (healthcare, childcare). While the acquisition and displacement of these homes represents a potentially disproportionately high and adverse impact to this neighborhood, relocation of displaced residents could occur within the Cedar Crest community.[7]

### *3.18.5.4.9 Population and Employment*

**Section 3.14.5.2, Socioeconomic and Community Facilities** describes economic and employment impacts as a result of the Build Alternatives. The Build Alternatives would displace between 44 to 74 businesses. The primary location of these businesses would be in Dallas and Harris counties. However, the Build Alternatives would create new temporary and permanent jobs in Dallas and Harris counties due to the HSR system terminal stations. Potential jobs would 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 Build Alternatives' 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 Build Alternatives and would not be predominantly borne by minority or low-income groups. The Build Alternatives would create a beneficial impact for employment opportunities to minority and/or low-income populations.

During construction, the temporary influx of construction-related spending would provide additional economic benefits to minority and low-income populations. Cumulative impacts to economic and demographic conditions are discussed in detail in **Chapter 4.0, Indirect and Cumulative Impacts**.

#### *3.18.5.4.10 Community Facilities*

There are 93 community facilities identified within the Study Area; 67 of these are within EJ block groups but none would be displaced. The Smith Family Cemetery and the Honey Springs Cemetery in Dallas County are located in EJ block groups and would be impacted by the Build Alternatives.

The Smith Family Cemetery is a roughly 0.15-acre property currently abutting a parking facility owned by a local engineering business. The business would be displaced by the Build Alternatives. The cemetery is within the LOD, but would be partially spanned by viaduct. The cemetery is currently bounded by a large boulevard to its immediate north and IH-45 to its east. The current adjacent transportation infrastructure of the existing UPRR railroad and IH-45 do not provide a meditative environment for visitors, and the addition of intermittent noise from the Build Alternatives would not create additional noise that would result in a severe noise impact. Additional information regarding the Smith Family Cemetery can be found in **Section 3.19, Cultural Resources**.

The Build Alternatives would span the western portion of the Honey Springs Cemetery, which includes a memorial at the front gate. 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, Noise and Vibration**, no severe noise impact would be anticipated.

Both cemeteries would be partially spanned by the Build Alternatives. Per the THC, the consideration of cemeteries near any infrastructure project 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 would remain unimpeded. Any impacts would be temporary in nature and occur during construction. The Honey Springs Cemetery is an eligible historic resource and is discussed in more detail in **Section 3.17.5.2, Recreation** and **3.19.4.1, Cultural Resources**.

Proposed temporary construction laydown areas adjacent to two community facilities - Wilmer-Hutchins High School in Dallas County (all Build Alternatives) and the Leon ISD Campus in Leon County (Build Alternatives A, B, D and E) could results in temporary construction impacts. These temporary impacts could result from the movement of vehicles and generation of dust. The primary potential impact would be to school ingress and egress. 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. Implementation of standard procedures for reducing fugitive dust emissions would be addressed in the construction safety plan developed prior to construction (**Section 3.2, Air Quality**). This would not represent a disproportionately high and adverse impact to an EJ community.

### *3.18.5.4.11 Safety and Security*

Permanent private road closures and modified 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 3.18.5.4.6, Transportation**, minority and/or low-income populations would not experience a disproportionately high and adverse impact due to road rerouting, relocations or closure. Traffic control plans would be established to ensure emergency response times are within regulatory limits across the entire Study Area. The analysis presented in **Section 3.16.6.2.2, Public Safety and Security** determined there would be no adverse effects from increased emergency response times as they would be within acceptable limits. Additionally, roadway rerouting, relocation, and closures would be temporary during the construction phase. Therefore, no disproportionately high and adverse safety and security impacts would occur in EJ areas.

### *3.18.5.4.12 Recreational Facilities*

The Build Alternatives would affect two recreational facilities. Both are located within EJ block groups — Honey Springs Cemetery (all Build Alternatives) and Lake Bardwell (Build Alternatives D, E and F) – and are discussed in more detail in **Section 3.17.5.2, Recreational Facilities**.

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. This resource would be spanned. 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 Build Alternatives 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 Build Alternatives would not impact this facility's designation as a special use park. Impacts to minority and/or low-income populations would not be disproportionately high or adverse.

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 an EJ 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. The 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, Recreational Facilities**.

Build Alternatives D, E and F would cause temporary and permanent impacts to these facilities due to construction and operation; however Lake Bardwell's recreational use would not be changed or prohibited. Depending on the selected Build Alternative, the LOD would be located between 2 to 3 miles from the boating area of the lake. Construction of the Build Alternatives would temporarily limit the use of the equestrian trails and hunting area to all communities. Therefore, impacts to Lake Bardwell would not represent a disproportionately high or adverse impact to an EJ community.

## 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 transportation and utility corridors to minimize impacts to parcel and structure acquisition and land use conversion. Within the 6 Build Alternatives, 53 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 property access and parcel severance impacts. Approximately 60 percent of the Build Alternatives would be on viaduct.

### 3.18.6.1 Mitigation Measures

As noted above, while there are impacts within EJ block groups, there are no disproportionately high and adverse impacts to minority and/or low-income populations. Specific mitigation measures beyond those already identified within their resource areas are listed below.

**EJ-MM#1: LeMay and LeForge Neighborhood Outreach.** Additional outreach to this community would be necessary to understand the existing connections between these residents and the greater Cedar Crest community. Public outreach would occur during the DEIS public outreach phase in conjunction with the LeMay and LeForge community.

## 3.18.7 Build Alternatives Comparison

A summary of the impacts to EJ areas in the Study Area is presented in **Table 3.18-11**. There are no noted disproportionately high and adverse impacts to minority and/or low-income populations as a result of the Build Alternatives.

**Table 3.18-11: Disproportionately High and Adverse Impact to Environmental Justice Communities by Build Alternative and Houston Station Options**

| Resource | Build Alternative | | | | | | Houston Station Option | | |
|---|---|---|---|---|---|---|---|---|---|
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site Terminal | Northwest Mall Terminal | Northwest Transit Center Terminal |
| Number of EJ block groups intersected by the Study Area | 86 | 86 | 85 | 85 | 85 | 84 | 4 | 3 | 4 |
| Total block groups intersected by the Study Area | 161 | 158 | 155 | 159 | 156 | 153 | 12 | 8 | 12 |
| Acquisitions and Displacements | No | No | No | No | No | No | No | No | No |
| Community Cohesion and Facilities | No | No | No | No | No | No | 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 |

**Table 3.18-11: Disproportionately High and Adverse Impact to Environmental Justice Communities by Build Alternative and Houston Station Options**

| Resource | Build Alternative | | | | | | Houston Station Option | | |
|---|---|---|---|---|---|---|---|---|---|
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site Terminal | Northwest Mall Terminal | Northwest Transit Center Terminal |
| Hazardous Materials | No | No | No | No | No | No | No | No | No |
| Aesthetic and Scenic Resources | No | No | No | No | No | No | No | No | No |
| Public 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, 2016

# 3.19 Cultural Resources

## 3.19.1 Introduction

The following 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:** 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 in 36 C.F.R. § 800.16(l)(1)

*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, traditional cultural properties (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:

- *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 after 1972). While the Secretary of 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) proscribes a criteria 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.

Not all resources that are cultural are considered significant under applicable cultural resources laws. Cultural resources that are significant must possess sufficient historic integrity to qualify the resource as a *historic property*, as defined by the National Historic Preservation Act (NHPA) (36 C.F.R. § 800.16(l)(1)):

- *Historic Property* means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (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 below in **Section 3.19.2**.

In the State of Texas, cultural resources may also merit designation as a State Antiquities Landmark (SAL). The criteria for SAL designation is provided below in **Section 3.19.2**.

## 3.19.2 Regulatory Context

### Federal

*FRA Procedures for Considering Environmental Impacts (64 Fed. Reg. 28545)*

The FRA procedures for considering environmental impacts govern the agency's compliance with NEPA and related environmental and historic preservation laws and regulations. FRA procedures require all EISs to identify historic properties that may be affected by the alternatives in accordance with Section 106 of the NHPA (54 U.S.C. § 306108). The EIS should also describe consultation with the SHPO (for this Project, the THC) and other consulting parties regarding the impacts of the proposed action on historic properties.

*National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.)*

The NHPA is the cornerstone of federal historic preservation law. Section 106 of the NHPA and its implementing regulation (*Protection of Historic Properties* [36 C.F.R. § 800]), requires that prior to issuing federal funding, partial funding, permitting, licensing, approval or taking other action, federal agencies take into account the effects of their undertakings on historic properties (defined in **Section 3.19.1**) and provide the Advisory Council of Historic Preservation (ACHP) an opportunity to comment on the undertaking (54 U.S.C. 306108).

The criteria established for evaluating the NRHP eligibility of a resource are defined in 36 C.F.R. § 60.4 (a-d), 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, cemeteries, reconstructed properties, 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 that derives its primary significance from its distinctive art or architecture, or is historically important;
b. a moved property that is primarily significant for architectural value or it is the only extant property associated with an important historic person or event;
c. a birthplace or grave site of a historical figure if the person is of transcendent importance, and if it is the only extant property directly associated with the person's significance;

d. a cemetery that is primarily significant because it contains graves of transcendent importance, from its age, its design, or association with historic events;
e. a reconstructed property that is in a suitable environment and presented in a proper physical context and with a suitable interpretation in a master plan, and when it is the only surviving example of a property with the same associations;
f. a commemorative property that has in itself gained significance in design, age, symbolic value, or tradition; and
g. a property less than 50 years of age that is of exceptional importance.

In general, the Section 106 process proceeds in four steps:

1) Initiate the process, which involves establishing 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 Area of Potential Effect (APE) as defined in 36 C.F.R § 800.16(d)[1] and carry forth the necessary level of effort to identify historic properties within the APE;

3) Assess adverse effects the project may have on historic properties identified within the APE; and

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 of historic properties (36 C.F.R. § 800.4(b)(2)) and phased application of adverse effects (36 C.F.R. § 800.5(a)(3)). In situations where a phased process is used for identification of historic properties or application of adverse effects, a Programmatic Agreement (PA) can provide the process for the development and implementation of phased identification, NRHP eligibility and effects evaluations, and treatment efforts, as applicable.

### *Section 4(f), U.S. Department of Transportation, 49 U.S.C. § 303*

Section 4(f) of the U.S. Department of Transportation Act of 1966, "…protects significant publicly owned public parks, recreation areas, and wildlife and waterfowl refuges, as well as significant historic sites, whether they are publicly or privately owned." 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.

[1] As defined in 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."

*Archeological Resources Protection Act of 1979 (ARPA) (16 U.S.C. Section 470 aa-470mm; Public Law 95-96)*

This statute 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.

*Native American Graves Protection and Repatriation Act (NAGPRA) (43 C.F.R. § 10)*

Enacted in 1990, regulations at 43 C.F.R. § 10 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. Since portions of the Build Alternatives fall within federal land under the jurisdiction of the USACE, a plan of action would be in place for any inadvertent discoveries on federal public land.

*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)*

The law allows "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'', approved March 2, 1945 [59 Stat. 18], as modified by section 5141 of the Water Resources Development Act of 2007 [121 Stat. 1253]." However, this law does not cover FRA's regulatory requirements under the NHPA, and the portion of the Dallas Floodway traversed by the Build Alternatives was included in the cultural resources investigations conducted by FRA.

### State

*Antiquities Code of Texas (Texas Natural Resources Code Title 9, Chapter 191); Texas Administrative Code (Title 13, Chapter 26)*

While a majority of the Build Alternatives are located on private property, various portions of the Build Alternatives 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, *Rules of Practice and Procedure*.

Prior to any fieldwork, an Antiquities Permit must be obtained from the THC. 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 § 26.2.

The Antiquities Code of Texas allows for certain cultural resources to be designated and protected as a SAL. For a historic building to be eligible for designation as an SAL, it must be listed in the NRHP prior to being designated an SAL. The same prerequisite does not apply to archeological sites. Eligibility criteria for SAL designation for archeological sites and historic buildings are as follows:

1. 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
2. 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
3. the site possesses unique or rare attributes concerning Texas prehistory and/or history
4. the study of the site offers the opportunity to test theories and methods of preservation, thereby contributing to new scientific knowledge
5. 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 (13 T.A.C. § 26.10)

*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])*

Historic 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; 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. 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.

## 3.19.3 Methodology

As discussed in **Chapter 1.0, Purpose and Need**, FRA may issue a Rule of Particular Applicability (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. These determinations constitute a federal undertaking subject to the NHPA Section 106 process (36 C.F.R. § 800.16[y]). FRA is coordinating compliance with the NHPA and NEPA as encouraged by the ACHP (36 C.F.R. § 800.8(a)). The cultural resources evaluation in this EIS was prepared in accordance with Section 106 of the NHPA and its implementing regulations (36 C.F.R. § 800). This section reflects the coordination of the methodologies for both the NEPA and Section 106 processes, consistent with 36 C.F.R. § 800.8.

### 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 the THC and other consulting parties for the purpose of seeking information from known knowledgeable parties concerning cultural resources in proximity to the Build Alternatives. FRA formally requested information from consulting parties in a letter dated January 12, 2016. A list of the consulting parties FRA contacted in February 2015 and January 2016, 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: Parties Identified for Section 106 Consultation**

| Organization | Date of Contact | Prime Contact | Mailing Address | Organization Response |
|---|---|---|---|---|
| USACE, Galveston District | February 23, 2015; January 12, 2016 | Felicity Dodson | 2000 Fort Point Road<br>Galveston, TX 77550 | Accepted Invitation for Section 106 Consulting Party |
| USACE, Fort Worth District | February 23, 2015; January 12, 2016 | Darvin Messer | PO Box 17300<br>819 Taylor Street, Room 3A37<br>Ft. Worth, TX 76102 | No Response |
| Preservation Texas | February 23, 2015; January 12, 2016 | Evan Thompson, Executive Director | PO Box 12832<br>Austin, TX 78711 | Accepted Invitation for Section 106 Consulting Party |
| County of Ellis, Texas Historical Commission | February 23, 2015; January 12, 2016 | Sylvia Smith | PO Box 275<br>Waxahachie, TX 75165 | Accepted Invitation for Section 106 Consulting Party |
| County of Freestone, Texas Historical Commission | February 23, 2015; January 12, 2016 | Brad Pullin | 245 FM 833 West<br>Streetman, TX 75840 | No Response |
| County of Grimes, Texas Historical Commission | February 23, 2015; January 12, 2016 | Denise Upchurch | 9927 FM 1696<br>Bedias, TX 77830 | No Response |
| County of Harris, Texas Historical Commission | February 23, 2015; January 12, 2016 | Janet Wagner | 710 North Post Oak Road, #400<br>Houston, TX 77002 | Accepted Invitation for Section 106 Consulting Party<br>Retracted Acceptance |
| County of Leon, Texas Historical Commission | February 23, 2015; January 12, 2016 | Charlie Casey | PO Box 866<br>Buffalo, TX 75833 | No Response |
| County of Limestone, Texas Historical Commission | February 23, 2015; January 12, 2016 | William Reagan | PO Box 860<br>Groesbeck, TX 76642 | No Response |
| County of Madison, Texas Historical Commission | February 23, 2015; January 12, 2016 | Bonne Hendrix | 802 S. May Street<br>Madisonville, TX 77864 | No Response |

**Table 3.19-1: Parties Identified for Section 106 Consultation**

| Organization | Date of Contact | Prime Contact | Mailing Address | Organization Response |
|---|---|---|---|---|
| County of Madison, Texas Historical Commission | February 23, 2015; January 12, 2016 | Sonny Knight | PO Box 925<br>Madisonville, TX 77864 | Accepted Invitation for Section 106 Consulting Party |
| County of Montgomery, Texas Historical Commission | February 23, 2015; January 12, 2016 | Larry Foerster | 414 West Phillips Suite 100<br>Conroe, TX 77301 | No Response |
| County of Navarro, Texas Historical Commission | February 23, 2015; January 12, 2016 | Bruce McManus | 3019 McKnight Lane<br>Corsicana, TX 75110 | No Response |
| County of Waller, Texas Historical Commission | February 23, 2015; January 12, 2016 | Truett Bell | PO Box 9<br>Pattison, TX 77445 | No Response |
| Ennis Main Street Program | February 23, 2015; January 12, 2016 | Becky McCarty, Program Manager | PO Box 220<br>Ennis, TX 75120 | No Response |
| City of Dallas | February 23, 2015; January 12, 2016 | Mark Doty, Historic Preservation Officer | 1500 Marilla Street, Room 5BN<br>Dallas, TX 75204 | No Response |
| City of Ennis Economic Development District | February 23, 2015; January 12, 2016 | Marty Nelson, CLG | PO Box 220<br>Ennis, TX 75120 | No Response |
| City of Corsicana, Main Street and Tourism | February 23, 2015; January 12, 2016 | Sara Beth Wilson, Historic Preservation Officer | 200 North 12th Street<br>Corsicana, TX 75110 | No Response |
| Advisory Council on Historic Preservation | February 23, 2015; January 12, 2016 | John Fowler, Executive Director | 401 F Street NW, Suite 308<br>Washington, DC 20001 | Accepted Invitation for Consultation |
| Boren Reagor Springs Historical Society | January 12, 2016 | Nancy Boren Solohubow President | 3817 Shoal Creek Drive<br>The Colony, Texas 75056 | Identified Cultural Resources within the area of Reagor Springs |

Source: AECOM, 2016

### *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. 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 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 Contacts**

| Tribal Nation | Date of Contact | Prime Contact | Mailing Address | Tribal Response |
|---|---|---|---|---|
| Kiowa Indian Tribe of Oklahoma | February 19, 2015 | Amie Tah-Bone, Museum Director and NAGPRA Representative | PO Box 369<br>Carnegie, OK 73015 | No Response |
| Mescalero Apache Tribe | February 19, 2015 | Danny Breuninger, Sr., President | c/o Holly Houghten, THPO<br>PO Box 227<br>Mescalero, NM 88340 | No Response |
| Muscogee (Creek) Nation of Oklahoma | February 19, 2015 | Odette Freeman, Manager's Assistant | George Tiger, Principal Chief<br>Creek National Tribal Complex<br>PO Box 580<br>Okmulgee, OK 74447 | Declined Invitation for Formal Consultation; Deferred to Other Tribes |
| The Delaware Nation | February 19, 2015 | Nekole Alligood, Director Cultural Preservation Office | Clifford Peacock, President<br>PO Box 825<br>Anadarko, OK 73005 | Declined Invitation for Formal Consultation; Deferred to Other Tribes |
| Thlopthlocco Tribal Town | February 19, 2015 | George Scott, Town King | PO Box 188<br>Okemah, OK 74859 | No Response |
| Tonkawa Tribe of Indians of Oklahoma | February 19, 2015 | Don Patterson, President | 1 Rush Buffalo Road<br>Tonkawa, OK 74653 | Declined Invitation for Formal Consultation; Notify if NAGPRA Remains |
| United Keetoowah Band of Cherokee Indians | February 19, 2015 | Lisa LaRue-Baker, Acting THPO | Mr. George Wickliffe, Chief<br>PO Box 748<br>Tahlequah, OK 74465 | Declined Invitation for Formal Consultation; Deferred to Other Tribes |
| Wichita and Affiliated Tribes | February 19, 2015 | Terri Parton, President | PO Box 729<br>Anadarko, OK 73005 | No Response |
| Caddo Nation of Oklahoma | February 19, 2015 | Robert Cast, THPO | PO Box 487<br>Binger, OK 73009 | No Response |
| Alabama-Coushatta Tribe of Texas | February 19, 2015 | Bryant J. Celestine, Historic Preservation Officer | 571 State Park Road 56<br>Livingston, TX 77351 | Declined Invitation for Formal Consultation; Notify if NAGPRA Remains |
| Apache Tribe of Oklahoma | February 19, 2015 | Lyman Guy, Chairman | PO Box 1330<br>Anadarko, OK 73005 | No Response |
| Coushatta Tribe of Louisiana | February 19, 2015 | Lovelin Poncho, Chairman | PO Box 818<br>Elton, LA 70532 | No Response |
| Comanche Nation of Oklahoma | February 19, 2015 | Jimmy Arterberry, THPO | Wallace Coffey, Chairman<br>PO Box 908<br>Lawton, OK 73502 | No Response |
| Alabama Quassarte Tribal Town | February 19, 2015 | Tarpie Yargee, Chief | PO Box 187<br>Wetumka, OK 74883 | No Response |

Source: AECOM, 2016

### *3.19.3.1.3 Public Involvement*

Public participation is an important component of Section 106 (36 C.F.R. § 800.3(e). As noted above, FRA is coordinating public participation for Section 106 and NEPA and consultation remains ongoing. Details of the public outreach process can be found in **Chapter 9.0, Public and Agency Involvement and Section 9.2.2 Public Scoping**. In addition, a draft PA developed in consultation with the THC, pursuant to 36 C.F.R. § 800.14(b), will be circulated with the Final EIS for public review and comment.

### 3.19.3.2 Phased Approach for Identification and Evaluation of Historic Properties

FRA met with the THC on September 15, 2015 regarding survey methods for historic and archeological resources. Through 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 § 800.5(a)(3), will be implemented due to the combined length and size of the Build Alternatives 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 between the FRA, THC and other consulting parties including the USACE Fort Worth, USACE Galveston, STB and TxDOT. The research designs define the respective APEs and methods for conducting literature reviews, background research, field surveys, reporting and impact assessments. 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*

The THC concurred on the final research designs for historic resources on November 18, 2015. The THC concurred on the archeological research design, submitted to the THC in conjunction with the Texas Antiquities Permit application, on November 24, 2015. The archeological investigation for the Build Alternatives 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 in 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 Build Alternatives, 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) and any other project-specific locations designated by TCRR’s conceptual design report (see **Appendix F, TCRR Conceptual Engineering Design Report**). The historic resources APE and the archeological resources APE for the Build Alternatives are different and are defined in the research designs and described below.

***Historic Resources APE***

The historic resources APE takes into account both direct and indirect effects resulting from construction and operation of the Build Alternatives. Direct effects are considered to be limited to ground disturbing activities associated with construction activities. Indirect effects 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 Build Alternatives would traverse. The three settings are defined as urban, suburban and rural. Each setting contains different typical conditions that influence the potential the Build Alternatives have to indirectly 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 Build Alternatives would be constructed in urban settings
- 700 feet beyond the LOD where the Build Alternatives would be constructed in suburban settings
- 1,300 feet beyond the LOD where the Build Alternatives 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 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 resources are within the initial APE.

The Build Alternatives in Dallas and Harris counties traverse urban, suburban and rural settings, which are reflected in the APE limits applied in those two counties. The Build Alternatives in the remaining eight counties traverse only rural settings, and the APE applied in those counties was 1,300 feet beyond the LOD.

***Archeological Resources APE***

The archeological APE, defined as the LOD, takes into account direct effects of the Build Alternatives. The APE is three-dimensional and takes into consideration length, width and depth, and focuses on potential ground-disturbing activities associated with construction of the Build Alternatives. 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.

### *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 APEs, as well as known archeological sites within a 1,000 meter (3,280.84 feet) Study Area from the Build Alternatives LOD to provide a general understanding of the distribution of archeological sites within the LOD of the Build Alternatives and the vicinity. Resources included NRHP-listed historic properties, NRHP-eligible historic properties, National Historic Landmarks (NHLs), SALs, Recorded Texas Historic Landmarks (RTHLs), Official Texas Historic Markers (OTHMs), Historic Texas Cemeteries (HTCs)[2] 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:

- 2012 – *Environmental Assessment: Dallas Horseshoe Project IH 30 and IH 35E, Dallas County*. Prepared by TxDOT and the U.S. Army Corps of Engineers as a cooperating agency (CSJ: 0196-03-205, 0442-02-118, 0442-02-132, 1068-04-099, 1068-04-116, and 0009-11-226).

[2] In 1998, the 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.

- 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.
- 2001 - *Historic Resource Survey of the Building Displacement for the Trinity River Parkway, Dallas, Texas*. Norman Alston Architects, 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 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 U.S. Department of the Interior'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."[3]

Contextual information for evaluating the significance of historic resources within the APE was gathered through archival research conducted during and post 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*;[4] 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.*[5]

The research gathered was compiled to identify significant historic themes relevant to the development of the prehistoric landscape and the built environment within the APE. Property information available from the County Appraisal Districts for each of the ten counties crossed by the Build Alternatives 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 Build Alternatives and prepared for this investigation can be found in **Appendix E, Cultural Resources Technical**

[3] *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_5.htm)
[4] *The Handbook of Texas Online* (https://www.tshaonline.org/handbook)
[5] *The Portal to Texas History* (https://texashistory.unt.edu/)

**Memorandum**, and has been incorporated in the interim reports submitted to the THC that are discussed further in **Section 3.19.4**.

**Archeological Resources**

Prior to archeological fieldwork, the archeological 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, near loamy, well drained soils in proximity to streams). This type of approach for locating prehistoric sites is commonly 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**). This approach was formalized in the archeological research design.

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 APE were examined prior to all fieldwork.

**Table 3.19-3: Probability Matrix of Archeological and Integrity Potential of the Project APE**

| EMU | Archeological Potential | Integrity Potential | Percent of APE | Pedestrian Survey | Shovel Testing | Backhoe Trenching |
|---|---|---|---|---|---|---|
| 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. | 10 | Yes | Only if Holocene sediments <1 m deep | Only 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. | 46 | Yes | 1 per 30 m | Only 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. | 13 | Document disturbances only | Judgmental - only if undisturbed soils are present | 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 | 1 per 30 m | Only 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. | 13 | Yes | 1 per 100 m | Not likely |
| 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. | 4 | Document disturbances only | Judgmental - only if undisturbed soils are present | 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 | Judgmental | Not likely |
| 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 | Judgmental | Not likely |
| 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. | 6 | Document disturbances only | Judgmental – only if undisturbed soils present | Not likely |

Source: AECOM, 2016; Notes: A – Archeological H – High I – Integrity L – Low M – Moderate P – Potential

### *3.19.3.2.5 Field Survey*

**Historic Resources**

Fieldwork for the historic resources survey of the Build Alternatives was conducted by a historian who meets the Secretary of the Interior's Professional Qualifications Standards, as defined in 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.

Not all historic resources identified during the literature review and background research, which has been ongoing to take into account design changes to the Build Alternatives, were recorded in the field either due to the lack of visibility from the public ROW or TCRR's refinements to the conceptual design post-fieldwork. The PA will require that following the completion of the EIS, but prior to construction, field documentation and evaluation of these resources be completed by an architectural historian who meets the Secretary of Interior's Professional Qualification Standards. The PA will also require the results be submitted to the THC as an addendum to the interim reports.

**Archeological Resources**

Intensive archeological fieldwork for the Build Alternatives 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 in 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 backhoe trenching was conducted.

With consideration to the requisite 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. 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 LOD, a shovel test intensity of at least 16 shovel tests per mile was used. For areal portions of the LOD, THC Minimum Survey Standards were followed for *Project Areas of 200 acres or Less* (0-2 acres, 3 per acre; 3-10 acres, 2 per acre; 11-100 acres, 1 every 2 acres; and 101-200 acres, 1 every 3 acres).

Shovel tests were 30 centimeters (11.81 inches) in diameter and excavated to the bottom of Holocene deposits, if possible. Dug in 20 centimeter (7.87 inches) levels, all excavated soils were screened through 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 shovels 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 trinomials. 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). Isolated finds were also designated when a cultural 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 are 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. 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 will require that following the completion of the EIS, but prior to construction, locations not surveyed during fieldwork due to the lack of access to private property or TCRR's refinements to the conceptual design post-fieldwork, will be investigated in the field by an archeologist who meets the Secretary of Interior's Professional Qualification Standards. The PA will also require that results be submitted to the THC as an addendum 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 the 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.

Any required survey work conducted prior to the start of construction to complete the identification and effects determinations of historic properties, and to continue consultation concerning measures to avoid, minimize, or mitigate any adverse impacts, will be documented as an addendum to the interim reports. The PA will provide for the development and implementation of post-EIS identification and evaluation efforts, which will be developed in consultation with the THC and other consulting parties.

##### *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**. The results of the surveys are documented within the separate archeological and historic resources interim reports that were submitted to the THC for review and comment.

Consultation with the THC regarding identified historic properties is ongoing. The historic properties were categorized as NRHP-listed, NRHP-eligible and Potentially NRHP-eligible. Brief definitions for these three categories of historic properties are as follows:

**NRHP-listed**: a resource listed in the NRHP;

**NRHP-eligible**: a resource determined eligible for listing in the NRHP; and

**Potentially NRHP-eligible**: a resource with no known previous NRHP designation that is determined to demonstrate a high or moderate level of significance and integrity based on the background research and literature review, but field verification is required. (*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 a demonstrated historical significance or has been substantially altered, and would most likely not qualify individually for the NRHP).

#### *3.19.3.2.8 Methodology for Assessment of Impacts*

FRA will assess historic properties identified within the historic resources and archeological resources APEs for potential impacts the Build Alternatives could have on these properties in accordance with 36 C.F.R. § 800.5. The assessment of impacts for the Build Alternatives is discussed in **Section 3.19.5.**

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 mitigating conditions agreed upon by the THC are imposed, such as subsequent review of plans for rehabilitation by the THC to ensure consistency with the *Secretary's Standards for the Treatment of Historic Properties* (36 C.F.R. § 68) and applicable guidelines, to avoid adverse effects.

**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

## 3.19.4 Affected Environment

Fieldwork for historic and archeological resources was conducted from January 15, 2016 through April 15, 2016. Additional fieldwork for historic resources was conducted from September 19, 2016, through October 7, 2016. The fieldwork efforts for both historic and archeological resources focused on the identification and evaluation of 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**.

### 3.19.4.1 Cultural Resources Investigations

#### *3.19.4.1.1 Historic Resources*

The historic resources literature review found 279 previously recorded and/or designated historic resources within the variable APE. Of these resources, 63 have the following designations determined through previous investigations not conducted as part of this Project. The 63 previous designations include: 2 NRHP-listed; 16 NRHP-eligible; 1 RTHL; 5 OTHMs; 3 Local Designations; 13 HTCs; and 23 cemeteries with no designation (**Table 3.19-4**). Eleven (11) of these resources are within the LOD of the Build Alternative segments, including Segment 1 (5 resources); Segment 2A (1 resource); Segment 2B (1 resource); Segment 4 (1 resource); and Segment 5 (3 resources).

The remaining 216 previously-recorded historic resources, concentrated within Dallas County (38 resources) and Harris County (178 resources), were previously evaluated by various agencies and determined not eligible for listing in the NRHP with concurrence from the THC. All of 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**

| County/ Segment | Resource Draft Interim Report Number | Resource Name | Resource Type | Designation | Within LOD |
|---|---|---|---|---|---|
| **Dallas** | | | | | |
| 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 | Yes |
| Segment 1 | DA.024a | Cadiz Pump Station | Building | NRHP Eligible | No |
| Segment 1 | DA.024b | Cadiz Pump Station | Building | NRHP Eligible | No |
| Segment 1 | DA.028 | Dallas Coffin Company (within Sears Complex Historic District) | 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 |

**Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE**

| County/ Segment | Resource Draft Interim Report Number | Resource Name | Resource Type | Designation | Within LOD |
|---|---|---|---|---|---|
| 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.070 | Corinth Street Viaduct | 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 | 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/Queen's City/Coming Home | Cemetery | No Designation | Yes |
| Segment 1 | DA.110a | Smith Family Cemetery | Cemetery | HTC | Yes |
| Segment 1 | DA.194 | W. A. Strain House | Historic District | NRHP Listed | No |
| **Ellis** | | | | | |
| Segment 2A | EL.040 | Boren | Cemetery | HTC | No |
| Segment 2A<br>Segment 2B | EL.016a | Geaslin | Cemetery | No Designation | Yes (2A) |
| Segment 2A<br>Segment 2B | EL.020 | Geaslin Homestead | Building | Local Designation (Palmer Preservation Society) | Yes (2B) |
| Segment 2B | EL.058 | Grady | Cemetery | No Designation | No |
| **Navarro** | | | | | |
| Segment 3A | NA.040 | Ward | Cemetery | HTC | No |
| Segment 3A | NA.046 | Anderson Family | Cemetery | HTC | No |
| Segment 3B | NA.050 | Shelton Family | Cemetery | HTC | No |
| **Freestone** | | | | | |
| Segment 3C | FR.034 | Johnson African American | Cemetery | HTC | No |

**Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE**

| County/ Segment | Resource Draft Interim Report Number | Resource Name | Resource Type | Designation | Within LOD |
|---|---|---|---|---|---|
| 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.008 | Unknown (Cotton Gin) | Cemetery | No Designation | No (within 100 feet of LOD) |
| Segment 4 | FR.016 | Furney Richardson School | Historic Marker | OTHM | No |
| Segment 4 | FR.024 | Unknown (S of Asia) | Cemetery | No Designation | No |
| **Limestone** | | | | | |
| 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** | | | | | |
| Segment 3C | LE.033 | Fred Graham | Cemetery | No Designation | No |
| Segment 3C | LE.034 | Nettles | Cemetery | No Designation | No (within 115 feet of LOD) |
| 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** | | | | | |
| 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 | No Designation | No (within 70 feet of LOD) |
| Segment 4 | MA.010 | Ten Mile | Cemetery | HTC | No (within 40 feet of the LOD) |
| Segment 4 | MA.019 | Oxford | Cemetery | NRHP Eligible/HTC | No |
| Segment 4 | MA.035 | Unknown Graves | Cemetery | No Designation | No |
| **Grimes** | | | | | |
| 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 | No |
| Segment 5 | GR.024 | Singleton | Cemetery | No Designation | Yes |
| Segment 5 | GR.033 | Ratliff | Cemetery | HTC | No (within 35 feet of LOD) |
| Segment 5 | GR.034a | Old Oakland – Roans Prairie | Cemetery | No Designation | No |
| Segment 5 | GR.034b | Oakland Baptist Church | Historic Marker | RTHL | No |

| Table 3.19-4: Previously Recorded and/or Designated Historic Resources within the APE | | | | | |
|---|---|---|---|---|---|
| **County/ Segment** | **Resource Draft Interim Report Number** | **Resource Name** | **Resource Type** | **Designation** | **Within LOD** |
| Segment 5 | GR.050 | Mason | Cemetery | No Designation | No |
| Segment 5 | GR.071 | Stonehamville/Simmons Chapel | Cemetery | No Designation | No |
| **Waller** | | | | | |
| None within the Waller County APE | | | | | |
| **Harris** | | | | | |
| 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 | No (adjacent to LOD) |

Source: AECOM, 2017

The literature review, background research and fieldwork conducted for the historic resources investigation found a total of 858 sites (containing 1,334 historic resources) are located within the historic resources APE. Not all of 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 Build Alternatives post-fieldwork, could be recorded in the field either due to lack of visibility from the public ROW or design changes post-fieldwork. Of the total historic resources within the APE, 407 sites (containing 628 resources) were recorded in the field. Resources that still require field verification were identified as having low, moderate, or high potential for NRHP eligibility (see Section 3.19.3.2.7). Field documentation and NRHP evaluation of these resources will be completed during a subsequent phase of fieldwork and prior to construction. Procedures for performing the additional fieldwork and NRHP evaluation will be formalized in the PA.

Interim reports providing the results of the ongoing historic resources survey were prepared for each of the ten counties crossed by the Build Alternatives. Fieldwork for historic resources was 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 resources recorded during fieldwork; available information for 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 has not 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. Consultation with the THC regarding the historic resources survey is ongoing, per the phased approach initiated for this effort. The interim historic resources reports for each county were submitted to the THC. The dates of submittal to the THC and dates of response from the 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 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 Submittal and THC Response**

| County | Date of Submittal | Date of Response | THC Response |
|---|---|---|---|
| **Dallas** | July 2017 | August 25, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 172 historic resources (2 NRHP-listed, 24 NRHP-eligible, 3 undetermined [treated as NRHP-eligible] and 145 not eligible); and<br>• Field verification and evaluation of remaining 64 historic resources to be submitted as an addendum to the interim report<br>THC comments:<br>• Recommend Resource DA.016, 1401 South Akard Street (KIXL Studios) be *treated as eligible,* but the project will have no adverse effect;<br>• Recommend Resource DA.020, 904 Cadiz Street (Good Luck Oil Company) be *eligible*, but the project will have no adverse effect;<br>• Recommend Resource DA.023 (Cadiz Street Underpass) is also *eligible* under Criterion A;<br>• 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;<br>• Recommend Resource DA.072 (Dallas Floodway Historic District) Belleview Pressure Sewer, a contributing resource to the *eligible* district, be avoided;<br>• 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 direct adverse impacts to any unmarked graves;<br>• Request intensive-level survey be conducted for Resource DA.110b, 3820 East Illinois Avenue (Linfield Elementary), to determine NRHP eligibility and potential impacts;<br>• Request intensive-level survey be conducted for Resource DA.110a (Smith Family Cemetery), to determine potential historical relationship with Linfield Elementary |
| **Ellis** | May 2017 | June 13, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 27 historic resources (all determined not eligible); and<br>• Field verification and evaluation of remaining 86 historic resources to be submitted as an addendum to the interim report |

| Table 3.19-5: Historic Resources Interim Report Submittal and THC Response | | | |
|---|---|---|---|
| **County** | **Date of Submittal** | **Date of Response** | **THC Response** |
| **Navarro** | June 2017 | June 14, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 82 historic resources (all determined not eligible); and<br>• Field verification and evaluation of remaining 79 historic resources to be submitted as an addendum to the interim report |
| **Freestone** | May 2017 | June 14, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 48 historic resources (one eligible and 47 not eligible); and<br>• Field verification and evaluation of remaining 32 historic resources to be submitted as an addendum to the interim report<br>THC comments:<br>• Recommend Resource FR.034 (Johnson African American Cemetery) is *eligible,* but the project will have no adverse effect; and<br>• Request additional information on potential effects on Resources FR.016a-g (Furney Richardson School) |
| **Limestone** | July 2016 | August 30, 2016 | THC concurrence on:<br>• Eligibility determinations for 24 historic resources (all determined not eligible); and<br>• No effect on historic properties |
| **Leon** | May 2017 | June 14, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 23 historic resources (all determined not eligible); and<br>• Field verification and evaluation of remaining 42 historic resources to be submitted as an addendum to the interim report<br>THC comment:<br>• Recommend Resource LE.001a (Little Flock Cemetery) is *eligible,* but the project will have no adverse effect |
| **Madison** | June 2017 | June 30, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Determination of eligibility for Resource MA.019 (Oxford Cemetery);<br>• Field verification and evaluation of 118 historic resources to be submitted as an addendum to the interim report; and;<br>• Determination of no adverse effect on Resource MA.019 (Oxford Cemetery) |

| Table 3.19-5: Historic Resources Interim Report Submittal and THC Response | | | |
|---|---|---|---|
| **County** | **Date of Submittal** | **Date of Response** | **THC Response** |
| **Grimes** | May 2017 | June 13, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research; and<br>• Field verification and evaluation of 142 historic resources to be submitted as an addendum to the interim report |
| **Waller** | May 2017 | June 13, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research; and<br>• Field verification and evaluation of 12 historic resources to be submitted as an addendum to the interim report |
| **Harris** | July 2017 | August 30, 2017 | THC concurrence on:<br>• APE limits;<br>• Information presented in the literature review and background research;<br>• Eligibility determinations for 256 historic resources (one eligible and 242 not eligible); and<br>• Field verification and evaluation of remaining 107 historic resources to be submitted as an addendum to the interim report<br>THC comments:<br>• Recommend intensive-level survey of Resource HA.004b, 29702 Castle Road, Waller vicinity, to verify NRHP-eligibility and NRHP boundary, if appropriate;<br>• Recommend Resource HA.024b, 26110 Hempstead Road, Cypress (Humble Oil Station) is also *eligible* under Criterion A;<br>• Recommend intensive-level survey of Resource HA.208 (NRHP-eligible), 1503 North Post Oak Road (Tex-Tube). |

Source: AECOM, 2016

Of the total documented historic resources within the APE, 31 are identified as historic properties: 2 NRHP-listed and 29 NRHP-eligible. These resources are located in the APEs for Segment 1, Segment 3C, Segment 4 and Segment 5. Four of the historic properties are within the Segment 1 LOD. 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 the TASA indicates there are 263 previously recorded archeological sites within the Archeological Study Area, (1,000 meters beyond the LOD) of the Build Alternatives (**Table 3.19-6**). Of these sites, 131 are prehistoric, 100 are historic and 25 contain both historic and prehistoric components. No data was available for 7 sites, citing the cultural and temporal affiliation as unknown. Fifty-four 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, 25 percent are open campsites, 14 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 37 percent farmstead or ranch-related sites, 28 percent historic dumps or trash scatters and 16 percent twentieth century military-related components. The remaining 19 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 in development areas within the alignments of the Build Alternatives.

**Table 3.19-6: Previously Recorded Archeological Sites and Historic Cemeteries Within 1,000 Meters of the Build Alternatives LOD**

| County | Prehistoric Sites | Historic Sites | Prehistoric and Historic Components | Unknown Period | Total Sites | Historic Cemeteries |
|---|---|---|---|---|---|---|
| Dallas | 14 | 19 | 2 | 1 | 36 | 4 |
| Ellis | 5 | 8 | 1 | 3 | 17 | 4 |
| Navarro | 9 | 4 | 4 | 2 | 19 | 8 |
| Freestone | 17 | 19 | 1 | 0 | 37 | 7 |
| Limestone | 5 | 0 | 0 | 0 | 5 | 2 |
| Leon | 45 | 37 | 17 | 0 | 99 | 11 |
| Madison | 6 | 2 | 0 | 0 | 8 | 4 |
| Grimes | 23 | 5 | 0 | 1 | 29 | 9 |
| Waller | 4 | 0 | 0 | 0 | 4 | 0 |
| Harris | 3 | 6 | 0 | 0 | 9 | 5 |
| Total Sites | **131** | **100** | **25** | **7** | **263** | **54** |

Source: TASA 2017

Relatively few systematic surveys were conducted within the counties encompassing the Build Alternatives, with a greater amount having occurred in the urban areas of Dallas and Houston. A review of the TASA indicates that 137 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; covering a combined 762.8 acres of the Build Alternatives (**Table 3.19-7**).

**Table 3.19-7: Previously Conducted Archeological Surveys Within 1,000 Meters of the Build Alternatives LOD**

| County | Areal Surveys | Linear Surveys | Total Surveys | Total Acreage of Previously Surveyed Areas within Build Alternatives LOD |
|---|---|---|---|---|
| Dallas | 22 | 7 | 29 | 161.5 |
| Ellis | 8 | 5 | 13 | 6.2 |
| Navarro | 15 | 0 | 15 | 6.2 |
| Freestone | 10 | 2 | 12 | 126.7 |
| Limestone | 2 | 0 | 2 | 0 |
| Leon | 12 | 6 | 18 | 124.9 |
| Madison | 1 | 2 | 3 | 151.5 |
| Grimes | 8 | 4 | 12 | 128.5 |
| Waller | 2 | 0 | 2 | 0 |
| Harris | 24 | 7 | 31 | 57.3 |

**Table 3.19-7: Previously Conducted Archeological Surveys Within 1,000 Meters of the Build Alternatives LOD**

| County | Areal Surveys | Linear Surveys | Total Surveys | Total Acreage of Previously Surveyed Areas within Build Alternatives LOD |
|---|---|---|---|---|
| Total Surveys | **104** | **33** | **137** | **762.8** |

Source: TASA 2017

Twenty previously recorded archeological sites were identified within the LOD of the Build Alternatives. The previously recorded sites include 6 prehistoric campsites, 2 prehistoric artifact scatters, 1 prehistoric quarry, 1 unknown prehistoric site, 3 historic homesteads, 1 historic mining community, 1 historic bridge, 1 historic rail line, 2 historic artifact scatters and 1 multi-component site. The remaining site is classified as unknown. Seven of the sites have an unknown NRHP eligibility, while 13 of these sites were previously determined not eligible. No previously recorded archeological sites within the LOD were previously determined eligible for inclusion in the NRHP (**Table 3.19-8**).

**Table 3.19-8: Previously Recorded Archeological Sites Within the Build Alternatives LOD**

| County/Segment | Site Number | Site Type | NRHP Status |
|---|---|---|---|
| **Dallas** | | | |
| Segment 1 | No sites | | |
| **Ellis** | | | |
| Segment 1 | No sites | | |
| Segment 2A | 41EL182 | Unknown | Unknown |
| Segment 2B | 41EL239 | Unknown Prehistoric; lithic scatter<br>Historic; ceramic, glass | Not eligible |
| Segment 3A | No sites | | |
| Segment 3B | No sites | | |
| Segment 3C | No sites | | |
| **Navarro** | | | |
| Segment 3A | 41NV17 / Pisgah Ridge | Unknown Prehistoric; quarry | Unknown |
| Segment 3A | 41NV673 | Historic; artifact scatter; cistern | Not eligible |
| Segment 3B | 41NV43 | Unknown Prehistoric | Unknown |
| Segment 3B | 41NV376 | Historic Love Bridge | Unknown |
| Segment 3C | 41NV658 / Redden Site | Unknown Prehistoric; campsite | Not eligible |
| **Freestone** | | | |
| Segment 3C | 41FT437 | Prehistoric; Hell Gap point, bifaces, debitage | Not eligible |
| Segment 4 | 41FT510 | Historic; farmstead | Not eligible |
| **Limestone** | | | |
| Segment 4 | No sites | | |
| **Leon** | | | |
| Segment 3C | 41LN363 | Unknown Prehistoric; campsite | Not eligible |

| Table 3.19-8: Previously Recorded Archeological Sites Within the Build Alternatives LOD | | | |
|---|---|---|---|
| **County/Segment** | **Site Number** | **Site Type** | **NRHP Status** |
| Segment 3C | 41LN364 | Unknown Prehistoric; campsite | Not eligible |
| Segment 3C | 41LN472 | Historic; farmstead | Not eligible |
| Segment 3C | 41LN475 | Unknown Prehistoric; lithic scatter | Unknown |
| Segment 4 | 41LN28 | Historic; mining community | Not eligible |
| **Madison** | | | |
| Segment 3C | No sites | | |
| Segment 4 | 41MA49 | Unknown Prehistoric; campsite | Not eligible |
| Segment 4 | 41MA52 | Unknown Prehistoric; campsite | Not eligible |
| **Grimes** | | | |
| Segment 3C | No sites | | |
| Segment 4 | No sites | | |
| Segment 5 | 41GM309 | Historic; homestead | Not eligible |
| Segment 5 | 41GM460 | Unknown Prehistoric; campsite | Unknown |
| **Waller** | | | |
| Segment 5 | 41WL33 | Unknown Prehistoric; lithic debitage, point base, pottery | Not eligible |
| **Harris** | | | |
| Segment 5 | 41HR399 | Historic; railroad | Unknown |

Source: TASA 2017

Five previously unrecorded archeological sites were documented during the survey (41EL268, 41EL269, 41EL270, 41NV733 and 41FT644), along with two historic isolated archeological resources (IF-EL-1 and IF-NV-1). In addition, four previously recorded sites were revisited (**Table 3.19-9**). Three of these sites (41NV673, 41NV658 and 41FT510) were previously determined not eligible for inclusion in the NRHP and site 41NV17 had an unknown determination. THC concurrence has been obtained on the assessment of the NRHP eligibility of the three newly recorded archeological sites in Ellis County (41EL268, 41EL269 and 41EL270) and previously recorded site 41NV17 in Navarro County. The NRHP eligibility of previously unrecorded sites 41NV733 and 41FT644 is undetermined. Copies of the correspondence from the THC are provided in **Appendix E, Cultural Resources Technical Memorandum.**

| Table 3.19-9: Archeological Sites Newly Identified or Revisited During Survey of the Build Alternatives LOD | | | | |
|---|---|---|---|---|
| **Site** | **County** | **Segment** | **Description** | **NRHP Eligibility** |
| [1]41EL268 | Ellis | 2B | Historic; farmstead | Not Eligible |
| [1]41EL269 | Ellis | 2B | Historic; farmstead | Not Eligible |
| [1]41EL270 | Ellis | 2B | Historic; artifact scatter | Not Eligible within the LOD |
| Isolated Find (IF-EL-1) | Ellis | 2A | Historic; small brick scatter | Not Eligible |
| [2]41NV17/ Pisgah Ridge Site | Navarro | 3A | Unknown Prehistoric; quarry site | Not Eligible within the LOD |

| Table 3.19-9: Archeological Sites Newly Identified or Revisited During Survey of the Build Alternatives LOD | | | | |
|---|---|---|---|---|
| **Site** | **County** | **Segment** | **Description** | **NRHP Eligibility** |
| [2]41NV673 | Navarro | 3A | Historic; occupation site; destroyed | Not Eligible |
| [2]41NV658/ The Redden Site | Navarro | 3C | Prehistoric campsite; site destroyed | Not Eligible |
| [1]41NV733 | Navarro | 3A | Historic; brick well with concrete slip and corral | Undetermined |
| Isolated Find (IF-NV-1) | Navarro | 3A | Historic; small brick scatter | Not Eligible |
| [2]41FT510 | Freestone | 4 | Historic; farmstead; partially within APE | Not Eligible |
| [1]41FT644 | Freestone | 4 | Historic; brick-lined well | Undetermined |

Source: AECOM, 2017
[1]Newly identified archeological site
[2]Previously recorded archeological site revisited/relocated during survey

Archeological fieldwork conducted to-date has been in conformance with the Research Design Report in coordination with THC and has been supervised by an archeological professional that 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 are to: identify and inventory archeological resources within accessible portions of the 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. Fieldwork for the archeological investigations covered a total of 2,289.88 acres in the counties of Ellis, Navarro, Freestone and Leon as of April 15, 2016, although due to refinements of the LOD, there are reductions in the surveyed acreage remaining within the Build Alternatives APE. Approximately 88 percent of the archeological 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 Build Alternatives post-fieldwork. The results of the initial historic and archeological surveys are discussed in **Section 3.19.4.2.**

The initial phase of the survey focused in areas designated as EMU 2 (see **Table 3.19-3** for full definitions of EMU 1 through EMU 9), which constitutes approximately 46 percent of the APE overall (**Table 3.19-10**), combined with the land areas where right-of-entry was granted. Areas designated as EMU 2 have the highest combination of archeological and integrity potential requiring only pedestrian and shovel testing survey methods. Components of the survey included reconnaissance, shovel testing, inspection of stream cut banks, animal burrows, historic road beds and animal paths.

Pedestrian survey and shovel testing was also conducted in portions of the other EMUs, and was carried out in accordance with the methodology presented in the Archeological Research Design, provided in **Appendix E, Cultural Resources Technical Memorandum.** EMU 1 constitutes the highest overall potential for site presence and preservation, making up approximately 9 percent of the archeological APE. The majority of EMU 1 is mapped along Holocene-age alluvial floodplain deposits, where the likelihood for deeply buried sites would typically necessitate deep mechanical prospection (e.g., backhoe trenching), a highly intensive level of field effort. The PA will require all field efforts conducted in areas designated as EMU 1 be completed prior to construction.

**Table 3.19-10: Fieldwork Conducted as of 4/15/2016 Within Evaluation Mapping Units of APE**

| EMU | Total APE Miles | EMU % of APE | Miles Surveyed | % of APE Surveyed | % of EMU Surveyed |
|---|---|---|---|---|---|
| 1 HAP-HIP | 41.72 | 10 | 3.12 | 0.76 | 8.02 |
| 2 HAP-MIP | 187.1 | 46 | 30.38 | 7.47 | 16.13 |
| 3 HAP-LIP | 50.93 | 13 | 3.58 | 0.88 | 7.01 |
| 4 MAP-HIP | 2.6 | 1 | 0.15 | 0.04 | 4.67 |
| 5 MAP-MIP | 54.66 | 13 | 9.18 | 2.26 | 16.08 |
| 6 MAP-LIP | 14.61 | 4 | 1.24 | 0.30 | 8.36 |
| 7 LAP-HIP | 0.00 | 0 | 0.00 | 0.00 | 0.00 |
| 8 LAP-MIP | 49.65 | 7 | 0.95 | 0.23 | 3.12 |
| 9 LAP-LIP | 24.26 | 6 | 0.002 | 0.0004 | 0.009 |
| **Total** | **405.53** | **100** | **48.602** | **11.9404** | **-** |

Source: AECOM, 2016
Notes: A – Archeological H – High I – Integrity L – Low M – Moderate P – Potential

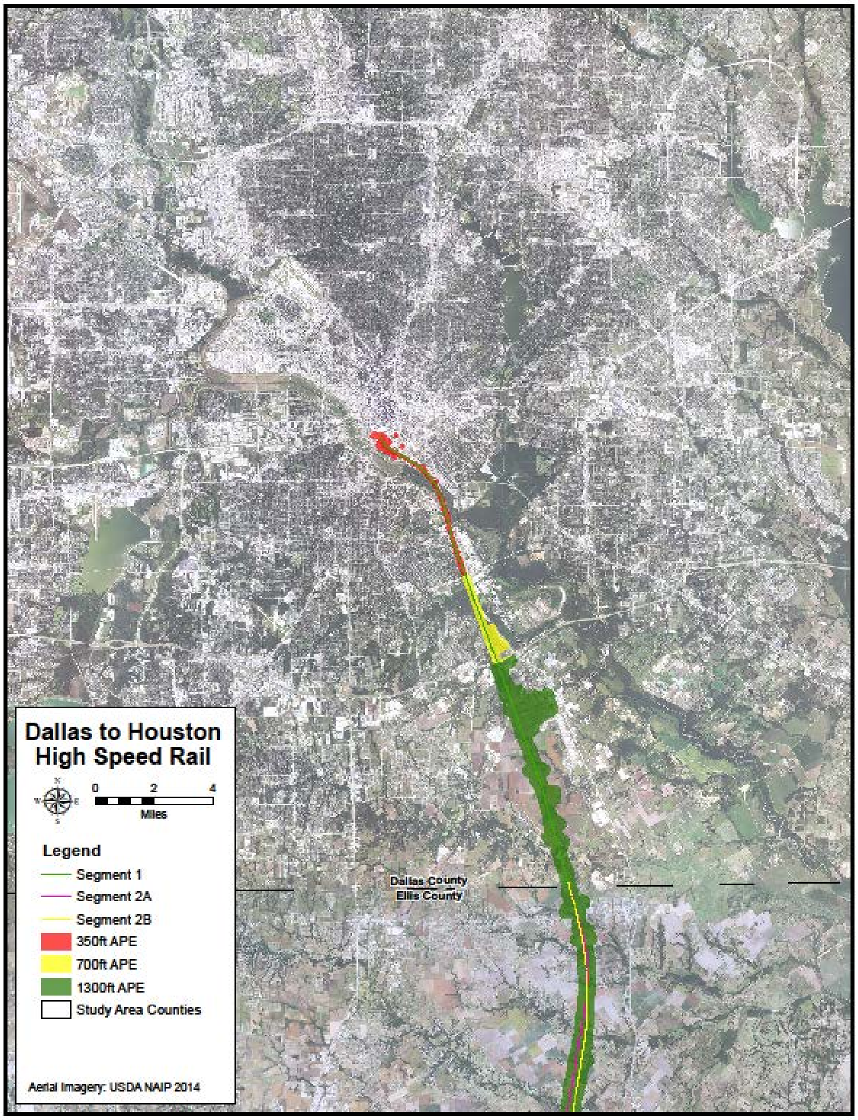
### 3.19.4.2 Cultural Resources by County

#### *3.19.4.2.1 Dallas County*

**Historic Resources**

The development along Segment 1 in Dallas County varies from urban, suburban and rural, with an associated APE for historic resources that varies from 350 feet, 700 feet and 1,300 feet. **Figure 3.19-1** illustrates the variable APE within Dallas County.

**Figure 3.19-1: Dallas County Variable Historic Resources APE**




Source: AECOM, 2017

A total of 254 historic resources (located on 205 sites) were identified within the historic resources APE of Segment 1 in Dallas County. The historic resources include domestic, agricultural, industrial, transportation, government, educational, funerary, commercial and religious property types. Of these, 172 historic resources (located on 141 sites) were recorded in the field and evaluated for NRHP eligibility. Of the evaluated historic resources, 29 (located on 22 sites) were found to retain sufficient integrity to convey significance to qualify for listing in the NRHP, and are determined historic properties. Six of these resources are located within the Segment 1 LOD in Dallas County, and will be exposed to potential direct impacts. Brief descriptions of each of the 29 historic properties are provided below.

The remaining 145 evaluated historic resources (located on 119 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

145 resources were not eligible for listing in the NRHP. The THC response letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total 254 historic resources, 82 (located on 64 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. All of these resources were found to lack significance and/or integrity, and are determined not eligible for listing in the NRHP.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. Determinations for historic resources identified in Dallas County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**. Brief descriptions of the 29 historic properties are provided below.

<u>DA.009 (Residence at 1300 Powhattan St.): **NRHP-eligible**</u>
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 Yonack, 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* 1906 July 15). At the time the 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 (Doty 2012). 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 gable 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 ca. 2007 two-car garage with a front-facing gable roof and overhead door is also located on the site. The 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 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

Resource DA.009 remains eligible for listing in the NRHP under Criteria A and C. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.010 (Residence at 1214 Powhattan St.): **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* 1906 July 15). 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 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 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 resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.016 (former KIXL Studios): **NRHP-eligible**
Site DA.016, located at 1401 S. Akard St., 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 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 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 Build Alternatives would have no impact on this property and it was determined the resource will be treated as potentially-eligible for listing in the NRHP. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.020 (Good Luck Oil Company): **NRHP-eligible**
Site DA.20, located at 904 Cadiz St., contains one commercial building constructed ca. 1934 (Resource DA.020) located in a mixed urban, commercial and industrial setting in south Dallas. Historically a gas station, the resource is angled toward the intersection of Cadiz and Lamar streets to provide auto access from both sides and is surrounded by concrete paving and a metal fence. Although the resource has been modified, it is currently a City of Dallas Landmark Structure.

Resource DA.020 is a one-story building with an irregular plan and a flat roof with low rounded parapet. The building was formerly part of the independent 'Good Luck' gas station company chain, based in Dallas during the early to mid-twentieth century that is no longer in business. The exterior walls are clad with a smooth stucco finish painted white and exhibits Art Deco stylistic elements. The owner/architect was reportedly influenced by the Art Moderne architecture he observed while visiting the nearby Texas Centennial at Fair Park in 1936. The key Art Deco feature on this building is a prominent stepped tower with curved edges that projects at the center of the building. Other Art Deco stylistic details include rounded window and door openings.

The main section of the building originally contained an office, restroom facilities and garage bays with a flat roof canopy projecting from the façade. The canopy originally had three open sides for automobile access, but it has since been enclosed and now exhibits a metal-frame, fixed window. The enclosure has partially enclosed the elliptical display windows that flanked the main central entry beneath the canopy. Three of the arched garage bay openings are still visible, but two were enclosed and one appears to retain an original overhead door that is non-functional. Black, glossy ceramic tiles are exhibited in a horizontal band around the foundation but are missing in many areas.

A ca. 1930s photograph shows the building also displayed extensive neon signage, including the name of the company in large capital letters with a horseshoe on both the tower and on all sides of the canopy. Additional lettering can be seen in the historic photograph above the garage bays and secondary door openings. No signage is extant on the building. Multiple gas pumps were located beneath the canopy and to the north and south of the building, but are no longer extant. One oval porcelain sign with the wording, 'USE GLOCO GAS-OIL' is present. The 'GLOCO' name was an abbreviation of the Good Luck Oil Company. The resource retains integrity of location; however, integrity of design, materials, workmanship, setting, feeling and association was diminished by modifications and changes to the surrounding landscape, including loss of adjacent buildings and modern construction.

Resource DA.020 was previously evaluated during a survey conducted by TxDOT in 2004, as part of the Pegasus project. The resource was determined not eligible for listing in the NRHP due to loss of integrity from alterations. The THC concurred with the determination.

During the current investigation, Resource DA.020 was re-evaluated and through consultation with the THC, it was found that previous alterations believed to diminish the resource's integrity could be reversed. The resource is also the last remaining station with this design. Therefore, the resource does retain sufficient integrity to convey significance as a commercial building constructed in the Art Deco style of architecture. Based on the consultation with the THC, FRA determined Resource DA.020 is eligible for listing in the NRHP, at the local level of significance, under Criterion C as a significant example of commercial Art Deco architecture. The resource is within the 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 S. Lamar St., contains the Chase Bag Company building constructed in 1928 with Neo-Classical stylistic influence (Resource DA.022). The building façade faces S. Lamar and the rear of the building faces Austin St. At the time the 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* 23 March 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 (Dallas Public Library 2016). 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 S. Lamar St. The second section of the building is to the southwest and consists of a one-story with pop-up that is three bays wide and ten bays deep, facing Austin St. 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 S. Lamar St, 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-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 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-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 resource is within the 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 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 Pegasus project. The resource was determined eligible for listing in the NRHP at the local level of 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, in consultation with the THC, 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. The boundary for the historic property is determined to include both associated railroad bridges, stariways, retaining walls, guardrails and decorative elements. The 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 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 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 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 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 resources are within the APE of Segment 1 in Dallas County, but are not located within the LOD.

<u>DA.028 (Dallas Coffin Company): **NRHP-listed (Contributing resource to local, City of Dallas designated Sears Complex historic district)**</u>

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 has been restored to its original configuration. 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 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 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 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 resource and City of Dallas historic district are within the 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 of 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 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 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 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 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 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 resource to the NRHP-eligible Sears Roebuck and Company Catalog Merchandise Distribution Center Historic District. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

<u>DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center):</u> <u>**Individually NRHP-eligible and Contributing Resource to Historic District**</u>

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 of 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 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 by 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 resource, there are few visible modifications to design, materials and workmanship. Visisble 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 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 of 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 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 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 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 resource to the NRHP-eligible Sears Roebuck and Company Catalogue Merchandise Distribution Center Historic District. The resource is within the 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 St., 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* 25 April 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 further 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 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 was 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 resource to the NRHP-eligible Sears Roebuck and Company Catalogue Merchandise Distribution Center Historic District. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

<u>DA.041 (Sigel's Liquor Store): **NRHP-eligible**</u>
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 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 resource's abandonment.

Although Resource DA.041 exhibits some material modifications, the 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 Modern 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 resource is within the 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, described as a "…gift manufacturing concern…" (*Dallas Morning News* 24 July 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 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* 2 September 1951; *Dallas Morning News* 17 October 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 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 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, Resource DA.048 remains eligible for listing in the NRHP under Criterion C. The resource is within the 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 road traffic along Corinth Street. The resource was constructed in 1932 per a plaque embedded in the concrete railing, and was 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 9 tracks, while the tracks of the northern bridge were removed. Two lanes of road traffic flow below the structure. Concrete stairs for pedestrian access are located at the north ends of the bridge. The 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 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. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

<u>DA.070 (Corinth Street Viaduct): **NRHP-eligible**</u>
Site DA.070 is the Corinth Street Viaduct, constructed in 1930 that spans the Trinity River flood plain (Resource DA.070). The bridge has a variable-depth, haunched cantilever girder main span with 64 cast-in-place girder approach spans. The main span exhibits the same concrete fascia finish as the flanking approach spans. The bridge retains its original concrete railing with I-shaped balusters. At the time of its construction the bridge featured the largest steel girders fabricated in Texas. The bridge was one of four viaducts constructed over the Trinity River Floodway during a three-year period between 1929 and 1931. The four bridges were intended to relieve congestion on the Houston Street viaduct. The resource retains integrity of location, design, setting, feeling, materials, workmanship and association.

Resource DA.070 was previously evaluated during a survey conducted by TxDOT in 2009 as part of the Trinity River Parkway Corridor project. The 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 the full length of the bridge, the approach spans, guardrails and decorative elements.

During the current investigation, Resource DA.070 was re-evaluated. No new information was identified to dispute the previous determination. Therefore, FRA, in consultation with the THC, determined Resource DA.009 remains eligible for listing in the NRHP under Criteria A and C. The resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

<u>DA.072 (Dallas Floodway Historic District): **NRHP-eligible**</u>
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 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 of the 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 crossed by the LOD.

DA.076a-b (Guiberson Corporation): **NRHP-eligible**

Site DA.076, located at 1000 Forest Ave., 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 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 clearstory windows. The 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 resource retains sufficient integrity of location, design, feeling, setting, materials and workmanship to convey its association with the Guiberson Corporation.

The remaining resources on the property (Resources DA.076c-h) include several support buildings 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 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 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 resources associated with the former Procter and Gamble manufacturing facility, which is now a Dallas ISD storage facility (Resources DA.080a-e). The majority of the 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 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 photograph from 1952 to 1989, but by the 1995 aerial photograph, the tanks were removed. The resource does not retain integrity of location, design, materials, workmanship, feeling and association. The 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 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 resource 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 doors are a mix of single-entry glazed metal units and rolling overhead metal doors at the loading bays. The 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 resource is located on the northwest corner of the lot, near Lenway St. The 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 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 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 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 resources on Site DA.080, Resource DA.080a is located outside the APE, although the remaining resources are within the APE of Segment 1 in Dallas County, but are not located within the LOD.

<u>DA.082 (Honey Springs Cemetery): **NRHP-eligible**</u>
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* 9 July 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 1000 burials, meaning there are potentially 443 to 943 grave sites 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 2-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 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 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 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 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 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 will be required by the PA. The resource is located within the LOD of Segment 1 in Dallas County.

DA.104 (Railroad Bridge at E. Illinois Ave.): **NRHP-eligible**

Site DA.104 consists of a railroad bridge over E. Illinois Ave., 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 resource retains integrity of location, design, setting, materials, workmanship, feeling, and association. Resource DA.104 is an excellent example of an Art Modern 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 resource is within the APE of Segment 1 in Dallas County, but is not located within the LOD.

DA.110a-b (Smith/Kinnard Family Cemetery [DA.110a]: **NRHP-eligible**; Linfield Elementary School [DA.110b]): **NRHP-eligible**

Site DA.110, located at 3820 E. Illinois Ave., 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 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 resource on this site is the former Linfield Elementary School (Resource DA.110b). Dallas CAD data identifies 1956 as the date of construction, but the resource is visible on the 1952 aerial photograph. Based on this research, the date of construction for Resource DA.110b is estimated to be ca. 1950. Information provided by the THC for the Linfield Elementary School states:

> "In September 1954, nearly four months after the Supreme Court's ruling 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, only to be denied. For years, the Wilmer-Hutchins school board regularly closed the children's nearby segregated school, the Melissa Pierce School, for six weeks each fall, reportedly "at the request of 'two prominent white farmers' who needed cotton pickers." (Vernon Daily Record 7 September 1954)

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. Although the cemetery dates to an earlier period than the elementary school located on the same parcel, at this time it is unknown if the two resources share a deeper association. 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. As mentioned, integrity of association remains unknown.

Resource DA.110b is the Linfield Elementary School. 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. The resource retains integrity of location, materials and workmanship, but integrity of design, setting and feeling has been diminished by additions and the change in the use of the building and in the surrounding landscape. Integrity of association requires further investigation.

Based on the results of the current investigation, FRA, in consultation with the THC, has determined an intensive-level investigation is required to clarify the historic association between Resources DA.110a and DA.110b, as well as to assess the significance of Resource DA.110b to the local civil rights and school desegregation movements. The NRHP eligibility of these resources is undetermined and both resources will be treated as eligible for listing in the NRHP. Both resources are within the LOD of Segment 1 in Dallas County, and consultation with the THC will continue as will be required by the PA.

DA.194 (W. A. Strain House Historic District): **NRHP-listed Historic District**

Site DA.194 consists of the W. S. 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 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 will be required by the PA. The results will be included as an addendum to the interim report. The site is partially within the APE of Segment 1 in Dallas County, but is not located within the LOD.

### Archeological Resources

Segment 1 in Dallas County encompasses 1,001.2 acres along 16.8 miles of the Build Alternatives. A review of the TASA indicates 30 previous cultural resources investigations were conducted 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 Build Alternatives and north of IH-20. Approximately 161.5 acres of the Segment 1 LOD in Dallas County has been previously surveyed as part of a separate investigation, but no archeological sites were discovered within the LOD of Segment 1.

The literature review and background research also identified 40 previously recorded archeological resources within the Archeological Study Area in Dallas County, including 36 archeological sites (14 prehistoric, 19 historic, 2 multi-component and 1 of unknown temporal association) and 4 historic cemeteries (see **Table 3.19-6**). Twenty-seven of the sites were determined not eligible for listing in the NRHP, 5 sites have an unknown eligibility status and 4 sites were previously determined eligible for listing in the NRHP. None of these archeological sites are located within the LOD.

The four historic cemeteries within the study area in Dallas County include Overton Cemetery, Smith/Kinnard Family Cemetery (DA.110a), Edgewood Cemetery and Honey Springs Cemetery (DA.082). Two of the cemeteries (Overton Cemetery and Smith/Kinnard Family Cemetery) have HTC designations. The Smith/Kinnard Family Cemetery has been determined to be treated as NRHP-eligible and 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 Build Alternatives (see discussions of Resources DA.082 and DA.110a above). The remaining cemetery has no designation. The Smith/Kinnard Cemetery and Honey Springs Cemetery are within the LOD of Segment 1. Due to the historic cemeteries being within the LOD, additional archeological investigations are necessary and will be conducted prior to construction, as will be required by the PA.

Based on the background review and the archeological probability matrix developed for this investigation, Segment 1 contains approximately 11 miles of High Archeological Potential (5.3 miles of EMU 1, 3.6 miles of EMU 2 and 2.1 miles of EMU 3). An additional 3 miles of Segment 1 are classified as having Moderate Archeological Potential, (1.7 miles of EMU 5 and 1.3 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***

The entire LOD was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

A total of 113 historic resources (located on 65 sites) were identified within the historic resources APE in Ellis County. The historic resources include domestic, agricultural and funerary property types. Of these, 27 resources (located on 20 sites) were recorded in the field and evaluated for NRHP eligibility. All 27 of the evaluated historic resources were found to lack integrity and/or did 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 current investigation, FRA, in consultation with the THC, determined the 27 evaluated resources are not eligible for listing in the NRHP. The THC concurrence letter dated June 13, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total 113 identified historic resources, 86 (located on 45 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. Eighty-one of these resources were found to lack significance and/or integrity to qualify for listing in the NRHP.

Five of the historic resources not recorded in the field (located on 3 sites) appear to retain sufficient integrity to convey significance and are determined to have moderate potential for NRHP eligibility. Four of these resources are within the Segment 2A APE and one resource is within the APE of Segments 3B and 3C. None of these five resources are within the LOD. Below is brief description of each of these five resources.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. All determinations for historic resources identified in Ellis County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

EL.031a-c: **Potentially NRHP-eligible**

Site EL.031a-c, located at 717 Slovacek Rd., consists of a domestic-single family dwelling (Resource EL.031a) and two agricultural outbuildings (Resources EL.031b-c) constructed in ca. 1920. The resources were not recorded in the field, but appear to retain sufficient integrity to convey historic and architectural significance. Based on the results of the current investigation, FRA determined Resources EL.031a-c have a moderate potential for NRHP eligibility under Criterion A for agricultural development in Ellis County and Criterion C for architecture. Resources EL.031a-c will be field verified and consultation with the THC will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. The resources are within the APE of Segment 2A in Ellis County, but are not located within the LOD.

EL.040 (Boren Cemetery): **Potentially 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 Spanish-American War and the Civil War and was designated as an HTC in 2005. The cemetery was not recorded in the field, but appears to retain sufficient integrity to convey historic significance and association with early community development in Ellis County. 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 determined Resource EL.040 has a moderate potential for NRHP eligibility under Criterion A for association with early community development in Ellis County and Criteria Consideration D: Cemeteries. The resource is within the APE of Segment 2A in Ellis County, but is not located within the LOD.

EL.062: **Potentially NRHP-eligible**
Site EL.062, located at 3160 FM 985, consists of a domestic-single family dwelling constructed in ca. 1910 (Resource EL.062). The resource was not recorded in the field, but appears to retain sufficient integrity to convey historic and architectural significance. Based on the current investigation, FRA determined Resource EL.062 has a moderate potential for NRHP eligibility under Criterion C at the local level of significance for architecture. The resource is within the APE of Segments 3B and 3C in Ellis County, but is not located within the LOD.

### Archeological Resources

A review of the TASA indicates 13 previous cultural resources investigations were conducted 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 LOD of Segments 1, 2A, 2B, 3A and 3B. Approximately 6.2 acres of the combined LOD in Ellis County was surveyed as part of a previous investigation, but no archeological sites were discovered.

The literature review and background research conducted for this investigation also identified 21 previously recorded archeological resources with the study area in Ellis County, including 17 archeological sites (5 prehistoric, 8 historic, 1 multi-component and 3 with unknown components or temporal association) and 4 historic cemeteries (see **Table 3.19-6**). Twelve 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 LOD. One site of unknown temporal association (41EL182) is within the LOD of Segment 2A and one multi-component site of prehistoric and historic artifact scatters (41EL239) is within the LOD of Segment 2B. No previously recorded archeological sites were identified within the LODs of Segments 3A, 3B and 3C in Ellis County.

The four historic cemeteries within the study area in Ellis County include Bluff Springs Cemetery, Boren Cemetery (EL.040), Grady Cemetery (EL.058) and Geaslin Cemetery (EL.016a). Two of the cemeteries (Bluff Springs Cemetery and Boren Cemetery) have HTC designations. The remaining two cemeteries have no designations. The Geaslin Cemetery is located within the LOD of Segment 2A. No cemeteries are within the LODs of Segments 2B, 3A, 3B and 3C in Ellis County. Due to the historic Geaslin Cemetery being within the LOD, an archeological investigation is necessary and will be conducted prior to construction, as will be required by the PA.

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 miles of High Archeological Potential (0.6 miles of EMU 2); 0.7 miles of Moderate Archeological Potential (0.7 miles of EMU5); and 0.2 miles of Low Archeological Potential (0.2 miles of EMU 8).

*Segment 2A:* contains approximately 15.6 miles of High Archeological Potential (2.8 miles of EMU 1, 11.6 miles of EMU 2 and 1.2 miles of EMU 3). An additional 5.6 miles of Segment 2A are classified as having Moderate Archeological Potential (0.5 miles of EMU 4, 4.7 miles of EMU 5 and 0.4 miles of EMU 6). The remaining 2.3 miles of Segment 2A in Ellis County are classified as having Low Archeological Potential (2.3 miles of EMU 8).

*Segment 2B:* contains approximately 16.1 miles of High Archeological Potential (2.4 miles of EMU 1, 11.5 miles of EMU 2 and 2.2 miles of EMU 3). An additional 4.8 miles of Segment 2B are classified as having Moderate Archeological Potential (0.3 miles of EMU 4, 4.4 miles of EMU 5 and 0.1 miles of EMU 6). The remaining 2.6 miles of Segment 2B are classified as having Low Archeological Potential (2.5 miles of EMU 8 and 0.1 miles of EMU 9).

*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 0.9 miles of High Archeological Potential (0.9 miles of EMU 2 and 0.02 miles of EMU 3). An additional 0.6 miles of each segment is classified as having Moderate Archeological Potential (0.2 miles of EMU 4, 0.3 miles of EMU 5 and 0.1 miles of EMU 6). The remaining 0.6 miles 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 LOD in Ellis County was surveyed through the literature review and background research, as presented above. Archeological fieldwork in Ellis County was conducted for 408.81 acres within Segment 2A and 192.48 acres within Segment 2B of the Build Alternatives. Fieldwork in Ellis County resulted in the identification of three previously unrecorded archeological sites, 41EL268, 41EL269 and 41EL270, located 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 isolated find (IF-EL-1), a small brick scatter, were recorded within the LOD of Segment 2A.

The three sites and isolated find are not associated with events that have made a significant contribution to the broad patterns of our history; are not associated with the lives of significant persons in our past; do not embody the distinctive characteristics of a type, period, or method of construction; nor do they yield or are likely to yield, information important in history or prehistory. The sites do not display any archaeological deposits that are preserved and intact thereby supporting the research potential or preservation interests.

FRA, in consultation with the THC, determined Sites 41EL268, 41EL269 and IF-1 are not eligible for inclusion in the NRHP, as well as the portion of Site 41EL270 within the LOD. 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 (**Appendix E, Cultural Resources Technical Memorandum)**.

The results of the investigation, including fieldwork and literature review and background research for the entire LOD, were compiled in a second archeological resources interim report covering all 10 counties. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

#### *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.

A total of 161 historic resources (located on 108 sites) were identified within the historic resources APE in Navarro County. The historic resources include domestic, agricultural and funerary property types. Of these, 82 resources (located on 48 sites) were recorded in the field and evaluated for NRHP eligibility. All 82 of these 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 current investigation, FRA, in consultation with the THC, determined these 82 evaluated resources are not eligible for listing in the NRHP. The THC concurrence letter dated June 14, 2017 is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total 161 identified historic resources, 79 (located on 60 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. Seventy-eight of these resources were found to lack significance and/or integrity to qualify for listing in the NRHP.

One of the historic resources not recorded in the field appears to retain sufficient integrity to convey significance and is determined to have moderate potential for NRHP eligibility. The resource is located within the Segment 3B APE, but is not within the LOD. A brief description of the resource is provided below.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. Determinations for historic resources identified in Navarro County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

NA.078: **Potentially NRHP-eligible**

Site NA.078, located at 7145 NW CR 1200, consists of a domestic-single family dwelling constructed in ca. 1920 (Resource NA.078). The resource was not recorded in the field, but appears to retain sufficient integrity to convey historic and architectural significance. Based on the results of the current investigation, FRA determined Resource NA.078 has a moderate potential for NRHP eligibility under Criterion C for architecture. The resource is within the APE of Segment 3B in Navarro County, but is not located within the LOD.

### Archeological Resources

Relatively few systematic surveys were previously conducted within the Build Alternatives LOD in Navarro County. Due to the proximity of the segment alignments, the Archeological Study Areas overlap, but the respective LODs remain unique to each segment. A review of the TASA indicates 13 cultural resources investigations were conducted 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 LOD of Segments 3A, 3B and 3C in Navarro County. Approximately 6.2 acres of the LOD in Navarro County was previously surveyed as part of separate investigations, but no archeological sites were discovered within the LOD.

The literature review and background research also identified 26 previously recorded archeological resources within the Archeological Study Area in Navarro County, including 19 archeological sites and 7 historic cemeteries (see **Table 3.19-6**). Of the previously recorded archeological resources, seven are within the study area of Segment 3A; 5 prehistoric sites, 1 historic site and 1 multi-component site. Five of the sites were determined not eligible for inclusion in the NRHP and 2 sites have an unknown eligibility status. None of the previously recorded archeological sites within the Study Area of Segment 3A were determined eligible for listing in the NRHP in Navarro County. Two of these archeological sites are within the LOD of Segment 3A, an ineligible historic cistern (41NV673) and a prehistoric quarry with unknown eligibility (41NV17).

Within the study area of Segment 3B, a total of 8 previously recorded archeological sites were identified; 3 prehistoric sites, 3 historic sites and 2 sites that have unknown temporal association. All eight of the sites were determined not eligible for inclusion in the NRHP. Two of these sites are present within the LOD of Segment 3B, a historic concrete bridge (41NV376) and a site with unknown temporal association (41NV43).

Eleven archeological sites were previously recorded within the Study Area of Segment 3C; 7 prehistoric sites, 1 historic site and 3 multi-component sites. Eight of the sites were determined ineligible for listing in the NRHP. The remaining three sites have an unknown NRHP status. One of these sites is within the LOD of Segment 3C (41NV658), an ineligible prehistoric campsite.

The seven historic cemeteries within the Study Area of Segments 3A, 3B and 3C include the Ward Family Cemetery (NA.040), Anderson Family Cemetery (NA.046), Shelton Family Cemetery (NA.050), Powers Cemetery, Cryer Creek Cemetery, Marshall Cemetery and Resthaven Memorial Park. Four of the cemeteries (Ward Family Cemetery, Anderson Family Cemetery, Shelton Family Cemetery and Powers Cemetery) have HTC designations. The remaining three cemeteries have no designations. None of the cemeteries are located within the LODs of Segments 3A, 3B or 3C in Navarro County, or are in proximity to the LOD 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 23.0 miles of High Archeological Potential (5.6 miles of EMU 1, 15.9 miles of EMU 2 and 1.6 miles of EMU 3). An additional 5.0 miles of Segment 3A are classified as having Moderate Archeological Potential (0.1 miles of EMU 4, 4.3 miles of EMU 5 and 0.7 miles of EMU 6). The remaining 0.6 miles of Segment 3A are classified as having Low Archeological Potential (0.4 miles of EMU 8 and 0.2 miles of EMU 9).

*Segment 3B:* contains approximately 19.5 miles of High Archeological Potential (1.7 miles of EMU 1, 15.5 miles of EMU 2 and 2.3 miles of EMU 3). An additional 7.2 miles of Segment 3B are classified as having Moderate Archeological Potential (0.2 miles of EMU 4, 5.7 miles of EMU 5 and 1.3 miles of EMU 6). The remaining 2.5 miles of Segment 3B are classified as having Low Archeological Potential (2 miles of EMU 8 and 0.5 miles of EMU 9).

*Segment 3C:* contains approximately 23.8 miles of High Archeological Potential (6.9 miles of EMU 1, 15.7 miles of EMU 2 and 1.2 miles of EMU 3). An additional 5.4 miles of Segment 3C are classified as having Moderate Archeological Potential (0.3 miles of EMU 4, 4.3 miles of EMU 5 and 0.9 miles of EMU 6). Segment 3C contains 0.1 acres of Low Archeological Potential, EMU 8.

***Navarro County Archeological Survey Results***

The entire LOD within Navarro County was surveyed through the literature review and background research, as presented above. Archeological fieldwork in Navarro County was conducted for 272.52 acres within Segment 3A of the Build Alternatives. The fieldwork resulted in the revisit of 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. One previously unrecorded site and one isolated find were located within the LOD of Segment 3A. Site 41NV733 consists of a brick well clad with a concrete slip and a wood and barbed-wire corral, and the isolated find includes IF-NV-1, which consists of a brick scatter. Due to site 41NV733 being just within the LOD, 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 portion of Site 41NV17 within the LOD of Segment 3A was not relocated and no cultural materials from this site were found. Since the entire site could not be accessed and reevaluated, the NRHP eligibility of this site remains as unknown.

The historic Site 41NV673 was determined ineligible for inclusion in the NRHP in 1999. Investigations of this site are consistent with the previous assessment, which was determined to be a low-potential site with little or no research value. What remains of the site is a small brick scatter. No additional artifacts were found and no features were located. The site does not display any archaeological deposits that are preserved and intact thereby supporting any research potential or preservation interests of the site.

Within Segment 3B, archeological fieldwork was conducted for 45.52 acres. No previously unrecorded sites were identified within the LOD.

Archeological fieldwork was conducted for 188.81 acres within Segment 3C, and previously recorded Site 41NV658 was revisited. Site 41NV658 is believed to be a prehistoric campsite. No evidence of the site was located due to the area in which the site was reported being completely removed by quarry activity. The THC had previously determined the site was not eligible for inclusion in the NRHP. The site does not display any archaeological deposits that are preserved and intact thereby supporting any research potential or preservation interests of the site. No previously unrecorded sites were identified during the survey of the LOD of Segment 3C.

The results of the investigation, including fieldwork and literature review and background research for the entire LOD, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

A total of 81 historic resources (located on 56 sites) were identified within the historic resources APE in Freestone County. The historic resources include domestic, agricultural, educational, funerary, commercial and religious property types. Of these, 49 resources (located on 31 sites) were recorded in the field and evaluated for NRHP eligibility. Of the resources recorded in the field, 7 resources (located on 1 site) and a historic cemetery were found to retain sufficient integrity to convey significance to qualify for listing in the NRHP, and are determined historic properties. The 7 resources are located within the APE of Segment 4, but outside of the LOD. The historic cemetery is located within the APE of Segment 3C, but outside the LOD. Below is brief description of each of these resources.

The remaining 41 historic resources recorded in the field (located on 29 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. Based on the results of the current investigation, FRA, in consultation with the THC, determined these 41 evaluated resources are not eligible for listing in the NRHP. The THC concurrence letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total identified historic resources, 32 (located on 25 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. All of these resources were found to lack significance and/or integrity to qualify for listing in the NRHP.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. Determinations for historic resources identified in Freestone County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

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 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 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 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 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 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 these ruins are believed to be associated with 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 these ruins are believed to be associated with 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 resource retains integrity of location and a good degree of design, materials, workmanship, setting, feeling and association. Furthermore, the 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 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 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 resources on the site, as a group, Resources FR.016a-g 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 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 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 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 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 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 resource is located within the historic resources APE of Segment 3C in Freestone County but is not within the LOD.

### Archeological Resources

Systematic surveys within the LOD in Freestone County are concentrated in the southern portion of the county. A review of the TASA indicates 12 cultural resources investigations were previously conducted within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted of linear and areal cultural resources surveys. Approximately 126.73 acres of the LOD in Freestone County were previously surveyed as part of a separate investigation, resulting in the discovery of two archeological sites within the LOD, one within the LOD of Segments 3C and one within the LOD of Segment 4.

The literature review and background research also identified 43 previously recorded archeological resources within the study areas of Freestone County, including 36 archeological sites and 7 historic cemeteries (see **Table 3.19-6**). None of the previously recorded archeological sites or historic cemeteries are within the LOD of Segments 3A and 3B in Freestone County.

Of the previously recorded archeological sites, 27 are within the Study Area of Segment 3C; 13 prehistoric sites and 14 historic sites. Twenty-five of the sites were determined not eligible for listing in the NRHP and 2 sites have an unknown eligibility status. None of the previously recorded archeological sites within the study area of Segment 3C were determined eligible for listing in the NRHP. One previously recorded archeological site is present within the LOD of Segment 3C (41FT437), a prehistoric campsite previously determined not eligible.

Nine of the previously recorded archeological sites are within the Study Area of Segment 4; 4 prehistoric sites, 4 historic sites and 1 multi-component site. None of the previously recorded archeological sites within the study area of Segment 4 were determined eligible for listing in the NRHP. One previously recorded archeological sites is present within the LOD (41FT510), a historic farmstead previously determined not eligible.

The seven historic cemeteries within the study areas in Freestone County include the Red Cemetery (FR.001), Cotton Gin Cemetery (FR.008), 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 Build Alternatives (see discussion of Resource FR.034 above). The remaining five cemeteries have no designation. None of the cemeteries are located within the LODs of Segments 3C or 4 in Freestone County. The Cotton Gin Cemetery is located approximately 100 feet from the LOD of Segment 4. Due to the proximity of the historic cemetery to the LOD, an archeological investigation is required to determine if any unmarked burials are present outside of the modern cemetery boundary. The archeological investigation of the Cotton Gin Cemetery will be conducted prior to construction, as will be required by the PA.

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 0.03 miles of High Archeological Potential, EMU 2.

*Segment 3C:* contains 26.2 miles of High Archeological Potential (3.2 miles of EMU 1, 8.2 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 0.7 miles of Segment 3C are classified as having Low Archeological Potential (0.1 miles of EMU 8 and 0.6 miles of EMU9). One previously recorded archeological site is present within the APE of Segment 3C (41FT437).

*Segment 4:* contains approximately 14.2 miles of High Archeological Potential (2.3 miles of EMU 1, 10.4 miles of EMU 2 and 1.5 miles of EMU 3). An additional 3.9 miles of Segment 4 are classified as having Moderate Archeological Potential (0.4 miles of EMU 4, 3.1 miles of EMU 5 and 0.4 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 LOD within Freestone County was surveyed through the literature review and background research, as presented above. Archeological fieldwork in Freestone County was conducted for 280.89 acres within Segment 4 of the Build Alternatives. Fieldwork in Freestone County resulted in the revisit of previously recorded Site 41FT510, located within Segment 4. The site is a historic farmstead that includes 2 cisterns, a brick lined well and several artifact scatters. Although the majority of the site is outside of the LOD, Site 41FT510 was previously determined to be not eligible for inclusion in the NRHP. No new information was identified during the current investigation to dispute the previous determination. The site does not display any archaeological deposits that are preserved and intact thereby supporting any research potential or preservation interests of the site. One newly recorded site was identified within the LOD of Segment 4. Site 41FT644 is a collapsed historic brick and concrete well. Due to site 41FT644 being just within the LOD, 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 results of the investigation, including fieldwork and literature review and background research for the entire LOD, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

A total of 25 historic resources (located on 14 sites) were identified within the historic resources APE of Segment 4 in Limestone County. The historic resources include domestic, agricultural and funerary property types. Of the historic resources identified in Limestone County, 24 (located on 13 sites) were recorded in the field and evaluated for NRHP eligibility. All 24 of these resources were found to lack integrity and/or do not possess the architectural or historical significant necessary to meet the NRHP guidelines for significance under Criteria A through D. Based on the results of the current investigation, FRA, in consultation with the THC, determined these 24 resources are not eligible for listing in the NRHP. The THC concurrence letter dated August 30, 2016, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total 25 identified historic resources, one was not recorded during fieldwork. The evaluation and NRHP-eligibility potential of the resource is based on the information gathered through the literature review and background research. The resource was found to lack significance and/or integrity to qualify for listing in the NRHP.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum 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

A review of the TASA indicates two cultural resources investigations were previously performed within the 1,000 meter Archeological Study Area, consisting of areal archeological surveys (see **Table 3.19-7**). No systematic surveys have been conducted within the LOD in Limestone County.

The literature review and background research also identified 7 previously recorded archeological resources within the Archeological Study Area in Limestone County, including 5 archeological sites and 2 historic cemeteries (see **Table 3.19-6**). All of the archeological sites are prehistoric; 2 were determined not eligible for listing in the NRHP and 3 have an unknown eligibility status. No previously recorded archeological sites are located within the LOD of Segment 4 in Limestone County.

The two cemeteries within the study area in Limestone County include the Personville Cemetery (LI.005), which has an HTC designation, and the New Hope Cemetery (LI.011), which has no designation. Neither of the cemeteries is located within the LOD 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 in to (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). An estimated 0.2 miles, EMU 8, are classified as having Low Archeological Potential.

#### *Limestone County Archeological Survey Results*

The entire LOD within Limestone County was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

## *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.

A total of 66 historic resources (located on 50 sites) were identified within the historic resources APE in Leon County. The historic resources include domestic, agricultural, funerary and religious property types. Of these, 24 resources (located on 17 sites) were recorded in the field and evaluated for NRHP eligibility. Twenty-three 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 current investigation, FRA, in consultation with the THC, determined 23 resources were not eligible for listing in the NRHP. One historic cemetery (Little Flock Cemetery [LE.001a]) was found to retain sufficient integrity to convey significance to qualify for listing in the NRHP, and was determined a historic property. The historic cemetery is located within the APE of Segment 3C, but outside of the LOD. The THC concurrence letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total identified historic resources, 42 (located on 32 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. Of these, 41 resources were found to lack significance and/or integrity to qualify for listing in the NRHP.

One of the historic resources not recorded in the field appears to retain sufficient integrity to convey significance and is determined to have moderate potential for NRHP-eligibility. The resource is located within the Segment 3C APE, but is not within the LOD. A brief description of the resource is provided below.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. Determinations for historic resources identified in Leon County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

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 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 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 resource is located within the historic resources APE of Segment 4 in Leon County, but is not within the LOD.

LE.048 (Washington School): **Potentially NRHP-eligible**
Site LE.048 consists of the former Washington Perkins School constructed in ca. 1930 (Resource LE.048). The resource was not recorded in the field, but appears to have retained sufficient integrity to convey its historic significance as a rural educational facility. Based on the results of the current investigation, FRA determined Resource LE.048 has a moderate potential for NRHP eligibility at the local level of significance under Criterion A for association with community development in Leon County. The resource is within the APE of Segment 3C in Leon County, but is not located within the LOD.

### Archeological Resources

Numerous systematic surveys previously conducted within the Build Alternatives LOD 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 19 cultural resources investigations were previously conducted 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 LODs of Segments 3C and 4 of the Build Alternatives. Approximately 151.5 acres of the LOD in Leon County has been previously surveyed as part of separate investigations, resulting in the discovery of three prehistoric sites in 2011.

The literature review and background research also identified 104 previously recorded archeological resources with the Archeological Study Area in Leon County, including 93 archeological sites and 11 historic cemeteries (see **Table 3.19-6**).

Of the previously recorded archeological sites, 50 are within the Study Area of Segment 3C; 23 prehistoric sites, 17 historic sites and 10 multi-component sites. Thirty-seven of the sites were determined not eligible for listing in the NRHP, 5 sites have an unknown eligibility status and 8 of the previously recorded archeological sites were determined eligible for listing in the NRHP. Four previously recorded archeological sites are present within the LOD of Segment 3C; 3 prehistoric artifact scatters (41LN363, 41LN364 and 41LN475) and 1 historic farmstead (41LN472), all of which were determined not eligible.

Forty-nine of the previously recorded archeological sites are within the study area of Segment 4; 22 prehistoric sites, 20 historic sites and 7 multi-component sites, of which 27 were determined ineligible for listing in the NRHP, 21 have an unknown eligibility status, and 1 site has been determined eligible, a historic Victorian home site. One site is present within the LOD (41LN28) a historic site determined not eligible.

The 12 historic cemeteries within the 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 Build Alternatives (see discussion of Resource LE.001a above). The remaining 11 cemeteries have no designation. None of the cemeteries are located within the LOD of Segments 3C or 4 in Leon County. The Nettles Cemetery is located approximately 115 feet from the LOD of Segment 3C. Due to the proximity of the historic cemetery to the LOD, additional archeological investigation is required to determine if any unmarked burials are present outside of the modern cemetery boundary. The archeological investigation of the Nettles Cemetery will be conducted prior to construction, as will be required by the PA.

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 24.2 miles of High Archeological Potential (1.6 miles of EMU 1, 8.3 miles of EMU 2 and 14.3 miles of EMU 3). An additional 11.6 miles of Segment 3C are classified as having Moderate Archeological Potential (7.2 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 23.0 miles of High Archeological Potential (2.1 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). The remaining 1 mile of Segment 4 is classified as having a Low Archeological Potential (EMU 8). One previously recorded site is present within the APE of Segment 4 (41LN28).

***Leon County Archeological Survey Results***

The entire LOD within Leon County was surveyed through the literature review and background research, as presented above. Archeological fieldwork in Leon County was conducted for 124.97 acres within Segment 4 of the Build Alternatives. No previously recorded sites were revisited and no previously unrecorded sites were identified during fieldwork.

The results of the investigation, including fieldwork and literature review and background research for the entire LOD, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

Fieldwork for historic resources has not been conducted in Madison County, but the entire LOD was surveyed through the literature review and background research. As a result, a total of 118 historic resources (located on 59 sites) were identified within the historic resources APE in Madison County. The historic resources include domestic, agricultural, commercial, funerary and religious property types. Of the identified resources, 103 were found to lack significance and/or integrity to qualify for NRHP eligibility.

One resource (Oxford Cemetery [MA.019]) was previously evaluated as part of a separate investigation and determined eligible for listing in the NRHP. In addition, 14 of the historic resources (located on 1 site) with no previous determination appear to retain sufficient integrity to convey significance and are determined to have moderate potential for NRHP-eligibility. These resources are located within the Segment 4 APE, but are not within the LOD. Brief descriptions of the resources are provided below.

Based on the results of the current investigation, FRA, in consultation with the THC, determined Resource MA.019 remains eligible for listing in the NRHP, and field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. The THC concurrence letter dated June 30, 2017, and determinations for historic resources identified in Madison County during this investigation are provided in **Appendix E, Cultural Resources Technical Memorandum**.

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 415 feet west of the LOD of Segment 4 of the Build Alternatives, 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 it meets 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 resource is within the APE of Segment 4 in Madison County, but is not located within the LOD.

MA.031a-n (Agricultural Complex): **Potentially NRHP-eligible**
Site MA.031 consists of a domestic-single family dwelling (Resource MA.031a) and 13 agricultural outbuildings (Resources MA.031b-n) constructed pre-1961. The resources are a complex of buildings associated with agricultural development in Madison County. The resources were not recorded in the field, but appear to have retained sufficient integrity of location, design, setting, feeling and association

to convey historic and architectural significance as an agricultural complex. Based on the results of the current investigation, FRA determined Site MA.019 has a moderate potentially for NRHP eligibility at the local level of significance under Criterion A for association with agricultural development in Madison County and Criterion C for architecture. These resources are within the APE of Segment 4 in Madison County, but are not located within the LOD.

### Archeological Resources

Relatively few systematic surveys were previously conducted within the LOD in Madison County. A review of the TASA indicates three cultural resources investigations were conducted within the Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations have consisted of linear and areal cultural resources surveys. Approximately 151.5 acres within the Build Alternatives LOD in Madison County were previously surveyed as part of separate investigations, resulting in the discovery of the two prehistoric archeological sites within the LOD of Segment 4.

The literature review and background research also identified 13 previously recorded archeological resources with the Archeological Study Area in Madison County, including 7 archeological sites and 6 historic cemeteries (see **Table 3.19-6**).

No previously recorded archeological sites or cemeteries are present within the LOD of Segment 3C in Madison County. The 7 previously recorded archeological sites are within the Study Area of Segment 4; 5 prehistoric sites and 2 historic sites, of which 6 were determined ineligible for listing in the NRHP and 1 has an unknown eligibility status. Two of these sites are within the LOD (41MA49 and 41MA52), both are ineligible prehistoric campsites.

The six cemeteries within the Study Area in Madison County include Randolph Cemetery (MA.003), Ten Mile Cemetery (MA.010), Oxford Cemetery (MA.019), Unknown Graves (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 Oxford Cemetery was determined eligible for listing in the NRHP (see discussion of Resource MA.019 above). The remaining four cemeteries have no designation. None of the cemeteries are located within the LOD of Segments 3C and 4 in Madison County. The Randolph Cemetery is within 70 feet of the LOD of Segment 4 and the Ten Mile Cemetery is within 40 feet of the LOD of Segment 4 in Madison County. Due to the proximity of the historic cemeteries to the LOD, additional archeological investigations are required to determine if any unmarked burials are present outside of the modern cemetery boundaries. The archeological investigations of the Randolph Cemetery and Ten Mile Cemetery will be conducted prior to construction, as will be required by the PA.

Based on the background review and the archeological probability matrix developed for this investigation, the segments in Madison County contain the following archeological potential:

*<u>Segment 3C:</u>* contains approximately 14.7 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 2.8 miles of Segment 3C are classified as having Moderate Archeological Potential (2.4 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).

*<u>Segment 4:</u>* contains approximately 11.3 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***

The entire LOD in Madison County was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

Fieldwork for historic resources has not been conducted in Grimes County, but the entire APE was surveyed through the literature review and background research. As a result, a total of 142 historic resources (located on 75 sites) were identified within the historic resources APE in Grimes County. The historic resources include domestic, agricultural, funerary and religious property types. Of the identified resources, 140 were found to lack significance and/or integrity to qualify for listing in the NRHP.

Two of the historic resources (located on two sites) appear to retain sufficient integrity to convey significance and are determined to have moderate potential for NRHP-eligibility. One of the resources is located within the Segment 3C APE and one is located within the Segment 5 APE, but both resources are not within the LOD. A brief description of the resource is provided below.

Based on the results of the current investigation, FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. The THC concurrence letter dated June 13, 2017, and determinations for historic resources identified in Grimes County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

GR.001 (Bethel Cemetery): **Potentially NRHP-eligible**

Site GR.001 has not been recorded in the field. The site is the Bethel Cemetery (Resource GR.001), established in 1848 with the burial of Sarah Bradley Dodson, is located in a rural area on a private road west of FM 143 immediately south of the Madison County line. Ms. Dodson was the designer of the first Lone Star Flag for the Texas Revolution. Although the cemetery is still in use, most of the 317 recorded interments date from the mid-1800s to the early 1900s, 23 of which were Confederate Veterans. The cemetery appears to retain sufficient integrity of location, setting, feeling and association to convey its historic significance and association with the early community development in Grimes County. 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 determined Resource GR.001 has moderate potential for NRHP eligibility at the local level of significance under Criteria Consideration D and Criterion A for association with early community development in Grimes County. Bethel Cemetery was designated as an HTC in 2005. The resource is within the APE of Segment 3C in Grimes County, but is not located within the LOD.

GR.004a (Domestic Dwelling): **Potentially NRHP-eligible**

Site GR.004a consists of a domestic-single family dwelling constructed in ca. 1920 (Resource GR.004a). The resource was not recorded in the field, but appears to have retained sufficient integrity of location, design, setting and association to convey its historic and architectural significance. Based on the results of the current investigation, FRA determined Resource GR.004a has moderate potentially for NRHP-eligibility at the local level of significance under Criterion C for architecture. The resource is within the APE of Segment 5 in Grimes County, but is not located within the LOD.

### Archeological Resources

Relatively few systematic surveys were previously conducted throughout the Build Alternatives LOD in Grimes County. A review of the TASA indicates 12 cultural resources investigations were conducted 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 128.52 acres of the LOD in Grimes County has been previously surveyed as part of separate investigations, resulting in the discovery of the three archeological sites within the LOD of Segment 5.

The literature review and background research also identified 38 previously recorded archeological resources within the Archeological Study Area in Grimes County, including 29 archeological sites and 9 historic cemeteries (see **Table 3.19-6**). No previously recorded archeological sites or cemeteries are within the LOD of Segment 3C in Grimes County.

Two prehistoric sites were previously recorded within the Study Area of Segment 4. Both sites were determined ineligible for listing in the NRHP. No previously recorded archeological sites or cemeteries are within the LOD of Segment 4 in Grimes County.

Twenty-seven archeological sites and 8 historic cemeteries were previously recorded within the Study Area of Segment 5; 21 prehistoric sites, 5 historic sites and 1 site of unknown temporal association. Seventeen of the sites were determined ineligible for listing in the NRHP and 10 have an unknown eligibility status. None of the previously recorded archeological sites within the Study Area of Segment 5 were determined eligible for listing in the NRHP. Two sites are present within the LOD; an ineligible historic farmstead (41GM309) and a prehistoric campsite with unknown eligibility (41GM460).

The nine historic cemeteries within the 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. Two of the cemeteries (Bethel Cemetery and Ratliff Cemetery) have HTC designations. The remaining seven cemeteries have no designations. The Singleton Cemetery is within the LOD of Segment 5 and the Ratliff Cemetery is within 35 feet of the LOD. Due to the Singleton Cemetery being with the LOD and the proximity of the Ratliff Cemetery to the LOD, additional archeological investigation are required and will be conducted prior to construction, as will be required by the PA.

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 3.2 miles of High Archeological Potential (0.7 miles of EMU 1 and 2.5 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 3.1 miles of High Archeological Potential (1 mile of EMU 1 and 2.1 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 29.0 miles of High Archeological Potential (1 mile of EMU 1, 27.1 miles of EMU 2 and 0.9 miles of EMU 3). An additional 10.5 miles of Segment 5 are classified as having Moderate Archeological Potential (10.2 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***

The entire LOD within Grimes County was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

#### *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.

Fieldwork for historic resources has not been conducted in Waller County, but the entire LOD was surveyed through the literature review and background research. As a result, a total of 12 historic resources (located on 9 sites) were identified within the historic resources APE in Waller County. The historic resources include domestic, agricultural and commercial property types. All 12 of the historic resources were found to lack significance and/or integrity, and are determined not eligible for listing in the NRHP.

Based on the results of the current investigation, FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. The THC concurrence letter dated June 13, 2017, and determinations for historic resources identified in Waller County during this investigation are provided in **Appendix E, Cultural Resources Technical Memorandum**.

### Archeological Resources

A review of the TASA indicates two cultural resources investigations were previously conducted within the Archeological Study Area. Previous archeological investigations have consisted of two areal cultural resources surveys. Neither of the surveys is within the LOD in Waller County (see **Table 3.19-7**).

The literature review and background research also identified a total of 4 previously recorded archeological sites within the Archeological Study Area in Waller County (see **Table 3.19-6**). All five of the sites are prehistoric. No historic cemeteries were identified.

Of the previously recorded archeological sites, three were determined not eligible for inclusion the NRHP and one has an unknown eligibility status. One site is located within the LOD 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 5.5 miles of High Archeological Potential (0.5 miles of EMU 1, 4 miles of EMU 2 and 1 mile of EMU 3). An additional 2 miles of Segment 5 are classified as having Moderate Archeological Potential (0.1 miles of EMU 4, 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***

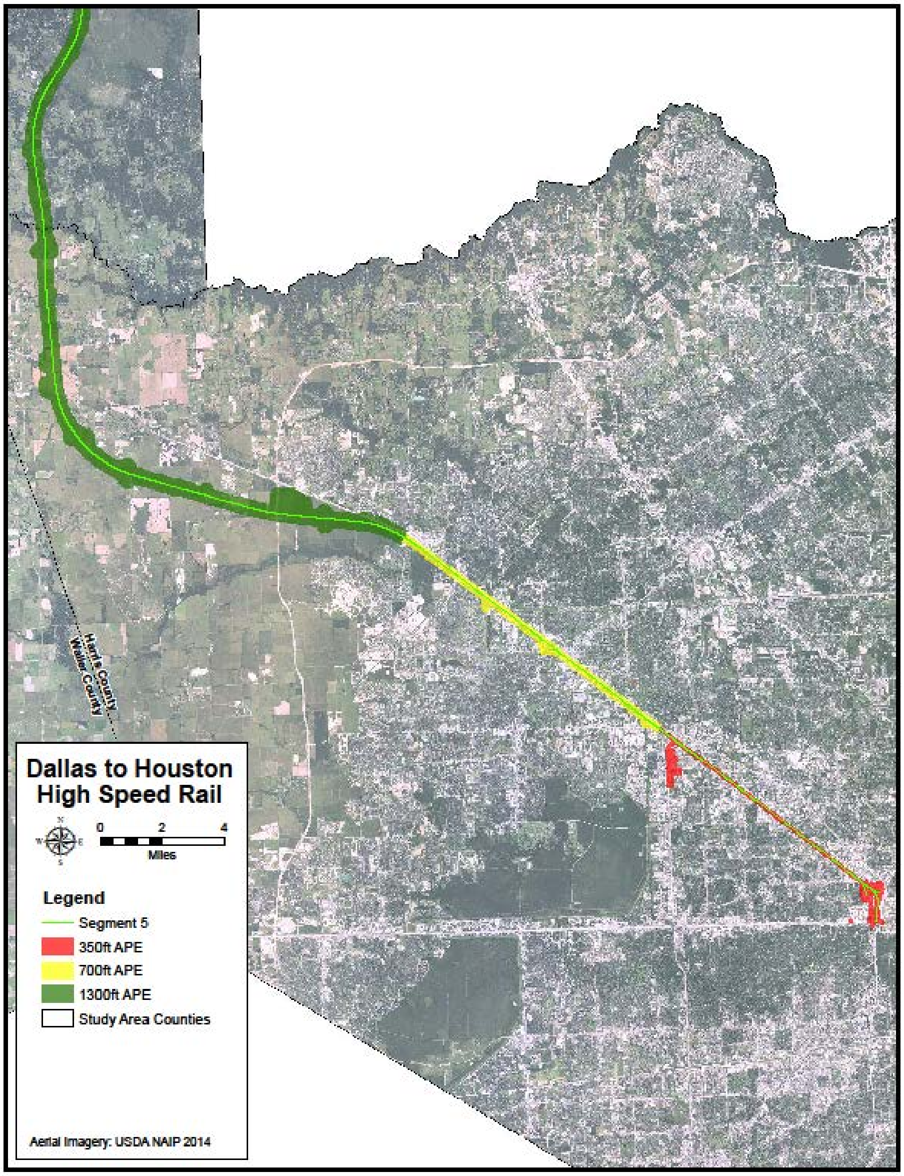
The entire LOD within Waller County was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum.**

### *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.

**Figure 3.19-2: Harris County Variable Historic Resources APE**




Source: AECOM, 2017

A total of 363 historic resources (located on 215 sites) were identified within the historic resources APE of Segment 5 in Harris County. The historic resources include domestic, agricultural, industrial, transportation, government, educational, funerary, commercial and religious property types. Of these, 256 historic resources (located on 138 sites) were recorded in the field and evaluated for NRHP eligibility. Of these resources, 3 (located on 3 sites) were found to retain sufficient integrity to convey significance to qualify for listing in the NRHP, and are determined historic properties. Two of these resources are located within the Segment 5 LOD in Harris County, and will be exposed to potential direct impacts. Brief descriptions of each of the three historic properties are provided below.

The remaining 253 evaluated historic resources (located on 135 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. Based on the results of the current investigation, FRA, in consultation with the THC, determined the 253 resources are not eligible for listing in the NRHP. The THC concurrence letter dated August 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

Of the total 363 identified historic resources, 107 (located on 77 sites) were not recorded in the field. The evaluation and NRHP-eligibility potential of these resources is based on the information gathered through the literature review and background research. All 107 of these resources were found to lack significance and/or integrity to qualify for listing in the NRHP.

FRA, in consultation with the THC, determined field verification of resources not recorded in the field will be conducted prior to construction, as will be required by the PA. The results will be included as an addendum to the interim report. Determinations for historic resources identified in Harris County during this investigation are included in **Appendix E, Cultural Resources Technical Memorandum**.

<u>HA.004a (Residence at 29702 Castle Road, Waller): **NRHP-eligible**</u>
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 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 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 resource retains integrity of location, design, setting, materials, workmanship, feeling and association.

The remaining three resources (Resources HA.004b-d) are wood frame barns constructed between ca. 1920 and ca. 1950. The 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 resource is within the LOD of Segment 5 in Harris County.

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 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 changes to the surrounding area, including the addition of relocated buildings and the construction of a shopping center northeast of the property in ca. 2004, the 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 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 resource is within the 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 resource is within the LOD of Segment 5 in Harris County.

### Archeological Resources

Numerous systematic surveys were previously conducted throughout the Build Alternatives LOD in Harris County. A review of the TASA indicates 31 cultural resources investigations were performed within the 1,000 meter Archeological Study Area (see **Table 3.19-7**). Previous archeological investigations consist of linear and areal cultural resources survey. Approximately 57.2 acres within the Build Alternatives LOD in Harris County has been previously surveyed as part of separate investigation.

The literature review and background research also identified 13 previously recorded archeological resources with the Archeological Study Area in Harris County, including 8 archeological sites and 5 historic cemeteries (see **Table 3.19-6**). Of the 8 previously recorded archeological sites, 2 are prehistoric, 5 are historic and 1 has multi-components of both prehistoric and historic. Two of the sites were determined not eligible for inclusion in the NRHP and 6 sites have an unknown eligibility status. One previously recorded archeological site (41HR399), a historic rail line with unknown eligibility, is located within the LOD of Segment 5 in Harris County.

The 5 cemeteries within the Study Area in Harris County include the 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 adjacent to the Segment 5 LOD at the Houston Northwest Transit Center Terminal Option. Due to the proximity of the historic cemetery to the LOD, additional archeological investigation is required to determine if any unmarked burials are present outside of the modern cemetery boundary. The archeological investigation of the Beth Yeshurun-Post Oak/Beth Cemetery will be conducted prior to construction.

Based on the background review and the archeological probability matrix developed for this investigation, Segment 5 contains approximately 3.8 miles of High Archeological Potential (0.2 miles of EMU 1, 3.4 miles of EMU 2 and 0.2 miles of EMU 3). An additional 2.3 miles of Segment 5 are classified as having a Moderate Archeological Potential (EMU 5). The remaining 31.9 miles of Segment 5 in Harris County have a Low Archeological Potential (12.9 miles of EMU 8 and 19 miles of EMU 9).

#### *Harris County Archeological Survey Results*

The entire LOD within Harris County was surveyed through the literature review and background research, as presented above. The results of the investigation, including literature review and background research, were compiled in the archeological resources interim report covering all 10 counties crossed by the Build Alternatives. The report was coordinated with the THC in September 2017. Correspondence from the THC is provided in **Appendix E, Cultural Resources Technical Memorandum**

## 3.19.5 Environmental Consequences

This section provides the effects of the Build Alternatives on cultural resources, which as previously defined includes structures, buildings, objects, sites, districts, landscapes, natural features, traditional cultural properties, and cemeteries. Under Section 106, adverse effects to historic properties are defined in 36 C.F.R. § 800.5(a)(1), "an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

Typically, direct effects are well understood and predictable. Direct effects are limited to activities associated with the construction of the Build Alternatives. Historic properties within the LOD are considered to be exposed to potential adverse direct effects. Indirect effects are those effects that may occur later in time, be farther removed by distance, or be cumulative. Historic properties within the historic resources APE that are not within the LOD are considered to be exposed to potential indirect adverse effects.

In addition to historic properties considered under Section 106, the Build Alternatives have 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. Cemeteries considered to be exposed to potential direct adverse impacts under NEPA, regardless of any designation or NRHP eligibility determination under Section 106, are those wholly or partially within the LOD, or historic cemeteries located within 115 feet or less of the LOD. The extended area of potential disturbance afforded to historic cemeteries is necessary to verify no unmarked burials are present outside of the modern cemetery boundary.

### 3.19.5.1 No Build Alternative

Under the No Build Alternative, the Build Alternatives would not be constructed. No new impacts or adverse effects to historic properties from construction and operation of the Build Alternatives 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. Therefore, potential impacts to historic properties could still occur under the No Build Alternative as new developments would continue, particularly in suburban and rural settings.

### 3.19.5.2 Build Alternatives Impact Assessment

The criteria a resource must meet to be considered a historic property is discussed in **Section 3.19.2 Regulatory Context**. Each resource identified within the APEs for historic and archeological resources was evaluated by applying these criteria. Based on the archeological investigation of the Build Alternatives, no previously recorded or newly identified archeological sites within the LOD were or have been determined eligible for inclusion in the NRHP and are therefore not historic properties.

Based on the historic resources investigation of the Build Alternatives, 65 resources were or have been identified as historic properties. These resources fall within one of three categories (NRHP-listed, NRHP-eligible and Potentially NRHP-eligible), as described in **Section 3.19.3.2.7**. The resources identified as Potentially NRHP-eligible (23 historic resources) have no known previous NRHP-eligibility determination and have not been recorded in the field to verify significance and integrity. The NRHP eligibility of the Potentially NRHP-eligible resource is based on the literature review and background research information collected during this investigation. Field verification and consultation with the THC will be conducted prior to construction, as will be required by the PA. The remaining 42 historic properties include 2 NRHP-listed properties and 40 NRHP-eligible properties.

In addition to historic properties, the impacts on cemeteries within 115 feet of the LOD must be considered, regardless of NRHP designation. Based on this investigation, a total of 37 cemeteries were identified within the APEs for historic and archeological resources. Of these, 2 are NRHP-eligible cemeteries and 8 are cemeteries with no NRHP designation. The distribution of all of the resources potentially impacted by the Build Alternatives (NRHP-listed, NRHP-eligible, Potentially NRHP-eligible and cemetery with no NRHP designation [within 115 feet]) is presented by category and location relative to the LOD in **Table 3.19-11**.

**Table 3.19-11: Distribution of Historic Properties (by Category) and Cemeteries in Relation to the LOD**

| Category | # of Resources | # Within LOD | # Outside LOD |
|---|---|---|---|
| NRHP-listed | 2 | - | 2* |
| NRHP-eligible | 40 | 8 | 32* |
| Potentially NRHP-eligible | 23 | - | 23* |
| Cemetery with no NRHP designation | 8 | 4 | 6** |

*Located within the historic resources APE
** within 115 feet of the LOD

The 2 NRHP-listed, 40 NRHP-eligible, 23 Potentially NRHP-eligible and 8 cemeteries with no NRHP designation within the APE were evaluated for potential impacts the construction and operation of the Build Alternatives could have on these resources. The distribution of these resources is quantified by segment, location in relation to the LOD and adverse impact in **Table 3.19.12**.

**Table 3.19-12: Historic Properties and Cemeteries with no NRHP designation by Segment and Location to LOD**

| Segment | # of Historic Properties/ Cemeteries | # Within LOD | # Outside LOD | # Adversely Impacted |
|---|---|---|---|---|
| Segment 1 | 29 | 6 | 23 | - |
| Segment 2A | 5 | 1 | 4 | 1 |
| Segment 2B | - | - | - | - |
| Segment 3A | - | - | - | - |
| Segment 3B | 2 | - | 2 | - |

**Table 3.19-12: Historic Properties and Cemeteries with no NRHP designation by Segment and Location to LOD**

| Segment | # of Historic Properties/ Cemeteries | # Within LOD | # Outside LOD | # Adversely Impacted |
|---|---|---|---|---|
| Segment 3C | 5 | - | 5 | 1 |
| Segment 4 | 26 | - | 26 | - |
| Segment 5 | 7 | 4 | 3 | 5 |

Source: AECOM, 2016

Of the total resources with a potential to be impacted by the Build Alternatives, the Potentially NRHP-eligible resources require further documentation and field verification to fully assess potential impacts. However, potential impacts to the 23 Potentially NRHP-eligible resources was distinguished as either direct or indirect (one of which falls within two segments), based on the location of the resource being within or outside of the Build Alternatives LOD. The distinction is construction and operation of the Build Alternatives could have a direct adverse impact on resources within the LOD and an indirect adverse impact on resources outside of the LOD, but within the historic resources APE. For the distribution of the Potentially NRHP-eligible resources, as either within or outside of the LOD, see **Table 3.19-11.**

The remaining 42 historic properties (NRHP-listed and NRHP-eligible) assessed for potential impacts are located along Segment 1 in Dallas County, Segment 3C in Freestone County, Segment 4 in Freestone, Leon and Madison counties and Segment 5 in Harris County. The 8 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 115 feet of the LOD. These resources are along Segment 2A in Ellis County, Segment 3C in Leon County, Segment 4 in Freestone and Madison counties and Segment 5 in Grimes County. The impact assessments of the historic properties (NRHP-listed, NRHP-eligible and Potentially NRHP-eligible) and 8 cemeteries are described below by segment, and summarized in **Table 3.19-13.**

### *3.19.5.2.1 Segment 1*

A total of 29 resources were included in the impact assessment for Segment 1, all of which are located within Dallas County. The resources include 29 historic properties (2 NRHP-listed, 25 NRHP-eligible buildings and 2 NRHP-eligible cemeteries). All of these 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 resource.

DA.009 (Residence at 1300 Powhattan St.): **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 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 resource from the LOD, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse impact 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 St.): **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 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 resource from the LOD, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse impact on Resource DA.010. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.016 (former KIXL Studios):</u> **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 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 resource from the LOD, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have no adverse impact on Resource DA.016. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.020 (Good Luck Oil Company): **No Adverse Impact**</u>
Resource DA.020 is a commercial building constructed ca. 1934 that is determined eligible for listing in the NRHP under Criteria A for architecture. The resource is approximately 302 feet from the LOD, where Station construction near the 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 resource is located, as well as the distance of the resource to the LOD, the new station would not directly or indirectly affect the property's integrity of location, 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 impact on Resource DA.020. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.022 (Chase Bag Company): **No Adverse Impact**</u>
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 56 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 352 feet from the LOD. Station construction near the 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 resource is located, as well as the façade facing away from the station, the new station would not directly or indirectly 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 impact on Resource DA.022. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.023 (Cadiz Street Overpass and Underpass): **Direct Adverse Impact**</u>
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 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 directly connect to the resource, which would affect the 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 would change the surrounding viewshed (see **Section 3.10 Aesthetic and Scenic Resources: Figures 3.10-32 and 3.10-33**). However, as a transportation resource that has historically been located in a commercial and industrial setting, the visual impact would not affect the resource's integrity. FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have a **direct adverse impact** on Resource DA.023. THC requested additional coordination at the 30-60-90 percent development of the Project design. The THC letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.024a (Cadiz Pump Station): **No Adverse Impact**</u>
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 Criterion C for architecture. The 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 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 resource from the LOD, the new station would have minimal effect on the resource's integrity of setting and feeling. Furthermore, integrity of location, design, materials and workmanship would not be directly or indirectly affected. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact on Resource DA.024a. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.024b (Cadiz Pump Station): **No Adverse Impact**</u>
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 Criterion C for architecture. The 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 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 resource from the LOD, the new HSR facilities would have minimal effect on the resource's integrity of setting and feeling. Furthermore, integrity of location, design, materials and workmanship would not be directly or indirectly affected. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact on Resource DA.024b. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>DA.028 (Dallas Coffin Company): **No Adverse Impact**</u>
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 Criterion C for architecture. The rear of the building facing Austin Street is approximately 201 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 350 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the resource is located, as well as the façade facing away from the construction, the new parking structure would not directly or indirectly

affect the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **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 255 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 357 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the resource is located, as well as the façade facing away from the construction, the new parking structure would not directly or indirectly affect the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **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 Criterion C for architecture. The rear and northwest elevation of the building facing Austin and Belleview streets are approximately 53 feet from the LOD, while the façade of the building facing South Lamar Street is approximately 233 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the resource is located, as well as the façade facing away from the construction, the new parking structure would not directly or indirectly affect the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact on Resource DA.030. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.041 (Sigel's Liquor Store): **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 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 resource from the LOD, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **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 222 feet from the LOD, while the façade of the building facing South Riverfront Street is approximately 297 feet from the LOD. Station construction would include a multi-level parking structure. Due to the current urban setting in which the resource is located, as well as the façade facing away from the construction, the new parking structure would not directly or indirectly affect the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA, in

consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **Indirect 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 Criterion C for engineering. The 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 resource from the southwest side. However, as a historic transportation resource, the effect on the resource's integrity of setting, feeling and design would be minimal. Furthermore, the resource's integrity of materials, workmanship and association would not be directly or indirectly affected. FRA, in consultation with the THC, determined the Build Alternatives have the potential to cause an **indirect adverse impact** on Resource DA.056. THC requested additional coordination at the 30-60-90 percent development of the Project design. The THC letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.070 (Corinth Street Viaduct): **No Adverse Impact**
Resource DA.070 is a transportation road-related structure (Corinth Street Viaduct) constructed in 1930 that is determined eligible for listing in the NRHP under Criterion A for community development and Criterion C for engineering. The resource is approximately 118 feet from the LOD, where road improvements at the intersection of Corinth Street and Riverfront Street would be constructed. Due to no anticipated changes in the viewshed and the distance of the resource from the LOD, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact on Resource DA.070.

DA.072 (Dallas Floodway Historic District): **No Adverse Impact**
Resource DA.072 is the Dallas Floodway Historic District that encompasses 3,554.20 acres along the Trinity River. The 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 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 (THC Letter dated December 30, 2011). FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **Direct 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 resource is mostly within the LOD, where track on viaduct would be constructed. Due to the location of the resource being within the LOD, it would most likely require demolition. Therefore, the resource would be directly impacted all aspects of its integrity would be lost. FRA, in consultation with the THC, determined the Build Alternatives would have a **direct adverse impact** 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): **Indirect 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 resource is approximately 85 feet from the LOD, where track on viaduct would be constructed. Due to the distance from the LOD, the viaduct would not directly affect the resource's integrity of location, materials, or workmanship. However, the impacts to the associated building (DA.076a) would indirectly impact the resources integrity of setting, feeling, design and association. FRA, in consultation with the THC, determined the Build Alternatives would have an **indirect adverse impact** 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): **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 resources are currently located in an urban industrial setting and the nearest resource to the LOD is approximately 109 feet, where track on viaduct would be constructed. Due to the urban landscape and the distance of the resources, the viaduct would not directly or indirectly affect the facility's integrity of location, design, setting, feeling, materials, workmanship, or association. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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): **Direct and Indirect 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 resource parcel boundary is partially located within 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 would indirectly affect the resource's integrity of design, setting, feeling and association. FRA, in consultation with the THC, determined the Build Alternatives would have an **indirect adverse impact** 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 of the modern cemetery boundary. Historic 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 within Segment 1 could have a **direct adverse impact** on Resource DA.082. 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 historic cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and will be required by the PA. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.104 (Railroad Bridge at E. Illinois Ave.): **No Adverse Impact**

Resource DA.104 is a railroad bridge over E. Illinois Ave., constructed in 1940 that is determined eligible for listing in the NRHP under Criterion C for architecture. The resource is approximately 189 feet from the LOD, where track on viaduct would be constructed. Due to the distance of the resource from the LOD, as well as it being a historic transportation resource, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact on Resource DA.104. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.110a (Smith/Kinnard Family Cemetery): **Direct Adverse Impact**

Resource DA.110a is the Smith/Kinnard Family Cemetery dating to the 1860s. The cemetery is partially within the LOD of Build Alternatives A, B, C, D, E and F within Segment 1, and is being treated as potentially eligible for listing in the NRHP, as determined in consultation between FRA and the THC. In addition, due to the cemetery being located within the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials. Historic cemeteries in Texas, such as the Smith/Kinnard 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 a **direct adverse impact** 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 within the area of ground disturbing activities. Ongoing consultation with the THC to assess potential impacts to the historic cemetery will be conducted prior to construction, as required by the Texas Health and Safety Code and will be required by the PA. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.110b (Linfield Elementary School): **Direct Adverse Impact**

Resource DA.110b is an educational building constructed in ca. 1950 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. Intensive-level survey is required to verify if the resource would be eligible for association with the local civil rights and school desegregation movements. The resource is partially located within the LOD, where track on viaduct would be constructed. Due to the resource being located within the LOD, the construction and operation of the HSR system would directly impact Resource DA.110b, likely by demolition. Therefore, FRA, in consultation with the THC, determined the Build Alternatives A, B, C, D, E and F would have a **direct adverse impact** on Resource DA.110b. The THC concurrence letter dated August 25, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

DA.194 (W. A. Strain House Historic District): **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 resource is partially located within the APE. The portion within the APE includes agricultural field, which is approximately 107 feet from the LOD, where temporary construction for the construction of a maintenance facility is expected to be constructed. The nearest permanent construction to the historic district is approximately 665 feet from where track on embankment would be constructed. Due to the resource being located outside of the LOD and the distance of the resource from any permanent construction, the construction and operation of the HSR system would not impact the viewshed or the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. FRA determined the Build Alternatives would have no impact on Resource DA.194. During consultation, the THC requested additional coordination including 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. 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 Segment 2A*

One resource was included in the impact assessment for Segment 2A in Ellis County. The resource is a cemetery within the LOD with no designation. The impact assessment for the resource is presented below.

EL.016a (Geaslin Cemetery): **Direct Adverse Impact**
Resource EL.016a is the Geaslin Cemetery established in the late nineteenth century. The resource is partially within the LOD of Segment 2A, where track on viaduct would be constructed. The cemetery was determined not eligible for listing in the NRHP; however, due to the historic cemetery being within the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials. Historic 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 could have a **direct 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, 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

### *3.19.5.2.3 Segment 3C*

Two resources were included in the impact assessment for Segment 3C in Freestone and Leon counties. These resources are both historic cemeteries within the Historic Resources APE. Resource FR.034 has an HTC designation. The impact assessments for the resources are presented below.

FR.034 (Johnson African American Cemetery): **No Adverse Impact**

Resource FR.034 is the Johnson African American Cemetery established in ca. 1871. The 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 resource is approximately 0.25 miles from the LOD, separated by the IH-45 ROW. The current setting in which the resource is located is rural. Due to the setting and the distance of the resource to the LOD, the Build Alternatives C and F would not directly or indirectly affect the property's integrity of location, setting or feeling. Furthermore, the historic 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. Therefore, FRA, in consultation with the THC, determined the Build Alternatives C and F would have no adverse impact 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): **Direct Adverse Impact**
Resource LE.034 is the Nettles Cemetery established in ca.1887 for European Americans. The resource is within 115 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 historic cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside of the modern cemetery boundary. Historic 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, in consultation with the THC, determined the construction and operation of the Build Alternatives could have a **direct 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

#### *3.19.5.2.4 Segment 4*

A total of twelve resources were included in the impact assessment for Segment 4, which are located within Freestone and Madison counties. The resources include: 9 NRHP-eligible resources and 3 cemeteries with no designation. The impact assessments for these resources are presented below.

FR.008 (Cotton Gin Cemetery): **Direct Adverse Impact**
Resource FR.008 is the Cotton Gin Cemetery established in 1854. The resource is within 100 feet of the LOD of Build Alternatives A, B, D and E within Segment 4. FRA, in consultation with the THC, determined the Cotton Gin Cemetery is not eligible for listing in the NRHP (THC letter dated June 14, 2017: **Appendix E, Cultural Resources Technical Memorandum**). However, due to the proximity of the historic 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. Historic cemeteries in Texas, such as the Cotton Gin 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, D and E could have a **direct adverse impact** on Resource FR.008. 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>FR.016a-g (Furney Richardson School Historic District): **No Adverse Impact**</u>
Site FR.016 consists of seven 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 not available, but one taken at a location with similar landscape features was reviewed (see **Section 3.10 Aesthetic and Scenic Resources: Figures 3.10-53 and 3.10-52).** 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 (see **Section 3.10.4.4**).

Based on the noise and vibration analysis conducted for the Build Alternatives, 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 resource is located, as well as distance from the LOD, the FRA determined the Build Alternatives A, B, D and E would not directly or indirectly affect the resource's integrity of location, setting, design, feeling, materials, workmanship, or association. Therefore, FRA determined the Build Alternatives would have no impact to the resources on Site FR.016. Coordination with the THC regarding FRA's impact determination for Site FR.016 is ongoing. The THC letter dated June 14, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>LE.001a (Little Flock Cemetery): **No Adverse Impact**</u>
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 resource is approximately 0.25 miles west of the LOD, surrounded by a

non-historic church, transmission lines and oil well pads. Due to the distance of the resource to the LOD, the Build Alternatives A, B, D and E would not directly or indirectly affect the property's integrity of location, setting, feeling or association. Furthermore, the historic cemetery is not in proximity to 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 A, B, D and E would have no adverse impact 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): **Direct Adverse Impact**
Resource MA.003 is the Randolph Cemetery established in 1851. The resource is within 70 feet of the LOD of Build Alternatives A, B, D and E within Segment 4. Based on the background research and literature review, the Randolph 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 historic 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. Historic 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 a **direct adverse impact** 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. TCRR will consult with the THC to assess potential impacts to the historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

MA.010 (Ten Mile Cemetery): **Direct Adverse Impact**
Resource MA.010 is the Ten Mile Cemetery established in 1890. The resource is within 40 feet of the LOD of Build Alternatives A, B, D and E within Segment 4, 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 would most likely not qualify for listing in the NRHP. However, due to the proximity of the historic 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. Historic 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, in consultation with the THC, determined Build Alternatives A, B, D and E could have a **direct 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>MA.019 (Oxford Cemetery):</u> **<u>No Adverse Impact</u>**
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 resource is approximately 360 feet from the LOD, where track on viaduct would be constructed. The current setting in which the 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 resource to the LOD, the construction and operation of the HSR system would not directly or indirectly affect the property's integrity of location, design, setting, feeling, materials, workmanship, or association. Furthermore, the historic 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 impact 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 <u>Segment 5</u>*

A total of 4 resources were included in the impact assessment for Segment 5, two of which are in Grimes County and 2 are in Harris County. In Grimes County, the resources include 2 cemeteries with no designation. In Harris County, the resources include 2 NRHP-eligible properties. All of these resources are located on a common alignment and the potential impacts to these resources would be the same for all Build Alternatives. The impact assessment for these resources is presented below, by resource, beginning with those in Grimes County.

<u>GR.024 (Singleton Cemetery):</u> **<u>Direct Adverse Impact</u>**
Resource GR.024 is the Singleton Cemetery established in 1916. The resource is partially within the LOD of Segment 5, where road repairs would be constructed. Based on the background research and literature review, the Singleton 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 historic cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials. Historic cemeteries in Texas, such as the Singleton 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 Texas, which prohibit 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 a **direct adverse impact** on Resource GR.024. 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code. The THC concurrence letter dated October 12, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

<u>GR.033 (Ratliff Cemetery):</u> **<u>Direct Adverse Impact</u>**
Resource GR.033 is the Ratliff Cemetery dating to 1837. The resource is 35 feet from the LOD of Segment 5, 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, due to the proximity of the historic

cemetery to the LOD, the construction and operation of the HSR system has the potential to disturb unmarked burials located outside of the modern cemetery boundary. Historic 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 a **direct 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code.

HA.004a (Domestic Dwelling): **Direct 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 resource is within 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 is within an area identified for road construction, which would require the building to be removed. All aspects of integrity would be lost. FRA, in consultation with the THC, determined the Build Alternatives would have a **direct adverse impact** on Resource HA.004a. The THC concurrence letter dated August 30, 2017, is provided in **Appendix E, Cultural Resources Technical Memorandum**.

HA.024b (Humble Oil Gas Station): **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 resource is approximately 208 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 resource is identified as drainage. The portion of the LOD identified as viaduct is approximately 271 feet from the resource. Due to the distance of the resource from the LOD and its association with transportation, the integrity of the property would not be directly or indirectly diminished. FRA, in consultation with the THC, determined the Build Alternatives would have no adverse impact 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 resource was included in the impact assessment for the Houston Industrial Site Terminal Station option, which is in Harris County. The resources include the NRHP-eligible Tex-Tube Complex. This resource is located on a common alignment and the potential impacts to the resources would be the same for all Build Alternatives. The impact assessment for this resource is presented below.

HA.208 (Tex-Tube Complex): **Direct 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 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 directly impacted, the landscape and other associated historic buildings that contribute to the property's significance would be directly 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 a **direct adverse impact** 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 resource was included in the impact assessment for the Houston Northwest Transit Center Terminal Station option, which is in Harris County. The resource, HA.212, is the historic Beth Yeshurun-Post Oak Cemetery. This resource is located on a common alignment and the potential impacts to the resource would be the same for all Build Alternatives. The impact assessment for this resource is presented below.

HA.212 (Beth Yeshurun-Post Oak/Beth Cemetery) **Direct Adverse Impact**
Resource HA.212 is the Beth Yeshurun-Post Oak Cemetery, designated an HTC in 2006, established in the early 1920's. The resource is adjacent to 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, due to the proximity of the historic 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. Historic 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 Build Alternatives A, B, C, D, E and F could have a **direct 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 historic cemetery prior to construction, as required by the Texas Health and Safety Code.

**Table 3.19-13: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible and Historic Cemeteries)**

| 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.020 (Good Luck Oil Company) | 904 Cadiz St., Dallas, TX | Commerce/trade | Eligible | C (Architecture) | 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 and 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 | A and C (Community Development and Commerce; Architecture) | 1 | A, B, C, D, E, F | Yes | Adverse: Direct |
| DA.024a (Cadiz Street Pump Station) | 411 Cadiz St., Dallas, TX | Government-public works | Eligible | A and C (Event and Architecture) | 1 | A, B, C, D, E, F | No | None |
| DA.024b (Cadiz Street Pump Station) | 411 Cadiz St., Dallas, TX | Government-public works | Eligible | A and C (Event and 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 | A and C (Community Development; Commerce; and Architecture) | 1 | A, B, C, D, E, F | No | None |

**Table 3.19-13: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible and Historic Cemeteries)**

| Resource ID | Address | Property Type | NRHP Recommendation | NRHP Criteria | Segment | Alternative | Within LOD | Potential Impact |
|---|---|---|---|---|---|---|---|---|
| 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 | Yes | None |
| 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 | None |
| DA.070 (Corinth Street Viaduct) | Corinth Street Viaduct, Dallas, TX | Transportation-road related | Eligible | A and C (Transportation and Architecture) | 1 | A, B, C, D, E, F | No | None |
| 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) | 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: Direct |
| DA.076b (Guiberson Corporation) | 1000 Forest Ave., Dallas, TX | Domestic-single family | Eligible | B (Association with Samuel A. Guiberson Jr.) | 1 | A, B, C, D, E, F | Yes | Adverse: Indirect |

**Table 3.19-13: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible and Historic Cemeteries)**

| Resource ID | Address | Property Type | NRHP Recommendation | NRHP Criteria | Segment | Alternative | Within LOD | Potential Impact |
|---|---|---|---|---|---|---|---|---|
| DA.080a-e (Proctor and Gamble Complex) | 3701 S. Lamar, 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 and Criterion Consideration D (Community Development) | 1 | A, B, C, D, E, F | Yes | Adverse: Indirect and Direct |
| DA.104 (Railroad Bridge at E. Illinois Ave.) | 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 | Eligible | N/A | 1 | A, B, C, D, E, F | Yes | Adverse: Direct |
| DA.110b (Linfield Elementary) | 3820 E. Illinois Ave., Dallas, TX | Educational | Eligible | A (Community Development) | 1 | A, B, C, D, E, F | Yes | Adverse: Direct |
| 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.16a (Geaslin Cemetery) | Epps Rd., Palmer, TX | Funerary-cemetery | Not Eligible | N/A | 2A | A, B, C | Yes | Adverse: Direct |
| **Freestone County** | | | | | | | | |
| FR.008 (Cotton Gin Cemetery) | FM 930, Teague, TX | Funerary-cemetery | Not Eligible | N/A | 4 | A, B, D, E | Within 100 feet | Adverse: Direct |
| FR.016a-g (Furney Richardson School) | FM 1365, Teague, TX | Educational | Eligible | A (Community Development) | 4 | A, B, D, E | No | None |

**Table 3.19-13: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible and Historic Cemeteries)**

| Resource ID | Address | Property Type | NRHP Recommendation | NRHP Criteria | Segment | Alternative | Within LOD | Potential Impact |
|---|---|---|---|---|---|---|---|---|
| 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 |
| **Leon County** | | | | | | | | |
| 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 |
| LE.036 (Nettles Cemetery) | IH-45 South Frontage Road, Buffalo, TX | Funerary-cemetery | Not Eligible | N/A | 3C | C, F | Within 115 feet | Adverse: Direct |
| **Madison County** | | | | | | | | |
| MA.003 (Randolph Cemetery) | 5577 Dawkins Rd., Normangee, TX | Funerary-cemetery | Not Eligible | N/A | 4 | A, B, D, E | Within 70 feet | Adverse: Direct |
| MA.010 (Ten Mile Cemetery) | FM 2289, Normangee, TX | Funerary-cemetery | Not Eligible | N/A | 4 | A, B, D, E | Within 40 feet | Adverse: Direct |
| 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.024 (Singleton Cemetery) | CR 176, Bedias, TX | Funerary-cemetery | Not Eligible | N/A | 5 | A, B, C, D, E, F | Yes | Adverse: Direct |
| GR.033 (Ratliff Cemetery) | US 90, Roans Prairie, TX | Funerary-cemetery | Not Eligible | N/A | 5 | A, B, C, D, E, F | Within 35 feet | Adverse: Direct |

**Table 3.19-13: Cultural Resources Impact Assessment (NRHP-listed, NRHP-eligible and Historic Cemeteries)**

| 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 | Yes | Adverse: Direct; |
| 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 | Yes | Adverse: Direct |
| 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 | Adjacent to LOD | Adverse: Direct |

Source: AECOM, 2017

## 3.19.6 Build Alternatives Comparison

As part of their initial engineering efforts, TCRR completed a desktop analysis to identify known cultural resource sites within the general study 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 the identified sites. Design features included collocation opportunities with existing transportation and utility corridors to minimize impacts to known historic properties. Within the six Build Alternatives, 53 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 historic property impacts. Approximately 60 percent of the Build Alternatives would be on viaduct.

Following are several design refinements TCRR already implemented in the conceptual design report in order to avoid impacts to cultural resources:

- Honey Springs Cemetery, Dallas County: Although no realignment options were available, a 2.5-acre facility location was removed and the LOD was redesigned to span the cemetery on viaduct.
- Geaslin Cemetery, Ellis County: Although no realignment options were available, LOD was reduced by 100 feet and redesigned to span the viaduct supports to avoid burials during construction and operation.
- Asia Cemetery, Freestone County: An approximate 16-acre, permanent road realignment was removed, eliminating a direct impact to the cemetery.
- Personville/Ebenezer Cemetery, Limestone County: An approximate 20-acre, permanent road realignment was removed, eliminating a direct impact to the cemetery.
- Ten Mile Cemetery, Madison County: An approximate 15-acre, permanent road realignment was removed, eliminating a direct impact to the cemetery. The cemetery remains within 40 feet of 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, eliminating a direct impact to the cemetery.
- Ratliff Cemetery, Grimes County: LOD was shifted approximately 65 feet east, eliminating a direct impact to the cemetery. The cemetery remains within 35 feet of the LOD and will require additional consultation with the THC.

As part of continued coordination with TCRR, FRA will identify additional opportunities to refine the LOD to further minimize or avoid 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. FRA will document additional engineering refinements that allow for further minimization or avoidance of cultural resources within the Final EIS.

### 3.19.6.1 Programmatic Agreement

To ensure the appropriate measures to minimize harm for potential impacts, 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 will establish the process that will govern the FRA's environmental compliance responsibilities under Section 106 and other applicable environmental laws, after approval of the undertaking. FRA will develop the draft PA in consultation with the THC, ACHP, TCRR and other consulting parties. As defined in 36 C.F.R. 800.16(f), consultation "means the process of seeking, discussing, and considering the views of other participants, and where feasible, seeking agreement with them regarding matters arising in the Section 106 process." FRA will consult with the consulting parties regarding treatment measures for adverse impacts to be included in the PA. FRA will provide consulting parties with an opportunity review and comment on the draft PA prior to the release of the Final EIS. FRA will provide the public an opportunity to comment on the draft PA by circulating the draft PA with the Final EIS, prior to issuance of the Record of Decision. Circulation of the Final EIS and draft PA may include email distribution and posting on FRA's website, as applicable.

The PA document will follow a standard format that includes three sections; the *Title*, *Preamble* and *Stipulations*. These sections will, in general, provide the following information:

- *Title* – Identifies the federal undertaking and lists the signatories to the agreement.
- *Preamble* – Provides facts regarding the undertaking at the time the agreement document was executed, including statutory authority, signatories, Section 106 consultation process, consulting parties and any other contextual information necessary to clearly present the intent and purpose of the agreement.
- *Stipulations* – Details the agreed upon avoidance, minimization, or mitigation measures that are to be implemented. This section also provides detailed administrative stipulations that cover procedures for, but not limited to, changes or modifications to the Project, dispute resolution, unanticipated discovery of historic properties, archeological data recovery, public involvement, monitoring and reporting, compliance with other federal laws, provisions for amendment of the agreement and duration of the agreement.

The stipulations to be included in the PA will define measures for completing the Section 106 process. The PA will also clearly state 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 responsibilities in the stipulations. The following measures, consistent with Section 106 and the Antiquities Code of Texas, will continue throughout the duration of the undertaking as agreed upon in the PA.

**Completion of the Phased Archeological and Historic Surveys.** Prior to the start of construction, Secretary of the Interior qualified cultural resources professionals shall continue to conduct both historic and archeological resources surveys on the final design of the selected alternative through the NEPA process in a phased approach in accordance with 36 C.F.R. § 800.4(b)(2), to identify and document historic properties as access to land parcels is granted. Survey work will continue to follow the research designs previously prepared by FRA and concurred upon by the THC.

**Ongoing Consultation with Native American Tribes.** Federally recognized Native American tribes identified in 3.19.3.1.2 that chose to participate will receive information on the planned treatment of historic properties as part of the NEPA and Section 106 processes and may request to consult on the undertaking, or request additional consultation with FRA in accordance with 36 C.F.R. § 800.2(c)(2). These federally recognized Native American tribes will be contacted in the case of an inadvertent discovery of Native American human remains.

**Public Comment Documentation.** Pursuant to 36 C.F.R. § 800.11(e) through (g), views of the public will be considered and included where appropriate, and consultation and compliance efforts shall be continued by TCRR in accordance with the terms of the PA.

**Preparation of Historic Properties Treatment Plans.** Treatment plans will address historic properties adversely impacted by the Build Alternatives, and set forth measures to avoid, minimize and mitigate adverse impacts. The treatment plans will conform to the principles of the ACHP's *Treatment of Archeological Properties: A Handbook Parts I and II*; *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 Fed Reg. 44716-44742 [September 29, 1983]) and appropriate THC guidelines. Determining the type of treatment a historic property should receive depends on the type of resource being impacted, as well as the nature of the impact.

Due to the phased approach implemented for compliance with Section 106, actions at all levels of the process can move forward simultaneously. For example, treatment for known adverse impacts to historic properties identified in this EIS can proceed prior to identification and evaluation of all affected historic properties. Treatment measures for historic properties adversely impacted by the project will be negotiated among the consulting parties and finalized in the PA.

- **Historic Resources Treatment Plan.** Where historic properties that are not archeological in nature may be adversely impacted by the Project, a Historic Resources Treatment Plan will be prepared and provide detailed descriptions of treatment measures to avoid, minimize or mitigate those impacts in accordance with 36 C.F.R. § 800.6. These treatment plans will take into account the cumulative and foreseeable impacts the Project could have on historic properties. While avoidance is the preferred measure, it is not always possible. Typical mitigation measures for adverse impacts to these types of historic properties includes, but is not limited to, the following:

    - Historic American Building Survey
    - Historic American Engineering Record
    - Historic American Landscapes Survey
    - National Register of Historic Places nomination
    - Interpretive Materials (e.g. brochure, booklet, poster, historic marker, website)

    These mitigation measures can be applied to both direct and indirect adverse impacts, and can be applied prior to construction, during construction and post construction. The treatment plans to address adverse impacts will be developed through the PA and in consultation with the THC and other consulting parties.

- **Archeological Treatment Plan.** Where archeological historic properties may be adversely impacted by the Project, an Archeological Treatment Plan will be prepared and will provide detailed descriptions of protection measures for archeological resources and resources of importance due to cultural affinity in accordance with 36 C.F.R. § 800.6. The treatment plans could include, but are not limited to, the following:

    - The establishment of archeologically sensitive areas
    - The use of preconstruction archeological excavation
    - Preservation-in-place
    - Avoidance, minimization and monitoring during construction where appropriate

- Processes for evaluation and data recovery of discoveries
- Compliance and curation of recovered materials pursuant to applicable Texas laws and NAGPRA

**Post-review Discoveries.** Secretary of the Interior qualified archaeologist will aid FRA in developing a plan for unanticipated discoveries of historic properties, pursuant to 36 C.F.R. § 800.13(a)(1), to outline agreed-upon measures that would be taken to implement post-review identification, assessment and resolution of any adverse impacts not specifically addressed in the PA.

- **Unanticipated Discovery Plan**. The Unanticipated Discovery Plan shall be implemented should new or additional cultural resources, including human remains, are found after construction has begun on the final design of the selected alternative; or could affect a previously unidentified historic property, which may be eligible for inclusion in the NRHP, or that the undertaking may affect a known historic property in an unanticipated manner. 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 within the immediate area of an unanticipated discovery shall be halted within a 100-foot radius buffer zone of the discovery;
  - Special attention shall be given to the possible extension of the discovery beyond the LOD, this buffer zone shall be secured through the installation of protective fencing;
  - Notification of the unanticipated discovery shall take place within 24 hours to the THC, FRA, consulting parties and the applicable County Coroner and Sheriff 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 or 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 discovery.

## 3.19.7 Build Alternatives Comparison

All Build Alternatives would adversely impact historic properties and cemeteries within the LOD or within 115 feet of the LOD, as shown in **Table 3.19-14**. Build Alternatives A and B quantify as having the greatest impact to significant cultural resources of the six end-to-end alternatives. 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 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 a direct 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 Build Alternatives LOD have been listed or determined eligible for listing in the NRHP.

**Table 3.19-14: Cultural Resources (Historic Properties and Cemeteries) Impacts by Build Alternative and Houston Station Options**

| | Build Alternatives | | | | | | Houston Station Option | | |
|---|---|---|---|---|---|---|---|---|---|
| | ALT A | ALT B | ALT C | ALT D | ALT E | ALT F | Industrial Site Terminal Station | Northwest Mall Terminal Station | Northwest Transit Center Terminal Station |
| Adverse Impacts | 13 | 13 | 11 | 12 | 12 | 10 | 1 | 0 | 1 |

Source: AECOM, 2017

# 3.20 Soils and Geology

## 3.20.1 Introduction

This section identifies existing soil and geological conditions along the Build Alternatives and provides the soil and geological setting which is 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. 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. 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 Build Alternatives 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 all federal projects, the Farmland Protection Policy Act requires federal agencies to a) identify and take into account the adverse effects of their programs on the preservation of farmland; b) consider alternative actions, as appropriate, to lessen adverse effects; and c) 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, the United States Department of Agriculture (USDA) is the department primarily responsible for the implementation of federal policy with respect to U.S. farmland. USDA granted the Natural Resources Conservation Service (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 CFR 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 if 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]

[1] Farmland Protection Policy Act, Code of Federal Regulations, Title 7, Part 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf
[2] Ibid.
[3] Prime and Unique Farmlands, Code of Federal Regulations, Title 7, Part 657, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part657.pdf
[4] Farmland Protection Policy Act, Code of Federal Regulations, Title 7, Part 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf

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 prime farmland, but fail because they lack the installation of water management facilities or they lack sufficient natural moisture. The USDA would consider these soils prime farmland if these practices were installed.[5]

### State

*Underground Pipeline Damage Prevention Program*

The Underground Facility Damage Prevention and Safety Act of 1999 regulates the notification, reporting and management of excavation activities within Texas.[6] The act is administered by the Railroad Commission of Texas through the Underground Pipeline Damage Prevention Program, under the authority of the Texas Administrative Code, Title 16, Part 1, Chapter 18.[7]

*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.[8] 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 benefits Texas schools. Lands may be leased for petroleum or non-petroleum resources. The Texas General Land Office (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

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[5] Farmland Protection Policy Act, Code of Federal Regulations, Title 7, Part 658, https://www.gpo.gov/fdsys/pkg/CFR-2012-title7-vol6/pdf/CFR-2012-title7-vol6-part658.pdf.

[6] Underground Facility Damage Prevention and Safety, Texas Utilities Code, Title 5, Chapter 251, http://www.statutes.legis.state.tx.us/Docs/UT/htm/UT.251.htm.

[7] Underground Pipeline Damage Prevention, Texas Administrative Code, Title 16, Part 1, Chapter 18, http://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=4&ti=16&pt=1&ch=18&rl=Y.

[8] 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.

conformance with geotechnical codes and regulations. During construction, these cities would have the authority to inspect various geotechnical aspects of construction, such as foundation excavation, tunneling excavation and drainage improvements.[9]

## 3.20.3 Methodology

The Study Area[10] for soils and geology encompasses the LOD for each of the six Build Alternatives and are depicted in the **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
- 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 below.

### 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,[11] 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 prime and unique farmlands.[12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22]

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[9] Dale A. Rudick, P.E. and J. Timothy Lincoln, P.E., "Infrastructure Design Manual." Department of Public Works and Engineering, City of Houston, July 2015, https://edocs.publicworks.houstontx.gov/documents/design_manuals/idm.pdf; Floodplain and Escarpment Zone Regulations, Dallas City Code, Chapter 51A Part II, Article V, https://dallascityhall.com/departments/trinitywatershedmanagement/DCH%20Documents/article5.pdf.

[10] 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.

[11] U.S. Department of Agriculture, Natural Resources Conservation Service, "U.S. General Soil Map (STATSGO2) by State," 2006, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

[12] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.nrcs.usda.gov.

[13] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Dallas County, Texas." February, 1980, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX113/0/dallas.pdf.

[14] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Ellis County, Texas." August, 1964, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX139/ellisTX1964.pdf.

[15] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Navarro County, Texas." December, 1974, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/navarroTX1974/navarroTX1974.pdf.

[16] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey of Freestone County, Texas." 2002, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX161/0/Freestone.pdf.

[17] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey of Limestone County, Texas." September, 1997, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX293/0/Limestone.pdf.

[18] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Leon County, Texas." July, 1989, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX289/0/leon.pdf.

[19] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Madison County, Texas." June, 1994, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX313/0/madison.pdf.

**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.[23] 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 is 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 quantitative description of the erodibility of a particular soil.[24] 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 geologic 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.[25] Corrosion review also included information from the Texas Bureau of Economic Geology, USGS and the Texas Railroad Commission.

**Prime and Special Status Farmlands:** As discussed in **Section 3.13.4.2.3, Land Use,** NRCS mapped soil data was collected for the Study Area and evaluated to identify actions under the Build Alternative that would potentially convert the prime and special status farmlands to nonagricultural uses. Areas of potential conversion were then quantified by acreage and discussed in the impacts analysis. To calculate

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[20] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey of Grimes County, Texas." January, 1996, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/grimesTX1996/grimesTX1996.pdf.
[21] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Austin and Waller Counties, Texas." March, 1984, Accessed December 2014, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX600/0/austin.pdf.
[22] U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Harris County, Texas." August, 1976, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/harrisTX1976/harris.pdf.
[23] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey of Freestone County, Texas." 2002, http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/texas/TX161/0/Freestone.pdf.
[24] Ibid.
[25] Gary B. Muckel (ed.), "Understanding Soil Risks and Hazards." United States Department of Agriculture, Natural Resources Conservation Service, 2004, http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052508.pdf.

the direct permanent conversion of these prime and unique farmlands to a non-agricultural use, the acreage for each Build Alternative was quantified. 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. The same 25-foot setback is not included in the evaluation of impacts to Soils and Geology.

### 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 geologic 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** below).[26] Information on potential hazards was obtained from USGS, the Texas State Historical Association (TSHA) and other scientific reports included in this analysis.

### 3.20.3.3 Seismicity

Seismicity refers to the geographic and historical distribution of earthquakes, which are typically measured using magnitude and intensity.[27] 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. [28]

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.[29, 30] These maps present the probability of an earthquake exceeding a certain percentage of the acceleration of

[26] U.S. Geological Survey, "Search Earthquake Archives." Accessed February 23, 2016, http://earthquake.usgs.gov/earthquakes/search/.
[27] U.S. Geological Survey, "Earthquake Glossary," last updated April 7, 2016, http://earthquake.usgs.gov/learn/glossary/.
[28] U.S. Geological Survey, "The Severity of an Earthquake." General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[29] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[30] 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 February 2016, http://pubs.usgs.gov/sim/3325/.

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.[31] 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

Texas General Land Office and Railroad Commission databases were reviewed to determine the mineral holdings for energy and mineral development.[32] 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 the Railroad 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 Build Alternatives to assess potential impacts.

### 3.20.4 Affected Environment

The Study Area contains unique geologic features, soils and mineral resource 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 below. Details of the data collection efforts for this section are provided in the **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**.[33]

**Table 3.20-1: Soil Characteristics within the Study Area – Dallas County**

| Soil Description* | Percent of Soils in Segment 1 |
|---|---|
| Prime and unique farmland | 49 |
| Somewhat poorly drained | 4 |
| Moderately well drained | 59 |

[31] U.S. Geological Survey, "ShakeMap Scientific Background," Accessed October 4, 2016. http://earthquake.usgs.gov/earthquakes/shakemap/background.php.

[32] Railroad Commission of Texas. "Mining Zones," Accessed December 28, 2015, www.rrc.state.tx.us/mining-exploration/historica-coal-mining/mining-zones.

[33] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2013, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

**Table 3.20-1: Soil Characteristics within the Study Area – Dallas County**

| Soil Description* | Percent of Soils in Segment 1 |
|---|---|
| Well drained | 30 |
| Frequently or occasionally flooded | 10 |
| Moderate and high shrink-swell potential | 16 |
| Very high shrink-swell potential | 62 |
| Moderate potential for erosion | 57 |
| Moderately corrosive to uncoated steel | 15 |
| Highly corrosive to uncoated steel | 80 |

Source: NRCS, 2016
*Individual soil units within the Dallas County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

### *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 province is underlain by bedrock of chalks and marls whose geologic structure tilts south and east while elevations descend from 1,000 to 450 feet. The Study Area ranges in elevation from 390 to 550 feet above mean sea level (AMSL).[34]

The Study Area within Dallas County is underlain by various geological formations including Austin Chalk (64.6 percent), Alluvium (27.4 percent) and Ozan (1.6 percent), as described in detail in the **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.[35]

### *3.20.4.1.3 Seismicity*

The Study Area in Dallas County lies in the regional tectonic setting of the East Texas Basin.[36] There are no known faults within the Dallas County area;[37] however, ground movement has been measured. Fourteen recorded earthquakes have equaled or exceeded a magnitude of 3.0 in Dallas County since 1900, with a maximum magnitude of 3.6. The nearest documented earthquake was a magnitude 3.0 located 6.8 miles northwest of the Study Area.[38] 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.[39] Dallas County is the only county in the Study Area that would be affected by induced

[34] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[35] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php,
[36] Bureau of Economic Geology, The University of Texas at Austin, "Tectonic Map of Texas," 1997. Accessed December 2015, http://www.lib.utexas.edu/geo/pics/tectonic2.jpg.
[37] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[38] U.S. Geological Survey, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014. https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.
[39] 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,

earthquakes, or earthquakes linked to fracking. Localized probability of earthquakes is higher in some areas. Recent projects show 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 Modified Mercalli Intensity scale.[40] 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.[41]

##### *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.[42] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[43]

#### 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.**[44]

**Table 3.20-2: Soil Characteristics within the Study Area – Ellis County**

| Soil Description* | Percent of Soils in Segment 1 | Percent of Soils in Segment 2A | Percent of Soils in Segment 2B | Percent of Soils in Segment 3A | Percent of Soils in Segment 3B | Percent of Soils in Segment 3C |
|---|---|---|---|---|---|---|
| Prime and unique farmland | 67 | 80 | 78 | 97 | 96 | 97 |
| Somewhat poorly drained | 3 | 2 | 3 | -- | -- | -- |
| Moderately well drained | 67 | 79 | 77 | 97 | 96 | 97 |
| Well drained | 29 | 19 | 20 | 3 | 4 | 3 |
| Frequently or occasionally flooded | 3 | 4 | 1 | -- | -- | -- |
| Moderate and high shrink-swell potential | -- | 5 | 3 | 6 | 9 | 6 |
| Very high shrink-swell potential | 100 | 95 | 97 | 94 | 91 | 94 |
| Moderate potential for erosion | 67 | 45 | 35 | 3 | 5 | 3 |
| High potential for erosion | -- | -- | -- | <1 | -- | <1 |
| Moderately corrosive to uncoated steel | -- | -- | -- | -- | <1 | -- |
| Highly corrosive to uncoated steel | 100 | 100 | 100 | 100 | 99 | 100 |

Source: NRCS, 2016
*Individual soil units within the Ellis County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

and Kenneth S. Rukstales. "Seismic-hazard maps for the Conterminous United States, 2014" U.S. Geological Survey, 2015. Accessed February 2016, http://pubs.usgs.gov/sim/3325/.

[40] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.

[41] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.

[42] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

[43] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.

[44] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

### *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**.[45] The Study Area ranges in elevation from 410 to 530 feet AMSL. Segment 1 is underlain by the Ozan geological formation (Ko). Segments 2A and 2B are predominately underlain by the Ozan geological formation (975.4 acres [92.3 percent] and 886.0 acres [90.8 percent] respectively), as described in **Appendix E, Soils and Geology Technical Memorandum**. Segments 3A/3C and 3B are underlain by the Wolfe City Formation (Kwc), a geological formation from the Cretaceous Period, Gulfian Epoch Series and Taylor Group, with a thickness of 75-300 feet. It is described as marl, sand, sandstone and mudstone and grades northward into an upper, fine-grained sand and silt unit that is calcareous and medium, yellowish gray. It also contains a lower mudstone unit that is calcareous, dark gray and weathers medium gray, as well as may contain marine megafossils.[46] In Ellis County, the Study Area is not identified as a karst region.[47]

### *3.20.4.2.3 Seismicity*

Several faults occur within Ellis County, but do not intersect with the Study Area.[48] Nine earthquakes have been documented in Ellis County with a magnitude greater than 2.5; with one equaling a magnitude of 3.0. The nearest documented earthquake was recorded 10.8 miles west of Segment 2A.[49] 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 and/or be of significant intensity is low.[50] In addition, the highest intensity predicted for the Study Area in Ellis County is V on the Modified Mercalli Intensity scale.[51] At this intensity, an earthquake may be felt and move some objects, but structural damage would not be likely.[52]

### *3.20.4.2.4 Mineral Resources*

Overall, Ellis County does not have many mineral resources or prospect mines across the county.[53] The nearest surface mine, the Midlothian Quarry and Plant, is located approximately one-half mile west of

[45] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[46] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[47] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[48] M. P. A. Jackson. "Fault Tectonics of the East Texas Basin." Bureau of Economic Geology, The University of Texas at Austin, 1982.
[49] U.S. Geological Survey. "Search Earthquake Archives." Accessed February 23, 2016. http://earthquake.usgs.gov/earthquakes/search/.
[50] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[51] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
[52] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[53] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/

Segment 2A. Commodities produced include cement, crushed stone, clay and shale.[54] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[55]

### 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.**[56]

**Table 3.20-3: Soil Characteristics within the Study Area – Navarro County**

| Soil Description* | Percent of Soils in Segment 3A | Percent of Soils in Segment 3B | Percent of Soils in Segment 3C |
|---|---|---|---|
| Prime and unique farmland | 68 | 73 | 64 |
| Somewhat poorly drained | <1 | 2 | 3 |
| Moderately well drained | 79 | 82 | 74 |
| Well drained | 18 | 16 | 23 |
| Frequently or occasionally flooded | 2 | 3 | 4 |
| Moderate and high shrink-swell potential | 32 | 35 | 21 |
| Very high shrink-swell potential | 68 | 65 | 77 |
| High potential for erosion | 20 | 13 | 17 |
| Moderately corrosive to uncoated steel | 6 | 1 | 4 |
| Highly corrosive to uncoated steel | 93 | 98 | 95 |

Source: NRCS, 2016
*Individual soil units within the Navarro County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum**.**
'—' Not Present

#### *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 geologic structure tilts towards the Gulf of Mexico while elevations descend from 800 to 300 feet AMSL.[57] The Study Area ranges in elevation from 320 to 520 feet AMSL. Ten, 10 and 8 geologic formations underlie Segments 3A, 3B and 3C, respectively. The Neylandville Formation and Marlbrook Marl undivided Formation and Wills Point Formation are predominant, as described in **Appendix E, Soils and Geology Technical Memorandum**. To a lesser extent, the Alluvium geological formation and the Nacatoch Sand Formation (Kns) are found within this Study Area. Nacatoch Sand underlies less than 10 percent of Segments 3A and 3C (107.3 acres and 38.2 acres, respectively) and 22.3 percent (275.2 acres) of

[54] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[55] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.
[56] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[57] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.

Segment 3B. The Nacatoch Sand Formation has a thickness of 250+/- feet and is within the Navarro Group from the Cretaceous Period and Gulfian Epoch Series. It is characterized by quartz sand that is fine-grained, poorly sorted, friable, silty and glauconitic and has local lenses of silty clay that are compact and light gray to greenish gray.[58] The Study Area is not identified as a karst region.[59]

#### *3.20.4.3.3 Seismicity*

The Mexia-Talco Fault Zone underlies the Study Area in Navarro County. Individual faults intersect Segment 3A at eight locations, Segment 3B at five 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.[60] 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.[61] The highest intensity predicted for the Study Area in Navarro County is V on the Modified Mercalli Intensity scale.[62] At this intensity, an earthquake may be felt and move some objects, but structural damage would not be likely.[63]

#### *3.20.4.3.4 Mineral Resources*

Although a few sand and gravel and clay mines exist, Navarro County does not have many mineral resources or prospect mines across the county.[64,65] No surface mines are located within the Study Area in Navarro County.[66] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[67]

### 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.**[68]

[58] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[59] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[60] U.S. Geological Survey, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014. https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.
[61] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[62] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
[63] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[64] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/
[65] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[66] Ibid.
[67] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.
[68] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

| Table 3.20-4: Soil Characteristics within the Study Area – Freestone County | | | | |
|---|---|---|---|---|
| **Soil Description*** | **Percent of Soils in Segment 3A** | **Percent of Soils in Segment 3B** | **Percent of Soils in Segment 3C** | **Percent of Soils in Segment 4** |
| Prime and unique farmland | 100 | 100 | 47 | 61 |
| Poorly drained | -- | -- | <1 | <1 |
| Somewhat poorly drained | -- | -- | 6 | 3 |
| Moderately well drained | 100 | 100 | 27 | 59 |
| Well drained | -- | -- | 67 | 37 |
| Somewhat excessively drained | -- | -- | <1 | 2 |
| Frequently or occasionally flooded | -- | -- | 8 | 13 |
| Moderate and high shrink-swell potential | -- | -- | 71 | 48 |
| Very high shrink-swell potential | 100 | 100 | 5 | 31 |
| Moderate potential for erosion | -- | -- | 27 | 29 |
| High potential for erosion | 100 | 100 | 47 | 44 |
| Moderately corrosive to uncoated steel | -- | -- | 68 | 45 |
| Highly corrosive to uncoated steel | 100 | 100 | 32 | 53 |

Source: NRCS, 2016
*Individual soil units within the Freestone County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum**.**
'—' Not Present

### *3.20.4.4.2 Geology*

Freestone County is located in the Interior Coastal physiographic province.[69] The Study Area generally ranges in elevation from 290 to 530 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 composed of the Calbert Bluff and Hooper formations as described in **Appendix E, Soils and Geology Technical Memorandum**. The Hooper Formation is the most abundant geological formation underlying Segment 4 (541.1 acres), followed by the Wills Point Formation (229.0 acres) and Alluvium (105.4 acres).[70, 71] The Study Area is not identified as a karst region.[72]

### *3.20.4.4.3 Seismicity*

One fault line intersects the Study Area for Segment 4 in Freestone County.[73] Although faults were identified in the western corner of Freestone County, no earthquakes have been documented in recorded history dating back to 1900.[74] 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

[69] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[70] Ibid.
[71] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[72] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[73] Ibid.
[74] U.S. Geological Survey, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014. https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.

low.[75, 76] The highest intensity predicted for the Study Area in Freestone County is V on the Modified Mercalli Intensity scale.[77] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[78]

#### *3.20.4.4.4 Mineral Resources*

Although a few stone mines exist, Freestone County does not have many mineral resources or prospect mines across the county.[79,80] No surface mines were identified within the Study Area in Freestone County.[81] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[82]

### 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.**[83]

**Table 3.20-5: Soil Characteristics within the Study Area – Limestone County**

| Soil Description* | Percent of Soils in Segment 4 |
|---|---|
| Prime and unique farmland | 50 |
| Somewhat poorly drained | 3 |
| Moderately well drained | 22 |
| Well drained | 75 |
| Frequently or occasionally flooded | 8 |
| Moderate and high shrink-swell potential | 42 |
| Very high shrink-swell potential | 3 |
| Moderate potential for erosion | 17 |
| High potential for erosion | 24 |
| Moderately corrosive to uncoated steel | 82 |
| Highly corrosive to uncoated steel | 18 |

Source: NRCS, 2016
*Individual soil units within the Limestone County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.

[75] Ibid.
[76] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[77] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
[78] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[79] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/
[80] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[81] Railroad Commission of Texas. "Mining Zones," Accessed December 2015, www.rrc.state.tx.us/mining-exploration/historical-coal-mining/mining-zones.
[82] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.
[83] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

### 3.20.4.5.2 Geology

In Limestone County, the Study Area is located within the Interior Coastal province.[84] The Study Area generally ranges in elevation from 360 to 470 feet AMSL. The geological formations underlying Segment 4 in Limestone County are predominately composed of the Calvert Bluff Formation (331.3 acres or 92.6 percent).[85] The Study Area is not identified as a karst region.[86]

### 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.[87, 88] No earthquakes have been documented in Limestone County and there is only 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. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[89, 90, 91] The highest intensity predicted for the Study Area in Limestone County is V on the Modified Mercalli Intensity scale.[92] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely but structural damage would not be likely.[93]

### 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 were identified in the Study Area in Limestone County.[94,95] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[96]

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[84] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.

[85] U.S. Geological Survey, "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 May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.

[87] Ibid.

[88] 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.

[89] Ibid.

[90] 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 February 2016, http://pubs.usgs.gov/sim/3325/.

[91] U.S. Geological Survey, "Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region," October 2014. https://www.usgs.gov/news/groundwater-level-declines-continue-cause-land-elevation-loss-houston-%E2%80%93-galveston-region.

[92] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.

[93] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.

[94] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/

[95] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

[96] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.

### 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* | Percent of Soils in Segment 3C | Percent of Soils in Segment 4 |
|---|---|---|
| Prime and unique farmland | 21 | 39 |
| Poorly drained | <1 | 2 |
| Somewhat poorly drained | 3 | 1 |
| Moderately well drained | 15 | 29 |
| Well drained | 79 | 65 |
| Somewhat excessively drained | 2 | 3 |
| Excessively drained | 1 | -- |
| Frequently or occasionally flooded | 6 | 3 |
| Moderate and high shrink-swell potential | 39 | 53 |
| Very high shrink-swell potential | 1 | 2 |
| Moderate potential for erosion | 34 | 47 |
| High potential for erosion | 2 | 5 |
| Moderately corrosive to uncoated steel | 57 | 42 |
| Highly corrosive to uncoated steel | 38 | 55 |

Source: NRCS, 2016
*Individual soil units within the Leon County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

#### *3.20.4.6.2 Geology*

Within Leon County, the Study Area is located within the Interior Coastal province.[97] The Study Area generally ranges in elevation from 290 to 600 feet AMSL. Dominant geological formations include Queen City Sand (43.7 percent of Segment 3C and 38.3 percent of Segment 4) and Sparta Sand (20.0 percent of Segment 3C and 16.4 percent of Segment 4) as described in **Appendix E, Soils and Geology Technical Memorandum**. Segment 3C, to a lesser extent (11.5 percent), includes 157.8 acres of the Weches Formation. The Weches Formation has thickness of 2,575 feet and is within the Claiborne Group from the Tertiary Period and Eocene Epoch Series. It is characterized by greensand, sand and clay. The greensand is mostly glauconite and in part marly, with quartz sand common. This geological formation is also interbedded with clay, silty, brown to gray, weathers light to dark reddish brown and locally forms layers of limonitic iron ore and clay ironstone concretions.[98,99] The Study Area is not identified as a karst region.[100]

[97] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[98] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[99] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[100] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.

#### 3.20.4.6.3 *Seismicity*

No faults occur within the Study Area for Segment 3C in Leon County.[101] One fault line intersects the Study Area for Segment 4 in Leon County.[102] No earthquakes have been documented in Leon County and 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.[103] The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[104] The highest intensity predicted for the Study Area in Leon County is V on the Modified Mercalli Intensity scale.[105] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[106]

#### 3.20.4.6.4 *Mineral Resources*

Overall, Leon County does not have many mineral resources or prospect mines across the county and no surface mines are located within the Study Area. [107, 108] A parcel of Permanent School Fund land is located near the Study Area; however, no state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[109]

### 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**.[110]

**Table 3.20-7: Soil Characteristics within the Study Area – Madison County**

| Soil Description* | Percent of Soils in Segment 3C | Percent of Soils in Segment 4 |
|---|---|---|
| Prime and unique farmland | 52 | 67 |
| Poorly drained | 2 | -- |
| Somewhat poorly drained | 8 | 12 |
| Moderately well drained | 77 | 85 |
| Well drained | 11 | 2 |
| Somewhat excessively drained | 1 | -- |

[101] U.S. Geological Survey, “Geologic Database of Texas, 1:250,000 scale data.” Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[102] Ibid.
[103] USGS . *Groundwater-Level Declines Continue to Cause Land Elevation Loss in Houston-Galveston Region.* October 8, 2014. http://www.usgs.gov/newsroom/article.asp?ID=4024#.VrVCVk32bGg (accessed Janaruy 22, 2016).
[104] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[105] 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.” U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
[106] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[107] Bureau of Economic Geology, “Texas Mineral Resource Map,” Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/
[108] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[109] Texas General Land Office, “Interactive Land Lease Mapping Program,” Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.
[110] U.S. Department of Agriculture, Natural Resources Conservation Service, “Soil Survey Spatial and Tabular Data (SSURGO),” Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

| Table 3.20-7: Soil Characteristics within the Study Area – Madison County | | |
|---|---|---|
| **Soil Description*** | **Percent of Soils in Segment 3C** | **Percent of Soils in Segment 4** |
| Frequently or occasionally flooded | 10 | 7 |
| Moderate and high shrink-swell potential | 90 | 79 |
| Very high shrink-swell potential | -- | 13 |
| Moderate potential for erosion | 48 | 33 |
| High potential for erosion | 41 | 60 |
| Moderately corrosive to uncoated steel | 37 | 32 |
| Highly corrosive to uncoated steel | 62 | 68 |

Source: NRCS, 2016
*Individual soil units within the Madison County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

### *3.20.4.7.2 Geology*

The Study Area within Madison County is located within the Interior Coastal province.[111] The Study Area generally ranges in elevation from 230 to 400 feet AMSL The Study Area is predominately (379.0 acres in Segment 3C and 437.1 acres in Segment 4) underlain by the Yegua geological formation which is within the Claiborne Group from the Tertiary Period, Eocene Epoch Series. This geological formation consists of sandstone, clay and lignite, some chert (fine-grained, subangular to subrounded, indurated to friable, calcareous, glauconitic, massive and locally crossbedded); clay (lignitic, bentonitic, sandy, silty, mostly well-laminated, chocolate brown to reddish brown and lighter colored upward); with lentils of lignite common.

The portions of this formation in Madison County are mostly clay, silty, gray and brown; weather light gray and brown; have fossil wood abundant and a thickness of 600-1,000 feet. The remainder of the Study Area is predominately underlain by the Cook Mountain Formation (167.5 acres in Segment 3C and 258.0 acres in Segment 4). The Cook Mountain Formation is within the Claiborne Group from the Tertiary Period and Eocene Epoch Series. It is characterized by clay and marly sand, argillaceous and carbonaceous sand, marl and clay and marly clay. This geological formation has a thickness of approximately 200-350 feet.[112,113] The Study Area is not identified as a karst region.[114]

### *3.20.4.7.3 Seismicity*

No faults or earthquakes have been documented within the Study Area in Madison County.[115] There is only 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. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[116] The highest intensity predicted for the

[111] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[112] Ibid.
[113] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[114] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[115] Ibid.
[116] 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 February 2016, http://pubs.usgs.gov/sim/3325/.

Study Area in Madison County is V on the Modified Mercalli Intensity scale.[117] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[118]

#### *3.20.4.7.4 Mineral Resources*

Overall, Madison County does not have many mineral resources or prospect mines across the county; however, some salt domes are present.[119, 120] No surface mines were identified in the Study Area in Madison County.[121] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[122]

### 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**.[123]

**Table 3.20-8: Soil Characteristics within the Study Area – Grimes County**

| Soil Description* | Percent of Soils in Segment 3C | Percent of Soils in Segment 4 | Percent of Soils in Segment 5 |
|---|---|---|---|
| Prime and unique farmland | 6 | 5 | 38 |
| Poorly drained | -- | -- | -- |
| Somewhat poorly drained | 19 | 12 | 17 |
| Moderately well drained | 81 | 86 | 63 |
| Well drained | -- | 2 | 20 |
| Frequently or occasionally flooded | -- | 31 | -- |
| Moderate and high shrink-swell potential | 100 | 100 | 60 |
| Very high shrink-swell potential | -- | -- | 14 |
| Moderate potential for erosion | 13 | 6 | 34 |
| High potential for erosion | 66 | 41 | 8 |
| Moderately corrosive to uncoated steel | 7 | -- | 34 |
| Highly corrosive to uncoated steel | 93 | 100 | 66 |

Source: NRCS, 2016
*Individual soil units within the Grimes County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

117 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
118 U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
119 Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/
120 U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
121 U.S. Geological Survey, "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, http://gisweb.glo.texas.gov/glomap/index.html.
123 U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

### *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 240 to 430 feet AMSL. The Yegua Formation is the most prevalent geological formation in Segments 3C and 4, underlying 81.7 acres (90.9 percent) of Segment 3C and 62.5 acres (78.7 percent) of Segment 4. The remainder of the Study Area for these segments is underlain by the Alluvium geological formation.[124,125]

Segment 5 spans the majority of the Study Area in Grimes County. The predominant geological formations within Segment 5 consist of the Willis Formation (coastward belt) and Fleming Formation, (21.1 percent and 24.6 percent, respectively). To a lesser extent (19.4 percent and 11.6 percent, respectively), the Manning Formation and Catahoula Formation also occur within the Study Area in Segment 5. The Study Area is not identified as a karst region.[126]

### *3.20.4.8.3 Seismicity*

No faults occur within the Study Area and no earthquakes have been documented in Grimes County.[127] The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[128] The highest intensity predicted for the Study Area in Grimes County is V on the Modified Mercalli Intensity scale.[129] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[130]

### *3.20.4.8.4 Mineral Resources*

Overall, Grimes County does not have many mineral resources or prospect mines across the county; however, some sand and gravel and stone sites are present.[131,132] No surface mines were identified within or near the Study Area in Grimes County.[133] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[134]

[124] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[125] U.S. Geological Survey, "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 May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[127] Ibid.
[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 February 2016, http://pubs.usgs.gov/sim/3325/.
[129] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.
[130] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.
[131] Bureau of Economic Geology, "Texas Mineral Resource Map," Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/
[132] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.
[133] ibid.
[134] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.

### 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.**[135]

**Table 3.20-9: Soil Characteristics within the Study Area – Waller County**

| Soil Description* | Percent of Soils in Segment 5 |
|---|---|
| Prime and unique farmland | 46 |
| Somewhat poorly drained | 42 |
| Moderately well drained | 46 |
| Well drained | 12 |
| Frequently or occasionally flooded | 3 |
| Moderate and high shrink-swell potential | 22 |
| Very high shrink-swell potential | <1 |
| Moderate potential for erosion | 13 |
| High potential for erosion | 41 |
| Moderately corrosive to uncoated steel | 7 |
| Highly corrosive to uncoated steel | 93 |

Source: NRCS, 2016
*Individual soil units within the Dallas County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.

#### *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 240 to 310 feet AMSL The Willis Formation (coastward belt) underlies 279.7 acres (91.4 percent) in Waller County.[136, 137] The Study Area is not identified as a karst region.[138]

#### *3.20.4.9.3 Seismicity*

No faults occur within the Study Area in Waller County.[139] No earthquakes have been documented in Waller County and there is only 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. The annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[140] The highest intensity

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[135] U.S. Department of Agriculture, Natural Resources Conservation Service, "Soil Survey Spatial and Tabular Data (SSURGO)," Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[136] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[137] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[138] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[139] Ibid.
[140] 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,

predicted for the Study Area in Waller County is V on the Modified Mercalli Intensity scale.[141] At this intensity, an earthquake may be felt and some unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[142]

#### *3.20.4.9.4 Mineral Resources*

Overall, Waller County does not have many mineral resources or prospect mines across the county and no surface mines are located within the Study Area.[143,144] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[145]

### 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**.[146]

**Table 3.20-10: Soil Characteristics within the Study Area – Harris County**

| Soil Description* | Percent of Soils in Segment 5 | Industrial Site Termination Option | Northwest Mall Termination Option | Northwest Transit Center Termination Option |
|---|---|---|---|---|
| Prime and unique farmland | 73 | -- | -- | -- |
| Poorly drained | 25 | 11 | 4 | 50 |
| Somewhat poorly drained | 54 | -- | -- | -- |
| Moderately well drained | <1 | -- | -- | -- |
| Well drained | 21 | -- | -- | -- |
| Frequently or occasionally flooded | <1 | -- | -- | -- |
| Moderate and high shrink-swell potential | 31 | 11 | 4 | 50 |
| Very high shrink-swell potential | -- | -- | -- | -- |
| Moderate potential for erosion | 4 | 8 | <1 | 48 |

and Kenneth S. Rukstales. “Seismic-hazard maps for the Conterminous United States, 2014” U.S. Geological Survey, 2015. Accessed February 2016, http://pubs.usgs.gov/sim/3325/.

141 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.” U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.

142 U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.

143 Bureau of Economic Geology, “Texas Mineral Resource Map,” Austin, TX: The University of Texas at Austin, accessed August 26, 2016, http://igor.beg.utexas.edu/txmineralresources/

144 U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

145 Texas General Land Office, “Interactive Land Lease Mapping Program,” Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.

146 U.S. Department of Agriculture, Natural Resources Conservation Service, “Soil Survey Spatial and Tabular Data (SSURGO),” Fort Worth, TX: U.S. Department of Agriculture, 2015, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

**Table 3.20-10: Soil Characteristics within the Study Area – Harris County**

| Soil Description* | Percent of Soils in Segment 5 | Industrial Site Termination Option | Northwest Mall Termination Option | Northwest Transit Center Termination Option |
|---|---|---|---|---|
| High potential for erosion | 75 | 3 | 3 | 3 |
| Moderately corrosive to uncoated steel | <1 | -- | -- | -- |
| Highly corrosive to uncoated steel | 99 | 11 | 4 | 50 |

Source: NRCS, 2016
*Individual soil units within the Harris County Study Area are provided in the Appendix E, Soils and Geology Technical Memorandum.
'—' Not Present

### *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 60 to 280 feet AMSL. The Lissie Formation (551.1 acres), Willis Formation (coastward belt) (428.9 acres) and Willis Formation (421.1 acres) comprise Segment 5 in Harris County. The Lissie Formation (Ql) dates to the Quaternary Period within the Holocene, Pleistocene Epoch Series. It has a thickness of +/- 200 feet and is characterized by clay, silt, sand and very minor siliceous gravel of granule and small pebble size gravel. Its surface is fairly flat to very gently rolling with the exception of numerous rounded shallow depressions and pimple mounds and minor amounts of gravel. The Willis Formation (Qw) is generally the same composition as the Willis Formation (coastward belt), but its maximum thickness is typically only 75 feet.[147, 148] The Study Area is not identified as a karst region.[149]

### *3.20.4.10.3 Seismicity*

Salt tectonics and fault systems contribute to fault activity in Harris County. From north to south, the three main active fault systems in the Study Area are the Hockley-Conroe Fault System, Addicks Fault System and Long Point-Eureka Heights Fault System.[150] Two individual faults were identified intersecting the Study Area. No earthquakes have been documented in Harris County and there is only 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. Annual probability for seismic hazards or earthquakes to occur and/or be of significant intensity is low.[151, 152, 153] The highest intensity predicted for the Study Area in Harris County is

[147] Bureau of Economic Geology, The University of Texas at Austin, "Physiographic Map of Texas," 1996. February 2016, http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf.
[148] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.
[149] Texas Speleological Survey, "Karst Regions of Texas," July 2014. Accessed May 2016, http://www.texasspeleologicalsurvey.org/karst_caving/karst_regions.php.
[150] Engelkemeir, Richard M. 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.
[151] 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 February 2016, http://pubs.usgs.gov/sim/3325/.
[152] U.S. Geological Survey, "Geologic Database of Texas, 1:250,000 scale data." Austin, Texas: Texas Water Development Board, U.S. Geological Survey, 2007.

V on the Modified Mercalli Intensity scale.[154] At this intensity, an earthquake may be felt and unstable objects may move or overturn. Plates and glass objects may break but structural damage would not be likely.[155]

#### *3.20.4.10.4 Mineral Resources*

Although several mines, including sand and gravel, clay and sulfur, are located in Harris County, no surface mines are located within the Study Area.[156] No state agency-owned lands or Permanent School Fund lands were identified in the Study Area.[157]

## 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 geologic 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 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 geologic 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. Potential risk factors to consider, due to soil and geologic conditions, during the design phase of the Build Alternatives include unstable soils, highly-expansive soils, low soil bearing strength, corrosive soils, slope failures, ground shaking and settlement. These conditions would present a lower risk to the Build Alternatives with the incorporation of standard engineering design features such as avoiding deep slopes to the maximum extent practicable, stockpiling topsoil for reclamation, and lime stabilization. The ultimate design of the Build Alternatives include structure types such as HSR bridges, roadway bridges, crash walls, retaining walls, noise walls, fences and utilities. In addition, some portions of the Build Alternatives would require the construction of embankments, which includes cutting, excavation and grading into existing subsurface materials at varying depths as well as vegetation removal. All structures, embankments and cut slopes would incorporate engineering design features to minimize short- and long-term impacts to the Build Alternatives in accordance with American Association of State Highway Transportation Officials

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[153] Petersen, M.D., Mueller, C.S., Moschetti, M.P., Hoover, S.M., Wheeler, R.L., Llenos, A.L, William, Michael, A.J., Rubenstein, J.L., MacGarr, A.F. and Rukstales, K.S., 2016. *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., http://dx.doi.org/10.3133/ofr20161035.

[154] 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." U.S. Geological Survey, 2016, http://dx.doi.org/10.3133/ofr20161035.

[155] U.S. Geological Survey. The Severity of an Earthquake. General Interest Publications of the U.S. Geological Survey, Denver: USGS, 1989.

[156] U.S. Geological Survey, "Active Mines and Mineral Processing Plants in the United States in 2003," Reston Virginia, U.S. Geological Survey, 2005.

[157] Texas General Land Office, "Interactive Land Lease Mapping Program," Austin, TX: Texas General Land Office, 2016, http://gisweb.glo.texas.gov/glomap/index.html.

Load and Resistance Factor specifications, FWHA-Soil Slopes and Embankment Design and FHWA-Soil and Foundation Reference Manual during more advanced design. With the implementation of standard engineering design measures, it is anticipated that the potential impacts to soil and geologic conditions from the Build Alternatives would not be substantial. Potential risk factors and impacts in regards to soils and geology for each Study Area county are discussed below.

#### *3.20.5.2.1 Soils*

As previously stated, the risk factors that should be considered in the design of the Build Alternatives as a result of soil conditions include unstable soils, highly-expansive soils, low soil bearing strength, corrosive soils, slope failures and settlement. Potential impacts to the Build Alternatives 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 close 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 the 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 Build Alternatives 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 Build Alternatives 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.

Soils along the Build Alternatives generally have a moderate to high to very high potential 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 Build Alternatives where there would be buried uncoated steel.

The dominant soil characteristics as well as acres of prime and unique farmlands within the Study Area for each county are detailed below as well as the **Tables 3.20-1** through **3.20-10** above.

**Dallas County**

The soils underlying the Study Area in Dallas County contain primarily moderately well drained and well drained clays with moderate erosion potential and very high and high shrink swell and corrosion properties, respectively.

> Prime Farmland Soils: In Dallas County, an estimated 487 acres within Segment 1 (Build Alternatives A though F) would be anticipated to be converted from prime and unique farmland soils.

**Ellis County**

The soils underlying the Study Area in Ellis County contain primarily moderately well drained and well drained clays with low to moderate erosion potential and very high and high shrink swell and corrosion properties, respectively.

> Prime Farmland Soils: In Ellis County, an estimated 16 acres of Segment 1, 778 acres of Segment 2A (Build Alternatives A through C), 746 acres of Segment 2B (Build Alternatives D through F), 116 acres of Segment 3A (Build Alternatives A and D), 117 acres of Segment 3B (Build Alternatives B and E) and 116 acres of Segment 3C (Build Alternatives C and F) would be anticipated to be converted from prime and unique farmland soils.

**Navarro County**

The soils underlying the Study Area in Navarro County contain primarily moderately well drained and well drained clays with moderate to high erosion potential and very high and high shrink swell and corrosion properties, respectively.

> Prime Farmland Soils: In Navarro County, an estimated 781 acres of the Segment 3A (Build Alternatives A and D), 889 acres of Segment 3B (Build Alternatives B and E) and 733 acres of Segment 3C (Build Alternatives C and F) would be anticipated to be converted from prime and unique farmland soils.

**Freestone County**

The soils underlying the Study Area in Freestone County contain primarily moderately well drained and well drained clays with high erosion potential and moderate to very high shrink-swell and corrosion properties.

> Prime Farmland Soils: In Freestone County, an estimated less than one acre of the Segment 3A (Build Alternatives A and D) and Segment 3B (Build Alternatives B and E), 641 acres of Segment 3C (Build Alternatives C and E) and 606 acres of Segment 4 (Build Alternatives A, B, D and E) would be anticipated to be converted from prime and unique farmland soils.

**Limestone County**

The soils underlying the Study Area in Limestone County contain primarily moderately well drained and well drained clays with low erosion potential and moderate to high and moderate shrink-swell and corrosion properties, respectively.

> Prime Farmland Soils: In Limestone County, an estimated 180 acres of Segment 4 (Build Alternatives A, B, D and E) would be anticipated to be converted from prime and unique farmland soils.

**Leon County**

The soils underlying the Study Area in Leon County contain primarily moderately well drained and well drained clays with low to moderate erosion potential and moderate to high shrink-swell and corrosion properties.

> Prime Farmland Soils: In Leon County, an estimated 293 acres of the Segment 3C (Build Alternatives C and F) and 448 acres of Segment 4 (Build Alternatives A, B, D and E) would be anticipated to be converted from prime and unique farmland soils.

**Madison County**

The soils underlying the Study Area in Madison County contain primarily moderately well drained clays with moderate to high erosion potential and moderate to high shrink-swell and corrosion properties.

> Prime Farmland Soils: In Madison County, an estimated 310 acres of the Segment 3C (Build Alternatives C and F) and 490 acres of Segment 4 (Build Alternatives A, B, D and E) would be anticipated to be converted from prime and unique farmland soils.

**Grimes County**

The soils underlying the Study Area in Grimes County are primarily moderately well drained clays with high erosion potential and moderate to high shrink swell and corrosion properties.

> Prime Farmland Soils: In Grimes County, an estimated 8 acres of the Segment 3C (Build Alternatives C and F), 4 acres of Segment 4 (Build Alternatives A, B, D and E) and 714 acres of Segment 5 (Build Alternatives A through F) would be anticipated to be converted from prime and unique farmland soils.

**Waller County**

The soils underlying Waller County are primarily somewhat poorly drained and moderately drained clays with high erosion potential and low and high shrink swell and corrosion properties, respectively.

> Prime Farmland Soils: In Waller County, an estimated 141 acres of Segment 5 (Build Alternatives A through F) would be anticipated to be converted from prime and unique farmland soils.

**Harris County**

Soils underlying Harris County are typically poorly drained and somewhat poorly drained, loamy or sandy soils with high erosion potential and moderate to high shrink swell and corrosion properties. The three Houston terminal station options would be comprised of the same two soil classifications and vary only in percentage of them; therefore, the soil composition is not a differentiating factor between these terminal options.

> Prime Farmland Soils: In Harris County, an estimated 1,073 acres of Segment 5 (Build Alternatives A through F) would be anticipated to be converted from prime and unique farmland soils.

#### *3.20.5.2.2 Geology*

During construction of the Build Alternatives, impacts to local geology would include ground disturbing activities, such as cutting and grading, which would permanently modify the local topography. The Build

Alternatives would be designed to follow local topography within each county, where practicable, in order to minimize impacts.

#### *3.20.5.2.3 <u>Seismicity</u>*

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 do exist in the Study Area, the probability of seismic hazards is low, as discussed below.

**Dallas County**
Although no faults would be expected to directly affect the Build Alternatives 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 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 or death to passengers.

Seismic activity in the Study Area has not generally exceeded 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 2000 have been strong enough or within proximity to the Build Alternatives to pose a significant risk, the increasing frequency of low to medium magnitude earthquakes in the last few years 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**
Based on the fault locations and recorded seismic activity in Ellis County, the Project would be subject to occasional, low intensity seismic activity. The 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 or death to passengers.

**Navarro County**
Faults from the Mexia-Fault Zone would intersect the Study Area in Navarro County. While faults may not actively cause seismic activity, studies show pumping fracking wastewater into the ground could induce movements along faults. Segment 3A (Build Alternatives A and D) would be affected more by induced seismic activity than the other segments because these segments are intersected by the greatest number of faults. Annual probabilities for seismic hazards are low and any potential earthquakes would likely be low intensity, and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury or death to passengers.

**Freestone County**
No faults would underlie Segment 3C (Build Alternatives C and F) and no impact would be anticipated. One fault from the Mexia-Fault Zone would intersect 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 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 or death to passengers.

**Limestone County**
No faults would underlie the Study Area in Limestone County. No earthquakes have been documented in Limestone County. 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 or death to passengers.

**Leon County**
Based on the absence of faults within the Study Area in Leon County and low annual probability of seismic activity, no direct impact would be anticipated for Segment 3C (Build Alternatives C and F). One fault would intersect Segment 4 (Build Alternatives A, B, D and E) in Leon. Annual probability for seismic hazards being felt is low, and would cause minimal to no structural damage to the HSR system and would not pose risk of injury or death to passengers.

**Madison County**
No faults or earthquakes have been documented within the Study Area in Madison County. Annual probability for seismic hazards being felt is low and would cause minimal to no structural damage to the HSR system and would not pose risk of injury or death to passengers.

**Grimes County**
No faults or earthquakes have been documented within the Study Area in Grimes County. Annual probability for seismic hazards being felt is low and would cause minimal to no structural damage to the HSR system and would not pose risk of injury or death to passengers.

**Waller County**
No faults or earthquakes have been documented within the Study Area in Waller County. Annual probability for seismic hazards being felt is low and would cause minimal to no structural damage to the HSR system and would not pose risk of injury or death to passengers.

**Harris County**
Two faults would intersect Segment 5 (Build Alternatives A through F) in Harris County. Annual probability for seismic hazards being felt is low, and would cause minimal to no structural damage to the HSR system and would not pose a risk of injury or death to passenger. Based on the absence of faults that would intersect all three terminal station options in Houston and low annual probability of seismic activity, no structural damage to the HSR system would occur or risk of injury or death 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 Build Alternatives. The Midlothian Quarry and Plant, was identified approximately one-half mile west of Segment 2A. This resource was identified through GIS point data outside of the Study Area. Field verification would 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. TCR may choose to avoid the land during the design phase or coordinate with the landowners/operators. Potential impacts to oil and gas resources are described in **Section 3.9, Utilities and Energy**.

## 3.20.6 Avoidance, Minimization and Mitigation

Approximately 60 percent of the Build Alternatives 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 geologic 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 Build Alternatives where high groundwater exists and where retained cut or other structures would be located, TCRR shall avoid or minimize the amount of groundwater withdrawal, re-inject groundwater at specific locations or use alternate foundations to offset the potential for settlement.

### 3.20.6.1 Mitigation Measures

The mitigation measures (MM) noted below would be anticipated and refined as further site-specific geotechnical and foundation analyses are completed during final design. These measures apply to Build Alternatives A through F.

**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 Build Alternatives 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, 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 if unstable locations are in need of improvement so that those areas 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. Satellite imagery indicates 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 the land is within the LOD, TCR can alter the design plans to avoid the quarry. If TCR chooses to keep the current rail plans, coordination with the owner of the surface rights and subsurface rights would be necessary and may require land conversion or acquisition of the mineral rights for the ROW.

See also **WQ-MM#1, WQ-MM#2 and WQ-MM#13: Sedimentation and erosion control, maintenance and inspection of temporary erosion and sediment controls and stormwater runoff control** discussed in **Section 3.3.6.2.1, Water Quality,** and **LU-MM#2: Prime Farmland Conversion** discussed in **Section 3.13.7.2.1, Land Use.**

## 3.20.7 Build Alternative Comparison

As noted in **Table 3.20-11** below, the soil and geology impacts across the Build Alternatives would be comparable. The only exception would be impacts to prime farmland soils. Across all of the Build Alternatives, more than 34,000 acres of prime farmland would be impacted. Based on combined acreage conversion of soils, the least impacts to prime farmland soils would occur on Build Alternative F (5,277 acres) and the highest would occur on Build Alternative B (5,942 acres). Impacts to prime farmland from Build Alternatives A, C, D and E would be comparable. While this comparison considers the impact to areas ideal for farmland use, the types of impacts to existing farmland, such as fragmentation, conversion, or whether existing will be temporary impacted or permanently, were previously discussed in **Section 3.13.7.2.1, Land Use.**

Based solely on impacts to soils and geology, and specifically prime farmland, Build Alternative F would be a preliminary preferred alignment.

**Table 3.20-11** provides a summary of total area of soils based on relevant characteristics including erosion, shrink/swell potential and corrosion, as well as surface mines for the Build Alternatives.

**Table 3.20-11: 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 | | 10,136.2 | 10,229.8 | 10,264.9 | 10,119.2 | 10,212.7 | 10,247.8 |
| Shrink-Swell Potential | Moderate | 1,416.4 | 1,400.7 | 1,447.7 | 1,416.4 | 1,400.7 | 1.447.7 |
| | High | 2,698.0 | 2,780.7 | 2,761.3 | 2,675.7 | 2,758.4 | 2,739.0 |
| | Very High | 3,140.2 | 3,161.5 | 2,902.8 | 3,145.6 | 3,166.9 | 2,908.2 |
| Erosion Potential | Moderate | 3,605.6 | 3,699.8 | 3,589.8 | 3,506.4 | 3,600.6 | 3,490.6 |
| | High | 2,605.9 | 2,533.5 | 2,485.9 | 2,605.9 | 2,533.5 | 2,485.9 |
| Corrosion Potential | Moderate | 2,318.3 | 2,265.6 | 2,779.9 | 2,318.3 | 2,265.6 | 2,779.9 |
| | High | 7,666.0 | 7,799.3 | 7,321.8 | 7,649.2 | 7,782.4 | 7,304.9 |
| Prime Farmland Soils | | 5,832.0 | 5,941.9 | 5,308.3 | 5,800.9 | 5,910.8 | 5,277.3 |
| Surface Mines | | 0* | 0* | 0* | 0 | 0 | 0 |

Source: NRCS, 2013 and NRCS, 2015

* One resource was identified through GIS point data outside of the Study Area. Limits would need to be field-verified to confirm or discount presence in the Study Area.

# 3.21 Greenhouse Gas Emissions and Climate Change

## 3.21.1 Introduction

This section describes potential climate change effects of the Build Alternatives through an analysis of transportation greenhouse gas (GHG) emissions. The purpose of this assessment is to identify potential climate change impacts resulting from construction and operation of the Build Alternatives, as compared to the No Build Alternative for NEPA analysis purposes. Resilience of Build Alternatives 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 carbon dioxide ($CO_2$) and methane ($CH_4$), but also includes nitrous oxide ($N_2O$) 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 shows global average temperature has increased 1.4$^{o}$ 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 in the past 12 years.[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 federal or state regulations, or executive orders, specifically requiring GHG emissions or resiliency of project features to climate change be determined for planning of 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 train, 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

[1] NOAA. *Global Climate Change Indicators*. 2016. https://www.ncdc.noaa.gov/indicators/ (accessed January 25, 2016).
[2] Ibid.

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.

Construction period GHG emissions were quantitatively estimated for the earthwork and major civil construction activities of the Build Alternatives as listed in **Section 3.2.3.1, Air Quality**. Non-road GHG emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained-fill rail segments, traction power substations, industrial buildings at the TMFs, MOWs and HSR stations, including parking garages and platform facilities, were calculated using emission factors derived from the NONROAD2008 emissions model. Emissions were determined using Tier 3 emissions standards consistent with the specific equipment construction standard classification code. The analysis assumed that the non-road track construction equipment (mobile, portable and stationary fuel-burning equipment) would be spread out evenly along the Build Alternatives and that all equipment would be used based on a 58-hour work week over the entire 48-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 a total of five stand-alone MOW facilities. All stations and the TMF and MOW facilities would be constructed in 2020 and 2021, which are 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 MOVES2014a emission factors. The equipment for the Build Alternatives 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 3.2-6**. For each scenario, the maximum material hauled in one 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, Air Quality**. 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 one percent compared to the lowest consuming Build Alternatives. Therefore, for the train 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 trains, stations and TMFs, is summarized in below, and described in more detail in **Section 3.2, Air Quality**.

Train 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 train operation GHGs. The GHG emissions factor for vehicles derived from MOVES2014a was used to calculate annual GHG using the VMT estimated to be reduced during operation of the HSR system. The specific methods and assumptions for obtaining factors from eGRID and MOVES2014a are described in **Section 3.2.3.4, Air Quality**. Vehicle emissions reductions from travel mode shift from cars to HSR were calculated using the EPA's MOVES2014a model and ridership information from the Draft Conceptual Engineering Report provided by TCRR. 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, Air Quality** under **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 MOVES2014a was used to derive the emissions factors, including GHG, for the Year 2040, using vehicle distribution, fuel, climatic and other model inputs from the transportation conformity emissions modeling conducted by the regional MPOs for Dallas and Houston. 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 3.2.3.4, Air Quality.**

Net GHG operational impacts were then determined by adding the train 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 is relatively coarse, while TxWRAP data resolution is higher. A five-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 was 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 Build Alternatives is 2040, for the purposes of this analysis, and considering the resolution of climate change forecasting, the predictions for 2041-2070 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 Build Alternative 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 significantly 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 two 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 to 105 degrees Fahrenheit 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]

[3] Melillo, Jerry M., 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.
[4] Ibid.
[5] Ibid
[6] Ibid
[7] National Oceanic and Atmospheric Association (NOAA). *Texas heat wave of 2011 largely caused by drought, ocean temperatures, says NOAA-led study*. November 15, 2012.

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 zero 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 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% & 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

[8] Melillo, Jerry M., 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.

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 (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, sea level rise is not projected to affect the GHG Study Area.

[9] Texas A&M Forest Service. *Texas A&M Forest Service Wildfire Risk Assessment Portal (TxWRAP)*. 2016. https://www.texaswildfirerisk.com/ (accessed January 20, 2016).
[10] Jones, Justice, April Saginor and Brad Smith. "2011 Texas Wildfires Common Denominators of Home Destruction." *Texas A&M Forest Service*. undated. http://tfsweb.tamu.edu/uploadedFiles/FRP/New_-_Mitigation/Protect_Your_Home/2011%20Texas%20Wildfires.pdf (accessed January 20, 2016).
[11] Ibid.

## 3.21.5 Environmental Consequences

### 3.21.5.1 No Build Alternative

Nationally, estimated GHG emissions have decreased by 9 percent between 2000 and 2013, while in Texas GHG emissions decreased by 1.7 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 2017 to 2021. However, following 2021, 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 0.14 million metric tons annually would be a small percentage (0.02 percent) of the most current state-wide estimated emissions estimate of 641 million metric tons annually.[13]

### 3.21.5.2 Build Alternatives

This section presents quantitative impacts of the Build Alternatives 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 Build Alternatives 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 Build Alternatives are shown in **Table 3.21-2.** The emissions shown are the maximum emissions during any given year for the construction period and are based on Tier 3 emission factors. 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**

| Construction Activity | $CO_2e$ (million metric tons) |
|---|---|
| Track[b] | 0.014 |
| Stations[c] | 0.008 |
| TMFs[d] | 0.005 |
| MOWs[e] | 0.008 |
| **Total** | **0.035** |

Source: AECOM, 2016

Notes: [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 2.2%.

[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.

[12] U.S. Energy Information Administration. *Energy-Related Carbon Dioxide Emissions at the State Level 2000-2013*. 2015. http://www.eia.gov/environment/emissions/state/analysis/ (accessed June 6, 2016).

[13] Ibid.

#### *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 Build Alternative construction and result in emissions of GHGs. Total annual $CO_2$e emissions in millions of metric tons resulting from all on-road construction-related vehicle operations for the Build Alternatives are shown in **Table 3.21-3**.

**Table 3.21-3: Maximum Annual On-Road Construction-Related Vehicle GHG Emissions**

| Construction Activity | $CO_2$e (million metric tons) |
|---|---|
| Truck Hauling | 0.020 |
| On-Road Vehicles - Track | 0.052 |
| On-Road Vehicles - Station | 0.006 |
| On-Road Vehicles - TMF | 0.002 |
| On-Road Vehicles - MOW | 0.005 |
| **Total** | **0.085** |

Source: AECOM, 2016

Notes:[a] 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 2.2 percent.

#### *3.21.5.2.3 Freight Rail Material Hauling Emissions*

Most of the material used for the construction of the Build Alternatives would be transported to the construction site using freight rail. **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 year 2018 emission factors. Year 2018 would be the first year that ballast and aggregate materials would be required for the project, and emission factors for that year 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 During Period 2018–2021**

| Construction Activity | $CO_2$e (million metric tons) |
|---|---|
| Material Hauling | 0.016 |

Source: AECOM, 2016

Notes: [a] 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 2.2 percent.

**Table 3.21-5** shows a summary of GHG emissions for the Build Alternatives. 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 for Years 2018–2021 | |
|---|---|
| **Construction Activity** | **$CO_2$e (million metric tons)** |
| Off-Road Construction Equipment | 0.035 |
| On-Road Construction Vehicles | 0.085 |
| Locomotive Hauling | 0.016 |
| **Total** | **0.14** |

Source: AECOM, 2016
Notes: [a] 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 2.2 percent.

As shown in **Table 3.21-4**, GHG emissions from the construction period were quantified. According to the U.S. Energy Information Administration (EIA), the total annual $CO_2$ emissions in Texas during 2013 were 641 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 just 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 Build Alternatives and the offset by operational reductions of GHG; the construction would not have significant 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 Build Alternatives would be vehicle and bus travel on roadways, air travel between Dallas and Houston and power generation for the electricity consumed by the HSR trains, 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 trains 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 train 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 Future Year Train Emissions Adjustment in **Section 3.2.3.2**, **Air Quality**,

[14] U.S. Energy Information Administration. *Energy-Related Carbon Dioxide Emissions at the State Level 2000-2013*. 2015. http://www.eia.gov/environment/emissions/state/analysis/ (accessed June 6, 2016).

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 train operation emissions and vehicle emissions reduction. **Table 3.21-6** provides the result. As shown, the net impact would be a reduction of 0.417 million metric tons annually. Compared to the most current (2013) state-level GHG annual emissions estimate of 641 million metric tons, the reduction would be a small percentage. However, this would be a long-term reduction. Therefore, the Build Alternatives 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 0.417 million metric tons per year is greater than the maximum annual construction emissions of 0.136 million metric tons. Therefore, the total construction emissions over 4 years at a maximum of 0.136 million metric tons per year would be offset by operational net reductions of 0.417 million metric tons per year within less than 2 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) |
|---|---|
| Train operation emissions | 0.088 |
| Vehicle emissions reduction | -0.505 |
| Net impact | -0.417 |

Source: AECOM, 2016

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 Build Alternatives would be expected to have similar reductions per passenger-mile from these other travel modes, since they would be electric trains. Overall, net reductions to shifting from the bus transit mode would be small for the Build Alternatives 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, Air Quality** under 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

[15] Hodges, T. "Public Transportation's Role in Responding to Climate Change." Federal Transit Administration, U.S. Department of Transportation, Washington D.C., 2010.

[16] Chester, Mikhail V. *Life-cycle Environmental Inventory of Passenger Transportation in the United States*. Dissertation, Berkeley, CA: Institute of Transportation Studies, University of California, Berkeley, 2008.

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 Build Alternatives 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, Air Quality** under Vehicle Emissions Reduction.

The Build Alternatives operation emissions would result in a long-term net reduction of GHG that would 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. Considering the net reduction and offset, the long-term impact of the Build Alternatives 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 Build Alternatives 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, 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 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 Build Alternatives 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 Build Alternatives 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, Floodplains**.

As discussed in detail in **Section 3.8, Floodplains**, the elevation of crossings for the Build Alternatives would be designed to have a minimum of three 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. 213 Subpart F require special inspections following severe weather, including floods and storms, with the potential to damage tracks. These do not specifically apply to this Project; however, the HSR system would have system-specific inspection regulations for severe weather as part of FRA's Rule of Particular Applicability. The proposed HSR system inspections would include nightly inspection of the rail that would employ instrumented train sets to inspect rail condition. The proposed HSR system would employ an ambient weather condition monitoring system that would include flood stage and rain gauges at multiple points along the Build Alternatives that would be remotely monitored by TCRR operating staff, and would indicate extreme precipitation or flooding conditions (see **Appendix F, TCRR Conceptual Engineering Design Report**). The HSR system would not be operated on track that had been flooded or otherwise impaired until it was inspected and cleared for operation.[17] 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 (60 % 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 significantly increase climate change vulnerability of the Build Alternatives.

#### *3.21.5.2.7 Temperature*

The impact of increasing temperatures could have implications for the infrastructure performance of the Build Alternatives because temperatures within the GHG Study Area are projected to double or quadruple the number of annual hottest days. The design of the rail Build Alternatives 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, both of which increase the risk of derailment. The temperature at which the rail would be expected to neither expand or contract is the rail neutral temperature, a key design quantity for managing and maintaining the track against this risk. Because of its continuous, gapless nature, continuously welded rail is specifically designed, constructed and maintained to manage buckling or fracture risk. 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.

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 Build Alternatives.[18,19, 20]

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[17] Personal communication. Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.

[18] Choate, Anne, 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, Federal Transit Administration (FTA), Springfield, VA 22161: National Technical Information Service (NTIS), 2013.

[19] Meyers, Warren S. "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.

[20] Nemry, Françoise 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.

However, temperature is one of the most important factors.[21] Any increase in the buckling risk would be expected to be greater in the southern portion of the GHG Study Area closer to Houston.

Because continuously welded rail is designed and constructed expressly to manage thermal risk, resiliency to increased temperature risk from climate change would be provided. Resiliency could be bolstered by considering and adjusting the design rail NT, or the actual in-place rail NT, in response to the increasing ambient temperature.[22, 23] 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. The compression that the rail can tolerate is also determined by the rest of the rail structure such as ballast and anchors. Therefore maintenance and adjustment of these components would provide other means of maintaining resiliency against buckling risk.

Besides inspections, wayside (i.e., at the track) ambient and rail temperature monitors can more accurately assess local conditions for increased buckling risk. The in-place rail neutral temperature can actually change with the age and change in conditions of the infrastructure. The Project would implement the design and maintenance inspections described above 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.[24]

Besides temperature, numerous factors can affect track buckling, such as dynamic forces from loaded, moving trains, 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 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 train that connects to the overhead catenary system (see **Appendix F, TCRR Conceptual Engineering Design Report**). This is the same auto-tensioned catenary system used by the Shinkansen HSR that employs counter weights 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.[25] Because several of the design aspects for managing sag are temperature-driven, they would be expected to

[21] Federal Railroad Administration (FRA). "Development of Rail Neutral Temperature Monitoring Device." Technical Report, Office of Railroad Policy and Development, FRA, U.S. Department of Transportation, Washington D.C., 2008.
[22] Choate, Anne, 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, Federal Transit Administration (FTA), Springfield, VA 22161: National Technical Information Service (NTIS), 2013.
[23] Adams, Peter. "Incorporating Resilience into Port Authority Infrastructure Design." *FRA Rail Program Delivery Meeting*. Washington D.C., 2015.
[24] Personal communication. Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.
[25] Personal communication. Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.

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 3.21.2**, 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.[26] 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 train 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, there would be no long term impacts to avoid or minimize. Moreover, the HSR project would likely reduce GHG emissions by shifting the modes of travel. However, all avoidance and minimization actions discussed in **Section 3.2.6, Air Quality**, would also be effective towards minimizing GHG.

The HSR system would employ the same 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**, these systems would include the implementation of HSR track neutral temperature design, rail and weather 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.[27]

[26] Azad, Sonia. *Wildfire North of Huntsville Prompts Evacuations*. 2011. http://abc13.com/archive/8199999/ (accessed January 25, 2016)
[27] Personal communication. Chris Taylor, ARUP, phone call with Carl Sepulveda and Megan Inman, AECOM, August 19, 2016.

## 3.21.7 Build Alternatives Comparison

The lengths of the Build Alternatives would vary by 5.35 miles at most. Therefore, the differences in GHG emissions produced from power consumption to propel HSR trains 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 the GHG Emissions from Operations subsection of **Section 3.21.5.1** was also done for the lowest power consuming Build Alternative E. The daily power consumption only varied by one percent from the highest consuming Build Alternative A. Therefore, GHG emissions would not vary significantly between the different Build Alternatives. In addition, the minor variations in distance would not significantly change ridership. The travel time differences at HSR speeds would be on the order of 1.5 to 2 minutes, which would be not be significant to an approximate 90-minute trip time envisioned for the Build Alternatives. Given the negligible travel time differences and ridership, GHG reductions from travel mode shift would be similar amongst the Build Alternatives. All of the Build Alternatives would have similar impacts on GHG emissions.

All of 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**. 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

Based solely on GHG and climate change impacts, no singular Build Alternative would be preferred.

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# 4.0 INDIRECT AND CUMULATIVE IMPACTS

## 4.1 Introduction

Indirect and cumulative impacts analyses are required by NEPA and CEQ. Preserving the distinction between indirect and cumulative analyses in environmental documents is important because of key inherent differences in the nature of the effects and the ways in which they are identified and measured. For this analysis, indirect effects are: 1) caused by the implementation and operation of the Build Alternatives; and, 2) focused on the activities associated with the Build Alternatives and the corresponding environmental impacts. 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 Build Alternatives. 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. Cumulative impacts can result from individually minor but collectively substantial impacts taking place over a period of time.

## 4.2 Regulatory Context

The CEQ regulations define indirect effects as effects "…which 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."[1] Cumulative impacts are defined by the CEQ as "the impact 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."[2]

### 4.2.1 Indirect Effects

The following section analyzes the indirect effects to the human, natural and cultural environment resulting from the construction, operation and maintenance of the HSR Project.

### 4.2.2 Types of Indirect Effects

The NCHRP Report 466 identifies three broad categories of indirect effects: Project-influenced development effects, effects related to project-influenced development and encroachment-alteration impacts.[3] Each of the three categories, or types, of indirect effect is described below.

As noted in the NCHRP guidance, "[i]ndirect effects can be linked to direct effects in a causal chain."[4] This analysis operates under the assumption that a proximate cause-effect relationship with the Project must be present in order for an indirect effect to occur. In cases where the Project would potentially contribute—but not be causally linked—to a potential effect, the contribution of the Project to this

[1] 40 C.F.R. § 1508.8
[2] 40 C.F.R. § 1508.7
[3] 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
[4] Ibid.

potential effect when added to other past, present, and reasonably foreseeable future actions by others is considered further in **Section 4.4**.

#### 4.2.2.1 Project-influenced Development Effects and Effects Related to Project-influenced Development

These two indirect effects, Project-influenced development effects and effects related to Project-influenced development are closely tied and discussed together. Project-influenced development, sometimes called induced growth or the "land use effect" is often related to changes in accessibility to an area. This, in turn, affects an area's attractiveness for development (effects related to Project-influenced development), and can have the potential to cause additional changes to the natural or human environment. This level of development could impact the following resources: noise and vibration, species habitat, waters of the U.S., aesthetic and visual, transportation and land use. For the HSR Project, areas of potential induced growth would be limited to the station sites located in Dallas, Grimes and Harris counties due to the "closed system" that would not directly support development along the HSR corridor. For the developed and urban Dallas and Harris counties, where residents are generally exposed to more noise and infrastructure than in Grimes County, the development impacts would focus on changes in transportation and land use. The Brazos Valley Station in Grimes County is more rural and the evaluation would need to consider all of the resources noted above. The three HSR stations would operate in a similar manner to airport terminals and would incorporate passenger amenities, such as retail and access to ground transportation (taxi, bus, rental car, etc.).

#### 4.2.2.2 Encroachment-alteration Impacts

These indirect effects result from changes in ecosystems, natural processes or socioeconomic conditions that are caused by the proposed action, but can occur later in time or are farther removed in distance. Encroachment-alteration impacts are more closely related to the direct temporary and permanent impacts associated with the construction and operation of the Project. Examples include long-term changes in stream hydrology downstream from a waterway crossing or gradual effects on a neighborhood's cohesion as a result of roadway encroachment, displacements or changes in mobility and/or access. This analysis requires FRA to look at the impacts to a resource 5, 10, or 20 years after construction to identify how the Project impacted the resource beyond the Project footprint.

## 4.3 Methodology

Due to the linear nature of this transportation infrastructure project and considering that the Build Alternatives would be wholly located in Texas, several guidance documents were reviewed to develop a methodology for this Project, including TxDOT's Guidance on Indirect Impact Analysis,[5] TxDOT's Cumulative Impact Analysis Guidance,[6] 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."[7] Additional guidance resources include the American Association of State Highway and Transportation Officials (AASHTO) Practitioner's Handbook,[8] which assists in the assessment of indirect and cumulative impacts, as well as the Fifth Circuit in *Fritiofson v. Alexander* ruling that addressed the importance of cumulative impacts.[9]

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[5] Texas Department of Transportation Environmental Affairs Division, "Guidance Indirect Impact Analysis," Version 1, July 2016.
[6] Texas Department of Transportation Environmental Affairs Division, "Cumulative Impacts Analysis Guidelines," Version 2, July 2016.
[7] 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.
[8] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.
[9] Fritiofson vs. Alexander, United States Court of Appeals, Fifth Circuit, 772 F.2d 1225 (5th Cir. 1985)

The indirect effects, including project-influenced development effects, effects related to project-influenced development and encroachment-alteration, were investigated through desktop research and review of publicly available information. Following identification of the potential indirect effects of the Build Alternatives, a determination was made regarding whether each indirect effect would be considered potentially adverse. Only those effects considered potentially adverse are further discussed.

FRA evaluated project-influenced development effects of the Project 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**. This type of economic development would not be expected between the stations as there would be no access to the system. Land use conversion adjacent to the stations areas would be anticipated to support development.

To supplement the land use plans, FRA asked planning experts their opinions on the types of development that could occur if an HSR station was constructed; if the station was constructed, would the type of development change from what is currently occurring; what type of negative impacts, if any, could result from the development; and if there are any barriers to developing the area. FRA reviewed the responses from the planning professionals to identify local development trends; aid in forecasting indirect land use effects to occur as a result of the Project; and identify reasonably foreseeable future actions expected to occur within the area.

FRA spoke with 12 individuals from both the private and public sector (local real estate developers, city planners and regional planners represented by the metropolitan planning organizations) with a broad range of knowledge of current land use and development trends in the areas of the respective terminal stations. The ultimate conclusions of the process with regard to potential indirect effects of the Project are incorporated in the subsequent analyses.

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. The direct impacts to existing traffic patterns near the stations are discussed in **Section 3.11.5, Transportation**. The indirect impacts are qualitatively evaluated to assess the potential of 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 terminal stations.

As noted in **Section 3.11.3.3.3**, a maximum growth rate was set at 4.0 percent for Dallas and 2.2 percent 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 Dallas and Houston terminal station options. In the absence of travel demand model data for the Brazos Valley Station, compared to the data available for the station locations in Dallas and Harris counties, a 2.0 percent growth rate was used, based on historical growth rates in the area.

FRA evaluated encroachment-alteration effects to distinguish the root cause and extent of potential effects as they relate to the surrounding environment. These impacts typically include socioeconomic and ecological effects. FRA used professional judgment to forecast impacts to resources as many as 5, 10, or 20 years after construction. For example, FRA evaluated the potential for encroachment-alteration effects on water resources due to increased impervious cover, which can lead to increased non-point source pollution from runoff during rain and flooding events. For this Project, stormwater pollution prevention including the use of retention basins to counter the adverse effect of increased impervious cover.

## 4.3.1 Project-influenced Development Effects and Effects Related to Project-influenced Development Analysis

### 4.3.1.1 The Dallas Terminal Station

Over the last several years the areas surrounding the proposed Dallas 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. 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 HSR station would result in the short-term acceleration of new development, meaning that planned development would continue, but new development to support the anticipated needs of HSR riders would be reasonably foreseeable. For example, this type of development, similar to an airport terminal, could include a fast-food chain or a clothing store to accommodate travelers.

Long-term, the construction of the HSR station could result in the densification of The Cedars and could have the potential to increase land use densities in proximity to the terminal and facilitate the development of TOD in downtown Dallas, which would be consistent with local plans and policies. This could include taller, more compact buildings, comparable to the recent transition of the Uptown area of Dallas. According to several members of the land use panel, the success of long-term development may be dependent on the development of office buildings, which maintain a consistent flow of non-travelers to the area.

In order to determine the indirect effect of induced growth, FRA evaluated how these changes in development would impact traffic circulation in and around the station area. As noted in **Section 3.11.5.2.1, Transportation**, the construction of the Dallas Terminal Station would impact 5 intersections, requiring improvements or other forms of mitigation in order to maintain, or improve their existing level of service. 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.

The HSR system could potentially connect to existing and proposed transit services in Dallas, resulting in an increase and/or redistribution of existing transit services. The Dallas Terminal Station option would be located adjacent to the Dallas Convention Center and DART currently provides rail and bus service to the Convention Center area. Rail and bus services to the convention center area could be expanded to accommodate increased ridership from HSR passengers, by adding additional buses or trains, or other adjustments in service in response to demand. Any changes in rail/bus service would be expected to have minimal indirect impact on traffic operations within the vicinity of the station. Additionally, the location of the Dallas Terminal Station option would allow for a track extension of the Trinity Railway Express (TRE), a commuter line owned and operated by the Fort Worth Transportation Authority and DART.

Indirect impacts to traffic patterns would be limited to the Dallas Terminal Station in response to the potential extension of the TRE service. If extended, the at-grade service would impact at least three main streets – South Houston Street, Jefferson Boulevard Viaduct/South Market Street and Memorial Drive before connecting to the HSR station. There are no current plans to extend the TRE track, but the operation of the HSR station could result in expanded operation of the TRE system to complement transit connectivity and provide enhanced commuter benefits. If an expansion of the TRE were planned this would be a separate undertaking from the Project and would require its own separate environmental and planning evaluation.

### 4.3.1.2 Brazos Valley Station

The Brazos Valley Station in Grimes County would require conversion of agriculture and rural land to transportation uses. The station would be located in a rural environment, and is anticipated to primarily serve as an intermediate stop for Texas A&M University, Sam Houston State University and the surrounding communities. However, the site would be 25.6 miles east of 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. Given the distance between the station and these two more populated areas, and the inclusion of concessions and amenities within the station, development beyond the station is not reasonably foreseeable.

The Brazos Transit District currently offers fixed-route bus service in the Bryan-College Station area and demand-response service in Grimes County. The Build Alternatives could result in the development of regularly scheduled service between Bryan-College Station and the Brazos Valley Station, including direct shuttle service to Texas A&M University.

### 4.3.1.3 Houston Terminal Station Options

In Harris County, FRA evaluated three potential sites in northwest Houston near highly travelled freeways and active freight infrastructure. Over the last several years, development in this area of northwest Houston has varied. While development near the Northwest Mall Site has mostly stagnated, the area closest to the Northwest Transit Center Site has recently experienced moderate development, including multi-family housing and strip center development. An industrial company currently occupies the Industrial Terminal Site Option and has indicated to THC an interest in selling the property. The redevelopment of this industrial site is anticipated to occur independently of the HSR Project; however, the type of development on this site could change depending on the location of the HSR station.

According to the planning professionals, there would be little difference in the development potential among the Houston Terminal Station Option sites due to their proximity to one another. The Industrial Site Option is the farthest site west of downtown Houston and is located less than one-half mile from the Northwest Transit Site, which is located closest to downtown Houston. Given how close the station sites are to one another, the development of one of the sites for the HSR station could potentially influence development at one of the other sites. For example, should the Industrial Site be selected, it would be reasonably foreseeable for additional development to occur at the Northwest Mall site given its proximity to the Industrial Site. Another factor is that both station sites require the acquisition of one large parcel. Although the Northwest Transit Center Site would be within a quarter-mile of the Northwest Site, the development of the site would require the acquisition of a number of parcels and would likely be a hurdle to development. Conversely, should the Northwest Transit Center site be selected for the HSR Project, it would be reasonably foreseeable that Project related development could occur at the Industrial Terminal site or the Northwest Mall site. It is reasonably foreseeable that the

Houston Terminal options could potentially increase land use densities in proximity to the station and facilitate the development of TOD in Houston.

In order to determine the indirect effect of induced growth, FRA evaluated how changes in development would impact traffic circulation in and around the station area. As noted in **Section 3.11.5.2.10, Transportation**, the construction of the Houston Terminal Station Options would impact 19, 16 and 17 intersections at the Industrial Site, Northwest Mall Site and Northwest Transit Center Site, respectively, requiring improvements or other forms of mitigation in order to maintain or improve the existing levels of service. 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.

Regardless of which station site FRA selects, it is reasonably foreseeable that development around the station area similar to an airport terminal could occur to accommodate travelers. This level of development could require additional traffic analyses and improvements to the nearby roadway network.

Another consideration related to the potential development of all three sites would be access. Houston METRO bus service is currently available to all three Houston Terminal Station options. METRO could increase or add new bus services to the Houston terminal station options to accommodate HSR passengers. The Northwest Transit Center Terminal Station option would be located adjacent to and immediately north of an existing METRO transit center and if selected could result in the expansion and/or relocation of the transit center. Additionally, Houston METRO light rail service, which currently operates in the downtown and medical center areas, could be extended to connect transit access from the Houston Terminal Station options to existing service areas.

### 4.3.2 Encroachment-alteration Impacts

For each resource evaluated, encroachment-alteration impacts were analyzed focusing on potential impacts to the socioeconomic, natural, physical and cultural environment. As noted above, these indirect effects result from changes in ecosystems, natural processes or socioeconomic conditions that are caused by the proposed action, but occur later in time or farther removed in distance. FRA separated these effects into three categories – impacts to the human, natural, and cultural environments.

#### 4.3.2.1 Resources to be Analyzed

FRA used an area of influence for encroachment-alteration impacts similar to the LOD of the Build Alternatives to determine which resources would be analyzed. Resources with direct adverse impacts were evaluated to determine the likelihood for indirect impacts. Due to the “closed system” nature of the Project, relatively undeveloped area throughout the majority of the Study Area and the noted direct adverse impacts, FRA eliminated the following resources from further review: air quality, water quality, noise and vibration, hazardous materials, vegetation, floodplains, transportation, elderly and handicapped, land use, electromagnetic fields, public safety, environmental justice, soils and geology, greenhouse gas emissions and climate change and Section 4(f)/Section 6(f). Design features of the Build Alternatives, namely avoidance of towns and cities outside of the two urban counties, use of viaduct or elevated structure to span over resources and locating the Build Alternatives adjacent to existing transportation and utility infrastructure across approximately 52 percent of the Build Alternatives minimized the direct and indirect impacts to many of the resources.

The following resources were analyzed based on potential indirect impacts resulting from the construction and maintenance of the Project.

- **Impacts to the Human Environment**
    - **Utilities** – Actions by utility providers
    - **Socioeconomics** – Community Character and Cohesion
- **Impacts to the Natural Environment**
    - **Threatened and Endangered Species; Federally Protected Species –** Houston toad, Large-fruited sand verbena, Navasota ladies'-tresses
    - **Waters of the U.S.** – Temporary and permanent encroachment on streams and wetlands
- **Impacts to the Cultural Environment**
    - **Cultural Resources** – Impacts to structures, buildings, objects, site, districts, landscapes, natural features, traditional cultural properties and cemeteries

### 4.3.2.2 Indirect Impacts to the Human Environment

#### *4.3.2.2.1 Utilities*

FRA evaluated the Project's impacts on underground water, wastewater, crude oil and natural gas pipelines, and communication service lines in **Section 3.9, Utilities and Energy**. Typically, impacts to utility resources that include the relocation or modification of existing above ground and below ground service lines or the introduction of new service line connections would be considered a direct impact; however, the actual location of these potential impacts cannot be reasonably determined by FRA at this time. These potential impacts would be evaluated, planned and resolved by a utility provider(s) through separate environmental processes. Because this responsibility falls to the utility provider(s), and not TCRR or FRA, the utility providers would determine the exact location of the utility connection or relocation and its subsequent impacts. The potential direct impacts of the Project to transmission lines will not be evaluated, planned and implemented through this EIS; therefore, only the potential indirect impacts are included in this assessment.

The utility providers will ultimately be responsible for all undertakings of the utility relocations, utility pole adjustments and/or new connections. The utility provider will be responsible for managing and leading any environmental process requirements associated with the modifications to provide the connections to TCRR's infrastructure. This process includes a routing analysis that requires environmental impact assessment, as well as a public involvement process, and would be coordinated through the Texas Public Utility Commission. It is assumed that each utility provider would assess their existing infrastructure against their own expansion or growth plans in concert with TCRR's needs in order to maximize the overall benefit to their system. For example, if Oncor planned to implement a new utility line, they may fold TCRR's request and power needs into the overall service plan of that new line. If no new plans are proposed, the utility provider could simply complete the environmental impact assessment and clearance for only TCRR's needs. It is important to note that each provider would utilize the environmental clearance process to determine a connection between their line (existing or new) and the HSR system that minimizes impacts. This may include following property lines, roadways or other utility easements versus creating a brand new easement or staking across a parcel.

Relocation of a utility may also necessitate additional land or easement acquisition or temporary facilities. Additional land requirements for relocation could encroach on existing residential areas or sensitive habitat areas. The final utility crossing decisions would be determined on a case-by-case basis by the utility provider during final design. Construction activities for relocations and/or protective actions would result in scheduled and/or accidental interruptions of utility services. Final design and phasing of construction activities would minimize interruptions.

#### *4.3.2.2.2 Socioeconomics*

As is typical of linear infrastructure, the Build Alternatives have a narrow footprint and would not change the pattern and intensity of land use in the broader cities and counties in which they are located; however, they can create a localized barrier between a residential community and social or commercial resources. Indirect impacts from this barrier include isolation, reduced or enhanced connectivity, changes to the development patterns and changes to the character of the residential community. Indirect impacts to community character and cohesion are discussed below.

**Community Cohesion**
All communities possess unique traits that could potentially be affected by the long-term changes related to the Project. These could include changes in access or travel patterns, modification to the landscape or general character of the neighborhood.

Segment 1 (Build Alternatives A through F) – LeMay and LeForge Neighborhood
As previously discussed in **Section 3.14.5.2.2, Socioeconomic and Community Facilities**, Segment 1 would directly displace approximately 14 homes on LeMay and LeForge Avenues in the Cedar Crest neighborhood, which is located between Illinois Avenue and Loop 12 in Dallas County. The location of the LeMay and LeForge neighborhood east of an active UPRR freight line already isolates it from the greater Cedar Crest Community due to the bisecting rail line. Segment 1 of the Build Alternatives would parallel UPRR and would pass on viaduct through the western edge of the neighborhood. Due to this neighborhood's existing isolation, the character of the larger Cedar Crest Community would not be adversely impacted; however, the cohesive character of the remaining 20 homes of the LeMay and LeForge neighborhood would be indirectly impacted by the bisection of the neighborhood. Due to this indirect impact, TCRR would also acquire the remaining 20 homes and relocate the residents to comparable properties within the greater Cedar Crest Community, if possible.

Segments 2 through 5 (Build Alternatives A through F)
With these segments, the impacts to community cohesion would not further isolate any neighborhoods. Impacts to neighborhoods, which would include noise and vibration and aesthetic and scenic, would be direct and are discussed in **Section 3.14.5.2.2, Socioeconomics and Community Facilities**.

**Economic Impacts**
FRA evaluated the direct and indirect economic impacts that may occur as a result of the Build Alternatives in **Section 3.14.5.2.3, Socioeconomics and Community Facilities**. The economic modeling for this EIS considers direct and indirect job growth and calculates the overall direct and indirect impacts to the economy that may occur as a result of the Build Alternatives. The following text summarizes the indirect impacts previously discussed. These analyses included direct and indirect impacts on employment and earnings, property impacts, property tax and net change in tax revenue.

Encroachment-alteration impacts on the local and regional economy would stem from displacement of businesses during ROW acquisition, which in turn could result in decreased tax revenues and potential job losses based on whether the employer chooses to relocate. While the analysis conducted in Section **3.14.5.2.3, Socioeconomic and Community Facilities**, suggests that displaced businesses would be able to find replacement properties nearby, a loss in tax base for the local economy would result if businesses chose to relocate outside of the area. Also, impacts to the economy would potentially occur due to temporary cessation of business operations during the relocation process. As stated in **Section 3.14.5.2.3, Socioeconomic and Community Facilities**, all displaced business owners would receive fair market value compensation for their land and improvements; for this reason, it is assumed that business operations would eventually resume. In most circumstances, decreased tax revenue as a result of business displacements during ROW acquisition is anticipated to be temporary; therefore, indirect impacts to the local and regional economy as a result of the business displacements during ROW acquisition would be negligible.

### 4.3.2.3 Impacts to Natural Environment

Potential encroachment-alteration impacts to ecological resources are discussed with regard to impacts to water resources and wildlife habitat, including habitat for threatened and endangered species. The primary activities that would potentially result in encroachment-alteration impacts include: clearing existing vegetation; grading, earthmoving, excavation and embankment construction; and track infrastructure placement.

#### *4.3.2.3.1 Federally Protected Species*

**Section 3.6.3, Natural and Ecological Systems and Protected Species** identified suitable habitat for the three federally listed species – Houston toad (*Anaxyrus houstonensis*), large-fruited sand verbena (*Abronia macrocarpa*) and Navasota ladies'-tresses (*Spiranthes parksii*). The first year of presence/absence surveys for all three species was conducted in coordination with USFWS. FRA evaluated the potential for indirect impacts to federally listed species habitat and determined that induced and project-influenced development would not occur due to the nature of the HSR "closed system." For most resources evaluated in this EIS this would limit the encroachment impact potential to Dallas, Grimes and Harris counties; however, federally protected species habitat could be directly impacted by the relocation, adjustment and potential new connections of overhead utility lines. The actual location of these potential impacts cannot be reasonably determined by FRA at this time, but FRA anticipates potential impacts to federally protected species habitat in Limestone, Freestone, Leon, Madison and Grimes counties. These potential impacts would be evaluated, planned and resolved by the utility provider(s) through separate environmental processes. Because responsibility of the utility relocation and connection falls to the utility providers, and not TCRR or FRA, the utility providers would determine the exact location of the utility connection or relocation.

The Study Areas of Dallas and Harris counties do not contain potential habitat for the federally listed species evaluated by FRA. Grimes County does contain potential habitat; however, no federally listed species have been identified within the county as discussed above in **Section 4.3.3.2**, and FRA does not anticipate reasonably foreseeable development associated with the Brazos Valley Station, so no additional indirect impacts to federally protected species habitat would be expected.

#### *4.3.2.3.2 Waters of the U.S.*

FRA evaluated the potential for indirect impacts to waters of the U.S. and determined that induced and project-influenced development would not occur due to the nature of the HSR "closed system" meaning that potential development related impacts would be limited to the station areas. Impacts to waters of the U.S. would not be expected near the station areas of Dallas and Houston due to the urban nature of the areas, and as previously noted development beyond the Brazos Valley Station would not be foreseeable. For most resources evaluated in this EIS the encroachment impacts would also be focused on the station areas in Dallas, Grimes and Harris counties; however, waters of the U.S. could be directly impacted by the relocation, adjustment and potential new connections of overhead utility lines. The actual location of these potential impacts cannot be reasonably determined by FRA at this time, but FRA anticipates potential impacts to waters of the U.S. in all 10 counties. These potential impacts may include a reduction in the function and quality of nearby wetlands and potential degradation of riparian habitat. These potential impacts would be evaluated, planned and resolved by a utility provider(s) through separate environmental processes. Because responsibility of the utility relocation and connection falls to the utility providers, and not TCRR or FRA, the utility providers would determine the exact location of the utility connection or relocation.

#### 4.3.2.4 Impacts to the Cultural Environment

**Section 3.19.3.2.2, Cultural Resources** includes the potential direct and indirect impacts of the Build Alternatives. The evaluation identified 65 previously recorded and designated historic resources of interest. Two of these resources – Guiberson Corporation Family Residence and Office and Honey Springs Cemetery – would result in adverse indirect impacts. Both resources are located in Dallas County and would be common to all Build Alternatives.

The Guiberson Corporation Family Residence and Office is located 85 feet outside of the LOD; however, its associated building, the Guiberson machine shop, would be directly impacted by the Build Alternatives. That direct impact to the machine shop affects the integrity of the remaining residence and office building.

The second resource would be the Honey Springs Cemetery. The original boundaries of the cemetery are not well known, as it does not appear on a topographic map or other known historic map. The current boundaries of the cemetery are believed to contain 3.9 acres. The resource is partially located within the LOD (approximately 0.47 acres), where track on viaduct would be constructed over the resource. Although the resource is located in an urban setting with mixed commercial, industrial, and residential properties, based on preliminary plans, the viaduct would be visually obstructive to the cemetery setting. Due to the visual obstruction, the Build Alternatives would indirectly affect the resource's integrity of design, setting, feeling and association.

### 4.3.3 Assessment of Consequences and Consideration of Mitigation

The majority of encroachment-alteration effects that would potentially occur as a result of the Build Alternatives would be considered probable. Mitigation measures for the potential effects to community cohesion as discussed in Section 4.3.4.2.2 and cultural resources as discussed in Section 4.3.4.4, are discussed below.

#### 4.3.3.1 Mitigation of Effects to Communities

Potential encroachment-alteration effects to communities would occur in the Le May and Le Forge neighborhood of the greater Cedar Crest Community. The construction and operation of the Build Alternatives would immediately change the community cohesion. Full acquisition of the LeMay and LeForge neighborhood (34 homes) and relocation of residents may be appropriate to mitigate community cohesion impacts to the neighborhood. FRA would conduct specific outreach to this community to understand the existing connections between the residents. For example, an elderly resident may receive care from a neighbor or another resident may 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. Mitigation for these impacts may include relocating neighbors so that they remain together or increasing the compensation for relocation to include the services that would be required (healthcare, childcare). Outreach efforts to this community to understand the existing connections between residents will be documented in the Final EIS and could include mailers, door hangers, meetings and one-on-one interviews. This information should inform the agreement between TCRR and the landowner for the purchase of homes within this neighborhood.

#### 4.3.3.2 Mitigation of Effects to Cultural Resources

Early investigations of and coordination on cultural resources informed and minimized the design of the Build Alternatives. The avoidance, minimization and mitigation measures proposed in **Section 3.19.6, Cultural Resources**, would also be proposed for indirect impacts to Cultural Resources. Indirect impacts to the Guiberson Corporation Family Residence and Office and Honey Springs Cemetery would be minimized through additional coordination with THC and in compliance with the Programmatic Agreement to be drafted by FRA. A draft of the Programmatic Agreement shall be distributed with the Final EIS and reviewed by the Section 106 consulting parties. Under the Programmatic Agreement, mitigation measures for indirect impacts to these two sites could include the completion of Historic American Building Survey documentation and documentation of the resources for preservation within a book or other public outreach material.

## 4.4 Cumulative Impacts

Cumulative impacts consider the combined results of past, current and future activities, in addition to the Project, and measures their cumulative impact on the environment. This cumulative analysis also considers the indirect impacts already discussed in Section 4.3.

### 4.4.1 Methodology

Combining the recommended steps from the Fifth Circuit in *Fritiofson v. Alexander*[10] and AASHTO's Practitioner's Handbook,[11] 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
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.[12] The following factors were considered:

- Protected by legislation or resource management plans
- Ecologically important

[10] Fritiofson vs. Alexander, United States Court of Appeals, Fifth Circuit, 772 F.2d 1225 (5th Cir. 1985)
[11] AASHTO, Practitioner's Handbooks Resource Materials: 12 Assessing Indirect Effects and Cumulative Impacts under NEPA, August 2016.
[12] Council on Environmental Quality, "Considering Cumulative Effects Under the National Environmental Policy Act," January 1997.

- 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."[13] Therefore, the cumulative impacts analysis in the following sections only focuses on the resources that will be directly or indirectly impacted by the Project.

### 4.4.2 Resources to be Analyzed

The examination of the current health and historical context of each resource is necessary to establish a baseline for determining the impacts of the Build Alternatives 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 4-1** summarizes direct and indirect 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.

[13] AASHTO, http://www.environment.transportation.org/pdf/programs/practitioners_handbook_12.pdf

**Table 4-1: Cumulative Analysis of Resources**

| Subject Considered for Direct and Indirect Impacts | Impact Assessment | | Cumulative Impact Assessment Criteria | | Included for Cumulative Impact Analysis? | Explanation for Including or Excluding the Subject from Cumulative Impact Analysis |
|---|---|---|---|---|---|---|
| | Direct Impacts | Indirect Impacts | 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) | • Net emissions benefit | N/A | No | Yes | Yes | **Included** because of prevailing non-attainment conditions. |
| **Water Quality** (Section 3.3) | • Impacts to upwards of 11 groundwater wells<br>• 3 public water system wells | N/A | No | No | 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) | • 27 severe noise residential impacts<br>• 325 moderate noise residential impacts<br>• 1 moderate noise institutional impact | N/A | No (anticipated to be mitigated to a level that is not severe) | No | No | Excluded because direct noise impact would be mitigated and no future sensitive receptors have been identified as of the date of the analysis. |
| **Hazardous Materials** (Section 3.5) | • 6 high-risk sites | N/A | No | No | No | Excluded because the project would not generate hazardous waste. Although hazardous materials sites were detected within the limits of disturbance, no adverse impacts were identified. |
| **Natural Resources** (Section 3.6) | | | | | | |
| Threatened and Endangered Species | • 340 average acres temporary impact to suitable habitat<br>• 1,446 average acres of permanent impact to suitable habitat<br>• First year of presence/absence surveys completed; no recorded species | Potentially | Potentially | Yes | Yes | **Included** due to the potential presence of three federally protected species; second year presence/absence surveys are ongoing. Also, potential indirect impacts from overhead transmission lines have not been determined and would be evaluated through a separate environmental process led by the utility provider. |

| **Table 4-1: Cumulative Analysis of Resources** | | | | | | |
|---|---|---|---|---|---|---|
| Subject Considered for Direct and Indirect Impacts | Impact Assessment | | Cumulative Impact Assessment Criteria | | Included for Cumulative Impact Analysis? | Explanation for Including or Excluding the Subject from Cumulative Impact Analysis |
| | Direct Impacts | Indirect Impacts | Would the Project result in adverse impacts to the resource? | Is the subject a scarce resource or in poor or declining health? | | |
| Vegetation and Wildlife Habitat | • 2,123 average acres of temporary impact to habitat<br>• 8,079 average acres of permanent impact to habitat | N/A | No | No | Yes | **Included** because construction of the Project and other projects would permanently impact existing vegetation and potentially create fragmented habitat. |
| **Waters of the U.S.** (Section 3.7) | • 10 miles of impacts to streams<br>• 38 acres of impact to waterbodies<br>• 106.2 acres of impacts to wetlands | Potentially | No | Yes | Yes | **Included**, while direct impacts to wetlands would be mitigated, potential indirect impacts from overhead transmission lines have not been determined and would be mitigated through a separate environmental process led by the utility provider. |
| **Floodplains** (Section 3.8) | • 565.5 average acres of permanent impacts to 100-year and 500-year floodplains<br>• 74.6 average acres of temporary impacts to 100-year and 500-year floodplains | N/A | No | No | No | Excluded because the project would not increase the base floodplain elevation that would violate applicable floodplain regulations. |
| **Utilities and Energy** (Section 3.9) | • 10 new connections<br>• 95 pole adjustments<br>• 114 electric connections<br>• 34 impacts to oil and gas wells | Yes | Yes | No | Yes | **Included** because the Project would elevate utilities in place and associated utility providers would relocate utilities and/or create new utility connections. |

**Table 4-1: Cumulative Analysis of Resources**

| Subject Considered for Direct and Indirect Impacts | Impact Assessment | | Cumulative Impact Assessment Criteria | | Included for Cumulative Impact Analysis? | Explanation for Including or Excluding the Subject from Cumulative Impact Analysis |
|---|---|---|---|---|---|---|
| | Direct Impacts | Indirect Impacts | Would the Project result in adverse impacts to the resource? | Is the subject a scarce resource or in poor or declining health? | | |
| **Aesthetic and Visual** (Section 3.10) | • 2 Beneficial impacts<br>• 9 Neutral impacts<br>• 1 Adverse impact | N/A | No | No | No | Excluded because only one landscape unit would have an adverse visual impact, and that landscape unit is located in a rural, sparsely populated area. Overall the project's aesthetic impacts are neutral. |
| **Transportation** (Section 3.11) | • 34 freight crossings<br>• 246 permanent impacts to roadways<br>• 2 impacts to airports | Yes | 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) | N/A | N/A | No | No | No | Excluded impacts to the community are already avoided, minimized, or mitigated. |
| **Land Use** (Section 3.13) | • 2,123.85 average acres of temporary land use conversion<br>• 8,072.45 average acres of permanent land use conversion | Yes | No | No | Yes | **Included** because the Project could result in additional land use conversion near the station areas as well as additional projects within the Study Area. |
| Farmland/Agriculture | • 1,507.40 average acres of temporary impacts to farmland<br>• 4,253.42 average acres of permanent impacts to farmland | Yes | No | No | Yes | **Included** due to conversion of farm and agricultural land as a result of other projects within the 10-county area. |
| **Socioeconomics and Community Facilities** (Section 3.14) | • 5 neighborhoods<br>• 6 schools<br>• 4 community facilities | Yes | 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 stations areas. |

**Table 4-1: Cumulative Analysis of Resources**

| Subject Considered for Direct and Indirect Impacts | Impact Assessment | | Cumulative Impact Assessment Criteria | | Included for Cumulative Impact Analysis? | Explanation for Including or Excluding the Subject from Cumulative Impact Analysis |
|---|---|---|---|---|---|---|
| | Direct Impacts | Indirect Impacts | Would the Project result in adverse impacts to the resource? | Is the subject a scarce resource or in poor or declining health? | | |
| Displacements and Relocations | • 49 average commercial properties displaced<br>• 207 residences displaced<br>• 2 community facilities displaced | Yes | No | No | No | 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) | N/A | N/A | No | No | No | Excluded because there are no EMF impacts. |
| **Safety and Security** (Section 3.16) | • 14 Road modifications that would results in a delay of 2+ minutes<br>• 11 Road modifications that would results in a delay of 1 minute or less<br>• 9 Fire and EMS providers with high potential to experience construction effects<br>• 8 Fire and EMS providers with high localized potential for construction effects | N/A | No | No | No | Excluded because first responder routes would be maintained throughout the construction of the HSR Project and any other project in the area. |
| **Recreational Facilities** (Section 3.17) | • 1 Park (Lake Bardwell) impacted | N/A | No | No | No | Excluded because the Project would not adversely affect this resource. |
| **Environmental Justice** (Section 3.18) | • 35 EJ Communities<br>• No disproportionate impacts | N/A | No | N/A | No | Excluded because there are no disproportionately high and adverse impacts to EJ communities and it is not a resource that can be quantified in terms of “poor or declining health.” |

**Table 4-1: Cumulative Analysis of Resources**

| Subject Considered for Direct and Indirect Impacts | Impact Assessment | | Cumulative Impact Assessment Criteria | | Included for Cumulative Impact Analysis? | Explanation for Including or Excluding the Subject from Cumulative Impact Analysis |
|---|---|---|---|---|---|---|
| | Direct Impacts | Indirect Impacts | Would the Project result in adverse impacts to the resource? | Is the subject a scarce resource or in poor or declining health? | | |
| **Cultural Resources** (Section 3.19) | • 7 adverse impacts | Yes | No | No | No | Excluded because adverse impacts will be mitigated through coordination with THC and consulting parties. Also, the area of influence for other reasonably foreseeable projects would not directly or indirectly affect these seven resources or historic districts within the Study Area. |
| **Soils and Geology** (Section 3.20) | • 2,735.52 average acres of high shrink-swell potential soil impacted<br>• 3,070.87 average acres of very high shrink-swell potential soil impacted<br>• 7,587.27 average acres of high corrosion potential soil impacted | N/A | No | No | No | Excluded because the Project would not adversely impact this resource. |
| **Greenhouse Gases** (Section 3.21) | • No long-term impacts | N/A | No | No | No | Excluded because operation of the Build Alternatives would generally reduce regional criteria and GHG pollutants. |

Source: AECOM, 2017

Based on the screening process above, 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

### 4.4.3 Resource Study Areas, Conditions and Trends

Cumulative impacts are considered within a spatial geographic area or Study Area, and were determined based on the environmental resources that were selected for this analysis.

#### 4.4.3.1 Temporal and Spatial Boundaries

The temporal boundary for this analysis extends from year 2000 through year 2040. 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 Build Alternatives would be anticipated to reach the final operating scenario by that time.

The geospatial boundary for determining encroachment-alteration impacts for the human environment varies based on the resource. The specific boundaries are:

- Community cumulative impacts: the LOD of the Build Alternatives
- Economic cumulative impacts: the ten-county Study Area
- Transportation cumulative impacts: the ten-county Study Area
- Utilities and Energy cumulative impacts: the ten-county Study Area
- Natural environment cumulative impacts: quarter mile buffer from the centerline of the HSR tracks

#### 4.4.3.2 Air Quality

The Study Area for air quality includes the air basins that encompass the ten-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.

#### 4.4.3.3 Natural Resources – Threatened and Endangered Species (Federally Protected)

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 two EORs within five miles of the Study Area in Freestone County, one within five miles in Leon

County, one within five miles in Madison County, and as well as one within the Study Area, two within one mile of the Study Area and 4 within five miles of the Study Area in Grimes County.

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.

#### 4.4.3.4 Natural Resources – Vegetation and Wildlife Habitat

The Study Area for vegetation and wildlife habitat consists of the areas that are within the 10-county LOD.

#### 4.4.3.5 Waters of the U.S.

The Study Area for waters of the U.S. consists of the watersheds within the 10-county area.

#### 4.4.3.6 Utilities and Energy

The Study Area for the cumulative analysis of utilities and energy is the ten counties in which the Build Alternatives would be located.

#### 4.4.3.7 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.

#### 4.4.3.8 Land Use- Farmland

The Study Area for land use and farmland is the ten- counties the Build Alternatives would traverse.

#### 4.4.3.9 Socioeconomic

The economic, demographic, and social data from counties was used in determining the Study Area for socioeconomics.

### 4.4.4 Direct and Indirect Effects on each Resource from the Project

The analysis of cumulative impacts must consider the direct and indirect impacts of the Build Alternatives within each resource Study Area. The direct and indirect impacts of the Build Alternatives were discussed in detail in Chapters **3.0, Affected Environment and Environmental Consequences** and **4.4, Indirect and Cumulative Impacts**, respectively.

### 4.4.5 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 which are not likely to proceed in the foreseeable future are not included in the analysis. **Table 4-2** lists the activities with quantitative data that have been considered in the cumulative impacts analysis.

**Table 4-2: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis**

| County | Description | Status | 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 | - 16 business displacements<br>- Loss of approximately 350 parking spaces<br>- Excess traffic noise at 2 receivers<br>- Approximately 13 Hazardous materials sites may be impacted<br>- 4.5 acres of riparian vegetation impacted (minor in nature and only avoidance measures are proposed)<br>- 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 | - No community, EJ, wetland, floodplain, or visual impacts<br>- 14.4 acres land use impacts for new ROW<br>- Positive transportation impacts<br>- Improvement to bicycle pedestrian facilities<br>- No historic or archeological impacts<br>- Section 4(f) *de minimus* impact<br>- Waters of the U.S.: Permanent impacts at 4 water crossings. Each would affect >.5 acre<br>- 9.5 acres of riparian forest and 0.6 acre of upland woodland habitat impacted<br>- Noise impacts at 13 receivers |
| Dallas County | IH-35 East – Construct additional concurrent managed lanes from US 380 to IH-635 | Currently in construction | - Traffic noise impacts<br>- 318 displacements<br>- 106 acres land use conversion to transportation use (North segment only)<br>- Section 4(f) impacts (Central segment only)<br>- Minor water resource impacts (>5 acres)<br>- Minor biological habitat impacts<br>- Traffic noise impacts<br>- No Air Quality Impacts |
| Dallas County | IH-35 East/US 67 – Construction of 11 miles of improvements | | - 3.63 acres of additional ROW<br>- 1.56 acres for drainage<br>- No impacts to federally threatened, endangered or candidate species or critical habitat<br>- 1.67 acres of riparian habitat impacted<br>- 0.53 acres of disturbed prairie habitat impacted<br>- 0.004 acre of permanent fill impacts<br>- 34 traffic noise barriers are proposed<br>- No impacts to groundwater, wetlands, prime farmlands, floodplains or air quality<br>- No impacts to archaeological or historic resources<br>- Improved bicycle and pedestrian facilities<br>- Improved vehicular mobility and connectivity |
| Dallas County | Trinity Parkway – Construction of 9 miles of a new 10-lane tolled roadway | Opening 2019-2028 | - 3 residential displacements and 29 commercial building displacements<br>- EJ impacts<br>- Positive economic impacts<br>- No archeological impacts, 1 adverse impact to a historic resource<br>- Water and wetland impacts: dredge/fill 64.8 acres of aquatic features<br>- 50.1 acres of riparian forest and 490.6 acres of maintained grassland impacted |

**Table 4-2: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis**

| County | Description | Status | Impacts |
|---|---|---|---|
| | | | - Wildlife connectivity impacts<br>- Minor water quality and floodplain impacts<br>- 4 reasonable and feasible noise barriers are proposed<br>- Approximately 1,850 linear feet of water line relocation, 3,000 feet of natural gas pipeline, 6 electrical lines, and 24 support tower relocations. |
| 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 | Opening TBD | - An estimated 331 commercial, 168 single-family residential, and 1,067 multi-family residential displacements<br>- 34 billboards, 4 places of worship, and two schools would be displaced.<br>- 4 historic resources and two parks would be affected |
| **Rail** | | | |
| Dallas County | TexRail – 27 mile commuter rail project from Fort Worth to DFW Airport | Opening late 2018 | - Traffic impacts<br>- Loss of parking |
| Dallas County | Dallas to Fort Worth Core Express – 30-mile rail line between downtown Fort Worth ITC and TCRR's Dallas Terminal Station Option | Opening TBD | - Scoping completed in 2014, EIS is underway<br>Based on scoping, main issues of concern:<br>Project cost, pedestrian access and safety, land use, and human environment.<br>- Improved air quality and a faster and safer transit option were brought up as favorable potentials of the project. |
| Dallas and Ellis Counties | Waxahachie Line – Construction of a 31-mile commuter rail with 11 stations and 42-minute end-to-end travel time | Opening 2035 | Conceptual Engineering Study phase; assumed impacts would be:<br>- Increased bicycle and pedestrian facilities (21 additional miles)<br>- 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).<br>- 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 | - No significant environmental impacts per the environmental determination memorandum (2015).<br>- 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 | Planning phase | - 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 |

| Table 4-2: Past, Present, and Reasonably Foreseeable Projects Considered for Cumulative Impact Analysis | | | |
|---|---|---|---|
| **County** | **Description** | **Status** | **Impacts** |
| | Tenaska Frontier Generating Station in Shiro, Texas for a natural gas-fueled electric generating facility. | | 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 | - 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 | - Part of the above project |
| Harris County | Mickey Leland International Terminal at George Bush Intercontinental Airport – $1.5 billion airport terminal expansion. | Opening date TBD | - No significant environmental impacts<br>- short-term and minor impacts to air quality and construction noise impacts and<br>- estimated increased demand for energy and natural resources for construction |

Source: AECOM, 2017

Notes: The City of Dallas approved a resolution on August 9, 2017 to reject the Trinity Parkway Alternative 3C as the City of Dallas' locally preferred alternative. The City of Dallas notified federal, state and regional partners of the decision to cancel the project.

Projects described in **Table 4-2** included quantitative data related to their impacts. This cumulative assessment also considered qualitative data when quantitative data was not available. **Table 4-3** 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.

| Table 4-3: Additional 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 high occupancy vehicle 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 |

| Table 4-3: Additional Projects Considered for Cumulative Impact Analysis | |
|---|---|
| **County** | **Project Description** |
| 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 | Dallas North Tollway – 17.6-mile extension from U.S. 380 to the Collin/Grayson county line (Phase 4A) and from the Collin/Grayson county line to Farm to Market 121 (Phase 5B) |
| 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 – Downtown Dallas (Final Alignment Unknown) |
| Dallas County | Cotton Belt Rail Line - DART – DFW Airport North to Shiloh Road |
| 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 – 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. |

| Table 4-3: Additional Projects Considered for Cumulative Impact Analysis | |
|---|---|
| **County** | **Project Description** |
| Brazos, Freestone, Grimes, Leon, Limestone, Madison, and Robertson Counties (Cross Texas Transmission line)<br><br>Grimes, Waller, Harris Counties (CenterPoint Energy Transmission line) | (Cross Texas Transmission Limestone to Gibbons Creek and CenterPoint Energy Gibbons Creek to Zenith 345-kV Transmission Line – This approximately 130-mile new transmission line would assist with electricity needs in the Houston area. |
| 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. Segment 3C (Build Alternatives C and F) would intersect the anticipated reservoir conservation pool footprint at three locations within 450 feet |
| 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 14 miles of a new 8-lane rural arterial roadway |
| 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 freeway |
| 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 | 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 9 miles of an existing divided highway from the Navasota River to Madisonville |
| Madison County | IH-45 – Roadway improvements on existing four-lane freeway |
| Grimes County | Gulf Coast Strategic Highway- 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 |

| Table 4-3: Additional Projects Considered for Cumulative Impact Analysis | |
|---|---|
| **County** | **Project Description** |
| 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 arterial roadway |
| Waller County | Addition of 2 lanes to 2.2 miles of an existing rural arterial |
| 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 Light Rail Extension – Construction of 7 miles of rail transit |
| Harris County | Uptown-Galleria Line Extension to Hempstead Intermodal Terminal – construction of .5 mile of rail |
| Harris County | 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. |
| Harris County | Houston Metro University Line – 10 miles of light rail east form 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 form Westpark to the Northwest Transit Center |

| Table 4-3: Additional Projects Considered for Cumulative Impact Analysis | |
|---|---|
| **County** | **Project Description** |
| Harris County | East End Line or Green Line – 4 mile long 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, 2017

### 4.4.6 The Overall Effects of the Build Alternatives Combined with other Actions

The effects and impacts of the projects listed above were evaluated in combination with the environmental impacts with the Build Alternatives. The analysis by resource area is provided below, beginning with a summary of the direct and indirect impacts, followed by a discussion of any additional cumulative impacts associated with other projects.

#### 4.4.6.1 Air Quality

FRA determined that the Build Alternatives would not result in adverse impacts to air quality within the Study Area. However, air quality in Dallas, Houston and their surrounding areas are 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.

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 *de minimis* 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 Build Alternatives 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), but the impact 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 estimate air quality impacts of the Build Alternatives, quantitative estimates were made of emissions from construction and operational sources for the Build Alternatives 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 of the Build Alternatives, with a broader study area, results in an evaluation of emissions and reductions across the entire region. The Project would introduce a new mode of transportation that would remove passenger vehicles from the Study Area, resulting in lower vehicle emissions and an overall net benefit to air quality.

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 4-2**, 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.

### 4.4.6.2 Natural Ecological Systems and Protected Species

Impacts to the vegetation types by Build 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. Total acreage of temporary and permanent vegetation impacts varies by Build Alternative. Build Alternative F would have the least acreage of temporary impacts, and Build Alternative B would have the greatest acreage of impact at 2,185 acres. In addition, Build Alternatives A and D would have the least acreage of permanent impacts at 7,961 acres, while Build Alternatives C and F would have the greatest (8,230 acres).

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.

All Build Alternatives 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 Build Alternatives and existing infrastructure, creating areas of less value to wildlife. There is a potential for cumulative impacts via habitat degradation and fragmentation when taking in to account past, present and future infrastructure projects. For example, the Cross Texas Transmission project, a 130-mile new transmission line that would impact Freestone, Limestone, Leon, Madison and Grimes counties has the potential to fragment habitat in the Study Area. The linear footprint of a transmission line is typically narrow and assumed to be narrower than the LOD of the Project. 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 Cross Texas Transmission and TxDOT SH 249 projects 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 USFWS to identify appropriate avoidance, minimization and mitigation measures.

Implementation of the Build Alternatives may affect, but would not likely adversely affect, the Houston toad, large-fruited sand verbena and Navasota ladies' tresses based on the utilization of various avoidance and mitigation measures described in **Section 3.6.6, Natural Ecological Systems and Protected Species**. Although the Build Alternatives may affect, but would not likely adversely affect each of the three federally listed species, there is a potential for cumulative impacts to federally listed species via habitat degradation and fragmentation when taking into account past, present and future infrastructure projects. These counties represent 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 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 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 completed one year of species surveys for each of the three federally listed species. Current survey results indicate an absence of the species, meaning the Build Alternatives would not likely adversely affect the species. FRA will complete second and third year surveys in coordination with USFWS. Should presence of a species be determined, FRA will include these findings and assessments within their BA for USFWS' consideration during the preparation of USFWS' BO. If FRA determines absence of the three species, preparation of a BA would not be required and the submittal of species specific survey reports would conclude informal consultation with USFWS.

Where practicable, the Build 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 60 percent of the Build Alternatives 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**.

### 4.4.6.3 Waters of the U.S.

Impacts to the waters of the U.S. by Build 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. Total acreage of temporary and permanent impacts vary by Build Alternative. Build Alternative E would impact the greatest amount of streams with 52,377 linear feet of permanent impacts, and Alternative C would impact the least amount of streams with 46,110 linear feet of permanent impacts total. Build Alternatives C would impact the greatest amount of wetlands with 106.2 acres of permanent impacts, and Build Alternatives D would impact the least amount of wetlands with 100.9 acres of permanent impacts. Build Alternative A would impact the greatest amount of waterbodies with 38 acres of permanent impacts, and Build Alternative F would impact the least amount of waterbodies with 25.4 acres permanent impacts.

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 Cross Texas Transmission project, a 130-mile new transmission line that would impact Freestone, Limestone, Leon, Madison and Grimes counties has the potential to impact waters of the U.S. in the Study Area. The linear footprint of a transmission line is typically narrow and assumed to be narrower than the LOD of the Project. The transmission line project covers 54 percent of the length of the HSR Project. 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 4-3)** could impact waters of the U.S. Any unavoidable impacts to waters of the U.S. would require USACE permission. The magnitude of impacts associated with these planning projects is unknown at this time and would be identified through permitting. FRA will coordinate with the USACE to determine appropriate avoidance, minimization and mitigation measures, which could include compensatory and/or offsite mitigation. TCRR and the USACE are currently conducting site visits to determine jurisdictional boundaries and mitigation requirements for the Section 404 CWA permit application. The extent of cumulative impacts on waters of the U.S. would be identified during this permitting process with the USACE.

#### 4.4.6.4 Utilities and Energy

Utility providers located within the ten-county Study Area would be responsible for undertaking any potential utility relocations, pole adjustments and/or new connections. **Section 3.9, Utilities and Energy** presents the known underground utilities that would require relocation or encasement (approximately 61 utilities under Build Alternatives A, C, D and F), the oil and gas wells impacted by the Build Alternatives (Build Alternative F would impact the most at 87) and the number of transmission line relocations, adjustments and/or new connections needed to support the power demand of the Build Alternatives. Past, present and reasonably foreseeable projects that would impact underground utilities would be relocated or protected through coordination with the utility owner. Impacted oil and gas wells would be subject to being purchased, capped and closed.

As discussed in **Section 4.4.3.3**, the length and location of any new electrical utility connections cannot be determined. The cumulative impacts of these separate utility projects would be determined and mitigated by third party utility providers and evaluated through an independent environmental clearance process coordinated through the Texas Public Utility Commission. There is a 130-mile transmission line project – Cross Texas Transmission line, which would include a connection to a CenterPoint transmission line in Grimes, Waller and Harris counties – that may afford either utility owner with an opportunity to provide connections to the HSR system. If other past, present or reasonably foreseeable projects impact existing utility transmission lines or would 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 also require energy to power the HSR trains, 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 train would represent 0.26 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.

### 4.4.6.5 Transportation

As detailed in **Section 3.11, Transportation, Table 3.11-61**, the Build Alternatives would impact 34 freight rail crossings, upwards of 246 roads (Build Alternative B) and impacts to upwards of 2 airports (Build Alternatives B and E). 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 (Build Alternatives) and without (No Build Alternative) the Project. Implementation of the Build Alternatives 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**, 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 improve existing levels of service. If the construction of these projects overlaps during the construction of the HSR Project, the station areas could experience short-term cumulative impacts such as added delays on local roadways impacted by construction. These types of delays would be managed through coordination with the local (county or city) jurisdiction. The Project does include traffic modifications for the station areas. FRA does not anticipate long-term 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.

### 4.4.6.6 Land Use

The impacts to land use and farmland are detailed in **Section 3.13, Land Use**. The land use most affected by the Build Alternatives for temporary (90 percent) and permanent (80 percent) land use conversion would be agricultural. The average acreage of special-status farmlands being permanently converted to a non-agricultural use under the Build Alternatives would be approximately 4,200 acres. Within the Study Area, there is nearly 2.3 million acres of special-status farmlands. The permanent loss of 4,200 acres of special-status farmland represents approximately 0.2 percent of all special-status farmland within the ten-county Study Area. Indirectly, the Build Alternatives would impact an additional 877 acres of special-status farmland.

The TxDOT SH 249 project located in Grimes County could result in additional losses in farmland. Also, the Cross Texas Transmission project would impact Freestone, Limestone, Leon, Madison and Grimes counties and has the potential to impact farmland in the Study Area. As noted above in Section 4.5.5.3.1, the linear footprint of a transmission line is typically narrow and assumed to be narrower than the LOD of the Project. Assuming the transmission line project would have a similar impact to special-status farmland compared to the HSR Project, another 2,275 acres could be affected.

### 4.4.6.7 Socioeconomics

**Section 3.14.5.2.3, Socioeconomic and Community Facilities** discussed the direct and indirect impacts of the Build Alternatives. 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 4-3** noted 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 five miles from the Houston terminal station sites would result in an estimated 331 commercial, 168 single-family residential and 1,067 multi-family residential displacements. The HSR Project would displace approximately 200 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 station options in Dallas and Houston would be expected to generate additional tax revenue for both cities. The area around the Dallas Terminal Station option 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 station options, property assessment values would increase between $71.4 million and $161.1 million as a result of the HSR Project (see **Table 3.14-23**). The Houston Terminal Station options are not currently being redeveloped, but the construction of the station would generate additional economic benefit. The Industrial Site Terminal Station option is an active steel manufacturing site. The relocation of the site (if maintained within the City of Houston and Harris County), along with the construction and operation of a station would be a net benefit in tax value to the city and county. The Northwest Mall Terminal Station option is 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. The Northwest Transit Center Terminal Station option includes 14 businesses that would be displaced by the construction of a station. The displaced landowners may choose to relocate or reinvest the proceeds from the sale of property into additional business ventures within the city and county.

Loss in agriculture production would offset gains due to development around the station areas. The Build Alternatives would result in a direct, annual loss in agriculture production that would range from $560,043 to $622,964 (see **Section 3.14.5.2.3, Socioeconomic and Community Facilities**). Additionally, a direct loss in 3,000 acres of pastureland would occur.

Other large scale projects, like SH 249 and CenterPoint utility projects in Grimes County, as well as the Cross Texas Transmission project have the potential to further impact agricultural production and result in additional losses of production or pastureland, as discussed in **Section 4.5.5.6** above. 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 2.3 million acres of farmland in the Study Area, this would not result in a significant cumulative impact.

## 4.4.7 Avoidance, Minimization and Mitigation

### 4.4.7.1 Air Quality

No cumulative impacts would arise to necessitate additional avoidance, minimization, or mitigation beyond what is provided in **Section 3.2, Air Quality.**

### 4.4.7.2 Natural Ecological Systems and Protect Species

The cumulative impacts to species habitat near any new electrical transmission line connections cannot be determined by FRA at this time due to the speculative nature of their location and length. The utility providers will complete a separate environmental evaluation that would include cumulative impacts as part of their process to provide new or additional connections from their systems to the HSR Project.

Federal and state projects impacting vegetation, wildlife habitat and/or protected species would be coordinated with TPWD and/or 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.**

### 4.4.7.3 Waters of the U.S.

The cumulative impacts to waters of the U.S. of any new electrical transmission line connections cannot be determined by FRA at this time due to the speculative nature of their location and length. The utility providers will complete a separate environmental evaluation that would include cumulative impacts as part of their process to provide new or additional connections from their systems to the HSR Project.

Projects that would affect federally regulated waters of the U.S. would be coordinated with USACE to identify appropriate mitigation measures and request necessary permissions. 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.**

### 4.4.7.4 Utilities and Energy

The cumulative impacts of any new electrical transmission line connections cannot be determined by FRA at this time due to the speculative nature of their location and length. The utility providers will complete a separate environmental evaluation that would include cumulative impacts 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.**

#### 4.4.7.5 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**

#### 4.4.7.6 Land Use

No cumulative impacts would arise to necessitate additional avoidance, minimization, or mitigation beyond what is provided in **Section 3.13, Land Use.**

#### 4.4.7.7 Socioeconomic

No cumulative impacts would arise to necessitate additional avoidance, minimization, or mitigation beyond what is provided in **Section 3.14, Socioeconomic and Community Facilities.**

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# 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 Build Alternatives 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 (42 USC 4332(C)(iv)) 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 (40 CFR 1502.16), 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 would have similar short-term impacts. For this analysis, short-term refers to the estimated four-year construction period. As detailed throughout Chapter 3.0, short-term impacts and use of resources resulting from any of the six Build Alternatives 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 noise, vibration, dust, light and glare generated by construction equipment and construction activities
- Temporary increases in waste and hazardous materials disposal
- Temporary adverse changes to the visual environment due to the presence of construction equipment, signage and temporary structures
- Reduced visibility, dust creation, soil erosion, respiratory hazards and increased sedimentation and turbidity in stormwater runoff as a result of ground clearing construction activities

Construction of the Build Alternatives would require the use of 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 the various structural components of the HSR system. Fossil fuels would also be consumed by construction equipment.

In addition, the Build Alternatives 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 Build Alternatives 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 of 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 Build Alternatives 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 Build Alternatives would directly and indirectly support economic growth and provide short- and long-term employment benefits. The Build Alternatives 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**, 80 percent of land use within the Study Area is agricultural; however, only about 23 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.

Short-term inconveniences to residents, motorists and business owners would be offset by the improved transportation network if construction of the Build Alternatives were to be completed. The Build Alternatives 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 Build Alternatives, but would also not support the long-term productivity in the two metropolitan areas as well as the Build Alternatives 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 Build Alternatives.

# 6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Build Alternatives would require the commitment of material and energy for construction and operation and the commitment of land for the new infrastructure. This section examines the irreversible and irretrievable commitment of natural, physical, human and fiscal resources.

## 6.1 Regulatory Context

NEPA (42 U.S.C. 4332(C)(v)) and the CEQ's NEPA implementing regulations (40 C.F.R. 1502.16) 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 (for example, 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 (for example, extinction of a threatened or endangered species or disturbance of a cultural site).

## 6.2 Irreversible and Irretrievable Commitment of Resources

As previously described in **Chapter 3.0**, any of the Build Alternatives would involve the commitment of natural, human, physical and fiscal resources.

### 6.2.1 Physical Setting

Construction of the Build Alternatives 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 Build Alternatives. 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 Build Alternatives 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 lay down and work areas, which represent a temporary, yet reversible, use of the land. As previously described, TCRR employed design features to avoid and minimize the irreversible commitments of land use. In developing the Build

Build Alternatives, 52 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 non-agricultural use for the Build Alternatives would range from approximately 3,145 acres (Build Alternative E) to 4,394.6 acres (Build Alternative D) depending on the Build Alternative. Within the ten counties, there is nearly 2.3 million acres of special-status farmlands. The average loss of 4,200 acres of special-status farmland represents approximately 0.2 percent of all special-status farmland within the ten counties. In order 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 877 acres of special-status farmland.

The permanent conversion of grazing lands would range from approximately 2,945 acres (Build Alternative F) to 3,280 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 crop lands would range from approximately 6,054 acres (Build Alternative C) to 6,570 acres (Build Alternative E).

Land to be acquired in the implementation of the Build Alternatives 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

The Build Alternatives would require the conversion of approximately 100.9 to 106.2 acres of wetlands uplands for transportation use. Potential 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. 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 Build Alternatives 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. If, based on the site specific evaluations, it is determined that protected species are present and likely to be adversely affected by the Project, FRA will develop avoidance and mitigation measures during Section 7 consultation with USFWS, as required by the Endangered Species Act, formulated in a Biological Opinion issued by USFWS.

### 6.2.5 Cultural Resources

The Build Alternatives would involve the significant loss in value (demolition) of three protected cultural resources – DA.076a (Guiberson Corporation Machine Shop), DA.110b (Linfield Elementary School) and HA.004a (Domestic Dwelling). All of the Build Alternatives would impact these three resources in Dallas and Harris counties, respectively. FRA will complete additional coordination with TCRR to determine if engineering refinements could avoid or minimize the 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 all other adverse effects to historic properties in accordance with Section 106.

## 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 Build Alternatives.

Fossil fuels, primarily diesel fuel, would be consumed during construction of the Build Alternatives. 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 Build Alternatives. 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 Build Alternatives would result in a slight increase in energy consumption—using approximately 57,331MM BTU of energy from all energy sources. However, the Build Alternatives would result in a long-term decrease in energy consumption through increased travel efficiencies – a net savings of 7,743,603MM BTU 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

## 7.1 Introduction

This evaluation has been prepared to comply with the provisions of 49 U.S.C. 303, hereinafter referred to as "Section 4(f)," and the Land and Water Conservation Fund (LWCF) Act of 1965, hereinafter referred to as "Section 6(f)." The FRA's *Procedures for Considering Environmental Impacts* (64 Federal Register [FR] 28545, Section 12, May 26, 1999 and 78 FR 2713, January 14, 2013) 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 (23 C.F.R. 774) and the revised FHWA Section 4(f) Policy Paper published in July of 2012.[1,2] Although FRA is not subject to the 23 C.F.R. Part 774 regulations, the FRA refers to these regulations and associated policies as additional guidance when applying Section 4(f).

This chapter identifies the requirements of Section 4(f) and Section 6(f), the presence of properties protected by these regulations in the Study Area, 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.

For the project, FRA may issue a Rule of Particular Applicability (i.e., regulations that apply to a specific railroad operation), impose requirements or condition by order(s) or of waiver(s), or take other regulatory action(s) to ensure the project is operated safely. Therefore, documentation of compliance with Section 4(f) is required. FRA will make its Section 4(f) determination as part of the Final EIS and/or ROD for the Build Alternatives, after considering public and agency comments on this Draft Section 4(f) evaluation. The proposed impact and preliminary use determinations are based on coordination with the officials having jurisdiction over the respective resources, as described in **Section 7.10**. These officials will be notified of FRA's intent to make *de minimis* impact determinations, as applicable. Should the officials with jurisdiction concur, FRA would issue determinations of *de minimis* impacts as part of its final Section 4(f) determination in the Final EIS and/or ROD.

FRA's will make its determination of effects regarding archeological and historic property resources prior to the ROD. Treatment measures to avoid, minimize, and mitigate adverse effects will be documented in a Programmatic Agreement (PA), which will provide guidelines for compliance with Section 106 of the NHPA throughout the entirety of the Project.

## 7.2 Regulatory Context

### 7.2.1 Section 4(f)

Section 4(f) of the USDOT Act (49 U.S.C. 303(a)) 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 projects receiving funding from the USDOT may not support the use of a Section 4(f) property unless the agency (e.g., FRA) determines the following:

[1] U.S. Department of Transportation Federal Highway Administration. *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. September 2016. https://www.environment.fhwa.dot.gov/projdev/impta6640.asp.

[2] U.S. Department of Transportation Federal Highway Administration. *Section 4(f) Policy Paper*. September 2016. https://www.environment.fhwa.dot.gov/4f/4fpolicy.asp

1. There is no feasible or prudent alternative to such use and the project includes all possible planning to minimize harm to the resource resulting from such use; or
2. A finding can be made that the project as a whole has a *de minimis*, or minimal, impact on the Section 4(f) resource. This provision allows avoidance, minimization, mitigation and enhancement measures to be considered in making a *de minimis* determination, which is defined in 23 C.F.R. § 774.17 as:
    a. 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)
    b. For historic sites, *de minimis* impact means that the FRA has determined, in accordance with 36 C.F.R. 800 that no historic property is affected by the project or the project would have "no adverse effect" on the property in question

A Section 4(f) use is defined and addressed in 23 C.F.R. § 774.17. 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 as determined by the criteria in § 774.13(d); or
- When there is a constructive use of a Section 4(f) property as determined by the criteria in § 774.15

Several exceptions, and additional conditions that must be met for use of an exception, are set forth in the implementing regulations found in 23 C.F.R. § 774.13. For example, temporary occupancy of land is not a Section 4(f) use if all of the following conditions exist:

- The duration of the occupancy must be less than the time needed for the construction of the project and there must not be a change in ownership;
- Both the nature and magnitude of the changes to the Section 4(f) resources are minimal;
- There are no anticipated permanent adverse physical changes nor interference with activities or purposes of the resource on a temporary or permanent basis;
- The land is restored to the same or better condition; and
- There is a documented agreement of the appropriate federal, state or local official(s) having jurisdiction over the resource regarding the above conditions

A constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features or attributes of the property are substantially diminished.

Public parks, recreation areas and wildlife and waterfowl refuges are protected under Section 4(f) when the property is publicly owned; the primary use is designated as a park, recreation area or refuge by the official with jurisdiction over the resource; it is considered a significant use by the agency with jurisdiction; and it is open to the public.

For Section 4(f), historic sites (23 C.F.R. § 774.17) may include an archeological or historic district, site, building, structure, object or Traditional Cultural Property (TCP) listed in, or eligible for listing in, the

NRHP.[3] Only archeological sites that warrant preservation in place are protected by the Section 4(f) statute. Section 4(f) does not apply if the FRA, after consultation with SHPO and/or the Tribal Historic Preservation Office (THPO), determines that the archeological resource is important chiefly because of what can be learned by data recovery, and has minimal value for preservation in place (23 C.F.R. § 774.13(b)(1)).

For *de minimis* findings, the Section 4(f) regulations also require notifying and informing the Department of the Interior (DOI) and relevant state and local officials if the property is a National Historic Landmark. For historic sites, consultation with SHPO is required. For recreational resources, consultation with the official(s) with jurisdiction over the resource(s) is also required.

### 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) (36 U.S.C. § 59.3).

If a project requires that 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 equal value, and that the proposed replacement property is of reasonably equivalent usefulness an location; and completion of required coordination (36 C.F.R. 59.3).

## 7.3 Study Area

The Study Area for Section 4(f) and Section 6(f) resources is as discussed in the following sections. The "Study Area" in this document refers to the geographic area delineated for analysis for each resource (i.e., Section 4(f) Parks, Recreation, Wildlife and Waterfowl Refuges; Section 4(f) Historic Properties; and Section 6(f) Properties) as described below; refer to **Sections 7.3.1 and 7.3.3**, as well as **Section 7.9, Section 6(f) Resources** for a description of the Study Area pertaining to Section 4(f) and Section 6(f). Within each Study Area, smaller geographic areas to assess impacts were delineated based on the resources and applicable regulation to effectively present detailed analysis of those resources that may be used or converted in accordance with Section 4(f) and Section 6(f) statute. These terms include:

- Area of Potential Effects (APE): the APE is the geographic area or areas within which the project may directly or indirectly cause alterations in the character or use of historic resources. The APE is defined during the Section 106 of the National Historic Preservation Act consultation process and includes an area in which both direct and indirect impact could occur to a property. Properties in the APE may be directly or indirectly impacted by the Build Alternatives.
- Limits of Development (LOD): The LOD is comprised of the construction footprint of the Build Alternatives 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. Properties that fall within the LOD may be directly and indirectly impacted by the Build Alternatives.

[3] U.S. Department of Transportation Federal Highway Administration. Section 4(f) Policy Paper. September 2016. https://www.environment.fhwa.dot.gov/4f/4fpolicy.asp

- Right-of-Way (ROW): the 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]).

### 7.3.1 Section 4(f) Public Parks and Recreation Lands; Wildlife and Waterfowl Refuges

The Study Area for Section 4(f)-protected public parks and recreation lands, and wildlife and waterfowl refuges is defined as one-quarter mile from the Build Alternatives’ LOD as used in **Section 3.17, Recreational Facilities**. Per **Section 3.4.3, Noise and Vibration**, screening distances are used to calculate how far noise and ground-borne vibration travel from its source (the Project). This analysis used a distance of 1,300 feet for noise impacts and 275 feet for vibration impacts.

### 7.3.2 Section 4(f) Historic Sites

This Project is a federal undertaking under Section 106 of the NHPA (54 U.S.C. 306108). Federal regulations implementing Section 106 (36 C.F.R. Part 800) require Federal agencies to establish an APE for the evaluation of potential effect to historic properties. As defined in 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 resources, if any such resources exist. 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.” As described in **Section 3.19, Cultural Resources**, FRA developed the APEs for historic and archaeological resources in consultation with the THC. This section 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.**

### 7.3.3 Historic Resources

As discussed in Section 3.19, Cultural Resources, the APE for historic resources is variable and is based on the typical conditions of the three general settings the Build Alternatives is likely to cross. Thus, the APE for historic resources was defined as:

- 350 feet beyond the ROW where the Build Alternatives would be constructed in urban settings
- 700 feet beyond the ROW where the Build Alternatives would be constructed in suburban settings
- 1,300 feet beyond the ROW where the Build Alternatives would be constructed in rural settings

### 7.3.4 Archaeological Resources

As discussed in Section 3.19, Cultural Resources, 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 APE is used in this section in addition to the term LOD. The LOD is comprised of the construction footprint of the Build Alternatives 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) and any other project-specific locations designated by the design.

## 7.4 Purpose and Need

Refer to **Chapter 1.0, Purpose and Need** for the purpose of the Build Alternatives.

## 7.5 Build Alternatives

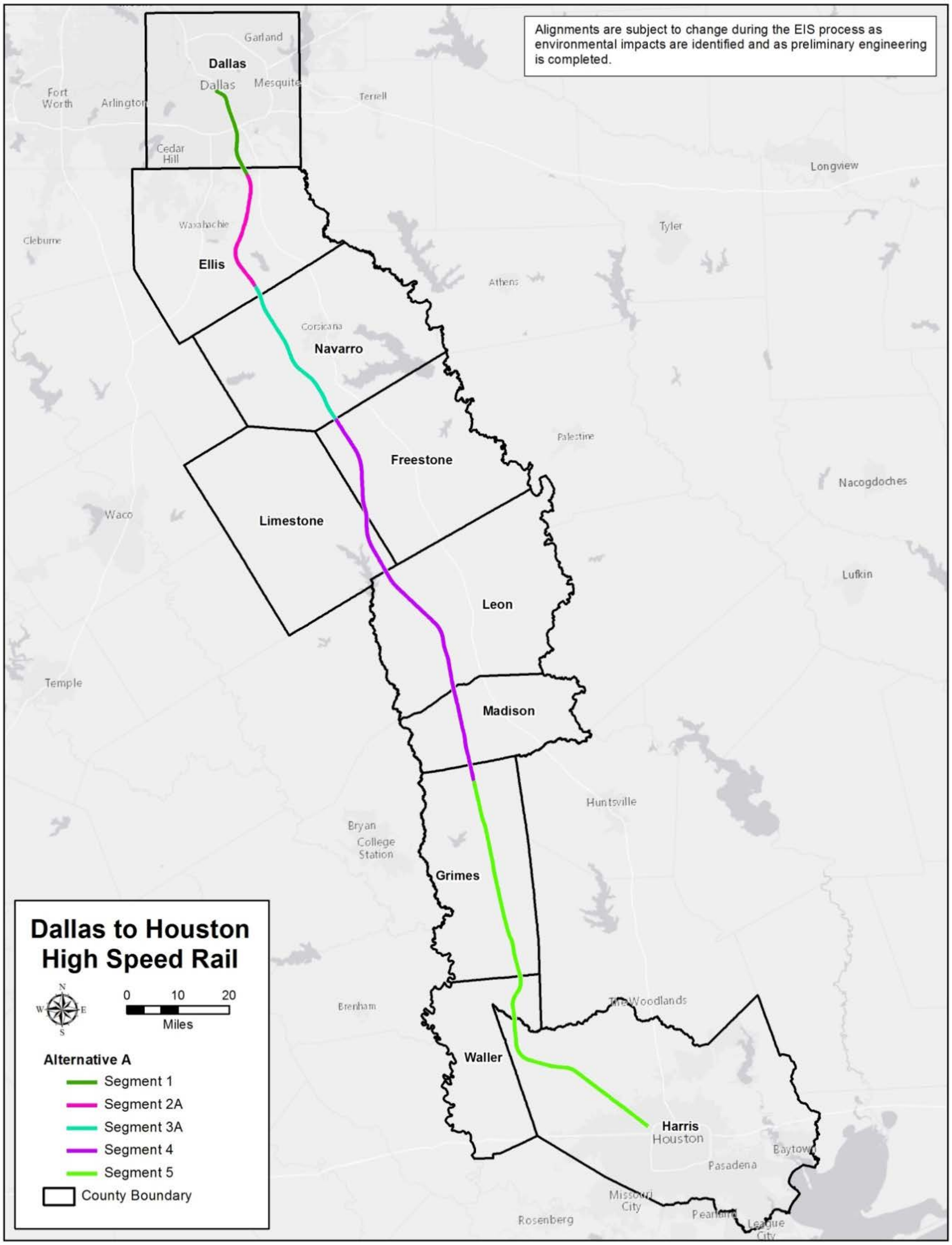
There are six Build Alternatives considered, Alternatives A-F. For analytical purposes, each alternative is divided into segments as depicted in **Figure 7-1** through **Figure 7-6**. **Table 7-1** illustrates which segments create each alternative. A full description of each of the Build Alternatives is presented in **Chapter 2.0, Alternatives Considered**.

**Table 7-1: Build Alternatives A-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 |

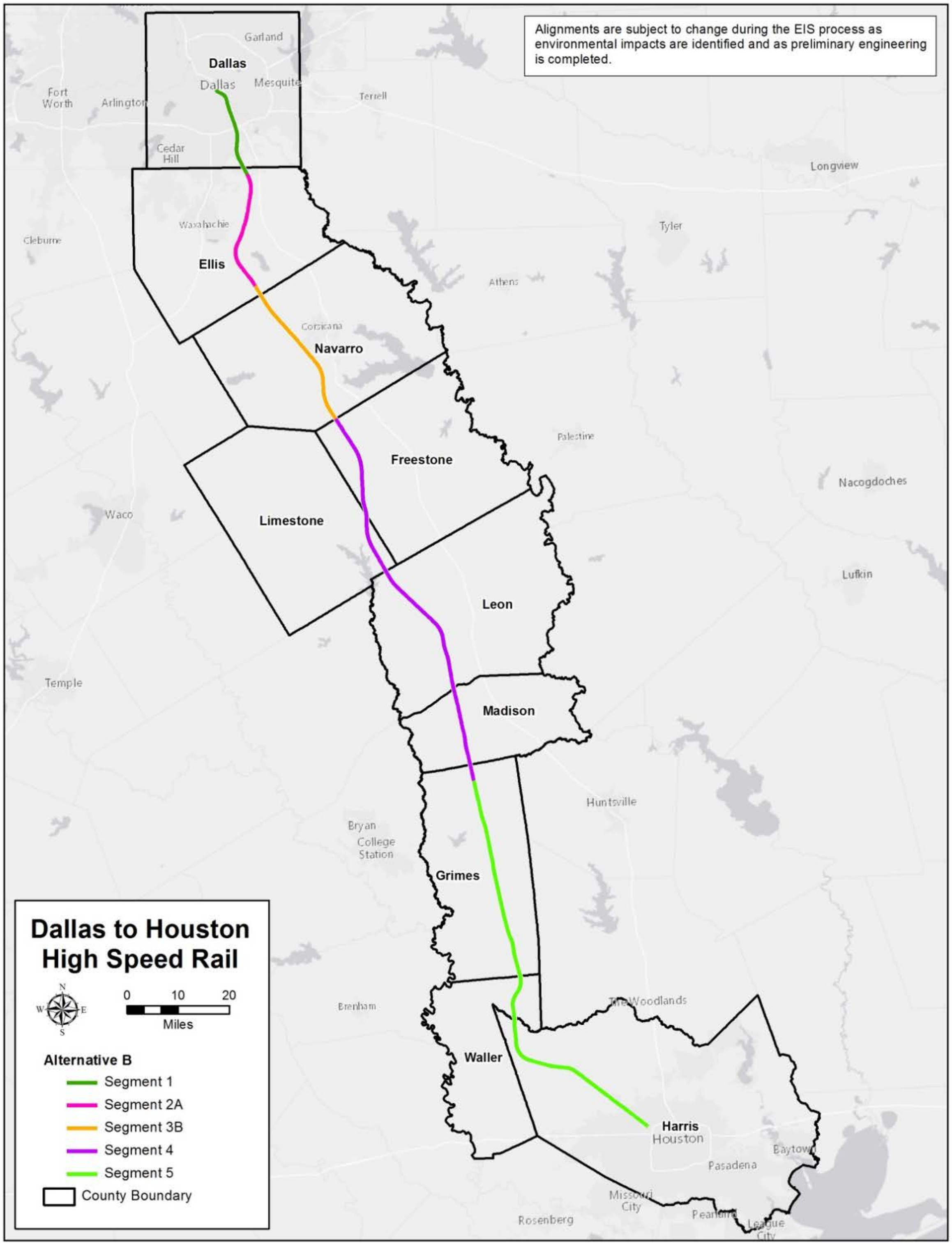
Source: AECOM, 2017

**Figure 7-1: EIS End-to-End Alignment Alternative A**



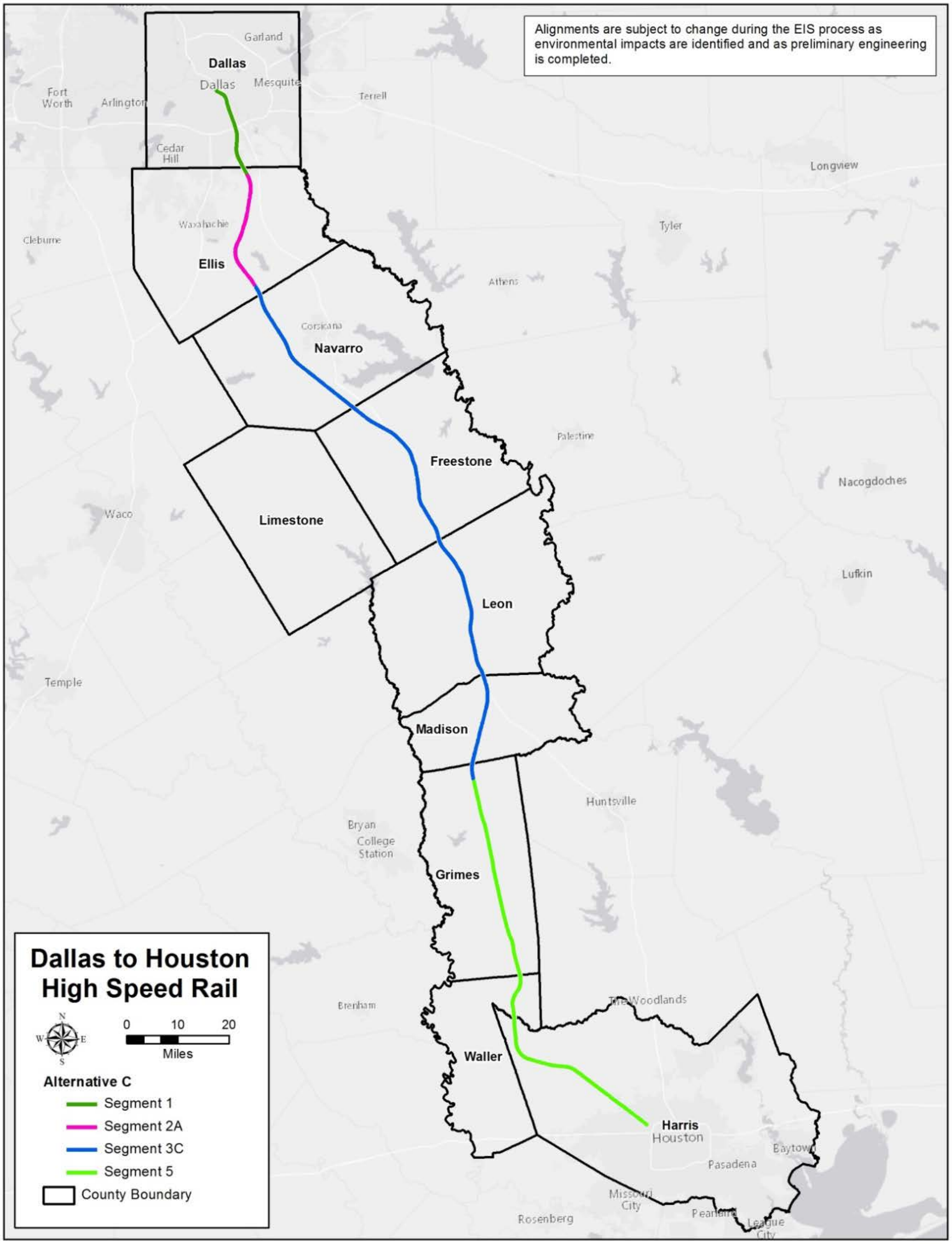

Source: AECOM, 2017

**Figure 7-2: EIS End-to-End Alignment Alternative B**



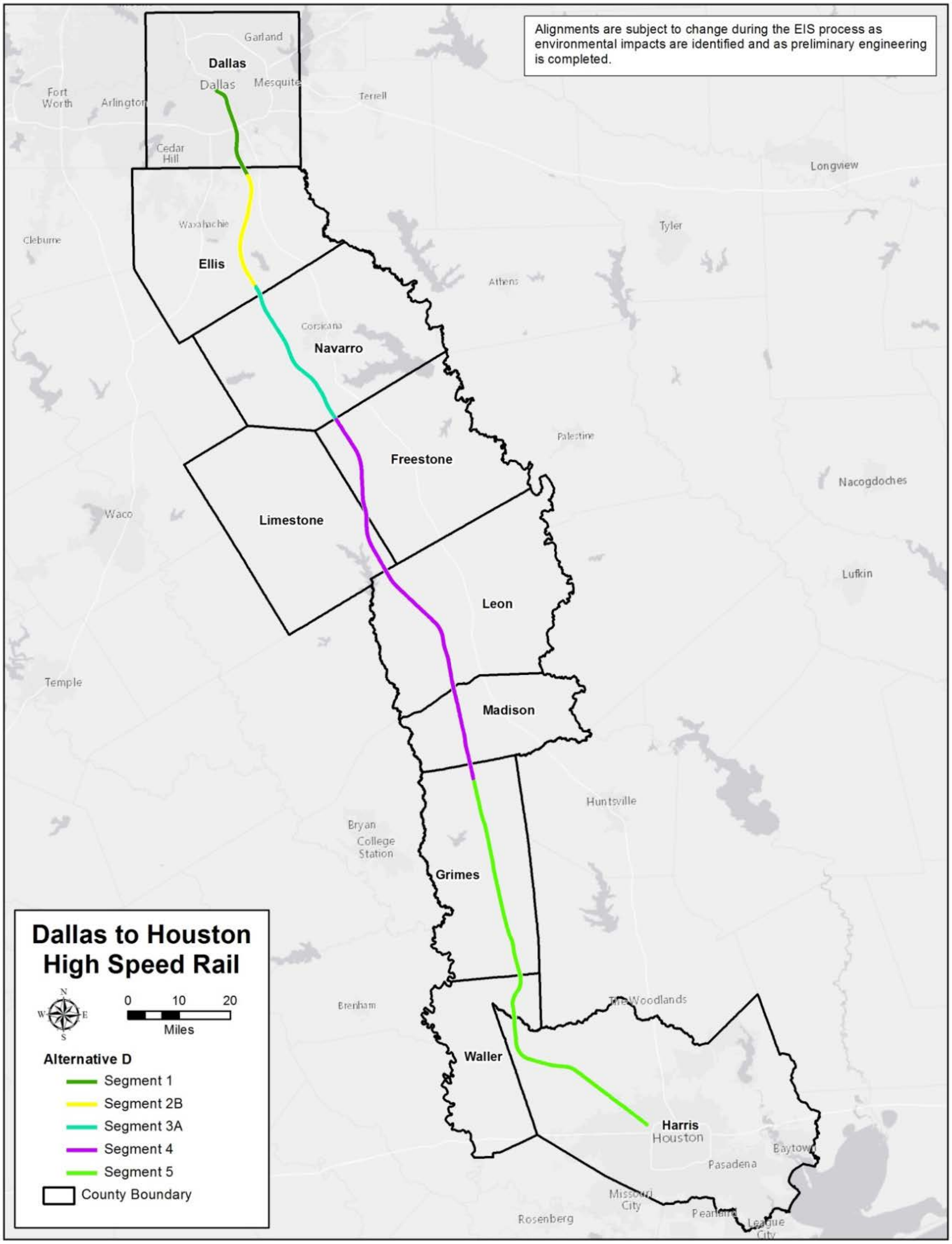

Source: AECOM, 2017

## Figure 7-3: EIS End-to-End Alignment Alternative C



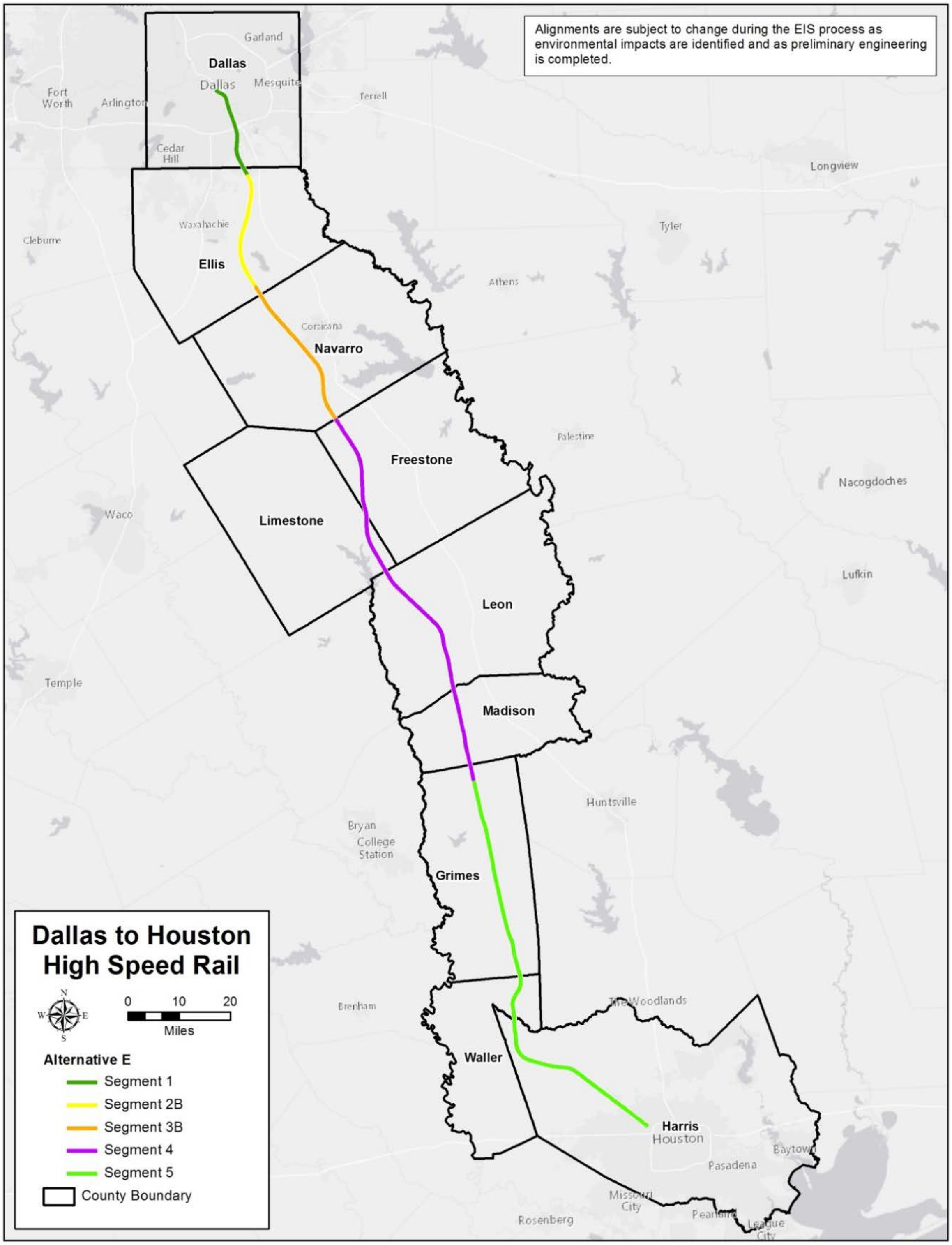

Source: AECOM, 2017

## Figure 7-4: EIS End-to-End Alignment Alternative D



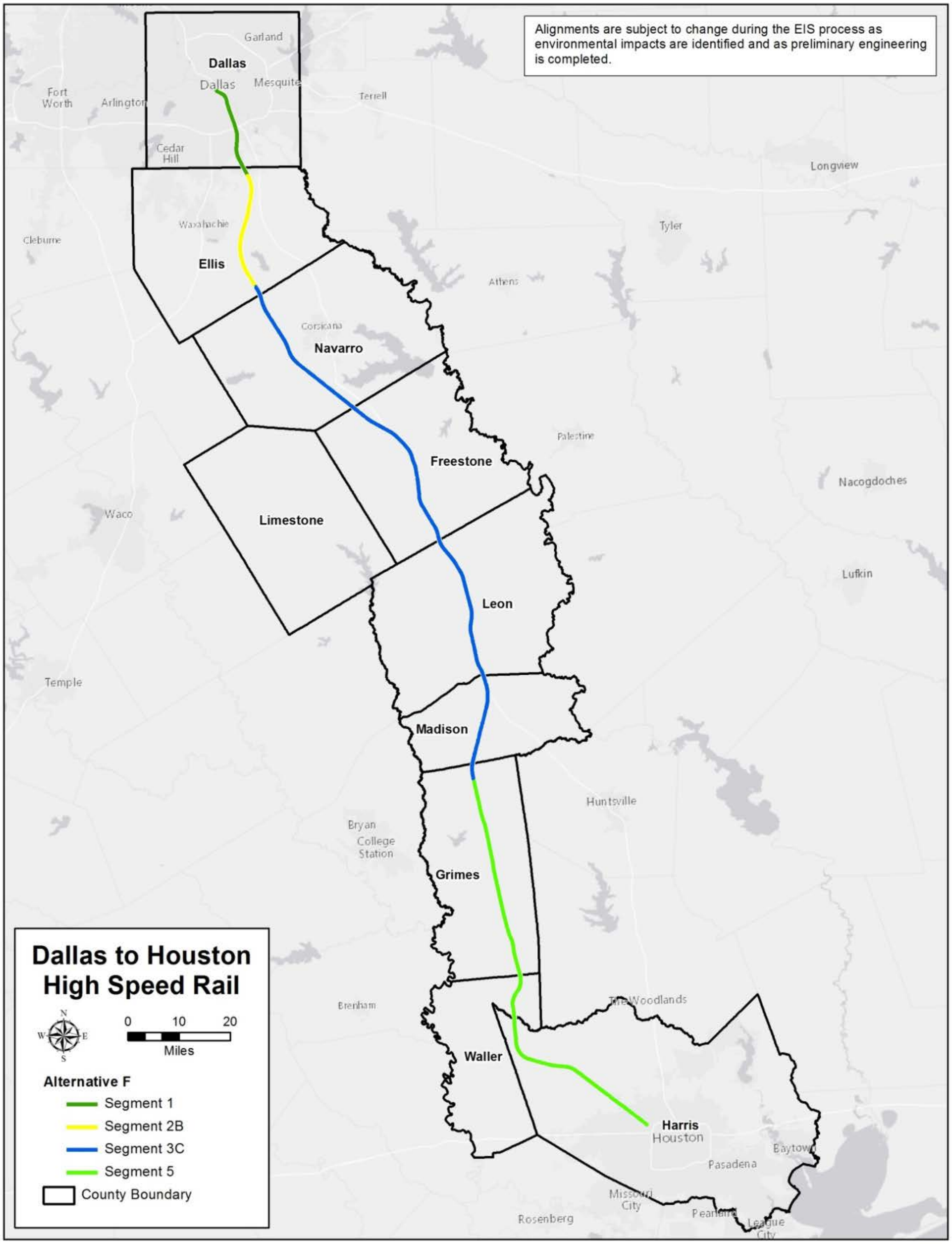

Source: AECOM, 2017

## Figure 7-5: EIS End-to-End Alignment Alternative E




Source: AECOM, 2017

## Figure 7-6: EIS End-to-End Alignment Alternative F




Source: AECOM, 2017

## 7.6 Section 4(f) Properties

Section 4(f) Public Parks and Recreation Facilities, and Historic Properties Sites within the Study Area are described below. Based on coordination with Texas Parks and Wildlife Department (TPWD), review of TXNDD and RTEST data, site visits, and as documented in a letter from that agency dated February 26, 2016, there are no wildlife and waterfowl refuges located in the Study Area. Refer to **Section 3.6, Natural Resources** for a discussion of biological resources in the Study Area.

### 7.6.1 Section 4(f) Methodology

The sources used to identify potential Section 4(f) properties included:

- 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 alternative alignments
- County and city general plans, specific plans, parks and recreation plans, and master plans
- Geographic information system (GIS) data, including U.S. Geological Survey (USGS) Geographic Names Information System and county parcel data (to determine public ownership)
- Information from agencies with jurisdiction over the resources, including meetings and direct correspondence
- Site visits

Within the Study Area, only those parks, recreational facilities, and open space resources eligible under Section 4(f) and identified as potentially affected by the alternatives (due to proximity effects and/or property acquisition) were further evaluated. To be consistent with **Section 3.17, Recreational Facilities**, park and recreational resources within a quarter-mile of the LOD were analyzed in detail to determine if a potential direct or proximity impact would result in a Section 4(f) use from the implementation of the Build Alternatives.

Within the Study Area, only those historic properties in the APE and identified as listed in, or eligible for listing in, the National Register of Historic Places (NRHP) under Criteria A, B, or C—or properties that contribute to an overall NRHP listed or eligible resource—were further evaluated. FRA determined that there would be no use to historic properties outside the ROW for which the Build Alternatives would have no effect, or no adverse effect through the Section 106 of the NRHP process. The remaining Section 4(f) historic properties were analyzed in detail to determine if a potential use would result from implementation of the Build Alternatives.

### 7.6.2 Section 4(f) Public Parks/Recreation Areas

There are 21 public parks and recreational areas located throughout the Section 4(f) Study Area, of which 16 qualify for protection under Section 4(f). **Section 3.17, Recreational Facilities**, **Table 7-2** identifies park and recreational facilities in the Study Area, and includes information to support the applicability of Section 4(f) to the property. **Table 7-3** provides similar data for existing and proposed trails located within the Study Area.

The LOD is comprised of the construction footprint of the Build Alternatives 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. The approximate distance from the LOD was measured to the approximate boundary of the parks, recreation areas and trails. Additional information for those parks, recreation areas and trails which qualify for protection under Section 4(f) is summarized below.

#### 7.6.2.1 Existing and Planned Public Parks and Recreation Areas

Public parks and other resources that have a recreational use that qualify for protection under Section 4(f) are discussed in this section, and presented by county and then by segment. **Figure 7-7** through **Figure 7-11** shows the Section 4(f) eligible properties that have been identified in the Study Area.

| Table 7-2: Existing and Planned Public Parks and Recreational Facilities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Name** | **Location** | **Ownership** | **Park Features** | **Total Acres[1]/ Acres in Study Area** | **Segment** | **Build Alternative(s)** | **Approximate Distance from LOD** | **Sec. 4(f)** |
| **Dallas County** | | | | | | | | |
| Pioneer Plaza | 1400 Marilla | City of Dallas Parks and Recreation | Recorded Texas Historic Landmark, historic gravesites | 4.4<br>0.8 | 1 | A, B, C, D, E, F | 1,160 feet | Yes |
| Dallas Heritage Village at Old City Park | 1717 Gano Street | City of Dallas | Special Use,[2] Historic Park and historic buildings | 17.8<br>4.8 | 1 | A, B, C, D, E, F | 1,000 feet | Yes |
| Reunion Park | 701 Sports Street | Hunt Woodbine Realty Corp; leased by the City of Dallas | Temporary Park; open lawn intermittently leased for events | 1.1<br>0.9 | 1 | A, B, C, D, E, F | 1,000 feet | No |
| Emerald Bracelet Park | Downtown Dallas | City of Dallas | Special Use Area[2] (proposed), trails, open space, pavilions | N/A[3] | 1 | A, B, C, D, E, F | 900 feet | No |
| Trinity River Greenbelt | 3700 Sylvan | City of Dallas | Boat ramp, nature observation platform, parking, trails | 2,286<br>88.4 | 1 | A, B, C, D, E, F | 900 feet | Yes |
| Forest Park | 2906 Parnell | City of Dallas | Outdoor basketball court, picnic tables, trails | 2.4<br>2.4 | 1 | A, B, C, D, E, F | 1,190 feet | Yes |
| Martin Luther King Median | 1300 to 2300 Blocks Cedar Crest Boulevard | City of Dallas (Streets) | Special Use,[5] sculpture, landscaping | 0.3<br>0.3 | 1 | A, B, C, D, E, F | 1,500 feet | Yes |
| Honey Springs Cemetery | 4001 Bulova Road | Bulova Homecoming Cemetery | Special Use (Cemetery)[6], memorial area | 4.1<br>4.1 | 1 | A, B, C, D, E, F | Within LOD | No |
| Great Trinity Forest | Southern Dallas | City of Dallas | Audubon Center, multiple parks, trails | 6,000<br>63.4 | 1 | A, B, C, D, E, F | 360 feet | Yes |
| Fruitdale Park | 4408 Vandervoort Drive | City of Dallas | Outdoor basketball court, picnic tables, playground, recreation center, parking | 5.1<br>5.1 | 1 | A, B, C, D, E, F | 220 feet | Yes |
| Seaton Park | 3200 Seaton Drive | City of Dallas | Playground, softball field | 4.2<br>3 | 1 | A, B, C, D, E, F | 1,140 feet | Yes |
| 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<br>3.5 | 1 | A, B, C, D, E, F | 1,000 feet | Yes |

| Table 7-2: Existing and Planned Public Parks and Recreational Facilities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Name** | **Location** | **Ownership** | **Park Features** | **Total Acres[1]/ Acres in Study Area** | **Segment** | **Build Alternative(s)** | **Approximate Distance from LOD** | **Sec. 4(f)** |
| **Ellis County** | | | | | | | | |
| Lake Bardwell | 4000 Observation Drive, Ennis | USACE | Limited use area (hunting), natural area with multi-use trails | 2,917<br>297.8 | 2B | D, E, F | Within LOD | No |
| **Leon County** | | | | | | | | |
| Shelley Pate Memorial Park | 1025 North Hill Street, Buffalo | USACE | Pavilion, baseball field, basketball court and grills | 17.1<br>10.5 | 3C | C, F | 420 feet | Yes |
| Fort Boggy State Park | 4994 Highway 75 South | Texas Parks and Wildlife Department | Fishing, boat ramp, hiking, mountain biking, pavilion | 1,847<br>713.0 | 3C | C, F | Within LOD | Yes |
| **Harris County** | | | | | | | | |
| Mallard Crossing Neighborhood Park | Mallard Crossing Drive, Hockley | Neighborhood Association (private) | Trail, playground, covered facility | 0.03<br>0.03 | 5 | A, B, C, D, E, F | 930 feet | No |
| Cypress Top Historic Park | 26026 Hempstead Road, Cypress | Cypress Historical Society | Historic park, guided tours, trails pavilion, historical buildings | 2.7<br>2.7 | 5 | A, B, C, D, E, F | 300 feet | Yes |
| Pitner Park | 8600 Block Pitner Road, Houston | Harris County | Trails, playground, picnic tables, BBQ grills | 1.2<br>0.8 | 5 | A, B, C, D, E, F | 1,000 feet | Yes |
| Spring Spirit Sports and Education Complex | 8526 Pitner Road, Houston | Spring Branch Baseball Program, Inc. (private) | Baseball, softball, soccer, after school programs, community programs | 7.6<br>4.6 | 5 | A, B, C, D, E, F | 850 feet | No |
| Cypress Falls High School | 9811 Huffmeister Road, Houston | Cypress-Fairbanks ISD | Track and field, tennis courts, baseball diamonds | 15.3<br>2.2 | 5 | A, B, C, D, E, F | 600 feet | Yes |
| Housman Elementary | 6705 Housman, Houston | Spring Branch ISD | Playground, soccer fields | 10.31<br>0.63 | 5 | A, B, C, D, E, F | 1,260 | Yes |

Source: City of Dallas, 2016; AECOM, 2017

[1] Display total acres of the resource followed by the number of acres that fall within the Study Area

[2] The City of Dallas Parks Department classifies Special Use Area 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.

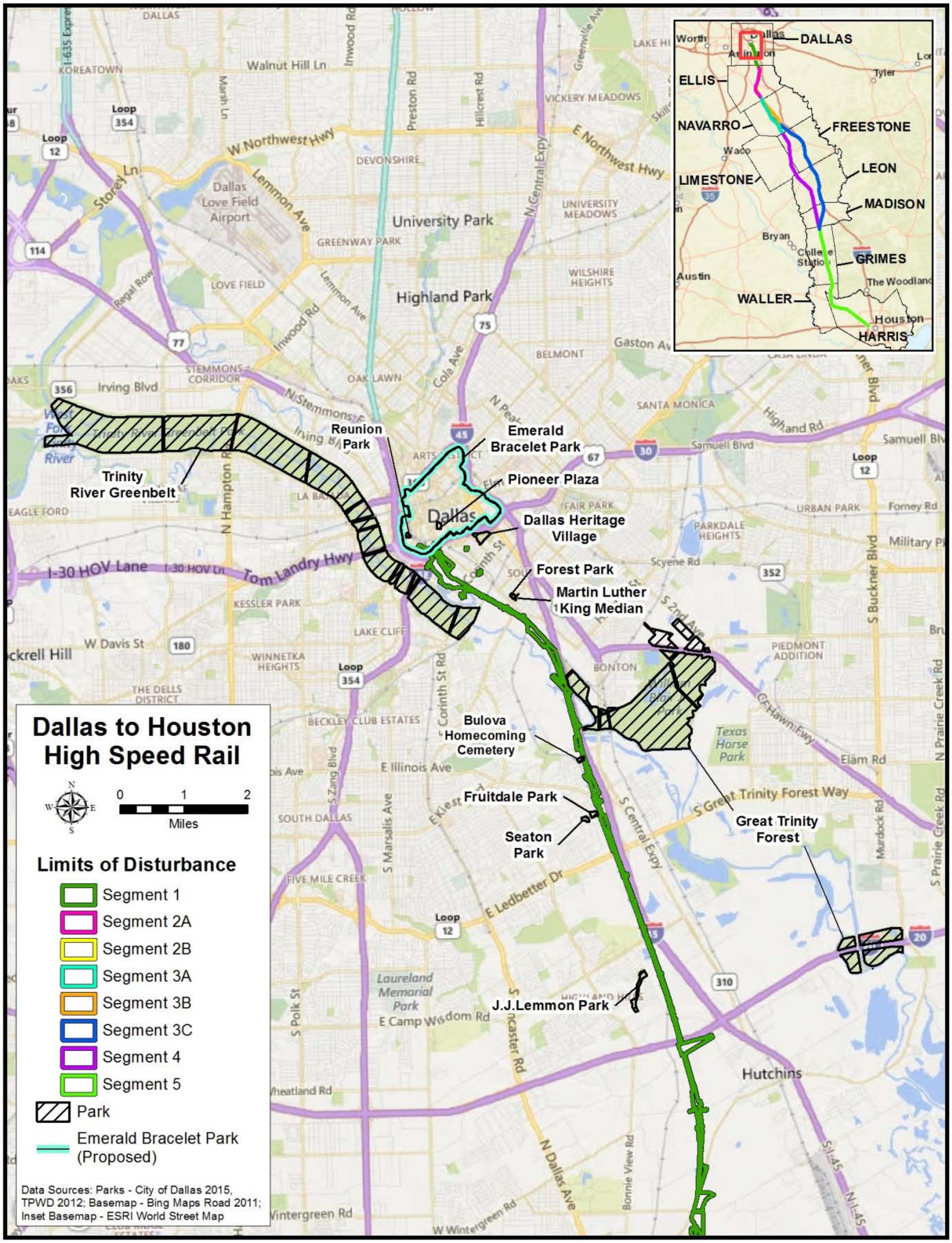
[3] Acreage for this proposed resource was not available because the park is in the design phase.

[4] Acreage for this resource is approximate and only includes recreational features (track, tennis courts and baseball diamonds) that are used by the public.

[5] For the purposes of the EIS, median has been classified as Special Use

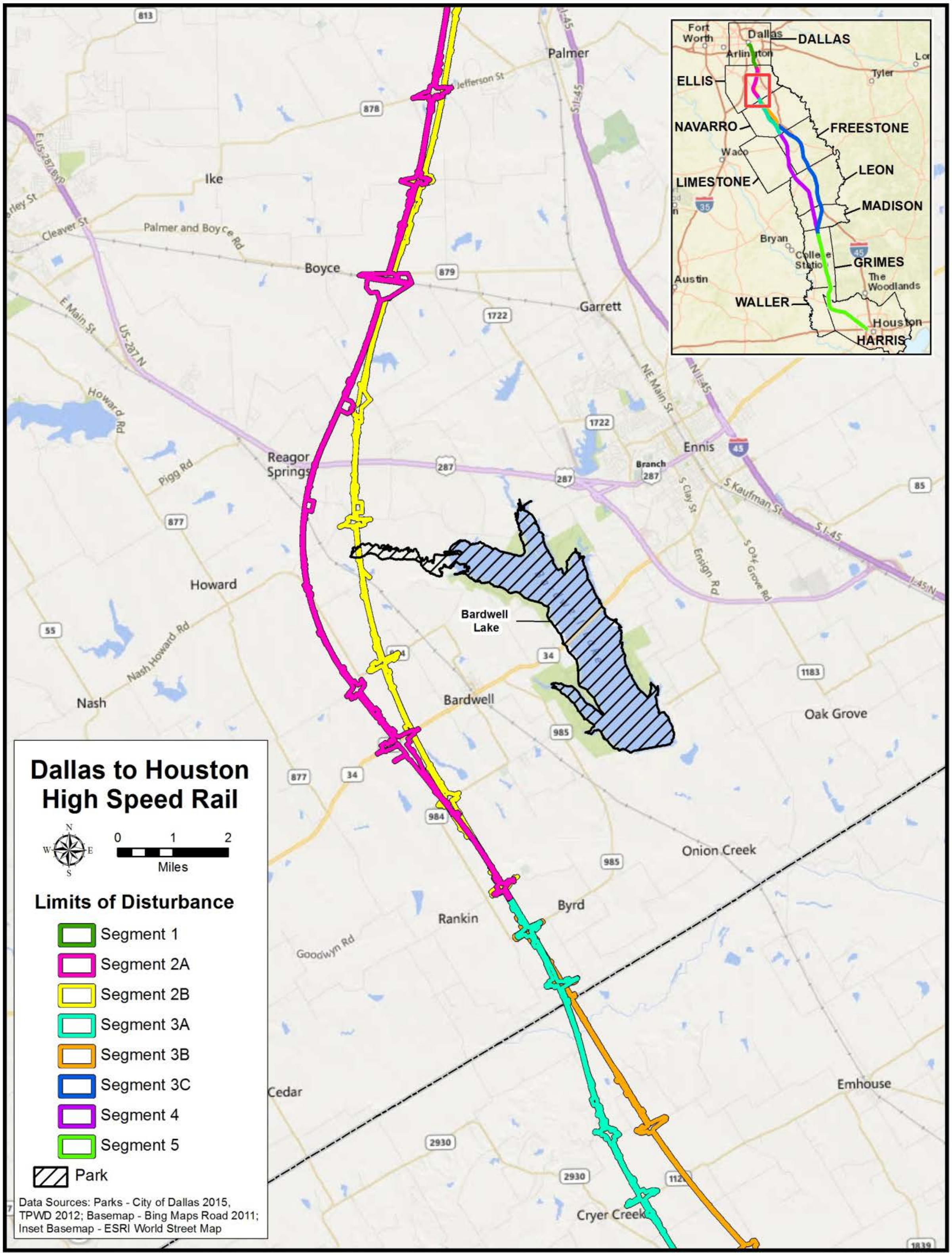
[6] This resource was not considered Section 4(f) eligible because there is no recreational use.

## Figure 7-7: Section 4(f) Existing and Planned Public Parks and Recreation Areas



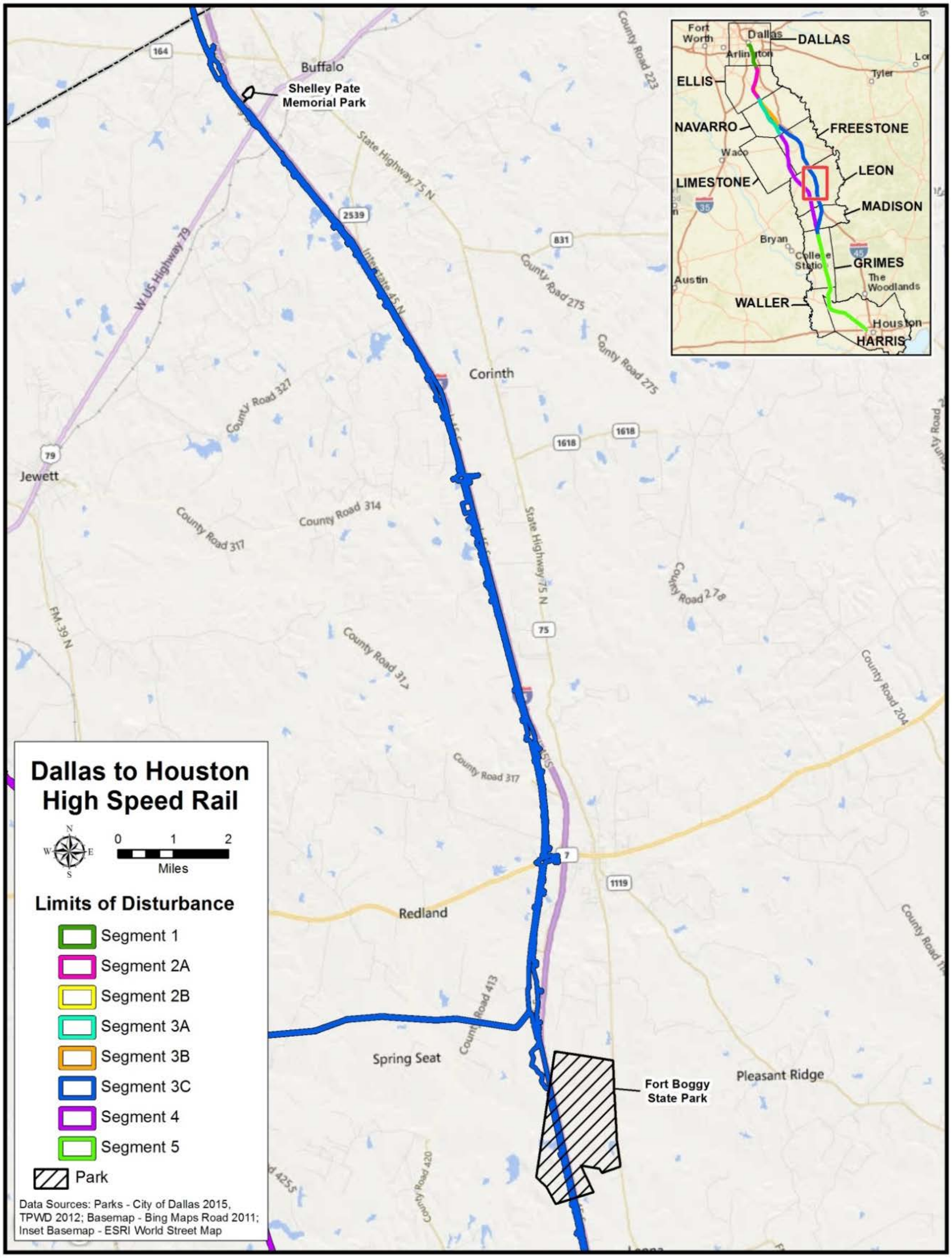

Source: AECOM, 2017

**Figure 7-8: Section 4(f) Existing and Planned Public Parks and Recreation Areas**



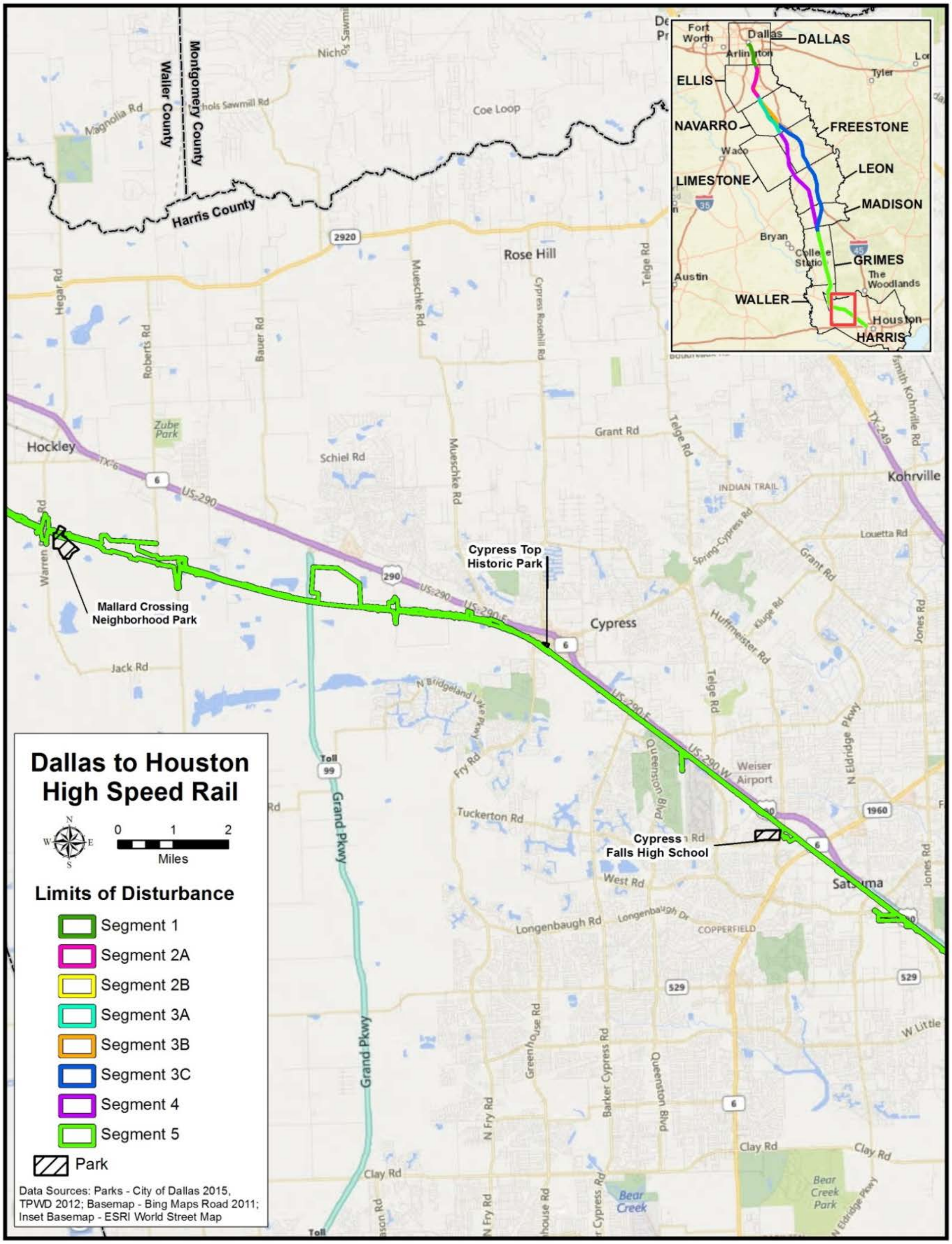

Source: AECOM, 2017

**Figure 7-9: Section 4(f) Existing and Planned Public Parks and Recreation Areas**



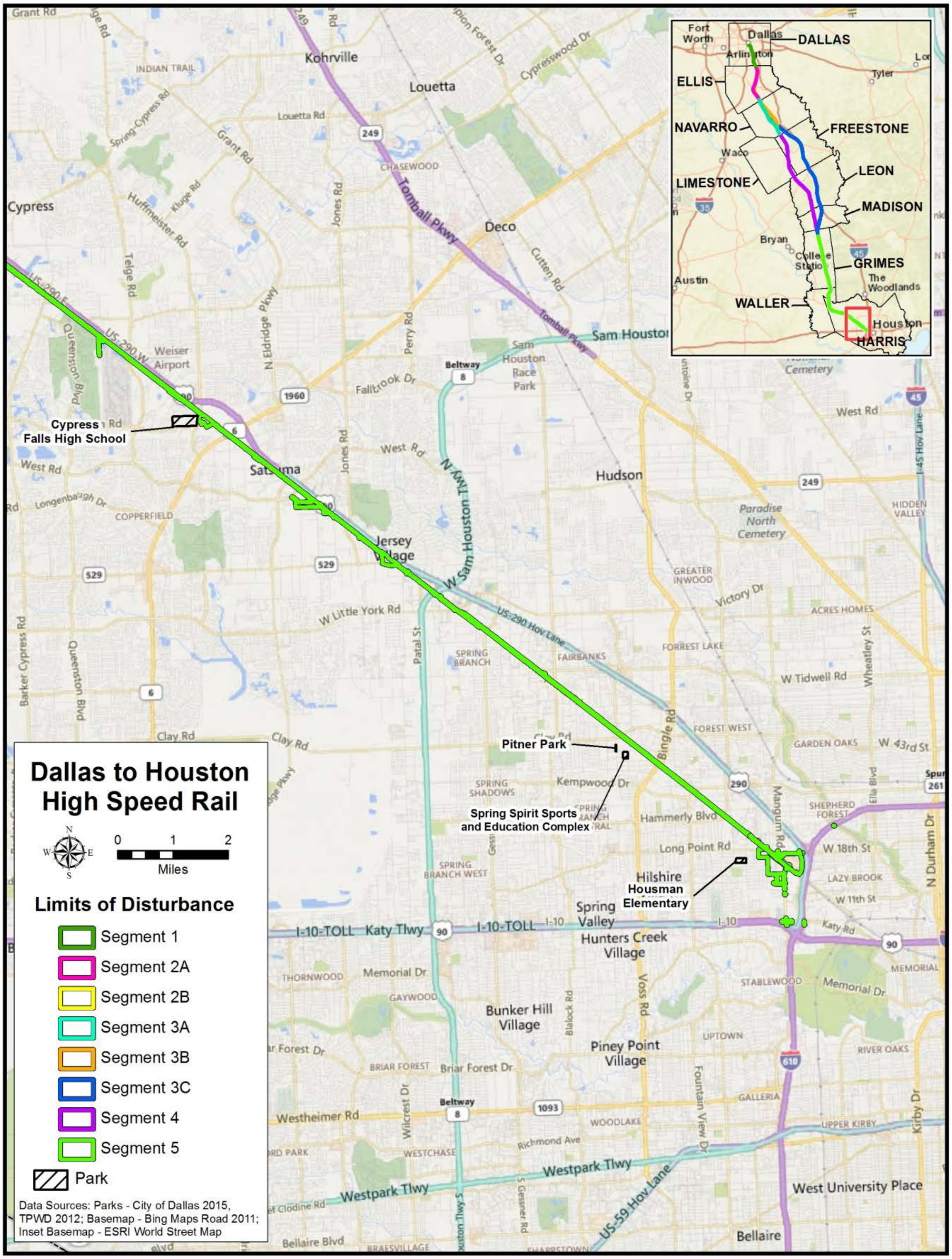

Source: AECOM, 2017

## Figure 7-10: Section 4(f) Existing and Planned Public Parks and Recreation Areas




Source: AECOM, 2017

**Figure 7-11: Section 4(f) Existing and Planned Public Parks and Recreation Areas**




Source: AECOM, 2017

*Dallas County (Segment 1)*

Twelve recreational facilities are located within the Study Area: Pioneer Plaza, Dallas Heritage Village at Old City Park, Reunion Park, Emerald Bracelet (proposed), Trinity River Greenbelt, Forest Park, Martin Luther King Median, Honey Springs Cemetery, Great Trinity Forest, Fruitdale Park, Seaton Park and J.J. Lemmon Park. Reunion Park is privately owned and is not considered a Section 4(f) property; therefore it is not discussed further in this section. Honey Springs Cemetery, although listed as a special use park, a City of Dallas designation for special use areas and parks that include historical areas, nature centers, golf courses, zoos, arenas and other types of facilities, does not contain recreational features and is therefore not considered a Section 4(f) property. In addition, through communication with the City of Dallas Park and Recreation Department, FRA confirmed that the Emerald Bracelet 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) resource. Refer to **Section 3.17, Recreational Facilities** for additional information regarding potential impacts to these resources, which are not further discussed in this Chapter.

Pioneer Plaza is considered a special use recreational area by the City of Dallas; it is located in Downtown Dallas adjacent to the northern portion of the Kay Bailey Hutchison Convention Center. Pioneer Plaza includes sculptures, water features, and a walking path. Pioneer Plaza is a 4.4-acre park located adjacent to Pioneer Cemetery, which includes Recorded Texas Historic Landmarks awarded by the THC; however, Pioneer Plaza would be located approximately located approximately 1,160 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 would be located approximately 1,000 feet from the LOD.

Trinity River Greenbelt Park is an existing 2,286-acre park located in the basin of the Trinity River within a levee. At its closest point, the park would be located approximately 900 feet from the LOD. Park amenities include trails, water features, and an observation platform.[4]

Forest Park is an existing city owned 2.4-acre park located on the southwest side of IH-45, directly west of the Trinity River. This neighborhood park would be located approximately 1,190 feet from the LOD. Amenities include trails, a basketball court, picnic tables and playground equipment.[5]

Martin Luther King Median is an existing City of Dallas, 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. This park, which displays a monument commemorating Martin Luther King, Jr., would be located approximately 1,500 feet from the LOD.

Great Trinity Forest is a city-owned park encompassing approximately 6,000 acres. The Great Trinity Forest includes a proposed 15-mile trail that would be located along the Trinity River traveling into the forest. This park would be located approximately 360 feet from the LOD. Amenities consist of the Trinity River Audubon Center, William Blair Jr. Park and the Texas Buckeye Trail; however, since these amenities are located outside of the study area they are not further discussed in this section.[6]

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[4] Dallas Parks and Recreation. *Parks and Trails.* Accessed January 2016. http://www.dallasparks.org/35/Parks-Trails

[5] Ibid.

[6] City of Dallas, Trinity River Corridor Project. *Great Trinity Forest.* Accessed March 2016. http://www.trinityrivercorridor.com/recreation/great-trinity-forest

Fruitdale Park 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. This park is located approximately 220 feet from the LOD.

Seaton Park is a City of Dallas owned park and would be located 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.[7]

J.J. Lemmon Park is a 19.7-acre park located west of IH-45 and directly south of Simpson Stuart Road. There is 3.5 acres of the park located within the Study Area and it is located approximately 1,000 feet from the LOD.

*Ellis County (Segments 2A, 2B, 3A, 3B and 3C)*

The Build Alternatives within Ellis County include Segments 2A, 2B, 3A, 3B and 3C. No parks or recreational facilities in Ellis County are located within the Study Area of Segments 2A, 3A, 3B or 3C. Segment 2B would intersect an area of the Lake Bardwell Limited Use Area. Hunting is allowed on the property from September to March. Lake Bardwell is a USACE-owned and operated lake and recreational facility in the City of Ennis. The facility includes 2,917 acres of water and five parks and multi-use trails. A portion of the property (approximately 230 acres) identified by USACE as a limited use area would be within the Study Area. 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." The USACE has specifically identified that the primary purpose of Lake Bardwell is flood control and water management.[8] At this time this property is not considered a Section 4(f) resource; however, FRA will continue to coordinate with USACE on the Section 4(f) eligibility of Lake Bardwell. For more information on this recreational facility, refer to **Section 3.17, Recreational Facilities**.

*Navarro County (Segments 3A, 3B, 3C and 4)*

The Build Alternatives within Navarro County includes Segments 3A, 3B, 3C and 4. No parks or recreational features are located within the Study Area.

*Limestone County (Segment 4)*

The Build Alternatives within Limestone County includes Segment 4; no parks or recreational facilities fall within the Study Area.

*Freestone County (Segments 3A, 3B, 3C, and 4)*

The Build Alternatives within Freestone County includes Segments 3A, 3B, 3C, and 4; no parks or recreation facilities are within the Study Area.

*Leon County (Segments 3C and 4)*

The Build Alternatives within Leon County includes Segments 3C and 4. There are no parks or recreation facilities within the Study Area of Segment 4.

Two parks are located within Segment 3C within Leon County: Shelley Pate Memorial Park and the Fort Boggy State Park. Shelley Pate Memorial Park is located east of IH-45 in Buffalo, Texas and would be

[7] Ibid.

[8] USACE, May 2016. http://www.swf-wc.usace.army.mil/bardwell/

approximately 420 feet from the LOD. This park is located within the Study Area; however, the Build Alternatives would be located just west of IH-45.

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 the TPWD and includes hiking trails, a 15-acre lake, a day use area, and three cabins. Of the 1,847 acres, 713 acres would be located within the Study Area. All recreational features are located on the east side of IH-45, while the Build Alternatives would be located west of the roadway.

*Madison County (Segments 3C and 4)*

The Build Alternatives within Madison County include Segments 3C and 4; no parks or recreation facilities occur within the Study Area.

*Grimes County (Segments 3C, 4 and 5)*

The Build Alternatives within Grimes County include Segments 3C, 4 and 5. No parks or recreational facilities are located within the Study Area.

*Waller County (Segment 5)*

The Build Alternatives within Waller County include Segment 5. No parks or recreational facilities are located within the Study Area.

*Harris County (Segment 5)*

The Build Alternatives within Harris County include Segment 5. There are six recreational facilities located within the Study Area (Mallard Crossing Neighborhood Park, Cypress Top Historic Park, Pitner Park, Spring Spirit Sports and Education Complex, Cypress Falls High School, and Housman Elementary School). Two of these properties (Mallard Crossing and Spring Spirit) are privately owned and not considered Section 4(f) properties; therefore, they are not discussed further in this section.

Cypress Top Historic Park is owned by Cypress Historical Society and is located on a 2.7-acre park along Hempstead Road. The park includes trails, a pavilion, historical buildings and offers guided tours. The property would be located 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.

Cypress Falls High School is located south of US 290 and directly west of Huffmeister Road. The recreation facilities at Cypress Falls High School are located on approximately 15.3 acres, at a distance of approximately 600 feet from the LOD. The facilities at this location are owned by Cypress-Fairbanks ISD, and open to the public during non-school hours.[9]

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 and soccer fields. At is closest point, these facilities are located approximately 1,260 feet from the LOD. The facilities at this location are open to the public during non-school hours.

[9] A June 27, 2016 phone conversation with Jennifer Young, Cypress Fall High School, and AECOM.

### 7.6.2.2 Existing and Planned Public Trails

This section identifies existing and proposed recreational trails in the study area. Recreational trails do not include on-street bikeways or other bicycle facilities considered to have a primary purpose as a transportation corridor. Additionally, this section does not include trails that are identified as ancillary amenities or included features occurring within a park property described in the parks section, above.

This section includes a number of proposed trails and details of the trail types, as defined by NCTCOG, City of Dallas, H-GAC or City of Houston. The types consist of major linear trails, sidewalk/street trails, neighborhood trails, and shared-use paths. A major linear trail typically connects to greenbelts, schools, neighborhoods, employment centers, transit centers and entertainment districts. A sidewalk/street trail is typically a trail that runs adjacent to streets and thoroughfares throughout the city. Neighborhood trails are primarily used to connect to adjoining neighborhoods and provide access to neighborhood parks. A shared-use trail or path is a form of infrastructure that supports multiple recreational opportunities. Shared-use paths often provide multiple lanes to prevent conflict from different modes of transportation.

This section also identifies planned trails, with portions to be constructed on land currently owned by public entities that would be constructed outside of transportation corridors, and have the potential to incur an actual Section 4(f) use. These trail segments, as well as those located on land currently owned by public entities within proximity to the LOD, are included in this document. In addition, it is important to note where trails intersect the Build Alternatives on viaduct TCRR would preserve access to existing trails. Should funding become available for the proposed trails, coordination between the managing entity and TCRR would occur. It is not anticipated that the Build Alternatives would prohibit these trails from being constructed.

The appraisal district was used to determine the ownership of parcels that were intersected by the trails and trail alignments along the Study Area; this information was used to determine whether specific parcels were privately or publicly owned.

Twelve trails are located within the Study Area: Santa Fe Trestle Trail, Grand Avenue Connector, Interurban Trail, Five Mile Creek Trail, El Camino de los Tejas National Historic Trail, Cole Creek, Jones Road/Rio Grande, Huffmeister/West Road, Hempstead Road, Cypress Creek Greenway, Cole Creek/Empire Central Drive and Fairbanks N. Houston Road. However, of these trails, five are located on privately owned land in the Study Area; coordination with City of Dallas Park and Recreation Department indicates that there is no easement or public access agreement for the portion of the trails on private land in the Study area.[10] Therefore these trails are not considered in Section 4(f) properties and are not discussed further in this section; refer to **Section 3.17, Recreational Facilities** for additional information regarding potential impacts to these resources.

As discussed in **Section 3.17, Recreational Facilities, Table 7-3** shows the existing and planned public trails that are located within the Study Area. **Figure 7-12** through **Figure 7-14** shows the existing and planned trails that are Section 4(f) eligible.

[10] An October 3, 2017 phone conversation with Leong Lim, City of Dallas Parks and Recreation Department

| Table 7-3: Existing and Planned Public Trails | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | **Location** | **Type/ Status** | **Surface** | **Width** | **Miles[1] Total/ Study Area** | **Seg.** | **Build Alternative(s)** | **Ownership** | **Approximate Distance from LOD** | **Section 4(f) Eligible[3]** |
| **Dallas County** | | | | | | | | | | |
| Santa Fe Trestle Trail | Within Trinity River Levees | Major Linear (existing) | Concrete | 12 Feet | 0.9<br>0.3 | 1 | A, B, C, D, E, F | DART, City of Dallas | 1,500 Feet | Yes |
| Grand Avenue Connector | Al Lipscomb Way | Sidewalk/Street (proposed) | Concrete | N/A[2] | 2.0<br>0.41 | 1 | A, B, C, D, E, F | Private, Dallas ISD | 125 Feet | Yes |
| Interurban Trail | John C Phelps Trail to Loop 12 | Major Linear (proposed) | Concrete | 12 Feet | 2.6<br>0.16 | 1 | A, B, C, D, E, F | DART, City of Dallas | 980 Feet | Yes |
| Five Mile Creek Trail | Westmoreland Park to Joppa Preserve | Major Linear (proposed) | Concrete | 8-12 Feet | 9.39<br>0.27 | 1 | A, B, C, D, E, F | Private, City of Dallas | Within LOD (private) (160 feet public) | Yes |
| **Freestone County** | | | | | | | | | | |
| El Camino Real de los Tejas National Historic Trail | Near Buffalo Creek, Freestone County | Natural Trails | N/A[2] | N/A[2] | 2,580<br>0.5 | 3C | C, F | Private | Within LOD | No |
| **Harris County** | | | | | | | | | | |
| Cole Creek | Cole Creek to Concord Park Drive | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 5.8<br>0.08 | 5 | A, B, C, D, E, F | Private | 1,200 Feet | No |
| Jones Rd/Rio Grande | Jones Road/Rio Grande to White Oak Bayou | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 4.4<br>0.5 | 5 | A, B, C, D, E, F | Private, State of Texas, Harris County MUD, Harris County Flood Control, Metro Transit Authority | 1,065 Feet | Yes |
| Huffmeister/ West Road | Huffmeister/ West Road to Sunbury Ln | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 3.0<br>0.9 | 5 | A, B, C, D, E, F | Private | Within LOD | No |
| Hempstead Road | Hempstead Road to Spencer | Shared Use Path/Transportation Feature (proposed) | N/A[2] | N/A[2] | 8.9<br>8.9 | 5 | A, B, C, D, E, F | Private, Metro Transit Authority | Within LOD | No |

| Table 7-3: Existing and Planned Public Trails | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | **Location** | **Type/ Status** | **Surface** | **Width** | **Miles[1] Total/ Study Area** | **Seg.** | **Build Alternative(s)** | **Ownership** | **Approximate Distance from LOD** | **Section 4(f) Eligible[3]** |
| Cypress Creek Greenway | Cypress Creek to Little Cypress Creek | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 15.3<br>1.0 | 5 | A, B, C, D, E, F | Private | Within LOD | No |
| Cole Creek/Empire Central Drive | Cole Creek/Empire Central Drive to Fisher Road | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 1.2<br>0.7 | 5 | A, B, C, D, E, F | Private | Within LOD | No |
| Fairbanks N. Houston Road | Fairbanks N Houston Road to Campbell Road | Shared Use Path/Trail (proposed) | N/A[2] | N/A[2] | 0.6<br>0.58 | 5 | A, B, C, D, E, F | Private | Within LOD | No |

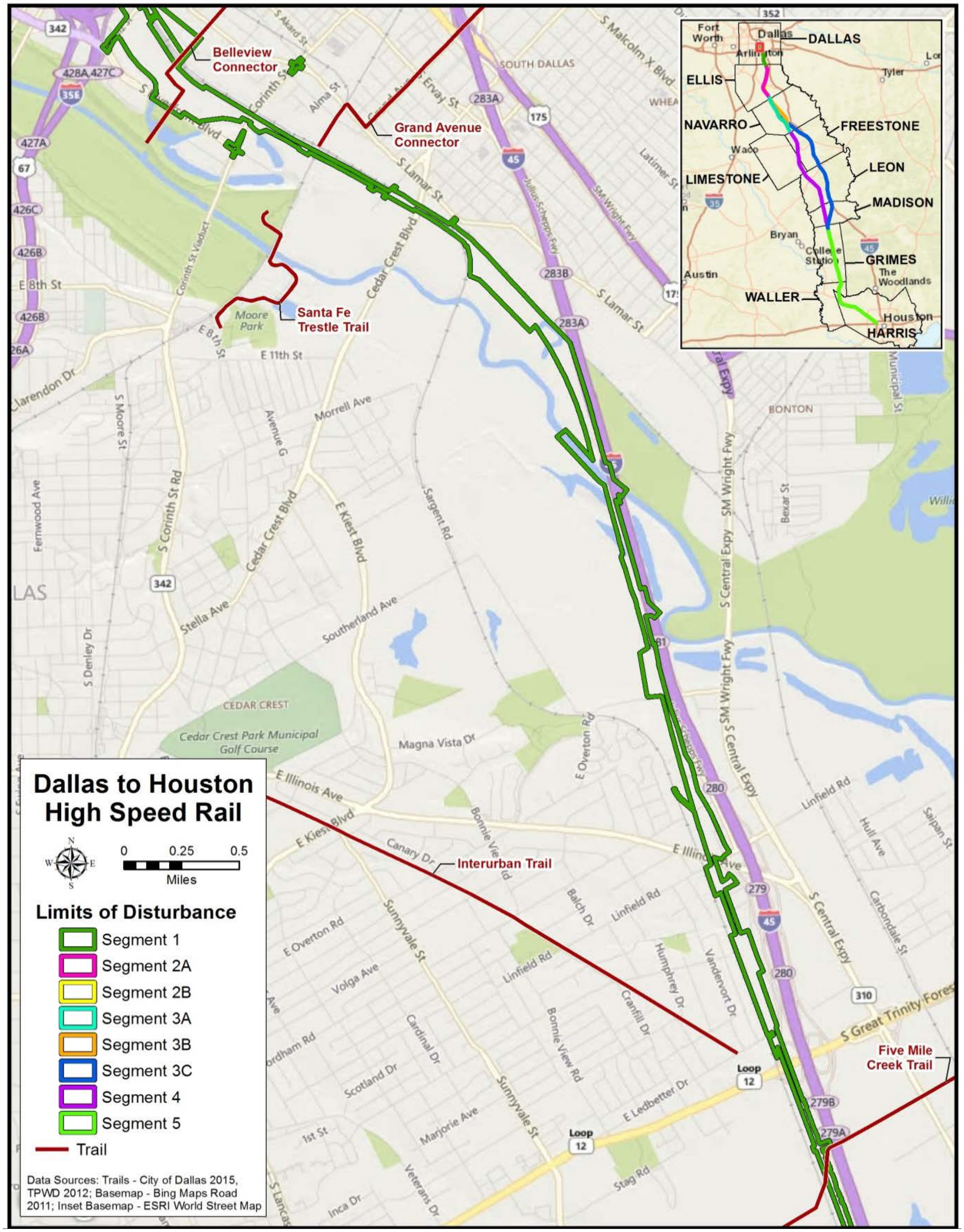
Source: City of Dallas, 2016; AECOM, 2017

[1] Displays total length of the resources followed by the number of miles that fall within the Study Area

[2] Detailed information for this resource is not available

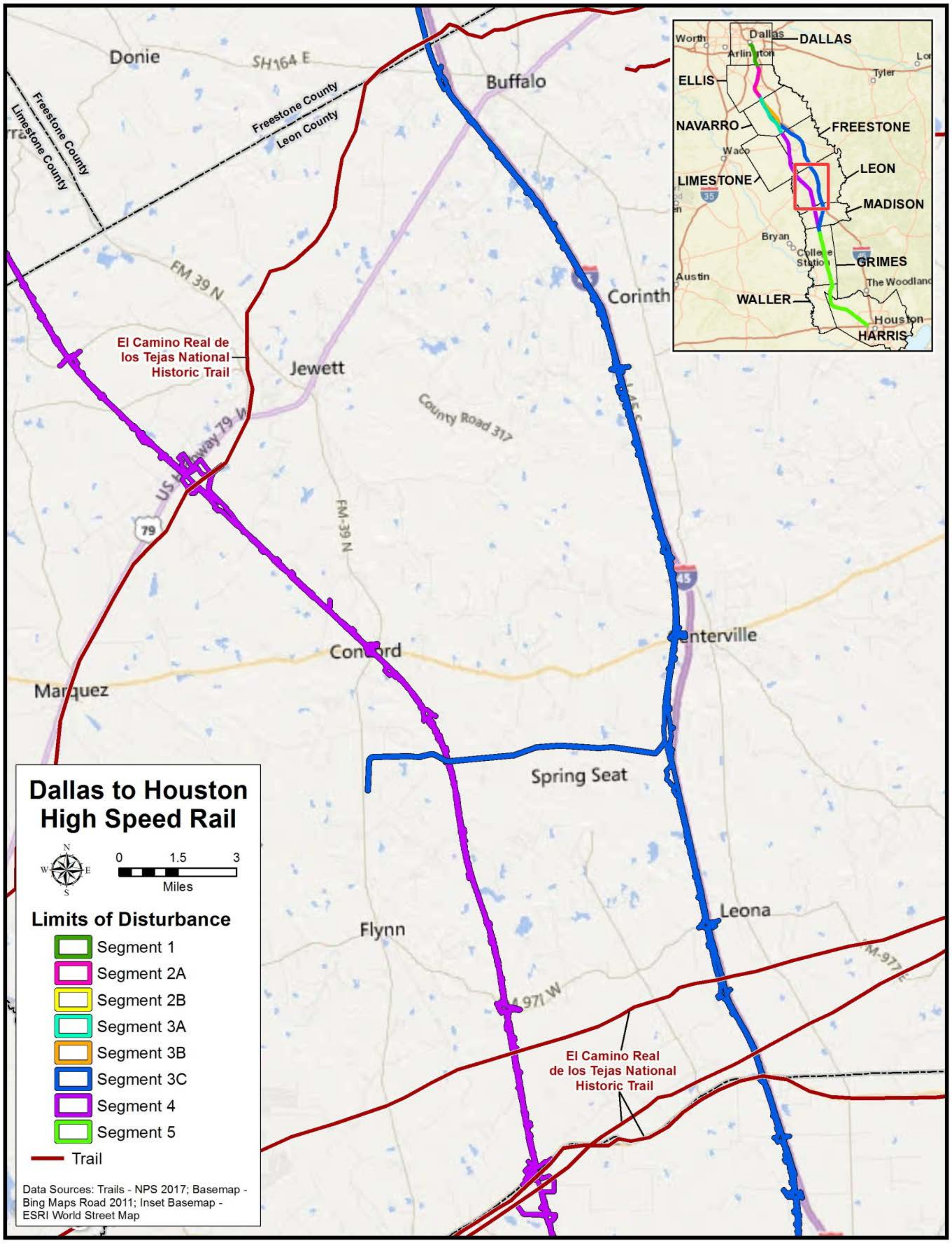
[3] Section 4(f) eligibility only pertains to portions that are on publicly owned land. Land within and immediately adjacent to the Build Alternatives that are privately owned are not Section 4(f) eligible.

**Figure 7-12: Section 4(f) Existing and Planned Trails**




Source: AECOM, 2017

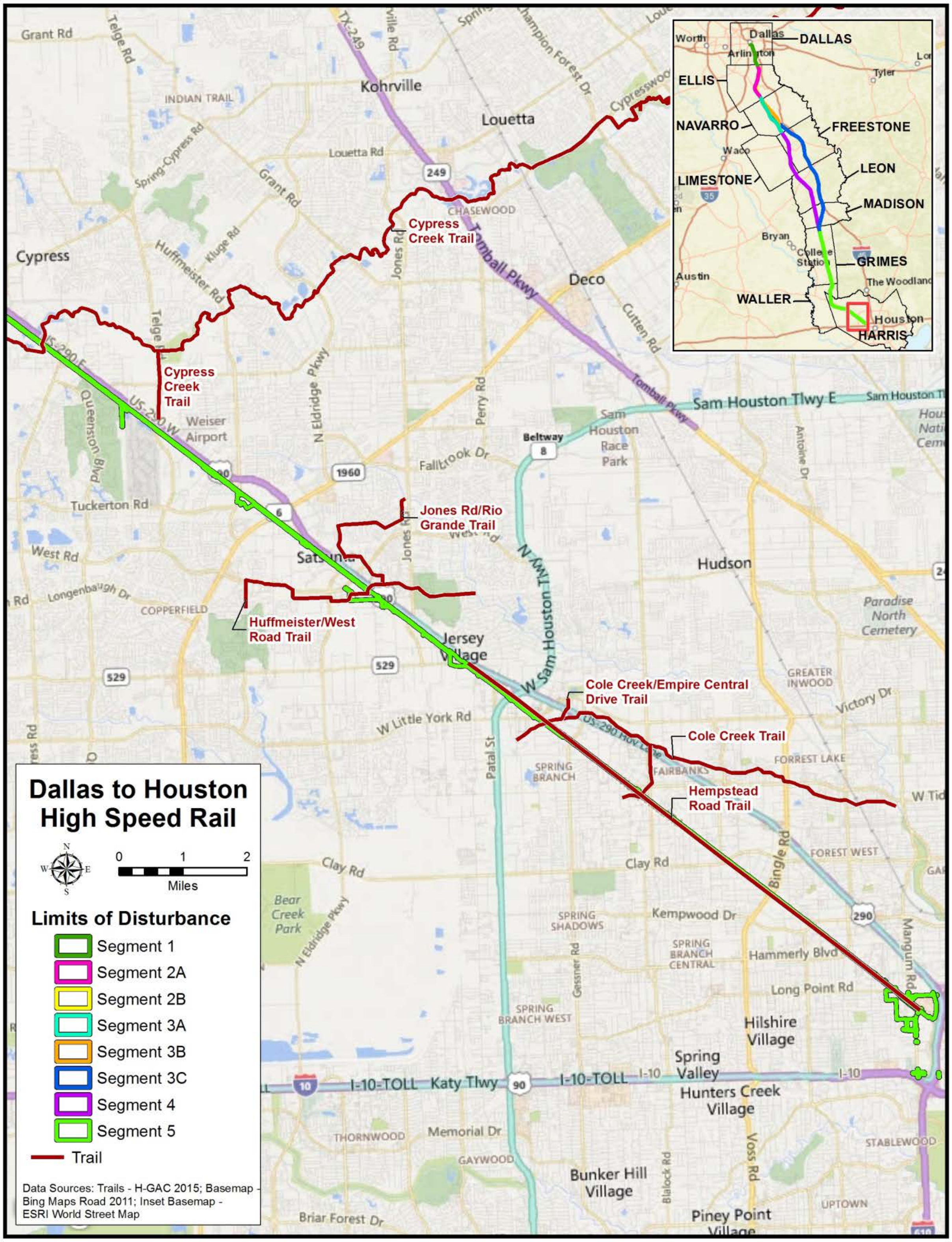
# Figure 7-13: Section 4(f) Existing and Planned Trails




Source: AECOM, 2017

Note: Portions of the El Camino Real de los Tejas National Historic Trail alignment are approximate since the trail is a network of roads and prehistoric footpaths.

## Figure 7-14: Section 4(f) Existing and Planned Trails




Source: AECOM, 2017

*Dallas County*

The Santa Fe Trestle Trail was identified within the Study Area. In addition, four proposed trails were identified in the Study Area within Dallas County: Santa Fe Trestle Trail, Grand Avenue Connector, Interurban Trail, and the Five Mile Creek Trail.

**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 one mile in length and has 0.3-mile-long of the trail within the Study Area.[11] 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 1,500 feet from the LOD.

The **Grand Avenue Connector** 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.

The **Interurban Trail** is a City of Dallas proposed trail which would operate along an existing utility corridor in the urban neighborhoods of South Dallas.[12] 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 would be approximately 980 feet from the LOD.

**Five Mile Creek Trail** is a proposed trail situated along the Five Mile Creek in Dallas County. It would cross under IH-45 and connect to the Trinity River.[13] 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 Park 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;[14], therefore, the Five Mile Creek Trail is not considered a Section 4(f) property. The closest parcel of publicly owned land of this planned trail is 160 feet from the LOD.

[11] City of Dallas GIS, 2015
[12] Ibid.
[13] Ibid.
[14] An October 3, 2017 phone conversation with Leong Lim, City of Dallas Parks and Recreation Department

*Freestone, Leon, and Madison Counties*

Segment 3C intersects the **El Camino Real de los Tejas National Historic Trail**, which crosses the Segment 3C just north of the Freestone/Leon County line along Alligator Creek and Buffalo Creek. El Camino Real de los Tejas National Historic Trail is currently administered by the NPS, and extends approximately 2,580 miles from the Rio Grande River near Eagle Pass and Laredo, Texas to Natchitoches, Louisiana. Although administered by the NPS, trail facility maintenance is dependent on local assistance and cooperation because the trail is not owned solely by the NPS.[15] In the Study Area, the trail crosses privately owned land, on which there are no known public access easements. The historic trail crosses the segment alternatives in several locations; however, within the Study Area there is no formal trail or path features, or associated museums or ancillary features. In accordance with Public Law 95-625, national historic trails are not protected under Section 4(f) as recreational properties; please refer **Section 3.17, Recreational Facilities** for a discussion of impacts to this recreational feature.

#### *7.6.2.2.1 Harris County*

All trails identified within the Study Area in Harris County are proposed, as shown in **Figure 7-14**.[16] Due to the early planning stages for these trails, there is limited information available. These trails would mostly be off-street within the Study Area and function as shared use paths. In addition, trails that are not classified as Section 4(f) (e.g., Cole Creek) are not analyzed in this section. Refer to **Section 3.17, Recreational Facilities** for additional information including descriptions of the proposed trails in Harris County.

The proposed **Jones Road/Rio Grande** trail would be located approximately 1,065 feet from the LOD. The segment extends from Jones Road/Rio Grande to White Oak Bayou. In the Study Area, the trail crosses lands owned by private and public entities.

### 7.6.3 Section 4(f) Historical Sites

The identification of historic and archeological resources within the APEs is ongoing through the Section 106 process. Background records of the THSA, TASA, NRHP database, TxDOT historic resources database and available previous reports were reviewed to identify previously recorded and/or designated historic and archeological resources—including NRHP-listed historic properties, NRHP-eligible historic properties, NHLs, SALs, Recorded Texas Historic Landmarks (RTHLs), Historic Texas Cemeteries (HTCs), and recorded cemeteries with no designation.

As described in **Section 7.3, Cultural Resources**, the identification of historic properties is being completed through a phased approach. Known historic properties within the APE are presented in **Table 7-4**, and summarized in the section below. Historic and archeological resources that are not considered protected under Section 4(f) (e.g., archaeological sites listed or eligible for listing in the NRHP only under Criterion D) are not discussed further in this section; refer to **Section 3.19, Cultural Resources** for additional information including descriptions of, and potential impacts to, these resources.

[15] NPS. *El Camino Real de los Tejas National Historic Trail Comprehensive Management Plan.* Accessed May 2016. http://parkplanning.nps.gov/elte0911

[16] City of Harris, GIS.

**Table 7-4: Known Section 4(f) Historic Sites within the APEs**

| Field ID/Resource Name | Resource Type | NRHP status; Criteria | Segment | Build Alternative(s) | In LOD | Approximate Distance from Segment(s) LOD |
|---|---|---|---|---|---|---|
| **Dallas** | | | | | | |
| DA.009 | Domestic Single-Family Dwelling | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 270 feet |
| DA.010 | Domestic Single-Family Dwelling | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 300 feet |
| DA.016 (former KIXL Studios) | Building | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 10 feet |
| DA.020 (Good Luck Oil Company) | Building | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | No | 295 feet |
| DA.022 (Chase Bag Company) | Building | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 55 feet |
| DA.023 (Cadiz Street Overpasses and Underpasses) | Bridge | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | Yes | Within LOD |
| DA.024a-b (Cadiz Pump Station) | Building | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 179 feet |
| DA.028 (Dallas Coffin Company) | Building | NRHP Listed; A & C | Segment 1 | A, B, C, D, E, F | No | 185 feet |
| DA.029 (Dining Hall) | Building | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | No | 252 feet |
| DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center) | Historic District | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 40 feet |
| DA.031 (Sears Roebuck and Company Furniture Warehouse Complex) | Building | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 340 feet |
| DA.041 (Sigel's Liquor Store) | Building | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | No | 90 feet |
| DA.048 (Oak Cliff Box Company) | Building | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | No | 210 feet |
| DA.056 (Corinth Street Underpass and Overpass) | Bridge | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 10 feet |
| DA.070 (Corinth Street Viaduct) | Bridge | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 250 feet |

| Table 7-4: Known Section 4(f) Historic Sites within the APEs | | | | | | |
|---|---|---|---|---|---|---|
| **Field ID/Resource Name** | **Resource Type** | **NRHP status; Criteria** | **Segment** | **Build Alternative(s)** | **In LOD** | **Approximate Distance from Segment(s) LOD** |
| DA.072 (Dallas Floodway Historic District) | Public Works | NRHP Eligible; A | Segment 1 | A, B, C, D, E, F | Yes | Within LOD |
| DA.076a (Guiberson Corporation) | Building | NRHP Eligible; B | Segment 1 | A, B, C, D, E, F | Yes | Within LOD |
| DA.076b (Guiberson Corporation) | Building | NRHP Eligible; B | Segment 1 | A, B, C, D, E, F | No | 85 feet |
| DA.080a-e (Proctor and Gamble Complex) | Building | NRHP Eligible; A & C | Segment 1 | A, B, C, D, E, F | No | 100-470 feet |
| DA.082 (Honey Springs Cemetery) | Cemetery | NRHP Eligible; A & D | Segment 1 | A, B, C, D, E, F | Yes | Within LOD |
| DA.104 (Railroad Bridge at E. Illinois Avenue) | Bridge | NRHP Eligible; C | Segment 1 | A, B, C, D, E, F | No | 210 feet |
| DA.194 (W. A. Strain Historic District) | Domestic Single-Family Dwelling | NRHP Listed; A | Segment 1 | A, B, C, D, E, F | No | 650 feet |
| **Ellis** | | | | | | |
| EL.031a | Domestic Single-Family Dwelling | NRHP Eligible[1]; A & C | Segment 2A<br>Segment 2B | A, B, C<br>D, E, F | No<br>No | 185 feet<br>185 feet |
| EL.031b | Building | NRHP Eligible[1]; A & C | Segment 2A<br>Segment 2B | A, B, C<br>D, E, F | No<br>No | 210 feet<br>210 feet |
| EL.031c | Building | NRHP Eligible[1]; A & C | Segment 2A<br>Segment 2B | A, B, C<br>D, E, F | No<br>No | 170 feet<br>170 feet |
| EL.040 (Boren Cemetery) | Cemetery | NRHP Eligible[1]; A & D | Segment 2A | A, B, C | No | 260 feet |
| EL.062 | Domestic Single-Family Dwelling | NRHP Eligible[1]; C | Segment 3A<br>Segment 3B<br>Segment 3C | A, D<br>B, E<br>C, F | No<br>No<br>No | 320 feet<br>125 feet<br>320 feet |
| **Navarro County** | | | | | | |
| NA.078 | Domestic Single-Family Dwelling | NRHP Eligible[1]; C | Segment 3B | B, E | No | 950 feet |
| **Freestone** | | | | | | |
| FR.016a (Furney Richardson School) | Historic Building | NRHP Eligible; A | Segment 4 | A, B, D, E | No | 790 feet |
| FR.034 (Johnson African American Cemetery) | Cemetery | NRHP Eligible; A & D | Segment 3C | C, F | No | 1,260 feet |

| Table 7-4: Known Section 4(f) Historic Sites within the APEs | | | | | | |
|---|---|---|---|---|---|---|
| **Field ID/Resource Name** | **Resource Type** | **NRHP status; Criteria** | **Segment** | **Build Alternative(s)** | **In LOD** | **Approximate Distance from Segment(s) LOD** |
| **Limestone** | | | | | | |
| Of the 25 historic resources identified and evaluated in Limestone County, none are NRHP-listed or recommended NRHP eligible. | | | | | | |
| **Leon** | | | | | | |
| LE.001a (Little Flock Cemetery) | Cemetery | NRHP Eligible; A &D | Segment 4 | A, B, D, E | No | 1,170 feet |
| LE.048 | Government | NRHP Eligible[1]; A | Segment 3C | C, F | No | 700 feet |
| **Madison** | | | | | | |
| MA.019 (Oxford Cemetery) | Cemetery | NRHP Eligible; A & D | Segment 4 | A, B, D, E | No | 415 feet |
| MA.031a | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 270 feet |
| MA.031b | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 125 feet |
| MA.031c | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 135 feet |
| MA.031d | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 195 feet |
| MA.031e | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 290 feet |
| MA.031f | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 370 feet |
| MA.031h | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 85 feet |
| MA.031i | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 315 feet |
| MA.031j | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 355 feet |
| MA.031k | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 45 feet |
| MA.031l | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 275 feet |
| MA.031m | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 305 feet |
| MA.031n | Building | NRHP Eligible[1]; A & C | Segment 4 | A, B, D, E | No | 300 feet |
| **Grimes** | | | | | | |
| GR.001 (Bethel Cemetery) | Cemetery | NRHP Eligible[1]; A & D | Segment 3C | C, F | No | 1,180 feet |
| GR.004a | Domestic Single-Family Dwelling | NRHP Eligible[1]; C | Segment 5 | A, B, C, D, E, F | No | 1,065 feet |
| **Waller** | | | | | | |
| Of the 12 historic resources identified and evaluated in Waller County, none are NRHP-listed or recommended NRHP eligible. | | | | | | |

| Table 7-4: Known Section 4(f) Historic Sites within the APEs | | | | | | |
|---|---|---|---|---|---|---|
| **Field ID/Resource Name** | **Resource Type** | **NRHP status; Criteria** | **Segment** | **Build Alternative(s)** | **In LOD** | **Approximate Distance from Segment(s) LOD** |
| **Harris** | | | | | | |
| HA.004a | Domestic Single-Family Dwelling | NRHP Eligible; C | Segment 5 | A, B, C, D, E, F | Yes | Within LOD |
| HA.024b (Humble Oil Gas Station) | Building | NRHP Eligible; C | Segment 5 | A, B, C, D, E, F | No | 205 feet |
| HA.208 (Tex-Tube Complex) | Complex | NRHP Eligible; A & C | Segment 5 | A, B, C, D, E, F | Yes | Within LOD |

Source: AECOM, 2017

[1]Resource requires additional research and/or survey to be fully evaluated; considering eligible for the purposes of this analysis.

#### 7.6.3.1 Dallas County

A total of 254 historic resources were identified within the historic resources APE in Dallas County. However, only 29 Section 4(f) historic resources have been identified in Dallas County along Segment 1. Some properites included more than one resource so they were with identified with a textual character following the resorce ID. The NRHP eligibility for all of the historic resources identified in Dallas County are included in **Appendix E, Cultural Resources Technical Memorandum.** For additional information and descriptions on historic resources refer to **Section 3.19, Cultural Resources.**

*Segment 1*

Six Section 4(f) historic resources have been identified within the LOD in Dallas County:

- DA.023 (Cadiz Street Overpasses and Underpasses): NRHP-eligible bridge (Criteria A and C)
- DA.072 (Dallas Floodway Historic District): NRHP-eligible district (Criterion A)
- DA.076a (Guiberson Corporation): NRHP-eligible buildings (Criterion B)
- DA.082 (Honey Springs): NRHP-eligible Cemetery (Criteria A and D)
- DA.110a (Smith Family Cemetery): NRHP-eligible Cemetery (Criteria A and D)
- DA.110b (Linfield Elementary School): NRHP-eligible building (Criteria A and C)

The remaining 23 resources are located within the APE, but outside of the LOD. Two of these resources 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 or recommended eligible for listing on the NRHP (ranging from 10 feet – 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.020 (Good Luck Oil Company): NRHP-eligible (Criteria C)
- DA.022 (Chase Bag Company): NRHP-eligible (Criteria A and C)
- DA.024a-b (Cadiz Pump Station): NRHP-eligible (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.070 (Corinth Street Viaduct): NRHP-eligible (Criteria A and C)
- DA.076b (Guiberson Corporation): NRHP-eligible buildings (Criterion B)
- DA.080a-e (Proctor and Gamble Complex): NRHP-eligible (Criteria A and C)
- DA.104 (Railroad Bridge at E. Illinois Avenue): NRHP-eligible (Criterion C)

#### 7.6.3.2 Ellis County

A total of 113 historic resources were identified within the historic resources APE in Ellis County. However, in the Study Area in Ellis County only five properties are considered potentially eligible for listing in the NRHP and are therefore potential Section 4(f) historic resources. Of these, no resources have been identified within the LOD of Segment 2A, 2B, 3A, 3B, or 3C. For additional information and descriptions on historic resources identified in Ellis County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 2A*

There are four potential Section 4(f) historic resources within the APE, but outside the LOD (pending additional investigation). These resources are located approximately 170 feet to 260 feet from the LOD.

- EL.031a-c: Potentially NRHP-eligible (Criteria A and C)
- EL.040 (Boren Cemetery): Potentially NRHP-eligible (Criteria A and D)

*Segment 2B*

There are three potential Section 4(f) historic resources within the APE, but outside the LOD (pending additional investigation). These resources are located approximately 170 feet to 210 feet from the LOD.

- EL.031a-c: Potentially NRHP-eligible (Criteria A and C)

*Segment 3A*

No potential Section 4(f) historic resources have been identified within the LOD of Segment 3A. However, one resource has been identified within the APE, but outside the LOD (EL.062: Potentially NRHP-eligible [Criterion C]). This resource is assumed eligible for the purposes of this analysis (pending additional investigation), and is located approximately 320 feet from the LOD.

*Segment 3B*

No potential Section 4(f) historic resources have been identified within the LOD of Segment 3B. However, one resource has been identified within the APE, but outside the LOD (EL.062: Potentially NRHP-eligible [Criteria C]). This resource is assumed eligible for the purposes of this analysis (pending additional investigation), and is located approximately 125 feet from the LOD.

*Segment 3C*

No potential Section 4(f) historic resources have been identified within the LOD of Segment 3C. However, one resource has been identified within the APE, but outside the LOD (EL.086: Potentially NRHP-eligible [Criterion C]). This resource is assumed eligible for the purposes of this analysis (pending additional investigation), and is located approximately 320 feet from the LOD.

### 7.6.3.3 Navarro County

A total of 161 historic resources were identified within the historic resources APE in Navarro County. However, only one of these properties is considered potentially eligble for listing in the NRHP and therefore considered a Section 4(f) resource. No Section 4(f) historic resources have been identified within the LOD of Segments 3A, 3B or 3C. For additional information and descriptions on historic resources identified in Navarro County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 3A*

There are no Section 4(f) historic resources within the LOD or APE of Segment 3A in Navarro County.

*Segment 3B*

There are no Section 4(f) historic resources within the LOD of Segment 3B. However, one resource has been identified within the APE, but outside the LOD (NA.078: Potentially NRHP-eligible [Criterion C]). This resource is assumed eligible for the purposes of this analysis (pending additional investigation), and is located approximately 950 feet from the LOD.

*Segment 3C*

There are no Section 4(f) historic resources within the LOD or APE of Segment 3C in Navarro County.

#### 7.6.3.4 Freestone County

A total of 81 historic resources were identified within the APE in Freestone County. Of these resources, two are considered protected under Section 4(f). Both resources (FR.034 and FR.016a) have been identified within the study areas of Segment 3C and Segment 4 but outside of the LOD. For additional information and descriptions on historic resources identified in Freesone County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 3C*

There are no Section 4(f) historic resources within the LOD of Segment 3C in Freestone County. However, one resource has been identified within the APE, but outside the LOD: FR.034 (Johnson African American Cemetery): NRHP-eligible (Criteria A and D). This resource is located approximately 1,260 feet from the LOD.

*Segment 4*

There are no Section 4(f) historic resources within the LOD of Segment 4 in Freestone County. However, one resource has been identified within the APE, but outside the LOD: FR.016a (Furney Richardson School): NRHP-eligible (Criterion A). This resource is located approximately 790 feet from the LOD.

#### 7.6.3.5 Limestone County

A total of 25 historic resources were identified within the historic resource APE of Segment 4 in Limestone County. However, none of these resources possess the architectural or historical significance necessary to meet the NRHP guidelines for significance under Criteria A through D, and are therefore not Section 4(f) resources.

#### 7.6.3.6 Leon County

A total of 66 historic resources were identified within the historic resources APE in Leon County. Of these resources, two have the potential to be considered a Section 4(f) historic resource. These resource have been identified within the Study Area of Segment 3C and Segement 4 but outside of the LOD within Leon County. For additional information and descriptions on historic resources identified in Leon County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 3C*

There is one Section 4(f) historic resource within the Study Area of Segment 3C. Resource LE.048 is potentially NRHP-eligible (Criteria A and D). This resource is located approximately 700 feet from the LOD of Segment 3C

.

*Segment 4*

There are no Section 4(f) resources within the LOD of Segment 4 in Leon County. However, one resource has been identified within the APE, but outside of the LOD: LE.001a (Little Flock Cemetery): NRHP-eligible (Criterion A). This resource is located approximately 1,170 feet from the LOD.

#### 7.6.3.7 Madison County

A total of 118 historic resources were identified within the historic resources APE in Madison County; of these, 14 are Section 4(f) historic resources. No Section 4(f) historic resources have been identified within the LOD of Segement 3C or Segment 4 in Madison County**.** For additional information and descriptions on historic resources identified in Madison County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 4*
There is one Section 4(f) historic resource located approximately 415 feet from the LOD of Segment 4. Resource MA.019 (Oxford Cemetery) is NRHP-eligible under Criteria A and D.

The remaining 13 resources are assumed eligible for the purposes of this analysis (pending additional investigation). However, the fourteen resources are within the APE, but outside of the LOD. These resources, which are potentially NRHP-eligible under Criteria A and C, are located on one site (MA.031a-n) and are located approximately 45 feet to 370 feet from the LOD of Segment 4.

#### 7.6.3.8 Grimes County

A total of 142 historic resources were identified within the historic resources APE in Grimes County, 2 of which have been identified as Section 4(f) historic resources (pending additional investigation). Neither is located within the LOD of Segment 3C, Segment 4 or Segment 5. For additional information and descriptions on historic resources identified in Grimes County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 3C*

One Section 4(f) historic resource (pending additional investigation) is located within the APE, but outside of the LOD: GR.001 (Bethel Cemetery): Potentially NRHP-eligible (Criteria A and D). This resource is located approximately 1,180 feet from the LOD of Segment 3C.

*Segment 4*
There are no Section 4(f) resources within the LOD or APE of Segment 4 in Grimes County.

*Segment 5*
One Section 4(f) historic (pending additional investigation) is located within the APE, but outside of the LOD: GR.004a: Potentially NRHP-eligible (Criterion C) This resource is located approximately 1,065 feet from the LOD of Segment 3C.

#### 7.6.3.9 Waller County

A total of 12 historic resources were identified within the historic resource APE of Segment 5 in Waller County. However, none are eligible for listing in the NRHP and therefore are not considered Section 4(f) properties.

#### 7.6.3.10 Harris County

A total of 363 historic resources were identified within the historic resource APEs of Segment 5, Industrial Site Terminal option, Northwest Mall Terminal option and Northwest Transit Terminal option in Harris County. Of these, only three Section 4(f) historic resources have been identified in the Study Area in Harris County. For additional information and descriptions on historic resources identified in Harris County refer to **Section 3.19, Cultural Resources** and **Appendix E, Cultural Resources Technical Memorandum.**

*Segment 5*
There is one Section 4(f) historic resources within the LOD of Segment 5: HA.004a: NRHP-eligible residential building (Criterion C). One additional Section 4(f) historic site is located approximately 205 feet from the LOD of Segment 5: HA.024b (Humble Oil Gas Station): NRHP-eligible building (CriterionC).

*Industrial Site Terminal Option*

There is one Section 4(f) historic resource within the LOD of the Industrial Site Terminal option: HA.208 (Tex-Tube Complex): NRHP-eligible complex (Criteria A and C).

## 7.7 Assessment of Use of 4(f) Properties

This section summarizes the potential use, if any, for each of the identified Section 4(f) resources that would potentially be affected by the Build Alternatives.

### 7.7.1 Pubic Parks/Recreation Areas

Properties within the Study Area but greater than a quarter-mile from the LOD were determined to be of sufficient distance that proximity impacts would not substantially impair the attributes of the properties that qualify them for protection under Section 4(f). Therefore, these resources are not further addressed in this Section 4(f) evaluation.

The following parks, recreation areas, and trails were identified within the Study Area but are located greater than a quarter-mile from the LOD or were located on privately owned land:

- Pioneer Plaza
- Dallas Heritage Village at Old City Park
- Reunion Park
- Emerald Bracelet Park
- Trinity River Greenbelt
- Forest Park
- Martin Luther King Median
- Honey Springs Cemetery
- Seaton Park
- J.J. Lemmon Park
- Lake Bardwell
- Shelley Pate Memorial Park
- Mallard Crossing Neighborhood Park
- Pitner Park
- Spring Spirit Sports and Education Complex
- Cypress Falls High School
- Housman Elementary
- Sante Fe Trestle Trail
- Interurban Trail
- El Camino Real de los Tejas National Historic Trail
- Cole Creek
- Jones Road/Rio Grande
- Huffmeister/West Road
- Hemstead Road
- Cypress Creek Greenway
- Cole Creek/Empire Central Drive
- Fairbanks N. Houston Road

Section 4(f) parks, recreation areas, and trails located within a quarter-mile of the LOD were analyzed in detail to assess the potential for a Section 4(f) use.

FRA identified six recreational resources for further evaluation. Four resources were identified on Segment 1 in Dallas County (i.e., Greater Trinity Forest, Fruitdale Park, Grand Avenue Connector and Five Mile Creek Trail), one resource was identified in Segment 3C in Leon County (Fort Boggy State Park) and one resource was identified in Segment 5 in Harris County (Cypress Top Historic Park), as shown on **Table 7-5** and further described in the following section.

**Table 7-5: Summary of Preliminary Use Determinations – Park, Recreation Area and Trails within a quarter-mile of the Build Alternatives**

| Section 4(f) Property | Segment Alternative | Distance from LOD | Section 4(f) Preliminary Use Determination | | |
|---|---|---|---|---|---|
| | | | No Use | De Minimis | Use |
| **Dallas County** | | | | | |
| Great Trinity Forest | 1 | 360 feet | • | | |
| Fruitdale Park | 1 | 220 feet | • | | |
| Grand Avenue Connector (Planned) | 1 | 125 feet | • | | |
| Five Mile Creek Trail (Planned) | 1 | Within LOD (Private) 160 feet (Public) | • | | |
| **Leon County** | | | | | |
| Fort Boggy State Park | 3C | Within LOD | | • | |
| **Harris County** | | | | | |
| Cypress Top Historic Park | 5 | 300 feet | • | | |

Source: AECOM, 2017

### 7.7.1.1 Dallas County (Segment 1)

Two existing and two planned Section 4(f) recreational features are located within quarter-mile of the LOD of Segment 1: Great Trinity Forest, Fruitdale Park, Grand Avenue Connector and Five Mile Creek Trail.

*Great Trinity Forest*

Great Trinity Forest is a city-owned park encompassing approximately 6,000 acres. The Great Trinity Forest includes a proposed 15-mile trail that would be located along the Trinity River traveling into the forest. This park would be located approximately 360 feet from the LOD. Amenities consist of the Trinity River Audubon Center, William Blair Jr. Park and the Texas Buckeye Trail; however, since these amenities are located outside of the study area they are not further discussed in this section.[17]

At its closest point, Segment 1 would be located approximately 360 feet from the Great Trinity Forest and located on an (elevated) viaduct. The Build Alternatives would not require the acquisition of land from the existing park; therefore, there would be no actual (direct) Section 4(f) use of this property.

Construction of the Build Alternatives would result in temporary increases in noise level; however, the anticipated recreational activities are not noise sensitive; therefore, the temporary increase in noise would not adversely affect the protected activities, features or attributes of the property that qualify it for protection under Section 4(f). Construction activities and the HSR infrastructure would likely be visible from the Great Trinity Forest, but would be consistent with the urban setting of this feature and user expectations. Access to this resource would not be permanently affected by the construction or operation of the Build Alternatives. Additional information regarding potential noise and aesthetics impacts is provided in **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual.**

FRA's preliminary determination is that the proximity impacts from construction and operation of the Build Alternatives A through F would not substantially impair the protected activities, features or attributes that qualify the property for protection under Section 4(f). Therefore, FRA's preliminary

[17] City of Dallas, Trinity River Corridor Project. *Great Trinity Forest.* Accessed March 2016. http://www.trinityrivercorridor.com/recreation/great-trinity-forest

determination is that no direct or constructive use of the Great Trinity Forest would occur and no additional Section 4(f) coordination would be required.

*Fruitdale Park*

Fruitdale Park 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. At its closest point, Segment 1 would be located approximately 220 feet from the Great Trinity Forest and located on an (elevated) viaduct. The Build Alternatives would not require the acquisition of land from the existing park; therefore, there would be no actual (direct) Section 4(f) use of this property.

Construction of the Build Alternatives would result in temporary increases in noise levels; however, the anticipated recreational activities are not noise sensitive; therefore, the temporary increase in noise would not adversely affect the protected activities, features or attributes of the property that qualify it for protection under Section 4(f). Construction activities and the HSR infrastructure would likely be visible from the Fruitdale Park, but would be consistent with the urban setting of this feature and user expectations. Access to this resource would not be permanently affected by the construction or operation of the Build Alternatives. Additional information regarding potential noise and aesthetics impacts is provided in **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual.**

FRA's preliminary determination is that the proximity impacts from construction and operation of the Build Alternatives A through F would not substantially impair the protected activities, features or attributes that qualify the property for protection under Section 4(f). Therefore, FRA's preliminary determination is that no direct or constructive use of the Fruitdale Park would occur and no additional Section 4(f) coordination would be required.

#### *7.7.1.1.1 Grand Avenue Connector*

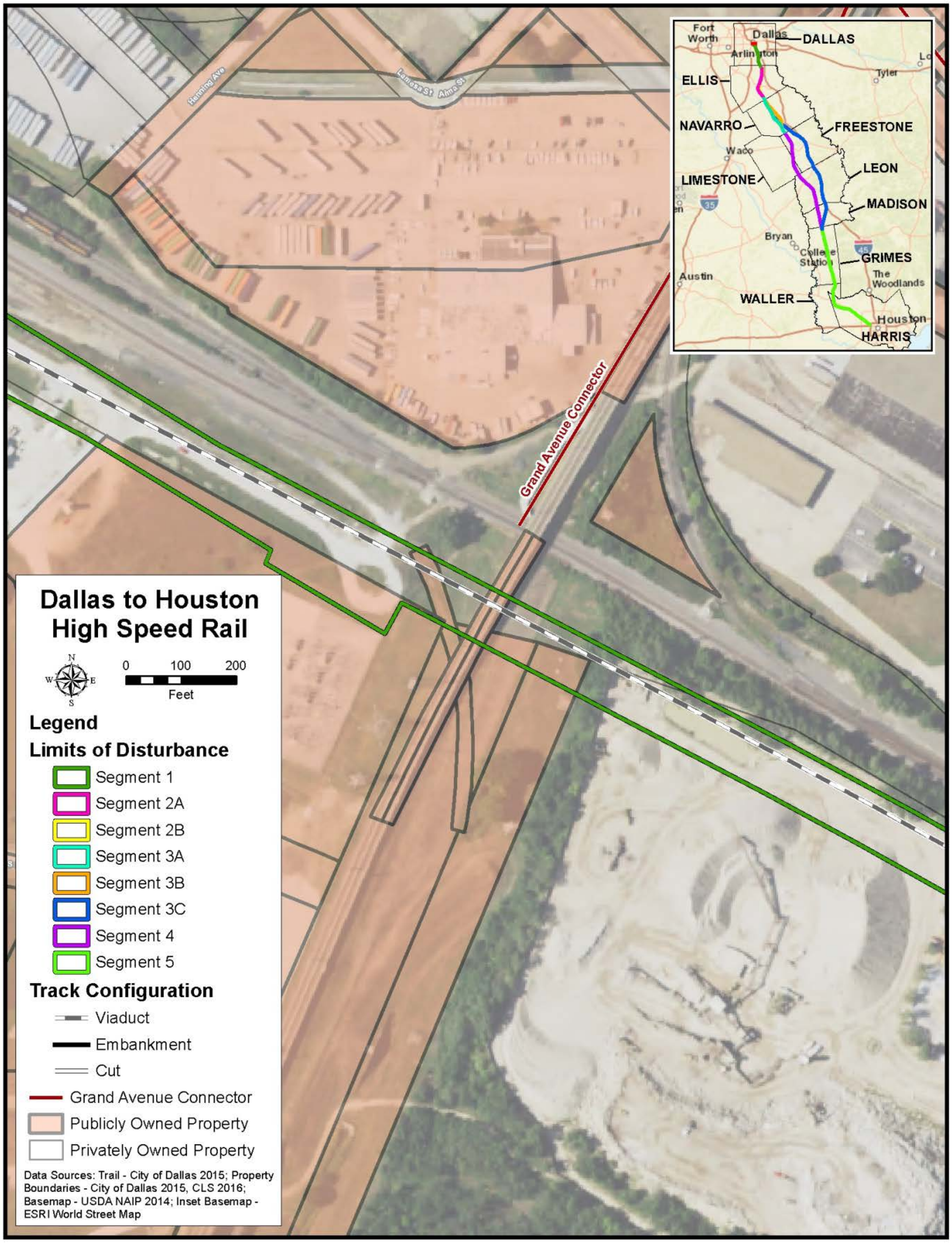
The Grand Avenue Connector is a planned two-mile-long on-street and off-street trail that would follow Al Lipscomb Way from South Lamar Street to Fair Park in east Dallas (**Figure 7-15**). The planned trail was identified in City of Dallas-provided GIS data. In the Study Area, the planned trail crosses land owned by both private and public agencies (Dallas ISD). There is currently no known funding or timeline for construction of this trail. Within the LOD, the trail would be located in an urban environment, adjacent to existing transportation corridors. Implementation of the Build Alternatives would not preclude the future development of this trail.

At its closest point, Segment 1 would be located approximately 125 feet from the Grand Avenue Connector, and located on an (elevated) viaduct. The Build Alternatives would not require the acquisition of land from the planned trail; therefore, there would be no actual (direct) Section 4(f) use of this property.

Construction of the Build Alternatives would result in temporary increases in noise levels, should the trail be constructed prior to the construction of the HSR system. However, the anticipated recreational activities (e.g., walking or bicycling) are not noise sensitive; therefore, the temporary increase in noise would not adversely affect the protected activities, features or attributes of the property that qualify it for protection under Section 4(f). Construction activities and the HSR infrastructure would likely be visible from the Grand Avenue Connector, but would be consistent with the urban setting of this feature and user expectations. Access to this resource would not be permanently affected by the construction or operation of the Build Alternatives. Additional information regarding potential noise and aesthetics impacts is provided in **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual.**

FRA's preliminary determination is that the proximity impacts from construction and operation of the Build Alternatives A through F would not substantially impair the protected activities, features or attributes that qualify the property for protection under Section 4(f). Therefore, FRA's preliminary determination is that no direct or constructive use of the Grand Avenue Connector would occur and no additional Section 4(f) coordination would be required.

**Figure 7-15: Grand Avenue Connector**

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#### *7.7.1.1.2 Five Mile Creek*

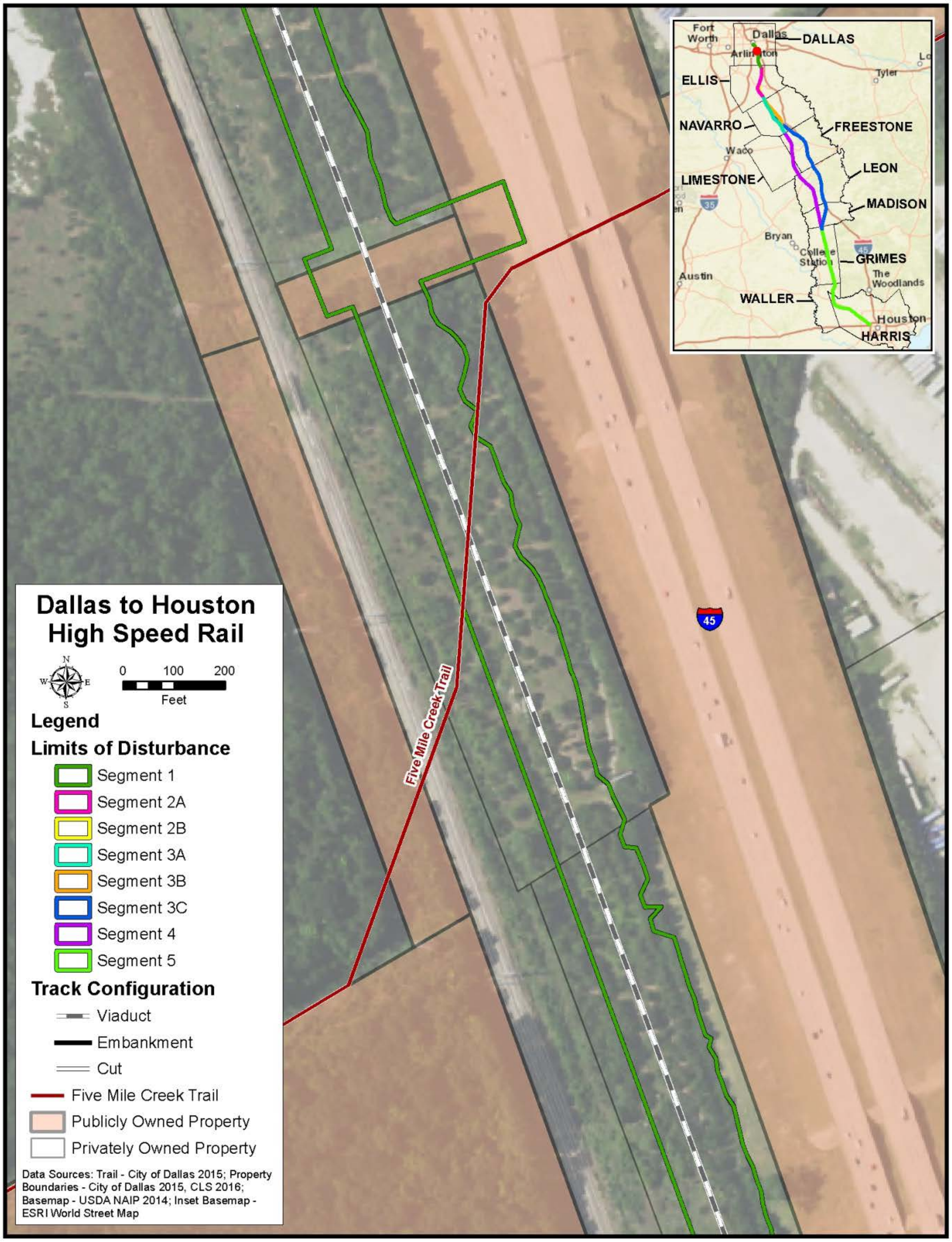
Five Mile Creek Trail is a City of Dallas-planned nine-mile-long trail along Five Mile Creek in Dallas County. It would cross IH-45 and BNSF rail line and connect to the Trinity River (**Figure 7-16**). The majority of the Five Mile Creek Trail is outside of the Section 4(f) Study Area, however, 0.27 miles of the 9.39-mile trail is within the Study Area. The planned trail crosses land currently owned by the City of Dallas and private entities. There is currently no known funding or timeline for construction of this trail. Within the Study Area, the trail would be located in a vegetated, undeveloped floodplain, would be adjacent to existing transportation corridors, and would be located near residential and industrial areas. Implementation of the Build Alternatives would not preclude the future development of this trail.

Segment 1 would perpendicularly cross the planned Five Mile Creek Trail on viaduct, parallel and adjacent to the existing railroad and IH-45 roadway. The portion of the trail in the LOD would be located on privately owned land; therefore, this portion of the trail does not qualify for protection under Section 4(f) and the acquisition does not constitute a direct (actual) use.

Segment 1 would be located within 160 feet of portions of the trail that would occur on publicly owned land. Therefore, an assessment of proximity impacts was completed to determine the potential for a constructive use of this property. Construction of the Build Alternatives could result in temporary increases in noise levels, should the trail be constructed prior to the construction of this alternative. However, the crossing would be adjacent to two existing noise-generating transportation corridors (IH-45 and BNSF). Therefore, potential increases in noise would be consistent with user expectation and would not be expected to adversely affect the future protected activities, features or attributes of the property. Construction activities and HSR infrastructure would likely be visible from the trail, but would be consistent with the setting of this feature and user expectations. Access to Five Mile Creek Trail would not be affected by the construction or operation of the Build Alternatives, and the location of Segment 1 on viaduct would allow for at-grade crossing of the project area at this location. Additional information regarding potential noise and aesthetic impacts is provided in **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual.**

FRA's preliminary determination is that the proximity impacts from construction and operation of the Build Alternatives A through F would not substantially impair the protected activities, features or attributes that qualify the property for protection under Section 4(f). Therefore, FRA's preliminary determination is that no direct or constructive use of Five Mile Trail would occur, and no additional Section 4(f) coordination would be required.

**Figure 7-16: Five Mile Creek Trail**

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#### 7.7.1.2 Leon County (Segment 3C)

##### *7.7.1.2.1 Fort Boggy State Park*

**Fort Boggy State Park** is located on either side of IH-45, a four-lane divided highway, approximately four miles south of Centerville (**Figure 7-17**). The 1,919-acre park is owned and managed by TPWD and includes hiking trails, a 15-acre lake, a day use area and three cabins. All developed areas of the park, including designated trails, are located on the east side of IH-45.

Segment 3C would directly impact the land associated with the park directly adjacent to the west side of IH-45 already bisecting the park. The construction of Segment 3C, reconstruction of the southbound access road and associated drainage improvements would all occur west of IH-45. Implementation of Segment 3C would require the permanent acquisition of 67 acres (3.5 percent) of the park; the area to be acquired is currently open space and does not contain developed recreational features. This permanent incorporation of the land would be considered an actual Section 4(f) use (**Figure 7-16**).

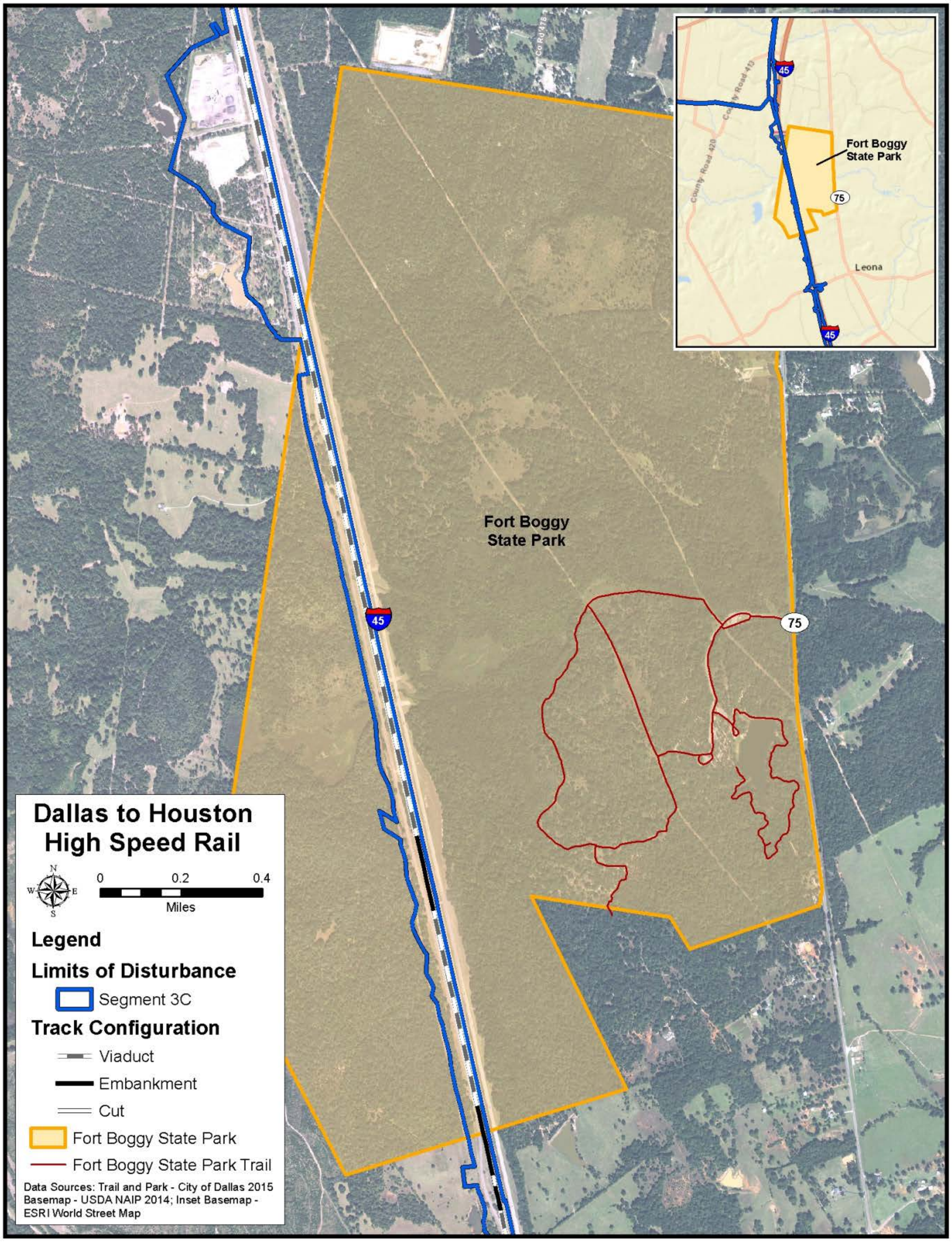
Construction of Segment 3C would result in temporary increases in noise levels. However, once constructed, the LOD would be adjacent to an existing transportation feature (IH-45) and noise levels would be consistent with user expectations in this portion of the park. Therefore, the increase in noise would not adversely affect the protected activities, features or attributes of the property. Construction activities and the HSR viaduct would likely be visible from several portions of the park, but is anticipated to be obscured by existing vegetation and IH-45 from the developed use areas of the park. Access to Fort Boggy State Park would be maintained during construction; operation of Segment 3C would have no permanent adverse impact to park access. Refer to **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual** for additional information regarding these potential impacts**.**

The following measures to minimize harm have been identified based on coordination to date:

- Segment 3C was designed to be predominately on viaduct through Fort Boggy State Park to minimize the direct impacts to resource
- During final design, TCRR would continue to identify ways to minimize impacts to Fort Boggy State Park

These minimization measures would not eliminate the permanent conversion of Section 4(f) property. FRA’s preliminary determination is that the use of Fort Boggy State Park, including any measures to minimize harm (such as any avoidance, minimization, mitigation or enhancement measures), would have a *de minimis* impact on the property because the acquisition of property would not adversely affect the activities, features, or attributes that qualify this park for protection under Section 4(f). Subsequent to the release of the Draft EIS, FRA will coordinate with the TPWD, the official with jurisdiction over this resource, regarding impacts to Fort Boggy State Park.

**Figure 7-17: Potential Section 4(f) Use of Fort Boggy State Park**

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#### 7.7.1.3 Harris County (Segment 5)

##### *7.7.1.3.1 Cypress Top Historic Park*

Cypress Top Historic Park is owned by Cypress Historical Society and is located on a 2.7-acre park along Hempstead Road. The park includes trails, a pavilion, historical buildings and offers guided tours. The property would be located approximately 300 feet from the LOD.

At its closest point, Segment 1 would be located approximately 360 feet from the Great Trinity Forest and located on an (elevated) viaduct. The Build Alternatives would not require the acquisition of land from the existing park; therefore, there would be no actual (direct) Section 4(f) use of this property.

Construction of the Build Alternatives would result in temporary increases in noise level; however, the anticipated recreational activities are not noise sensitive; therefore, the temporary increase in noise would not adversely affect the protected activities, features or attributes of the property that qualify it for protection under Section 4(f). Construction activities and the HSR infrastructure would likely be visible from the Great Trinity Forest, but would be consistent with the urban setting of this feature and user expectations. Access to this resource would not be permanently affected by the construction or operation of the Build Alternatives. Additional information regarding potential noise and aesthetics impacts is provided in **Section 3.4, Noise and Vibration** and **Section 3.10, Aesthetic and Visual.**

FRA's preliminary determination is that the proximity impacts from construction and operation of the Build Alternatives A through F would not substantially impair the protected activities, features or attributes that qualify the property for protection under Section 4(f). Therefore, FRA's preliminary determination is that no direct or constructive use of the Great Trinity Forest would occur and no additional Section 4(f) coordination would be required.

### 7.7.2 Historic Sites

FRA met with the THC on September 15, 2015, regarding survey methods for historic and archeological resources. FRA and SHPO have determined a phased process for compliance with Section 106, as provided for in 36 C.F.R. § 800.4(b)(2), will be implemented due to the length of the Build Alternatives and the limited access to private property. Through the implementation of the phased process for Section 106, background research, ongoing field studies and ongoing consultation will continue prior to construction to inform the potential effects the preferred alignment, once identified, could have on historic properties. Ongoing identification and evaluation of historic properties will be provided for in the Programmatic Agreement pursuant to 36 C.F.R. § 800.14(b). Additionally, 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 APEs. Refer to **Section 3.19.3.2, Cultural Resources** for details of the phased cultural resources effort conducted to comply with NEPA and Section 106.

Historic resources were documented and evaluated for NRHP eligibility during the onsite survey. The condition, materials, alterations, and other features for evaluating significance and integrity of each resource was recorded and each surveyed resource was documented with digital photographs. A documentation of surveyed resources was conducted from the public ROW. If an evaluation was unable to be documented during fieldwork due to the lack of visibility from the public ROW or as a result of refinements to the Project design post-fieldwork, the evaluation of the resource will be completed prior to construction and submitted to the THC as an addendum to the interim reports. Refer to **Section**

**3.19.3.2, Cultural Resources** for details of the fieldwork process and the identification and evaluation of historic properties.

Section 4(f) only applies to archeological sites that are eligible for listing in the NRHP and also warrant preservation in place. It is unusual for archeological sites to meet both of these criteria and unlikely that identified or yet to be identified archeological sites in the direct impact APE would be considered Section 4(f) resources. However, this will be confirmed during the NRHP process.

As described in Section 7.6.3, Section 4(f) Historic Properties, 36 historic sites have been identified within the LOD as listed in, or determined or recommended eligible for listing in the NRHP, as shown in **Table 7-6**, below. For the purposes of this analysis the following historic are characterized as potentially NRHP-eligible but are not located within the LOD: (EL.031a-c, EL.040-Boren Cemetery, EL.062, NA.078, LE.048, MA.031a-n, GR.001-Bethel Cemetery and GR.004a); these properties require additional research and/or survey, as well as further evaluation of significance and evaluation of potential impacts**.** Therefore, these properties are not addressed in this section.

FRA completed preliminary use determinations of the 36 historic sites listed as determined or recommended eligible for listing in the NRHP within the APE. **Table 7-6** summarizes this evaluation. As described in **Section 7.6.1. Section 4(f) Methodology**, the NHPA Section 106 effect determinations (refer to **Section 3.19, Cultural Resources**; **Table 3.19-9**) informed the preliminary use determinations for these properties. For those historic properties located outside the LOD and for which the preliminary Section 106 effect determination is “no effect” or “no adverse effect” a determination of “no use” was made and these properties were not further evaluated or discussed in this chapter:

- DA.009
- DA.010
- DA.016 (former KIXL Studios)
- DA.020 (Good Luck Oil Company)
- DA.022 (Chase Bag Company)
- DA.024a-b (Cadiz Street Pump Station)
- DA.028 (Dallas Coffin Company)
- DA.029 (Dining Hall)
- DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center)
- DA.031 (Sears Roebuck and Company Furniture Warehouse Complex)
- DA.041 (Sigel’s Liquor Store)
- DA.048 (Oak Cliff Box Company)
- DA.056 (Corinth Street Underpass and Overpass)
- DA.070 (Corinth Street Viaduct)
- DA.080a-e (Proctor and Gamble Complex)
- DA.104 (Railroad Bridge at E. Illinois Avenue)
- DA.194 (W. A. Strain Historic District)
- FR.016a (Furney Richardson School)
- FR.034 (Johnson African American Cemetery)
- LE.001a (Little Flock Cemetery)
- MA.019 (Oxford Cemetery)
- HA.024b (Humble Oil and Gas Station)

**Table 7-6** summarizes the preliminary use determinations on all of the historic sites evaluated by FRA for the Project.

**Table 7-6: Summary of Preliminary Use Determinations – Section 4(f) Historic Sites**

| Section 4(f) Property | Segment Alternative | Distance from LOD | Section 106 Affect Determination | Section 4(f) Preliminary Use Determination | | |
|---|---|---|---|---|---|---|
| | | | | No Use | De Minimis | Use |
| **Dallas County** | | | | | | |
| DA.009 | Segment 1 | 270 feet | No Adverse Effect | • | | |
| DA.010 | Segment 1 | 300 feet | No Adverse Effect | • | | |
| DA.016 (former KIXL Studios) | Segment 1 | 10 feet | No Adverse Effect | • | | |
| DA.020 (Good Luck Oil Company) | Segment 1 | 295 feet | No Adverse Effect | • | | |
| DA.022 (Chase Bag Company) | Segment 1 | 55 feet | No Adverse Effect | • | | |
| DA.023 (Cadiz Street Underpasses and Overpasses) | Segment 1 | Within LOD | Adverse Effect | | | • |
| DA.024a-b (Cadiz Street Pump Station) | Segment 1 | 179 feet | No Adverse Effect | • | | |
| DA.028 (Dallas Coffin Company) | Segment 1 | 185 feet | No Adverse Effect | • | | |
| DA.029 (Dining Hall) | Segment 1 | 252 feet | No Adverse Effect | • | | |
| DA.030 (Sears Roebuck and Company Catalog Merchandise Distribution Center) | Segment 1 | 40 feet | No Adverse Effect | • | | |
| DA.031 (Sears Roebuck and Company Furniture Warehouse Complex) | Segment 1 | 340 feet | No Adverse Effect | • | | |
| DA.041 (Sigel's Liquor Store) | Segment 1 | 90 feet | No Adverse Effect | • | | |
| DA.048 (Oak Cliff Box Company) | Segment 1 | 210 feet | No Adverse Effect | • | | |
| DA.056 (Corinth Street Underpass and Overpass) | Segment 1 | 10 feet | No Adverse Effect | • | | |
| DA.070 (Corinth Street Viaduct) | Segment 1 | 125 feet | No Adverse Effect | • | | |
| DA.072 (Dallas Floodway Historic District) | Segment 1 | Within LOD | No Adverse Effect | | • | |
| DA.076a (Guiberson Corporation) | Segment 1 | Within LOD | Adverse Effect | | | • |
| DA.076b (Guiberson Corporation) | Segment 1 | Parcel Boundary within LOD | Adverse Effect | | | • |
| DA.080a-e (Proctor and Gamble Complex) | Segment 1 | 100-470 feet | No Adverse Effect | • | | |
| DA.082 (Honey Springs Cemetery) | Segment 1 | Within LOD | Adverse Effect | | | • |
| DA.110a (Smith Family Cemetery) | Segment 1 | Within LOD | Adverse Effect | | | • |
| DA.110b (Linfield Elementary School) | Segment 1 | Within LOD | Adverse Effect | | | • |

**Table 7-6: Summary of Preliminary Use Determinations – Section 4(f) Historic Sites**

| Section 4(f) Property | Segment Alternative | Distance from LOD | Section 106 Affect Determination | Section 4(f) Preliminary Use Determination | | |
|---|---|---|---|---|---|---|
| | | | | No Use | De Minimis | Use |
| DA.104 (Railroad Bridge at E. Illinois Avenue) | Segment 1 | 210 feet | No Adverse Effect | • | | |
| DA.194 (W. A. Strain Historic District) | Segment 1 | 650 feet | No Adverse Effect | • | | |
| **Freestone County** | | | | | | |
| FR.016a (Furney Richardson School) | Segment 4 | 790 feet | No Adverse Effect | • | | |
| FR.034 (Johnson African American Cemetery) | Segment 3C | 1,260 feet | No Adverse Effect | • | | |
| Leon County | | | | | | |
| LE.001a (Little Flock Cemetery) | Segment 4 | 1,170 feet | No Adverse Effect | • | | |
| **Madison County** | | | | | | |
| MA.019 (Oxford Cemetery) | Segment 4 | 415 feet | No Adverse Effect | • | | |
| **Harris County** | | | | | | |
| HA.004a | Segment 5 | Within LOD | Adverse Effect | | | • |
| HA.024b (Humble Oil and Gas Station) | Segment 5 | 207 feet | No Adverse Effect | • | | |
| **Industrial Site Terminal Option** | | | | | | |
| HA.208 (Tex-Tube Complex) | Industrial Site Terminal | Within LOD | Adverse Effect | | | • |

Source: AECOM, 2017

### 7.7.2.1 Section 4(f) Use Determinations

Preliminary Section 4(f) use determinations are presented below for each County.

#### *7.7.2.1.1 Dallas County*

Six Section 4(f) historic resources with the potential to incur a use from construction of Segment 1 of the Build Alternatives within Dallas County, as further described below. There are no historic properties located outside the LOD in Dallas County that would incur an adverse effect as a result of the Build Alternatives.

***Site DA.023 (Cadiz Street Underpasses and Overpasses)***

The Cadiz Street Underpasses and Overpasses are transportation features constructed by the Works Progress Administration in the 1930's along Cadiz Street, near its intersection with Austin Street, in Dallas (**Figure 7-18**). The property consists of arches between the piers along the balusters of Cadiz Street. The property was previously determined eligible for listing in the NRHP at the local level of significance under Criterion C for engineering. The current setting is an urban mix of non-historic and historic buildings, structures, and objects and empty lots where buildings have been removed.

This resource is located within the LOD of Segment 1; near the location of the Dallas Terminal Station option. Approximately 0.54 acres of land would be temporarily or permanently acquired as part of the construction of Segment 1 under the Build Alternatives within the boundaries of this property. The 0.54 acre of acquired land would be incorporated into a transportation feature for the construction of track on viaduct and the Dallas Terminal Station option.

The resource is partially within the LOD, where station construction near this resource would include roadway improvements, a pedestrian bridge, and the station building. Based on preliminary plans, the pedestrian bridge would directly connect to the resource, which would affect the resource's integrity of setting, feeling, design, and potentially materials and workmanship. As such, it was determined that the Build Alternatives would result in a direct adverse impact to the property. Therefore, FRA's preliminary determination is that the Build Alternatives would constitute a Section 4(f) use of this property.

***Site DA.072 (Dallas Floodway Historic District)***

The Dallas Floodway Historic District is located along the Trinity River in Dallas (**Figure 7-19**). 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 LOD of Segment 1 in Dallas County crosses a narrow portion of the Dallas Floodway Historic District (approximately 140 feet wide) at the south end of the district at the Santa Fe Railroad tracks; refer to **Section 3.13, Land Use** for more information on this parcel. Previous coordination between the USACE and the THC determined that some changes in the setting of the historic district is expected and it is anticipated that the construction of additional bridges across the floodway would have no adverse effect to the historic floodway (THC Letter dated December 30, 2011); refer to **Section 3.19, Cultural Resources** for more information to the impacts to this historic property. FRA's preliminary determination is that, consistent with the Section 106 process, the Build Alternatives would have no adverse effect to the activities, features, or attributes that make this property eligible for protection under Section 4(f) and would therefore result in a Section 4(f) *de minimis* impact.

***Site DA.076a-b* (Guiberson Corporation)**

The Guiberson Corporation consists of nine historic resources located at 1000 Forest Avenue in Dallas (**Figure 7-19**). The site was previously determined significant for its association with the Guiberson Corporation from 1926 to 1956. Two of the resources (DA.076a and DA.076b) were found to retain sufficient 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. DA.076a is a one-story industrial/processing facility; both were constructed circa 1920. DA.076b is a two-story domestic-single family building/industrial related building; FRA, in consultation with the THC, determined the remaining resources on the parcel were found to lack integrity or were constructed after the period of significance and were determined not eligible for listing in the NRHP.

DA.076a is located within the LOD of Segment 1 in Dallas County. At this location, the project includes construction of track on viaduct that would require total demolition of DA.076a and would result in a direct adverse effect to this resource under Section 106 of the NHPA. Therefore, FRA's preliminary determination is that the Build Alternatives would result in a Section 4(f) use of this resource because land from this resource would be incorporated into a transportation feature, and have an adverse impact on the resource, for the construction of track on viaduct.

DA.076b is located within the LOD of Segment 1 in Dallas County, where the track would be constructed on viaduct. The viaduct would not require demolition of the resource or directly affect the resource's integrity of location, materials, or workmanship, but would indirectly impact the resources integrity of setting, feeling, design, and association with DA.076a. In addition, 1.9 acres of the overall 3.41 acres identified by the THC as the site boundary would be needed for the construction of track on viaduct. Since the boundary of both resources, DA.076a and DA.076b, will become incorporated into transportation feature and require a permanent acquisition of land, and result in an adverse impact to these resources, FRA's preliminary determination is that Build Alternatives would result in a Section 4(f) use of DA.076a and a Section 4(f) use of DA.076b.

***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 7-20**). 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 in circa 2003 lists the names of those known to be interred at the site. The cemetery retains sufficient integrity to convey its historic significance and association with the early development of south Dallas. The resource is recommended eligible for listing in the NRHP at the local level of significance under Criteria Consideration D and Criterion A for association with early community development in south Dallas.
The property is located along Bulova Street, which intersects the Julius Schepps Service Road east of the property. In addition, the resource is currently adjacent to the noise generating transportation corridors of IH-45 on the east and BNSF railroad on the west. This resource is located within the LOD of Segment 1 and the construction of Segment 1 would require a permanent acquisition of 0.47 acre of the property. At this location, Segment 1 would include HSR track on viaduct located over the eastern portion of the property, which would be located behind visitors viewing the memorial wall on the eastern side of the property. As described in **Section 3.10, Aesthetic and Scenic Resources**, the scale and mass of the new construction would be visually intrusive on the historic property and diminish integrity of design, setting, feeling and association. The Section 106 determination is that the Build Alternatives would result in an indirect adverse effect due to the proximity of the viaduct to the memorial wall and a direct adverse effect due to the potential to disturb unmarked graves. Because the Build Alternative would incorporate 0.47 acres of the parcel into a transportation use, and result in a Section 106 adverse effect, the Build Alternatives would result in a Section 4(f) use of this resource. Refer to **Section 3.19, Cultural Resources** for more information on this parcel and resource**.**

***Site DA.110a* (*Smith Family Cemetery)***

The Smith Family Cemetery is a family cemetery dating to the 1860s (**Figure 7-20)**. The cemetery is located at 3820 E Illinois Avenue, in Dallas, TX, on the same parcel as Linfield Elementary School (DA.110b—described below). Although the cemetery dates to an earlier period than the Linfield Elementary School, the contextual relationship of the two resources is currently unknown. The Smith Family Cemetery is also known as the Kinnard Family Cemetery. The cemetery contains three known burials (Thomas M. Smith, William Kinnard, and Howard Kinnard), with the earliest burial dating to 1866; however, it is presumed that several unmarked graves are also located within the cemetery. FRA, in consultation with the THC, has determined an intensive-level investigation is required to clarify the historic association between Resources DA.110a and DA.110. The Smith Family Cemetery 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. The NRHP eligibility of this resource is undetermined; but is assumed eligible for listing in the NRHP under Criterion A and D for the purposes of this analysis. Refer to **Section 3.19, Cultural Resources** for more information on this parcel and resource**.**
The property is located at 3820 E Illinois Ave in Dallas, TX, which is partially within the LOD. At this location, the track would be constructed on viaduct. Approximately 6.46 acres of land within the boundaries of this property would be permanently acquired as part of the construction of Segment 1. FRA's preliminary Section 106 determination is that the Build Alternatives would result in a direct

adverse effect to the site. Since the whole site would be permanently incorporated into transportation feature and would result in an adverse effect to the property, FRA's preliminary determination is that Build Alternatives would result in a Section 4(f) use of DA.110a.

***Site DA.110b (Linfield Elementary School)***
The Linfield Elementary School is located at 3820 E. Illinois Ave. in Dallas, TX (**Figure 7-20).** 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 school is located on the same parcel as the Smith Family Cemetery (DA.110a—described above). As described above, although the cemetery dates to an earlier period than the Linfield Elementary School, the contextual relationship of the two resources is currently unknown. However, FRA, in consultation with the THC, has determined an intensive-level investigation is required to clarify the historic association between Resources DA.110a and DA.110. However, through communication with the THC the NRHP eligibility of this resource is undetermined; but is assumed eligible for listing in the NRHP under Criterion A and C for the purposes of this analysis. Refer to **Section 3.19, Cultural Resources** for more information on this parcel and resource.

The property is located at 3820 E. Illinois Ave., which is partially within the LOD. At this location, the track on viaduct would be constructed. Approximately 6.46 acres of land within the boundaries of this property would be permanently acquired as part of the construction of Segment 1. The Build Alternatives would require the demolition of this site, and therefore result in a Section 106 direct adverse effect to the property. Since the whole site would be permanently incorporated into transportation feature and would be adversely affected (i.e., demolished), FRA's preliminary determination is that Build Alternatives would result in a Section 4(f) use of DA.110b.

#### *7.7.2.1.2 Ellis County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Ellis County.

#### *7.7.2.1.3 Navarro County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Navarro County

#### *7.7.2.1.4 Freestone County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Freestone County.

#### *7.7.2.1.5 Limestone County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Limestone County.

#### *7.7.2.1.6 Leon County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Leon County.

#### *7.7.2.1.7 Madison County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Madison County.

#### *7.7.2.1.8 Grimes County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Grimes County in Segment 5.

#### *7.7.2.1.9 Waller County*
No Section 4(f) historic resources would occur under the Build Alternatives located within Waller County in Segment 5.

#### *7.7.2.1.10 Harris County*
One Section 4(f) historic resource with the potential to incur a use as a result of implementation of the Build Alternatives is located within Harris County.

***Site HA.004a***

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 (**Figure 7-21**). Historic and modern aerial photographs and topographic maps show the site contains one domestic historic resource (HA.004a) and three agricultural resources (HA.004b-d), which FRA, in consultation with the THC, determined are not eligible for listing on the NRHP. The domestic historic resource, a single-family dwelling, and one outbuilding (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.
Of the four resources located on the site (HA.004a-d) only one resource, HA.004a, is eligible for listing on the NRHP and is located within the LOD. Resource HA.004a is a 1.5-story Craftsman style single-family dwelling constructed circa 1920; refer to **Section 3.19 Cultural Resources** for more information on this parcel and resource. At this location, the project includes construction of track on cut and embankment which would require a total demolition of Site HA.004a and would incorporate the whole 3.01 parcel into a transportation use. Therefore, FRA's preliminary determination is that the construction of the Build Alternatives would result in a Section 4(f) use.

#### *7.7.2.1.11 Industrial Site Terminal Option*
One Section 4(f) historic resource with the potential to incur a use as a result of implementation of the Industrial Site Terminal option is located with in Harris County.

***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. 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 option, as shown in **Figure 7-22**. The entire 38.95 acres would be acquired for the construction of the Industrial Site Terminal Station option, which would include parking, pedestrian accessibility, transportation alterations and landscaping improvements. Although the main office building, one historic feature of the Tex-Tube Complex, would not be adversely affected by the Industrial Site Terminal Station option, the Site Terminal Station option would require total demolition of the additional historic features (three

associated warehouses and the historic landscape) that comprise HA.208 (Tex-Tube Complex). Therefore, FRA's preliminary determination is that the Industrial Site Terminal option would result in a Section 4(f) use because the construction of the Industrial Site Terminal option would incorporate the Tex-Tube Complex into a permanent transportation use and adversely affect the features of this property that qualify it for protection under Section 4(f).

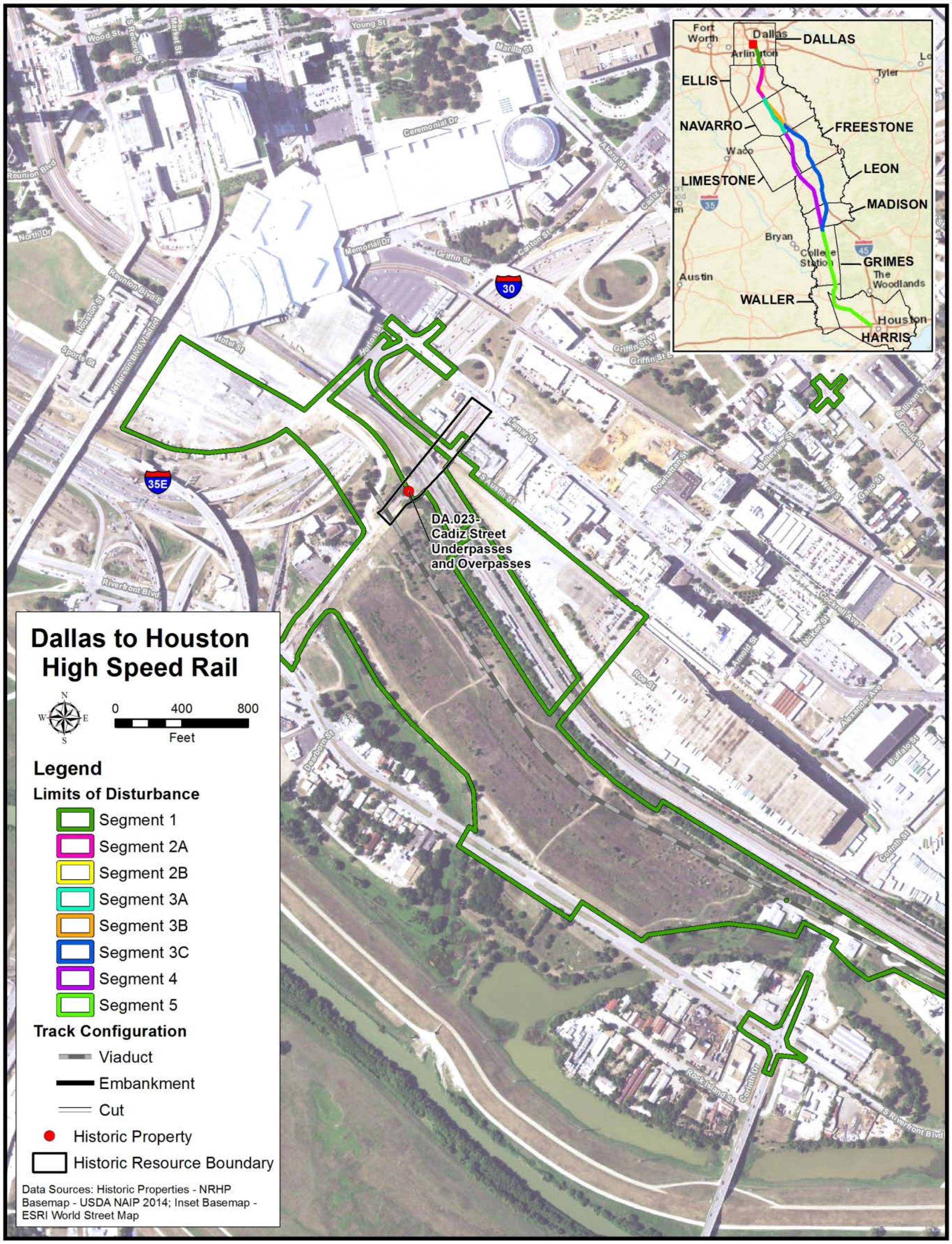
##### *7.7.2.1.12 Northwest Mall Terminal Option*

No Section 4(f) historic resources with the potential to incur a use as a result of implementation of the Northwest Mall Terminal option located in Harris County.

##### *7.7.2.1.13 Northwest Transit Terminal Option*

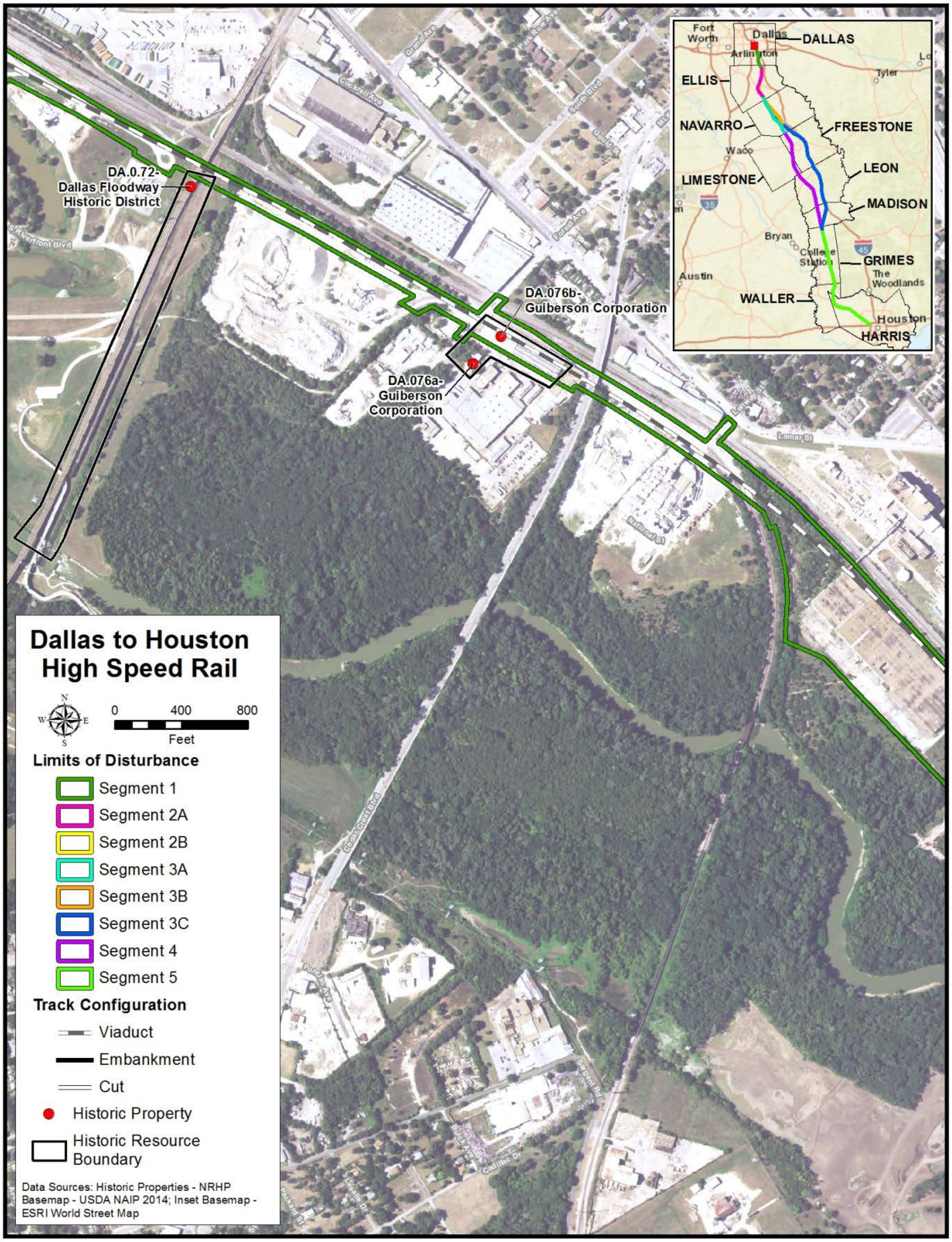
No Section 4(f) historic resources with the potential to incur a use as a result of implementation of the Northwest Transit Terminal option located in Harris County.

**Figure 7-18: Dallas County (Segment 1) Section 4(f) Properties**



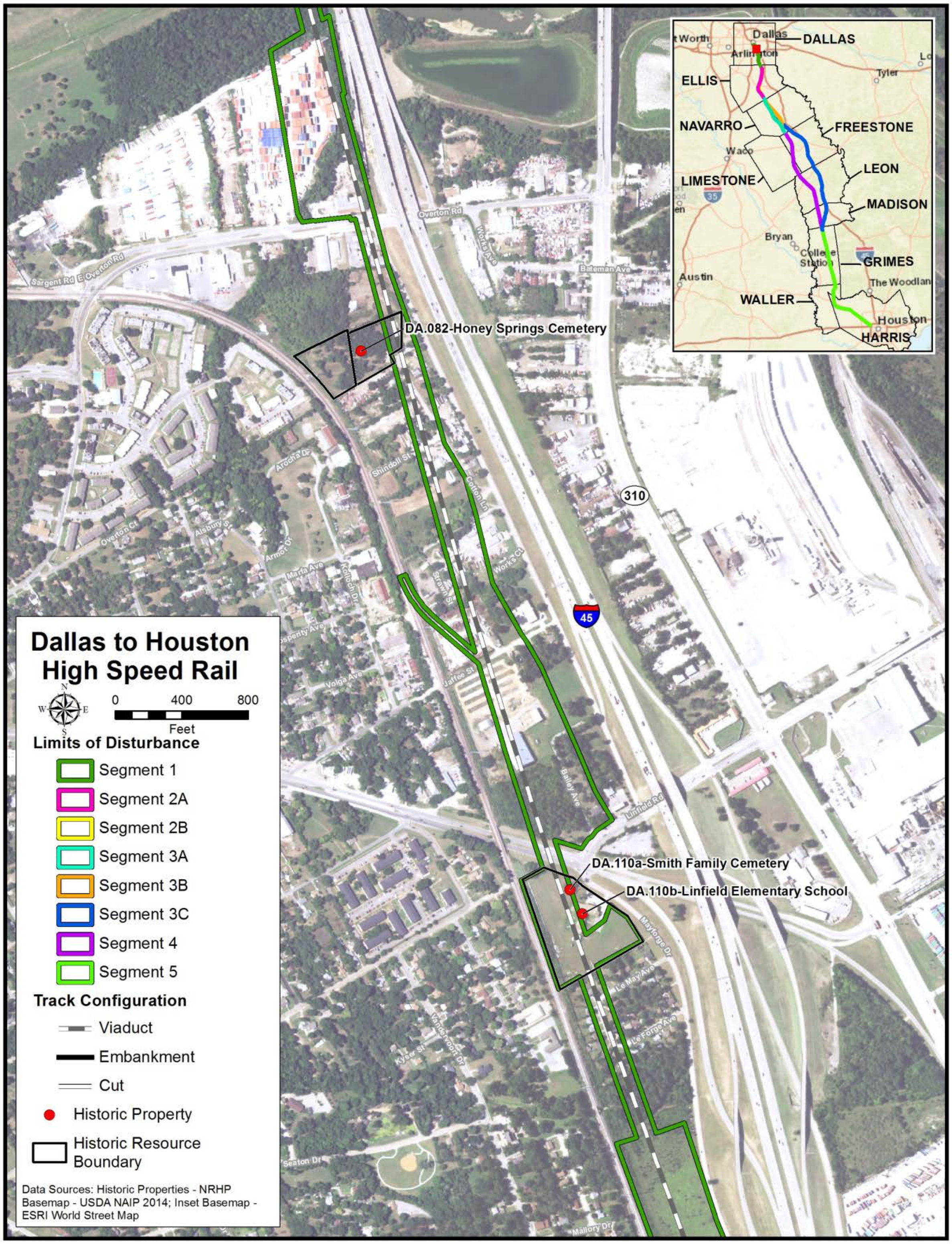

Source: AECOM, 2017

## Figure 7-19: Dallas County (Segment 1) Section 4(f) Properties



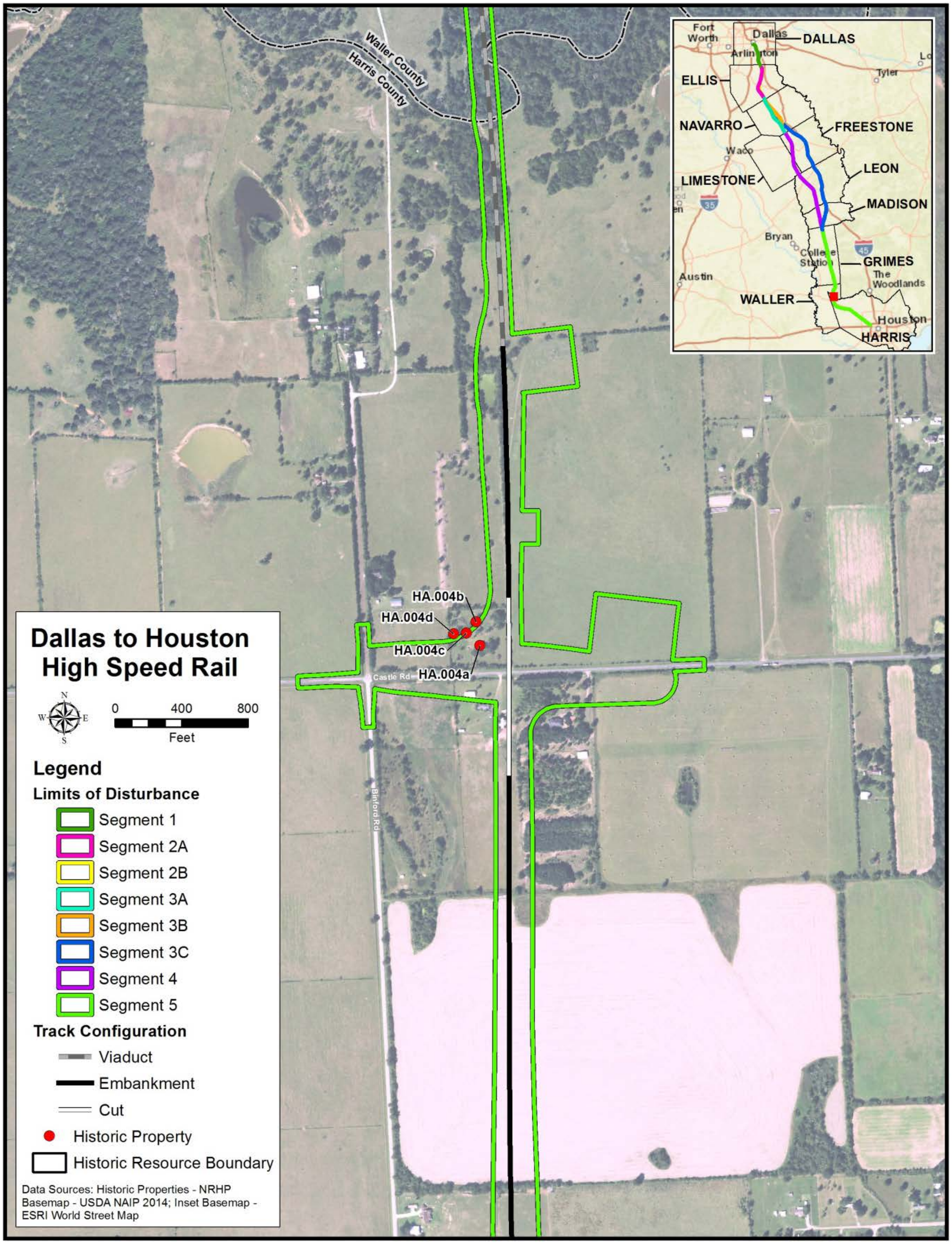

Source: AECOM, 2017

## Figure 7-20: Dallas County (Segment 1) Section 4(f) Properties



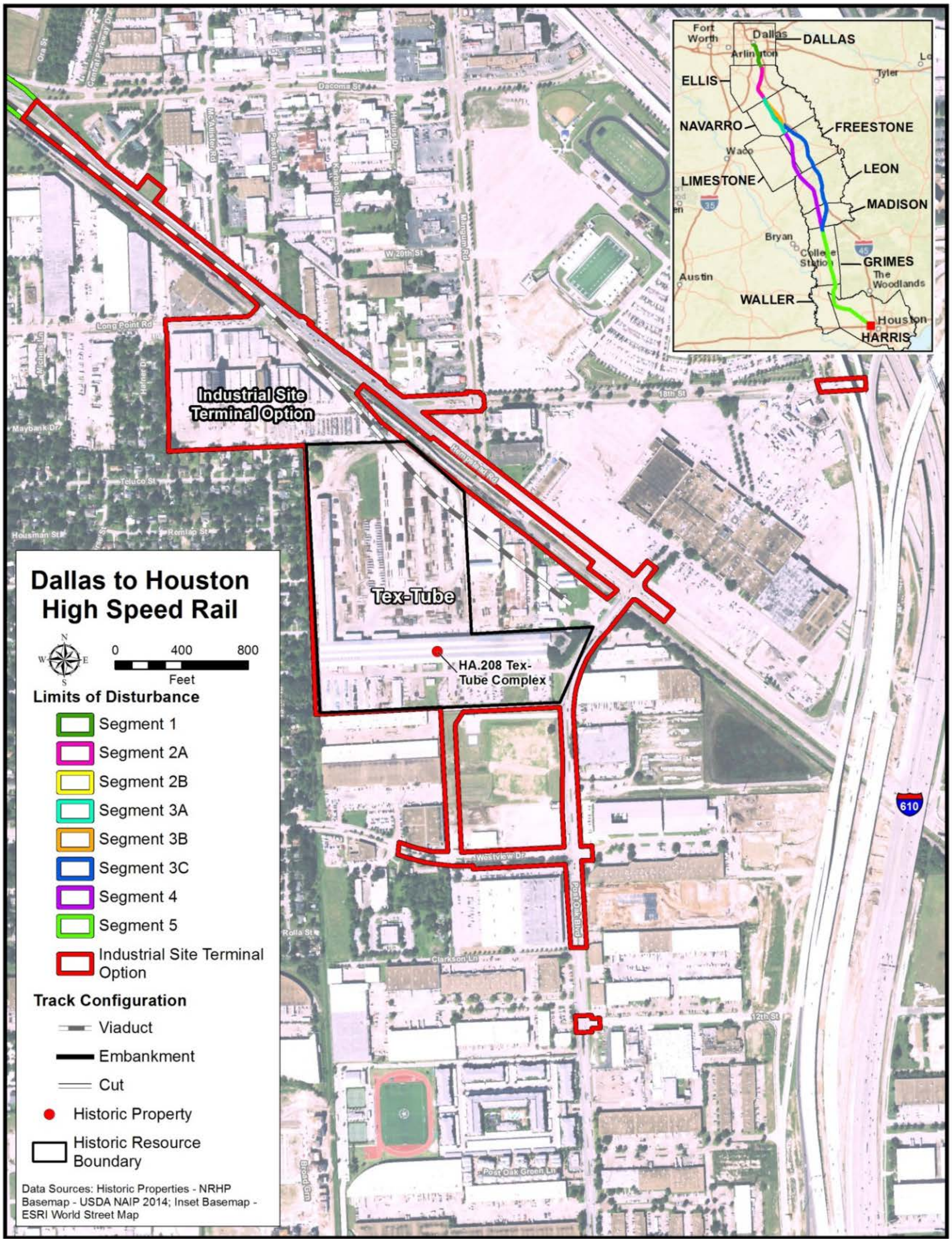

Source: AECOM, 2017

## Figure 7-21: Harris County (Segment 5) Section 4(f) Properties




Source: AECOM, 2017

## Figure 7-22: Harris County (Industrial Site Terminal Option) Section 4(f) Properties




Source: AECOM, 2017

### 7.7.3 Avoidance Alternatives

FRA may not approve a use of a Section 4(f) property unless there is no feasible and prudent alternative. In this context, the terms feasible and prudent are specifically defined in 23 C.F.R. § 774.17. An alternative is considered not feasible if cannot be built as a matter of sound engineering judgment. An alternative is considered not prudent if:

1. It compromises the project to a degree that it is unreasonable to proceed in light of the project's stated need and purpose (i.e., the alternative does not address the need and purpose of the project);
2. It results in unacceptable safety or operational problems;
3. 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 resources protected under other federal statutes;
4. It results in additional construction, maintenance, or operational costs of extraordinary magnitude;
5. It causes other unique problems or unusual factors; or
6. 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.

This section evaluates alternatives that avoid any use of Section 4(f) property using the feasible and prudent criteria listed above. **Table 7-7** and **Table 7-8** in **Section 7.8, Summary of Preliminary Use Determinations** notates that FRA's preliminary determination is that seven resources would incur a Section 4(f) use and two resources would incur a Section 4(f) *de minimis* impact. The resources identified in **Table 7-8** are located on common segments of the Build Alternatives. Refer to **Build Alternatives**, below, for more information on alternatives for the common segments within Dallas and Harris Counties.

***Build Alternatives***

The FRA eliminated the BNSF and UPRR corridors because BNSF and UPRR declined consent to share ROW for the majority of distance between Dallas and Houston and the immediate adjacency to the corridors would require a cost-prohibitive barrier wall along the 240-mile length of the corridor. 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.

FRA eliminated the IH-45 Corridor because a sufficiently sized ROW does not exist throughout the entirety of the interstate corridor and would result in greater property impacts. The IH-45 corridor was the only corridor alternative that would directly impact the Sam Houston National Forest, resulting in impacts to recreation resources and managed habitat. Additionally, the curvature of the highway ROW would not be suitable for HSR operations and eliminating the curves would result in greater property impacts. In addition, roadway interchanges would require extensive reconstruction above or below the HSR tracks and would result in property impacts.

As part of continued coordination with TCRR, FRA will identify additional opportunities to refine the LOD to further avoid impacts to Section 4(f) 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. FRA will document any additional engineering refinements that allow for further minimization or avoidance of cultural resources within the Final EIS.

*Dallas County*

Segment 1 is located in Dallas County which is a common segment of the Build Alternatives. The HSR track would be on viaduct as it leaves the Dallas Terminal Station. Impacts to 4(f) resources in Dallas County would be concentrated in the area south of the station. Segment 1 would operate east of the UPRR corridor for approximately 2.3 miles at a distance of approximately 155 feet. In addition, Segment 1 would operate west of IH-45 for approximately 4.25 miles at a distance of approximately 160 feet. These existing infrastructure constraints as well as the HSR system's curvature requirements would limit the ability for engineering refinements to avoid the Section 4(f) resources.

In addition to the existing infrastructure within the area, TCRR completed multiple rounds of coordination with the City of Dallas and USACE to determine the least impactful way to cross the Trinity River. Based on the information regarding the common segments in Dallas County, there is no feasible or prudent alternative to avoid the preliminary use determinations identified along the Build Alternatives in Segment 1. Since no feasible or prudent avoidance alternatives can be identified in Dallas County, additional steps to minimize harm were taken and are discussed in **Section 7.8.3**. FRA will complete additional coordination with TCRR to determine if engineering refinements (i.e., slightly shifting the alignment to the east or west) could minimize or avoid impacts to the resources.

*Harris County*

Segment 5 is located in Harris County which is a common segment of the Build Alternatives. The HSR track would be constructed on cut and embankment as well as viaduct. The Build Alternative would join Hempstead road near Cypress paralleling US 290/Hempstead Road and an active UPRR freight line into Houston. It continues along Hempstead Road to the Northwest Mall area just south of IH-610 and US 290 where the alignment terminates. Development in this area of Houston is adjacent to the existing transportation infrastructure. Shifting the alignment away from the infrastructure to avoid resources would cause greater impacts to residential and commercial properties. FRA will complete additional coordination with TCRR to determine if engineering refinements (i.e., use of viaduct instead of cut and embankment) could avoid Section 4(f) resources in Harris County.

***Terminal Station Options***

Resource **HA.208, Tex-Tube Complex**, is located within the LOD of the Industrial Site Terminal Station option. The FRA's preliminary determination is that the construction of the Industrial Site Terminal Station option would result in a Section 4(f) use of resource HA.208 (Tex-Tube Complex) under Section 4(f) because it would have a direct adverse effect and require the permanent incorporation of property into the transportation facility. However, there are two feasible and prudent alternative station options (Northwest Mall Terminal option and Northwest Transit Terminal option) that would minimize harm to the Section 4(f) use of Resource HA.208 (Tex-Tube Complex).

## 7.8 Summary of Preliminary Section 4(f) Determination

This section summarizes the preliminary Section 4(f) determinations, if any, for each of the identified Section 4(f) resources that would potentially be affected by the Build Alternatives. This includes parks, recreation areas, trails and historic sites.

### 7.8.1 Section 4(f) *de minimis* Determinations

As described in **Section 7.7, Assessment of Use of Section 4(f) Properties**, the Build Alternatives would require **acquisition of property** from one park and recreation property: Fort Boggy State Park (Build Alternatives C and F), as shown in **Table 7-7**. FRA's preliminary determination is that the use of Fort Boggy State Park will have a *de minimis* impact, as defined in 23 C.F.R. § 774.17, on the property. Build Alternatives C and F would be designed predominately on viaduct through Fort Boggy State Park to minimize the direct impacts to the resource. Additionally, Build Alternative C or F would be located west of IH-45, on the opposite side of the road and a significant distance from the park's recreational features.

In accordance with 23 C.F.R. § 774.5, the public review of this Draft EIS provides an opportunity for public comment concerning the effects of the Build Alternatives to Fort Boggy State Park. Concurrently, subsequent to the release of this Draft EIS, FRA will coordinate with TPWD, as the official with jurisdiction over this resource, to discuss the preliminary findings and receive TPWD's determination and/or concurrence in compliance with the Section 4(f) consultation process.

Resource DA.072, the Dallas Floodway Historic District, would be located within the LOD of the Build Alternatives, but would not be adversely affected by the Build Alternatives. The LOD was refined to span resource DA.072 to minimize harm to the resource. In addition, previous coordination between the USACE and the THC determined that due to the type of resource, some changes in the setting of the historic district must be expected and that it is anticipated that the construction of additional bridges across the floodway would not adversely affect the historic district.[18] FRA's preliminary determination is that the impacts associated with the use of this Section 4(f) resource would be *de minimis* pursuant to 23 C.F.R. § 774.3(b). TCRR designed the Build Alternatives on viaduct through the Dallas Floodway District to minimize the direct impacts to the resource.
In accordance with 36 C.F.R. § 800, THC must concur with the findings concerning the effects of the Build Alternatives to the Dallas Floodway Historic District. Concurrently, subsequent to the release of this Draft EIS, FRA will coordinate with the THC, the official with jurisdiction over this resource to continue the Section 4(f) consultation process.

[18] Texas Historical Commission (THC). THC letter dated December 30, 2011.

| Table 7-7: Summary of Section 4(f) Preliminary *de minimis* Determinations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Section 4(f) Resource** | **Segment** | **Build Alternatives** | | | | | |
| | | **A** | **B** | **C** | **D** | **E** | **F** |
| Fort Boggy State Park | Segment 3C | -- | -- | *de minimis* | -- | -- | *de minimis* |
| DA.072 (Dallas Floodway Historic District) | Segment 1 | *de minimis* | *de minimis* | *de minimis* | *de minimis* | *de minimis* | *de minimis* |

Source: AECOM, 2017

### 7.8.2 Section 4(f) Use Determinations

As described in **Section 7.7.2, Historic Sites**, the Build Alternatives would require the use of seven historic resources: DA.023 (Cadiz Street Underpasses and Overpasses), DA.076a (Guiberson Corporation), DA.076b (Guiberson Corporation), DA.082 (Honey Springs Cemetery), DA.110a (Smith Family Cemetery), DA.110b (Linfield Elementary School),and HA.004a. These resources are located on Segment 1 in Dallas County, which is a common segment to all Build Alternatives. The impacts associated with the Build Alternatives would have direct adverse effects on the properties which are protected under Section 4(f). Therefore, FRA's preliminary determination of the impacts associated with all of the Build Alternatives would result in the use of these Section 4(f) properties, as shown in **Table 7-8**.

| Table 7-8: Summary of Section 4(f) Preliminary Use Determinations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Section 4(f) Resource** | **Segment** | **Build Alternatives** | | | | | |
| | | **A** | **B** | **C** | **D** | **E** | **F** |
| **Dallas County** | | | | | | | |
| DA.023 (Cadiz Street Underpasses and Overpasses) | Segment 1 | Use | Use | Use | Use | Use | Use |
| DA.076a (Guiberson Corporation) | Segment 1 | Use | Use | Use | Use | Use | Use |
| DA.076b (Guiberson Corporation) | Segment 1 | Use | Use | Use | Use | Use | Use |
| DA.082 (Honey Springs Cemetery) | Segment 1 | Use | Use | Use | Use | Use | Use |
| DA.110a (Smith Family Cemetery) | Segment 1 | Use | Use | Use | Use | Use | Use |
| DA.110b (Linfield Elementary School) | Segment 1 | Use | Use | Use | Use | Use | Use |
| **Harris County** | | | | | | | |
| HA.004a | Segment 5 | Use | Use | Use | Use | Use | Use |

Source: AECOM, 2017

There are three Houston Terminal Station options. The building associated with one resource, HA.208 (Tex-Tube Complex), would be demolished for construction and implementation of the Industrial Site Terminal Station option. FRA's preliminary determination is that the construction of the Industrial Site Terminal Station option would result in a Section 4(f) use of this resource because the entire 38.95 acres would be acquired for the construction of the Industrial Site Terminal option, which would consist of parking, transportation alterations, pedestrian accessibility and landscaping improvements. Given that there are two other Houston Terminal Station options that would avoid a use to properties protected by Section 4(f), FRA may not approve the use of this Houston Terminal Station option.

| Table 7-9: Summary of Section 4(f) Preliminary Use Determinations – Terminal Option | | |
|---|---|---|
| **Section 4(f) Resource** | **Station** | **Build Alternatives** |
| HA.208 (Tex-Tube Complex) | Industrial Site Terminal | Use |

Source: AECOM, 2017

### 7.8.3 All Possible Planning to Minimize Harm

Before FRA can approve the use of a property protected by Section 4(f), it must demonstrate that it has made all possible planning efforts to minimize harm resulting from the use. Planning efforts to minimize harm to Section 4(f) properties are addressed in this section. Coordination with officials with jurisdiction over the properties (THC for historic properties) is ongoing. The mitigation measures that will be required to mitigate and minimize harm to historic properties will be included in the Section 106 Programmatic Agreement; refer to **Section 3.19, Cultural Resources** for additional discussion of the Programmatic Agreement.

*Dallas County*

***Site DA.028 (Cadiz Street Overpasses and Underpasses)***

Resource DA.028 (Cadiz Street Overpasses and Underpasses) is located on a common segment, where track on viaduct would be constructed. TCRR previously refined the engineering design to minimize impacts to DA.028 by spanning the resource on viaduct. FRA will continue to seek to minimize harm through additional coordination on the engineering design to determine if changes in the pier placement or track curvature could result in additional minimization without impacting new resources. Additionally, FRA will continue to consult with the THC and City of Dallas regarding impacts to this resource.

***Site DA.076a-b (Guiberson Corporation)***

Resource DA.076a-b (Guiberson Corporation) is located on a common segment, where track on viaduct would be constructed. FRA will continue to seek to minimize harm through additional coordination on the engineering design to determine if changes in the pier placement or track curvature could result in additional minimization without impacting new resources. Additionally, FRA will continue to consult with the THC and City of Dallas regarding impacts to this resource.

***Site DA.082 (Honey Springs Cemetery)***

The LOD was previously reduced by 100 feet to minimize the impact to the resource while still maintaining track curvature and operating speeds. In addition, TCRR redesigned the track to span a 75-foot buffer around the boundary of the cemetery to potentially avoid any unmarked burials. Extensive survey of the area would be completed in consultation with the THC and the City of Dallas to confirm the boundaries of the cemetery and assess the potential to impact unmarked graves. The results of the survey could narrow the boundaries of the cemetery and minimize impacts to the resource.

***Site DA.110a (Smith Family Cemetery)***

The LOD would be constructed on viaduct to minimize the impacts to the site and associated resources by spanning the Smith Family Cemetery. The LOD has been refined to the fullest extent possible to limit the impacts to DA.110a (Smith Family Cemetery). The entire parcel associated with DA.110a would be permanently acquired, which would incorporate this resource into a transportation feature for the construction of Segment 1 in Dallas County. FRA will continue to seek to minimize harm to the cemetery through coordination with the THC as the official with jurisdiction over the resource.

***Site DA.110b (Linfield Elementary School)***
At this location the Build Alternatives would be constructed on viaduct to minimize the impacts to Linfield Elementary School. However, the resource is located within the LOD, and would need to be partially or totally demolished to construct track on viaduct. The LOD has been refined to the fullest extent possible to limit the impacts to resource DA.110b (Linfield Elementary School). FRA will continue to seek to minimize harm to the site through coordination with the THC as the official with jurisdiction over the resource.

*Harris County*
***Site HA.004a***
At this location, track would be constructed on cut transitioning from embankment, which requires Castle Road to be constructed over the rail, and subsequently directly affects the integrity of HA.004a. FRA will continue to coordinate with TCRR and consult with the THC and Harris County regarding minimizing impacts to this resource.

*Industrial Site Terminal Option*
***Site HA.208 (Tex-Tube Complex)***
Construction of the Industrial Site Terminal Option would result in a use of resource HA.208 (Tex-Tube Complex) under Section 4(f) because it would have a direct adverse effect and require the permanent incorporation of property into the transportation facility. There are two feasible and prudent alternative station options (Northwest Mall Terminal option and Northwest Transit Terminal option); therefore, FRA will not seek to further minimize impacts to this resource.

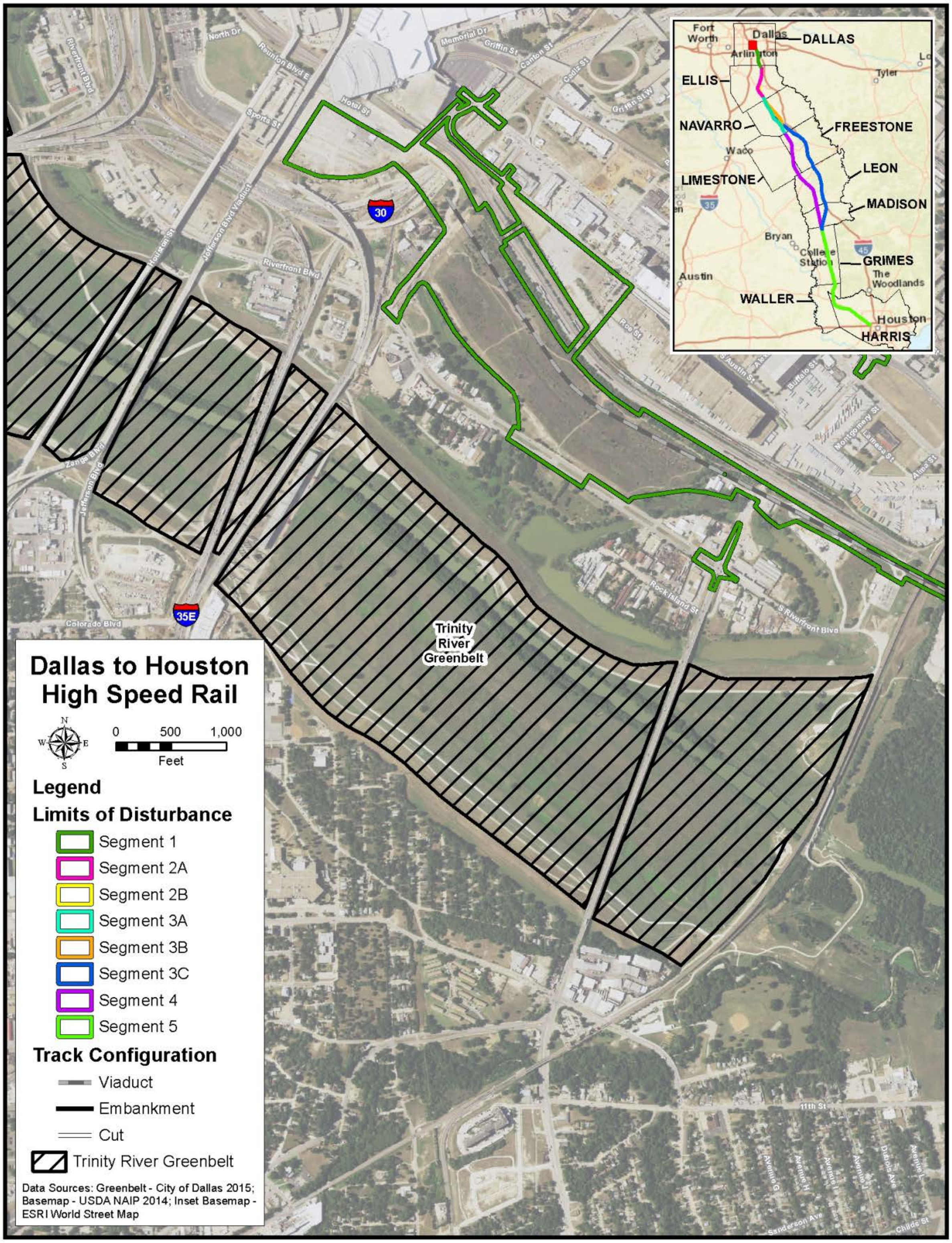
## 7.9 Section 6(f) Resources

The Study Area for Section 6(f)-protected resources is defined as one-quarter mile from the Build Alternatives' LOD.

### 7.9.1 Assessment of Conversion of 6(f) Properties

There is one resource within the Study Area protected under Section 6(f), the City of Dallas' Trinity River Greenbelt (**Figure 7-23**). The Trinity River Greenbelt is owned by the City of Dallas. The City of Dallas received the Land and Water Conservation Fund Grant in 1971 for an amount of $256,360.28 that was used to acquire the greenbelt. The project was completed in 1972. At its closest point, the greenbelt would be 700 feet from the Segment 1 LOD or track. This property is not within the LOD; therefore, no conversion of 6(f) property would occur. There are no other 6(f) properties within a quarter mile of the Build Alternatives.

## Figure 7-23: Trinity River Greenbelt




Source: AECOM, 2017

### 7.9.2 Coordination

Coordination with agencies and the public has been ongoing through project development and will continue with the release of the Draft EIS. Agency coordination for the EIS process began in June 2014 when FRA sent letters to representatives at federal agencies and tribal governments, inviting them to participate in the scoping process. **Table 7-11** lists the dates and attending agencies of applicable meetings, and the general topic of the meeting. Details of the public outreach process can be found in **Chapter 9.0, Public and Agency Involvement**, and is summarized below.

FRA will coordinate with officials with jurisdiction for all historic and recreational resources. For Section 4(f) parks and recreation areas, this Draft EIS provides public notice and an opportunity for public review and comment concerning the effects on the protected activities, features, or attributes of these properties. Following a public review and comment, and coordination with the applicable official(s) with jurisdiction over each Section 4(f) resource, FRA will make its final Section 4(f) determination.

**Table 7-11: Agency Coordination Meetings**

| Date | Attendees | Topic |
|---|---|---|
| June 25, 2014 | TxDOT, TPWD, USFWS, FHWA | 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, train capacity |
| October 7, 2014 | THC | Introduce the Project ; discuss compliance with Section 106 |
| October 8, 2014 | FHWA, FTA, HUD, THC, TPWD, TxDOT, USACE (Ft. Worth & Galveston District), USFWS | Permit requirements, purpose and need, official document review schedule, Section 404(b)(1) of Clean Water Act, environmental methodology and data, Section 106 coordination, corridor alternatives and screening procedure, expected level of analysis |
| May 5, 2015 | TPWD, USFWS | Project overview |
| September 14, 2015 | THC | Discuss historic and archaeology research design reports |
| September 17, 2015 | EPA, FHWA, FTA, STB, USACE, USFWS | Alternatives Analysis |
| October 18, 2016 | FHWA, FTA, USACE, USFWS | Cooperating agencies were invited to participate in a project update webinar to discuss the status of the project since the Alternatives Analysis Assessment. |
| May 4, 2017 | FHWA, FTA, USACE, USFWS, TxDOT | Cooperating agencies were invited to participate in a project update webinar 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 | FHWA, FTA, USACE, USFWS, TxDOT | Cooperating agencies were invited to participate in a Draft EIS webinar 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 | EPA representative were unavailable on July 17, 2017. A second meeting was scheduled 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 | USFWS | A natural resources specific webinar was hosted with USFWS to discuss any preliminary concerns or questions on the Administrative Draft EIS. |
| August 8, 2017 | USACE | A webinar was hosted with USACE to discuss any preliminary concerns or questions on the Administrative Draft EIS. |

Source: AECOM, 2017

As part of the Section 106 process, FRA initiated formal consultation with the SHPO on February 23, 2015, concurrently with letters of invitation to potential consulting parties (**Appendix E, Cultural**

**Resources Technical Memorandum**), as shown in **Table 7-12**. Responses from the potential consulting parties are also provided in **Table 3.19-1** and **Appendix E, Cultural Resources Technical Memorandum**.

**Table 7-12: Parties Contacted through Section 106 Consultation**

| Organization | Organization Response |
|---|---|
| USACE, Galveston District | Accepted Invitation for Section 106 Consulting Party |
| Preservation Texas | Accepted Invitation for Section 106 Consulting Party |
| County of Ellis, Texas Historical Commission | Accepted Invitation for Section 106 Consulting Party |
| County of Freestone, Texas Historical Commission | No Response |
| County of Grimes, Texas Historical Commission | No Response |
| County of Harris, Texas Historical Commission | Accepted Invitation for Section 106 Consulting Party Retracted Acceptance |
| County of Leon, Texas Historical Commission | No Response |
| County of Limestone, Texas Historical Commission | No Response |
| County of Madison, Texas Historical Commission | No Response |
| County of Madison, Texas Historical Commission | Accepted Invitation for Section 106 Consulting Party |
| County of Montgomery, Texas Historical Commission | No Response |
| County of Navarro, Texas Historical Commission | No Response |
| County of Waller, Texas Historical Commission | No Response |
| Ennis Main Street Program | No Response |
| City of Dallas | No Response |
| City of Ennis Economic Development District | No Response |
| City of Corsicana, Main Street and Tourism | No Response |
| USACE, Fort Worth District | No Response |
| Advisory Council on Historic Preservation | Accepted Invitation for any Memoranda of Agreement Consultation |
| Boren Reagor Springs Historical Society | Identified Cultural Resources within the area of Reagor Springs |

Source: AECOM, 2017

FRA contacted the regional historical societies and specified local government agencies in anticipation of their assistance in providing information concerning significant cultural resources in proximity of the Build Alternatives. Through a letter dated January 12, 2016, FRA requested information to determine if there were significant resources that area residents may be aware of. These letters, found in **Appendix E, Cultural Resources Technical Memorandum**, were sent to all parties previously identified for Section 106 consultation (see **Table 3.19-1**), with the addition of the Boren Reagor Springs Historical Society and the Dallas County Historical Commission.

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# 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 numerous federal laws and regulations relevant to the Project. In addition, TCRR is responsible to fulfill all requirements of applicable statutes, regulations and policies associated with Project construction and operation. These permits and authorizations will be obtained in concurrence with the Record of Decision (ROD) or prior to construction. **Table 8-1** provides a summary 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.

**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. |
| Section 4(f) | Review project for impacts to parkland, recreational areas, wildlife refuges and significant historic sites | FRA, Department of Interior | Review for compliance with Section 4(f) | 49 U.S.C. 3030, Section 4(f) of the U.S. DOT Act of 1966 |
| Section 6(f) | Review projects for impact to 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 Land and Conservation Fund (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 Biological Assessment and USFWS issuance of a Biological Opinion | ESA of 1973 as amended (16 U.S.C. 1531 et seq) |
| | 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 five 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 Permit | Clean Water Act (33 U.S.C. 1342); Chapter 26 of the Texas Water Code |
| | 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) |
| | Crossing 100-year floodplain | USACE | Floodplain use permits | 40 U.S.C. 961 |
| | Construction in or modification of floodplains | FRA | Review for compliance | 42 U.S.C. 4321 Executive Order No. 11988 Floodplains |
| | Construction in or modification of wetlands | FRA | Review for compliance | 42 U.S.C. 4321 Executive Order No. 11990 Wetlands |
| | Construction in or across navigable waters of the US | EPA and USACE | Section 10 permit and/or 404 permit | Rivers and Harbors Act 0f 1899 (33 U.S.C. 403) |
| | Discharge of dredge or fill material into Waters of the U.S. | EPA and USACE | 404 Permit | Clean Water Act (33 U.S.C. 1344) |
| | Alteration or occupation or use of a 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 |
| | Construction or modification of a bridge or causeway crossing a navigable waterway of the United States. | USCG | Bridge permit | Section 9 of the Rivers and Harbors Act of 1899; General Bridge Act of 1946 (33 C.F.R, Parts 114 and 115; 33 C.F.R. § 2.36) |
| 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) |
| | 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) |

**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 |
|---|---|---|---|---|
| Air Quality | Project impacts to air quality | EPA, TCEQ | Conformity review<br>Applicable Air Pollution Control Permits | |
| 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<br>Traffic Management Plan | |
| Land Use | Land Use and Zoning Permits/Approvals | Local Jurisdictions | Conditional use permits, zoning waivers | |
| | Conversion of prime farmland | NRCS | Review and coordination of project, however, no permit is anticipated | |

Source: AECOM, 2017

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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, EJ communities and the public.

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

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
- EJ outreach
- Notification and circulation of the Draft EIS, followed by public hearings

FRA has recorded and considered all comments received as of the date this Draft EIS was issued, and will continue to consider all comments received until FRA issues a Record of Decision (ROD).

## 9.1 Public Communication

### 9.1.1 Project Website

FRA created a website for the Project (http://www.fra.dot.gov/Page/P0700) 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.

[1] The previous Project-specific website, www.dallashoustonhsr.com, has been redirected to FRA's website.

To date, three 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 hard copy 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.
- Other newsletters are planned with the release of the Draft EIS and then the Final EIS.[2]

## 9.2 Public Scoping

Per 40 C.F.R. 1501.7 and in fulfillment of the first requirement of public involvement, FRA published a Notice of Intent (NOI) for the Project in the *Federal Register* on June 25, 2014.[3] 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, 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 (**Appendix C**).

### 9.2.1 Public Scoping Meetings

Scoping for 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**.[4]

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 listen to participants' concerns about the Project. The materials distributed at these meetings generally consisted of a Project newsletter and comment forms.

[2] Copies of the newsletters can be found on the project website at https://www.fra.dot.gov/Page/P0780.
[3] 79 FR 36123, Pages 36123 -36124, FR Doc. 2014-14771, June 24, 2014. Available at: https://federalregister.gov/a/2014-14771
[4] Additional details on these public scoping meetings may be found at http://www.fra.dot.gov/Page/P0776.

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 reviewed online at: https://www.fra.dot.gov/eLib/Details/L16346.[5]

**Table 9-1: Scoping Meeting Dates and Locations**

| Date | Venue | Number in Attendance | Number of Verbal Commenters |
|---|---|---|---|
| Tuesday, Oct 21, 2014<br>4:30 – 8 p.m. | Dallas Infomart<br>1950 N. Stemmons Fwy.<br>Dallas, TX | Elected: 6<br>News Media: 1<br>Public: 116 | 11 |
| Wednesday, Oct 22, 2014<br>4:30 – 8 p.m. | IOOF Event Center<br>601 N 45th St.<br>Corsicana, TX | Elected: 2<br>News media: 0<br>Public: 76 | 5 |
| Thursday, Oct 23, 2014<br>4:30 – 8 p.m. | Teague Community Center<br>511 Main St.<br>Teague, TX | Elected: 5<br>News media: 0<br>Public: 141 | 21 |
| Monday, Oct 27, 2014<br>4:30 – 8 p.m. | Brazos Center<br>3232 Briarcrest Dr.<br>Bryan, TX | Elected: 12<br>News media: 2<br>Public: 130 | 8 |
| Tuesday, Oct 28, 2014<br>4:30 – 8 p.m. | Veterans Conference Center<br>455 SH75N<br>Huntsville, TX | Elected: 20<br>News media: 0<br>Public: 157 | 24 |
| Wednesday, Oct 29, 2014<br>4:30 – 8 p.m. | NRG Center/Second Floor<br>1 Reliant Parkway<br>Houston, TX | Elected: 12<br>News media: 1<br>Public: 178 | 26 |
| Monday, Dec 1, 2014<br>4:30 – 8 p.m. | Jewett Civic Center<br>111 North Robinson<br>Jewett, TX | Elected: 11<br>News Media: 5<br>Public: 141 | 19 |
| Monday, Dec 1, 2014<br>4:30 – 8 p.m. | Waxahachie Civic Center<br>2000 Civic Center Lane<br>Waxahachie, TX | Elected: 13<br>News media: 0<br>Public: 124 | 13 |
| Tuesday, Dec 2, 2014<br>4:30 – 8 p.m. | Waller High School<br>Auditorium<br>20950 Fields Store Rd<br>Waller, TX | Elected: 15<br>Media: 2<br>Public: 173 | 20 |
| Tuesday, Dec 2, 2014<br>4:30 – 8 p.m. | Truman Kimbro Convention Center<br>111 West Trinity<br>Madisonville, TX | Elected: 4<br>News Media: 1<br>Public: 61 | 5 |

[5] FRA, "Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report," April 29, 2015, https://www.fra.dot.gov/eLib/Details/L16346

| Table 9-1: Scoping Meeting Dates and Locations | | | |
|---|---|---|---|
| **Date** | **Venue** | **Number in Attendance** | **Number of Verbal Commenters** |
| Wednesday, Dec 3, 2014<br>4:30 – 8 p.m. | Lone Star College - Tomball<br>Beckendorf Conference Center<br>30555 Tomball Parkway<br>Tomball, TX | Elected: 6<br>News Media: 3<br>Public: 140 | 16 |
| Thursday, Dec 4, 2014<br>4:30 – 8 p.m. | Grimes County Expo Center<br>5220 F.M. 3455<br>Navasota, TX 77868 | Elected: 12<br>News Media: 3<br>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

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 reviewed at: https://www.fra.dot.gov/eLib/Details/L16346.[6]

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://www.fra.dot.gov/eLib/Details/L16346.[7]

| 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

[6] FRA, "Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report," April 29, 2015, https://www.fra.dot.gov/eLib/Details/L16346

[7] Ibid.

FRA announced the scoping meetings on the FRA project website,[8] as well as the Project website,[9] 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 | First Publishing Date | Second Publishing Date |
|---|---|---|
| **October Meetings** | | |
| Houston Chronicle | Oct 7 | Oct 28 |
| La Voz | Oct 12 | Oct 26 |
| Corsicana Daily Sun | Oct 7 | Oct 21 |
| The Eagle | Oct 7 | No second run |
| The Huntsville Item | Oct 7 | Oct 27 |
| The Dallas Morning News | Oct 8 | No second run |
| Al Dia | Oct 8 | No second run |
| The Conroe Courier | Oct 7 | Oct 27 |
| Waxahachie Daily Light | Oct 8 | Oct 21 |
| The Teague Chronicle | Oct 9 | Oct 23 |
| The Buffalo Press | Oct 6 | Oct 20 |
| The Madisonville Meteor | Oct 8 | Oct 22 |
| Navasota Examiner | Oct 8 | Oct 27 |
| Ennis Daily News | Oct 7 | Oct 21 |
| **December Meetings** | | |
| The Houston Chronicle | Nov 18 | No second run for round 2 ads |
| La Voz de Houston | Nov 23 | No second run for round 2 ads |
| Corsicana Daily Sun | Nov 18 | No second run for round 2 ads |
| The Eagle | Nov 19 | No second run for round 2 ads |
| The Huntsville Item | Nov 17 | No second run for round 2 ads |
| The Dallas Morning News | Nov 17 | No second run for round 2 ads |
| Al Dia | Nov 19 | No second run for round 2 ads |
| The Conroe Courier | Nov 19 | No second run for round 2 ads |
| Waxahachie Daily Light | Nov 18 | No second run for round 2 ads |
| The Teague Chronicle | Nov 27 | No second run for round 2 ads |
| The Buffalo Press | Nov 18 | No second run for round 2 ads |
| The Madisonville Meteor | Nov 19 | No second run for round 2 ads |
| Navasota Examiner | Nov 19 | No second run for round 2 ads |
| Ennis Daily News | Nov 18 | No second run for round 2 ads |
| Normangee Star | Nov 19 | No second run for round 2 ads |
| Jewett Messenger | Nov 19 | No second run for round 2 ads |
| Centerville News | Nov 19 | No second run for round 2 ads |
| Buffalo Express | Nov 17 | No second run for round 2 ads |
| The Freestone County Times | Nov 19 | No second run for round 2 ads |
| Fairfield Recorder | Nov 27 | No second run for round 2 ads |
| Groesbeck Journal | Nov 19 | No second run for round 2 ads |
| Mexia News | Nov 20 | No second run for round 2 ads |
| Montgomery County News | Nov 19 | No second run for round 2 ads |
| Waller County News-Citizen | Nov 20 | No second run for round 2 ads |
| The Waller Times | Nov 19 | No second run for round 2 ads |

[8] FRA, "Dallas to Houston High-Speed Rail – Passenger Service from Houston to Dallas," http://www.fra.dot.gov/Page/P0700
[9] The previous Project-specific website, www.dallashoustonhsr.com, has been redirected to FRA's website.

| Table 9-3: Newspapers in Which Scoping Meeting Ads Were Run | | |
|---|---|---|
| **Newspaper** | **First Publishing Date** | **Second Publishing Date** |
| Times Tribune | Nov 20 | No second run for round 2 ads |
| Hot Line | Nov 19 | No second run for round 2 ads |
| Katy Times | Nov 20 | No second run for round 2 ads |

Source: AECOM, 2016

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 reviewed at: https://www.fra.dot.gov/eLib/Details/L16346.[10]

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.

**Public Scoping Comments**

FRA received 4,383 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 the Scoping Report, which can be reviewed at: https://www.fra.dot.gov/eLib/Details/L16346.[11]

| 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 |

[10] FRA, "Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report," April 29, 2015, https://www.fra.dot.gov/eLib/Details/L16346

[11] Ibid.

| Table 9-4: Public Scoping Comment Summary | |
|---|---|
| **Comment Topic** | **Number of Comments** |
| 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 |
| Climate Change | 1 |
| **TOTAL** | **4,383** |

Source: AECOM, 2016

After the public scoping period, TCRR continued to have public open houses. These open houses were separate from the EIS process. They were typically held in the evening to allow interested individuals to attend and converse directly with TCRR employees and/or representatives. For example, several homeowners associations, particularly in northwest Houston, requested meetings with TCRR to better understand the project and ask questions. However, since FRA did not sponsor or participate in those meetings, they are not described in this chapter.

## 9.3 Government to Government Consultation

### 9.3.1 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[12] and in **Appendix C, Public and Agency Involvement**.

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
- FWHA

[12] FRA, "Dallas to Houston High-Speed Rail Environmental Impact Statement - Scoping Report," April 29, 2015, https://www.fra.dot.gov/eLib/Details/L16346

- FTA
- STB
- Department of Homeland Security (DHS)
- USFS
- Federal Emergency Management Agency (FEMA)
- USCG
- Housing and Urban Development (HUD)

State

- State Historic Preservation Office (THC)
- TPWD
- TCEQ

Tribes

- Wichita and Affiliated Tribes

FRA invited these agencies and 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 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.

Seventeen representatives from 4 agencies (TxDOT, TPWD, USFWS, 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:

- 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, train capacity

On October 7, 2014, FRA consulted with the 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

- Section 404(b)(1) of the Clean Water Act
- Environmental methodology and data
- Section 106 coordination
- Corridor alternatives and screening procedure
- Expected level of analysis

Potential consulting parties were identified as part of Section 106 coordination. These included the SHPO, Tribal Historic Preservation Offices, local governments, county historical societies interested parties and the public.

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 above in **Section 9.2.1.**

FRA sent invitation letters to Section 106 consulting parties 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.

In coordination with the release of the Draft EIS, Section 106 consultation will be coordinated by FRA. Consultation during the Draft EIS will focus on cultural resource findings and impacts noted in the **Section 3.19, Cultural Resources**.

## 9.3.2 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 EJ |
| STB | General EIS review |
| FTA | General EIS review |
| FHWA | General EIS review |
| USACE Fort Worth District | Section 404 Clean Water Act permit jurisdiction |
| USACE Galveston District | Section 404 Clean Water Act 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.

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.

In addition, FRA continued to schedule one-on-one or small group meetings with the cooperating agencies and other agencies, including the following:

- May 5, 2015 – Met with TPWD and USFWS to provide a project overview
- September 14, 2015 – Met with THC to discuss historic and archaeology research design reports
- September 17, 2015 – Hosted a webinar with EPA, FHWA, FTA, STB, USACE and USFWS to discuss the status of the alternatives analysis

Additional agency review meetings were held in October and November 2016, as well as May, July and August 2017. They included:

- October 18, 2016 – All the cooperating agencies were invited to participate in a project update webinar to discuss the status of the project since the Alternatives Analysis Assessment.
- May 4, 2017 – All the cooperating agencies were invited to participate in a project update webinar 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 – All the cooperating agencies were invited to participate in a Draft EIS webinar 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. A second meeting was scheduled 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 – A natural resources specific webinar was hosted with USFWS to discuss any preliminary concerns or questions on the Administrative Draft EIS.
- August 8, 2017 – A webinar was hosted with USACE to discuss any preliminary concerns or questions on the Administrative Draft EIS.

Separate from FRA’s outreach under 40 C.F.R. 1501.7, TCRR also held meetings with various stakeholders, including federal, state and local agencies, elected officials and other interested parties. The meetings hosted by TCRR are separate from the EIS process. TxDOT also met with local planning organizations including the Ellis, Leon and Waller 391 County Sub Regional Commissions. Meeting minutes were transmitted to FRA to assist in the preparation of this EIS.

More detailed meeting documentation may be found in **Appendix C, Public and Agency Involvement**.

## 9.4 Environmental Justice Outreach

As part of the preparation of this EIS, all persons who have a potential interest in the Project, including minority, low-income, disadvantaged groups and tribes have been invited to participate in the environmental review process. FRA is committed to meeting all EJ requirements needed to comply with EO 12898; therefore, FRA conducted specific outreach efforts to communities of concern, including low-income and minority populations, as well as those with LEP. The purpose of this outreach was to increase understanding of how the Project may potentially affect these populations and allow them the opportunity to comment.

FRA identified specific communities of concern located within one mile of each Build Alternative where the community is primarily minority or low-income, or where portions of the population are LEP. More detailed information about the process used to define these communities of concern, as well as an in-depth description of each community is found in **Section 3.18, Environmental Justice**. Within the environmental justice Study Area, FRA identified communities of concern within the following six counties:

- Dallas County
- Ellis County
- Freestone County
- Leon County
- Grimes County
- Harris County

As detailed in **Section 3.18.3.3, Environmental Justice**, FRA distributed informational materials (e.g., fact sheets) through direct contact with communities of concern 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 allow individuals to comment as a means to identify the goals and concerns of each affected EJ community.

As shown in **Table 9-6**, four listening sessions were held in the communities at familiar locations and at convenient times for local residents.

**Table 9-6: Environmental Justice Listening Sessions**

| Location | County | Date | Attendees | 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 |

Source: AECOM, 2016

Invitations to meetings 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 and Build Alternatives. Information materials were available in Spanish and English, the identified languages of the EJ communities. If translation services were requested or needed, they were available. 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 Project comment database and Administrative Record for consideration in developing this EIS. Meeting summaries can be found in **Appendix C, Public and Agency Involvement**.

Additional information targeting communities of concern was posted on FRA's Project website (translated into appropriate languages). To supplement the listening sessions, a fact sheet with frequently asked questions about the Project was distributed to individuals, local social service agencies and pertinent community organizations in October 2016. Over 1300 fact sheets in 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**.

**Table 9-7: Environmental Justice Outreach**

| 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 an EJ area in Grimes County |

Source: AECOM, 2016

## 9.5 Ongoing Efforts

All comments received since the close of the scoping 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 EIS.

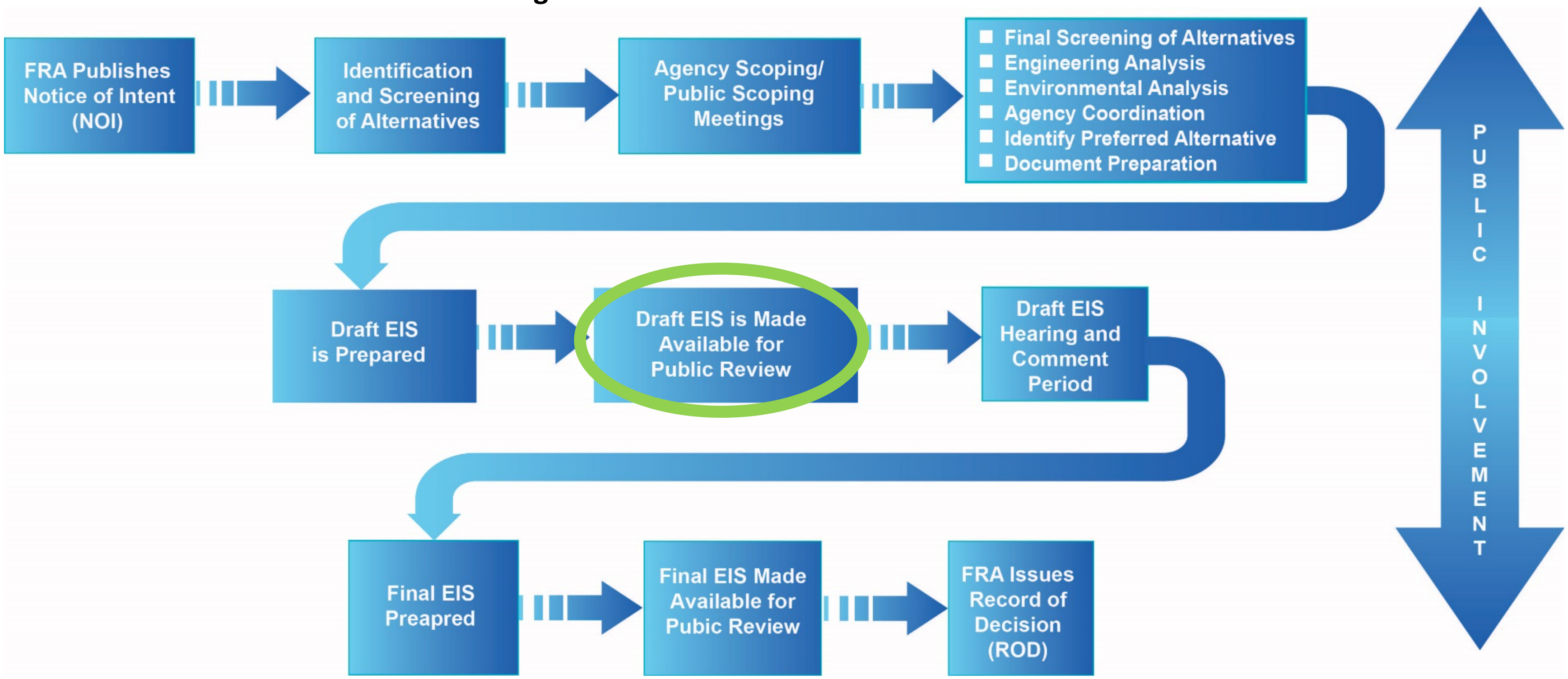
## 9.6 Next Steps

**Figure 9.1** summarizes the steps of the public involvement process for this EIS. The current step in the public involvement process is the issuance of the Draft EIS and the corresponding 60-day public and agency comment period. During this 60-day public review period, FRA will host Draft EIS hearings. The Draft EIS is available to the public to review in hard copy at the locations listed in **Appendix B, Distribution List** of this document. The Draft EIS is also posted on the FRA Project website https://www.fra.dot.gov/Page/P0700.

The Final EIS, and later the ROD, for this Project will consider the public and agency comments on the Draft EIS. The Final EIS will include any updated information and analysis, as well as respond to comments on the Draft EIS. The Final EIS will be made available for agency and public review and a 30-day no action period will commence. No additional meetings will be held during this time.

Following a 30-day no action period, during which agencies and the public will be able to review the Final EIS, FRA will prepare a ROD. The ROD will document FRA's selected alternative, summarize the impacts of the selected alternative and list required mitigation measures.

**Figure 9-1: EIS Public Involvement Process**




Source: AECOM, 2016

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