

*Appendix A:*  
Project Purpose and Need



# Dallas-Fort Worth Core Express Service

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## Purpose and Need

Version 1 August 2015

Prepared for:  
Federal Railroad Administration and  
Texas Department of Transportation

Prepared by:  
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August 2015





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## **1.0 Statement of Purpose and Need**

### **1.1 *Project Overview***

The Texas Department of Transportation (TxDOT) is working with the Federal Railroad Administration (FRA) to study a possible high-performance, intercity passenger rail service between Dallas and Fort Worth, Texas. The 30-mile, Dallas-Fort Worth Core Express Service (Project) will evaluate the potential for a high-speed rail connector, linking other potential high- and higher-speed passenger rail projects in Texas.

In addition to providing faster, limited-stop trains for people traveling between Dallas and Fort Worth, the Project could provide a critical link between projects including:

- The proposed 240-mile Dallas to Houston High-Speed Rail Project, which would terminate in Dallas; and,
- The Texas-Oklahoma Passenger Rail Study (TOPRS), which evaluates a range of possible conventional, higher-speed and high-speed service alternatives that could span 850 miles from Oklahoma City to South Texas, through the Dallas-Fort Worth Metroplex.

This Purpose and Need Statement defines needs to be addressed by the Project, provides a basis for evaluating alternatives, and supports the decision-making process in selecting a Preferred Alternative.

### **1.2 *Project History and Background***

The Project builds on the results of the TOPRS Program Level Environmental Impact Statement (EIS). TOPRS evaluated alternatives to provide high-performance passenger rail service along an 850-mile corridor extending between Edmond, Oklahoma north of Oklahoma City and south Texas (Corpus Christi, Laredo, and the Rio Grande Valley). TOPRS examined the study area in three geographic passenger rail markets:

- Northern Section: Edmond, Oklahoma (just outside Oklahoma City) to Dallas and Fort Worth, Texas
- Central Section: Dallas and Fort Worth to San Antonio
- Southern Section: San Antonio to south Texas (Laredo, Corpus Christi, and the Rio Grande Valley)

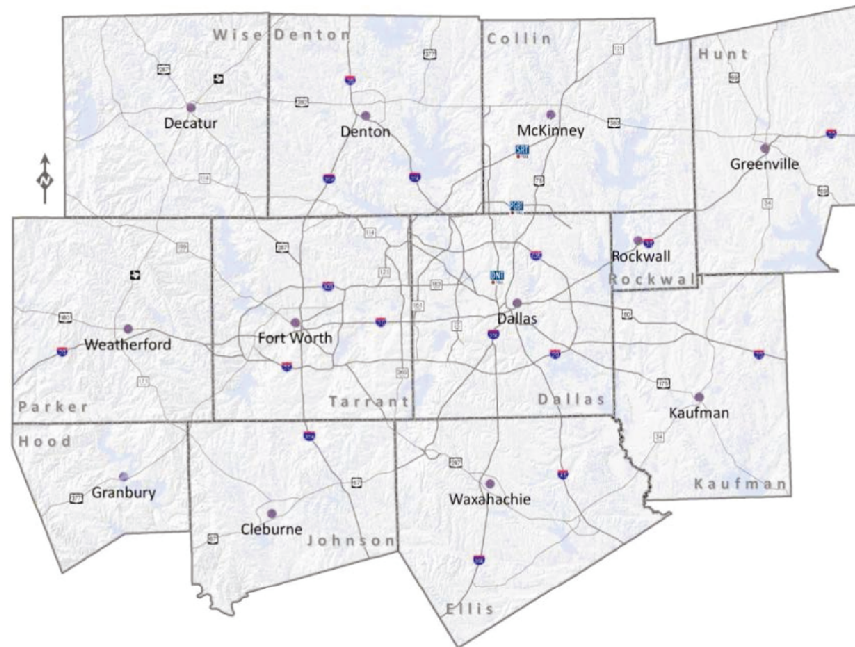
Each of these sections has a “distinct level of existing passenger rail service and opportunity for development while remaining connected to and interdependent with the passenger rail network across the overall Program corridor” (TOPRS, TxDOT 2014).

The Project is in the Dallas-Fort Worth-Arlington, Texas Metropolitan Statistical Area (MSA), otherwise referred to as the Metroplex. The 12-county Metroplex includes the cities of



Arlington, Carrollton, Dallas, Denton, Frisco, Fort Worth, Grapevine, Irving, McKinney, Plano, and Richardson. *Figure 1-1* illustrates the Metroplex.

*Figure 1-1: Dallas-Fort Worth-Arlington Metroplex*



Source: North Central Texas Council of Governments (NCTCOG), *Mobility 2035*, 2013

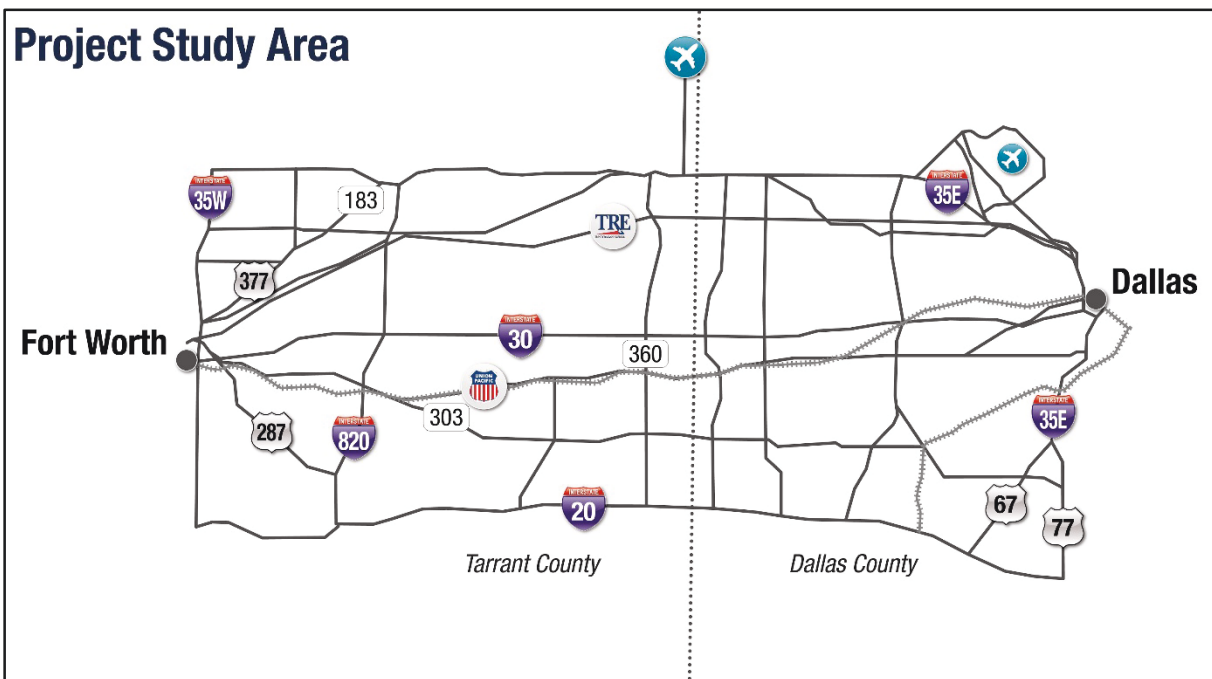
### 1.3 Project Description

The Project includes an approximately 30-mile corridor through Tarrant and Dallas counties. The largest cities in the Project study area are Dallas (the county seat of Dallas County), Fort Worth (the county seat of Tarrant County), Arlington (in Tarrant County), Irving (in Dallas County) and Grand Prairie (in both Tarrant and Dallas counties). The Project study area includes two major airports, Dallas-Fort Worth (DFW) and Love Field. The Project study area also includes the approximately 2,700-acre Arlington Entertainment District, which contains several major attractions: Six Flags Over Texas, Hurricane Harbor, Texas Rangers Ballpark, Legends of the Game Museum, AT&T Stadium (home of the Dallas Cowboys), Lincoln Square Mall, and the Arlington Convention Center.

Primary transportation routes between Dallas and Fort Worth include Interstates 30 (I-30), I-20, the Trinity Railway Express (TRE), Amtrak's Texas Eagle, and the Union Pacific Railroad (UPRR). *Figure 1-2* illustrates the study area for the Project.



Figure 1-2: Study Area for the Project



Source: Parsons Brinckerhoff 2015

## 1.4 Federal, State and Local Transportation Planning Initiatives

A goal of the Project is to be consistent with federal, state, and local transportation planning initiatives. Descriptions of these federal, state, and local transportation planning initiatives are discussed in the following sections.

### 1.4.1 National Passenger Rail Strategy

In 2008, Congress enacted a major reauthorization of intercity rail passenger programs, creating a new priority for rail passenger service, known as the Passenger Rail Investment and Improvement Act of 2008 (Public Law 110-432). As a result, federal appropriations supporting high-speed and intercity passenger rail services were authorized and implemented. In the American Recovery and Reinvestment Act of 2009, Congress appropriated \$8 billion in capital assistance for high-speed rail corridors and intercity passenger rail service. Also in 2009, FRA issued a strategic plan entitled, *A Vision for High-Speed Rail in America* (FRA 2009), which described the agency's plan for intercity passenger rail development and subsequent program guidance to implement a High-Speed Intercity Passenger Rail Program.

### 1.4.2 TxDOT Texas Rail Plan

The *Texas Rail Plan* establishes the vision, goals, and objectives for the passenger and freight rail system in the state (TxDOT 2010). The vision is to “provide cost-effective, energy-



efficient, sustainable personal mobility and goods movement that connects Texas communities and links Texas businesses with domestic and international markets, minimizing environmental impacts, reducing road congestion, improving air quality, and promoting economic growth” (TxDOT 2010).

### **1.4.3 Texas-Oklahoma Passenger Rail Study**

The 850-mile TOPRS extends from Edmund, Oklahoma in the north through Oklahoma City, Fort Worth, Austin, and San Antonio to destinations in south Texas, including Laredo, Corpus Christi, and Brownsville. Existing passenger rail service includes intercity service on the Heartland Flyer (Oklahoma City to Fort Worth), Texas Eagle (Chicago to San Antonio via Dallas and Fort Worth), and Sunset Limited (Los Angeles to New Orleans via San Antonio) operated by Amtrak, and regional/commuter rail service on the Trinity Railway Express (Dallas to Fort Worth) and Capital MetroRail (Austin) operated by Texas operators. The purpose of TOPRS is to evaluate alternatives to provide high performance passenger rail service to meet future intercity travel demand and to improve rail facilities, reduce journey times, and improve connections with regional public transit services.

### **1.4.4 TxDOT Statewide Long-Range Transportation Plan 2035**

In 2011, TxDOT published the *Statewide Long-Range Transportation Plan*. This plan:

“provides an inventory and addresses the need for improvements to the state’s transportation system—roadways, pedestrian and bicycle facilities, transit, freight and passenger rail, airports, waterways and ports, pipelines, and intelligent transportation systems (ITS)” (TxDOT 2011).

The goal of the plan is to:

“provide safe and efficient movement of people and goods, enhance economic viability, and improve the quality of life for the people that travel in the state of Texas by maintaining existing roadways and collaborating with private and local entities to plan, design, build and maintain expanded transportation infrastructure” (TxDOT 2011).

This plan also emphasizes delivering a modern, interconnected, and multimodal transportation system in Texas.

### **1.4.5 NCTCOG Mobility Plans**

In 2013, the North Central Texas Council of Governments (NCTCOG) published its long-range transportation plan, *Mobility 2035*, for the Metroplex. The plan defines a vision for the region’s multimodal transportation system and identifies guidelines for expenditures of state and federal funds over the next 20+plus years. *Mobility 2035* provides, “a blueprint for a





comprehensive, modern transportation system for the Dallas-Fort Worth area” (NCTCOG 2013).

NCTCOG is currently developing the next long-range transportation plan, known as *Mobility 2040*. Draft recommendations are expected to be available in late 2015, and the Regional Transportation Council is expected to approve the new long-term plan in spring 2016.

#### **1.4.6 Dallas Area Rapid Transit 2030 Transit System Plan**

The Dallas Area Rapid Transit’s (DART’s) *2030 Transit System Plan* identifies planned improvement projects that result from changing land use and development patterns in its service area (DART 2006). Guiding principles for this plan include providing an efficient, cost-effective, and affordable transit system that integrates with other modes in the transportation system, while promoting accessibility and performance to meet customer needs, and attract new customers.

#### **1.4.7 Fort Worth Transportation Authority, Tex Rail**

The Fort Worth Transportation Authority (The T) completed a Draft EIS in 2008 for the proposed Southwest-to-Northeast Rail Corridor regional passenger rail service, now known as TEX Rail. The Record of Decision for the project was issued by the Federal Transit Administration in September 2014. TEX Rail is a 27-mile commuter rail project that will follow existing rail lines from downtown Fort Worth into the DFW Airport. The route will provide access to major activity centers in the corridor and connect with other transportation services, including the TRE commuter rail service, Amtrak, and The T’s downtown bus transfer center at the downtown Fort Worth Intermodal Transportation Center and the Texas & Pacific Station.

#### **1.4.8 Fort Worth Transportation Authority 2010 Strategic Plan**

In 2010, The T began implementing a 25-year long-range strategic plan to enhance public transportation services and cover more of Tarrant County. The *Strategic Plan* will expand the transportation network, improves performance and upgrade technology (The T 2010).

### **1.5 Project Purpose**

The TOPRS EIS defined the purpose of the Project as introducing a new, limited service transportation option in the Metroplex. The Project will increase intercity mobility to, from, and within the Metroplex by providing enhanced passenger rail service as a transportation option that is competitive with automobile, bus, and other travel modes. The Metroplex is an integral part of the larger Northern and Central Sections evaluated in the TOPRS EIS. The connection to other high- performance intercity passenger rail services in Texas, as well as regional transit service is critical to facilitate improved travel to, from, and within the Metroplex.





Building upon the TOPRS program rationale, the purpose of the Project is to create a financially viable, safe, reliable, and environmentally sustainable intercity passenger rail service connecting Dallas and Fort Worth, while providing a key linkage to the existing and developing Texas high-performance passenger rail system. Specifically, the Project will provide a link between the proposed high-speed rail service between Dallas and Houston on the east end and passenger rail services linking Oklahoma City and South Texas metropolitan areas via the Metroplex. This service will provide a convenient alternative to travel by automobile and enhance existing public transportation travel to and from the state's largest metropolitan areas.

The Project is being developed to:

- Advance the local, state and regional high-performance rail network in accordance with the *State Rail Plan* by linking the Metroplex with other planned high-performance rail corridors linking Austin, Houston, and San Antonio;
- Enhance connectivity of the Metroplex to other existing and planned passenger rail services, freight rail, commercial airports, roadway infrastructure, bicycle and pedestrian facilities, and be competitive with private automobile travel and air travel as a viable additional transportation option;
- Promote improved air quality and reduced transportation energy consumption by providing a new travel option within the Metroplex to compete with private automobile travel; and
- Augment economic development opportunities of the Metroplex by providing improved access to employment, entertainment, recreation, health, and shopping opportunities for residents of, and visitors to, the region and the state.

## 1.6 *Project Need*

The need for the Project results from capacity constraints in the existing transportation system. If nothing is done to address these constraints, the region will experience greater levels of traffic congestion and travelers to and from the Metroplex will continue to have limited mobility options. Expected growth in both population and economic development opportunities will further strain the congested transportation system. Existing and future transportation issues to be addressed by the Project include:

- Planning for rapid population and economic growth of the Metroplex and the state through 2040;
- Enhancing transportation connectivity to, from, and within the Metroplex;







- Facing access constraints to the DFW Airport and other major activity centers because of limited transportation options within and beyond the Metroplex; and
- Improving air quality within the Metroplex.

### 1.6.1 Population and Economic Growth

Between 2010 and 2040, the state of Texas is anticipated to grow by approximately 45 percent (*Table 1-1*), and the Metroplex is one of its fastest growing urbanized areas within the state. Increasing population and economic growth of the Metroplex will increase travel demand, congestion, and vehicle miles travelled (VMT). In 2010, the MSA had a population of approximately 6.3 million (*Table 1-2*). By the year 2040, the MSA is forecasted to grow to 10.7 million residents, an increase of more than four million people (NCTCOG 2015). This growth represents a 68 percent increase in the population of North Central Texas (NCTCOG 2015).

*Table 1-1: Estimated Population in Texas between 2010 and 2040.*

Year	Population	Population Change from 2010 (Percent)
2010	25,145,561	-
2020	28,813,282 <sup>A</sup>	14.59
2030	32,680,217	29.96
2040	36,550,595	45.36

Source: Office of the State Demographer. 2014. Texas Population Projections 2010 to 2050

A. Data from the Office of the State Demographer and the Texas State Data Center using a 0.5 migration scenario. The 0.5 scenario represents an approximate average rate of migration from 2000 to 2010 and is the recommended scenario for conducting long-term planning.

As shown in *Table 1-2*, the population of Tarrant and Dallas counties are projected to grow by 1,306,249 (73 percent) and 1,019,728 (44 percent), respectively, between 2010 and 2040. The Metroplex has continued to sustain an unprecedented level of population and economic growth as a result of factors such as favorable business climate, attractive tax policies, and an abundance of available land (TxDOT 2014). According to the NCTCOG, “The transportation system is central to this growth because it allows for the efficient movement of people and goods. Understanding not only population but employment growth is critical to the transportation planning process and to providing the best system to move people to and from jobs” (NCTCOG 2013). Increasing population and economic growth within the Metroplex will increase travel demand, congestion, and vehicle miles traveled on the already strained transportation system. The additional constraints on the system will limit the ability of citizens to move in and out of the Metroplex to other destinations in Texas and beyond.





*Table 1-2: Population and Employment Growth by County, 2010-2040*

Population			County	Employment		
2010	2040	% Change		2010	2040	% Change
778,427	1,560,421	100.5%	Collin	452,982	762,919	68.4%
2,337,741	3,357,469	43.6%	Dallas	1,884,799	3,197,471	69.6%
652,270	1,241,681	90.4%	Denton	251,394	445,079	77.0%
148,000	283,898	91.8%	Ellis	58,519	96,874	65.5%
50,481	81,578	61.6%	Hood	18,045	29,450	63.2%
84,260	131,022	55.5%	Hunt	40,702	70,102	72.2%
148,290	252,521	70.3%	Johnson	64,198	105,195	63.9%
102,014	210,097	105.9%	Kaufman	40,558	64,037	57.9%
113,806	195,286	71.6%	Parker	52,532	80,406	53.1%
77,678	166,357	114.2%	Rockwall	33,163	53,369	60.9%
1,788,400	3,094,649	73.0%	Tarrant	1,036,558	1,739,330	67.8%
58,147	101,865	75.2%	Wise	31,516	47,227	49.9%
<b>6,339,514</b>	<b>10,676,844</b>	<b>68.4%</b>	<b>Total</b>	<b>3,964,966</b>	<b>6,691,459</b>	<b>68.8%</b>

Source: NCTCOG Regional Data Center, 2040 Demographic Forecast, May 2015.

According to the Dallas Chamber of Commerce, the Metroplex is the Number 1 visitor and leisure destination in the State of Texas, attracting over 44 million visitors annually. Activity centers/employment areas are seeing strong employment demand, including downtown Dallas, the Southwestern Medical District, Stemmons Corridor, Las Colinas, Galleria/Tollway Corridor, DFW Airport, the Telecom Corridor, and Legacy. Additionally, NCTCOG is projecting continued high employment growth in Beach Street, North Richland Hills-Iron Horse, North Richland Hills-Smithfield, and Summer Creek areas (*TEX Rail* 2014). This dispersal of employment and entertainment centers results in complex travel patterns in the Metroplex that affects residents, business travelers, and tourists.

As a major economic, social, and political center, the Metroplex supports a diverse economy and is home to 18 *Fortune* 500 companies. As shown in *Table 1-2*, jobs within the MSA are predicted to increase 69 percent from 3,964,966 in 2010 to 6,691,459 in 2040. According to NCTCOG's 2040 Demographic Forecasts, the highest increase in the number of jobs is projected to occur in Dallas County at 1,312,672; a growth rate of 70 percent. Dallas County is followed by Tarrant County, which is projected to have 702,772 additional jobs or a 68 percent increase.







Additionally, an increase in freight volumes also contributes to rising congestion on the transportation system within the Metroplex and on the Texas transportation system. According to TxDOT (2010), “Texas freight volumes are expected to increase overall by about 82 percent between 2008 and 2035. In this timeframe, rail and rail/truck volume (a combination of freight in rail cars and truck trailers shipped by rail) will increase 91 percent and truck volume will increase 77 percent.” Congestion and intensity of freight movement affect traveler and business connectivity to and from and within the Metroplex.

The transportation system is central to the continued growth of the Metroplex because it allows for the efficient movement of people and goods. NCTCOG recommends improving transportation options, travel efficiency measures and system enhancements that balance land use and transportation, and develop programs that reduce automobile trips (NCTCOG 2013). This is also consistent with the *Texas Rail Plan* (TxDOT 2010), which focuses on alternative modes of transportation to “provide cost-effective, energy-efficient, sustainable personal mobility and goods movement that connects Texas communities and links Texas businesses with domestic and international markets, minimizing environmental impacts, reducing road congestion, improving air quality, and promoting economic growth” (TxDOT 2010).

### *1.6.2 Regional Transportation Connectivity of the Metroplex*

In accordance with federal and state plans to establish a high-performance rail network, NCTCOG is examining the potential for high-performance rail in the Metroplex.

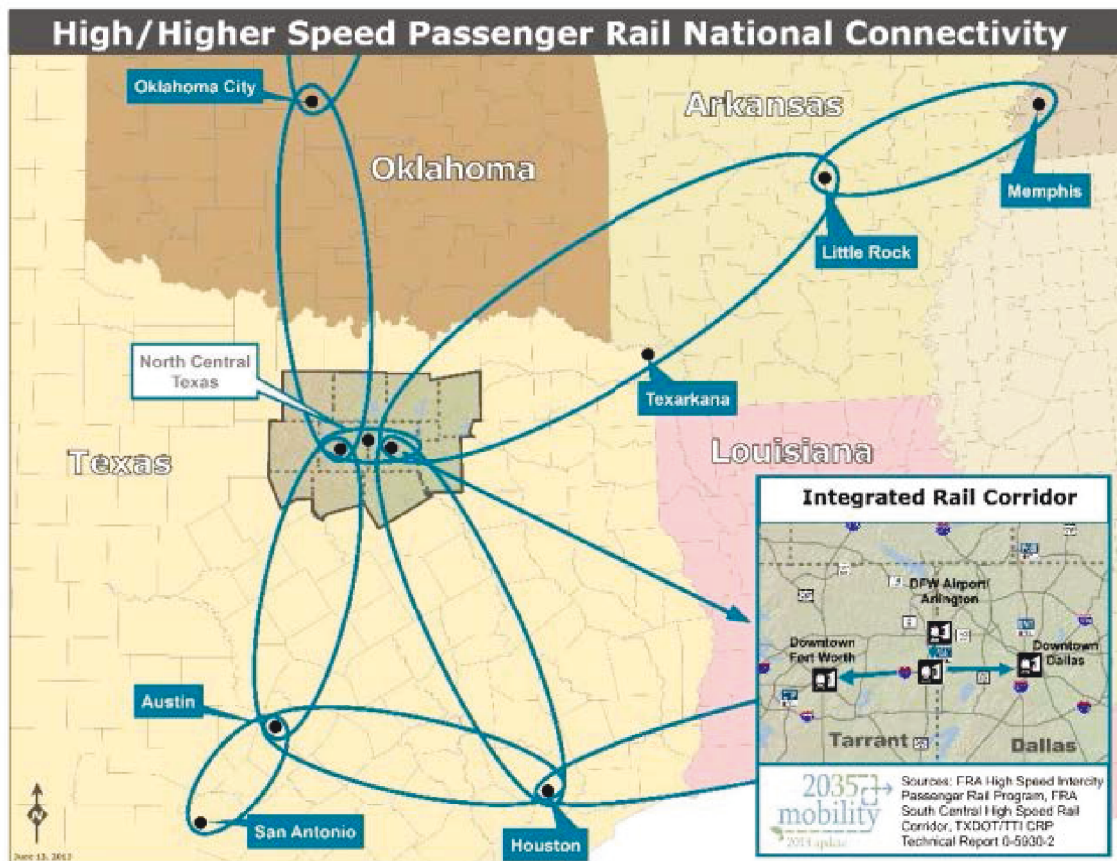
“The Regional Transportation Council has discussed where stations would initially be located and identified three points of interest including Fort Worth, Dallas/Fort Worth International Airport (with access to the airport coming from Arlington), and Dallas. Options include corridors between North Central Texas and Austin, Houston, Oklahoma City, and Little Rock. The Dallas-Fort Worth to Houston corridor has been identified as the corridor with the most potential for high-speed rail service.” (NCTCOG 2013).

TOPRS and the Project, along with the Dallas Houston High-Speed Rail Project, the DART Rail Orange Line (light rail), and the proposed Cotton Belt (commuter rail) and TEX Rail (commuter rail) are all potential components of this integrated passenger rail system. Such a system has the potential to operate at speeds high enough to compete with air travel over distances up to about 400 miles. The service could provide an alternative to automobile and air travel within the state for business, tourism, and other travel purposes. *Figure 1-3* illustrates potential high-speed rail linkages.





Figure 1-3: High/Higher Speed Rail Connectivity

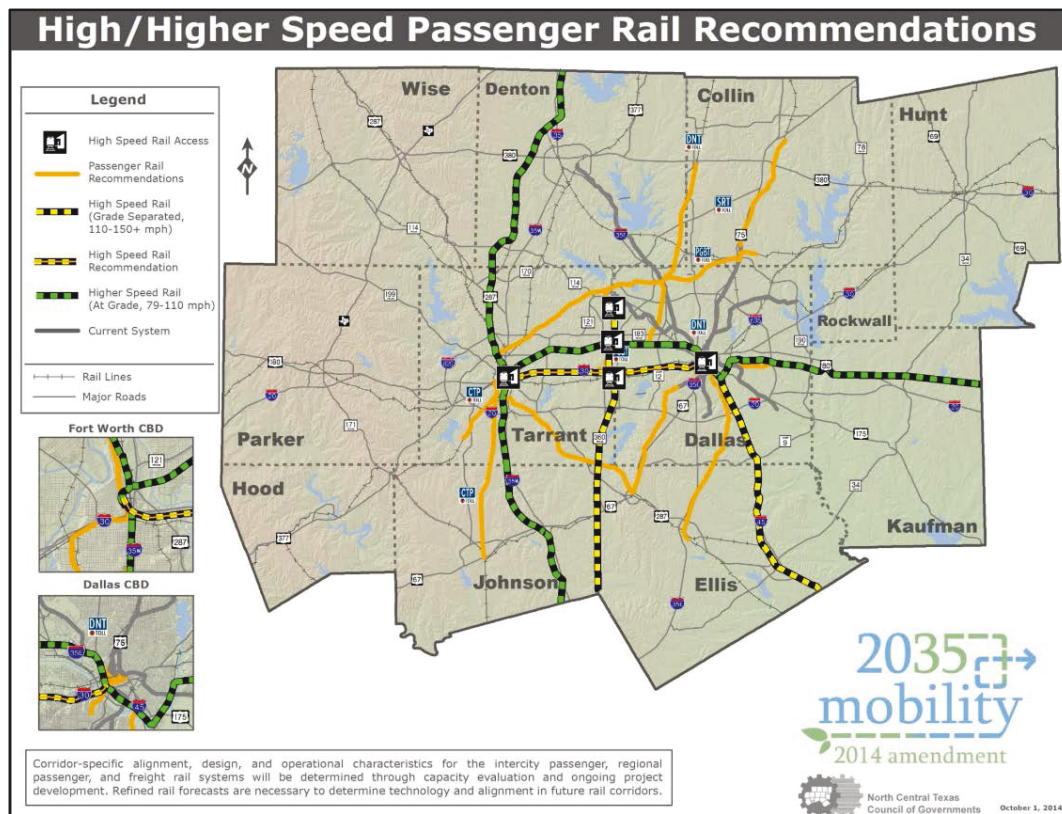


Source: NCTCOG, *Mobility 2035*, Mobility Options.

In its 2014 amendment to *Mobility 2035*, NCTCOG proposed high- or higher-speed rail (grade separated, 110-150+ mph) along I-30 (funded recommendation), SH 360, and I-45 East, as well as higher-speed rail (at grade, 79-110 mph) along the TRE line, I-35 West, and US 80 (NCTCOG 2014). *Figure 1-4* illustrates NCTCOG's recommendations for high- and higher-speed passenger rail service.



Figure 1-4: Proposed High/Higher Speed Rail Alignments



Source: NCTCOG, *Mobility 2035: 2014 Amendment*, Frequently Referenced Maps

### 1.6.3 Airport and Activity Center Accessibility

As indicated in several studies (i.e. *Dallas 2030*, *Mobility 2035*, *Cotton Belt Corridor [2010]*, *TEX Rail [2014]*), improving access to major activity centers, such as the DFW Airport is

“an important goal of the region as mobility and air quality issues demand alternative modes of travel to single occupant vehicles. Current transit access to DFW Airport and other activity centers is limited in scope due to [sic] access and travel time constraints and residents outside The T’s service area currently do not have access to transit.” (*The T* 2014)

The length and unreliability of travel times for existing over-the-road transit modes because of congestion along the major roadways between the Fort Worth and Dallas downtowns and the DFW Airport inconvenience travelers. Additionally, most transit trips from the downtowns to the airport require multiple transfers. As a result, the existing level of transit offers no advantage in travel time or convenience over the automobile. The reliability of bus service to the DFW Airport and other activity centers within the Metroplex would be further affected by traffic congestion and other traffic incidents. As shown in *Figure 1-5*, the DART Rail Orange Line (light rail) and the proposed Cotton Belt (commuter rail) and TEX Rail (commuter rail)

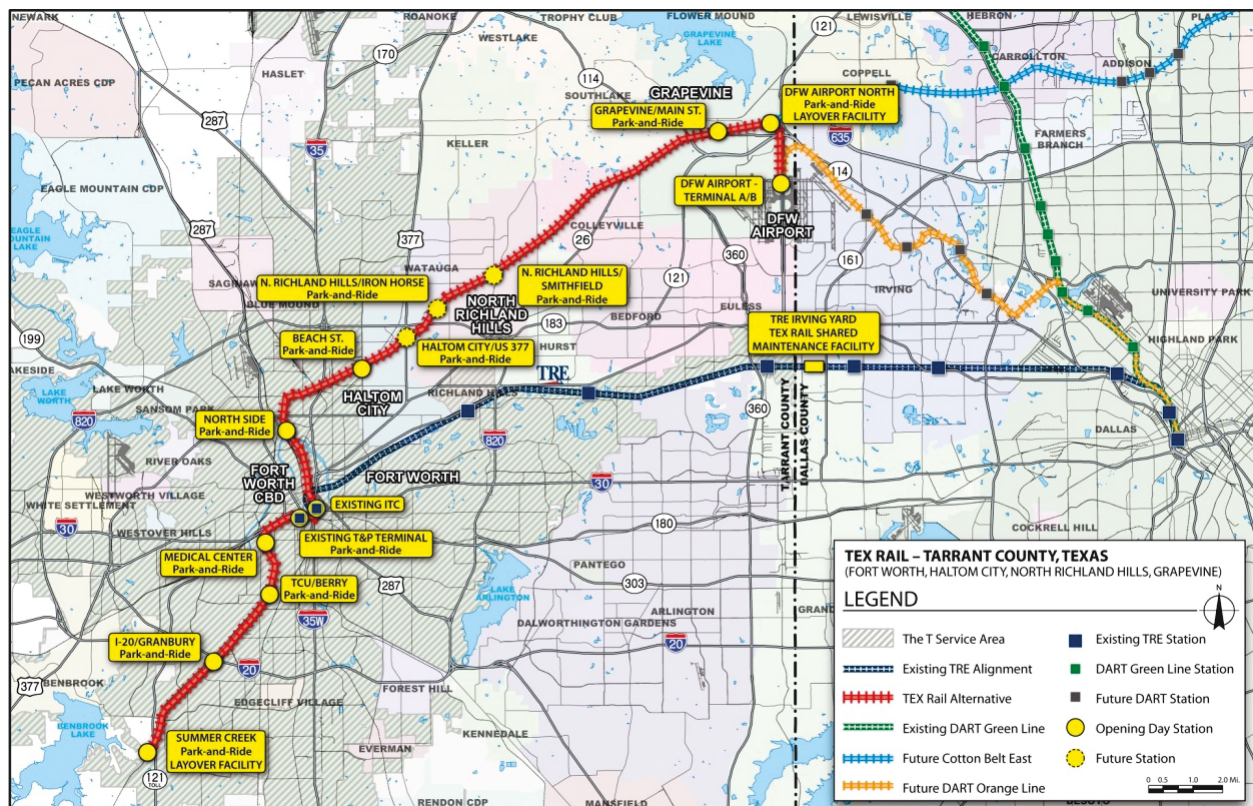




lines connect the Dallas and Fort Worth Central Business Districts to the DFW Airport from the north, but there is no direct southern rail route to the airport.

Additionally, a transportation option that is able to operate efficiently during severe weather conditions that ground planes will benefit travelers to and from the Metroplex. To provide better transit connectivity and reduce single-occupancy vehicle travel and roadway congestion, it is important to provide efficient, reliable, and multi-modal transportation options to the airport and other activity centers in the Metroplex and for those travelers connecting through DFW from Oklahoma and other parts of Texas

*Figure 1-5: Rail Transit Network and DFW Airport Connections*



Source: TEX Rail, 2014

## 1.6.4 Air Quality

Dallas and Tarrant counties currently do not meet the federal air quality standard for ozone. However, the efficiency in high performance passenger rail would reduce fuel consumption and associated air emissions. According to the American Public Transportation Association (2012), no other mode of transportation could reduce the demand for fossil fuel as dramatically as high performance passenger rail. Depending on the power source, the amount of fuel savings varies, but in general, train travel is 21 percent more fuel efficient than auto travel per mile and 17 percent more efficient than airlines on a per-passenger-



mile basis (*APTA 2012*). By providing a transportation option to and within the Metroplex that is competitive with the automobile and air travel, the Project would contribute to improving air quality while also reducing energy consumption for transportation.



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*Appendix B:*  
Ridership Demand Forecasting  
Methodology





## Technical Memorandum

**To:** Chad Coburn, TxDOT; Catherine Dobbs and Melissa Hatcher; FRA  
**From:** Ed Campbell  
**Cc:** Melissa Neeley, Erik Stevens, Mark Werner, TxDOT; Margarita Gagliardi, MTAC  
**Date:** March 24, 2016  
**Subject:** Ridership Forecasting Methodology Overview

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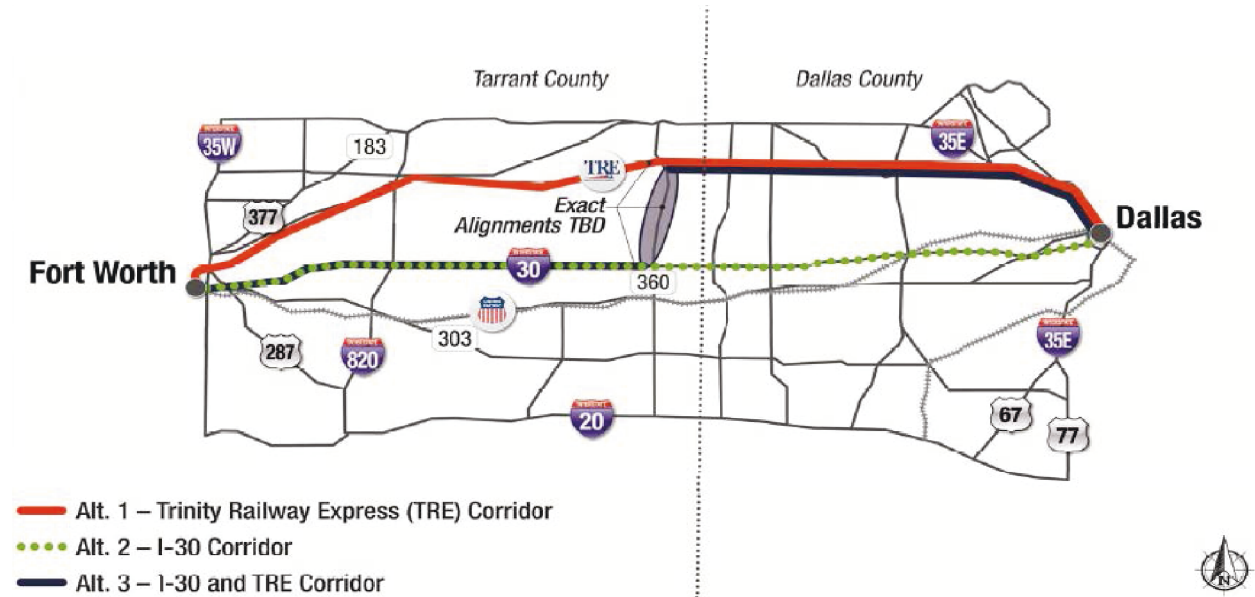
# 1 Introduction

## 1.1 Project Description

The Texas Department of Transportation (TxDOT) is working with the Federal Railroad Administration (FRA) to study a possible high-speed, intercity passenger rail service between Dallas and Fort Worth, Texas. The Dallas–Fort Worth Core Express Service (the Project) supports a statewide framework of high-speed rail service connecting Oklahoma City through Fort Worth to South Texas and the Dallas/Fort Worth Metroplex to Houston. A private developer, Texas Central Partners, is advancing the Dallas to Houston corridor as a privately funded and operated service (Texas Central Railway or TCR). The Texas Oklahoma Passenger Rail Study (TOPRS) is a Tier 1 Environmental Impact Statement (EIS) that includes a high-level evaluation of the Dallas/Fort Worth Metroplex as part of its corridor alternatives analysis.

The Project is a Tier 2 EIS that evaluates the environmental impacts, service characteristics, and capital, operating and maintenance costs to identify a preferred alternative alignment and service plan. The Project evaluates steel wheel on steel rail trainsets with operational speeds of 90, 125, and 220 miles per hour (mph). The physical limits of the project extend from downtown Fort Worth at either the Intermodal Transportation Center (ITC) or the Texas & Pacific (T&P) Station on the south side of downtown at the western terminus to downtown Dallas at either the Dallas Union Station or the proposed Texas Central Railway (TCR) Station near the Interstate (I)-30/I-35E interchange south of Union Station on the east. The alternative conceptual corridors under evaluation consist of the I-30 corridor, the Trinity Railway Express (TRE) corridor, and the corridor along I-30, State Highway (SH) 360 and the TRE, as shown in Figure 1.

FIGURE 1: PROJECT LOCATION MAP AND ALTERNATIVE CORRIDORS



## 1.2 Objective

This Technical Memorandum provides an overview of the ridership forecasting methodology, the descriptions of the ridership input variables, and estimated fare structures. It serves as an interim deliverable, and will be augmented with the No Build Alternative Technical Memorandum (submitted under separate cover for interim review). The analyses from these technical memoranda will be included in the Project’s Alternatives Analysis Report (AA).

## 1.3 Purpose and Need

The Purpose and Need Statement for the Project (August, 2015) defines the purpose as :

*“.....to create a financially viable, safe, reliable, and environmentally sustainable intercity passenger rail service connecting Dallas and Fort Worth, while providing a key linkage to the existing and developing Texas high-performance passenger rail system.”*

It should be noted that because the Project is part of an overall developing high-speed rail network linking two north/south high-speed rail corridors, and because there is an existing commuter rail service between Dallas and Fort Worth in the Metroplex, all of the alternatives evaluated assume that TOPRS and TCR are operational by 2040. Both projects are mentioned in the North Central Texas Council of Governments (NCTOG’s) Mobility 2040 Plan (March 2016), but are not included in the Dallas-Fort Worth Expanded Travel Demand Model (DFX) for the 2040 planning horizon or on the list of fiscally constrained projects for the region.

## 2 Ridership Methodology Overview

### 2.1 Modifications to Existing Travel Demand Models

As the Metropolitan Planning Organization for the Metroplex, NCTCOG maintains the DFX for the region. In August 2014, discussions between NCTCOG, the Texas Department of Transportation (TxDOT) and WSP | Parsons Brinckerhoff were initiated to determine the best approach to integrating high-speed rail into the DFX. As a result, a scope of work to augment the 2010 DFX was developed to incorporate an intra-regional high-speed rail (HSR) ridership forecasting model for the Metroplex. In part, this scope of work states:

*“The HSR ridership forecasting model shall include the capability to forecast intra-regional HSR trips and their effect on destination choice, treatment of special markets unique to HSR, the effects of inter-regional HSR trips on the transportation system within the DFW region. The work effort will also require integration of this enhanced modeling system with inter-regional HSR forecasts being developed separately.....”<sup>1</sup>*

As discussed below, model enhancements were developed to provide the necessary detail in the DFX to determine HSR ridership and evaluate the changes in the transportation network as a result.

#### 2.1.1 DFX Model Enhancements

##### 2.1.1.1 Mode Choice Expansion

The 2010 DFX did not include HSR as a modal option; therefore the first task was to develop a module to expand the modal choice component of the model. The mode choice expansion module also predicts the various ways in which riders access the HSR system, such as commuter rail, car, bus transit, light rail, walking, or by air, with the necessary intermediate linkages.

##### 2.1.1.2 Latent and Induced Demand

The introduction of a new transportation mode may provide enough enhancement to the overall transportation network to encourage more usage by passengers who would like to use the system but don't (latent demand) or generate new usage on the new mode and/or connecting links due to the nature of the mode (induced demand).

##### 2.1.1.3 Air Passenger Model

An explicit air passenger model is important to understand how the intercity HSR might compete with airlines for the D-FW to Houston travel market. This enhancement also

<sup>1</sup> Texas Department of Transportation (2015), Contract 83-2SDP5008 Work Authorization No. 4, Exhibit B Services to be Provided by the Engineer.

provides for analysis of the access and egress patterns of diverted air passengers. This component was developed by the WSP | Parsons Brinckerhoff team.

### 2.1.1.4 Special Events Model

NCTOG's 2035 long-range transportation plan included a representative corridor for HSR service along I-30 with a station in Arlington to serve the entertainment district that includes Six Flags, AT& T Stadium (home of the Dallas Cowboys), Globe Life Park (home of the Texas Rangers), Six Flags Hurricane Harbor, and the Arlington Conventions Center, among other venues. This component evaluates how the Arlington Station shifts passengers from passenger vehicles to the HSR system for special events, including baseball and football games.

## 2.1.2 Inter-regional Model Enhancements

The Texas Statewide Analysis Model (SAM) has been enhanced with an inter-regional HSR system component. The enhancements also include integration of the SAM outputs used as inputs into the enhanced DFX.

### 2.1.2.1 Mode Choice Expansion

SAM was expanded to include HSR as a mode choice between Dallas and Houston based on TOPRS in order to maintain consistency for the system. For the connect air market (for trips that use a hub airport in one of the metropolitan airports but with an ultimate origin or destination outside the Metroplex), an air itinerary choice model was estimated based on the revealed preferences of current air travelers in the D-FW and Houston air markets. Rail access connect air forecasts produced by the model were added to the inter-urban rail forecasts.

### 2.1.2.2 Intercity Modeling for D-FW to Houston Corridor

An inter-urban HSR ridership forecasting model is included for the TCR. The inter-urban forecast provides anticipated ridership based on the demand between the metropolitan areas of Houston and D-FW.

The model study area includes the 240-mile corridor between D-FW and Houston metropolitan areas and extends 50 miles on either side of the DHSSR corridor. Trip tables were developed using current anonymous cell phone data from AirSage, processed to distinguish between trips made by Texas residents and out-of-state visitors. Trip tables for intercity bus were created from a supply-side analysis of bus schedules with an estimated load factor. Air trip tables were developed from public data available at the Bureau of Transportation Statistics.

### 2.1.2.3 Urban Access to HSR Station in Houston

The travel demand model for the Houston-Galveston Area Council of Governments (H-GAC) was used to evaluate the access and egress from one terminal station in the greater Houston area.

## 2.2 System Integration and Calibration

The applicable model enhancements are integrated into a copy of the DFX model and into a copy of the SAM to forecast HSR ridership, including ridership along the D-FW to Houston corridor, and the impact of HSR system on the other modes at a sufficient level of detail to support the comparison of alternatives, including the No Build Alternative, for the EIS effort of the Project. Testing and calibration of the individual enhancements as well as the fully assembled enhanced model will be documented in the Model Development Report.

## 3 Ridership Input Variables

Ridership forecasting requires a set of input of data to describe an alternate which is defined by a corridor alignment and a combination of stations locations. The alignment alternatives shown in Figure 1 are:

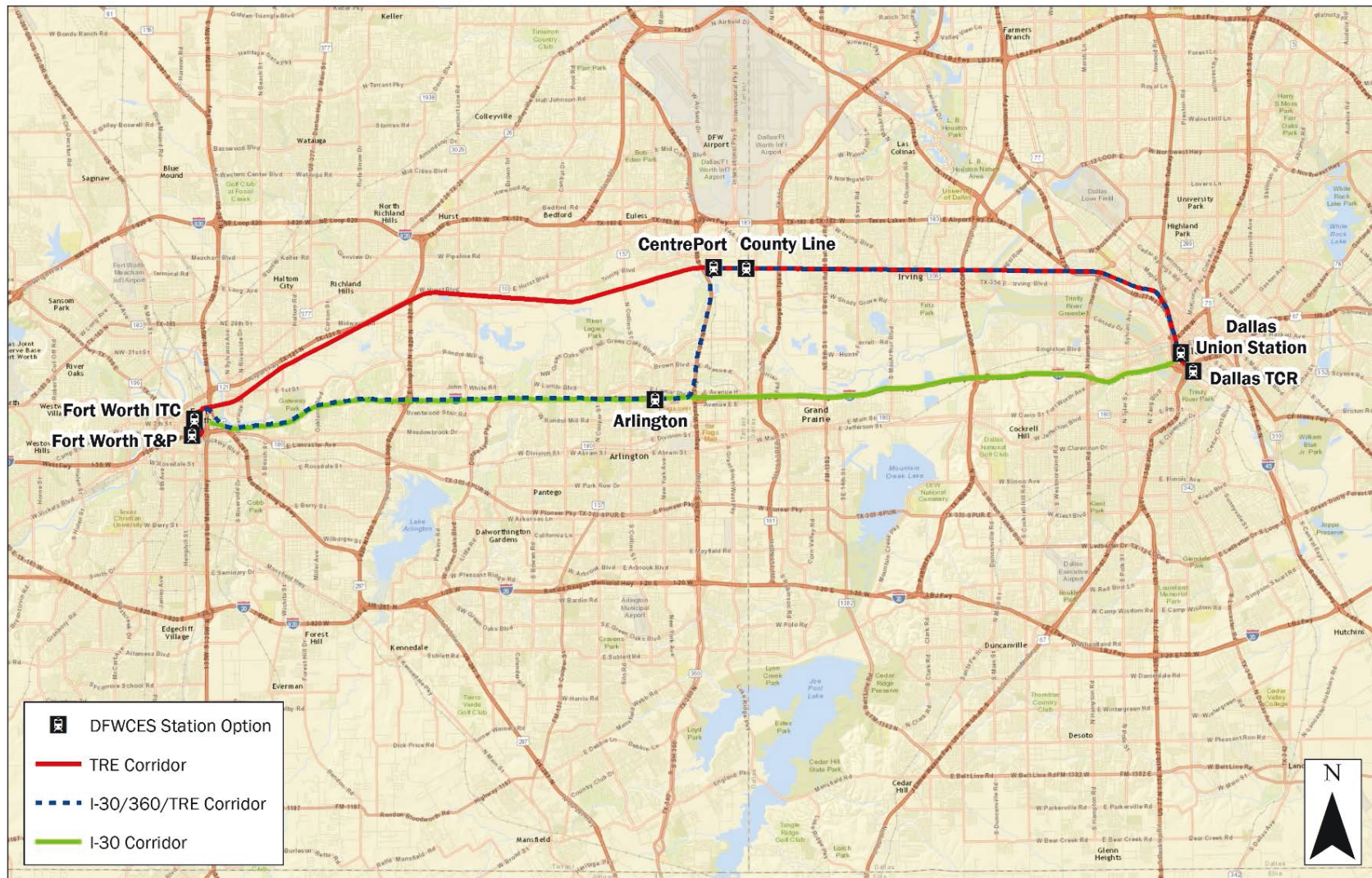
- Trinity Railway Express (TRE) Corridor,
- Interstate 30 (I-30) Corridor, and
- I-30/State Highway 360 (SH 360)/TRE Corridor.

The station options shown in Figure 2 are:

- Fort Worth T & P Station is on the south edge of downtown and a terminal stop on the TRE. Two bus routes serve this station
- Fort Worth Intermodal Transportation Center (ITC) Station is on the southeast side of downtown and the primary terminal station for the TRE. Seventeen local all day and nine peak hour express bus routes serve this station. A free downtown circulator trolley also serves the ITC.
- CentrePort Station is near the Dallas/Tarrant county line in east Fort Worth. The descriptions of the three bus services are provided below in Section 3.1.2.
- Arlington Station is adjacent to I-30. This is a new station that is served by one modified existing express shuttle described below in Section 3.1.2.
- County Line Station is approximately one mile east of CentrePort on the TRE. This a station option is on a CentrePort circulator route and served by a free DFW Airport shuttle comparable to the one serving CentrePort.



FIGURE 2: POTENTIAL STATION OPTIONS FOR THE PROJECT





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- Dallas Union Station is in downtown Dallas and provides connectivity via the Dallas Area Rapid Transit (DART) light rail system and five existing bus routes. A shuttle between Union Station and the proposed Dallas Texas Central Railway (TCR) Station is included in the model for those alternatives that do not include both stations. The shuttle is assumed to be free. This assumption may be adjusted based upon the evaluation for the AA.
- Proposed Dallas TCR Station for the TCR project, located southeast of Union Station, south of I-30 and adjacent to the Union Pacific Railroad. The undeveloped property does not have any existing transit connections. A modification to Dallas Area Rapid Transit (DART) Route 26 is assumed with all alternatives to provide connectivity to Cedars Station on the Red and Blue light rail lines. Cedar Station is approximately 2,100 feet east of the preliminary station location.

The characteristics of the alignment corridors and stations are summarized in the following sections. The appendix to this memo presents for each alternative by corridor and each station the specific characteristics or variables that will be used in the ridership model.

### 3.1 Alignment Variables

For each corridor, a geographic information system (GIS) shapefile was created to link the track alignment with the attributes associated with travel time between stations, local transit modifications and fare. The attributes that do not change across alternatives are called constants. Those attributes that change are the variables and the variables that can be altered to evaluate the impact on ridership are called variants.

#### 3.1.1 Constant Attributes

For the alignments, there are three constants attributes: station locations, connectivity to TOPRS and TCR, and terminal locations.

##### 3.1.1.1 Station Locations

Table 1 indicated the stations being considered for each alternative alignment.



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**TABLE 1: STATIONS CONSIDERED FOR EACH ALIGNMENT WITHIN THE CORRIDORS**

Station Name	Location	New or Existing	Existing Connecting Transit Service	Proposed Connecting Transit Service	Alignment Alternative		
					TRE	I-30	Hybrid
<b>T &amp; P</b>	Downtown Fort Worth	Existing	Bus, Commuter Rail	Local Bus, Commuter Rail	X	X	X
<b>Intermodal Transportation Center</b>	Downtown Fort Worth	Existing	Local and Express Bus, Trolley Commuter Rail, Amtrak	Local and Express Bus, Trolley Commuter Rail, Amtrak	X	X	X
<b>Arlington</b>	Arlington on I-30	New	N/A	Express Bus		X	X
<b>CentrePort</b>	East Fort Worth	Existing	Express Bus, Circulator Bus and Airport Shuttle	Express Bus, Circulator Bus and Airport Shuttle	X	X	X
<b>County Line</b>	Grand Prairie	New	N/A	Circulator Bus, Airport Shuttle			X
<b>Union Station</b>	Downtown Dallas	Existing	Bus, Commuter Rail, Light Rail, Amtrak	Bus, Commuter Rail, Light Rail, Amtrak, and Station Shuttle*	X	X	X
<b>TCR</b>	South Downtown Dallas	New	N/A	Local Bus and Station Shuttle*	X	X	X

Notes: \* Station Shuttle between Union Station and TCR Station for those alternatives that do not include both stations.

The City of Arlington submitted an optional location for its station approximately 5,000 feet west of the location identified by the study team. Since the access to I-30 and the location relative to the Entertainment District are comparable, the ridership analysis did not vary the location of the Arlington station. Figure 2 show the location of the Arlington station sites and major venues in the Entertainment District.

### 3.1.1.2 Connectivity with TOPRS and TCR

All alignments will be connected to TOPRS on the west side of the corridor and TCR on the east side.







### 3.1.1.3 Terminal Locations

The primary terminal stations are the ITC on the west side of the corridor and Dallas Union Station on the east side. There are several alignment options that include terminal stops at the T&P in Fort Worth and the proposed TCR station in Dallas.

### 3.1.2 Variable Attributes

Attributes that may change depending upon the alignment alternative are called variable attributes. The primary variable attribute for the Project is local transit modifications.

Modifications to bus routes included in *Mobility 2040*, are included in the model if necessary to provide a link to the public transportation networks operated by the Fort Worth Transportation Authority (The T) and/or DART. Each transportation authority operates a bus system and jointly operates the TRE, the commuter train service between downtown Fort Worth and Downtown Dallas. DART also has a light rail network that is laid out in spokes from downtown shown in Figure 3.

FIGURE 3: DART LIGHT RAIL NETWORK



Source: <https://www.dart.org/maps/printrailmap.asp>, Accessed March 18, 2016

The following sections summarizes the transit route modifications that are in the alignment shapefiles for those alternatives that include the stations listed below. No modifications are included for the five routes serving the T&P nor the 28 routes serving the ITC.

### 3.1.2.1 CentrePort Station

The CentrePort station on the TRE provides a connection to three separate bus operations:

- The Arlington MAX (MAX) is sponsored by City of Arlington, Arlington Chamber of Commerce, University of Texas Arlington, DART, The T, and the TRE. The service is an express bus (DART, Route 221) that connects the University of Texas at Arlington, downtown Arlington and the Entertainment District with the TRE station at CentrePort in east Fort Worth. A single trip fare is \$5.00.<sup>2</sup> This service is included in the DFX.
- The CentrePort Circulator (The T, Route 30) is a three-route network that serves CentrePort, a 1,300-acre mixed use development south of DFW Airport. The development has over 100 tenants with land uses that include multi-family, retail, distribution, corporate offices, and call centers.<sup>3</sup> This service is included in the DFX.
- DFW Airport operates a free shuttle service between CentrePort Station and the south remote parking lot. Passengers then transfer to one of three shuttles goes directly to one or more terminals.

The TRE corridor alternatives do not require any changes to the existing bus service. The I-30 corridor requires a modification to the MAX service to include the Arlington station. The I-30/SH 360/TRE alternative requires modification to the MAX route for those alternatives that include the Arlington station.

### 3.1.2.2 County Line

The County Line station is a station on the I-30/SH 360/TRE alignment corridor located approximately one mile east of CentrePort on the TRE, between Trinity Boulevard (Fort Worth) and Valley View Lane (Irving, north of TRE) / Roy Orr Boulevard (Grand Prairie, south of TRE). The horizontal curve between the SH 360 leg and the TRE leg of the I-30/SH 360/TRE alignment does not permit the use of CentrePort station, even with a speed reduction to 40 mph.

The CentrePort Circulator East Loop route passes the proposed station location on Trinity Boulevard. It is assumed this route can be used to access the commuter rail at CentrePort Station.

- A new free DFW Airport Shuttle is assumed in all alternatives with the County Line station to provide the comparable service to DFW Airport's south remote parking lot that is currently in place at CentrePort Station.
- Extending the existing DART bus service from the West Irving Station, 2 miles east of the County Line station, was considered but not included in the ridership forecasting. The

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<sup>2</sup> <http://www.ridethemax.com/>

<sup>3</sup> Fort Worth Chamber of Commerce, [http://www.fortworthchamber.com/chamber/old/eco/industrial\\_bus.html#4](http://www.fortworthchamber.com/chamber/old/eco/industrial_bus.html#4)

existing commuter rail service provides the connection to these bus routes at a lower cost and the local routes do not serve a major traffic generator, such as DFW Airport.

The I-30/SH 360/TRE Corridor is the only one that includes the County Line station.

### 3.1.2.3 Arlington

The Arlington Station has two potential locations that are being evaluated as part of the station planning task. Road access and parking capacity are comparable; thus ridership is assumed to be equivalent. The location used for the ridership modeling is on the south side of I-30 between Legends Way and Ballpark Way just north of the Arlington Convention Center. The parking lot serves as overflow parking for both the convention center and the sporting venues.

The MAX route is modified to include Arlington station for all of the I-30 alternatives and the I-30/SH 360/TRE alternatives that include the Arlington Station. The route modification provides the link to UT Arlington, downtown Arlington and to DFW Airport through the transfer to the DFW Airport Shuttle at CentrePort station.

The City of Arlington does not have a public transportation system and no new service is included in Mobility 2040. There is a three bus circulator within the University of Texas-Arlington campus and a four shuttle circulator that serves the Entertainment District. These services are not included in the ridership model due to the limited service areas.

### 3.1.2.4 Dallas Union Station

The intermodal Dallas Union Station includes commuter and light rail as well as five bus routes. The Central Business District (CBD) West Transfer Center is eight blocks northeast of the station.

For those alternatives that have Dallas Union Station as the terminal station, an express shuttle to the proposed TCR Station is included to provide the connection. The shuttle is assumed to be free or included in the price of the fare.

### 3.1.2.5 TCR Station

The TCR Station is proposed as a mixed use development with a substantial amount of parking on the south side of downtown Dallas on undeveloped property adjacent the Union Pacific Railroad. The current proposed location is approximately 0.7 mile southeast of Union Station. For more information on the Dallas/Houston High Speed Rail project (see [www.texascentral.com](http://www.texascentral.com)).

For those alternatives that have the TCR Station as the terminal station and do not include a stop at Union Station, an express shuttle to the TCR Station is included to provide the connection. The shuttle is assumed to be free or included in the price of the fare.



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The modification to DART, Route 26, is included in all alternatives, whether there is a stop at the TCR Station or not, to provide a bus connection to the light rail service at Cedars Station approximately 2,100 feet east of the TCR Station.

### 3.1.3 Variant Attributes

Attributes that may be changed to compare with impact of the change the ridership forecast are called variants. The variants are operating speed and fare structure.

#### 3.1.3.1 Operating Speed

Operation speed is a key variant for the ridership forecasting. For each alignment corridor, travel times are generated between stations for three operating speeds and two trainset technologies shown in Table 2. The travel times are developed using geometrically defined horizontal and vertical alignment for each corridor.

**TABLE 2: TRAINSET TECHNOLOGY BY OPERATING SPEED**

Trainset Technology	Maximum Operating Speed		
	90 mph	125 mph	220 mph
Diesel-Electric	X	X	
Electric		X	X

Two technologies are considered for 125 mph to compare the anticipated improvement in travel time but higher capital cost for an electric propulsion system compared to the lower capital cost and slower travel time for a diesel-electric (diesel) propulsion system.

Travel times for the TRE and the I-30/SH 360/ TRE corridors are summarized in Table 3 and Table 4 below for early review. Note, the I-30 corridor travel times will be included in the final version of this technical memorandum.

For each corridor, a series of stopping patterns (combinations of termini and intermediate stops) are evaluated in the eastbound (EB) and westbound (WB) directions. The end-to-end travel times shown in Table 3 and Table 4 include a one minute dwell time at each intermediate station. Total travel times are shown for each stopping patterns, by technology and maximum operating speed in a combination of four trainsets.



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**TABLE 3: TRE CORRIDOR TRAVEL TIMES**

Stopping Pattern		220 mph Shinkansen		125 mph ICE ED		125 mph Pendolino		90 mph Diesel	
		EB	WB	EB	WB	EB	WB	EB	WB
1	T&P, ITC, CentrePort, Dallas Union St, TCR	0:27:23	0:27:23	0:27:45	0:27:52	0:29:31	0:29:39	0:43:09	0:44:45
4	ITC, CentrePort, Dallas Union St, TCR	0:25:01	0:25:01	0:25:27	0:25:33	0:26:58	0:27:06	0:40:01	0:41:38
7	ITC Centreport, Dallas Union St	0:22:29	0:22:28	0:22:59	0:23:03	0:24:19	0:24:18	0:36:49	0:38:19
9	ITC Centreport, TCR	0:23:39	0:23:41	0:24:09	0:24:14	0:25:29	0:25:41	0:38:12	0:39:58

**TABLE 4: I-30/SH 360/TRE HYBRID CORRIDOR TRAVEL TIMES**

Stopping Pattern		220 mph Shinkansen		125 mph ICE ED		125 mph Pendolino		90 mph Diesel	
		EB	WB	EB	WB	EB	WB	EB	WB
2	T&P, ITC, Arlington, County Line, Dallas Union St, TCR	0:34:19	0:34:23	0:34:06	0:34:19	0:36:15	0:36:34	0:51:17	0:52:44
5	ITC, Arlington, Dallas Union St, TCR	0:29:17	0:29:27	0:29:10	0:29:25	0:30:45	0:31:22	0:44:02	0:45:14
8	ITC, Arlington, Dallas Union St	0:26:44	0:26:53	0:26:42	0:26:55	0:28:06	0:28:34	0:40:50	0:42:25
11	ITC, Arlington, TCR	0:27:56	0:28:08	0:27:53	0:28:07	0:29:16	0:29:57	0:42:14	0:44:02
16	ITC, County Line, Dallas Union St, TCR	0:29:19	0:29:19	0:29:10	0:29:17	0:31:01	0:31:12	0:45:23	0:46:33
17	ITC, Arlington, County Line, Dallas Union St	0:28:47	0:28:50	0:28:39	0:28:49	0:30:33	0:30:43	0:44:39	0:45:59
18	ITC, Arlington, County Line, TCR	0:29:58	0:30:05	0:29:49	0:30:01	0:31:42	0:32:07	0:46:02	0:47:34
19	ITC, County Line, TCR	0:27:57	0:28:00	0:27:52	0:27:59	0:29:31	0:29:48	0:43:34	0:44:49

### 3.1.3.2 Fare Structure

The draft base fare structure will be provided as a separate technical memorandum. Fares are considered a variant and will be modified in some of the ridership forecasting runs to assess the impact on ridership.

The estimated fares are based on United States precedents from other operating systems in Texas, Maryland, California as well as other high speed rail studies (TOPRS, and California High Speed Rail) for trips of a similar length to the Project (around 30 miles) in urban areas.

It should be noted that the overall service characteristics including potential speed are considered; however travel time saving estimates were not available. As a result, the value of time savings are not factored in the analysis. Similarly, no consideration was given to differences in the operating costs or service plans between the rail technologies, and no surveys were undertaken so no adjustment was made for unique characteristics of the Metroplex.

Being based upon subsidized precedents and without the benefit of detailed surveys these fares will not be operating profit/ net revenue maximizing in the way an unsubsidized concessionaire or private operator would require. Thus it is likely that the ridership levels forecasted will be higher than those forecast by such a concessionaire (or as part of a shadow bid estimate of the viability of a Public Private Partnership/Comprehensive Development Agreement.

The following are included in the base fare assumptions:

- All fares one way
- 2015 prices
- Average fare makes allowances for advance purchase discounts
- No difference in fare charged from/to Dallas Union Station or TCR Station.
- No difference in fare from/to Fort Worth T&P or ITC.
- Once boarded there is a charge minimum fare (i.e. Dallas TCR Station to Union Station).

As described in the sections below, fare assumptions varied by the speed of the system being measured.

### 220 mph Capable Alternatives

Based on the California High Speed Rail Metropolitan Transportation Commission zones and TOPRS, the fare estimation for the 220 mph alternatives use the following assumptions:

- \$15.00 boarding fee + \$0.30/mile for non-business and \$0.45/mile for business use.
- Minimum fare of \$19.50
- Incremental cost of through trip from Houston \$0.30/mile for non-business and \$0.45/mile for business

## 125mph Capable Alternatives

Based on the Northeast Corridor regional pricing and TOPRS, the fare estimation for the 125 mph alternatives use the following assumptions:

- \$10.00 boarding fee + \$0.30/mile for non-business and \$0.45/mile for business.
- Minimum Fare of \$14.50.

## 90 mph Capable Alternatives

Based on Caltrain, the California commuter rail line on the San Francisco Peninsula and in the Santa Clara Valley, and the Maryland Area Regional Commuter (MARC) 2 Zone system, the 90 mph Capable Alternatives assumes \$4.00 per zone

## Fare Table Summary

Table 5 summarizes the results of the fare analysis for the Project. For the 220 mph alternatives, fares range from \$19.50, non-business class from Dallas to CentrePort to \$28.50 from Dallas to Fort Worth, within an additional \$13.50 for passengers originating in Houston. For the 125 mph alternatives, fares range from \$14.50 to \$23.50. At 90 mph, the fares range between \$4.00 and \$8.00.

**TABLE 5: FARE SUMMARY TABLE**

Speed	220 mph Alternatives		125 mph Alternatives		90 mph Alternatives	
Type	Non-Business	Business	Non-Business	Business	Non-Business	Business
Dallas Union/TCR Station to:						
CentrePort	\$19.50	\$21.75	\$14.50	\$16.75	\$4.00	\$4.00
Fort Worth	\$24.00	\$28.50	\$19.00	\$23.50	\$8.00	\$8.00
Additional Fare charged to Passengers originating in Houston:						
CentrePort	+\$4.50	+\$6.75	-	-	-	-
Fort Worth	+\$9.00	+\$13.50	-	-	-	-

## 3.2 Station Variables

Each station is defined as a point shapefile with group of attributes at that are defined for each alternative. Those attributes that change are the variables that can be altered to evaluate the impact on ridership are called variants.

### 3.2.1 Constant Attributes

The attributes that do not change across alternatives for a specific station include:





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- Rail Transit Connectivity. The status for existing commuter and light rail is maintained. *Mobility 2040* does not include any new rail service to the existing stations.
- Distance and Walk Times for Park and Ride/Kiss and Ride. The number of parking spaces is a variant; however the assumption is additional parking will be accomplished by construction of a garage. Therefore the distance to the mid-point of the parking area does not change. The location of the kiss and ride drop-off points remain the same.
- Transit Modifications. Where transit modifications are proposed, the peak and off-peak headways remain the same across the alternatives.

### 3.2.2 Variable Attributes

The following attributes change as a result of operating speed or station combination or a variable used to define the station:

- Station Type. A station is either elevated or at-grade, depending on the operating speed and/or alignment corridor. The walk time from station entrance to platform varies with station type.
- Total Walking Time. This value is the sum of park and ride walk time plus station to platform walk time. The station type changes, this value will also change.

### 3.2.3 Variant Attributes

The following attributes may be modified to compare the impact of the change on the ridership forecast within a specific alternative:

- Parking cost. As parking costs increase, passengers may shift access to the stations to transit or may shift mode to commuter rail.
- Number of parking spaces. A change in the number of parking spaces may shift passenger access to or away from transit.
- Transit Fares. The current fares for connecting services are used as for the initial run of each alternative. A change in transit fare may shift passenger access to or away from transit.

DFWCES Alternative Corridor Characteristics

Characteristics	TRE Alternative			I-30			I-30/SH360/TRE (hybrid)		
Speed	90 mph	125 mph	220 mph	90 mph	125 mph	220 mph	90 mph	125 mph	220 mph
Station Combinations	#1 Ft.Worth T&P /Ft. Worth ITC/ CentrePort/ Dallas Union Station/ Dallas TCR	#1 Ft.Worth T&P /Ft. Worth ITC/ CentrePort/ Dallas Union Station/ Dallas TCR	#1 Ft.Worth T&P /Ft. Worth ITC/ CentrePort/ Dallas Union Station/ Dallas TCR	#3 Ft. Worth T&P /Ft. Worth ITC/ Arlington/ Dallas Union Station /Dallas TCR	#3 Ft. Worth T&P /Ft. Worth ITC/ Arlington/ Dallas Union Station /Dallas TCR	#3 Ft. Worth T&P /Ft. Worth ITC/ Arlington/ Dallas Union Station /Dallas TCR	#2 Ft. Worth T&P/ Ft. Worth ITC/ Arlington / County Line/Dallas Union Station / Dallas TCR	#2 Ft. Worth T&P/ Ft. Worth ITC/ Arlington / County Line/Dallas Union Station / Dallas TCR	#2 Ft. Worth T&P/ Ft. Worth ITC/ Arlington / County Line/Dallas Union Station / Dallas TCR
	#4 Ft. Worth ITC/ CentrePort/ Dallas Union Station / Dallas TCR	#4 Ft. Worth ITC/ CentrePort/ Dallas Union Station / Dallas TCR	#4 Ft. Worth ITC/ CentrePort/ Dallas Union Station / Dallas TCR	#6 Ft. Worth ITC/ Arlington / Dallas Union Station /Dallas TCR	#6 Ft. Worth ITC/ Arlington / Dallas Union Station /Dallas TCR	#6 Ft. Worth ITC/ Arlington / Dallas Union Station /Dallas TCR	#5 Ft. Worth ITC/ Arlington / Dallas Union Station / Dallas TCR	#5 Ft. Worth ITC/ Arlington / Dallas Union Station / Dallas TCR	#5 Ft. Worth ITC/ Arlington / Dallas Union Station / Dallas TCR
	#7 Ft. Worth ITC/ CentrePort/ Union Station	#7 Ft. Worth ITC/ CentrePort/ Union Station	#7 Ft. Worth ITC/ CentrePort/ Union Station	#9 Ft. Worth ITC/ Arlington / Dallas Union Station	#9 Ft. Worth ITC/ Arlington / Dallas Union Station	#9 Ft. Worth ITC/ Arlington / Dallas Union Station	#8 Ft. Worth ITC/ Arlington /Dallas Union Station	#8 Ft. Worth ITC/ Arlington /Dallas Union Station	#8 Ft. Worth ITC/ Arlington / Dallas Union Station
	#10 Ft. Worth ITC/ CentrePort/ Dallas TCR	#10 Ft. Worth ITC/ CentrePort/ Dallas TCR	#10 Ft. Worth ITC/ CentrePort/ Dallas TCR	#12 Ft. Worth ITC/ Arlington/Dallas TCR	#12 Ft. Worth ITC/ Arlington/Dallas TCR	#12 Ft. Worth ITC/ Arlington/Dallas TCR	#11 Ft. Worth ITC/ Arlington /Dallas TCR	#11 Ft. Worth ITC/ Arlington /Dallas TCR	#11 Ft. Worth ITC/ Arlington /Dallas TCR
							#16 Ft. Worth ITC/ County Line/ Dallas Union Station / Dallas TCR	#16 Ft. Worth ITC/ County Line/ Dallas Union Station / Dallas TCR	#16 Ft. Worth ITC/ County Line/ Dallas Union Station / Dallas TCR
							#17 Ft. Worth ITC/ Arlington /County Line/Dallas Union Station	#17 Ft. Worth ITC/ Arlington /County Line/Dallas Union Station	#17 Ft. Worth ITC/ Arlington /County Line/Dallas Union Station
							#18 Ft. Worth ITC/ Arlington /County Line/Dallas TCR	#18 Ft. Worth ITC/ Arlington /County Line/Dallas TCR	#18 Ft. Worth ITC/ Arlington /County Line/Dallas TCR
							#19 Ft. Worth ITC/ County Line/Dallas TCR	#19 Ft. Worth ITC/ County Line/Dallas TCR	#19 Ft. Worth ITC/ County Line/Dallas TCR
	Trainset	Diesel N/A	Diesel Electric	N/A Electric	Diesel N/A	Diesel Electric	N/A Electric	Diesel N/A	Diesel Electric
	1-seat ride (Ft.Worth to Houston)	N/A	N/A	Yes	N/A	N/A	Yes	N/A	N/A
	Shared Use	Yes (freight, TRE, TxRail, TRE Express, Amtrak)	Yes (freight, TRE, TxRail, TRE Express, Amtrak)	N/A	Yes (freight, TRE, TxRail, TRE Express, Amtrak)	Yes (freight, TRE, TxRail, TRE Express, Amtrak)	N/A	Yes (freight, TRE, TxRail, TRE Express, Amtrak)	Yes (freight, TRE, TxRail, TRE Express, Amtrak)
Frequency	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)	Peak - 30 minutes (6 to 9 AM, 4 to 7 PM)
	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes	Non-peak -60 minutes
Trip Time	See alternative-specific sheets.								
No-Build	Consists of all existing and planned services in 2040 Plan, without DFWCES.								

Ridership Alternative	Corridor	Station						
		FT. Worth T&P	Fort Worth ITC	Centreport	County Line	Arlington	Dallas Union Station	TCR
1	TRE	X	X	X			X	X
2	Hybrid	X	X		X	X	X	X
3	I-30	X	X			X	X	X
4	TRE		X	X			X	X
5	Hybrid		X			X	X	X
6	I-30		X			X	X	X
7	TRE		X	X			X	
8	Hybrid		X			X	X	
9	I-30		X			X	X	
10	TRE		X	X				X
11	Hybrid		X			X		X
12	I-30		X			X		X
16	Hybrid		X		X		X	X
17	Hybrid		X			X	X	
18	Hybrid		X		X	X		X
19	Hybrid		X		X			X

13,14,15 - Not Used

Alternative	Station Stop	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station Entrance to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)	
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?													Avg Discounted Fare
TRE Alt 1-90	Texas & Pacific (T&P)	90	8.00	8.00	Start	2:06	10036	Yes	1.33	No			Yes	1.30	No	NA	Yes	No	386	0	X		0	0.100	2.0	1.5	0.004	0.1
TRE Alt 1-90	Intermodal Transportation Center	90			2:08	19:15	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
TRE Alt 1-90	CentrePort Station	90	4.00	4.00	17:41	18:05	30251	Yes	1.33	No			Yes	1.30	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.009	0.2
TRE Alt 1-90	Union Station	90	N/A	N/A	18:09	2:19	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-90	Texas Central Railway – Dallas	90	N/A	N/A	2:11	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

# from NCTCOG 2040 DFX Model

\* Based on Tarrant County 1 zone discounted monthly pass rate

<http://www.trinityrailwayexpress.org/farezones.html>

^^New connection to Cedars Station

The T Park and Ride parking space source:

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Alternative	Station NameStation Stop	Fare and Travel Time							Station TAZ	Transit Connectivity								ProposedParking				Station Type		Walk Time Station Entrance to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)	
										Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?													Avg Discounted Fare
TRE Alt 1-125	T&P	125	19.00	23.50	Start	1:18	Start	1:33	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1
TRE Alt 1-125	Intermodal Transportation Center	125			1:18	11:05	1:33	11:49	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 1-125	CentrePort Station	125	14.50	16.75	11:00	10:59	11:29	11:29	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 1-125	Union Station	125	N/A	N/A	10:59	1:30	11:50	1:48	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-125	Texas Central Railway – Dallas	125	N/A	N/A	1:28	Start	1:39	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000			X	0.5	0.104	2.1	2	0.016	0.3

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^^New connection to Cedars Station

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								ProposedParking				Station Type		Walk Time Station Entrance to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
TRE Alt 1-220	T&P	220	24.00	28.50	Start	1:22	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1
TRE Alt 1-220	Intermodal Transportation Center	220			1:22	10:36	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 1-220	CentrePort Station	220	19.50	21.75	10:29	10:52	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 1-220	Union Station	220			11:00	1:33	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-220	Texas Central Railway – Dallas	220			1:32	Start	7817	YES	1.82	Yes - #26^^	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Stop	Fare and Travel Time					City	Station TAZ	Transit Connectivity								ProposedParking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 4-90	Intermodal Transportation Center	90	8.00	8.00	Start	19:14	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
TRE Alt 4-90	CentrePort Station	90			17:41	18:05	Fort Worth	30251	Yes	1.33	No			Yes	1.30	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.009	0.2
TRE Alt 4-90	Union Station	90	4.00	4.00	18:09	2:19	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-90	Texas Central Railway – Dallas	90			2:11	Start	Dallas	7817	YES	1.82	Yes - #26^^	30	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time							Station TAZ	Transit Connectivity								ProposedParking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
										Available?	Avg* Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 4-125	Intermodal Transportation Center	125	19.00	23.50	Start	11:04	Start	11:49	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 4-125	CentrePort Station	125			11:00	10:59	11:29	11:29	30251	Yes	1.33	No			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 4-125	Union Station	125	14.50	16.75	10:59	1:30	11:50	1:48	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-125	Texas Central Railway – Dallas	125			1:28	Start	1:39	Start	7817	YES	1.82	Yes - #26^^	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 4-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:36	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 4-220	CentrePort Station	220			10:29	10:52	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 4-220	Union Station	220	19.50	21.75	11:00	1:33	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-220	Texas Central Railway – Dallas	220			1:32	Start	7817	YES	1.82	Yes - #26^^	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								ProposedParking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^			
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulato n Time (min)	Distance (mi)	Walk Time (min)	
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare													
TRE Alt 7-90	Intermodal Transportation Center	90	8.00	8.00	Start	19:14	40789	Yes	1.33	No	NA	NA	Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
TRE Alt 7-90	CentrePort Station	90			17:41	18:05	30251	Yes	1.33	No	NA	NA	Yes	1.30	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.009	0.2	
TRE Alt 7-90	Union Station	90	4.00	4.00	18:08	Start	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3	
	TCR is not a stop on the 'run' but the information still needs to be attached to the station																												
TRE Alt 7-90	Texas Central Railway – Dallas						7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	

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^^New connection to Cedars Station  
\*\* New shuttle connection to TCR  
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Alternative	Station Name	Fare and Travel Time							City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*		Kiss and Ride^			
											Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 7-125	Intermodal Transportation Center	125	19.00	23.50	Start	11:04	Start	11:49	Fort Worth	40789	Yes	1.33	N	NA	NA	Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 7-125	CentrePort Station	125			11:00	10:59	11:29	11:29	Fort Worth	30251	Yes	1.33	N	NA	NA	Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 7-125	Union Station	125	14.50	16.75	10:59	Start	11:50	Start	Dallas	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
	TCR is not a stop on the 'run' but the information still needs to be attached to the station																														
TRE Alt 7-125	Texas Central Railway – Dallas								Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 7-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:36	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 7-220	CentrePort Station	220			10:29	10:52	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 7-220	Union Station	220	19.50	21.75	11:00	Start	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3

TCR is not a stop on the 'run' but the information still needs to be attached to the station

TRE Alt 7-220	Texas Central Railway – Dallas						7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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# from NCTCOG 2040 DFX Model  
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^^New connection to Cedars Station  
\*\* New shuttle connection to TCR  
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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulato n Time (min)	Distance (mi)	Walk Time (min)
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
TRE Alt 10-90	Intermodal Transportortion Center	90	8.00	8.00	Start	19:14	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
TRE Alt 10-90	CentrePort Station	90					17:41	19:44	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2
TRE Alt 10-90	Texas Central Railway – Dallas	90	4.00	4.00	19:31	Start	7817	Yes	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
								YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
										Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
TRE Alt 10-125	Intermodal Transportation Center	125	19.00	23.50	Start	11:04	Start	11:49	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 10-125	CentrePort Station	125			11:00	12:10	11:29	12:52	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 10-125	Texas Central Railway – Dallas	125	14.50	16.75	12:09	Start	13:00	Start	7817	Yes	1.82	New HSR Shuttle**	30	60	NO		NO	YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
										YES	1.82	Yes - #26^^	35	35	NO		NO	YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
								Available?	Avg <sup>n</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
TRE Alt 10-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:36	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
TRE Alt 10-220	CentrePort Station	220			10:29	12:05	30251	Yes	1.33	N			Yes	1.30	No	NA	Yes	Yes	1016	0		X	0.5	0.124	2.5	2	0.009	0.2
TRE Alt 10-220	Texas Central Railway – Dallas	220	19.50	21.75	12:10	Start	7817	Yes	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
								YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
IH 10 Alt 3-90	T&P						Fort Worth	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0	X		0	0.100	2.0	1.5	0.004	0.1
IH 10 Alt 3-90	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
IH 10 Alt 3-90	Arlington						Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 10 Alt 3-90	Union Station						Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 10 Alt 3-90	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

# from NCTCOG 2040 DFX Model  
\* Based on Tarrant County 1 zone discounted monthly pass rate  
<http://www.trinityrailwayexj> Assumed  
^^New connection to Cedars Station

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Alternative	Station Name		Fare and Travel Time						City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Station to Platform							
			Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)			Pendolino Westbound Travel Time (min)	Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated	Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
												Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 3-125	T&P							Fort Worth	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1		
IH 30 Alt 3-125	Intermodal Transportation Center							Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9		
IH 30 Alt 3-125	Arlington							Arlington	9903			Yes -Max	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3		
IH 30 Alt 3-125	Union Station							Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3		
IH 30 Alt 3-125	Texas Central Railway – Dallas							Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3		

# from NCTCOG 2040 DFX Model

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<http://www.trinityrailwayexpress.org/farezones.html>

^^New connection to Cedars Station

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Alternative	Fare and Travel Time						City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
	Station Name	Speed (mph)	Fare (Non-Business) From Dallas	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 3-220	T&P						Fort Worth	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1
IH 30 Alt 3-220	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 3-220	Arlington						Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 3-220	Union Station						Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 3-220	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 6-90	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 6-90	Arlington						Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-90	Union Station						Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
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											Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 6-125	Intermodal Transportation Center								Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 6-125	Arlington								Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-125	Union Station								Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 6-125	Texas Central Railway – Dallas								Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
IH 30 Alt 6-220	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 6-220	Arlington						Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-220	Union Station						Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 6-220	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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^^New connection to Cedars Station  
  
The T Park and Ride parking space source:  
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Alternative	Fare and Travel Time						City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
	Station Name	Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
									Available?	Avg.# Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 9-90	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 9-90	Arlington						Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-90	Union Station						Dallas	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is not a stop on the 'run' but the information still needs to be attached to the station																													
IH 30 Alt 9-90	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time							City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^			
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*		Kiss and Ride^				
											Available?	Avg.# Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)	
IH 30 Alt 9-125	Intermodal Transportation Center								Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 9-125	Arlington									Arlington	9903			Yes - MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-125	Union Station								Dallas	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3	
TCR is not a stop on the 'run' but the information still needs to be attached to the station																																
IH 30 Alt 9-125	Texas Central Railway – Dallas								Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	

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		Speed (mph)	Fare (Non-Business) From Dallas	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulator Time (min)	Distance (mi)	Walk Time (min)
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
IH 30 Alt 9-220	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 9-220	Arlington						Arlington	9903	Yes	1.33	Yes for MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-220	Union Station						Dallas	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is not a stop on the 'run' but the information still needs to be attached to the station																													
IH 30 Alt 9-220	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
IH 30 Alt 12-90	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 12-90	Arlington						Arlington	9903			Yes - Max	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-90	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
												Yes - #26^^	35	35															

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Alternative	Station Name	Fare and Travel Time							City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare Business From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)	
											Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?													Avg Discounted Fare
IH 30 Alt 12-125	Intermodal Transportation Center								Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 12-125	Arlington								Arlington	9903			Yes- MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-125	Texas Central Railway – Dallas								Dallas	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Alternative	Station Name	Fare and Travel Time					City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas	Fare Business From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)			Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
									Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
IH 30 Alt 12-220	Intermodal Transportation Center						Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
IH 30 Alt 12-220	Arlington						Arlington	9903			Yes for MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-220	Texas Central Railway – Dallas						Dallas	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
											Yes - #26^^	35	35																

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 2-90	T&P	90	8.00	8.00	Start	2:25	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0	X		0	0.100	2.0	1.5	0.004	0.1
Hybrid Alt 2-90	Intermodal Transportation Center	90			2:26	17:35	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 2-90	Arlington	90			17:21	9:14	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 2-90	County Line	90			8:25	17:11		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 2-90	Union Station	90	4.00	4.00	16:54	2:19	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-90	Texas Central Railway – Dallas	90			2:11	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time							City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
											Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 2-125	T&P	125	19.00	23.50	Start	1:59	Start	2:03	Fort Worth	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1
Hybrid Alt 2-125	Intermodal Transportation Center	125			1:59	10:51	2:03	11:38	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 2-125	Arlington	125			10:42	5:35	11:10	6:11	Arlington	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 2-125	County Line	125			5:33	10:24	6:11	10:54	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 2-125	Union Station	125	14.50	16.75	10:24	1:30	11:12	1:48	Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-125	Texas Central Railway – Dallas	125			1:28	Start	1:39	Start	Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 2-220	T&P	220	24.00	28.50	Start	1:59	10036	Yes	1.33	N			Yes	1.30	No	NA	Yes	No	386	0		X	0.5	0.100	2.0	1.5	0.004	0.1
Hybrid Alt 2-220	Intermodal Transportation Center	220			1:59	10:51	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 2-220	Arlington	220			10:40	5:42	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 2-220	County Line	220			5:42	10:17		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 2-220	Union Station	220	19.50	21.75	10:25	1:34	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-220	Texas Central Railway – Dallas	220			1:33	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
Hybrid Alt 5-90	Intermodal Transportation Center	90	8.00	8.00	Start	17:34	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 5-90	Arlington	90			17:21	23:51	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 5-90	Union Station	90	4.00	4.00	22:30	2:19	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-90	Texas Central Railway – Dallas	90			2:11	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

# from NCTCOG 2040 DFX Model  
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<http://www.trinityrailwayexpress.org/farezones.html>  
^^ New connection to Cedars Station

The T Park and Ride parking space source:  
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Alternative	Station Name	Fare and Travel Time							Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
										Available?	Avg <sup>a</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 5-125	Intermodal Transportation Center	125	19.00	23.50	Start	10:50	Start	11:38	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		x	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 5-125	Arlington	125			10:42	15:05	11:10	15:56	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 5-125	Union Station	125	14.50	16.75	15:00	1:30	15:56	1:48	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-125	Texas Central Railway – Dallas	125			1:28	Start	1:39	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 5-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:51	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 5-220	Arlington	220			10:40	15:02	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 5-220	Union Station	220	19.50	21.75	15:04	1:34	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-220	Texas Central Railway – Dallas	220			1:33	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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Alternative	Station Name	Fare and Travel Time					City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
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									Available?	Avg.* Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 8-90	Intermodal Transportation Center	90	8.00	8.00	Start	17:34	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 8-90	Arlington	90			17:21	23:51	Arlington	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 8-90	Union Station	90	4.00	4.00	22:29	Start	Dallas	7494	Yes	1.82	New HSR Shuttle**	35	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is a stop on the 'run' but the information still needs to be attached to the station																													
Hybrid Alt 8-90	Texas Central Railway – Dallas	90					Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)			Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
											Available?	Avg.* Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 8-125	Intermodal Transportation Center	125	19.00	23.50	Start	10:50	Start	11:38	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 8-125	Arlington	125			10:42	15:05	11:10	15:56	Arlington	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 8-125	Union Station	125	14.50	16.75	15:00	Start	15:56	Start	Dallas	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is a stop on the 'run' but the information still needs to be attached to the station																															
Hybrid Alt 8-125	Texas Central Railway – Dallas								Dallas	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 8-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:51	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 8-220	Arlington	220			10:40	15:02	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 8-220	Union Station	220	19.50	21.75	15:04	Start	7494	Yes	1.82	New HSR Shuttle**	30	60	Yes	1.82	Yes	1.82	yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is a stop on the 'run' but the information still needs to be attached to the station																												
Hybrid Alt 8-220	Texas Central Railway – Dallas						7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 11-90	Intermodal Transportation Center	90	8.00	8.00	Start	17:34	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 11-90	Arlington	90			17:21	25:28	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 11-90	Texas Central Railway – Dallas	90	4.00	4.00	23:53	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Hybrid Alt 11-125	Intermodal Transportation Center	125	19.00	23.50	Start	10:50	Start	11:38	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 11-125	Arlington	125			10:42	16:17	11:10	17:19	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 11-125	Texas Central Railway – Dallas	125	14.50	16.75	16:11	Start	17:06	Start	7817	YES	1.33	New HSR Shuttle**	30	60	No		No		Yes	Yes	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
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Hybrid Alt 11-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:51	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 11-220	Arlington	220			10:40	16:17	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 11-90	Texas Central Railway – Dallas	220	19.50	21.75	16:16	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Hybrid Alt 16-90	Intermodal Transportation Center	90	8.00	8.00	Start	25:03	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 16-90	County Line	90			24:18	17:11		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-90	Union Station	90	4.00	4.00	16:54	2:19	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-90	Texas Central Railway – Dallas	90			2:11	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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<http://www.trinityrailwayexpress.org/farezones.html>  
^^New connection to Cedars Station

The T Park and Ride parking space source:  
[http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917\\_FINAL-REV\\_Overview-of-Services.pdf](http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917_FINAL-REV_Overview-of-Services.pdf)

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Alternative	Station Name	Fare and Travel Time							Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
										Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 16-125	Intermodal Transportation Center	125	19.00	23.50	Start	15:23	Start	16:30	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 16-125	County Line	125			15:18	10:24	16:10	10:54		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-125	Union Station	125	14.50	16.75	10:24	1:30	11:12	1:48	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-125	Texas Central Railway – Dallas	125			1:28	Start	1:39	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 16-220	Intermodal Transportation Center	220	24.00	28.59	Start	15:28	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 16-220	County Line	220			15:21	10:17		Yes	1.33	New DFW Shuttle	35	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-220	Union Station	220	19.50	21.75	10:25	1:34	7494	Yes	1.82	N			Yes	1.82	Yes	1.82		Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-220	Texas Central Railway – Dallas	220			1:33	Start	7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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								Available?	Avg# Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare												
Hybrid Alt 17-90	Intermodal Transportation Center	90	8.00	8.00	Start	17.34	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 17-90	Arlington	90			17:21	9:14	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 17-90	County Line	90	4.00	4.00	8:25	17:11		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-90	Union Station	90			16:53	Start	7494	Yes	1.82	NEW HSR shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3

TCR is not a stop on the 'run' but the information still needs to be attached to the station

Hybrid Alt 17-90	Texas Central Railway – Dallas		7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Alternative	Station Name	Fare and Travel Time							Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Park and Ride*					Kiss and Ride^	
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated	Walk Time Station to Platform (min)	Park and Ride*		Kiss and Ride^			
										Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 17-125	Intermodal Transportation Center	125	19.00	23.50	Start	10:50	Start	11:38	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 17-125	Arlington	125			10:42	5:35	11:10	6:11	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 17-125	County Line	125	14.50	16.75	5:33	10:24	6:11	10:54		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-125	Union Station	125			10:24	Start	11:12	Start	7494	Yes	1.82	NEW HSR shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TCR is not a stop on the 'run' but the information still needs to be attached to the station																														
Hybrid Alt 17-125	Texas Central Railway – Dallas								7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3

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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*		Kiss and Ride^		
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Hybrid Alt 17-220	Intermodal Transportation Center	220	24.00	28.50	Start	10:51	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 17-220	Arlington	220			10:40	5:42	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 17-220	County Line	220	19.50	21.75	5:42	10:17		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-220	Union Station	220			10:25	Start	7494	Yes	1.82	NEW HSR shuttle**	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3

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Hybrid Alt 17-220	Texas Central Railway – Dallas						7817	YES	1.82	Yes - #26^^	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Park and Ride*			Kiss and Ride^		
								Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?								Avg Discounted Fare	Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 18-90	Intermodal Transportation Center	90	8.00	8.00	Start	17:34	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 18-90	Arlington	90			17:21	9:14	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 18-90	County Line	90			8:25	18:46		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-90	Texas Central Railway – Dallas	90	4.00	4.00	18:16	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
										Yes - #26^^	35	35																

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Hybrid Alt 18-125	Intermodal Transportortation Center	125	19.00	23.50	Start	10:50	Start	11:38	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 18-125	Arlington	125			10:42	5:35	11:10	6:11	Arlington	9903	Yes	1.33	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid Alt 18-125	County Line	125			5:33	11:36	6:11	12:18	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-125	Texas Central Railway – Dallas	125	14.50	16.75	11:34	Start	12:21	Start	Dallas	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Hybrid Alt 18-220	County Line	220			5:42	11:32		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-220	Texas Central Railway – Dallas	220	19.50	21.75	11:36	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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Hybrid Alt 19-90	County Line	90			24:18	18:46		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-90	Texas Central Railway – Dallas	90	4.00	4.00	18:16	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
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\*\*New shuttle to Union Station  
The T Park and Ride parking space source:  
[http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917\\_FINAL-REV\\_Overview-of-Services.pdf](http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917_FINAL-REV_Overview-of-Services.pdf)

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Alternative	Station Name	Fare and Travel Time							Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	ICE EDP Eastbound Travel Time (min)	ICE EDP West Bound Travel Time (min)	Pendolino Eastbound Travel Time (min)	Pendolino Westbound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
										Available?	Avg <sup>#</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 19-125	Intermodal Transportation Center	125	19.00	23.50	Start	15:23	Start	16:30	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 19-125	County Line	125			15:18	11:36	16:10	12:18		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-125	Texas Central Railway – Dallas	125	14.50	16.75	11:34	Start	12:21	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
												Yes - #26^^	35	35																

Alternative	Station Name	Fare and Travel Time					Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^		
		Speed (mph)	Fare (Non-Business) From Dallas (\$)	Fare (Business) From Dallas (\$)	Eastbound Travel Time (min)	West Bound Travel Time (min)		Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade		Elevated	Park and Ride*			Kiss and Ride^	
								Available?	Avg <sup>W</sup> Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounted Fare	Available?	Avg Discounted Fare								Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
Hybrid Alt 19-220	Intermodal Transportation Center	220	24.00	28.50	Start	15:28	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9
Hybrid Alt 19-220	County Line	220			15:21	11:32		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-220	Texas Central Railway – Dallas	220	19.50	21.75	11:36	Start	7817	YES	1.82	New HSR Shuttle**	30	60	NO	NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
										Yes - #26^^	35	35																

# from NCTCOG 2040 DFX Model  
\* Based on Tarrant County 1 zone discounted monthly pass rate  
<http://www.trinityrailwayexpress.org/farezones.html>  
^^New connection to Cedars Station  
\*\*New shuttle to Union Station  
the T Park and Ride parking space source:  
[http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917\\_FINAL-REV\\_Overview-of-Services.pdf](http://www.tmasterplan.org/wp-content/uploads/2015/09/T-State-of-the-System-150917_FINAL-REV_Overview-of-Services.pdf)

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Station Name	City	Station TAZ	Transit Connectivity									Proposed/Available Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
			Bus		Route Modifications	Peak Headway (min)	Off Peak Headway (min)	Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
			Available?	Avg <sup>#</sup> Discounted Fare				Available?	Avg Discounted Fare	Available?	Avg Discounted Fare				Daily								
T&P	Fort Worth	10036	Yes	1.33	No	-	-	Yes	1.30	No	NA	Yes	No	386	0	90	125,220	0 (90) 0.5 (125,220)	0.100	2	1.5	0.004	0.1
Intermodal Transportation Center	Fort Worth	40789	Yes	1.33	No	-	-	Yes	1.30*	No	NA	Yes	Yes	1,000	6	90	125, 220	0 (90) 0.5 (125,220)	0.09	1.8	1.5	0.046	0.9
Arlington	Arlington	9903	Shee Arligton Tab																				
Centreport Station	Fort Worth	30251	Yes	1.33	No	-	-	Yes	1.30	No	NA	Yes	Yes	1,015	0	90	125,220	0 (90) 0.5 (125, 220)	0.124	2.5	2	0.009	0.2
County Line	Grand Prairie	7176	See County Line Tab																				
Union Station	Dallas	7494	See Union Station Tab																				
Texas Central Rail Way	Dallas	7817	See TCR Tab																				

# Based on NCTCOG 2040 DFX Model  
\* Based on Tarrant County 1 zone discounted monthly pass rate  
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\* Average based on review of 10 existing PNR in three systems (2 each). See PNR tab  
^ If not an existing KNR, used an average based on7 stations in 3 services. See KNR tab

T&P	City	Station TAZ	Transit Connectivity									Proposed/Available Parking				Station Type							
			Bus		Route Modification s	Peak Headway (min)	Off Peak Headway (min)	Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Cost	At-grade	Elevated	Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
			Available?	Avg# Discounted Fare				Available?	Avg Discounted Fare	Available?	Avg Discounted Fare				Daily				Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
IH 30 Alt 3-90	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0	X		0	0.1	2	1.5	0.004	0.1
IH 30 Alt 3-125	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0		X	0.5	0.1	2	1.5	0.004	0.1
IH 30 Alt 3-220	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0		X	0.5	0.1	2	1.5	0.004	0.1
TRE Alt 1-90	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0	X		0	0.1	2	1.5	0.004	0.1
TRE Alt 1-125	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0		X	0.5	0.1	2	1.5	0.004	0.1
TRE Alt 1-220	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0		X	0.5	0.1	2	1.5	0.004	0.1
Hybrid 2-90	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0	X		0	0.1	2	1.5	0.004	0.1
Hybrid 2-125	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0			0.5	0.1	2	1.5	0.004	0.1
Hybrid 2-220	Fort Worth	10036	Yes	1.33	N			Yes	1.3	No	NA	Yes	No	386	0		X	0.5	0.1	2	1.5	0.004	0.1

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ITC	City	Station TAZ	Transit Connectivity										Proposed/Available Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
			Bus		Route Modification s	Peak Headway (min)	Off Peak Headway (min)	Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Cost	At-grade	Elevated	Distance (mi)		Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)	
			Available?	Avg Discounted Fare				Available?	Avg Discounted Fare	Available?	Avg Discounted Fare													
IH 30 Alt 3-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 3-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6			0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 3-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 6-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 6-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 6-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 9-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 9-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 9-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 12-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 12-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
IH 30 Alt 12-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 2-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 2-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 2-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 5-90	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 5-125	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		x	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 5-220	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 8-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 8-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 8-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 11-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 11-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 11-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 16-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 16-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 16-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 17-90	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 17-125	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 17-220	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 18-90	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 18-125	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 18-220	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 19-90	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6	X		0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 19-125	Fort Worth	40789	Yes	1.33	N			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	
Hybrid Alt 19-220	Fort Worth	40789	Yes	1.33	No			Yes	1.30*	No	NA	Yes	Yes	1000	6		X	0.5	0.09	1.8	1.5	0.046	0.9	

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CenterPort	City	Station TAZ	Transit Connectivity									Proposed/Available Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
			Bus		Route Modification s	Peak Headway (min)	Off Peak Headway (min)	Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
			Available?	Avg <sup>#</sup> Discounted Fare				Available?	Avg Discounted Fare	Available?	Avg Discounted Fare				Daily								
TRE Alt 1-90	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.00947	0.2
TRE Alt 1-125	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 1-220	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 4-90	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.00947	0.2
TRE Alt 4-125	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 4-220	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 7-90	Fort Worth	30251	Yes	\$ 1.33	No	NA	NA	Yes	1.3	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.00947	0.2
TRE Alt 7-125	Fort Worth	30251	Yes	\$ 1.33	No	NA	NA	Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 7-220	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 10-90	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.33	No	NA	Yes	Yes	1015	0	X		0	0.124	2.5	2	0.00947	0.2
TRE Alt 10-125	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1015	0		X	0.5	0.124	2.5	2	0.00947	0.2
TRE Alt 10-220	Fort Worth	30251	Yes	\$ 1.33	No			Yes	1.3	No	NA	Yes	Yes	1016	0		X	0.5	0.124	2.5	2	0.00947	0.2

# from NCTCOG 2040 DFX Model

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<http://www.trinityrailwayexpress.org/farezones.html>

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^ If not an existing KNR, used an average based on7 stations in 3 services. See KNR tab based on7 stations in 3 services. See KNR tab

Arlington	City	Station TAZ	Transit Connectivity									Proposed/Available Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
			Bus		Route Modificatio ns	Peak Headway (min)	Off Peak Headway (min)	Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)
			Available?	Avg <sup>#</sup> Discounted Fare				Available?	Avg Discounted Fare	Available?	Avg Discounted Fare				Daily								
IH30 Alt 3-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 3-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 3-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 6-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 9-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
IH 30 Alt 12-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 2-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 2-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 2-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 5-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 5-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 5-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 8-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 8-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 8-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 11-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 11-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 11-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 17-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 17-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 17-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 18-90	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 18-125	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3
Hybrid 18-220	Arlington	9903	Yes	\$2.50	MAX	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.104	2.1	2	0.016	0.3

# Based on <http://www.ridethemax.com/#/reduced-fare-riders/c2049>  
 \* Based on Tarrant County 1 zone discounted monthly pass rate  
<http://www.trinityrailwayexpress.org/farezones.html>

\* Average based on review of 10 existing PNR in three systems (2 each). See PNR tab. If not an existing PNR, used an average based on 10 existing stations.  
 ^ If not an existing KNR, used an average based on7 stations in 3 services. See KNR tab

Alternative	Station Name - County Line	City	Station TAZ	Transit Connectivity									Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
				Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulato n Time (min)	Distance (mi)	Walk Time (min)
				Available?	Avg <sup>#</sup> Discounte d Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg Discounte d Fare	Available?	Avg Discounte d Fare												
Hybrid Alt 2-90	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 2-125	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 2-220	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-90	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-125	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 16-220	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-90	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-125	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 17-220	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-90	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-125	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 18-220	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-90	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-125	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3
Hybrid Alt 19-220	County Line	Grand Prairie		Yes	1.33	New DFW Shuttle	30	60	No	No	No	No	Yes	Yes	1000	5		X	0.5	0.100	2	2	0.016	0.3

# from NCTCOG 2040 DFX Model  
\* Based on Tarrant County 1 zone discounted monthly pass rate  
<http://www.trinityrailwayexpress.org/farezones.html>

\* Average based on review of 10 existing PNR in three systems (2 each). See PNR tab. If not an existing PNR, used an average based on 10 existing stations.  
^ If not an existing KNR, used an average based on 7 stations in 3 services. See KNR tab

Alternative	Name - Union Station	City	Station TAZ	Transit Connectivity									Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^	
				Bus					Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulation Time (min)	Distance (mi)	Walk Time (min)
				Available?	Avg#Discounted Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Avg*Discounted Fare	Available?	AvgDiscounted Fare												
IH 10 Alt 3-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 3-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 3-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 6-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 6-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 6-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 9-90	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 9-125	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
IH 30 Alt 9-220	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 1-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 4-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 7-90	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
TRE Alt 7-220	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 2-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-90	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-125	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 5-220	Union Station	Dallas	7494	Yes	1.82	No			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 8-90	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 8-125	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 8-220	Union Station	Dallas	7494	Yes	1.82	New HSR Shuttle	30	60	Yes	1.82	Yes	1.82	yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-90	Union Station	Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-125	Union Station	Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 16-220	Union Station	Dallas	7494	Yes	1.82	N			Yes	1.82	Yes	1.82		Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 17-90	Union Station	Dallas	7494	Yes	1.82	NEW HSR shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 17-125	Union Station	Dallas	7494	Yes	1.82	NEW HSR shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3
Hybrid Alt 17-220	Union Station	Dallas	7494	Yes	1.82	NEW HSR shuttle	30	60	Yes	1.82	Yes	1.82	Yes	Yes	1000	6		X	0.5	0.110	2.2	1	0.017	0.3

#Based on NCTCOG 2040 DFX Model

\* Based on Tarrant County 1 zone discounted monthly pass rate

<http://www.trinityrailwayexpress.org/farezones.html>

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^ If not an existing KNR, used an average based on 7 stations in 3 services. See KNR tab

Alternative	Station Name - TCR	City	Station TAZ	Transit Connectivity								Proposed Parking				Station Type		Walk Time Station to Platform (min)	Park and Ride*			Kiss and Ride^			
				Bus^^				Commuter Rail		Light Rail		Park and Ride	Kiss and Ride	Total Parking Spaces	Daily Parking Cost	At-grade	Elevated		Distance (mi)	Walk Time (min)	Circulaton Time (min)	Distance (mi)	Walk Time (min)		
				Available?	Avg# Discounte d Fare	Route Mods?	Peak Headway (min)	Off Peak Headway (min)	Available?	Discounte d Fare	Available?													Discounte d Fare	
IH 10 Alt 3-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 3-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 3-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 6-90	TCR - Dallas	Dallas	7817	Yes	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 6-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 6-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 9-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 9-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 9-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
IH 30 Alt 12-90	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
	TCR - Dallas					Yes - #26	35	35																	
IH 30 Alt 12-125	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
	TCR - Dallas					Yes - #26	35	35																	
IH 30 Alt 12-220	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
TRE Alt 1-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 1-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000			X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 1-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 4-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 4-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 4-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 7-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 7-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 7-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 10-90	TCR - Dallas	Dallas	7817	Yes	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
				YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 10-125	TCR - Dallas	Dallas	7817	Yes	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
				YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
TRE Alt 10-220	TCR - Dallas	Dallas	7817	Yes	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
				YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 2-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 2-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 2-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 5-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 5-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 5-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 8-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 8-125	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 8-220	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 11-90	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
Hybrid Alt 11-12	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
Hybrid Alt 11-90	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
Hybrid Alt 16-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 16-12	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 16-22	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 17-90	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 17-12	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 17-22	TCR - Dallas	Dallas	7817	YES	1.82	Yes - #26	35	35	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3	
Hybrid Alt 18-90	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
Hybrid Alt 18-12	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,000	6		X	0.5	0.104	2.1	2	0.016	0.3
						Yes - #26	35	35																	
Hybrid Alt 18-22	TCR - Dallas	Dallas	7817	YES	1.82	New HSR Shuttle		30	60	NO		NO		YES	YES	5,0									

#Based on NCTCOG 2040 DFX Model

^^ New connection to Cedar Station

\* Based on Tarrant County 1 zone discounted monthly pass rate

[http://www.trinityrailwayexpress.org/farezones.html</](http://www.trinityrailwayexpress.org/farezones.html)



Transit System	City	PNR location	Miles from drop off midpoint of parking to station entrance	
			Straight	"Walkable"
MARTA	Sandy Springs, GA	North Springs	0.062	0.089
MARTA	Doraville, GA	Doraville	0.173	0.186
TRE	Irving	Centreport	0.124	0.124
TRE	Dallas	Union Station	0.104	0.110
TRE	Fort Worth	T& P	0.100	0.105
SEPTA	Philadelphia, PA	Frankford Transportation Center	-	0.161
SEPTA	Norristown, PA	Norristown Transportation Center	0.059	0.059
Sounder Train	Tacoma, WA	Tacoma Dome Station	0.057	-
Sounder Train	Auburn, WA	Auburn Station	0.024	-
Average			0.088	0.119
Total Average			0.104	

Miles from drop off midpoint of parking to platform	
0.060	0.078

Transit System	City	KNR location	Miles from drop off to station entrance
TRE	Fort Worth	Centreport/DFW Airport	0.009
TRE	Fort Worth	Intermodal Transportation Center (ITC)	0.046
TRE	Fort Worth	T & P	0.004
TRE	Dallas	Union Station	0.017
MARTA	Sandy Springs, GA	North Springs	0.002
MARTA	Stone Mountain, GA	Indian Creek	0.007
Sounder Train	Auburn, WA	Auburn Station	0.028
Average			0.016

50 feet  
226 Ft but if pre-paid, the distance to platform is 140 Ft  
  
Assumed curb side drop off on S. Houston Street

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## DFWCES Ridership Overview

## Alternative Analysis

11-17-2016

Ridership analysis of the DFWCES TRE, Hybrid, and I-30 alternatives included an evaluation of 4 different technologies: 90 mph diesel, 125 mph diesel, 125 mph electric, and 220 mph electric for 12 different scenarios of station groupings and alignments:

	Station groups											
<i>Alignment</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>
Station	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Fort Worth T&P	X	X	X									
Fort Worth ITC	X	X	X	X	X	X	X	X	X	X	X	X
Centreport	X			X			X			X		
County Line		X										
Arlington		X	X		X	X		X	X		X	X
Dallas Union	X	X	X	X	X	X	X	X	X			
Dallas TCR	X	X	X	X	X	X			X	X	X	X

The initial steps included performing a series of ridership analyses on the scenarios representative of the TRE and Hybrid alignments with different technology, station combinations, and fares. Results at the end of each round were analyzed to determine scenarios to be carried forward to the next round of ridership analysis. The purpose was to compare the ridership performance results by technology and fare variation through Scenario S1 and station performance through all scenarios.

In the first round of ridership analysis the following shaded scenarios by corridor and technology were tested. I-30 scenarios were eliminated as technical and environmental review of the corridor indicated that the I30 corridor is not feasible as an alternative.

	Station groups											
<i>Alignment</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>
Station	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Fort Worth T&P	X	X	X									
Fort Worth ITC	X	X	X	X	X	X	X	X	X	X	X	X
Centreport	X			X			X			X		
County Line		X										
Arlington		X	X		X	X		X	X		X	X
Dallas Union	X	X	X	X	X	X	X	X	X			
Dallas TCR	X	X	X	X	X	X			X	X	X	X

## DFWCES Ridership Overview

## Alternative Analysis

11-17-2016

All other Scenarios were evaluated. S1 included the evaluation of all technologies – 90 mph diesel, 125 mph diesel, 125 mph electric, and 220 mph electric – and tested a spectrum of fares appropriate for the various technologies. The other scenarios S2, S4, S5, S7, S8, S10 and S11 were tested for 90 mph diesel only.

First Round Findings include:

- Elimination of the I-30 corridor ridership analysis
- S1 ridership for 125 mph diesel and 125 mph electric technologies was similar.

County Line Station performed significantly less favorably to other stations due to its location, connectivity, and access. The Fort Worth T&P and ITC stations performed as one station .

First round conclusions included that the County Line Station would be dropped. I-30 Scenarios would be dropped. 125 mph diesel and 125 mph electric performed similarly such that only one 125 mph technology would be tested in future rounds, and testing ridership on Scenarios S2, S4 and S5 would adequately compare the remaining stations, alignments, and technologies. In addition, a review of fare performance yielded a decision that an \$8 fare would apply to all modes in the next round of scenarios.

Second Round ridership analysis included only Scenarios S2, S4, and S5 for the 90 mph diesel, 125 mph diesel and electric, and 220 mph electric.

	Station groups											
<i>Alignment</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>	<i>TRE</i>	<i>H</i>	<i>I30</i>
Station	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Fort Worth T&P	X	X	X									
Fort Worth ITC	X	X	X	X	X	X	X	X	X	X	X	X
Centreport	X			X			X			X		
County Line		X										
Arlington		X	X		X	X		X	X		X	X
Dallas Union	X	X	X	X	X	X	X	X	X			
Dallas TCR	X	X	X	X	X	X			X	X	X	X

Second Round ridership analysis revealed that the S5 Hybrid Scenarios for 125 mph and 220 mph technologies performed better than any of the S4 TRE Scenarios. The Ft. Worth multi-station concept of the S2 Hybrid Scenarios performed best for 125mph and based on S4 results for 220 mph as well.

## DFWCES Ridership Overview

## Alternative Analysis

11-17-2016

## Round 2 Ridership estimates

Characteristics	TRE alternative			Hybrid alternative		
	90 mph D	125 mph D	220 mph E	90 mph	125 mph	220 mph
<b>Stations</b>	<b>S1</b>			<b>S2</b>		
<b>Total riders</b>	<b>3,468</b>	<b>2,356</b>	<b>1,959</b>	<b>5,520</b>	<b>6,368</b>	
TOPRS-related	1,254	921	786	3,366	3,497	
TCP-related	1,217	956	818	967	1,449	
Local riders	998	480	354	1,187	1,422	
ITC-US fare	\$8.00	\$21.93	\$26.93	\$8.00	\$8.00	
ITC-US T.T.	37.83	23.98	23.48	45.67	45.67	
<b>Stations</b>	<b>S4</b>			<b>S5</b>		
<b>Total riders</b>	<b>2,718</b>	<b>3,344</b>	<b>3,374</b>	<b>4,894</b>	<b>5,430</b>	<b>5,425</b>
TOPRS-related	1,254	1,379	1,379	3,341	3,497	3,497
TCP-related	889	1,260	1,285	935	1,166	1,163
Local riders	575	705	710	619	767	764
ITC-US fare	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
ITC-US T.T.	37.83	23.98	23.48	41.85	27.70	27.74

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# Dallas - Fort Worth Core Express Service Technical Memorandum

To: Chad Coburn  
From: Ed Campbell  
cc: Mark Werner, Erik Steavens, Margarita Gagliardi, Melissa Neeley, Rick Donnelly, Leta Huntsinger, Tina Walker  
Date: Sunday, January 29, 2017  
Subject: Revised Ridership Approach

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## Revised Ridership Approach

The current scope of work and budget provides ridership forecasting for the No Build Alternative, two Build Alternatives for the Draft Environmental Impact Statement (DEIS) and the Preferred Alternative for the Final Environmental Impact Statement (FEIS). For each DEIS and FEIS alternative, there is an assumption of ten (10) model runs to test different scenarios related to variables, such as changing the amount of parking, the cost of parking, transit connections, fare structure and service plan.

The FRA has directed the study team to provide ridership forecasts on 16 conceptual alternatives, defined by the corridor, operating speed and combination of stations. There are three corridors:

- Trinity Railway Express (TRE),
- IH 30, and
- IH 30/SH 360/TRE (Hybrid).

There are three operating speeds and four trainsets:

- 90 mph conventional diesel locomotive,
- 125 mph enhanced diesel locomotive,
- 125 mph electric propulsion, and
- 220 mph high speed rail technology (e.g. Shinkansen).

The Project Team will use the SDG forecast for C4B at 186 mph, factored down to account for differences in ridership due to:

- The shorter time assumed to reach Dallas from Arlington than Fort Worth,
- The assumption of one-seat ride in C4B, and
- The additional fare and transfer time to change from TOPRS to DFWCES in Fort Worth.







## Technical Memorandum

Our approach also reflects the following specific approach comprised of:

- Fares between Fort Worth and all stations south of it will remain the same as assumed in the 186 mph C4B scenario.
- TOPRS C4C travel times from Fort Worth from and to all stations south accessing the DFW Metroplex will be used.
- Service planning will assume 16 trains per day as indicated in the TOPRS 186 mph scenarios.
- A 10 minute transfer time – essentially a platform-to-platform timed transfer – between DFWCES and TOPRS trains in both directions.
- Transferring passengers will pay the same fare and have same travel time between Fort Worth and Dallas as local DFWCES passengers between those two stations. That is, someone traveling from San Antonio to Dallas will be assumed to pay the SAT-FTW fare on TOPRS, as well as the FTW-DUS fare on DFWCES.
- Professional judgment, based on SDG’s prior experience with the TOPRS models and PB’s experience with similar scenarios in the California HSR forecast reviews, to identify the range of likely ridership reductions from C4B that we’ll assume going forward.

This approach is an expedient one, necessitated by the need to try to keep the project on track. It is necessary for the project team to run a new forecast with the recommended TOPRS alternative if and when we complete the final ridership forecast for the DFWCES EIS, as those forecasts may differ from what we’ve assumed.

### Mitigating Budget Shortfall

Our approach to mitigate some of the budget shortfall is to proceed as currently budgeted with analyses of the most promising alternatives, with the expectation that certain combinations of station groupings, fares, and service levels will quickly drop out. Once these combinations are identified in the first alignment tested, they will be dropped from subsequent alignments. Moreover, alignments with substantially similar service characteristics – fares, travel times between Dallas and Fort Worth, and frequency of service – can be combined and treated as a single blended alternative. There might be no practical difference from ridership standpoint between a service running between Dallas and Fort Worth that stops in Arlington versus one that stops at the proposed County Line station, for example. This multi-dimensional reduction in alternatives, and service variants of them, might reduce the number of model runs.

### Risk Management

There are risks with this approach, including that it cannot be known beforehand which combinations will fall out, or how quickly. Differences in station parking cost and availability,





## Technical Memorandum

as well as transit and highway accessibility (especially if one includes connections to commuter rail that the other does not) might outweigh small differences in overall travel time between Fort Worth and Dallas. Thus, there is no guarantee that small differences between alternatives in one dimension will necessarily result in equally small differences in ridership.

The other risk is that the budget will not provide for evaluating all of the alternatives. We can apply professional judgment and experience from other projects to inform our approach, but cannot know for certain until we see preliminary results. We will make every effort to be as frugal as possible while we move forward in coordination with TxDOT on a contract amendment to address any shortfalls.

*Appendix C:*  
Capital Cost Estimation  
Methodology

**To:** Project Team  
**From:** Ed Campbell  
**Date:** March 7, 2016  
**Subject:** DFWCES \_Capital Cost Estimate Methodology

## **Technical Memorandum:**

### **1. Introduction**

#### *1.1 Project Description*

The Texas Department of Transportation (TxDOT) is working with the Federal Railroad Administration (FRA) to study a possible high-speed, intercity passenger rail service between Dallas and Fort Worth, Texas. The 30-mile, Dallas - Fort Worth Core Express Service (the Project) evaluates the potential for a core express rail connector, connecting the Central Business Districts of Dallas and Fort Worth and other high-speed rail projects, existing intercity passenger services, and last-mile connections. The Project evaluates environmental impacts, service characteristics, and capital costs to determine a preferred alternative alignment. The Project evaluates steel wheel steel rail trainsets with operational speeds of 90, 125, and 220 mph.

The physical limits of the project extend from the existing Fort Worth Intermodal Transportation Center (ITC) at the western terminus to the proposed Texas Central Railway (TCR) high-speed rail station near the I-30/I-35E interchange in Dallas. The alternative conceptual corridors under evaluation consist of the I-30 corridor, the Trinity Railway Express (TRE) corridor, and the Hybrid corridor of TRE from Dallas to the SH360 to I-30 to Fort Worth as shown in Figure 1.

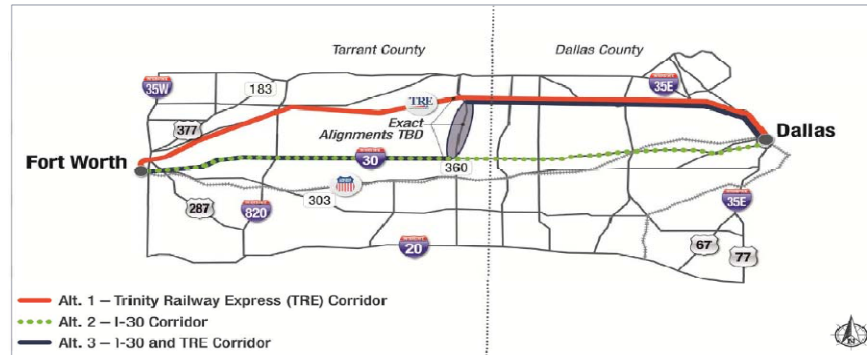


Figure 1: Project Location Map and Alternative Corridors

## 1.2 Objective

This technical memorandum provides a Capital Cost Estimate Methodology (Methodology) that assures the project capital cost estimates are prepared in a consistent and uniform manner, organized and standardized in methods, and formatted in order to facilitate estimate reviews and reporting for the Project alternatives being evaluated for TxDOT. The capital costing methodology provides cost estimates applicable to the specific Project phase. At the Project Alternative Analysis phase of the project unit costs per mile are developed to compare the capital costs of alignments, facilities, and train technologies. Capital costs will be further refined with greater detail once the Project Locally Preferred Alternative is determined. The capital cost estimate will be developed using the FRA Standard Cost Categories (SCC).

Estimating methodologies are not static and must be flexible enough to adjust to the needs of the project's stage in the development process. Each Project development phase is represented by a range of environmental review and engineering design completion and influenced by ongoing updates to the ridership demand forecast and associated revisions to estimate system capacity, service design and operating plans. The level of design detail and known information, and therefore the accuracy of capital cost estimates, increases as the project advances. This methodology aligns with the level of design completed for the evaluation of alternatives and preferred alternative and provides for the development of costs and contingencies to account for Project unknowns and risks.

## 1.3 General Assumptions

The Methodology provides Project capital cost estimates.

The Methodology provides a consistent format for reporting, estimating, and managing the Project's capital costs and uses SCC established by the FRA for the American Recovery and Reinvestment Act (ARRA) grant application requirements.

The Methodology provides the framework for development of capital cost estimates for the Alternative Analysis phase of the project and the preferred alternative phase of the project. Each phase of capital cost estimate development will be based on previously completed planning and construction United States and International projects. The Alternative Analysis phase of the Project develops capital cost estimates at a cost per mile for each of the SCC standard categories 10 through 90.

The Methodology and completed capital cost estimates will undergo review and comment from and be considered draft until they receive final review and approval from TxDOT and FRA

The Methodology provides capital cost estimates in 2015 dollars (base year). Capital costs are adjusted for inflation at a rate of 3% each year up to the anticipated mid-point of construction.

## 2. Capital Cost Methodology

### 2.1 FRA Standard Cost Categories

FRA's Standard Costing Category (SCC) is separated into 10 categories for capital projects/programs. Table 1 identifies the ten major categories:

Table 1: FRA Standard Cost Categories

Standard Cost Categories	
10	Track Structures and Track
20	Stations, Terminals, Intermodal
30	Support Facilities: Yards, Shops, Administration Buildings
40	Sitework, Right-of-Way, Land, Existing Improvements
50	Communications and Signaling
60	Electric Traction
70	Vehicles
80	Professional Services
90	Unallocated Contingencies
100	Finance Charges

Each Standard Cost Category breaks down into subcategory items that further detail the capital cost estimate of each major category. The capital cost estimates only include categories 10 through 90 as category 100. The value for category 100 will be determined in subsequent stages of the project. Capital Cost Estimate definitions and unit costs for FRA categories 10: Track Structures & Track through 80: Professional Services are listed under Paragraph 7.

### *2.2 Contingencies*

The Methodology applies allocated and unallocated contingencies. Allocated contingency is added to each cost category, based on an assessment of the level of available design information, means and methods, and site accessibility available for individual items of work. Unallocated contingency includes more widespread uncertainties not associated with individual construction activities. Unallocated contingency will be based on a percentage of the total project cost for categories 10 through 80.

For the Project the allocated contingency is 50% to mitigate the many unknowns at this level of design. The unallocated contingency is assumed at 15% for the conceptual level cost to mitigate the uncertainty in the overall implementation of the project including schedule, governance, stakeholder agreements and other issues.

Project contingencies reduce in value as the design and delivery approach clarifies in line with progress and detail of the overall project development.

Table 3 lists the assumed contingencies for capital cost estimates utilized for this project.

Table 3: Capital Cost Contingencies

Cost Category	Allocated Contingency
10 Track Structures and Track	50%
20 Stations, Terminals, Intermodal	50%
30 Support Facilities: Yards, Shops, Administration Buildings	50%
40 Sitework, Right-of-Way, Land, Existing Improvements	50%
50 Communications and Signaling	50%
60 Electric Traction	50%
70 Vehicles	50%
80 Professional Services	50%
90 Unallocated Contingency	15%

## 2.3 SCC 20 Stations

The Methodology provides station cost estimates based on improvements to and the use of existing or proposed terminal facilities in the Dallas and Fort Worth central business districts and one or two (maximum) new intermediate stations along each alternative corridor. For the purposes of the estimated costs it is assumed that the existing Fort Worth T&P or the Intermodal Transportation Center (ITC) and the Dallas Union Station or the proposed Texas Central Railway (TCR) station would provide the station buildings for the terminal stations. Costs for platforms and accessibility to those platforms for the Project will be included as part of this project's estimates.

Intermediate station sites include potential station locations in Arlington, at the TRE CentrePort Station and a county line location near the TRE CentrePort station. The Methodology provides a standard unit cost for intermediate stations treating them initially as large Stations per Amtrak's Station Program and Planning Guidelines (2013). Should ridership results indicate the station



size and capital costs will be adjusted. The intermediate station building costs will be represented as a lump sum per station.

## 2.4 SCC 30 Support Facilities

Support facility requirements will be determined based on the service plan for the Project as determined by ridership. Support facilities include vehicle storage and light maintenance facilities, heavy maintenance facilities, wayside maintenance facilities, and administrative facilities. These costs will be lump sum costs and based on past similar project maintenance facility layouts for similar fleet sizes.

## 2.5 SCC 40 Sitework, Right of Way, Land, Existing Improvements

The project will include an evaluation of right-of-way needs that may consist of up to three types of property: Urban, Suburban, and Undeveloped right-of-way acquisition. Table 4 provides additional definition of each type of property for estimating purposes. A minimum right-of-way width of 60 feet will be assumed for the Project.

Table 4: Real Estate Cost Items

40.07	Purchase or Lease of Real Estate	
Subcategory	Item	Definition
40.07.01	Urban Right-of-Way	Purchase of property in the densely developed areas of downtown Dallas and Fort Worth
40.07.02	Suburban Right-of-Way	Purchase of property in less densely developed areas outside of downtown Dallas and Fort Worth, but with some improvements on the purchased land
40.07.03	Undeveloped Right-of-Way	Purchase of property without improvements (land only)

## 2.6 SCC 70 Vehicles

Vehicle unit cost estimates include diesel electric and electric vehicle technologies satisfying operating speeds of 90mph (diesel electric) 125mph (diesel electric or electric), and 220mph (electric),

Vehicle purchase costs (including design) will be included in FRA standard cost category 70 on a cost-per-trainset basis. The trainset number of cars and seating capacity and be based on the ridership analysis and service operating plan developed for the project. Standard trainset amenities such as including 2 x 2 seating, video displays, automated station announcement/displays, audio entertainment availability, Wi-Fi internet access, and 110 volt

power at each seat are assumed. Costs for an additional 20% of vehicles (spar cars) and replacement parts will also be included in the estimate.

The cost of rolling stock includes estimation of both revenue vehicles. Non revenue vehicles will be included as part of Operations and Maintenance cost estimates. The cost of vehicles will be determined from recently completed studies and vehicle purchases within the united states and publicly available data regarding recent sales of comparable equipment to other High Speed Rail projects around the world.

## 2.7 SCC 80 Professional Services

The costing approach for professional services will be based on percentages of the construction cost for categories 10 through 60. Cost category 70: Vehicles will be excluded because professional services for vehicle procurement, design, and manufacturing will be included in the cost of the vehicles.

These percentages are common practice percentages adjusted for the anticipated magnitude of the capital cost. Table 5 shows the assumed percentage values that will be used.

Table 5: Professional Services by Percent

80 Professional Services		
	Item	Percentage of Construction Cost
80.01	Service Development/Service Environmental	Not Applicable (currently underway)
80.02	Preliminary Engineering/Project Environmental	4%
80.03	Final Design	7%
80.04	Project Management for Design and Construction	3%
80.05	Construction Administration and Management	3%
80.06	Professional Liability and Other Non-Construction Insurance	0%, Negligible
80.07	Legal; Permits; Review Fees by Other Agencies and Cities	0%, Negligible
80.08	Survey, Testing, and Investigation	1%
80.09	Engineering Inspection	1%
80.10	Start Up	Not Applicable

### 3. Unit Costs and Units of Measure

Unit costs will be derived from multiple comparable services that have been either evaluated (such as the Texas-Oklahoma Passenger Rail Study, Caltrans, California High Speed Rail, Midwest Regional Rail Initiative, Florida High Speed Rail, High Speed Rail Feasibility studies completed by the Georgia Department of Transportation and others) as well as Amtrak Acela service currently in operation in the northwestern U.S. These unit costs will serve the basis for estimating per mile costs for analysis of the alternative alignments and technologies. For the preferred alternative, unit prices will be developed based on common methods used for estimating unit prices. Unit prices for each of the items include cost of material, labor, overhead, and profit. When limited engineering details are available, historical bid price method will typically be used. Below is a list of resources that will be referenced, in addition to the previous studies when developing the unit costs:

- Published construction documents, such as “RSMeans Heavy Construction Cost Data,” current edition;
- TxDOT and other State Transportation agencies’ weighted unit cost;
- Federal Transit Administration (FTA) website for typical elements cost;
- Available state HSR studies, planning, and design documents;
- Various Class 1 railroad cost estimates; and
- Estimating experience and historical costs for similar planned construction elements.

The project team will update all unit costs to 2015 dollars for the design and construction of the Project. Escalating these unit costs to 2015 dollars will be conducted by utilizing the *Engineering News Record* Construction Cost Index (CCI) for Dallas/Fort Worth. The CCI uses local prices for portland cement and 2x4 lumber and the national average price for structural steel. It also uses local union wages (plus fringes) for carpenters, bricklayers, and iron workers. The following formula will be used to escalate unit costs to 2015 dollars:

$$Unit\ Cost_{2015} = (Unit\ Cost_{Year\ X}) \times \frac{(October\ 2015\ Index) - (Prior\ Year\ Index)}{Prior\ Year\ Index}$$

All units will be based on U.S. Customary Units defined by the National Institute of Standards and Technology. U.S. Customary Units are officially used in the United States and are also known in

the U.S. as “English” of “Imperial” units. Actual units of measure for each of the items will be determined during the capital cost estimating phase.

## 4. Quantities

Conceptual quantities will be developed based on the engineering plans for the FRA cost categories listed in this memorandum in line with the percent complete of drawings and specifications. These initial quantities are related to , structures, track roadbed, rail, track materials, turnouts, stations, support facilities, right-of-way, communications and signaling, electric traction, and vehicles. Quantities that are specific to preliminary engineering and final design including earthwork, sitework, and utilities are estimated as part of the per mile costs for the analysis of alternatives. These undefined quantities can be significant cost drivers and thus are also addressed within the allocated and unallocated contingencies.

Quantities will be based on plan and profile drawings, typical sections, and sketches created during the conceptual and preliminary engineering tasks.

## 5. Capital Cost Estimate Segments

The capital cost estimates are presented by alternative alignment along the three corridors – I-30, TRE, and the Hybrid (TRE, SH360, I-30) for alternatives on each side of the corridor segments for the three corridors and associated alternatives being evaluated for the Project:

- TRE Corridor – for North, South and North/South Alignments
  - TCR Station to Union Station
  - Union Station to the TRE Centreport Station
  - TRE Centerport Station to Fort Worth ITC Station
  - Fort Worth ITE Station to Fort Worth T&P Station
- I-30 Alternative Corridor – for North, South, and North/South Alignments
  - Union Station to Arlington Station
  - TCR to Arlington Station
  - Arlington Station to ITC Station

Note – It is possible that an alignment from Dallas Union Station to Arlington Station is not feasible in that case only a connection to the TCR station will be estimated.

Note – The TCR Station to Union Station and ITC Station to T&P Station costs are the same for all alternatives.

- I-30/ SH 360/ TRE Alternative Hybrid Corridor-for East, West, and East/West Alignments
  - Union Station to County Line Station

- County Line Station to Arlington Station

Note – The Arlington Station to ITC Station costs are the same for all alternatives.

## 6. Life-Cycle Cost Forecast

A conceptual and high-level life cycle cost (LCC) forecast for system renewal will be developed for each of the two route alternatives. The LCC will identify significant asset capital rehabilitation investments (that go beyond routine maintenance) associated with achieving a state of good repair during the first 50 years of operations and asset replacement costs associated full replacement of major component during the first 50 years of operations. Only major system components will be included in the LCC analysis.

The LCC cost estimate will be presented in 2015 dollars (base year) as an annual cost stream over 50 years, as an average annual cost, and as a net present value at 3% and 7% discount rates. In this manner, LCC costs may be combined with operations and maintenance cost estimates developed separately for evaluation by others of overall life cycle costs, benefit-cost analysis, economic analysis, or other study needs.

The LCC will be computed for major system components with a replacement life span or mid-life rehabilitation period of 50 years or less at the FRA SCC sub-category level of detail as shown in Table 2. Costs will include allowances for professional services and allocated contingency appropriate for the conceptual design phase of future asset rehabilitation and replacement projects. The following life cycles will be used for major system components requiring renewal:

- SCC 10 Track Structures and Track
  - 136LB rail will have an average life span for passenger train operations of 25 years Concrete ties and other track material will have average life span for passenger operations of 50 years.
- SCC 20 Stations, Terminals, Intermodals
  - All SCCs are assumed to have life cycles greater than 50 years.
- SC 30 Support Facilities: Yards, Shops, Administrative Buildings
  - All SCCs are assumed to have life cycles of 50 years.
- SCC 40 Sitework, Right-of-Way, Land, Existing Improvements

- All SCCs are assumed to have life cycles greater than 50 years.
- SCC 50 Communications and Signaling
  - All SCCs are assumed to have life cycles around 30 years.
- SCC 60 Electric Traction
  - All SCCs are assumed to have life cycles around 30 years.
- SCC 70 Vehicles
  - All SCCs are assumed to have life cycles around 25 years.

## 7. FRA Cost Items

In the table below are the FRA Cost items, definition, unit cost, and unit of measurement tabulated for the infrastructure and vehicle elements used for development of capital cost estimates in support of the analysis of alternatives and refinement of costs for the locally preferred alternative.

Table 5: FRA Cost Items

10 Track Structures and Track				
	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
10.01	Track Structure: Viaduct	Includes elevated track structure of significant length, consisting of multiple spans of generally equal length (substructure and superstructure)	Up to 30' height: \$132,000,000 30' to 60' height: \$148,000,000 Greater than 60' height: \$170,000,000 Check unit costs	Corridor Mile (assumed double-track)
10.02	Track Structure: Major/Movable Bridge	Includes all elevated track structures with a movable span and/or a span of significant length (generally 400' or longer)	Not applicable	Not applicable
10.03	Track Structure: Undergrade Bridges	Includes elevated track structure greater than 20' that does not fall into cost categories 10.01 and 10.02	Double Track over Interstate: \$1,830,000 Double Track over Major Roadway: \$1,460,000 Double Track over Minor Roadway: \$710,000 Double Track over Major Waterway: \$1,150,000 Double Track over Minor Waterway: \$120,000	Each
10.04	Track Structure: Culvert and Drainage Structure	Includes all minor undergrade drainage (generally 20' or less in width)	Urban Non-Dense: \$60,000 Urban Dense: \$500,000	Corridor Mile



## Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
10.05	Track Structure: Cut and Fill (greater than 4' height/depth)	Includes grading and subgrade stabilization of roadbed	\$1,550,000	Track Mile
10.06	Track Structure: At-Grade (grading and subgrade stabilization)	Includes all grading and subgrade stabilization of roadbed not included under cost categories 10.01 through 10.05, and 10.07	\$750,000	Track Mile
10.07	Track Structure: Tunnel	Includes double-track section using Tunnel-Boring Machine (TBM)	Provide	Provide
10.08	Track Structure: Retaining Walls and Systems	Includes permanent retaining wall and associated appurtenances	\$70	Square Foot
10.09	Track New Construction: Conventional Ballasted	Includes all ballasted track construction on prepared subgrade, on new or existing rights-of-way (rail, ties, ballast, other track materials)	136LB CWR on Concrete Ties: \$2,200,000	Track Mile
10.10	Track New Construction: Non-Ballasted	Includes all slab, direct fixation, embedded, and other non-ballasted track construction on prepared subgrade, on new or existing rights of way	\$2,500,000	Track Mile





## Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
10.11	Track Rehabilitation: Ballast and Surfacing	Includes undercutting, ballast cleaning, tamping, and surfacing not associated with new track construction	\$140,000	Track Mile
10.12	Track Rehabilitation: Ditching and Drainage	Includes regrading of existing ditches, extensions of drainage pipes, and rehabilitation of existing headwalls	\$60,000	Track Mile
10.13	Track Rehabilitation: Component Replacement (rails and ties)	Includes replacement of existing rail with 136LB CWR and replacement of ties and other track materials	30% Rehabilitation: \$790,000 60% Rehabilitation: \$1,510,000 100% Rehabilitation: \$2,200,000	Track Mile
10.14	Track: Special Track Work (switches, turnouts, and insulated joints)	Includes minor turnouts and interlocking, such as crossovers and turnouts at the ends of passing tracks	Ballasted TO (60 mph): \$425,000 Ballasted TO (80 mph): \$550,000 Ballasted TO (110 mph): \$775,000 Ballasted TO (150 mph): \$1,000,000	Each
10.15	Track: Major Interlockings	Significant interlockings at major stations and where routes converge from three or more directions.	Not applicable (no converging routes)	Not applicable



## Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
10.16	Track: Switch Heaters (with power and control)	Includes cost of power distribution equipment from commercial power source to interlocking location.	\$50,000	Each
10.17	Track: Vibration and Noise Dampening	Includes installation of vibration and noise dampening systems	To be determined (TBD) based on specific characteristics of the vibration and noise dampening application applied pending environmental investigation	TBD
10.18	Other Linear Structures (including fence, sound walls, and crash barrier)	Includes installation of right-of-way fencing and sound walls/crash barrier as applicable	8' Fence (curved top, 2" mesh galvanized): \$600,000 Barrier Wall: \$2,500,000	Corridor Mile
<b>20 Stations, Terminals, Intermodal</b>				
20.01	Station Buildings: Intercity Passenger Rail Only	Includes intercity passenger rail station building and associated amenities	Dallas Station: \$12,000,000 (improvements/additions to Union or TCR Station) DFW/Intermediate: \$25,000,000 Fort Worth Station: \$12,000,000 (improvements/additions to Union or TCR Station)	Each
20.02	Station Buildings: Joint Use (commuter rail and intercity bus)	Includes joint-use passenger rail station building and associated amenities	Not applicable	Not applicable
	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)



## Memorandum

20.03	Platforms	Includes construction of new and extension of existing platforms, including canopy over platform	\$800	Track Foot
20.04	Elevators and Escalators	Includes installation of elevators and escalators at elevated platforms and overhead pedestrian bridge structures for access over tracks	\$4,000,000	Per Station
20.05	Joint Commercial Development	Includes construction at station sites intended to support non-transportation commercial activities (shopping, restaurants, residential, office space). Does not include cost of incidental commercial use of station space intended for use by passengers (newsstands and snack bars). Costs may not be allowable for Federal reimbursement.	Not Applicable	Not Applicable
	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)

20.06	Pedestrian/Bike Access and Accommodation, Landscaping, and Parking Lots	Includes sidewalks, paths, plazas, landscape, site and station furniture, site lighting, signage, public artwork, bike facilities, and permanent fencing	Provide	Per Station
20.07	Automobile, Bus, Van Accessways (including roads)	Includes all on-grade paving, including driveways to stations	\$75	Square Yard
20.08	Fare Collection Systems and Equipment	Includes fare sales/swipe machines and fare counting equipment outside of station areas	Not applicable	Not applicable
20.09	Station Security	Includes security cameras network and other security measures	Provide	Per Station
<b>30 Support Facilities: Yards, Shops, Administrative Buildings</b>				
30.01	Administration Buildings: Office, Sales, Storage, Revenue Counting	Includes building space for administration activities	Not applicable (assumed as part of SCC 30.03)	Not applicable
30.02	Light Maintenance Facility	Includes service, inspection, and storage facilities and equipment.	\$100,000,000	Each
30.03	Heavy Maintenance Facility	Includes heavy maintenance, overhaul facilities, equipment, and associated buildings	Provide	Size per service plan



## Memorandum

30.04	Storage or Maintenance-of-Way Building	Includes storage and maintenance-of-way area for parts/vehicles	Not applicable (assumed as part of SCC 30.03)	Not applicable
30.05	Yard and Yard Track	Includes yard construction and track associated with the yard	Not applicable (assumed as part of SCC 30.03)	Not applicable
<b>40 Sitework, Right-of-Way, Land, Existing Improvements</b>				
40.01	Demolition, Clearing, Site Preparation	Includes project/program-wide clearing, demolition and fine grading	\$120,000	Corridor Mile
40.02	Site Utilities and Utility Relocation	Includes all site utilities - storm, sewer, water, gas, and electric	Light: \$1,000,000 Medium: \$3,000,000 Heavy: \$5,000,000	Corridor Mile
40.03	Hazardous Material, Contaminated Soil Removal/Mitigation, Ground Water Treatments	Includes underground storage tanks, fuel tanks, other hazardous materials and treatments	To be determined (TBD) pending environmental investigation	TBD
40.04	Environmental Mitigation: Wetlands, Historic/Archeology, Parks	Includes mitigation costs associated with environmental impacts	To be determined (TBD) pending environmental investigation	TBD
40.05	Site structures (including retaining walls and sound walls)	Includes retaining walls and sound walls for site	Not applicable (to be included in SCC 10.08)	Not applicable (to be included in SCC 10.08)

# Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
40.06	Temporary Facilities and Other Indirect Costs During Construction	Includes temporary facilities/indirect costs associated with construction activities or maintaining current services	To be determined (TBD) based on specific characteristics of the corridor and temporary items that need to be applied	Lump Sum
40.07	Purchase or Lease of Real Estate	If the value of right-of-way, land and existing improvements is to be used as in-kind local match to the federal funding of the project/program, include the total cost on this line item. In backup documentation, there will be separate cost for land and cost for improvements to the land. Costs will identify whether items are leased, purchased or acquired through payment, or for free. Includes the costs for permanent surface and subsurface easements, and trackage rights.	Urban: \$1,045,440 Suburban: \$696,960 Undeveloped: \$522,720  (specific property costs to be determined in ongoing project phases)	Acre

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
40.08	Highway/Pedestrian Overpass/Grade Separations	Includes earthwork, roadway, bridge, and retaining wall. Other than the grade separations included in this line item, highway-rail grade crossing safety enhancements generally fall under 50.06	Roadway overpass (2 lanes): \$8,000,000 Roadway overpass (4 lanes): \$10,000,000 Roadway underpass (2 lanes): \$10,000,000 Roadway underpass (4 lanes): \$12,000,000	Each
40.09	Relocation of Existing Households and Businesses	Costs are in compliance with Uniform Relocation Act	To be determined (TBD)	TBD
<b>50 Communication and Signaling</b>				
50.01	Wayside Signaling Equipment	Includes installation of wayside signals and appurtenances	\$970,000	Corridor Mile
50.02	Signal Power Access and Distribution	Includes providing power to signals for operations	\$5,300	Corridor Mile
50.03	On-Board Signaling Equipment	Includes on-board cab signal, Automatic Train Control (ATC), and Positive Train Control (PTC) related equipment	\$400,000	Train Set
50.04	Traffic Control and Dispatching Systems	Includes equipment necessary for train dispatch/operations	\$9,360,000	Lump Sum



## Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
50.05	Communications	Includes associated communications equipment (fiber optic cable, conduit, et al) for service	\$560,000	Corridor Mile
50.06	Grade Crossing Protection	Includes all types of highway-rail grade crossing safety enhancements except for grade separation projects, which fall under 40.08	Not applicable	Not applicable
50.07	Hazard Detectors (dragging equipment high water, and slide)	Includes all necessary items for hazard detectors	\$10,000	Corridor Mile
50.08	Station Train Approach Warning System	Includes all necessary items for station approach warning systems	\$150,000	Station
<b>60 Electric Traction</b>				
60.01	Traction Power Transmission: High Voltage	Includes all utility interfaces between the catenary system and existing poser service	\$70,000 ( <i>assumes double track operation</i> )	Corridor Mile
60.02	Traction Power Supply: Substations	Includes installation of traction power substations and appurtenances	\$1,850,000 ( <i>assumes double track operation</i> )	Corridor Mile
60.03	Traction Power Distribution: Catenary	Includes all items required for overhead catenary system	\$3,670,000 ( <i>assumes double track operation</i> )	Corridor Mile
60.04	Traction Power Control	Includes the SCADA system for electrified corridors	\$1,680,000	Lump Sum



70 Vehicles				
	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
70.00	Vehicle Acquisition: Electric Locomotive	Includes purchase of electric locomotive trainsets	Locomotive: \$5,000,000	Each
70.01	Vehicle Acquisition: Non-Electric Locomotive	Includes purchase of non-electric locomotive trainsets	Provide	Each
70.02	Vehicle Acquisition: Electric Multiple Unit	Includes purchase of electric multiple unit (EMU) trainsets	Not applicable	Not applicable
70.03	Vehicle Acquisition: Diesel Multiple Unit	Includes purchase of diesel multiple unit (DMU) trainsets	Provide	Each
70.04	Vehicle Acquisition: Loco-Hauled Passenger Cars w/ Ticketed Space	Includes cars with coach space	Passenger car: \$3,000,000	Each
70.05	Vehicle Acquisition: Loco-Hauled Passenger Cars w/o Ticketed Space	Includes dedicated food service, lounge, baggage and other service support cars	Not applicable	Not applicable
70.06	Vehicle Acquisition: Maintenance-of-Way Vehicles	Includes vehicles for maintenance-of-way operations	\$50,000,000	Lump Sum
70.07	Vehicle Acquisition: Non-Railroad Support Vehicles	Includes hi-rail bucket trucks and other highway vehicles	Hi-rail 6-man truck: \$75,000  Hi-rail ten wheeler boom truck crew cab: \$400,000  Substation bucket truck: \$600,000	Each

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
70.08	Vehicle Refurbishment: Electric Locomotive	Includes refurbishment of electric locomotive trainsets	Not applicable	Not applicable
70.09	Vehicle Refurbishment: Non-Electric Locomotive	Includes refurbishment of non-electric locomotive trainsets	Not applicable	Not applicable
70.10	Vehicle Refurbishment: Electric Multiple Unit	Includes refurbishment of electric multiple unit (EMU) trainsets	Not applicable	Not applicable
70.11	Vehicle Refurbishment: Diesel Multiple Unit	Includes refurbishment of diesel multiple unit (DMU) trainsets	Not applicable	Not applicable
70.12	Vehicle Refurbishment: Loco-Hauled Passenger Cars w/ Ticketed Space	Includes coaches and sleeping cars	Not applicable	Not applicable
70.13	Vehicle Refurbishment: Non-Passenger Loco-Hauled Car w/o Ticketed Space	Includes food service, lounge, baggage and other service support cars	Not applicable	Not applicable
70.14	Vehicle Refurbishment: Maintenance-of-Way Vehicles	Includes refurbishment of vehicles for maintenance-of-way operations	Not applicable	Not applicable
70.15	Spare Parts	Includes additional parts for ongoing vehicle maintenance	To be determined (TBD)	TBD

80 Professional Services				
	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
80.01	Service Development/Service Environmental	Includes service-level development and environmental activities	Not applicable (currently underway)	Not applicable (currently underway)
80.02	Preliminary Engineering/Project Environmental	Includes preliminary-level development and environmental activities	4%	Percentage of construction cost
80.03	Final Design	Includes final design engineering activities	7%	Percentage of construction cost
80.04	Project Management for Design and Construction	Includes management of design and construction activities	3%	Percentage of construction cost
80.05	Construction Administration and Management	Includes construction management and administration activities	3%	Percentage of construction cost
80.06	Professional Liability and other Non-Construction Insurance	Includes insurance requirements for professional services	0%, negligible	Percentage of construction cost
80.07	Legal; Permits; Review Fees by Other Agencies and Cities	Includes legal, permitting, and other fees associated with engineering	0%, negligible	Percentage of construction cost
80.08	Survey, Testing, and Investigation	Includes surveying and testing activities during engineering and construction	1%	Percentage of construction cost



## Memorandum

	Item	Definition	Unit Cost (\$2015)	Unit of Measure (per)
80.09	Engineering Inspection	Includes engineering inspection services during construction	1%	Percentage of construction cost
80.10	Start Up	Includes project start-up costs	Not applicable	Not applicable

○

*Appendix D:*  
Operations and Maintenance  
Cost Estimation Methodology

**To:** Project Team  
**From:** Ed Campbell  
**Date:** March 16, 2016  
**Subject:** DFWCES \_Operations & Maintenance Cost Estimate Methodology

## Technical Memorandum:

### 1. Introduction

#### 1.1 Project Description

The Texas Department of Transportation (TxDOT) is working with the Federal Railroad Administration (FRA) to study a possible high-speed, intercity passenger rail service between Dallas and Fort Worth, Texas. The Project evaluates environmental impacts, service characteristics, and capital and operating and maintenance costs to determine a preferred alternative. The Project evaluates steel wheel steel rail trainsets with operational speeds of 90, 125, and 220 mph. The physical limits of the project extend from the existing Fort Worth Intermodal Transportation Center (ITC) at the western terminus to the proposed Texas Central Railway (TCR) high-speed rail station near the I-30/I-35E interchange in Dallas. The alternative conceptual corridors under evaluation consist of the I-30 corridor, the Trinity Railway Express (TRE) corridor, and the Hybrid corridor of TRE from Ft. Worth to the SH360 to I-30 to Dallas as shown in Figure 1.

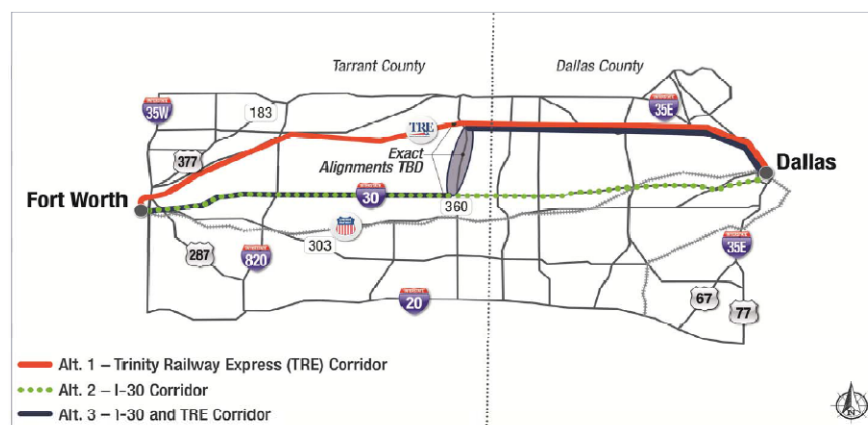


Figure 1: Project Location Map and Alternative Corridors

## 1.2 Objective

This technical memorandum provides an Operations and Maintenance (O&M) Estimate Methodology that assures the project O&M cost estimates are prepared in a consistent and uniform manner, organized and standardized in methods, and formatted in order to facilitate reviews and reporting for the evaluation of Project alternatives.

Estimating methodologies are not static and must be flexible enough to adjust to the needs of the Project's stage in the development process. Each Project development phase is represented by a range of environmental review and engineering design completion and influenced by ongoing updates to the ridership demand forecast and associated revisions to estimate system capacity, service design and operating plans. The level of development of a service plan and ridership information and therefore the accuracy of O&M cost estimates, increases as the project advances.

## 2. O&M Cost Methodology

### 2.1 General Assumptions

Service options including ridership, route miles, annual operating days, annual trips, annual train miles, average ridership per train, cars per train, annual car miles, and stations provide the basis for determining Project O&M Costs. O&M cost development occur during the analysis of alternatives within the following corridors:

- I-30
- TRE
- TRE/SH360/I30

For each corridor alignment, different technologies of trainsets and speeds will be evaluated including:

- 90 mph diesel electric
- 125 mph diesel electric
- 125 mph electric
- 220 mph electric

Parametric cost information from existing passenger rail operations and recently completed studies will be used to develop O&M costs and used in the comparison of alternatives.

Parametric costs will be identified for the following overall O&M Cost Categories:

- **Maintenance of Way** – Cost of maintaining the track, signals, buildings, structures, bridges, etc.
- **Maintenance of Equipment** – Cost of layover and turnover servicing and preventative maintenance, wreck and accidents, and contractor maintenance
- **Transportation (train movement)** – Operating cost of trainmen, enginemen, bus connections, train fuel, propulsion power, and railroad access,
- **Sales and Marketing** – Operating cost of advertising, marketing, and reservations
- **Station** – Operating cost of station staff (ticketing, baggage etc.), building rent, utilities, and security and station maintenance costs – cleaning, trash pickup, lighting, fire, emergency egress, communication systems, and connecting bus/shuttle service.
- **General / administrative expenses**

, A contingency of 15% will be applied to the total O&M cost to account for unknowns and to mitigate the uncertainty in the overall implementation of the Project including schedule, governance, stakeholder agreements, and other issues that could impact O&M costs.

The following projects will be used as a basis in developing O&M costs for both phases of O&M cost development:

- California High Speed Rail O&M Cost Model Documentation – including international input
- FRA Heartland Flyer (Kansas City – Oklahoma City – Ft. Worth)
- FRA NEC Future Capital and O&M Cost Methodology (with approval from FRA)
- FRA Connect Model Input Capital and O&M Costs ( with approval from FRA)

## 2.2 O&M Cost Categories

The following cost categories will be used in developing O&M Costs and informed by the developed service options.

### Maintenance of Way

- Salary and Benefits
  - Track
    - Surfacing
    - Grinding
    - Inspection



- Work Train
  - Materials and Equipment
- Communications and Signal
  - Signals
  - Communications
  - Materials and Equipment
- Electric Traction
  - Overhead Catenary
  - Power Transmission
  - Substation, Catenary, Transmission Materials
  - Materials and Equipment
- Maintenance of Way Bridges and Railings
  - Structures – Right-of-way and RR infrastructure
  - Stations / wayside
  - Materials and Equipment

### **Maintenance of Equipment**

- Locomotive Maintenance
  - Monthly/Quarterly Inspections
  - Equipment Inspection Staffing
  - Materials and Equipment
- Car Maintenance
  - Monthly/Quarterly Inspections
  - Equipment Inspection Staffing
  - Materials and Equipment
- Major Repairs
- Maintenance of Equipment Vehicles
- Maintenance of Equipment Supplies/Expenses

### **Transportation**

- Salary and Benefits
  - On Board Services

- Onboard Personnel
- Trainmen and Enginemen
  - Onboard Personnel
- Yard Dispatch
  - Yard Dispatch Personnel
- Operations Control Center
  - Personnel
- Terminal Station Control
  - Facility Wages and Personnel
- Fuel
- Power / Electric Traction
- Materials, Supplies, and Expenses
- Vehicles
- Connecting Bus Services

### **Sales and Marketing**

- Sales
- Information
- Marketing and Advertising Costs

### **Stations**

- Station Maintenance
- Bus/Shuttle Connections
- Station Service Staff
- Station Utilities
- Supplies and Expenses
- Police and Security
  - Police Officers
  - Police Vehicles
  - Equipment and Supplies

### **General and Administration**

- Corporate Administration
- Vehicles
- Supplies and Expenses

### Contingency

- Overall Contingency 15%

*Appendix E:*  
DFWCES DEIS Methodology



# Dallas-Fort Worth Core Express Service

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## Environmental Methodology Reports

Draft Version 3

Prepared for:  
Federal Railroad Administration and  
Texas Department of Transportation

Prepared by:  
Parsons Brinckerhoff, Inc.  
August 2015





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## Acronyms

APE	Area of Potential Effects
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Protection Act
NRHP	National Register of Historic Places
OWJ	Official with Jurisdiction
PA	Programmatic Agreement
ROD	Record of Decision
ROW	Right-of-way
RSA	Resource Study Area
SAL	State Archeological Landmarks
TAC	Texas Administrative Code
THC	Texas Historical Commission
TPWD	Texas Parks and Wildlife Department
TxDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey



## 1.0 Introduction

This methodology report describes the process of (1) gathering relevant and sufficient data, (2) evaluating potential impacts under the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.), and (3) designing feasible and effective measures to mitigate significant impacts. This provides a general framework, recognizing that some resources or topics require greater flexibility than others. If a discrepancy exists between the material in this guidance and adopted federal and state agency guidelines or manuals applicable to the resources or topics analyzed by the environmental impact statement (EIS), the agency guideline or manual controls.

Within the methodology report, Project alternative refers to either the No-Build Alternative or the Build Alternatives as described below:

- The No-Build Alternative is defined as the existing transportation network that serves the Project area, plus any other committed transportation improvements independent of the Project. In the EIS, the No-Build Alternative will provide a baseline for comparing impacts with the Build Alternatives.
- The Build Alternatives include all Project components analyzed including the track alignment, maintenance areas, and opportunity zones for future station sites. The Project footprint refers to the area needed to construct, operate and maintain permanent Project service features.

### 1.1 *Summary of Approach*

Within the EIS, each resource section will begin with an overview of the resource, a summary of the crucial issues or concerns relating to the resource area, and a list of federal and state laws and regional and local regulations, and orders applicable to the resource.

The affected environment discussion will identify the resource study area (RSA) specific to each resource in terms of physical extent and existing conditions relevant to the RSA being evaluated and succinctly describe the environmental areas/resources to be affected by the Project alternatives. The affected environment discussion will focus on data and issues that may influence potential impacts, with the level of detail and analysis being commensurate with the level of impact; minor impacts will be summarized, consolidated, or simply referenced.

The RSA specific to each resource will be described in terms of physical extent and existing conditions relevant to the RSA being evaluated. The RSA will consider the full range of reasonably foreseeable impacts associated with the Project. It should be noted that the RSA for indirect and cumulative impacts encompasses the area affected by the accumulation or interaction of Project impacts with impacts of other actions. Section 22.0, Indirect and Cumulative Impacts, of this methodology provides a more detailed discussion.



The RSA contains these components:

- Facilities or features within the Project, particularly stations opportunity zones, maintenance facilities, and consequential actions that affect the environmental resource.
- Areas to determine characteristics and context relevant to the Project.
- Areas specific to the resource to evaluate the intensity and determine the significance of direct and indirect impacts, beneficial and adverse impacts of Project improvements, and associated activities.
- Areas needed to implement, operate, or maintain mitigation measures or off-site mitigation measures and mitigation sites (such as relocations and off-site storage).

The environmental consequences discussion will consider the range of impacts associated with the Project, including construction and operations impacts of the Project on each resource, as appropriate. Construction and operations impacts of the Project on the resource will be evaluated and the research and analysis used to identify impacts (e.g., data collection methods and sources, inventory of regional and local conditions, evaluation of analytical context, qualitative or quantitative data analysis techniques) will be explained. A summary in table format will be provided for each resource section, as appropriate.

The results of the analysis will be summarized in the appropriate section of the Draft EIS and Final EIS. Where appropriate, a technical report will be prepared to provide the detailed analysis for a particular resource. In general, technical reports or survey reports will be developed when reviews are requested by TxDOT from FRA, Cooperating Agencies, and/or other federal and state resource agencies. Technical reports will be provided in the EIS as a technical appendix.

For other resource areas, Project memorandums may be developed for review by TxDOT technical specialists. The format for the Project memorandum(s) will generally follow the format of the EIS (see *Project Annotated Outline*, (August 2015), and would be used to solicit consensus from TxDOT prior to the Administrative Draft EIS. *Table 1-1* identifies each environmental resource section in the Draft EIS.

It should be noted that within the various resource sections of the EIS, cross referencing will be used to develop a comprehensive analysis of Project related impacts and benefits.



**Table 1-1. Resource Area Review.**

Resource Area	Submission Review Method	Anticipated Review Agency
Air Quality	Technical Report	TxDOT, FRA, NCTCOG
Water Quality and Water Resources	Technical Report	TxDOT, FRA, U.S. Army Corps of Engineers (USACE)
Noise and Vibration	Technical Report	TxDOT, FRA
Solid Waste Disposal	Memorandum	TxDOT
Natural Ecological Systems and Wildlife	Technical Report (combined with Water Quality and Water Resources, above)	TxDOT, FRA, USACE, U.S. Fish & Wildlife Service (USFWS), Texas Parks and Wildlife Department (TPWD)
Wetlands		
Threatened and Endangered Species		
Flood Hazards and Floodplain Management		
Energy Resources	Memorandum	TxDOT
Utilities	Memorandum	TxDOT
Geological Resources	Memorandum	TxDOT
Aesthetics	Memorandum	TxDOT
Land Use	Memorandum	TxDOT
Environmental Justice, Socioeconomics, Relocations, Elderly and Handicapped Populations	Memorandum	TxDOT
Public Health, Safety, security and Hazardous Materials	Memorandum	TxDOT
Parks and Recreational Resources and Section 6(f)	Memorandum	TxDOT (FRA, National Park Service and TPWD for Section 6(f))
Historic Resources	Survey Report	TxDOT, FRA, Texas Historical Commission (THC), consulting parties
Archeological Resources	Survey Report	TxDOT, FRA, THC, consulting parties
Transportation	Memorandum	TxDOT
Construction Impacts	Memorandum	TxDOT
Indirect and Cumulative Impacts	Technical Report	TxDOT, FRA
Section 4(f) Evaluation	Technical Report	TxDOT, FRA, National Park Service, officials with jurisdiction





## 2.0 Air Quality

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for air quality analysis, including providing a concise description of existing air quality, sensitive receptors, local meteorological conditions, and monitored data along the Project. The approach will present an overview of air quality conditions and requirements in the study area and the critical issues and concerns considered in the Project analysis. A regional air quality analysis will be conducted to evaluate the Project's impact criteria pollutants. Information will be presented on local construction and operational air quality impacts, including direct, indirect, temporary, and long-term impacts. The section will also address the methodology for addressing greenhouse gases and climate change.

### 2.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to air quality will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Federal Clean Air Act Amendments and Transportation and General Conformity Requirements.
- National Ambient Air Quality Standards.
- USEPA, Control of Hazardous Air Pollutants from Mobile Sources (USEPA, 2007).
- Council on Environmental Quality's December 2014 Draft Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts (*final guidance has not been released as of July 16, 2015*).
- TxDOT Environmental Compliance Air Quality Toolkit.
- Texas Clean Air Act.
- Texas Commission on Environmental Quality, Transportation Conformity.

### 2.2 *Affected Environment*

The affected environment subsection will describe the affected air quality environment in the RSA, including the region's nonattainment area status for ozone, with a classification as moderate. This discussion will identify baseline conditions, including current air pollution levels and trends and the region's compliance with state and federal standards. The subsection will include a list of the modeling input and values, as known, based on local, state, and federal guidelines. Three general classes of air pollutants are of concern for this Project—criteria pollutants, mobile source air toxics and greenhouse gases. Criteria pollutants are those for which the USEPA has set ambient air quality standards.





The study area is currently only in nonattainment for ozone. Since ozone is not directly emitted but is formed later in time away from the source, its precursor compounds, nitrogen oxides and volatile organic compounds will be analyzed. USEPA has identified seven mobile source air toxics of concern as having significant contributions from mobile sources — acrolein, benzene, 1,3 butadiene, diesel particulate matter and diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter. Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases, including nitrogen trifluoride and hydrofluorinated ethers.

A summary description of existing air quality along the Project will include:

- Attainment status for each pollutant.
- Description of the status of the Project in the applicable Metropolitan Transportation Plan.
- Provision of existing ambient air quality data at local air monitors for the past three years of available data.

### **2.3**      *Definition of Resource Study Area*

The local air quality impact analysis focuses on the effects of criteria pollutant and mobile source air toxics emissions from both the construction and operations of the Project on nearby sensitive receivers. Sensitive receivers include residential dwellings, schools, churches, hospitals, and parks. The study area has been determined based on typical screening distances, based on USEPA modeling guidance, and project-specific factors of the Project.

The regional air quality analysis evaluates the Project's impact on criteria pollutants on a regional basis. It is this analysis that will be the basis for complying with general conformity requirements. Greenhouse gases are usually estimated on a statewide basis because their impacts are not localized or regional; this is because of their rapid dispersion into the global atmosphere. The estimation of greenhouse gases on a statewide basis provides a comprehensive study area for the analysis of the Project's impact on statewide vehicle miles traveled, aircraft travel, and energy use. (Note, depending upon the ridership modeling for the Project being developed and used, this impact area may change.)

### **2.4**      *Environmental Consequences*

The analysis will identify direct and indirect impacts related to air quality through quantitative analysis and, where necessary, using qualitative analysis. In addition, the analysis will discuss temporary impacts which may occur during construction and long-term impacts related to operation. (Note: the analytical results for construction impacts and operations impacts are presented separately in the EIS).



The methodology used to evaluate air quality impacts is generally based on the Clean Air Act and Clean Air Act Amendments, as well as the applicable federal, state and local guidance. The analysis will determine significance of impacts under NEPA based on application of the following methods:

- Describe the emission sources included in the analysis (e.g., Project operations, traffic around stations and electrical generation for the system).
- Explain requirements, including State Implementation Plan and Transportation Improvement Plan status.
- Discuss statewide emission burden projections.

The USEPA's latest air quality model, Motor Vehicle Emission Simulator (commonly known as MOVES2014), will be used to estimate emissions for mobile sources at the national, county, and Project level for criteria pollutants, greenhouse gases, and air toxics.

For the purposes of the Project's EIS document, the evaluation of NEPA impact significance does not use intensity gradations. As described in Section 1508.27 of the NEPA regulations, context and intensity are considered together when determining whether an impact is significant under NEPA. For air quality, guidance from federal agencies specifies the use of general conformity thresholds for determining the significance of an impact.

Project emissions of criteria pollutants are compared to the general conformity *de minimis* applicability thresholds (general conformity thresholds) on a calendar-year basis for both construction and operational emissions. If annual Project-related emissions generated in a nonattainment or maintenance area exceeds the general conformity thresholds, a general conformity determination will be required.

## 2.5 Greenhouse Gases and Climate Change

On February 18, 2010, the Council on Environmental Quality released draft guidance on the consideration of Greenhouse Gas in NEPA documents for federal actions. The USEPA released updated draft guidance in December 2014.

Currently, TxDOT uses a qualitative method to evaluate impacts to greenhouse gases and climate change. Project specific methodology will be based on TxDOT's current practices. The analysis will also be referenced in cumulative impact section of the Draft EIS. The analysis will also acknowledge the effect of the Project on climate change, including a qualitative assessment of resilience of the Project's infrastructure in the face of extreme weather vulnerability.

A summary table of impacts will be included in the Air Quality section of the Draft EIS.



## 2.6 *Air Quality/Greenhouse Gases Technical Report*

An Air Quality Technical Report will be prepared to provide detailed information on local construction and operational air quality impacts, as well as regional air quality and statewide Greenhouse gas impacts as a result of the Project. The Draft EIS will contain a summary of the results of the analyses, in particular, the manner by which the Build Alternatives impact air quality in the RSA. The Final EIS will summarize the impacts of the Preferred Alternative on air quality.

## 3.0 **Water Quality and Water Resources**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for water quality and water resources, including identification of relevant water quality and water resources, classification of water quality and impaired waters, and analysis of direct and indirect impacts to water quality and water resources that may occur during construction and operation.

### 3.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to water quality and water resources will be briefly described, or reference made to other sections where they are more fully described. Applicable legislation and regulations include, but are not limited to, the following:

- Clean Water Act (33 United States Code (USC) § 1251 et seq.).
- Rivers and Harbors Act of 1899 (33 USC § 401 et seq.) Sections 9 and 10 /General Bridge Act of 1946 (33 USC § 525 et seq.).
- Safe Drinking Water Act of 1974 (42 USC § 300 et seq.).
- Texas Water Development Board Regional Water Plans.
- Texas Pollutant Discharge Elimination System.
- Texas Surface Water Quality Standards.
- TxDOT Environmental Compliance Water Resources Toolkit.

### 3.2 *Affected Environment*

The potentially affected water quality and water resources will be identified via desktop spatial analyses along the Build Alternatives for comparative purposes. Potential impacts to surface waters will be identified using the Geographic Information System (GIS) database layers for the Build Alternatives. Linear and area impact for waters of U.S. (streams, wetlands) will be determined and presented in tabular form. Design practices will be identified and incorporated to avoid or minimize Project impacts.

The following conditions will be discussed in the Affected Environment section:



- Climate, precipitation, and topography.
- Surface water quality.
- Groundwater.

In the Final EIS, for the Preferred Alternative, limited field verification and site surveys may be used to collect localized information necessary to develop the analysis and specific mitigation measures.

### 3.3 *Definition of Resource Study Area*

The RSA for water quality and water includes the Project footprint tributary and physical ground disturbance associated with construction.

### 3.4 *Environmental Consequences*

Project related impacts to water quality and resources will result from potential changes surface waters (streams), or ground water as a result of construction or maintenance. Potential impacts to surface water quality from runoff, potential water temperature increases caused by removal of vegetative cover, and discharges associated with Project construction will be identified, as well as actions that will be taken to conform to Texas Pollutant Discharge Elimination System requirements. Direct and indirect impacts related to water quality and water resources will be analyzed through quantitative analysis and, where necessary, with qualitative analysis

The analysis will be focused on the Project's potential to alter drainage patterns. As part of the EIS, best management practices or avoidance or minimization features of Project operations will be documented. The analysis will also identify where permit applications will be needed and will provide information to support future permit review (such as Section 404 or 408 permits).

The Draft EIS will contain a summary of the results of the analysis and will discuss how the Build Alternatives would affect the resource.

### 3.5 *Ecological and Natural Resources Technical Report*

An Ecological and Natural Resources Technical Report will be prepared to provide detailed information on the following resources: Water Quality and Water Resources (Section 3.0 of this Methodology Report), Natural Ecological Systems and Wildlife (Section 6.0), Wetlands (Section 6.5), Threatened and Endangered Species (Section 8.0), and Flood Hazards and Floodplains Management (Section 9.0).

## 4.0 **Noise and Vibration**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for noise and vibration, including providing a description of



ambient noise conditions and existing noise and vibration sensitive receptors, as well as procedures for conducting the noise and vibration impacts analysis.

#### *4.1 Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to noise and vibration will be briefly described, or reference made to other sections where they are more fully described. Applicable legislation and regulations include, but are not limited to, the following:

- FRA, Railroad Noise Emission Compliance Regulation (49 Code of Federal Regulations (CFR) Part 210).
- FRA, High-Speed Ground Transportation Noise and Vibration Impact Assessment (DOT/FRA/ORD-12/15) – (FRA 2012 guidance manual).
- Federal Transit Administration (FTA), Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06) – (FTA 2006 guidance manual). Jurisdictional noise ordinances and codes (and their requirements applicable to the Project).
- TxDOT Environmental Compliance Traffic Noise Toolkit.

#### *4.2 Affected Environment*

The section will include a summary description of ambient noise conditions and existing noise sensitive receptors along the Build Alternatives. Relevant sensitive noise and vibration receptors will be identified, with a map to illustrate noise sensitive receptors and alternatives. The analysis will describe the ambient noise conditions in the Project area and in the vicinity of potentially affected noise receivers. Stakeholder issues and concerns from public outreach efforts and personal contact with local agencies will be described. The modeling input and values as known based on the FRA 2012 guidance manual, the FTA 2006 guidance manual and TxDOT noise analysis protocols will be listed.

#### *4.3 Definition of Resource Study Area*

The boundaries of the RSA for noise and vibration extend beyond the Project footprint. The noise and vibration impact analyses focus on the impacts of source noise and vibration on sensitive receivers, which are assessed at the receiver. Sensitive receivers include, but are not limited to, residential dwellings, schools, churches, hospitals, parks, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, libraries, picnic areas, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio and television production and sound recording studios, recreation areas, and, in some cases trails, and historic properties.

For direct noise impacts on sensitive receivers, the RSA is the Project footprint plus 350 to 600 feet from the track centerline. This RSA is based on typical screening distances as defined by FRA and Project-specific factors. If receivers are located farther than these



screening distances, the FRA 2012 guidance manual has determined that impacts would be unlikely. The particular noise context, the characteristics of Project-generated noise, amount of design information, and level of design detail will be considered so that the RSA will be sufficient for the Project.

The vibration study area for the Project is as follows:

- Project station opportunity zones— 40 feet from the station boundary unless trains will bypass a station traveling at high speed (125-250 miles per hour); if so then 220 feet would be used.
- Project alignment study areas, including existing railroads — up to 220 feet from the edge of the ROW.
- Highway study areas — 40 feet from the nearest travel way.

The vibration impact assessment uses the FRA screening procedure for rail. Screening distances indicate the potential for vibration impact on vibration-sensitive receivers. FRA 2012 guidance manual was used to determine that receivers located beyond the screening distances are not likely to be affected by the Project.

#### **4.4**      *Environmental Consequences*

The analysis will be focused on the Project's potential to alter existing and future noise and vibration conditions in the RSA. Direct and indirect impacts related to noise and vibration will be analyzed generally through quantitative analysis and, where necessary, with qualitative analysis. Temporary impacts that may occur during construction and long-term impacts related to operation of the Project will be analyzed. The analysis will consider relevant aspects of context (e.g., existing noise and vibration levels, receptor sensitivity, presence of tunnel portals, stations, etc.) and appropriate factors of intensity (e.g., level of change, duration of change) for determining impacts. The evaluation of effects will also consider Project actions that improve or otherwise benefit noise and vibration values.

In addition, the discussion will identify where permit applications are needed (such as requests for FRA approval of Quiet Zones) and provide the level of analysis needed to support future permit review.

##### **4.4.1**      *Train Operation Noise and Vibration Methodology*

The analysis will estimate the operation noise and vibration levels of the Build Alternatives and No-Build Alternative using current high-speed rail system operation plans and the prediction models provided in the FRA 2012 and FTA 2006 guidance manual, as appropriate. The discussion will show a tabulation of the Project noise and existing ambient noise exposures at the identified receivers or clusters of receivers, and compare the existing and projected noise exposure to determine the level of impact (no impact, moderate impact,



or severe impact) on sensitive receptors. The level of impact will be identified by comparing existing noise levels with projected noise levels. The discussion of vibration will compare the existing vibration levels at the identified receivers or clusters of receivers with the Project's projected vibration levels to determine the level of impacts as a result of the operation of the Project alternatives.

#### 4.4.2 *Station Opportunity and Maintenance Facility Zone Noise Methodology*

Project noise at noise-sensitive receivers will be analyzed using methodology in the FTA 2006 guidance manual for both the station zones and the maintenance facility. An estimation procedure or measurement program will be included at representative clusters of receivers to determine existing ambient noise conditions and a noise prediction method to determine future-with-Project noise conditions.

The Draft EIS will summarize the projected noise and existing ambient noise exposures at the identified receivers or clusters of receivers and the level of impact will be determined by comparing the existing and projected noise exposure for each Build Alternative compared with the No-Build. The Final EIS will update the level of impact for the Preferred Alternative.

#### 4.4.3 *Construction Noise and Vibration Methodology*

, the Federal Highway Administration's (FHWA) *Roadway Construction Noise Model* may be used for construction impact analysis. The criteria for highway noise impacts (relevant to the extent Project causes changes in traffic patterns) are from *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. Professional judgment, based on scientific literature (such as National Cooperative Highway Research Program *Project 25-35 Final Report Appendix L, March 2014*) will be used for evaluation of noise impacts related to tunnel portals.

Noise methodology will include noise emissions from equipment expected to be used by contractors, construction methods using the equipment identified above, usage scenarios for how the equipment will be operated, estimated site layouts of equipment along the right-of-way, and relationship of the construction operations to nearby noise-sensitive receivers, as appropriate.

Construction vibration is assessed quantitatively where a potential for blasting, pile-driving, vibratory compaction, demolition, or excavation close to vibration-sensitive structures exists. Criteria for annoyance and damage are applied to determine construction vibration impacts. The methodology for comparing the Build Alternatives includes vibration source levels from equipment expected to be used by contractors, estimated site layouts of equipment along the ROW, and relationship of the construction operations to nearby vibration-sensitive receivers, as appropriate.





#### 4.5 *Noise and Vibration Technical Report*

A Noise and Vibration Technical Report will be prepared to describe the methodologies used to determine the noise and vibration impacts caused by the Project and present the detailed analysis of impacts. Tables and figures will be used to display the results in the technical report. The Draft EIS will contain a summary of the results of the analyses, in particular, the manner by which the Build Alternatives affect the existing noise and vibration conditions in the RSA. The Final EIS will summarize the noise and vibration impacts of the Preferred Alternative.

### 5.0 **Solid Waste Disposal**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for solid waste disposal, including providing a description of existing solid waste disposal sites; identifying relevant landfills; and describing the process for evaluating potential impacts.

#### 5.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to solid waste disposal will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Resource Conservation and Recovery Act (42 USC § 6901 et seq.) (as applicable).
- Executive Order (EO) 12088, Federal Compliance with Pollution Control.
- Texas Health and Safety Code, Solid Waste Disposal Act (Chapter 361) (as applicable).

#### 5.2 *Affected Environment*

The affected environment subsection will document the existing conditions within the Project footprint where the generation and removal of solid waste would be anticipated. General solid waste management practices and major waste management facilities in the Project vicinity that would be considered for disposal of Project solid waste will be identified and described. General waste generated by Build Alternatives will be identified, in addition to the capacity of handling these wastes. Municipalities within the study area that either manage their own solid waste collection program or contract with a private enterprise to manage a program will be identified.

Landfills and major industrial solid waste disposal sites within the one-mile buffer of the Project footprint will be identified by available GIS databases. An inventory of adopted local and regional plans, ordinances, or guidelines related to solid waste disposal will be developed.







### 5.3 *Definition of Resource Study Area*

The boundaries of the RSA for solid waste disposal consists of the Project plus a one-mile buffer of the Project footprint to account for issues related to the generation and disposal of solid waste by the Project and the impact of the Project to existing solid waste (landfill) disposal sites along the Build Alternatives.

### 5.4 *Environmental Consequences*

This subsection will document potential impacts of the generation, handling, and disposal of solid waste resulting from construction of the Build Alternatives and potential impacts on existing landfills and major industrial solid waste disposal sites.

The analysis of the Build Alternatives' impact to these resources will be summarized in the Draft EIS. Mapping illustrating these resources and detailed tables of the impact to the resources will be included in the Appendix to the Draft EIS. The Final EIS will address the impacts of the Preferred Alternative on these resources.

## 6.0 **Natural Ecological Systems and Wildlife**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for natural ecological systems and wildlife, including providing a list and description of biological resources and special aquatic resources, and analyzing direct and indirect impacts that may occur during construction and operation of the Project.

### 6.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to natural ecological systems and wildlife will be briefly described. Applicable legislation and regulations include, but are not limited to, the following:

- Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 et seq.).
- U.S. Fish and Wildlife Coordination Act (16 USC § 661–666c).
- Migratory Bird Treaty Act (16 USC § 703–712) and Treaty Reform Act (16 USC § 703 et. seq.; Public Law 108–447).
- EO 13186, Protection of Migratory Bird Populations.
- EO 13113, Invasive Species.
- TxDOT Ecological Resources Compliance Toolkit.

### 6.2 *Affected Environment*

The potential affected biological resources will be identified based on information available from reference documents and limited field investigations. The Project's regional setting will be developed using the Texas Natural Diversity Database and databases of USFWS, TPWD,



and the North Central Texas Council of Governments. Vegetation classifications of the plant communities will be derived from the Ecological Mapping System of Texas maintained by TPWD. Vegetative communities will be identified, evaluated, and mapped in GIS. This information will be used to develop lists of existing biological resources, and critical habitats that may be affected by the Project. Mapping may also be used to show protected or regulated habitats.

### **6.3**      *Definition of Resource Study Areas*

In general, the RSA for biological resources encompasses the entire potential area of disturbance associated with the Project footprint plus up to a 1,000-foot buffer to evaluate direct and indirect impacts.

### **6.4**      *Environmental Consequences*

The fundamental method for evaluating biological impacts includes: (1) quantifying or describing qualitatively the direct and indirect impacts of the Project, and (2) determining whether the impacts are significant. Impacts will be assessed for temporary (e.g., construction) and permanent (e.g., Project placement or operational) impacts.

Direct and indirect impacts to biological resources will be described by type and acreage, and a comparison of impacts from the Project will be provided. The impact analysis will focus on areas where the Build Alternatives could disrupt biological resources that are dependent either upon habitat or movement across a landscape. For wildlife movement, existing and accessible drainage corridor crossings (e.g., bridges and culverts) will be evaluated in terms of their relative function to facilitate wildlife movement through the landscape.

The Draft EIS will summarize the analysis of the Build Alternatives' impact to these resources. Mapping illustrating these resources and detailed tables of the impact to the resources will be included in the Ecological and Natural Resources Technical Report (see Section 6.5 below). The Final EIS will address the impacts of the Preferred Alternative on these resources.

### **6.5**      *Ecological and Natural Resources Technical Report*

The detailed information on wetlands will be included in the Ecological and Natural Resources Technical Report (described above in Section 3.5).

## **7.0**      **Wetlands**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for wetlands, and the process for conducting a wetland impact analysis. This section will also review the preparation of a Wetlands Delineation Report for the Preferred Alternative.





## 7.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to wetlands will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Clean Water Act (33 United States Code (USC) § 1251 et seq.), including the US EPA final rule defining waters of the US effective on August 28, 2015.
- EO 11990, Protection of Wetlands.
- USACE Regulatory Guidance Letter (08-02) dated June 26, 2008.
- Preservation of the Nation's Wetlands (U.S. Department of Transportation (USDOT) Order 5660.1A).

## 7.2 *Affected Environment*

The potentially affected wetlands will be identified via desktop spatial analyses along the Build Alternatives for comparative purposes. Potential wetlands, as determined by the final rule defining waters of the US, will be identified based on the following:

- Use of soil maps to identify areas of hydric soil.
- Review of UFWS National Wetland Inventory Maps.
- Color infrared photos.
- NCTCOG's Resource Ecological Framework.

In the Draft EIS, the area of impact for each potential wetland site shall be summarized in a table type, wetland community classification and relative quality and estimate of quantity. Wetland quality and quantity will be addressed with comparisons made between the Build Alternatives. Limited on-site investigations may be conducted where rights-of-entry are obtained.

Based on the information gathered for the Draft EIS, TxDOT and FRA will determine the need for wetland permit coordination with the USACE. If necessary, a conceptual mitigation plan for inclusion in the Draft EIS will be prepared. Types of mitigation proposed, such as restoration, enhancement, creation and banking, along with related mitigation ratios would be considered and discussed.

For the Preferred Alternative following the Draft EIS, wetland delineations would be conducted in accordance with the USACE 1987 Manual where rights of entry are available. Final Mitigation Plans will be developed as part of the Section 404 permitting process, as necessary. The Final EIS will summarize the results of the wetland delineation, and any coordination with resource agencies.



### 7.3 *Definition of Resource Study Areas*

For the wetland study area in the Draft EIS, the boundary will be the Project footprint plus a 250-foot buffer to evaluate direct and indirect impacts on wetlands. Wetland delineations and field surveys of the Preferred Alternative will be established for the Project footprint only.

### 7.4 *Environmental Consequences*

The fundamental method for evaluating wetland impacts includes a process for: (1) quantifying or describing qualitatively the direct and indirect impacts of the Project, and (2) determining whether the impacts are significant for purposes of NEPA. Impacts will be assessed for temporary (e.g., construction) and permanent (e.g., Project placement or operational) impacts.

Direct and indirect impacts related to wetlands will be analyzed through quantitative analysis and, where necessary, with qualitative analysis. Impacts which may occur during construction and operation of the Project will be analyzed. Direct and indirect impacts to wetlands will be described by type and acreage, and a comparison of impacts across the Build Alternatives will be provided.

Direct impacts occur if the Project footprint, either along the alignment or at a mitigation site, alters, disrupts, or removes existing wetlands/waters. Indirect impacts occur where wetlands/waters adjacent to the Project footprint or mitigation site would change as a result of the Project, particularly during operation. Secondary impacts occur when implementation of a mitigation measure alters, disrupts, or removes existing wetlands/waters. Indirect or secondary impacts are caused by the Project and are later in time or farther removed in distance, but are still reasonably foreseeable.

For the Preferred Alternative, impacts to jurisdictional waters will be quantified through a detailed evaluation of the Project activities and elements (e.g., stations, tracks, temporary construction areas) and the associated jurisdictional water type (e.g., canal/ditch seasonal wetland). For the majority of jurisdictional waters, direct impacts will be quantified in the manner described above by overlaying the mapped features on the construction footprint.

### 7.5 *Ecological and Natural Resources Technical Report*

The detailed information on wetlands will be included in the Ecological and Natural Resources Technical Report (described above in Section 3.5). The Draft EIS will summarize the wetland findings for the Build Alternatives. The Final EIS will summarize the findings for the Preferred Alternative.



## 8.0 Threatened and Endangered Species

This section summarizes the process of gathering and reporting relevant and sufficient data to identify concerns for threatened and endangered species resulting from the Project. The threatened and endangered species analysis for the Project will address impacts on federal and state endangered and threatened species of plants and wildlife. It will also cover state species of concern. Limited field investigations and habitat assessments will occur for the Preferred Alternative.

### 8.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to threatened and endangered species will be briefly described. Applicable legislation and regulations include, but are not limited to, the following:

- Endangered Species Act of 1973 (16 USC § 1531 et seq.).
- Bald and Golden Eagle Protection Act (16 USC § 668–668(d); 50 CFR Part 22).
- Endangered Species (Chapter 68 of the Texas Parks and Wildlife Code).
- TxDOT Ecological Resources Compliance Toolkit.

### 8.2 *Affected Environment*

Potential locations and critical habitat for listed species will be identified by review of data provided by TPWD's Natural Diversity Database, NCTCOG's Resource Ecological Framework, and USFWS resources (including county lists). Based on this information, a technical report will be developed for review and comment. The report will include a topographic quadrangle identifying locations of protected species' preferred habitat(s) and locations of previously recorded occurrences, as necessary. The report will also include a discussion of recommendations, if appropriate.

For the Draft EIS, a preliminary habitat assessment will be conducted to determine the potential presence of species that are federally or state-listed. The habitat study area will be developed from consideration of the documented habitats in the region and reported occupied habitats. Preliminary vegetation mapping will be included in the assessment. Vegetation classifications of the plant communities will be derived from the Ecological Mapping System of Texas maintained by TPWD. For the vegetation mapping, vegetative communities will be identified, evaluated, and mapped in GIS.

Based on the data gathered for the Draft EIS, TxDOT, FRA, and the USFWS will review the need to develop a Biological Assessment for the Preferred Alternative. For the Final EIS, surveys for protected species or for habitat of protected species will include:





- Species listed by the USFWS as threatened or endangered or proposed for listing as threatened or endangered (50 CFR 17.11-12).
- Species that are candidates for review for listing by FWS as threatened or endangered (per most recently updated list in Federal Register).
- Species listed as threatened or endangered species by TPWD (State of Texas Threatened and Endangered Species Listings, TPWD).

These surveys will be summarized in the Final EIS. At this time, formal Section 7 consultation is not anticipated.

### **8.3**      *Definition of Resource Study Areas*

For the TPWD review, a 1.5-mile radius will be used for the query. However, in general, the RSA for species of concern encompasses the Project footprint plus up to 1,000-foot of buffer to evaluate direct and indirect impacts to threatened and endangered species.

### **8.4**      *Environmental Consequences*

For the Draft EIS, the fundamental method for evaluating threatened and endangered species impacts includes a process for (1) quantifying or describing qualitatively the direct and indirect impacts of the Project, and (2) determining whether the impacts are significant for purposes of NEPA. Impacts will be assessed for temporary (e.g., construction) and permanent (e.g., Project placement or operational) impacts.

Direct and indirect impacts related to threatened and endangered species will be analyzed through quantitative analysis and, where necessary, with qualitative analysis. Direct and indirect impacts to threatened and endangered species will be described by type and acreage, and a comparison of impacts across the Build Alternatives will be provided.

The threatened and endangered species impact analysis focuses particularly on areas where Build Alternatives disrupt threatened and endangered species that are dependent upon critical habitats. Impacts resulting from the Preferred Alternative will be documented in the Final EIS.

### **8.5**      *Ecological and Natural Resources Technical Report*

The detailed information on threatened and endangered species will be included in the Ecological and Natural Resources Technical Report (described above in Section 3.5). The Draft EIS will summarize the findings for the Build Alternatives. The Final EIS will summarize the findings for the Preferred Alternative.

## **9.0**      **Flood Hazards and Floodplain Management**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for flood hazards and floodplain management, including



identification of relevant floodplains, critical issues and concerns, and analysis of direct and indirect impacts to floodplains that may occur during construction and operation.

### 9.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to flood hazards and floodplain management will be briefly described, or reference made to other sections where they are more fully described. Applicable legislation and regulations include, but are not limited to, the following:

- Clean Water Act (33 United States Code (USC) § 1251 et seq.) Section 408.
- Rivers and Harbors Act of 1899 (33 USC § 401 et seq.), Section 14/General Bridge Act of 1946 (33 USC § 525 et seq.).
- National Flood Insurance Act (42 USC § 4001 et seq.) and Flood Disaster Protection Act (42 USC §§ 4001 to 4128).
- EO 11990, Protection of Wetlands.
- EO 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input.
- Federal Emergency Management Agency, Draft Revised Guidelines for Implementing E 11988, Floodplain Management<sup>1</sup>.
- USDOT Order 5650.2 (Floodplain Management and Protection).
- Trinity River Corridor Development Certificate.

### 9.2 *Affected Environment*

The presence of floodplain resources in relation to the Build Alternatives will be identified based on data obtained from Federal Insurance Rate Maps, Tarrant Regional Water District, Dallas County Flood Control District, and Trinity River Authority. The examination of floodplains will include identification of 100-year floodplains to show Special Flood Hazard Areas; evaluation of potential impacts of the Project to impede floodwaters; and determination of Project impacts on the ability of local maintaining agencies to maintain flood protection facilities.

### 9.3 *Definition of Resource Study Area*

The RSA for Flood Hazards and Floodplain Management will extend to the Flood Emergency Management Act-designated floodplains within the Project footprint.

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<sup>1</sup> This EO was updated in the spring of 2015 to direct federal agencies to develop guidance on implementation. The U.S. DOT has not issued guidance at this time. The methodology may need to be adjusted to reflect the guidance in the Draft EIS.





## 9.4 *Environmental Consequences*

For the Project footprint a preliminary indication of whether the encroachment would be consistent with or require a revision to the regulatory floodplain. Impacts will be quantified through the use of GIS information and hydraulic modeling and present in tabular form.

Any incompatibility with floodplain development and preservation of floodplain values as well as the Project affect to floodplain resilience relating to climate change will be qualitatively discussed in the EIS. If necessary, a *Floodplain Risk Assessment* will be prepared for the Project.

## 9.5 *Ecological and Natural Resources Technical Report*

The detailed information on flood hazards and floodplain management will be included in the Ecological and Natural Resources Technical Report (described above in Section 3.5). The Draft EIS will summarize the findings for the Build Alternatives. The Final EIS will summarize the findings for the Preferred Alternative.

# 10.0 *Energy Resources*

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for energy resources that are proposed to be used in powering the Project. The process will develop a list of energy resources in the RSA and provide an energy resources impact analysis of the construction and operation of the Project.

## 10.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to energy resources planning will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- EO 13423, Strengthening Federal Environmental, Energy and Transportation Management.
- Energy Conservation Design Standards (Texas Administrative Code (TAC), Title 34, Part 1, Chapter 19, Subchapter C) (as applicable).
- Building Energy Performance Standards (Texas Health and Safety Code, Title 5 §388.003) (as applicable).

## 10.2 *Affected Environment*

The Draft EIS will list the energy resources in the RSA to be used in powering the system based on information from local agencies, maps, photographs, database searches, and site surveys. This section will provide a baseline of how much electrical energy is currently used and projected to be used in the RSA and discuss how much energy would be available when







needed for the Project. The discussion will describe recent trends regarding deficiencies in the region's energy supply during peak summer and winter periods (for example, rolling brown-outs). The section will also provide a discussion of how new USEPA standards may affect energy supply and demand.

### **10.3**     *Definition of Resource Study Area*

The boundaries of the RSA for energy resources extend beyond the project footprint. The energy impact analysis focuses on direct and indirect impacts to changes in the transportation energy consumed, on a regional basis, and construction-related energy consumption. The RSA for cumulative impacts will be larger than the Project-related RSA to encompass the area within which Project impacts related to energy resources accumulate or interact with the impacts of other actions.

### **10.4**     *Environmental Consequences*

The analysis will discuss how much energy would be used by travelers between Dallas and Fort Worth under the No-Build Alternative, compared to how much energy would be consumed with the Build Alternatives. This analysis will be based on roadway vehicle miles traveled and energy requirements of the Project.

The energy analysis will focus on four areas: (1) the Project's demand on regional energy supply and the potential need for additional electrical generation capacity to support operations; (2) peak-period electricity demand or operations; (3) overall energy consumption for transportation; and (4) construction-related energy consumption. The demand will be calculated in terms of megawatts and compared to current estimates of peak demand and supply capacity within the grid controlled by the Public Utilities Commission of Texas. In addition to the energy demand of the Project, the energy impacts in terms of fuel usage resulting from other modes of transportation affected by the Project, such as automobiles, planes, and trains, will be calculated in terms of British thermal units and barrels of oil.

Energy impacts caused by the Project might include the additional consumption of electricity required to power the Project (direct use) and consumption of resources to construct the Project facilities (indirect use). Energy data will be provided on a regional level and will be consistent with the information used in the air quality and transportation analyses. Indirect energy impacts will be evaluated quantitatively.

The Draft EIS will present the analysis of energy resources for the Build Alternatives. The Final EIS will summarize the findings for the Preferred Alternative. The modeling output will be included in an appendix to the Draft EIS.

## **11.0**     **Utilities**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for utilities, including the identification and evaluation of major



utility conflicts and the development of an opinion of probable cost for impacts to major utilities.

### **11.1**     *Affected Environment*

The affected environment subsection will identify and describe major utilities along the Build Alternatives (e.g. distribution wires and towers, communications lines, overhead electrical transmission lines, underground pipelines, etc.) using information gathered from available GIS based utility mapping, aerial photography, the Public Utility Commission of Texas, and the Railroad Commission of Texas. Further information may be obtained from coordination with TxDOT utility specialists.

### **11.2**     *Definition of Resource Study Area*

The boundary of the RSA for utilities consists of the Project footprint.

### **11.3**     *Environmental Consequences*

This subsection will identify potential utility conflicts between the Build Alternatives and major utilities. Any compatible digital location information provided by utility companies will be incorporated into a GIS database to aid in the identification of potential conflicts. An opinion of probable cost will be developed for relocating and/or adjusting the affected major utilities.

The Draft EIS will report the impacts of the Build Alternatives to major utilities. The Final EIS will summarize the findings for the Preferred Alternative. Within the Final EIS, major utility conflicts will be catalogued and evaluated using the recommended practices and procedures described in American Society of Civil Engineers Publication CI/ASCE 38-02 (Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data) per Quality Level “D”: Utility Records Research. Any planned improvements to utilities will be incorporated in the impact assessment. The opinion of probable cost will be updated for the Final EIS.

## **12.0**     **Geologic Resources**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for geologic resources, including providing descriptions of geologic surface and subsurface conditions and resources, and identifying potential geologic hazards and impacts (e.g. seismic events).

### **12.1**     *Laws, Regulations, and Orders*

- Applicable local, state, and federal laws and regulations related to geologic resources will be briefly described, or reference to other sections where they are more fully described will be provided. Currently, there is no applicable legislation and regulations to be addressed in this section.





## **12.2**     *Affected Environment*

The affected environment subsection will describe the geologic surface and subsurface conditions within the Project area, including topography and geology (types of soil/rock, depth to bedrock, groundwater depth) using information gathered from the U.S. Geological Survey, local jurisdictions, Texas Bureau of Economic Geology, the USEPA, U.S. Department of Agriculture, and Natural Resources Conservation Service among others. Further information may be obtained from communications with local, state, and federal agencies. Geologic resources, including minable minerals and petroleum, will be identified and a map will be created to illustrate these resources and alternatives.

## **12.3**     *Definition of Resource Study Area*

The RSA boundary extends 100 feet beyond the Project footprint, in order to consider relevant geologic resources that may be impacted by construction and operation.

## **12.4**     *Environmental Consequences*

This subsection will assess impacts resulting from the Build and No-Build Alternatives on geologic resources. Potential geologic hazards including seismic risk, areas of karst, swelling and corrosive soils, and areas of slope instability will be identified. Impacts on natural landmarks and landforms will be identified and discussed.

The discussion of impacts will be included in the Draft EIS for Build Alternatives and in the Final EIS for the Preferred Alternative, as needed.

# **13.0**     **Aesthetics**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for aesthetics and visual quality, including providing a concise description of existing aesthetics and visual resources along the Build Alternatives; identification of relevant aesthetic and visual resources; and evaluation of aesthetics and visual quality impacts.

## **13.1**     *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to aesthetics and visual quality will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Architectural Barriers Texas Accessibility Standards (as applicable).
- State of Texas, State Purchasing and General Services Act, Section 2166.404 of the Government Code (as applicable).
- Title 43, TAC Part I, Chapter 11, Subchapter D (as applicable).



## 13.2 Affected Environment

The affected environment subsection will list the aesthetic and visual resources in the Project area based on the review of applicable planning documents, observations during field surveys, or definition by local sources. Relevant aesthetic and visual resources will be identified and a map will be used to illustrate the locations of historic resources, parks, unique topography or landforms and the Project. Specific key viewpoints will be referenced when relevant.

## 13.3 Definition of Resource Study Area

The boundaries of the RSA for aesthetics and visual quality extend beyond the Project footprint to generally encompass the identified viewshed(s). However, the RSA will be expanded or reconfigured as warranted by resource conditions and the potential extent of impacts of the Project's improvements and operations. In addition, the RSA may be refined, in consultation with the local jurisdiction, to reflect local conditions.

## 13.4 Environmental Consequences

The FHWA's *Visual Impact Assessment for Highway Projects* (Pub. No. FHWA-HI-88-054) provides useful methodological guidance for transportation projects, as does TxDOT's *Landscape and Aesthetics Design Manual* (2012).

Sufficient detail will be provided to allow the analysis of the anticipated design of the completed Project or of reasonable assumptions for Project implementation. The analysis will focus on the Project's potential to alter existing conditions of the affected resources in the RSA. This analysis will clarify the important distinction between changes in visual character or quality that are incompatible with existing views, and visual changes that, while different than existing aesthetic character, are compatible with surrounding uses and resources, as well as consistent with adopted plans and policies.

The discussion of aesthetic and visual impacts will be provided in the Draft EIS for the Build Alternatives, and, as appropriate, in the Final EIS for the Preferred Alternative. Project visualizations and detailed mapping to illustrate the geographic relationship of the alternatives to the visual environment will be contained in an appendix and referenced in the text.

## 14.0 Land Use

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for land use, including providing a concise description of existing land use, which encompasses station planning, regional growth, agricultural lands, and joint development. Station and facility planning will have direct and indirect impacts on land use in the immediate and surrounding vicinity of station locations as well as the maintenance facility. Regional growth affects land use and development, while the development of a rail



facility will have impacts on regional growth. Joint development is directly relevant to station planning.

The Project lies entirely in the Dallas-Ft Worth Census designated urbanized area and thus is not subject to the Farmlands Preservation Policy Act (7 USC 4201–4209 and 7 CFR 658).

### 14.1 *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to land use and farmlands will be briefly described. Applicable legislation and regulations include, but are not limited to, the following:

- Texas Conservation Easement Enabling Statutes (Tex. Nat. Res. Code Ann. §§ 183.001 to 183.006 (2004) (as applicable).
- Regulation of Land Use, Structures, Businesses, and Related Activities (Texas Local Government Code Title 7, Subtitles A-C).
- Regional, County and Municipal Comprehensive and Land Use Plans.
  - *Forward Dallas! Comprehensive Plan (City of Dallas).*
  - *Fort Worth Mobility and Air Quality (MAQ) Plan (City of Fort Worth).*
  - *2015 Comprehensive Plan (City of Fort Worth).*
  - *99 SQ Miles A Vision for Arlington's Future. Draft Comprehensive Plan (City of Arlington).*
  - *2008 Comprehensive Plan Update Report (City of Irving).*

### 14.2 *Affected Environment*

The affected environment subsection will include a description of existing and future land uses along the Build Alternatives. Mapping will illustrate existing land uses along the alignment and at station opportunity zones. Land uses in the Project area will be identified based on information available from local and regional planning documents, GIS data, and on-the-ground surveys, as appropriate. Future/planned uses will be identified based on reviews of sources such as current comprehensive land use plans, sub area plans, and conversations with local and regional planning agencies.

While the Project area is within a Census designated urbanized area, there are some open spaces along the Build Alternatives that may be farmed or used for agricultural purposes. The section will list relevant known farmlands in the RSA, and show the location of agricultural conservation easements in the RSA. Data on existing agricultural lands and uses will be obtained from federal, state, regional, county, and municipal agencies, and resource conservation districts.



### 14.3 *Definition of Resource Study Area*

The boundary of the RSA for land use in undeveloped areas is generally the Project footprint, while the RSA boundary in suburban and urban areas extends 150 feet beyond the Project footprint to consider the potential change to land use composition adjacent to the Project footprint. The land use impact analysis will focus particularly on station opportunity zones and maintenance facilities, which have the greatest probability of changing land use type and intensity, population density, and patterns of development. Physical and operational elements of the RSA will be described in this subsection.

### 14.4 *Environmental Consequences*

This subsection will identify and describe potential changes to adjacent land uses along the Build Alternatives, such as disrupting established land use patterns, and conformity of these changes with land use plans. Prior and on-going efforts to avoid disruption to existing land uses and community structure will be described.

The analysis will evaluate the compatibility of the Project on the bases of: 1) the potential sensitivity of various existing land uses to the changes that likely would result from the Project; and 2) the potential impact of these changes on the type, intensity and pattern of existing land uses. It will also identify where city and county zoning and building permits, will be needed and provide analysis to support future permit review.

The analysis will address the following topics:

- Proposed project in relationship to other planned projects and whether the Project would:
  - Disrupt existing or planned development anticipated to benefit the community, or
  - Enhance or permit planned uses to be achieved.
- Direct and indirect land use and development impacts associated within increased density of development around stations opportunity zones.
- Existing development and character of the station opportunity zones (e.g., long-established single family neighborhood, industrial area, retail area, historic district, agriculture, parks and recreation, and cultural resources).
- Conceptual transit-oriented and/or station-oriented joint development.
- Relative sensitivity of existing land uses proximate to the Project to conditions arising from construction, operation or maintenance of the Build Alternatives.

The discussion of land use impacts will be provided in the Draft EIS for the Build Alternatives, and, as appropriate, in the Final EIS for the Preferred Alternative. Detailed



mapping to illustrate existing and future land uses will be included in an Appendix and referenced in the text.

## **15.0 Environmental Justice, Socioeconomics, Relocation, Elderly and Handicapped**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for Environmental Justice (EJ), socioeconomics, relocations, and elderly and handicapped analysis, including providing a summary description of existing populations, communities, and demographic and economic conditions of the Build Alternatives; providing an overview of the potential for displacement and relocation of residences and businesses within the Project area; conducting focused outreach to EJ populations (e.g. minority and low-income populations); and evaluating impacts.

### **15.1 *Laws, Regulations, and Orders***

Applicable local, state, and federal laws and regulations related to EJ, socioeconomics, relocation, and elderly and handicapped will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.
- EO 13045 Protection of Children from Environmental Risks and Safety Risks
- USDOT Updated Environmental Justice Order 5610.2(a), 2012.
- Americans with Disabilities Act (42 USC §§ 12101–12213) (as applicable).
- Title VI of the Civil Rights Act of 1964, (42 USC §2000d) (as applicable).
- Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 USC § 61) (as applicable).
- Texas Property Code Annotated § 21.046: Texas Statutes - Section 21.046: Relocation Assistance Program (as applicable).
- TxDOT Environmental Compliance Community Impact Assessment Toolkit.

### **15.2 *Affected Environment***

Existing demographic and economic conditions in the region will be described based on data and issues that may influence potential impacts and environmental commitments. Existing residences, businesses and community facilities that may be affected by displacement; the displacement area population characteristics; and displacement area community service characteristics will be described.







In addition, existing populations, including elderly and disabled populations, along the Build Alternatives will be identified. Existing neighborhoods, community services, and local businesses will be mapped. Pertinent stakeholder issues and concerns from public outreach efforts will be described.

For the EJ analysis, three factors will be considered: (1) the area comprising the general population that will be affected by the Project (reference community), (2) the area that would be most directly affected by the Project (RSA), and (3) the presence of EJ populations within the RSA. Demographic characteristics for EJ populations within the RSA will be defined using US Census and American Community Survey data census tracts and block groups. The most recent American Community Survey data will be used. City, county, Metropolitan Statistical Area, and state data will be collected from the same sources for an accurate comparison of geographic units.

The following demographic characteristics will be identified:

- Total population.
- Percentage minority populations.
- Distribution of minority populations.
- Percentage of population living at or below the federal Health and Human Services poverty level.
- Percentage of population over 65 years.
- Percentage of households with limited English proficiency.
- Existing number of households.
- Percentage of households with incomes below the federal poverty level.
- Median household income.

The topics that will be used to determine impacts to EJ populations include: air quality; traffic noise; water pollution; hazardous waste; aesthetic values; community cohesion; economic vitality; employment impacts; displacement of persons, businesses, or farms and other relocation impacts; accessibility; traffic congestion; safety; and construction and/or temporary impacts.

### **15.3**     *Definition of Resource Study Area*

The RSA for these resources are the boundaries of the census tracts that are abutting the Project footprint.





## **15.4**     *Environmental Consequences*

### **15.4.1**   *Environmental Justice*

The analysis will follow the policies expressed in the USDOT's Environmental Justice Order 5610.2(a). Changes resulting from the Project to EJ populations will be measured based on the overall population in the Project area. Any impacts that are found to be greater to EJ populations will be considered disproportionate and adverse and discussed. Coordination with EJ populations will be conducted and used to revise Project elements as necessary to reduce the level of impact. The analysis will describe the coordination and the measure to minimize harm. In determining whether a mitigation measure or an alternative is "practicable," the social, economic (including costs) and environmental effects of avoiding or mitigating the adverse effects will be taken into account. Both construction-related and operational impacts will be included in the discussion.

### **15.4.2**   *Socioeconomics Including Elderly and Handicapped*

The qualitative community impact analysis will summarize potential division of adjacent communities through the physical removal of residences, businesses, and important community facilities. Particular consideration will be given to how the Project facilities affect elderly and disabled populations (populations of low mobility status). Temporary or permanent barriers that could be created by the Project facilities will also be described based on whether these barriers would isolate portions of a community, separate residents from important community facilities or services, or alter access to such resources.

### **15.4.3**   *Relocations*

The number of acres and structures that would be acquired will be summarized based on the Project footprint. Residential and nonresidential units within the displacement area of the Project will be documented and the characteristics of potentially displaced buildings, types of occupants (to the extent possible through field observations), displacement area population characteristics, and displacement area community service characteristics will be summarized in tabular form and include an analysis of the availability of suitable replacement housing and business locations. The qualitative analysis of the inconvenience of relocation to residents and businesses and the potential for gain or loss in business activity for relocated firms will be summarized.

The discussion of EJ, socioeconomics, relocation, and elderly and handicapped populations will be provided in the Draft EIS for the Build Alternatives, and, as appropriate, in the Final EIS for the Preferred Alternative.

## **16.0**     **Public Health, Safety, Security and Hazardous Materials**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for public health, safety, security and hazardous materials. The



section will include a list of known resources and a description of existing hazardous materials sites, in addition to describing the process for conducting an emergency services analysis and hazardous materials studies for the evaluation of potential impacts.

### *16.1 Laws, Regulations, and Orders*

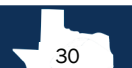
Applicable local, state, and federal laws and regulations related to public health, safety, security and hazardous materials will be briefly described, or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Hazardous and Solid Waste Amendment (42 USC § 6901 et seq.) (as applicable).
- Comprehensive Environmental Response, Compensation and Liability Act (42 USC § 9601 et seq.) (as applicable).
- Superfund Amendments and Reauthorization Act (42 USC § 9601 et seq.) (as applicable).
- Rail Safety Improvement Act of 2008 (Public Law 110-432) (as applicable).
- USC on Railroad Safety (49 USC § 20101 et seq.) (as applicable).
- Department of Homeland Security/Transportation Security Administration (49 CFR Part 1580) (as applicable).
- Transportation Security Administration—Security Directives for Passenger Rail (as applicable).
- TxDOT Hazardous Materials Compliance Toolkit, as applicable.

### *16.2 Affected Environment*

The affected environment subsection for public health, safety, security, and hazardous materials will include a concise summary description of existing emergency services, law enforcement, emergency medical services, emergency response plans, community safety features, oil and gas wells, and potential environmental concern sites along the Build Alternatives.

The potential environmental sites of concern will be identified by a limited Initial Site Assessment for hazardous materials developed using the Environmental Data Resources (EDR) data base. The EDR database search will consist of a current (2015) computerized database search of readily available government environmental lists and databases for properties, supplemented by a review of past assessments and corrective actions, available historical aerial photographs, and a limited site reconnaissance to evaluate areas visually of possibly contaminated surfaces. Hazardous material issues associated with the operation of the Project will be assessed and summarized in map and table form.





The location of known public health, safety and security resources (e.g. government facilities, hospitals, etc.) will be identified and mapped using readily available published sources and information from NCTCOG and local governments.

### **16.3**      *Definition of Resource Study Area*

The boundaries of the RSA for Public Health, Safety and Security extend a half-mile beyond the Project footprint.

The boundaries of the RSA for hazardous materials will consist of the Project footprint plus a 150-foot buffer. The focus will be on impacts of the presence of hazardous materials and wastes in managed conditions or as contaminants in the nearby environment on the construction and operation of the Project. For areas adjacent to landfills, the RSA will be increased to a quarter-mile to assess landfill potential to release methane gas.

### **16.4**      *Environmental Consequences*

The results of the Initial Site Assessment will be based on the Project's potential to alter existing conditions of the affected resources in the RSA. Concerns identified during the Initial Site Assessment, will be addressed. The evaluation of the impacts to vulnerable populations will include a qualitative description of how the Project could affect health issues based on a literature review. Information on railroad modifications, crossings, and closures as a result of the Project footprint will also be included and a detailed map of sufficient scale will be prepared to illustrate the geographic relationship of the alternatives to public health, safety and security and clearly show the location and extent of Project impacts and major landscape features.

Impacts that may occur during construction and operation of the Project will be summarized. Additionally, the results of the emergency services analysis will be described and mapped to address any estimated change in response time of emergency services, and access to community health care facilities as a result of the Project.

The discussion of these resources will be provided in the Draft EIS for the Build Alternatives, and, as appropriate, in the Final EIS for the Preferred Alternative.

## **17.0**      **Parks and Recreational Resources and Section 6(f)**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for parks and recreational resources including providing a description of relevant public parks, recreational facilities, and open space uses, as well as an analysis of impacts to these resources, and potential mitigation measures. Also noted will be the Project's use of land from within a park or recreational area that has received funding from Section 6(f) of the Land and Water Conservation Fund. Parks and recreational facilities under Section 4(f) of the U.S. DOT Act of 1966, will be discussed below in Section 23.0.



### **17.1**     *Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to parks and recreational resources will be briefly described or reference to other sections where they are more fully described will be provided. Applicable legislation and regulations include, but are not limited to, the following:

- Section 6(f) of the Land and Water Conservation Fund Act (16 USC § 460I-8(f) and 36 CFR Part 59.1) (as applicable).
- Texas Parks and Wildlife Code (Chapter 26).
- TxDOT Environmental Compliance Section 4(f), U.S. Department of Transportation Act Toolkit.
- TxDOT Environmental Compliance Section 6(f), Land and Water Conservation Fund Act Toolkit.
- Open space, parks and recreation, aesthetics, land use, conservation, or other similar elements of municipal or county comprehensive/general plans.
- County and municipal parks and recreation master plans.

### **17.2**     *Affected Environment*

The affected environment subsection will include a summary description of existing parks and recreational areas within the RSA. Parks and recreational uses (including trails and bikeways) will be identified and described. The analysis for Parks and recreational areas will be based on available reports and data, discussions with federal, state, and local agency representatives in the region, and limited field investigations. A map of the RSA will illustrate the locations of parks and recreational resources at a sufficient scale to illustrate the geographic relationship of these areas.

### **17.3**     *Definition of Resource Study Area*

The RSA for parks and recreational facilities includes the Project footprint including any physical ground disturbance associated with construction. If necessary, the RSA will expand to include driveway access into parks and recreational facilities, if the Project alters or changes access.

### **17.4**     *Environmental Consequences*

Information and discussion will be summarized to present content effectively to the general public, with the parks and recreational resources impact analysis focused on Project impacts to access and use. Detailed impact information such as parks and recreational resource acquisitions will be presented in an appendix.



Direct and indirect impacts to parks and recreational resources will be summarized based on the GIS spatial analysis, which would identify the distance of parks and recreational resource facilities from the Project. The GIS analysis will also help determine the amount of park and recreational resource land that would be acquired and facilities and functions that would be affected by the Project. This section will also use construction, ROW plans, and station area zones to determine whether the resource property will be temporarily or permanently acquired.

The potential disruption of established community and visitor use of parks and recreational resources because of temporary construction easements and general construction activity will also be summarized.

The discussion of parks and recreation areas will be provided in the Draft EIS for the Build Alternatives, and, as appropriate, in the Final EIS for the Preferred Alternative.

### **17.5**      *Section 6(f) Coordination*

This section will identify Project area public parklands and recreational resources subject to Section 6(f) of the Land and Water Conservation Fund Act that would be affected by the Project. In addition to coordinating with local officials with jurisdiction, the TPWD will be contacted to determine which resources are applicable. Section 6(f) coordination requirements for those resources will be explained and coordination efforts planned or initiated will be documented.

Section 6(f) impacts will be disclosed as simply as possible as acreage of potential impact and type of facilities affected (e.g., picnic tables, play grounds, ball fields). The discussion will also include the identification of land needed for Section 6(f) conversion. Following the Record of Decision (ROD), land acquisition will adhere to TxDOT's ROW process.

## **18.0**      **Historic Resources**

This section provides the framework for conducting and reporting historic resources data gathering, determining the study area, applying relevant thresholds for identifying impacts to historic resources, sequencing of activities and preparing documentation in a manner that is in compliance with the requirements of NEPA (42 USC 4321 et seq.) and Section 106 of the National Historic Preservation Act of 1966, as amended (54 USC 300101). Specific reference will be made to related content in other sections of the EIS that influence or are influenced by the Historic Resources impact analysis, including Section 4(f) analysis (Section 23.0) and Aesthetics (Section 13.0).

The FRA is responsible for compliance with Section 106 coordination and determination requirements. The timing of the historic resources deliverables and activities conducted to comply with Section 106 will be integrated with the overall environmental document delivery schedule. The results of the Section 106 compliance efforts and consultation will be



incorporated into the NEPA compliance process, to the extent feasible, so that the EIS is consistent with the stipulated mitigation measures outlined in a Memorandum of Agreement (MOA) or Programmatic Agreement (PA) that would be developed if adverse impacts would occur from the Project) and those measures included in the Project ROD.

The FRA will take the lead in consulting with Tribal consulting parties, based on the requirement to conduct government-to-government consultation. Under Section 106, additional consulting parties include Certified Local Governments, and individuals and organizations with a demonstrated interest in the undertaking. The Public Involvement Plan will be amended as necessary to identify the methods to be used to notify consulting parties and the public of the Project actions and for considering input from these parties.

### *18.1 Laws, Regulations, and Orders*

Applicable local, state, and federal laws and regulations related to historic resources will be briefly described, or reference made to other sections where they are more fully described. Applicable legislation and regulations include, but are not limited to, the following:

- Section 106 of the National Historic Preservation Act as amended (54 USC 300101).
- Section 4(f) of the Department of Transportation Act (49 USC 303).
- The Antiquities Code of Texas (9 Texas Natural Resources Code [TNRC] § 191).
- TxDOT Environmental Compliance Historic Resources Toolkit.

### *18.2 Affected Environment*

The affected environment subsection will describe the methodology for developing the study area for historic resources, which is defined as the Area of Potential Effects (APE) under Section 106, initiating coordination with consulting parties and the public, and conducting background and field investigations under NEPA and Section 106. Methods will be based on the TxDOT-Texas Historical Commission (THC) Memorandum of Understanding (MOU) (13 TAC § 26.25) as applicable, the, standard practices for NEPA compliance, and previous FRA projects. Further refinement or explication of methods may take place under a new MOA or PA specific to the Project or to FRA projects in Texas.

A research design will be prepared in consultation with TxDOT and the FRA to address a two-tiered approach (historical constraints survey of the Build Alternatives followed by any reconnaissance survey deemed necessary by THC).

A summary of the surveys and studies conducted to identify historic resources along the Build Alternatives will be included, making reference to technical reports as appropriate. This summary will include information about the current eligibility or listing of each resource for the National Register of Historic Places (NRHP). Pertinent stakeholder issues and concerns identified through public outreach efforts and personal contact with local agencies



will be documented. All subsections of the EIS that describe the resources or are related to the resources will be cross-referenced.

### **18.3**     *Definition of Area of Potential Effects*

The APE for historic resources would likely be 150 feet from existing or Project ROW within existing transportation corridors and 300 feet from Project ROW for new-location alignments. The APE will be developed in consultation between FRA and THC, and consulting parties.

### **18.4**     *Environmental Consequences*

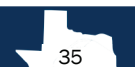
This subsection describes the process for evaluating impacts under NEPA and Section 106. Methods presented here are based on the TxDOT-THC MOU (13 TAC § 26.25) as applicable, the TxDOT's Environmental Compliance Historic Resources Toolkit, standard practices for NEPA compliance, and previous FRA projects. Further refinement or clarification of methods may take place in consultation with THC. Direct and indirect impacts to historic resources will be analyzed, including impacts that may occur during construction and operation of the Project. The analysis will be based on a review of available reports and data (including federal and state statutes, resource agency, local, and regional agency policies and ordinances), discussions with agency representatives in the region, field investigation, modeling (where applicable) and professional judgment. A thorough record of all consultation with THC, tribes, and other consulting parties will be kept for use in the Impacts Assessment.

GIS databases will be developed, including data from (1) Project design, or (2) from available federal, state, and local sources. Analysis will be focused on the Project's potential to alter existing conditions of the affected resources.

Eligibility assessment includes consultation with the THC, tribes, and consulting parties. A thorough record of all consultation will be kept. This step is followed by an assessment of whether the Project would adversely affect the characteristics of a resource that contribute to its historical significance.

Both NEPA and Section 106 describe the historic significance of a resource in terms of eligibility for listing in the NRHP. NRHP criteria, defined in 36 CFR 60.4, state that a resource must be at least 50 years old (unless meeting exceptional criteria) and possess the quality of significance in American history, architecture, archaeology, engineering, and culture and is present in districts, sites, buildings, structures, and objects that meet one or more of the following criteria:

- (a) Is associated with events that have made a significant contribution to the broad patterns of history;
- (b) Is associated with the lives of persons significant in the past;







- (c) Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; and/or
- (d) Has yielded, or may be likely to yield, information important in prehistory or history.

A property must also retain sufficient integrity to convey its significance. There are seven aspects of integrity—location, design, setting, materials, workmanship, feeling, and association. For a property to retain integrity, it should retain most aspects of integrity, though the retention of some aspects of integrity is critical to certain properties while other aspects of integrity are not as crucial. For this reason, the determination of whether a property retains sufficient integrity to be considered significant must relate to and be informed by the qualities that make the property significant (referred to as character defining features). If a particular resource meets one of these criteria and retains integrity, it is considered as an “historic property” eligible for listing in the NRHP. For the purposes of simplicity, the term historic property is used in this guidance to refer to historic resources determined significant under both state and federal criteria.

### *18.5 Historic Resources Reconnaissance Survey Report*

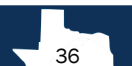
A Historic Resources Reconnaissance Survey Report will be prepared, following TxDOT’s current documentation standards at sufficient levels to satisfy THC requirements for determining the presence of historically significant non-archeological properties in the APE. This report will document the historic-age resources in the APE and identify which resources, if any, are recommended eligible for the NRHP. The FRA will make the determination of eligibility and request THC’s concurrence. The report will then make recommendations for determinations regarding the Project’s potential to affect those resources.

### *18.6 Memorandum of Agreement/Programmatic Agreement*

A draft MOA/PA regarding adverse impacts will be developed in consultation with the Advisory Council on Historic Preservation, TxDOT, FRA, and THC, as well as consulting parties identified for the section. The MOA or PA will be developed and made available for public review with the Final EIS. This agreement will be executed before the ROD is issued.

Upon completion of the identification, evaluation, and impacts determination for historic properties, the treatment plans will be prepared pursuant to the MOA or PA to address adversely affected historic properties and set forth applicable mitigation measures in consultation with THC, appropriate agencies, and other MOA or PA signatories. The concerns of the consulting parties will be considered in determining the measures to be implemented.

A draft MOA or PA will be prepared and submitted to TxDOT, FRA, THC, other reviewing agencies, and consulting parties for comment and concurrence. The MOA or PA will







document mitigation measures to resolve adverse impacts, including treatment plans for historic resources.

## **19.0 Archeological Resources**

This section provides the framework for conducting archeological resources data gathering, determining the study area and APE, applying relevant thresholds for determining impacts upon archeological resources, sequencing of activities and preparing documentation in a manner that is in compliance with the requirements of NEPA (42 USC 4321 et seq.) and Section 106 of the National Historic Preservation Act of 1966, as amended (54 USC 300101). Specific reference will be made to related content in other sections of the EIS that influence or are influenced by the Archeological Resources impact analysis, including Section 4(f) (Section 23.0) and Aesthetics (Section 13.0).

As discussed in Section 18.0, the FRA is responsible for compliance with Section 106 coordination and determination requirements. The timing of the archeological resources deliverables and activities conducted to comply with Section 106 will be integrated with the overall environmental document delivery schedule.

### **19.1 *Laws, Regulations, and Orders***

Applicable local, state, and federal laws and regulations related to archeological resources will be briefly described, or reference made to other sections where they are more fully described. Applicable legislation and regulations include, but are not limited to, the following:

- Section 106 of the National Historic Preservation Act, as amended (54 USC 300101)
- Section 4(f) of the Department of Transportation Act (49 USC 303).
- Native American Graves Protection and Repatriation Act (25 USC 3001-3013).
- Archaeological Resources Protection Act (16 USC 470aa-470mm).
- The Antiquities Code of Texas (9 TNRC § 191).
- TxDOT Environmental Compliance Archeological Sites and Cemeteries Toolkit.
- Texas Health and Safety Code.

### **19.2 *Affected Environment***

The affected environment subsection will describe the methodology for developing the APE for archeological resources, initiating coordination with consulting parties and the public, and conducting background and field investigations under NEPA, Section 106, and the Antiquities Code. Methods presented here are based on the TxDOT-THC Memorandum of Understanding (MOU) (13 TAC § 26.25) as applicable, the TxDOT Environmental Compliance Archeological Sites and Cemeteries Toolkit, standard practices for NEPA compliance, and



previous FRA projects. Further refinement or explication of methods may take place under a new PA specific to the Project or to FRA projects in Texas.

This subsection will also include a concise summary of applicable regulations, as outlined in this guidance document. A summary of the surveys and studies conducted to identify archeological resources along the Build Alternatives will be included, making reference to technical reports as appropriate. This summary will include information about the eligibility of each resource for the NRHP. Pertinent stakeholder issues and concerns identified through public outreach efforts and personal contact with local agencies will be documented. All subsections of the EIS that describe the resources or are related to the resources will be cross-referenced.

### **19.3**      *Definition of Area of Potential Effects*

For archeological resources, the APE typically consists of the entirety of the Project footprint in three dimensions, including all existing and Project ROW, easements, associated utility relocations, and Project-specific locations such as borrow pits, equipment staging areas, and drainage modifications (13 TAC § 26.25). The vast majority of archeological sites do not contain values that make them subject to indirect adverse impacts; however, in rare cases, the archeological APE may be larger than the Project footprint if such expansion is required to fully evaluate Project impacts on a known Traditional Cultural Property, NRHP district, or other sensitive resource.

FRA will develop the APE in consultation with THC, and consulting parties, including tribes.

### **19.4**      *Research and Survey*

The survey, also known as a Phase I inventory, will be limited to the existing ROW and archeological work products will include 1) Background Studies, 2) Texas Antiquities Permit Application, and 3) Intensive or Reconnaissance Survey Report. A research study plan will be prepared in consultation with TxDOT and the FRA to initiate the documentation of known archeological sites and areas determined to be high probability areas.

#### **19.4.1**    *Background Studies*

Risk will be evaluated by conducting background research using the restricted Archeological Sites Atlas maintained by THC and the Texas Archeological Research Laboratory to identify previously recorded archeological sites, cemeteries, State Archeological Landmarks (SALs), NRHP properties and districts, and historical markers within the APE and the study area for the full range of the Build Alternatives. Historic aerial photographs and historic maps will be examined, such as soil maps, USGS topographic maps, geologic maps, Sanborn Fire Insurance maps, and TxDOT highway maps, as available, to establish potential historic-age archeological targets. A predictive model of potential archeological site locations will be constructed by querying modern topographic and soil datasets to assess where prehistoric



and historic-age settlement is most likely to have occurred and to have been preserved in surface, shallow subsurface, and deep subsurface contexts. The Potential Archeological Liability Map data will be integrated for the Project area, to determine whether previously analysis by TxDOT has resulted in recommendations for no further investigation, surface survey, or deep testing (e.g., trenching/coring). Concerning the Project, the Potential Archeological Liability Map data is available for both Dallas and Tarrant counties and will be checked against other desktop sources and modified as necessary; for instance, aerial evidence of localized erosion or recent construction may allow areas called out for survey in the Potential Archeological Liability Map to be eliminated. All sources above and other appropriate references will be utilized to evaluate the long-term stability of the landscape, and the likelihood that Holocene deposits are preserved.

If required by TxDOT, the results will be presented, including conclusions from predictive modeling, in a Risk Assessment form and/or Background Study (Review Standards).

The integration of NEPA alternatives analysis may involve the public display of constraints maps that include cultural resources. The locations of SALs, archeological sites, and address-restricted NRHP districts cannot be shown publicly.

#### *19.4.2 Texas Antiquities Permit*

An application for a Texas Antiquities Permit will be prepared under 13 TAC § 26.15. The most likely level of investigation for a major rail Project is Intensive Survey (Permit Category 6 under 13 TAC § 26.15).

#### *19.4.3 Archeological Survey Methods*

Survey investigations will be conducted that meet or exceed the Archeological Survey Standards for Texas (hereafter the “Survey Standards”). Survey Standards for the Project will conform to the TxDOT-THC MOU. If necessary, however, TxDOT may deviate from the Survey Standards if the THC confirms that the deviation remains adequate.

If the Project is constructed using a design-build process, the design will not be completed until after the environmental document is finalized and after a design-build contractor is under contract. Because of this, APEs to guide survey will be based on preliminary design information. An additional factor to be considered during survey planning is that obtaining access to parcels to conduct pedestrian surveys will continue to be a challenge, and a reasonable and good-faith effort will be made to evaluate inaccessible parcels from accessible parcels and/or public ROW. The combination of preliminary engineering and lack of access may require survey fieldwork to be undertaken in phases, with revisits as additional parcels become available and/or the design shifts.

Any archeological sites encountered will be documented on standard Texas Archeological Research Laboratory archeological site forms, preferably using the TexSite database. The



report will include evaluations of NRHP/SAL eligibility for all sites recorded, with the understanding that such an evaluation is provisional at this level of investigation. The methods outlined in National Register Bulletin 38 will be followed in order to identify and evaluate potential Traditional Cultural Properties and cultural landscapes that could be affected by the Project. The potential for identifying Traditional Cultural Properties of importance to Native Americans and other non-Native American descendant communities will be considered based on information gathering while conducting background research. Properties that have been previously evaluated need not be reevaluated unless the previous evaluations do not meet current standards. To determine if properties meet the NRHP eligibility threshold additional evaluative studies may be necessary.

### *19.5 Environmental Consequences*

The process for evaluating impacts will be based on the TxDOT-THC MOU (13 TAC § 26.25) as applicable, the TxDOT Environmental Compliance Archeological Sites and Cemeteries Toolkit, standard practices for NEPA compliance, and previous FRA projects. Further refinement or clarification of methods may take place under a new PA specific to the Project or to FRA projects in Texas. Direct and indirect impacts related to archeological resources will be analyzed, including impacts that may occur during construction and operation of the Project. The analysis will be based on a review of available reports and data (including federal and state statutes, resource agency, local, and regional agency policies and ordinances), discussions with agency representatives in the region, field investigation, modeling (where applicable) and professional judgment. A thorough record of consultation with THC, tribes, and consulting parties will be used in the Impacts Assessment.

GIS databases will be developed, including data from (1) Project design or (2) from available federal, state, and local sources, which will provide sufficient detail to allow complete analysis of the anticipated design of the completed Project or of reasonable assumptions for Project implementation, including structures for grade-separated alignment crossings and water crossings, maintenance road access, all electrical and utility connections or modifications, maintenance and train storage facilities, etc. The analysis will focus on the Project's potential to alter existing conditions of the affected resources.

Eligibility assessment includes consultation with THC, tribes, and consulting parties. This step is followed by an assessment of whether the Project would adversely affect the characteristics of a resource that contribute to its historical significance.

Both NEPA and Section 106 describe the historic significance of an archeological resource in terms of eligibility for listing in the NRHP under criterion d, as defined in 36 CFR 60.4 and presented above in Section 18.4. Under Criterion D, an archeological property would be eligible for the NRHP if it “has yielded, or may be likely to yield, information important in prehistory or history.”



## 19.6 Archeological Survey Report

An Archeological Survey Report will be prepared, following TxDOT's current documentation standards. This report will document the archeological resources in the APE, zones of observed disturbance, methods used to investigation surface, near-surface, and deep deposits (if applicable), and justify deviations from Council of Texas Archeologists /THC standards. The report will identify which resources, if any, are eligible for the NRHP or as SALs. The report will then make recommendations regarding the Project's potential to affect those resources (Determination of Effect) for review by TxDOT and FRA.

## 19.7 Memorandum of Agreement/Programmatic Agreement

If the Preferred Alternative would have an unavoidable adverse effect on a NRHP listed or eligible archeological resource (i.e., important for preservation in place), FRA will consult with the Advisory Council on Historic Preservation, TxDOT, and the THC, as well as consulting parties on draft MOA or PA. The concerns of the consulting parties will be considered in determining the measures to be implemented. The MOA or PA will document mitigation measures to resolve adverse impacts. The MOA or PA will be developed and made available for public review and will be executed before the ROD is issued.

## 20.0 Transportation

The following direction is specific to the transportation network, including at-grade intersections as well as other transportation elements. These other elements include public transportation service and facilities; railroad, bike and sidewalk facilities; roadway, and other established grade-separated and at-grade crossings of the build alternatives.

Documentation will include established local policies concerning the context of transportation impacts, such as local and regional Level of Service standards from documents such as general plans, Congestion Management Plans, and TxDOT. The date of Project implementation discussed in this section will be 2025. The design year will be 2040.

### 20.1 Laws, Regulations, and Orders

Applicable local, state, and federal laws and regulations that will be summarized include, but are not limited to, the following:

- Railroads (USC, Title 45).
- Rail Programs (USC, Title 49, Subtitle V).
- Texas Transportation Code.
- Rail Facilities (TAC, Title 43, Part 1, Chapter 7).
- Planning and Development of Transportation Projects (TAC, Title 43, Part 1, Chapter 16).
- *Texas Transportation Plan 2040.*





- *Texas Rail Plan.*
- NCTGOG's *Mobility 2040* (expected to be approved in early 2016).

## 20.2 *Affected Environment*

For the analysis, the following data will be collected for the study area:

- Commuter rail services including schedules and potential service improvements.
- Freight infrastructure and the movement of goods will be determined based on designated freight truck and rail routes.
- Average daily traffic counts on arterials adjacent and providing access to the proposed station zones and at selected locations along affected freeways and roadways.
- Traffic volume at existing at-grade crossings affected by the Build Alternatives.
- Roadway characteristics such as type (arterial, ramp, freeway), number of lanes, speed limit, parking, bicycle and pedestrian facilities, and classification. Intersection geometry including lane channelization may be necessary at selected locations. Type of traffic control (traffic signal, stop/yield sign), and signal timing and phasing at select signalized intersections.
- Non-motorized travel will identify bicycle lanes, bicycle routes, and existing walkways and pedestrian access facilities.
- Existing parking supply and of parking facilities.

Depending on the location of the Build Alternatives, signalized intersection operations within a quarter-mile of the existing and/or proposed at-grade crossings for peak traffic period impacts would be evaluated.

## 20.3 *Definition of Resource Study Area*

The boundaries of the RSA for transportation extend beyond the Project footprint. The study area for direct impacts includes the area of potential disturbance associated with Project construction, as well as intersections and transportation facilities within a quarter-mile, particularly around stations. For indirect impacts on transportation, the study area includes the extent of the roadway networks that may reflect changes in circulation as a consequence of Project conditions. The RSA also includes the vicinity of the maintenance facilities since traffic in these areas could be affected by the Project. Physical and operational elements of the RSA will be described in this subsection.

## 20.4 *Environmental Consequences*

Changes to traffic operations in the RSA for the design year from the Project will be evaluated based on the travel demand forecast model and the following parameters:





- Impacts on existing freight and commuter rail serves.
- Impacts on morning and afternoon peak periods.
- Parking accumulation (number of vehicles parked at a given instance of time) will be evaluated at each of the proposed station zones.
- Impacts on vehicular traffic, pedestrian flow, and transit operation will be evaluated for each station zone. Analysis of pedestrian flow will consist of providing for pedestrian cycle at signalized intersections and identification of pedestrian crosswalks. Impacts on transit operation will consist of including number of proposed buses on the affected locations to account for their effect on level of service and delay.

Existing 2013 aerial photography provided by NCTCOG and available internet applications, such as Google Earth, will be used to develop the baseline attributes for existing freight and commuter rail corridors, sidings, roadway, intersection, parking, and ramp configurations potentially affected by the Project.

For the station zones and required street modifications/closures for the Project features, impacts of the build alternatives will be assessed on city streets for vehicular, pedestrian, bicyclists and public transit operations. Parking accumulations will be estimated and their impact assessed. The analysis will be conducted using VISSIM for morning or afternoon peak period, and level of service or delay will be used to gauge the level of operation and identify locations and or movements that would be deficient. The results will be presented in table and maps.

For both the existing and design year, the following software will be used to determine level of service, flow rates, and density: VISSIM, HCS and/or CORSIM. Based upon the location of the Build Alternatives, a traffic data collection plan will be developed and coordinated with FRA and TXDOT to identify locations and data needed to perform analysis of existing and future conditions at at-grade crossings. The plan will also identify growth factors to bring all data to a uniform base year.

The DEIS Transportation Section will summarize the impacts for the Build Alternatives, and the FEIS Transportation will summarize the impacts for the Preferred Alternative.

## **21.0 Construction Impacts**

The following discussion presents direction specific to construction impacts, which will be a compilation of impacts specific to construction activities affecting resources. These are the same resources for which impacts are assessed in the individual resource. Much of the information for this section will be drawn from the studies conducted to assess the existing conditions of those resources and impacts from the Project. Specific reference will be made to related content in other sections of the EIS that influence or are influenced by the construction impacts analysis and supportive/associated technical documents.



NEPA guidelines specifically state that, “Significance cannot be avoided by terming an action temporary...” 40 C.F.R. 1508.27(b)(7). Construction period impacts are those that occur for a limited time only and are considered temporary (e.g., short-term ground disturbance, construction staging and activities, construction associated with implementing mitigation measures, noise from equipment operation).

### **21.1**     *Resource Study Area*

The RSA for construction impacts may not be exactly the same as the RSA for operational impacts, but will need to be developed based on the construction activities that will be conducted, the size of the area affected by those activities, and the types of equipment that will be used. The boundaries of the RSA may extend beyond the Project footprint. In determining the RSA, the analyst will start with the construction footprint, and then refer to the individual resource sections for the areas in which the resource studies considered construction impacts. The RSA will vary based on the resource type and the construction activities to be undertaken. The analysis will focus on the construction impacts to sensitive or protected resources, communities, and community services.

### **21.2**     *Environmental Consequences*

A high-level summary of construction impacts resulting from the No-Build and Build Alternatives will be presented with reference made to the specific resource section where a more detailed evaluation was already provided.

This section will summarize quantitative and qualitative analysis of temporary direct and indirect impacts that may occur during construction of the Project. The analysis will be based on a review of the individual resource sections in Chapter 3 of the EIS, the resource technical reports, the alternative design schematics, and station area plans. It also will account for implementation of best management practices specifically related to construction activities.

Construction impacts will be assessed for the period extending from the initiation of Project construction to the time that it is fully operational. The impact analysis will be structured to allow for the assessment of impacts related to road closures or lane reconfigurations implemented during construction. A summary matrix will categorize construction impacts from the resource analyses by temporary and permanent impacts (as applicable).

The Draft EIS will summarize the findings for the Build Alternatives. The Final EIS will summarize the findings for the Preferred Alternative.

## **22.0**     **Indirect and Cumulative Impacts**

This section guides the Project through a thorough process of gathering and reporting relevant and sufficient data for indirect and cumulative impacts, including analyzing the indirect and cumulative impacts of implementing the Project in combination with other past,





present, and reasonably foreseeable future projects that contribute to those impacts; and identifying any crucial issues or concerns relating to the consideration of indirect and cumulative impacts.

## 22.1 *Laws, Regulations, and Orders*

The analysis includes indirect impact assessment and the cumulative direct impact assessment as part of standard practices for NEPA compliance as identified in the previous subsections.

Additionally, the analysis will use the first four of eight steps outlined in *National Cooperative Highway Research Program Report 466*. Community and regional plans for the study area, as well as local policies, regulations, and ordinances will be examined and areas with unique policies and requirements will be identified.

TxDOT's Environmental Compliance Toolkits contains procedural requirements which will be followed in order to complete a thorough and defensible indirect induced growth impacts analysis.

## 22.2 *Indirect Impacts*

### 22.2.1 *Affected Environment*

The Project area's ongoing trends will also be based on population growth, development trends, and regional economic and industrial trends. Mapping and spatial data will identify and general patterns of growth and development. An inventory of the study area's notable features will be prepared, with primary reliance on data collected on the affected environment for the various resource sections.

For the indirect induced growth impacts analysis, GIS databases for the Project will be developed (1) as part of Project design or (2) from available federal, state, and local sources. Sufficient detail will be provided to allow complete analysis of the anticipated design of the Project or of reasonable assumptions for Project implementation.

Quantitative analysis and GIS tools will be used to determine indirect impacts from the Project footprint, as well as land development induced by station planning zones, land use, regional growth and joint development actions. The analysis will be focused on the Project's potential to alter existing resource conditions and future land development.

### 22.2.2 *Definition of Resource Study Area*

The RSA boundaries will include political or geographic boundaries within which the Project will be forecast to draw ridership. It would also include the overall study area for the resources detailed above.



Determination of the appropriate RSA also requires consideration of an appropriate time frame. For the Project, the indirect impacts analysis will adopt the 2040 Project horizon.

### *22.2.3 Environmental Consequences*

Potentially substantial indirect impacts of the Build Alternatives will be identified, analyzed and discussed. Indirect impacts may include encroachment-alteration impacts (direct encroachment or alteration of resources removed in time or distance) and induced growth impacts (impacts of growth and development induced by the Project). The indirect impacts analysis will document indirect impacts that were identified, regardless of whether they are considered potentially substantial. After identifying indirect impacts, their magnitude will be assessed. Only indirect impacts that are so substantial that they may be significant need to be addressed in detail.

Potential socioeconomic impacts will also be considered as part of encroachment-alteration impacts. The analysis will focus on how the Build Alternatives affect adjacent resources. The presence of potentially affected resources will be evaluated and a discussion of anticipated impacts will be included.

Along with the indirect encroachment impacts analysis, an indirect induced growth impacts analysis will also be conducted. Land use impacts will be discussed in value-neutral terms, as the desirability or undesirability of such changes depend on the local and regional context, area goals, and local perceptions. If induced growth is anticipated, subsequent impacts related to that induced growth will be summarized.

The indirect induced growth impacts analysis will focus on how station areas would indirectly impact existing and proposed development. The type of development and redevelopment opportunities that are created through potential adverse and beneficial impacts related to induced growth and development likely to result from the Project will be summarized. Where new public or private development is expected to be constructed, the availability of appropriately zoned, nearby land will be evaluated and anticipated impacts will be discussed.

## *22.3 Cumulative Impacts*

### *22.3.1 Affected Environment*

Based on the resource evaluations identified above, a determination will be made regarding which resources would be affected by the Project and should therefore be included in the cumulative impacts analysis. Important stress factors and pertinent environmental regulations and standards will be included in the discussion to provide a historical context. A determination will be made regarding whether the resources, ecosystems, and human communities of concern are approaching conditions where additional stresses will have an important cumulative impact. Two types of information will be used to describe stress



factors: (1) the types, distribution and intensity of key social and economic activities in the region; and (2) individual indicators of stress on specific resources, ecosystems, and human communities. Special attention will be paid to common natural resource and socioeconomic issues that arise as a result of cumulative impacts.

This section will identify the reasonably foreseeable public and private future actions that would likely affect resources included in the cumulative impacts analysis. A figure showing the locations of these actions will be created and sufficient detail about the types and extent of impacts that it can be used to describe the overall relationship of the Project to the relevant cumulative impacts. For purposes of compiling the list, “reasonably foreseeable future projects” is defined to mean those that are likely to occur within the 2040 planning horizon for the Project.

### *22.3.2 Definition of Resource Study Area*

For cumulative impacts, the RSA will include the geographic extent of each affected resource within which Project impacts accumulate or interact with the impacts of other actions. The RSA will be identified for each resource that will be used for the cumulative impacts analysis and coordination will occur with the cumulative lead in identifying any modifications to the RSA necessary to analyze fully the potential cumulative impacts of the Project.

### *22.3.3 Environmental Consequences*

The research and analysis methods used to determine environmental consequences will be summarized. A clear and thorough description of the methodology used to identify the cumulative impacts, the existing conditions (including historic context and health of the resource), the reasonably foreseeable past, present, and future actions that contribute to the cumulative impacts and the resulting characterization of the contributions of the Project in the context of the cumulative significant impacts will be included.

A description of the cumulative impact to the resource resulting from the Project’s incremental contribution in combination with the contributions of past, present and reasonably foreseeable probable future projects, and whether the resulting cumulative impact would be significant will be summarized. If the impact is significant, the Project’s incremental contribution to the significant cumulative impact will be evaluated. A summary table will be used to illustrate the cause-and-effect relationships of past, present, and reasonably foreseeable probable future projects in combination with the Project impacts.

A summary table will be used to illustrate the cause-and-effect relationships of past, present, and reasonably foreseeable probable future projects in combination with the Project impacts.



## 22.4 *Indirect and Cumulative Impacts Technical Report*

An Indirect and Cumulative Impacts Technical Report will be prepared and included as a technical appendix. The Draft EIS will summarize the impacts for the Build Alternatives, and the Final EIS will summarize the impacts for the Preferred Alternative, as needed.

## 23.0 Section 4(f) Evaluation

This section only applies if a Section 4(f) evaluation or a *de minimis* impact finding is needed for the Project. This section will guide the methods used for the evaluation of actual use of Section 4(f) resources. The organization of the Section 4(f) evaluation, if required, will be organized into subsections for each resource evaluated.

The Section 4(f) resource analysis in the Draft EIS will make preliminary findings regarding the potential use of a resource as a result of the Project. Any Section 4(f) evaluation required will be included in the Final EIS. Throughout the development of the Draft and Final EIS, the Section 4(f) analysis also will refer to efforts to avoid and/or minimize resources in the alternatives analysis process.

### 23.1 *Laws, Regulations, and Orders*

Along with the regulatory context of Section 4(f), other relevant regulations and guidance include, but are not limited to, the following:

- 23 CFR Part 774, Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites.
- 36 CFR Part 59, Land and Water Conservation Fund Program Assistance to States.
- American Association of State Highway and Transportation Officials' (AASHTO) Practitioner's Handbook Complying with Section 4(f) of the USDOT Act.
- 23 CFR 771, Environmental Impact and Related Procedures, Section 4(f).
- TxDOT Environmental Compliance Chapter 26, Parks and Wildlife Code Toolkit.
- TxDOT Environmental Compliance Section 4(f), U.S. Department of Transportation Act Toolkit.
- TxDOT Environmental Compliance Section 6(f), Land and Water Conservation Fund Act Toolkit.

### 23.2 *Definition of Resource Study Area*

The RSA for publicly owned parks, recreation areas, and wildlife areas are defined in Sections 6.0 and 17.0 of this report. In Sections 18.0 and 19.0, the Section 106 APE will serve as the study area for Section 4(f) historic architecture, archeological or cultural landscape properties. If necessary, the RSA may be expanded to identify proximity impacts for each Section 4(f) resource.



### 23.3 Existing Conditions

Potential Section 4(f) properties will be identified early in the planning and project development process (i.e., during the alternatives analysis), so that complete avoidance will be given full and fair consideration. Potential Section 4(f) resources will be based on the results of the analysis conducted for Sections 6.0, 17.0, 18.0, and 19.0 in this methodology report. In addition, entities and individuals who are considered the officials with jurisdiction (OWJ) under Section 4(f) will be determined. A consultation summary table will be provided for each Section 4(f) resource evaluated.

### 23.4 Environmental Consequences

The Section 4(f) analysis in the Draft EIS (Draft Section 4(f) Evaluation) will make preliminary findings regarding the potential use, including constructive use, of a resource as a result of the Project. The Draft Section 4(f) evaluation will include various impacts to the different properties affected by the Build Alternatives. Different categories of “use” under Section 4(f) will be defined and evaluated as well. The degree of impact and impairment will be determined in consultation with the OWJ for each resource in accordance with 23 CFR 774.15(d)(3). The Section 4(f) use definitions will be applied to each property and discussion will be included on whether a use would occur as a result of the Project, considering amount of land to be used, facilities and functions affected by noise, and visual impediments, known as constructive use, created by the Project.

Where a Section 4(f) property might experience proximity impacts as a result of the Project, FRA determine whether these proximity impacts could result in a constructive use.

#### 23.4.1 De minimis Determinations

Where appropriate, a *de minimis* impact determination may be made for the net impact on the Section 4(f) property. The Draft EIS will include sufficient supporting documentation for measures to minimize harm that were applied to the Project by FRA to make the *de minimis* impact determination. If the potential impacts have been reduced to a *de minimis* level and the OWJ is in agreement, FRA will make a *de minimis* determination, which will be reported in the Final EIS.

#### 23.4.2 Individual Section 4(f) Resource Impacts

An Avoidance Alternatives Analysis will be conducted for each Section 4(f) resource for which a *de minimis* determination is not appropriate. When a use of Section 4(f) property by the Project is anticipated, location and design alternatives that would minimize impacts or avoid the Section 4(f) resources will be identified and evaluated. The design alternatives will be in the immediate area of the property and will consider minor alignment shifts, a reduced facility, retaining structures, noise walls, etc., individually or in combination, as appropriate.



If necessary, this section will include a description of why some alternatives are not feasible or prudent. Measures to minimize the impacts of the Project on the Section 4(f) property or properties will be discussed if there are no prudent and feasible avoidance alternatives. Detailed discussions of mitigation measures will be referenced and summarized. The Draft Section 4(f) Evaluation will be presented as a separate chapter in the Draft EIS.

The Draft Section 4(f) evaluation is required to disclose the various impacts to the different Section 4(f) properties thereby initiating the balancing process. It will also disclose the relative differences among alternatives regarding non-Section 4(f) issues such as the extent to which each alternative meets the Project purpose and need. Preliminary assessment of how the alternatives compare to each other may also be included. After circulation of the draft Section 4(f) evaluation in accordance with 23 CFR Part 774.5(a), FRA will consider comments received on the evaluation and finalize the comparison of factors listed in 23 CFR Part 774.3(c)(1) for the alternatives. The analysis and identification of the alternative with the least overall harm will be documented in the Final Section 4(f) evaluation in the Final EIS.

The basis for concluding that no feasible and prudent alternatives exist to the use of the Section 4(f) property will be documented. The supporting information will demonstrate that, “there are unique problems or unusual factors involved in the use of alternatives that avoid these properties or that the cost, social, economic, and environmental impacts, or community disruption resulting from such alternatives reach extraordinary magnitudes” (23 CFR Part 771.135(a)(2)).

The Draft Section 4(f) Evaluation, if needed, will be presented as a separate chapter in the Draft EIS. The Final Section 4(f) Evaluation, if needed, will be presented as a separate chapter in the Final EIS.

*Appendix F:*  
Environmental Assessment  
Approach for Alternatives  
Analysis

## STEP 2 ENVIRONMENTAL CONSTRAINTS SCREENING

The Step 2 Environment Constraints Screening consists of a more detailed comparison of the alternatives carried forward from the Step 1 Screening to determine if some alternatives would result in potential environmental effects substantially greater than other alternatives. The TRE and I-30/SH 360/TRE corridors passed the Step 1 screening process, therefore these corridors were evaluated under the Step 2 Environmental Constraints Screening. A Step 2 Environmental Constraints Screening was also performed for the following six potential alignment alternatives within each corridor:

1. *TRE North*: Alignment that runs exclusively to the north of the existing TRE rail infrastructure.
2. *TRE South*: Alignment that runs exclusively to the south of the existing TRE rail infrastructure.
3. *TRE Refined*: Alignment that shifts from the north and south of the existing TRE rail infrastructure.
4. *I-30/SH 360/TRE North*: Exclusively to the north of the existing I-30 highway infrastructure and TRE rail infrastructure and west of the existing SH 360 highway infrastructure.
5. *I-30/SH 360/TRE South*: Exclusively to the south of the existing I-30 highway infrastructure and TRE rail infrastructure and west of the existing SH 360 highway infrastructure.
6. *I-30/SH 360/TRE Refined*: Alignment that shifts from the north and south of the existing I-30 and TRE rail infrastructure and east and west of the existing SH 360 highway infrastructure.

The Step 2 Environmental Screening is based on a Geographic Information Systems (GIS) analysis and desktop level research from readily available state and federal databases. Fieldwork, modeling, and a detailed technical evaluation of alternatives in accordance with NEPA and FRA's procedures will be completed as part of the Draft Environmental Impact Statement (DEIS).

Table E-1, below, presents the environmental criteria that will be studied as part of the NEPA evaluation process, as discussed in the Dallas-Fort Worth Core Express Service Environmental Methodology Report prepared by Parsons Brinkerhoff, Inc. in January 2016 (Appendix E). The table also specifies which criteria will be screened as part of the Alternatives Analysis (AA) and those that will be studied in more detail as part of the DEIS and FEIS.

**TABLE E-1: ENVIRONMENTAL RESOURCES ANALYSES**

Environmental Criteria	Studied In	
	AA	DEIS/FEIS
Air Quality		X
Water Quality and Water Resources	X	X
Noise & Vibration		X
Solid Waste Disposal	X	X



Natural Ecological Systems and Wildlife		X
Wetlands	X	X
Threatened & Endangered Species		X
Flood Hazards and Floodplain Management	X	X
Energy Resources		X
Utilities		X
Geologic Resources		X
Aesthetics		X
Land Use	X	X
Environmental Justice, Socioeconomics, Relocation, Elderly, and Handicapped	X	X
Public Health, Safety, Security, and Hazardous Materials	X	X
Parks and Recreational Facilities and Section 6(f)	X	X
Historic Resources	X	X
Archaeological Resources		X
Transportation		X
Construction Impacts		X
Indirect and Cumulative Impacts		X
Section 4(f)	X	X

Table E-2 presents the environmental evaluation criteria analyzed during the Step 2 Environmental Constraints Screening process. In order to estimate potential effects, a preliminary study area was identified for each route alternative. In addition, the study area for the corridor includes the right-of-way<sup>1</sup> (ROW) and a buffer, which is specific to each environmental criterion. The study area for the alignments is limited to the ROW, with the exception of the environmental justice, which includes a study area of the ROW plus 0.5 miles.

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<sup>1</sup> While ROW widths can vary considerable, according to Parsons Brinkerhoff, the right-of-way is approximately 70 feet wide throughout the project area.

**TABLE E-2: ENVIRONMENTAL SCREENING CRITERIA<sup>2</sup>**

<b>Environmental Screening Criteria</b>	<b>Measure</b>	<b>Corridor Study Area</b>	<b>Alignment Study Area</b>	<b>Data Source</b>	<b>Description</b>
Wetlands	Acres	ROW + 250 feet buffer	ROW	-US Fish and Wildlife Service National Wetland Inventory -National Land Cover Dataset	National Wetland Inventory wetlands impacted
Streams	No. of Stream Crossings	NQ	ROW	National Atlas	Direct alignment crossing of waterways
Floodplains	Acres	ROW	ROW	Federal Emergency Management Act (FEMA)	100-year floodplain impacted
Parks & Recreational Facilities	No. Publically owned parks	ROW + 300 feet buffer	ROW	-Texas Parks and Wildlife Department (TPWD) -Google Maps	Publically owned parkland
Threatened and Endangered Species	No. of elements of occurrence	ROW + 0.5 miles	ROW	-TPWD Texas Natural Diversity Database	Known locations of species based on at least one observation (representation of a known population of an element)
Historic Resources	No. of Historic Sites	ROW + 300 feet buffer	ROW	-Texas Historical Commission -National Register of Historic Places (NRHP)	NRHP listed or eligible properties and districts impacted
Hazardous Material Sites	No. of sites	ROW + 150 feet buffer	ROW	-Geosearch	Superfund, permitted industrial hazardous waste, radioactive waste, and treatment/disposal/ storage sites
Landfills	No. of sites	ROW + 150 feet buffer	ROW	Texas Commission on Environmental Quality	Permitted solid waste disposal sites and landfills impacted
Land Use	Acres	NQ	ROW	North Central Council of Governments	Commercial, industrial, and residential land impacted
Environmental Justice	No. of census block groups of non-white residents (>50% of population)	ROW + 0.5 mile buffer	ROW+ 0.5 mile buffer	US Census Bureau (2008-12)	Estimated non-white population affected
	No. of household income below poverty	ROW + 0.5 mile buffer	ROW + 0.5 mile buffer	US Census Bureau (2008-12)	Estimated population below the poverty line impacted
Relocations	No. of Buildings	ROW + 25 feet buffer	ROW	Google Earth (manual count)	-Corridor: Residential and non-residential relocations -Alignment: Residential relocations

NQ: not quantified

### ***Step 2 Environmental Screening Process (Methodology)***

The Step 2 Environmental Screening process utilized a ratio method to score the corridor, alignment and station location alternatives. Scoring for each environmental evaluation criteria was based on the lowest score having the least potential to create an environmental impact. The environmental screening criteria analyzed were not weighted during Step 2 because each have regulatory processes, mitigation requirements, public involvement and/or costs associated with impacting these resources.

Table E-3 provides an example of scoring environmental evaluation criteria using the ratio method and includes the potential alignment alternatives and the scoring for floodplain criteria.

**TABLE E-3: SCORING EXAMPLE: RATIO METHODOLOGY**

Alignments	Floodplains	
	Acreage	Score
TRE Initial South	62	6.000
TRE Initial North	62	6.000
TRE Refined	60	5.583
I-30/SH 360/TRE Initial North	55	4.542
I-30/SH 360/TRE Initial South	38	1.000
I-30/SH 360/TRE Refined	39	1.208

Because there are six alternative alignments, the scores range from 1.000 to 6.000 (note that if there are only two alternatives, the scores range from 1.000 to 2.000). For each criterion, the lowest impact is scored a 1.000 (I-30/SH 360/TRE Initial South) and the greatest impact(s) is scored a 6.000 (TRE Initial South and TRE Initial North). The remaining potential alternative alignments are scored relative to the minimum and maximum scores using the following formula:

$$X = A - ((H - I_x)/(H - L) * (H - L))$$

Where the variables for the equation above are presented in Table E-4, below.

**TABLE E-4: SCORING FORMULA VARIABLE DEFINITIONS**

Variable	Units	Description
X	Point value	Score for the alternative environmental resource being analyzed
A	Number	No. of alternatives
H	Acre or number	Value of the highest impact
I <sub>x</sub>	Acre or number	Value of impact of the alternative environmental resource being analyzed
L	Acre or number	Value of the lowest impact

### ***Corridor Step 2 Environmental Screening Results***

Table 5-16 in the report presents the summary results of the Step 2 Environmental Constraints Screening for the corridor alternatives. As illustrated in this summary table, the results of the Step 2 Environmental Constraints Screening for the TRE and I-30/SH 360/TRE corridors were similar in that some of the environmental criteria scores were higher for TRE and some were higher for I-30/SH 360/TRE.

### ***Alignment Step 2 Environmental Screening Results***

Since there are opportunities to shift potential alignments from one side of the existing infrastructure to the other at various locations along the corridor in order to minimize environmental effects and established land uses, the project team performed a Step 2 Environmental Screening for the alternative alignments on the TRE and I-30/SH 360/TRE corridors.

Table 5-8 in the report presents the results of the Step 2 Environmental Constraints Screening for the alignment alternatives and Table 5-9 identifies the rank of the potential alignment alternatives from fewest effects to most effects based on the scores presented in Table 4-16.

As indicated in Table 5-9, the I-30/SH 360/TRE Refined alignment alternative has the least adverse environmental impact based on the Step 2 Environmental Constraints Screening process. In addition, the TRE Refined alignment and the I-30/SH 360/TRE South alignments have considerably fewer effects than the TRE South, TRE North, and I-30/SH 360/TRE North alignments. Since the I-30/SH 360/TRE Refined alignment is a refined version of the I-30/SH 360/TRE South alignment, only the I-30/SH 360/TRE Refined alignment and the TRE Refined alignment will move forward to the Step 2 Constructability/Financial Constraints or DEIS.

The alignments presented in this document are preliminary and subject to change. The Refined alignments will continue to be refined and evaluated in accordance with NEPA. The DEIS will further evaluate and document potential environmental effects identified through modeling, detailed field investigations, and public/agency input. These environmental effects may dictate further minor route modifications to avoid and/or minimize an effect. Additionally, the project team will refine the alignments during preliminary engineering, which will occur simultaneously with the preparation of the DEIS. FRA will evaluate the modifications to the alignments through the EIS process and ultimately identify a Preferred Alternative for the project.

### ***Terminal Station Step 2 Environmental Screening Results***

There are a total of four terminal station location options associated with the I-30/SH 360/TRE Refined and TRE Refined alignments; two in Fort Worth (FW-ITC and FW-T&P) and two in Dallas (DAL-Union Station and DAL-TCR). Please refer to Chapter 3 for details on the terminal station locations. One terminal station in Fort Worth and one terminal station in Dallas will ultimately be selected for either the I-30/SH 360/TRE Refined or TRE Refined alignment. Tables 5-10 and 5-11 in the report present the Step 2 Environmental Constraints Screening conducted for the two stations in Fort Worth and the two stations in Dallas, respectively.

Based on the results of the terminal station Step 2 Environmental Constraints Screening, the station in Fort Worth that would have the least adverse effects is the FW-T&P station and the station in Dallas that would have the least adverse effects is the DAL-TCR station. Since the scoring differentials between terminal stations (Fort Worth and Dallas) are relatively small it is recommended that all terminal stations be further analyzed in the DEIS.

### ***Line Station Step 2 Environmental Screening Results***

There is one line station alternative for the I-30/SH 360/TRE Refined alignment (ARL1-Arlington) located in the Arlington Entertainment District. There are two line stations for the TRE Refined alignment; one at the existing CentrePort/DFW TRE station (CP1-CentrePort) and one potential new location immediately west of the Tarrant/Dallas county line near Trinity Way and the TRE commuter rail line (CL1-County Line). Please refer to Chapter 3 for details on the line station locations.

Since there is only one line station alternative location for I-30/SH 360/TRE Refined alignment, a Step 2 Environmental Constraints Screening was not performed for this alternative. There were no wetlands, floodplains, parks & recreational facilities, threatened and endangered species, historic resources, hazardous material sites, or landfills in the proposed ARL1-Arlington line station location. In addition, no relocations would be required for the construction of this station. There is a low income population of 420 and a minority population of 2,000 (5 census block groups).

Table 5-12 in the report presents the Step 2 Environmental Constraints Screening conducted for the CP1-CentrePort and CL1-County Line stations. Based on the results of the terminal station Step 2 Environmental Constraints Screening, CL1-County Line would impact a smaller minority and low income population. However, CL1-CentrePort is an existing station and therefore, the actual effects on the minority and low income populations could be greater by constructing CL1-County Line since it is not a previously existing structure. Therefore, based on the environmental constraints screening, both TRE line stations be further analyzed in the DEIS.

### ***Operations and Maintenance Facility Step 2 Environmental Screening Results***

A total of seven operations and maintenance (O&M) facility location alternatives are along the TRE Refined alternative (M-FW4, M-FW5, M-FW6, M-DAL1, M-DAL2, M-DAL3, M-DAL4) and four of these O&M facilities are also along the I-30/SH 360/TRE Refined alignment (M-DAL1, M-DAL2, M-DAL3, M-DAL4). Please refer to Chapter 3 for details on the O&M facility locations. The Step 2 Environmental Constraints Screening conducted for the O&M facility locations are shown on Tables 5-13 and 5-14 in the report, which identify the rank of the potential alignment alternatives from fewest effects to most effects.

The O&M facility location along the I-30/SH 360/TRE Refined alternative that would have the least adverse effects is the M-DAL4 location. Since the scoring differentials between I-30/SH 360/TRE O&M facilities are relatively small it is recommended, based on the environmental constraints screening, that all O&M facilities be further analyzed in the DEIS.

The M-DAL2 O&M facility location along the TRE Refined alternative has the least adverse environmental effect, followed by M-FW4. The significance of these effects and other environmental effects will be further analyzed in the DEIS and FEIS.

### **Environmental No Build**

The project would not be constructed under the No-Build Alternative and would not present major environmental challenges. However, the current rail routes between Fort Worth and Dallas would continue to be used, resulting in continued minor environmental effects such as erosion and sedimentation from railroad grades to adjacent waterbodies and wetlands and noise. Other travel modes would continue to be used and would likely become more congested in the future as travel demand increases, resulting in potential effects on sensitive areas (i.e., air emissions, ROW acquisitions for infrastructure improvements). In addition, other passenger rail sections in this area could be developed and result in acquisition of ROW and effects on sensitive areas.

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## Step 2 Environmental Constraints Screening Appendices

Table E-5 provides a comparison of the effects for both corridor alternatives using information gathered during the environmental desktop study.

**TABLE E-5: TRE & I-30/SH 360/TRE CORRIDOR STEP 2 ENVIRONMENTAL SCREENING RESULTS**

Environmental Screening Criteria		Corridor Alternatives	
		TRE	I-30/SH 360/TRE
Wetlands	Acres	21	20
	Score	2.000	1.000
Floodplains	Acres	33	29
	Score	2.000	1.000
Parks & Recreational Facilities	No.	13	15
	Score	1.000	2.000
Threatened and Endangered Species	No.	14	16
	Score	1.000	2.000
Historic Resources	No.	13	10
	Score	2.000	1.000
Hazardous Material Sites	No.	2	2
	Score	1.000	1.000
Landfills	No.	6	0
	Score	2.000	1.000
Environmental Justice (Minority Population)	No.	81	113
	Score	1.000	2.000
Environmental Justice (Low Income Population)	No.	5,528	7,957
	Score	1.000	2.000
Relocations	No.	5	2
	Score	2.000	1.000
<b>Total Score</b>		<b>15.000</b>	<b>14.000</b>


Table E-6 provides a comparison of the effects for each alignment alternative using information gathered during the environmental desktop study. The scores were totaled based on the aggregation of the individual scores received for each environmental screening criteria. The alignment alternatives were then ranked from lowest to highest score, with the lowest score (1) identified as the potential for least adverse environmental impact. Table E-7 identifies the rank of the potential alignment alternatives from fewest effects to most effects.



**TABLE E-6: TRE & I-30/SH 360/TRE ALIGNMENT STEP 2 ENVIRONMENTAL SCREENING RESULTS**

Environmental Screening Criteria		Alternative Alignments					
		TRE North	TRE South	TRE Refined	I-30/SH 360/TRE North	I-30/SH 360/TRE South	I-30/SH 360/TRE Refined
Wetlands	Acres	2	2	2	2	2	2
	Score	1.000	1.000	1.000	1.000	1.000	1.000
Streams	No.	6	6	6	5	5	5
	Score	6.000	6.000	6.000	1.000	1.000	1.000
Floodplains	Acres	62	62	60	55	38	39
	Score	6.000	6.000	5.583	4.542	1.000	1.208
Parks & Recreational Facilities	No.	3	7	5	4	6	4
	Score	1.000	6.000	3.500	2.250	4.750	2.250
Threatened & Endangered Species	No.	14	14	14	16	16	16
	Score	1.000	1.000	1.000	6.000	6.000	6.000
Historic Resources (Properties)	No.	1	0	0	1	0	0
	Score	6.000	1.000	1.000	6.000	1.000	1.000
Historic Resources (Districts)	No.	4	3	2	4	3	2
	Score	6.000	3.500	1.000	6.000	3.500	1.000
Hazardous Material Sites	No.	1	1	1	0	2	0
	Score	3.500	3.500	3.500	1.000	6.000	1.000
Landfills	No.	8	9	9	0	0	0
	Score	5.444	6.000	6.000	1.000	1.000	1.000
Land Use (Industrial)	Acres	12	7	9	5	3	4
	Score	6.000	3.222	4.333	2.111	1.000	1.556
Land Use (Commercial)	Acres	70	75	57	65	55	45
	Score	5.167	6.000	3.000	4.333	2.667	1.000
Land Use (Residential)	Acres	35	43	24	31	9	16
	Score	4.824	6.000	3.206	4.235	1.000	2.029
Environmental Justice (Minority Population)	No.	82	80	81	114	113	113
	Score	1.294	1.000	1.147	6.000	5.853	5.853
Environmental Justice (Low Income Population)	No.	5,607	5,460	5,528	7,910	7,763	7,750
	Score	1.300	1.000	1.139	6.000	5.700	5.673
Residential Relocations (Single Family)	No.	5	22	2	27	12	0
	Score	1.926	5.074	1.370	6.000	3.222	1.000
Residential Relocations (Multi-Family)	No.	0	0	0	123	8	0
	Score	1.000	1.000	1.000	6.000	1.325	1.000
<b>Total Score</b>		<b>57.455</b>	<b>57.296</b>	<b>43.779</b>	<b>63.471</b>	<b>46.017</b>	<b>33.570</b>

**TABLE E-7: TRE & I-30/SH 360/TRE ALIGNMENT RANKING**

Alignment Alternative	Total Score	Rank	
I-30/SH 360/TRE Refined	33.570	1	<p>Least Adverse Environmental Effects</p>  <p>Most Adverse Environmental Effects</p>
TRE Refined	43.779	2	
I-30/SH 360/TRE South	46.017	3	
TRE South	57.296	4	
TRE North	57.455	5	
I-30/SH 360/TRE North	63.471	6	

Tables E-8 and E-9 presents the Step 2 Environmental Screening scores for the terminal stations in Fort Worth and Dallas, respectively.

**TABLE E-8: FORT WORTH TERMINAL STATION STEP 2 ENVIRONMENTAL SCREENING RESULTS**

Environmental Screening Criteria		FW-ITC	FW-T&P
Wetlands	Acres	0	0
	Score	1.000	1.000
Floodplains	Acres	0	0
	Score	1.000	1.000
Parks & Recreational Facilities	No.	0	0
	Score	1.000	1.000
Threatened and Endangered Species	No.	0	0
	Score	1.000	1.000
Historic Resources (Properties and Markers)	No.	1	0
	Score	2.000	1.000
Historic Resources (Districts)	No.	0	1
	Score	1.000	2.000
Hazardous Material Sites	No.	0	0
	Score	1.000	1.000
Landfills	No.	0	0
	Score	1.000	1.000
Relocations – Industrial	No.	0	0
	Score	1.000	1.000
Relocations - Commercial	No.	1	0
	Score	2.000	1.000
Relocations – Residential	No.	0	0
	Score	1.000	1.000
Environmental Justice (Minority Population)	No.	5	3
	Score	2.000	1.000
Environmental Justice (Low Income Population)	No.	591	498
	Score	2.000	1.000
Total Score		17.000	14.000

**TABLE E-9: DALLAS TERMINAL STATION STEP 2 ENVIRONMENTAL SCREENING RESULTS**

<b>Environmental Screening Criteria</b>		<b>DAL-Union Station</b>	<b>DAL-TCR</b>
Wetlands	Acres	0	0
	Score	1.000	1.000
Floodplains	Acres	0	0
	Score	1.000	1.000
Parks & Recreational Facilities	No.	0	0
	Score	1.000	1.000
Threatened and Endangered Species	No.	0	0
	Score	1.000	1.000
Historic Resources (Properties and Markers)	No.	0	0
	Score	1.000	1.000
Historic Resources (Districts)	No.	1	0
	Score	2.000	1.000
Hazardous Material Sites	No.	0	0
	Score	1.000	1.000
Landfills	No.	0	0
	Score	1.000	1.000
Relocations – Industrial	No.	0	0
	Score	1.000	1.000
Relocations - Commercial	No.	0	0
	Score	1.000	1.000
Relocations – Residential	No.	0	0
	Score	1.000	1.000
Environmental Justice (Minority Population)	No.	4	5
	Score	1.000	2.000
Environmental Justice (Low Income Population)	No.	92	87
	Score	2.000	1.000
<b>Total Score</b>		<b>15.000</b>	<b>14.000</b>

Table E-10 presents the Step 2 Environmental Constraints Screening conducted for the CP1-CentrePort and CL1-County Line stations.

**TABLE E-10: LINE STATION STEP 2 ENVIRONMENTAL SCREENING RESULTS  
(TRE REFINED ALIGNMENT)**

<b>Environmental Screening Criteria</b>		<b>CP1- CentrePort</b>	<b>CL1-County Line</b>
Wetlands	Acres	0	0
	Score	1.000	1.000

Floodplains	Acres	0	0
	Score	1.000	1.000
Parks & Recreational Facilities	No.	0	0
	Score	1.000	1.000
Threatened and Endangered Species	No.	0	0
	Score	1.000	1.000
Historic Resources (Properties and Markers)	No.	0	0
	Score	1.000	1.000
Historic Resources (Districts)	No.	0	0
	Score	1.000	1.000
Hazardous Material Sites	No.	0	0
	Score	1.000	1.000
Landfills	No.	0	0
	Score	1.000	1.000
Relocations – Industrial	No.	0	0
	Score	1.000	1.000
Relocations - Commercial	No.	0	0
	Score	1.000	1.000
Relocations – Residential	No.	0	0
	Score	1.000	1.000
Environmental Justice (Minority Population)	No.	6	4
	Score	2.000	1.000
Environmental Justice (Low Income Population)	No.	180	148
	Score	2.000	1.000
<b>Total Score</b>		<b>15.000</b>	<b>13.000</b>

Tables E-11 and E-12 present the Step 2 Environmental Constraints scores for the O&M facility locations. The scores were totaled based on the aggregation of the individual scores received for each environmental screening criteria. The alignment alternatives were then ranked from lowest to highest score, with the lowest score (1) identified as the potential for least adverse environmental impact. Tables E-13 and E-14 identify the rank of the O&M facility location alternatives from fewest effects to most effects.

**TABLE E-11: O&M FACILITY STEP 2 ENVIRONMENTAL SCREENING RESULTS (I-30/SH 360/TRE REFINED ALIGNMENT)**

Environmental Screening Criteria		M-DAL1	M-DAL2	M-DAL3	M-DAL4
Wetlands	Acres	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Floodplains	Acres	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Parks & Recreational Facilities	No.	0	0	0	0
	Score	1.000	1.000	1.000	1.000

Threatened and Endangered Species	No.	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Historic Resources (Properties and Markers)	No.	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Historic Resources (Districts)	No.	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Hazardous Material Sites	No.	0	0	1	1
	Score	1.000	1.000	4.000	4.000
Landfills	No.	0	0	0	0
	Score	1.000	1.000	1.000	1.000
Relocations – Industrial	No.	1	3	1	1
	Score	1.000	4.000	1.000	1.000
Relocations - Commercial	No.	1	25	34	26
	Score	1.000	3.182	4.000	3.273
Relocations – Residential	No.	1	0	0	0
	Score	4.000	1.000	1.000	1.000
Environmental Justice (Minority Population)	No.	12	2	1	1
	Score	4.000	1.273	1.000	1.000
Environmental Justice (Low Income Population)	No.	916	282	164	164
	Score	4.000	1.471	1.000	1.000
<b>Total Score</b>		<b>22.000</b>	<b>18.925</b>	<b>19.000</b>	<b>18.273</b>

**TABLE E-12: O&M FACILITY STEP 2 ENVIRONMENTAL SCREENING RESULTS (TRE REFINED ALIGNMENT)**

<b>Environmental Screening Criteria</b>		<b>M-FW4</b>	<b>M-FW5</b>	<b>M-FW6</b>	<b>M-DAL1</b>	<b>M-DAL2</b>	<b>M-DAL3</b>	<b>M-DAL4</b>
Wetlands	Acres	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Floodplains	Acres	0	3.1	2.01	0	0	0	0
	Score	1.000	7.000	4.890	1.000	1.000	1.000	1.000
Parks & Recreational Facilities	No.	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Threatened & Endangered Species	No.	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Historic Resources (Markers and Properties)	No.	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Historic Resources (Districts)	No.	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hazardous Material Sites	No.	0	1	1	0	0	1	1
	Score	1.000	7.000	7.000	1.000	1.000	7.000	7.000
Landfills	No.	0	0	0	0	0	0	0
	Score	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Relocations (Industrial)	Acres	10	3	1	1	3	1	1
	Score	7.000	2.333	1.000	1.000	2.333	1.000	1.000
Relocations (Commercial)	Acres	4	2	3	1	25	34	26
	Score	1.545	1.182	1.364	1.000	5.364	7.000	5.545
Relocations (Residential)	Acres	0	0	0	1	0	0	0
	Score	1.000	1.000	1.000	7.000	1.000	1.000	1.000
Environmental Justice (Minority Population)	No.	1	1	1	12	2	1	1
	Score	1.000	1.000	1.000	7.000	1.545	1.000	1.000
Environmental Justice (Low Income Population)	No.	322	328	237	916	282	164	164
	Score	2.261	2.309	1.582	7.000	1.941	1.000	1.000
<b>Total Score</b>		<b>20.806</b>	<b>27.824</b>	<b>23.836</b>	<b>31.000</b>	<b>20.184</b>	<b>25.000</b>	<b>23.545</b>

**TABLE E-13: O&M FACILITY LOCATION RANKING (I-30/SH 360/TRE REFINED ALIGNMENT)**

Alignment Alternative	Total Score	Rank	
M-DAL4	18.273	1	<div>Least Adverse Environmental Effects</div> <div>↓</div> <div>Most Adverse Environmental Effects</div>
M-DAL2	18.925	2	
M-DAL3	19.000	3	
M-DAL1	22.000	4	

**TABLE E-14: O&M FACILITY LOCATION RANKING (TRE REFINED ALIGNMENT)**

Alignment Alternative	Total Score	Rank	
M-DAL2	20.184	1	<div>Least Adverse Environmental Effects</div> <div>↓</div> <div>Most Adverse Environmental Effects</div>
M-FW4	20.806	2	
M-DAL4	23.545	3	
M-FW6	23.824	4	
M-DAL3	25.000	5	
M-FW5	27.824	6	
M-DAL1	31.000	7	