OVERVIEW OF PROJECT 0-5930

TTI recently completed TxDOT Research Project 0-5930 *Potential for Development of a Intercity Passenger Transit System in Texas* which examined 18 intercity corridors within the state to determine current capacity for intercity travel by road, air, and rail. Project 0-5930 examined only long-distance, intercity corridors connecting regions of the state and provided data on estimated travel times for each corridor at a variety of potential high speed rail speeds up to (HrSR) standards (and have subsequently been updated to include high speed rail (HSR) speeds). The study evaluated current employment and population as well as projected population growth for the state to 2040 based on figures developed by the Texas State Demographer. Researchers used the 2035 FHWA Freight Analysis Framework projected traffic levels to estimate segment-by-segment volume-to-capacity (V/C) ratios along existing roadways in each of the corridors. The existing bus and rail transit systems connecting to each potential corridor were documented as were a variety of demographic data along each route. The corridors were then ranked as to their need for future expansion in intercity passenger transportation capacity. These corridor rankings have formed the basis for the advancement of four study corridors being submitted by TxDOT in this round of HSIPR applications.

INTRODUCTION

Texas has undergone a quiet transformation over the past several decades, passing New York in population to become the second most populous state in the U.S. behind only California. While much larger than the other two states, the population of Texas is concentrated largely within in the eastern half of the state—along and east of the I-35 corridor. Texas contains three of the U.S.'s top 10 urban areas by population—Dallas-Fort Worth, Houston, and San Antonio—all located within 200-300 miles of one another. The city of Austin, also over a million in population, is located on the I-35 corridor and serves as the state's capital attracting both business and government travelers. Texas sits at the crossroads, in the middle of the continent, astride trade and travel corridors connecting both north and south NAFTA traffic and the east and west flow of goods from Asia to the eastern U.S.

The State of Texas has long been a leader in the provision of quality transportation infrastructure for its citizens. Along with its federal funding partners, the state has built the most expansive highway system of any state with over 79,000 lane-miles. Texas has also benefitted from an excellent air transportation system that has steadily grown in use as urban airports in Dallas-Fort Worth and Houston have become national and international hubs. Airports in other Texas urban areas have grown to meet the intercity and regional travel demand that is not met by the highway system and as feeders to the hub airports for interstate travel. Over time, Texan's urban and suburban work and travel patterns have shifted, becoming longer and more frequent. Interconnectivity between urban areas throughout the state has grown in importance as centers of both housing and commercial activity have spread along existing transportation routes.

The state's burgeoning population and its rapid transition from a rural state to an urban one have strained elements of the existing transportation system. To meet the need for new intercity transportation capacity will require new financing and operational methods to provide the required infrastructure for continued economic growth and quality of life. High-performance intercity passenger rail systems must be considered as a part of the solution to meeting this challenge. A well-designed intercity rail system with coordinated transit connections in urban areas served by it could improve performance of the existing highway and air transportation systems allowing each mode—highway, air, and rail—to operate more effectively.

Figure 1 demonstrates the relative size of and distances between Texas' population centers and the relative distance between these centers within the state of Texas along the corridors identified and studied by TTI during TxDOT Project 0-5930. The close proximity and growth in the major urban centers shows in the Texas Urban Triangle area including Dallas-Fort Worth, Houston, San Antonio, and Austin. The Dallas-Fort Worth to Houston corridor connects the two largest Texas major urban centers, both of which are rapidly growing. The Dallas-Fort Worth to Houston corridor is one of the most heavily travelled air corridors in the U.S. at over 130 flights daily in 2006. Previous high-speed passenger rail studies along the proposed study corridor in the past two decades have been undertaken; however, opposition from airline interests proved successful in blocking implementation of such plans. More recent efforts have indicated that airlines may now be ready to consider how the air and rail modes could cooperate to serve this corridor.

While a direct high-speed passenger rail route between the Dallas-Fort Worth and Houston urban areas along I-45 has been examined in the past, the historic and projected growth of the College Station-Bryan metropolitan statistical area in-between Dallas and Houston and its importance as a center for higher education and premier bio-medical and other services make it an attractive area for inclusion in the overall study corridor. This urbanized area lies just to the west of the direct I-45 corridor and along and between several of the existing freight rail routes between Dallas-Fort Worth and Houston. Widening the study corridor to include College Station as a potential stop on Dallas-Fort Worth to Houston route options should be encouraged due to its added prospective ridership. TxDOT Project 0-5930 included a separate analysis of the Houston to Waco corridor via College Station along US 290 and TX 6. Information on the Houston to Waco via College Station corridor developed by TTI is included after a description of the direct Dallas-Fort Worth to Houston corridor along I-45.

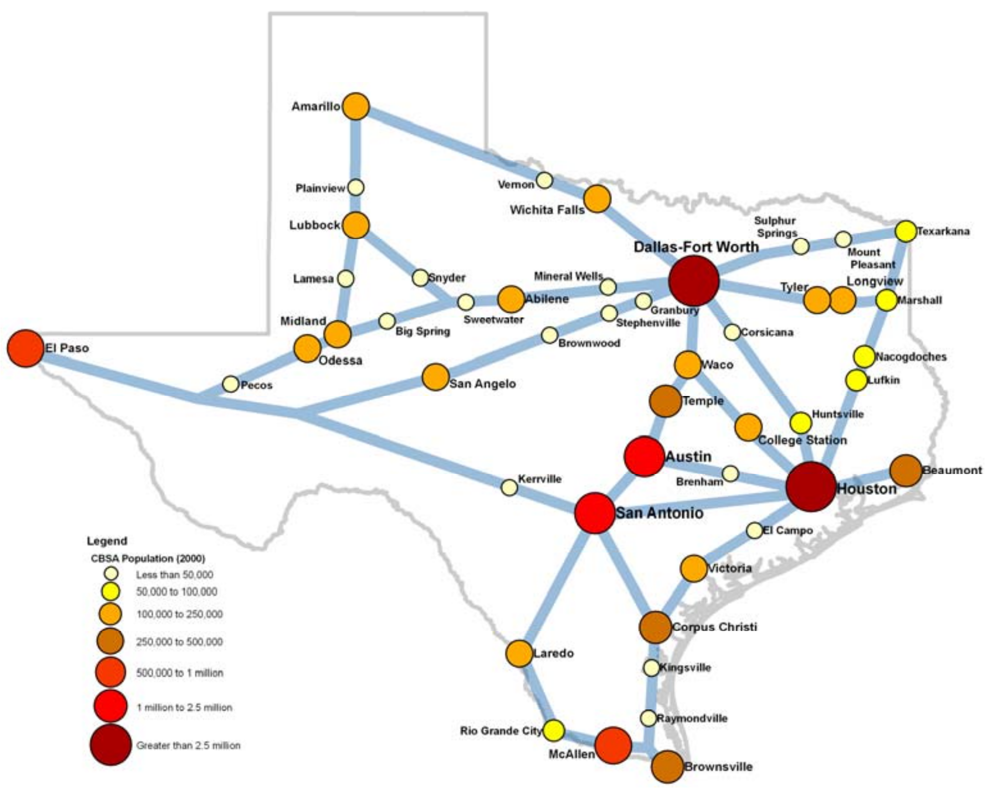

Figure 1. Relative Size and Distance of Texas Population Centers along 0-5930 Study Corridors.

DALLAS-FORT WORTH TO HOUSTON CORRIDOR OVERVIEW

This section includes a compilation of data and statistics developed during TxDOT Project 0-5930 for the Dallas-Fort Worth to Houston corridor. The corridor selected for study generally followed the route of I-45 which directly connects the two major urban areas. As discussed in the previous section, however, additional route options which might incorporate additional urban areas along the route and the associated ridership must also be considered. The following paragraphs discuss the direct I-45-based corridor. Following this discussion, the additional option of another optional route from Houston via College Station and Waco to Dallas-Fort Worth is discussed.

Figure 2 provides a view of the CBSA populations along the Dallas-Fort Worth to Houston I-45 corridor along with a showing the relative distance between the urban centers. The corridor is approximately 250 miles in length with a total of four CBSAs: two classified as metropolitan and two as micropolitan. According to the 2000 federal census, over 5.1 million people resided in the Dallas-Fort Worth-Arlington CBSA, while the population of the Houston-Sugar Land-Baytown CBSA exceeded 4.7 million people. The two micropolitan CBSAs along the route are Corsicana, with a 2000 population of approximately 45,000, and Huntsville, with a 2000 population of 61,800.

In addition to the 2000 population, Figure 2 contains the 2008 census estimates and the expected 2040 population for all four CBSAs in the corridor based on projections by the Texas State Demographer. The Dallas-Fort Worth-Arlington CBSA is expected to almost double to over 10 million people by 2040. The Houston-Sugar Land-Baytown CBSA is also expected to grow significantly, from 4.7 to 8.4 million in 2040. The Corsicana and Huntsville CBSA are expected to reach 70,900 and 77,800, respectively, in 2040.

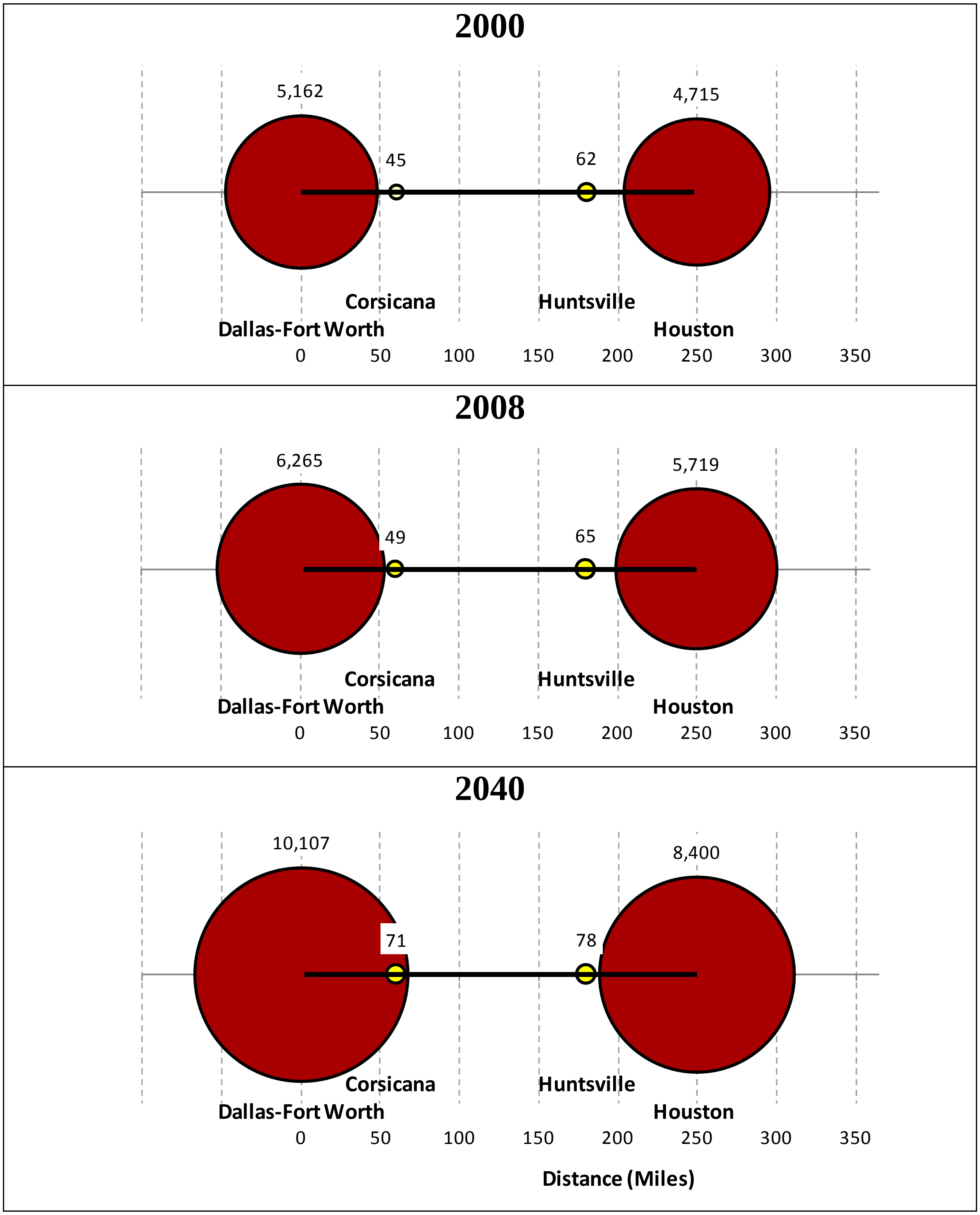

Figure 2. Dallas-Fort Worth to Houston Corridor Population and Distance (population in thousands)

Table 1 shows the distance between the urban areas along the corridor and estimated travel time between urban areas for a variety of average rail operational speeds along the corridor based on a direct alignment paralleling I-45.

Table 1. Dallas-Fort Worth to Houston CBSA Population, Distances, and Estimated Travel Times

CBSA	Population			Distance		Travel Time (hours:minutes)				
	2000	2008	2040	Segment	Cumulative	60 mph	80 mph	110 mph	150 mph	200 mph
DFW	5,161,500	6,265,000	10,106,800	0	0	0:00	0:00	0:00	0:00	0:00
Corsicana	45,100	49,300	70,900	60	60	1:00	0:45	0:32	0:24	0:18
Huntsville	61,800	64,600	77,800	120	180	3:00	2:15	1:38	1:12	0:54
Houston	4,715,400	5,718,700	8,400,100	70	250	4:10	3:07	2:16	1:40	1:15

MARKET POTENTIAL

This section exhibits several demographic and roadway travel statistics for the DFW to Houston corridor. Projected population numbers are presented by the Texas State Demographer, while the roadway information comes from the TxDOT TxDOT's Road–Highway Inventory Network (RHiNo) database and FHWA Freight Analysis Framework database.

Population, Economic Activity, and Special Generators:

The Dallas-Fort Worth to Houston corridor had a total population in the corridor CBSAs of 9.9 million in 2000. The population level is expected to reach over 18.6 million people by 2040 as shown in

Table 2. The average population per mile is expected to greatly increase from 39,618 in 2000 to 74,030 by 2040. Considerable growth is also expected in the segment of the population 65 years of age and older.

Table 2 shows that in 2000 the percentage of the total corridor population over 65 years of age was 7.8 percent, while in 2040 that percentage is expected to increase to 17.8 percent of the total corridor population.

The corridor maintained in 2005 approximately 251,000 employer establishments that employed over 4.5 million persons in 2005. Finally, the total higher education enrollment in 2006 was over 233,000 students, as shown in

Table 2.

Table 2. Dallas-Fort Worth to Houston Demographics

Data Element	DFW to Houston
Population	
2000	9,983,833
2040	18,655,657
Population per Mile*	
2000	39,618
2040	74,030
Population - Over 65	
2000	785,672
2040	3,321,769
Employment	
No. of Employees (2005)	4,503,956
No. of Employer Establishments (2005)	251,274
Total Public or Private University Enrollment (Fall 2006)	233,169

*Calculation using corridor length = 252 miles

Corridor Travel Patterns: Commercial Air Carrier Service

The existing commercial airports within the Dallas/Fort Worth to Houston corridor include Dallas/Fort Worth International (DFW), Dallas Love Field (DAL), Easterwood Field Airport (CLL) in College Station, Houston's William P. Hobby Airport (HOU), and Houston George Bush Intercontinental Airport (IAH). Table represents the market distance between airport pairs within the corridor.

Table 3. Intrastate Passenger Air Service City-Pair Market Distance

Airport A	Airport B	Market Distance (Statute Miles)
DFW	HOU	247
DFW	IAH	224
DAL	HOU	239
DAL	IAH	217
DFW	CLL	164
IAH	CLL	74

In 2006, the total number of air trips between Dallas/Fort Worth airports and Houston airports was 1,643,640, which is a 2.45 percent decrease when compared to 1996. Between 1996 and 2008, specific indices for the air travel demand for Corridor Dallas/Fort Worth to Houston are shown in Table .

Table 4. Air Travel Demand for Corridor Dallas/Fort Worth to Houston from 1996 to 2008

Year	Number of Flights	Number of Passengers	Number of Seats	Load Factor
1996	68,265	4,328,035	6,822,809	0.63
2008	43,007	3,021,462	4,295,927	0.70
1996-2008 (Annual percent change)	-2.85%	-2.32%	-2.85%	0.84

In 2006, the average number of scheduled flights per day on the corridor between Dallas/Fort Worth and Houston is 130 flights per day. In Texas, nearly 71 million passengers were enplaned in 2007 and the number is expected to grow more than 104 million per year by 2025 according to FAA projected numbers. Houston George Bush Intercontinental (IAH), Houston’s William P. Hobby (HOU), Dallas/Fort Worth International (DFW), and Dallas Love Field (DAL) airports are the four busiest airports in Texas and accounted for 81 percent of the total enplanements in the state in 2007.

Corridor Travel Patterns: Highway

The most direct highway route between the Houston area and Dallas-Fort Worth is along Interstate 45 (I-45). This corridor experienced a weighted corridor-average AADT increase of 4.57 percent each year between 1997 and 2006, with the 2006 AADT being 53,634 vehicles per day. The 10-year weighted AADT trend is shown in Figure 3. The projected average AADT levels are expected to reach over 106,000 vehicles per day over the corridor, as shown in Table .

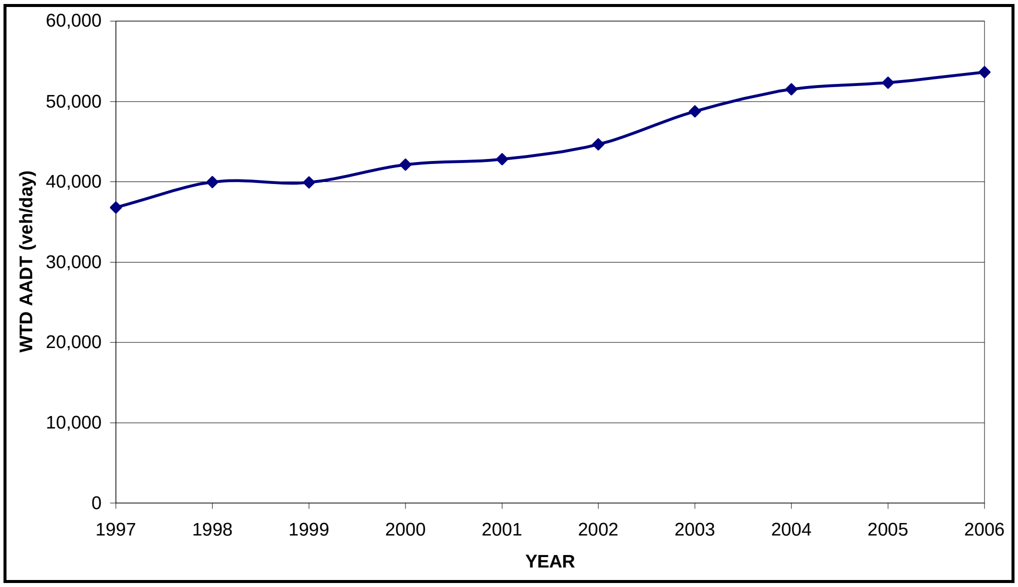

Figure 3. Dallas-Fort Worth to Houston 10-Year Weighted AADT, 1997-2006

The overall I-45 corridor volume-to-capacity ratio in 2002 was 0.60, with a 1.0 representing a roadway at capacity. The 2035 projected volume-to-capacity ratio worsens to an expected value of 1.28. This is shown in the 2002 and 2035 estimated average speed over the corridor dropping from 59 mph in 2002 to 39 mph in 2035. Finally, the number of trucks will increase along with the traffic growth in the corridor; however, the percentage of trucks along the corridor is expected to remain approximately the same at 19-20 percent in 2035. Table 5 shows the highway travel statistics.

Table 5. Dallas-Fort Worth to Houston Highway Travel Patterns

Data Element	DFW to Houston
% Annual Growth in Average Corridor AADT (1997-2006)	4.57%
Average Corridor AADT	
2006	53,634 vehicles per day
2035	106,475 vehicles per day
Average Volume-to-Capacity Ratio	
2002	0.60
2035	1.28
Average Speed	
2002	59 mph
2035	39 mph
Average % Trucks	
2002	19.29%
2035	20.12%

PASSENGER RAIL, BUS TRANSIT, INTERMODAL SERVICES, AND FREIGHT RAIL

The following sections summarize the existing transit and freight rail services and routes in the study corridor area. These are for the I-45 corridor only. (A description of the adjacent corridor via College Station and Waco appears in a later section.)

Existing Intercity Passenger Rail Service

No direct existing passenger rail service is available on the DFW-Houston corridor despite the heavy travel between the two cities. Amtrak service between the two regions was discontinued in the mid-1990's.

Existing Bus Service

Greyhound provides intercity bus service eight times daily between Dallas and Houston, five times daily from Fort Worth to Houston, and six times daily from Houston to Fort Worth.

Intermodal Facilities

Intermodal facilities include passenger train stations, bus stops/stations, transit centers and other facilities that could potentially become intermodal facilities if market demands and development allows. On the Dallas/Fort Worth to Houston Corridor, specific facilities are as follows:

- Dallas Union Station
- Fort Worth Intermodal Transportation Center
- Cleburne Intermodal Terminal
- Corsicana Greyhound Station
- Houston Amtrak Station
- Houston Greyhound Stations

Transit Agencies

- Dallas Area Rapid Transit (DART)
- The T (Fort Worth)
- Denton County Transportation Authority
- Cletran (Cleburne)
- Collin County Area Regional Transit
- The District (Brazos Transit)
- METRO (Harris County)
- METRORail
- Connect Transportation (Texas City)
- Fort Bend County Transit

Existing Freight Rail Operations

There are several existing freight rail routes that travel between Dallas-Fort Worth and Houston. None of the existing freight rail routes directly follow I-45 south of Corsicana into Houston. North of Corsicana a UP line goes to Dallas, while a BNSF line goes to Fort Worth. Table 6 provides the segment listings for four existing route options between Dallas-Fort Worth and Houston, along with the adjacent roadway and rail owner. The shortest path would be a combination of the UP line from Dallas to Corsicana, and then the BNSF line from Corsicana to Houston. One item to note is that the UP utilizes relatively parallel routes to maintain specific directional operations. So based on operations, UP may use one route for northbound traffic, while utilizing a different route for southbound traffic. This would need to be taken into account in studying potential addition of passenger rail along these lines.

Table 6. Freight Rail Lines Associated with Study Corridors – General Segment Description

Segment Detail	General Description of Rail Lines and Adjacent Roadways	Segment RR
DFW to Houston, Option 1		
DFW to Waco	Parallels I-35	UP
Waco to Navasota	Parallels TX 6	UP
Navasota to Houston	Parallels US 290	UP
DFW to Houston, Option 2		
DFW to Waco	Parallels US 287 until Corsicana	UP
Waco to Hearne	Predominantly parallels TX 6	UP
Hearne to Navasota	Parallels TX 6	UP
Navasota to Houston	Parallels US 290	UP
DFW to Houston, Option 3		
DFW to Temple	Parallels I-35	BNSF

Segment Detail	General Description of Rail Lines and Adjacent Roadways	Segment RR
Temple to Sealy	Predominantly parallels TX 6	BNSF
Sealy to Houston	Parallels TX 36	BNSF
DFW to Houston, Option 4		
DFW to Corsicana	Parallels US 287	BNSF
Corsicana to Houston	Parallels I-45	BNSF

Based on information obtained from the Class I freight railroads, as well as freight rail mobility studies conducted by TxDOT, the existing rail line segments between Dallas-Fort Worth and Houston experience an average of approximately 45 – 50 MGTM/Mi of freight each year as shown in

Table . Additionally, Table 7 provides current and expected train volumes on select rail segments, based on a projected annualized growth rate of 3%. Several secondary rail lines in Texas were not examined in this analysis and are not included in Table 7. These levels, presented in

Table , indicate significant growth is expected on many of the existing freight rail line segments between Dallas-Fort Worth and Houston by 2035.

Table 7. Freight Rail Lines Associated with Study Corridors – Segment Density and Volumes

Segment Detail	Segment RR	Segment Density (MGTM/Mi)	Current Volume (trains per day)	Future Volume* (trains per day)	Growth (trains per day)	Percent Growth
DFW to Houston, Option 1						
DFW to Waco	UP	60-70	45-50	110-120	65-70	140
Waco to Navasota	UP	30-55	20-40	50-95	30-55	130-150
Navasota to Houston	UP	30-35	15-20	40-50	25-30	100-200
DFW to Houston, Option 2						
DFW to Waco	UP	60-70	45-50	110-120	65-70	140
Waco to Hearne	UP	30-55	35-40	85-95	50-55	130-150
Hearne to Navasota	UP	30-35	20-25	50-60	30-35	140-150
Navasota to Houston	UP	30-35	15-20	40-50	25-30	100-200
DFW to Houston, Option 3						
DFW to Temple	BNSF	50-70	20-30	40-75	20-45	100-150
Temple to Sealy	BNSF	60-90	30-35	75-85	45-50	150
Sealy to Houston	BNSF	50-55	30-35	75-85	45-50	150
DFW to Houston, Option 4						
DFW to Corsicana	BNSF	10-20	5-10	20-30	15-20	100-200
Corsicana to Houston	BNSF	15-20	5-10	20-30	15-20	100-200

*by year of 2035, excluding passenger trains

Based on current and forecast train levels and available capacity, the *National Rail Freight Infrastructure Capacity and Investment Study* (2007) presented a Level of Service (LOS) estimate for these routes. It is estimated that several of these line segments will experience LOS 'D' (approaching theoretical capacity) or worse in 2035 unless significant infrastructure improvements are undertaken. Table 8 shows the current and projected LOS for the possible routes as identified in the 2007 capacity and investment study.

Table 8. Freight Rail Lines Associated with Study Corridors – Current and Future Levels-of-Service

Segment Detail	Segment RR	Current LOS	Future LOS - Unimproved	Future LOS - Improved
DFW to Houston, Option 1				
DFW to Waco	UP	A, B, C	D	A, B, C
Waco to Navasota	UP	A, B, C	F	A, B, C
Navasota to Houston	UP	A, B, C	A, B, C	A, B, C
DFW to Houston, Option 2				
DFW to Waco	UP	A, B, C	E	A, B, C
Waco to Hearne	UP	A, B, C	A, B, C	A, B, C
Hearne to Navasota	UP	A, B, C	F	A, B, C
Navasota to Houston	UP	A, B, C	A, B, C	A, B, C
DFW to Houston, Option 3				
DFW to Temple	BNSF	A, B, C	D	A, B, C
Temple to Sealy	BNSF	A, B, C	F	A, B, C
Sealy to Houston	BNSF	D	F	A, B, C
DFW to Houston, Option 4				
DFW to Corsicana	BNSF	Not in 2007 study.	Not in 2007 study.	Not in 2007 study.
Corsicana to Houston	BNSF	Not in 2007 study.	Not in 2007 study.	Not in 2007 study.

The following pages describe data from the adjacent Houston to Waco via College Station Corridor examined in 0-5930.

TXDOT 0-5930 PROJECT- HOUSTON TO DALLAS VIA COLLEGE STATION/BRYAN AND WACO CORRIDOR OPTION

CORRIDOR OVERVIEW

The Houston to Waco corridor examined in 0-5930 traverses US 290 between Houston and Hempstead and then Texas Highway 6 (TX 6) from Hempstead to Waco, where it passes through the College Station-Bryan metropolitan CBSA as shown in Figure 5. The Waco CBSA is also classified as a metropolitan CBSA. From Waco, the corridor could extend north along the I-35 corridor to reach Dallas-Fort Worth. The I-35 Corridor is the subject of another HSIPR application. Connecting to another existing corridor could potentially minimize the length of the overall Texas high-speed rail network and reduce construction and operational costs.

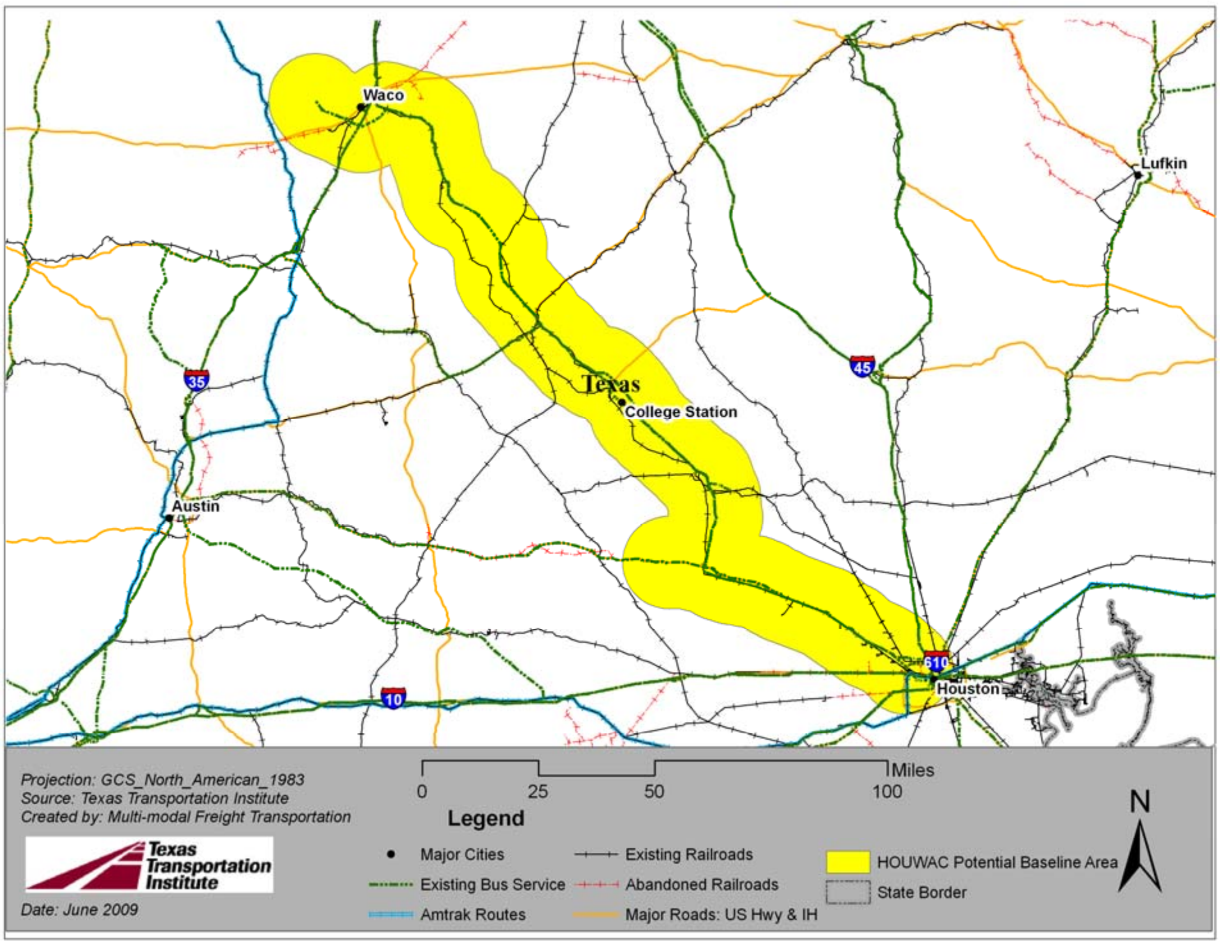

Figure 5. Houston to Waco Corridor Map

Figure provides a view of the CBSA populations along the Houston to College Station to Waco to Dallas corridor, along with a demonstration of the distance between these urban centers. The corridor is approximately 285 miles in length, with the Houston-Sugar Land-Baytown CBSA providing the majority of the population for the corridor. However, the corridor stretches to the Waco CBSA, which is located on the heavily utilized I- 35 corridor and north along it to Dallas- Fort Worth. In 2000, the Houston-Sugar Land-Baytown CBSA population exceeded 4.7 million people. As is seen in Figure , that population level is expected to grow to 8.4 million people by 2040. The College Station-Bryan and Waco CBSAs are expected to grow from 185,000 to 268,000 and 214,000 to 286,000, respectively. While these smaller CBSAs growth rate is relatively slow compared with that of Houston or Dallas, they are much larger and, due to their historic educational and medical facilities, much more likely to generate further development potential than the intermediate urban areas along the I-45 corridor between Dallas-Fort Worth and Houston.

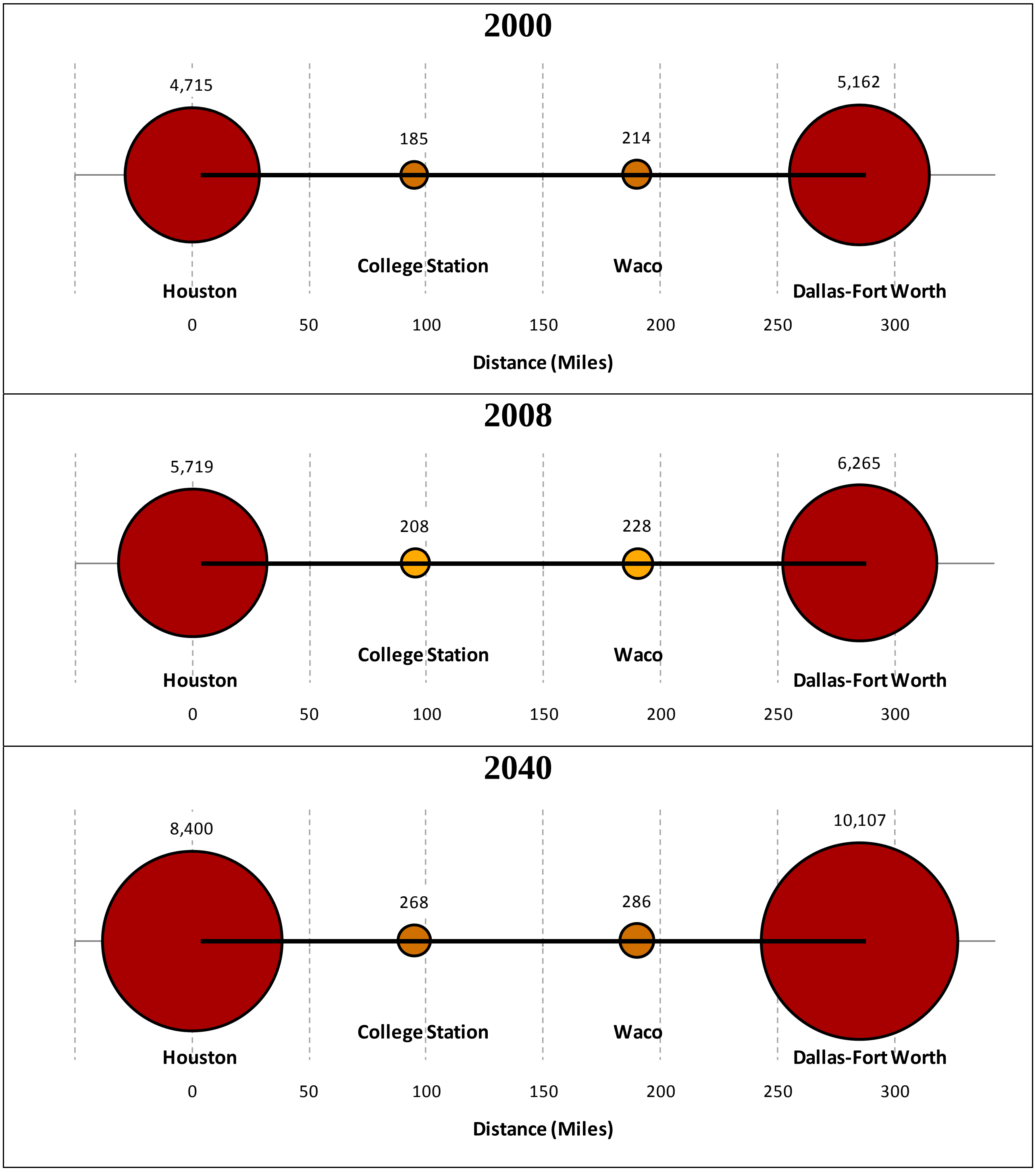

Figure 6. Houston to Waco Corridor Population Distributions

Additionally, Table shows the distance between the urban areas along the corridor and estimated travel time along the entire corridor.

Table 9. Houston to Waco to Dallas-Fort Worth CBSA Population, Distances, and Estimated Travel Times

CBSA	Population			Distance		Travel Time (hours:minutes)				
	2000	2008	2040	Segment	Cumulative	60 mph	80 mph	110 mph	150 mph	200 mph
Houston	4,715,400	5,718,700	8,400,100	0	0	0:00	0:00	0:00	0:00	0:00
College Station	184,900	208,400	267,700	95	95	1:35	1:11	0:51	0:38	0:28
Waco	213,500	228,500	285,500	95	190	3:10	2:22	1:43	1:16	0:57
DFW	5,161,500	6,265,000	10,106,800	95	285	4:45	3:33	2:35	1:54	1:25

MARKET POTENTIAL

This section demonstrates several demographic and roadway travel statistics for the Houston to Dallas-Fort Worth via College Station/Bryan and Waco corridor. Projected population numbers are presented by the Texas State Demographer, while the roadway information comes from the TxDOT Road–Highway Inventory Network (RHiNo) database and FHWA Freight Analysis Framework database.

Population, Economic Activity, and Special Generators

The Houston to Dallas-Fort Worth via College Station/Bryan and Waco corridor maintained a total population in the corridor CBSAs of 5.1 million in 2000. The population level is expected to reach over 8.9 million people in 2040 as shown in **Error! Reference source not found.** below. The population per mile is expected to greatly increase from 36,053 people per mile in 2000 to 66,877 people per mile in 2040. Considerable growth is expected in the population 65 years of age and older, as seen in **Error! Reference source not found.**. The corridor maintained in 2005 approximately 258,621 employer establishments that employed over 4.6 million persons in 2005. Finally, the total higher education enrollment in 2006 was 146,702 students for the Waco to Houston segment studied in 0-5930, as shown in **Error! Reference source not found.**.

Table 10. Houston to Dallas via College Station and Waco Demographics

Data Element	Houston to Waco
Population	
2000	10,275,353
2040	19,060,210
Population per Mile*	
2000	36,053
2040	66,877
Population - Over 65	
2000	816,698
2040	3,385,731
Employment	
No. of Employees (2005)	4,625,297
No. of Employer Establishments (2005)	258,621
Total Public or Private University Enrollment (Fall 2006)	146,702**

*Calculation using corridor length = 285 miles

**Houston to Waco Corridor numbers only. Does not include DFW-Waco segment which was not part of 0-5930 study for this corridor.

Corridor Travel Patterns: Commercial Air Carrier Service

The existing commercial airports within the Houston to Dallas/Fort Worth via Waco corridor include Dallas/Fort Worth International (DFW), Dallas Love Field (DAL), Easterwood Field Airport (CLL), Houston's William P. Hobby Airport (HOU), and Houston George Bush Intercontinental Airport (IAH). Table represents the market distance between airport pairs within the corridor.

Table 11. Intrastate Passenger Air Service City-Pair Market Distance

Airport A	Airport B	Market Distance (Statute Miles)
DFW	HOU	247
DFW	IAH	224
DAL	HOU	239
DAL	IAH	217
DFW	CLL	164
IAH	CLL	74

In 2006, the total number of air trips between Houston and Waco was 2,070, which is a 21.56 percent decrease compared to 1996. Between 1996 and 2008, specific indices for the air travel demand for Corridor Houston to Waco are shown in Table .

Table 12. Air Travel Demand for Corridor Houston-Waco from 1996 to 2008

Year	Number of Flights	Number of Passengers	Number of Seats	Load Factor
1996	6,295	67,618	157,106	0.43
2008	7,617	130,893	260,464	0.50
1996-2008 (Annual percent change)	1.62%	7.20%	5.06%	1.29

Corridor Travel Patterns: Highway

The corridor segment between Houston and Waco experienced an annual increase in AADT of 3.85 percent between 1997 and 2006. The 10-year weighted AADT growth trend for this area is shown in Figure 7. The projected AADT levels for the entire corridor are expected to reach over 92,000 vehicles per day along this corridor, as shown in Table .

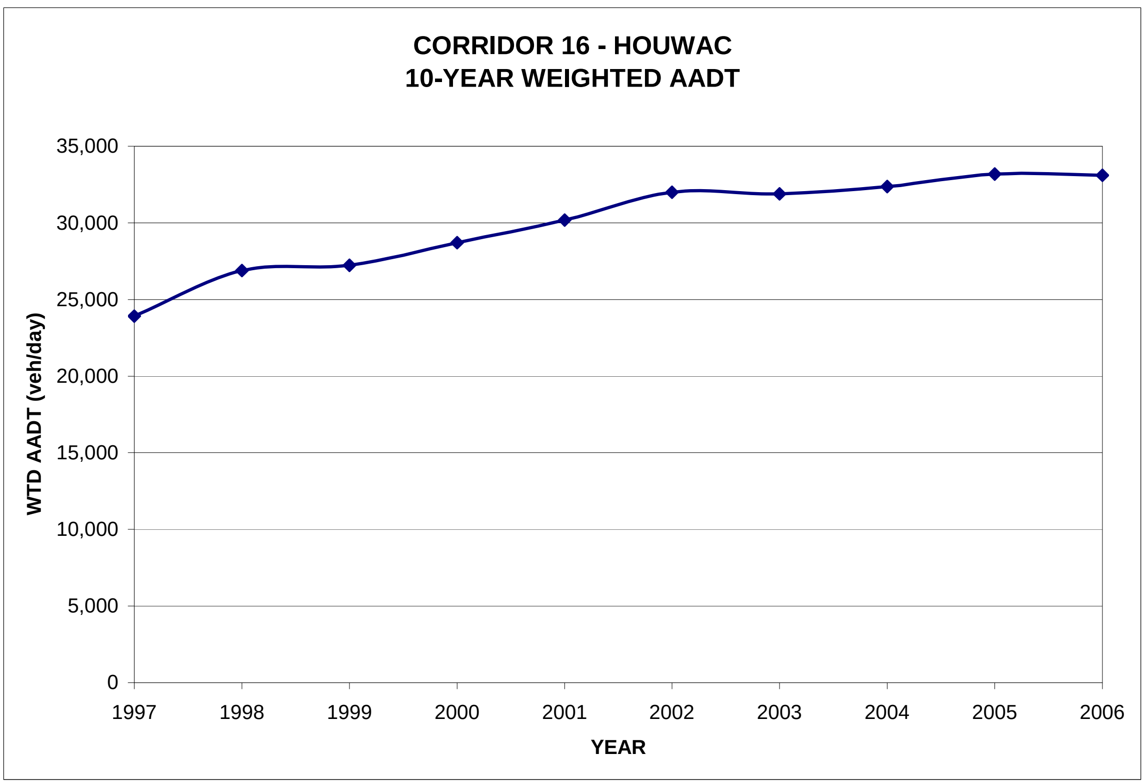

Figure 7. Corridor 16 – HOUWAC – 10-Year AADT.

The Houston to Waco segment weighted corridor volume-to-capacity ratio in 2002 was 0.65, with a 1.0 representing a roadway at capacity. The 2035 projected ratio worsens to an expected value of 1.71. This is shown in the 2002 and 2035 average speed over the corridor dropping from 44 mph in 2002 to 27 mph in 2035. Finally, the percent of trucks along the corridor is expected to remain consistent at 11-12 percent of overall traffic to 2035. Table 13 shows the highway travel statistics for the Houston to Waco segment prior to intersecting with the I-35 corridor as studied in 0-5930.

Table 13. Houston to Waco Highway Travel Patterns

Data Element	Houston to Waco
% Annual Growth in Average Corridor AADT (1997-2006)	3.85%
Average Corridor AADT	
2006	33,112 vehicles per day
2035	92,762 vehicles per day
Average Volume-to-Capacity Ratio	
2002	0.65
2035	1.71
Average Speed	
2002	44 mph
2035	27 mph
Average % Trucks	
2002	11.5%
2035	11.9%

EXISTING PASSENGER RAIL, BUS TRANSIT, AIR SERVICES, AND FREIGHT RAIL

The following sections summarize the existing transit and freight rail services and routes in the Houston to Dallas Fort Worth via Waco corridor area. These services overlap in several cases with those described previously for the I-45 direct corridor.

Existing Passenger Rail Service

No existing passenger rail service is available on this corridor. Previous Amtrak routes between Dallas-Fort Worth and Houston served the College Station area before being discontinued in the mid-1990s.

Existing Bus Service

In this corridor, Greyhound provides intercity bus service two times daily between Dallas and Houston via Waco and Bryan/College Station, one time daily between Fort Worth and Houston via Waco and Bryan/College Station.

The Kerrville Bus Company provides interlined service with Greyhound once daily from Houston to Waco via Austin.

Intermodal Facilities

Intermodal faculties include passenger train stations, bus stops/stations, transit centers and other facilities that could potentially become intermodal facilities if market demands and development allows. In the Houston to Dallas/Fort Worth via Waco Corridor, specific facilities are as follows:

- Arlington Greyhound Station
- Bryan Greyhound Station
- Corsicana Greyhound Station
- Dallas AAU Westmoreland Greyhound Station
- Dallas Union Station
- Dallas South Park Greyhound Station
- Fort Worth AAU
- Fort Worth Greyhound Station
- Fort Worth Intermodal Transportation Center
- Hearne Greyhound Station
- Hillsboro Greyhound Bus Stop
- Houston Amtrak Station
- Houston Greyhound Stations
- Navasota Greyhound Station
- Prairie View Greyhound Station
- Waco Intermodal Transit Center
- Waco Greyhound Station
- Waxahachie Greyhound Station

A new Houston Northern Intermodal Facility has been planned/ proposed to be established in the corridor.

Transit Agencies

The corridor of Houston to Dallas/Fort Worth via Waco goes through four planning regions. There are seven existing transit agencies along the corridor, namely:

- Connect Transportation (Texas City)
- Dallas Area Rapid Transit (DART)
- Fort Bend County Transit
- Heart of Texas Council of Governments (HOTCOG) Rural Transit
- Metropolitan Transit Authority of Harris County Houston Texas (METRO)
- The District (Brazos Transit)
- The T (Fort Worth)
- Waco Streak
- Waco Transit

Existing Freight Rail Operations

There are two existing Union Pacific-owned freight rail lines within the Houston to Waco corridor: Houston to Navasota via Hempstead, and Navasota to Waco. The former rail line parallels US 290 and turns north just east of Brenham where it predominantly parallels TX 6. The latter goes parallel to TX 6. Table represents the current train volumes as obtained from the freight railroad operators and various freight movement mobility studies conducted by TxDOT, and future train volumes per rail line segment based on an annualized growth rate of 3%.

Table 14. Segment Density and Rail Volumes

Segment	Current Volume (trains per day)	Future Volume* (trains per day)	Growth (trains per day)	Percent Growth	Segment Density (MGTM/Mi)
Houston to Navasota	5-10	20-30	15-20	100-200	5 - 10
Navasota to Waco	15-20	40-50	25-30	100-150	30-35

*by year of 2035, excludes passenger rail

Based on these current and forecast train levels and available capacity, the *National Rail Freight Infrastructure Capacity and Investment Study* (2007) presented a Level of Service (LOS) estimate for these corridors. It is estimated that several of these line segments will experience LOS ‘D’ (approaching theoretical capacity) or worse in 2035 unless significant infrastructure improvements are undertaken. Table shows the current and projected LOS for the possible routes as identified in the 2007 *Capacity and Investment Study*.

Table 15. Freight Rail Lines Associated with Study Corridors – Current and Future Levels-of-Service

Segment Detail	Segment RR	Current LOS	Future LOS - Unimproved	Future LOS - Improved
DFW to Houston, Option 1				
DFW to Waco	UP	A, B, C	D	A, B, C
Waco to Navasota	UP	A, B, C	F	A, B, C
Navasota to Houston	UP	A, B, C	A, B, C	A, B, C
DFW to Houston, Option 2				
DFW to Waco	UP	A, B, C	E	A, B, C
Waco to Hearne	UP	A, B, C	A, B, C	A, B, C
Hearne to Navasota	UP	A, B, C	F	A, B, C
Navasota to Houston	UP	A, B, C	A, B, C	A, B, C
DFW to Houston, Option 3				
DFW to Temple	BNSF	A, B, C	D	A, B, C
Temple to Sealy	BNSF	A, B, C	F	A, B, C
Sealy to Houston	BNSF	D	F	A, B, C

ENVIRONMENTAL QUALITY

Currently Designated Nonattainment Areas in Texas for All Criteria Pollutants

As of January 06, 2010, the nine counties in the Dallas/Dort Worth area (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant) are designated as moderate nonattainment for 8-Hr Ozone by the EPA. In addition the eight counties in the Houston area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller) are designated as severe nonattainment for 8-Hr Ozone by the EPA. Figure 4 is a map of these counties.

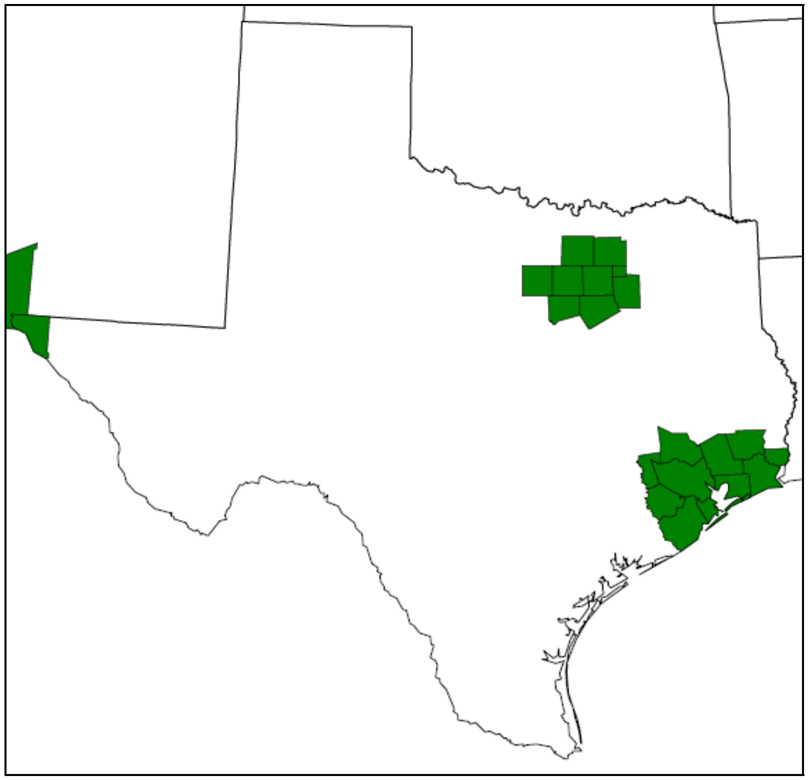

Figure 4. Texas Counties Designated "Nonattainment" for Clean Air Act's National Ambient Air Quality Standards (NAAQS).

There are tangible air quality and congestion management benefits that accrue to the public from the existence of the rail services and to the highway users in the form of improved traffic flow on the existing roadway system. Intercity passenger rail service is shown to have an impact on congestion, and thus pollution, when targeted to areas where roads are at or near their design capacity. As more traffic uses these roads, travel time increases sharply and the delays are felt by all travelers. An intercity rail line that parallels IH-45 would potentially alleviate highway traffic. Rail adds capacity to the regional transportation system without the disruption and expense of highway expansion. Moreover, increasing rail capacity is as simple as adding another rail car or providing more frequent service.

According to Will Kempton, Director of the California Department of Transportation, in testimony provided to the House Committee on Transportation and Infrastructure, “Intercity passenger rail is estimated to use at least 15 percent less energy on a per passenger mile basis than the airlines and 21 percent less than the automobile.” Mr. Kempton also noted that “the average intercity train produces 60 percent fewer CO_2 emissions on a per passenger mile basis than the average auto and about half the green house gas emissions of an airplane."

A viable intercity rail system would also benefit the environment by limiting urban sprawl and concentrating development in close proximity to the rail lines.

Vehicles are a primary source of ozone-forming and greenhouse gas emissions in both Houston and Dallas-Fort Worth, both regions struggling to comply with federal air quality standards. Intercity high speed passenger rail will benefit air quality in the region by providing a viable, fuel efficient option to automobile or air travel, thereby reducing vehicle congestion, fuel consumption and emissions on interregional highways, as well as air traffic congestion and related emissions at airports. There is considerable passenger travel between Dallas-Fort Worth and Houston. While alternatives to single occupant vehicle travel are available in the major cities, there are little to no viable alternatives available between cities, leading to increased congestion and air pollution. Intercity passenger rail would remove vehicles from the road, reducing emissions and improving travel conditions for the vehicle trips that remain. Improvements in technology have had a considerable effect on the reduction of air pollution (emissions from new vehicles have declined over time as emission controls and fuel efficiency have improved). Further improvements in fossil-fuel burning vehicle emissions will, however, have less significant impacts.

According to the Competitive Enterprise Institute, throughout the metro areas in the nation, vehicle miles of travel are predicted to increase at a much higher rate than population growth. Therefore, in order to reduce criteria pollutants, even though we have cleaner vehicles, we must reduce vehicle miles of travel. Reduction in the growth of vehicle miles of travel requires behavioral changes rather than solely relying on improvements in technology. The challenge is to reduce the length of most trips and to identify and implement strategies to encourage walking, bicycling and transit use, including intercity passenger rail.

The following reference the reality of the environmental benefits noted by intercity passenger rail on a local level and nationally:

- According to the California based Sonoma – Marin Area Rail Transit's (SMART) Environmental Impact Report, SMART will prevent at least 30 million pounds of greenhouse gases from entering the atmosphere each year by removing 5,300 car trips daily from North Bay roads.
- Nationally, The Center for Clean Air Policy and the Center for Neighborhood Technology estimate that completion of a national high-speed rail network would reduce car travel by 29 million trips and air travel by nearly 500,000 flights annually. Additionally, they estimate that a national high-speed rail network would reduce global warming pollution by 6 billion pounds, the equivalent of taking almost 500,000 cars off the road.
- Concerning energy savings, intercity passenger rail could reduce our dependence on oil. According to a February 9, 2010 article by U.S. PIRG, the federation of state Public Interest Research Groups (PIRGs), "On average, an Amtrak passenger uses 23 percent less energy per mile than an airplane passenger, 40 percent less than a car passenger, and 57 percent less than a passenger in an SUV or pickup truck."

LIVABLE COMMUNITIES

The basis of any effective planning effort rests primarily on a determination of the area's base year demographics (population, household size, employment, household income, and land use) and future projections of these demographics. For the future years, various federal and state government data sources were used for the population and employment forecast totals in five year increments to the year 2035. For the first time, the MPO engaged the public and policy makers in a discussion of alternative growth plans for the area.

Scenario Planning was initiated to engage residents and policy makers in a discussion of the region's future growth and development patterns. Scenario planning enhances the traditional transportation planning process by raising awareness of citizens and decision makers of the factors that affect growth and impact our transportation system. Factors include an aging population, land use policies, economics, and environmental concerns. In scenario planning, citizens and policy makers are asked to consider alternative approaches, or “scenarios” to shaping the region and understanding the differences between each approach. The ultimate goal is to create a sustained quality of life for citizens and visitors in our region.

The Federal Highway Administration (FHWA) sees scenario planning as an enhancement of, not a replacement for, the traditional transportation planning process. It enables communities and transportation agencies to better prepare for the future. Scenario planning highlights the major forces that may shape the future and identifies how the various forces might interact, rather than attempting to predict one specific outlook. As a result, regional decision makers are prepared to recognize various forces to make more informed decisions in the present and be better able to adjust and strategize to meet tomorrow's needs.

MULTI-MODAL PLANNING PROCESS

The MPO’s typically address all types of transportation modes when considering its long range plan. Planning for the future transportation needs of the MPO regions require a comprehensive look at the current transportation system, future demographics, and the anticipated available funding for the area for transportation projects. For example, the San Antonio metropolitan area's economy and environment depend heavily on the condition and efficient performance of the regional transportation system. Recognizing the mobility needs of the community and addressing those needs will eventually lead to improvements in the economy and quality of life.

The MPO’s and their partner agencies look at all modes of transportation, including: bicycle and pedestrian facilities, public transportation systems and roadway needs