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16. Abstract

This report summarizes the results of Tasks 1 through 5 of TxDOT Research Project 0-5930: Potential Development of an Intercity Passenger Transit System in Texas. Rather than focus on any regional commuter or light rail systems within or radiating from individual urban areas, this project aims to determine which longer intercity and interregional corridors are most likely to need additional intercity travel capacity in the coming decades. Using these tools, the state of Texas could determine in which corridors to most appropriately invest its resources to connect different regions of the state to create an interregional, statewide transit system. The underlying analysis is based upon several factors related to:

- current and future population and demographic projections along 18 intercity corridors in the state;
- projected future demand based upon forecasts by the Texas State Demographer and other state agencies; and
- current network capacity and routes for intercity highway, bus, air, and rail travel.

The concept plan produced in Task 5 will be further explored in the remaining months of the project to determine potential costs and benefits of implementing the concept plan or individual components.

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POTENTIAL DEVELOPMENT OF AN INTERCITY PASSENGER TRANSIT SYSTEM IN TEXAS – REPORT ON TASKS 1-5

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data, opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official view or policies of the Texas Department of Transportation (TxDOT), Federal Highway Administration (FHWA), The Texas A&M University System, or the Texas Transportation Institute (TTI). This report does not constitute a standard, specification, or regulation. In addition, the above listed agencies assume no liability for its contents or use thereof. The researcher in charge of the project was Mr. Curtis A. Morgan.

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CHAPTER 1: INTRODUCTION

This report documents the progress and initial findings of Tasks 1-5 of TxDOT Project 0-5930, "Potential Development of an Intercity Passenger Transit System in Texas." The purpose of the project is to assess the potential value of creating an intercity passenger rail and express bus system within the state of Texas. The research includes an examination of the capacity of the existing highways, air routes, and rail systems that connect the state's urban areas; the current and future demand for intercity trips that could be accommodated by passenger rail and express bus; the costs involved to develop a robust passenger rail and express bus system; and how such a system would interact with existing and planned highway, air, and freight rail transportation systems within urban areas. For an intercity mass transit system to work, it must be designed to operate seamlessly with existing urban transportation systems and be organized in a manner that will allow the proper infrastructure investments to be made that will directly meet the transportation challenges facing the state.

In Year 1 of this project, the research team focused on the state's existing transportation infrastructure and services and on the current and projected future transportation demand along identified major travel corridors. The objectives of Year 1 tasks were as follows:

Task 1:

- Document the existing passenger transit services in Texas.
- Identify the variety of rail and express bus technologies available for intercity passenger service.
- Assess the different transit options and the key factors that influence ridership.

Task 2:

- Identify the current major intercity corridors in the state.
- Quantify current travel by corridor and intercity travel demand.
- Develop new/updated corridor evaluation criteria based upon previous methods used.
- Analyze highway/air/rail/bus capacity in identified corridors.
- Evaluate the capacity of existing/planned transportation facilities in each corridor to meet future travel demand.

Task 3:

- Review planning documents of transit agencies and jurisdictional bodies operating transit throughout the state to ensure that any proposed statewide system can interconnect well with local transit providers.

Task 4:

- Identify corridors in which rail and express bus services are appropriate to meet travel demand and address capacity constraints of the existing transportation system.

Task 5:

- Describe a preliminary concept and priority corridors for development of a potential statewide intercity bus and rail network.

Task 6:

- Complete this report on Year 1 activities and the previous tasks.

ORGANIZATION OF THIS REPORT

The remainder of this report is divided into nine chapters. Chapter 2 identifies and describes the intercity travel corridors identified by the research team, and describes the existing roadway, air service, intercity transit service, and freight rail infrastructure. Chapter 2 also summarizes current and projected population, employment, and travel demand along these corridors. Chapter 3 focuses on air passenger service in the state and describes air service demand and capacity issues. Chapter 4 provides more detailed information on Texas' freight rail infrastructure and capacity. Chapter 5 describes the analysis methods and criteria used by the research team to evaluate the need for the provision of rail or express bus transit services in each of the identified intercity travel corridors. Chapter 6 provides more information about existing intercity and local/feeder transit service in the state. Chapter 7 identifies available transit technologies that could be employed in a statewide intercity bus and rail network and summarizes some of the factors that have been shown to encourage transit ridership. Chapter 8 describes the preliminary conceptual plan for an intercity bus/rail system based upon the corridor ranking results. Chapter 9 briefly lists the tasks that will be completed in the remainder of Year 2 of this project.

CHAPTER 2: INTERCITY HIGHWAY TRAVEL IN TEXAS

This chapter reports the TTI research team's findings regarding intercity travel demand and describes the methodologies and factors developed to select, analyze, and prioritize intercity corridors in the state. The information contained in this chapter was collected and analyzed in Task 2 of the research project. The highway network that connects Texas cities has served as the basis for intercity travel since its development. As the data presented in this chapter show, the existing highway network will face great challenges in addressing expected passenger and freight traffic growth.

IDENTIFICATION AND ANALYSIS OF TEXAS INTERCITY TRAVEL CORRIDORS

The first element of Task 2 was to identify the current major intercity travel corridors in the state. Initial corridors that were identified for evaluation by the research team in the project's proposal were derived from the 1976 TTI report entitled "An Evaluation of Intercity Travel in Major Texas Corridors" with the following changes:

- addition of an intercity travel corridor between Houston and Texarkana along U.S. Highway 59; and
- split of the Dallas/Fort Worth to Texarkana intercity travel corridor into two study segments; one along Interstate 30 and one along Interstate 20 toward northwestern Louisiana.

Based on the input of the project management committee at the first project update meeting on January 9, 2008, the following additional corridors were added for study:

- Houston to Waco via Bryan/College Station, along U.S. Highway 290 and Texas State Highway 6;
- Laredo to Brownsville, along U.S. Highway 83; and
- Dallas/Fort Worth to San Antonio, along U.S. Highway 281.

Finally, in light of its designation in the "Ports to Plains" trade corridor, the research team added an additional intercity evaluation corridor between Lubbock and Midland-Odessa, following U.S. Highway 87 and Texas State Highway 349. Figure 2-1 shows the intercity travel corridors evaluated in this study. Study corridors shown in blue were included in the original analysis of a 1976 TTI report on intercity travel within the state of Texas. The corridors shown in red are corridors that have been added for this research effort. These corridors have also become important intercity travel corridors over the past 30 years as the population of the state has grown.

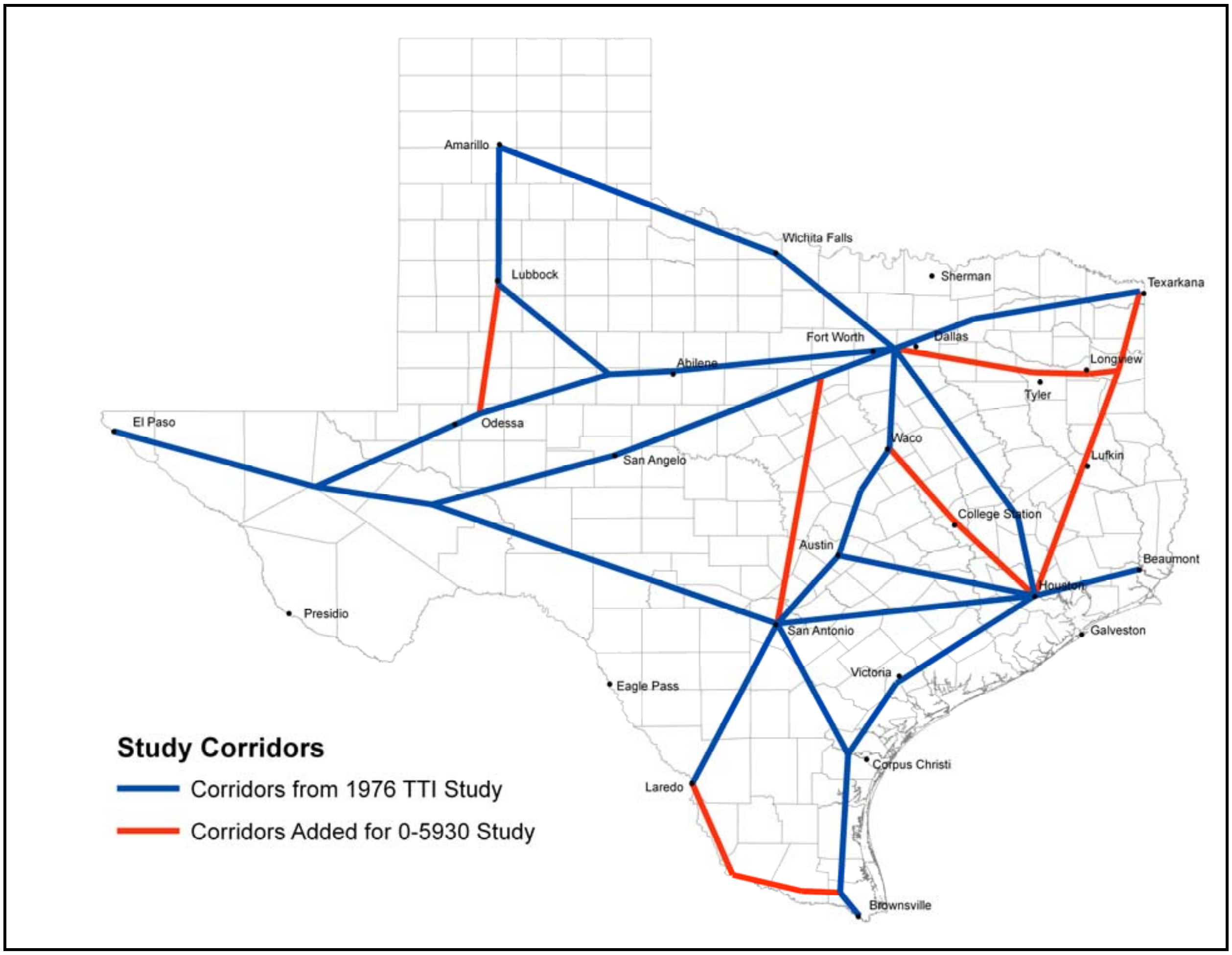


Figure 2-1. Map of Intercity Travel Evaluation Corridors for Project 0-5930.

Table 2-1 is a map of the project-designated abbreviated name, full description, subject roadways, and length of each of the study corridors. The project-designated abbreviations were developed for the ease of reporting data on each corridor without requiring the full description for each. The subject roadways were selected based on the most direct route between the corridor endpoint cities along major roadways. Length of each corridor was measured in miles along the subject roadways between major roadway junctions or other interchanges in each of the corridor endpoint cities. For corridors with an endpoint in Dallas/Fort Worth (DFW), the length was computed as the average of the distance between Dallas and the opposite corridor endpoint and the distance between Fort Worth and the opposite corridor endpoint.

Table 2-1. Description of Project 0-5930 Intercity Travel Evaluation Corridors.

Corridor Reference Number	Corridor	Corridor Description	Roadway(s)	Length (Miles)
1	AMALBB	Amarillo to Midland-Odessa via Lubbock	I-27, US 87, TX 349	245
2	DFWABI	Dallas/Fort Worth to El Paso via Abilene	I-20, I-10	621
3	DFWAMA	Dallas/Fort Worth to Amarillo via Wichita Falls	US 287	362
4	DFWHOU	Dallas/Fort Worth to Houston	I-45	252
5	DFWLBB	Dallas/Fort Worth to Lubbock via Abilene	I-20, US 84	331
6	DFWLOU	Dallas/Fort Worth to Louisiana Border	I-20	183
7	DFWSAT	Dallas/Fort Worth to San Antonio	I-35	267
8	DFWSATb	Dallas/Fort Worth to San Antonio via US-281	US 281, US 377	294
9	DFWSNA	Dallas/Fort Worth to El Paso via San Angelo	US 377, US 67, I-10	648
10	DFWTXK	Dallas/Fort Worth to Texarkana	I-30	190
11	HOUAUS	Houston to Austin	US 290	163
12	HOUBMT	Houston to Beaumont	I-10	87
13	HOUBVN	Houston to Brownsville via Corpus Christi	US 59, US 77	364
14	HOUSAT	Houston to San Antonio	I-10	199
15	HOUTXK	Houston to Texarkana	US 59 (I-69)	307
16	HOUWAC	Houston to Waco via Bryan/College Station	US 290, TX 6	184
17	SATBVN	San Antonio to Brownsville via Corpus Christi	I-37, US 77	280
18	SATELP	San Antonio to El Paso	I-10	636
19	SATLRD	San Antonio to Brownsville via Laredo	I-35, US 83	349

Each of the study highway corridors described above as the major intercity travel corridors in the state are surrounded by additional facilities that could be used in the development of an improved intercity transit network. Figure 2-2 shows the study highway corridors along with the location of Texas' commercial airports, bus stations, Amtrak passenger rail and Thruway bus connector stations, and significant freight rail lines. For purposes of this study, the term "significant rail lines" includes all of the state's Class I and certain secondary railroads that are parallel to or adjacent to sections of the identified intercity travel corridors that are being evaluated.

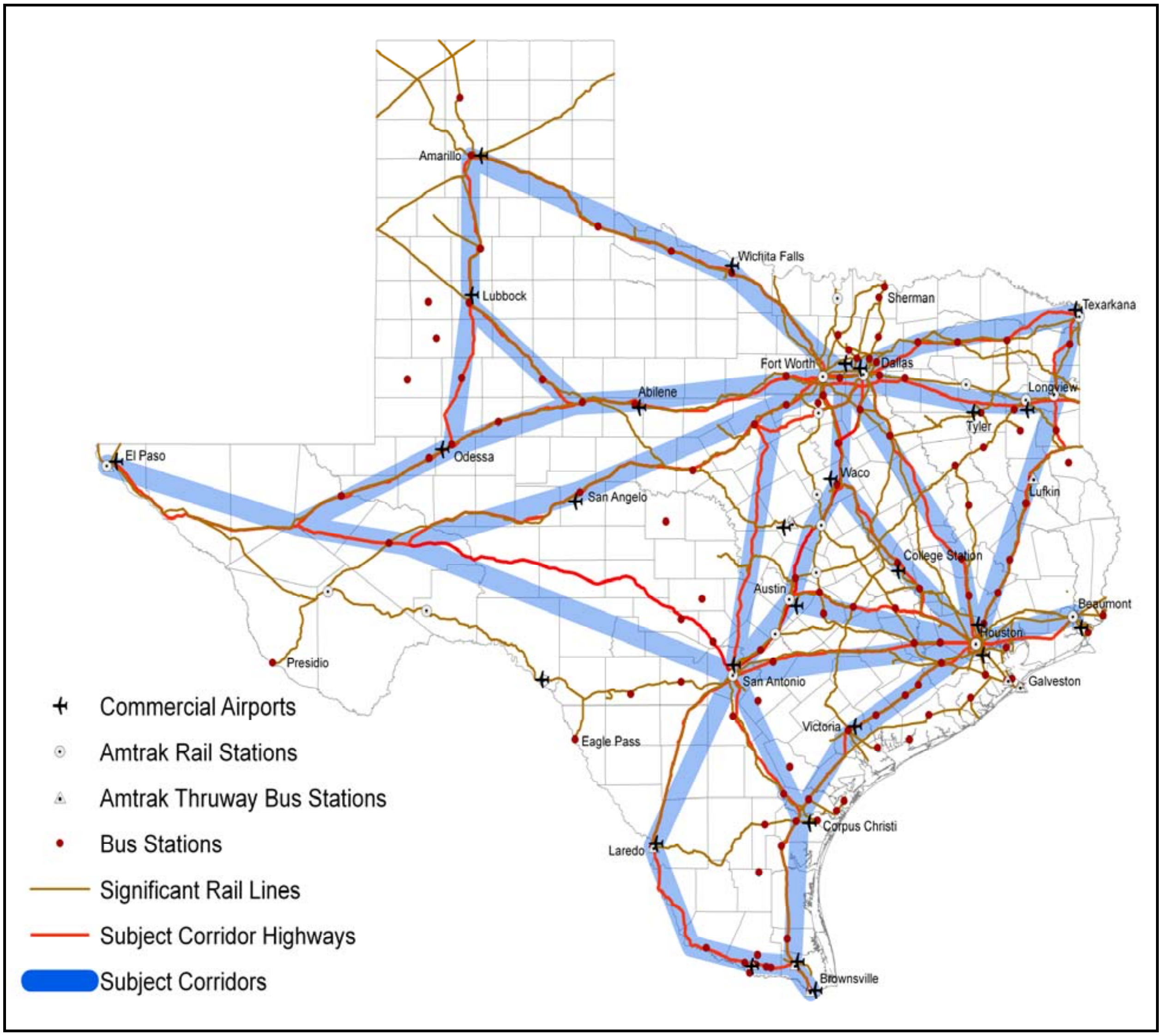


Figure 2-2. Study Corridors Map Showing Alternative Modal Facilities.

DESCRIPTION OF INTERCITY TRAVEL CORRIDORS

The following sections begin a description of the statistics associated with individual corridors, the nomenclature used by the study team to identify each of them, and graphic representations of each of them. Table 2-2 correlates the Corridor ID and Corridor Name introduced in the previous section with a corridor reference number for each of the 19 corridors under study. Table 2-3 displays the traffic data for each corridor from 2002 and projected traffic for 2035 based on the Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF) 2.2 dataset. This database is based upon publicly available data trends and methodologies that have been approved by the FHWA to use in all official studies. As can be seen in Table 2-3, both Annual Average Daily Traffic (AADT) and Annual Average Daily Truck Traffic (AADTT) are expected to more than double on several of the study corridors. In fact, 12 of the 19 study corridors also show a Volume to Capacity Ratio (VCR) greater than 1.0 in 2035, indicating that traffic volumes are greater than the existing road configurations can handle in one or more segments along their length. Projected speeds along these corridors are forecast to be extremely low as well. Such decreases in speed between cities are unacceptable for both business and personal travel. As a result, it becomes clear that major investments in new or expanded roadways or alternative transportation modes will be required. Table 2-4 provides the weighted AADT figures over the ten-year period from 1997-2006.

Table 2-2. Study Corridor Reference Numbers.

Corridor Ref. #	Corridor ID	Corridor Name
1	AMALBB	Amarillo to Midland thru Lubbock
2	DFWABI	DFW to El Paso thru Abilene
3	DFWAMA	DFW to Amarillo
4	DFWHOU	DFW to Houston
5	DFWLBB	DFW to Lubbock thru Abilene
6	DFWLOU	DFW to Louisiana (I-20)
7	DFWSAT	DFW to San Antonio (I-35)
8	DFWSATb	DFW to San Antonio (US281)
9	DFWSNA	DFW to El Paso thru San Angelo
10	DFWTXK	DFW to Texarkana (I-30)
11	HOUAUS	Houston to Austin
12	HOUBMT	Houston to Beaumont
13	HOUBVN	Houston to Brownsville
14	HOUSAT	Houston to San Antonio
15	HOUTXK	Houston to Texarkana
16	HOUWAC	Houston to Waco thru Bryan
17	SATBVN	San Antonio to Brownsville thru Corpus Christi
18	SATELP	San Antonio to El Paso
19	SATLRD	San Antonio to Brownsville thru Laredo

Table 2-3. Corridor Traffic Data & Projections 2002 and 2035 – FHWA Freight Analysis Framework 2.2.

CORRIDOR TRAFFIC DATA & PROJECTIONS - FHWA FREIGHT ANALYSIS FRAMEWORK (FAF 2.2)																				
			2002										2035								
	Corridor*	Length	AADT	AADTT	FAF	Non-FAF	CAP	SF	VCR	SPEED	DELAY	AADT	AADTT	FAF	Non-FAF	CAP	SF	VCR	SPEED	DELAY
		Miles	Vehicles per Day	Trucks per Day**	Trucks per Day***		Vehicles per Hour****		SF/CAP	Mph	Hours	Vehicles per Day	Trucks per Day**	Trucks per Day***		Vehicles per Hour****		SF/CAP	Mph	Hours
1	AMALBB	227	10,801	1,127	762	366	3,549	645	0.17	57	0.01	24,693	2,860	1,606	1,255	3,540	1,471	0.38	53	0.03
2	DFWABI	587	17,476	6,837	5,876	961	2,996	931	0.28	68	0.01	36,715	17,561	15,468	2,093	2,841	1,965	0.63	63	0.04
3	DFWAMA	320	13,688	3,695	867	2,828	2,740	877	0.31	47	0.00	29,279	8,236	2,065	6,171	2,749	1,881	0.66	45	0.01
4	DFWHOU	220	47,178	9,102	4,850	4,253	4,438	2,885	0.60	59	0.02	106,475	21,423	15,602	5,821	4,601	6,499	1.28	39	0.19
5	DFWLBB	299	16,381	5,332	4,663	668	3,087	942	0.31	61	0.00	34,723	13,018	11,407	1,611	3,032	1,999	0.67	56	0.02
6	DFWLOU	156	31,089	8,534	5,633	2,900	3,378	1,629	0.49	65	0.00	69,292	19,983	12,347	7,636	3,538	3,635	1.05	43	0.07
7	DFWSAT	251	71,952	11,588	6,950	4,638	4,619	3,715	0.80	55	0.02	178,452	30,069	18,347	11,722	4,810	9,190	1.90	15	0.46
8	DFWSATb	263	16,195	1,157	169	988	2,579	1,305	0.47	39	0.08	39,497	3,075	349	2,727	2,858	3,308	1.10	29	0.28
9	DFWSNA	651	10,624	2,923	2,278	645	2,358	653	0.24	55	0.02	22,835	8,123	6,701	1,422	2,203	1,419	0.53	50	0.08
10	DFWTXK	159	28,007	8,482	6,783	1,699	3,331	1,613	0.48	66	0.00	67,367	20,903	17,864	3,039	3,452	3,880	1.07	47	0.09
11	HOUAUS	150	38,920	4,261	619	3,642	3,479	2,363	0.60	48	0.04	109,037	12,226	2,899	9,327	3,591	6,621	1.68	33	0.41
12	HOUBMT	86	62,682	11,149	5,388	5,761	5,087	3,701	0.69	52	0.02	141,082	24,980	15,602	9,378	5,206	8,359	1.47	29	0.28
13	HOUBVN	356	33,700	3,884	1,524	2,360	3,442	2,311	0.57	44	0.04	77,625	9,225	3,890	5,336	3,522	5,310	1.27	36	0.21
14	HOUSAT	195	49,613	7,073	4,071	3,002	4,136	3,596	0.79	57	0.04	105,052	18,390	14,421	3,969	4,206	7,730	1.71	19	0.37
15	HOUTXK	292	29,604	5,383	1,911	3,471	3,330	1,622	0.44	49	0.01	69,934	13,213	6,128	7,085	3,333	3,821	0.98	42	0.12
16	HOUWAC	177	33,773	3,915	560	3,355	3,143	2,242	0.65	44	0.05	92,762	11,060	1,665	9,395	3,241	6,100	1.71	27	0.44
17	SATBVN	278	22,391	3,052	2,434	618	3,483	1,677	0.46	58	0.01	49,173	6,864	5,537	1,327	3,567	3,692	1.00	45	0.11
18	SATELP	549	15,319	4,422	4,163	258	2,727	876	0.25	71	0.01	33,159	12,647	12,204	443	2,404	1,915	0.59	66	0.08
19	SATLRD	358	23,783	3,397	1,689	1,708	3,240	1,484	0.44	53	0.04	60,529	9,349	5,320	4,028	3,276	3,720	1.05	37	0.23

*All corridor calculations weighted by section length

**Based on FAF, originally based on Highway Performance Monitoring System data (HPMS)

***Based on FAF, which disaggregates HPMS trucks into long distance (FAF) and local (non-FAF) trucks (< 50 mi)

****Peak Hour, Peak Direction

Table 2-4. Corridor 10-YEAR AADT – TxDOT RHiNo Data 2006.

Corridor		Length (miles)	CORRIDOR 10-YEAR AADT (Vehicles per Day)*									
			2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
1	AMALBB	219	8,684	9,090	8,904	8,592	8,163	7,995	8,022	8,192	7,631	7,433
2	DFWABI	624	20,777	20,794	20,313	18,990	18,765	18,074	18,077	17,682	17,134	16,028
3	DFWAMA	322	15,252	15,076	14,824	14,240	13,692	13,558	12,878	12,706	12,431	11,816
4	DFWHOU	231	53,634	52,342	51,502	48,769	44,635	42,778	42,111	39,931	39,944	36,816
5	DFWLBB	346	16,434	16,351	15,976	15,445	15,459	15,089	14,655	13,961	13,724	13,292
6	DFWLOU	160	32,713	32,659	32,292	31,738	31,055	29,528	30,125	28,908	26,936	25,761
7	DFWSAT	285	66,939	66,562	65,231	62,968	64,485	62,101	61,081	59,836	56,098	54,147
8	DFWSATb	293	21,214	18,935	18,515	18,231	17,899	16,724	16,579	15,748	15,265	14,145
9	DFWSNA	714	12,884	12,894	12,529	11,726	11,241	11,067	11,112	10,650	10,561	9,608
10	DFWTXK	161	29,070	29,807	28,800	28,830	27,552	27,223	28,951	25,423	24,563	23,641
11	HOUAUS	165	36,441	37,591	36,316	35,270	36,422	34,329	33,501	31,834	31,600	27,119
12	HOUBMT	88	72,525	67,929	67,036	67,123	63,402	62,953	61,308	61,070	62,338	59,130
13	HOUBVN	372	32,689	33,448	32,587	32,266	32,327	29,373	28,636	27,600	28,898	26,222
14	HOUSAT	202	54,071	50,948	50,023	48,852	48,634	46,665	44,138	43,093	44,664	41,888
15	HOUTXK	348	28,616	29,010	28,151	28,846	27,191	27,237	24,386	23,082	23,271	22,111
16	HOUWAC	208	33,112	33,170	32,367	31,893	31,990	30,184	28,703	27,222	26,900	23,904
17	SATBVN	308	24,829	24,739	24,405	23,723	23,200	21,704	21,625	21,105	20,163	19,621
18	SATELP	566	20,222	19,395	19,286	17,982	17,283	17,332	17,552	17,157	16,722	15,384
19	SATLRD	381	28,689	25,603	25,020	24,313	23,574	23,068	21,894	20,438	19,818	19,005

*All corridor calculations weighted by section length

AADT data for this analysis were obtained from the 2006 TxDOT Roadway Highway Inventory Network (RHiNo) database and the FAF. For each of the two AADT-based criteria, a higher value indicates a greater demand for travel within an intercity corridor and thus indicates a greater need for investment in intercity rail or express bus service in that corridor. These AADT values include traffic internal to the study corridors (i.e., not only vehicles that are traveling between the corridor endpoint cities). Despite this, the research team determined that these two AADT-based criteria were appropriate early planning-level surrogate measures of travel demand within an intercity corridor acceptable for transit analysis since shorter distance, intra-corridor trips would certainly be taken by either intercity rail or express bus passengers. Later in the planning and development process, detailed ridership studies should be performed to more accurately measure and isolate intercity travel demand between specific endpoint city pairs and at intermediate stops.

In both types of AADT analyses, the historical 10-year trends (TxDOT RHiNo data) and the future forecast (FHWA FAF data), the control sections comprising each intercity corridor were selected graphically and independently, each from its own individual Geographic Information System (GIS). The reason is that the control section numbering system, the geographical characteristics (length, start/end points, etc.), as well as the AADT values differed between the two datasets/GIS systems. The cardinal rule followed, however, was common between the two; intercity corridors excluded inner loop control sections in order to avoid accounting for intracity traffic that would artificially raise the AADT level for each corridor.

In traditional transportation planning analyses for intercity highways, the lowest AADT along the corridor is typically assumed to represent the AADT between the two extreme ends of the corridor and is adopted as the design traffic level. In addition, origin-destination surveys at both ends are typically conducted in order to obtain trip interchange data (numbers, frequency, trip purpose, mode choice, route choice, etc.) that would allow a more accurate estimation of potential intercity transit ridership levels. However, this project prescribed a macroscopic examination of longer stretches of intercity corridors that, naturally, comprise smaller—but not insignificant—urban areas along their lengths. The research team felt that the scope and data examined in this project, could not justify disregarding intra-corridor AADT (potential transit ridership). For this reason the typical highway design assumption could not be supported in this case. On the other hand, origin-destination surveys are well beyond the scope of this project.

However, they are integral future activities that would allow more accurate estimation of potential transit ridership levels between the two extremes of the corridors that show priority through this project.

Therefore, data constraints and the macroscopic perspective of this research necessitated the development of an overall weighted (by length) AADT for each intercity corridor in the study (as compared to a simple numerical average) in order to avoid biases in the corridor AADTs that would be introduced by the unequal lengths of the control sections comprising each corridor. Figures 2-3 to 2-21 graphically show the growth trend in AADT on each of the study corridors over that same ten-year period.

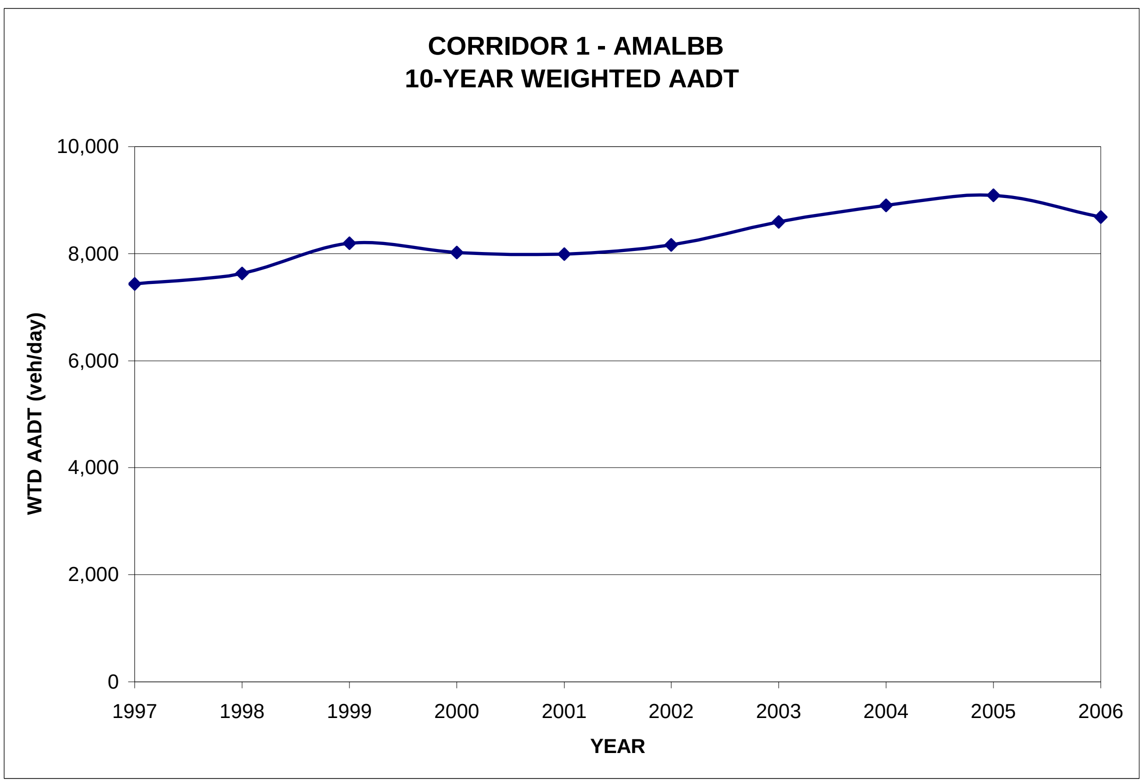


Figure 2-3. Corridor 1 – AMALBB – 10-Year AADT.

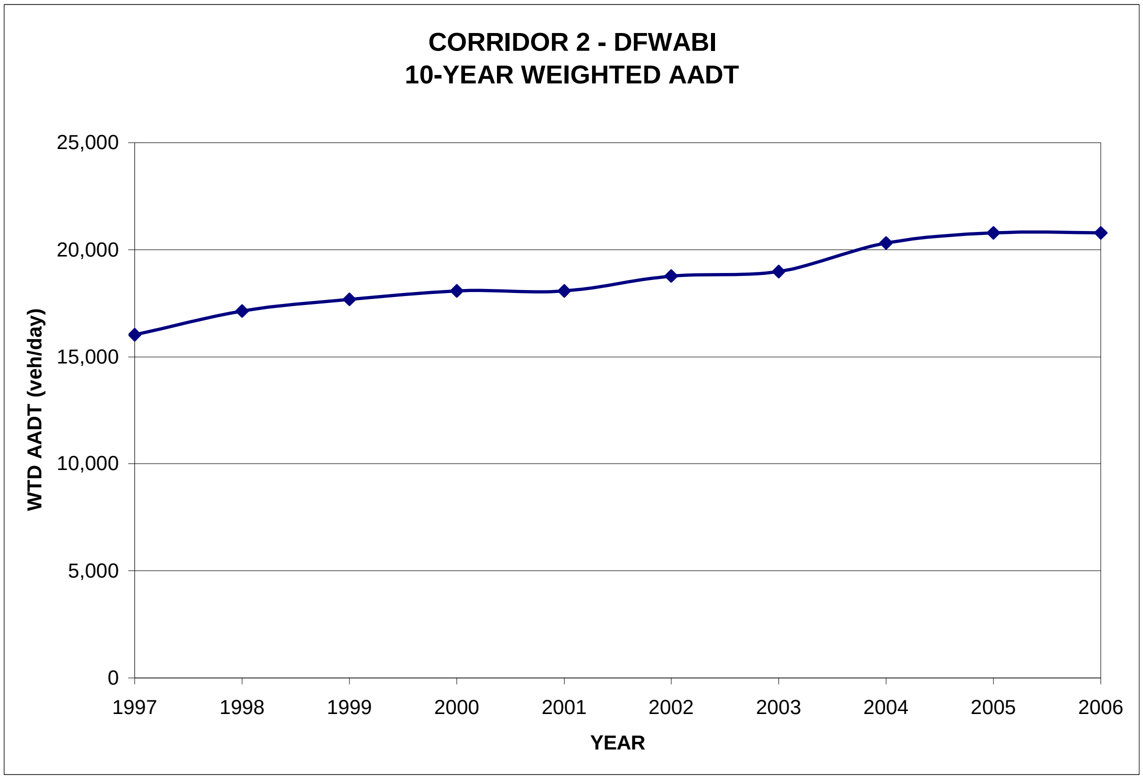


Figure 2-4. Corridor 2 – DFWABI – 10-Year AADT.

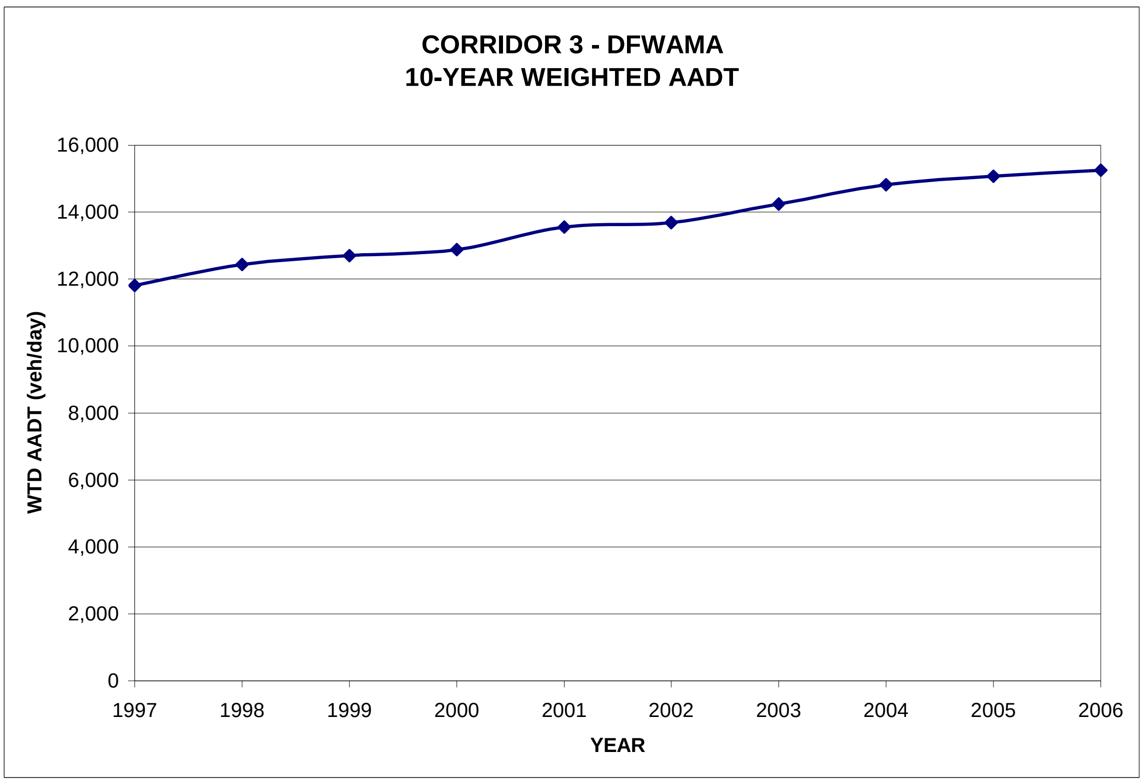


Figure 2-5. Corridor 3 – DFWAMA – 10-Year AADT.

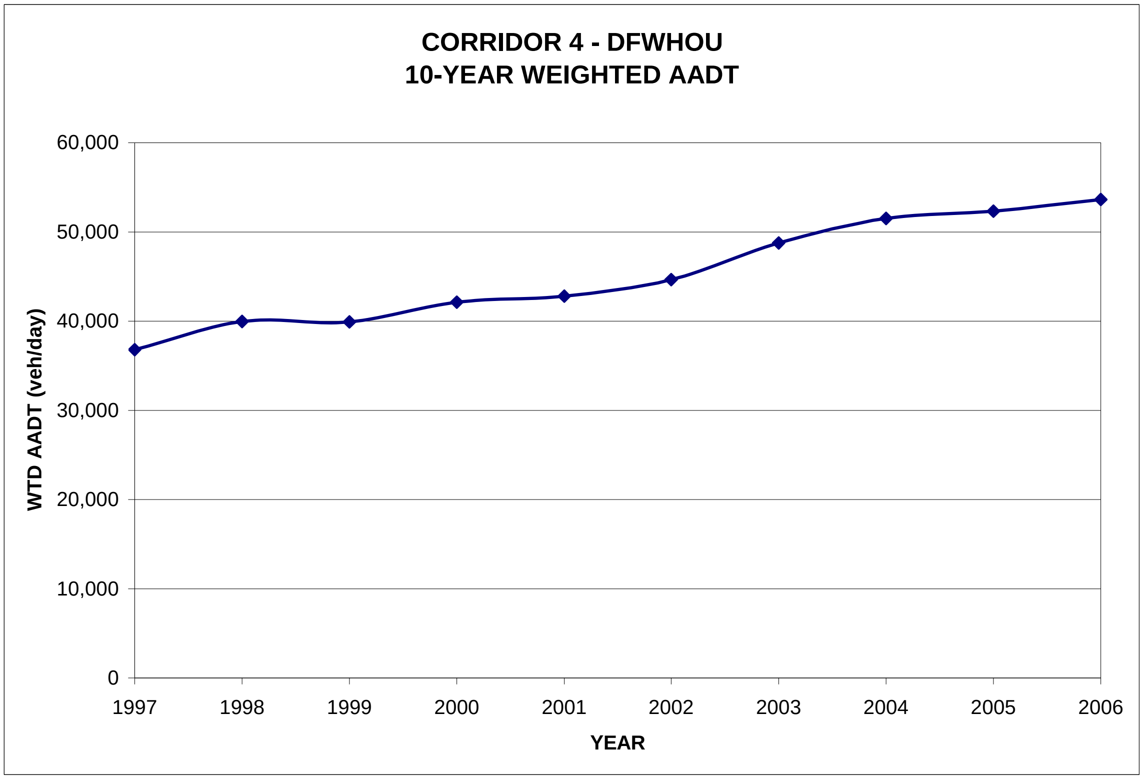


Figure 2-6. Corridor 4 – DFWHOU – 10-Year AADT.

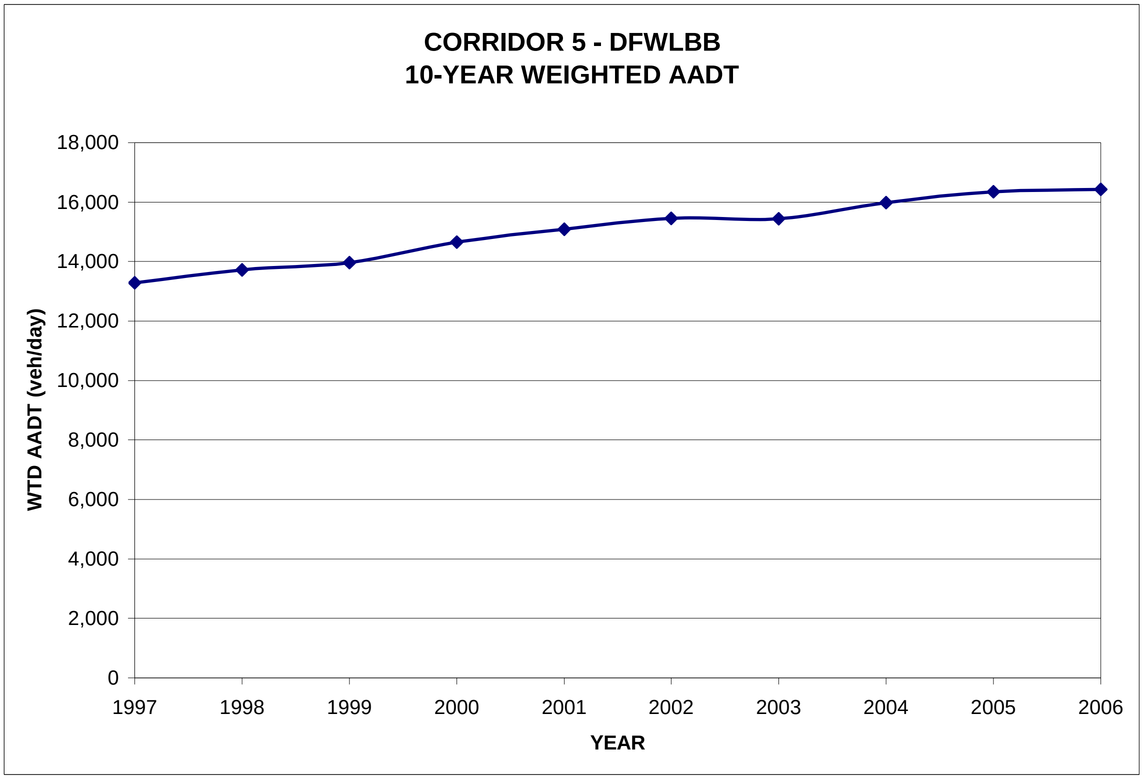


Figure 2-7. Corridor 5 – DFWLBB – 10-Year AADT.

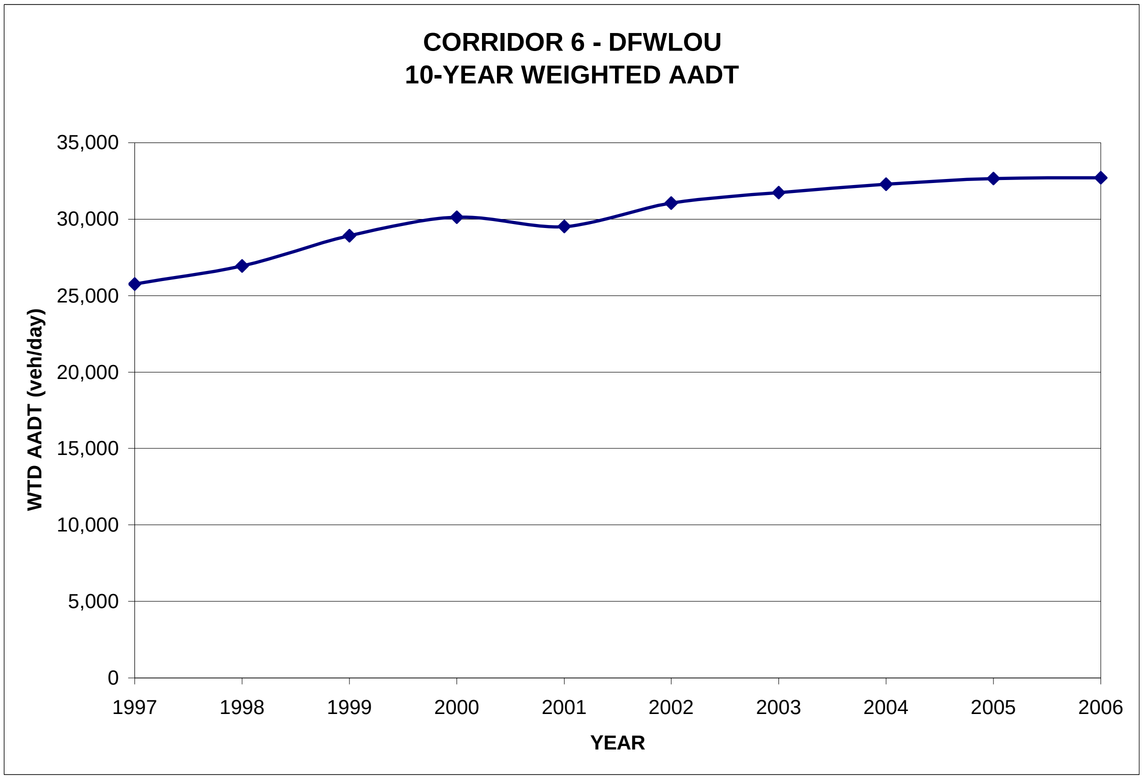


Figure 2-8. Corridor 6 – DFWLOU – 10-Year AADT.

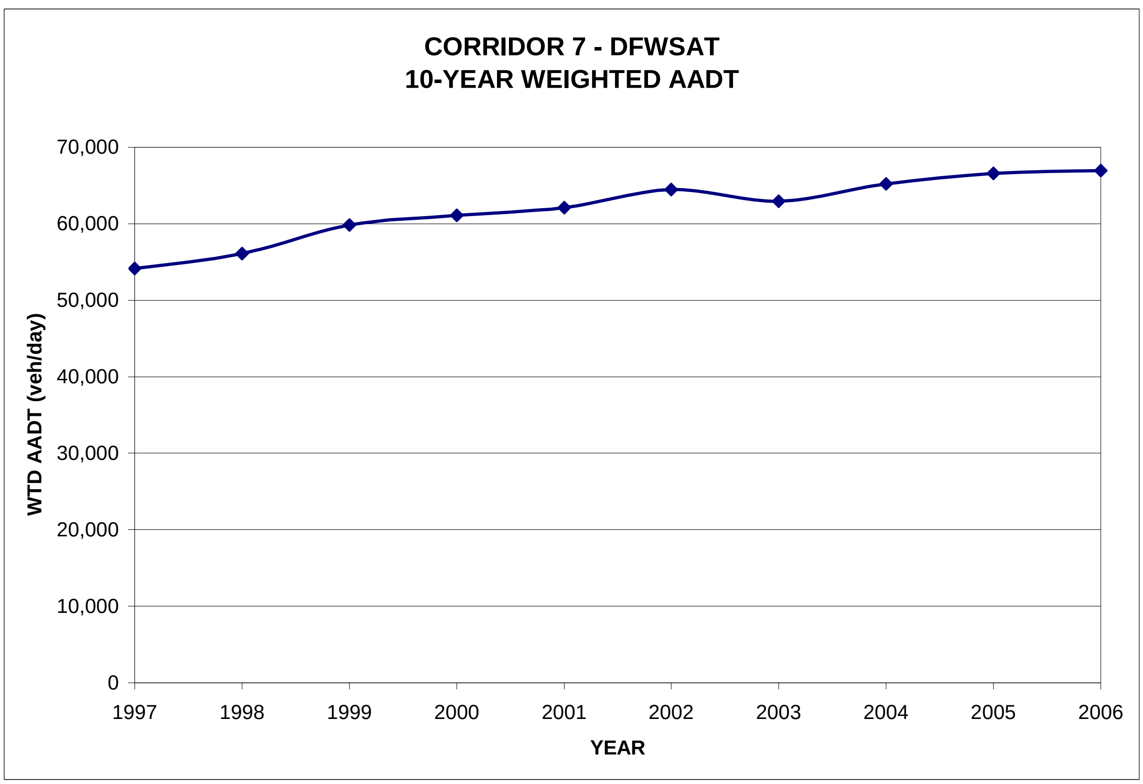


Figure 2-9. Corridor 7 – DFWSAT – 10-Year AADT.

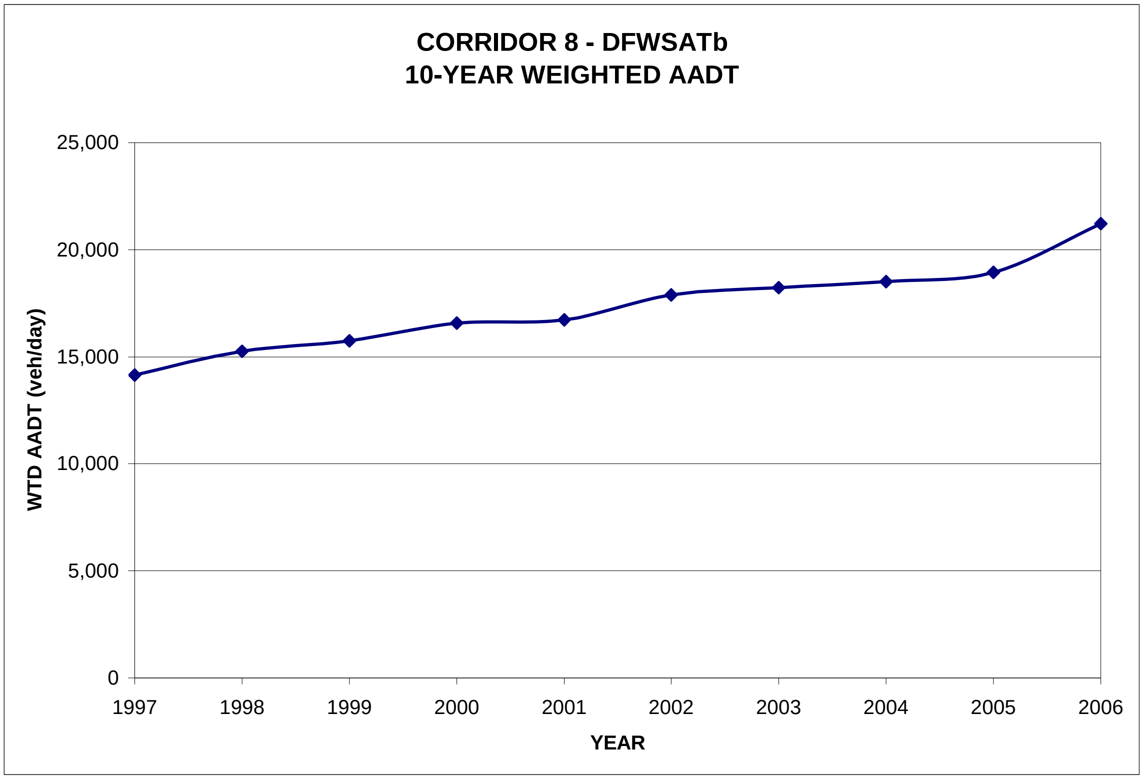


Figure 2-10. Corridor 8 – DFWSATb – 10-Year AADT.

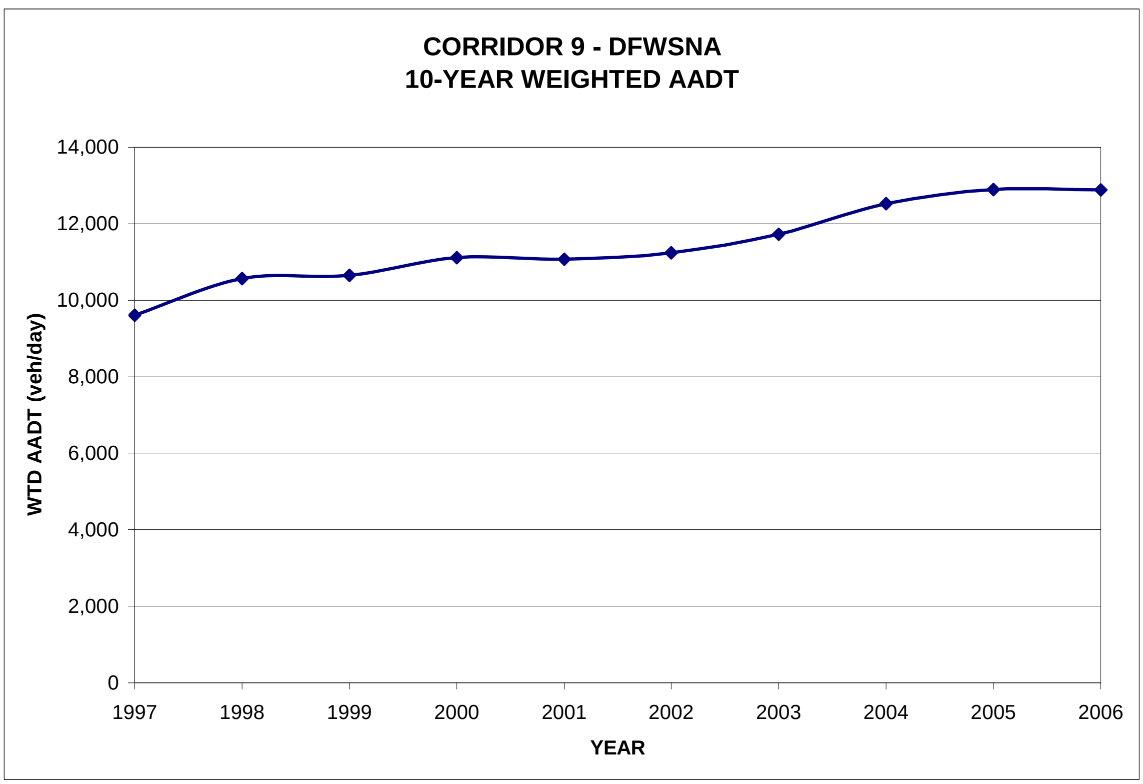


Figure 2-11. Corridor 9 – DFWSNA – 10-Year AADT.

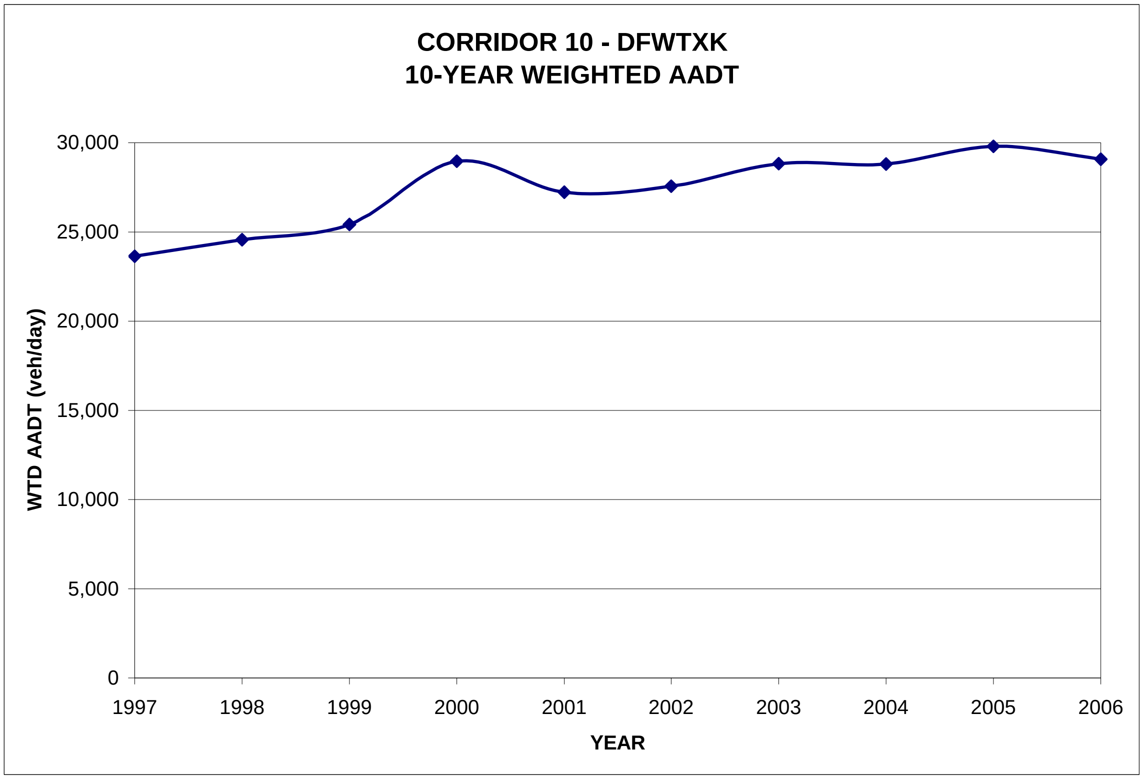


Figure 2-12. Corridor 10 – DFWTXK – 10-Year AADT.

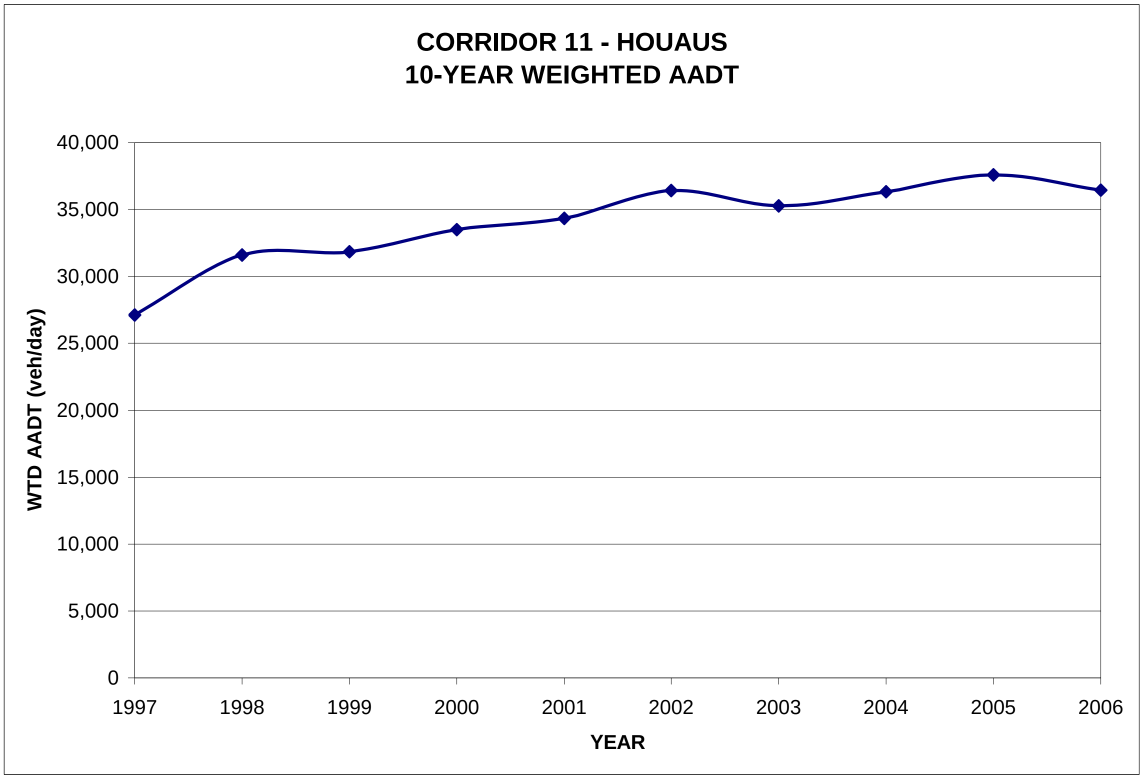


Figure 2-13. Corridor 11 – HOUAUS – 10-Year AADT.

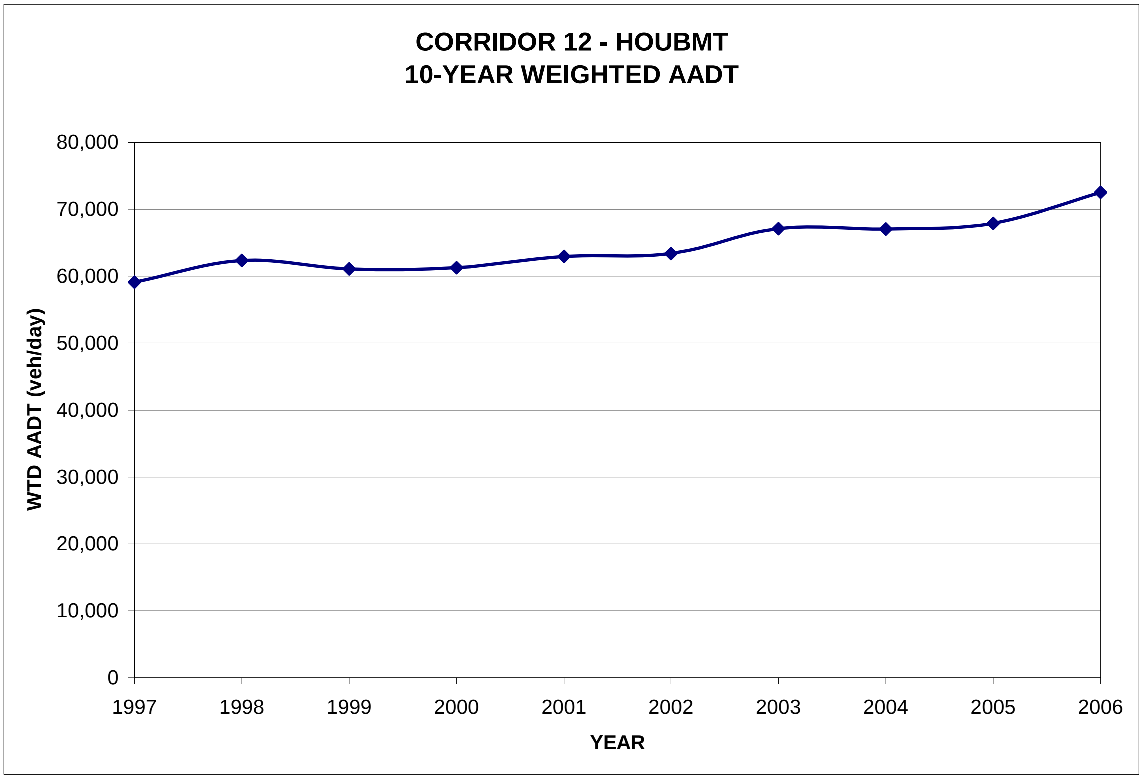


Figure 2-14. Corridor 12 – HOUBMT – 10-Year AADT.

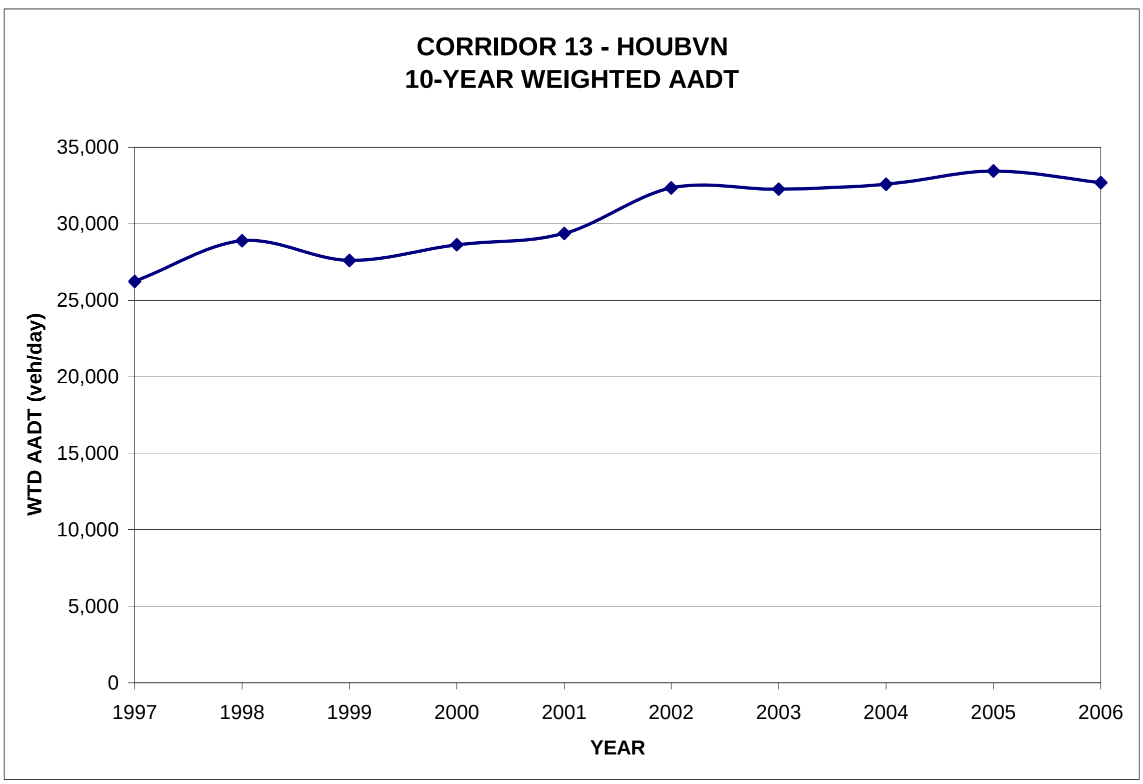


Figure 2-15. Corridor 13 – HOUBVN – 10-Year AADT.

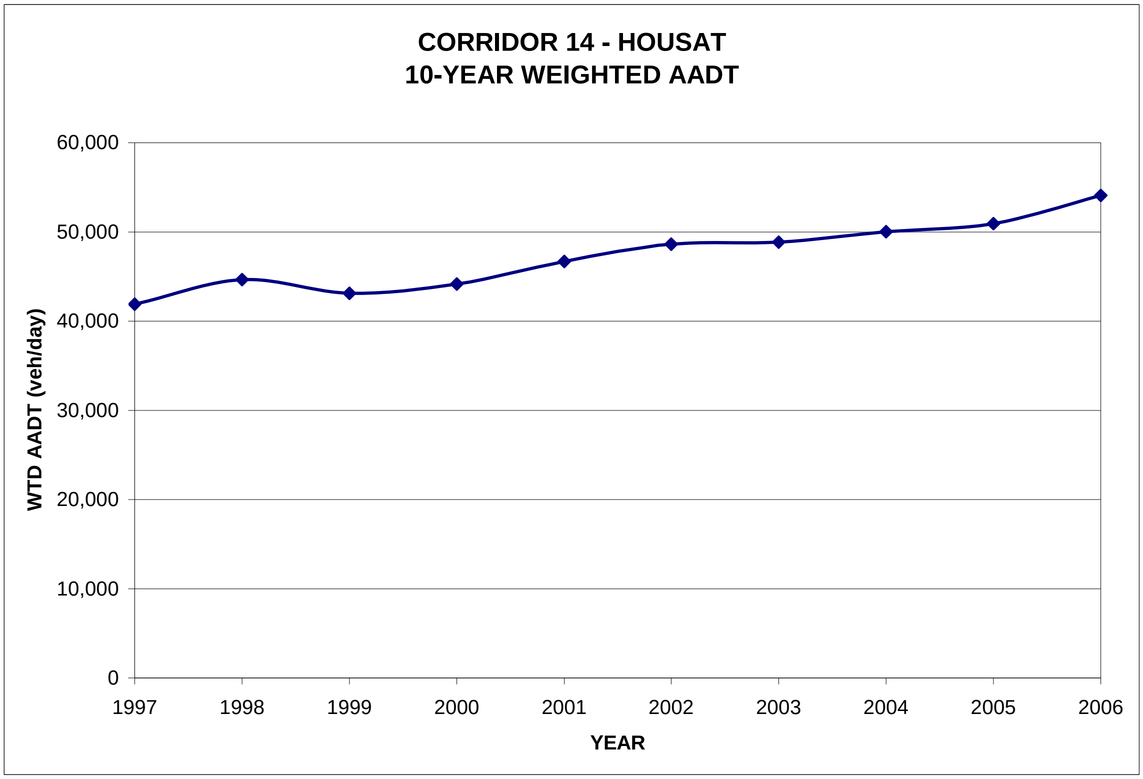


Figure 2-16. Corridor 14 – HOUSAT – 10-Year AADT.

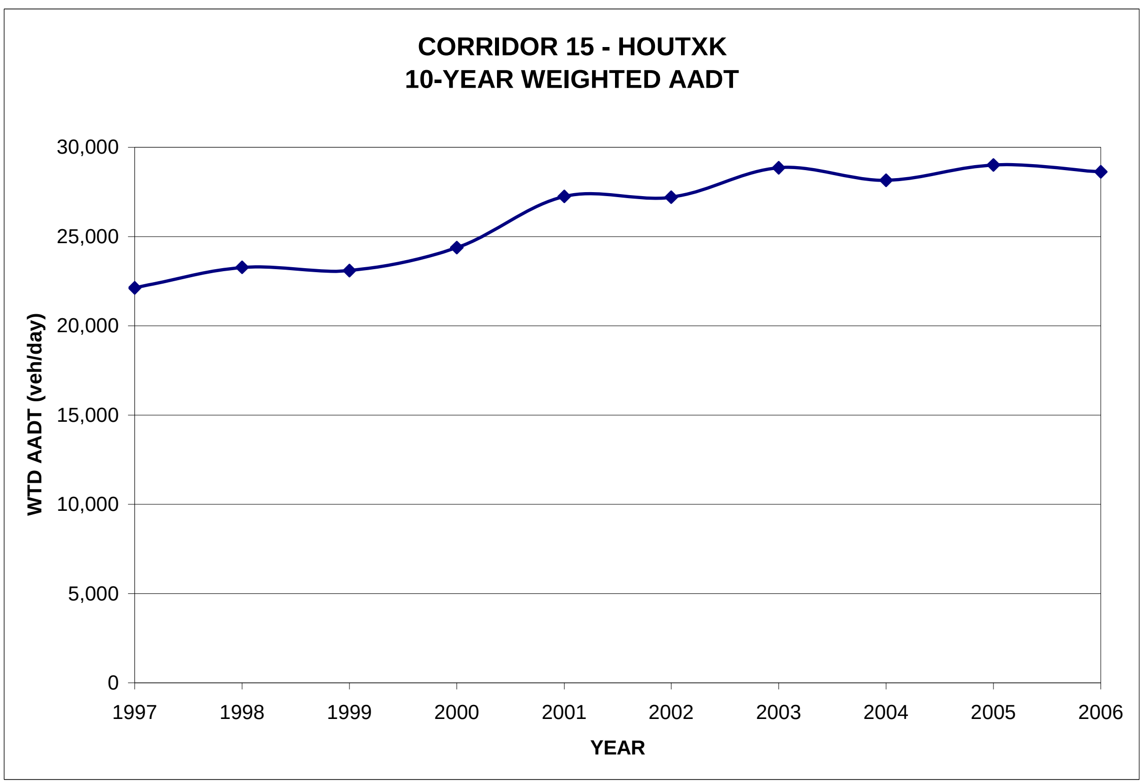


Figure 2-17. Corridor 15 – HOUTXK – 10-Year AADT.

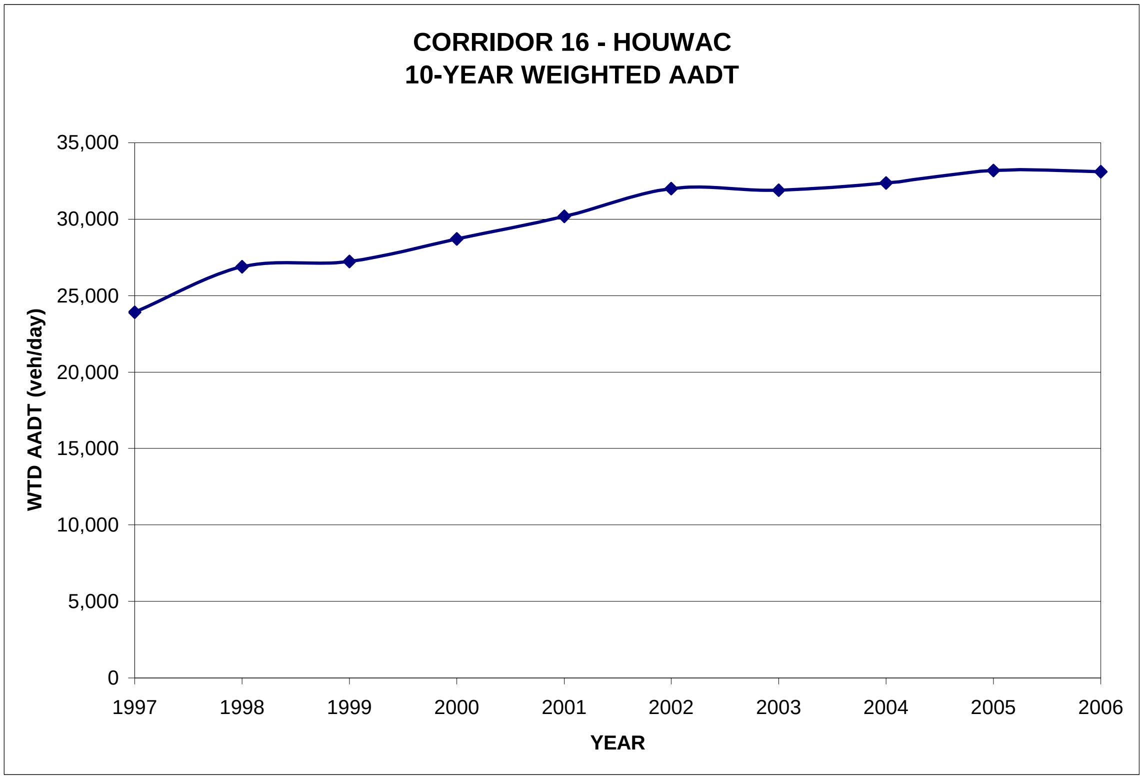


Figure 2-18. Corridor 16 – HOUWAC – 10-Year AADT.

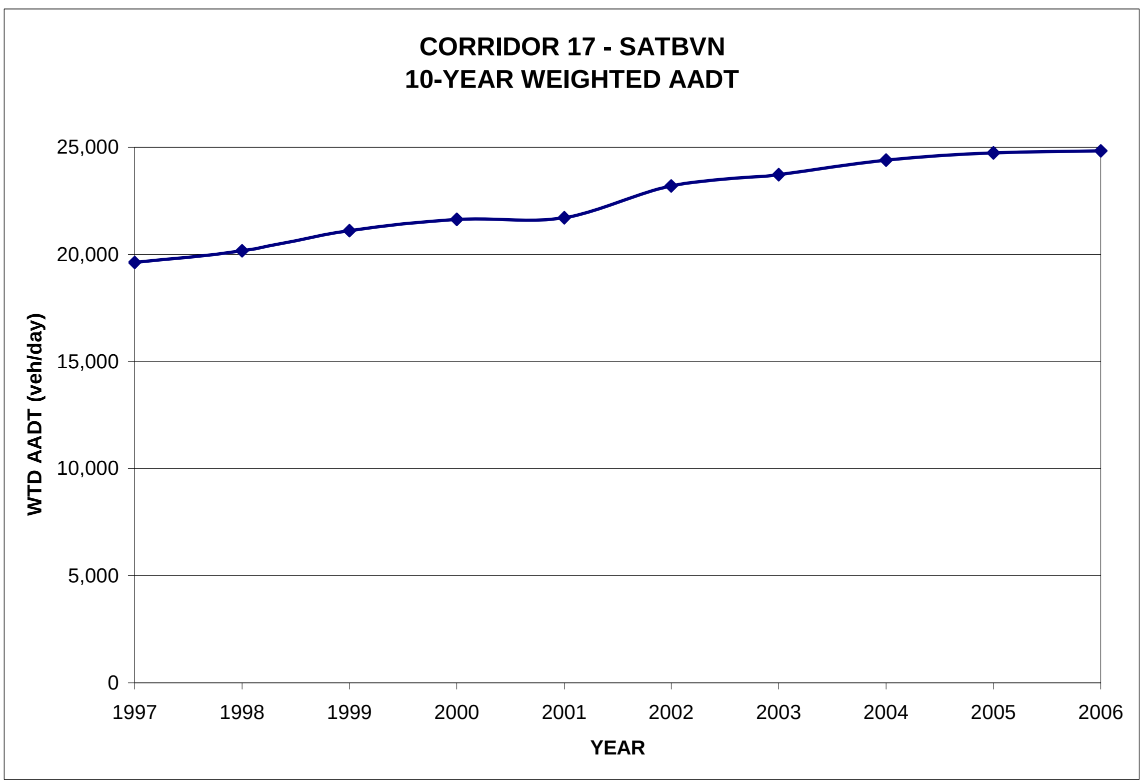


Figure 2-19. Corridor 17 – SATBVN – 10-Year AADT.

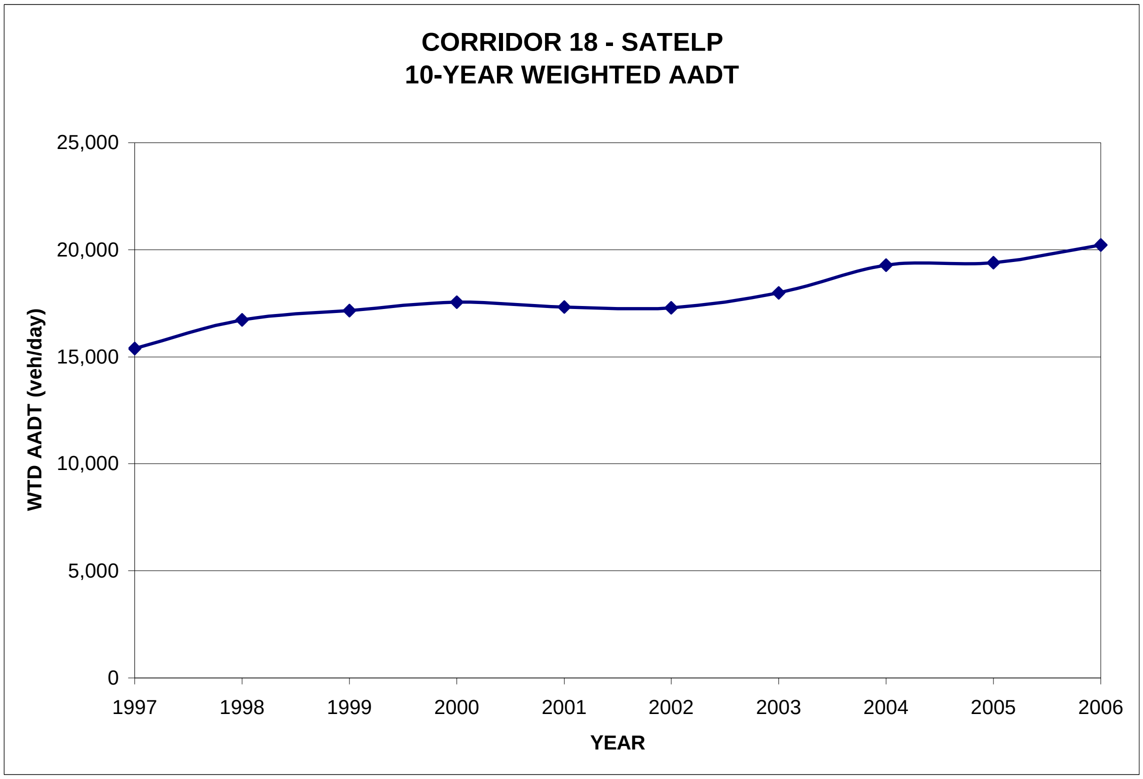


Figure 2-20. Corridor 18 – SATELP – 10-Year AADT.

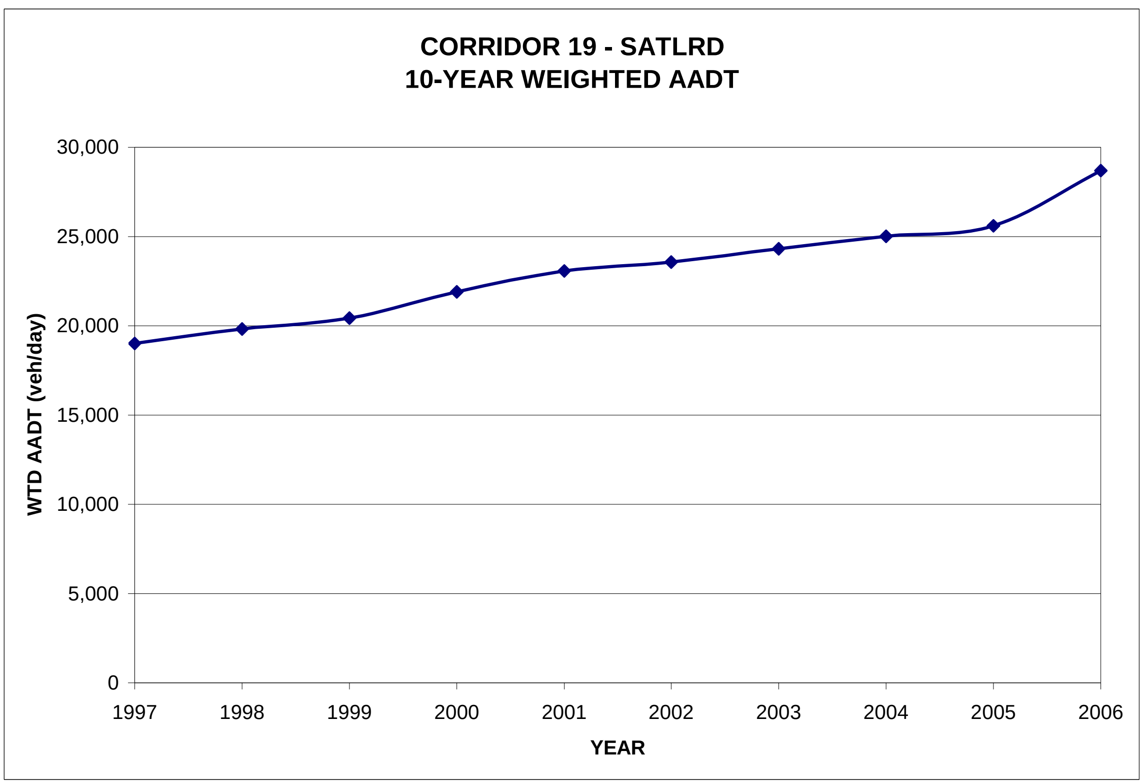


Figure 2-21. Corridor 19 – SATLRD – 10-Year AADT.

CORRIDOR POPULATION AND DEMOGRAPHICS

Some of the key factors influencing the success or impact of planned transit improvements in a particular travel corridor include:

- elements related to the current population size,
- projected growth, and
- other demographic characteristics of the travel market.

When evaluating the population and other demographic characteristics of the intercity travel corridors, the research team explored many different alternatives for the geographic scale (i.e., city, county, or other unit) by which to measure the population and demographic characteristics on the corridor level. The research team had to select a geographic scale for the measurement of population and demographics that would reflect, as accurately as possible, the geographic areas that would be served by a proposed intercity corridor transit system.

One approach for estimating the population and demographic characteristics of the intercity travel corridors was to develop a "buffer zone" around each of the subject highways along a corridor and use the power of GIS analysis tools to determine the population that lived within this zone. This approach proved to be problematic, since it did not resolve the basic issue (what geographic scale to use for the measurement) and also did not take into account the fact that, in many of the state's urban areas, there is a significant amount of interaction between areas close to the subject roadways (within the "buffer zone") and areas adjacent to the zone.

Another approach considered by the research team was to sum the population of each county through which the subject roadways of each corridor passed; this approach resulted in a greater amount of data being available for analysis (data compiled at the county level as its lowest level) but also did not resolve the issue of accounting for the interaction between counties within a large urban area.

One of the assumptions made in the 1976 TTI intercity corridors report was that only cities with a population of 10,000 or greater (as of the 1970 census) would generate a significant level of intercity travel between them, and thus only the populations of those cities should be included in computing the total population that could be potentially served by future intercity transit corridor operations. Further study of the past report's methodology revealed that the researchers actually used the population of the Standard Metropolitan Statistical Areas (SMSAs), (the predecessor of the Metropolitan Statistical Areas used in the 2000 census) whenever a corridor terminated at or passed through one of the SMSA-designated counties. The researchers also used the population of incorporated places over 10,000 population for cities not in SMSA-designated counties along the corridors as the components of the total population of the intercity travel corridors. The Project 0-5930 research team concluded that while the idea that only cities above 10,000 population would be generating a significant amount of intercity travel (and thus, include only those city populations in corridor population estimates), the amount of data available at the city level (both current data and projections) is not as robust as what is available on the county level. Additionally, unincorporated areas as well as towns and cities below a population of 10,000 could also generate significant ridership along such long-distance, statewide corridors if the smaller towns are interdependent on nearby larger urban areas.

The research team ultimately determined that the federal Office of Management and Budget (OMB) standards for defining Core Based Statistical Areas (CBSAs) provided the ideal geographic unit to estimate the population and demographic characteristics of the intercity travel corridors in this study. In its *Federal Register* notice on December 27, 2000, OMB defined a CBSA as a "geographic entity associated with at least one core of 10,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties." (*1*) There are two classifications of CBSAs: metropolitan statistical areas (MSAs), which are defined as CBSAs with a population core of 50,000 or greater, and micropolitan statistical areas (µSAs), which are CBSAs with a population core between 10,000 and 49,999. In Texas, the "geographic entity" used to define a CBSA is the county or a combination of counties. Figure 2-22 is a map of the CBSAs in Texas along with the intercity travel corridors being studied in this research project.

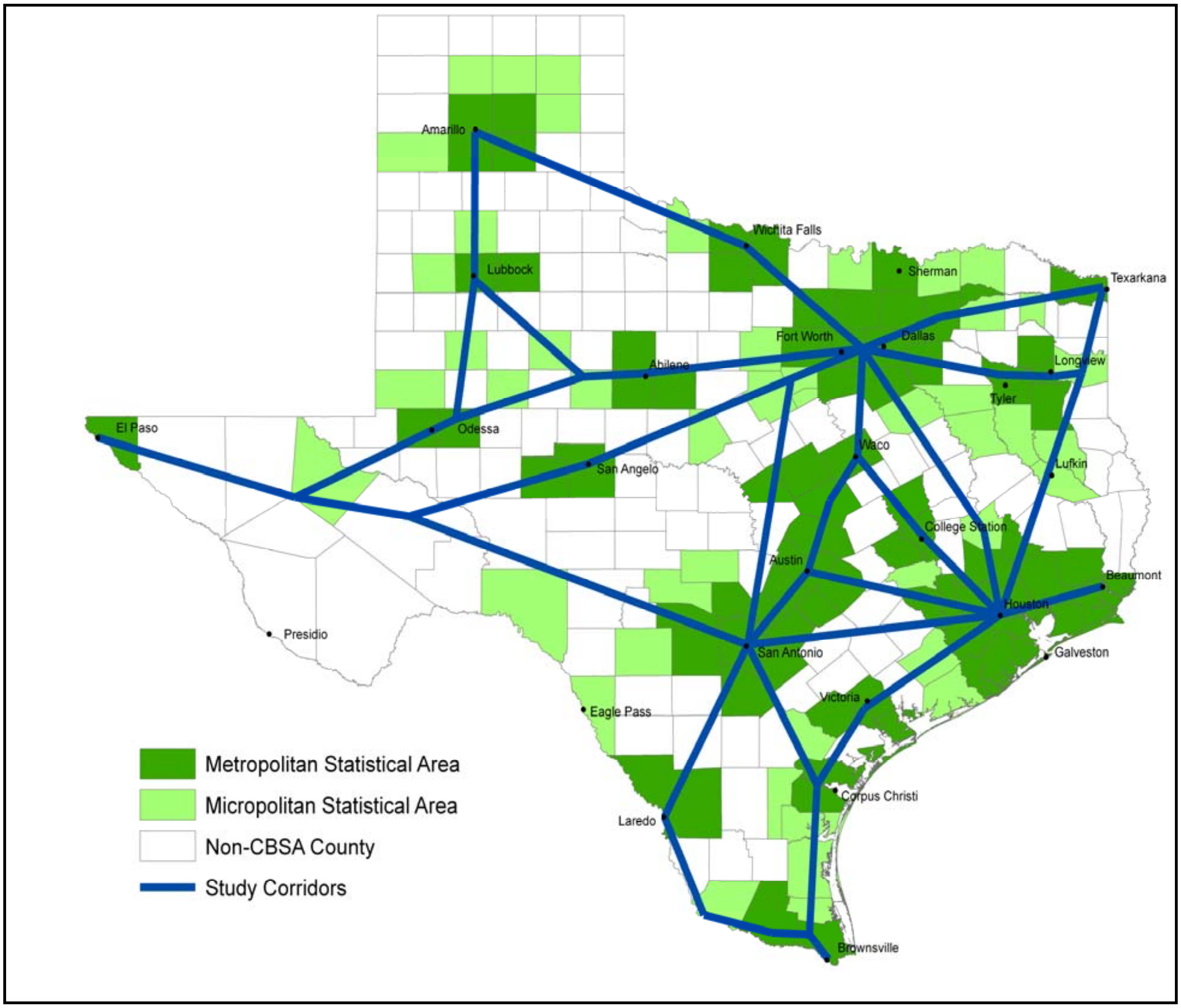


Figure 2-22. Map of Core Based Statistical Areas in Texas.

Using CBSAs as the basic geographic unit from which to analyze population and demographic characteristics for each of the intercity travel corridors in this study allowed the research team to utilize county-level data while only including populations that are expected to generate a significant amount of intercity travel (that is, population cores greater than 10,000 and the surrounding area with a high degree of interaction with those cores). Figure 2-23 shows how the CBSAs interrelate to the transportation infrastructure of the state—particularly the transit-related infrastructure such as highways, bus stations, and existing rail corridors that could become part of a future passenger rail or express bus transit system.

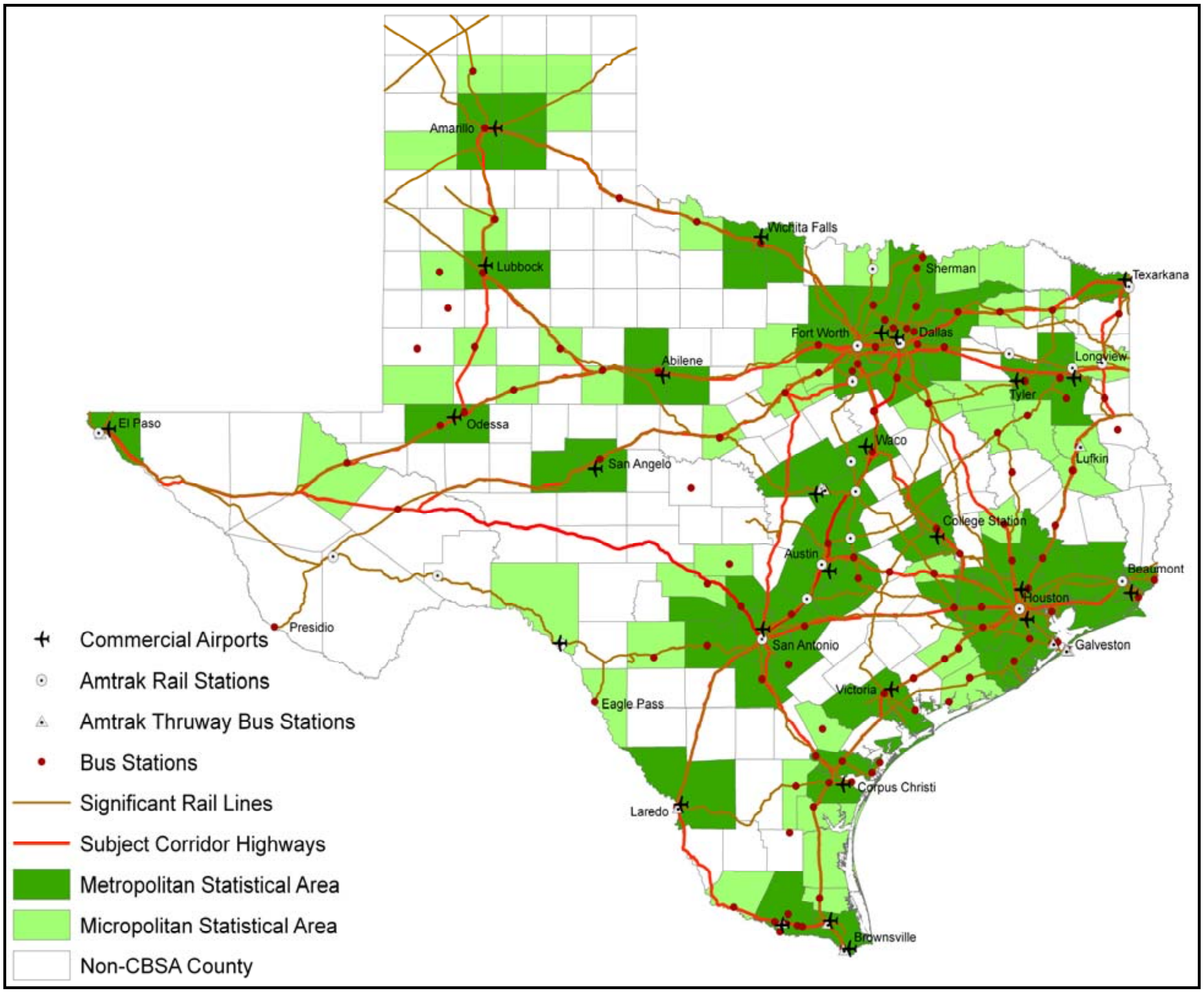


Figure 2-23. CBSA Map Showing Transportation Infrastructure.

Figures 2-24 to 2-28 show the 19 study corridors in more detail. Each figure shows the proximity of the corridor to major cities, highway and rail infrastructure, and existing transit system features.

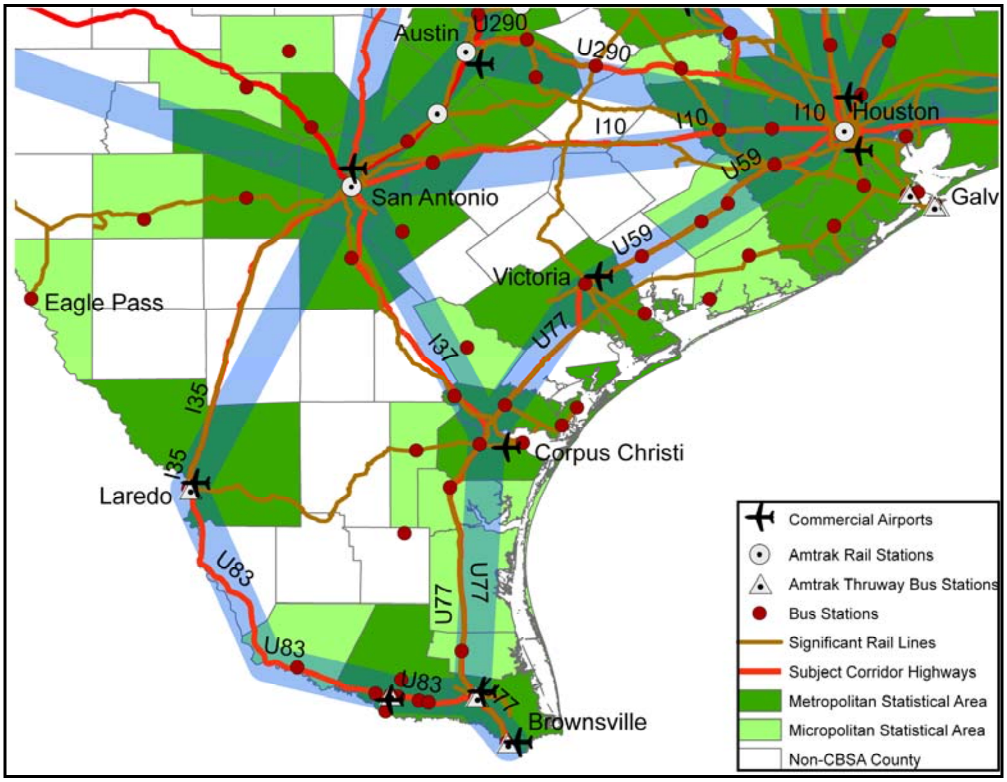


Figure 2-24. HOUAUS, HOUBMT, HOUBVN, HOUSAT, SATBVN, and SATLRD Corridors.

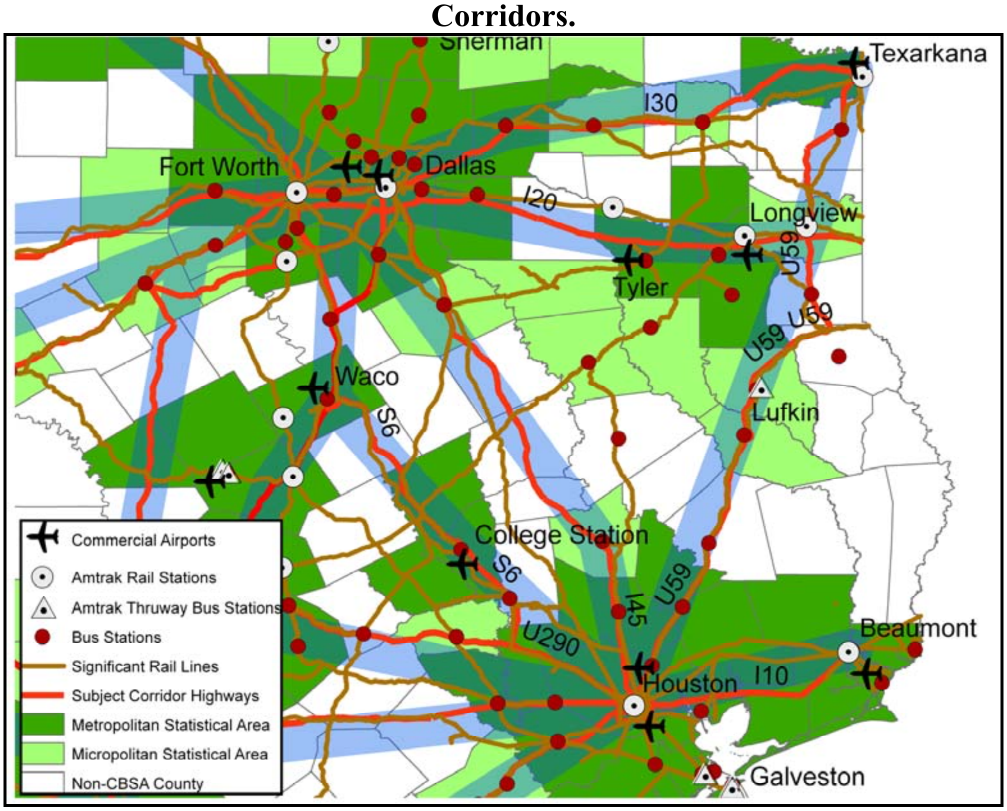


Figure 2-25. DFWHOU, DFWLOU, DFWTXK, HOUBMT, HOUTXK, and HOUWAC Corridors.

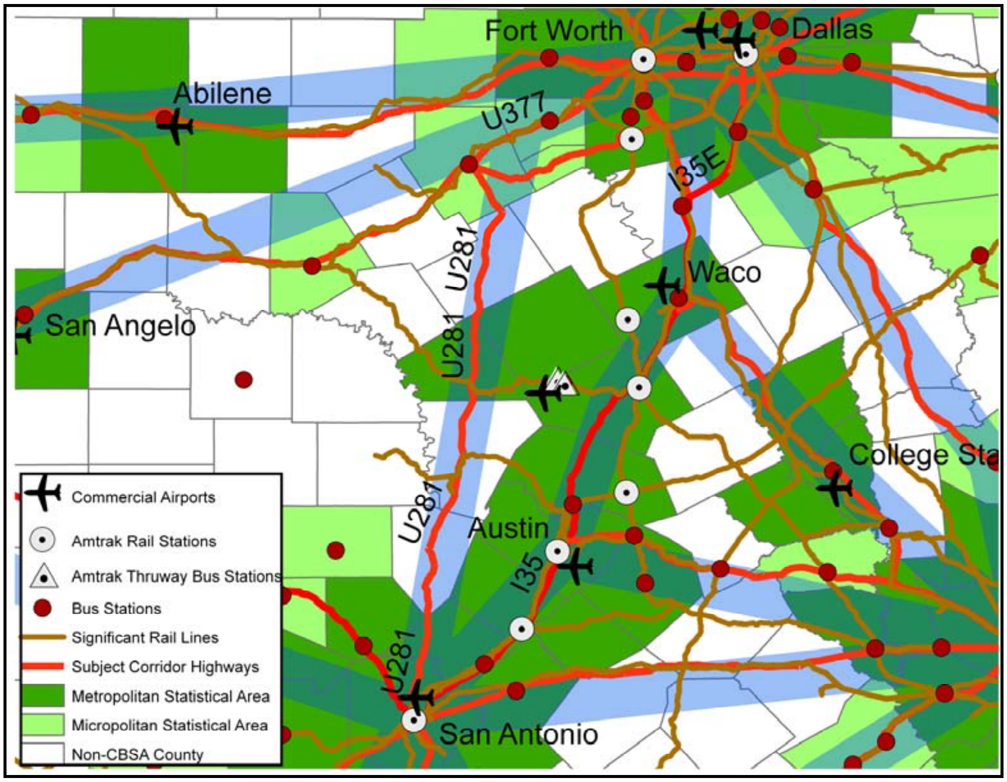


Figure 2-26. DFWSAT and DFWSATb Corridors.

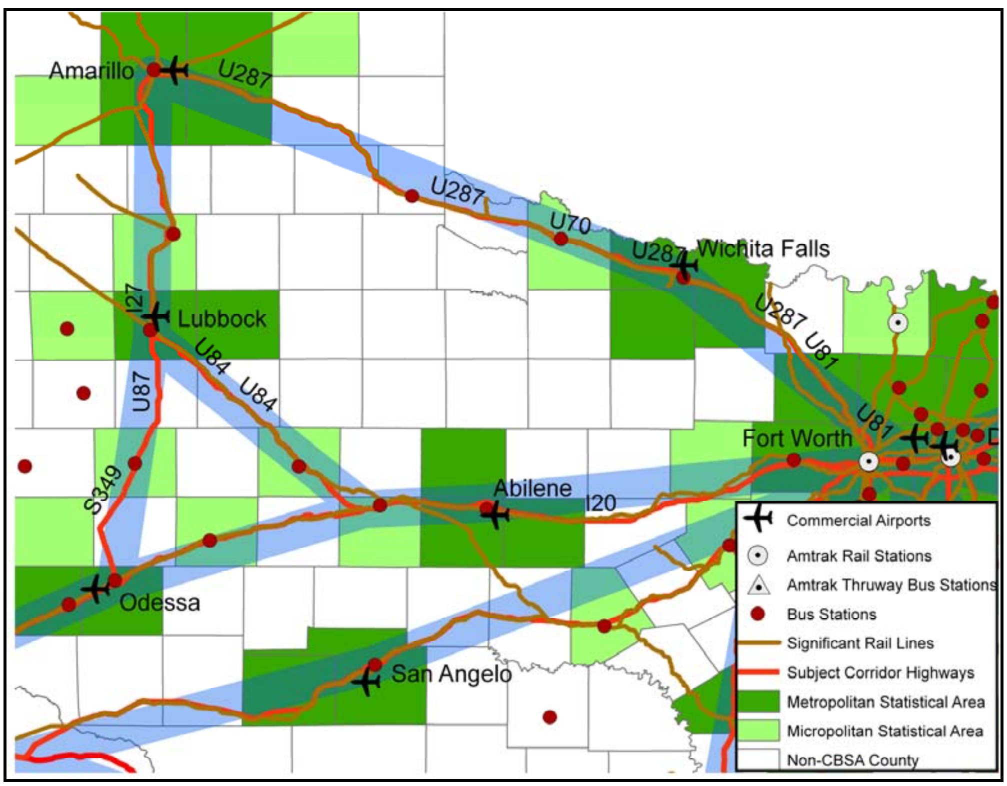


Figure 2-27. AMALBB, DFWAMA, and DFWLBB Corridors.

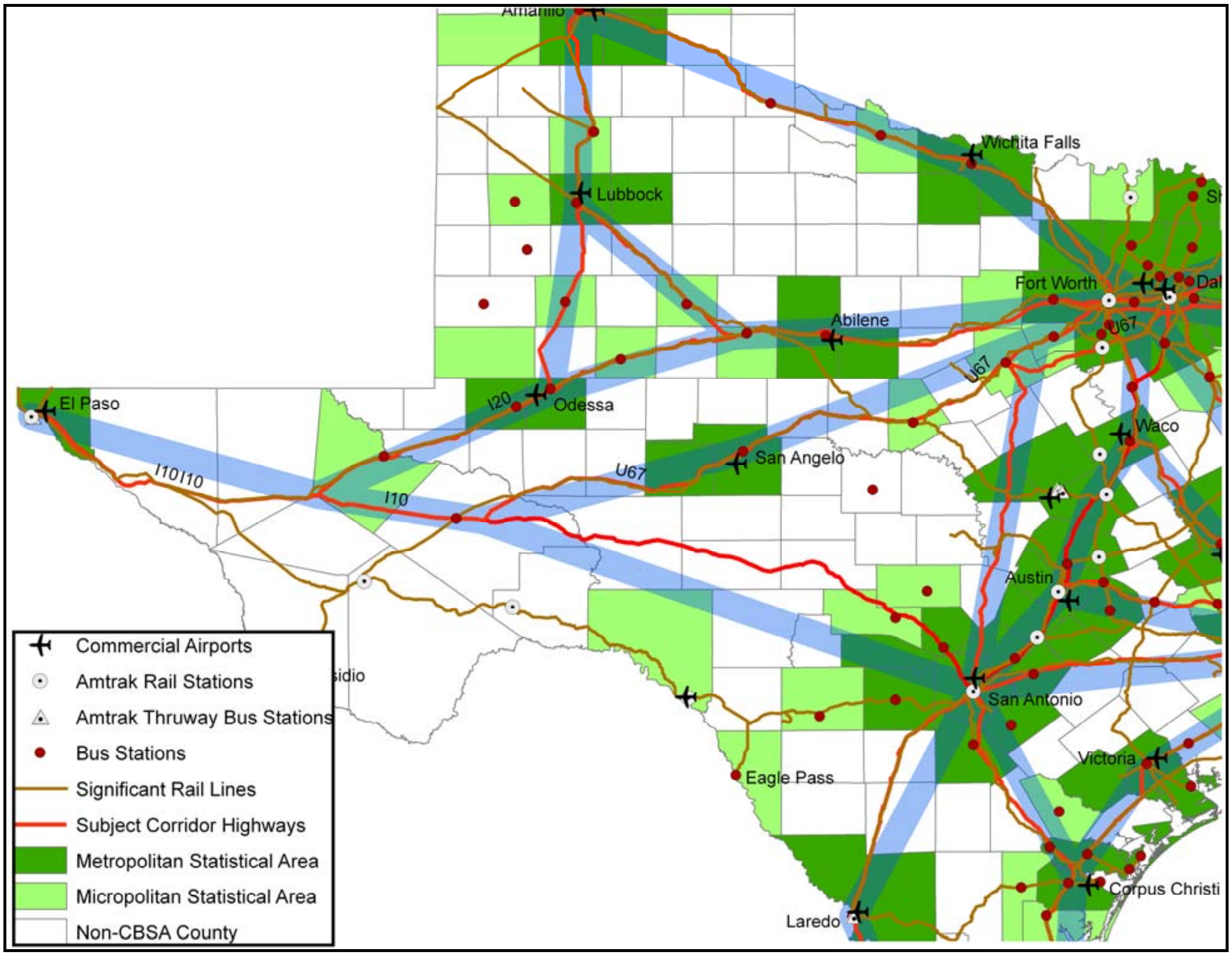


Figure 2-28. DFWABI, DFWSNA, DFWELP, and SATELP Corridors.

Table 2-5 shows the 2005 employment figures along each of the study corridors. Employment is one of the most effective methods of determining the total economic activity that can be expected along each corridor leading to additional demand for intercity travel. Additional work in determining projected employment along each corridor and in each CBSA continues by the research team. Table 2-6 shows the 2000 and projected 2040 population along each corridor. It also shows the total percent change and annual percent rate of change in population forecast over this time period. Table 2-6 also shows similar numbers by corridor for the 65-year old+ age group, as this demographic factor has been identified in previous research as a particularly useful indicator of transit-dependent people or those likely to choose to use an improved transit system.

Table 2-5. Total Employment by Corridor, 2005.
Source: U.S. Census Bureau County Business Patterns

Corridor	Corridor Name	Total Employees 2005	Total Establishments 2005
AMALBB	Amarillo to Midland thru Lubbock	252,192	17,904
DFWABI	DFW to El Paso thru Abilene	2,849,134	160,539
DFWAMA	DFW to Amarillo	2,622,788	144,597
DFWHOU	DFW to Houston	4,503,956	251,274
DFWLBB	DFW to Lubbock thru Abilene	2,659,182	147,799
DFWLOU	DFW to Louisiana (I-20)	2,654,034	146,404
DFWSAT	DFW to San Antonio (I-35)	3,908,853	219,844
DFWSATb	DFW to San Antonio (US-281)	3,261,637	181,073
DFWSNA	DFW to El Paso thru San Angelo	2,748,544	153,148
DFWTXK	DFW to Texarkana (I-30)	2,534,325	138,414
HOUAUS	Houston to Austin	2,593,949	151,395
HOUBMT	Houston to Beaumont	2,127,555	122,516
HOUBVN	Houston to Brownsville	2,287,155	134,921
HOUSAT	Houston to San Antonio	2,667,813	153,331
HOUTXK	Houston to Texarkana	2,173,525	126,337
HOUWAC	Houston to Waco thru Bryan	2,145,207	123,807
SATBVN	San Antonio to Brownsville through Corpus Christi	904,126	55,162
SATELP	San Antonio to El Paso	879,606	52,747
SATLRD	San Antonio to Brownsville through Laredo	975,101	59,605
	State of Texas	**8,305,086**	**497,758**

Table 2-6. Population by Corridor 2000 and 2040 with Total and Annual Percent Change, Total and 65+.

Source: Texas State Demographer/TTI Corridor Analysis

Corridor	Population 2000 All	Population 2040 All	Total % Change	Annual % Change	Population 2000 65+	Population 2040 65+	Total % Change	Annual % Change
AMALBB	643,818	841,573	31	0.8	75,318	152,327	102	2.6
DFWABI	6,328,135	11,854,718	87	2.2	533,467	2,113,865	296	7.4
DFWAMA	5,554,266	10,626,353	91	2.3	455,556	1,920,369	322	8.0
DFWHOU	9,983,833	18,655,657	87	2.2	785,672	3,321,769	323	8.1
DFWLBB	5,663,679	10,710,728	89	2.2	468,943	1,932,251	312	7.8
DFWLOU	5,592,402	10,682,401	91	2.3	466,260	1,931,667	314	7.9
DFWSAT	8,667,241	16,116,530	86	2.1	737,059	3,001,173	307	7.7
DFWSATb	7,284,871	13,306,145	83	2.1	631,654	2,436,246	286	7.1
DFWSNA	6,065,531	11,559,409	91	2.3	505,495	2,064,222	308	7.7
DFWTXK	5,310,928	10,272,730	93	2.3	427,003	1,858,643	335	8.4
HOUAUS	5,995,543	11,098,155	85	2.1	463,114	2,031,180	339	8.5
HOUBMT	5,100,497	8,855,679	74	1.8	418,258	1,560,385	273	6.8
HOUBVN	5,658,810	9,964,671	76	1.9	476,647	1,724,183	262	6.5
HOUSAT	6,427,110	10,912,169	70	1.7	552,290	1,965,479	256	6.4
HOUTXK	5,200,198	9,006,728	73	1.8	432,283	1,594,614	269	6.7
HOUWAC	5,113,809	8,953,396	75	1.9	410,388	1,563,431	281	7.0
SATBVN	2,502,255	3,871,808	55	1.4	274,508	703,433	156	3.9
SATELP	2,434,978	3,716,064	53	1.3	261,872	684,639	161	4.0
SATLRD	2,863,107	5,282,527	85	2.1	296,645	858,473	189	4.7
State Total	**20,851,820 3**	**5,761,201**	**72**	**1.8**	**2,072,532**	**6,448,251**	**211**	**5.3**

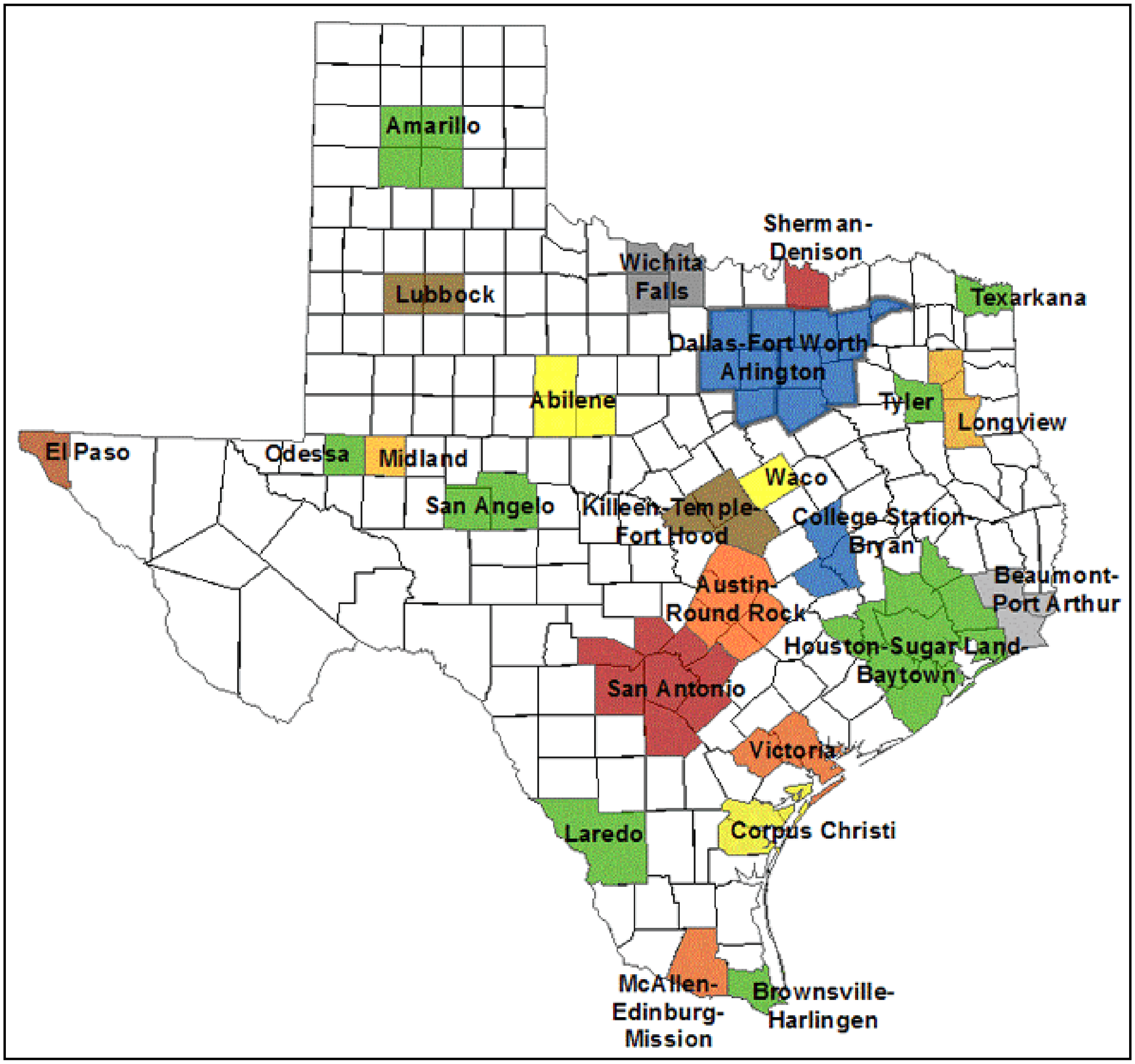
CHAPTER 3: INTERCITY AIR TRAVEL IN TEXAS

This chapter reports the TTI research team's findings regarding intercity air service in Texas and describes the issues surrounding air service demand and capacity. This chapter contains the information that was collected and analyzed in Task 2 of the research project.

COMMERCIAL AIR SERVICE IN TEXAS

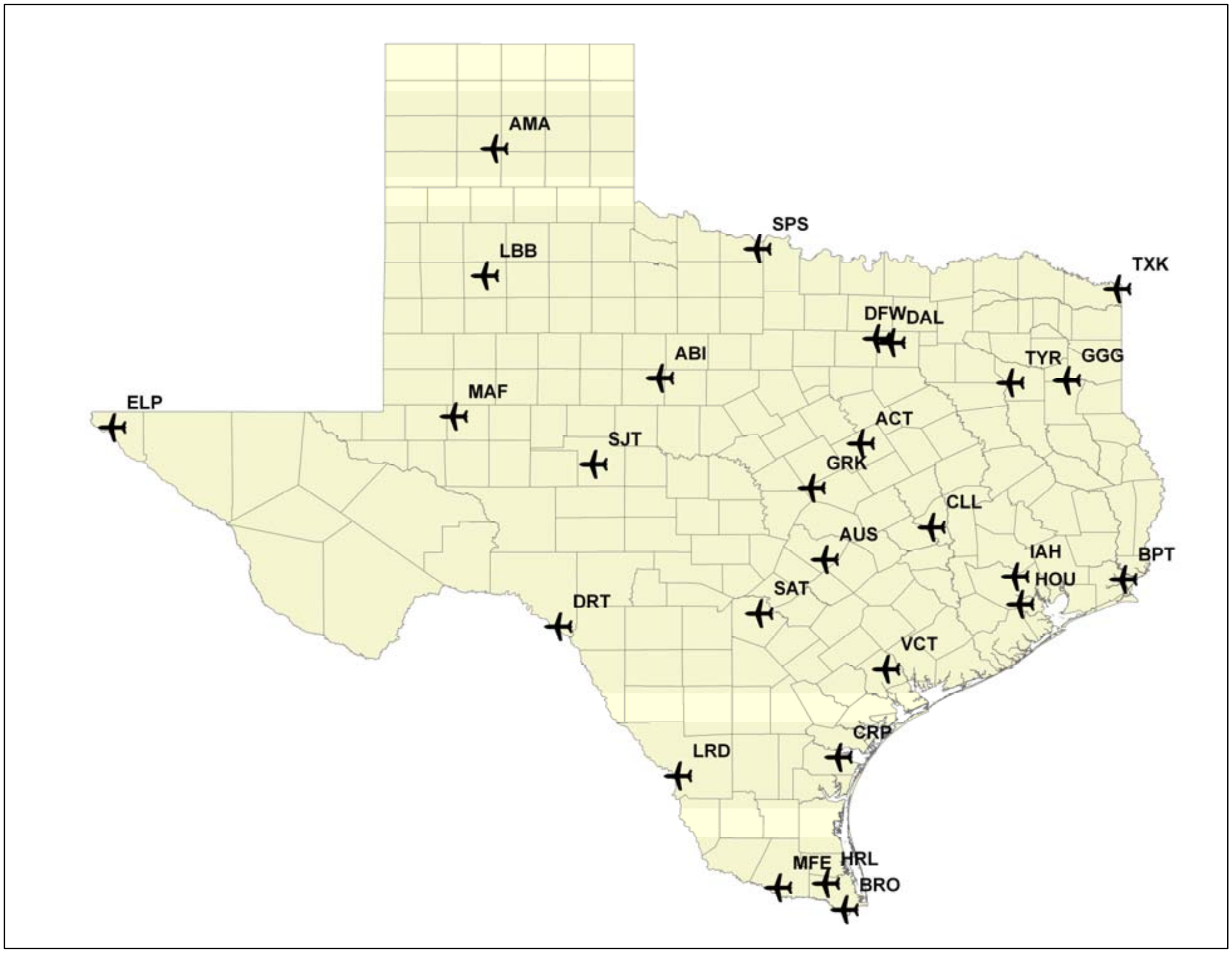
Air service in the identified major intercity corridors in Texas is well established. Population centers in the state continue to enjoy adequate access to the air transportation system with the major population centers having a choice of airports and airlines from which to choose. Commercial service airports are located in Texas' 25 metropolitan statistical areas (MSAs) that together include more than 85 percent of the state's population. Figure 3-1 shows the state's MSAs. Figure 3-2 shows the locations of the 27 commercial service airports serving Texas. Among states in the U.S., Texas is unique in that it is home to three major airlines—American Airlines, Continental Airlines, and Southwest Airlines. Southwest Airlines serves secondary airports within the state's two largest metropolitan areas. Southwest's operations at Houston Hobby Airport and Dallas Love Field have maintained for consumers an alternative to legacy carriers such as Continental Airlines and American Airlines, who themselves have significant operations at Houston George Bush Intercontinental Airport and Dallas/Fort Worth International Airport, respectively.

Texas residents make frequent use of commercial aviation services for both intrastate and interstate travel. In 2006, nearly 700 million passengers traveled by air domestically within the United States (*2*). This number is expected to increase by an average annual rate of 3.4 percent through the year 2020 reaching 1.066 billion passengers per year through the national system. In Texas, nearly 66 million passengers were enplaned in 2005 and that number is expected to grow to more than 102 million per year by 2020 (*3*). Dallas/Fort Worth International, Dallas Love Field, Houston George Bush Intercontinental, and Houston's William P. Hobby together accounted for 81 percent of these enplanements in 2005. According to the Air Transport Association (ATA), the Houston-Dallas/Fort Worth market continues to be one of the most heavily traveled airline route segments in the nation, ranking 16th among domestic airline markets in 2006 while the Dallas/New York market ranked 18th (*4*).



Source: Texas State Data Center.

Figure 3-1. Texas Metropolitan Statistical Areas.



Source: Texas Transportation Institute

Figure 3-2. Location of Texas Commercial Service Airports.

Air service to smaller communities is no less important to those they serve but is much more susceptible to the economic and financial condition of the country and the airline industry itself. Smaller Texas communities have, for the most part, enjoyed suitable levels of air service to the larger hubs in the state. This service is predominantly to and from airports in the Dallas and Houston areas where connections to other locations within the state or longer distances across the country can be made. This service is provided, for the most part, by regional airlines that are either owned by or partner with the larger air carriers.

Regional airlines feed passengers from smaller communities into larger hubs. They provide short- and medium-haul scheduled airline service connecting smaller communities with larger cities and hub airports operating nine to 78 seat turboprops and 30 to 108 seat regional jets. Their operations tend to be of a smaller scale and more regionally geographic in nature. According to the Regional Airline Association, 25 percent of all domestic passengers fly on a regional airline. With more than 15,000 regional airline flights every day, one in four domestic airline passengers now travel on regional airlines. Operating more than 2,700 aircraft, the regional fleet comprises about one-third of the U.S. commercial airline fleet (*5*).

Within Texas, regional carriers play a major role in intercity transportation. In addition to being the home of three major air carriers, Texas is also home to two of the largest regional carriers in the country, American Eagle and ExpressJet. Other regional airlines that serve Texas communities include Chautauqua Airlines and Republic Airlines (both part of Republic Holdings) as well as Pinnacle Airlines' subsidiary Colgan Air. For passengers, the use of these regional carriers is not always evident as they often fly under the banner of a major carrier. The primary regional aircraft used in Texas are the Saab 340 turboprop (34 seats) and the Embraer 135/145 regional jets (37/50 seats). Table 3-1 shows the airports in Texas and the percentage of regional flights at the airport in 2007 and 2008. Thirteen airports in Texas are currently served exclusively by regional flights/carriers; these flights accounted for 19 percent of the state's enplaned passengers and 40 percent of statewide aircraft departures in 2007. Figure 3-3 shows the two major regional airline partnership arrangements in the state.

Table 3-1. Percentage of Regional Flights at Texas Airports.

Source: Regional Airline Association, Annual Report 2007 and 2008.

Airport	Percentage of Flights Provided by Regional Airline 2007	Percentage of Flights Provided by Regional Airline 2008
Abilene	97	100
Amarillo	57	52
Austin	27	24
Beaumont	100	100
Brownsville	100	100
College Station	100	100
Corpus Christi	78	76
Dallas Love	16	10
Dallas/Fort Worth	35	36
Del Rio International	100	100
El Paso	22	25
Fort Hood/Killeen (Robert Gray)	98	100
Harlingen	29	30
Houston Hobby	8	7
Houston Intercontinental	56	57
Laredo	97	96
Longview	100	100
Lubbock	52	52
McAllen	33	18
Midland	48	55
San Angelo	100	100
San Antonio	20	25
Texarkana	100	100
Tyler	100	100
Victoria	100	100
Waco	100	100
Wichita Falls	100	100

American Airlines	American Eagle	American Eagle
		American Eagle/ Executive
	American Connection	Chautauqua Airlines
		Trans States Airlines
Continental Airlines	Continental Express	Chautauqua Airlines
		ExpressJet
	Continental Connection	Cape Air
		Colgan Air
		CommutAir
		Gulfstream International Airlines

Source: Regional Airline Association Annual Report 2008.

Figure 3-3. Texas' Major Airline Partnerships: Mainline Carrier, Regional Brand, and Operating Partners.

MODE CHOICE AND MARKET DISTANCE

Understanding the travel behavior of intercity passengers is a key factor in determining their choice of mode. Critical to understanding this decision process is the distance of the travel. Table 3-2 shows mode share for various trip lengths for all trip purposes. Personal vehicle is the dominant mode until travel distances reach 750 miles. If a work/business trip purpose were disaggregated from these data, one would expect personal vehicle travel to drop off more as trip distance increased. This would also be a function of the air transportation network and how well it serves the needed market. Nevertheless, there seems to be clear demarcations in how far travelers are willing to drive and what distance will get them to choose other modes.

Table 3-2. Mode Share for Various Trip Lengths.

Percentage of Trips by Mode by Distance Group					
Transportation Mode	**50-499 miles**	**500-749 miles**	**750-999 miles**	**1000-1499 miles**	**1500+ miles**
Personal Vehicle	95.4	61.8	42.3	31.5	14.8
Air	1.6	33.7	55.2	65.6	82.1
Bus	2.1	3.3	1.5	1.5	1.4
Train	0.8	1.0	0.9	0.7	0.8
Other	0.2	0.1	0.1	0.7	1.0
Total 89.8		**3.1**	**2.0**	**2.3**	**2.8**

NOTE: Only trips in which the transportation mode and trip distance could be identified are included.
SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Federal Highway Administration, National Household Travel Survey, long distance file, 2001, (Washington, DC).

Within Texas, the airlines serve markets that vary in distance from 74 miles to 677 miles. Figure 3-4 shows the distribution of Texas air service markets by distance. Table 3-3 lists each of the individual city-pairs for Texas and their respective distances. Table 3-4 shows, in summary form, the existing intrastate air service markets served in Texas.

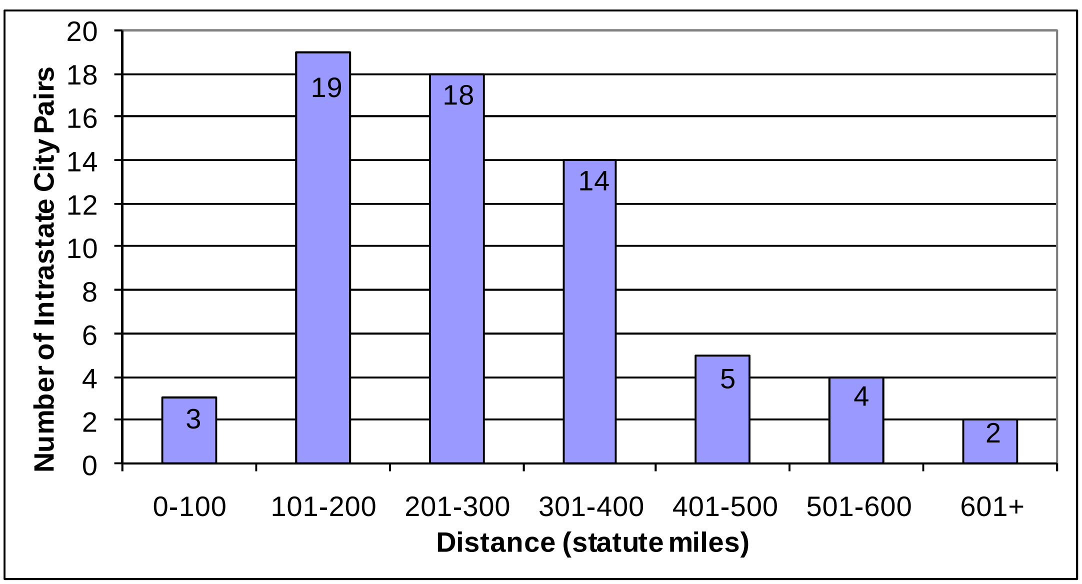


Figure 3-4. Texas Intrastate Air Service Markets by Distance.

Table 3-3. Texas Intrastate Passenger Air Service City-Pair Market Distances (Statute Miles).

Origin	Destination	Distance
Abilene	Dallas/DFW	157
Abilene	Houston/IAH	307
Amarillo	Dallas/DFW	313
Amarillo	Dallas/DAL	324
Amarillo	Houston/IAH	518
Austin	Corpus Christi	167
Austin	Dallas/DAL	189
Austin	Dallas/DFW	190
Austin	El Paso	529
Austin	Harlingen	273
Austin	Houston/HOU	148
Austin	Houston/IAH	140
Austin	Lubbock	341
Austin	Midland/Odessa	295
Beaumont	Houston/IAH	79
Brownsville	Houston/IAH	308
College Station	Dallas/DFW	164
College Station	Houston/IAH	74
Corpus Christi	Austin	167
Corpus Christi	Dallas/DAL	352
Corpus Christi	Dallas/DFW	354
Corpus Christi	Houston/IAH	201
Corpus Christi	Houston/HOU	187
Dallas Love	Amarillo	324
Dallas Love	Austin	189
Dallas Love	Corpus Christi	352
Dallas Love	El Paso	561
Dallas Love	Houston/HOU	239
Dallas Love	Houston/IAH	217
Dallas Love	Lubbock	293
Dallas Love	Midland/Odessa	319
Dallas Love	San Antonio	248
Dallas/Fort Worth International	Abilene	157
Dallas/Fort Worth International	Amarillo	313
Dallas/Fort Worth International	Austin	190
Dallas/Fort Worth International	College Station	164
Dallas/Fort Worth International	Corpus Christi	354
Dallas/Fort Worth International	El Paso	551
Dallas/Fort Worth International	Houston/HOU	247
Dallas/Fort Worth International	Houston/IAH	224
Dallas/Fort Worth International	Killeen	134

Table 3-3 (Continued). Texas Intrastate Passenger Air Service City-Pair Market Distances (Statute Miles).

Origin	Destination	Distance
Dallas/Fort Worth International	Laredo	394
Dallas/Fort Worth International	Longview	140
Dallas/Fort Worth International	Lubbock	282
Dallas/Fort Worth International	Midland/Odessa	309
Dallas/Fort Worth International	McAllen	468
Dallas/Fort Worth International	San Angelo	228
Dallas/Fort Worth International	San Antonio	247
Dallas/Fort Worth International	Texarkana	181
Dallas/Fort Worth International	Tyler	103
Dallas/Fort Worth International	Waco	89
Dallas/Fort Worth International	Wichita Falls	113
Del Rio	Houston/IAH	343
El Paso	Austin	529
El Paso	Dallas/DAL	561
El Paso	Dallas/DFW	551
El Paso	Houston/HOU	677
El Paso	Houston/IAH	668
El Paso	Lubbock	296
El Paso	Midland/Odessa	246
El Paso	San Antonio	497
Harlingen/South Padre Island	Austin	273
Harlingen/South Padre Island	Houston/HOU	276
Harlingen/South Padre Island	Houston/IAH	295
Harlingen/South Padre Island	San Antonio	233
Houston Hobby	Austin	148
Houston Hobby	Corpus Christi	187
Houston Hobby	Dallas/DAL	239
Houston Hobby	Dallas/DFW	247
Houston Hobby	El Paso	677
Houston Hobby	Harlingen	276
Houston Hobby	Midland/Odessa	441
Houston Hobby	San Antonio	192
Houston Intercontinental	Abilene	307
Houston Intercontinental	Amarillo	518
Houston Intercontinental	Austin	140
Houston Intercontinental	Beaumont	79
Houston Intercontinental	Brownsville	308
Houston Intercontinental	College Station	74
Houston Intercontinental	Corpus Christi	201
Houston Intercontinental	Dallas/DAL	217
Houston Intercontinental	Dallas/DFW	224

Table 3-3 (Continued). Texas Intrastate Passenger Air Service City-Pair Market Distances (Statute Miles).

Origin	Destination	Distance
Houston Intercontinental	Del Rio	343
Houston Intercontinental	El Paso	668
Houston Intercontinental	Killeen	166
Houston Intercontinental	Harlingen	295
Houston Intercontinental	Lubbock	458
Houston Intercontinental	Laredo	301
Houston Intercontinental	Midland/Odessa	429
Houston Intercontinental	McAllen	316
Houston Intercontinental	San Angelo	321
Houston Intercontinental	San Antonio	191
Houston Intercontinental	Texarkana	252
Houston Intercontinental	Tyler	163
Houston Intercontinental	Victoria	123
Houston Intercontinental	Waco	159
Killeen	Dallas/DFW	134
Killeen	Houston/IAH	224
Laredo	Dallas/DFW	394
Laredo	Houston/IAH	301
Longview	Dallas/DFW	140
Lubbock	Austin	341
Lubbock	Dallas/DAL	293
Lubbock	Dallas/DFW	282
Lubbock	El Paso	296
Lubbock	Houston/IAH	458
Midland/Odessa	Austin	295
Midland/Odessa	Dallas/DAL	319
Midland/Odessa	Dallas/DFW	309
Midland/Odessa	El Paso	246
Midland/Odessa	Houston/HOU	441
Midland/Odessa	Houston/IAH	429
McAllen	Dallas/DFW	468
McAllen	Houston/IAH	316
San Angelo	Dallas/DFW	228
San Angelo	Houston/IAH	321
San Antonio	Dallas/DAL	248
San Antonio	Dallas/DFW	247
San Antonio	El Paso	497
San Antonio	Harlingen	233
San Antonio	Houston/HOU	192
San Antonio	Houston/IAH	191
Texarkana	Dallas/DFW	181

Table 3-3 (Continued). Texas Intrastate Passenger Air Service City-Pair Market Distances (Statute Miles).

Origin	Destination	Distance
Texarkana	Houston/IAH	252
Tyler	Dallas/DFW	103
Tyler	Houston/IAH	163
Victoria	Houston/IAH	123
Waco	Dallas/DFW	89
Waco	Houston/IAH	159
Wichita Falls	Dallas/DFW	113

Table 3-4. Existing Intrastate Air Passenger Markets Served in Texas.

	ABI	AMA	AUS	BPT	BRO	CLL	CRP	DAL	DFW	DRT	ELP	HRL	HOU	IAH	GRK	LRD	GGG	LBB	MAF	MFE	SJT	SAT	TXK	TYR	VCT	ACT	SPS
ABI									X					X													
AMA								X	X					X													
AUS							X	X	X		X	X	X	X				X	X								
BPT														X													
BRO														X													
CLL									X					X													
CRP			X					X	X				X	X													
DAL	X		X				X				X		X	X			X		X		X						
DFW	X	X	X		X		X				X		X X		X X		X X		X X		X X		X X			X	X
DRT														X													
ELP			X				X		X				X	X			X		X		X						
HRL			X										X	X								X					
HOU		X				X		X	X	X		X							X			X					
IAH	X X		X X		X X		X X		X X		X X				X X			X	X X		X X		X X		X X		
GRK									X					X													
LRD									X					X													
GGG									X																		
LBB			X				X		X		X		X														
MAF			X				X		X		X		X	X													
MFE									X					X													
SJT									X					X													
SAT								X	X		X	X	X	X													
TXK									X					X													
TYR									X					X													
VCT														X													
ACT									X					X													
SPS									X																		

Note: As of October 2007.

FUTURE AIR SERVICE ISSUES AND CHALLENGES

A discussion of air service issues in the state would not be complete without some mention of the issues and challenges facing the industry today. The future of air service in Texas, like that in many states across the country, is unpredictable. This is even more so for small communities. The current economic difficulties facing the country and the increasing cost of fuel have placed significant burdens upon airlines. Airlines have been reducing capacity in their networks for some time and they continue to reduce flights and in some cases eliminate service altogether. In the last year, "nearly 30 cities across the United States have seen their scheduled service disappear (*6*)." In addition, "more than 400 airports, in cities large and small, have seen flights cut (*6*)." The Official Airline Guide reports that the total number of flights has decreased in the last year by 3 percent. Texas service has not been immune. In May 2008, American Airlines announced it would no longer serve Austin from Dallas Love Field cutting its eight daily flights between the two airports (*7*). These cuts were part of a larger number affecting cities outside of Texas as well. At the same time, ExpressJet cut flights to San Antonio and Austin from Tulsa International Airport (*8*).

The airlines have and continue to reduce capacity in their respective systems in an effort to increase efficiency and cut costs. Any gains in this effort are seemingly offset by either steep increases in fuel costs or economic downturn (*6*). Subsequently, many airlines are financially distressed, have entered or contemplated bankruptcy, and put off ordering new aircraft. While fuel prices have subsided some in the fall of 2008, airlines continue to restructure fleets and schedules. Despite the drop in oil prices, the industry struggles in the midst of a weakened economy with no clear understanding of how long it will last and when oil prices may spike again. The past has shown that a variety of factors, rational and otherwise, can drive the oil market over short periods of time.

Complicating the air service issue is the emerging trend in the reduction of 50-and-less seat regional jets (*9*). Once seen as the solution for small community air service, they are now being pulled from smaller airports to provide service on mainline routes in their efforts to reduce costs, save fuel, and reduce capacity (seats). The current economics of the aircraft no longer work for shorter distances. The impact on air service for smaller communities is the reduction or complete elimination of service. This trend has led to the re-emergence of turboprop aircraft, which not too long ago had nearly ceased production. "The market for new 50-seat jets has all but disappeared and aircraft in the 70-seat category have dominated turboprop sales (*10*)."

Over the years, some communities have benefited from essential air service programs and other grants and subsidies designed to keep small communities connected to the air transportation system. These programs have kept air service in some communities and have done little in others. Debate at the federal level continues regarding their effectiveness and future.

The resurgence of turboprop production is good news for smaller communities as the new-generation aircraft are capable of sustaining markets that jet aircraft cannot. In addition to increased comfort, new turboprop aircraft (i.e., Bombardier Q-400) offer 30 percent lower seat costs, which add to airlines' financial viability. Some of these aircraft are beginning to show up in service in other states but regional airlines in Texas still predominantly utilize the older, less efficient Saab 340 aircraft. This is due to the individual fleets of the airlines and their regional partners that serve the state. More recently, American Airlines implemented plans to eliminate the Saab 340 aircraft from American Eagle's fleet. American Eagle is now operating regional jet aircraft on most, if not all, flights within Texas. Jet service is preferred and perceived to be safer by customers resulting in a positive impression with potential passengers. The downside is that if the airline decides to cut costs and eliminate inefficient routes (turboprops are more efficient on shorter routes), many market pairs in Texas could be vulnerable to service reductions if not outright eliminations.

While levels of service have been reduced and service eliminated in smaller communities across the country, Texas has fared better than most. None of the state's 27 commercial airports have seen complete elimination of service. Air service to and from Victoria, Texas, remains vulnerable and is currently supported by an essential air service program grant through June 2009. This grant helps support two flights per day to Houston Intercontinental Airport. Additionally, Del Rio was recently the recipient of new air service. Under a Continental Airlines partnership arrangement, three flights per day are now provided from Del Rio International Airport to Houston Intercontinental Airport.

Texas has benefited from a stronger economy than most parts of the country during this recent downturn and has subsequently seen fewer impacts including those on its air service. Texas, however, remains vulnerable to service reductions and eliminations. Concerns over this possibility have sparked debate over the development of additional air service models to provide air travel within the state. Some concepts have this "intra-state" airline based in Austin with hub-and-spoke operations serving smaller communities across the state. At this time, this is only conceptual. There are no plans or concrete ideas about how this service would be operated or who would be capable of providing it.

AVIATION TRAVEL DEMAND

Activity at commercial service airports in Texas has been increasing since the terrorist events of September 2001. Demand in 2005 surpassed that of 2000 for the first time. This trend is expected to continue as passenger enplanements at the state's 27 commercial service airports are projected to hit 116,594,577 in 2025 (*11*). This represents a 77 percent increase over 2005 levels. The Terminal Area Forecast data represent the unconstrained demand and make no consideration of the airport's or the air traffic control system's ability to accommodate it. Table 3-5 provides a summary of past and projected enplanements at each of the commercial service airports in Texas. Figure 3-5 charts the total past and projected enplanements.

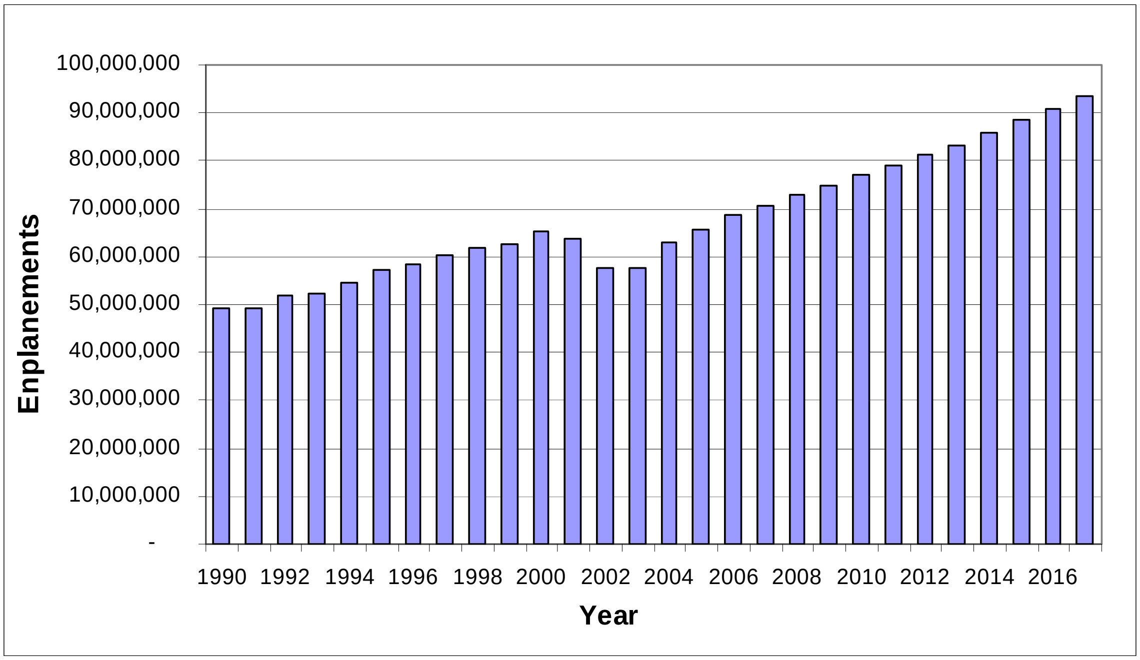
The FAA's Terminal Area Forecast shows that most of the increased enplanements will occur at the seven busiest airports. These airports are: Dallas/Fort Worth International (DFW), George Bush Intercontinental in Houston, Houston Hobby, Dallas Love, San Antonio International, El Paso International, and Austin-Bergstrom International Airport. According to the Air Transport Association, Dallas/Fort Worth International ranked as the fourth busiest domestic airport in passenger enplanements and George Bush Intercontinental ranked as the eighth busiest in 2006 in arriving and departing passengers.

Table 3-5. Forecast of Domestic and International Passenger Enplanements at Texas Commercial Service Airports.

Airport	1990	1995	2000	2003	2005	2008	2011	2014	2017
Abilene	74,063	67,631	55,236	46,166	75,414	82,942	84,775	86,651	88,569
Amarillo	453,233	465,713	445,463	384,829	442,327	456,465	474,149	493,463	514,555
Austin	2,137,905	2,652,309	3,585,357	3,157,961	3,601,135	3,911,107	4,262,440	4,647,278	5,069,069
Beaumont	113,117	112,033	92,174	43,931	55,484	37,789	40,231	42,837	45,618
Brownsville	179	78,749	67,790	60,087	73,361	91,289	96,842	102,735	108,989
College Station	79,825	85,281	92,645	67,459	83,866	78,755	82,877	87,219	91,792
Corpus Christi	455,629	507,839	444,632	358,843	413,364	431,816	454,808	479,714	506,693
Dallas Love	2,884,504	3,418,261	3,544,454	2,783,787	2,976,972	3,130,327	3,330,306	3,846,946	4,977,919
Dallas/Ft. Worth	24,269,536	26,947,281	28,661,863	24,601,481	27,960,344	29,962,237	32,192,850	34,608,068	37,225,080
Del Rio International	-	941	-	-	7,638	7,638	7,638	7,638	7,638
El Paso	1,675,459	1,861,059	1,684,368	1,418,974	1,617,793	1,676,893	1,779,943	1,890,235	2,008,369
Fort Hood/Killeen (Robert Gray)	-	-	18,395	3,159	153,930	154,117	154,117	154,117	154,117
Harlingen	532,404	500,336	468,371	392,733	429,541	455,782	480,507	507,357	536,584
Houston Ellington Field	19,505	47,105	42,069	44,797	2,976	2,976	2,976	2,976	2,976
Houston Hobby	3,989,708	3,925,461	4,331,462	3,691,967	3,947,543	4,702,677	5,458,116	5,715,391	5,985,030
Houston Intercontinental	8,127,228	11,494,226	16,182,975	15,934,088	18,636,208	21,694,345	23,841,932	26,203,496	28,806,026
Killeen	47,331	56,979	98,012	92,106	-	-	-	-	-
Laredo	59,279	64,198	90,647	73,210	94,042	87,893	96,795	106,705	117,735
Longview	38,617	33,891	34,376	29,022	23,250	25,110	27,306	29,694	32,294
Lubbock	619,613	594,641	578,429	504,916	545,340	592,877	633,683	677,956	726,043
McAllen	230,168	328,835	320,008	263,431	341,824	391,558	415,021	439,954	466,448
Midland	584,255	563,308	475,752	399,334	439,507	484,341	506,673	532,486	562,325
San Angelo	54,809	52,920	44,329	42,688	63,785	59,894	61,198	62,531	63,894
San Antonio	2,681,958	3,066,256	3,535,268	3,121,545	3,518,786	4,008,147	4,386,679	4,804,180	5,265,147
Texarkana	41,627	43,545	40,802	25,634	33,573	33,273	35,520	37,920	40,483
Tyler	60,311	74,993	72,654	53,854	81,723	91,870	98,934	106,541	114,733
Victoria	22,609	18,686	19,321	10,775	11,115	10,249	10,558	10,876	11,203
Waco	41,372	59,974	63,462	49,915	70,851	77,238	84,387	92,238	100,861
Wichita Falls	59,664	62,078	55,965	39,608	47,126	47,053	47,053	47,053	47,053
Total	**49,353,908**	**57,184,529**	**65,146,279**	**57,696,300**	**65,748,818**	**72,786,658**	**79,148,314**	**85,824,255**	**93,677,243**

- signifies no commercial flights that year or none forecast for future year

*Killeen Municipal flights have shifted to Ft.Hood-Killeen (Robert Gray) airfield.



Source: FAA Terminal Area Forecasts – 2006

Figure 3-5. Texas Airport System Plan Commercial Service Passenger Enplanements.

A simple measure of capacity on an air route does not exist in the sense of a volume-to-capacity ratio for a highway segment. However, some measures do allow for an understanding of how much travel on a corridor is possible given the specific origin-destination airport pairs and the equipment selected by the airlines that serve it. Since the individual capacity analysis for all 27 commercial service airports in Texas is beyond the scope of this study, 'load factor' will be used as a measure of capacity. The load factor is simply the percentage of available seats that are filled on a flight. For example, if a flight has 100 seats available and 75 passengers, the load factor is 0.75 or 75 percent. The load factor can also be calculated for a particular route or corridor for a period of time longer than one flight. Load factors were calculated for all of the corridors for 1996 and 2006 as well as the average annual percent change. Tables 3-6 and 3-7 show the load factors for 1996 and 2006, respectively. Table 3-8 shows the percent change for each corridor.

Unlike the demand itself, load factors have been increasing. The air carriers' efforts to become more efficient and draw capacity out of the system are reflected in this trend. This has resulted in fewer available seats and better utilization on each flight. A reduction of seats could be achieved by reducing the number of flights or changing the type of aircraft serving the route from a larger to a smaller aircraft. These are the types of complexities that make capacity measurement difficult. Airline management makes these decisions based on the financial interests of the company and its stakeholders. Capacity on a particular route can change literally overnight. Load factors, for the most part, are a fair representation of the capacity on a particular route at any given time given existing operational constraints. As a note of caution, a high load factor could be representative of a low frequency, underserved market and a low load factor could indicative of an over served market. Either one could indicate a need for an alternative mode or propensity to divert to another mode. A high load factor could indicate a need for more service or choice, and a low load factor may indicate a service that is not going to be continued by the airlines.

Bureau of Transportation Statistics (BTS) data were used in the analysis of intrastate air travel corridors. Specifically, they are data from the T-100 section of Form 41, which includes "non-stop segment and on-flight market data (*12*)." Air carriers are required to file a Form 41 with the Bureau of Transportation Statistics on a quarterly basis. The data used are segment data and not market data. "Segment data" is defined as a pair of points served by a single stage of at least one flight. Market data is defined by the first departure airport on a ticket and the ultimate arrival airport. The market origin and destination airports differ from segment origin and destination airports in that there may be intermediate destinations and more than one plane may be used (*12*). There are some differences in the types of data included in each database. Using segment data, TTI researchers examined the passenger demand for the airports in the state and the corridors under study.

The trend line from 1996 to 2006 for intrastate travel is less encouraging than the statewide airport activity forecasts (intra- and inter-state activity) made by the Federal Aviation Administration in their Terminal Area Forecasts mentioned above. Tables 3-6 and 3-7 show these trends. These data represent a sum of the air passenger traffic from airports along the corridor. For the 18 air corridors analyzed, 16 realized decreases in flights and 12 realized decreases in passengers over the 10-year period as measured on an annual percent change basis. One of the corridors that showed an increase did not have existing passenger service in 1996. There was also a decrease in available seats as 16 corridors saw that measure of capacity fall as well. (Note: In Tables 3-6 to 3-8, only 18 corridors are listed since two of the highway corridors are alternate routes for DFWSAT travel via I-35 and via US 281, while only one air market between the two exists.)

Table 3-6. Intrastate Air Passenger Travel Demand by Corridor, 1996 .

Corridor	Travel Corridor Name	Number of Flights	Number of Passengers	Number of Seats	Load Factor
AMALBB	Amarillo to Midland (Odessa) via Lubbock	366	6,789	23,156	0.29
DFWABI	Dallas/Fort Worth to El Paso via Abilene	27,968	1,711,258	2,779,780	0.62
DFWAMA	Dallas/Fort Worth to Amarillo via Wichita Falls	20,406	789,291	1,411,121	0.56
DFWHOU	Dallas/Fort Worth to Houston	68,265	4,328,035	6,822,809	0.63
DFWLBB	Dallas/Fort Worth to Lubbock via Abilene	21,164	869,377	1,564,051	0.56
DFWLOU	Dallas/Fort Worth to Louisiana Border	6,408	98,939	210,611	0.47
DFWSAT	Dallas/Fort Worth to San Antonio	66,155	4,779,512	7,016,205	0.68
DFWSNA	Dallas/Fort Worth to El Paso via San Angelo	19,386	1,103,547	1,759,281	0.63
DFWTXK	Dallas/Fort Worth to Texarkana	5,830	42,470	181,548	0.23
HOUAUS	Houston to Austin	15,439	1,176,925	1,942,879	0.61
HOUBMT	Houston to Beaumont	4,086	68,890	141,093	0.49
HOUBVN	Houston to Brownsville via Corpus Christi	29,713	1,424,015	2,451,097	0.58
HOUSAT	Houston to San Antonio	17,460	1,406,112	2,239,373	0.63
HOUTXK	Houston to Texarkana	-	-	-	0.00
HOUWAC	Houston to Waco via Bryan/College Station	6,295	67,618	157,106	0.43
SATBVN	San Antonio to Brownsville via Corpus Christi	1,825	131,327	210,115	0.63
SATELP	San Antonio to El Paso	3,051	285,736	405,710	0.70
SATLRD	San Antonio to Brownsville via Laredo	1,453	125,663	186,552	0.67

Source: TTI Analysis

Table 3-7. Intrastate Air Passenger Travel Demand by Corridor, 2006.

Corridor	Travel Corridor Name	Number of Flights	Number of Passengers	Number of Seats	Load Factor
AMALBB	Amarillo to Midland (Odessa) via Lubbock	-	-	-	0.00
DFWABI	Dallas/Fort Worth to El Paso via Abilene	24,561	1,535,880	2,346,210	0.65
DFWAMA	Dallas/Fort Worth to Amarillo via Wichita Falls	16,483	683,799	1,119,487	0.61
DFWHOU	Dallas/Fort Worth to Houston	47,467	3,188,084	4,491,549	0.71
DFWLBB	Dallas/Fort Worth to Lubbock via Abilene	17,478	850,952	1,251,716	0.68
DFWLOU	Dallas/Fort Worth to Louisiana Border	5,535	126,362	185,286	0.68
DFWSAT	Dallas/Fort Worth to San Antonio	56,640	4,328,498	5,825,538	0.74
DFWSNA	Dallas/Fort Worth to El Paso via San Angelo	13,297	988,163	1,447,664	0.68
DFWTXK	Dallas/Fort Worth to Texarkana	4,382	100,416	180,964	0.55
HOUAUS	Houston to Austin	13,019	1,214,868	1,745,836	0.70
HOUBMT	Houston to Beaumont	3,384	78,337	126,326	0.62
HOUBVN	Houston to Brownsville via Corpus Christi	26,690	1,412,849	2,051,650	0.69
HOUSAT	Houston to San Antonio	13,940	1,320,207	1,934,472	0.68
HOUTXK	Houston to Texarkana	2,698	42,496	88,536	0.48
HOUWAC	Houston to Waco via Bryan/College Station	7,324	146,556	259,364	0.57
SATBVN	San Antonio to Brownsville via Corpus Christi	1,397	117,200	181,023	0.65
SATELP	San Antonio to El Paso	2,635	249,914	359,116	0.70
SATLRD	San Antonio to Brownsville via Laredo	1,397	117,200	181,023	0.65

Source: TTI Analysis

Table 3-8. Annual Percent Change in Intrastate Air Passenger Travel Demand by Corridor, 1996-2006.

Corridor	Travel Corridor Name	Number of Flights	Number of Passengers	Number of Seats	Load Factor
AMALBB	Amarillo to Midland (Odessa) via Lubbock	-10.00	-10.00	-10.00	-10.00
DFWABI	Dallas/Fort Worth to El Paso via Abilene	-1.22	-1.02	-1.56	0.63
DFWAMA	Dallas/Fort Worth to Amarillo via Wichita Falls	-1.92	-1.34	-2.07	0.92
DFWHOU	Dallas/Fort Worth to Houston	-3.05	-2.63	-3.42	1.19
DFWLBB	Dallas/Fort Worth to Lubbock via Abilene	-1.74	-0.21	-2.00	2.23
DFWLOU	Dallas/Fort Worth to Louisiana Border	-1.36	2.77	-1.20	4.52
DFWSAT	Dallas/Fort Worth to San Antonio	-1.44	-0.94	-1.70	0.91
DFWSNA	Dallas/Fort Worth to El Paso via San Angelo	-3.14	-1.05	-1.77	0.88
DFWTXK	Dallas/Fort Worth to Texarkana	-2.48	13.64	-0.03	13.72
HOUAUS	Houston to Austin	-1.57	0.32	-1.01	1.49
HOUBMT	Houston to Beaumont	-1.72	1.37	-1.05	2.70
HOUBVN	Houston to Brownsville via Corpus Christi	-1.02	-0.08	-1.63	1.85
HOUSAT	Houston to San Antonio	-2.02	-0.61	-1.36	0.87
HOUTXK	Houston to Texarkana	10.00	10.00	10.00	10.00
HOUWAC	Houston to Waco via Bryan/College Station	1.63	11.67	6.51	3.13
SATBVN	San Antonio to Brownsville via Corpus Christi	-2.35	-1.08	-1.38	0.36
SATELP	San Antonio to El Paso	-1.36	-1.25	-1.15	-0.12
SATLRD	San Antonio to Brownsville via Laredo	-0.39	-0.67	-0.30	-0.39

Source: TTI Analysis

Additionally, the research team compiled air passenger demand data for city-pairs in Texas using the 10 percent ticket sample database available from the BTS. This provides a reasonable measure of intercity travel in Texas via scheduled airline service. While total passenger traffic increased at Texas' airports according to the FAA's Terminal Area Forecast, 21 of the 27 airports in Texas saw decreases in intrastate traffic. The forecasted demand by airport and the growth rates used by the FAA are available through the year 2025.

AIRPORT CAPACITY ISSUES

An airport's capacity can be measured in different ways and can be affected by a variety of factors. Capacity constraints can be related to the airfield or airside of the airport as well as the terminal or landside of the airport. These factors include:

- the number and layout of runways;
- the number and layout of taxiways;
- the airspace restrictions surrounding the airport;
- any separation requirements imposed by air traffic control;
- the existing weather conditions (wind, ceiling, visibility);
- the fleet mix of aircraft using the facility;
- any noise or environmental mitigation practices; and
- the ability of passenger terminal (number of gates) to service passengers/planes for processing, security screening, and baggage claim.

The Federal Aviation Administration recently made an effort to assess future capacity needs through a study entitled *Capacity Needs in the National Airspace System, 2007-2025*. This analysis, referred to as "FACT2" since it is the second Future Airport Capacity Task report, highlighted the airports and the metropolitan areas determined to have the greatest need for additional capacity. The study examined capacity needs for U.S. airports in the years 2007, 2015, and 2025. No Texas airports showed a capacity improvement need for 2007. Three airports, San Antonio International, Houston-Bush Intercontinental, and Houston Hobby airport showed a need for additional capacity if planned improvements do not occur. The same was true for the 2025 timeframe. Also, the Houston Metropolitan area was determined to be in need of capacity in 2025 if planned improvements were not made. These capacity needs reflect both airport and airspace capacity needs. Figure 3-6 shows the 27 airports and 15 metropolitan areas in need of capacity enhancements in 2025 if none of the planned improvements are made.

It is worth revisiting the previously mentioned notion of "unconstrained forecasts" as given in the FACT2 report. While every airport will ultimately reach the limits of how many passengers it can serve, it is expected that over time additional airports will begin to serve some passengers previously served by existing system airports. Some smaller community airports may begin service to other airports, both in and out of state. This, in turn, will free up capacity at a larger airport. For example, passengers connecting to Las Vegas or Washington, D.C. through Houston or Dallas may see direct service from their own local airport once the market grows enough. This may reduce the need for flights to those destinations from the larger cities and may, in fact, draw passengers from the larger airport to the smaller one. This will free up space at the larger hubs for service elsewhere including internationally.

Figure 3-6. Airports and Metropolitan Areas Needing Capacity in 2025 if Planned Improvements Do Not Occur *(13)*.

In essence, airports within a leakage area could be seen as absorbing overflow demand and/or becoming a new hub for some destinations. Leakage in this case refers to the loss of passengers to other airports in the surrounding area as some passengers, for a variety of reasons—not limited only to cost or scheduling—are willing to drive to other airports in lieu of utilizing the airport closest to them. While this type of scenario is likely years away, it must be considered when evaluating future intercity travel demand. This logic is similar to the development of secondary airport systems that is going on in many communities across the country. At some point, the existing airport system will not be able to accommodate demand without adding significant capacity whether at the existing airport or at an entirely different or new one. Land use planning would point to an existing airport being utilized or expanded or constructing a new one, which would need to be constructed far away from the urban center of the metropolitan area it serves.

CONCLUDING COMMENTS CONCERNING INTERCITY AIR SERVICE

Predicting the demand and capacity in air travel has been challenging. Industry turmoil caused by a variety of factors—not the least of which is high fuel prices—has made this difficult to do more than a few years into the future. Air travel is a vital component of our intercity transportation system and our economy and it always will be. A certain level of demand will always be present despite modal alternatives offered by public or private entities, and the airlines and airports will adjust their capacity based on their own financial and operational constraints in order to accommodate demand as best they can. It is much easier for airlines to add or reduce flights at a given airport on short notice—much quicker than highway miles can be built—as long as the airport and its surrounding airspace has the physical capacity to handle additional flights. The airlines can add flights using similar or larger aircraft or they can reduce the number of existing flights and utilize larger or smaller aircraft, whichever suits their business model at the time. They can also alter the city-pairs they serve and add flights to new destinations or eliminate flights to others. Overall, capacity enhancements or reductions can be made fairly quickly in air travel with little or short notice. Pricing of the flights can also be managed much more actively to meet a planned return in the number of passengers projected.

The ability to predict these factors is very difficult as characterized in recent news reports. Within the span of one recent week, airlines were reporting that 41 million fewer passengers flew domestically in the last 12 months and that American Eagle was increasing capacity, but not necessarily frequency, on its College Station, Texas, to Dallas, Texas, route (*14*, *15*). The frequency could actually be reduced as the switch involves the use of a larger aircraft. This action is counter to current trends of increasing capacity in smaller markets.

Future physical capacity enhancements at commercial service airports across the county and technological advancements in air traffic management associated with the Next Generation Air Transportation System (NextGen) are planned by the FAA and underway in an effort to accommodate the projected demand. The Joint Planning and Development Office is the governmental agency charged with managing this process. They describe NextGen in the following manner:

> "NextGen is a leveraging of technologies that already exist. The vision for NextGen is a system that is based on satellite navigation and control, digital non-voice communication and advanced networking. It is a shifting of decision making from the ground to the cockpit. Flight crews will have increased control over their flight trajectories and ground controllers will become traffic flow managers (*16*)."

This program is critical to the future of air transportation given the highly constrained environment in which airports operate regarding safety, financing, and environmental compliance. How officials respond to capacity needs in air transportation could affect our intercity travel behavior with respect to other modes.

Due to the rapid increases in fuel prices in the summer of 2008 and the economic downturn in the fall of 2008, several airlines operating within the state have adjusted their schedules, changed aircraft type, and/or eliminated service to some of the smaller airports in the state. For example, by the fall of 2008, Continental Airlines, through its partner Colgan Air, stopped service from its hub in Houston to three Texas cities: San Angelo, Abilene, and Texarkana. The availability of air service described in this chapter, reflecting 2006 data, may need to be reevaluated prior to the end of the project to ensure that accurate data on flights are used. The research team will coordinate with the PMC to determine if changes in flight schedules affect the overall outcome of the analysis.

CHAPTER 4: FREIGHT RAIL CAPACITY IN TEXAS

This chapter further describes the TTI research team's findings regarding freight rail capacity in the state, with a focus on the rail lines along the identified intercity corridors described in Chapter 2. Task 2 of the research project collected and analyzed much of the information contained in this chapter.

Texas currently has 45 freight railroads operating on over 10,800 miles of track. Texas' position along the U.S.-Mexico border, on the Gulf Coast, and along both north-south and east-west intercontinental trade routes make it a major contributor to national freight rail operations (*17*). Several recent reports focus on the existing and forecast freight rail capacity conditions throughout the U.S. This section describes these conditions and discusses the freight rail lines in Texas that are generally associated with the potential rail and/or express bus transit corridors within the state. It is important to examine the freight rail capacity situation given that most of the current U.S. intercity passenger rail, all of the current Texas passenger rail routes, and most federal rail planning for future passenger rail routes are located along existing freight rail corridors.

NATIONAL CONDITION OF RAIL CAPACITY

A large number of factors affect rail corridor capacity, both localized and system wide. Some of these factors which drive rail capacity include:

- volume levels;
- train density;
- train mix (i.e., intermodal, merchandise, passenger, etc.);
- physical plant elements, such as:
    - single versus double track,
    - siding lengths,
    - distance between sidings,
    - signal type and spacing,
    - yard capacity,
    - productivity, and
    - people.

The dominant factors utilized to estimate capacity in the *National Rail Freight Infrastructure Capacity and Investment Study* are number of tracks, type of signal system, and the mix of train types (*18*).

Future capacity on the freight rail network is a major concern, especially considering the expected growth in freight volumes. A report to the National Surface Transportation Policy and Revenue Study Commission (NSTPRSC) projects an increase of 69 percent by tonnage and 84 percent by ton-miles between 2005 and 2035 (*19*). The rail industry has mostly been able to keep pace with the increase in freight demand over the past couple of decades despite large reductions in rail network route miles over the past half century. The total amount of freight rail miles is about half the size of the system that existed in the early 1900s. This is a result of trimming unprofitable low-volume lines primarily through rail line abandonment and spinning off lines to short line railroad operators. This downsizing of the network in combination with the growth in demand creates the rail capacity concern. Testimony before the NSTPRSC has succinctly stated this problem as "increasing demand has caught up with the downsized rail system, resulting in rail congestion and deteriorating service levels in many rail corridors and at interchange locations (*19*)."

The Class I railroad companies over the past five years have spent an average of $8.02 billion per year on capacity (*20*). The *National Rail Freight Infrastructure Capacity and Investment Study* estimates about $148 billion must be invested between 2005 and 2035 on infrastructure expansion to adequately handle future demand. It also states that annually there would be an amount not covered by the marketplace of $1.4 billion (*18*).

The investment study, submitted to the NSTPRSC, investigates current rail line capacity of over 50,000 miles of primary Class I trackage in the U.S. rail system, along with the expected condition of the network in 2035. In order for the charts in the study to be more readily understood, and in line with highway transportation planning nomenclature, the consultant that completed the study developed an A through F classification system for rail that is similar to the one used by highway planners to describe the Level of Service (LOS) for highway congestion. LOS A, B, or C means that the rail is generally free of congestion and below its theoretical capacity with existing infrastructure. LOS D means that the line is operating near its theoretical capacity. LOS E is at theoretical capacity due to physical and operational limitations, while LOS

F means that the line is moving rail traffic over its theoretical limitation and traffic flow is continually breaking down as a result.

The study calculated that:

- Currently,
    - 88 percent of the primary freight rail corridors operate below their theoretical capacity, meaning there is sufficient capacity to accommodate periodic maintenance activities and to recover from incidents that interfere with routine operations;
    - 9 percent operate near their theoretical capacity;
    - 3 percent operate at their theoretical capacity limit, meaning there is limited ability to accommodate maintenance needs or accommodate incidents; and
    - Less than 1 percent operate above their theoretical capacity limit;
- Under growth projections, without additional capacity by 2035,
    - 45 percent of the primary freight rail corridors will operate below their theoretical capacity;
    - 10 percent will operate near their theoretical capacity limit;
    - 15 percent will operate at their theoretical capacity limit; and
    - 30 percent will operate above their theoretical capacity limit (*18*).

Figure 4-1 maps these results, which reflect the current situation, and Figure 4-2 maps the future conditions without improvements.

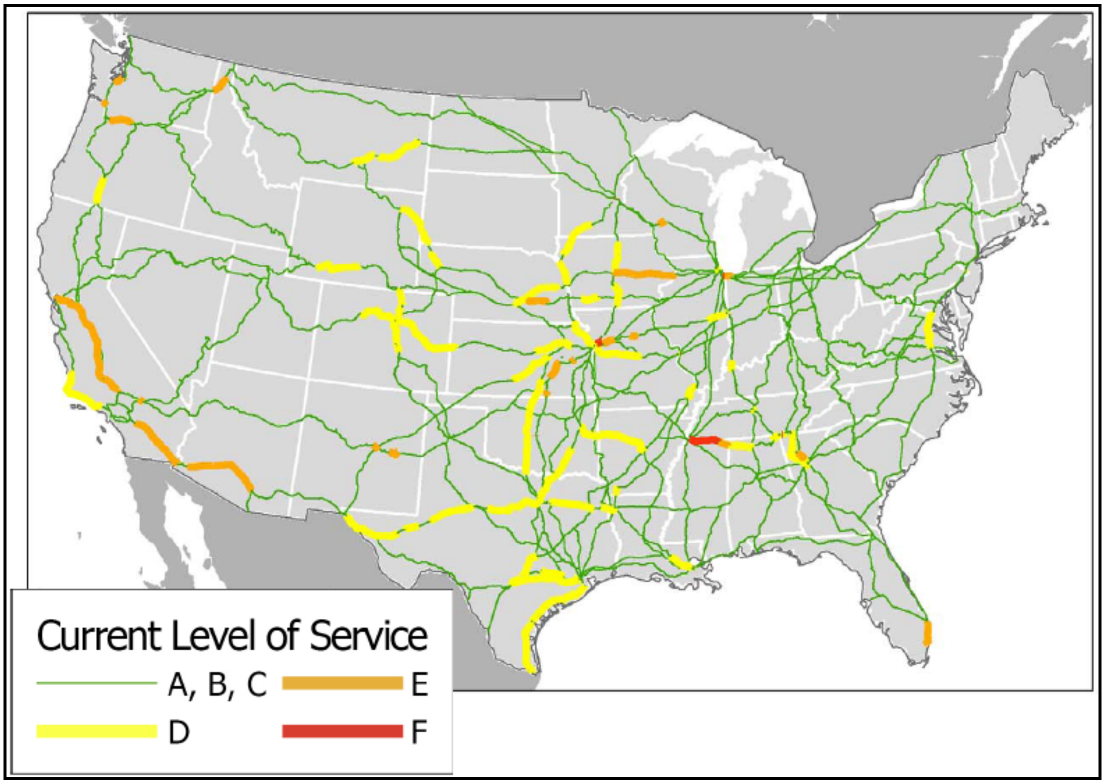


Figure 4-1. Current Volumes Compared to Current Capacity.

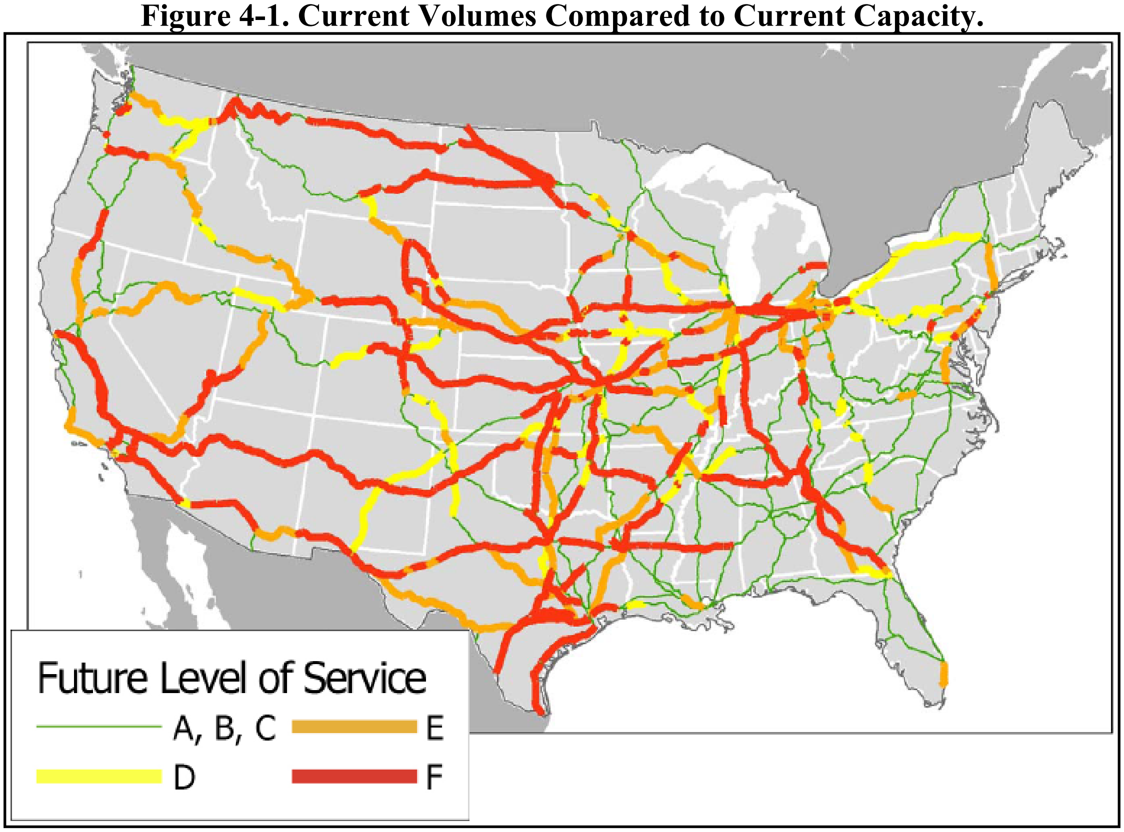


Figure 4-2. Future Volumes Compared to Current Capacity in 2035 without Improvements.

CORRIDOR EVALUATION

Utilizing the *National Rail Freight Infrastructure Capacity and Investment Study* (*18*) along with several additional sources, the freight rail line network and capacity were analyzed for the proposed rail and express bus transit corridors and presented in the following section. The defined corridors for this project follow primary highway routes between the coordinating origins and destinations. In Texas, most of these routes also closely parallel an existing rail line. In some instances, more than one rail line travels between origin and destination pairs, especially where more than one railroad company serves both locations. In Table 4-1 each rail line that generally follows the designated corridor was evaluated where possible.

Table 4-1 provides general descriptions of the rail lines and segments associated with each study corridor. Several of the corridors contain multiple rail lines generally traversing the entire corridor. For example, the Dallas to Houston corridor describes four possible rail routes that traverse the corridor. Table 4-2 presents the current and future levels of service as indicated by the *National Rail Freight Infrastructure Capacity and Investment Study* for lines within Texas. This information is taken from the above figures, which indicate that the current rail conditions in Texas are near or below capacity. Looking at the study corridors, the Dallas to El Paso corridor through Abilene and the Houston to San Antonio corridor are the only corridors with current rail conditions nearing capacity. As demonstrated in Figure 4-2, the situation worsens for the Texas rail network by 2035 without making needed improvements to handle anticipated freight volume growth. This is indicated in Table 4-2, where the majority of the rail line segments in 2035 reflect levels of service nearing or exceeding capacity. With the proposed improvements in the study, the freight rail capacity results in widespread operations below capacity—defined as level of service C or better.

The current and future train volumes per rail line segment according to the *National Rail Freight Infrastructure Capacity and Investment Study* are presented in Table 4-3, along with the estimated rail line density, noted from the 2007 National Transportation Atlas Database (NTAD 2007). Several rail line segments have current daily train activities approaching 100 trains per day, with many of these projected to see between 100 and 200 daily trains in 2035. Most of the rail line segments in the study network are expected to experience between 50 and 100 trains per day by 2035. Several lower traffic rail lines in the state were not evaluated in the study. These routes are listed in the table but no current or projected level of service is shown.

Table 4-1. Freight Rail Lines Associated with Study Corridors – General Segment Description.

Corridor	Corridor Name	General Description of Rail Lines	Segment Detail	Segment RR
AMALBB	Amarillo to Midland through Lubbock	Parallels I-27	Amarillo to Lubbock	BNSF
		Parallels US-84	Lubbock to Sweetwater	BNSF
		Parallels I-20	Sweetwater to Midland	UP
DFWABI	DFW to El Paso through Abilene	Parallels I-20	DFW to Sweetwater	UP
		Parallels I-20 & I-10	Sweetwater to Sierra Blanca	UP
		Parallels I-20 & I-10	Sierra Blanca to El Paso	UP
DFWAMA	DFW to Amarillo		DFW to Wichita Falls	BNSF
		Parallels US-287	Wichita Falls to Amarillo	BNSF
DFWHOU	DFW to Houston, Option 1	Parallels I-35	DFW to Waco	UP
		Parallels Hwy 6	Waco to Navasota	UP
		Parallels US-290	Navasota to Houston	UP
	DFW to Houston, Option 2	Parallels US-287 until Corsicana	DFW to Waco	UP
			Waco to Hearne	UP
		Parallels Hwy 6	Hearne to Navasota	UP
		Parallels US-290	Navasota to Houston	UP
	DFW to Houston, Option 3	Parallels I-35	DFW to Temple	BNSF
			Temple to Sealy	BNSF
			Sealy to Houston	BNSF
	DFW to Houston, Option 4	Parallels US-287	DFW to Corsicana	BNSF
		Parallels I-45	Corsicana to Houston	BNSF
DFWLBB	DFW to Lubbock through Abilene	Parallels I-20	DFW to Abilene	UP
		Parallels I-20	Abilene to Sweetwater	UP
		Parallels US-84	Sweetwater to Lubbock	BNSF
DFWLOU	DFW to Louisiana (I20), Option 1	Parallels I-20	DFW to Shreveport	UP
	DFW to Louisiana (I20), Option 2	Parallels I-20	DFW to Shreveport	KCS

Table 4-1 (Continued). Freight Rail Lines Associated with Study Corridors – General Segment Description.

Corridor	Corridor Name	General Description of Rail Lines	Segment Detail	Segment RR
DFWSAT	DFW to San Antonio (I35), Option 1	Parallels I-35	DFW to Waco	UP
		Parallels I-35	Waco to Austin	UP
		Parallels I-35	Austin to San Antonio	UP
	DFW to San Antonio (I35), Option 2	Parallels I-35	DFW to Temple	BNSF
		Parallels I-35	Temple to Austin	UP
		Parallels I-35	Austin to San Antonio	UP
DFWSATb	DFW to San Antonio (US281)	Same as DFWSAT		
DFWSNA	DFW to El Paso through San Angelo	Parallels US-377	DFW to San Angelo	FWWR
		Parallels US-377 & US-67	San Angelo to Alpine	TXPF
		Parallels US-90	Alpine to Sierra Blanca	UP
		Parallels I-10	Sierra Blanca to El Paso	UP
DFWTXK	DFW to Texarkana (I30)	Parallels I-30	DFW to Sulphur Springs	KCS, DGNO, BLR
		Parallels I-30	Sulphur Springs to Winfield	BLR
		Parallels US-67	Winfield to Texarkana	UP
HOUAUS	Houston to Austin	Parallels US-290	Houston to Sealy	BNSF
			Sealy to Taylor	UP
			Taylor to Austin	UP
HOUBMT	Houston to Beaumont	Parallels I-10; Two distinct UP rail lines connect cities	Houston to Beaumont	UP
HOUBVN	Houston to Brownsville	Houston South to coast	Houston to Algoa	UP
		Southwest along coast	Algoa to Lolita	UP
		Alternate Houston along coast (Parallels US-59)	Rosenberg to Victoria	KCS
		Parallels US-77	Lolita to Brownsville	UP
HOUSAT	Houston to San Antonio, Option 1	Parallels US-59	Houston to Rosenberg	UP
			Rosenberg to Seguin	UP
		Parallels I-10	Seguin to San Antonio	UP
	Houston to San Antonio, Option 2	Parallels US-59	Houston to Rosenberg	UP
			Rosenberg to San Marcos	UP
		Parallels I-35	San Marcos to San Antonio	UP

Table 4-1 (Continued). Freight Rail Lines Associated with Study Corridors – General Segment Description.

Corridor	Corridor Name	General Description of Rail Lines	Segment Detail	Segment RR
HOUTXK	Houston to Texarkana, Option 1	Parallels I-45, Turns NE at Palestine to Longview	Houston to Longview	UP
		Parallels I-20	Longview to Marshall	UP
		Parallels US-59	Marshall to Texarkana	UP
	Houston to Texarkana, Option 2	Parallels I-45, Turns NE at Palestine to Longview	Houston to Longview	UP
		Parallels I-20	Longview to Big Sandy	UP
		Big Sandy N to Mt. Pleasant, Parallels I-30 from Mt. Pleasant	Big Sandy to Texarkana	UP
	Houston to Texarkana, Option 3	Parallels US-59 to Tenaha, through Shreveport	Houston to Lewisville	UP
		Parallels US-82	Lewisville to Texarkana	UP
HOUWAC	Houston to Waco through Bryan	Parallels US-290, Turns N just E of Brenham	Houston to Navasota	UP
		Parallels Hwy 6	Navasota to Waco	UP
SATBVN	San Antonio to Brownsville through Corpus	Parallels I-37	San Antonio to Corpus Christi	UP
		Parallels US-77	Corpus Christi to Brownsville	UP
SATELP	San Antonio to El Paso	Parallels US-90	San Antonio to Sierra Blanca	UP
		Parallels I-10	Sierra Blanca to El Paso	UP
SATLRD	San Antonio to Brownsville through Laredo	Parallels I-35	San Antonio to Laredo	UP
			Laredo to Brownsville	UP

Legend:
BNSF- BNSF Railway
DGNO- Dallas, Garland, and Northeastern Railroad
UP- Union Pacific Railroad
TXPF- Texas Pacifico Transportation
BLR- Blacklands Railroad
KCS- Kansas City Southern Railroad

Table 4-2. Freight Rail Lines Associated with Study Corridors – Current and Future Levels of Service.

Corridor	Segment Detail	Segment RR	Current LOS	Future LOS - Unimproved	Future LOS - Improved
AMALBB	Amarillo to Lubbock	BNSF	A, B, C	D	A, B, C
	Lubbock to Sweetwater	BNSF	A, B, C	A, B, C	A, B, C
	Sweetwater to Midland	UP	D	F	A, B, C
DFWABI	DFW to Sweetwater	UP	D	F	A, B, C
	Sweetwater to Sierra Blanca	UP	D		
	Wichita Falls to Amarillo	BNSF	A, B, C	A, B, C	A, B, C
DFWHOU	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 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 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 Corsicana	BNSF			
	Corsicana to Houston	BNSF			
DFWLBB	DFW to Abilene	UP	D	F	A, B, C
	Abilene to Sweetwater	UP	A, B, C	F	A, B, C
	Sweetwater to Lubbock	BNSF	A, B, C	A, B, C	A, B, C
DFWLOU	DFW to Shreveport	UP	D	F	A, B, C
	DFW to Shreveport	KCS			
DFWSAT	DFW to Waco	UP	A, B, C	E	A, B, C
	Waco to Austin	UP	A, B, C	F	A, B, C
	Austin to San Antonio	UP	D	F	A, B, C
	DFW to Temple	BNSF	A, B, C	D	A, B, C
	Temple to Austin	UP	A, B, C	F	A, B, C
	Austin to San Antonio	UP	D	F	A, B, C

Table 4-2 (Continued). Freight Rail Lines Associated with Study Corridors – Current and Future Levels of Service.

Corridor	Segment Detail	Segment RR	Current LOS	Future LOS - Unimproved	Future LOS - Improved
DFWSATb	Same as DFWSAT				
DFWSNA	DFW to San Angelo	FWWR			
	San Angelo to Alpine	TXPF			
	Alpine to Sierra Blanca	UP	A, B, C	E	A, B, C
	Sierra Blanca to El Paso	UP	D	F	A, B, C
DFWTXK	DFW to Sulphur Springs	KCS, DGNO, BLR			
	Sulphur Springs to Winfield	BLR			
	Winfield to Texarkana	UP	A, B, C	E	A, B, C
HOUAUS	Houston to Sealy	BNSF	D	F	A, B, C
	Sealy to Taylor	UP	A, B, C	E	A, B, C
	Taylor to Austin	UP	A, B, C	F	A, B, C
HOUBMT	Houston to Beaumont	UP	A, B, C	F	A, B, C
HOUBVN	Houston to Algoa	UP	A, B, C	A, B, C	A, B, C
	Algoa to Lolita	UP	D	F	A, B, C
	Rosenberg to Victoria	KCS			
	Lolita to Brownsville	UP	D	F	A, B, C
HOUSAT	Houston to Rosenberg	UP	D	F	A, B, C
	Rosenberg to Seguin	UP	D	F	A, B, C
	Seguin to San Antonio	UP	D	F	A, B, C
	Houston to Rosenberg	UP	D	F	A, B, C
	Rosenberg to San Marcos	UP	D	F	A, B, C
	San Marcos to San Antonio	UP	D	F	A, B, C
HOUTXK	Houston to Longview	UP	A, B, C	A, B, C	A, B, C
	Longview to Marshall	UP	A, B, C	A, B, C	A, B, C
	Marshall to Texarkana	UP	A, B, C	A, B, C	A, B, C
	Houston to Longview	UP	A, B, C	A, B, C	A, B, C
	Longview to Big Sandy	UP	D	F	A, B, C
	Big Sandy to Texarkana	UP	A, B, C	E	A, B, C

Table 4-2 (Continued). Freight Rail Lines Associated with Study Corridors – Current and Future Levels of Service.

Corridor	Segment Detail	Segment RR	Current LOS	Future LOS - Unimproved	Future LOS - Improved
	Houston to Lewisville	UP	A, B, C	E	A, B, C
	Lewisville to Texarkana	UP	A, B, C	A	A, B, C
HOUWAC	Houston to Navasota	UP	A, B, C	A, B, C	A, B, C
	Navasota to Waco	UP	A, B, C	F	A, B, C
SATBVN	San Antonio to Corpus Christi	UP			
	Corpus Christi to Brownsville	UP	D	F	A, B, C
SATELP	San Antonio to Sierra Blanca	UP	A, B, C	E	A, B, C
	Sierra Blanca to El Paso	UP	D	F	A, B, C
SATLRD	San Antonio to Laredo	UP	A, B, C	F	A, B, C
	Laredo to Brownsville				

Note: Empty cells are for possible rail corridors that were not evaluated in the Cambridge Systematics Study.
Source: *National Rail Freight Infrastructure Capacity and Investment Study(18).*

Table 4-3. Freight Rail Lines Associated with Study Corridors – Segment Density and Volumes.

Corridor	Segment Detail	Segment RR	Segment Density (MGTM/Mi)	Current Volume (trains per day)	Future Volume (trains per day)	Growth (trains per day)	Percent Growth
AMALBB	Amarillo to Lubbock	BNSF	10-19.9	0-15	25-50	0-30	50-100
	Lubbock to Sweetwater	BNSF	20-39.9	0-15	50-100	0-30	50-100
	Sweetwater to Midland	UP	20-39.9	25-50	100-200	30-80	100-2500
DFWABI	DFW to Sweetwater	UP	20-39.9	15-25	100-200	0-30	100-2500
	Sweetwater to Sierra Blanca	UP	20-39.9	25-50	100-200	30-80	100-2500
	Sierra Blanca to El Paso	UP	40-59.9	25-50	100-200	30-80	100-2500
DFWAMA	DFW to Wichita Falls	BNSF	40-59.9	15-25	50-100	0-30	50-100
	Wichita Falls to Amarillo	BNSF	40-59.9	15-25	50-100	0-30	50-100
DFWHOU	DFW to Waco	UP	20-39.9	50-100	100-200	0-30	50-100
	Waco to Navasota	UP	20-39.9	50-100	100-200	30-80	100-2500
	Navasota to Houston	UP	20-39.9	25-50	100-200	0-30	100-2500
	DFW to Waco	UP	20-39.9	25-50	50-100	0-30	50-100
	Waco to Hearne	UP	20-39.9	25-50	50-100	30-80	100-2500
	Hearne to Navasota	UP	20-39.9	25-50	50-100	30-80	100-2500
	Navasota to Houston	UP	20-39.9	25-50	100-200	0-30	100-2500
	DFW to Temple	BNSF	40-59.9	50-100	100-200	0-30	50-100
	Temple to Sealy	BNSF	60-99.9	50-100	100-200	0-30	100-2500
	Sealy to Houston	BNSF	20-39.9	25-50	100-200	0-30	50-100
	DFW to Corsicana	BNSF	5-9.9				
	Corsicana to Houston	BNSF	40-59.9				
DFWLBB	DFW to Abilene	UP	20-39.9	15-25	50-100	0-30	100-2500
	Abilene to Sweetwater	UP	20-39.9	15-25	50-100	0-30	100-2500
	Sweetwater to Lubbock	BNSF	20-39.9	0-15	50-100	0-30	50-100
DFWLOU	DFW to Shreveport	UP	40-59.9	50-100	50-100	30-80	100-2500
	DFW to Shreveport	KCS	10-19.9				

Table 4-3 (Continued). Freight Rail Lines Associated with Study Corridors – Segment Density and Volumes.

Corridor	Segment Detail	Segment RR	Segment Density (MGTM/Mi)	Current Volume (trains per day)	Future Volume (trains per day)	Growth (trains per day)	Percent Growth
DFWSAT	DFW to Waco	UP	20-39.9	50-100	50-100	0-30	50-100
	Waco to Austin	UP	10-19.9	50-100	50-100	0-30	50-100
	Austin to San Antonio	UP	20-39.9	15-25	50-100	0-30	100-2500
	DFW to Temple	BNSF	40-59.9	50-100	100-200	0-30	50-100
	Temple to Austin	UP	20-39.9	50-100	50-100	0-30	50-100
	Austin to San Antonio	UP	20-39.9	15-25	50-100	0-30	100-2500
DFWSATb	Same as DFWSAT						
DFWSNA	DFW to San Angelo	FWWR					
	San Angelo to Alpine	TXPF					
	Alpine to Sierra Blanca	UP	20-39.9	15-25	50-100	0-30	50-100
	Sierra Blanca to El Paso	UP	40-59.9	25-50	100-200	30-80	100-2500
DFWTXK	DFW to Sulphur Springs	KCS, DGNO, BLR	5-9.9				
	Sulphur Springs to Winfield	BLR	10-19.9				
	Winfield to Texarkana	UP	20-39.9	15-25	25-50	0-30	100-2500
HOUAUS	Houston to Sealy	BNSF	20-39.9	25-50	100-200	0-30	50-100
	Sealy to Taylor	UP	10-19.9	25-50	100-200	0-30	100-2500
	Taylor to Austin	UP	20-39.9	15-25	50-100	30-80	100-2500
HOUBMT	Houston to Beaumont	UP	20-39.9	25-50	100-200	0-30	100-2500
HOUBVN	Houston to Algoa	UP	40-59.9	15-25	25-50	0-30	0-50
	Algoa to Lolita	UP	20-39.9	15-25	50-100	0-30	50-100
	Rosenberg to Victoria	KCS					
	Lolita to Brownsville	UP	5-9.9	0-15	25-50	0-30	50-100
HOUSAT	Houston to Rosenberg	UP	20-39.9	25-50	50-100	0-30	50-100
	Rosenberg to Seguin	UP	20-39.9	15-25	25-50	0-30	50-100
	Seguin to San Antonio	UP	40-59.9	15-25	25-50	0-30	50-100
	Houston to Rosenberg	UP	20-39.9	25-50	50-100	0-30	50-100
	Rosenberg to San Marcos	UP	20-39.9	0-15	15-25	30-80	100-2500
	San Marcos to San Antonio	UP	20-39.9	15-25	25-50	0-30	100-2500

Table 4-3 (Continued). Freight Rail Lines Associated with Study Corridors – Segment Density and Volumes.

Corridor	Segment Detail	Segment RR	Segment Density (MGTM/Mi)	Current Volume (trains per day)	Future Volume (trains per day)	Growth (trains per day)	Percent Growth
HOUTXK	Houston to Longview	UP	10-19.9	0-15	0-15	0-30	100-2500
	Longview to Marshall	UP	60-99.9	15-25	50-100	0-30	50-100
	Marshall to Texarkana	UP	60-99.9	15-25	50-100	0-30	50-100
	Houston to Longview	UP	10-19.9	0-15	0-15	0-30	100-2500
	Longview to Big Sandy	UP	40-59.9	25-50	50-100	30-80	100-2500
	Big Sandy to Texarkana	UP	20-39.9	15-25	50-100	0-30	100-2500
	Houston to Lewisville	UP	10-19.9	15-25	50-100	0-30	50-100
	Lewisville to Texarkana	UP		15-25	50-100	0-30	50-100
HOUWAC	Houston to Navasota	UP	20-39.9	0-15	100-200	0-30	100-2500
	Navasota to Waco	UP	20-39.9	50-100	100-200	30-80	100-2500
SATBCN	San Antonio to Corpus Christi	UP	5-9.9				
	Corpus Christi to Brownsville	UP	5-9.9	0-15	15-25	0-30	50-100
SATELP	San Antonio to Sierra Blanca	UP	20-39.9	15-25	50-100	0-30	50-100
	Sierra Blanca to El Paso	UP	40-59.9	50-100	100-200	30-80	100-2500
SATLRD	San Antonio to Laredo	UP	20-39.9	15-25	25-50	0-30	100-2500
	Laredo to Brownsville						

MGTM/Mi- Million Gross Ton Miles per Mile

Data Source: NTAD 2007, *National Rail Freight Infrastructure Capacity and Investment Study (18).*

CHAPTER 5: CORRIDOR ANALYSIS

Task 4 of this project was to identify the transit needs and potential solutions for the intercity travel corridors that had been identified in previous tasks of the project. This chapter describes the development of the corridor evaluation methodology, the evaluation criteria, and ranking schemes used by the research team to prioritize intercity travel corridors for potential intercity rail or bus service. Figure 5-1 shows the intercity travel corridors considered in this study (repeated from Figure 2-2).

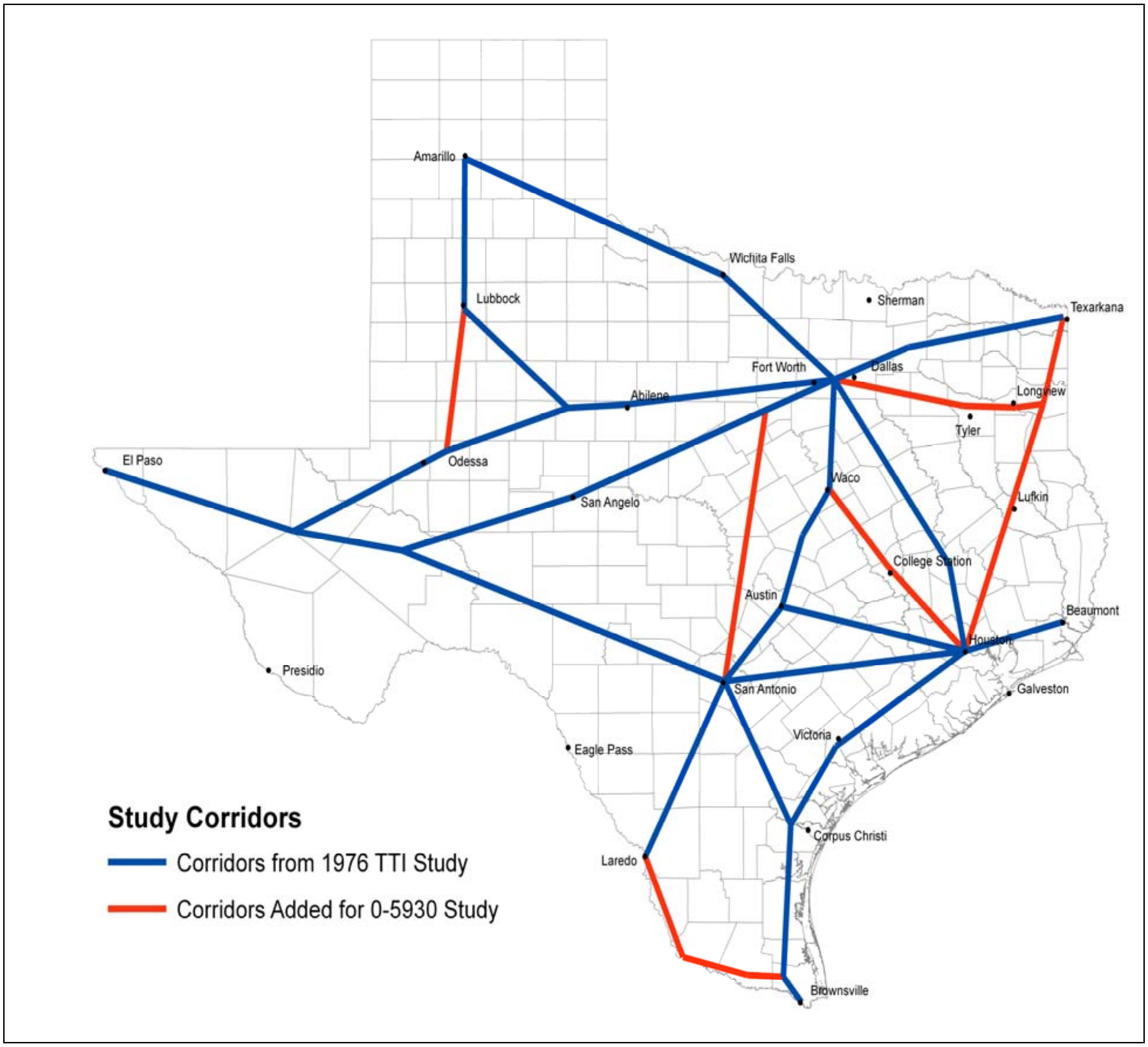


Figure 5-1. Map of Texas Intercity Travel Corridors for Project 0-5930.

Table 5-1 provides the project-designated abbreviated name, full description, subject roadways, and length of each of the study corridors. This table is similar to Table 2-1, but reflects the final list of corridors selected by the research team for analysis. The subject roadways were selected based on the most direct route between the corridor endpoint cities along major roadways. Length of each corridor was measured in miles along the subject roadways between major roadway junctions or other interchanges in each of the corridor endpoint cities. For corridors with an endpoint in Dallas/Fort Worth, the length was computed as the average of the distance between Dallas and the opposite corridor endpoint and the distance between Fort Worth and the opposite corridor endpoint.

Table 5-1. Description of Project 0-5930 Intercity Travel Evaluation Corridors.

Name	Corridor Description	Roadway(s)	Length (mi)
AMALBB	Amarillo to Midland-Odessa via Lubbock	I-27, US 87, TX 349	245
DFWABI	Dallas/Fort Worth to El Paso via Abilene	I-20, I-10	621
DFWAMA	Dallas/Fort Worth to Amarillo via Wichita Falls	US 287	362
DFWHOU	Dallas/Fort Worth to Houston	I-45	252
DFWLBB	Dallas/Fort Worth to Lubbock via Abilene	I-20, US 84	331
DFWLOU	Dallas/Fort Worth to Louisiana Border	I-20	183
DFWSAT	Dallas/Fort Worth to San Antonio	I-35	267
DFWSNA	Dallas/Fort Worth to El Paso via San Angelo	US 377, US 67, I-10	648
DFWTXK	Dallas/Fort Worth to Texarkana	I-30	190
HOUAUS	Houston to Austin	US 290	163
HOUBMT	Houston to Beaumont	I-10	87
HOUBVN	Houston to Brownsville via Corpus Christi	US 59, US 77	364
HOUSAT	Houston to San Antonio	I-10	199
HOUTXK	Houston to Texarkana	US 59 (TTC-69)	307
HOUWAC	Houston to Waco via Bryan/College Station	US 290, TX 6	184
SATBVN	San Antonio to Brownsville via Corpus Christi	I-37, US 77	280
SATELP	San Antonio to El Paso	I-10	636
SATLRD	San Antonio to Brownsville via Laredo	I-35, US 83	349

To accomplish the objectives of Task 4, the research team developed a methodology for evaluating the need for the provision of rail or express bus transit services in the intercity travel corridors identified in previous tasks. The purpose of this evaluation was to provide the research team with an objective evaluation of the study corridors over a set of criteria that accurately measures some aspect of the purpose or need for the provision of intercity rail or express bus transit in the study corridors. The research team will then use the outcome of this evaluation as a tool to guide the development of a proposed rail and express bus network for the intercity travel corridors of Texas. The following sections describe the approach to developing the evaluation methodology, the details of the evaluation criteria, and how the methodology was utilized to guide the research team's formation of an intercity transit system for Texas.

DEVELOPMENT OF EVALUATION METHODOLOGY

The research team's presentation to the Project Monitoring Committee on June 12, 2008, included a discussion of the team's proposed evaluation criteria. Table 5-2 lists the criteria upon which the research team and the PMC agreed. Three broad categories of measures that are expected to impact the need for an intercity rail or express bus network are defined: population and demographics (P), intercity travel demand factors (D), and intercity travel capacity (C). Within each category, individual measures are listed by both a reference number and a more detailed description. The individual measures were selected by the project research team based on the review of current intercity travel literature performed in Task 1 of this project as well as the project team's own experience in this area. Some of the principles that guided the selection of the evaluation criteria included the following:

- Selected criteria must be able to demonstrate, in an objective fashion, the planning-level need for the provision of rail or express bus in an intercity travel corridor.
- Selected criteria must allow the research team to easily measure or observe the differences in the transit needs among the intercity travel corridors.
- Selected criteria must not contain inherent bias toward a particular socioeconomic group, region of the state, or political consideration.
- To ensure the transferability of the evaluation methodology as a research product, selected criteria must be related to data that are publicly available from a reliable source.

The research team considered other criteria in the areas of air quality nonattainment areas, the compatibility of existing railroad infrastructure, and the potential for connections to bordering states and Mexico; however, it was determined that these additional factors would not be included in this objective evaluation and would be best taken into account later in the project to differentiate between corridors that are similarly ranked. At this point, the research team felt that only the criteria in the three categories identified in Table 5-2 should be used in ranking corridors.

Table 5-2. Evaluation Criteria for Project 0-5930 Study Corridors Evaluation.

Category	Ref.	Criteria
Population & Demographics (P)	P.1	Number of core-based statistical areas along corridor.
	P.2	Total population of CBSA counties along corridor, 2000.
	P.3	Growth in total population of CBSA counties along corridor, 2000-2040.
	P.4	Total population per mile of the corridor, 2000.
	P.5	Percent of total corridor population age 65 and older, 2040.
	P.6	Total employees, 2005.
	P.7	Total enrollment at public or private universities along corridor, Fall 2006.
Intercity Travel Demand (D)	D.1	Average corridor AADT, 2006.
	D.2	Percent annual growth in average corridor AADT, 1997-2006.
	D.3	Air passenger travel between corridor airports, 2006.
	D.4	Percent annual growth in air travel between corridor airports, 1996-2006.
Intercity Travel Capacity (C)	C.1	Average volume-capacity ratio on subject highways in corridor, 2002
	C.2	Average percent trucks on subject highways in corridor, 2002.
	C.3	Load factor on corridor flights, weighted by boarding passengers, 2006.
	C.4	Average number of corridor flights per day, 2006.

One issue that the research team encountered in its development of an evaluation methodology was the treatment of the Dallas/Fort Worth to San Antonio intercity travel corridor defined by US 281. This corridor was added to the list of study corridors at the request of the PMC . After a review of this corridor, the project research team asserts that the emergence of US 281 as an intercity travel corridor worthy of study is related to deteriorating traffic flow conditions on the I-35 corridor between Dallas/Fort Worth and San Antonio. Specifically, the demand for travel along US 281 consists of travelers wishing to avoid these conditions on I-35 in their travel between Dallas/Fort Worth (particularly Fort Worth and other areas in the western part of the region) and San Antonio.

Consequently, if the corridor evaluation were to move forward with these two corridors as separate corridors, each of the corridors (I-35 and US 281) would be evaluated against the other study corridors as well as themselves—thus diluting the true measure of demand in the Dallas/Fort Worth-San Antonio corridor. Given that the Dallas/Fort Worth to San Antonio intercity travel corridor aligns with one of the largest and most heavily traveled areas in the state, evaluating US 281 and I-35 as separate corridors would diminish the true magnitude of the need for an intercity rail or express bus route in the corridor. Additionally, the provision of adequate intercity rail or express bus service between Dallas/Fort Worth and San Antonio would serve to improve traffic flow and functionality on both US 281 and I-35. Given this situation, the research team determined to move forward with the evaluation with a single intercity travel corridor between Dallas/Fort Worth and San Antonio with combined data from each corridor (US 281 and I-35) to reveal a complete picture of the need for a rail or express bus route on this intercity travel corridor.

TRAVEL CORRIDOR EVALUATION: POPULATION & DEMOGRAPHICS

The first category of criteria used in the evaluation of Texas intercity travel corridors is an evaluation of the market for intercity rail or express bus based on measures of population and demographics. Table 5-3 lists the seven criteria selected to measure population and demographics and the units of measurement for each.

Table 5-3. Population & Demographics Criteria for Project 0-5930 Evaluation.

Ref.	Criteria	Units
P.1	Number of core-based statistical areas along corridor.	Number
P.2	Total population of CBSA counties along corridor, 2000.	Persons
P.3	Growth in total population of CBSA counties along corridor, 2000-2040.	Percent
P.4	Total population per mile of the corridor, 2000.	Persons/Mile
P.5	Percent of total corridor population age 65 and older, 2040.	Persons
P.6	Total employees, 2005.	Employees
P.7	Total enrollment at public or private universities along corridor, Fall 2006.	Students

Chapter 2 of this report describes the rationale for selecting the Office of Management and Budget's Core-Based Statistical Areas as the geographical unit from which to compute the measures of corridor population and other demographic data.

Column P.1 in Table 5-4 shows the value of the first population and demographics evaluation criterion that is the number of CBSAs through which the route of each intercity travel corridor under study passes. This criterion was selected because the research team believes these CBSAs to be the primary generators of intercity travel. As such, an intercity travel corridor with a larger number of CBSA-designated areas increases the potential for intercity travel in that corridor, which would then indicate a greater need for the provision of intercity rail or express bus.

Column P.2 in Table 5-4 contains values for the second population and demographics criterion that is the total population of CBSA-designated areas through which the route of each study corridor passes. Population data from the 2000 decennial census were used in the computation of the total corridor populations. This criterion was selected because the total corridor population is a measure of the market size from which ridership on a statewide rail or express bus network will be drawn. A larger total corridor population indicates a greater need for the provision of intercity rail or express bus in that corridor.

The third population and demographics evaluation criterion, P.3, is the annual percentage growth in total corridor population between the 2000 census and projections of total corridor population for the year 2040. Population projections for the year 2040 for each study corridor were computed using projections developed by the Population Estimates and Projections Program of the Texas State Data Center, Office of the Texas State Demographer.

Table 5-4. Population & Demographics Evaluation Data for Project 0-5930 Study Corridors.

Corridor	P.1*	P.2*	P.3*	P.4*	P.5*	P.6*	P.7*
AMALBB	5	643,818	0.77%	2627.8	18.10%	252,192	41,922
DFWABI	9	6,328,135	2.18%	10190.2	17.83%	2,849,134	163,141
DFWAMA	4	5,554,266	2.28%	15343.3	18.07%	2,622,788	144,352
DFWHOU	4	9,983,833	2.17%	39618.4	17.81%	4,503,956	233,169
DFWLBB	7	5,663,679	2.23%	17110.8	18.04%	2,659,182	179,230
DFWLOU	4	5,592,402	2.28%	30559.6	18.08%	2,654,034	137,752
DFWSAT	5	8,667,241	2.15%	32461.6	18.62%	3,908,853	280,359
DFWSNA	6	6,065,531	2.26%	9360.4	17.86%	2,748,544	168,053
DFWTXK	4	5,310,928	2.34%	27952.3	18.09%	2,534,325	132,428
HOUAUS	3	5,995,543	2.13%	36782.5	18.30%	2,593,949	173,438
HOUBMT	2	5,100,497	1.84%	58626.4	17.62%	2,127,555	105,779
HOUBVN	7	5,658,810	1.90%	15546.2	17.30%	2,287,155	109,511
HOUSAT	2	6,427,110	1.74%	32297.0	18.01%	2,667,813	131,021
HOUTXK	6	5,200,198	1.83%	16938.8	17.70%	2,173,525	105,258
HOUWAC	3	5,113,809	1.88%	27792.4	17.46%	2,145,207	146,702
SATBVN	5	2,502,255	1.37%	8936.6	18.17%	904,126	65,965
SATELP	3	2,434,978	1.32%	3828.6	18.42%	879,606	66,266
SATLRD	5	2,863,107	2.11%	8203.7	16.25%	975,101	73,451

* Criteria P.1-P.7 are defined in Table 5-3 and in the text.

For the projected corridor populations, the research team used data from the one-half 1990-2000 migration scenario (also known as the 0.5 scenario), which was the scenario recommended by the State Demographer for long-term planning applications. Just as the total corridor population is a measure of the current market for intercity travel, the growth in total corridor population was selected as a criterion to measure the potential for growth in size of each study corridor's market for intercity travel. Higher annual percentage growth in total corridor population indicates a greater need for the provision of intercity rail or express bus in a particular corridor.

The fourth population and demographics evaluation criterion is the total corridor population per mile of corridor, shown for each corridor under column P.4 in Table 5-4. The population per mile of the corridor is computed by dividing the total corridor population from measure P.2 by the total route-miles for each travel corridor from Table 5-1. As an evaluation criterion, including the total corridor population per mile adds a measure to the evaluation process that considers the total population but also incorporates the impact of corridor length in determining the need for intercity rail or express bus. A higher total corridor population per mile indicates a greater need for the provision of intercity rail or express bus service in that corridor.

The fifth population and demographics evaluation criterion, P.5, is the percentage of the total corridor population that, in the year 2040, will be age 65 and older. Projections of population by age group from the Texas State Demographer, utilizing the 0.5 migration scenario, were used to compute these percentages. This criterion was included in the evaluation methodology based on the findings of Task 1 of the project, which found that persons age 65 and older were a target market for transit ridership. However, it is noted that the percentage of population age 65 and older is essentially the same for each of the study corridors; as such, it cannot be used to conclude that a particular corridor has a greater need for improved intercity transit on the basis that it has more persons 65 and older than another. Thus, this criterion was removed from the evaluation methodology by the research team.

The sixth population and demographics evaluation criterion, P.6, is the total number of persons employed by business establishments located in the CBSA-designated areas along each corridor. These data were obtained from the U.S. Census Bureau's survey of county business patterns, 2005 update. This criterion was included in the evaluation because it is assumed that as the number of persons employed along a corridor increases, the potential for intercity business travel (and the need for improved intercity connections) will increase as well. Therefore, a higher total number of persons employed along a corridor indicates a greater need for intercity rail or express bus in that corridor.

The final population and demographics evaluation criterion is the total enrollment at public or private universities in CBSA-designated areas along each corridor, shown for each corridor under column P.7 in Table 5-4. Enrollment data were obtained from the Texas Higher Education Coordinating Board's Certified Fall 2006 enrollment counts for two classes of higher education institutions: Texas Public Universities and Texas Independent Senior Colleges and

Universities. This criterion was included in the evaluation because intercity travel by students was identified in Task 1 of this project as a target market for transit ridership. Enrollments from other classes of higher education institutions, such as junior colleges, community colleges, or medical centers were not included, since it was assumed that these types of institutions would not generate a significant amount of intercity traffic. A higher total student enrollment at public or private universities along the corridor indicates a greater need for intercity rail or express bus service in a corridor.

TRAVEL CORRIDOR EVALUATION: INTERCITY TRAVEL DEMAND

The second category of criteria used in the evaluation of Texas intercity travel corridors is an estimation of the demand for intercity travel along each of the study corridors. Table 5-5 lists the four criteria selected by the research team to evaluate the demand for travel along the project's study corridors.

Table 5-5. Intercity Travel Demand Criteria for Project 0-5930 Evaluation.

Ref.	Criteria	Units
D.1	Average Corridor AADT, 2006	Vehicles/Day
D.2	Annual Growth in Average Corridor AADT, 1997-2006	Percent
D.3	Air Passenger Travel between Corridor Airports, 2006	Persons
D.4	Annual Growth in Air Passenger Travel between Corridor Airports, 1996-2006	Persons/Mile

The criteria selected to evaluate the demand for intercity travel along the study corridors focus on the demand for automobile travel and air travel. While other modes are available in the form of intercity passenger rail and bus, travel by these modes comprises only a small portion of all intercity travel in Texas. Data for the intercity travel demand criteria for each study corridor can be found in Table 5-6.

Two of the intercity travel demand criteria are related to measures of intercity automobile travel along the subject highways as measured by the average annual daily traffic along each intercity travel corridor in this study. The first criterion (D.1) is the AADT for each study corridor for the year 2006, which is included to evaluate existing highway traffic conditions on each travel corridor. The second criterion (D.2) is the percentage annual growth in the travel corridor AADT between 1997 and 2006, which is included with the purpose of being an estimate of the growth in demand for highway travel in each travel corridor. AADT data for this project were obtained from the TxDOT RHiNo database. For each of the two AADT-based criterion, a higher value indicates a greater demand for travel in an intercity corridor and thus indicates a greater need for investment in intercity rail or express bus service in that corridor. These AADT values include traffic external to the study corridors (i.e., vehicles that are not traveling between the corridor endpoint cities). Despite this drawback, the research team still determined that these two AADT-based measures were appropriate planning-level surrogate measures of travel demand in an intercity corridor.

Table 5-6. Intercity Travel Demand Evaluation Data for Project 0-5930 Study Corridors.

Corridor	D.1*	D.2*	D.3*	D.4*
AMALBB	8,684	1.68%	20	-95.45%
DFWABI	20,777	2.96%	606,870	-2.75%
DFWAMA	15,252	2.91%	260,240	-1.46%
DFWHOU	53,634	4.57%	1,643,640	-2.45%
DFWLBB	16,434	2.36%	336,520	-1.28%
DFWLOU	32,713	2.70%	4,170	-22.65%
DFWSAT	88,153	2.91%	1,407,110	-1.24%
DFWSNA	12,884	3.41%	364,710	-2.94%
DFWTXK	29,070	2.30%	3,590	-12.38%
HOUAUS	36,441	3.44%	217,520	-6.90%
HOUBMT	72,525	2.27%	800	-14.77%
HOUBVN	32,689	2.47%	342,680	-3.59%
HOUSAT	54,071	2.91%	265,760	-4.64%
HOUTXK	28,616	2.94%	1,300	-23.08%
HOUWAC	33,112	3.85%	2,070	-21.56%
SATBVN	24,829	2.65%	74,620	-2.61%
SATELP	20,222	3.14%	132,890	-0.58%
SATLRD	28,689	5.10%	77,410	-3.24%

* Criteria D.1-D.4 are defined in Table 5-5 and in the text.

The other two intercity travel demand criteria are measures of the demand for intercity air travel in the study corridors. The first criterion (D.3) is the total number of airline trips between airport pairs within a travel corridor in 2006. The second criterion (D.4) is the growth in the total number of airline trips between airport pairs within a travel corridor between 1996 and 2006. These data were obtained from the research team's analysis of the Bureau of Transportation Statistics' Airline Origin and Destination Survey (DB1B), which is a 10 percent sample of airline tickets sold by reporting carriers. The raw number of tickets for each commercial airport pair in the state were identified, and the number of tickets for each airport pair in a corridor were added together to find the total air travel for a particular corridor. This value was multiplied by 10 to determine the actual number of air passengers for each corridor. As with the AADT-based intercity demand measures, a higher value for each of the air travel demand criterion indicates a greater need for the provision of intercity rail or express bus in a corridor.

TRAVEL CORRIDOR EVALUATION: INTERCITY TRAVEL CAPACITY

The third category of criteria used in the evaluation of Texas intercity travel corridors is an approximation of the intercity travel capacity of each of the study corridors. The research team selected four criteria to evaluate each study corridor's intercity travel capacity, shown in Table 5-7.

Table 5-7. Intercity Travel Capacity Criteria for Project 0-5930 Evaluation.

Ref.	Criteria	Units
C.1	Average volume-capacity ratio on subject highways in corridor, 2002.	Ratio
C.2	Average percent trucks on subject highways in corridor, 2002.	Percent
C.3	Load factor on corridor flights, weighted by boarding passengers, 2006.	Ratio
C.4	Average number of corridor flights per day, 2006.	Flights/Day

As with the criteria for measuring intercity travel demand, the criteria selected for evaluating intercity travel capacity are focused on the capacity of the highway and air modes. Data for the intercity travel capacity criteria can be found in Table 5-8.

The first two intercity travel capacity criteria are measures of roadway travel capacity. The first intercity travel capacity criterion (C.1) is the average volume-capacity ratio on subject highways along each travel corridor. The second intercity travel capacity criterion (C.2) is the average percentage of trucks traveling on highway segments along each study corridor. Data for these measures were derived from the research team's analysis of the Freight Analysis Framework utilizing its most recent (2002) data. While volume-capacity ratio is a traditional measure of highway capacity, the percentage trucks measure is included as more of a measure of "impedance" to intercity travel, that is, if more trucks are on an intercity corridor it is more difficult to introduce additional intercity travelers into that mix. For each of these measures of intercity travel capacity, a high value for a corridor indicates a deficiency in travel capacity along that corridor and thus a greater need for the provision of intercity rail or express bus services in that corridor.

Table 5-8. Intercity Travel Demand Evaluation Data for Project 0-5930 Study Corridors.

Corridor	C.1*	C.2*	C.3*	C.4*
AMALBB	0.174	10.44%	0.000	0
DFWABI	0.284	39.12%	0.663	67
DFWAMA	0.309	27.00%	0.620	45
DFWHOU	0.602	19.29%	0.710	130
DFWLBB	0.308	32.55%	0.686	47
DFWLOU	0.493	27.45%	0.685	15
DFWSAT	0.631	14.46%	0.755	155
DFWSNA	0.236	27.52%	0.689	36
DFWTXK	0.477	30.28%	0.555	12
HOUAUS	0.602	10.95%	0.717	35
HOUBMT	0.689	17.79%	0.621	9
HOUBVN	0.568	11.53%	0.706	73
HOUSAT	0.792	14.26%	0.712	38
HOUTXK	0.437	18.18%	0.480	7
HOUWAC	0.645	11.59%	0.572	20
SATBVN	0.462	13.63%	0.647	3
SATELP	0.249	28.86%	0.696	7
SATLRD	0.439	14.28%	0.647	3

* Criteria C.1-C.4 are defined in Table 5-7 and in the text.

The other two measures that were selected by the research team to evaluate the travel capacity of statewide intercity corridors are measures of air travel capacity. The first air travel capacity criterion (C.3) is the load factor on all flights between airports located along a travel corridor. This is computed as the percentage of seats on an aircraft that are occupied for a particular segment of flight; for corridors with multiple airport pairs, the corridor average was weighted by the number of passengers on each route. A higher load factor for a corridor indicates that access to air service for intercity flights is more difficult and thus would indicate a greater need for investment in an intercity rail or express bus service in that corridor. The second air travel capacity criterion (C.4) is the average number of scheduled flights per day between airports in a corridor. Values for these air travel measures were computed from the research team's analysis of flight segment data obtained from the Bureau of Transportation Statistics' Air Carrier Statistics (T-100) form data for the year 2006. A higher average number of corridor flights per day shows that air travel is easily accessible on that corridor; therefore, corridors with fewer average flights per day are locations where improved intercity travel options are needed.

TRAVEL CORRIDOR EVALUATION: CORRIDOR RANKING SCHEMES

Having established the criteria that will be used to evaluate the intercity transit needs for the study corridors with the help of the PMC, the next task for the research team was to develop the proper scheme for applying these criteria in order to compare the intercity transit needs of the various study corridors. The goal of this process is to develop a method for ranking the study corridors using the selected criteria with the desired output being a list of the study corridors ranked in order of their intercity transit needs. This output would be one of the many tools that the research team will then use to guide the development of an intercity rail and express bus network for the state. Development of this output consisted of two independent tasks: the assignment of weights to each category of criteria or individual criteria and the selection of a ranking scheme.

A total of 14 criteria were selected to evaluate the intercity travel corridors in this project. As these criteria were used to evaluate the transit needs of the study corridors, the research team suggested that some consideration should be made for the relative importance of the larger categories of evaluation criteria categories (population and demographics, demand, and capacity) and the relative importance of the individual criterion within a particular category. The project researchers discussed what weightings could be applied to different criteria, but during a meeting with the PMC it was directed that all of the categories and the criteria should be equally weighted.

There are many schemes that can be employed to rank continuous data such as the values representing the evaluation criterion. The research team suggested two of these as possible methods to analyze the intercity travel corridors in this study. The first potential ranking scheme was an absolute ranking (in this case, 1 to 18) of each travel corridor by evaluation criteria. Under this scheme, the corridor with the greatest need for improved intercity transit (for each individual criterion) is assigned a score of one; the second greatest need assigned a score of two, and so on until all corridors have been assigned a score. These scores are then summed for each study corridor across all evaluation criteria to determine a composite score for each travel corridor. The travel corridors are ranked on their composite scores from lowest to highest. The travel corridor with the lowest composite score is the travel corridor with the greatest need for investment in intercity rail or express bus. The travel corridor with the highest composite score is the travel corridor where there is very little need for the investment in additional intercity travel alternatives. Table 5-9 shows the output of the absolute ranking scheme with equal weighting assigned to each evaluation category. The individual scores in each of the three categories of criteria and the composite score for each study corridor are provided.

Table 5-9. Evaluation of Project 0-5930 Study Corridors, Absolute Ranking Method.

Rank	Corridor	Population/ Demographic Criteria	Demand Criteria	Capacity Criteria	Composite
1	Dallas/Fort Worth to Houston	1.278	1.000	2.833	5.111
2	Dallas/Fort Worth to San Antonio	1.278	1.167	2.833	5.278
3	Dallas/Fort Worth to El Paso via Abilene	1.833	2.500	3.417	7.750
4	Houston to Austin	2.500	2.500	2.917	7.917
5	Houston to San Antonio	3.111	2.583	2.417	8.111
6	Dallas/Fort Worth to El Paso via San Angelo	2.000	2.833	3.333	8.167
7	Dallas/Fort Worth to Lubbock via Abilene	1.778	3.250	3.167	8.194
8	Dallas/Fort Worth to Louisiana Border	2.444	4.000	2.583	9.028
9	Houston to Brownsville via Corpus Christi	3.056	3.083	3.667	9.806
10	San Antonio to Brownsville via Laredo	4.278	2.583	3.000	9.861
11	Dallas/Fort Worth to Amarillo via Wichita Falls	2.778	3.250	3.917	9.944
12	Dallas/Fort Worth to Texarkana	2.722	4.333	2.917	9.972
13	Houston to Waco via Bryan/College Station	3.722	3.250	3.500	10.472
14	San Antonio to El Paso	5.444	2.583	2.500	10.528
15	Houston to Beaumont	4.000	4.167	2.583	10.750
16	San Antonio to Brownsville via Corpus Christi	4.778	3.583	3.083	11.444
17	Houston to Texarkana	3.667	4.333	3.500	11.500
18	Amarillo to Midland (Odessa) via Lubbock	5.333	6.000	4.583	15.917

The second potential ranking scheme developed by the project research team was an index ranking scheme. Under this scheme, the travel corridor with the most favorable outcome for the need for intercity rail or express bus in a particular criterion is assigned a score of one. The other 17 study corridors are then assigned a score based on the location of each corridor's value for that particular criterion relative to the value of the most favorable travel corridor. For example, if one corridor had a value of 10 for a particular criterion and another corridor had a value of 5 for the same criterion, then the first corridor would be assigned a score of 1.000 (assuming this was the highest-ranked corridor in that criterion) and the second corridor would be assigned a value of 0.500.

Table 5-10 shows the output of the index ranking scheme with equal weighting assigned to each evaluation criterion, with all three categorical scores and the composite score provided. As with the absolute ranking scheme, the individual scores for each criterion within a travel corridor are summed to determine a composite score for each study corridor. For this scheme, the travel corridor with the highest composite score is the travel corridor that has the greatest need for improved intercity rail and express bus service. This scheme is differentiated from the absolute ranking scheme in that it incorporates not only the relative positions of each corridor within a particular criterion, but also the relative difference between each corridor. The TxDOT PMC selected the index ranking method as the most appropriate one for this project and it has been used in subsequent stages of analysis.

Table 5-10. Evaluation of Project 0-5930 Study Corridors, Index Ranking Method.

Rank	Corridor	Population/ Demographic Criteria	Demand Criteria	Capacity Criteria	Composite
1	Dallas/Fort Worth to San Antonio	0.265	0.241	0.181	0.687
2	Dallas/Fort Worth to Houston	0.271	0.228	0.183	0.683
3	Dallas/Fort Worth to El Paso via Abilene	0.220	0.116	0.188	0.524
4	Dallas/Fort Worth to Lubbock via Abilene	0.212	0.109	0.179	0.501
5	Houston to San Antonio	0.179	0.123	0.194	0.496
6	Houston to Beaumont	0.187	0.109	0.188	0.484
7	Houston to Austin	0.204	0.109	0.168	0.481
8	Dallas/Fort Worth to Louisiana Border	0.199	0.077	0.192	0.468
9	Dallas/Fort Worth to El Paso via San Angelo	0.201	0.103	0.162	0.465
10	Dallas/Fort Worth to Amarillo via Wichita Falls	0.185	0.108	0.160	0.454
11	Houston to Brownsville via Corpus Christi	0.185	0.102	0.163	0.450
12	Dallas/Fort Worth to Texarkana	0.194	0.069	0.183	0.446
13	San Antonio to Brownsville via Laredo	0.131	0.129	0.176	0.437
14	Houston to Waco via Bryan/College Station	0.173	0.097	0.160	0.430
15	San Antonio to El Paso	0.091	0.161	0.176	0.428
16	Houston to Texarkana	0.173	0.077	0.150	0.400
17	San Antonio to Brownsville via Corpus Christi	0.110	0.089	0.177	0.376
18	Amarillo to Midland (Odessa) via Lubbock	0.067	0.036	0.124	0.227

CHAPTER 6: EXISTING TRANSIT SERVICES IN TEXAS

This chapter describes the current intercity rail and bus transit services in the state and summarizes local transit services and intermodal facilities in each of Texas' 24 planning regions. The research team collected the information contained in this chapter and the Appendix during in Tasks 1 and 3 of the research project.

INTERCITY PASSENGER RAIL SERVICE

Amtrak currently operates three routes through Texas—the Heartland Flyer, the Sunset Limited, and the Texas Eagle, as described in Table 6-1 and shown graphically in Figure 6-1. Amtrak also provides through ticketing and coordinated schedules for rail passengers to additional destinations via connecting bus service known as Thruway Motorcoach service, which is also described in Table 6-1.

Table 6-1. Current Amtrak Routes and Connecting Bus Service in Texas.

Route Name	Description
Heartland Flyer	Operates between Fort Worth and Oklahoma City, OK, once daily in each direction, southbound in the morning, returning northbound in the evening.
Sunset Limited	Operates three days per week in each direction between New Orleans, LA, and Los Angeles, CA. Westbound stops: Beaumont and Houston on Mon, Weds, Fri. San Antonio, Del Rio, Sanderson, Alpine, and El Paso on Tues, Thurs, and Sat. Eastbound stops: El Paso, Alpine, Sanderson, Del Rio, and San Antonio on Mon, Thurs, and Sat. Houston and Beaumont on Tues, Fri, and Sun. Thruway Motorcoach connections are provided to Galveston via Houston, Brownsville, and Laredo via San Antonio, and Albuquerque, NM, via El Paso.
Texas Eagle	Operates between Chicago, IL, and San Antonio daily and between Chicago and Los Angeles, CA, three days per week in conjunction with the Sunset Limited. Stations west of San Antonio are served on the same schedule as the Sunset Limited. Thruway Motorcoach connections are provided to Shreveport and Houston via Longview, Ft. Hood, and Killeen via Temple, Brownsville, and Laredo via San Antonio, and Albuquerque, NM, via El Paso.

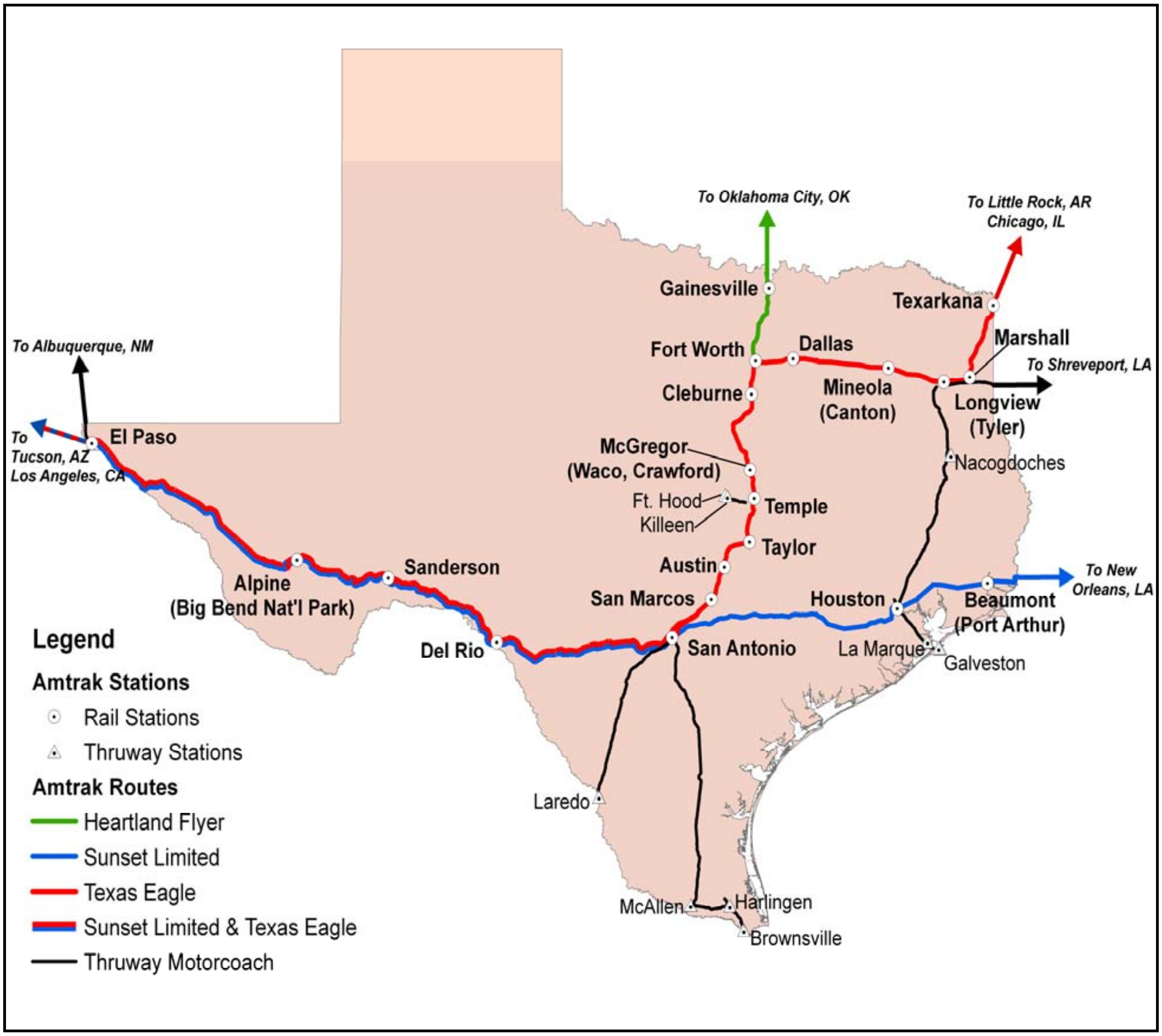


Figure 6-1. Texas Amtrak Passenger Rail and Thruway Motorcoach Service.

Detailed Amtrak ridership data were provided to the research team by Amtrak in late 2007 regarding origin and destination pairs on the intercity passenger rail network in Texas for the period from September 2006 to August 2007. Analysis of these data shows the following facts. The total number of passengers with a destination in Texas during this period was 214,424. Of these trips only 49,341, or approximately 23 percent, originated and ended within the state. This indicates that the remaining 77 percent of trips that ended somewhere within the state of Texas originated outside of the state.

Part of this number can be accounted for easily by the success of the Heartland Flyer. The origin-destination pair of Fort Worth and Oklahoma City served by the Heartland Flyer had the highest ridership of any pair at 35,663 during this period. Other interstate trips also rank high in the most popular city pairs as shown in Table 6-2. In fact, the first five city pairs with one endpoint in Texas originate or end at a location outside the state.

Table 6-2. Most Popular (Ridership >3000) Amtrak Intercity Passenger City-Pairs with at Least One Endpoint in Texas for the Period Sept. 2006-Aug. 2007.

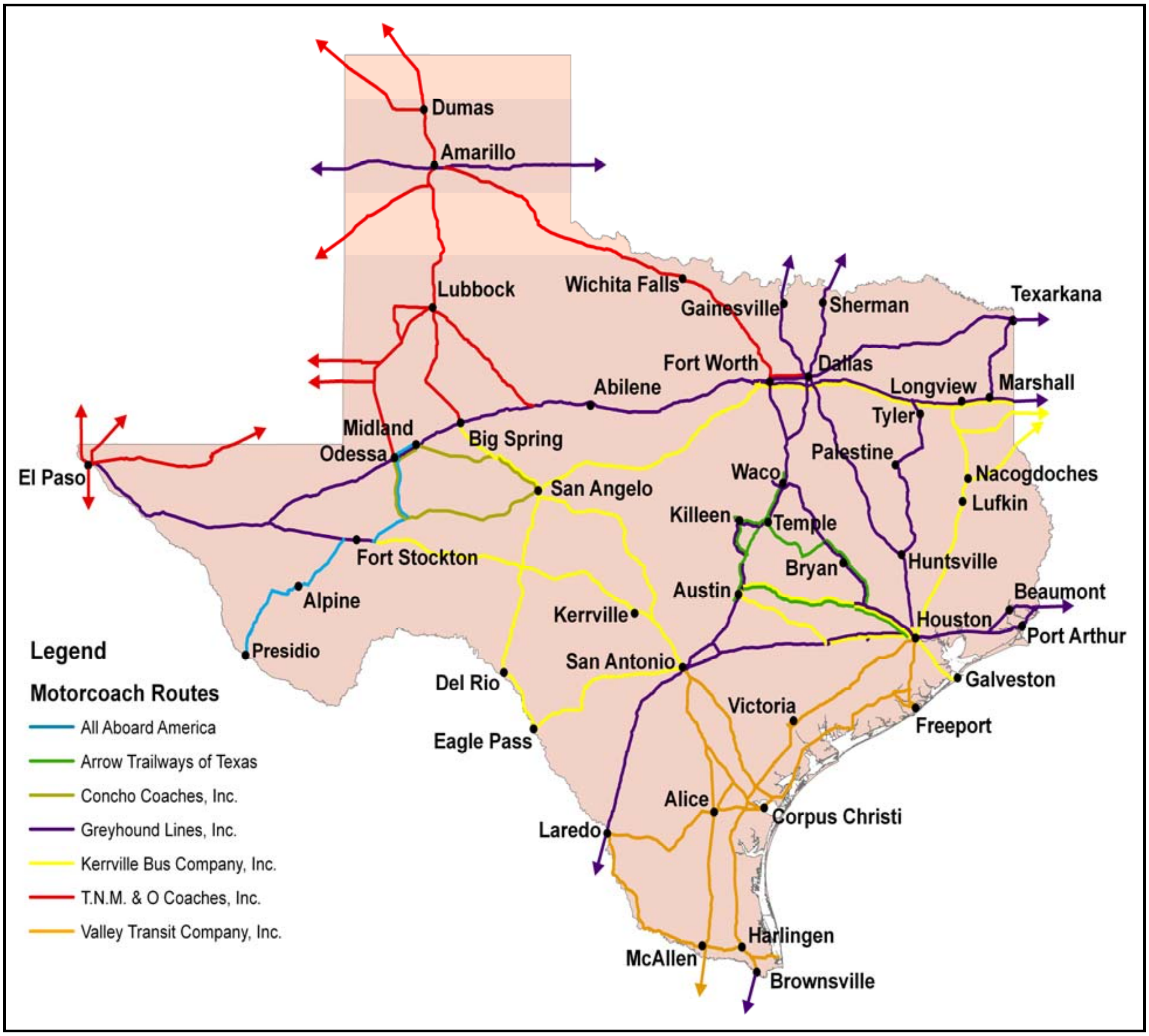
Train	Station Codes	Station Names	Ridership
Heartland Flyer	FTW-OKC	Fort Worth, TX - Oklahoma City, OK	35,663
Texas Eagle	CHI-LVW	Chicago, IL - Longview, TX	10,132
Texas Eagle	CHI-DAL	Chicago, IL - Dallas, TX	9,292
Texas Eagle	CHI-SAS	Chicago, IL - San Antonio, TX	8,144
Heartland Flyer	FTW-NOR	Fort Worth, TX - Norman, OK	7,924
Texas Eagle	FTW-SAS	Fort Worth, TX - San Antonio, TX	7,192
Sunset Ltd.	LAX-SAS	Los Angeles, CA - San Antonio, TX	6,391
Texas Eagle	AUS-FTW	Austin, TX - Fort Worth, TX	5,721
Texas Eagle	CHI-FTW	Chicago, IL - Fort Worth, TX	4,942
Sunset Ltd.	HOS-LAX	Houston, TX - Los Angeles, CA	4,869
Sunset Ltd.	HOS-NOL	Houston, TX - New Orleans, LA	3,934
Texas Eagle	AUS-CHI	Austin, TX - Chicago, IL	3,909
Heartland Flyer	GLE-OKC	Gainesville, TX - Oklahoma City, OK	3,675
Heartland Flyer	ADM-FTW	Ardmore, OK - Fort Worth, TX	3,282
Sunset Ltd.	ELP-LAX	El Paso, TX - Los Angeles, CA	3,120

INTERCITY BUS SERVICE

The bus service in Texas provides extensive coverage throughout the state. The map presented in Figure 6-2 represents the existing intercity bus services provided in Texas, as indicated by the Texas Bus Association, Inc., an industry organization representing several major intercity bus service providers. The existing bus service travels over almost 8,000 miles of Texas roadways and services an estimated 190 stations.

Greyhound Lines, Inc. provides coordinated schedules and through ticketing services for passengers along routes served by the following companies:

- All Aboard America;
- Kerrville Bus Company, Inc.;
- Valley Transit Company, Inc.; and
- T.N.M. & O Coaches, Inc.



Source: TTI Map created in GIS based on information provided by Texas Bus Association, Inc.

Figure 6-2. Intercity Scheduled Motorcoach Service Local Intercity Transit Services.

The remaining two lines shown in Figure 6-2, Arrow Trailways of Texas and Concho Coaches, do not participate in this arrangement with Greyhound; therefore, passengers wishing to travel on these carriers must obtain schedules and purchase tickets from the individual bus company.

In addition to the U.S.-based intercity carriers listed for each region, several Mexican intercity bus companies provide service in the state, particularly along the Laredo-Dallas corridor. El Conejo, El Expreso, Tornado, Autobus Adame, and Americanos USA are a few of the carriers operating in Texas cities. Finding route and schedule information for these carriers is more difficult than for the larger U.S.-based carriers; they advertise primarily in Spanish-language newspapers and only some of them provide information on the Web. Table 6-3 shows some of the Texas cities served by the Mexico-based carriers.

Table 6-3. Mexican Bus Companies and Cities Served in Texas.

Bus Company	Cities Served
Tornado Bus Company	• Austin • Brownsville • Dallas • El Paso • Houston • Laredo • McAllen • San Antonio • Waco
El Conejo Bus Company	• Dallas • El Paso • Laredo
El Expreso Bus Company	• Brownsville • Houston • Laredo • McAllen • Nacogdoches • Texarkana
Autobuses Americanos	• Laredo • San Antonio • Austin • Dallas • Fort Worth • Houston • El Paso
Autobus Adame	• Brownsville • Hidalgo • Laredo • San Antonio • Houston

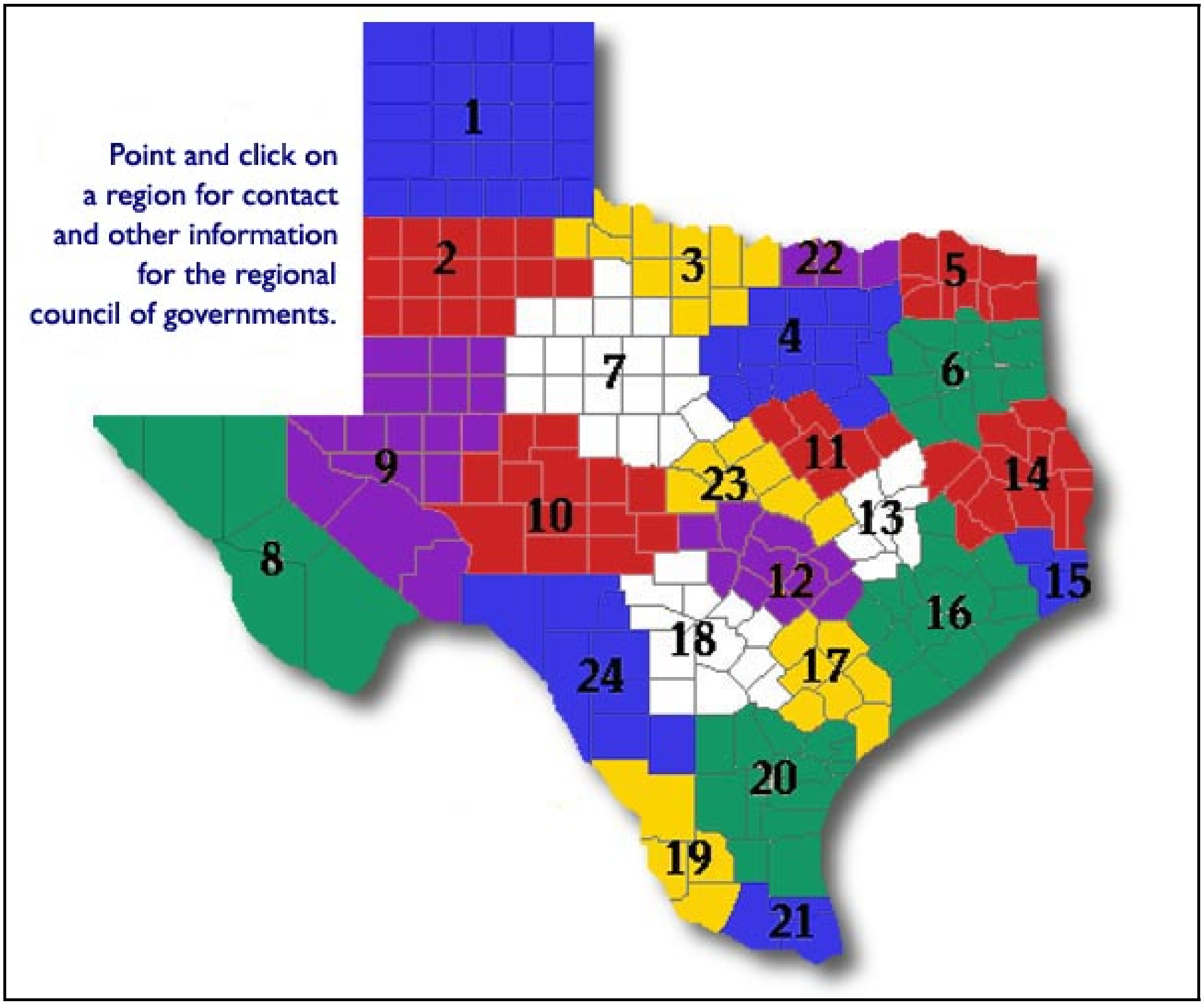
Most of the Mexico-based carriers continue intercity service further north and east within the U.S. beyond Texas. El Expreso, for instance, has stops throughout the southeastern states and a route that travels north to Chicago, Illinois. Tornado also travels to Chicago, as well as to

Waukeegan, Illinois; Milwaukee, Wisconsin; Nashville, Tennessee; Charlotte, North Carolina; Atlanta, Georgia; and Fort Myers, Florida. Autobuses Americanos U.S. destinations include El Paso to Phoenix and Los Angeles, Kansas City; El Paso to Denver via Albuquerque; Laredo to Chicago via San Antonio, Dallas, and Kansas City; and Laredo to Houston via San Antonio. Another route connects El Paso to Dallas allowing travel from the western U.S. to Chicago. These U.S. routes connect to an extensive network within Mexico. Additional destinations in the southeastern U.S. such as Atlanta, the Carolinas, and Florida are served on a more infrequent basis or through partnerships with other bus companies.

PUBLIC PASSENGER TRANSIT SERVICES IN TEXAS

There are currently seven metropolitan transit systems, 29 urban transit systems, and 39 rural transit providers operating in Texas. In 2006, public transit accounted for 247 million trips statewide. Local transit plans, regional transit coordination plans, and metropolitan plans were examined for information about intercity transit availability, local and commuter transit services, and intermodal transit facilities.

Beginning in the fall of 2005, 24 planning regions in the state began development of regional transit coordination plans, with the intent of improving and expanding transit services to Texans. Several of these regional plans addressed intercity and other regional travel via coordination among not only local transit providers, but also between publicly funded local providers and private-sector intercity providers such as Greyhound and Amtrak. A map of the regions can be found in Figure 6-3.



Source: http://txregionalcouncil.org/display.php?page=regions_map.php

Figure 6-3. Texas Regional Council's Map of 24 Planning Regions in Texas.

Table 6-4 summarizes the intercity and local transit services in each of these planning regions. Several regions in the state already actively support or pursue increased intercity transit options, providing connecting service to existing intercity providers such as Amtrak and Greyhound, and/or developing commuter rail, bus rapid transit, or other regional transit services. Some of these areas are described in more detail in the following sections. The Appendix provides detailed information on intercity and local transit services in all 24 planning regions.

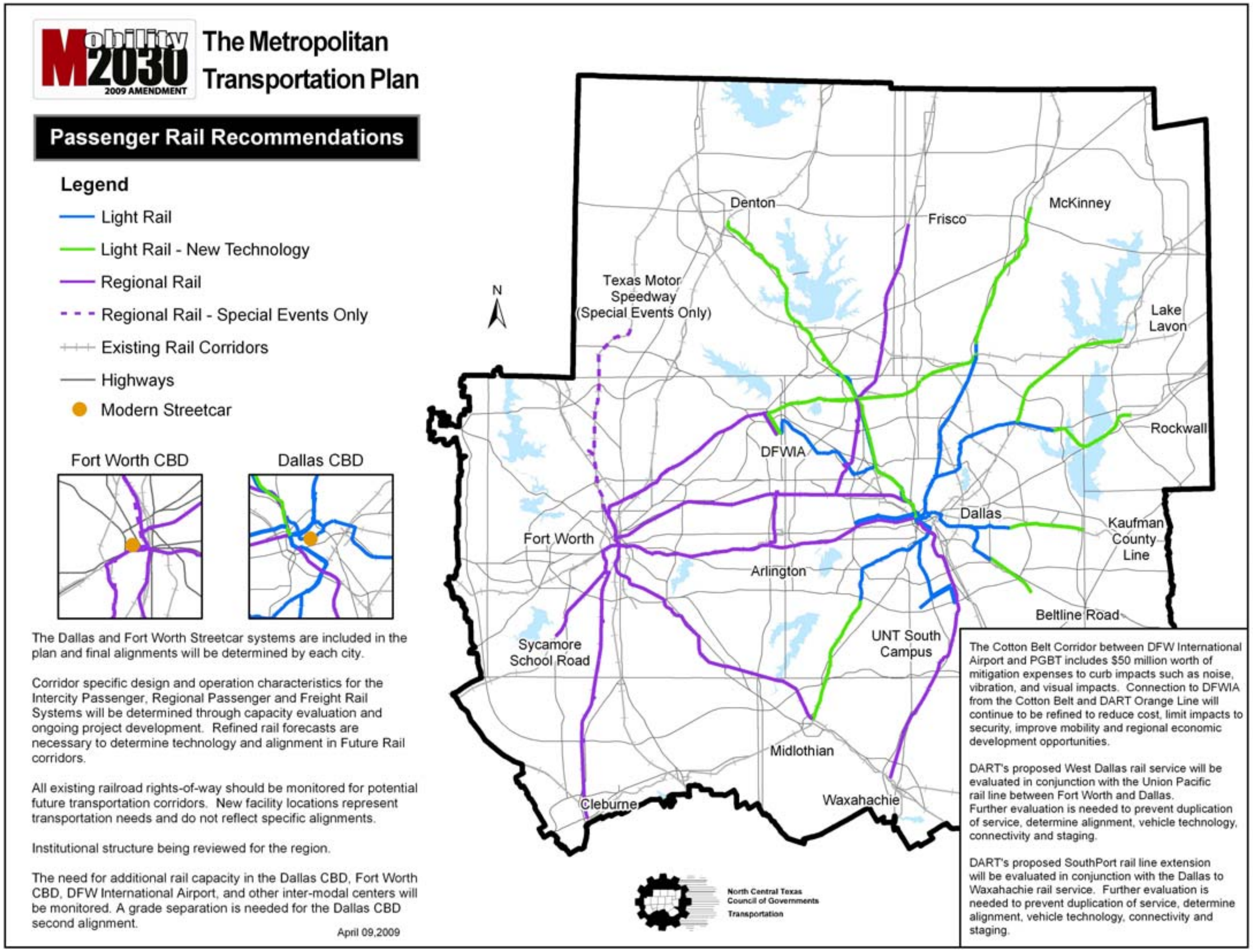
Table 6-4. Transit Services in 24 Planning Regions in Texas.

Region Number	Major Urban Areas in Region	Intercity Service (* indicates proposed new intercity rail service)	Local Transit Service
1	Amarillo	Greyhound	Amarillo City Transit, Panhandle Transit
2	Lubbock, Plainview	Greyhound	Citibus, SPARTAN, CapTrans
3	Wichita Falls, Gainesville	Amtrak, Greyhound	Wichita Falls Transit, TAPS, Rolling Plains Management Rural Transit
4	Dallas, Fort Worth, Arlington, Cleburne, Corsicana, Denton	Amtrak, Greyhound, Kerrville Bus Company, Trinity Railway Express, City County Transportation Express Bus, Regional Rail Corridors*	DART, The T (Fort Worth), Denton County Transportation Authority, Cletran, Collin County Area Regional Transit
5	Texarkana	Greyhound	T-Line, Ark-Tex Rural Transit District
6	Tyler, Longview	Amtrak, Greyhound	Tyler Transit, Longview Transit, East Texas Rural Transit
7	Abilene, Sweetwater	Greyhound	Citylink, CARR, SPARTAN, Double Mountain Coach
8	El Paso	Amtrak, Greyhound, All Aboard American, Rail Runner extension*	Sun Metro
9	Midland, Odessa	Greyhound	EZ Rider, TRAX
10	San Angelo, Kerrville	Kerrville Bus Lines, Concho Coaches	Thunderbird Transit, San Angelo Street Railroad Company
11	Waco	Greyhound	Waco Transit, Waco Streak, HOTCOG Rural Transit
12	Austin, Bastrop, Round Rock, Georgetown, San Marcos	Amtrak, Greyhound, Arrow Trailways, Kerrville Bus Company, Austin-San Antonio Commuter Rail*	Capital Metro, CARTS
13	Bryan, College Station, Navasota, Brenham	Greyhound	Brazos Transit
14	Crockett, Lufkin, Nacogdoches	Amtrak (bus service), Greyhound, Kerrville Bus Company	Brazos Transit
15	Beaumont, Port Arthur	Amtrak, Greyhound	Beaumont Municipal Transit, Port Arthur Transit, SETT Rural Transit
16	Houston, Galveston, Conroe, Katy	Amtrak, Greyhound/Valley Transit, Kerrville Bus Company, Galveston-Houston Commuter Rail*	METRO, METRORail, Connect Transportation, Island Transit, Fort Bend County Transit, Brazos Transit
17	Victoria	Valley Transit/Greyhound	Victoria Transit, RTransit
18	San Antonio, Kerrville	Amtrak, Greyhound, Austin-San Antonio Commuter Rail*	VIA Transit, CARTS, Alamo Area Regional Transit
19	Laredo	Amtrak (bus), Greyhound	El Metro, El Aguila, Rainbow Lines
20	Corpus Christi, Kingsville	Greyhound	The B (Corpus Christi), rural transit services in surrounding counties
21	Brownsville, Harlingen, McAllen	Valley Transit/Greyhound, Valley Commuter Rail District*	Harlingen Express, Brownsville Urban Transit, McAllen Express
22	Sherman, Denison	Greyhound	TAPS
23	Killeen, Temple, Fort Hood	Amtrak, Arrow Trailways	Hill Country Transit
24	Del Rio, Eagle Pass, Uvalde	Kerrville Bus Company, Greyhound	Southwest Transit, Del Rio Transit

Region 4: North Central Texas (Dallas/Fort Worth and Vicinity)

The North Central Texas region covers 16 counties and includes the cities of Dallas, Fort Worth, and Arlington, among many others. Extensive intercity and local transit options are available, particularly across the Dallas/Fort Worth metroplex. Services include:

- Amtrak's Heartland Flyer and Texas Eagle routes both stop in Fort Worth; the Texas Eagle also stops at Union Station in Dallas and in Cleburne and the Heartland Flyer stops in Gainesville.
- Greyhound makes several stops in the area, including Union Station and three additional stops in Dallas and two stops in Fort Worth. Additional Greyhound stations are located in Arlington, Corsicana, Denton, Dublin, Garland, Lewisville, Richardson, Stephenville, Terrell, Waxahachie, and Weatherford.
- The Kerrville Bus Company also provides intercity service out of Dallas and Fort Worth. Additional intercity/regional bus service is provided by the privately owned City County Transportation Express Bus route, connecting the cities of Cleburne, Joshua, Burleson, and Fort Worth.
- The Trinity Railway Express (TRE), a 35-mile commuter rail service with 10 stations connects downtown Dallas and downtown Fort Worth, via the mid-cities, and DFW International Airport via Centreport.
- Additional rail transit service may be coming to the area as a result of Rail North Texas, the latest rail planning effort to identify transit needs in the North Central Texas region. North Central Texas Councils of Government (NCTCOG) built on its previous efforts of the Regional Transit Initiative and the Regional Rail Corridor Studies focusing on transit needs. Proposed rail corridors would total over 250 miles, with passenger rail service reaching as far as Cleburne, Midlothian, Waxahachie, Denton, McKinney, and North Frisco, with numerous stops throughout the region. (See Figure 6-4.)



Source: http://www.nctcog.org/trans/mtp/2030/Railrecommendationsmap.pdf

Figure 6-4. Map of Existing and Potential Rail Service in NCTCOG Area.

Local Transit Services in the Region

Dallas Area Rapid Transit (DART) serves the cities of Addison, Carrollton, Cockrell Hill, Dallas, Farmers Branch, Garland, Glenn Heights, Highland Park, Irving, Richardson, Rowlett, Plano, and University Park. DART's services include 45 miles of light rail and 130 bus routes. DART Light Rail connects with the TRE for service to the DFW International Airport and to Fort Worth. DART's 2030 system plan includes an additional 43 miles of light rail service, 77 miles of enhanced bus service corridors, and 20 miles of rapid bus service corridors.

The Fort Worth Transit Authority (The T) offers fixed route and express bus service within Fort Worth, plus a "Rider Request" demand-response circulator service in Richland Hills. Many of The T's bus routes connect with the TRE at either the Intermodal Transportation Center or the T&P Station (historic former Texas and Pacific station). The T's strategic plan includes expanded regional bus and rail service, including a TRE express train, potential bus rapid transit corridors, and high-capacity circulators for downtown and uptown Fort Worth. The T is also developing a new commuter rail corridor called the "Southwest to Northeast Corridor" or "SW2NE Rail" that will connect southwestern Fort Worth to the northern end of the DFW airport along existing freight rail corridors through North Richland Hills, Colleyville, and Grapevine. At DFW the line will connect with DART Light Rail and planned commuter rail service along the Cotton Belt Line from Dallas. SW2NE Rail is currently in the environmental study stage and is planned to enter service in the 2012-2013 timeframe.

The Denton County Transportation Authority (DCTA) provides fixed-route service in the cities of Denton, Lewisville, and Highland Village. DCTA's Commuter Express bus service travels from park-and-rides in Denton and Lewisville to downtown Dallas, the DART North Carrollton Transit Center, Texas Women's University, and the University of North Texas. A regional passenger rail line connecting Carrollton and Denton began construction in June 2009. The line will connect to the DART Northwest Corridor rail line, which is planned to terminate in Carrollton.

Handitran provides demand-response paratransit service for seniors and persons with disabilities in the cities of Arlington and Pantego. Handitran also shares transfer points with The T and with two of TRE's stations. Cletran provides urban transit service with the Cleburne city limits and connects with Amtrak and with City County Transportation regional bus at the

Cleburne Intermodal Terminal. Collin County Area Regional Transit (CCART) provides demand-response transit service in Collin County, fixed-route transit in the cities of McKinney and Plano, and DART-On-Call flex-route service in the city of Plano.

Multimodal stations in the area include Union Station in Dallas (DART light rail and bus, TRE commuter rail, Amtrak, close to Greyhound station), the Fort Worth Intermodal Transportation Center (The T, TRE, Amtrak, taxi), and the Cleburne Intermodal Terminal (Amtrak, Cletran urban bus, City County Transportation regional express bus).

Regions 12 and 18: Capital Area and Alamo Area (Austin-San Antonio Corridor)

While these two metropolitan areas and their surrounding counties have separate transit providers and service areas, the amount of intercity travel between Austin and San Antonio creates demand for intercity transit services. Planned intercity services for this region include the Austin-San Antonio Commuter Rail, which will potentially travel from Georgetown to San Antonio (110 miles, with 13 stations), as well as a commuter rail line connecting downtown Austin with Leander, which is now scheduled to open by late 2009.

Amtrak stops in Austin, San Marcos, and San Antonio. All three stops are on Amtrak's Texas Eagle Route, which travels north to Dallas/Fort Worth and on to Chicago (or connects in Dallas/FortWorth to the Heartland Flyer route to continue to Oklahoma City). San Antonio is also on Amtrak's Sunset Limited route, which extends east to New Orleans and west to Los Angeles. (Amtrak service east of New Orleans is currently suspended.) Greyhound has several stops throughout the area, including terminals in Austin, Bastrop, Kerrville, San Antonio, San Marcos, and Round Rock. Arrow Trailways (terminal in Round Rock) and the Kerrville Bus Company (terminal in Bastrop) are two other intercity bus providers that serve the area. Commuter bus services also provide connections between cities in this region.

Local Transit Services in the Region

The Capital Metropolitan Transportation Authority (Capital Metro) provides urban transit service in the cities of Austin, Manor, San Leanna, Leander, Jonestown, Lago Vista, Point Venture, Volente, and some of the incorporated areas of Travis and Williamson Counties. A variety of bus services serve different travel markets; options include local, limited-stop and "flyer," crosstown, and express bus routes, feeder routes that connect selected neighborhoods to Capital Metro Transit Centers, airport shuttles, downtown circulators, and a dial-a-ride route serving Lago Vista, Jonestown, and Leander. Planned future transit services within the Capital Metro service area include 10 new rapid bus lines and 10 new or expanded express bus routes.

The Capital Area Rural Transportation System (CARTS) offers commuter bus service into Austin from Smithville and from Bastrop. The CARTS County Connector bus route links Bastrop, Elgin, and Smithville. CARTS has additional express bus routes planned to link destinations in Hays and Williamson Counties with Travis County destinations. CARTS has a long history of partnering with intercity bus services and is developing service routes specifically connecting to intercity transit services in Round Rock, San Marcos, and Bastrop. The first of these routes began service in late 2008. In addition to intercity and feeder service, CARTS provides general transportation services throughout Williamson, Hays, Travis, Bastrop, Blanco, Burnet, Caldwell, Fayette, and Lee Counties.

VIA Metropolitan Transit (VIA) provides public transportation services to the City of San Antonio, 13 suburban cities and the unincorporated areas of Bexar County. Services currently include 85 fixed routes and four downtown circulator routes. "Starlight" late-night service is provided on a demand-response basis within Loop 410 and the Medical Center area between 1:00 and 4:00 a.m. VIA also sponsors commuter vanpools in partnership with Enterprise Rent-a-Car; some of these vanpools travel between San Antonio and Austin. Finally, the VIATrans Paratransit system provides demand-response service to riders with disabilities. Bus Rapid Transit (BRT) is among the proposed transit options described in the San Antonio Mobility 2030 Plan. Plans for a BRT system in the San Antonio area, operated by VIA, are underway with service expected to begin in 2012. The primary BRT corridor will follow Fredericksburg Road, linking San Antonio's central business district with the South Texas Medical Center. Buses will operate in a dedicated busway for part of the corridor and in mixed traffic close to downtown.

Alamo Regional Transit (ART), operated by the Alamo Area Council of Governments, provides demand-response rural public transportation in Atascosa, Bandera, Comal, Frio, Gillespie, Karnes, Kendall, Kerr, Medina, and Wilson Counties. Public transportation in Guadalupe County is provided through ART's subcontractor, the Community Council of South Central Texas. The rural transit service also connects with the intercity Kerrville Bus Company at the Kerrville Intermodal Facility.

Multimodal terminals along the Austin-San Antonio corridor include several CARTS stations: the CARTS Central Terminal in Austin (also serving Capital Metro); and CARTS stations in Round Rock (Greyhound, Arrow Trailways); San Marcos (Greyhound, Amtrak); and Bastrop (Greyhound, Kerrville Bus Company). Additional intermodal transit centers are planned for the cities of Taylor and Georgetown, as well as in south and west Williamson County and in Hays County. San Antonio's West Side Multimodal Center, to be constructed in the near west of San Antonio's central business district, will serve VIA bus and BRT initially, and later expand to serve Greyhound, the Austin-San Antonio commuter rail, Amtrak, taxi, and auto rental services. The Kerrville Intermodal Facility (in the City of Kerrville) serves Alamo Regional Transit as well as the Kerrville Bus Company.

Region 16: Gulf Coast (Houston-Galveston)

The Gulf Coast planning region includes 13 counties. Houston, Galveston, Conroe, and Katy are some of the many urban areas in the region. Amtrak's Sunset Limited route serves the Houston area; the Amtrak station in downtown Houston, close to the intersection of I-45 and I-10, also serves as a stop for Greyhound. Amtrak's bus service stops in La Marque and Galveston. Greyhound stops in Houston as well as in Galveston, Katy, and Conroe. Greyhound's affiliate Valley Transit connects Houston with Bay City, Corpus Christi, and Victoria, along with other cities along US-59 and TX-35. The Kerrville Bus Company shares a station with Greyhound and one with Coach USA in Houston, and also has stops in Katy, Humble, Galveston, and other cities in the region.

Local Transit Services in the Region

Houston METRO provides bus and light rail transit service to the Houston metropolitan area, including over two-thirds of Harris county and portions of Fort Bend and Montgomery counties. METRO's bus services include local routes and park-and-ride routes that utilize the city's high occupancy vehicle (HOV) lanes. The METRORail light rail currently operates along a single 7.5-mile corridor from the Fannin South Park-and-Ride to the University of Houston Downtown campus. An additional 30 miles of light rail is planned for implementation by 2012, including a continuation of the north end of the Red Line to a new Northern Intermodal Facility. Additionally, the 2035 Metro Solutions plan calls for 28 miles of commuter rail along U.S. Highways 90A and 290 and toward Galveston. Planned bus service expansions include "Signature Bus" and suburban bus rapid transit to provide further connections to rail lines and city activity centers.

Connect Transportation, operated by the Gulf Coast Center, provides rural and medical transportation services in Brazoria County and on the mainland of Galveston County, as well as demand-response transit from Galveston Island to the mainland. Island Transit operates fixed-route bus and trolley service on Galveston Island. A proposed Galveston-Houston Commuter Rail line is under evaluation.

Fort Bend County Transit provides commuter park-and-ride service from University of Houston-Sugar Land campus to Greenway Plaza and the Galleria, rural transit service, and urban demand-response service in portions of Fort Bend county that are within the Houston urbanized area but outside the METRO service area.

Brazos Transit District provides transit services in Liberty County, including local circulators in Ames, Liberty, Dayton, and Cleveland. Preliminary engineering and environmental analyses have been completed for a possible park-and-ride facility in Dayton that would support commuter service into the Houston central business district. The Brazos Transit District and Coach USA operate the Woodlands Express commuter park-and-ride from The Woodlands to the Houston central business district, the Texas Medical Center, and Greenway Plaza.

Fort Bend County Transit provides commuter park-and-ride service from UH-Sugar Land to Greenway Plaza and the Galleria, rural transit service, and urban demand-response service in portions of Fort Bend county that are within the Houston urbanized area but outside the METRO service area. Colorado Valley Transit provides rural transit and medical transportation service to Austin and Colorado Counties.

The Houston-Galveston Area Council (H-GAC) 2035 Metropolitan Transportation Plan (MTP) includes further recommendations for regional and intercity transit service in the 13-county planning region, including the consideration of high-capacity transit corridors (light rail, commuter rail, express bus or BRT) extending outside the current METRO service area. (See Figure 6-5.) Potential corridors include State Highways 249, 288, 225, 146, and 35, and FM 521. H-GAC is conducting a regional commuter rail accessibility study to evaluate high-traffic corridors in the region for possible commuter rail service (*21*). The 2035 MTP also supports the efforts of the Texas High Speed Rail and Transportation Corporation (THSRTC) to develop high-speed rail service linking Dallas/Fort Worth, San Antonio, Killeen/Temple, Bryan/College Station, and Houston in a configuration called the "Texas T-Bone." (See Figure 6-6.)

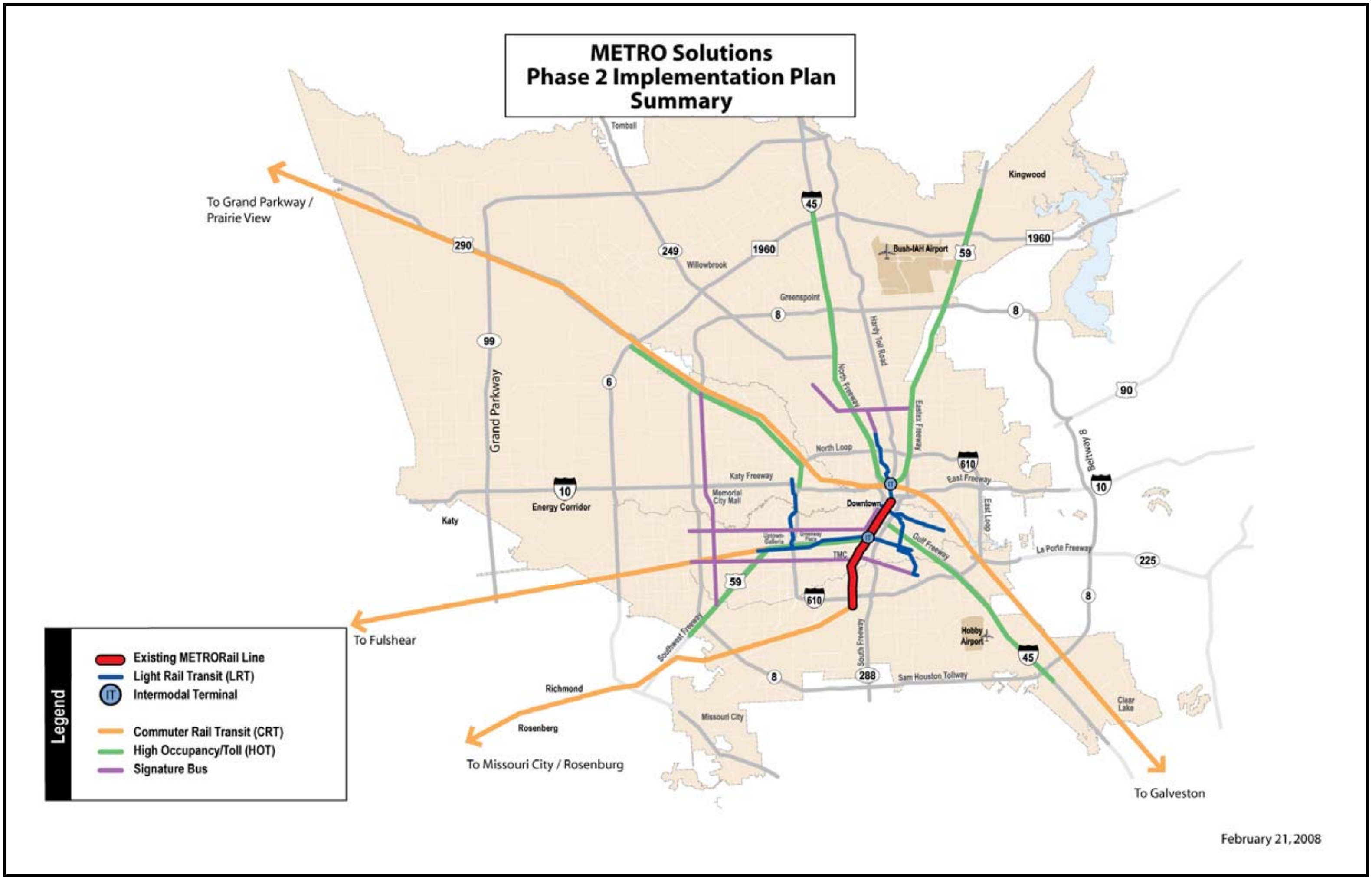
The planned Northern Intermodal Facility (to be constructed in the vicinity of North Main and Burnett Streets, just north of downtown) will serve future commuter rail service, Amtrak, freight rail, light rail, intercity bus carriers, and local bus routes. The station will replace the current Amtrak station for the city. While not specified as multimodal facilities, five new METRO transit centers and four new Park-and-Rides are planned as part of the overall expansion of transit services in the Houston area.

Region 8: Rio Grande (El Paso)

Outside of the City of El Paso and El Paso County, transit service is limited throughout this large six-county region. Amtrak's Sunset Limited route serves Alpine and El Paso. El Paso is also a stop for Amtrak's thruway bus service heading north to Albuquerque, New Mexico. Greyhound operates along the I-10 corridor with stops in Alpine, El Paso, Marfa, Presidio, and Van Horn. All Aboard American/Industrial Bus Lines, Inc. provides limited intercity service from Midland-Odessa to Ft. Stockton, Marfa, Presidio, and Alpine.

Local Transit Services in the Region

Locally, Sun Metro provides service within the city limits of El Paso. El Paso County Transit operates rural public transportation for the cities, town and *colonias* in El Paso County, including five fixed routes connecting non-urbanized areas of El Paso County to the city of El Paso. El Paso County Transit and Sun Metro allow passengers to transfer between the two services. Sun Metro buses stop close to Amtrak's Union Depot in El Paso, though there is no shared facility. No local transit service currently operates in Brewster, Culberson, Hudspeth, Jeff Davis, or Presidio Counties.



Source: http://metrosolutions.org/posted/1068/MS022108_Summary_.194783.jpg

Figure 6-5. Map of Planned METRO Light Rail, Commuter Rail, HOT Lanes, and Signature Bus Routes.

Source: http://www.thsrtc.com/articles.asp?id=241

Figure 6-6. Map of High-Speed Corridors in Southeast United States, including the THSRTC's Proposed Brazos Express Corridor Forming the "Texas T-Bone."

As part of the El Paso Metropolitan Planning Organization's Transborder 2035 Metropolitan Transportation Plan, Sun Metro has developed a plan for expanding and improving transit service in the El Paso area that includes improved local bus service as well as bus rapid transit. The first BRT corridor will provide service from the international bridges to the University of Texas-El Paso and other downtown locations. Four additional corridors are planned for implementation over the next 7-12 years. Depending on passenger growth, one or more of the planned BRT corridors may be converted to light rail or commuter rail in the future. Three downtown transit terminals currently serve local bus routes and will become part of the BRT network. Proposed future regional transit service includes an extension of New Mexico's Rail Runner commuter rail line from its current terminus in Belen, New Mexico, to El Paso. The Rail Runner currently extends north to Santa Fe.

Regions 11 and 23: Central Texas and Heart of Texas (Waco-Temple-Killeen)

The Central Texas planning region (Killeen, Temple, Fort Hood) and the Heart of Texas region (Waco and surrounding area) have separate transit systems, but have a history of informal service coordination, particularly for paratransit service needs. Amtrak's Texas Eagle route stops in McGregor, in Temple, and in Taylor. Amtrak's bus service also connects Fort Hood and Killeen with the rail station in Temple. Greyhound serves the area with stops in downtown Waco (Waco Intermodal Center), Hillsboro, Buffalo, and Fairfield (drop-off point only; no boardings).

Local Transit Services in the Region

The Hill Country Transit District (HCTD) provides demand-response transit service to Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, and San Saba Counties and fixed-route service in the cities of Copperas Cove, Killeen, Harker Heights, Nolanville, and Temple. Waco Transit provides fixed-route service within the Waco city limits and connects to Greyhound at the Waco Intermodal Center. The Waco Streak bus line provides three roundtrips per day from the Waco urbanized area to the Dallas/Fort Worth International Airport. The Heart of Texas Council of Governments (HOTCOG) provides demand-response rural transit in Bosque, Falls, Freestone, Hill, Limestone, and McLennan Counties. The Waco Intermodal Transit Center serves Waco Transit as well as Greyhound.

Region 21: Lower Rio Grande Valley (Brownsville)

Valley Transit Company, a Greyhound affiliate company, provides intercity transit service to all three counties, with stops in the three primary cities (Brownsville, Harlingen, and McAllen). The Valley Transit/Greyhound service connects the Lower Rio Grande Valley to Houston, San Antonio, and Laredo.

The Valley Transit "Main Line" through the Lower Rio Grande Valley also operates as express bus service along U.S. Highway 83 from Brownsville to McAllen. As part of the 2006 regional transit coordination plan, the Lower Rio Grande Valley Development Council (LRGVDC) negotiated with Valley Transit to provide additional "runs" of this route, to supplement Valley Transit's schedule, and to initiate some direct intercity transit connections from Raymondville to Harlingen and McAllen. LRGVDC's Rio Metro now operates five intercity routes in partnership with Valley Transit and McAllen Express Transit:

- Intercity Route 1 between McAllen and Edinburgh;
- Intercity Route 2, connecting McAllen and Mission;
- Intercity Route 3 connecting McAllen, Pharr, San Juan, and Alamo;
- Intercity Route 4, connecting McAllen, La Joya, Penitas, Palmview, and Mission; and
- The Rio Metro Career Link.

The Rio Metro Career Link or "JARC" (Job Access and Reverse Commute) Route provides three "clockwise" and three "counterclockwise" loops per day along U.S. 83 and connecting FM roads, with stops in 15 urbanized areas throughout the Lower Rio Grande Valley. The primary function for the service is bringing workers to jobs in the Valley.

The Harlingen Express, a flex-route bus service, began in the spring of 2008 in the City of Harlingen. The Brownsville Urban System (BUS) provides urban transit service within the City of Brownsville. McAllen Express Transit provides urban transit service within the City of McAllen. Specific multimodal facilities are not named in local plans, but planned coordination of feeder routes and Valley Transit along U.S. 83 will likely include timed stops at existing Valley Transit stations.

Region 6: East Texas (Tyler-Longview)

Amtrak's Texas Eagle route includes stations in Marshall, Longview, and Mineola. Amtrak's Lone Star Coach bus service and Greyhound also serve the area. The East Texas

Regional Transportation Coordination Plan (2006) recommends increasing the use of these services through public outreach and promotion, as well as through agreements to interconnect these services with those of local transit providers. The plan also recommends the construction of multimodal transit centers located throughout the East Texas area to connect urban, rural, and intercity services. The region is planning a feasibility study on the construction of a rail system that would be integrated into the planned Dallas/Fort Worth rail system.

Currently, Tyler Transit provides urban fixed-route service within the Tyler city limits, as well as Job Access – Reverse Commute (JARC) service that extends beyond the city limits. Longview Transit provides urban fixed-route service within the Longview city limits. The East Texas Rural Transit District provides demand-response rural service to the 14-county region. Tables 6-5 and 6-6 list existing and planned intermodal transit facilities within the state, respectively.

Table 6-5. Existing Intermodal Transit Stations in Texas.

Region	City/Terminal Name	Transit Providers Served
12	Austin Central Terminal	Capital Metro CARTS
	Round Rock	CARTS Greyhound Arrow Trailways
	San Marcos	CARTS Greyhound Amtrak
	Bastrop	CARTS Greyhound Kerrville Bus Company
18	Kerrville Intermodal Facility	Kerrville Bus Company Alamo Regional Transit
4	Dallas Union Station	DART light rail TRE commuter rail Local bus Amtrak
	Fort Worth Intermodal Transportation Center	The T TRE Amtrak
	Cleburne Intermodal Terminal	Amtrak Cletran urban bus City County Transportation (regional bus)
22	Sherman: TAPS intermodal terminal	Local bus (including TAPS) Greyhound
11	Waco Intermodal Transit Center	Waco Transit Greyhound
24	Del Rio Multimodal Transit Center	Del Rio Transit Greyhound
5	Texarkana Greyhound Terminal	Greyhound T-Line (local bus)

Table 6-6. Planned or Proposed Intermodal Transit Stations in Texas.

Region	City/Terminal Name	Transit Providers Served
12	Taylor	CARTS Intercity (TBD)
	Georgetown	CARTS Intercity (TBD)
	South Williamson County	CARTS Intercity (TBD)
	West Williamson County	CARTS Intercity (TBD)
	Hays County	CARTS Intercity (TBD)
18	San Antonio West Side Multimodal Center	VIA and VIA BRT (later) Greyhound Austin-San Antonio Commuter Rail Amtrak
16	Houston: Northern Intermodal Facility	Commuter rail Amtrak Freight rail METRORail light rail Intercity bus carriers Local bus
6	East Texas area (one or more facilities)	Local bus Intercity carriers
4	City of Krum/City of Denton	Amtrak DCTA TBD
10	San Angelo – feasibility study conducted	TBD
8	El Paso Union Plaza (proposed)	Sun Metro (local bus) Amtrak
7	Abilene – feasibility study conducted	TBD
17	Victoria – feasibility study conducted	TBD

Twelve counties in the state are not currently served by local urban or rural transit services: Brewster, Culberson, Hudspeth, Jeff Davis, and Presidio Counties in Region 8; Jasper, Newton, Sabine, San Augustine, Shelby, and Tyler Counties in Region 14; and Chambers County in Region 16.

CHAPTER 7: EXPANDING INTERCITY TRANSIT

This chapter describes some of the transit technologies available for intercity transit service, both rail and bus, and summarizes some of the factors that have been shown to increase transit service in general and are likely to be particularly pertinent to longer-distance, intercity transit trips. The research team collected the information in this chapter during Task 1 of the project.

RAIL AND BUS TECHNOLOGIES AVAILABLE FOR INTERCITY TRANSIT SERVICE

Rail Technologies

There are several major types of rail rolling stock that can be used to serve intercity passenger markets. The first major category by which to classify passenger trains is by their source of locomotive power. Passenger trains can either be locomotive-hauled (one or more locomotives pulling unpowered passenger coaches, dining car, etc.) or self-powered passenger cars (no separate locomotive—engines are located on passenger cars which may pull additional passenger coaches). Further, locomotives can be classified by their power source (i.e., diesel-electric locomotive power or direct contact electric power from an overhead catenary or third-rail). The actual type of rolling stock chosen for any project is dependent on a variety of economic and operational factors. Some typical intercity passenger rail configurations or "consists" are described below:

Diesel-Electric Locomotive-hauled Passenger Train. This is the type of train most typical for intercity long-distance passenger rail service and is also used in many commuter rail operations. One or more diesel-electric locomotives are joined to several unpowered passenger coaches or other specialty cars. Because this train configuration can operate on existing tracks used by freight trains without having to invest in or maintain a new overhead catenary power grid, this option is often the most inexpensive for starting new intercity passenger systems. These trains can also be operated in a push-pull mode when a cab-control car is added at the rear of the train.

Electric-powered Locomotive Passenger Train. In several high-use passenger train corridors additional investment has been made to power trains by using electric power produced at power stations rather than producing electricity with diesel engines onboard the locomotive. Typically this power is transferred to an electric locomotive via an overhead catenary wire system that runs the length of the tracks. Because power is generated and distributed from outside the train itself, the train is lighter and can accelerate and decelerate more quickly—thereby improving train performance. This type of consist can also operate in push-pull mode with the use of a cab-control car. Most high-speed rail systems in Europe and around the world use electric power from overhead catenaries as the means for propelling their rolling stock.

Diesel-Multiple Unit (DMU) Vehicles. DMU vehicles are classified as self-powered rail cars (SPRC). Each car has an onboard diesel engine that provides power to its own wheels but, unlike a locomotive, the car also has seats for passengers. Several DMUs can be linked together to provide additional seating for passengers, and most DMU vehicles are powerful enough to pull an additional one or two unpowered passenger coaches if ridership demands exceed the capacity of the powered vehicles. The smaller size and flexibility of the DMU and other SPRCs as well as their fuel efficiency has made them appealing for use in intercity service; however, most DMU vehicles produced worldwide do not meet Federal Railroad Administration (FRA) crashworthiness standards. This means that the vehicles are not allowed to operate over existing freight rail tracks at the same time as freight trains. Only recently have DMU vehicles meeting FRA crashworthiness standards been designed and placed into service for intercity travel in the U.S.

Several other emerging technologies such as magnetic levitation (Maglev) propulsion and tilt-train technology can be applied to improve train speed or performance in the future but have not been proven in intercity passenger service in the U.S. at this time. The technology chosen by any system will result from an analysis of the tradeoff between cost, performance, passenger demand, and transportation needs within a corridor.

Express Bus Technologies

There are three general types of bus technologies available for intercity service: transit buses, express bus/bus rapid transit, and intercity buses.

Transit Buses. The most common bus design for urban transit systems has front and center doors, low-back seating, and no restroom facilities or luggage compartments. These buses generally range from 30 to 40 feet in length and are usually able to accommodate one or two wheelchairs. Class A transit buses are equipped with more than 35 passenger seats, Class B buses contain 25 to 35 seats, and Class C buses contain less than 25 seats (*22*, *23*). Articulated buses can be 54 to 60 feet long and can hold around 60 passengers. Rural transit systems may use urban-type transit buses, vans, or "body-on-chassis" minibuses, any of which may be manufactured or modified to be Americans with Disabilities Act (ADA)-accessible.

Express Bus/Bus Rapid Transit. Bus rapid transit employs a network of facilities and services that are intended to provide many of the benefits of rail transit (greater speed, travel time reliability) at a lower cost and/or greater flexibility. BRT systems often are designed to resemble rail transit systems, with stations (instead of roadside stops), distinctive vehicles, and frequent service. Transit Cooperative Research Program Project A-23 identified the following three general categories of bus rapid transit operating in North and South America, Europe, and Australia:

- BRT that operates entirely on exclusive or protected rights of way. This type of system most closely resembles rail rapid transit.
- BRT that operates within some combination of exclusive rights of way (ROW), median lanes, curbside bus lanes, and street lanes. This type of system most closely resembles light rail transit.
- BRT that operates mainly on regular street lanes with regular traffic, usually with some form of on-street priority. This type of system is similar to tram or streetcar service.

BRT systems often employ intelligent transportation systems (ITS) including automatic vehicle location, passenger information systems including real-time arrival information at stations, and traffic signal priority. Many BRT systems lead to significantly increased ridership levels (compared to the traditional bus services they replaced). Past experience has shown that BRT has the greatest chance for success in urban areas with populations over a million that experience significant levels of congestion. The more "rail"-type aspects that a BRT system has (dedicated or prioritized ROW, attractive and easily accessible vehicles and stations, off-vehicle fare collection), the more likely it will be to attract high ridership levels (*24*).

Intercity Buses. Also called "over-the-road coaches," intercity buses tend to have one front door, high-backed seats, restroom facilities, and luggage compartments. They tend to be 40 feet long or more and hold about 40 passengers. Traditionally, these buses were not designed to accommodate wheelchairs, but legislation passed in 2000 requires that new vehicles purchased for intercity services be ADA-compliant (*25*). As a result, one of the barriers to integrating intercity transit service with urban and/or rural public transit is beginning to be addressed, as intercity fleets are replaced. For example, over half of Greyhound's buses, including all of the vehicles purchased in 2001 or later, are wheelchair-accessible (*26*). The Over-the-Road Bus Transportation Accessibility Act of 2007, passed into law on July 30, 2008, amended Title 49 to provide further clarification and enforcement of ADA standards for intercity transportation carriers (*27*). In an effort to attract more commuters and other "choice" riders to intercity bus service, many intercity transit providers have begun to purchase over-the-road coaches that emulate the look and feel of commuter rail coaches.

KEY FACTORS INFLUENCING TRANSIT RIDERSHIP

Widespread vehicle ownership, an extensive state and interstate highway system, and relatively inexpensive air travel have all contributed to a nationwide decline in the use of buses and passenger rail for intercity trips. However, rising fuel costs, traffic volumes, and travel delays (both on the road and in the air) may be starting to reverse the trends of recent decades (*28*). This section addresses some of the factors that have been shown to increase transit ridership in general, and that also have the potential to influence mode choice for longer-distance trips.

External Factors Contributing to High Transit Ridership

The findings of Transit Cooperative Research Program Report 111 indicate that external factors influencing ridership may have a greater effect on ridership than system/service design factors, which can be directly affected by transit service providers (*29*). The following external factors were listed as the most important to consider.

Regional Growth. Increased population and economic growth within a region tend to increase transit ridership simply by expanding the potential ridership base. Increases in ridership are also associated with high populations or growing populations of senior citizens, college students, and recent immigrants. Growing tourism can also increase the number of transit riders.

Cost and Convenience of Other Modes. As other travel alternatives become more expensive, transit use tends to increase. As mentioned previously, the rising cost of oil is causing the two most popular intercity travel modes—personal vehicles and air travel—to become increasingly expensive. Transit use also tends to increase if the quality of service for other modes decreases due to increased congestion, increased travel times, or decreased convenience.

Public Policies. Transit use tends to increase within an area when public transportation is integrated with welfare-to-work efforts, education, and/or social service programs. Local policies such as air quality mandates and auto emission standards can also encourage transit ridership within that area, though there is little information about the effect of these policies on long-distance intercity trips.

Transit System Features Contributing to High Transit Ridership

Coordinated Services, Easy Connections. People intending to ride intercity bus or rail must be able and willing to travel from their origin point to an intercity transit station and from another intercity station to their final destination. Intermodal stations that provide connections between local and intercity transit services, as well as options for automobile travel (parking facilities, rental car services) maximize the feasibility of intercity bus/rail as a travel mode. Coordinated schedules (e.g., a local feeder bus schedule that coordinates with train departures from the station they both serve) minimize the time passengers must wait at the transit station between legs of their trip; reductions in out-of-vehicle wait times have been shown to have greater influence than actual travel times on passengers' decisions to ride transit (*29*).

Service Improvements. Transit providers that have restructured their routes or introduced specialized services to increase travel speed, service frequency, service hours, and/or capacity often see a rise in ridership as a result. Travel time reliability and on-time performance is another important factor in a rider's perception of service quality (*30*). Transit modes that have the advantage of a separate right of way, on-street priority, or other tools that allow them greater speed or reliability are likely to attract riders.

Reduced or Special Fares. Deep discount passes, outlet/internet sales of fare media, free transfers, and other means of reducing transit fares have been shown to increase ridership. Greyhound has introduced a frequent rider program similar to airline "frequent flyer" programs, with discounts and other benefits as rewards to riders for accruing travel miles.

Improved Image. Transit tends to suffer from the perception that it is the poor person's mode of travel, with the attendant assumptions that it is not a particularly safe, comfortable, or desirable travel option. In general, rail transit is viewed by riders as more "upscale" than bus transit. Many local and intercity bus operators have begun to purchase vehicles that have the look and feel of light rail or commuter rail coaches, as well as upgrading stations and stops with on-site ticketing and other amenities similar to those associated with rail transit. Measures that increase safety and security, such as safety features aboard vehicles and a security presence at transit stations, also promote a more positive image. Finally, customer service and attitude of the vehicle operator and/or other transit staff with whom the passenger interacts are important to maintaining a positive image of transit (*29*).

Improved Marketing and Information. Marketing of a transit service is a primary tool for communicating service improvements, cost savings, new services, and amenities to potential riders. Transit information services can also play a role in increasing transit ridership by educating potential riders on available options for their travel needs.

CHAPTER 8: CORRIDOR RANKINGS AND PRELIMINARY CONCEPTUAL PLAN

INTRODUCTION

Task 5 of the project work plan calls for the research team to present a preliminary concept configuration for an improved intercity rail and express bus transit system based upon the analysis completed in Tasks 1-4. At the time the project was conceived, it was thought that, at this point in the work, some determination could be made regarding the proposed bus/rail system configuration based on intercity travel demand patterns and demographic projections. While this remains somewhat true, the answers to the question are not as clear as originally hoped. The research team has found that political and geographic interest factors, as well as population and demographics, intercity travel demand, and the capacity of alternative intercity modes for travel that they conceived and included in the analysis, will ultimately determine the configuration of the future intercity rail system in Texas.

The results of the research thus far provide only a tool for TxDOT to use in making decisions related to the state's future role in that development. Other factors not included in the analysis (such as air quality nonattainment) may also have an impact on which routes and in which order specific segments of a statewide rail and express bus system may be developed. The conceptual plan presented here is the result of the analysis completed during this project as outlined in previous technical memoranda and reports. The plan was crafted using the following assumptions regarding initial conditions:

- The purpose of this work is to determine the most likely intercity travel corridors within the state needing to be connected by an intercity rail/express bus system.
- Factors included in the analysis were based on the development of statewide travel needs and not on local/regional travel demand within any one region of the state.
- The concept of this project was based on previous studies carried out by TTI on the conventional intercity passenger rail system (Amtrak service of up to 79 mph and in some places up to 110 mph) in California, Pennsylvania, and other states throughout the United States within existing rail rights of way. This does not preclude the consideration of higher speed rail systems to meet the travel demand identified in

existing highway and rail corridors, but these systems would require new, fully grade-separated corridors to operate above 125 mph in almost all cases.

- Local and regional development of improved bus, light rail, and commuter rail systems would continue within the major urban areas of the state to allow for distribution of travel from the statewide transit system conceptualized here.

INTERCITY TRAVEL DEMAND BY CORRIDOR RANKING RESULTS

Figure 8-1 shows the result of the ranking of the 18 intercity travel corridors. The vertical axis of the chart is the "corridor evaluation" total score that is the sum of indexed scores for each travel corridor over the 14 evaluation criteria with each criterion carrying equal weight in the final total. As can be seen from the chart, two corridors—Dallas/Fort Worth to San Antonio and Dallas/Fort Worth to Houston—ranked highest in need for intercity passenger or express bus service according to the factors and equal weighting of each of those factors, as directed by the PMC.

The next two highest ranking corridors link west Texas and the Panhandle to the DFW area and would converge to the same corridor between Abilene and the DFW Metroplex. The next two link Houston to San Antonio and Houston to Austin. Most of the other interregional corridors ranked basically equally beyond those few corridors. These resultsllow the individual corridors to be evaluated by statewide transportation plannersin future work to determine how additional corridors might be added. Figure 8-2 is a graduated, graphic representation of corridor ranking based on this analysis.

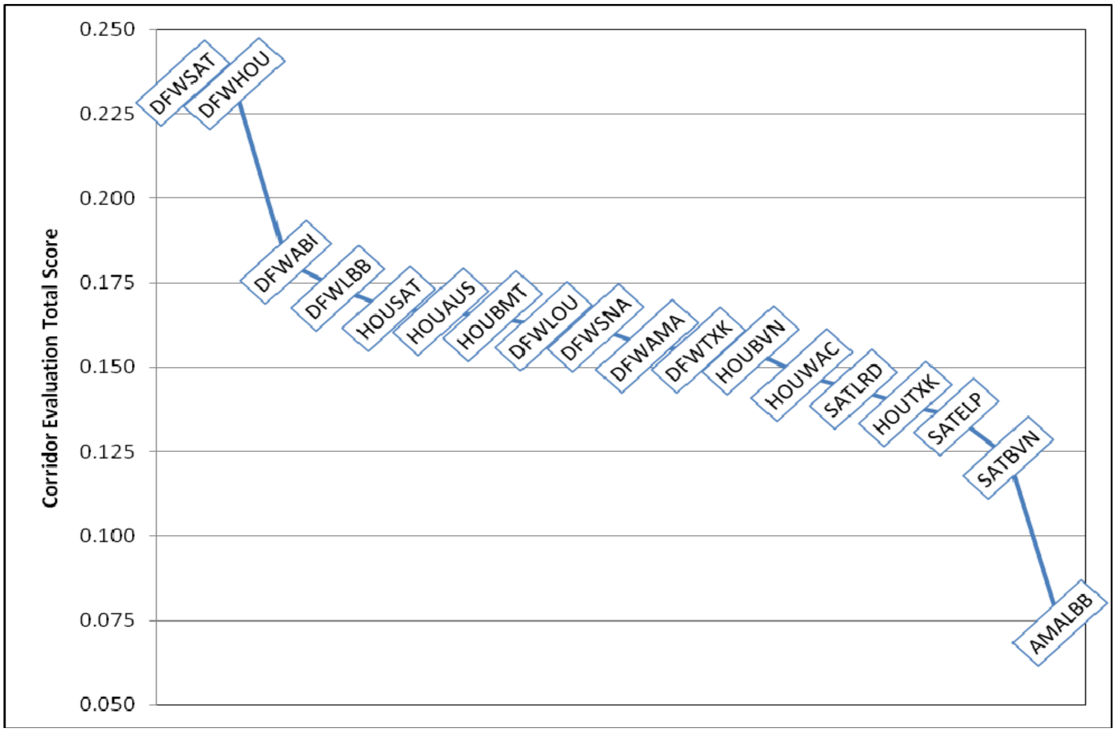


Figure 8-1. Corridor Ranking Chart with All Evaluation Factors Equally Weighted.

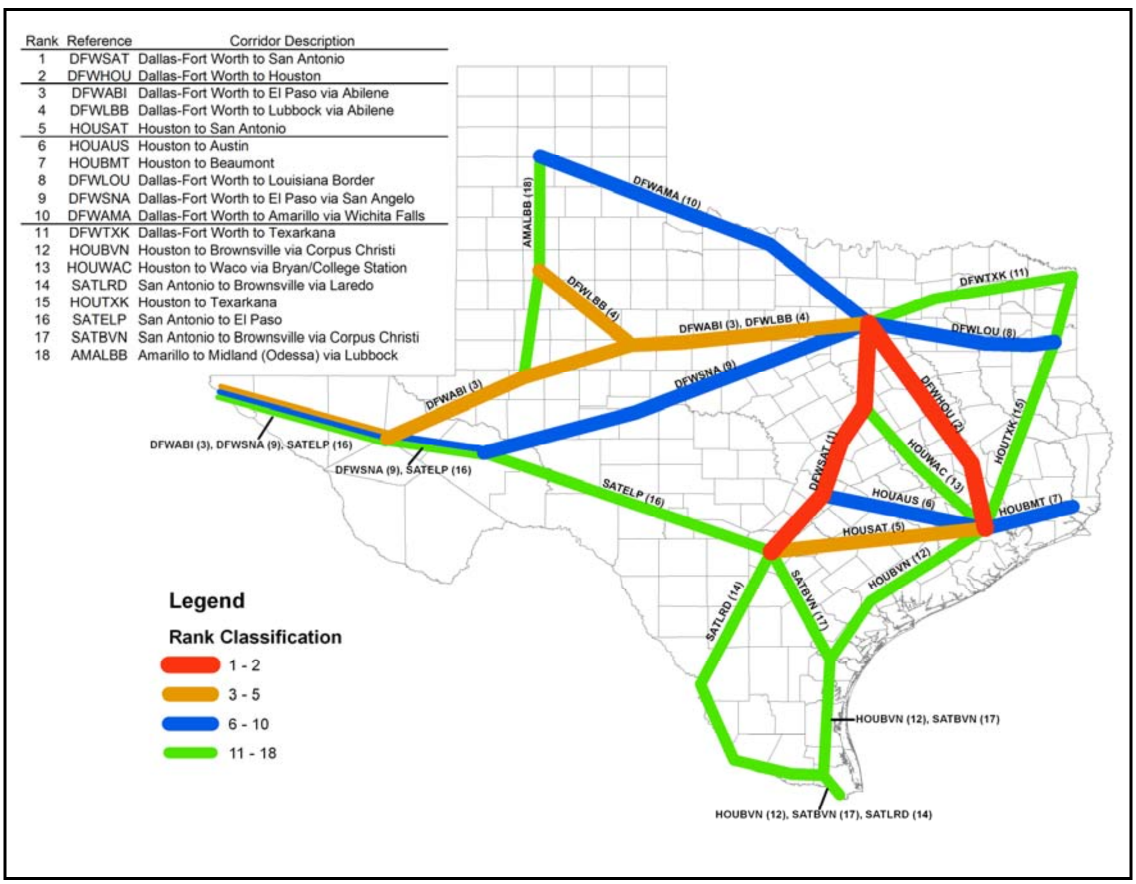


Figure 8-2. Graphic Representation of Grouped Corridor Rankings.

DISCUSSION OF RESULTS

Initial analysis of these results indicates that an improved rail system connecting DFW with San Antonio and DFW with Houston are the priority corridors for TxDOT to consider in developing a statewide transit system. This result is consistent with previous intercity passenger rail studies within Texas, which identified these as the two major growth corridors. Questions still remain: Is it best to have rail service in an "inverted V" configuration (or the Greek letter lambda, "Λ")—directly linking the four major urban areas of the state via two lines from DFW as I-35 and I-45 do at present—or would a "T-shaped" configuration linking Houston to the DFW-San Antonio corridor somewhere between Austin and Waco serve an even larger constituency by bringing the Bryan/College Station urban area into the proposed alignment? Another alternative configuration would be to build Houston to Austin or Houston to San Antonio routes as well as the "inverted V" to create a "triangle-shaped" service that more directly serves the state's four largest urban areas. The answer to which of these is more effective would largely be a tradeoff between the higher ridership generated by improved direct service and the cost to construct the additional infrastructure mileage that such a system would require.

Differences of opinion have also been expressed as to where the connection to Houston should be along the I-35 corridor and if a T-shaped system should be selected. While many people in San Antonio and on the southern end of the corridor would like to see the connection point to Houston in a two-corridor system be no further north than the Austin area, the results of this study, thus far, indicate that a more northern connection point in Waco or Hillsboro would more fully address the two highest ranked corridor intercity demand routes and better serve the growing DFW population base. Further study is needed to determine the most efficient connection point between the two corridors for a T-shaped system.

The addition of an improved intercity bus service from El Paso to DFW is also indicated from the research results, until ridership grows to the point that rail service along all or some of the route could be supported. For example, rail service from DFW to Abilene could be added with feeder express bus services to and from Abilene to El Paso, San Angelo, Lubbock, and Amarillo in order to serve West Texas.

Further analysis planned for Year 2, regarding project phasing and interconnections with existing and planned rail systems, will refine and determine which segments of this conceptual intercity system might be economically feasible to undertake first. For example, the completion of the Austin-San Antonio commuter rail service planned by the Austin-San Antonio Intermunicipal Commuter Rail District might suggest building the segments north of Austin prior to implementing service on the statewide system between those two cities. Likewise, if the efforts of the East Texas Corridor Council and the North Central Texas Council of Governments are successful in developing an intercity rail link in East Texas, the statewide system could instead focus on connections between the major urban areas, leaving regional rail systems to connect internal destinations. Alternatively, the same East Texas corridor to Louisiana and the one from Houston to Beaumont might be determined to be more vital since they can potentially connect the statewide system to improved interstate rail corridors being planned in the southeastern United States.

CHAPTER 9: PLANNED TASKS FOR YEAR TWO

The tasks to be undertaken during year two of Project 0-5930 build upon those tasks completed in the first year. These tasks, as described in the project proposal, include the following:

- Task 7 will research the projected costs to implement an intercity rail and express bus system as envisioned in Task 5 or as modified by the research team and the PMC. Cost estimates will be based upon the best available data available from similar projects implemented throughout the U.S. as gathered during the literature review and site visits to transit agencies. From these data, unit cost estimates for various aspects of the system will be developed and applied to the proposed transit corridors.
- Task 8 will identify probable priority corridors based upon the intercity travel demand and population growth data discovered during year one research. Several potential corridors may be identified as starter segments and phased implementation options for the overall system will be explored.
- Task 9 will center on clarifying the roles that various levels of government and local transit agencies could play in the development of a statewide rail and express bus system. For example, capital funding for infrastructure may be largely a federal and state role while right-of-way acquisition in urbanized areas may be a local government role of the MPO that would be funded with Texas Metropolitan Mobility Program (TMMP) funds. Defining such roles to enable implementation of the proposed transit system is vital in order for it to become a reality. A matrix assigning single or joint responsibility for each implementation task to each stakeholder will be produced as part of this task. Meetings with local, regional, and state transportation officials have begun and will be an important part of completing this task.
- Task 10 will look at how the proposed system will interconnect with urban and rural transit systems, airports, and other intermodal facilities. Designing the system in such a way that seamless connectivity is achieved will be necessary for its success. Team members will evaluate the impacts that each proposed transit corridor has on existing transportation systems. Site visits to local transit agencies,

airports, and intermodal facilities may be required in order to discuss potential service plans with agency representatives and build upon the insights developed during the Task 3 review of planning documents.

- Task 11 will outline the qualitative benefits that implementation of a statewide rail and express bus system could have. Mobility, congestion relief, economic development, emissions reduction, reduced roadway maintenance costs, and other issues will be addressed. The potential reduction in short distance flights, reducing airport congestion, and allowing more long-distance flight operations will also be examined. At the completion of Task 11, GIS maps showing intercity passenger demand and potential of the proposed passenger rail and express bus system to meet demand will be prepared and submitted to RTI as Product 2 (P2). A technical memo will also be submitted describing the projected benefits to the state of implementing such a system.
- Task 12 will be the development of the project report, designated as Report 2 (R2). It will be a comprehensive review of the entire research project and its findings. TTI researchers will document the results and lessons learned from each of the previous tasks. It will incorporate information from both years of the project research describing potential intercity rail and express bus corridors, documenting the work performed, methods used, and results achieved.
- Task 13 will consist of the completion and submission to RTI of a Project Summary Report (PSR) of the research project and its findings.

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APPENDIX: TRANSIT SERVICES AND PLANS BY REGION

REVIEW OF REGIONAL TRANSIT PLANNING DOCUMENTS

Regional transit coordination plans, transit provider plans, metropolitan long-range transportation plans, and other planning documents that address Texas transit services were reviewed to summarize the transit services available throughout the state. Particular attention was given to intercity transit options, transit services that support intercity travel through feeder services or other connections, and intermodal facilities. Medical transportation services (services funded under Section 5310 of the Federal Transit Administration) were not included in this review.

Region 1: Panhandle

Intercity transit service
Greyhound stops in the cities of Amarillo and Childress.

Supporting transit service
Amarillo City Transit (ACT) provides fixed-route urban transit over approximately 85 percent of the City of Amarillo, excluding the less-dense eastern end of the city.

Panhandle Transit provides demand-response rural transit to the 26 counties of the Panhandle.

Multimodal facilities
None exist; the 2006 Panhandle Transportation Coordination Study suggests exploring the feasibility of renovating an existing downtown transit station into a multimodal facility serving both local and intercity transit.

Region 2: South Plains (Lubbock/Plainview)

Intercity transit service
Greyhound serves the region with stops in the cities of Brownfield, Denver City, Levelland, Lubbock, and Plainview.

Supporting transit service
Lubbock's Citibus provides fixed route service within the city limits, including Texas Tech University.

South Plains Community Action Center (SPARTAN) provides rural transit services to Bailey, Cochran, Garza, Hockley, Lamb, Lubbock, Lynn, Terry, and Yoakum Counties.

CapTrans provides rural service in Crosby, Dickens, Floyd, Hale, King, and Motley Counties.

Multimodal facilities
None found.

Region 3: Nortex

Intercity transit service
Greyhound serves the area with stops in Wichita Falls, Vernon, and Gainesville. Amtrak's Heartland Flyer route stops in Gainesville.

Supporting transit service
City of Wichita Falls provides route-deviation transit service (a hybrid of fixed-route and demand-response service) within the city limits.

Rolling Plains Management provides rural transit service to Archer, Baylor, Cottle, Foard, Hardeman, Wichita, Wilbarger, and Young Counties.

Texoma Area Paratransit System (TAPS), a service of the Texoma Area Council of Governments, provides rural transit service to Clay, Jack, and Montague Counties.

Multimodal facilities
None found.

Region 4: North Central Texas Region (Dallas/Fort Worth)

Intercity transit service
The Trinity Railway Express (TRE) is a 35-mile commuter rail line with 10 stations connecting downtown Dallas and downtown Fort Worth, the mid-cities, and DFW International Airport via Centreport.

Greyhound has several stops in the area, including Union Station and three additional stops in Dallas and two stops in Fort Worth. Additional Greyhound stations are located in Arlington, Corsicana, Denton, Dublin, Garland, Lewisville, Richardson, Stephenville, Terrell, Waxahachie, and Weatherford. The Kerrville Bus Company also provides intercity service out of Dallas and Fort Worth.

Amtrak's Heartland Flyer and Texas Eagle routes both stop in Fort Worth; the Texas Eagle also stops at Union Station in Dallas and in Cleburne.

The privately owned City County Transportation Express Bus route connects the cities of Cleburne, Joshua, Burleson, and Fort Worth.

The North Central Texas Council of Government (NCTCOG) Regional Transit Initiative and Regional Rail Corridor studies were conducted in parallel to identify transit needs and identify potential solutions for the North Central Texas region. The Regional Rail Corridor Study focused on transit needs in eight potential rail corridors in the Dallas/Fort Worth metropolitan area, plus the existing TRE rail system. Proposed rail corridors would total over 350 miles, with passenger rail service reaching as far as Cleburne, Midlothian, Waxahachie, Denton, McKinney, and North Frisco, with numerous stops throughout the region.

Supporting transit service

Dallas Area Rapid Transit (DART) serves the cities of Dallas, Addison, Carrollton, Cockrell Hill, Dallas, Farmers Branch, Garland, Glenn Heights, Highland Park, Irving, Richardson, Rowlett, Plano, and University Park with 45 miles of light rail and 130 bus routes and paratransit service. DART Rail connects with the TRE for service to the DFW International Airport and to Fort Worth. DART On-Call demand-response vans serve neighborhoods where rider demand is too low to support fixed-route bus, providing a connection to DART transit centers as well as neighborhood destinations. DART vanpools and carpool-matching service provide additional travel options for commuters in the metroplex. DART's 2030 plan includes an additional 43 miles of light rail service, 77 miles of enhanced bus service corridors, and 20 miles of rapid bus service corridors.

The T offers fixed route and express bus service within Fort Worth, plus a "Rider Request" demand-response circulator service in Richland Hills. The T's demand-response Mobility Impaired Transportation Service (MITS) operates in Fort Worth, Richland Hills, and Blue Mound. Many of The T's bus routes connect with the TRE at either the Intermodal Transportation Center or the T&P Station. The T's strategic plan includes expanded regional bus and rail service, including a TRE express train, potential bus rapid transit corridors, and high-capacity circulators for downtown and uptown Fort Worth.

The Denton County Transportation Authority (DCTA) provides fixed route service in the cities of Denton, Lewisville, and Highland Village. DCTA's Commuter Express bus service travels from park-and-rides in Denton and Lewisville to downtown Dallas, the DART North Carrollton Transit Center, Texas Women's University, and the University of North Texas. A regional passenger rail line connecting Carrollton and Denton is being planned. The line will connect to the DART Northwest Corridor rail line, which is planned to terminate in Carrollton.

Handitran provides demand-response paratransit service for seniors and persons with disabilities in the cities of Arlington and Pantego. Handitran also shares transfer points with The T and with two of TRE's stations.

Cletran provides urban transit service with the Cleburne city limits and connects with Amtrak and with City County Transportation regional bus at the Cleburne Intermodal Terminal.

Collin County Area Regional Transit (CCART) provides demand-response transit service in Collin County, fixed-route transit in the cities of McKinney and Plano, and DART-On-Call flex-route service in the city of Plano.

Multimodal facilities

Union Station in Dallas serves DART light rail, the TRE commuter rail, local bus routes, and Amtrak. A Greyhound bus terminal is nearby.

Region 5: Ark-Tex

Intercity transit service
Greyhound stops in Texarkana.

Supporting transit service
Texarkana's urban transit service, the T-Line, includes a bus stop at the Greyhound terminal in Texarkana. The Ark-Tex Rural Transit District provides demand-response rural transit service to the nine-county region, as well as Job Access-Reverse Commute service and New Freedom (beyond ADA requirements) service.

Multimodal facilities
Greyhound terminal in Texarkana also serves T-Line.

Region 6: East Texas (Tyler-Longview)

Intercity transit service
Amtrak's Texas Eagle route includes stations in Marshall, Longview, and Mineola. Amtrak's Lone Star Coach bus service and Greyhound also serve the area. The East Texas Regional Transportation Coordination Plan (2006) recommends increasing the use of these services through public outreach/promotion as well as through agreements to interconnect these services with those of local transit providers.

Supporting transit service
Tyler Transit provides urban fixed-route service within the Tyler city limits, as well as Job Access – Reverse Commute (JARC) service that extends beyond the city limits.

Longview Transit provides urban fixed-route service within the Longview city limits.

The East Texas Rural Transit District provides demand-response rural service to the 14-county region.

Multimodal facilities
The Regional Transportation Coordination Plan recommends the construction of multimodal transit centers located throughout the East Texas area to connect urban, rural, and intercity services, but none currently exist.

Region 7: West Central Texas (Abilene/Sweetwater)

Intercity transit service
Greyhound provides intercity bus service with stops in the cities of Comanche, Brownwood, Santa Anna (bus stop only), Ballinger, Abilene, Sweetwater, and Snyder.

Supporting transit service
Abilene's CityLink provides fixed route (as well as ADA paratransit) service within the city limits.

The Central Texas Rural Transit District (CARR) provides rural service as well as limited scheduled service from rural areas in the region to Abilene, Brownwood, San Angelo, or Stephenville. CARR has transit facilities in Sweetwater (which is also a transfer point to the South Plains SPARTAN service), Abilene, and Brownwood.

The Aspermont Small Business Development Corporation (ASBDC) operates the Double Mountain Coach, which provides rural transit in seven counties in the northern portion of the West Central Texas region as well as trips from the rural areas into Abilene, including Abilene's Greyhound station.

Multimodal facilities
A feasibility study found both local interest and a growing need for a multimodal transportation facility in downtown Abilene. The facility as currently envisioned would provide a direct connection between local transit and Greyhound bus service, and would be within walking distance of (and include a pedestrian corridor for) a potential Amtrak stop.

CARR provides an office and wait area for other transportation providers and passengers in Abilene.

Region 8: Rio Grande (El Paso)

Intercity transit service
Greyhound operates along the I-10 corridor with stops in Alpine, El Paso, Marfa, Presidio, and Van Horn.

All Aboard American/Industrial Bus Lines, Inc. provides limited intercity service from Midland-Odessa to Fort Stockton, Marfa, Presidio, and Alpine.

Amtrak's Sunset Limited route serves Alpine and El Paso. El Paso is also a stop for Amtrak's thruway bus service heading north to Albuquerque, New Mexico.

Supporting transit service
Sun Metro provides service within the city limits of El Paso. El Paso County Transit operates rural public transportation for the cities, town and *colonias* in El Paso County, including five fixed routes connecting non-urbanized areas of El Paso County to the city of El Paso. El Paso County Transit and Sun Metro allow passengers to transfer between the two services.

As part of the El Paso MPO's Transborder 2035 Metropolitan Transportation Plan, Sun Metro has developed a plan for expanding and improving transit service in the El Paso area that includes improved local bus service as well as bus rapid transit. The first BRT corridor will provide service from the international bridges to the University of Texas-El Paso and other downtown locations. Four additional corridors are planned for implementation over the next 7-12 years. Depending on passenger growth, one or more of the planned BRT corridors may be converted to light rail or commuter rail in the future.

Proposed future regional transit service includes an extension of New Mexico's Rail Runner commuter rail line from its current terminus in Belen, New Mexico, to El Paso. The Rail Runner currently extends north to Santa Fe.

No local urban or rural transit services operate in Brewster, Culberson, Hudspeth, Jeff Davis, or Presidio Counties.

Multimodal facilities
Sun Metro buses stop close to Amtrak's Union Depot in El Paso, though there is no shared facility. Three downtown transit terminals serve the existing bus routes, and will become part of the BRT network.

Planned facilities through 2025 include eight additional transit/BRT terminals and six park-and-ride lots.

Region 9: Permian Basin (Midland-Odessa)

Intercity transit service
Greyhound provides some intercity service to this area, with stops in both Midland and Odessa.

Supporting transit service
EZ Rider urban transit operates fixed routes within Midland and within Odessa (but not from one city to the other). West Texas Opportunities Permian Basin Rural Transit District (TRAX) provides rural transit service in the surrounding counties. The Permian Basin Regional Plan for Coordinated Transportation (2006) identifies intercity transit service (including transit service from each city to the Midland International Airport) and intermodal facilities as priorities to be further explored.

Multimodal facilities
None found.

Region 10: Concho Valley (San Angelo)

Intercity transit service
Concho Coaches and Kerrville Bus Lines provide intercity service in this area of the state.

Supporting transit service
Thunderbird Transit provides rural transit service to the 13 counties in the region, including trips into San Angelo and Kerrville each week. Thunderbird Transit is operated by the Concho Valley Transit District, which formed in 2006. The transit district consolidated urban, rural, and medical transportation services under one organizational umbrella.

The San Angelo Street Railroad Company (SASRRC) provides fixed-route bus service within the City of San Angelo.

Multimodal facilities
Planning for a multimodal terminal began in 2004 with an Intermodal Feasibility Study that assessed the potential for developing a centralized facility for passenger service, dispatch, administration, and vehicle maintenance for both local and intercity transit services. The Concho Valley Transit District (CVTD) is continuing to move forward with plans for such a facility.

Region 11: Central Texas (Waco) and Region 23: Heart of Texas (Temple-Killeen)

Intercity transit
Greyhound serves the area with stops in downtown Waco (Waco Intermodal Center), Hillsboro, Buffalo, and Fairfield (drop-off point only; no boardings).

The Waco Streak bus line provides three rounds trips per day from the Waco urbanized area to the Dallas/Fort Worth International Airport.

Amtrak's Texas Eagle route stops in McGregor, Temple, and Taylor. Amtrak's bus service also connects Fort Hood and Killeen with the rail station in Temple.

Supporting transit services
The Hill Country Transit District (HCTD) provides demand response transit service to Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, and San Saba Counties and fixed route service in the cities of Copperas Cove, Killeen, Harker Heights, Nolanville, and Temple.

Waco Transit provides fixed-route service within the Waco city limits and connects to Greyhound at the Waco Intermodal Center.

The Heart of Texas Council of Governments (HOTCOG) provides demand-response rural transit in Bosque, Falls, Freestone, Hill, Limestone, and McLennan counties.

Multimodal facilities
The Waco Intermodal Transit Center serves Waco Transit as well as Greyhound.

Region 12: Austin and Region 18: San Antonio

Intercity and regional transit service
Greyhound has several stops throughout the area, including terminals in Austin, Bastrop, Kerrville, San Antonio, San Marcos, and Round Rock. Arrow Trailways (terminal in Round Rock) and the Kerrville Bus Company (terminal in Bastrop) are two other intercity bus providers that serve the area.

Amtrak stops in Austin, San Marcos, and San Antonio in these regions. All three stops are on Amtrak's Texas Eagle Route, which travels north to Dallas/Fort Worth and on to Chicago (or connects in Dallas/Fort Worth to the Heartland Flyer route to continue to Oklahoma City). San

Antonio is also on Amtrak's Sunset Limited route, which extends east to New Orleans and west to Los Angeles. Amtrak service east of New Orleans is currently suspended.

Commuter bus services also provide connections between cities in this region. Texas State University - San Marcos offers commuter bus service between the Texas State campus in San Marcos and downtown Austin. The Capital Area Rural Transportation System (CARTS) offers commuter bus service into Austin from Smithville and from Bastrop. The CARTS County Connector bus route links Bastrop, Elgin, and Smithville. Commuter vanpools operated by San Antonio's VIA Transit also travel between the two metropolitan areas.

Planned intercity services for this region include the Austin-San Antonio Commuter Rail, which will potentially travel from Georgetown to San Antonio (110 miles, with 13 stations), as well as a commuter rail line connecting downtown Austin with Leander, which is scheduled to open by late 2008. CARTS has additional express bus routes planned to link destinations in Hays and Williamson Counties with Travis County destinations.

Supporting transit service

The Capital Metropolitan Transportation Authority (Capital Metro) provides urban transit service in the Cities of Austin, Manor, San Leanna, Leander, Jonestown, Lago Vista, Point Venture, Volente, and some of the incorporated areas of Travis and Williamson Counties. A variety of bus services serve different travel markets; options include local, limited-stop and "flyer," crosstown, and express bus routes, feeder routes that connect selected neighborhoods to Capital Metro Transit Centers, airport shuttles, downtown circulators, and a dial-a-ride route serving Lago Vista, Jonestown, and Leander. Capital Metro also operates a commuter vanpool program as well as a ride-matching service for carpools. Planned future transit services within the Capital Metro service area include 10 new rapid bus lines and 10 new or expanded express bus routes.

CARTS provides general transportation services throughout Williamson, Hays, Travis, Bastrop, Blanco, Burnet, Caldwell, Fayette, and Lee Counties. CARTS has a long history of partnering with intercity bus services and is developing service routes specifically connecting to intercity transit services in Round Rock, San Marcos, and Bastrop. The first of these routes is expected to begin service in late 2008.

VIA Metropolitan Transit provides public transportation services to the City of San Antonio, 13 suburban cities and the unincorporated areas of Bexar County. Services currently include 85 fixed routes and four downtown circulator routes. "Starlight" late-night service is provided on a demand-response basis within Loop 410 and the Medical Center area between 1:00 and 4:00 a.m. VIA also sponsors commuter vanpools in partnership with Enterprise Rent-a-Car; some of these vanpools travel between San Antonio and Austin. Finally, the VIATrans Paratransit system provides demand-response service to riders with disabilities. Bus Rapid Transit (BRT) is among the proposed transit options described in the San Antonio Mobility 2030 Plan. Plans for a BRT system in the San Antonio area, operated by VIA, are underway with service expected to begin in 2012. The primary BRT corridor will follow Fredericksburg Road, linking San Antonio's central business district with the South Texas Medical Center. Buses will operate in a dedicated busway for part of the corridor and in mixed traffic close to downtown.

Alamo Regional Transit (ART), operated by the Alamo Area Council of Governments, provides demand-response rural public transportation in Atascosa, Bandera, Comal, Frio, Gillespie, Karnes, Kendall, Kerr, Medina, and Wilson Counties. Public transportation in Guadalupe County is provided through ART's subcontractor, the Community Council of South Central Texas. The rural transit service also connects with the intercity Kerrville Bus Company at the Kerrville Intermodal Facility.

Multimodal facilities
The CARTS Central Terminal in Austin (corner of 6th Street and Robert L. Martinez Jr. Street) is a transfer point for Capital Metro and CARTS buses. CARTS also operates intermodal facilities in Round Rock, San Marcos, and Bastrop; Table A-1 lists these facilities and the other transit providers each serves.

Table A-1. CARTS Intermodal Facilities.

CARTS Station	Also Serves
Round Rock	Greyhound, Arrow Trailways
San Marcos	Greyhound, Amtrak
Bastrop	Greyhound, Kerrville Bus Company

Additional intermodal transit centers are planned for the cities of Taylor and Georgetown, as well as in south and west Williamson County and in Hays County. San Antonio's West Side Multimodal Center, to be constructed in the near west of San Antonio's central business district, will serve VIA bus and BRT initially, and later expand to serve Greyhound, the Austin-San Antonio commuter rail, Amtrak, taxi, and auto rental services.

The Kerrville Intermodal Facility (in the City of Kerrville) serves Alamo Regional Transit as well as the Kerrville Bus Company.

Region 13: Brazos Valley

Intercity transit service
Greyhound serves the cities of Bryan, Navasota, Buffalo, Hearne, and Brenham.

Supporting transit service
The Brazos Transit District provides fixed-route transit in Bryan and College Station, as well as rural demand-response service in the seven counties (Brazos, Robertson, Grimes, Washington, Burleson, Madison, Leon). None of the fixed routes connect with the Bryan Greyhound stop.

Multimodal facilities
None found.

Region 14: Deep East Texas

Intercity transit service
Greyhound/Kerrville Bus Company serves the area with stops in the cities of Center, Corrigan, Crockett, Livingston, Lufkin, and Nacogdoches. Amtrak's bus service stops in Nacogdoches.

Supporting transit service
The Brazos Transit District provides demand-response service to Houston, Polk, San Jacinto, and Trinity Counties, as well as fixed-route urban transit service to the cities of Lufkin (in Angelina County) and Nacogdoches (in Nacogdoches County). Jasper, Newton, Sabine, San Augustine, Shelby, and Tyler Counties appear to be without local transit service.

Multimodal facilities
None found.

Region 15: South East Texas (Beaumont-Port Arthur)

Intercity transit service
Amtrak's Sunset Limited route stops in Beaumont.

Greyhound has stops in the cities of Beaumont and Port Arthur.

The 2006 Regional Transportation Coordination plan recommended a transit service between the cities of Beaumont and Port Arthur as a pilot project. (A similar service called The Link operated between the two cities between 2001 and 2003.)

Supporting transit service
Beaumont Municipal Transit and Port Arthur Transit provide fixed-route transit service within those cities.

South East Texas Transit (SETT) provides demand-response transit services via three subcontractors:

- Orange County Transportation (curb-to-curb demand response service M-F for residents of Orange County;
- Orange Community Action Association, which provides demand-response transit primarily within the Orange city limits (occasionally outside the city limits); and
- Nutrition and Services for Seniors, which provides demand-response transit in north Jefferson and Hardin Counties.

ABC Transit is a private, for-profit transit service that provides demand-response service for the general public and trips to the Southeast Texas Regional Airport in Beaumont on Sundays.

Multimodal facilities
None found.

Region 16: Gulf Coast (Houston-Galveston)

Intercity transit service
Greyhound has stops in Houston as well as in Galveston, Katy, and Conroe. Greyhound's affiliate Valley Transit connects Houston with Bay City, Corpus Christi, and Victoria, along with other cities along US-59 and TX-35.

Kerrville Bus Company shares a station with Greyhound and one with Coach USA in Houston and also has stops in Katy, Humble, Galveston, and other cities in the region.

Amtrak's Sunset Limited route serves the Houston area; an Amtrak station is in downtown Houston, close to the intersection of I-45 and I-10, and also serves as a stop for Greyhound. Amtrak also has bus stations in La Marque and Galveston.

The Houston-Galveston Area Council (H-GAC) 2035 Metropolitan Transportation Plan includes further recommendations for regional and intercity transit service in the 13-county planning region, including the consideration of high-capacity transit corridors (light rail, commuter rail, express bus or BRT) extending outside the current METRO service area. (See Figure 6-6.) Potential corridors include State Highways 249, 288, 225, 146, and 35, and FM 521. H-GAC is conducting a regional commuter rail accessibility study to evaluate high-traffic corridors in the region for possible commuter rail service [http://www.hgaccommuterrail.com/]. The 2035 MTP also supports the efforts of the Texas High Speed Rail and Transportation Corporation (THSRTC) to develop high-speed rail service linking Dallas/Fort Worth, San Antonio, Killeen/Temple, Bryan/College Station, and Houston in a configuration called the "Texas T-Bone."

Supporting transit service
Houston METRO provides bus and light rail transit service to the Houston metropolitan area, including over two-thirds of Harris County and portions of Fort Bend and Montgomery Counties. METRO's bus services include local routes and park-and-ride routes that utilize the city's HOV lanes. The METRORail light rail currently operates along a single 7.5-mile corridor from the Fannin South Park-and-Ride to the University of Houston Downtown campus. An additional 30 miles of light rail is planned for implementation by 2012, including a continuation of the north end of the Red Line to a new Northern Intermodal Facility. Additionally, the 2035 Metro Solutions plan calls for 28 miles of commuter rail along U.S. Highways 90A and 290 and toward Galveston. Planned bus service expansions include "Signature Bus" and suburban bus rapid transit to provide further connections to rail lines and city activity centers.

Colorado Valley Transit provides rural transit and medical transportation service to Austin and Colorado Counties.

Connect Transportation, operated by the Gulf Coast Center, provides rural and medical transportation services in Brazoria County and on the mainland of Galveston County, as well as demand-response transit from Galveston Island to the mainland. Island Transit operates fixed-route bus and trolley service on Galveston Island.

A feasibility study has been completed for the proposed Galveston-Houston Commuter Rail line.

Fort Bend County Transit provides commuter park-and-ride service from UH-Sugar Land to Greenway Plaza and the Galleria, rural transit service, and urban demand-response service in portions of Fort Bend County that are within the Houston urbanized area but outside the METRO service area.

Brazos Transit District provides transit services in Liberty County, including local circulators in Ames, Liberty, Dayton, and Cleveland. Preliminary engineering and environmental analyses have been completed for a possible park-and-ride facility in Dayton that would support commuter service into the Houston central business district. The Brazos Transit District and Coach USA operate the Woodlands Express commuter park-and-ride from The Woodlands to the Houston central business district, the Texas Medical Center, and Greenway Plaza.

Multimodal facilities
The planned Northern Intermodal Facility (to be constructed in the vicinity of North Main and Burnett Streets, just north of downtown) will serve future commuter rail service, Amtrak, freight rail, light rail, intercity bus carriers, and local bus routes. The station will replace the current Amtrak station for the city.

While not specified as multimodal facilities, five new METRO transit centers and four new Park-and-Rides are planned as part of the overall expansion of transit services in the Houston area.

Region 17: Golden Crescent (Victoria)

Intercity transit service
Greyhound/Valley Transit serves the area with a stop in Victoria.

Supporting transit service
RTransit coordinates rural transit service in the seven-county Golden Crescent region plus Matagorda County.

Victoria Transit provides urban fixed-route transit within the Victoria city limits.

Multimodal facilities
A feasibility study to construct an intermodal terminal in Victoria was conducted in 2006.

Region 18: Alamo Area (grouped with Region 12)

Region 19: South Texas (Laredo and surrounding area)

Intercity transit service
Greyhound serves the area with stops in Laredo, Zapata, and Rio Grande City. Amtrak's bus service travels between Laredo and San Antonio.

Supporting transit service
Laredo Transit Management, Inc. (El Metro) provides fixed-route urban service in the City of Laredo.

Rural transit service is provided by El Aguila in Webb County and by Rainbow Lines (operated by the Community Action Council of South Texas) in Starr, Jim Hogg, Zapata and Duval Counties. (Duval County is in the Coastal Bend region.)

El Aguila also provides connections from rural areas of Webb County to some of El Metro's fixed-route stops, including the Laredo Transit Center.

Multimodal facilities
El Metro and El Aguila share the Laredo Transit Center, along with other bus stops. Greyhound and El Metro used to share the Laredo Transit Center, but the address now listed for the Laredo Greyhound station is different (approximately one mile from the Laredo Transit Center).

Region 20: Coastal Bend (Corpus Christi)

Intercity transit service
Greyhound serves the area with stops in the cities of Alice, Aransas Pass, Beeville, Corpus Christi, Kingsville, Robstown, Rockport, and Sinton.

Supporting transit service
The Corpus Christi Regional Transit Authority (CCRTA) provides fixed-route transit within the city of Corpus Christi and a flex route (hybrid of fixed route and demand-response service) in Port Aransas.

Kleberg County Human Services (KCHS) provides rural public transportation in Kleberg and Kenedy Counties.

Bee Community Action Agency (BCAA) provides rural public transportation in Bee, Aransas, Live Oak, and Refugio Counties.

Rural Economic Assistance League (REAL) provides rural transportation to Jim Wells, Brooks, and San Patricio Counties.

Multimodal facilities
None found.

Region 21: Lower Rio Grande Valley (Brownsville, Harlingen, McAllen)

Intercity transit service
Valley Transit Company, a Greyhound affiliate company, provides intercity transit service to all three counties, with stops in the three primary cities (Brownsville, Harlingen, and McAllen). The Valley Transit "Main Line" through the Lower Rio Grand Valley operates as express bus service along U.S. Highway 83 from Brownsville to McAllen. As part of the 2006 regional

transit coordination plan, the Lower Rio Grande Valley Development Council (LRGVDC) negotiated with Valley Transit to provide additional "runs" of this route, to supplement Valley Transit's schedule, and to initiate some direct intercity transit connections from Raymondville to Harlingen and McAllen. LRGVDC's Rio Metro now operates five intercity routes in partnership with Valley Transit and McAllen Express Transit: Intercity Route 1 between McAllen and Edinburgh; Route 2, connecting McAllen and Mission; Route 3, connecting McAllen, Pharr, San Juan, and Alamo; Route 4, connecting McAllen, La Joya, Penitas, Palmview, and Mission, and the Rio Metro Career Link. The Career Link, or "JARC" (Job Access and Reverse Commute) Route provides three "clockwise" and three "counterclockwise" loops per day along U.S. 83 and connecting FM roads, with stops in 15 urbanized areas throughout the Lower Rio Grande Valley. The primary function for the service is bringing workers to jobs in the Valley.

The Valley Transit/Greyhound service connects the Lower Rio Grande Valley to Houston, San Antonio, and Laredo.

Supporting transit service
A flex-route bus service called the Harlingen Express began in the spring of 2008 in the City of Harlingen.

The Brownsville Urban System (BUS) provides urban transit service within the City of Brownsville.

McAllen Express Transit provides urban transit service within the City of McAllen.

Multimodal facilities
Specific multimodal facilities are not named in local plans, but planned coordination of feeder routes and Valley Transit along U.S. 83 will likely include timed stops at existing Valley Transit stations.

Region 22: Texoma (Sherman-Denison)

Intercity transit service
Greyhound serves the area with a stop in Sherman-Denison that also is a terminal for the Texoma Area Paratransit System (TAPS).

Supporting transit service
TAPS provides public transportation in Sherman-Denison urban and surrounding rural areas, including the three counties in the Texoma region (Grayson, Cook, and Fannin) and four counties not in the Texoma COG region (Clay, Jack, and Montague Counties in the Nortex Region and Wise County in the North Central Texas region). TAPS operates a number of regional routes including shuttles connecting the cities of Sherman and Denison with the DART train station in Plano (Texoma Express); service between the city of Peterbilt and the cities of Nocona, Gainesville, and Bowie; and employment routes for Texas Instruments, Trailblazer, and United America that connect Denison, Sherman, Bonham, McKinney, and Richardson. Another "employment shuttle" connects several Texoma-area communities to the Alliance Airport.

Multimodal facilities
The TAPS intermodal terminal in Sherman serves TAPS urban and rural bus services as well as Greyhound.

Region 23: Heart of Texas (Temple-Killeen); Grouped with Region 11

Region 24: Middle Rio Grande (Del Rio, Eagle Pass, Uvalde)

Intercity transit service:
Kerrville Bus Company and Greyhound serve the area with stations in Del Rio, Eagle Pass, and Uvalde.

Supporting transit services:
Southwest Transit, operated by the Community Council of Southwest Texas, provides rural transit (demand response and deviated fixed route) to Dimmit, Edwards, Kinney, La Salle, Maverick, Real, Uvalde, and Zavala counties.

The City of Del Rio operates Del Rio Transit, providing rural transit (demand-response and deviated fixed route) to Val Verde County.

Intermodal facilities
Southwest Transit has two multimodal facilities: the Kerrville Bus Terminal in Uvalde and the Kerrville Bus Station in Eagle Pass.

Del Rio Multimodal Transit center serves Del Rio Transit and Greyhound.