Chapter 3
Evaluation of Future Conditions

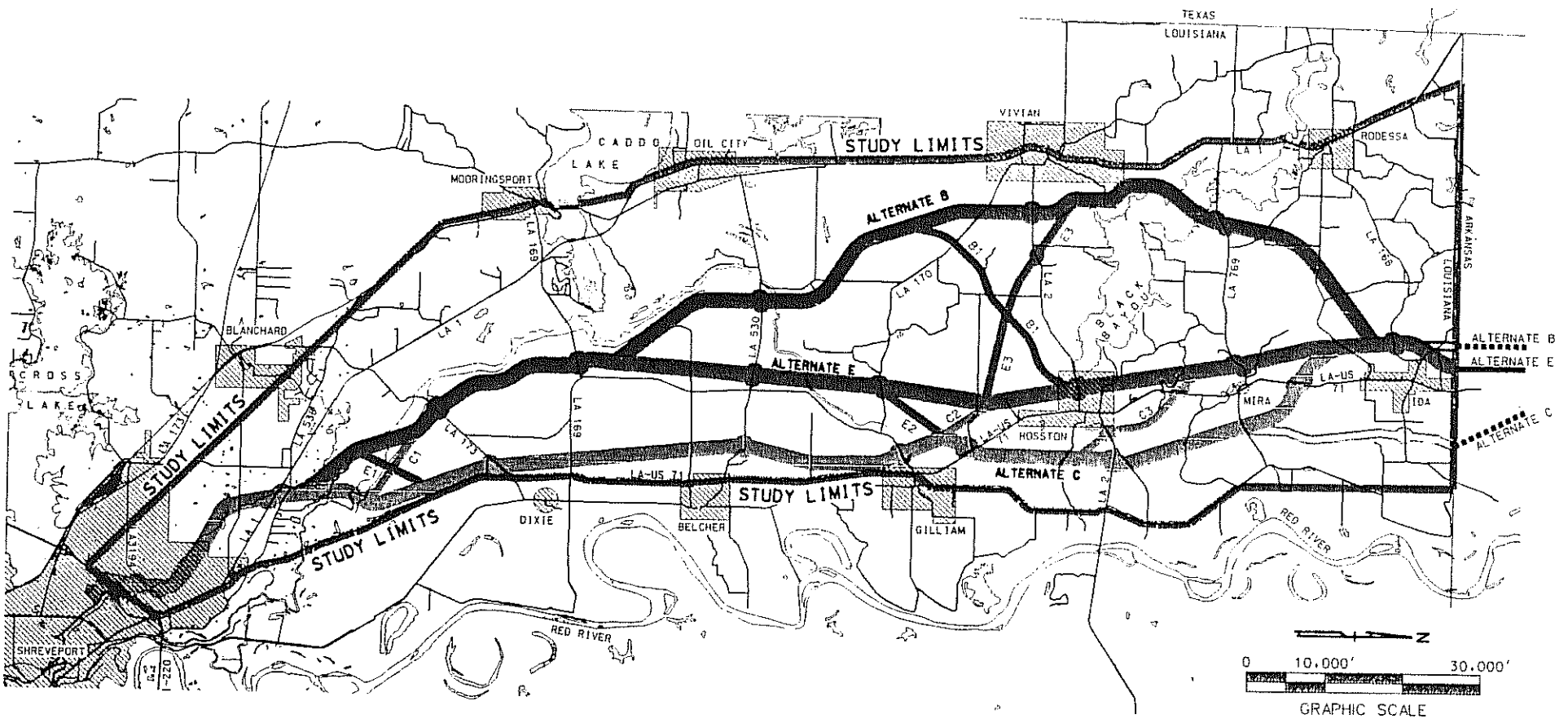
This chapter documents estimated future traffic volumes and the evaluation of alternative alignments for the proposed North-South Expressway between Interstate 220 in Shreveport and the Arkansas State Line. Future traffic volumes were estimated for year 2005 (estimated year of project completion) and year 2020 (design year). Traffic impacts associated with the alternative highway alignments were evaluated by comparing future traffic volume projections and various measures of effectiveness such as levels-of-service (LOS), vehicle miles and hours of travel, average trip lengths and total vehicle delays.

Alternative Highway Alignments

Alternative corridor alignments for the proposed North-South Expressway were identified by the Consultant Team in coordination with LaDOTD staff. Selection of the generalized alternative alignments recognized the location of existing land use constraints such as major developments, railroads, agricultural farm lands, floodplains, waterways, wetlands, and other significant land use features. The location of the alternative alignments at the Arkansas State Line are consistent with the location of alternative corridor alignments being considered for the North-South Expressway in the State of Arkansas. For consistency, the letter designations assigned to the Arkansas corridor alternatives are also used for the alternative alignments selected for this study. The alternative corridor alignments selected for this study are shown in **Figure 9**.

All alternatives were assumed to be freeway or interstate-type facilities, with a total of four travel lanes (mainlanes) and two-way, two-lane frontage roads on both sides of the freeway mainlanes along most of its length. Location of interchanges for each alternative are shown in Figure 9. Design standards for the alternatives were assumed to be in accordance with the following design standards adopted by LaDOTD for freeways:

- Design Speed - 120 k/hr (70 mph) (desirable)
- Design Level-of-Service (LOS) - LOS C
- Width of Travel Lanes - 3.6 meters (12 feet)
- Width of Shoulders
  Outside - 3.0 meters (10 feet)
  Median - 1.8 meters (6 feet)



ALTERNATIVE HIGHWAY ALIGNMENTS

NORTH-SOUTH EXPRESSWAY
I-220 TO ARKANSAS STATE LINE
STATE PROJECT NO. 700-24-0072
FEDERAL AID PROJECT NO. DE-NHS-0009 (801)
CADDO PARISH

DENOPULOS and FERGUSON, INC.
CONSULTING ENGINEERS

Figure 9

- Width of Median
  Depressed - 27 meters (90 feet) (desirable)
  Continuous Barrier - 4.2 meters (14 feet)
- Width of Right-of-Way (ROW) - 90 meters (300 feet) (desirable); also varies as needed
- Horizontal Clearance From - Travel Lane - 10.5 meters (34 feet)
- Horizontal Curvature - 595 meters (3°) (desirable)

It is recognized that uniform application of the indicated design standards may be difficult to apply in all areas due to possible right-of-way acquisition constraints, construction costs and adverse environmental impacts. In these areas, special cross section designs will need to be considered.

Development of Travel Demand Models

This section summarizes the development and calibration of computerized travel demand forecasting models, which were used for estimating future traffic volumes and evaluating alternative alignments of the proposed North-South Expressway. TRANPLAN, a microcomputer-based transportation modeling package, and other mathematical modeling software were used for estimating future traffic volumes within the traffic analysis study area.

The development of travel demand models for simulating existing traffic volumes and projecting future traffic volumes in the study area involved three basic steps--trip generation, trip distribution, and traffic assignment. The first step, trip generation, involved estimating the number of trips generated in (productions) and attracted to (attractions) each traffic analysis zone. The second step, trip distribution, involved the distribution of the trips ends between all possible zones. This was accomplished by a mathematical trip distribution model ("gravity" model). The third step, traffic assignment, involved the assignment of vehicle trips to the study area roadway network.

Existing Roadway Network - The existing roadway network in the traffic analysis study area was simulated by describing roadways and intersections in numerical and digital terms. Each intersection, referred to as a "node", was connected to adjacent intersections by "links", which represent the associated roadway sections. Each link was assigned a distance, speed, capacity, and

other roadway characteristics. The roadway network allowed for the determination of zone-to-zone travel times and assignments of traffic on the study area highways.

Traffic Analysis Zones - The study area was divided into traffic analysis zones, which were used in the modeling process to relate travel demand to population and land use characteristics, and to develop travel moments between area developments. There are a total of 43 internal zones within the study area and 16 external zones representing highways entering and exiting the study area.

Existing Population - Existing population for the entire study area and by traffic analysis zone was estimated using 1990 Census data provided by NLCOG. These population estimates were used as input variables for the travel demand models to estimate the number of vehicle trips produced by or attracted to development within each traffic analysis zone.

Model Calibration - Existing traffic assignments on the roadway network were made using origin-destination information obtained from roadside surveys conducted on LA 1, U.S. 71, and LA 3, and supplemented with a synthetic gravity model. This process created a total trip table that was used for iterative "capacity restraint" traffic assignments on the existing roadway network.

The validity of the models and their ability to simulate existing traffic patterns was tested by comparing the model traffic assignments with actual (observed) traffic volumes on the area highway system. Overall, the final model traffic assignment resulted in 316,344 daily vehicle trips compared to the 315,386 observed trips at all locations where traffic volume counts were available. The model traffic assignments are within only 0.3 percent of the observed traffic volumes, with a correlation (R^2) of 0.98. A correlation coefficient (R^2) of 1.0 indicates a perfect correlation.

The comparison of assigned vehicle trips to observed traffic volumes on highways throughout the study area confirmed that the traffic models are in close agreement with existing traffic conditions, and attest to their ability to replicate existing travel patterns. Accordingly, it was concluded that the traffic models could be used to reliably forecast future travel demands.

Future Population and Growth

Future population and development in northwest Louisiana will have a significant influence on future traffic volumes on the proposed North-South Expressway and area highway system. Historic and future population projections for Caddo and Bossier Parishes and the Cities of Shreveport and Bossier City are shown in **Figure 10**. Year 1970-1990 population figures were obtained from U.S. Census data, with Year 2000-2020 population projections obtained from several sources including the publication entitled Population Projections to 2010 of Louisiana Parishes; Dr. Kenneth Hinze, LSU-Shreveport, December, 1994; and, Wilbur Smith Associates.

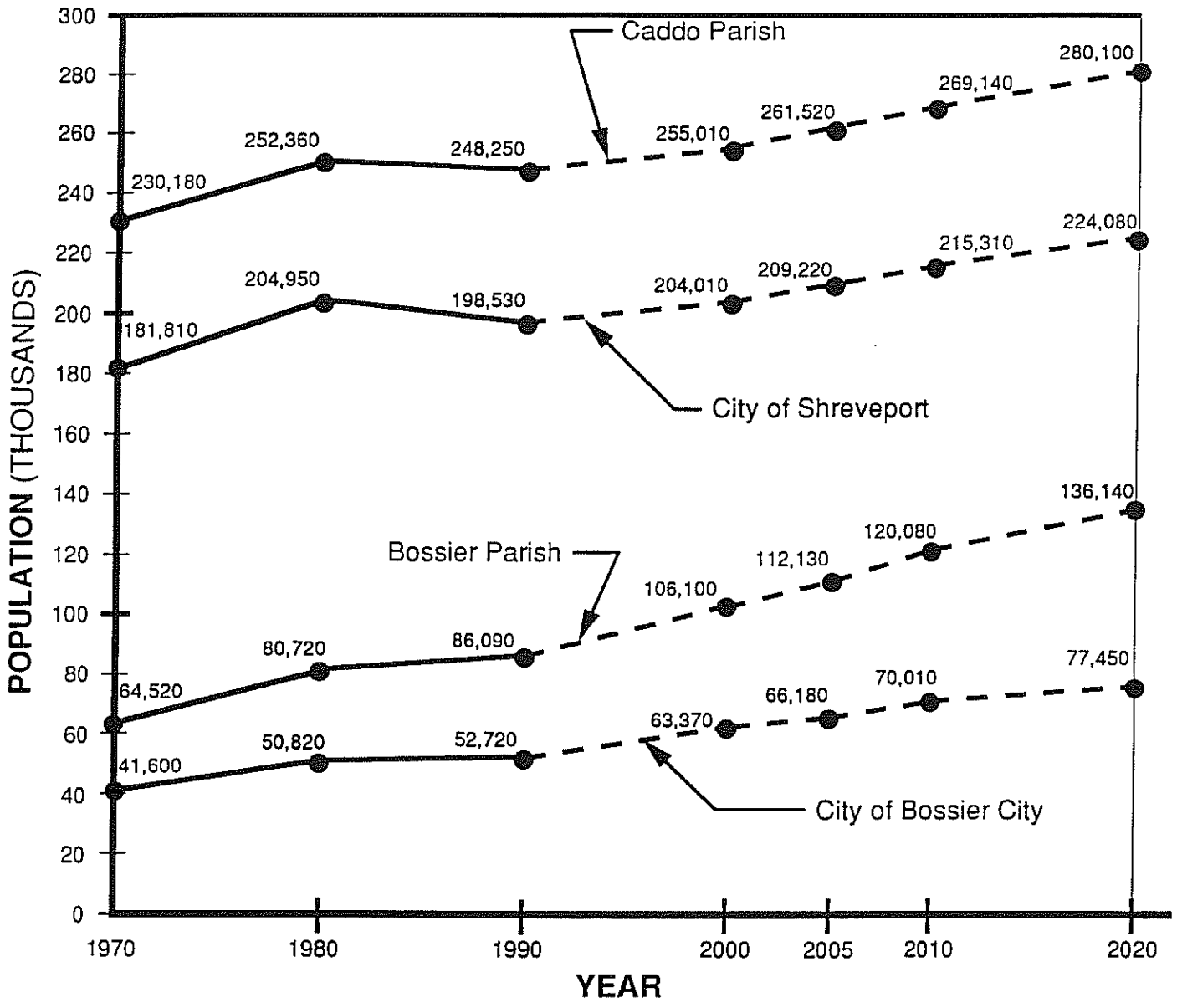
Caddo Parish experienced a historic population growth ranging from 230,180 persons in 1970 to 248,250 persons in 1990, which represents an annual increase of 0.38 percent per year. Caddo Parish's population is projected to increase at a similar rate for the next twenty-five years, with a population of 280,100 persons estimated in year 2020. This projected population growth represents an annual increase of 0.43 percent per year.

Bossier Parish has experienced a higher population growth rate than Caddo Parish over the last two decades, and is also projected to grow at a higher rate through year 2020. Bossier Parish's population increased from 64,520 persons in 1970 to 86,090 persons in 1990, representing an annual increase of 1.45 percent per year. Bossier Parish is projected to experience an annual growth rate of 1.40 percent per year through year 2020, when its population is estimated to be 136,140 persons.

Future population for the traffic analysis study area was estimated based on its historical population growth (1970-1990) and considering the population projections for Caddo and Bossier Parishes and the Cities of Shreveport and Bossier City. The study area population was then disaggregated by traffic analysis zone and used as input variables to the travel demand forecasting model.

Future Traffic Volumes

Future traffic volumes on the proposed North-South Expressway will consist of traffic resulting from normal growth in the area, traffic diversion from parallel highways, long-distance traffic rerouting, and induced traffic. These traffic sources are described as follows:



Sources: (1) 1970-1990 population figures obtained from U.S. Census data.

(2) 2000-2010 Caddo Parish populations obtained from Population Projections to 2010 of Louisiana Parishes, Michael D. Irwin, LSU, 1992.

(3) 2000-2020 Bossier Parish populations estimated by Kenneth E. Hinze, LSU-Shreveport, 1994.

(4) 2000-2020 City populations estimated by Wilbur Smith Associates.

Historic and Projected Population

North-South Expressway Corridor Study

Shreveport to Arkansas State Line

Wilbur Smith Associates

Figure 10

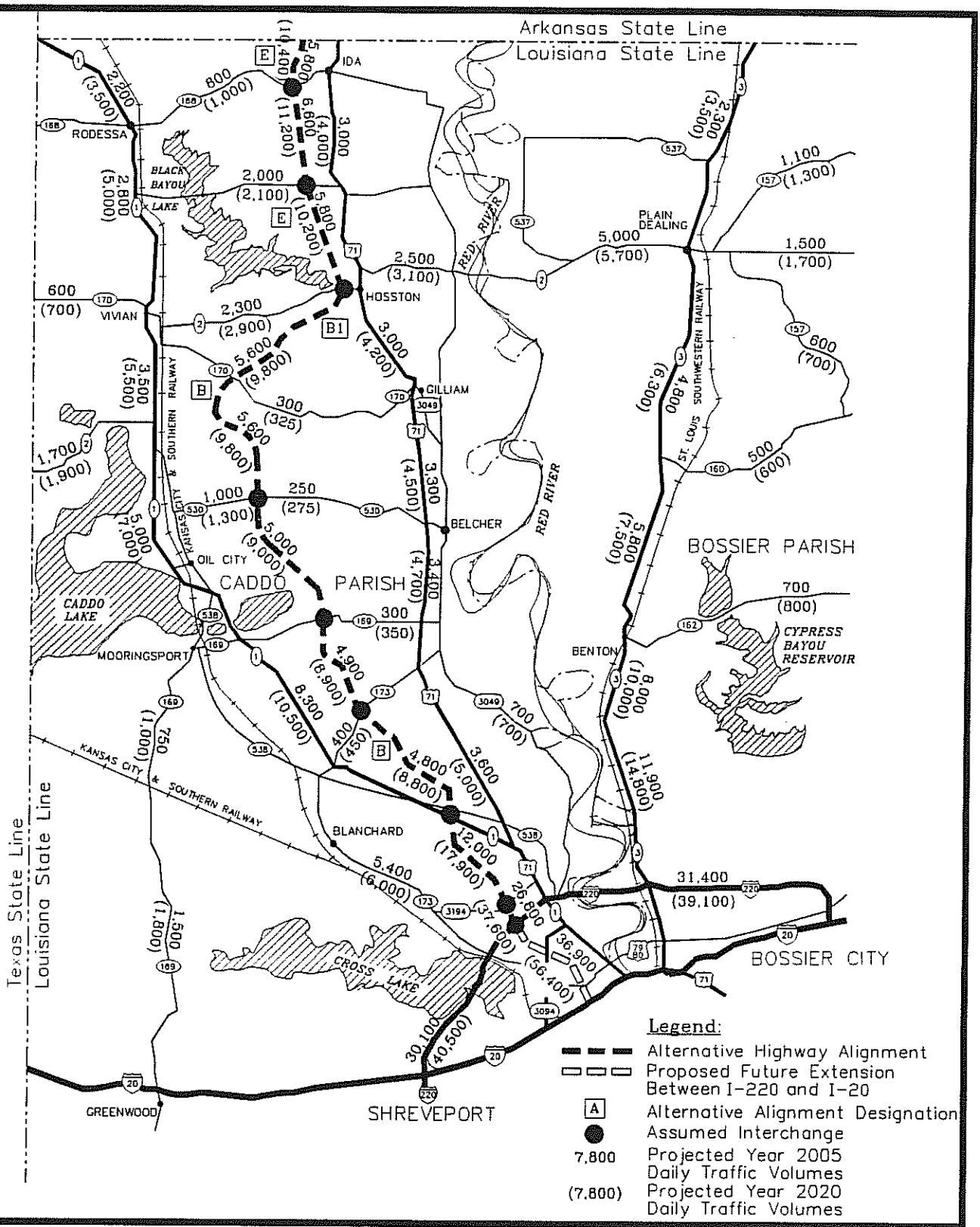
- **Normal Traffic Growth** - Increases in traffic will occur in the region due to population and development growth, increased visitation of tourist places, increased business, and economic activity. Future traffic volumes on the North-South Expressway and adjacent roadway system were estimated based on historic traffic volume increases on area highways and projected future population growth previously discussed. Additionally, consideration was given to future increases in truck traffic resulting from the North American Free Trade Agreement (NAFTA).

- **Diversion from Other Roads** - When the North-South Expressway is built, it will offer faster, more efficient and safer travel for vehicles in the region. This will cause some cars and commercial trucks, especially through trips, to divert to the North-South Expressway from other highways such as U.S. 71, LA 1, and LA 3. Estimates of traffic that would divert from the parallel highways was based on origin-destination information obtained from the travel surveys conducted for this study on U.S. 71, LA 1, and LA 3.

- **Long Distance Traffic Rerouting** - Some traffic that now travels on IH-20 and IH-40 and uses other more distant connecting highways between the two Interstate Highways could, in some instances, choose to use the North-South Expressway. This could include some traffic that currently uses IH-35 and IH-55 to visit destinations in the North-South Expressway Corridor region between Shreveport and Kansas City, Missouri.

- **Induced Traffic** - In addition, there could be more traffic generated on the proposed North-South Expressway merely because the new highway exists. For example, by making travel faster between the southern areas of Texas and Louisiana and Branson, Missouri, more visitors may be attracted to these and other tourist areas and use the new highway.

Future daily traffic volumes estimated on the seven alternative North-South Expressway alignments for year 2005 (estimated year of project completion) and year 2020 (design year) are shown in **Figures 11-17**. These future traffic volume forecasts were estimated using computerized travel demand models, study area population projections, and estimates of the previously discussed traffic sources such as normal traffic growth, traffic diversion from existing highways in the area and



Future Year Traffic Volumes for Alternative B-B1-E

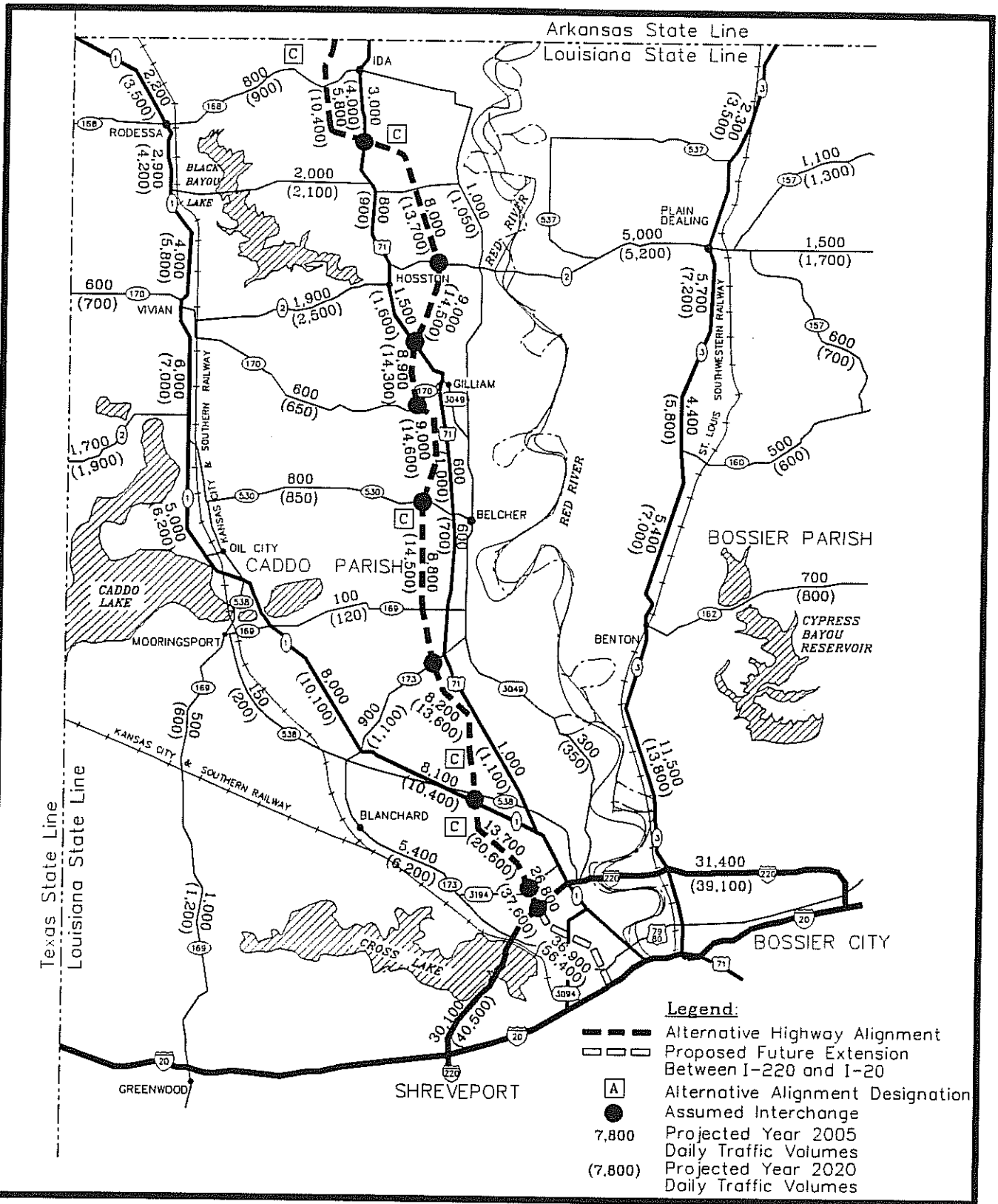
North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 12



Future Year Traffic Volumes for Alternative C

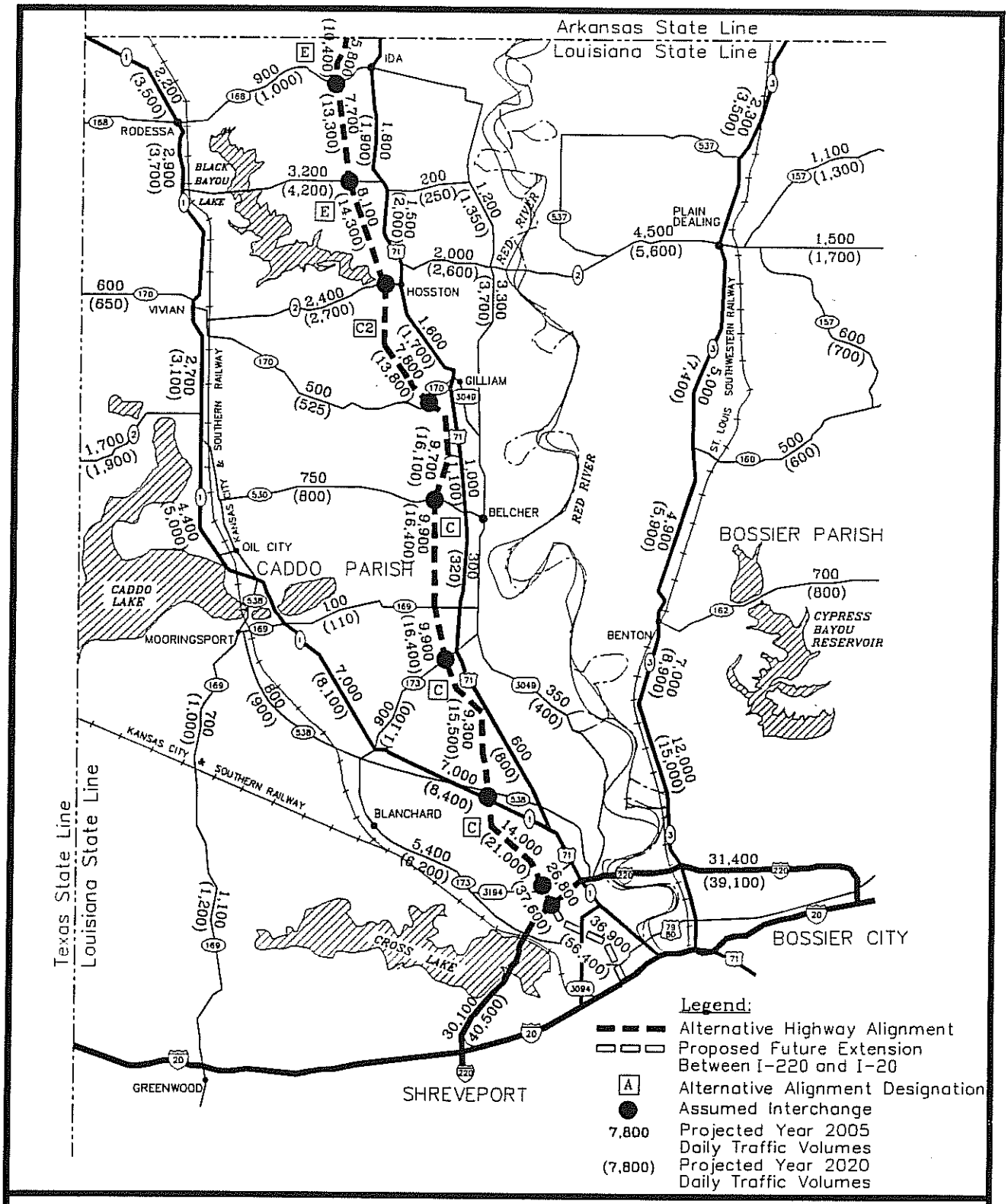
North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 13



Future Year Traffic Volumes for Alternative C-C2-E

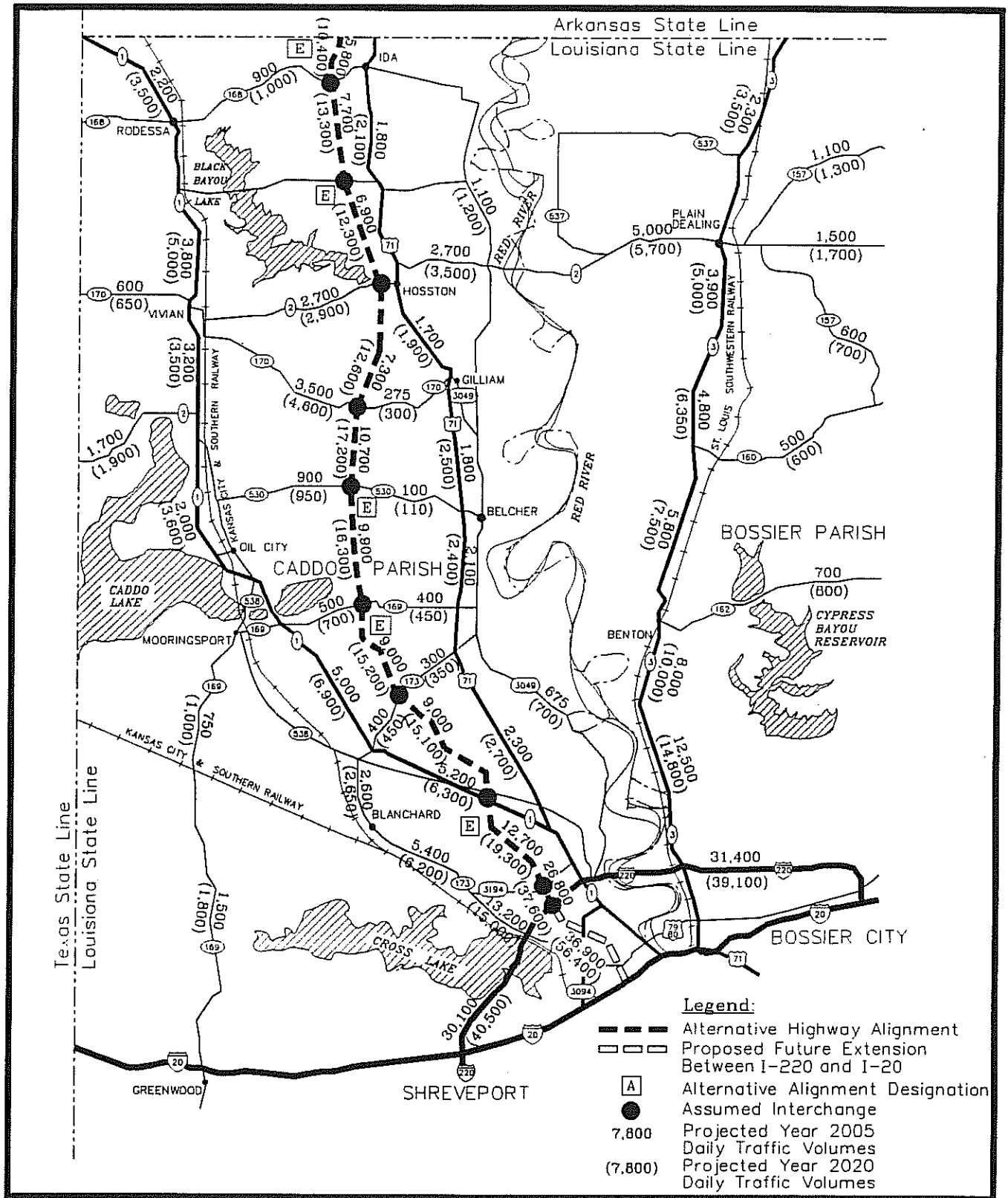
North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 14



Future Year Traffic Volumes for Alternative E

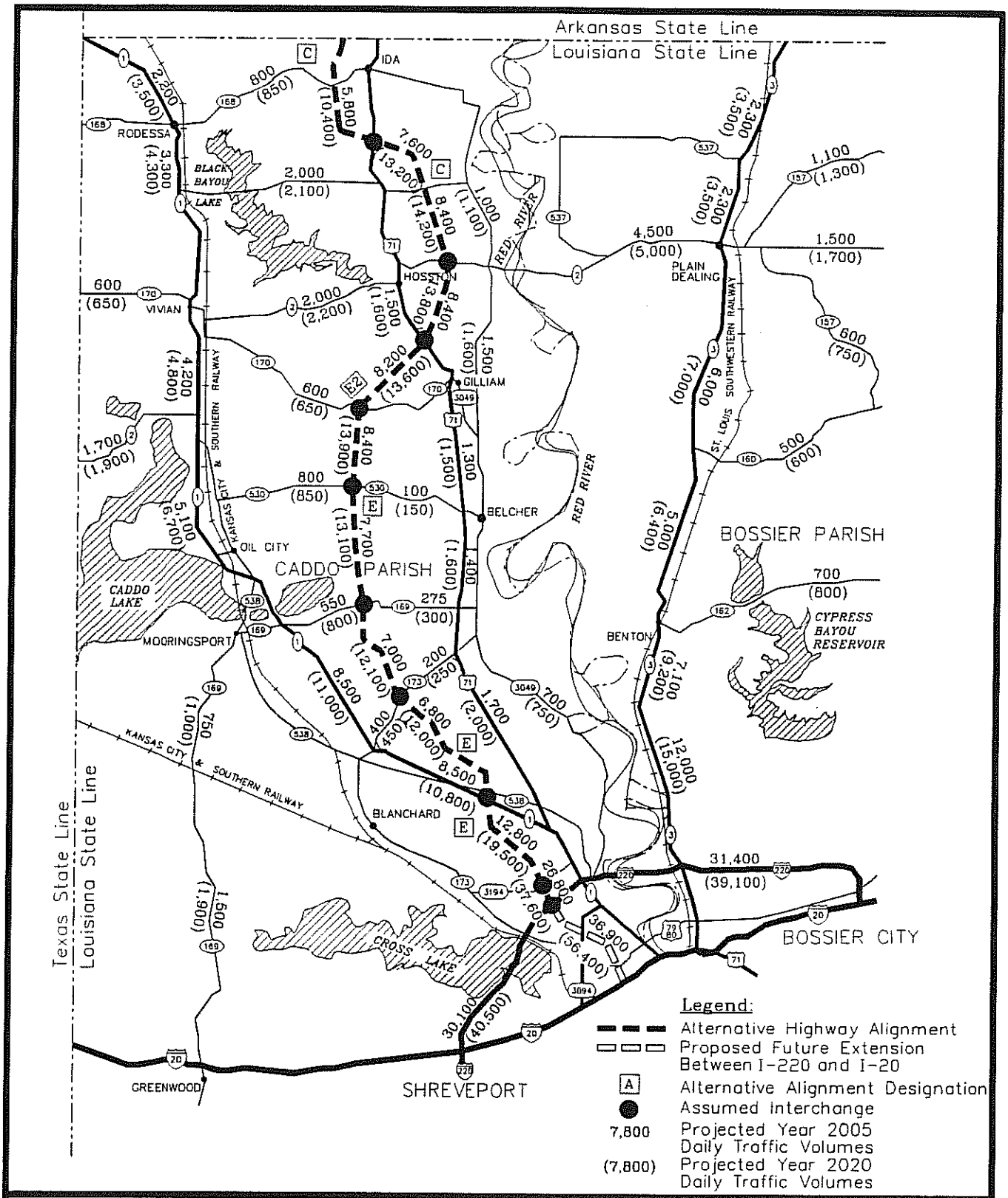
North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 15



Future Year Traffic Volumes for Alternative E-E2-C

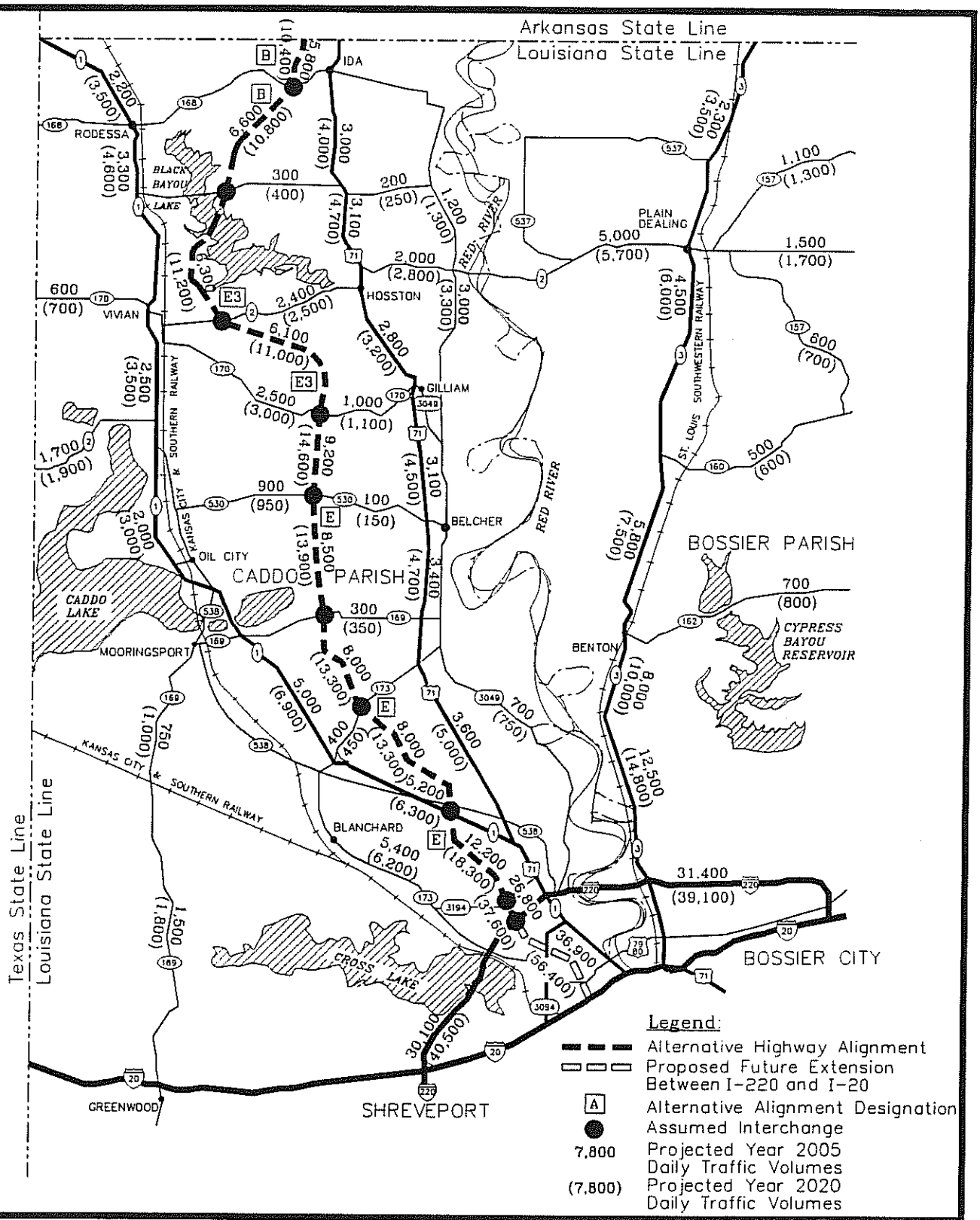
North-South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 16



Future Year Traffic Volumes for Alternative E-E3-B

North-South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 17

region, and induced traffic. The future traffic volumes shown in these figures assumed implementation of the proposed future extension of the North-South Expressway between Interstates 220 and 20.

Year 2005 traffic volumes on all alternative alignments at the northern and southern project limits are estimated to be the same, ranging from approximately 5,800 vehicles per day (vpd) at the Arkansas State Line to 26,800 vpd north of Interstate 220 and 36,900 vpd south of Interstate 220. Year 2020 traffic volumes on the alternative highway alignments range from 10,400 vpd at the Arkansas State Line to 37,600 vpd north of Interstate 220 and 56,400 vpd south of Interstate 220. The average annual traffic growth on the North-South Expressway alternatives between years 2005 and 2020 range from a 3.97 percent annual increase at the Arkansas State Line to a 2.28 percent annual increase north of Interstate 220 and 2.87 percent annual increase south of Interstate 220. Future traffic volumes between the north and south limits of the North-South Expressway alternatives, which are also shown in Figures 11-17, vary depending on their alignment and areas served.

Evaluation of Alternatives

Alternative alignments of the North-South Expressway were evaluated by comparing levels-of-service (LOS) and other performance measures provided by the alternatives and a "no-build" alternative (i.e., assumes the proposed North-South Expressway is not constructed). The performance measures, or measures of effectiveness (MOE), for the "no-build" condition and alternative highway alignments were estimated by the computerized travel demand models used for this study and are indicated in **Table 3**.

As indicated in Table 3, all of the North-South Expressway alternatives provide more efficient traffic service than that provided with the "no-build" condition. It should be noted that the traffic performance measures presented in Table 3 are for the entire study area selected for this traffic analysis. The improvement in traffic service and operating conditions along the adjacent north-south highways within the study corridor are significantly higher, as shown in **Table 4**. Considering all of the measures of effectiveness for the entire study area, Alternatives C and C-C2-E generally provide the best traffic service and operating conditions of the alternatives selected for this study.

Table 3

COMPARISON OF YEAR 2020 MEASURES OF EFFECTIVENESS

North-South Expressway Corridor Study
Shreveport to Arkansas State Line

YEAR 2020 MEASURES OF EFFECTIVENESS (MOE) FOR TOTAL STUDY AREA

Alternative	Total Trips	Average Trip Length		Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Average Speed (MPH)	Total Vehicle Delay (Hours)
		Minutes	Miles				
No-Build	203,332	16.5	10.3	2,109,234	56,159	37.6	4,992
Alternative B	209,150	15.6	10.7	2,244,699	54,254	41.4	1,653
Alternative B-B1-E	209,150	15.8	10.7	2,240,295	53,990	40.7	2,153
Alternative C	209,150	15.5	10.6	2,223,065	53,977	41.2	1,643
Alternative C-C2-E	209,150	15.4	10.6	2,224,529	53,809	41.3	1,485
Alternative E	209,150	15.5	10.7	2,229,739	54,079	41.2	1,673
Alternative E-E2-C	209,150	15.6	10.7	2,236,729	54,381	41.1	1,823
Alternative E-E3-B	209,150	15.8	10.8	2,259,040	54,920	41.1	1,945

Table 4

COMPARISON OF YEAR 2020
VMT AND VHT ON NORTH-SOUTH HIGHWAYS
North-South Expressway Corridor Study
Shreveport to Arkansas State Line

	Year 2020 Vehicles Miles Traveled (VMT)						Year 2020 Vehicle Hours Traveled (VHT)					
	LA1	U.S. 71	U.S. 71/ LA1	LA3	N-S Exp.	Total	LA1	U.S. 71	U.S. 71/ LA1	LA3	N-S Exp.	Total
No-Build	322,752	240,987	99,492	314,180	--	977,411	6,267	4,748	3,286	5,868	--	20,169
Alternative B	153,898	102,460	66,386	261,532	559,782	1,144,058	2,826	2,064	1,441	4,834	9,128	20,293
Alternatives B-B1-E	269,284	137,677	67,859	261,532	407,331	1,143,683	5,104	2,776	1,506	4,834	6,677	20,896
Alternative C	274,582	38,880	64,851	247,967	514,488	1,140,769	5,218	799	1,383	4,564	8,434	20,398
Alternative C-C2-E	221,629	35,407	64,708	250,828	540,996	1,113,567	4,128	735	1,380	4,624	8,879	19,746
Alternative E	185,763	71,233	66,165	261,532	527,285	1,111,979	3,420	1,451	1,430	4,834	8,616	19,751
Alternative E-E2-C	275,384	58,949	66,065	254,397	501,674	1,156,469	5,231	1,204	1,428	4,693	8,182	20,738
Alternative E-E3-B	174,274	143,323	67,859	261,532	504,468	1,151,457	3,199	2,881	1,506	4,834	8,234	20,654

The vehicle miles of travel (VMT) for the "no-build" condition is lower than the VMT for the alternative highway alignments. This is primarily due to the diverted and induced traffic that is estimated on the North-South Expressway, which is represented by the difference in total vehicle trips in the study area (203,332 trips for the "no-build" condition versus 209,150 trips for the alternatives).

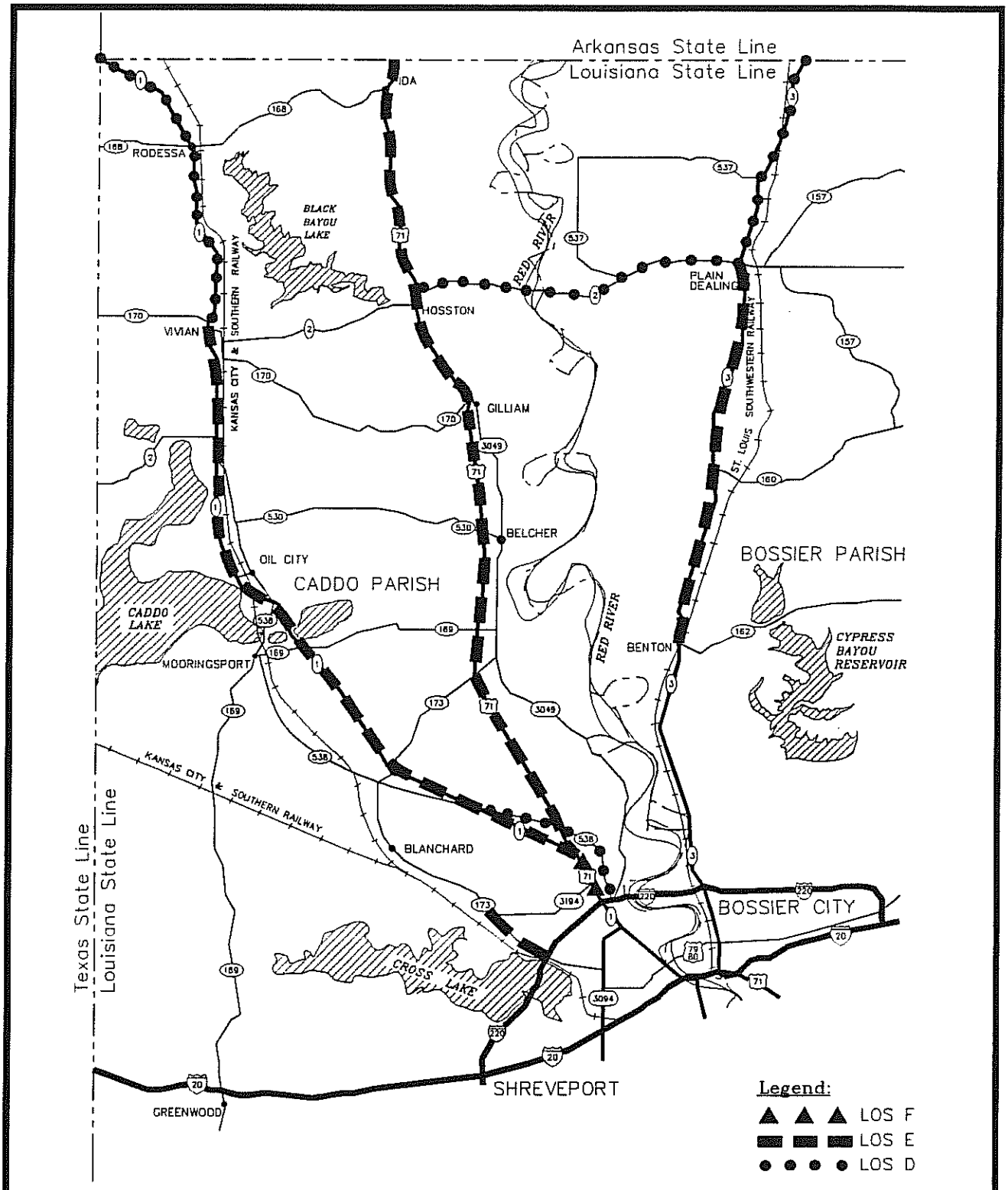
Study area highways projected to operate at unacceptable LOS D, E or F for the "no-build" condition by year 2020 are shown in **Figure 18** and described as follows:

- LA 1 - Between Arkansas State Line and LA 2 (LOS D);
- LA 1 - Between LA 2 and U.S. 71/LA 1 split (LOS E);
- U.S. 71 - Between Arkansas State Line and U.S. 71/LA 1 split (LOS E);
- U.S. 71/LA 1 - Between U.S. 71/LA 1 split and Interstate 220 (LOS F);
- LA 3 - Between Arkansas State Line and LA 2 (LOS D);
- LA 3 - Between LA 2 and LA 162 (LOS E);
- LA 173 - Between LA 3194 and Interstate 220 (LOS E);
- LA 538 - Between LA 1 and Interstate 220 (LOS D); and,
- LA 2 - Between U.S. 71 and LA 3 (LOS D).

Many of the year 2020 capacity deficiencies and poor levels-of-service projected for the "no-build" condition are eliminated or alleviated with any of the alternative North-South Expressway alignments. Highways projected to continue to operate at LOS D, E or F with the North-South Expressway are shown in **Figure 19** and include the following:

- LA 1 - Between LA 2 and LA 169 (LOS D for Alternatives C, E-E2-C, C-C2-E, and B-B1-E only);
- LA 1 - Between LA 169 and LA 538 (LOS E for Alternatives C, E-E2-C, C-C2-E, and B-B1-E and LOS D for Alternatives B, E, and E-E3-B);
- U.S. 71/LA 1 - Between U.S. 71/LA 1 split and Interstate 220 (LOS D);
- LA 3 - Between LA 2 and LA 162 (LOS D);
- LA 538 - Between LA 1 and Interstate 220 (LOS D); and,
- LA 2 - Between North-South Expressway and LA 3 (LOS D).

All of the North-South Expressway alternatives are projected operate at LOS A between the Arkansas State Line and LA 3194, and LOS B-C between LA 3194 and Interstate 220.



Year 2020 Roadway Deficiencies for "No-Build" Condition

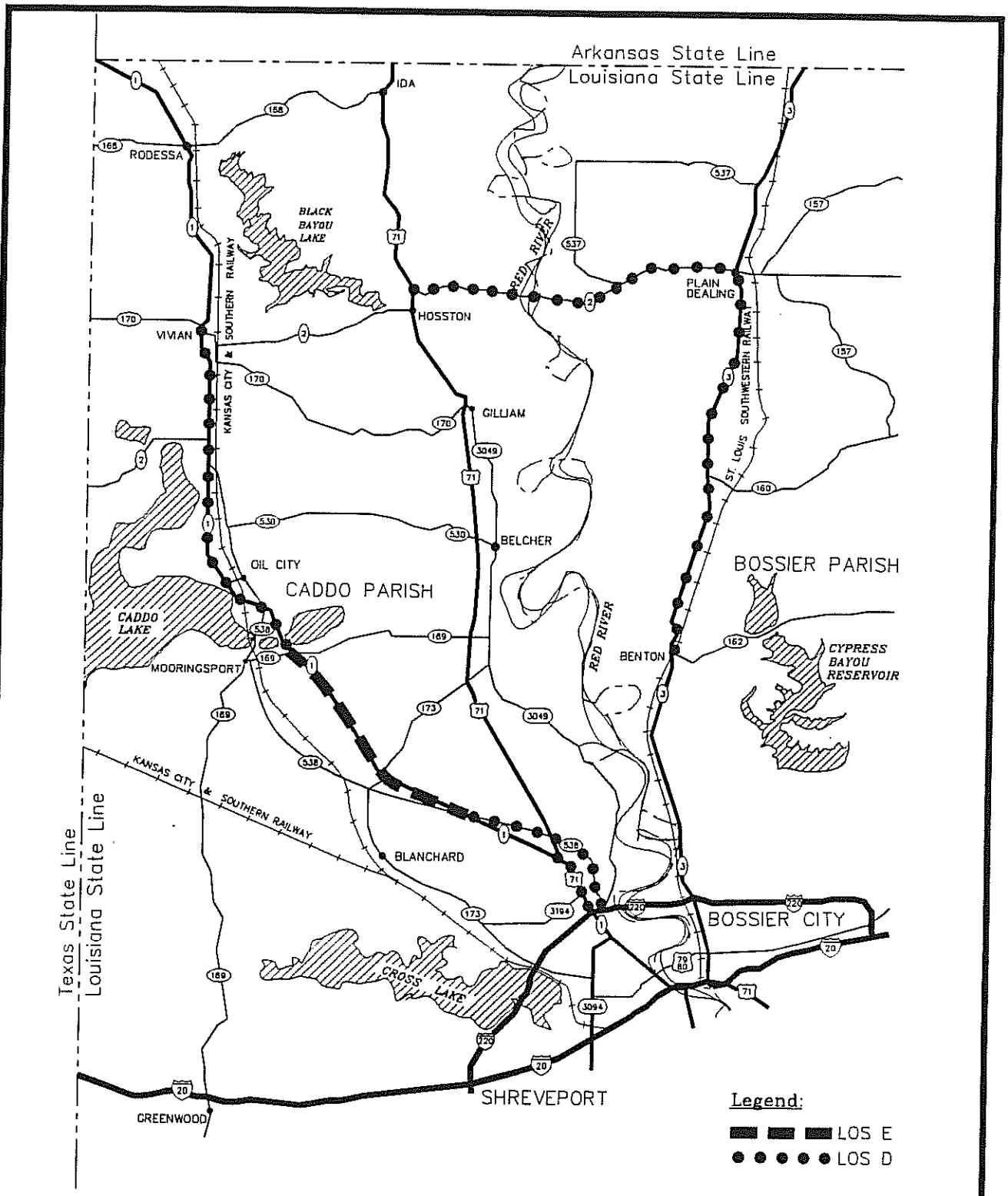
North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 18



Year 2020 Roadway Deficiencies With Implementation of N-S Expressway

North–South Expressway Corridor Study

Shreveport to Arkansas State Line

3 2 1 0 3M
SCALE IN MILES

Wilbur Smith Associates

Figure 19