Chapter 3 - Demographics & Travel Demand Model

DEMOGRAPHIC DATA

The purpose of the following section is to examine existing and future demographic conditions that are used as inputs to the area travel demand computer model. The model is used to estimate existing and future trip generation and traffic volumes for area roadways. Demographic variables discussed in this section include population, employment and income. Through analysis of these variables and development of forecasts, future transportation needs can be identified and evaluated. This report discusses basic demographic information for the City of Laredo and Webb County and summarizes forecasts developed for the study area. More detailed information is presented in a separate report entitled, Socioeconomic Data Collection and Forecast Study. The transportation networks and travel demand model developed for this study will be discussed in further detail later on this chapter.

Methodology

This chapter addresses existing and future conditions that are closely associated with travel demand and trip generation characteristics of the Laredo Metropolitan area. Demographic estimates were prepared for the base year 2003 and forecasts were prepared for the years 2010, 2020 and 2035. The forecasts were prepared for the Laredo MPO planning area at the Traffic Analysis Zone (TAZ) level. Traffic Analysis Zones (TAZs) define geographic areas (Census block groups) which are used to relate travel demand to socioeconomic characteristics. The resulting traffic analysis zone system is shown in **Figure 3-1**. There are a total of 232 TAZs within the Laredo MPO planning area, 216 of which are internal zones and 16 of which are external zones (locations where traffic enters and exits the study area). Demographic variables examined within each TAZ include:

- Population
- Households
- Housing Units
- Total Employment
- Retail Employment
- Basic Employment
- Service Employment
- Median Household Income
- Undeveloped Acreage

Base Year Estimates

Base year estimates were developed using available data from the US Census Bureau, Texas Workforce Commission and City of Laredo. In developing 2003 estimates for population, households and housing units, 2000 US Census Bureau block level data was aggregated to the TAZ level. This data was then adjusted to reflect the Texas State Data Center's 2003 population estimate for Webb County through utilizing available plat data to determine the number of housing units built since the Year 2000.

Figure 3-1a Traffic Analysis Zones, Study Area

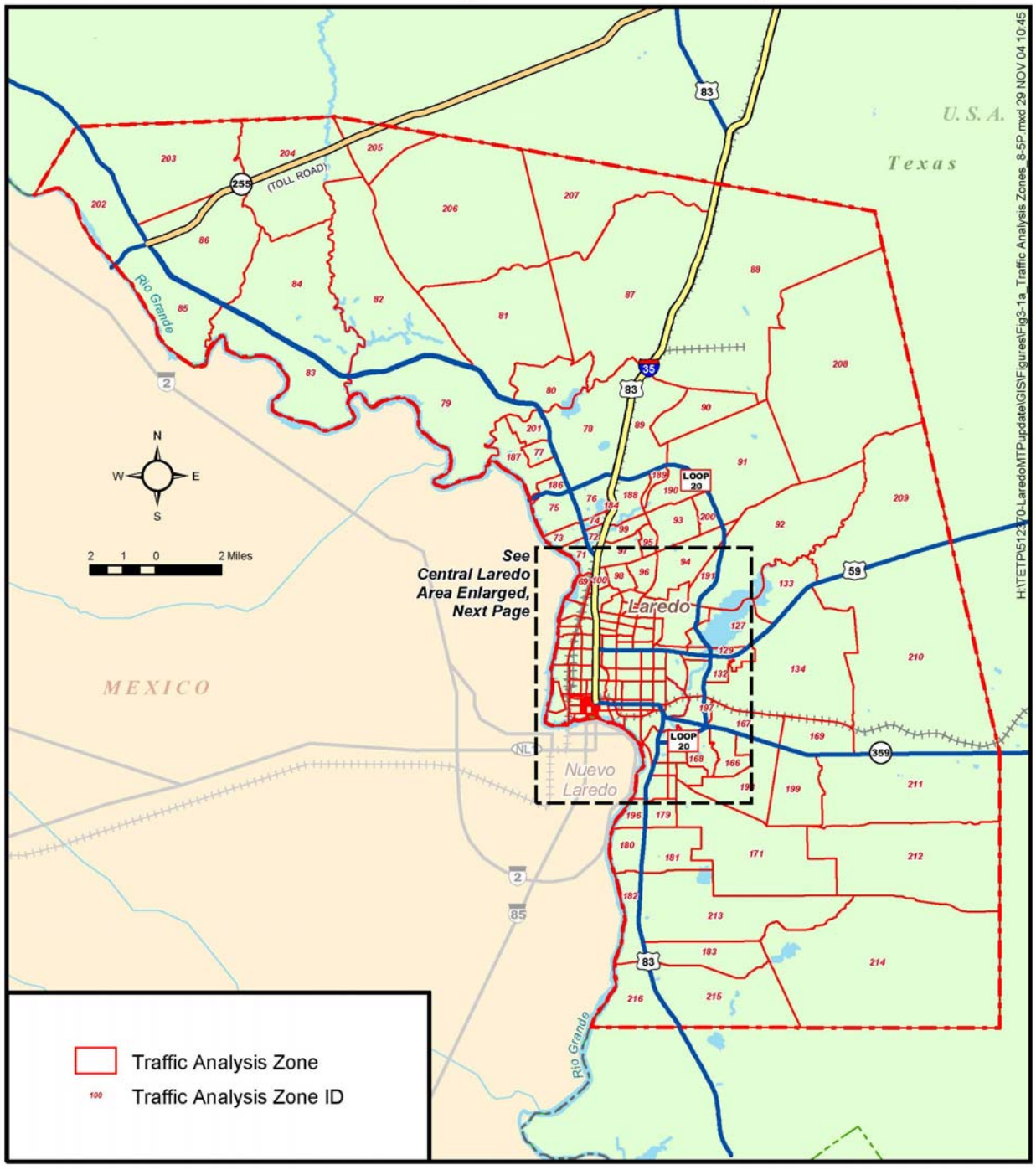
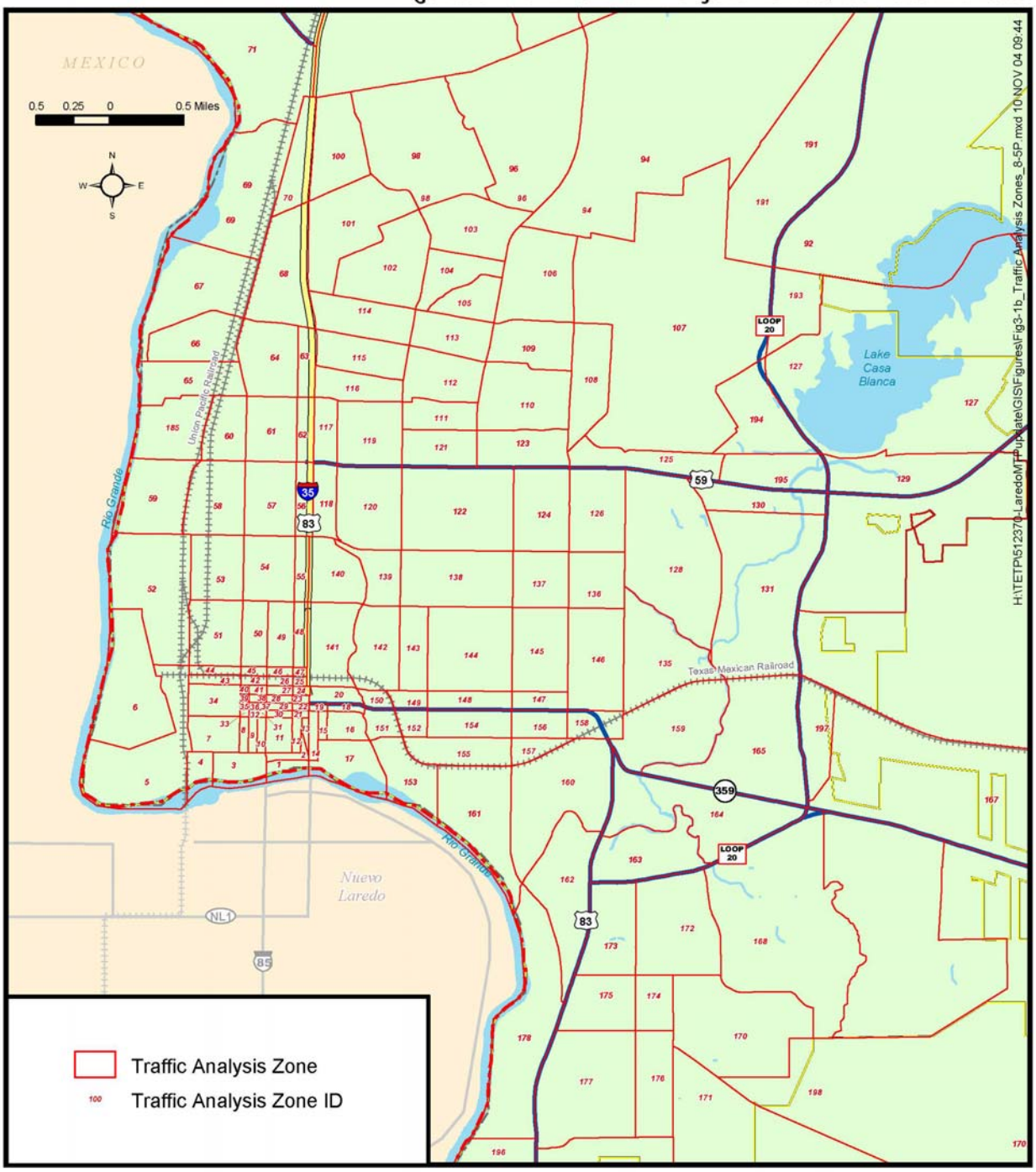


Figure 3-1b Traffic Analysis Zones, Central Laredo



In developing base year data for employment, a database of employers and their number of employees in Webb County was obtained from an outside vendor. This database, as well as data obtained from the City and Texas Workforce Commission was used to disaggregate employment to the TAZ level.

Median Household Income for the Year 2003 was developed by applying historical growth rates in median household income in Webb County to the 2000 U.S. Census Bureau estimates. Finally undeveloped acreage was estimated using an existing land use inventory obtained from the City, supplemented by aerial photography flown in 2003.

Control Totals

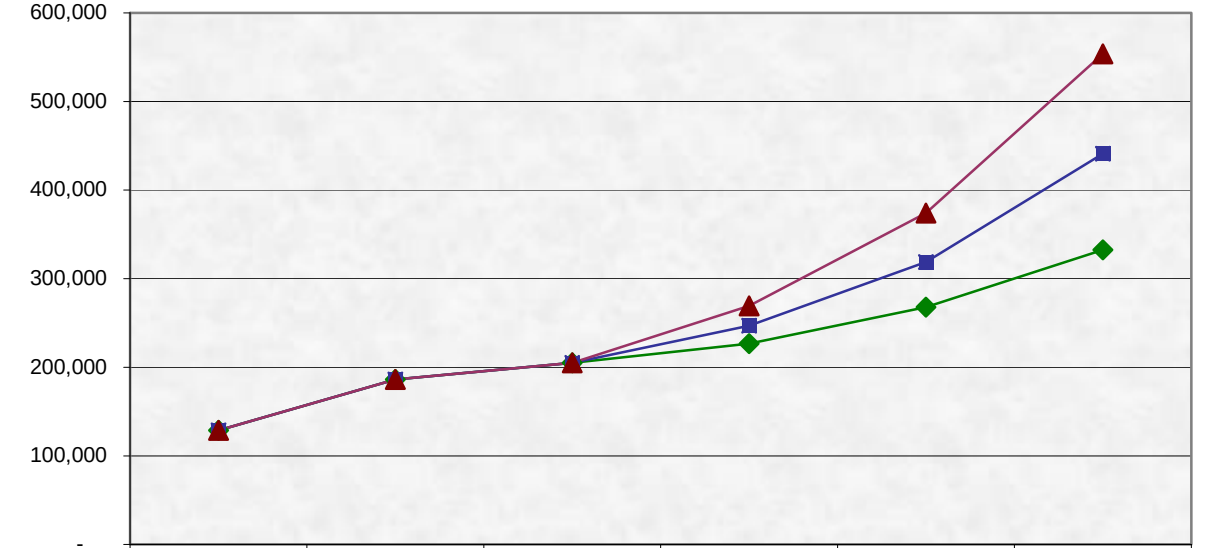
The initial step in developing socioeconomic data for the study area was to establish existing and future population "control totals". The Texas State Data Center, the Census Bureau's state-level affiliate based at Texas A&M University, is one of many public and private entities that prepare population projections for cities, counties and metropolitan areas using sophisticated models that consider migration patterns as well as fertility (birth) and mortality (death) rates. Three projections scenarios are produced by the State Data Center which differ in their assumptions relative to net migration. The 0.0 Migration Scenario assumes that immigration and outmigration are equal resulting in growth only through natural increase. The 0.5 Migration Scenario assumes rates of net migration one-half of those of those experienced during the 1990s and the 1.0 Migration Scenario assumes that migration patterns of the 1990s will continue to occur in the future. The 1990s was a period of rapid growth and it is unlikely that this growth will continue to occur, therefore the Texas State Data Center recommends the 0.5 Migration Scenario as appropriate for most Texas counties as this scenario reflects slower but steadier growth than that experienced in the 1990s. Texas State Data Center forecasts for Webb County were adapted to reflect the Study area's share of the county population.

Displayed in **Figure 3-2** are alternative population projections for the study area. As shown, forecasts for the Year 2035 range from 332,532 (0.0 Scenario) to 553,917 (1.0 Scenario).

In selecting a growth scenario historical growth patterns were examined in Webb County and Laredo. According to the results of the 2000 U.S. Census, Laredo is one of the fastest growing cities in Texas and the U.S. Laredo's location as the center of a primary trade route between Mexico, U.S. and Canada and increased trade activity have resulted in significant growth in the Laredo metropolitan area over the past decade. Economic growth of recent years has spurred considerable new investment and migration into the Laredo area and this growth is expected to continue over the next decade, therefore the 1.0 scenario was chosen for the forecast year 2010. However in the long-term, growth in the Laredo region is not expected to continue at such an aggressive rate, therefore the 0.5 scenario was chosen for forecast Years 2020 and 2035. Utilizing theses scenarios resulted in the following population control totals:

- 2003 – 205,081
- 2010 – 269,203
- 2020 – 347,979
- 2035 – 482,300

Figure 3-2
Population Projections
Laredo Metropolitan Transportation Plan Update



	1990	2000	2003	2010	2020	2035
0	128,702	186,120	205,081	226,619	267,740	332,532
0.5	128,702	186,120	205,081	246,932	318,653	441,142
1	128,702	186,120	205,081	269,203	373,943	553,917

Employment forecasts are a function of population and are based on the population projections outlined above. Employment control totals were developed by using a ratio of employment to overall population, considering historical employment figures and unemployment trends. Retail, Basic and Service employment was determined through examining their historical shares of total employment and adjusting these shares based on projected state and national trends. Control totals for employment are shown below:

- 2003 – 76,398
- 2010 – 99,482
- 2020 – 128,881
- 2035 – 178,629

Allocation Of Control Totals

Once the control totals for population and employment were determined, input was solicited to identify the zones that are suitable for future development and most likely to develop by Forecast Years 2010, 2020 and 2035. This input was used to guide the assignment of future population and employment. Staff identified TAZs as high or moderate growth for both residential and nonresidential development and for forecast years 2010, 2020 and 2035. The moderate and high growth areas are those with pending development and availability of utilities

and transportation access. TAZs not identified as high or moderate growth areas were assumed to have limited growth.

Population

Historical Population

Webb County has experienced significant growth over the past several decades. As shown in **Table 3-1**, the county's population has more than doubled since 1970 as it grew from 72,859 people in the Year 1970 to over 193,000 people in the Year 2000, an annual increase of 3.3 percent. The most significant growth occurred during the 1990s with an average annual growth rate of 3.8 percent. Historical growth rates for the City of Laredo mirrored those of the County. Laredo is the largest city in the county and in the Year 2000 comprised 91 percent of the County's total population.

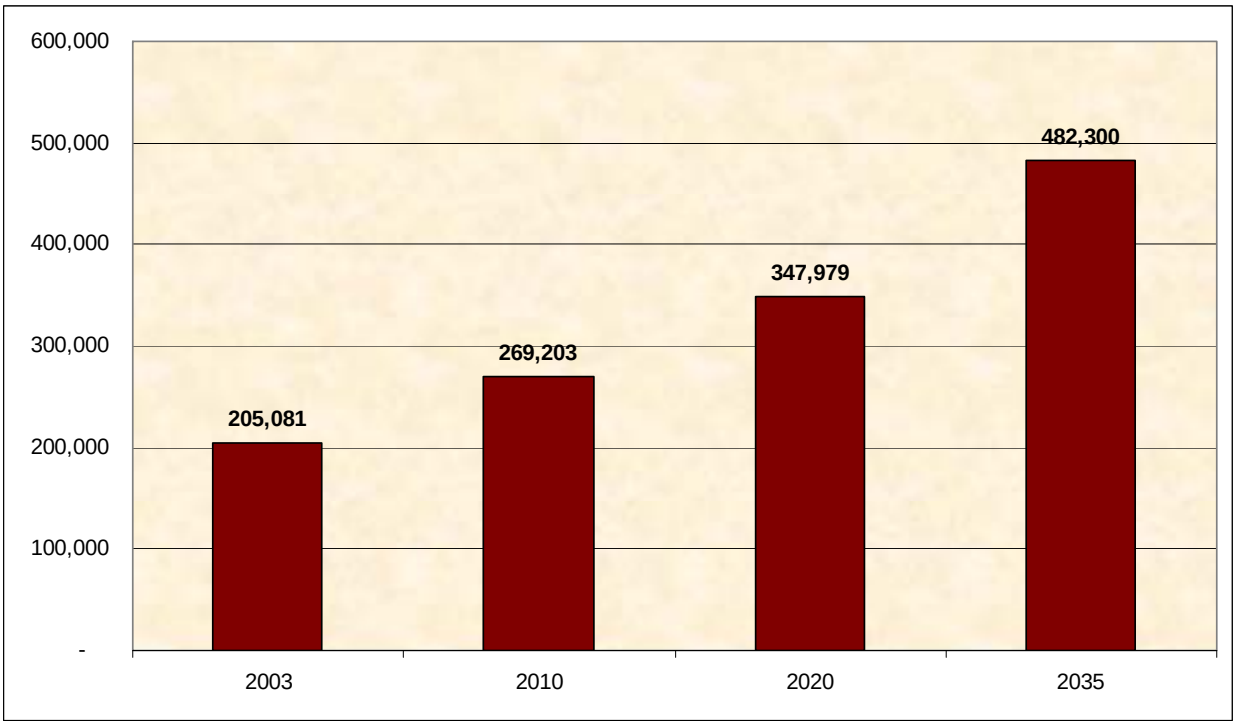
Table 3-1
Historical Population
Laredo Metropolitan Transportation Plan Update

Year	Webb County	Annual % increase	Laredo	Annual % increase
1970	72,859		69,024	
1980	99,258	3.1%	91,449	2.9%
1990	133,239	3.0%	122,899	3.0%
2000	193,117	3.8%	176,576	3.7%

Projected Population

Figure 3-3 displays base and forecast year population for the MPO planning area. As shown, the MPO planning area is expected to experience continued growth over the next several decades. Population is projected to grow from 205,081 in the Year 2003 to 482,300 in the Year 2035, an annual increase of 2.7 percent.

Figure 3-3
Projected Population
Laredo Metropolitan Transportation Plan Update



Households & Housing Units

Historical

Between 1990 and 2000 households and housing units grew at a faster rate than population. As shown in **Table 3-2**, households, or occupied housing units grew by 47 percent in Webb County from 34,438 households in 1990 to 50,740 households in the Year 2000. Housing units grew by 48 percent from 37,197 units in 1990 to 55,206 units in the Year 2000. This resulted in an 8 percent housing vacancy rate in the Year 2000.

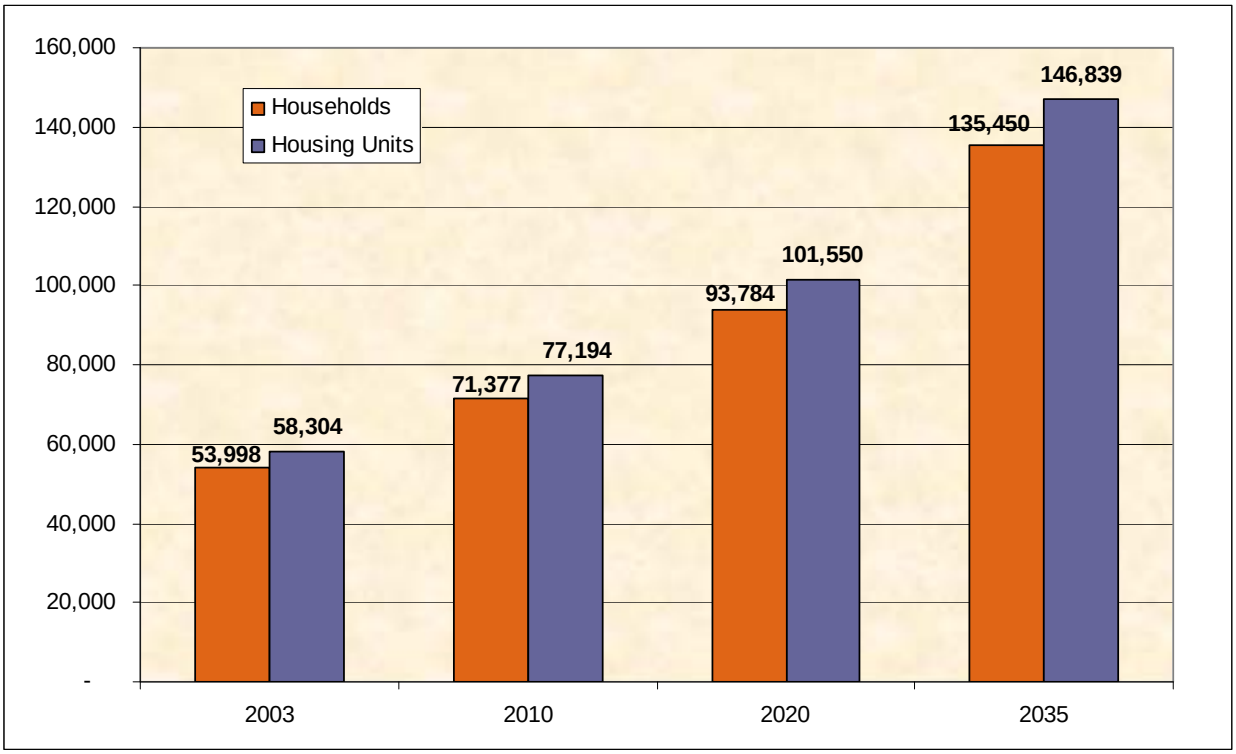
Table 3-2
Households and Housing Units
Laredo Metropolitan Transportation Plan Update

	Webb County		Laredo	
	Households	Housing Units	Households	Housing Units
1990	34,438	37,197	32,029	33,998
2000	50,740	55,206	46,852	50,319

Projected Households and Housing Units

As displayed in **Figure 3-4**, households in the MPO planning area projected to increase by 151 percent from 53,998 in the Year 2003 to 135,450 in the Year 2035, and annual increase of 2.9 percent. Within the MPO planning boundary housing units are projected to grow by 152 percent from 58,304 units in the Year 2003 to 146,839 units in the Year 2035, an average annual increase of 2.9 percent.

Figure 3-4
Projected Households and Housing Units, MPO Boundary
Laredo Metropolitan Transportation Plan Update



Employment

Employment by Industry

Table 3-3 displays covered employment data, employment for which unemployment taxes are collected, for Webb County. As shown total employment in Webb County was estimated at 77,187 in the Year 2003 with Trade, Transportation and Utilities industries comprising the largest percentage, 33 percent, of total employment followed by Local Government and Education and Health Services, with 18 and 13 percent of total employment respectively.

Table 3-3
Employment by Industry, Webb County, 2003 (fourth quarter)
Laredo Metropolitan Transportation Plan Update

Industry	Employment	Percent of Total
Natural Resources & Mining	1,509	2.0%
Construction	2,496	3.2%
Manufacturing	1,126	1.5%
Trade, Transportation & Utilities	25,391	32.9%
Information	660	0.9%
Financial Activities	4,139	5.4%
Professional & Business Services	4,814	6.2%
Education & Health Services	10,237	13.3%
Leisure & Hospitality	7,244	9.4%
Other Services	1,340	1.7%
Nonclassifiable	35	0.0%
Federal Government	2,327	3.0%
State Government	1,723	2.2%
Local Government	14,146	18.3%
Total Employment	***77,187***	***100.0%***

Source: Texas Workforce Commission, 2003

Major Employers

Based on data obtained from the Laredo Development Foundation there are 8 employers with over 1,000 employees in Laredo. These major employers include:

- United Independent School District – 4,500 employees
- Laredo Independent School District – 3,857 employees
- City of Laredo – 2,084 employees
- Laredo Medical Center – 1,661 employees
- H.E.B Grocery – 1,327 employees
- Webb County – 1,270 employees
- U.S. Department of Border Protection – 1,147 employees
- McDonald's Restaurant – 1,114 employees

Unemployment Rates

Based on data obtained from the Texas Workforce Commission, the Laredo Metropolitan Statistical Area (MSA) labor force grew by almost 10,000 people or 12.8 percent between 2000 and 2003. An additional 8,600 people were employed in the region as employment increased from 69,396 in the Year 2000 to 77,996 employees in the year 2003. As shown in **Table 3-4**, the labor force has been increasing at a greater rate than employment, resulting in increasing unemployment rates over the past couple of years.

Table 3-4
Unemployment Rates, Laredo MSA
Laredo Metropolitan Transportation Plan Update

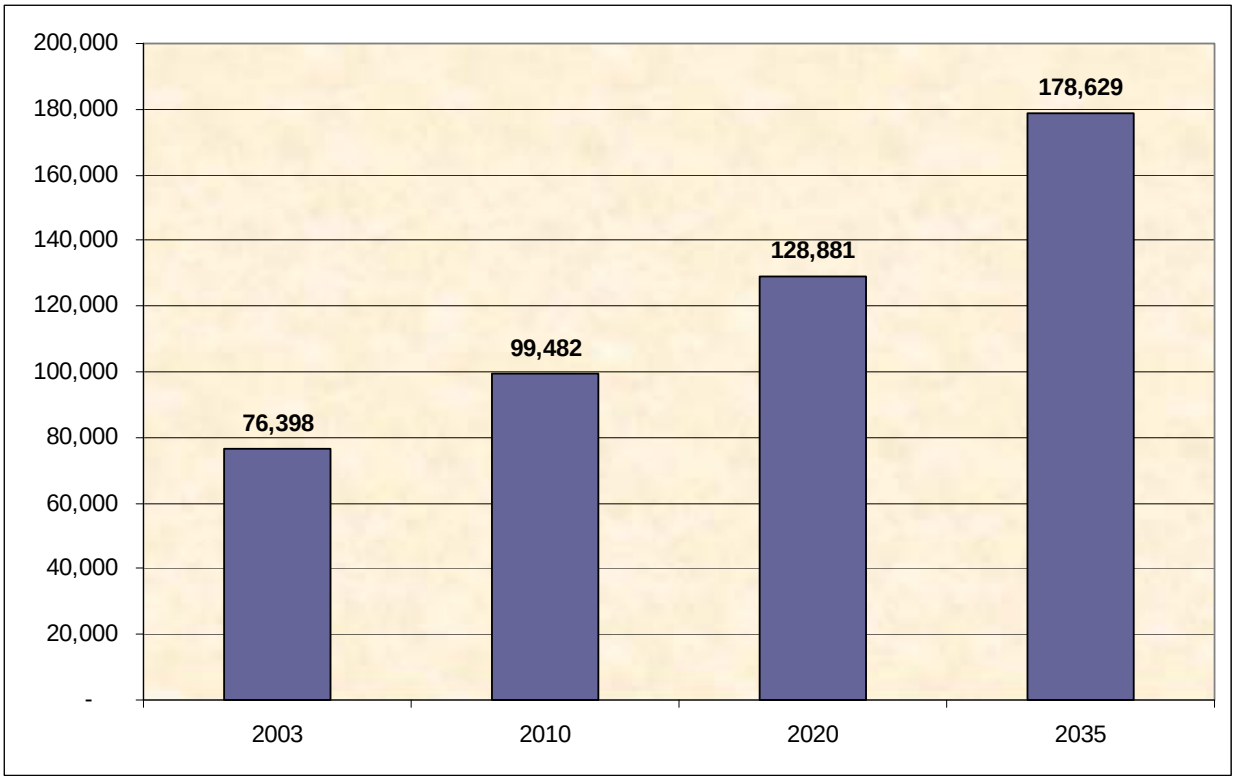
Year	Labor Force	Employment	Unemployment	Unemployment Rate
2000	74,614	69,396	5,218	7.0
2001	76,301	70,952	5,349	7.0
2002	80,404	74,523	5,881	7.3
2003	84,173	77,996	6,177	7.3

Source: Texas Workforce Commission, 2003

Projected Employment

As shown in **Figure 3-5**, the MPO planning area is expected to experience continued growth in employment over the next several decades. Within the MPO planning area, over 102,000 jobs are expected be added to the economy by the Year 2035, increasing employment from 76,398 in the year 2003 to 178,629 in the Year 2035. This represents an annual increase of 2.7 percent.

Figure 3-5
Projected Employment
Laredo Metropolitan Transportation Plan Update



Income

Table 3-5 displays median household income for Webb County and the City of Laredo. In 1999, the City of Laredo had a median household income of $29,108, which is higher than the county average of $28,100.

Table 3-5
Median Household Income
Laredo Metropolitan Transportation Plan Update

	Webb County	Laredo
1989	$18,074	$18,395
1999	$28,100	$29,108

Special Generators

Special generators are major employers, institutions and attractors which create unique travel patterns. These include high schools and post-secondary schools that have peak travel times other than the typical rush hours. Regional shopping malls also have heavy traffic during mid-day rather than from 7:00-9:00 a.m. and 4:00-6:00 p.m. Regional/state parks and entertainment centers also create unique traffic patterns and peak times. Additionally, hospitals and a number of manufacturing plants work around the clock with three shifts of employees creating heavier-than-normal traffic in the off-hours. Special Generators in the Laredo Metropolitan Area are shown in **Table 3-6**.

Table 3-6
Special Generators
Laredo Metropolitan Transportation Plan Update

Schools			
TAZ	**School**	**Students**	**Staff**
92	Texas A&M International University	4,100	1,031
6	Laredo Community College	7,352	580
180	Laredo Community College - South Campus	100	2,000
94	John B. Alexander High School	1,989	246
93	United High School	2,411	250
168	United South High School	1,007	245
124	Nixon High School	2,093	245
54	Martin High School	1,741	250
177	Cigarroa High School	1,499	210
144	St. Augustine Jr./Sr. High School	629	58
213	Lyndon B. Johnson	1,482	250
Airports			
TAZ	**Airports**	**Number of Boardings**	**Number of Deplaning Passengers**
107	Laredo International Airport	73,648	72,345
Transit Center			
TAZ	**Transit Center**	**Annual Bus System Transfers**	
9	Laredo Intermodal Transit Center	326,783	
Hospitals			
TAZ	**Hospitals**	**Number of Employees**	**Number of Beds**
123	Mercy Regional Medical Center	1,700	326
188	Doctor's Hospital	721	178
Regional Shopping Malls			
TAZ	**Regional Shopping Malls**	**Number of Employees**	
101	Mall del Norte	1,441	
131	Wal Mart Super Center	523	
Regional Entertainment/Sports Facilities			
TAZ	**Regional Entertainment/Sports Facilities**	**Type**	**Capacity**
54	Laredo Civic Center	Special Event	Auditorium: 1,979 Ballroom: 1,200 4 Meeting Rooms: 250 each
191	Laredo Entertainment Center	Special Event	Arena: 8065 (sports) 9622 (concerts) 6 meeting rooms: 400 each club level: 150 Parking: 2,000
Regional Parks			
TAZ	**Regional Parks**	**Acreage**	**Visitors**
92, 127, 133	Lake Casa Blanca International State Park	371 (plus 1,650 acre lake)	16,928 (overnight) 310,252 (day)

DEMOGRAPHICS USED IN THE MODEL

The demographic forecasts discussed above were generated after the model was developed. Therefore for the purpose of this study, forecasts previously prepared for the MPO in 1999 were used as the demographic inputs for the travel demand model. Utilizing the forecasts prepared in 1999 versus those prepared in 2003 has an insignificant impact on the travel demand model and its results.

NETWORKS/TRAVEL DEMAND MODEL

In addition to the demographics previously discussed another major input to the travel demand model is the transportation networks. The following section describes these networks and the development and calibration of the transportation model that was used for evaluating existing travel conditions and forecasting future travel demand for the Laredo MPO area. The development of mathematical models capable of simulating existing traffic patterns and projecting future travel demand is one of the most important phases of the transportation planning process.

Networks

The 2000 Laredo model network is a geographical depiction of the Laredo MPO roadway system. A travel demand model compares demand for travel to the supply of the roadway system within a defined study area. Travel demand is derived from population and employment, while the supply side of the equation is the roadway system on which travel occurs. Similar to socioeconomic and demographic data previously described, network attributes describe the characteristics of the roadway system.

The Laredo model network was developed from the Laredo MPO's thoroughfare system. The study area networks are developed and maintained by both the Laredo MPO and TxDOT Laredo District, while TxDOT's Transportation Planning and Programming (TP&P) Division manages the travel forecasting process. The remaining discussion in Chapter 3 is based on documentation from the Laredo Travel Demand Model 1998 Validation summary prepared by TxDOT – TP&P on October 12, 2001.

The following model network features are used to develop a geographical representation of a road thoroughfare system:

- Links,
- Nodes,
- Centroid Connectors, and
- Centroids.

Links are used to represent roadway sections. Nodes are used to split links where roadway attributes differ (i.e., speed limits, number of lanes, or facility type) or where intersections or interchanges occur. Interchanges differ from intersections in that multiple links and nodes are needed. Interchanges require links representing access and egress ramps and require nodes where those ramp connections occur with the intersecting roadway.

Special links and nodes are used to "load" traffic onto the network. Traffic originates from and is destined to geographic areas called traffic analysis zones (TAZs). Special nodes called

"centroids" are used to represent TAZs in the network. Special links called "centroid connectors" are used to represent local streets contained in a TAZ and provide access between centroids and the network. Also, a centroid can have more than one centroid connector.

Figure 3-6 presents the network layout for the year 2003 "base" network. In addition to the graphical depiction of the network, a database is also associated with the model network. The database is used to store link attribute data including but not limited to length (typically in feet), direction of flow (one-way vs. two-way), functional class, area type, number of lanes, posted speeds, model-adjusted speeds and travel times (typically in minutes), directional and total roadway capacities, and observed traffic count data where collected. The base network for the Laredo model was originally calibrated to year 2000 traffic counts, and then this network was utilized to develop the 2025 and 2030 forecast networks (with annotation data about projects and other network modifications).

The forecast networks were updated during a review of each network link's roadway functional class, area type, and number of lanes. Roadway functional class is used to categorize a network link based on its design and intended performance. For example, Del Mar Boulevard has a different functional class than Interstate 35. These facilities are designed differently and intended to perform different travel functions. We expect that speed limits and carrying capacity should differ between the two facilities in our example. The following describes the functional class system for the Laredo MPO region.

Laredo Functional Class System:

Facility Type	Description
1	Radial Freeways
2	Circumferential Freeways
3	Expressways
4	Divided Primary Arterials
5	Undivided Primary Arterials
6	Divided Minor Arterials
7	Undivided Minor Arterials
8	Collectors
9	Local Roads
0	Centroid Connectors

Area type classifies the interaction between a network link and the surrounding land use (for example, urban, suburban, and rural). For example, Santa Maria Avenue provides for more intense interactions between its surrounding land uses than Loop 20 provides to its surrounding land uses. Again, speed and carrying capacity should differ between the two facilities.

Figure 3-6a 2003 Network, Study Area

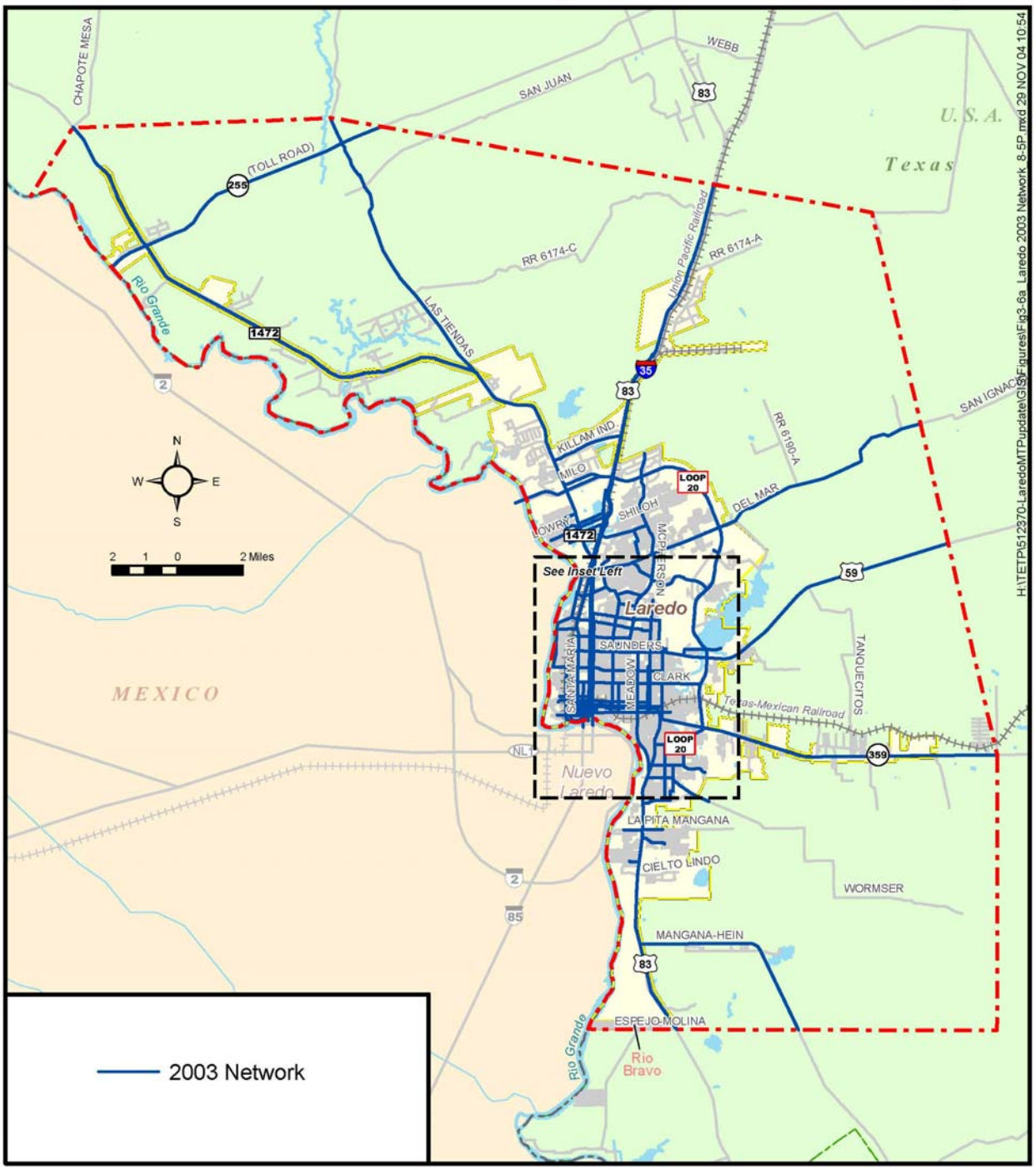
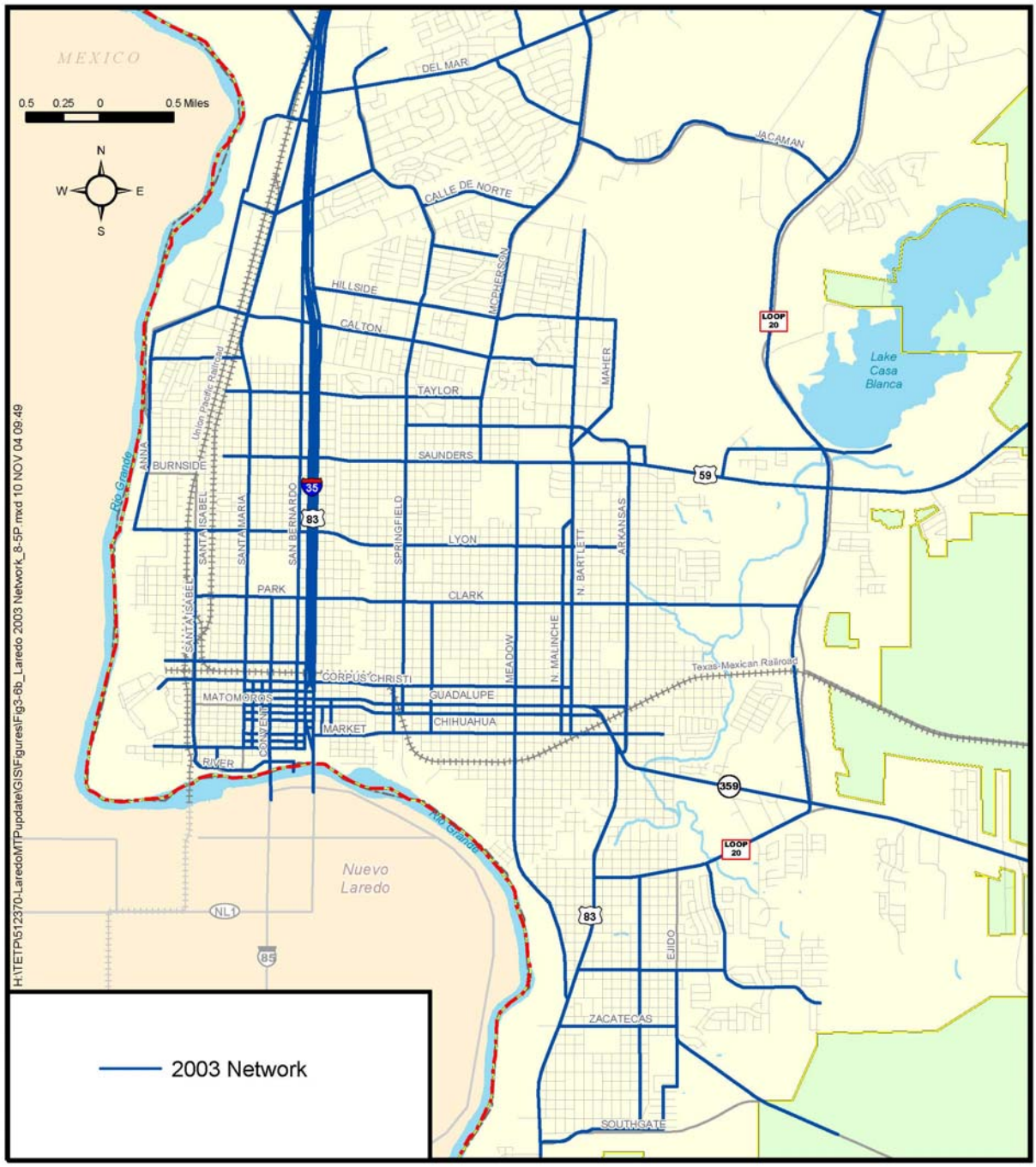


Figure 3-6b 2003 Network, Central Laredo



The number of lanes is also an important roadway feature, representing network supply. Generally speaking, the more lanes a facility has the greater its carrying capacity. These three variables (functional class, area type, and number of lanes) are used to assign speed and capacity values to a network link. **Table 3-7** provides the speed-capacity lookup table for the Laredo model network links.

Table 3-7
Speed – Capacity Lookup Table
Laredo Metropolitan Transportation Plan Update

Note: The top number is *Speed* (mph), the bottom number is *Lane Capacity* (vpd)

	Area Type					
Functional Class	**CBD (1)**	**CBD Fringe (2)**	**Urban (3)**	**Suburban (4)**	**Industrial (5)**	**Rural (6)**
1	35 19,200	43 18,900	51 18,400	55 16,700	52 15,300	60 13,900
2	32 19,200	35 19,700	42 20,100	49 18,900	43 17,900	55 16,900
3	25 10,200	27 10,000	33 9,700	37 8,500	33 7,500	53 6,300
4	23 7,500	28 7,400	33 7,100	36 6,200	33 5,500	53 4,600
5	24 6,700	27 6,600	32 6,400	36 5,600	32 5,000	44 4,200
6	23 6,500	25 6,400	31 6,100	35 5,400	30 4,800	43 4,000
7	22 5,900	25 5,800	30 5,600	34 5,000	30 4,400	42 3,800
8	25 5,000	29 4,900	34 4,700	38 4,200	35 3,700	45 3,100
9	30 3,000	32 3,000	36 2,900	44 2,500	36 2,300	50 1,900
0	22 N/A	25 N/A	30 N/A	35 N/A	30 N/A	42 N/A

Travel Model Forecasting

The entire network development and review process described above is often referred to as network coding. Once network coding is completed, the model network is used as an input to the travel demand model. Prior to forecasting travel demand, the base year model results should be compared to existing traffic patterns of the base year, which is a process referred to as model validation. Validation involves the adjustment of model parameters, so that assigned model volumes fall within an established confidence interval of observed traffic volumes (ground counts) obtained in the base year. **Table 3-8** shows the model validation results by area type and functional class.

Table 3-8

Comparison of Assigned to Counted VMT
Laredo Metropolitan Transportation Plan Update

Area Type	Observed	Assigned	Percent
CBD	38,190	33,841	112.85%
CBD Fringe	717,933	679,192	105.70%
Urban	567,895	567,814	100.01%
Suburban	276,075	271,983	101.50%
Industrial	338,557	337,892	100.20%
Rural	326,525	316,272	103.24%
Total	***2,265,175***	***2,206,994***	***102.64%***

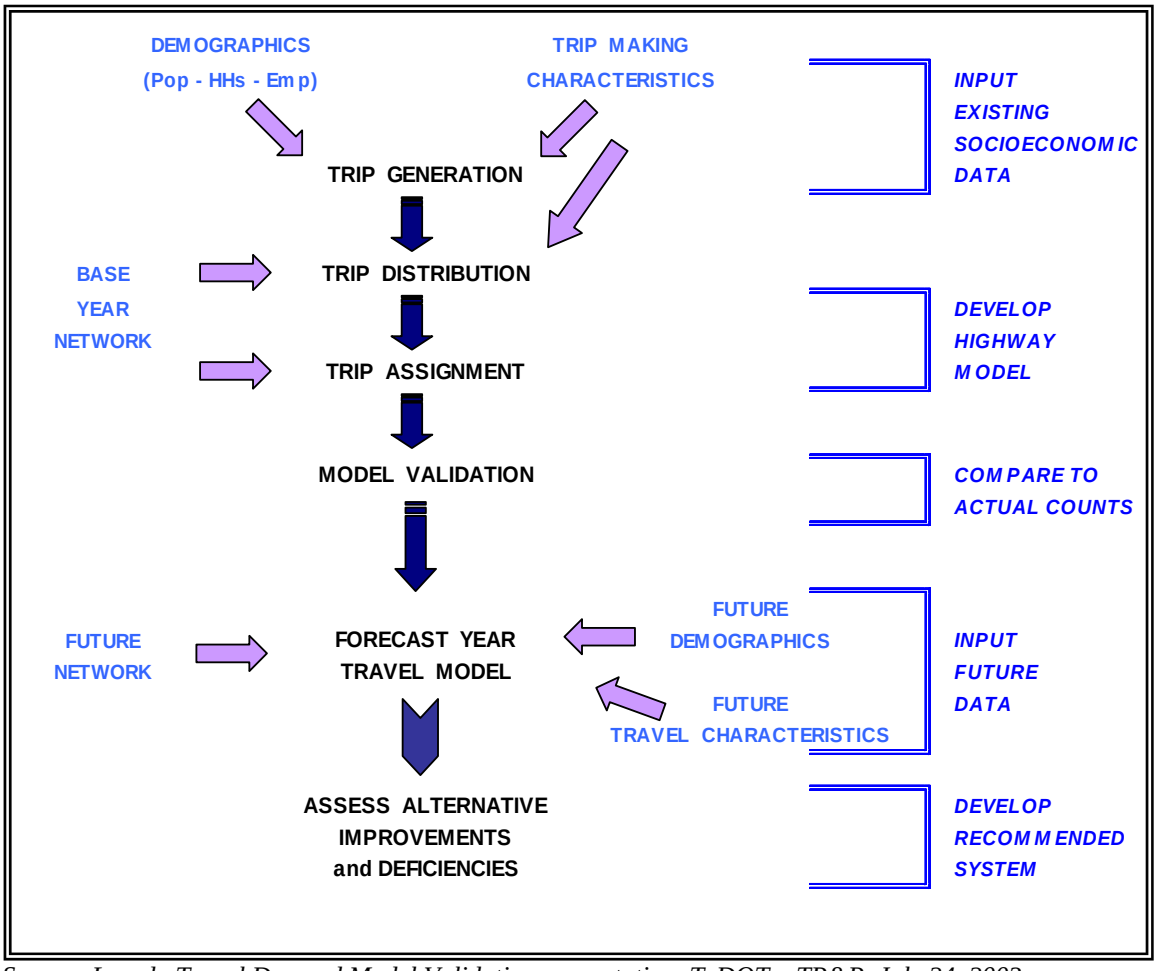
Functional Class	Observed	Assigned	Percent
Freeways	612,973	606,087	101.14%
Expressways	419,317	397,174	105.58%
P. Arterials	603,752	583,377	103.49%
M. Arterials	530,313	505,244	104.96%
Collectors	75,703	93,395	81.06%
Local Roads	23,116	21,717	106.44%
Total	***2,265,174***	***2,206,994***	***102.63%***

The validation results indicate that the model is performing within an acceptable range. Once confident in its performance, the model can be utilized to test the adequacy of proposed transportation improvements for serving projected demand. Travel model forecasting also works in conjunction with land use forecasts, since both depend largely on the following factors:

- Socioeconomic conditions affecting trip productions and attractions,
- Land use patterns based on locations and intensities of use, and
- The type, extent, and quality of transportation networks and facilities.

The Laredo MTP model forecasting process is based on the Texas Model package, which is a modified 4-step analysis maintained by TxDOT-TP&P. This forecasting process includes the trip generation, trip distribution, and traffic assignment steps, as well as a model validation procedure previously described. **Figure 3-7** presents the four steps of the Texas Model along with the inputs to and analyses within the process. One particular input is the TAZ map layer and / or data file; which contains all socioeconomic and demographic data that are a factor in determining the generation and distribution of trips between zones.

Figure 3-7
Travel Demand Model Process Chart
Laredo Metropolitan Transportation Plan Update



Source: Laredo Travel Demand Model Validation presentation, TxDOT – TP&P, July 24, 2003.

The Laredo travel demand model is a planning analysis tool which helps the Laredo MPO and District with their MTP development by evaluating system improvements, identifying system deficiencies, and conducting alternative analyses. One performance measure that helps with this analysis is the volume-to-capacity (V/C) ratio, which helps to determine if a roadway and / or improvement is deficient in capacity (supply) to meet a projected volume (travel demand). The V/C ratio is also useful in describing the Level of Service (LOS) of a particular roadway.

Trip generation is the initial modeling step, which provides an estimation of the amount of travel within the Laredo MTP study area. This method determines the number of trip ends produced from and attracted to each TAZ, and also classifies these trip ends by the following trip purposes:

- HBW = Home-based work trips
- HBNW = Home-based non-work trips
- NHB = Non-home base trips (within the study area)
- NHB-Ext = Non-home base trips (with external destinations)
- Truck / Taxi = "Specialized" truck and carpool trips
- Ext-Through = External "pass-through" trips
- Ext-Local = External trips (with local destinations)

For trip generation, the Texas Model utilizes Tripcal5, a multi-functional and flexible program that can estimate trip productions and attractions for a TAZ coverage of no more than 10,000 zones. TripCal5 has several types of cross-classification or linear regression models; three of which are used for estimating trip-end productions and five for trip attractions. The cross-classification models for trip productions are based on the number of households by household size, income, or auto ownership. Conversely, the trip attraction models estimate the number of employees by area type.

Trip distribution is the second step performed by the model. Trip distribution uses the TAZ productions and attractions output from trip generation, and assigns each production to a destination and each attraction to an origin for all possible zones in the study area. This step is typically accomplished using the gravity model based on Isaac Newton's mathematical formula. The gravity model analyzes the frequency of trip interchange between zone pairs based on the relationship between each zone's productions and attractions and the travel time between the zones.

However, the Texas Model utilizes the Atomistic Model that considers the travel opportunities within a zone to be spatially distributed around instead of concentrated at the zone's centroid. Therefore instead of the single travel time relationship used in the gravity model, the Atomistic Model uses trip attractions and trip length frequencies as factors for calibrating each model iteration, until the model converges on the desired attraction and trip length frequency settings.

The final step involves an iterative process called *traffic assignment*. The trip productions and attractions (from trip generation) are converted to origins and destinations (from trip distribution). The output of trip distribution is an origin-destination (O-D) matrix which contains total vehicle trips for each O-D pair. The O-D matrix is assigned to the network using a minimum path algorithm based on travel time and capacity restraints.

The Texas Model uses the User Equilibrium (UE) method for assignment, which runs iterative minimum path assignments and readjusts travel times according to link delays. Link delays increase as a result of congestion on a particular link. As link volumes approach link capacity, the V/C ratio increases for that link. The result is a decrease in the LOS on that link and travel time is reduced. As travel time is reduced due to congestion, vehicles divert to other links with faster travel times. This process is continued until no one vehicle can further reduce their travel time. At this point, the assignment is said to have reached "equilibrium". The results of the equilibrium assignment are displayed in the network database for further analysis and for presentation purposes.

The results from the UE assignment are then compared back to the "ground counts" for validation of the base year model (previously discussed). Once the model has been validated, through feedback loops, it is ready for use in the planning and development of forecast networks.