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Chapter 1 2025 Regional Growth Forecast

Overview

The forecast of population and employment used for the 2025 RTP was produced by H-GAC in a two-phase process. The first phase entailed the development of county-level forecast “control totals” for population, households and employment. In the second phase, the growth forecast for each county was “assigned” to smaller levels of geography for use in modeling travel demand. These results were evaluated by H-GAC’s Forecast Committee (see Figure 1) and made available for review by local elected officials and the public. Each of these steps is described in greater detail below.

County-Level Forecasts

Forecasts for each of the eight counties in the Transportation Management Area (TMA) were developed with the Regional Economic Models, Inc., (REMI) econometric forecasting tool, which is widely used by public agencies, universities and the private sector. The REMI model considers economic interactions within the region, as well as between the region and the nation.

Figure 1 - H-GAC Forecast Committee

Name	Title	Organization
Curtiss Brown Jr.	Director of Community Resources	Galveston County
Larry Buehler	Business Development and Retention	Brazoria County Partnership
Perri L. D'Armond	Vice President of Development	Greater Fort Bend Economic Dev. Corp.
Theresa DeBose	Senior Business Analyst	CenterPoint Energy
Jesse Hegemeier	County Engineer	Fort Bend County Engineer's Office
Steven Jennings	Executive Director	Harris County Central Technology Center
C.A. (Skip) Kasdorf III	Manager of Research	Greater Houston Partnership
Mike Kubik	Director of Communications	Chambers County
Jim Ludtke	Director Application Support/GIS	Harris County Appraisal District
Mr. Madan Mangal	Division Manager	City of Houston Planning & Development
Craig McNair	Concerned Citizen	Liberty County
Ms. Pat Miller	Director of Property Transactions	Montgomery County Appraisal District
Carol Nixon	District Director of Transportation Planning	Texas Department of Transportation
Chris Olavson	Senior Planning Manager	Parsons, Brinckerhoff, Quade & Douglas, Inc.
Vincent L. Sanders	Sr. Transportation Systems Planner	Metropolitan Transit Authority
Vince Yokom	Executive Director	Waller County Econ Dev Partnership

Growth Scenarios

County-level totals of population, households and employment were produced using REMI for “Moderate” and “Aggressive” forecast scenarios. Both scenarios are based on adjustments made to the “out of the box” REMI model.

In the Moderate Scenario:

- a) REMI’s year 2000 county level population numbers were adjusted to year 2000 Census population totals.
- b) REMI’s year 2000 county level migration is adjusted to the year 2000 census
- c) An alternative set of REMI supplied growth rates were applied to a subset of industries in each county to minimize the residual error between the model and the last 10 years of historical data. This results in industry growth rates that more closely follow 1990-2000 trends.

In addition to the changes noted above, increased energy sector activity is assumed in the Aggressive Scenario. This increase is modeled by:

- d) A 25% linear increase in mining sector sales that begins in 2010, peaks in 2020 and is sustained through 2025.
- e) Corresponding increases (12%) in professional and other business services.

These adjustments assume likely energy sector fluctuations beyond those embedded in 1990’s trend data that were not reflected in the Moderate Scenario model results. This assumption was based on the most recent (1999) forecast of world oil prices developed by the U.S. Energy Information Agency. The percentages used in the model adjustments were based on the historical average increase that occurred in the corresponding sectors during periods of peak oil prices. This assumes that at

Both of these scenarios appear to be reasonable futures and are within the range of other widely used forecasts for the region produced by the Texas State Data Center, the Texas Water Development Board, and the University of Houston Institute for Regional Forecasting. H-GAC selected the Aggressive Scenario for use in transportation planning, as well as its other long range planning programs.

Other Model Adjustments

Several other adjustments were made to the REMI output to enable its use with H-GAC’s small area forecasting tool

Employment

REMI reports "total employment," a measure used by the U.S. Bureau of Economic Analysis. The Texas Workforce Commission and other regional agencies regularly report "non-farm wage and salary" employment based data from the U.S. Bureaus of Labor Statistics. H-GAC scales REMI output to reflect "non-farm wage and salary," rather than "total" employment for consistency with these other data sources.

Households and Population

REMI reports both total and household population but does not generate a household count. H-GAC used age- and race-specific household headship rates to convert REMI's reported household population to total households. The headship rates are derived by determining the number of household heads in a specific age-race category as reported by the 2000 census.

Small Area Forecasts

In order to assign the growth to smaller sub-county areas, H-GAC utilized the UrbanSim model developed by Urban Simulation Project at the University of Washington. UrbanSim is a leading-edge tool that attempts to replicate the interaction of population and job growth with the land development process. Using the county-level forecasts as the “demand” factors, UrbanSim places growth in specific locations based on their “attractiveness” for development. Attractiveness is determined by factors such as land availability and cost, existing land uses, household characteristics, employment patterns and access to the transportation system. A full description of the model is available at www.urbansim.org.

The primary geographic unit of analysis used in the small area forecast is the Regional Analysis Zone ("RAZ"). The TMA contains 199 RAZs, which are further subdivided into 2,634 Transportation Analysis Zones (TAZ). Population and employment data at the TAZ level is then used to forecast travel demand.

Following is a brief description of the steps that were taken to localize and calibrate the model.

Year 2000 Initial Conditions

In the model, the region is represented by a grid consisting of roughly 250,000 1000 x 1000 foot grid “cells” (a geographic equivalency file, external to the model, is used to move from the "grid cell" level model output to TAZ and RAZ level summary reports). Information about land use, building areas, households, and jobs, are associated with each grid cell. Three basic datasets were used to describe initial conditions in the H-GAC region:

1) Land-Use

A combination of appraisal records and satellite imagery was used to determine the total building area and land use mix within each grid cell. Based on this mix, each grid cell was classified into 1 of 25 predominant development types. These are shown in Figure 2.

Figure 2: UrbanSim Predominant Development Types

Residential Land Uses	Residential 1	1 to 10 Units
	Residential 2	11 to 40 Units
	Residential 3	41 to 80 Units
	Residential 4	81 to 140 Units
	Residential 5	141 to 200 Units
	Residential 6	201 to 300 Units
	Residential 7	301 to 600 Units
	Residential 8	Over 600 Units
Mixed Land Uses	Mix 9	1 to 80 Residential with 6,000 to 40,000 sq ft Commercial
	Mix 10	81 to 300 Residential with 25,000 to 40,000 sq ft Commercial
	Mix 11	81 to 300 Residential with 40,001 to 100,000 sq ft Commercial
	Mix 12	81 to 300 Residential with 100,001 to 300,000 sq ft Commercial
	Mix 13	81 to 300 Residential with Over 300,000 sq ft Commercial
	Mix 14	Over 300 Residential with 40,001 to 80,000 sq ft Commercial

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	Mix 15	Over 300 Residential with 80,001 to 240,000 sq ft Commercial
	Mix 16	Over 300 Residential with Over 240,000 sq ft Commercial
Commercial Land Uses	Commercial 17	40,000 to 250,000 sq ft
	Commercial 18	250,001 to 1,000,000 sq ft
	Commercial 19	Over 1,000,000 sq ft
Industrial Land Uses	Industrial 20	40,000 to 250,000 sq ft
	Industrial 21	250,001 to 1,000,000 sq ft
	Industrial 22	Over 1,000,000 sq ft
Institutional Land Uses	Government 23	Universities, Medical Facilities, Prisons, Govt Buildings
Vacant Land	Vacant 24	Open Space
Other Land	Other 25	Parks, Airports, Water, Lowlands, Heavily Industrialized

2) Employment

Number and types of jobs were assigned to each grid cell using data generated from a proprietary record-level database. Employment was classified into one of the following 7 categories based on Standard Industrial Classifications (SIC):

Durable Goods

Non-Durable Goods

Mining

Construction/Transportation-Utilities

Finance-Insurance-Real Estate/Services/Agriculture

Retail-Wholesale Trade

Government/Medical/Education

This data was then re-assembled into the 6 employment categories used in H-GAC's travel demand model.

Office

Industrial

Government

Medical

Education

Retail

Employment was scaled to match the REMI regional control totals. Additionally, a TAZ level control were used to ensure that TAZ level employment corresponded to the levels H-GAC's transportation modeling group uses to calibrate its regional transportation model.

3) Households

Records representing individual households were also distributed to the grid cell level. Census block group data was used to assign household size and income characteristics to these households. Household data were scaled to match the Census Block Group and REMI regional controls.

Post year 2000 Household and Employment Location Choice

The net growth of households and jobs for each county must then be place in grid cells within the county. UrbanSim bases this assignment on a statistical model that identifies the preference of

particular household and job types for particular types of locations. This choice matrix is described below:

Household Attributes

Household Income (4 levels)

Location Characteristics

Home access to Employment by transit or auto
Proximity of other homes (4 Income Categories)

Employment Attributes

Sector (7 categories)

Location Characteristics

Proximity to other Jobs (7 categories)
Proximity to commercial, retail,
or mixed use development types
Proximity to arterials and highways
Work access to employment
Work access to population
Travel time to CBD
Distance to Airport

Mathematically, these choices are represented by two “multinomial logit” models—one for housing choice and another for employment location choice.

Land Development

As previously stated, year 2000 land use for each grid cell was classified into 1 of 25 development types. This initial classification represents enough residential and employment land uses to accommodate all year 2000 households and jobs. UrbanSim then evaluates the likelihood of various types of land transitions that may occur, including development of vacant land and transition of developed land to higher intensity uses. Possible transitions are shown below.

- vacant to low density residential
- vacant to residential
- vacant to mixed
- vacant to commercial/government
- vacant to industrial
- low density residential to residential
- residential to dense-residential
- density-residential to mixed-use
- mixed-use to commercial
- commercial to high density-commercial/institutional

Some grid cells (e.g., those representing highly industrialized areas along the ship channel, wastewater treatment plants, landfills, environmentally sensitive areas, etc.) were not allowed to transition into new uses. The land development model was tested using a representation on 1990 land-use as baseline data. This test model was run through year 2000 and calibrated to reproduce as closely as possible the year 2000 data for land development type, households, and jobs.

Anticipated Development Events

The model allows users to incorporate development events that over-ride normal model dynamics. Unless done carefully, inputting a large number of these event random events can result in an artificial development "bust" that negatively affects model results. However, there are a number of large Houston area developments planned between 2000 and 2005 that can, with a reasonable level of certainty, be expected to occur. On reviewing sample output, H-GAC observed that the model's dynamics tended to accurately reflect employment and housing growth in the areas in which these events were expected to occur. Because of this, H-GAC took a conservative approach to including such announced projects as "development events" that would override normal model dynamics.

To a limited degree, an exception was made for the Houston CBD. The CBD represents the region's most intense use of urban land, and the sample of 1990-2000 events for which downtown development intensified even further was extremely small. With this constraint in mind H-GAC added additional downtown commercial building square footage ("development events") based on 1985-1995 building trends. For downtown residential units, a dataset from the Downtown Houston Association was used to ensure that housing units actually constructed between 2000 and 2003 were added as future development event for years 2001 -2003.

Travel Matrices

H-GAC transportation modeling group provided matrices that measure the "costs" of traveling from each zone (TAZ) in the region to every other zone. As the travel network changes (i.e. roadway improvements added, congestion levels change, etc.), the values in this matrix will change. For the purposes of the forecast, a matrix representing year 2000 conditions was used for years 2000 - 2007. The travel matrix for year 2007 was used for all years after 2007.

Review Process

After the baseline data was established, H-GAC tested the model's ability to reproduce historical 1990-2000 growth patterns for selected areas and made calibrations accordingly. Once this process was completed, preliminary results were produced for review by H-GAC's Forecast Committee. After review and revision, the forecast was then made available for review by all local governments in the TMA, as well as by the general public. The 2025 Regional Growth Forecast was adopted by H-GAC's Board of Directors on May 20, 2003.

Conclusions

This forecast was the first produced by H-GAC using REMI and UrbanSim. While these models are more data- and labor-intensive than previously used methodologies, they appear to be more representative of the true dynamics of a metropolitan economy and the resulting growth patterns. UrbanSim, in particular, appears to have successfully captured both the trends of continued strong suburban growth and reinvestment in the central city.

H-GAC will produce regular updates of the forecast as new information is becomes available on significant transportation projects, major residential and commercial developments, or on any new constraints on future land use. These updates will be posted on H-GAC's web site www.h-gac.com.

Chapter 2 System Evaluation

This chapter summarizes the results of analyses of various measures used to describe the effectiveness of the greater Houston-Galveston area transportation system as it exists today and as it is planned for the future.

The discussion begins with comparisons of Houston to several Peer Cities defined as those with similar size populations. The data compared include the Travel Time Index (TTI) and the Transportation Choice Ratio (TCR). Those are followed by discussions of Houston area Levels of Mobility (LOM), User Benefits and Accessibility for the current and future (2025 RTP) regional roadway and transit systems. Then a brief discussion is presented that shows the relationships between the projects in the 2025 RTP, identified safety Hot Spots and major traffic bottleneck locations. That discussion highlights the strategic nature of the investments being made and planned for the transportation system in this region.

PEER CITIES COMPARISONS-TTI and TCR

The first indicator, the Travel Time Index (TTI), is reported by the Texas Transportation Institute in the annual Urban Mobility Report. The TTI index is based on a comparison of peak-period and free-flow travel. The TTI index shows that the level of congestion in Houston has been fairly flat and comparable to several other very large metropolitan areas, such as Dallas/Ft. Worth and Philadelphia, Pennsylvania (Figure 1). (Larger metropolitan areas such as New York and Los Angeles have significantly larger populations and their indices are not as comparable to Houston.)

Figure 1

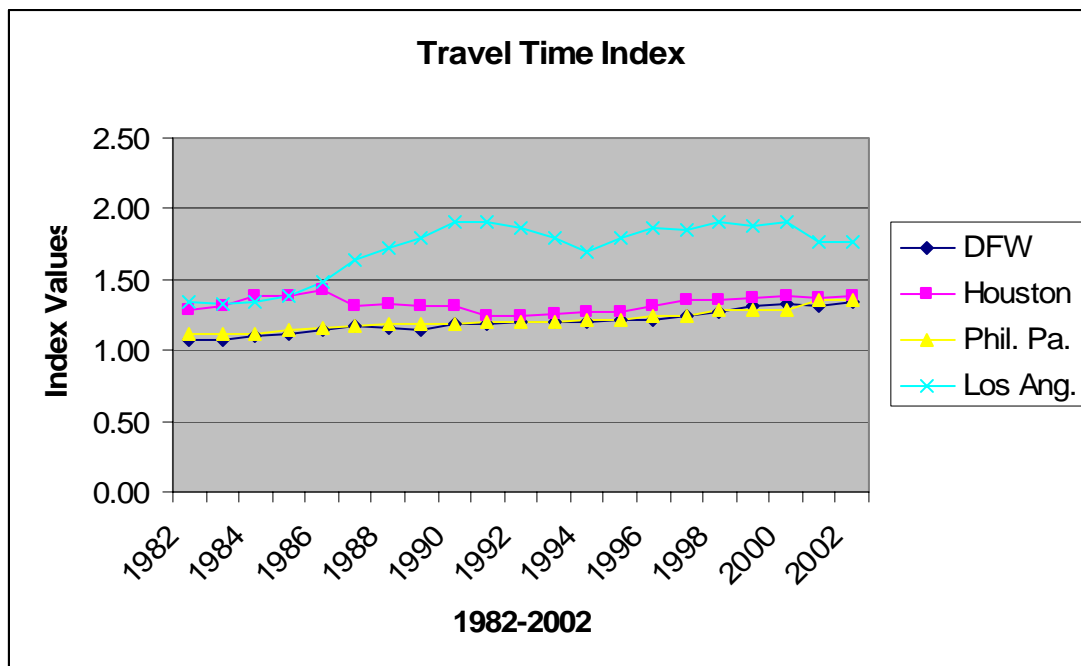


Figure 1 shows a slight improvement in the Houston TTI during the late 1980s, about the same time that the index for Los Angeles increased significantly. Some attribute that drop in the TTI index in Houston to the completion of some very large freeway improvement projects that were part of the Regional Mobility Plan crafted in the early 1980s. Others say that the drop in congestion levels was due to the impact of the national recession during that time that slowed the rate of employment growth in the Houston area. It was probably the combined effect of both factors that resulted in that improvement in the TTI. As indicated, the TTI started increasing again in the late 1990s and is consistent with recent public opinion polls in Houston indicating that traffic-related concerns are becoming dominant again. **The main point is that traffic congestion exists in all large cities. The Houston area has implemented some projects and programs that have had a beneficial impact. More effort is needed to maintain the mobility improvements and to optimize all of the strategies outlined in the 2025 Regional Transportation Plan.**

The Transit Choice Ratio (TCR) is a measure of the relative availability of transit as an alternate mode of travel. It is calculated using the supply of public transportation available compared to the supply of roadways available. Although it is a crude estimation technique, it points out some significant differences between areas (Table 1). **According to the research report, the Houston metropolitan area lags behind several other areas of similar size.** That is partly the result of the geographic coverage of the METRO service area, which does not include some of the higher-density population groups in eastern Harris County, which opted out of the METRO referendum in the late 1970's. Some of those areas have been identified as places where expanded transit services are needed today (see the Regional Transportation Needs Assessment -Appendix M).

Table 1

1999 Transportation Choice Ratio		
City	Population in million	Ratio
Detroit, MI	4.0	0.63
Houston, TX	3.3	0.96
Dallas-Fort Worth, TX	3.8	1.21
Los Angeles, CA	12.6	1.22
Philadelphia, PA	4.5	1.94
Washington, DC	3.5	2.69
Chicago, IL	8.0	2.73
Boston, MA	3.0	2.88
San Francisco, CA	4.5	3.56
New York, NY	17.0	6.30

Source: Easing the Burden: A Companion analysis of the Texas Transportation Institute's Congestion Study, May 2001.

ROADWAY SYSTEM ANALYSES - LOM

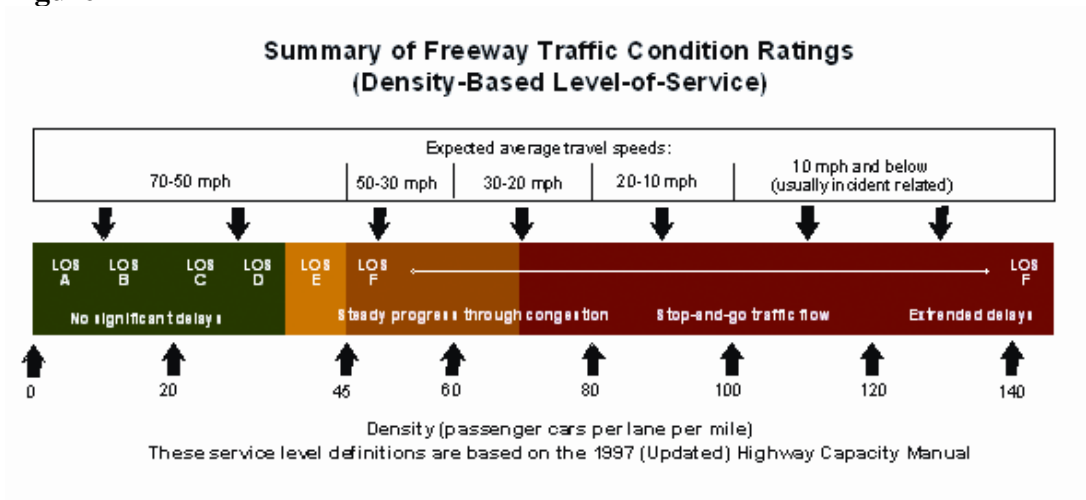
This analysis considered the regional freeway and arterial roadway systems with serious and severe levels of congestion measured by the Level of Mobility (LOM). The LOM was developed

to graphically illustrate the degree of congestion on roadways within the region. The LOM is comparable to the standard engineering Level of Service (LOS) measure which is based on volume-to-capacity (V/C) ratios. The LOM incorporates local adjustments to account for facilities that carry higher volumes than they were designed to carry.

Table 2

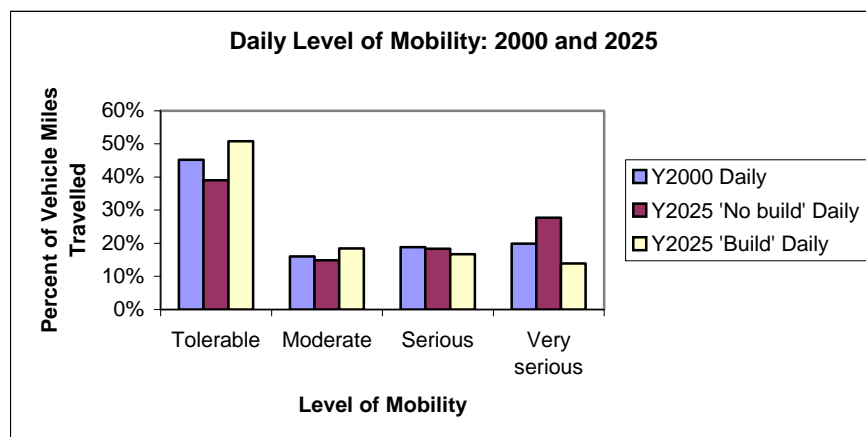
Level of Mobility	V/C Ratio	Level of Service (LOS)
Tolerable	V/C less than 0.85	A,B
Moderate	V/C between 0.85 and 1.00	C
Serious	V/C between 1.00 and 1.25	D
Severe	V/C greater than 1.25	E, F

Figure 2



The LOM for the majority of the daily (24-hour) vehicle miles traveled (VMT) in the Houston-Galveston region is within the tolerable to moderate levels (Figure 3). That regional proportion is not expected to change significantly in future years and some improvement is expected if the projects in the RTP are implemented as planned.

Figure 3



As with most urban areas, it is travel during peak periods that is the primary cause of serious and severe congestion. Houston's AM peak has the most marked congestion problem, largely because it is compressed into a two-hour timeframe, 6:30 a.m. to 8:30 a.m., when most people are traveling directly to work (Figure 4). The PM peak is of a longer duration, 3:30 p.m. to 6:30 p.m., and covers a wider geographic area, as workers divert to other activities (shopping, academic/sports activities) rather than traveling home directly (Figure 5).

Figure 4

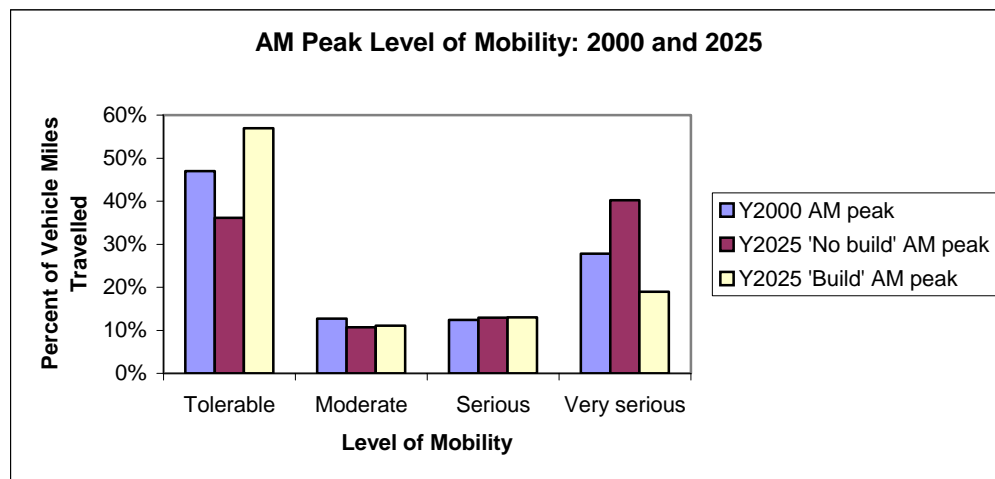
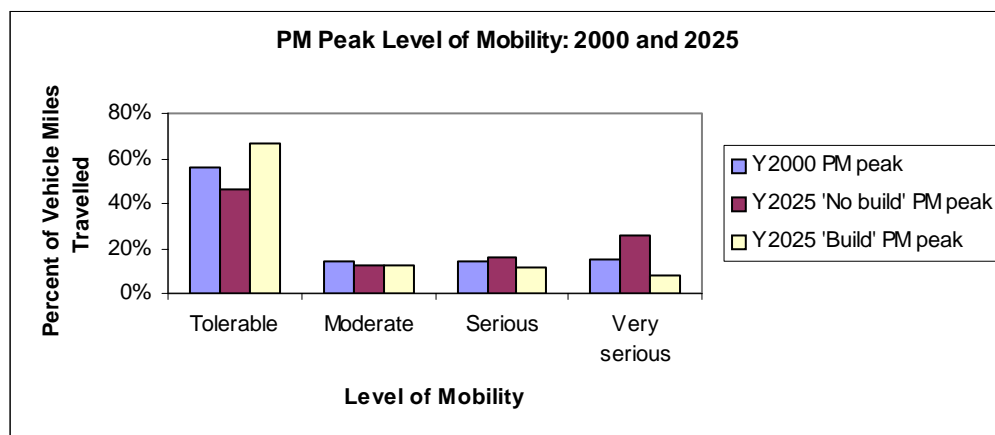


Figure 5



Regional Accessibility to Downtown Houston by Automobile

The term accessibility is used here to describe the level of ease or convenience that travelers experience in getting to and from various parts of the region for various trip purposes. Travel times for home-based work trips are the primary focus of the following discussion. According to Census Bureau estimates, the mean (weighted average) perceived travel time to work in Harris County increased from about 26 minutes in 1990 to 28 minutes in 2000. For both years those values are about 3-4 minutes higher (slower) than the mean travel time to work for the state of Texas (Table 3).

Table 3--Mean Travel Time to Work ¹

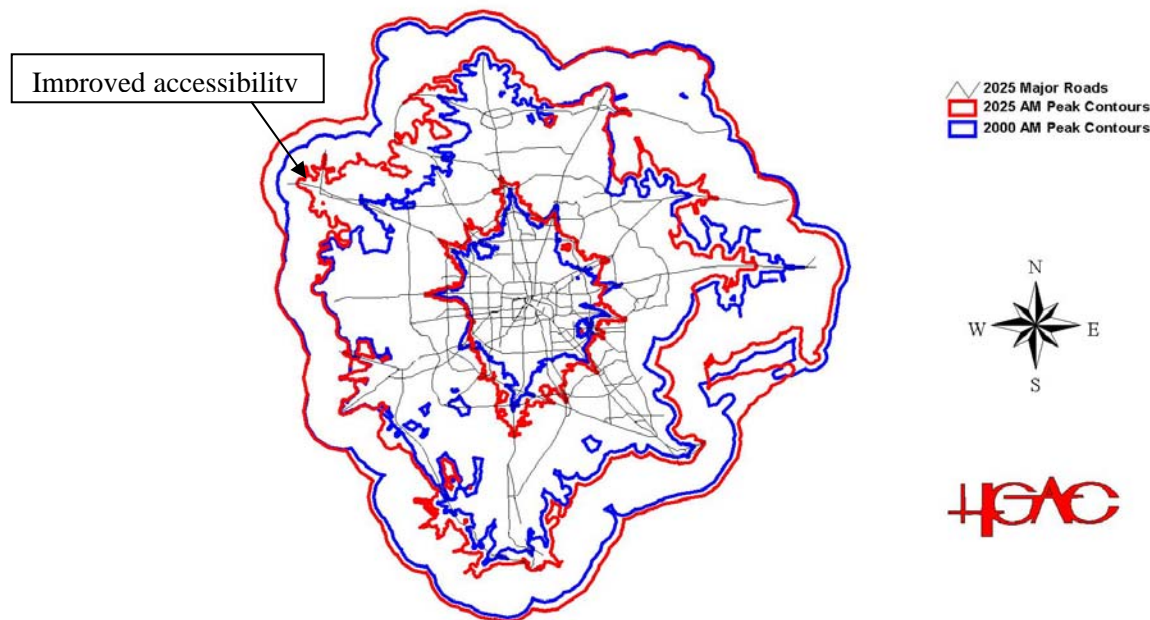
<u>Year</u>	<u>Harris County</u>	<u>Texas</u>
1990	25.8	22.2
2000	28.1	25.4

In the following discussion, average transportation network travel times are the basic unit of measurement and are based on travel demand network characteristics, not perceived travel times. The accessibility analyses discussed below indicate general trends by modes of travel, auto and transit, during different times of the day, peak and off-peak, for the current and future transportation systems.

Regional accessibility is represented by travel time contours. These contours are based on the average travel times from the originating traffic analysis zones (TAZs) to downtown, combined into equal time-bands. Those equal time-bands (contours) are referenced to the area's roadway network geography and displayed to show the relative distances from downtown, that are within specific time frames. (Figure 6)

Figure 6

2000 and 2025 AM Peak Travel Time Contours to CBD (30 minute intervals)



¹ U.S. Census Bureau, Transportation Planning Package (CTPP 1990, 2000). Perceived travel times are reported by census survey respondents.

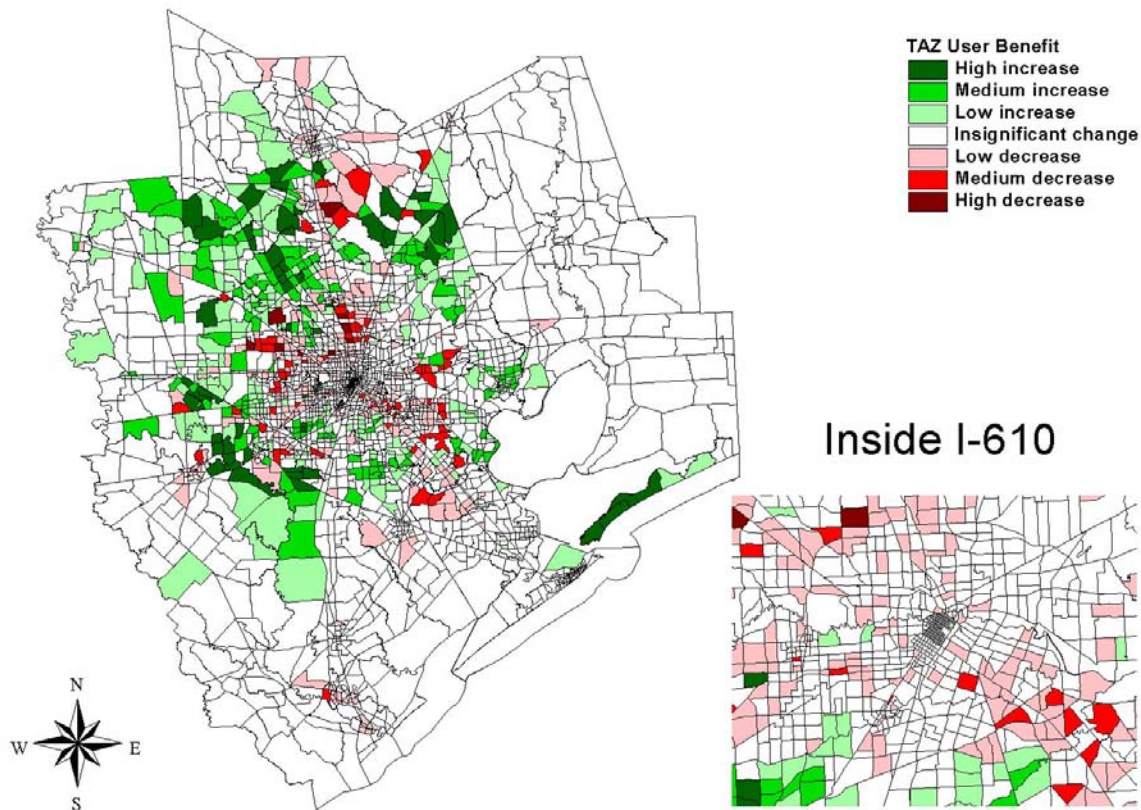
Figure 6 compares the auto travel time contours for the current 2000 and the future 2025 roadway system. **It shows that the 2025 regional accessibility to downtown (CBD) by auto, will be very similar to today (with the RTP projects) and the mobility will be better in the US 290 NW Corridor.**

User Benefits - Auto

System user benefits are calculated by the Summit software package. The benefits are based on the microeconomics theory relative to the value of time saved for users of the transportation system. Figure x below shows the areas where travelers would have varying degrees of travel time savings shaded in green and areas in red showing time losses. The losses in travel time are likely the result of increased regional growth and peak period congestion levels in the 2025 roadway system (see Figure 7 below).

Figure 7

2025 RTP vs 2000 Auto User Benefits from TAZ Productions



As shown above the areas that will receive the greatest travel time savings (benefits) for auto travel are the outer northwest, southwest and northeast quadrants of the 8 county region. The areas that will have travel time increases (or have minor changes) are primarily inside of State Hwy 6/ FM 1960, in the southeast quadrant of the region and inside the 610 Loop

area. The map illustrates the most congested travel locations projected in the future (in red) compared to current mobility levels as measured by travel times (person minutes).²

REGIONAL TRANSIT SYSTEM ANALYSES - Accessibility, User Benefits

Public transit accessibility is displayed in Figures 8-11 below. The figures show the average travel times to the CBD by walking access to local, express and commuter buses in the year 2000. Figure 5 shows the average travel times by drive access to park and ride bus services.

Figure 8

Year 2000 AM Walk-Local Bus to CBD (taz 14) weighted travel time

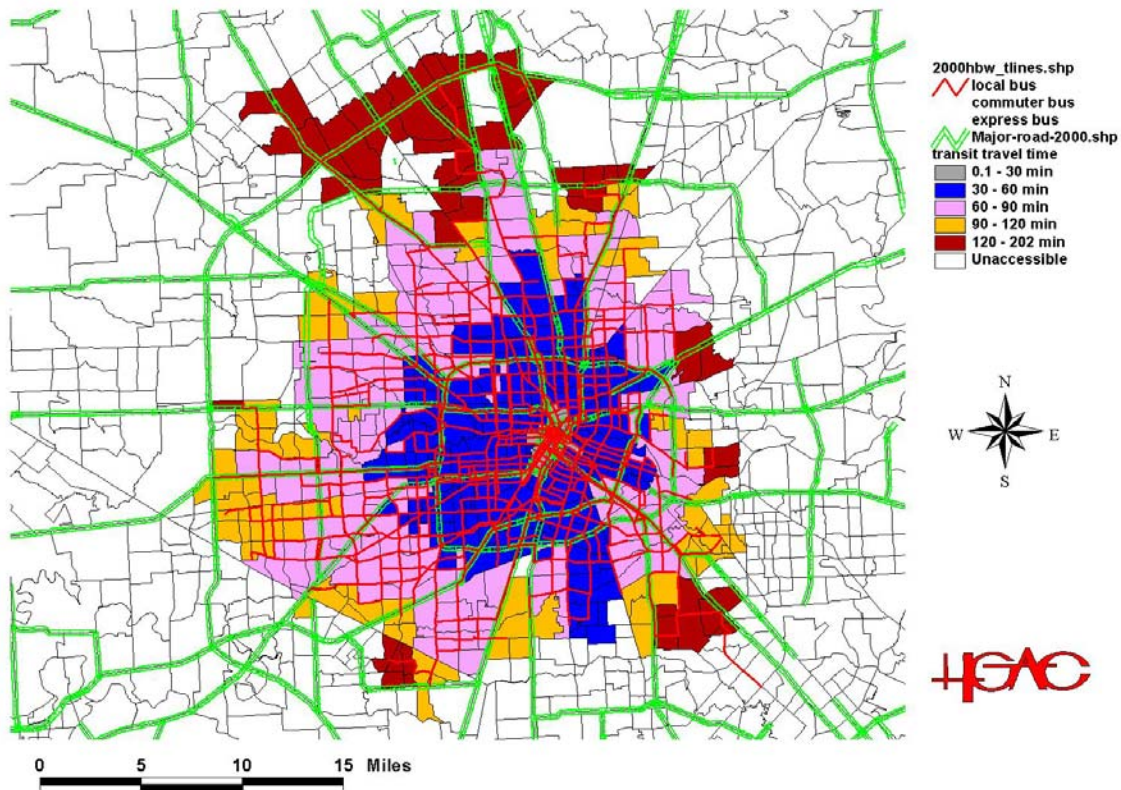
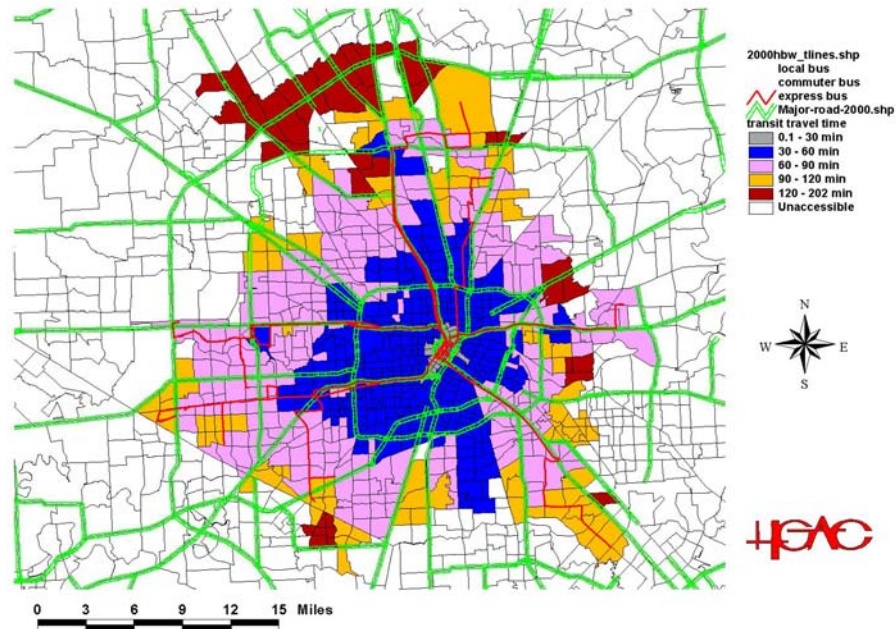


Figure 8 shows the areas in the south, southwest and northern portions of the city that have relatively better access to the CBD compared to the southeast and eastern parts of the region. The area shaded in blue represents 30-60 minutes access to downtown by transit during the morning peak period. Those areas also have higher levels of fixed-route bus services. **Also notable are the areas within the Beltway 8 loop that are more than 2 hours from downtown (120 minutes or more as shown in the area shaded in brown).** There is a large concentration of TAZs adjacent to FM 1960 and north of Beltway 8 North that have limited access to local bus services, probably due to the longer distances. That could indicate an opportunity to provide expanded bus service in those areas if it is warranted by potential users. That consideration is discussed further in the development of the Regional Transit Plan section of the 2025 RTP.

² The Traffic Analysis Zones (TAZ) are the geographical units for the analysis. The productions represent home-based trips for all trip purposes.

Figure 9

Year 2000 AM Walk-Express Bus to CBD (taz 14) weighted travel time



Areas in the north (Bush Airport), east (Maxey Road) and southeastern (South Belt) parts of the service area show improved access due to the express bus routes that operate there.

Figure 10

Year 2000 AM Walk-Commuter Bus to CBD (taz 14) weighted travel time

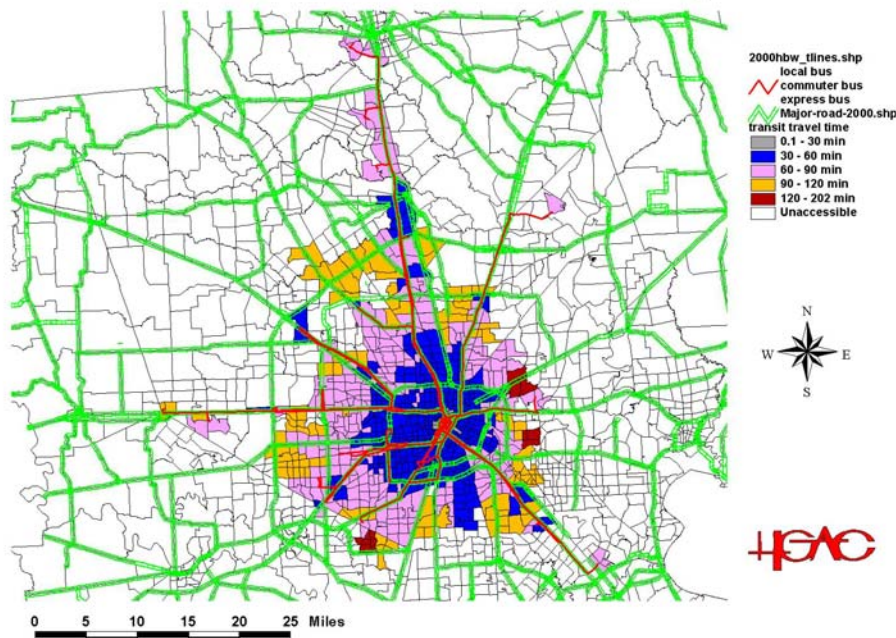
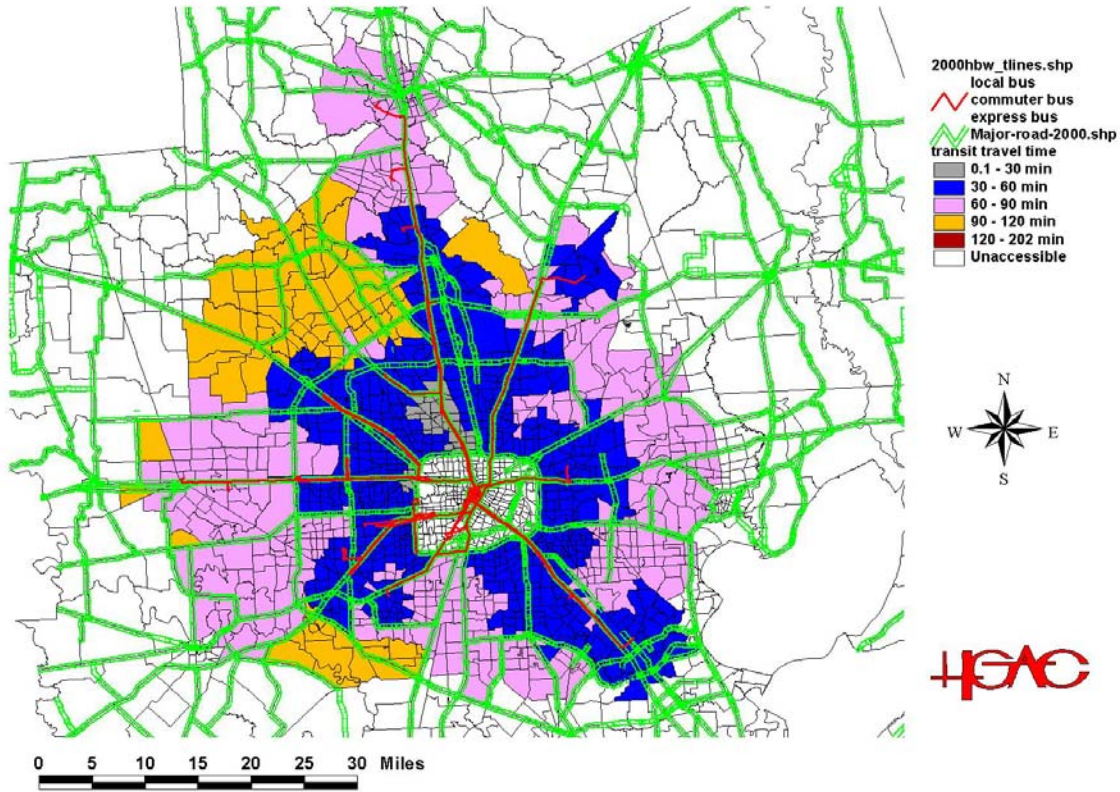


Figure 10 shows that the increased access to areas in the vicinity of I-45 North to Conroe, Kingwood, Bay Area and Katy are much farther from downtown and benefit from the premium park and ride services that utilize the HOV lanes into downtown. Figure 11 illustrates the expansion of the benefits (in terms of travel time saved) for patrons that drive to the park and ride lots. Most notable is the increase in the areas (shaded in blue) within 30-60 minutes of downtown.

Figure 11

Year 2000 AM Park-and-Ride to CBD (taz 14) weighted travel time



Another way of measuring the changes in regional accessibility is the calculation of the regional population and employment within the time contours by time of day for the current and future transportation system. Chart 1 highlights the share of regional population accessible within 30-60 minutes using transit to the CBD for home-based work (HBW) peak-period trips.

Chart 1 shows the regional percentage of population that is accessible by transit for the years 2000 and 2025, by mode of access to transit, during the morning peak period. **The chart indicates that the number of people that will have access to the CBD, by transit within 30-60 minutes will decrease for patrons walking to local and express bus routes, compared to today. Accessibility will improve for those able to drive to access the park and ride system, primarily because of travel-time savings by using high-occupancy vehicle (HOV) lanes.**

Chart 1

Population 30-60 min Transit

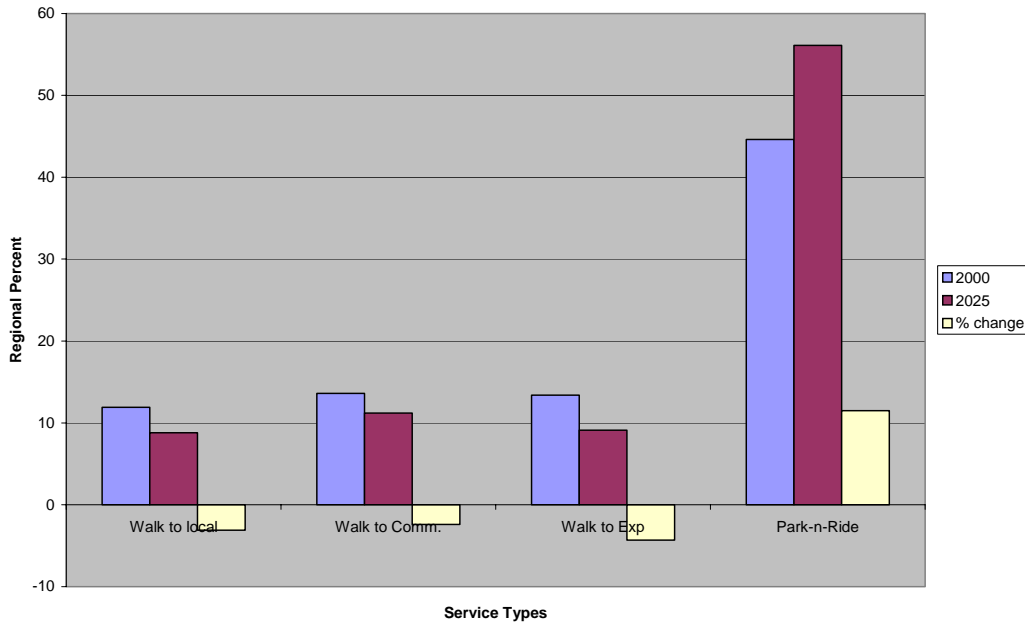


Chart 2 shows the regional percentage of employment accessible by transit (2000, 2025) by mode of access. It also indicates a decrease in accessibility for the local and express transit subsystems and an increase for those with driving access to the park and ride system.

Chart 2: Employment 30-60 Transit

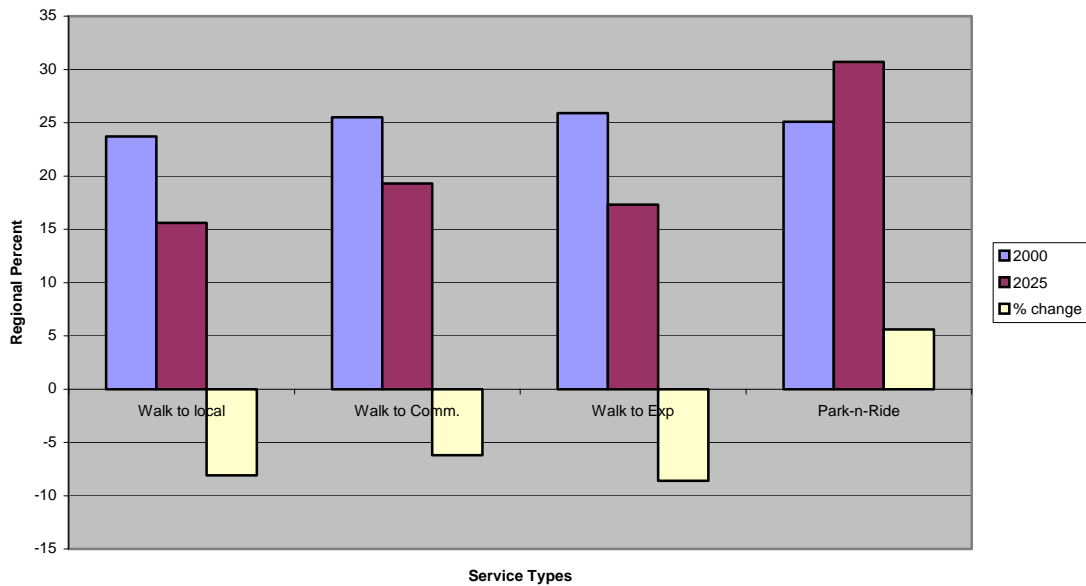
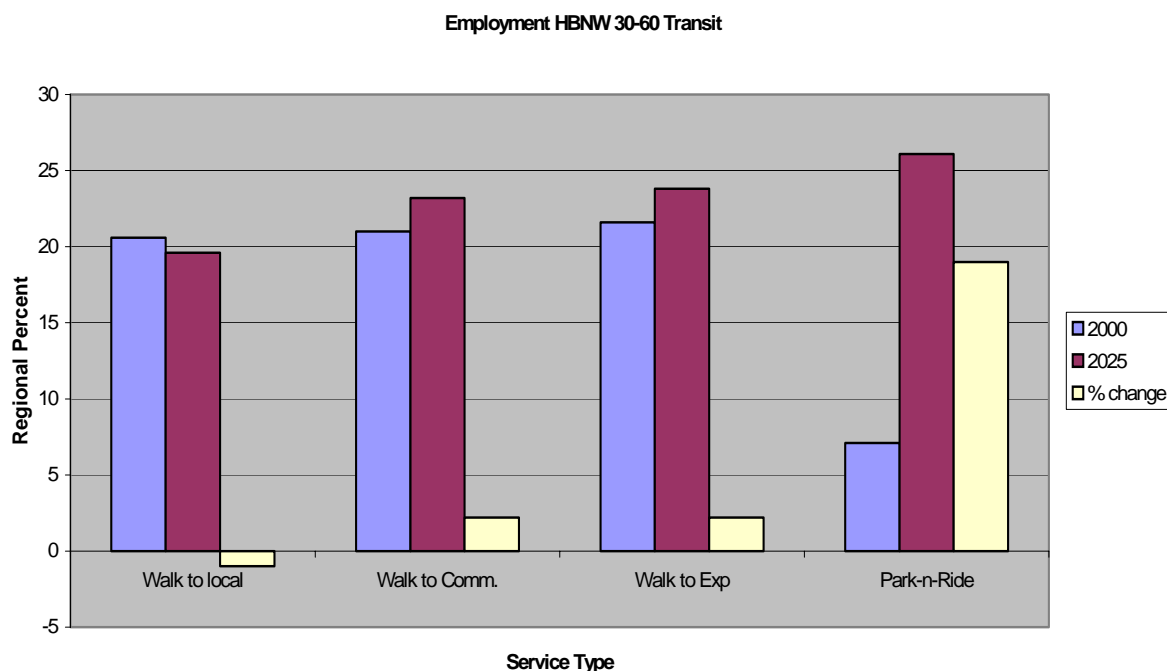


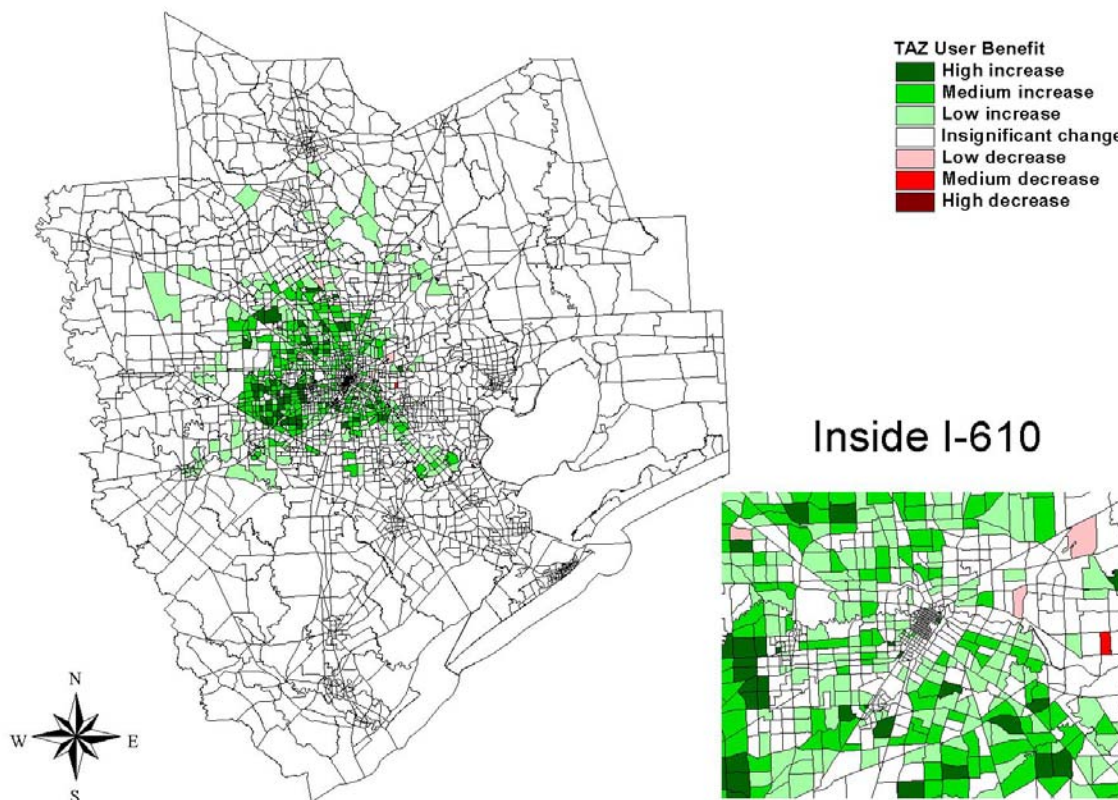
Chart 3 shows that the 30-60 minute accessibility to the CBD/Downtown will improve for off-peak travel, represented by the home-based non-work (HBNW) trips for each access mode, except walking access to local transit routes, which decreases. The most significant increase in off-peak accessibility relates to the park and ride services.

Chart 3



An additional analysis of User Benefits for transit system users is shown below. It indicates that the implementation of the METRO Solutions 2025 Transit Plan will have beneficial impacts for those transit users in the City of Houston and most of Harris County, (except eastern Harris County). It also shows that transit users in adjacent counties with access to park and ride transit services will experience some improvements in their travel times. A few locations are highlighted in red and indicate some increased transit travel times. Those areas require closer study. See Figure 12 below.

2025 RTP vs 2000 Transit User Benefits from TAZ Productions

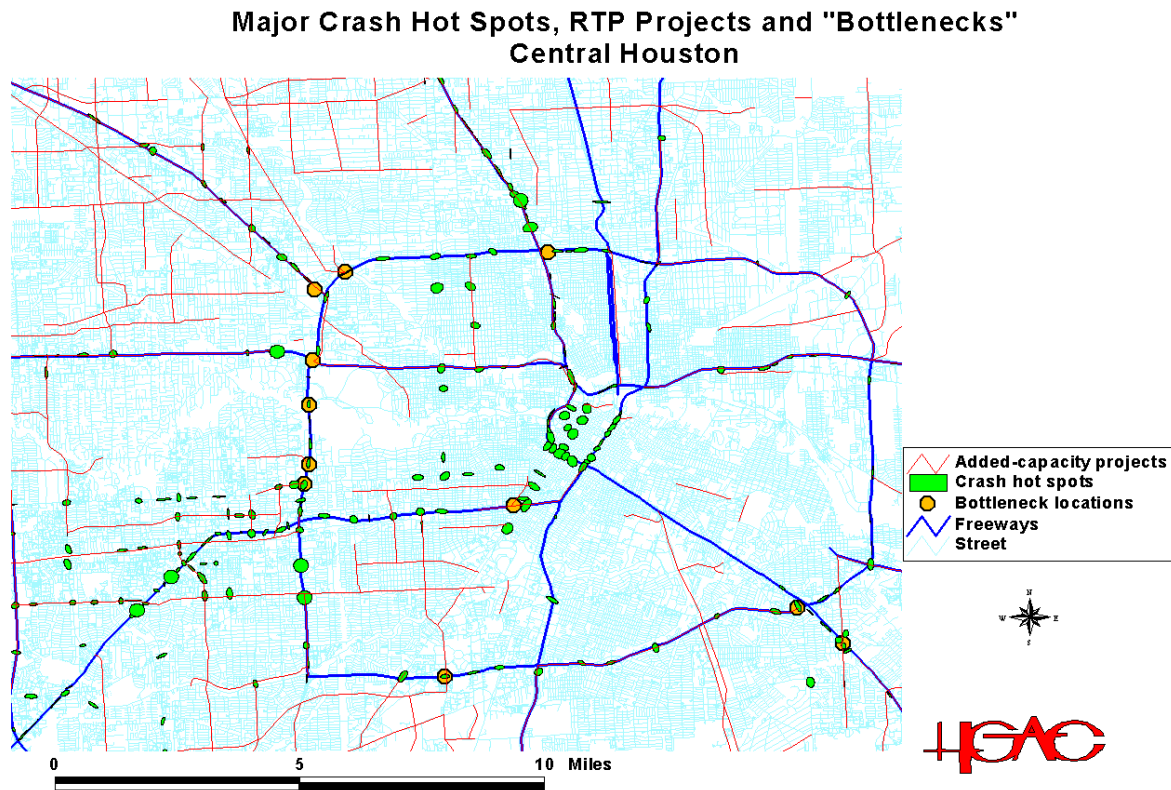


Comparison of RTP Projects, Safety Hot Spots and Bottlenecks.

The following highlights the importance of the strategic system improvements that are included in the 2025 RTP. The intent is to point out the relationships between those roadway system improvements that have been planned by transportation agencies and local governments (red lines) and new information that has been developed from the GIS-based crash information system. A safety analysis identified 344 major crash hot spots that account for 20% of all serious crashes in the region (green ellipses; see Appendix A).

GIS was used to combine the point locations of known system bottlenecks (large dots) and the crash hot spots.³ Many of the locations that were identified as major traffic bottlenecks have improvements under construction or planned for the very near future including the 610 W. Loop, I-10 Katy Freeway and inner Southwest Freeway/US 59 South. As shown below, (Figure 13), many of the locations overlap. Of the 17 bottleneck locations, 10 overlap the crash hot spots. Similarly, of the 1342 added-capacity projects, 189 overlap the crash hot spots. On the other hand, 133 of the 344 crash hot spots do not overlap the major bottleneck locations nor the added-capacity projects. In addition, even for the overlapping projects, it's not clear whether the projects actually address the safety concerns at those locations. Nevertheless, the fact that there are projects at those locations creates the potential for addressing the safety concerns, too.

³ The traffic bottlenecks were analyzed in a series of studies performed by the Texas Transportation Institute (TTI) for the Houston District TxDOT; information was provided in a 1998 Bottleneck Study Update memo.



RTP System Evaluation Conclusions:

- Improved peak period Level of Mobility.
- Improved Regional Access for park and ride transit users.
- Decreased regional mobility for most system users (auto and transit), primarily due to significant regional growth.

Recommendations.

- Implementation of 2025 RTP Projects.
- Promotion of strategies and programs to increase ridesharing including mass transit, carpooling and vanpooling).
- Implementation of more incentives for demand management strategies such as alternate work hours, trip reduction days, parking management and tele-working.
- Strategic operational and safety improvements in highly congested corridors to remove (or mitigate) major traffic bottlenecks.

Chapter 3

Regional Travel Patterns

The information in this chapter summarizes the major regional travel patterns, at the county level, to the four major activity centers and from suburb to suburb. Information is also presented relative to the development of other large concentrations of employment in the region that are shaping some emerging travel patterns that are quite different.

The travel patterns summaries are based on the morning peak period work related travel as a starting point for further discussion. The regional work trips were about 18% of total person trips on a daily basis (in 1995) and are heavily concentrated in the morning peak period, or rush hours, according to a TxDOT traffic congestion index. This analysis of the peak period travel patterns shows how those regional patterns have changed over time and are likely to change further, if the regional population and employment forecasts become reality. The four major activity centers that were studied are the Central Business District (CBD), the Uptown/ Galleria, Texas Medical Center and Greenway Plaza.

Historically, the radial roadway and public transit system in Houston, like the hub-and- spokes of a wheel, focused on the (CBD) as the primary work trip destination. As the city grew and expanded over time, the radial roadway system also expanded outwards and became inter-connected. The hub-and-spoke system has been supplemented with a series of loop freeways, approximately 5 miles apart. The IH-610 Loop, portions of SH6/FM 1960, and the Sam Houston Tollway/Beltway 8 and the proposed Grand Parkway/SH 99, all facilitate crosstown travel without going through the downtown/CBD hub.

The decentralized development pattern that has emerged in Houston since the 1960s has contributed to an enlarged urbanized area that is now characterized by multiple major employment centers, employment corridors, and large activity districts outside of the CBD. In addition, large residential developments outside of the IH 610 Loop coupled with that employment growth in the same areas, have resulted in more localized travel, reverse commutes and suburb-to-suburb travel patterns. Those travel patterns require additional investments in the transportation system to accommodate better efficiencies.

The 2025 RTP includes a recommendation to develop the smart/ express streets concept that would address those emerging travel patterns by providing alternate routes to the radial freeway system. Those smart streets also compliment the implementation of the METRO Solutions Signature Express Bus Routes that would benefit from improved traffic flows along those routes.

Information is provided relative to:

1. Regional Travel Patterns- County Level
2. Sub-Regional Travel Patterns to 4 Major Activity Centers
3. Emerging Travel Patterns to Major Employment Concentrations.

Regional Travel Patterns

The dominant regional travel patterns (to work) in terms of the volume of person trips are within Harris County (650,000) and from Fort Bend (46,000) and Montgomery Counties (31,500) into

Harris County. Total regional workers are estimated at 1.9 million daily with more than 60% of those leaving home before 8 AM in Harris County, (2000 Census CTPP).

As shown in Figure P.1 and Table P.1 below, internal county level trips are next in terms of total volumes. As indicated in Figure P.2 and Table P.2 future 2025 volumes are expected to increase significantly within Harris County and from Fort Bend and Montgomery counties into Harris County.

Figure P.1:

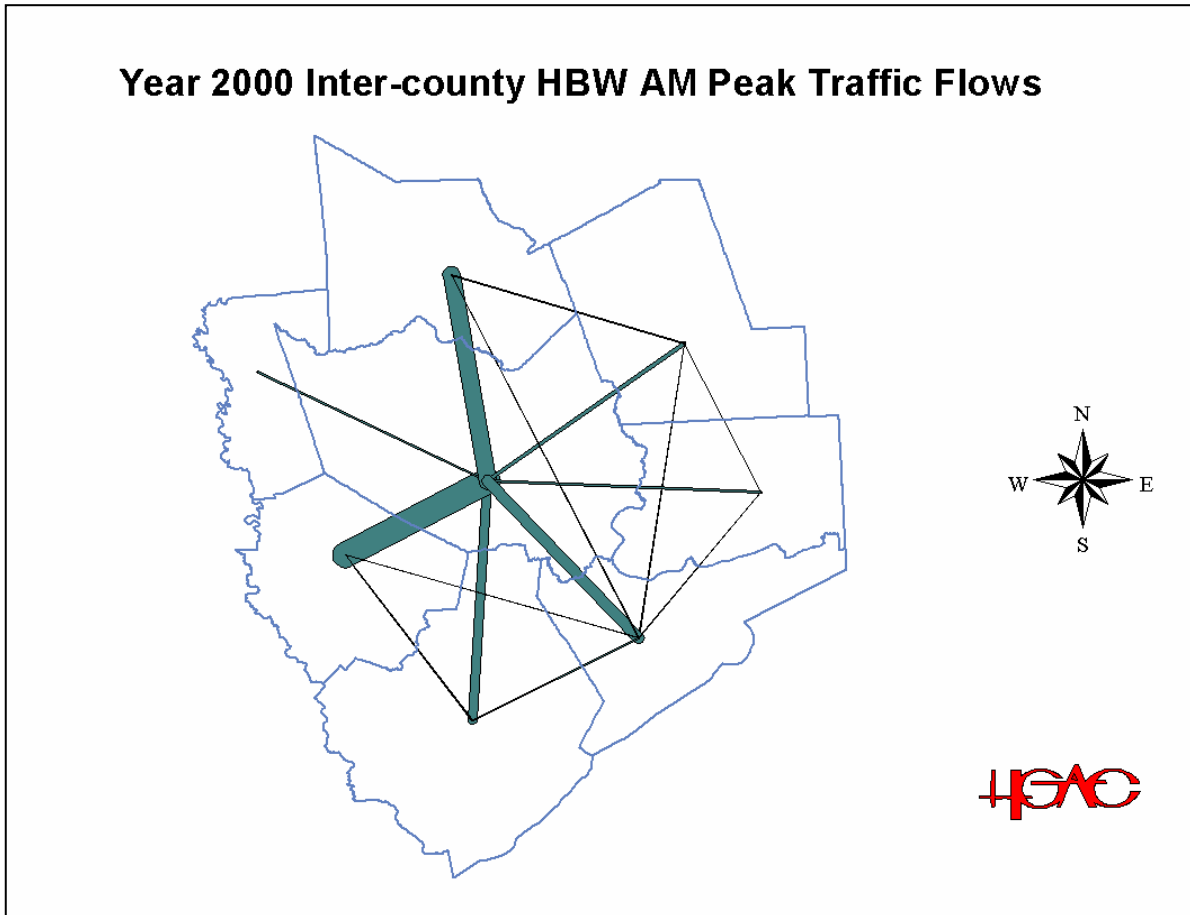


Table P.1: Year 2000 HBW AM Peak County-to-County Person Trips

From/To	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
Harris	647574	3909	14863	1452	8231	890	1375	5807
Brazoria	16643	28183	1578	18	72	11	35	1353
Fort Bend	46127	849	24471	282	144	14	25	294
Waller	3196	11	170	2163	145	3	2	6
Montgomery	31518	91	305	223	28372	456	26	91
Liberty	6303	38	54	7	556	5249	282	66
Chambers	3531	27	29	2	19	84	1525	92
Galveston	20894	1443	361	10	57	19	96	28716

Figure P.2:

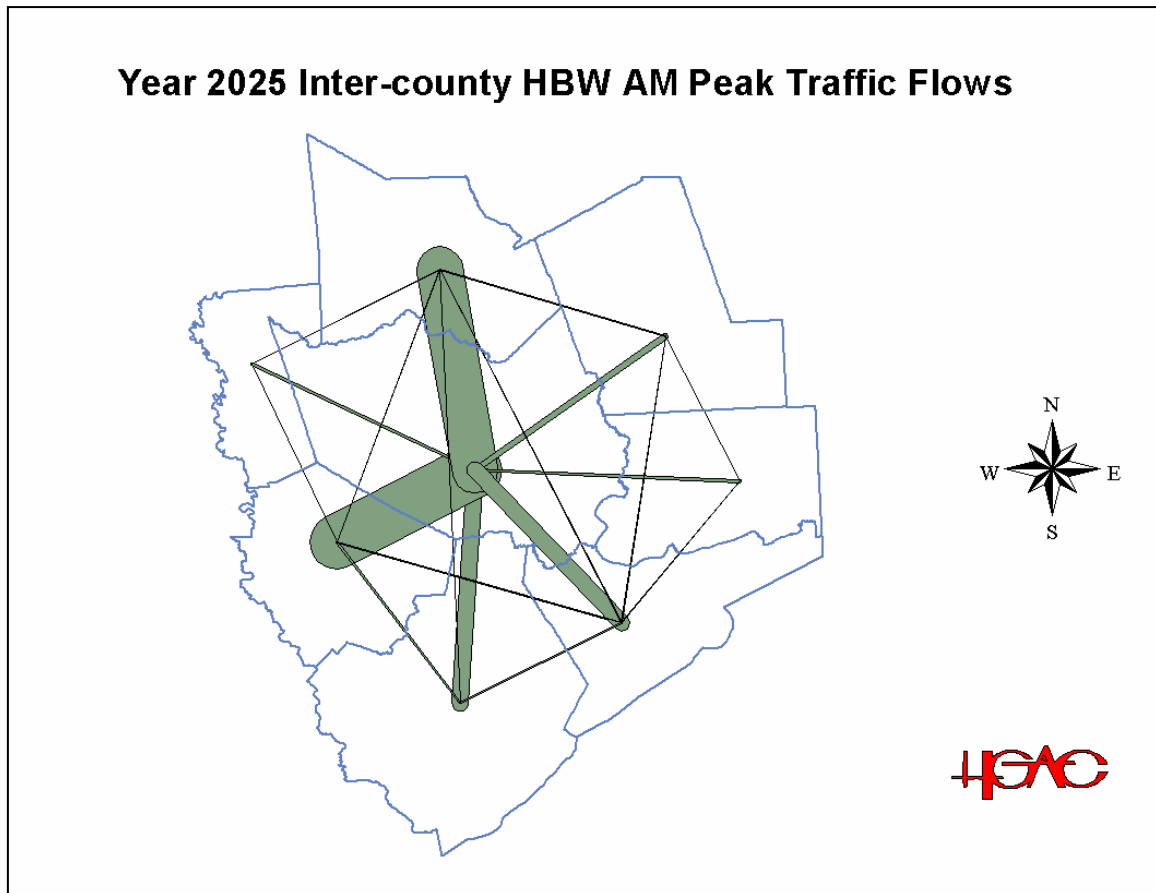


Table P.2: Year 2025 HBW AM Peak County-to-County Person Trips

From/To	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
Harris	974251	7475	26073	3703	20814	3297	1807	11683
Brazoria	31420	34155	3584	49	220	58	47	2948
Fort Bend	100503	3256	56653	937	649	88	55	1096
Waller	5750	35	412	3091	430	13	3	24
Montgomery	85888	391	1351	1115	47158	1393	101	355
Liberty	10449	88	138	21	1004	7761	283	175
Chambers	5180	54	65	7	80	216	1629	213
Galveston	30650	2498	710	21	151	67	133	37243

Sub-Regional Travel Patterns

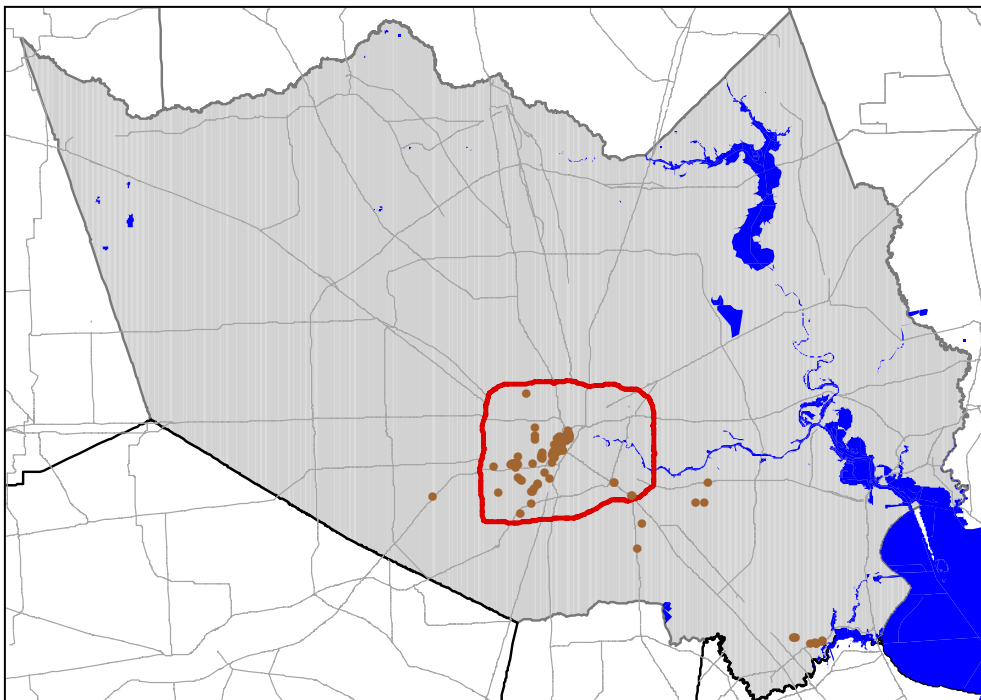
Since the 1960s, growth in regional office buildings has primarily been outside of the central business district, as indicated in tables P.3-P.6 and figures P.3- P.6. The following series of maps show the increase in office space development during several phases in Houston, from the 1960's.

Table P.3:

New Office Space Locations: Pre- 1969

Pre-1960	Sites	GSF (millions)
CBD	46	12.3
Inside Loop	59	3.9
Outside Loop	33	2.7

Figure P.3:

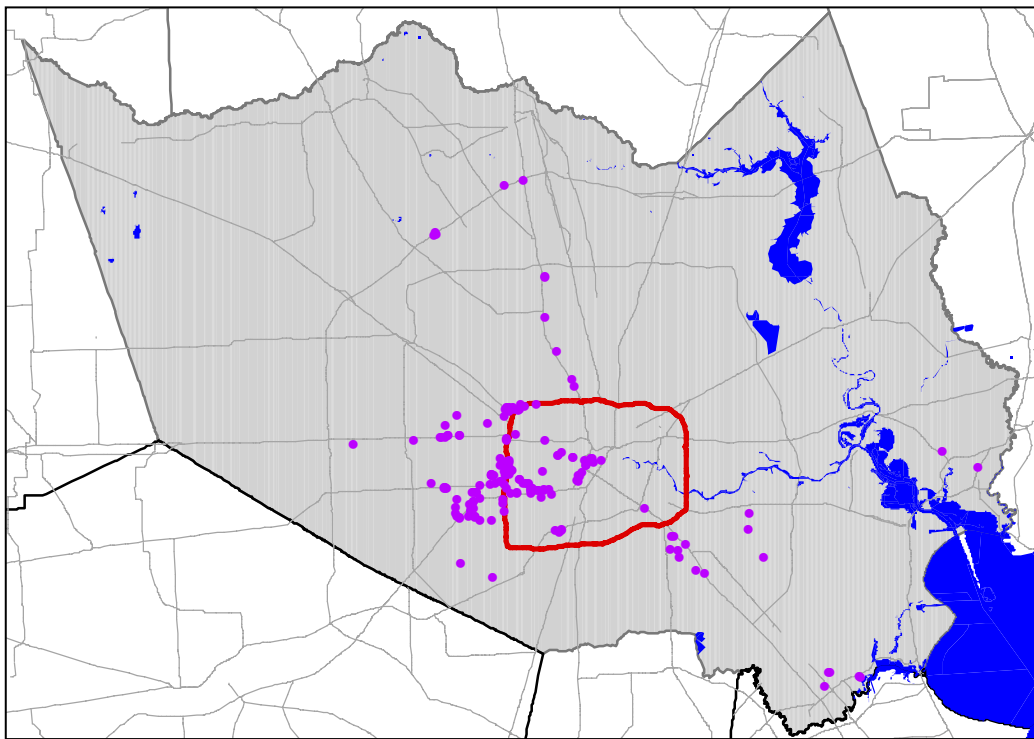


Before 1960 the CBD and the area within the Loop 610 contained the most dense employment sites.

**Table P.4:
New Office Space Locations: 1969-1973**

1969-1973	Sites	GSF (millions)
CBD	9	8.2
Inside Loop	58	6.7
Outside Loop	119	7.7

Figure P.4

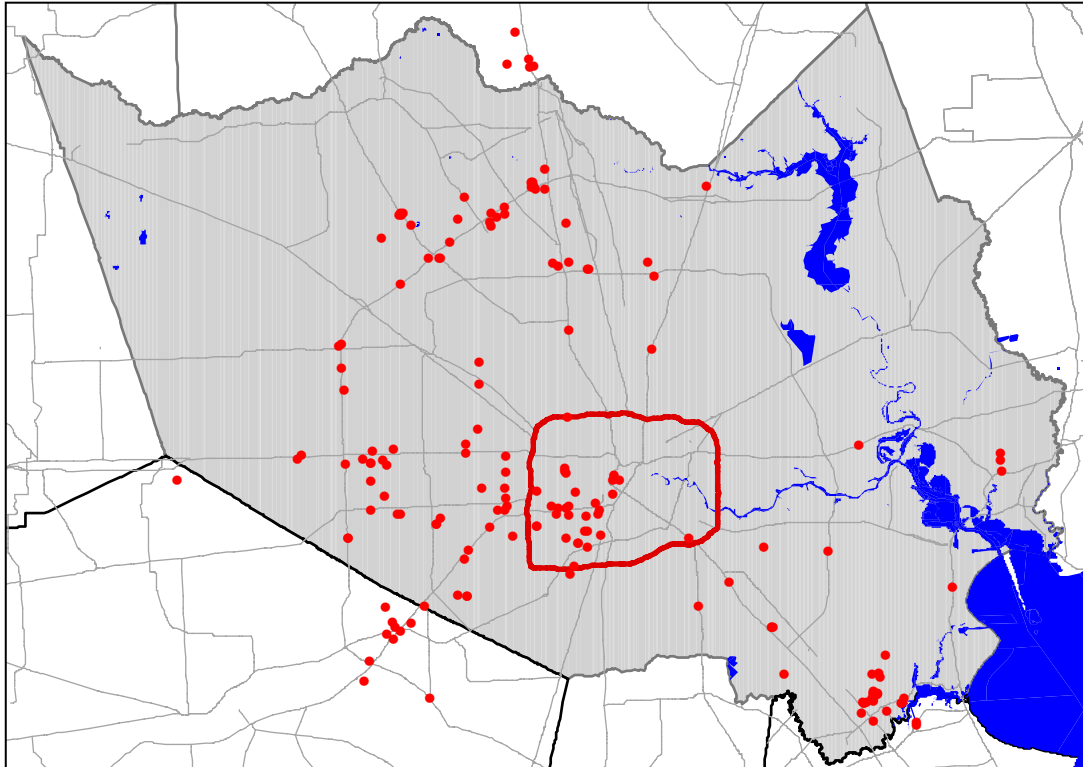


During the late 1960's and early 1970's the areas along the Southwest Freeway and West Loop added substantial growth.

**Table P.5:
New Office Space Locations: 1984-1988**

1984-1988	Sites	GSF (millions)
CBD	5	4.6
Inside Loop	27	3.5
Outside Loop	155	17.7

Figure P.5

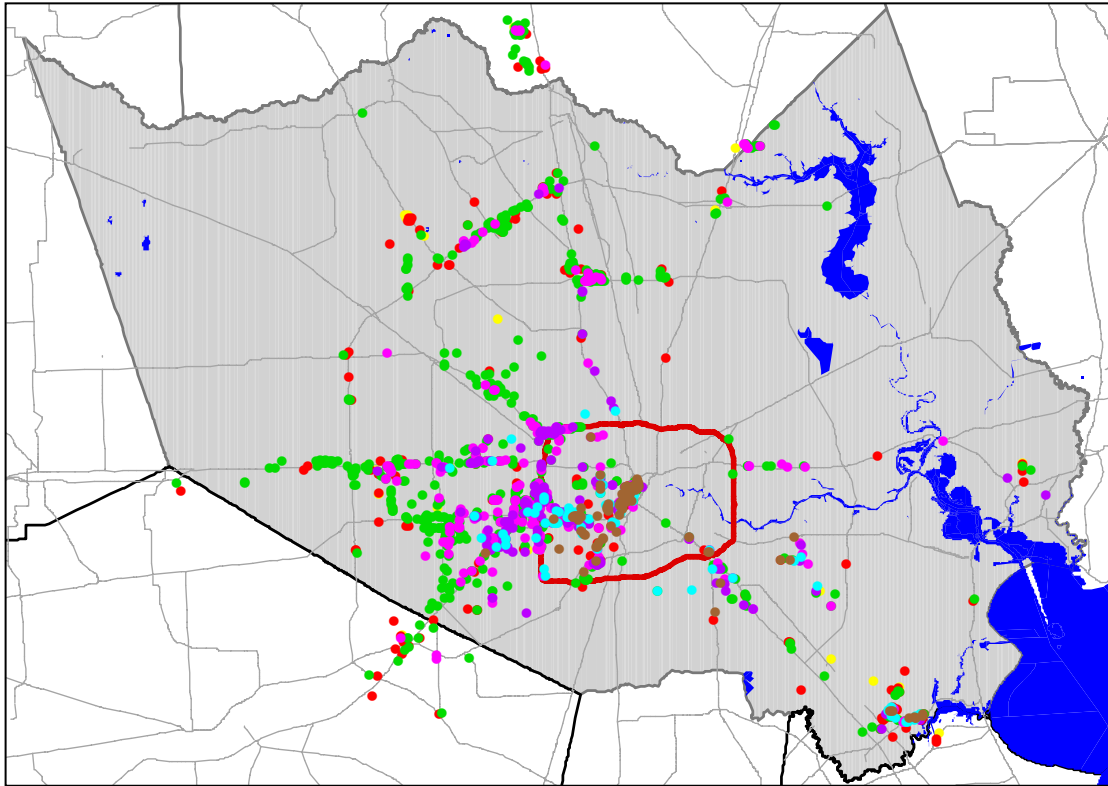


During the 1980's many new sites were located along the Southwest and Katy Freeways, and along FM 1960.

**Table P.6:
New Office Space Locations- 1969-2000**

All Years	Sites	GSF (millions)
CBD	89	49.4
Inside Loop	350	39.2
Outside Loop	1,119	114.4

Figure P.6:



During the last three decades, more than 145 million square feet of office space has been developed outside of the CBD.

Sub-Regional Travel Patterns to 4 Major Activity Centers (MAC)

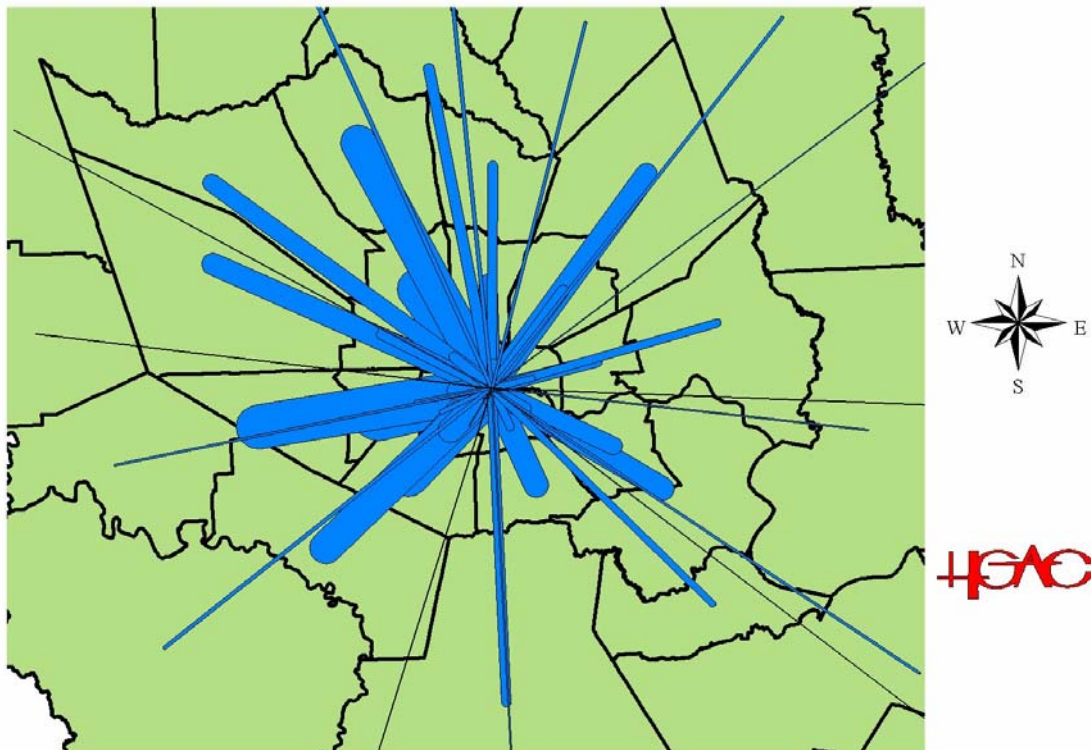
Work Trips to MACs

A detailed travel pattern analysis was made of the four Major Activity Centers (MAC). Historically, these have been the most important in terms of regional employment centers. Even though their relative share of regional employment is decreasing, they still will increase their employment over the next couple of decades. It is important, therefore, to understand these centers and how they have shaped (and are still shaping) regional travel.

Overall patterns are discussed for the most significant (highest volume) regional home-based work trips to the four MACs. Close to 400 thousand work trips are attracted to those areas each workday. Other significant travel patterns, (suburb-to-suburb) are discussed later. This analysis is derived from a travel demand modeling trip matrix. The matrix utilizes graphic plots of the highest volume (sector to sector) movements. The matrix plots are shown below for the year 2000 (Figures P.7-P.10). Below each graphic is a brief summary of the primary patterns that were identified for each MAC. In general terms, the highlighted travel patterns to the major employment centers are projected to increase in volume and trip lengths in the 2025 transportation system. Another presentation of the MAC travel patterns combines the four centers into one (to simplify the comparison) for the 2000 and 2025 forecast years (see Figures P.11 and P.12).

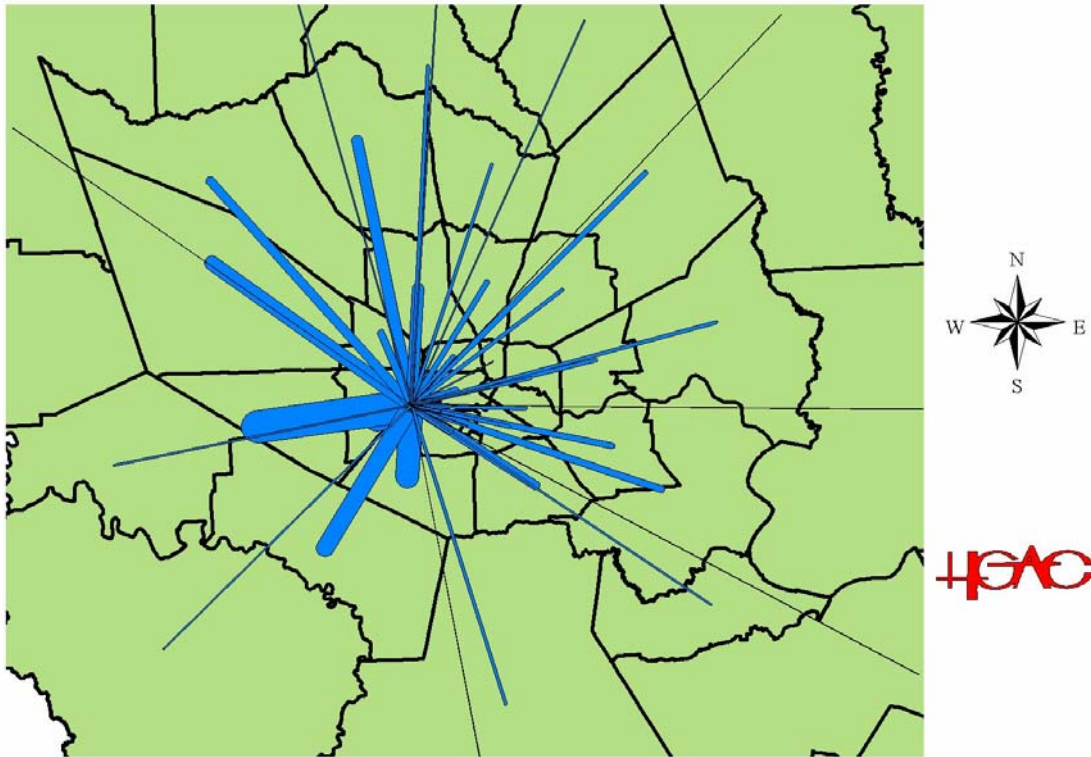
Figure P.7:

Year 2000 Sector Level AM HBW Persons Trip to CBD



The dominant patterns to the CBD originate in the southwest quadrant of Harris County with some large flows evident from Fort Bend and northwestern Harris County. Other significant patterns are also observed from western Harris County, parallel to the I-10 Katy Freeway corridor. Although less significant than those already mentioned, noticeable patterns are shown from the outer northeast Eastex Freeway /US 59 North area near Kingwood. In general terms, the work trip commuters converge towards downtown each workday and the freeways and major arterial streets in the southwest and northwest quadrants of the region continuously carry relatively higher daily volumes.

Figure P.8:
Year 2000 Sector Level AM HBW Persons Trip to Uptown



The primary patterns to Uptown/Post Oak are similar to those to downtown, with dominant patterns from the southwest and northwest quadrants of the region. They both show the relative absence of large volumes of inner city (ie. Third Ward, Fifth Ward) trip origins. These patterns maybe reflective of the higher income office workers in the Uptown area that live in southwest Houston, the suburban locations near FM1960 north, the villages along the Katy Freeway corridor and growing communities in southwest Harris County and northern Fort Bend County.

Figure P.9:

Year 2000 Sector Level AM HBW Persons Trip to Greenway

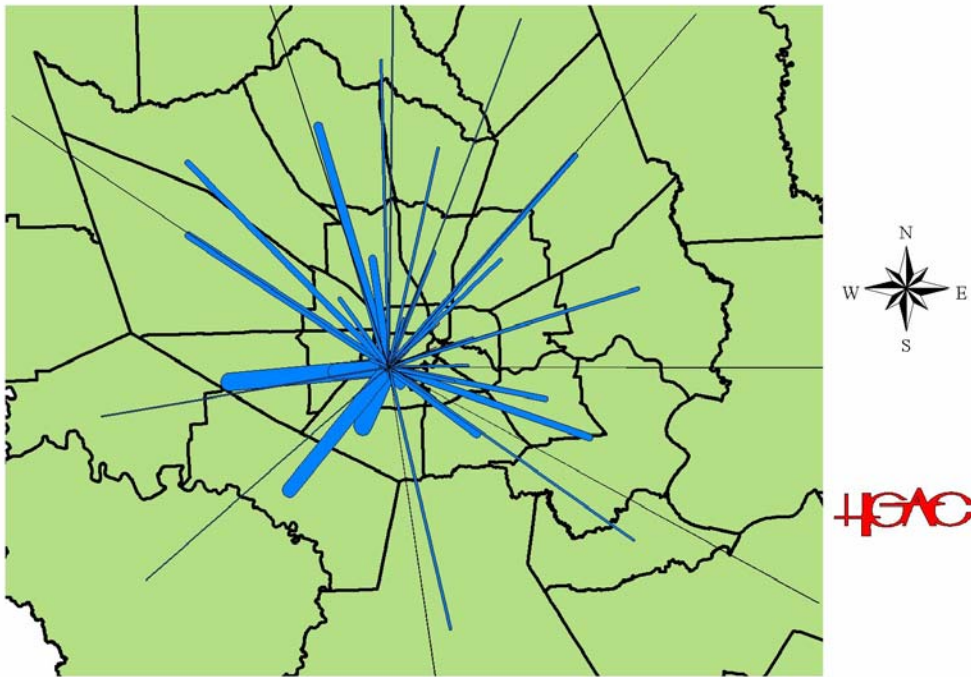
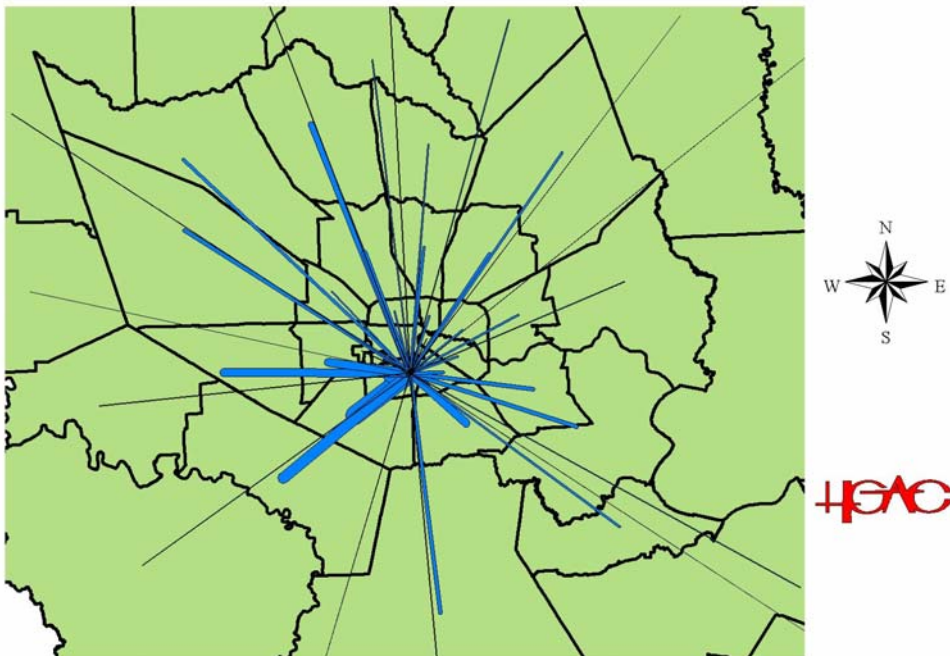


Figure P.10:

Year 2000 Sector Level AM HBW Persons Trip to TX Medical Center



The trip patterns to the TMC (Figure P.10) are generally similar to those for Greenway Plaza. The patterns shown above highlight the high degree of dispersion of origins for home based work trips destined to the MACs. Those trip patterns have been dominant in the Houston region for decades as the city has grown from one central business district to having several "downtowns" when compared to some other cities. Those dominant patterns have been shaped by the radial roadway and transit facilities and services with the 4 MAC's in the center of the region as the primary focus for years past. That role may be changing according to regional forecasts.

In general terms, the travel patterns indicate the need for multi-directional (north, south, east and west) accessibility and multi-modal (highway and transit) options so that local crosstown travelers and longer distance commuters could utilize higher speed and higher capacity transit options if they were available.

Currently, the majority of the higher speed (express) transit services and all of the HOV lanes focus into the CBD as the primary destination with limited direct park- and -ride or express services to the other MAC's. That type of new transit service to suburban employment centers was recommended in the TRIP 2000 study as a means to increase transit ridership in the region. Expansion of the regional transit system is recommended in the 2025 RTP. Increasing the transit modal share of (express bus) commuters to non-downtown destinations could potentially lessen the peak period traffic congestion on the region's freeways.

Work Trips to Four MACs Combined

Travel patterns are displayed and discussed below relative to the four MACs combined for ease of comparison (visually). This is another way of looking at the dominant regional travel patterns to the central part of the region. Results are shown for the current and future time frames.

Figure P.11:

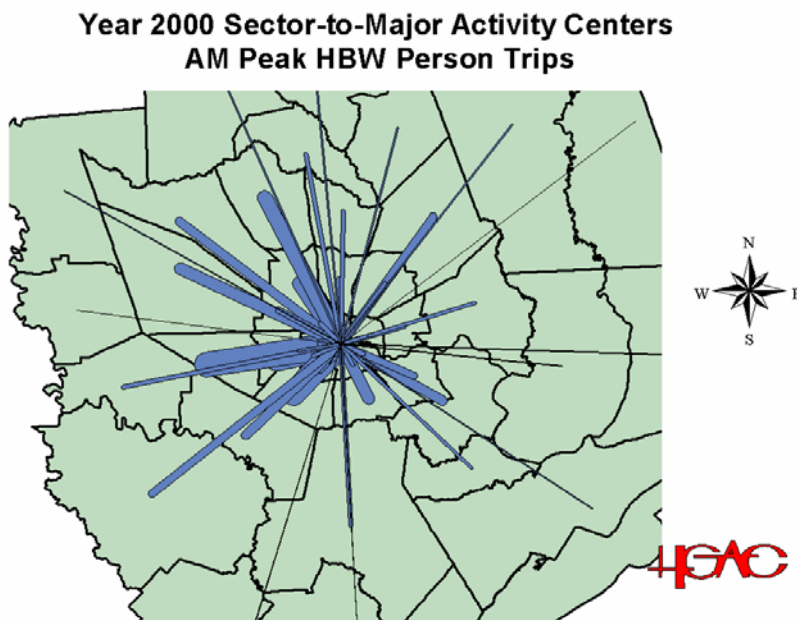


Figure P.12:
Year 2025 Sector-to-Major Activity Centers
AM Peak HBW Person Trips

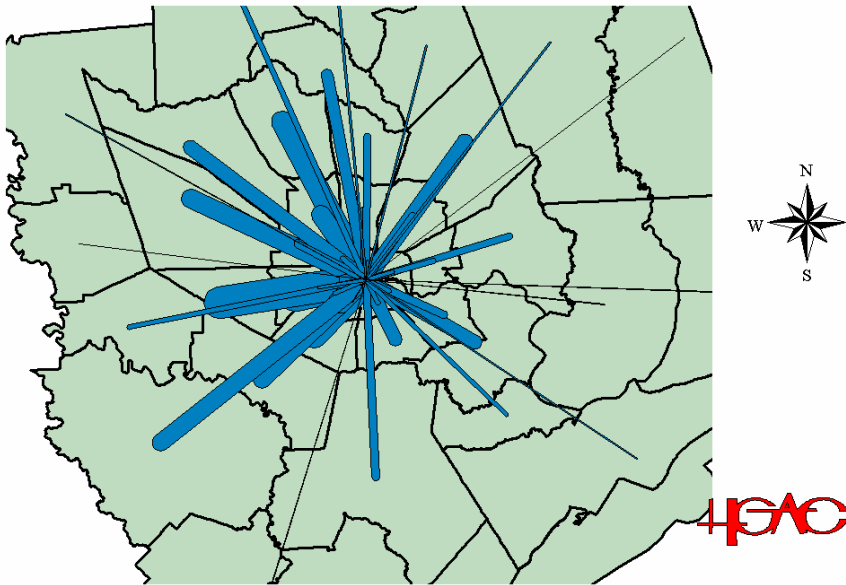
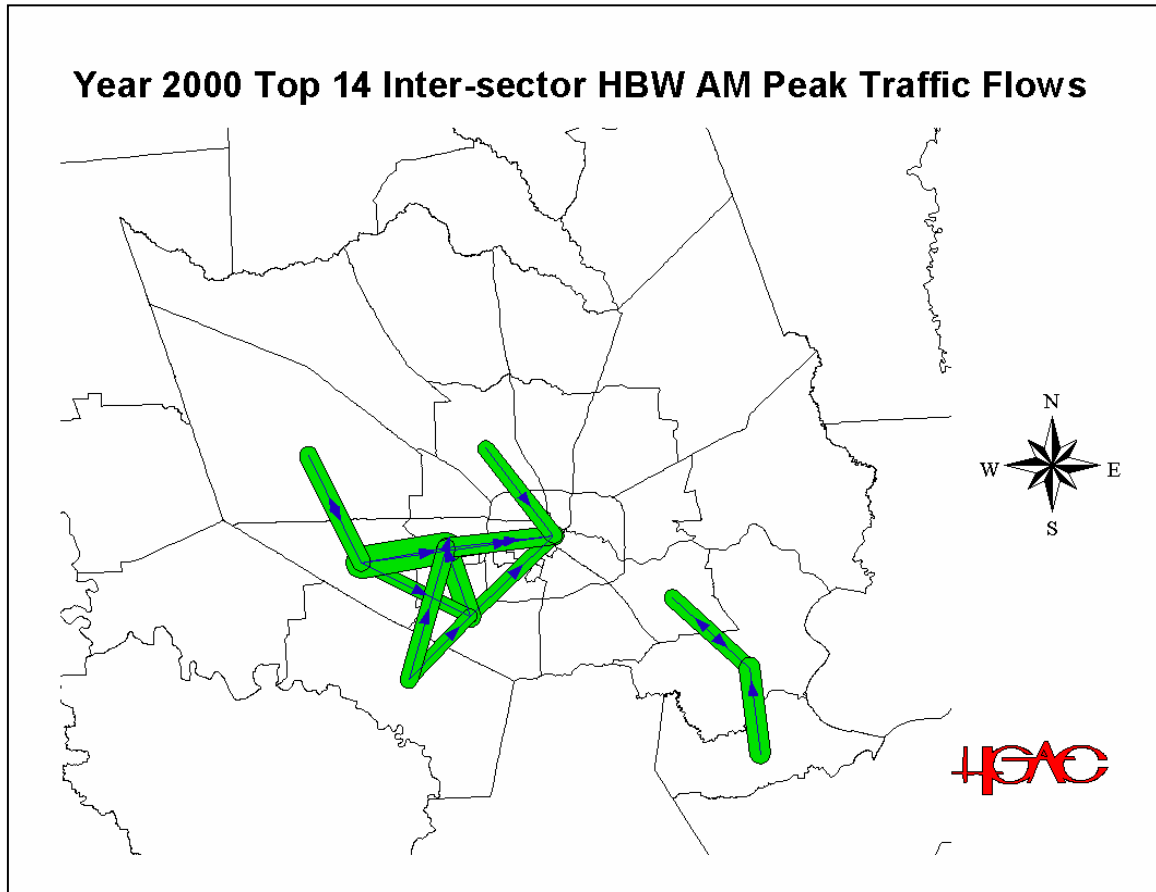


Figure P.12 shows that the future travel patterns to the four MACs are projected to increase in volume along the primary travel corridors. More demands will be placed on the future transportation system as additional suburban employment centers develop. Transportation services will have to be tailored to each of the major employment centers seen in figure P.?? to make the transportation system of the future more efficient.

Emerging Travel Patterns: Suburb-to-Suburb

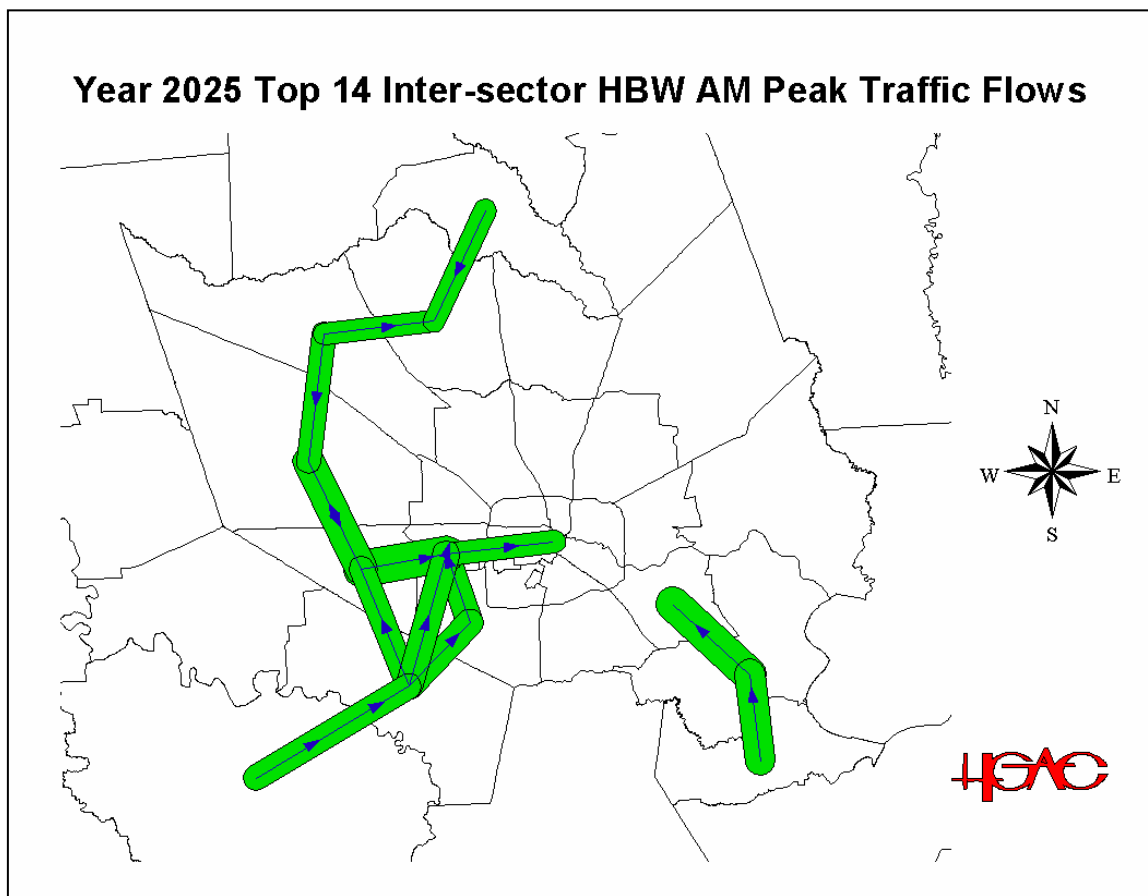
Another emerging and significant set of regional travel patterns relate to the suburb-to-suburb, or crosstown, commutes. National data, as reported in the National Personal Transportation Survey (NPTS), indicates a growing trend towards suburban commuting patterns in large metropolitan areas. In the Houston area, this is accented by the rapid growth in housing and employment locations outside of the four major employment centers as discussed above.

Figure P.13:



The dominant (highest volume) peak-period travel patterns shown in Figure P.13 indicates that large numbers of travelers are making the suburb-to-suburb commutes to and from work on a daily basis and those volumes will increase along with the complexity of those movements in the future as shown in Figure 14 below.

Figure P.14:



The Houston region's roadway and transit systems were not designed initially to facilitate the kinds of movements that are occurring today and projected for the future. In many areas, the bumper-to-bumper traffic along major arterials, such as Hillcroft Road, Chimney Rock and Westheimer in southwest Houston, are the result of the large number of crosstown (suburban) travelers who do not have viable north-south or east-west options. The incomplete grid network of major arterial roads results in some travelers using the freeway system for relatively short local trips because of the lack of continuous parallel arterial roads. However, the radial and loop freeway corridors require circuitous travel, which is less efficient. The proposed system of arterial street improvements in the 2025 RTP including Smart Streets and other operational improvements would potentially improve the options available. As the Houston-Galveston continues to grow in size and complexity, with more dispersed regional centers different travel patterns will be shaped in the future. Some of the dynamics of that growth are discussed in the following section.

Employment Centers and Employment Corridors

In most metropolitan areas of the United States, employment is typically more concentrated than population. Due to a number of historical factors – zoning, land prices, and market preferences, metropolitan employment tends to be located in specific areas, typically where there are low residential densities. In more recent years, this pattern has become blurred as many mixed use

developments are emerging both in central cities and in the suburbs. Nevertheless, in spite of these trends, employment is still relatively concentrated.

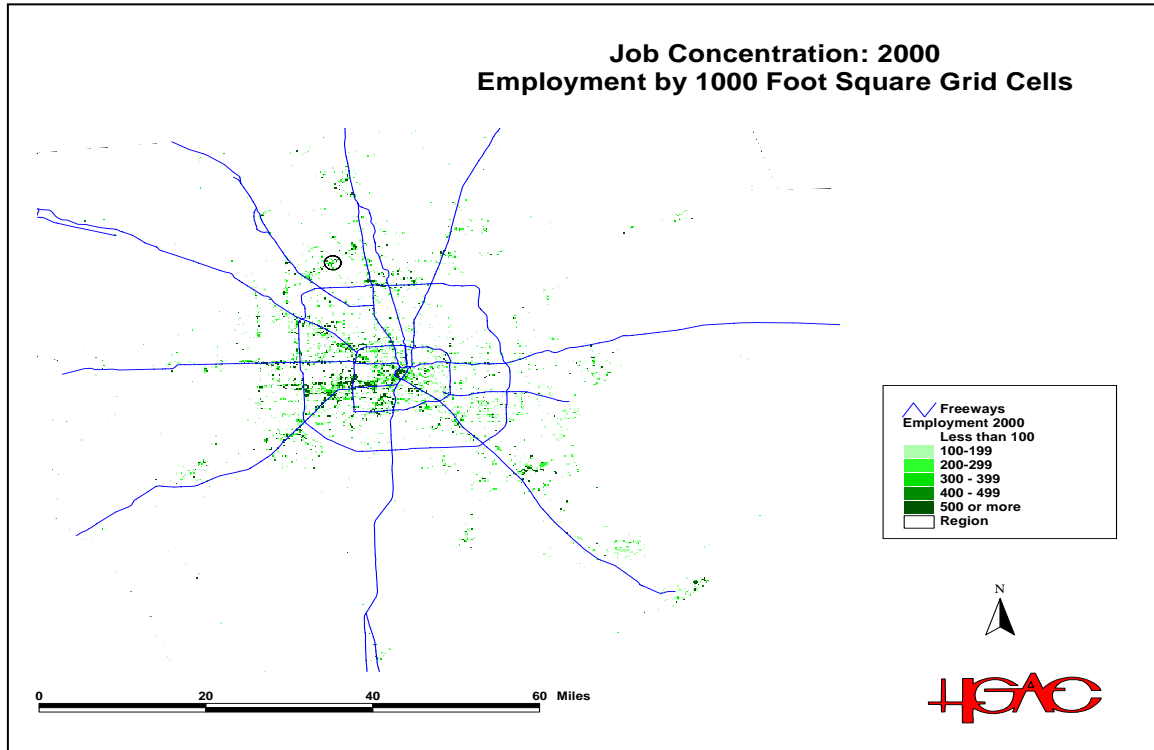
The Houston metropolitan area is slightly different than many metropolitan areas in that it is characterized by both major employment centers, employment districts, and concentrations of employment along major corridors. In Figure P.15 below, the number of employees in small grids (geographic area of 0.03587 square miles, approximately 0.1894 miles on a side) for 2000 is shown. The data were developed by the H-GAC Community and Environmental Planning forecasting group. They have a very large database of all firms of 10 employees or more (which includes many firms with fewer than 10 employees), and which is updated continually. Several commercial databases are used to update the list of employers (including Dun and Bradstreet) and the building permits register of most of the larger jurisdictions are also utilized.

In addition, H-GAC is part of a GIS consortium that conducts aerial photographs of the region on a periodic basis; Harris County, for example, is photographed annually where most of the surrounding counties are photographed every other year. Using these photographs, the forecasting group conducts land use analysis in order to identify new commercial construction. When they identify new developments, they find out from the jurisdiction who will occupy the buildings and the employment level. These multiple sources are cross-checked in order to resolve inconsistencies and the geographic unit chosen (the grid cell) is as small as it is possible to maintain spatial accuracy. The result is a very extensive database of employment in the region. It is far more accurate than any private commercial database since it is updated continually.

Notice in the map how there are both concentrations of employment in small areas, such as the CBD as well as stretches of employment along major corridors. There are also a few major employment 'districts', concentrations of employment over a larger area than a center. In other words, far more employment exists on these 'linear' stretches than in the major activity centers or the employment 'districts'. While Houston is not unique in having employment corridors, it is one of the characteristic features of the region.

There are a number of reasons for the corridors. First, the existence of frontage roads along most major freeways encourages a linear employment development. Second, the increasing suburbanization produces a greater dependency on the freeway for transportation, which in turn reinforces the frontage road development. The two characteristics reinforce each other. Whether this is "good" or "bad" is less important than the fact that the Houston region has emerged this way. H-GAC believes that these trends will continue and will replace the traditional activity center with a more linear employment pattern. It is very important to build transportation planning on the emerging employment corridors because the future metropolitan area will be very much shaped by this structure.

Figure P. 15:



Identifying Employment Concentrations

To see this, let's start with some definitions. Three types of employment concentration need to be distinguished:

1. Employment centers (5 square miles or smaller)
2. Employment corridors (2 mile zone around freeways/major arterials)
3. Employment districts (larger than 5 square miles)

Employment Centers

An employment center is a concentration of employment in a very small geographical area. The region has some well known activity centers, such as the Downtown (Central Business District – CBD), the Uptown/Galleria area, the Texas Medical Center, and Greenway Plaza. But it also has many smaller employment centers, some of which have not been explicitly recognized by local and regional planners.

H-GAC needs to know where the employment centers are located. The aim is to identify locations where there will be substantial travel demand, either by motor vehicle or by transit. Regional transportation planning uses a model for regional travel (called a 'travel demand model') in which population and employment in small zones are linked to trips over the region, by travel mode and by route. The trips 'ends' must be very small areas since travel is very specific about location. For this type of model, it's important to have definitions of employment concentrations that link to the travel model. Typically, H-GAC uses a small geographical unit

called a Traffic Analysis Zone (TAZ) for this purpose. However, small circles will suffice since they essentially measure the same thing.

Employment Density

To standardize the different small areas, H-GAC staff used a measure of employment density. This is the number of employees that work within a specified area, typically one mile square. Thus, H-GAC defines employment concentration as the number of employees per square mile. For travel modeling, it's essential to identify small areas that generate and attract many trips. Consequently, H-GAC decided on the employment density measure as the best indicator of demand for travel.

Using the H-GAC Community and Environmental Planning Group database of employment by small grid cells, H-GAC staff examined employment centers. For employment centers, a circle with a one mile radius was placed over each grid cell and the number of employees that fell within the circle was enumerated. The area of the circle was calculated in square miles (3.14 square miles per circle) and the employment density was defined as the employment divided by the area of the circle. The TAZ's could have been used, too. But, because TAZ's vary in size and shape, a circle approach was considered more accurate.

Once this process was finished, it was possible to rank order the top centers. Table P.7 shows the 25 major employment centers as defined by this method while Figure P.16 shows the location of these employment centers. They are listed from the highest to the least dense.

Table P.7:
25 Major Employment Centers: 2000
Employment Within One Mile Radius

Employment Center	Centered Near	2000 Employment	Employment Per Sq. Mile
CBD	Louisiana/Lamar	162,709	52,056
Uptown/Galleria	Post Oak/San Felipe	63,211	20,223
Greenway Plaza	Richmond/Edloe	57,454	18,381
Texas Medical Center	Holcombe/Bertner	56,278	18,005
Westchase	Fountain View/ Richmond	32,730	10,471
West Houston I	Richmond/Briarpark	29,501	9,438
US 290/NW	US 290/Alamo	24,391	7,803
Sharpstown	US 59 W/Bellaire	23,107	7,393
Greenspoint	IH 45 N/BW 8 N	22,953	7,343
Northwest Mall	US 290/Dacoma	19,743	6,316
NASA I	NASA RD 1/ El Camino Real	19,493	6,236
Universities	Wheeler/Calhoun	17,515	5,604
West Houston II	BW 8 W/IH 610 S	16,691	5,340
Energy Corridor I	IH 10/Dairy Ashford	15,948	5,102
Brookhollow	IH 610 W/Hempstead	13,125	4,199
Southwest I	US 59 W/BW 8 W	12,000	3,839
Bush Int'l	JFK/BW 8 N	11,147	3,566
FM 1960 I	FM 1960/1 st St	10,840	3,468
FM 1960 II	FM 1960/ Steubner Airline	10,770	3,446
Hobby Airport	IH 45 S/Airport	10,376	3,320
Woodlands	IH 45 N/ Woodlands Parkway	9,663	3,092
East End I	Lockwood/Wayside	9,109	2,914
FM 1960 III	SH 249/FM 1960	8,867	2,837
NASA II	NASA Rd 1/2 nd St	8,634	2,762
Energy Corridor II	IH 10 W/Park Ten	7,400	2,367
TOTAL OF 25 CENTERS		673,655	8,621
TOTAL FOR REGION		2,165,033	270

Overall, there were 673,655 employees/jobs in the top 25 employment centers. This accounted for 31.1% of the region's employment. The top center is, by far, the downtown area with 162,709 jobs in 2000 followed by the Uptown-Galleria area with 63,211, Greenway Plaza with 57,454 jobs, and the Texas Medical Center with 56,278 jobs. There are also a number of smaller employment centers concentrated in a small area, such as Westchase, West Houston I, US 290,

Sharpstown, Greenspoint, Northwest Mall, NASA I, and the Universities areas. There is some overlap between some of the circles defining the centers, though surprisingly little. For the 25 centers, approximately 1.3 million work trips each day to and from these centers.

Employment Corridors

The second type of employment concentration is along a major corridor. In the greater Houston region, there is far more employment along employment corridors than in the employment/activity centers. Using a similar geographical definition, H-GAC staff defined a two mile wide corridor around each of the 12 major freeways and Westheimer Road; that is, the corridor included one mile on each side of the major road. This is analogous to a circle with a one mile radius (or a two mile diameter).

Figure P.16:

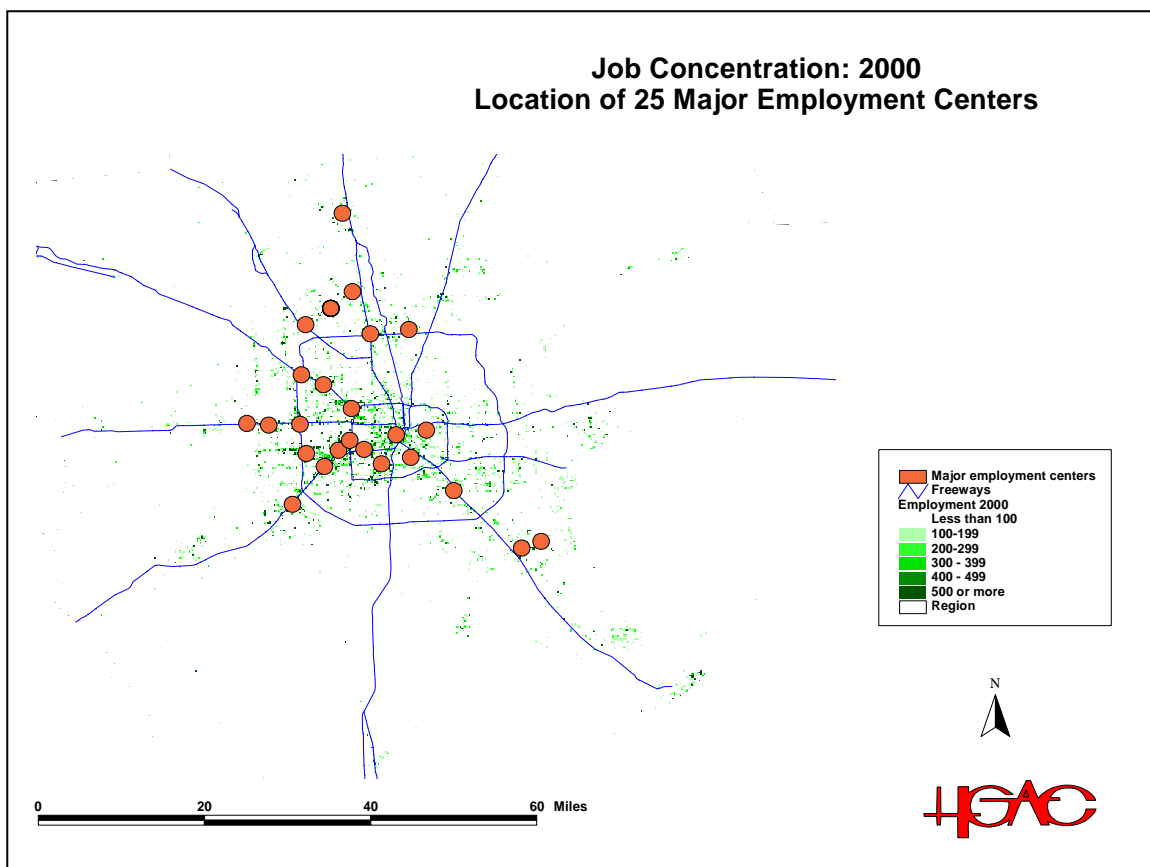


Table P.8 lists the employment density within the 13 corridors ordered by employment density while figure P.17 shows the employment corridors. The overlap with the CBD has been generally removed. Overall, a sizeable proportion of the region's total employment falls within these 13 corridors. There are 1,375, 265 jobs within these corridors, which represents 63.5% of the region's total employment. The employment density within the corridors is 1,170.

The IH 610 corridor has the highest density of employment followed by the Westheimer, US 59 W (Southwest freeway), IH 45 S (Gulf freeway), IH 10 W (Katy), IH 45 N (North freeway), and Beltway 8 corridors.

Table P.8:
13 Major Employment Corridors: 2000
Employment Within Two Mile Wide Corridor

Employment Corridor	Square Miles	2000 Employment	Employment Per Sq. Mile
IH 610	75.8	273,750	3,610
Westheimer	82.0	294,349	3,591
US 59 W	96.9	293,297	3,027
IH 45 S	95.1	193,194	2,030
IH 10 W	84.1	151,911	1,805
IH 45 N	106.5	134,092	1,259
BW 8	175.7	197,538	1,124
US 290	114.8	110,758	965
SH 225	34.1	30,336	890
US 59 E	97.5	58,777	603
US 249	78.8	44,906	570
SH 288	140.6	78,160	556
IH 10 E	125.0	53,370	427
TOTAL FOR 13 CORRIDORS	1,175.0	1,375,265	1,170
TOTAL FOR REGION	8,025.7	2,165,033	270

Unlike the employment centers, there is substantial overlap in these corridors (e.g., the Westheimer corridor overlaps both the US 59 W and the IH 610 corridors). Consequently, the total number of workers within these 13 corridors was estimated at approximately 1.4 million with an overall employment density of 1,170. This translates into approximately 2.8 million work trips a day to and from these corridors.⁴

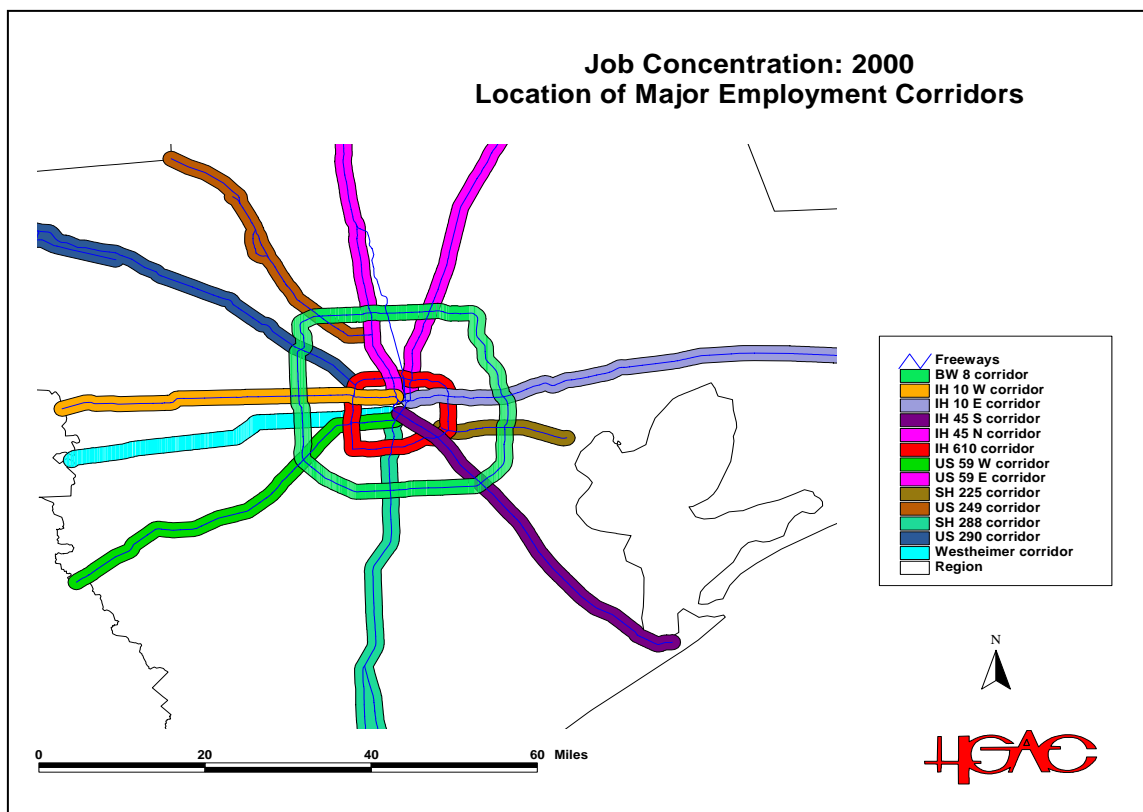
Comparing the centers with the corridors, it is clear that the concentration (density) of employment is higher in the centers, but that far more employment is conducted within the corridors. The average density of the top 25 centers was 8,621 workers per square mile but there were only 673,655 jobs in these centers. On the other hand, the average density of the top 13 corridors was only 1,170, but there were 1,375,265 jobs along these corridors.

Employment Districts

⁴ The estimate does not include work trips that pass through the corridors. Below, an estimate of that is produced.

A third type of employment concentration is the district. There are a number of geographical areas that have much employment. They are bigger than centers, but are not corridors either. Historically, these have also been called “Activity Centers”, mixing up the centers with these larger areas. In order to clarify the differences, H-GAC staff is now calling these *employment districts*. Among the widely recognized ones are the CBD (again, as a district), the Uptown/Galleria area, the Texas Medical Center, the Greenway Plaza/Bellaire area, Westchase, and Sharpstown. But, there are also some newer corridors that are becoming very important, such as the Energy Corridor District, the Greenspoint District, and the Woodlands.

Figure P.17



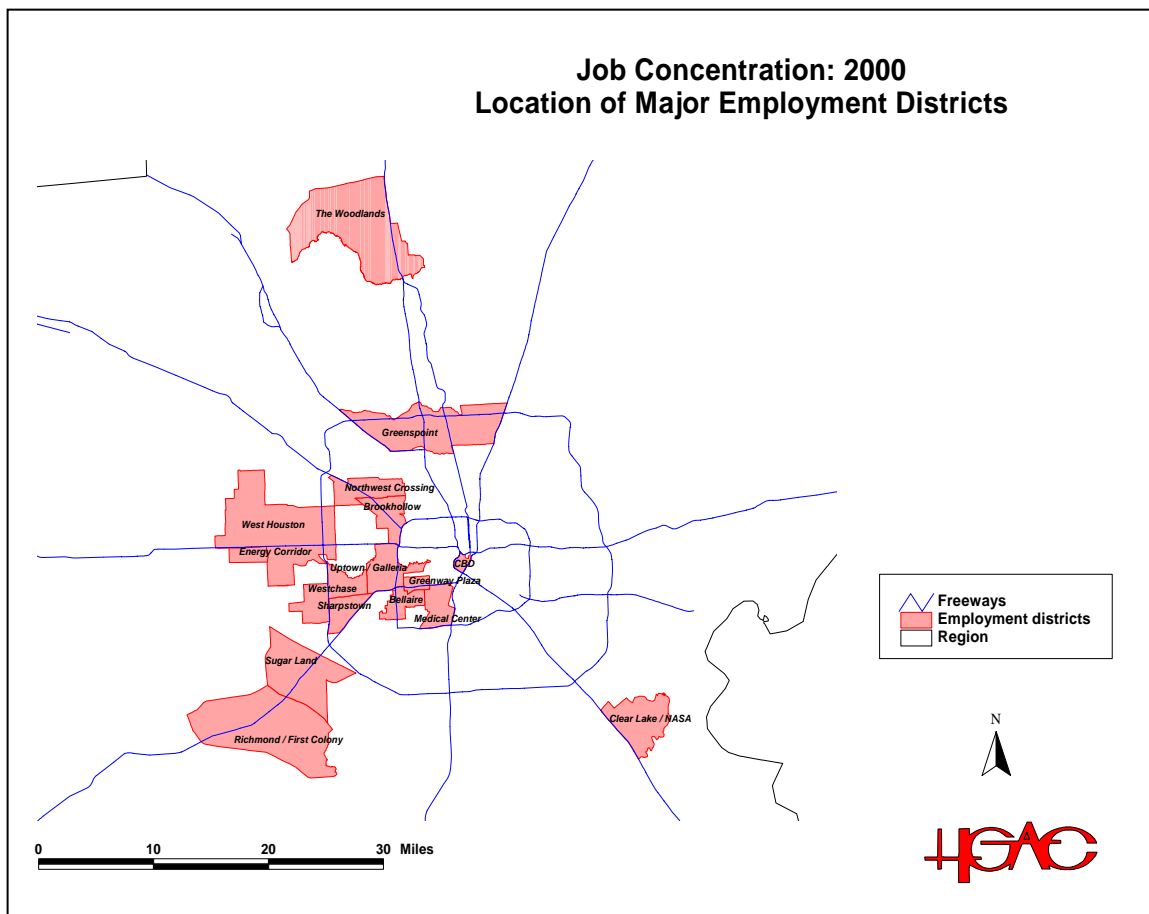
Unlike a center or a corridor, there is not a systematic definition of a district. These have evolved organically over time through the work of cities, counties, and private organizations. Among the newer districts are tax-increment reinvestment zones (TIRZ) and improvement districts. These types of districts represent a different level of transportation planning with the efforts focusing on circulation plans and the interaction between economic development and transportation.

H-GAC staff has started to identify the different districts in the region. While the list is not yet complete, a partial identification can be seen below in Table P.9. They are sorted by employment density. Note that some of these were also included as employment centers (e.g., the four major activity centers, Clear Lake/NASA). With the exception of the CBD, the district boundaries are larger than the center boundaries (which were uniformly 3.14 square mile circles). Figure P.18 maps the 16 districts.

Overall, the 16 districts had 880,771 employees in 2000. This accounted for 40.7% of the region's total employment. There is, of course, overlap of districts with the centers and corridors. Still, even though there is less total employment in the districts than the corridors, the employment density in the districts is greater than the corridors. One can think of these districts as emerging employment zones, rather than centers per se.

The four major activity centers have an employment concentration much greater than other districts. Essentially, these are centers, not districts because they have very high employment densities. Aside from these, there are a number of employment districts with moderately high employment densities: 1) the Sharpstown district; 2) the Brookhollow district; 3) the Westchase district; 4) the Northwest Crossing district; 5) the Energy Corridor (Harris County Improvement District #4); 6) the Bellaire district; and 7) the Clear Lake/NASA district.

Figure P.18:



In other words, aside from employment centers and employment corridors, there are employment districts with sizeable number of employees and moderately high employment densities. The travel implications of these districts are very different than for centers and corridors. Circulation issues that relate the different parts of the district are important issues. Without adequate internal circulation, the parts do not become integrated into a whole that is strong. Historically, however, circulation issues have been the province of the local government, not the MPO.

Table P.9:
Major Employment Districts: 2000
Employment By Designated District

Employment District	Square Miles	2000 Employment	Employment Per Sq. Mile
CBD	1.5	136,560	89,679
Greenway Plaza	2.7	64,560	24,107
Texas Medical Center	8.3	88,197	10,687
Uptown/Galleria	11.9	120,672	10,132
Sharpstown	7.1	32,623	4,623
Brookhollow	9.3	40,275	4,318
Westchase	15.2	57,969	3,805
Northwest Crossing	11.1	40,096	3,602
Energy Corridor	13.8	41,268	2,996
Bellaire	6.4	18,361	2,861
Clear Lake/ NASA	18.8	42,539	2,259
Greenspoint	39.6	66,613	1,681
Sugar Land	28.8	47,938	1,664
West Houston	54.4	80,922	1,489
The Woodlands	57.1	31,623	554
Richmond/ First Colony	57.4	10,141	177
TOTAL FOR 16 DISTRICTS	334.2	880,771	2,635
TOTAL FOR REGION	8,025.7	2,165,033	270

Travel in the Employment Centers

There is a moderate amount of travel in the employment centers, though much less than was once true. Table P.10 present the vehicle miles traveled (VMT) for the top 25 employment centers.

Table P.10:
Vehicle Miles Traveled in Employment Centers: 2000 and 2025
Daily VMT for 25 Major Employment Centers

Employment Center	2000 Daily VMT	2025 Daily VMT	Percent Change 2000-2025
CBD	1,536,381	2,159,420	40.6%
Uptown/Galleria	896,679	1,182,157	31.8%
Greenway Plaza	921,700	1,218,991	32.3%
Texas Medical Center	302,601	385,772	27.5%
Westchase	913,697	1,227,338	34.3%
Sharpstown	910,942	1,213,473	33.2%
West Houston I	543,839	777,973	43.1%
Northwest Mall	967,681	1,388,863	43.5%
NASA I	185,373	276,807	49.3%
Greenspoint	720,179	1,181,617	64.1%
US 290/NW	576,496	854,910	48.3%
Universities	510,564	792,065	55.1%
West Houston II	882,138	1,239,464	40.5%
Energy Corridor I	423,576	667,807	57.7%
Brookhollow	756,417	1,166,256	54.2%
Southwest I	618,051	966,188	56.3%
Bush International	277,505	661,137	138.2%
FM 1960 I	171,065	187,855	9.8%
FM 1960 II	140,781	195,974	39.2%
Hobby Airport	606,375	801,029	32.1%
The Woodlands	190,722	459,604	141.0%
East End	223,194	347,398	55.9%
FM 1960 III	337,979	551,352	63.1%
NASA II	58,139	100,756	73.3%
Energy Corridor II	423,576	667,808	57.7%
TOTAL FOR 25 CENTERS	14,306,058	20,806,645	45.4%
TOTAL FOR REGION	112,727,700	199,255,700	76.8%

Overall, travel in the top 25 centers will increase quite moderately. Considering that VMT in the region will increase by 76.8% over the period (or, about 3.1% a year), the growth will be quite slow, varying from a low of 9.8% for FM 1960 I to a high of 141.0% in the Woodlands. It's clear that the suburban centers will grow faster than the central city centers, but neither will grow as fast as the region. As shall be shown shortly, the reason is the increasing dispersion of employment along corridors and to special employment districts that are accompanying the

suburbanization of the region. The centers, while still growing, will play an increasingly smaller role in the region's travel behavior.

Travel Along the Major Corridors

When travel along the major corridors is examined, however, a slightly different perspective is seen. Measuring trips by purpose is not easily done with large geographical areas such as a travel corridor. Consequently, the measure used was the vehicle miles traveled (VMT) along the corridor. These data came from the H-GAC modeling group. Starting with population and employment data by small zones (traffic analysis zones), the travel demand model allocates trips from production zones to attraction zones. Then, it splits these trips into different travel modes and, finally, into particular routes. The methodology is different than the employment enumeration discussed in the early part of the chapter.

Table P.11 presents the VMT along each of the 13 corridors, for both 2000 and forecast in 2025. The corridors are ranked by 2000 VMT.

Table P.11:
Vehicle Miles Traveled Along Employment Corridors: 2000 and 2025
Daily VMT for 13 Major Employment Corridors

Employment Corridor	2000 Daily VMT	2025 Daily VMT	Percent Change 2000-2025
IH 610	14,752,888	21,213,110	43.8%
BW 8	13,775,844	23,168,284	68.2%
US 59 W	12,347,739	18,567,403	50.4%
IH 45 S	11,239,856	15,824,398	40.8%
IH 45 N	10,204,128	17,222,457	68.8%
IH 10 W	9,469,160	14,718,894	55.4%
US 59 E	8,567,397	13,450,795	57.0%
IH 10 E	8,495,421	13,057,163	53.7%
Westheimer	7,121,985	10,142,485	42.4%
SH 288	5,134,951	7,510,479	46.3%
US 290	6,222,493	11,303,442	81.7%
US 249	2,774,938	6,634,093	139.1%
SH 225	2,732,870	4,262,912	56.0%
TOTAL FOR 13 CORRIDORS	82,354,801	133,568,633	62.2%
TOTAL FOR REGION	112,727,748	199,255,676	76.8%

Not surprisingly, the two top corridors in terms of daily travel in 2000 were the IH 610 'loop' and Beltway 8. The IH 610 loop is located close to many of the employment 'centers' in the region while the Beltway 8 corridor is just very large in terms of area. The third heaviest volume corridor in 2000 was the Southwest Freeway (US 59 W), followed by the Gulf Freeway (IH 45 S), the North Freeway (IH 45 N), and the Katy Freeway (IH 10 W).

Note that these are comparing only the absolute vehicle miles traveled. The corridors differ substantially in length. For example, SH 288 is about 70 miles long whereas SH 225 is only 17 miles long. Consequently, a long corridor will have a higher VMT, all other things being equal, than a shorter corridor. It would be possible to standardize these comparisons, for example by dividing the total VMT by the number of square miles. This would indicate the intensity of travel along the corridor. For the purposes of this document, however, a raw comparison of VMT is sufficient to show the high volume corridors.

However, there will be major changes in the travel patterns along these corridors by 2025. In 2000, the daily VMT in these 13 corridors accounted 73.1% of the region's total VMT. By 2025, according to the H-GAC travel forecast, this percentage will decrease to 67.0%, a sizeable shift. H-GAC staff forecast that VMT in the region as a whole will grow by 76.8% over the period. Among these 13 corridors, there are only two – US 249 and US 290 that will grow faster than the region as a whole. The northwest part of the region will grow very fast in terms of travel and there will be moderate amounts of growth in travel for the north and northeast sections of the region.

For the remaining corridors, however, most of the growth in daily VMT will be substantially less than the region as a whole. What these facts seem to imply is that travel will shift away from the major corridors towards other areas of the region. The Smart Streets/Express Streets concept discussed in the RTP does imply the need to expand and improve the arterial network in the region. The major freeways will not be able to handle the increased travel demand for the region as a whole.

Travel within Major Employment Districts

The last analysis was conducted on the travel volumes within the 12 major employment districts. As with travel along the major corridors, the measure used was the daily VMT. Table P.12 shows the results, sorted by daily VMT.

Again, these comparisons are for absolute vehicle miles traveled. Some of the districts are very large (e.g., the Woodlands is 57.4 square miles) while others are very small (e.g., Greenway Plaza which is only 2.7 square miles or the CBD which is only 1.5 square miles). Again, it is possible to standardize the comparisons, for example by dividing the VMT by the square miles to indicate intensity of use. But, for a simple comparison of areas on traffic volume, the raw VMT is sufficient.

A couple of observations can be made. First, the the CBD has actually very little traffic volume in spite of the large employment base. The reason is that it covers only a small area. On the other hand, West Houston (which also overlaps the Energy Corridor) has very high traffic volumes primarily because it is very large. A reader should not make too much of these simple comparisons because the order could be inverted by simply standardizing. For the purpose of this document, however, one can see the relative rankings of the districts by traffic volume.

Table P.12:
Vehicle Miles Traveled in Employment Districts: 2000 and 2025
Daily VMT for 16 Major Employment Districts

Employment District	2000 Daily VMT	2025 Daily VMT	Percent Change 2000-2025
CBD	504,985	694,142	37.5%
Greenway Plaza	1,054,579	1,385,002	31.3%
Texas Medical Center	1,352,134	1,773,133	31.1%
Uptown/Galleria	2,075,149	2,775,683	33.8%
Sharpstown	1,179,449	1,677,807	42.3%
Brookhollow	1,826,866	2,661,876	45.7%
Westchase	1,807,170	2,601,554	44.0%
Northwest Crossing	1,214,674	1,776,214	46.2%
Energy Corridor	2,066,497	2,983,290	44.4%
Bellaire	1,000,046	1,342,117	34.2%
Clear Lake/NASA	992,403	1,473,653	48.5%
Greenspoint	3,583,338	5,989,832	67.2%
Sugar Land	1,640,945	2,837,442	72.9%
West Houston	4,369,255	6,444,846	47.5%
The Woodlands	1,450,584	3,421,356	135.9%
Richmond/First Colony	1,314,873	2,870,687	118.3%
TOTAL FOR 16 DISTRICTS	27,432,946	42,708,632	55.7%
TOTAL FOR REGION	112,727,748	199,255,676	76.8%

The most interesting aspect is the dimension of change that will occur. Between 2000 and what H-GAC forecasts for 2025, many of the older activity districts/centers will grow only slowly. For example, vehicle miles traveled in the CBD will grow by 37.5%, an average of about 1.5% a year. Similarly, VMT growth will be about 33.8% in the Uptown/Galleria area, 31.1% in the Texas Medical Center, and 31.3% in Greenway Plaza. These are all very slow growth rates for employment. On the other hand, many of the suburban employment centers will grow much faster: The Woodlands (135.9%), Richmond/First Colony (118.3%), Sugar Land (72.9%), and Greenspoint (67.2%). The continuing suburbanization of the Houston metropolitan region will cause higher growth rates in the suburbs than in the central core.

Still, an important point to realize is that all these districts will show growth in vehicle miles traveled. Because employment will continue to grow in the region, traffic will grow everywhere in it. There is no getting around the fact that traffic will occur throughout the region. The travel patterns are decentralizing and becoming more complex, but they are still growing.

Conclusion

In conclusion, there is a definite pattern in travel behavior for the region. Currently, there are major employment centers, corridors and districts that account for a sizeable proportion of the region's employment and, consequently, travel behavior. The employment centers were established first; the CBD developing in the 19th Century while the other major activity centers developed in the 1950s and 1960s. However, the increasing suburbanization over the last 40 years has shifted employment away from these centers towards major freeway corridors. Currently, the Houston region has a radial pattern of employment, essentially defined by the freeway frontage roads.

Over time, however, it appears that there will be a slow shift in both employment and travel towards other parts of the region. Increasingly, travel will move directly between the suburbs, rather than between the suburbs and the major activity centers, and will shift slowly away from the major freeway corridors. There will be a quantitative shift of trips outward towards the suburbs and an increasing complexity of travel patterns defined by a multitude of trip links. Travel will no longer be 'radial' along the major freeways, but will become increasingly complex. This process will take a long time, but it is important that we anticipate these changes.

There will be a need to provide more travel routes for the areas between the freeways. There will also be a need to provide more alternatives in terms of both routes and travel modes. Transit service, which is almost non-existent outside of Harris County, will need to be provided for the growing suburban populations. In the RTP, concepts of Smart Streets/Express Streets and a regional rail system are discussed. These types of improvements (and more) will be needed to meet the growing complexity of travel that will occur in the region.

Chapter 4

Corridor Summaries

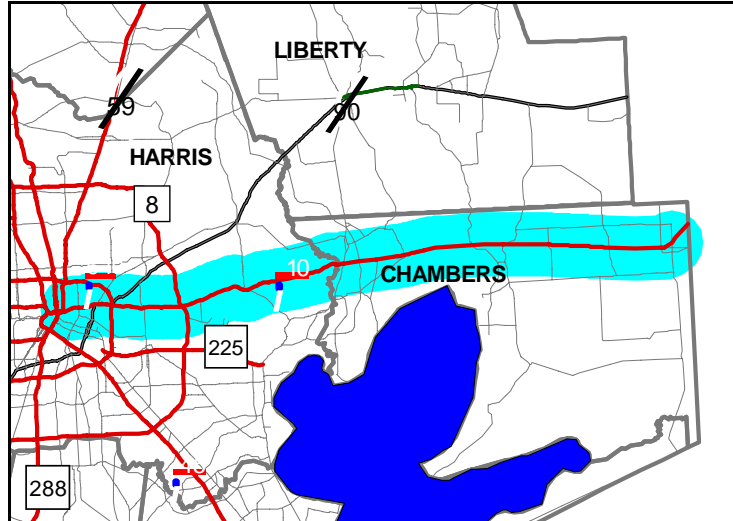
This chapter describes the following corridors and areas:

Interstate 10 East
Interstate 10 West
Interstate 45 North
Interstate 45 South
U.S. 59 North
U.S. 59 South
U.S. 90 East
U.S. 90A
U.S. 290
Hardy Toll Road
SH 6
SH 35
SH 105
SH 146
SH 225
SH 249
SH 288
FM 1960
FM 1093/Westheimer
Westpark
SH 99/Grand Parkway
Central Business District
Greenway Plaza
Texas Medical Center
Uptown/Galleria

I-10 East Corridor

Overview

The Interstate 10 East Freeway corridor extends approximately 63 miles from Interstate 45, near the Houston Central Business District (CBD), east to the Jefferson County line. It consists of the freeway facility and the surrounding area approximately two to five miles north and south of the freeway. Included within the corridor are portions of Harris and Chambers counties, and the cities of Houston, Jacinto City, Galena Park, Baytown, Mont Belvieu and Winnie.



Land Use

Land use within the I-10 East corridor varies from a dense, diverse mixture of uses near Houston's center to sparsely populated agricultural land in Chambers County. The portion of the corridor between downtown and Baytown, adjacent to the Houston Ship Channel, has a relatively high concentration of industrial use, as does the northwest corner of the intersection of I-10 East and the I-610 Loop.

Most of the residential use in this area is located north of the freeway, with pockets, such as Galena Park and Jacinto City, to the south. Commercial usage in this section is predominately found immediately adjacent to the freeway and intermingled within the industrial areas. Baytown, with nearly 67,000 residents, contains residential, commercial, and industrial uses within its city limits. Land-use intensity drops significantly throughout the Chambers County segment of I-10 East. This section of the corridor is predominately agricultural and open space with limited residential use. Commercial use is extremely sparse throughout this section.

Major Trip Generators and Attractors		
Facility	Type	Location
S.P. Houston Intermodal Hub	Truck/Rail Facility	North of IH-10; East of I-45
American National Can	Industrial	Northwest Quadrant; IH-10 & IH-610
Budweiser	Industrial	Southwest Quadrant; IH-10 & IH-610
Herman Brown Park	Recreation	Oates Road at Wallisville Road
Greenspoint Industrial Park	Industrial	Houston Ship Channel east of Federal Road
Jacinto Port (Port of Houston)	Port Terminal	Houston Ship Channel at S. Sheldon Road
Houston Fuel Oil Terminal	Truck/Pipeline Terminal	Jacinto Port
Oiltanking Houston, Inc.	Truck/Pipeline Terminal	Jacinto Port
Stolhaven, Inc.	Truck/Pipeline Terminal	Jacinto Port
Lynchburg Ferry	Ferry Station	Houston Ship Channel at S. Lynchburg Road
San Jacinto State Park	Recreational	Battleground Road at Houston Ship Channel
Arco Chemical	Industrial	North Drive at Newtown Road
Channel View Fairgrounds & Sports Complex	Recreational	Sheldon Road at Wood Park
Whites Lake	Recreational	North of IH-10 at Crosby-Lynchburg Road
San Jacinto Mall	Commercial	IH-10 at Garth Road
Humphrey Airport	Transportation	E. Lynchburg-Cedar Bayou Road at Barkaloo Road
Various Chemical Plants	Industrial	North of IH-10 along SH 146

Transit

METRO is responsible for transit service and facility improvements, as well as the operation and maintenance of the HOV system within Harris County. However, the majority of the corridor is located outside the county and lacks other transit service. The corridor is served by one commuter route and one express route. Service in the corridor is limited beyond the I-610 Loop. There is a park and ride facility at Maxey and Woodforest, which serves two commuter routes, and the Fifth Ward Transit Center on Lockwood Drive, just north of I-10 East, which serves as a transfer point for eight routes.

Demographics

The I-10 East corridor is expected to experience moderate population and employment growth through 2025. Population in the corridor is anticipated to increase by 32 percent, (47,000 people) during this period. Much of the population growth will most likely occur between I-610 and SH 146. The section between Beltway 8 and SH 146 is projected to experience a 62 percent increase in population by 2025. Employment in the corridor is expected to grow by 50 percent by 2025, adding nearly 30,000 jobs. The segment between I-610 and Beltway 8 is predicted to receive nearly half of those jobs.

Population	2000	2025	Growth	Percent Growth
	4,669,627			
Regional Growth	7	7,661,571	2,991,944	64.1 percent
I-10 East Corridor	145,283	192,244	46,961	32.3 percent
Downtown - I-610	48,154	54,361	6,207	12.9 percent
I-610 - BW 8	54,437	73,485	19,048	35.0 percent
BW 8 - SH146	30,540	49,473	18,933	62.0 percent
SH 146 - Jefferson Co. Line	12,152	14,925	2,773	22.8 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
I-10 East Corridor	60,177	90,152	29,975	49.8 percent
Downtown - I-610	26,946	32,836	5,890	21.9 percent
I-610 - BW 8	16,909	31,702	14,793	87.5 percent
BW 8 - SH146	13,541	22,287	8,746	64.6 percent
SH 146 - Jefferson Co. Line	2,781	3,327	546	19.6 percent

Traffic Analysis

Much of I-10 East experiences serious levels of mobility (LOM) between Decker Drive/Spur 330 and downtown during the morning hours. A serious LOM represents a roadway where the number of vehicles on the roadway reaches or exceeds the roadway's capacity by up to 25 percent. The section between Normandy and I-610 East, as well as the section between Kress and U.S. 59 North, experience severe LOM during this period, where the number of vehicles on these stretches of roadway exceed 125 percent of the roadway's capacity. Dell Dale, Federal, and U.S. 59 North register severe LOM as they intersect with I-10 East.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	7.6	12.0	57.7 percent
Percent of Roads Congested	1.4 percent	7.0 percent	399.2 percent

Overall congestion during the afternoon commute decreases on the facility. The sections between U.S. 59 North and Lyons, as well as I-610 East and Normandy, experience serious LOM during this period, with the section between I-610 East and Oates registering severe LOM. U.S. 59 North and Dell Dale both show severe LOM at their intersections with I-10 East.

Safety

In 1998, 881 crashes were recorded along I-10 East. Within a quarter mile of the road, an average of 2.4 crashes occurred per day. On a per-mile basis, there were about 14.1 crashes per mile along the 63-mile stretch of I-10 East. Several locations were identified along I-10 East that had a higher-than-average number of crashes. These locations include the East Belt interchange (51 crashes) and the intersections with Sheldon Road (43) and Cedar Bayou (44).

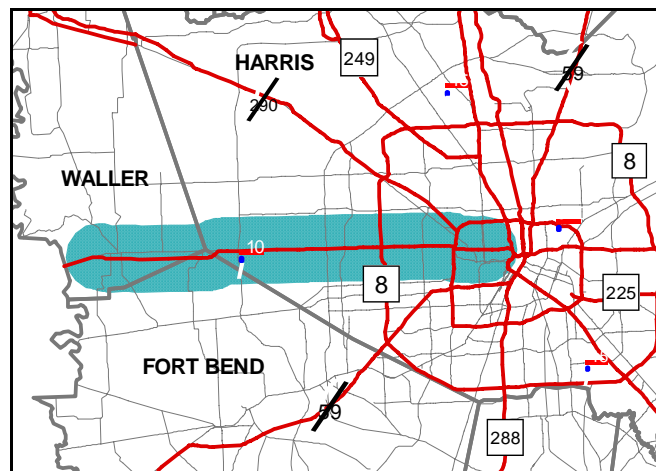
It is estimated that close to 80 percent of the freeway crashes in Houston involve large trucks. It is likely that the high concentration of industrial uses in the area and the associated volume of heavy truck traffic along I-10 are part of the overall safety concern of the corridor. TxDOT conducted a recent demonstration project in coordination with the city of Houston that restricted truck traffic to the outside lanes along a stretch of I-10. The results of that project reported a significant reduction in crash rates.

IH-10 East Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
IH-10 East	Trinity River Bridge to SH 61	Widen & reconstruct to six lanes	\$ 40,000,000
IH-610 East Loop	US 59 North to IH-10 E	Rehab & widen to 10 main Lanes	\$ 35,680,000
US 90	0.62 mi E of Hunting Bayou to 0.59 mi E of Wallisville	Construct six main lanes	\$ 21,400,000
Woodforest Blvd.	Oates to John Ralston	Construct 4-lane undivided	\$ 12,330,000
Mercury/Oates	IH-10 E to Wallisville	Construct two 24' concrete roads	\$ 5,656,000
Market St.	N. Wayside to Fidelity	Widen to 4-lane undivided	\$ 5,090,000
Oates	Market to IH-10 E	Widen to 4-lane undivided	\$ 4,600,000
Polk	Lockwood to Hughes	Widen to 4-lane undivided	\$ 2,590,000
TOTAL:			\$ 127,346,000
Long-Term			
Facility	Section	Description	Cost
US 90	IH-10 E to Uvalde	Construct six main lanes	\$ 30,000,000
IH-10 E	US 59 to Wayside	Widen to 10 lanes with HOV	\$ 29,900,000
IH-10 E	SH 73 to Jefferson County Line	Widen to six lanes	\$ 10,000,000
Dell Dale St.	Wallisville Rd to Woodforest	Widen to four lanes	\$ 7,000,000
Wallisville	N. Wayside to IH-610 E	Widen to four lanes divided	\$ 1,000,000
TOTAL:			\$ 77,900,000

I-10 West Corridor

Overview

The Interstate 10 West (Katy Freeway) corridor extends approximately 40 miles from the Houston CBD west to the Brazos River. It consists of the freeway facility and the surrounding area three to five miles north and south of the freeway. Included within the corridor are portions of Harris, Fort Bend and Waller counties and the cities of Houston, Spring Valley, Hunters Creek, Piney Point, Hedwig, Bunker Hill, Katy, Brookshire and Pattison.



Land Use

Within the I-610 Loop, land use in the corridor is highly mixed with all development types, including industrial usages north of the intersection with I-610 and Memorial Park, located at the southeast corner of the intersection. Between I-610 and SH 6, much of the area is residential with solid commercial use lining I-10 West. Land-use density drops between SH 6 and Katy, with larger-lot, low-density residential development and limited commercial activity. The City of Katy has a strong commercial base anchored by Katy Mills, a 1.3 million square foot mall with more than 200 stores. Beyond Katy, land use is predominantly open space and agriculture.

Major Trip Generators and Attractors		
Facility	Type	Location
Memorial Park	Recreational	SE Corner IH-10 & IH-610
Houston Galleria/Uptown	Retail	SW Corner Westheimer & IH-610
Memorial City Shopping Center	Retail	SE Corner IH-10 & Gessner
Town & Country Village	Retail	SE Corner IH-10 & Beltway 8
West Houston Airport	Transportation	SE Corner Barker/Cypress Rd & Clay Rd
Katy Mills Mall	Retail	Katy

Transit

METRO operates six commuter routes and one express route on I-10 West for a portion of the trips. The Northwest Transit Center, located near the intersection of I-10 West and the I-610 Loop West, serves as a transfer point for 14 routes. The corridor also has three Park and Ride facilities: Kingsland (Mason Road and Kingsland Blvd.), Addicks (SH 6 and I-10 West) and Katy/West Belt (Beltway 8 north of I-10 West). METRO also maintains and operates the HOV lanes, which run from east of Loop 610 to SH 99. Colorado Valley Transit provides door-to-door demand response service within Waller County.

Demographics

The I-10 West Corridor is expected to experience moderate population and employment growth through 2025. Population in the corridor is anticipated to increase by 57 percent, (94,000 people), during this period. The section between I-610 and Beltway is projected to experience a 68 percent increase (35,000 people) in population by 2025. Employment in the corridor is expected to grow by 45 percent by 2025, adding nearly 64,000 jobs. The segment between SH 6 and the Fort Bend County line is predicted to grow by 20,000 jobs, an increase of 102 percent.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
I-10 West	164,798	258,863	94,065	57.1 percent
Downtown - I-610	31,481	44,413	12,932	41.1 percent
I-610 - BW 8	52,520	88,210	35,690	68.0 percent
BW 8 - SH 6	25,247	40,979	15,732	62.3 percent
SH 6 - Fort Bend Co Line	47,404	65,618	18,214	38.4 percent
Fort Bend Co. Line – Austin Co. Line	8,146	19,643	11,497	141.1 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
I-10 West	141,860	205,835	63,975	45.1 percent
Downtown - I-610	35,542	42,780	7,238	20.4 percent
I-610 - BW 8	47,665	66,666	19,001	39.9 percent
BW 8 - SH 6	34,814	48,804	13,990	40.2 percent
SH 6 - Fort Bend Co Line	19,584	39,592	20,008	102.2 percent
Fort Bend Co. Line–Austin Co. Line	4,255	7,993	3,738	87.8 percent

Traffic Analysis

I-10 West experiences significant congestion between Mason Road and Downtown during morning and afternoon commute times. Much of this segment, specifically between Fry Road and I-610 West, registers severe congestion during these periods. I-610 West, Chimney Rock, Bunker Hill, Gessner, Beltway 8, SH 6, and Barker-Cypress register severe LOM as they intersect with I-10 West during commute periods.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	9.1	14.5	59.1 percent
Percent of Roads Congested	16.8 percent	27.9 percent	65.4 percent

Safety

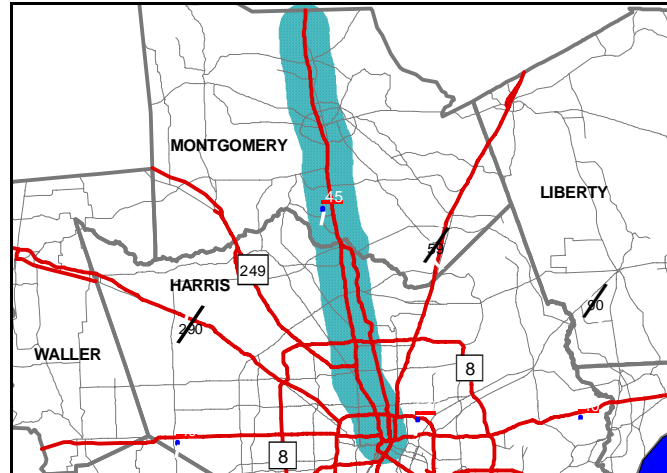
The crash rate in the urbanized section is significantly higher than statewide averages. In 1993, there were 1,970 accidents on I-10 between SH 6 and I-45, an average of five per day. Severe congestion, inadequate highway shoulders, inadequate vehicle clearances and other design limitations are some of the reasons for the higher than average crash rate. Several crash hot spots have been identified, including a particularly hazardous one-mile stretch from Gessner to Beltway 8 (89 crashes in 1998).

IH-10 West Corridor Future Improvements				
Short-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>	
Hammerly Extension	Brittmore to Eldridge	Construct 4-lane divided	\$	51,730,000
IH-10 W	Washington Ave. to Taylor	Extend & widen frontage roads to 3 lanes w/bridge at White Oak Bayou	\$	44,400,000
Kingsland Rd.	SH 6 to S. Barker-Cypress	Construct new 4-lane road	\$	17,135,000
Kingsland Blvd.	Peek Rd. to Pin Oak Rd.	Widen to 4-lane undivided	\$	10,470,000
Westview	Gessner to Wirt	Widen to 4-lanes	\$	9,020,000
Morton Rd.	Raintree Village to Mason Rd	Construct 4-lane blvd. with storm sewer drainage	\$	5,100,000
Woods Rd.	Morton to US 90	Construct new 2-lane undivided	\$	3,820,000
Park Row	SH 99 to Porter	Construct new 4-lane road	\$	3,500,000
Groeschke	SH 6 to Barker-Cypress	Reconstruct & widen to 4-lane divided	\$	3,335,000
Franz Rd.	Harris-Waller County Line for 1.6 miles west	Construct new 2-lane undivided	\$	3,220,000
Hollister	Hammerly to Long Point	Widen to four lanes	\$	2,990,000
Katy-Fort Bend Rd.	IH-10 to Colonial Pkwy	Widen to 4-lane concrete blvd. w/storm sewer drainage	\$	2,500,000
Sixth W.	Yale to Shepherd	Widen to 4-lane undivided	\$	2,000,000
Katy-Fort Bend Rd.	Harris County Line for 0.5 miles south	Construct new 2-lane	\$	1,200,000
Long Point	Hempstead to Gessner	Widen to 4-lanes	\$	600,000
S. Fry	IH-10 to Kingsland	Widen to 6-lane concrete blvd	\$	600,000
			TOTAL:	\$ 161,620,000
Long-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>	
Patterson	Eldridge to SH 6	Widen to 4-lane divided	\$	5,400,000
Dairy Ashford	Memorial to Briar Forest	Widen to six lanes	\$	2,590,000
Katy-Fort Bend Rd.	Franz to Morton	Construct 4-lane road	\$	2,130,000
Greenhouse Rd.	Hanston Court to Greenwind Chase	Widen to 4-lane concrete with storm sewers	\$	1,250,000
			TOTAL:	\$ 11,370,000

I-45 North Corridor

Overview

The 50-mile Interstate 45 North corridor consists of the freeway facility and the surrounding area two to five miles west and east of the freeway. The corridor extends from the Houston CBD to the Walker County line. Included within the corridor are portions of Harris and Montgomery counties and the cities of Houston, Spring, The Woodlands and Conroe.



Land Use

Land use between downtown and Beltway 8 consists of low- to moderate-level residential development with commercial activity lining the freeway and arterials throughout the corridor. Beyond Beltway 8 to the Montgomery County line, the amount of development declines. The corridor contains less residential development and has large areas of open space throughout it. With the exception of The Woodlands, a master-planned, mixed-use community, and the city of Conroe, the section of the I-45 corridor that runs through Montgomery County is predominately rural.

Major Trip Generators and Attractors		
Facility	Type	Location
George Bush Intercontinental Airport	Transportation	NE side of I-45 near Will Clayton Road
Northline Mall	Retail	NE Corner I-45 & Airline Rd.
The Woodlands Mall	Retail	NW Corner I-45 & Woodlands Parkway
Greenspoint Mall	Retail	SE Corner I-45 & Greens Rd.
North Harris Community College	Education	FM 242 west of I-45
Lake Conroe	Recreational	NW Corner I-45 & Loop 336
Splash Town USA	Recreational	I-45 and Louetta
Conroe Outlet Mall	Retail	I-45 and League Line Rd.

Transit

METRO operates six commuter routes and one express route on I-45 North. The corridor has two transit centers, Greenspoint (serving three routes at Greenspoint Mall) and Northline (serving four routes at Northline Mall). The corridor also has three park and ride facilities: Spring (FM 1960 and Bammel), Kuykendahl (Kuykendahl and I-45 North) and North Shepherd Drive (North Shepherd and Little York). There is also an HOV lane, which runs from downtown Houston to just north of FM 1960. In addition to services METRO provides in the corridor, the Brazos Transit System (BTS) operates two park and ride facilities with service connecting The Woodlands to major activity centers in Harris County, including the Texas Medical Center, Greenway Plaza and downtown Houston.

Demographics

The I-45 North corridor is expected to experience considerable population and employment growth through 2025. Population in the corridor is anticipated to increase by 120 percent (47,000

people) by 2025. Employment in the corridor is expected to grow by more than 72 percent by 2025, adding nearly 85,000 jobs. The segment between Beltway 8 and the Montgomery County line is predicted to grow by 41,000 jobs, an increase of 106 percent.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
I-45 North	206,551	347,793	141,242	68.4 percent
Downtown - I-610	22,878	32,512	9,634	42.1 percent
I-610 - BW 8	69,442	108,546	39,104	56.3 percent
BW 8 - Montgomery Co. Line	55,646	93,146	37,500	67.4 percent
Montgomery Co. Line - SH105	39,722	87,283	47,561	119.7 percent
SH105 - Walker Co. Line	18,863	26,306	7,443	39.5 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
I-45 North	116,927	201,647	84,720	72.5 percent
Downtown - I-610	6,807	10,307	3,500	51.4 percent
I-610 - BW 8	28,642	48,045	19,403	67.7 percent
BW 8 - Montgomery Co. Line	38,523	79,481	40,958	106.3 percent
Montgomery Co. Line - SH105	29,646	45,524	15,878	53.6 percent
SH105 - Walker Co. Line	13,309	18,290	4,981	37.4 percent

Traffic Analysis

Much of I-45 North experiences at least serious LOM between Conroe and downtown Houston during the morning hours. Sections registering severe LOM include the segments between Loop 336 and FM 1488, the Montgomery County line and Cypresswood, and Mount Houston and downtown. FM 1488, SH 242, Robinson, Spring-Steubner, FM 1960, Greens, Veterans Memorial and Little York register severe LOM as they intersect with I-45 North.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	9.8	17.3	76.6 percent
Percent of Roads Congested	9.0 percent	22.3 percent	147.2 percent

The amount of severe congestion during the afternoon commute decreases on I-45 North. The facility still experiences serious LOM during this period between downtown and North Rankin Road, with the section between Crosstimbers and Mount Houston registering severe LOM. The section between Cypresswood and the Montgomery County line registers severe LOM during this period. In addition, the section between FM 1488 and Loop 336 in Conroe shows serious congestion with the southern half of the segment showing severe LOM. Little York, Veterans Memorial, Beltway 8, Robinson and SH 242 show severe LOM at their intersections with I-45

Safety

In 1998, there were 1,418 motor vehicle crashes, including 10 with fatalities and 73 with incapacitating injuries. Eleven crash hot spots were identified in this corridor, including the following:

- A five-mile stretch surrounding Loop 336, with 243 crashes, including 14 incapacitating injuries.
- A four-mile stretch between SH 242 and Woodlands Parkway, with 192 crashes, including one fatality and five incapacitating injuries.
- A half-mile stretch around the FM 1960 and I-45 North intersection, with 134 crashes, and eight incapacitating injuries.

Severe congestion and inadequate highway shoulders and clearances, as well as other design limitations appear to be some of the reasons for these accidents.

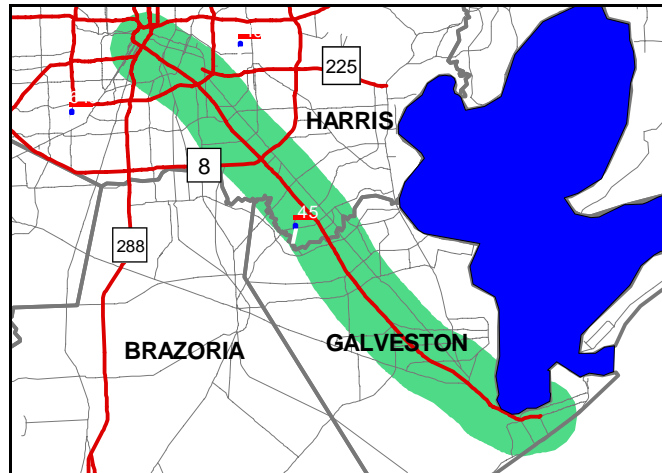
IH-45 North Corridor Future Improvements				
Short-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>		<u>Cost</u>
Hardy Toll Road	IH-610 N. to Houston CBD	Construct 6-lane toll road extension	\$	70,000,000
IH-45 N	FM 830 to Walker County Line	Widen to six main lanes	\$	38,067,198
Mt. Houston	IH-45 N. to Aldine Westfield	Widen & construct 4-lane undivided	\$	11,500,000
SH 75	FM 2432 to Teas Nursery Road	Construct 4-lane divided	\$	10,439,000
Imperial Valley Dr.	Rankin to Airtex	Construct 4-lane undivided	\$	9,540,000
SH 242	Greenbridge to MP RR	Widen to 6-lane divided	\$	8,660,000
Gosling Rd.	SH 242 to FM 1488	Construct new 4-lane divided road	\$	8,640,000
Ella Blvd	Pinemont to Little York	Widen to 4-lane divided	\$	7,500,000
Ella Blvd	Little York to W. Gulf Bank	Widen to 4-lane divided	\$	6,615,000
FM 2854	LP 336 to IH-45 N	Widen to 4 lane divided	\$	6,113,000
Hirsch	Kelley to Crosstimbers	Widen to 4-lane divided	\$	6,000,000
Robinson Rd.	Hanna Rd. to Imperial Oaks	Widen to 4-lane undivided	\$	5,340,000
Ist St.	SH 105 to Foster Dr.	Widen to 4-lane undivided	\$	3,780,000
Richey Rd. W.	Ella Blvd to IH-45 N	Widen to four lanes	\$	3,500,000
7th St.	Foster to Creighton	Construct 4-lane undivided	\$	3,090,000
Ist St.	South End to Creighton	Construct new 4-lane undivided road	\$	3,090,000
Parker	Airline to Hardy Toll Road	Widen to 4-lane divided	\$	3,000,000
Sixth W.	Yale to Shepherd	Widen to 4-lane undivided	\$	2,000,000
Hanna Rd.	Todd Rd. to Woodson Rd.	Widen to 4-lane divided	\$	1,580,000
Richards Rd.	Rayford Rd. to Hanna Rd	Widen to 4-lane divided	\$	1,380,000
SH 75	S. Post Oak Dr. to IH-45 Underpass	Widen to 4-lane divided	\$	1,000,000
Aldine Westfield Rd.	FM 1960 to N. Spring	Construct center left-turn lane	\$	1,000,000
TOTAL:				\$ 211,834,198

IH-45 North Corridor Future Improvements				
Long-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>		<u>Cost</u>
IH-45 N	IH-10 to US 59 S.	Widen to 10 lanes	\$	105,000,000
Gosling Rd	FM 1488 to LP 336 S	Construct new 4-lane road	\$	12,520,000
Ella Blvd	Louetta to FM 1960	Widen to 4-lane blvd	\$	12,000,000
Rosslyn/Cebra	Tidwell to Little York	Construct 4-lane undivided	\$	10,280,000
T.C. Jester	BW 8 to SH 249	Construct 4-lane road	\$	9,280,000
T.C. Jester	SH 249 to Gulf Bank	Construct 4-lane divided	\$	5,500,000
Robinson	IH-45 N to Hardy	Widen to 4-lane undivided	\$	5,134,900
Creighton Rd.	IH-45 N to Gosling Rd.	Construct new 4-lane undivided	\$	5,130,000
Research Forest Dr.	IH-45 N to Gosling Rd.	Widen to 6-lane divided	\$	4,605,000
Gladstell	IH-45 N to LP 336 W	Widen to 4-lanes	\$	4,500,000
Richards Rd.	Tamina Rd. to SH 242	Rehab & construct 2-lane road	\$	3,920,000
Riley-Fuzzel	Rayford to Hardy	Widen to 4-lane undivided	\$	3,760,900
Foster	US 75 to FM 1314	Widen to 4-lane undivided	\$	3,320,000
T.C. Jester	W. Rankin to Greens Rd.	Construct 4-lane road	\$	2,870,000
Aldine Westfield Rd.	Jensen to Tidwell	Widen to 4-lane undivided	\$	1,330,000
TOTAL:				\$ 189,150,800

I-45 South Corridor

Overview

The I-45 South (Gulf Freeway) corridor extends approximately 45 miles from downtown Houston (at U.S. 59) south to 61st Street in Galveston and serves as the primary north-south corridor between the two cities. Included within the corridor are portions of Harris and Galveston counties, as well as the cities of Houston, Friendswood, Webster, League City, Dickinson, La Marque, Texas City, Bayou Vista, Tiki Island and Galveston.



Land Use

The segment between downtown and I-610 is the most dense and diverse segment of the corridor, including industrial, commercial and residential uses. There is a higher concentration of jobs in this segment than residential population. Notable attractors in this corridor include the University of Houston and Texas Southern University.

Between Loop 610 and Beltway 8, land use remains diverse, however, there is a larger amount of residential development compared to commercial. There is a large cluster of commercial developments at the intersection of Almeda-Genoa Road and I-45 South, anchored by Almeda Mall. Hobby Airport is the most active attractor, employing 4,000 workers and serving 8.6 million passengers in 2001. There are also three industrial parks located within a half-mile of the airport.

South of Beltway 8 to the Galveston Causeway, land use becomes more rural. However, substantial development, primarily residential, exists away from the freeway within cities, such as Clear Lake, Friendswood, League City, La Marque and Texas City. The intersections of I-45 South at Bay Area Boulevard and at FM 518 are the exceptions to the rural character of this section of the corridor.

Major Trip Generators and Attractors		
Facility	Type	Location
Texas Southern University/University of Houston	University	Southwest side of I-45 between US 59 and Wayside
Gulfgate Mall	Retail	NW Corner I-45 at I-610 E and SH 35
Hobby Airport	Transportation	SW side of I-45 near Airport Blvd.
Almeda Mall	Retail	SW Corner I-45 & Almeda Genoa Rd.
The Commons at Southgreen	Retail	NE Corner I-45 & Fuqua
South Point Center	Retail	NE Corner I-45 & Kurland
Southwestern Bell Telephone	Communications	NE Corner I-45 & Beltway 8
Ellington Field	Transportation	SH 3 and FM 1959
Baybrook Mall	Retail	NW Corner I-45 and W. Bay Area Blvd.
Deauville Fashion Mall	Retail	SE Corner I-45 and Bay Area Blvd.
Columbia Clear Lake Regional Medical Center	Healthcare	SE Corner I-45 and Bay Area Blvd.
Johnson Space Center (NASA)	Employment	E. NASA Road 1
Gulf Greyhound Park	Recreation	SE Corner FM 1764 and I-45
Port of Galveston	Transportation	Pelican Island Causeway and south
Scholes Airport	Transportation	South of Offatts Bayou across from I-45/ Harborside interchange
Galveston Beaches and Strand	Recreation	Galveston

Transit

METRO operates four commuter routes and one express route on I-45 South. The corridor has one transit center, the Eastwood Transit Center on Lockwood Drive, which serves as a transfer point for nine routes. The corridor also has four park and ride facilities: Bay Area (Bay Area Blvd. and Featherpoint), South Point (Fuqua, east of I-45), Fuqua (Fuqua, west of I-45) and Monroe (Easthaven and I-45). There is also an HOV lane that runs from downtown Houston to Dixie Farm Road. In addition to services METRO provides in the corridor, Island Transit operates seven routes within the City of Galveston. Also, Connect Transportation provides curb-to-curb services for citizens in Galveston County who need medical assistance.

Demographics

The I-45 South Corridor is expected to experience modest population and employment growth through 2025. Population in the corridor is anticipated to increase by 47 percent (94,000 people) during this period. The section between I-610 and Beltway 8 is projected to experience the largest amount of growth, adding nearly 33,000 people by 2025, a 42 percent increase. Employment in the corridor is expected to grow by 47 percent by 2025, adding nearly 69,000 jobs. Much of the growth will be spread out between Downtown and the Galveston County line. The segment between I-610 and Beltway 8 will experience the largest amount of growth, adding nearly 24,000 jobs by 2025.

<i>Population</i>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
I-45 South	201,525	295,627	94,102	46.7 percent
Downtown - I-610	46,307	67,919	21,612	46.7 percent
I-610 - BW 8	77,668	110,383	32,715	42.1 percent
BW 8 - Galveston Co. Line	34,292	53,099	18,807	54.8 percent
Galveston Co. Line - FM 2004	24,770	37,450	12,680	51.2 percent
FM 2004 – City of Galveston	18,488	26,776	8,288	44.8 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
I-45 South	146,147	215,046	68,899	47.1 percent
Downtown - I-610	76,743	96,933	20,190	26.3 percent

I-610 - BW 8	33,904	57,642	23,738	70.0 percent
BW 8 - Galveston Co. Line	21,808	39,488	17,680	81.1 percent
Galveston Co. Line - FM 2004	8,127	12,038	3,911	48.1 percent
FM 2004 – City of Galveston	5,565	8,945	3,380	60.7 percent

Traffic Analysis

I-45 South experiences severe congestion between FM 518 and downtown during morning commute times. NASA Road 1, El Dorado, FM 2351, Beltway 8 and Elgin Street register severe LOM as they intersect with I-45 during this period. Overall congestion during the afternoon commute decreases on the facility but remains at a serious level. The section between downtown and FM 518 experiences serious LOM during this period, with the section between Dixie Farm and El Dorado registering severe LOM. Scarsdale, Bay Area Boulevard and NASA Road 1 show severe LOM at their intersections with I-45 South.

<i>Travel Data</i>	2000	2025	Percent Change
Daily VMT (in millions)	9.4	13.3	40.9 percent
Percent of Roads Congested	8.4 percent	15.9 percent	89.3 percent

Safety

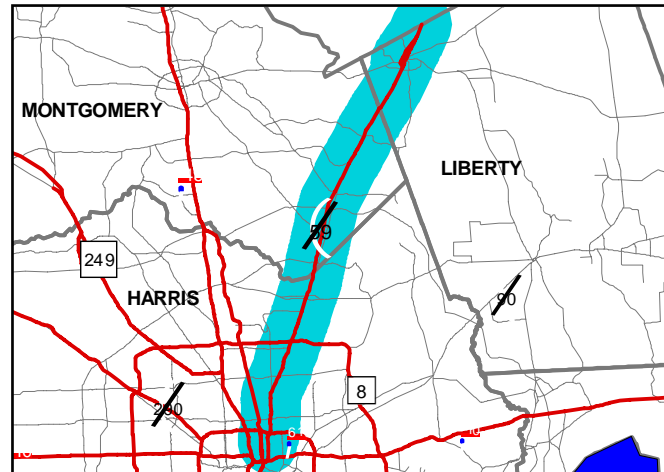
Generally, accident rates on I-45 South have been lower than statewide averages for similar freeway facilities. However, there are a couple locations that have been identified that require more detailed studies to mitigate potentially unsafe driving conditions – the intersections of I-45 South at FM 528, NASA Road 1 (126 crashes in 1998) and near Bay Area Boulevard (92 crashes in 1998). The reasons for these crashes can be attributed to severe congestion, following too closely, inadequate highway shoulders, and inadequate vehicle clearances.

IH-45 South Corridor Future Improvements			
Short-Term			
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>
IH-45 S	Medical Center Dr. to BW 8	Widen to 10 main lanes, 2-3 front. & 2 HOV lanes	\$ 91,354,375
IH-45 S	61st St. to 0.1 miles south of causeway	Widen to 8 main lanes & two 2-lane front. roads	\$ 74,600,000
IH-45 S	North of FM 1764 to North of FM 517	Widen to 8 main lanes & two 2-lane front. roads & 2 HOV lanes	\$ 44,870,000
IH-45 S	North of FM 517 to north of FM 518	Widen to 8 main lanes & three 2-lane front. roads & 2 HOV lanes	\$ 43,160,000
IH-45 S	North of FM 519 to north of FM 1764	Widen to 8 main lanes & two 2-lane front. roads & 2 HOV lanes	\$ 41,710,000
IH-45 S	Bay Area Blvd to Clear Creek	Widen to 10 main lanes with 2 HOV lanes	\$ 30,380,000
IH-45 S	0.1 miles north of Causeway to south of Texas City Wye	Widen to 8 main lanes & two 2-lane front. roads	\$ 24,340,000
61st St.	Broadway to Harborside Dr.	Construct 4-lane extension	\$ 16,500,000
SH 35	0.13 miles south of S. Wayside to Bellfort	Construct 8-lane freeway	\$ 14,718,000
US 59 SW	SH 288 to SH 527	Widen to 10 lanes	\$ 12,000,000
SH 3	North Texas City limit to 0.53 km of FM 1764	Widen to 4-lane divided	\$ 10,023,348
Beamer Rd.	S. Canyon to W. Bay Area Blvd.	Widen to 4-lane concrete blvd	\$ 10,000,000
SH 35	0.27 mi north of Wayside to 0.13 mi south of Wayside	Construct 8-lane freeway	\$ 9,350,000
Monroe	Fuqua to BW 8 South Loop	Construct 4-lane divided	\$ 6,790,000
NASA Rd. 1	IH-45 S to FM 528	Construct 4-lane divided	\$ 5,900,000
FM 646	IH-45 S to FM 517	Widen to 4-lane divided	\$ 5,500,000
FM 270	FM 518 to FM 646	Widen to 4-lane divided	\$ 5,320,000
El Dorado Blvd	IH-45 S to Beamer Rd.	Const 4-lane concrete blvd.	\$ 4,500,000
Polk	Lockwood to Hughes	Widen to 4-lane undivided	\$ 2,590,000
Old Spanish Trail	ML King Blvd to Wayside	Widen to six lanes	\$ 2,200,000
Wheeler	Blodgett to Calhoun	Widen to 4-lane divided	\$ 2,200,000
El Dorado Blvd	Carrack to Beamer Rd	Widen to 4-lane concrete blvd	\$ 850,000
TOTAL:			\$ 458,855,723
Long-Term			
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>
IH-45 S	Texas City Wye Interchange	Reconstruct IH-45/SH 146/SH 3/SH 6 Interchange	\$ 70,000,000
SH 35	IH-45 S to Griggs Rd.	Construct 8-lane freeway	\$ 35,500,000
IH-45 S	North of Texas City Wye to FM 519	Widen to 8-mainlanes with two front roads & two HOV lanes	\$ 27,240,000
FM 2004	IH-45 S to Galveston County Line	Widen to four lanes	\$ 9,530,000
FM 519	IH-45 S to SH 6	Widen to 4-lanes divided	\$ 6,700,000
North Aerospace Ave.	Challenger 7 Pkwy to Preston Ave.	Construct 4-lane divided extension	\$ 6,281,543
FM 518 Bypass	FM 518 to FM 270	Construct 4-lane divided	\$ 6,020,000
Brittany Bay Blvd.	Hobbs Rd. to Bay Area Blvd	Construct 4-lane divided	\$ 5,478,000
Blodgett	Main to Scott	Widen to 4-lane undivided	\$ 4,500,000
Fairwood Rd.	SH 6 to IH-45 S.	Improve to 4-lane with turn lane	\$ 3,490,000
US 90A	Lawndale to Polk	Widen to six lanes	\$ 1,110,000
TOTAL:			\$ 175,849,543

U.S. 59 North Corridor

Overview

The U.S. 59 North (Eastex Freeway) corridor extends approximately 48 miles from I-45, near the Houston CBD, north to the San Jacinto County line. It consists of the freeway facility and the surrounding area approximately two to five miles east and west of the freeway. Included within the corridor are portions of Harris, Montgomery and Liberty counties, and the cities of Houston, Kingwood, Humble, Splendora and Cleveland.



Land Use

Land use within the U.S. 59 North corridor is characterized as predominately low-to-medium density residential and commercial within Beltway 8. The level of density progressively diminishes toward Beltway 8 with increasing amounts of open space. With the exception of Kingwood, a low-to-medium density residential area of approximately 53,000 residents, the majority of the corridor north of Beltway 8 is rural open space with small communities such as Splendora and Cleveland towards its northern end.

Major Trip Generators and Attractors		
Facility	Type	Location
Bush Intercontinental Airport	Airport	Northwest quadrant of BW 8 and US 59
Kingwood College	College	Kingwood Drive and Sorters Road
Deerbrook Mall	Retail	FM 1960 and US 59

Transit

METRO operates four commuter routes and one express route on U.S. 59 North. The corridor has two transit centers, Kashmere (serving seven routes at Hirsch and Kelly) and Tidwell (serving five routes at Tidwell and U.S. 59). The corridor also has three park and ride facilities: Kingswood (West Lake Houston near Kingswood Drive), Townsen (North of FM 1960), and Eastex (Old Humble south of Aldine Bender). There is also an HOV lane that runs from Quitman to north of Will Clayton Parkway.

Demographics

Population in the U.S. 59 North Corridor is anticipated to increase by 66 percent (122,000 people) by 2025. The section between I-610 and Beltway 8 is projected to experience the largest amount of growth, increasing by 70 percent (53,000 people). Employment in the corridor is expected to grow by nearly 84 percent by 2025, adding more than 53,000 jobs. Much of the growth will be spread out between I-610 and the Montgomery County line, and will double in size by 2025. The segment between Beltway 8 and the Montgomery County line will experience the largest amount of growth, adding nearly 22,000 jobs by 2025, an increase of 101 percent.

Population	2000	2025	Growth	Percent Growth
<u>Regional Growth</u>	4,669,627	7,661,571	2,991,944	64.1 percent
U.S. 59 North	185,397	307,295	121,898	65.7 percent
Downtown - I-610	25,317	27,699	2,382	9.4 percent
I-610 - BW 8	76,536	129,812	53,276	69.6 percent
BW 8 - Montgomery Co. Line	38,609	66,402	27,793	72.0 percent
Montgomery. Co. Line - Liberty Co. Line	34,310	66,678	32,368	94.3 percent
Liberty Co. Line - San Jacinto Co. Line	10,625	16,704	6,079	57.2 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
U.S. 59 North	63,953	117,458	53,505	83.7 percent
Downtown - I-610	7,887	10,676	2,789	35.4 percent
I-610 - BW 8	17,236	36,456	19,220	111.5 percent
BW 8 - Montgomery Co. Line	21,792	43,715	21,923	100.6 percent
Montgomery. Co. Line - Liberty Co. Line	10,774	16,776	6,002	55.7 percent
Liberty Co. Line - San Jacinto Co. Line	6,264	9,835	3,571	57.0 percent

Traffic Analysis

U.S. 59 North experiences serious morning congestion between FM 1485 and downtown. Much of the stretch between FM 1314 and Will Clayton Parkway registers severe LOM during this period. FM 1485, FM 1314, North Park, Kingwood, Will Clayton Parkway, Beltway 8, Bentley and I-10 East all register severe LOM as they intersect with U.S. 59 North during the morning commute. Congestion levels during the afternoon commute decrease on the facility. The section between Will Clayton Parkway and FM 1314 experiences serious LOM during this period, with the section between the Montgomery County line and North Park Drive registering severe LOM. Little York, West Gulf Bank, Will Clayton Parkway, Kingwood, North Park, FM 1314 and FM 1485 show severe LOM at their intersections with U.S. 59 North during the afternoon commute.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	7.5	12.4	65.6 percent
Percent of Roads Congested	9.5 percent	13.3 percent	40.5 percent

Safety

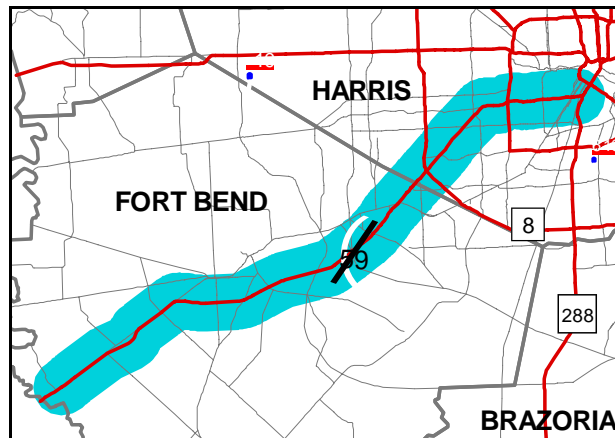
There were 816 crashes in 1998 and 766 crashes in 1999. There are six hot spots for accidents along this corridor, including the intersections of U.S. 59 North with FM 1314, Loop 184, Will Clayton Parkway, Bender Road, Aldine Bender and West Gulf to Langley.

US 59 N Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
Hardy Toll Road	IH-610 to Houston CBD	Construct 6-lane toll extension	\$ 70,000,000
US 59 N	Liberty County Line to 0.9 mi south of FM 2090	Widen to 6-lane freeway	\$ 36,000,000
US 59 N	0.9 mi south of FM 2090 to Roman Forest Blvd	Widen to six mainlanes & construct SB front rd	\$ 30,152,208
US 59 N	Roman Forest Blvd to 1 mi north of Community	Widen to eight mainlanes & construct SB front rd	\$ 19,784,000
Sorters/McClennon Rd.	FM 1314 to US 59 N	Widen to 4-lane undivided	\$ 13,920,000
BW 8	0.8 mi west of US 59 to 0.3 mi of Old Humble Rd	Widen to six mainlanes	\$ 13,000,000
Hirsch	Kelley to Crosstimbers	Widen to 4-lanes divided	\$ 6,000,000
Greens Rd	J.F.K. to Lee Rd	Widen to 4-lanes divided	\$ 5,500,000
Greens Rd	US 59 N to Wilson Rd	Construct 4-lane undivided	\$ 5,000,000
Wilson Rd.	BW 8 to FM 1960 bypass	Widen to 4 lanes	\$ 4,500,000
Woodland Hills	Kingwood to Montgomery county line	Construct 4-lane road	\$ 4,110,000
Aldine Westfield Rd.	Tidwell to Little York	Widen to 4-lane divided	\$ 3,500,000
Lockwood	Bennington to Tidwell	Widen to 4-lane divided	\$ 3,500,000
LP 494	Kingwood to Harris County Line	Widen to 4-lane divided	\$ 2,855,000
Lee Rd	FM 1960 to Will Clayton Pkwy	Reconstruct & realign to 4-lane road	\$ 2,850,000
S. Houston	Atascosita to BW 8	Construct 4-lane divided road	\$ 2,760,000
Parker Rd.	Cheeves to N. Wayside	Widen to 4-lanes divided	\$ 2,600,000
Will Clayton Pkwy	US 59 N to S. Houston Ave.	Widen to 4-lanes w/center left turn lane	\$ 2,400,000
Woodland Hills	North Park to Ford Road	Construct two-lane undivided road	\$ 1,690,000
Lockwood	Tidwell to Hirsch	Widen to 4-lane undivided	\$ 1,600,000
Garrett Rd.	Homestead to N. Wayside	Construct two-lane undivided road	\$ 1,350,000
TOTAL:			\$ 233,071,208
Long-Term			
Facility	Section	Description	Cost
US 59 N	Montgomery County Line to south end of Cleveland bypass	Construct 6-line rural freeway	\$ 55,000,001
Rankin Rd.	US 59 to Intercontinental Airport	Widen to 4-lane divided	\$ 8,417,405
Parker Rd	Hardy Toll Road to US 59 N	Widen to 4-lane divided	\$ 6,500,000
US 59 N	North end of Cleveland bypass to San Jacinto County Line	Construct 4-lane rural freeway	\$ 5,000,000
Tram (Galaxy)	FM 2090 to Long St	Widen to 4-lane divided	\$ 3,955,100
Aldine-Westfield Rd	Jensen to Tidwell	Widen to 4-lane undivided	\$ 1,330,000
Aldine Mail Route	US 59 N to Lee Rd	Construct two-lane undivided road	\$ 680,000
TOTAL:			\$ 10,965,100

U.S. 59 South Corridor

Overview

The U.S. 59 South corridor, approximately 48 miles in length, consists of the area one to two miles on both sides of the facility that stretches between Spur 527 and the Fort Bend/ Wharton County lines. Included within the corridor are the cities of Houston, Sugar Land, Stafford, Missouri City, Richmond and Rosenberg, as well as the unincorporated areas of Harris and Fort Bend counties.



Land Use

From downtown to SH 6, the U.S. 59 South corridor has a heavy concentration of commercial activity, including large employment centers (Greenway Plaza and the Uptown/Galleria area). There are also large clusters of commercial use around Sharpstown and Westwood Malls. Residential densities are moderate throughout this section with higher densities within the I-610 Loop. Beyond Sugar Land and SH 6, the corridor becomes more rural in nature.

Major Trip Generators and Attractors		
Facility	Type	Location
University of St. Thomas	University	Montrose at Alabama
Houston Baptist University	University	Fondren at Beechnut
Greenway Plaza	Employment Center	Richmond between Kirby and Wesleyan
Uptown/Galleria	Employment Center/Retail	NW Quadrant of U.S. 59 and I-610 West
Sharpstown Mall	Retail	Bellaire at U.S. 59
Westwood Mall	Retail	Bissonnet at U.S. 59
First Colony Mall	Retail	U.S. 59 at SH 6

Transit

METRO operates five commuter routes and two express routes on U.S. 59 South. The corridor has two transit centers, Hillcroft (serving four routes at Hillcroft and Westpark) and the Greenway Plaza Transportation Center (serving four routes at Greenway Plaza). The corridor also has three park and ride facilities: Bellfort (Bellfort at U.S. 59), Alief (Bissonnet near Wilcrest) and Westwood (Bissonnet at U.S. 59). There is also an HOV lane that runs from Shepherd near Greenway Plaza into Fort Bend County.

Demographics

The U.S. 59 South corridor is anticipated to experience tremendous growth, adding more than 210,000 people by 2025. The section between Beltway 8 and SH 6, the Stafford-Sugar Land area, is projected to experience the largest amount of growth, adding more than 80,000 people, a 114 percent increase for the section. Employment in the corridor is expected to grow by nearly 31 percent by 2025, adding nearly 89,000 jobs. Much of the growth will be spread out between downtown and SH 6, with the segment between I-610 and Beltway 8 receiving the largest amount of growth, adding more than 31,000 jobs by 2025, an increase of 24 percent.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
U.S. 59 South	368,985	579,488	210,503	57.0 percent
Downtown - I-610	66,591	86,780	20,189	30.3 percent
I-610 - BW 8	184,481	252,117	67,636	36.7 percent
BW 8 - SH 6	70,270	150,582	80,312	114.3 percent
SH 6 - FM 723	37,636	76,393	38,757	103.0 percent
FM 723 - Wharton Co. Line	10,007	13,616	3,609	36.1 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
U.S. 59 South	290,396	379,146	88,750	30.6 percent

Downtown - I-610	104,874	129,326	24,452	23.3 percent
I-610 - BW 8	130,241	161,120	30,879	23.7 percent
BW 8 - SH 6	45,848	66,003	20,155	44.0 percent
SH 6 - FM 723	5,961	16,268	10,307	172.9 percent
FM 723 - Wharton Co. Line	3,472	6,429	2,957	85.2 percent

Traffic Analysis

U.S. 59 South experiences severe congestion between SH 99 and downtown Houston during morning commute times. Arterials, including U.S. 90A, Dulles, Beltway 8, Bissonnet, Beechnut, Bellaire and I-610 West, all register severe LOM for several miles as they approach U.S. 59 South during this period. Overall congestion during the afternoon commute decreases to a serious LOM on the facility. Sections from I-610 West to Westpark, Bissonnet to Beltway 8, and Kirkwood to SH 6 all experience severe LOM during this period. I-610 West, Bellaire, Beechnut, Bissonnet, Bellfort, Kirkwood, U.S. 90A and SH 99 show severe LOM at their intersections with U.S. 59 South, however, there is less congestion during the afternoon than the morning commute.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	11.4	17.5	54.0 percent
Percent of Roads Congested	14.9 percent	25.1 percent	68.0 percent

Safety

Along U.S. 59 South, there were 2,151 crashes in 1998 and 2,201 crashes in 1999. The six hot spot crash locations along U.S. 59 South, outside of Beltway 8, were identified and include a 3.1-mile stretch from FM 1092 to about one mile south of U.S. 90A (204 crashes).

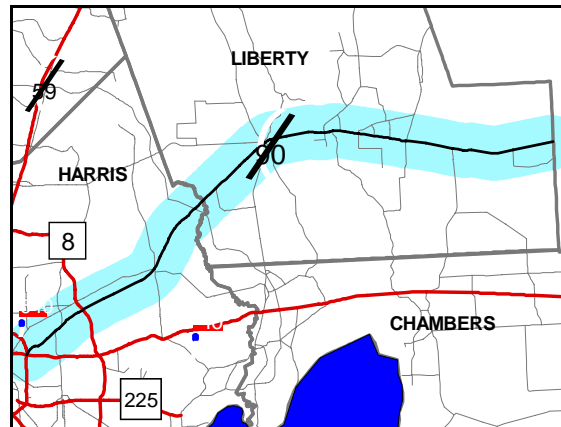
US 59 South Corridor Future Improvements				
Short-Term				
Facility	Section	Description	Cost	
US 59 S	SH 36 to west of SP 10	Widen to 6-lane rural freeway w/front rds.	\$	51,599,222
US 59 S	FM 2759 to west of FM 762	Widen to 8-mainlanes w/front rds & 2-way HOV lanes	\$	50,657,501
US 59 S	FM 762 to west of SH 36	Widen to 6-lane rural freeway w/front rds.	\$	44,704,213
US 59 S	SH 288 to SP 527	Widen to 10 main lanes	\$	12,000,000
FM 2218	FM 1640 to US 59 S	Widen to four lanes	\$	6,200,000
Weslayan	Bissonnet to Bellaire	Wident to 4-lanes undivided	\$	2,820,000
TOTAL:			\$ 167,980,936	

US 59 South Corridor Future Improvements				
Long-Term				
Facility	Section	Description		Cost
W. Airport Blvd	West of S. Kirkwood to Harris County Line	Widen to six lanes divided	\$	5,960,000
New Territory Blvd	SH 99 to First Colony Blvd	Construct 4-lane blvd	\$	5,500,000
University Blvd	End of Commonwealth Blvd to US 59 S	Widen to 6-8 lanes divided roadway	\$	5,000,000
FM 762	US 59 S to Crabb River Rd	Widen to 4-lane divided	\$	4,750,000
Brooks St. Bypass	Camellia to US 90A	Construct 4-lane road	\$	3,800,000
Kirkwood	US 59 S to Harris County Line	Widen to 6-lane divided	\$	3,490,000
Dairy Ashford	W. Airport to Harris County Line	Widen to 6-lane divided	\$	2,890,000
Williams Trace Blvd	US 59 to Oyster Creek	Widen to 6-lane divided	\$	2,080,000
Lexington Blvd	Oxbow Dr to Commonwealth Blvd/SH 6 bypass	Construct 4-lane blvd	\$	1,840,000
FM 1640	FM 2218 to FM 762	Widen to six lanes	\$	1,399,127
TOTAL:			\$	36,709,127

U.S. 90 East Corridor

Overview

The 69-mile U.S. 90 East (Beaumont Highway/Crosby Freeway) corridor consists of the roadway facility and the surrounding area approximately two to five miles north and south of the roadway. The corridor extends from Loop 610, near I-10, through Liberty County, to the Jefferson County line. Included within the corridor are portions of Harris and Liberty counties, and the cities of Houston, Dayton and Liberty.



Land Use

The U.S. 90 East corridor has a much lower level of development compared to many other corridors. Much of the corridor consists of rural open space. The segment within Beltway 8 has a comparatively high level of open space compared to other segments within Beltway 8. Residential use is primarily contained within Beltway 8 and the communities of Crosby, Barrett, Dayton, and Liberty. The segment of the corridor within Beltway 8 has a significant level of industrial usage, especially at the intersection of U.S. 90 and I-610.

Transit

There are no transit operations in this corridor.

Major Attractors

There are no major trip generators or attractors within the U.S. 90 East corridor. However, the heavy influence of industrial and intermodal activities in adjacent corridors may impact traffic demand and travel patterns within this corridor.

Demographics

Population in the U.S. 90 East corridor is anticipated to increase by 64 percent (54,000 people) by 2025. The I-10 to Beltway 8 and Beltway 8 to Liberty County line sections are projected to grow by 21,000 and 20,000 people respectively. The population in the section between Beltway 8 and the Liberty County line is expected to grow by 118 percent. Employment in the corridor is expected to grow by nearly 79 percent by 2025, adding more than 25,000 jobs. More than half of the growth is expected to occur in the section between I-10 and Beltway 8, adding more than 13,000 jobs during this period.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
U.S. 90 East	84,542	138,347	53,805	63.6 percent
I-10 - BW 8	45,039	65,877	20,838	46.3 percent
BW 8 - Liberty Co Line	17,052	37,206	20,154	118.2 percent
Liberty Co. Line - SH146 North	17,509	26,547	9,038	51.6 percent
SH146 North - Hardin Co. Line	4,942	8,717	3,775	76.4 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
U.S. 90 East	32,229	57,522	25,293	78.5 percent
I-10 - BW 8	15,640	29,067	13,427	85.9 percent
BW 8 - Liberty Co Line	8,200	15,310	7,110	86.7 percent
Liberty Co. Line - SH146 North	7,118	10,682	3,564	50.1 percent
SH146 North - Hardin Co. Line	1,271	2,463	1,192	93.8 percent

Traffic Analysis

U.S. 90 East experiences limited amounts of serious and severe congestion. The section between John Ralston and Mesa, as well as a small segment intersecting Beltway 8, experience serious congestion during the morning commute. The majority of the facility experiences tolerable or moderate congestion.

Travel Data	<u>2000</u>	<u>2025</u>	<u>percent</u> <u>Change</u>
Daily VMT (in millions)	2.1	5.6	164.3 percent
percent of Roads Congested	1.0 percent	14.0 percent	1337.7 percent

Safety

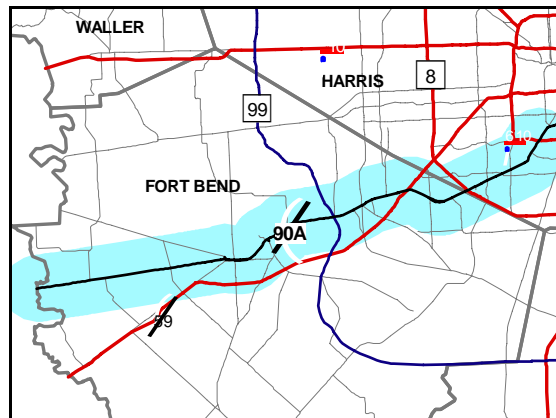
There were 155 crashes in 1998 and 159 crashes in 1999. These included three fatal and 29 incapacitating injury crashes. Two hotspots were identified in the corridor – the intersection at U.S. 90 and SH 146, and the one-mile stretch where the multiple junctions with SH 321, SH 146 and FM 1409 occur.

US 90 East Corridor Future Improvements				
Short-Term				
Facility	Section	Description		Cost
John Ralston Rd.	US 90 to IH-10 E.	Construct 4-lane road	\$	23,810,000
US 90	0.62 mi east of Hunting Bayou to 0.59 mi east of Wallisville	Construct six mainlanes	\$	21,400,000
BW 8 E	0.78 mi south of new US 90 to Uvalde Rd	Construct 3-level interchange	\$	15,569,000
SH 99	US 90 to Liberty county line	Construct 4-lane highway	\$	13,510,000
Woodforest Blvd	Oates to John Ralston	Construct 4-lane undivided	\$	12,330,000
Oates	Wallisville to US 90	Construct 4-lane undivided	\$	9,270,000
Mercury/Oates	IH-10 E to Wallisville	Construct two 24' concrete roads	\$	5,656,000
Oates	Market to IH-10 E	Widen to 4-lane undivided	\$	4,600,000
Normandy	Wallisville to US 90	Construct new 4-lane road	\$	4,370,000
TOTAL:				\$ 110,515,000
Long-Term				
Facility	Section	Description		Cost
US 90	0.5 mi north of Runneburg to Liberty county line	Construct & upgrade to 4-lane freeway	\$	73,130,000
US 90	IH-10 E to Uvalde	Construct 6-mainlane freeway	\$	30,000,000
BS 90	Mesa Rd to BW 8 E	Widen to 6-lane divided	\$	19,830,000
US 90	4.0 mi west of Jefferson county line to SH 61 in Devers	Widen to four lanes	\$	7,000,000
TOTAL:				\$ 129,960,000

U.S. 90A Corridor

Overview

The U.S. 90A (S. Main) corridor, approximately 41 miles in length, consists of the area one to two miles wide on both sides, stretching between Loop 610 and the Fort Bend/ Wharton County lines. Included within the corridor are the cities of Houston, Sugar Land, Stafford, Missouri City, Richmond and Rosenberg, as well as the unincorporated areas of Harris and Fort Bend counties.



Land Use

Overall, U.S. 90A is not a heavily developed corridor. Land use at the intersection of U.S. 90A and I-610 is heavily commercial, consisting of several business parks, the Astrodome complex, and AstroWorld. Light industrial and commercial development abuts U.S. 90A between Loop 610 and Missouri City, with low-to-medium levels of residential use throughout this segment. This segment also has a considerable amount of non-rural open space. Beyond Missouri City and Sugar Land, which are primarily residential areas with light commercial activity, the remainder of the corridor is rural to the Wharton County line.

Major Attractors

Within the U.S. 90A corridor, there are eight major trip generators and attractors, including the Sugar Land Airport, AstroWorld and the Astrodome, First Colony Mall, Imperial Sugar, Texas Department of Corrections, Manor Care Hospital and Fort Bend Community Hospital.

Major Trip Generators and Attractors		
Facility	Type	Location
Sugar Land Municipal Airport	Airport	US 90A and SH 6
AstroWorld and Astrodome	Recreational	US 90A and I-610S
First Colony Mall	Retail	US 59S and SH 6
Imperial Sugar	Commercial	US 90A and SH 6
Texas Department of Corrections	Government	US 90A and SH 6
Manor Care Hospital	Medical	US 90A and Jonathan
Fort Bend Community Hospital	Medical	US 90A and Murphy Street

Transit

METRO operates two express routes on U.S. 90A. The corridor has one park and ride facility at U.S. 90A and Fondren, which serves both express routes.

Demographics

The U.S. 90A Corridor is anticipated to experience tremendous growth, adding more than 181,000 people by 2025. The section between SH 6 and FM 723 is projected to experience the largest amount of growth, adding more than 88,000 people, a 140 percent increase for the section. Employment in the corridor is expected to grow more than 62 percent by 2025, adding nearly 53,000 jobs. Growth will be spread out between I-610 and FM 723. The segment between SH 6 and FM 723 is expected to grow the most, adding more than 21,000 jobs by 2025, an increase of 118 percent.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
U.S. 90A	170,405	351,831	181,426	106.5 percent
I-610 - BW 8	56,694	91,881	35,187	62.1 percent
BW 8 - SH 6	41,522	96,618	55,096	132.7 percent
SH 6 - FM 723	62,830	150,944	88,114	140.2 percent
FM 723 - Wharton Co. Line	9,359	12,388	3,029	32.4 percent
Employment	2000	2025	Growth	Percent Growth

Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
U.S. 90A	84,594	137,398	52,804	62.4 percent
I-610 - BW 8	17,405	29,120	11,715	67.3 percent
BW 8 - SH 6	45,777	62,501	16,724	36.5 percent
SH 6 - FM 723	18,181	39,702	21,521	118.4 percent
FM 723 - Wharton Co. Line	3,231	6,075	2,844	88.0 percent
Traffic Analysis				

U.S. 90A experiences serious to severe congestion between Harlem Road and I-610 South during morning commute times. The section from Harlem to U.S. 59 South, as well as from Fondren to Willowbend, registers severe LOM during this period. U.S. 59 South, Dulles, FM 1092 and Beltway 8 register severe congestion as they approach U.S. 90A during this period. Overall congestion during the afternoon continues to register a serious LOM. Sections from South Post Oak to Hillcroft, as well as from U.S. 59 South to Harlem, still register severe LOM in the afternoon commute.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	4.4	8.3	90.7 percent
Percent of Roads Congested	5.4 percent	17.6 percent	225.2 percent

Safety

In 1998, there were 470 crashes along U.S. 90A within the corridor that resulted in three fatalities. The 1.25-mile area between Austin Street and 5th Street in the Richmond and Rosenberg area experienced 66 crashes in 1998. Other high crash locations within the corridor at or near the intersections with U.S.90A include FM 2234, Post Oak Road, FM 1092, U.S. 59 South, and between Howard Lane and Herdon Street.

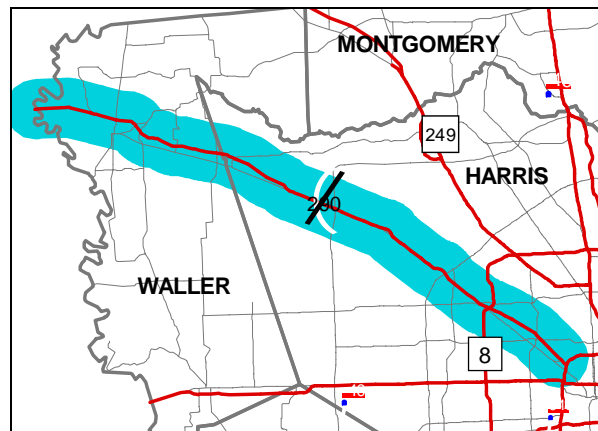
US 90A Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
US 59 S	West of SH 35 to west of SP 10	Widen to 6-lane rural freeway w/front rds	\$ 51,599,222
US 59 S	West of FM 762 to west of SH 36	Widen to 6-lane rural freeway w/front rds	\$ 44,704,213
Chimney Rock	S. Main to BW 8 S	Construct new 4-lane divided	\$ 21,110,000
Stafford Rd/Staffordshire Rd	US 90A to FM 2234	Widen to 4-lane concrete divided	\$ 11,250,000
Stafford Rd/Staffordshire Rd	BW 8 to US 90A	Widen to 4-lane concrete divided	\$ 10,094,100
Holmes	Main to Kirby	Widen to 4-lane divided	\$ 9,100,000
FM 2218	FM 1640 to US 59 S	Widen to 4-lane divided	\$ 6,200,000
Buffalo Speedway	Holmes to Airport Blvd	Construct 4-lane divided	\$ 4,500,000
Buffalo Speedway	W. Bellfort to Holmes	Construct 4-lane divided	\$ 3,600,000
Kirby Dr.	Holmes to Reed	Construct 4-lane divided	\$ 3,500,000
TOTAL:			\$ 165,657,535

US 90A Corridor Future Improvements			
Long-Term Facility	Section	Description	Cost
FM 2234	US 90A to Independence	Widen to 6-lanes divided	\$ 8,400,000
Lexington Blvd	Columbia Blue to FM 2234	Construct 4-lane concrete divided	\$ 7,799,221
Burney Rd Bypass	Jess Pirtle Blvd to US 90A	Construct 4-lane roadway	\$ 7,000,000
W. Airport Rd	Eldridge to SH 6	Construct 2nd half of 4-lane blvd.	\$ 6,000,000
W. Airport Rd	West of S. Kirkwood to Harris county	Widen to 6-lane divided	\$ 5,960,000
New Territory Blvd	SH 99 to First Colony Blvd.	Construct 4-lane blvd	\$ 5,500,000
Independence Blvd	Moore Rd. to Staffordshire	Widen to 4-lane concrete divided	\$ 5,334,000
Reed Rd	Alameda to Kirby	Construct 4-lane divided	\$ 4,230,000
FM 762	FM 1640 to US 90A	Widen to 6-lane divided	\$ 4,100,000
Brooks St. Bypass	Camellia to US 90A	Construct 4-lane roadway	\$ 3,800,000
Independence Blvd	Fifth St. to FM 1092	Construct 2-lane concrete divided	\$ 3,578,890
Kirkwood	US 59 S to Harris county line	Widen to 6-lane divided	\$ 3,490,000
Bellfort W.	Buffalo Speedway to Stella Link	Construct two 24' concrete roadways	\$ 3,200,000
Dairy Ashford	W. Airport to Harris county line	Widen to 6-lane divided	\$ 2,890,000
Independence Blvd	Moore Rd. to 5th St.	Construct 2-lane concrete divided	\$ 2,730,000
Hillcroft	BW 8 to Fort Bend county line	Widen to 6-lane divided	\$ 2,440,000
Williams Trace Blvd	US 59 S to Oyster Creek	Widen to 6-lane divided	\$ 2,080,000
Kirby Dr.	Reed to Alameda	Widen to 4-lane road	\$ 1,000,000
TOTAL:			\$ 79,532,111

U.S. 290 Corridor

Overview

The U.S. 290 (Hempstead Highway/Northwest Freeway) corridor, extending approximately 50 miles from Loop 610 West to the Washington County line, consists of the freeway facility and the surrounding area approximately five miles north and south of the freeway.



Land Use

The U.S. 290 corridor can be divided into two sections – the developed section, from the I-610 Loop to the FM 1960/SH 6 intersection, and the rural section, from that point to the Washington County line. Within the developed section of the corridor, there are a variety of land uses, including several industrial areas focused around the I-610 Loop and Beltway 8. Much of the corridor along U.S. 290 and Hempstead Road is heavily commercial. Residential density decreases as one goes farther away from I-610. Beyond FM 1960/SH 6, land use is predominately rural in nature with residential areas in Fairfield, Prairie View, and Hempstead.

Major Attractors

Within the U.S. 290 corridor, six major trip generators and attractors were identified, including Dohman Stadium, Northwest Mall, Tinseltown, Northwest Crossing Shopping Center, Bane Park Shopping Center and numerous automobile dealerships. These attractors are primarily retail, sporting, recreational, restaurant and entertainment facilities.

Major Trip Generators and Attractors		
Facility	Type	Location
Dolman Stadium	Recreation	US 290 and West Loop
Northwest Mall	Retail	US 290 and West Loop
Tinsel Town/Restaurants	Entertainment	US 290 and West Tidwell
Northwest Crossing Shopping Center	Retail	US 290 and West Tidwell
Bane Park Shopping Center	Retail	US 290 and Beltway 8
Automobile Row	Retail	US 290 and Beltway 8

Transit

METRO operates two commuter routes on U.S. 290. The Northwest Transit Center, serves as the transfer point for 14 routes, including the two commuter routes. The corridor has three park and ride facilities: Northwest Station (Castlebridge at U.S. 290), West Little York (West Little York and Hempstead) and Pinemont (Pinemont at Lumberdale). There is also an HOV lane that runs from I-10 West to FM 1960. Colorado Valley Transit provides door-to-door demand response service within Waller County.

Demographics

Population in the U.S. 290 corridor is anticipated to increase by 81 percent (106,000 people) by 2025. The section between Beltway 8 and the proposed SH 99 is projected to receive the most growth, increasing by almost 95 (nearly 47,000 people). Employment in the corridor is expected to grow by 48 percent by 2025, adding more than 55,000 jobs. More than half of the growth is expected to occur in the section between I-610 and Beltway 8, adding more than 31,000 jobs during this period.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
U.S.290	130,999	236,853	105,854	80.8 percent
I-610 - BW 8	60,952	94,830	33,878	55.6 percent
BW 8 - SH99	49,466	96,211	46,745	94.5 percent
SH99 - Waller Co. Line	5,169	17,840	12,671	245.1 percent
Waller Co. Line - Washington Co. Line	15,412	27,972	12,560	81.5 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
U.S.290	115,445	170,849	55,404	48.0 percent
I-610 - BW 8	87,245	118,518	31,273	35.8 percent
BW 8 - SH99	21,721	40,242	18,521	85.3 percent
SH99 - Waller Co. Line	744	3,401	2,657	357.1 percent
Waller Co. Line - Washington Co. Line	5,735	8,688	2,953	51.5 percent

Traffic Analysis

U.S. 290 experiences predominantly severe congestion from Roberts Road to I-610 North during both morning and afternoon commute times. The section from SH 6 to I-610 North, as well as most of the segment from Bauer to Jarvis, registers severe LOM during this period. Cypress-Rosehill, SH 6, Beltway 8 and most arterials between Beltway 8 and I-610 register severe congestion as they approach U.S. 290 during this period.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	6.5	12.1	85.1 percent
Percent of Roads Congested	9.1 percent	32.9 percent	263.1 percent

Safety

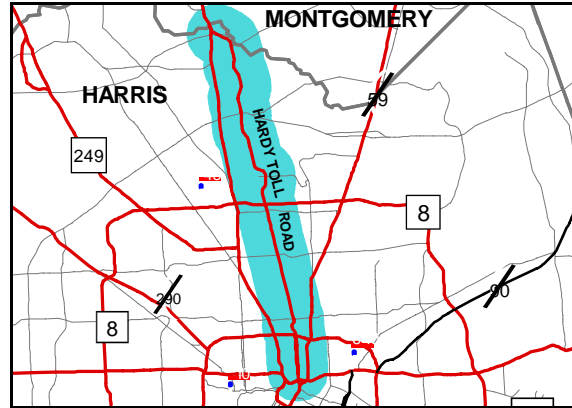
In 1998, there were 676 crashes on U.S. 290, including 10 fatalities. In 1998, hot spots were identified on Clay Road, Bingle Road, Gardendale Road, Dacoma Street, Mangum Road, Post Oak Road, and between Clay Road and Loop 610, with 51 crashes that occurred at these locations. Additionally, 59 crashes occurred on U.S. 290 between West Road and Flintlock Street in 1998.

US 290 Corridor Future Improvements			
Short-Term			
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>
US 290	IH-610 to FM 529	Widen to 8-10 lane freeway	\$ 66,500,000
US 290	West end of Cypress Bypass to east of Hockley	Widen to 8-10 lane freeway	\$ 37,810,600
Hollister	Hammerly to Clay Rd.	Widen to 4-lane divided	\$ 7,720,000
Little York W	US 290 to Houston City Limits	Widen to 6-lane divided	\$ 6,160,000
Fallbrook Dr.	Eldredge to Huffmeister	Construct new 4-lane road	\$ 5,300,000
Tanner Rd.	BW 8 to Gessner	Widen to 4-lane asphalt	\$ 5,215,652
Hollister	Hammerly to Long Point	Widen to four lanes	\$ 2,990,000
TOTAL:			\$ 131,696,252
Long-Term			
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>
Hempstead Rd.	Dacoma to Brittmore	Widen to 6-lane divided	\$ 27,202,502
Hollister	Little York to Breen	Construct 4-lane blvd	\$ 8,000,000
Cypress N. Houston	Huffmeister to N. Eldridge Pkwy	Widen to 6-lane w/median	\$ 5,500,000
Gessner	West Rd to Breen	Construct 4-lane divided road	\$ 3,700,000
TOTAL:			\$ 44,402,502

Hardy Toll Road Corridor

Overview

The Hardy Toll Road corridor extends 21 miles from I-610 North, near the Houston CBD, to I-45 North, near the Montgomery County line, north of Bush Intercontinental Airport. It consists of the freeway facility and the surrounding area approximately two to five miles west and east of the freeway.



Land Use

The Hardy Toll Road corridor runs relatively adjacent to I-45 North and has parallel land uses throughout its route. However, with the lack of frontage roads, there is far less commercial activity that occurs within the corridor.

Major Attractors

The majority of trip generators and attractors in this corridor are employment, commercial, recreational and some industrial. Most of the traffic on the weekdays is related to work trips to the Houston CBD. Other trip generators include recreational or commercial trips to The Woodlands and trips to Bush Intercontinental Airport.

Major Trip Generators and Attractors		
Facility	Type	Location
CBD	Employment	Intersection of Elysian Street & IH- 10
Northline Mall	Retail	NE Corner I-45 & Airline Rd.
Greenspoint Mall	Retail/Employment	SE Corner I-45 & Greens Rd.
North Harris Community College	Education	Aldine Westfield & Richey
Gorge Bush Intercontinental Airport	Transportation	Hardy Toll Road & Will Clayton
The Woodlands Mall	Retail	NW Corner I-45 & Woodlands Parkway

Transit

There is no provision of transit in this corridor.

Demographics

Population in the Hardy Toll Road Corridor is anticipated to increase by 69 percent (nearly 94,000 people) by 2025. The section between I-610 and Beltway 8 is projected to receive the most growth, adding more than 53,000 people. Employment in the corridor is expected to grow by 76 percent by 2025, adding more than 53,000 jobs. Most of the growth is expected to occur in the section between Beltway 8 and I-45, which will add more than 38,000 jobs during this period.

<u>Population</u>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
Hardy Toll Road	136,322	230,222	93,900	68.9 percent

I-610 - BW 8	80,989	134,171	53,182	65.7 percent
BW 8 - I-45	55,333	96,051	40,718	73.6 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
Hardy Toll Road	69,972	123,392	53,420	76.3 percent
I-610 - BW 8	29,889	45,066	15,177	50.8 percent
BW 8 - I-45	40,083	78,326	38,243	95.4 percent

Traffic Analysis

The Hardy Toll Road experiences serious congestion from I-45 North to I-610 North during morning commute times. Sections from Cypresswood to FM 1960, as well as from Aldine Mail to I-610 North, register severe LOM during this period. Beltway 8 registers severe congestion as it approaches the Tollway during this period. During the afternoon commute, congestion on the facility is reduced to tolerable-to-moderate levels.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	3.6	6.2	72.6 percent
Percent of Roads Congested	3.5 percent	16.4 percent	374.7 percent

Safety

In 1998, there were 58 crashes on the Hardy Toll Road, including two fatal and three incapacitating injury crashes. The intersection at the Hardy Toll Road and FM 525 (Aldine Bender) is particularly hazardous, but more so along FM 525 than on the Hardy Toll Road.

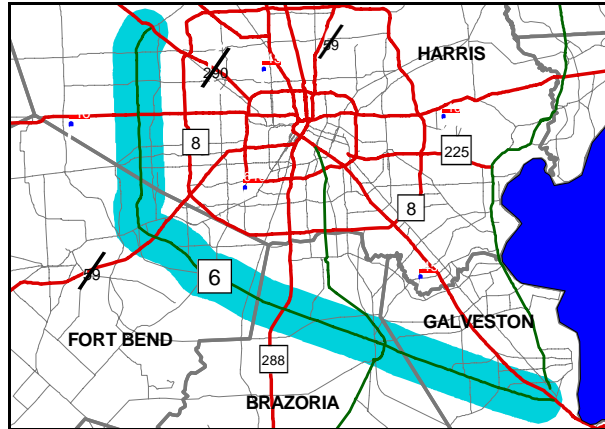
Hardy Toll Road Corridor Future Improvements				
Short-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>	
Hardy Toll Road	IH-610 to Houston CBD	Construct 6-lane toll extension	\$	70,000,000
Imperial Valley Dr.	Rankin to Airtex	Construct 4-lane undivided	\$	9,540,000
Airtex Blvd	Imperial Valley to Aldine Westfield	Construct 4-lane road at new location	\$	7,910,000
Hirsch	Kelley to Crosstimbers	Widen to 4-lane divided	\$	6,000,000
Aldine Westfield	Tidwell to Little York	Widen to 4-lane divided	\$	3,500,000
Parker	Airline to Hardy Toll Road	Widen to 4-lane divided	\$	3,000,000
Aldine Westfield	FM 1960 to N. Spring	Construct center turn lane	\$	1,000,000
			TOTAL:	\$ 100,950,000

Hardy Toll Road Corridor Future Improvements				
Long-Term				
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>	
Parker Rd.	Hardy Toll Road to US 59	Widen to 4-lane divided	\$	6,500,000
Riley-Fuzzel	Rayford to Hardy	Widen to 4-lane undivided	\$	3,760,900
Aldine Westfield	Jensen to Tidwell	Widen to 4-lane undivided	\$	1,330,000
			TOTAL:	\$ 11,590,900

SH 6 Corridor

Overview

The State Highway 6 (SH 6) corridor, approximately 70 miles in length, consists of the area one to two miles on both sides of the facility that stretches between U.S. 290 on the north to I-45 South. Included within the corridor are the cities of Houston, Sugar Land, Missouri City, Arcola, Manvel, Alvin, Santa Fe, Hitchcock and La Marque, as well as the unincorporated areas of Harris, Fort Bend, Brazoria and Galveston counties.



Land Use

Land use within the SH 6 corridor varies from suburban residential and commercial on the west side of Houston to a more rural character from Missouri City to its terminus at I-45 South near La Marque. There are many undeveloped areas within the western part of the corridor, including Barker and Addicks Reservoirs. In the rural portion of the corridor, SH 6 serves as a major thoroughfare for small communities such as Arcola, Manvel, Alvin, Santa Fe, Hitchcock and La Marque.

Major Attractors

Within the SH 6 corridor, major trip generators are commercial and retail centers. The corridor has three airports, three major retail centers, two hospitals, a recreational area and one major government facility.

Major Trip Generators and Attractors		
Facility	Type	Location
Sugar Land Municipal Airport	Airport	SH 6 and US 90A
Houston Southwest Airport	Airport	SH 6 and FM 521
Alvin Airport	Airport	SH 6 and CR 146
Bear Creek Park	Recreational	SH 6 and Clay Road
Copperwood Regional Shopping Center	Retail	SH 6 and FM 529
West Oaks Mall	Retail	SH 6 and Westheimer Road
First Colony Mall	Retail	SH 6 and US 59S
Texas Department of Corrections	Government	SH 6 and US 90A
Charter Hospital	Medical	SH 6 and First Colony Boulevard
Fort Bend Community Hospital	Medical	SH 6 and Murphy Street

Transit

METRO does not provide transit service in this corridor. There are two park and ride facilities accessible within the corridor – Addicks (at I-10 West) and Mission Bend (Alief Clodine at METRO Blvd.) – which connect to the METRO system.

Demographics

Population in the SH 6 corridor is anticipated to increase by 83 percent (nearly 306,000 people) by 2025. Much of the growth is projected to occur within Fort Bend County, where the Fort Bend County line-to-U.S. 59 and U.S. 59-to-the Brazoria County line segments are expected to grow by 73,000 and 113,000 people respectively, more than doubling the population in those sections. Employment in the corridor is expected to grow by 82 percent by 2025, adding nearly 93,000 jobs. Much of the growth is expected to be spread out through the Harris and Fort Bend County sections of the corridor.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 6	367,279	672,850	305,571	83.2 percent
U.S. 290 - I-10	101,116	151,176	50,060	49.5 percent
I-10 - Fort Bend Co. Line	62,448	102,136	39,688	63.6 percent
Fort Bend Co. Line - U.S.59	67,559	140,852	73,293	108.5 percent
U.S. 59 - Brazoria Co. Line	86,311	199,183	112,872	130.8 percent
Brazoria Co. Line - Galveston Co. Line	24,508	43,738	19,230	78.5 percent
Galveston Co. Line - I-45	25,337	35,765	10,428	41.2 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 6	112,962	205,849	92,887	82.2 percent
U.S. 290 - I-10	26,998	50,770	23,772	88.1 percent
I-10 - Fort Bend Co. Line	34,775	57,958	23,183	66.7 percent
Fort Bend Co. Line - U.S.59	19,683	35,164	15,481	78.7 percent
U.S. 59 - Brazoria Co. Line	17,995	39,727	21,732	120.8 percent
Brazoria Co. Line - Galveston Co. Line	7,878	11,942	4,064	51.6 percent
Galveston Co. Line - I-45	5,633	10,288	4,655	82.6 percent

Traffic Analysis

SH 6 experiences severe congestion from Westheimer to U.S. 290 during morning and afternoon commute times. Westheimer, I-10 West, Clay Road, Little York and FM 529 register severe congestion as they approach SH 6.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	6.3	11.6	83.4 percent
Percent of Roads Congested	9.2 percent	20.6 percent	123.1 percent

Safety

In 1998, there were 873 crashes along SH 6, including 10 fatalities. Several hot spots were identified, including a stretch of 0.9 miles around the intersection with Clay Road (53 crashes)

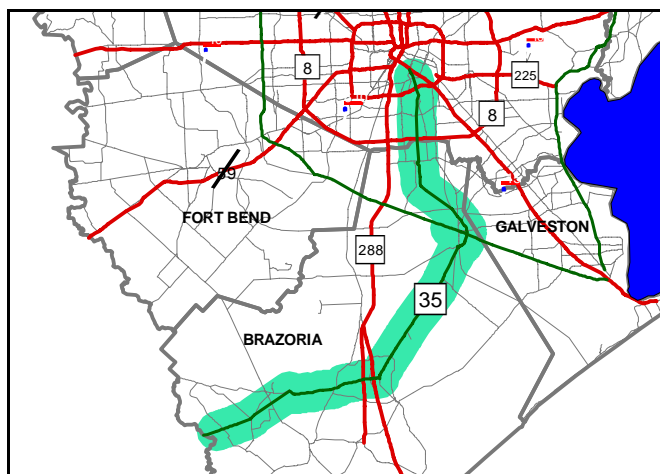
and a stretch of 0.8 miles around the intersection with Bellaire Blvd. (66 crashes, 28 at the intersection itself).

SH 6 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
Westpark Tollway	SH 6 to FM 1464	Construct 4-lane tollway	\$ 98,500,000
Oilfield Road	Commonwealth Blvd to University Blvd	Reconstruct & widen to 4-lane blvd	\$ 16,870,000
Lake Olympia Pkwy	Thompsons Ferry Rd to Murphy Rd	Construct 4-lane divided concrete road	\$ 11,475,000
Vicksburg Dr.	Hillcroft to Missouri City city limits	Construct 4-lane divided concrete road	\$ 5,508,000
Fallbrook Dr	Eldridge to Huffmeister	Construct new 4-lane rd	\$ 5,300,000
Westpark	Eldridge to SH 6	Construct new 6-lane rd	\$ 3,600,000
Groeschke	SH 6 to Barker-Cypress	Reconstruct & widen to 4-lane divided	\$ 3,335,000
TOTAL:			\$ 144,588,000
Long-Term			
Facility	Section	Description	Cost
IH-45 S	Texas City Wye Interchange	Reconstruct IH-45/SH 146/SH 3/SH 6 interchange	\$ 70,000,000
IH-45 S	North of Texas City Wye to North of FM 519	Widen to 8 mainlanes w/two front rds & 2 HOV lanes	\$ 27,240,000
Hillcroft	SH 122 to south of Steep Bank Trace	Construct 4-lane divided concrete road	\$ 15,376,500
Hillcroft	Truesdale to Lake Olympia Pkwy	Construct 4-lane divided concrete road	\$ 10,389,600
Lake Olympia Pkwy	Hillcroft to SH 122	Construct 4-lane divided concrete road	\$ 9,364,680
Burney Rd Bypass	Jess Pirtle Blvd to US 90A	Construct 4-lane road	\$ 7,000,000
University Blvd	Commonwealth Blvd to SH 6 @ FM 1092	Construct 5-6 lane road	\$ 7,000,000
Hillcroft	SH 6 to SH 122	Construct 4-lane divided concrete road	\$ 6,885,000
FM 519	IH-45 South to SH 6	Widen to 4-lane divided	\$ 6,700,000
W. Airport Blvd	Eldridge to SH 6	Construct 2nd half of 4-lane blvd	\$ 6,000,000
New Territory Blvd	SH 99 to First Colony Blvd	Construct 4-lane blvd	\$ 5,500,000
Patterson	Eldridge to SH 6	Widen to 4-lane divided	\$ 5,400,000
Beechnut	Harris county line to Addicks Clodine	Widen to 4-lane divided	\$ 4,690,000
Burney Rd	W. Bellfort to Voss Rd	Reconstruct & widen to 4-lane rd	\$ 4,300,000
Brooks St. Bypass	Camellia to US 90A	Construct 4-lane road	\$ 3,800,000
Independence Blvd	5th St to FM 1092	Construct 2-lane divided concrete road	\$ 3,578,890
Fairwood Rd.	SH 6 to IH-45 S	Improve to 4-lane with turn lane	\$ 3,490,000
Old Richmond	Eldridge to SH 6	Construct 4-lane undivided road	\$ 3,160,000
FM 517	Galveston county line to SH 35	Widen to 4-lane divided	\$ 3,110,000
2nd St	SH 6 to Schiro	Construct 4-lane undivided road	\$ 2,880,000
Independence Blvd	Moore Road to 5th St	Construct	\$ 2,730,000
Dairy Ashford	Memorial to Briar Forest	Widen to six lanes	\$ 2,590,000
Lake Olympia Pkwy	East of Village Brook Dr. to Hillcroft	Construct 4-lane divided concrete road	\$ 2,402,000
Williams Trace Blvd	US 59 to Oyster Creek	Widened to 6-lane divided	\$ 2,080,000
Lexington Blvd	Oxbow Dr. to Commonwealth Blvd/SH 6 Bypass	Construct 4-lane blvd	\$ 1,840,000
Dulles	Cartwright Rd to SH 6	Widen to 6-lane divided	\$ 960,000
TOTAL:			\$ 218,466,670

SH 35 Corridor

Overview

The State Highway 35 (SH 35) corridor includes a new alignment, as well as use, of current facilities from I-45 in Harris County to the Brazoria/Matagorda County line. The proposed corridor follows Mykawa Drive from I-45 to Loop 610 south and to the west of Pearland, and then southeast to the current SH 35 facility north of Alvin. The cities of Alvin, Danbury, Houston, Liverpool, Pearland and West Columbia are within this corridor.



Land Use

Much of the SH 35 corridor is rural in nature. The facility serves rural communities, such as Alvin, Angleton, and West Columbia in Brazoria County. SH 35 also runs through Pearland. The most intense level of land use is within Beltway 8, which includes Hobby Airport, several industrial parks, Texas Southern University and the University of Houston. Most of the residential and commercial areas are located north of Hobby Airport.

Major Attractors

There are four major attractors – Hobby Airport, Palms Center, Gulfgate Mall and Phillips Petroleum.

Major Trip Generators and Attractors		
Facility	Type	Location
Hobby Airport	Commercial Airport	SH 35 and Airport Blvd
Palms Center	Retail	Griggs and ML King
Gulfgate Mall	Retail	I-45 and I-610
Phillips Petroleum	Manufacturing	SH 35 and FM 524/CR 262

Transit

METRO provides local transit service in this corridor in Harris County. The corridor has no park and ride facilities or transit centers. Connect Transportation and the Gulf Coast Center provide door-to-door demand response service in Brazoria County.

Demographics

Population in the proposed SH 35 corridor is anticipated to increase by 45 percent (78,000 people) by 2025. Much of the growth is projected to occur between I-610 and SH 6, with the I-610 to Beltway 8 segment growing by 59 percent (38,000 people). Employment in the corridor is expected to grow by 49 percent by 2025, adding nearly 43,000 jobs. Nearly half of the growth is expected to occur in the I-610 to Beltway 8 segment of the corridor.

Population	2000	2025	Growth	Percent Growth
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Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 35	174,359	252,623	78,264	44.9 percent
I-45 - I-610	22,490	32,715	10,225	45.5 percent
I-610 - BW 8	63,812	101,704	37,892	59.4 percent
BW 8 - SH 6	39,108	60,274	21,166	54.1 percent
SH 6 - SH 288	36,080	44,450	8,370	23.2 percent
SH 288 - Matagorda Co. Line	12,869	13,480	611	4.7 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 35	86,217	128,723	42,506	49.3 percent
I-45 - I-610	20,163	26,079	5,916	29.3 percent
I-610 - BW 8	28,792	49,061	20,269	70.4 percent
BW 8 - SH 6	12,617	18,204	5,587	44.3 percent
SH 6 - SH 288	19,492	29,335	9,843	50.5 percent
SH 288 - Matagorda Co. Line	5,153	6,044	891	17.3 percent

Traffic Analysis

SH 35 and Mykawa Road, the future alignment for SH 35, both experience serious congestion for most of their routes from FM 518 to I-610 South during morning commute times. SH 35 between FM 518 and Airport primarily registers serious LOM, with most of the segment between FM 518 and Beltway 8 showing severe levels of mobility. Mykawa Road, from Brookside to Bellfort, has serious LOM with the southern half of the facility experiencing severe LOM. Beltway 8, as it intersects SH 35, registers severe LOM. Congestion levels are reduced for both SH 35 and Mykawa Road during the afternoon commute. SH 35 between Beltway 8 and FM 518 shows serious congestion during this period, while the stretch of Mykawa Road between Beltway 8 and Brookside registers severe congestion.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	3.7	7.8	114.4 percent
Percent of Roads Congested	3.6 percent	6.6 percent	85.4 percent

Safety

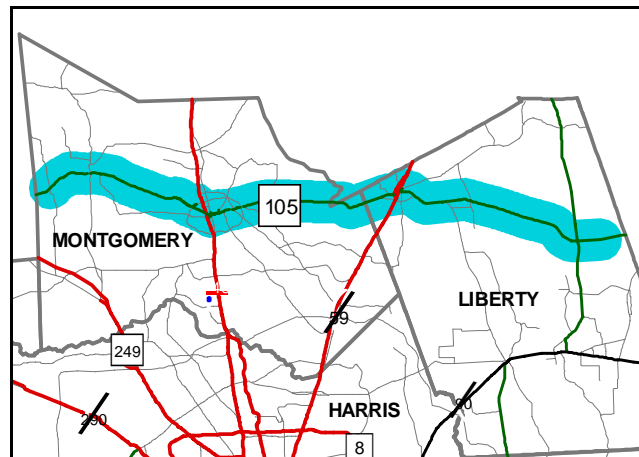
In 1998, there were at least 522 crashes on SH 35, including eight with fatalities and 39 with incapacitating injuries. Several hot spots were identified, including a major one in and around Alvin (81 crashes). Currently, there is no crash data available for the proposed SH 35 alignment.

SH 35 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
SH 35	North of Alameda-Genoa to BW 8	Construct 8 mainlanes w/two 3-lane front rds	\$ 22,905,000
SH 35	0.13 mi south of S. Wayside to Bellfort	Construct 8-lane freeway on new location	\$ 14,718,000
SH 35	FM 523 to Rock Island St in Angleton	Widen to six lanes	\$ 10,457,000
S. Wayside	Airport Blvd to BW 8 South	Construct 4-lane undivided	\$ 10,330,000
SH 35	0.27 mi north of Wayside to 0.13 mi south of Wayside	Construct 8-lane freeway on new location	\$ 9,350,000
FM 865	Alameda Genoa Rd to Brazoria County Line	Widen to 4-lane divided	\$ 5,368,000
Polk	Lockwood to Hughes	Widen to 4-lane undivided	\$ 2,590,000
SH 35	T.J. Wright to SH 288	Widen to 6-lane divided	\$ 2,323,000
Old Spanish Trail	ML King Blvd to Wayside	Widen to six lanes	\$ 2,200,000
Wheeler	Blodgett to Calhoun	Widen to 4-lane divided	\$ 2,200,000
FM 524	South side of Phillips Refinery to SH 35	Construct refinery bypass	\$ 2,150,000
ML King Blvd	Alameda Genoa Rd to BW 8 South	Construct & widen to 4-lane undivided	\$ 2,090,000
SH 35	Rock Island St in Angleton to BS 288	Widen to 3-lane one-way pair	\$ 1,230,000
SH 35	BS 288 to T.J. Wright	Widen to 3-lane one-way pair	\$ 839,000
TOTAL:			\$ 88,750,000
Long-Term			
Facility	Section	Description	Cost
SH 35	North of Bellfort to north of Alameda-Genoa	Construct 8-lane freeway	\$ 43,882,000
SH 35	FM 2403 to FM 523	Widen to 4-lane divided	\$ 43,530,000
Mykawa Rd	Airport to BW 8 S	Widen to four lanes	\$ 40,000,000
SH 35	IH-45 S to Griggs Rd	Construct 8-lane freeway on new location	\$ 35,500,000
FM 865	Harris county line to FM 518	Widen to 4-lane divided	\$ 4,000,000
FM 517	Galveston county line to SH 35	Widen to 4-lane divided	\$ 3,110,000
US 90A	Lawndale to Polk	Widen to 6 lanes	\$ 1,110,000
TOTAL:			\$ 171,132,000

SH 105 Corridor

Overview

The State Highway 105 corridor is approximately 70 miles in length, running from the Grimes County line on the west to the Hardin County line on the east. Included within the corridor are portions of Montgomery and Liberty counties, as well as the cities of Conroe, Cut and Shoot, Woodbranch Village and Cleveland.



Land Use

With the exception of Conroe, which is a mix of residential and commercial development, land use within the SH 105 corridor is predominately rural open space.

Major Attractors

Since most of the corridor is rural, there are a limited number of major attractors. Attractors in the corridor include shopping and resort activities in and around the city of Conroe.

Transit

Brazos Transit provides demand-response services in the corridor.

Demographics

The SH 105 Corridor is expected to experience slow population and employment growth through 2025. Population in the corridor is anticipated to grow by 41 percent (33,000 people) during this period. The growth is anticipated to be uniform throughout the corridor. Employment in the corridor is expected to grow by 23,000 jobs, a 76 percent increase, by 2025. Nearly half the growth is anticipated to occur between I-45 North and U.S. 59 North.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
<u>SH 105</u>	80,394	113,083	32,689	40.7 percent
Grimes Co. Line - I-45 N	26,222	36,699	10,477	40.0 percent
I-45 N - U.S. 59 N	36,600	47,283	10,683	29.2 percent
U.S. 59 N - Hardin Co. Line	17,572	29,101	11,529	65.6 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
<u>SH 105</u>	31,007	54,481	23,474	75.7 percent
Grimes Co. Line - I-45 N	9,384	18,231	8,847	94.3 percent
I-45 N - U.S. 59 N	18,874	30,037	11,163	59.1 percent
U.S. 59 N - Hardin Co. Line	2,749	6,213	3,464	126.0 percent

Traffic Analysis

SH 105 experiences minimal serious or severe congestion. Sections between Crockett-Martin and Loop 336, as well as between Walden Road and McCaleb Road, show serious levels of congestions during both morning and afternoon commute periods. Walden Road is the only facility in the corridor that shows severe LOM during commute periods as it intersects with SH 105.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	2.1	3.4	62.2 percent
Percent of Roads Congested	6.1 percent	12.1 percent	97.4 percent

Safety

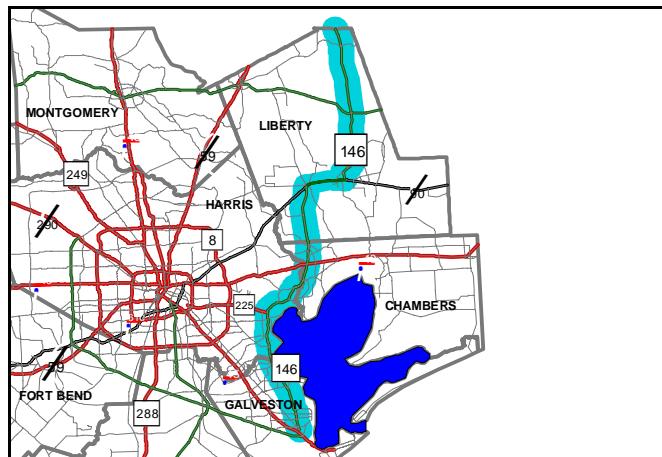
In 1998, there were 373 crashes along SH 105, including six fatal and 25 incapacitating injury crashes. Particular hot spots are the intersection of SH 105 and U.S. 59 (77 crashes) and the 1.3-mile stretch of SH 105 that overlaps intersections with I-45 and SH 75 (60 crashes).

SH 105 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
LP 336	IH-45 N. to Conroe city limits 0.47 mi east of MP RR	Widen to 6-lane divided	\$ 7,673,000
FM 2854	LP 336 to IH-45 N	Widen to 4-lane divided	\$ 6,113,000
1st St.	SH 105 to Foster Dr	Widen to 4-lane undivided	\$ 3,780,000
Gladstell	FM 1314 to LP 336 E	Construct new 4-lane undivided road	\$ 3,500,000
SH 75	S. Post Oak Dr. to IH-45 Underpass	Widen to 4-lane divided	\$ 1,000,000
TOTAL:			\$ 22,066,000
Long-Term			
Facility	Section	Description	Cost
SH 321	LP 573 in Cleveland to SH 105	Widen & reconstruct to 4-lane divided	\$ 12,500,000
US 59 N	North end of Cleveland bypass to San Jacinto county line	Construct 4-lane rural freeway	\$ 5,000,000
Gladstell	IH-45 N to LP 336 W	Widen to four lanes	\$ 4,500,000
Walden	Walden to FM 149	Construct 2-lane undivided extension	\$ 3,420,000
Foster	US 75 to FM 1314	Widen to 4-lane undivided	\$ 3,320,000
TOTAL:			\$ 28,740,000

SH 146 Corridor

Overview

The State Highway 146 corridor consists of the highway facility and the surrounding area three to five miles north and south of the freeway. The corridor extends about 40 miles from U.S. 90 in Liberty County in the north to I-45 in Galveston County in the south. Included within the corridor are portions of Chambers, Liberty, Harris and Galveston counties, and the cities of Dayton, Mont Belvieu, Baytown, La Porte, Morgan's Point, Shore Acres, Taylor Lake Village, Seabrook, El Lago, Houston, League City, Clear Lake Shores, Kemah, Texas City and La Marque. SH 146 serves as the primary corridor along east Galveston Bay.



Land Use

Land use in the northern section of the corridor is primarily agricultural, with low-density residential and commercial land uses in Dayton and Mont Belvieu. From I-10 East, development is more mixed, with residential communities and commercial areas scattered along Galveston Bay. There is also a greater presence of industrial activity, especially between I-10 East and the City of Seabrook, with heavy concentrations in Baytown and La Porte.

Transit

There is no transit within the corridor.

Major Attractors

Running adjacent to Galveston Bay, SH 146 serves many of the ports and petrochemical operations that are major employers in the region. Within the SH 146 corridor, 21 major trip generators and attractors have been identified.

Major Trip Generators and Attractors		
Facility	Type	Location
Conoco	Industrial	West side of SH 146 north of I-10 south of Crosby Barbers Hill Road (FM 1942)
Exxon	Industrial	West side of SH 146 north of I-10
Chevron	Industrial	West side of SH 146 north of I-10 near Loop 207
Diamond Shamrock	Industrial	East side of SH 146 north of I-10 on Loop 207
Exxon Chemical	Industrial	North of Park South of SH 330
DuPont De Nemours	Industrial	Northwest corner of SH 225 and SH 146
Barbours Cut Channel/Terminal	Transportation	North side of W. Barbours Cut Blvd.
Container Freight Station	Transportation	Northwest corner Barbours Cut Blvd. and N. Broadway
PPG	Industrial	Northwest corner SH 146 and Fairmont Pkwy.
Goodyear/Rohn & Haas/Lubrizol	Industrial	Southwest corner SH 146 and Fairmont Pkwy
Hercules/Himont/Big Three/ Arco/FMC	Industrial	Northwest corner SH 146 and Choate Road
Carpenter Chem/ WelChem	Industrial	Southwest corner SH 146 and Choate
Dixie Chem/Gulfcoast Limestone	Industrial	West of Port Road south of Choate Road
Bayport Channel/Terminal	Transportation	Northeast corner SH 146 and Port Road
United Energy/Petro United/ Celanese	Industrial	Northeast corner SH 146 and Port Road
American Hoechst	Industrial	Southeast corner SH 146 and Port Road
Armand Bayou Park	Recreational	Between Bay Area Blvd and Kirby on Red Bluff Road
Houston Lighting & Power Co.	Energy	East of SH 146 and south of Grand
Union Carbide/Amoco Chemical Company/Texas City Plant	Industrial	East of SH 146 between 5th Ave South and SH 341
Union Carbide/ Phibro	Industrial	East of SH 146 on east side of Loop 197
Port of Texas City	Transportation	East of SH 146 on east side of Loop 197
Arco Pipe Line Co	Industrial	East of SH 146 south of SH 341 and west of Loop 197

Demographics

Population in the SH 146 Corridor is anticipated to increase by nearly 50 percent (more than 72,000 people) by 2025. The section between I-10 East and the Galveston County line is expected to receive the majority of the growth, increasing by 57 percent (43,000 people). Employment in the corridor is expected to grow by nearly 62 percent by 2025, adding more than 33,000 jobs. Two-thirds of those jobs are anticipated to locate between I-10 East and the Galveston County line.

Population	2000	2025	Growth	Percent Growth
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Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 146	144,388	216,476	72,088	49.9 percent
San Jacinto Co. Line - FM 1409	16,388	26,525	10,137	61.9 percent
FM 1409 - I-10 E	9,651	14,012	4,361	45.2 percent
I-10 E - Galveston Co. Line	75,455	118,365	42,910	56.9 percent
Galveston Co. Line - I-45 S	42,894	57,574	14,680	34.2 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 146	53,608	86,624	33,016	61.6 percent
San Jacinto Co. Line - FM 1409	5,702	9,144	3,442	60.4 percent
FM 1409 - I-10 E	4,471	5,897	1,426	31.9 percent
I-10 E - Galveston Co. Line	27,621	50,116	22,495	81.4 percent
Galveston Co. Line - I-45 S	15,814	21,467	5,653	35.7 percent

Traffic Analysis

Most of SH 146 has tolerable to moderate levels of congestion. The section between FM 518 and Repsdorph Road registers severe levels of mobility during both the morning and afternoon commutes.

<i>Travel Data</i>	2000	2025	Percent Change
Daily VMT (in millions)	2.9	5.8	104.3 percent
Percent of Roads Congested	2.1 percent	8.8 percent	315.1 percent

Safety

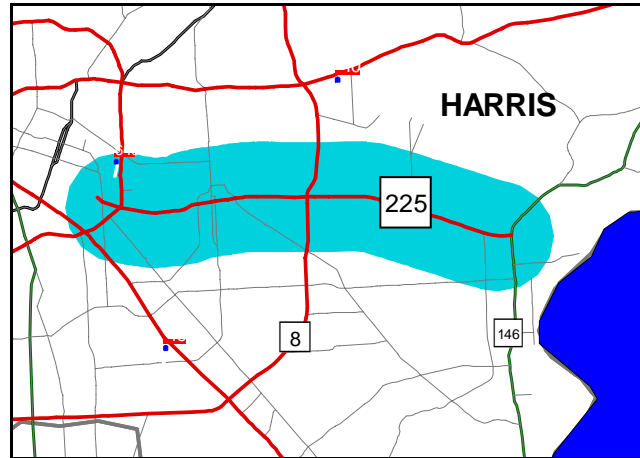
In 1998, there were 387 crashes along SH 146, including three fatal crashes. Of these, 323 (including the fatal crashes) occurred on SH 146, south of U.S. 90. Four crash hot spots were identified, including a 2/3-mile stretch south of Main Street (40 crashes) and a 2/3-mile stretch around SH 99/NASA Road (39 crashes).

SH 146 Corridor Future Improvements				
Short-Term Facility	Section	Description	Cost	
SH 146	South side of Kemah Channel @ 3rd St. to FM1765/FM 348/5th Ave in Texas City	Widen to six lanes w/two 3-lane front rds	\$	112,500,000
BS 146	SH 146 to SP 55	Reconstruct & widen to 4-lane freeway and 4-lane front rd	\$	30,383,813
SH 146	Red Bluff to south side of Kemah Channel @ 3rd St	Widen to six lanes w/two 3-lane front rds	\$	30,000,000
Bay Area Blvd	Spencer Hwy to SH 225	Widen to 4-lane road	\$	8,000,000
BS 146 (LP 410)	Fairmont Pkwy in La Porte to SH 146	Widen to 4-lane divided	\$	7,841,000
BS 146	Fairmont Pkwy in La Porte to SH 146	Widen to 4-lane divided	\$	7,841,000
FM 518	FM 1266 to SH 146	Widen to 4-lane divided	\$	4,827,000
25th Ave N.	SH 3 to SH 146	Construct 4-lane divided road	\$	4,595,000
FM 646	1.0 mi east of SH 146 to SH 146	Widen to 4-lane divided	\$	3,062,000
TOTAL:			\$	209,049,813

SH 225 Corridor

Overview

The 15-mile SH 225 (La Porte Freeway) corridor consists of the freeway facility and the surrounding area. The corridor begins at the I-610 East and follows SH 225 to its end at SH 146 in La Porte. The cities within the corridor are Houston, Pasadena, Deer Park and La Porte.



Land Use

Nearly the entire SH 225 corridor is lined with petrochemical refining and other industrial uses that are served by their proximity to the Interstate Highway System and to the Port of Houston Ship Channel. This is particularly true on the north side of the highway corridor (between SH 225 and the Houston Ship Channel).

Major Attractors

Within the SH 225 corridor, nine major trip generators and attractors have been identified. Running parallel with the Houston Ship Channel, the area is contains many industrial activities, primarily serving the petrochemical industry.

Major Trip Generators and Attractors		
Facility	Type	Location
Miles Chem./Goodyear/Mobil Hem/ Texas Petroleum	Industrial	Southside of SH 225 between I-610 East and Allen Genoa Road
Houston Ship Channel/Sims Bayou Turning Basin	Transportation	2500 feet on each side of the channel is within the Port Authority Limits
Charter Oil/Arco/Crown Central/ Lyondell Petroleum/Sinclair	Industrial	Northside of 225 between I-610 East and Electric Co. Road
Marathon Tanks	Industrial	Southside of SH 225 between Red-Bluff Road and Jefferson
Crown Central Petroleum/GATX Pasadena/ Mobil Chem./ Philips/ Ethyl/Georgia Gulf/Tenneco	Industrial	Northside of SH 225 between Red-Bluff Road and Beltway 8
Shell Oil/Lubrizol/Rohm & Haas/BF Goodrich/ITC/Paktank Deer Park/Rollin Env/WR Grace	Industrial	Northside of SH 225 between Beltway 8 and SH 134
Occidental Chem./Cosden Oil/BF Goodrich/Texas Alkyls/Dow Chemical/USS Chemicals/ HL&P Sam Bertron Station/DuPont Syngas/Air Products La Porte	Industrial	Northside of SH 225 between SH 134 and Sens Road
DuPont De Nemours	Industrial	Northside of SH 225 between Sens Road and Strang Road
Barbours Cut Turning Basin and Container Terminal	Transportation	The northside of W. Barbours Cut Blvd. East

Transit

There is no transit provided within the corridor.

Demographics

Population in the SH 225 Corridor is anticipated to increase by 43 percent (more than 24,000 people) by 2025. Most of the growth is projected to occur between Broadway and Beltway 8, adding more than 17,000 people. Employment in the corridor is expected to grow by 52 percent by 2025, adding more than 17,000 jobs. Most of the growth is expected to occur in the section between Broadway and Beltway 8, which will add more than 11,000 jobs during this period.

<u>Population</u>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 225	57,213	81,662	24,449	42.7 percent
Broadway St. - BW 8	46,444	63,861	17,417	37.5 percent
BW 8 - Galveston Bay	10,769	17,801	7,032	65.3 percent

<u>Employment</u>	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 225	33,491	50,957	17,466	52.2 percent
Broadway St. - BW 8	17,841	29,179	11,338	63.6 percent
BW 8 - Galveston Bay	15,650	21,778	6,128	39.2 percent

Traffic Analysis

SH 225 experiences serious to severe levels of congestion between Beltway 8 and I-610 East during the morning commute. The section between Red Bluff Road and Allen Genoa Road shows severe LOM during this period, as well as the intersection where SH 225 meets I-610 East. The afternoon commute registers less congestion along this section, however, serious congestion exists from I-610 East to Tatar.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	2.6	4.2	60.5 percent
Percent of Roads Congested	0.9 percent	15.3 percent	1530.7 percent

Safety

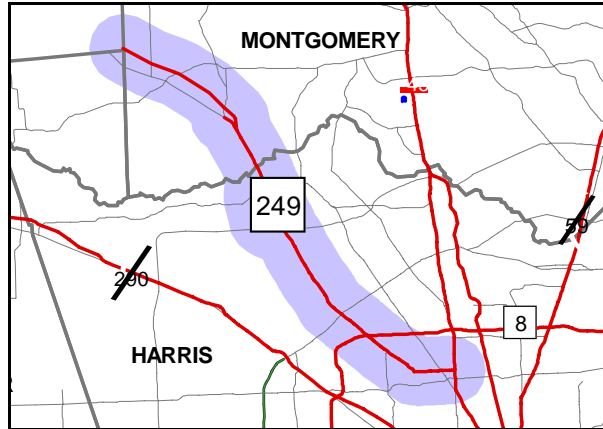
There were 96 crashes on SH 225 in 1998, including 12 that had incapacitating injuries and no identified fatalities. There were no hot spots identified on SH 225, and compared to other major roads in the region, the highway is not hazardous.

SH 225 Corridor Future Improvements			
Short-Term			
<u>Facility</u>	<u>Section</u>	<u>Description</u>	<u>Cost</u>
Bay Area Blvd	Spencer Hwy to SH 225	Widen to four lanes	\$ 8,000,000
Harris Ave	Shaver to Red Bluff	Widen to 4-lane undivided	\$ 6,130,000
TOTAL:			\$ 14,130,000

SH 249 Corridor

Overview

The State Highway 249 (Tomball Parkway) corridor is approximately 37 miles in length and consists of the area two miles east and west of the freeway. The corridor originates at the intersection of SH 249 and I-45 North, and runs northwest through Montgomery County to the Waller and Grimes County lines. The corridor is comprised of cities within both Harris and Montgomery counties, including the City of Houston, Tomball, Decker Prairie, Pinehurst and Magnolia.



Land Use

Land use from I-45 North and Spring-Cypress Road consists of residential clusters with commercial activity along the major thoroughfares. Many of these residential areas are separated by large areas of open space. The area between Beltway 8 and Spring-Cypress Road has more residential and commercial activity than within the Beltway. Much of this may be due to Willowbrook Mall and the presence of HP/Compaq in the area. Beyond Spring-Cypress Road, land use intensity decreases. This portion of the corridor is primarily open space with low-density residential areas in communities, such as Tomball, Pinehurst, and Magnolia.

Major Attractors

Within the SH 249 corridor, there are six major trip generators or attractors, including Tomball College, Compaq Computer Corporation's headquarters, Willowbrook Mall, Sam Houston Race Park, Spring Creek Park and Tomball Regional Hospital.

Major Trip Generators and Attractors		
Facility	Type	Location
Tomball College	Higher Education	30555 SH 249 at Park Place
HP/Compaq Computer	Commercial / Manufacturer	SH 249 and Compaq Center Drive
Willowbrook Mall	Commercial	FM 1960 and SH 249
Sam Houston Race Park	Commercial	SH 249 and N. Sam Houston Pkwy
Spring Creek Park	Public / Municipal	SH 249 and Brown Road
Tomball Regional Hospital	Medical	605 Holderreith Blvd.

Transit

METRO operates one commuter route on SH 249. The corridor has a transit center at Little York near West Montgomery, which serves as a transfer point for five routes. The Seton Lake Park and Ride facility is located at Bammel and North Houston, serving two routes.

Demographics

The SH 249 corridor is expected to experience considerable population and employment growth through 2025. Population in the corridor is anticipated to grow by 66 percent (101,000 people) during this period. The majority of growth will occur within Harris County. Employment in the corridor is expected to grow by nearly 49,000 jobs, a 90 percent increase by 2025. More than half the growth is anticipated to occur between FM 1960 and the Montgomery County line.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 249	153,884	255,178	101,294	65.8 percent
I-45 N - FM 1960	62,867	102,410	39,543	62.9 percent
FM 1960 - Montgomery Co. Line	78,395	125,079	46,684	59.5 percent
Montgomery Co. Line - Waller Co. Line	12,622	27,689	15,067	119.4 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 249	54,542	103,420	48,878	89.6 percent
I-45 N - FM 1960	22,263	41,675	19,412	87.2 percent
FM 1960 - Montgomery Co. Line	30,433	57,927	27,494	90.3 percent
Montgomery Co. Line - Waller Co. Line	1,846	3,818	1,972	106.8 percent

Traffic Analysis

A considerable portion of SH 249 experiences serious congestion during the morning commute. Much of the facility from FM 149 to West Gulf Bank registers serious LOM. Sections from Boudreaux to Spring-Cypress Road and intermittent spots between Cypresswood and West Gulf Bank register severe levels. Cypresswood, FM 1960, Gessner and Cutten show severe LOM at their intersections with SH 249. The afternoon commute shows an overall reduction in congestion on the facility. Several sections of SH 249, including West Gulf Bank to Mount Houston and Spring-Cypress to Boudreaux, show severe levels of congestion during this period.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	3.0	7.5	153.5 percent
Percent of Roads Congested	14.8 percent	32.8 percent	121.6 percent

Safety

In 1998, the Department of Public Safety (DPS) documented 572 crashes occurring on State Highway 249. These crashes included 10 involving fatalities and 34 involving incapacitating injuries.

The seven areas in the corridor that accounted for a minimum of 25 crashes or more are:

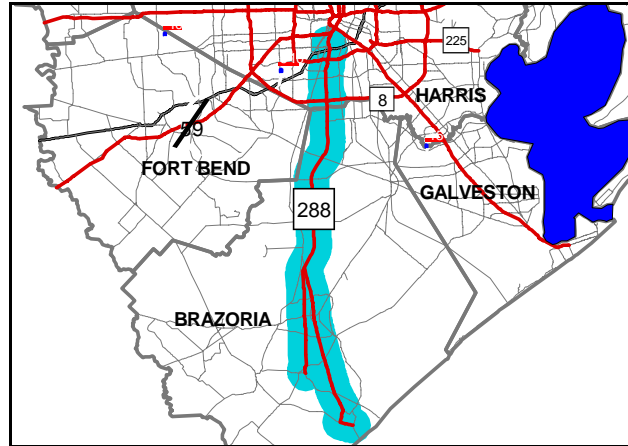
1. A 2/3-mile stretch bordering the crossing with Verteran's Memorial (25 crashes, including one fatal crash).
2. A 0.8-mile stretch between Mosielee Road and Lincoln Road (41 crashes, including one fatal and four incapacitating injury crashes).
3. A 2/3-mile stretch between Houston-Rosslyn and Seton Lake (63 crashes, including two with incapacitating injuries).
4. A 0.6-mile stretch around the intersection with Beltway 8 (50 crashes, including one fatal and one incapacitating injury crash).
5. A 0.6-mile stretch from Compag Visitor Drive (29 crashes).
6. A 0.7-mile stretch northwest from Spring Cypress Drive (42 crashes, including three with incapacitating injuries).
7. A 0.6-mile stretch on both sides of FM 2920 (49 crashes).

SH 249 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
SH 249	FM 1774 to Grimes county line	Construct four mainlanes	\$ 40,000,000
SH 249	Willow Creek to Brown Rd	Construct 6-lane freeway	\$ 23,746,959
FM 1774	0.56 km south of FM 1488 to FM 149	Widen to 4-lane divided	\$ 16,960,000
Mt. Houston	IH-45 N to Aldine Westfield	Widen to and construct 4-lane divided	\$ 11,500,000
Hollister	Breen Rd to Fallbrook	Construct 4-lane concrete blvd	\$ 8,500,000
Cypress-N. Houston	Jones Rd to Perry	Construct 4-lane road	\$ 7,000,000
SH 249	Brown Rd to Montgomery county line	construct two 3-lane frontage roads	\$ 6,793,000
Ella (Wheatley)	Little York to W. Gulf Bank	Widen to 4-lane divided	\$ 6,615,000
W. Greens Rd	SH 249 to Cutten Rd	Construct 4-lane divided concrete road	\$ 6,500,000
Perry Rd	FM 1960 to Mills Rd	Widen to 4-lane road	\$ 5,000,000
Grant Rd	Cypress Creek to west of Jones Rd	Construct 4-lane blvd or 5-lane road	\$ 4,800,000
FM 1774	Grimes county line to Montgomery county line	Widen to 4-lane divided	\$ 4,300,000
West Rd	Hollister to SH 249	Construct new 4-lane divided	\$ 3,000,000
TOTAL:			\$ 144,714,959
Long-Term			
Facility	Section	Description	Cost
SH 249	Harris county line to FM 1774	Construct six mainlanes	\$ 27,903,700
SH 249	Westlock Dr. to Willow Creek	Phase 2-Construct 6-lane freeway	\$ 26,534,400
Greens Rd	SH 249 to Jones Rd	Construct 4-lane road	\$ 25,640,000
Fallbrook Dr.	SH 249 to IH-45 N	Construct 4-lane road	\$ 19,990,000
T.C. Jester	BW 8 to SH 249	Construct 4-lane road	\$ 9,280,000
T.C. Jester	SH 249 to Gulf Bank	Construct 4-lane divided	\$ 5,500,000
SH 249	Brown Rd to Montgomery county line	Construct six mainlanes	\$ 5,040,000
TOTAL:			\$ 119,888,100

SH 288 Corridor

Overview

The State Highway 288 (South Freeway) corridor is approximately 63 miles in length and consists of the area two miles east and two miles west of the freeway. The corridor originates at the intersection of SH 288 and U.S. 59 South in Harris County. It spans south through Brazoria County, merges with SH 288 Business, south of Clute, and ends at the intersection of SH 288 and SH 36 in Freeport. This corridor includes Harris and Brazoria counties and the cities of Houston, Angleton, Lake Jackson, Freeport, Surfside Beach and Pearland.



Land Use

Most of the development within the SH 288 Corridor occurs at each end of the corridor. The northern end, between downtown and the I-610 Loop, has a variety of land use activities, including residential and commercial use, Rice and Texas Southern Universities, the Texas Medical Center, the Astrodome Complex, and several business and industrial parks around the intersection of I-610. The southern end of the corridor, near the Gulf of Mexico, is highly industrialized with the presence of petrochemical facilities, including Dow in Lake Jackson, and the Port of Freeport. Much of SH 288 through Brazoria County is characterized by its floodplains and is primarily rural open space with low-density residential areas.

Major Attractors

Within the SH 288 corridor, there are five major trip generators or attractors, including Rice and Texas Southern Universities, the Texas Medical Center, the Dow Chemical Facility in Freeport, and the Port of Freeport on the Gulf of Mexico.

Major Trip Generators and Attractors		
Facility	Type	Location
Rice University	University	Main and University
Texas Southern University	University	Blodgett and Ennis
Texas Medical Center	Health Care Complex	Holcombe between S. Main & Almeda
Dow Chemical	Manufacturing	Freeport, east of SH 1495
Port of Freeport	Transportation/ Warehousing	Freeport, along the Brazos River

Transit

Transit is limited to a few local routes within this corridor. Paratransit services in Brazoria County are provided by Connect Transportation.

Demographics

Population in the SH 288 corridor is anticipated to increase by nearly 50 percent (more than 70,000 people) by 2025. The section between Beltway 8 and SH 6 is expected to receive a significant portion of the growth, increasing by 215 percent (46,000 people). Employment in the corridor is expected to grow by nearly 32 percent by 2025, adding more than 35,000 jobs. Half of

those jobs are anticipated to locate in the section between U.S. 59 South and I-610 during this period.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 288	141,803	212,054	70,251	49.5 percent
U.S.59 S - I-610	40,826	60,155	19,329	47.3 percent
I-610 - BW 8	10,634	22,702	12,068	113.5 percent
BW 8 - SH 6	14,742	46,471	31,729	215.2 percent
SH 6 - SH 35	15,280	20,106	4,826	31.6 percent
SH 35 - City of Freeport	60,321	62,620	2,299	3.8 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 288	111,346	146,370	35,024	31.5 percent
U.S.59 S - I-610	68,050	85,913	17,863	26.2 percent
I-610 - BW 8	6,071	11,673	5,602	92.3 percent
BW 8 - SH 6	927	2,100	1,173	126.5 percent
SH 6 - SH 35	9,603	13,274	3,671	38.2 percent
SH 35 - City of Freeport	26,695	33,410	6,715	25.2 percent

Traffic Analysis

SH 288 registered serious to severe levels of mobility during the morning commute from Brazoria County Road 58 to Old Spanish Trail. Several sections of the facility, including Dallas Road to FM 518, FM 2234 to Beltway 8, and Almeda Genoa to Reed Road, register severe levels of congestion during this period. Dallas Road, FM 518 and I-610 South all show severe LOM at their intersection with SH 288. Congestion is reduced during the afternoon commute. The facility shows tolerable to moderate LOM with the exception of the stretch between Reed Road and Almeda Genoa, which registers serious congestion during this period.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	5.0	7.3	48.2 percent
Percent of Roads Congested	2.7 percent	6.6 percent	147.0 percent

Safety

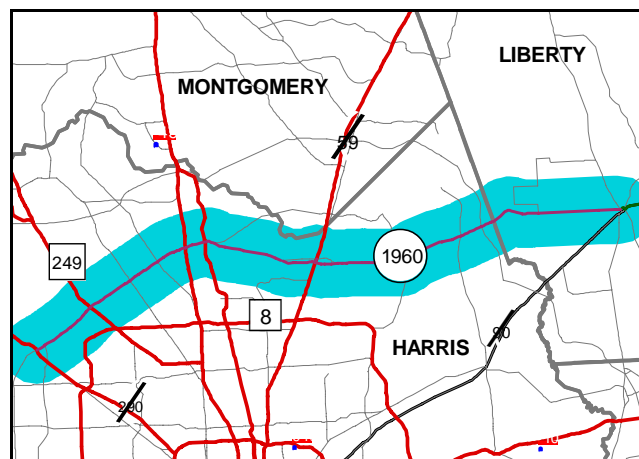
There were 348 motor vehicle crashes in 1998, including seven fatal and 28 incapacitating injury crashes. One crash hot spot was identified at the intersection of SH 288 and SH 35, where there were 24 crashes.

SH 288 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
BS 288B	0.8 mi south of SH 35 to north end of Bastrop Bayou	Widen to six lanes	\$ 18,800,000
US 59 S	SH 288 to SP 527	Widen to 10 main lanes	\$ 12,000,000
SH 35	FM 523 to Rock Island St. in Angleton	Widen to 6-lane divided	\$ 10,457,000
FM 2234	Fort Bend county line to SH 288	Widen to four lanes	\$ 7,000,000
CR 403	SH 288 to FM 865	Widen to four lanes	\$ 6,680,000
FM 865	Almeda-Genoa to Brazoria county line	Widen to 4-lane divided	\$ 5,368,000
FM 523	SH 332 to 0.2 mi south of FM 1495	Widen to 4-lane divided	\$ 5,310,000
Scott	East Orem to Fuqua	Construct 4-lane road	\$ 4,600,000
Buffalo Speedway	W. Bellfort to Holmes	Construct 4-lane divided	\$ 3,600,000
Kirby Dr.	Holmes to Reed	Construct 4-lane divided	\$ 3,500,000
SH 35	T.J. Wright St. to SH 288	Widen to 6-lane divided	\$ 2,323,000
Wheeler	Blodgett to Calhoun	Widen to 4-lane divided	\$ 2,200,000
SH 35	Rock Island St. in Angleton to BS 288B	Widen to 3-lane one-way pair	\$ 1,230,000
SH 35	BS 288B to T.J. Wright St.	Widen to 3-lane one-way pair	\$ 839,000
FM 521	Tyler Dr. to Fort Bend county line	Widen to 4-lane divided rural	\$ 733,000
TOTAL:			\$ 84,640,000
Long-Term			
Facility	Section	Description	Cost
Blodgett	Main to Scott	Widen to 4-lane undivided	\$ 4,500,000
Reed Rd	Almeda to Kirby	Construct 4-lane divided	\$ 4,230,000
FM 865	Harris county line to FM 518	Widen to 4-lane divided	\$ 4,000,000
FM 2004	SH 288 to SH 332	Widen to 4-lane divided	\$ 3,450,000
Kirby Dr	Reed to Almeda	Widen to 4-lane road	\$ 1,000,000
TOTAL:			\$ 17,180,000

FM 1960 Corridor

Overview

The FM 1960 corridor is approximately 47 miles long. The corridor consists of the area that is one to two miles on either side of the facility from U.S. 290 on the West to its intersection with U.S. 90. Included within the corridor are the Cities of Houston, Spring and Humble, and unincorporated portions of Harris and Liberty counties.



Land Use

Land use in the FM 1960 corridor between U.S. 290 and I-45 North is predominately residential, with commercial activities lining the major arterials. The level of density declines east of I-45 North, with residential use primarily occurring between U.S. 59 and Lake Houston in Kingwood and Humble. The most notable activity center in the area is Bush Intercontinental Airport, which served 35 million passengers in 2001. Beyond Lake Houston, land use consists of mostly undeveloped farm and ranch lands.

Major Attractors

Within the FM 1960 corridor, eight major trip generators and attractors were identified. These attractors and generators include George Bush Airport, Willowbrook Mall, two major shopping plazas and 4 major medical facilities.

Major Trip Generators and Attractors		
Facility	Type	Location
Bush IAH Airport	Airport	FM 1960 and US 59N
Willowbrook Mall	Commercial	FM 1960 and SH 249
Humble Wood Plaza	Commercial	FM 1960 and US 59N
North Junction Plaza	Commercial	FM 1960 and I – 45N
THC Houston	Medical	FM 1960 and Fallbrook
Cy-Fair Medical Center	Medical	FM 1960 and Fallbrook
Cypress Creek Hospital	Medical	FM 1960 and Cypress Station
Northwest Medical Center	Medical	FM 1960 and Oakleaf

Transit

METRO has limited local service within the corridor. There are two accessible park and ride facilities within the corridor – Spring (Bammel and FM 1960) and Townsen (North of Deerbrook Mall) – which connect to the METRO system.

Demographics

Population in the FM 1960 corridor is anticipated to increase by 60 percent (nearly 141,000 people) by 2025. The section between U.S. 290 and I-45 North is expected to grow by 48 percent (64,000 people). Employment in the corridor is expected to grow by nearly 77 percent by 2025, adding nearly 75,000 jobs. The section between U.S. 290 and I-45 North is anticipated to register the greatest increase, adding nearly 34,000 jobs during this period.

<i>Population</i>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
FM 1960	234,636	375,230	140,594	59.9 percent
U.S. 290 - I-45 N	133,620	197,986	64,366	48.2 percent
I-45 N - U.S. 59 N	45,944	85,989	40,045	87.2 percent
U.S. 59 N - Liberty Co. Line	48,998	81,986	32,988	67.3 percent
Liberty Co. Line - U.S. 90 E	6,074	9,269	3,195	52.6 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent

FM 1960	97,523	172,091	74,568	76.5 percent
U.S. 290 - I-45 N	60,933	94,723	33,790	55.5 percent
I-45 N - U.S. 59 N	23,130	43,637	20,507	88.7 percent
U.S. 59 N - Liberty Co. Line	12,685	32,179	19,494	153.7 percent
Liberty Co. Line - U.S. 90 E	775	1,552	777	100.3 percent

Traffic Analysis

Much of FM 1960 from the Hardy Toll Road to U.S. 290 experiences serious to severe congestion during the morning commute. Much of the section from Champion Forest to SH 249, as well as from Fallbrook to U.S. 290, registers severe LOM during this period. The majority of the facility east of the Hardy Toll Road experiences tolerable to moderate congestion, with the exception of a 2.5-mile stretch between Townsen to Lake Houston Parkway, which shows severe congestion. Aldine-Westfield, the Hardy Toll Road, and Ella Boulevard experience severe congestion at their intersection with FM 1960. Congestion is reduced during the afternoon commute, however, the section between U.S. 290 and the Hardy Toll Road remains predominately serious. Sections, including U.S. 290 to Eldridge Parkway and Mills to Cutten, show severe LOM during this period. Perry, Veterans Memorial, Ella Boulevard, and Aldine-Westfield exhibit severe LOM at their intersection with U.S. 290.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	5.1	8.7	70.0 percent
Percent of Roads Congested	16.5 percent	37.6 percent	127.1 percent

Safety

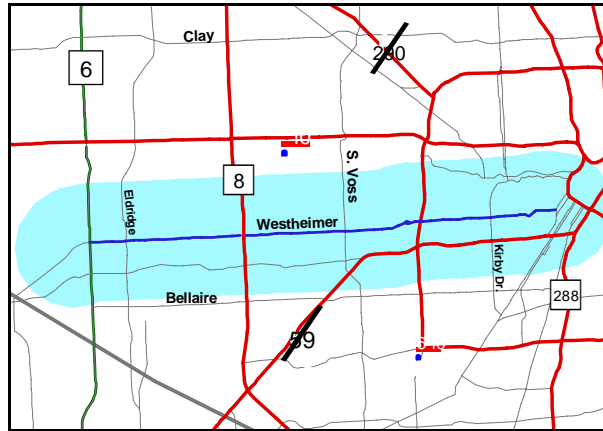
In 1998, there were 1,260 crashes identified on FM 1960. Of these crashes, five involved fatalities and 53 involved incapacitating injuries. Some of the major hot spots for crashes within this corridor includes the area around U.S. 290, west of Veterans Memorial, near Kuykendahl Road and the intersection with U.S. 59 North.

FM 1960 Corridor Future Improvements			
Short-Term			
Facility	Section	Description	Cost
FM 1960	0.1 mi east of Humble to 0.3 mi west of San Jacinto Bridge	Widen to 6-lane divided	\$ 34,073,000
Richey Rd	Veterans Memorial Dr. to Ella Blvd	Construct 4-lane road	\$ 16,050,000
FM 2100	2.1 mi north of Wolf Rd. to FM 1960	Widen to 4-lane divided	\$ 15,467,000
Treaschwig	Aldine Westfield to Cypresswood	Widen to 4-lane undivided	\$ 12,000,000
FM 1960	FM 2100 to Harris-Liberty county line	Widen to 4-lane undivided	\$ 7,096,000
Cypress N. Houston	Jones Rd. to Perry	Construct 4-lane road	\$ 7,000,000
W. Greens Rd	SH 249 to Cutten Rd.	Construct 4-lane divided concrete road	\$ 6,500,000
Fallbrook Dr.	Eldridge to Huffmeister	Construct new 4-lane road	\$ 5,300,000
Perry Rd.	FM 1960 to Mills Rd.	Widen to four lanes	\$ 5,000,000
Richey Rd. W.	Ella Blvd to IH-45 N	Widen to four lanes	\$ 3,500,000
Lee Rd.	FM 1960 to Will Clayton Pkwy	Reconstruct & realign to 4-lane road	\$ 2,850,000
Will Clayton Pkwy	US 59 N to S. Houston Ave	Widen to four lanes w/center left turn	\$ 2,400,000
Aldine Westfield Rd.	FM 1960 to N. Spring	Construct center left-turn lane	\$ 1,000,000
TOTAL:			\$ 118,236,000
Long-Term			
Facility	Section	Description	Cost
Greens Rd.	SH 249 to Jones Rd.	Construct 4-lane road	\$ 25,640,000
Rankin Rd.	US 59 N to Intercontinental Airport	Widen to 4-lane divided	\$ 8,417,405
Cypress N. Houston	Huffmeister to N. Eldridge Pkwy	Widen to six lanes	\$ 5,500,000
TOTAL:			\$ 39,557,405

FM 1093/Westheimer Corridor

Overview

The FM 1093/Westheimer corridor is approximately 16 miles long and between one and two miles wide. The segment runs from SH 6 to the west to Main Street in downtown Houston to the east.



Land Use

FM 1093/Westheimer is a densely populated area that features single and multi-family residential sites, commercial/industrial, retail and business development. The corridor also contains major employment centers, such as Greenway Plaza and the Uptown/Galleria area.

Major Attractors

The FM 1093/Westheimer study area is one of the denser business corridors in the region, contributing to many work-related trips. The Uptown/Galleria area is reported as the nation's largest urban business district.

Major Trip Generators and Attractors		
Facility	Type	Location
Uptown/Galleria	Employment Center/Retail	Northwest quadrant of US 59 S and IH-610 W
Memorial Park	Recreational/Park	Southeast quadrant of IH-10 W and IH-610 W
Greenway Plaza	Employment Center	US 59 S and Buffalo Speedway
West Oaks Mall	Retail	Richmond and FM 1093
Westchase	Employment Center	Westheimer and Beltway 8
Rosewood Medical Center	Medical/Health	Westheimer west of Fondren

Transit

The corridor has a complete range of transit services, including local, commuter, flyer and cross-town routes. The corridor connects four major employment centers: Westchase, Uptown, Greenway Plaza and the CBD. The Westheimer Route is one of the most used routes in the system, with more than 10,000 boardings a day.

Demographics

Population in the FM 1093/Westheimer corridor is anticipated to increase by 46 percent (91,000 people) by 2025. The section between Beltway 8 and SH 6 is expected to receive almost half of the growth, increasing by 64 percent (45,000 people). Employment in the corridor is expected to grow by 24 percent by 2025, adding more than 58,000 jobs. These jobs are expected to be well spread throughout all sections of the corridor.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
FM 1093/Westheimer	195,742	286,498	90,756	46.4 percent
Downtown - I-610	49,577	66,435	16,858	34.0 percent
I-610 - BW 8	75,056	103,817	28,761	38.3 percent
BW 8 - SH 6	71,109	116,246	45,137	63.5 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
FM 1093/Westheimer	239,754	298,134	58,380	24.3 percent
Downtown - I-610	89,232	109,317	20,085	22.5 percent
I-610 - BW 8	112,762	134,739	21,977	19.5 percent
BW 8 - SH 6	37,760	54,078	16,318	43.2 percent

Traffic Analysis

The FM 1093/Westheimer corridor shows significant levels of congestion during both morning and afternoon commutes. Most of the congestion exists between SH 6 and I-610 West. During the morning commute period, FM 1093/Westheimer shows predominately severe congestion, specifically between Dairy Ashford and Chimney Rock. Parallel facilities in the corridor, such as Briarforest, Richmond, Westpark, and U.S. 59 South, register serious to severe LOM. Intersecting roads, such as SH 6, Dairy Ashford, Gessner, and I-610 West show severe LOM at their intersection with the facility. During afternoon peak times, severe congestion is reduced, however, FM 1093/ Westheimer and its parallel arterials still show serious levels of congestion. Intermittent segments between Hillcroft and Dairy Ashford still register severe LOM. Intersecting roads, such as I-610 West, Fondren, Gessner, Wilcrest and SH 6 experience severe LOM at their intersection with the facility during this period.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	4.4	6.4	42.9 percent
Percent of Roads Congested	17.7 percent	34.6 percent	95.3 percent

Safety

Safety is a problem at a number of intersections within the corridor. Recent data indicates that safety countermeasures are warranted at several major intersections along FM 1093/ Westheimer, such as at Chimney Rock, Dunvale Road, and the access to Beltway 8.

Future Improvements

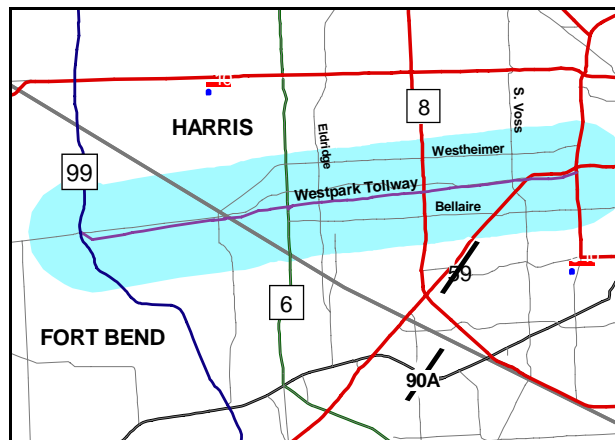
Several entities are working together to meet the transit and transportation needs of this corridor. TxDOT has plans to reconstruct I-610, provide strategically placed direct connectors, and make bridge and frontage road improvements. The Harris County Toll Road Authority (HCTRA) is planning a future Westpark Toll Road. Metro is currently involved in corridor preservation efforts for a future high-capacity transit facility. The Uptown Development Authority has initiated a comprehensive plan to improve overall mobility in the area. In addition to roadway infrastructure and intersection improvements, Uptown will implement a full-scale transportation management system and, an Uptown Shuttle and Uptown Connector transit link. On the western end, the Westchase District has recommended improvements to the intersection of BW 8 and FM 1093/Westheimer. The improvements will likely include a depressed arterial facility.

FM 1093/Westheimer Corridor Future Improvements				
Short-Term				
Facility	Section	Description		Cost
FM 1093	Austin county line to FM 1463/FM359	Widen to 4-lane divided	\$	17,970,000
US 59 S	SH 288 to SP 527	Widen freeway to 10 mainlanes	\$	12,000,000
Westpark	Wilcrest to Dairy Ashford	Construct new 6-lane divided	\$	6,300,000
Rogerdale	Westheimer to north of Westpark	Widen to four lanes	\$	5,330,000
Westpark	Eldridge to SH 6	Construct new 6-lane road	\$	3,600,000
Fondren/Piney Point	Memorial Dr. to Westheimer	Widen to 4-lane undivided	\$	1,950,000
TOTAL:			\$	47,150,000
Long-Term				
Facility	Section	Description		Cost
Gessner	North of Briar Forst to Richmond	Widen to six lanes	\$	1,395,000
Richmond Ave	West of Rogerdale to Wilcrest	Widen to six lanes	\$	1,250,000
Boone Rd.	Alief Clodine to Westpark	Construct 4-lane road	\$	500,000
TOTAL:			\$	3,145,000

Westpark Corridor

Overview

The Westpark corridor is approximately 19.9 miles long and spans from I-610 West to SH 99. Included within the corridor is Houston and unincorporated portions of Harris County.



Land Use

The Westpark corridor is relatively dense with a variety of land uses, including residential areas, light industrial and commercial along major arterials, and major business centers in the Galleria and Westchase areas. The level of density decreases beyond Beltway 8. The land between SH 6 and SH 99 is mostly undeveloped open space.

Major Attractors

Within the Westpark corridor, there are seven major trip generators or attractors, including the Galleria, West Oaks Mall, the Westchase Business District, West Houston Medical Center, the Carillon Shopping Center, Westchase Mall and the Uptown area.

Major Trip Generators and Attractors		
Facility	Type	Location
The Galleria	Commercial	Westheimer and I-610 W
West Oaks Mall	Commercial	Westheimer and SH 6
Westchase Business District	Office	Beltway 8 and Westheimer
West Houston Medical Center	Medical	Richmond and Old Westheimer
Carillon Shopping Center	Retail	Westheimer and Briarpark
Westchase Mall	Retail	Westheimer and Wilcrest

Transit

METRO operates two commuter routes within the corridor. The Hillcroft Transit Center serves as the transfer point for 4 routes. The corridor also has two park and ride facilities: Mission Bend (Alief Clodine and METRO Blvd.) and Gessner (Gessner and Westpark).

A key east-west feature within the corridor is the Southern Pacific Railroad right of way, purchased by METRO in 1992, that runs from Kirby Drive west to SH 6, paralleling Westpark Drive and Alief-Clodine Road. METRO has sold all but 50 feet of this right of way to the Harris County Toll Road Authority, which, in conjunction with the Fort Bend County Toll Road Authority, is currently in the process of constructing a toll road facility from I-610 West to SH 99.

Demographics

Population in the Westpark Corridor is anticipated to increase by 45 percent (nearly 96,000 people) by 2025. The section between Beltway 8 and the Fort Bend County line is expected to grow by 62 percent (45,000 people). Employment in the corridor is expected to grow more than 30 percent by 2025, adding nearly 39,000 jobs. The section between I-610 and Beltway 8 is anticipated to register the largest increase, adding nearly 22,000 jobs during this period.

<i>Population</i>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
Westpark	212,536	308,465	95,929	45.1 percent
I-610 - BW 8	125,144	163,973	38,829	31.0 percent
BW 8 - Fort Bend Co. Line	72,814	117,592	44,778	61.5 percent
Fort Bend Co. Line - SH 99	14,578	26,900	12,322	84.5 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent

Westpark	128,675	167,713	39,038	30.3 percent
I-610 - BW 8	100,674	122,524	21,850	21.7 percent
BW 8 - Fort Bend Co. Line	27,732	43,016	15,284	55.1 percent
Fort Bend Co. Line - SH 99	269	2,173	1,904	707.8 percent

Traffic Analysis

The Westpark Drive corridor experiences serious to severe congestion, as does its parallel facilities between Dairy Ashford and I-610 West, during both morning and afternoon commutes. Bellaire, Alief-Clodine, Harwin, Richmond and Westpark show predominately serious LOM during the morning commute with sections of severe congestion. Westheimer shows severe congestion in this area during this time between Dairy Ashford and I-610 West, as well as the section between Mason Road and FM 1464. During the afternoon commute, congestion remains serious on these facilities, but with fewer stretches of severe congestion.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	4.6	7.6	63.5 percent
Percent of Roads Congested	17.0 percent	25.1 percent	47.5 percent

Safety

In 1998, there were 4,200 motor vehicle crashes in the Westpark corridor (12 percent of all crashes within the Houston Police Department coverage area) and more than 100 pedestrian accidents (about 1/6 of all pedestrian accidents within the Houston Police Department cover area).

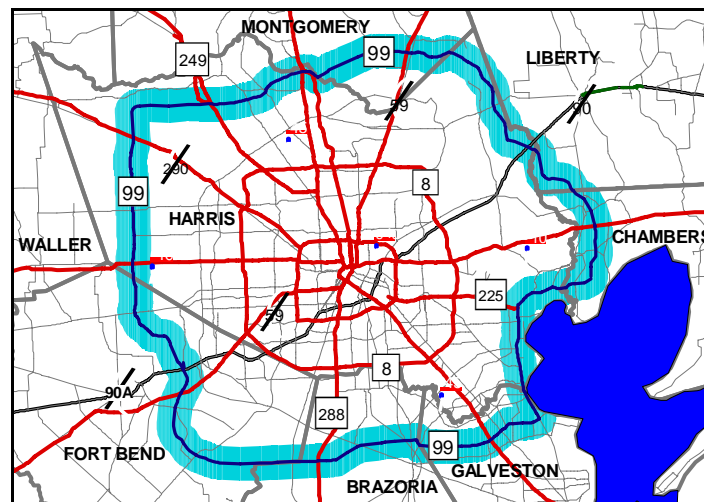
Westpark Corridor Future Improvements				
Short-Term				
Facility	Section	Description	Cost	
Westpark Tollway	SH 6 to FM 1464	Construct 4-lane tollway	\$	98,500,000
Westpark Tollway	FM 1464 to SH 99	Construct 4-lane tollway	\$	60,000,000
Westpark Tollway	Harris county line to FM 1464	Construct 4-lane tollway	\$	58,000,000
Westpark	Wilcrest to Dairy Ashford	Construct new 6-lane divided roadway	\$	6,300,000
Rogerdale	Westheimer to north of Westpark	Widen to four lanes	\$	5,330,000
Westpark	Eldridge to SH 6	Construct new 6-lane road	\$	3,600,000
Bellaire Blvd.	Addicks Clodine to FM 1464	Construct new 4-lane road	\$	3,450,000
			TOTAL:	\$ 235,180,000
Long-Term				
Facility	Section	Description	Cost	
Bellaire Blvd.	San Pablo to SH 99	Construct 4-lane blvd	\$	30,770,000
Beechnut	Lobera to SH 99	Widen to & construct 4-lane roadway	\$	10,528,000
Bellaire Blvd.	Fondren to BW 8	Widen to eight lanes	\$	7,521,948
Beechnut	Harris county line to Addicks Clodine	Widen to 6-lane divided	\$	4,690,000
Richmond Ave	West of Rogerdale to Wilcrest	Widen to six lanes	\$	1,250,000
Boone Rd.	Alief Clodine to Westpark	Construct 4-lane road	\$	500,000
			TOTAL:	\$ 55,259,948

Proposed State Highway 99/Grand Parkway Corridor

Overview

The State Highway 99 (Grand Parkway) corridor consists of the SH 99 freeway facility, both existing and future segments, and the surrounding area (approximately two miles on either side of the freeway). The SH 99 freeway is a partially completed, four-lane freeway that is proposed to serve as Houston's third loop. Once completed, the 170-mile facility will be a four-lane, limited access highway with a greenbelt easement. It is possible that the four lanes will, eventually, be extended to six.

Construction Status of Each SH 99 Freeway Segment				
SH 99 Segment	Location	Constructed	Study Completed/Underway	Planned
A	SH 146 to I-45 S.			X
B	I-45 S. to SH 288			X
C	SH 288 to U.S. 59 S.		X	
D	U.S. 59 S. to I-10 W.	X		
E	I-10 W. to U.S. 290		X	
F	U.S. 290 to I-45 N.		X	
G	I-45 N. to U.S. 59 N.		X	
H	U.S. 59 N. to I-10 E.			X
I	I-10 E. to FM 225			X



Land Use

The SH 99 corridor serves several major intermodal facilities in the region, including four airports, two port terminals and one truck/rail facility. Development along the SH 99 corridor consists of both residential and commercial/business areas. The corridor's residential areas are not densely developed, with some exceptions (e.g., The Woodlands).

Major Attractors

Within the SH 99 corridor, the four major trip generators and attractors include NASA, the Port of Houston, The Woodlands and Compaq Computer Corporation.

Demographics

Population in the proposed SH 99 corridor is anticipated to increase by more than 110 percent, adding more than 357,000 people by 2025. Two segments are expected to experience significant levels of growth. The section between I-45 North and FM 1960 is projected to increase by 181 percent (71,000 people). The section between U.S. 59 South and I-10 West is expected to add more than 107,000 people by 2025. Employment in the corridor is expected to grow by 150 percent by 2025, adding more than 104,000 jobs. The section between I-10 East and I-45 South and the section between U.S. 59 South and I-10 West are expected to register the largest amount of growth in employment, adding approximately 24,000 and 22,000 jobs, respectively.

<i>Population</i>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
SH 99	322,958	680,052	357,094	110.6 percent
I-10 W - U.S. 290	16,421	43,290	26,869	163.6 percent
U.S. 290 - I-45 N	39,207	84,961	45,754	116.7 percent
I-45 N – FM 1960	39,229	110,222	70,993	181.0 percent
FM 1960 - I-10 E	6,069	15,131	9,062	149.3 percent
I-10 E - I-45 S	98,130	145,209	47,079	48.0 percent
I-45 S - SH 288	35,914	66,479	30,565	85.1 percent
SH 288 - U.S. 59 S	17,036	36,271	19,235	112.9 percent
U.S. 59 S - I-10 W	70,952	178,489	107,537	151.6 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
SH 99	69,545	173,917	104,372	150.1 percent
I-10 W - U.S. 290	2,084	14,154	12,070	579.2 percent
U.S. 290 - I-45 N	10,067	29,361	19,294	191.7 percent
I-45 N – FM 1960	6,268	19,680	13,412	214.0 percent
FM 1960 - I-10 E	734	2,069	1,335	181.9 percent
I-10 E - I-45 S	37,384	61,810	24,426	65.3 percent
I-45 S - SH 288	4,801	11,992	7,191	149.8 percent
SH 288 - U.S. 59 S	1,393	6,216	4,823	346.2 percent
U.S. 59 S - I-10 W	6,814	28,635	21,821	320.2 percent

Traffic Analysis

The existing SH 99 corridor experiences low levels of commuter travel and freight movement, primarily because the facility being only partially constructed.

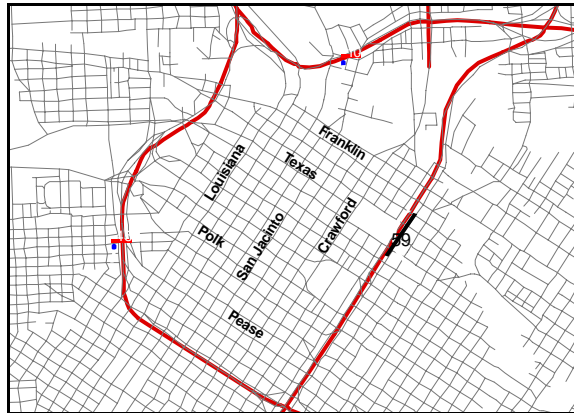
Safety

Since only a small section of SH 99 has been built, safety problems cannot be identified. In 1998, there were four crashes on the part of the corridor that has been built.

Central Business District

Overview

The Houston Central Business District (CBD) is located within I-610 and is comprised of the area immediately south and west. The CBD is bounded by I-10, I-45 and U.S. 59, and it has a land area of roughly 2.25 square miles.



Land Use

The Houston CBD is home to many large corporate companies, including Continental Airlines, Shell Oil, Dynegy, Chevron and Pennzoil-Quaker State Company, Exxon U.S.A and Reliant Energy. Before recent developments, tall skyscrapers and crisscrossing expressways characterized downtown Houston as only a workplace. Now, the Houston CBD has Minute Maid Park and the Toyota Center, as well as a thriving theater district.

Major Attractors

Approximately 100 buildings provide this area with office space. Total existing office space in the Houston CBD is approximately 40 million square feet. The Houston CBD contains four hotels and there are approximately 2,000 rooms for lodging. Total meeting space is more than 600,000 square feet, including some space for meetings from area hotels and the George R. Brown Convention Center. Governmental space totals approximately 6 million square feet and includes correctional, court and non-office facilities. The Houston CBD contains approximately 3 million square feet of retail space.

Transit

The Houston CBD effectively serves as the main transportation hub for the region. The majority of METRO's routes either pass through or have their terminus within the CBD. In January 2004, METRO expanded its transit offerings, opening a 7.5-mile light rail line, connecting the CBD with the Medical Center and the Reliant Center complex. In addition to local transit, both the main bus and train stations are located in the area, providing city-to-city transportation options.

Demographics

Being primarily an employment center, employment growth is expected to exceed population growth in the CBD. Population is expected to increase by 17,530 people, while employment is anticipated to grow by 27,000 jobs.

<i>Population</i>	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
CBD	13,004	30,534	17,530	134.8 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
CBD	156,965	184,011	27,046	17.2 percent

Traffic Analysis

The majority of the CBD experiences tolerable to moderate levels of mobility during morning and afternoon commutes. U.S. 59 North, as well as the ramps from I-45 North and I-10 West into downtown, experience severe congestion during the morning commute. While congestion on U.S. 59 North is reduced to serious LOM during the afternoon commute, the ramps to I-45 North and I-10 West still register severe congestion.

<u>Travel Data</u>	2000	2025	Percent Change
Daily VMT (in millions)	1.2	1.6	40.4 percent
Percent of Roads Congested	2.6 percent	11.4 percent	336.4 percent

Safety

In 1998, there were 281 motor vehicle crashes within the CBD (excluding those on the adjacent freeways), including 12 crashes with incapacitating injuries. Particularly hazardous locations were at Fannin and Walker, where there were six crashes, and at Fannin and St. Joseph, where there were also six crashes. Seven other locations had four crashes each.

Future Improvements

The city of Houston and METRO have begun an ambitious renovation of Fannin and Main streets, including improvements to the associated underground utilities and center median, as well as rebuilding all center lanes. Additional plans are being developed to ensure future access to all downtown components.

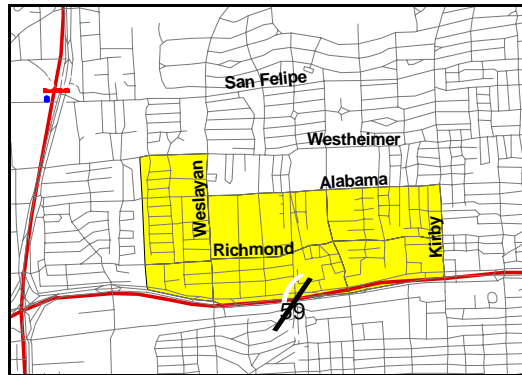
The following is a list of capacity increasing projects in the downtown area:

- Connector Street, from Houston Ave. to I-45 at Franklin, I-10 CBD Ramp, construct easterly portion of HOV Lane Connector Ramp
- I-10 West, CBD to Loop 610, construct 2 HOV Lanes
- I-10 West, Loop 610 to Houston CBD, reconstruct main lanes Ancillary lanes and 2 HOV lanes

Greenway Plaza

Overview

Greenway Plaza is located in close proximity to the Uptown/Galleria activity center within I-610, 2.4 miles southwest of Downtown Houston, and is bounded by Southern Pacific Railroad to the west, Alabama Street to the north, Kirby Avenue to the east and U.S. 59 to the south. It has a land area of about 1.5 square miles.



Land Use

The Greenway Plaza development is the centerpiece of the area. The concept called for a fully integrated office, retail, residential and entertainment complex. The Greenway Plaza area is comprised of approximately 12 million square feet of office space, several clusters of multifamily and single family residential development, and 820,000 square feet of retail. The area also contains the Compaq Center, the former home of the WNBA's Houston Comets and the American Hockey League's Houston Aeros.

Transit

METRO operates a several routes in the area, including seven local routes and three express routes. The Greenway Plaza has a transit center at Buffalo Speedway and Richmond, which serves as a transfer point for the express routes.

Demographics

Population growth in Greenway Plaza is expected to be small. The area will add another 2,400 residents by 2025. Total employment is anticipated to increase by nearly 14,000 workers during this period.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
Greenway Plaza	6,386	8,765	2,379	37.3 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
Greenway Plaza	49,892	63,781	13,889	27.8 percent

Traffic Analysis

Congestion within most of Greenway Plaza is tolerable to moderate during morning and afternoon commutes. U.S. 59 South registers serious levels of congestion during these periods, with the section between Wesleyan and Edloe showing severe LOM. During morning hours, Wesleyan and Kirby both exhibit serious LOM upon intersecting with U.S. 59 South. During the afternoon commute, serious conditions can be found on Wesleyan, Edloe and Buffalo Speedway as they meet with the freeway.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	0.3	0.4	29.2 percent
Percent of Roads Congested	5.7 percent	26.0 percent	358.2 percent

Safety

In 1998, there were 136 motor vehicle crashes within the area including two with incapacitating injuries. A particularly hazardous stretch exists on Kirby between Alabama and U.S. 59, where there were 39 crashes. A bad hot spot is at Kirby and Algerian Way, where there were 10 crashes in 1998. Two other crash hot spots are at Kirby and Norfolk, where there were seven crashes, and at Farnham Road and Sandman Road, where there were also seven crashes.

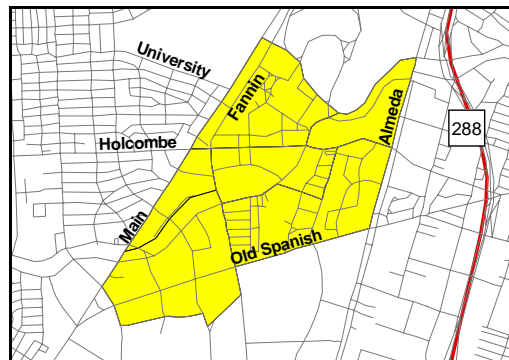
Future Improvements

In this area, there will be no capacity increasing projects during the planning years. However, there are some projects for bicyclists. With bike paths along Wesleyan and West Alabama, mobility for cyclists should improve.

Texas Medical Center

Overview

The Texas Medical Center (TMC), located approximately 2.5 miles south of the CBD, is a densely developed collection of medical facilities that provides superior patient care, research and educational services. The study area is approximately 1.3 square miles and is bounded by Bissonet/Binz to the north, South Braeswood to the south, Almeda Road to the east and South Main to the west.



Land Use

The land use in the TMC is integrated and mixed, involving numerous distinct site-owner entities. The TMC borders single-family communities to the east and south, and higher-density residential communities to the northwest. The area features several major hospital and medical treatment complexes, universities, medical and dental schools, hotels, banks and Hermann Park.

Transit

METRO provides local and commuter transit service to the area via an extensive, interconnected network of circulator, standard passenger, commuter, flyer and express services, as well as restricted bus lanes. In January 2004, the first phase of METRO light rail began serving the area.

Major Attractors

Besides the various facilities at the Medical Center, major traffic generators include AstroWorld, WaterWorld amusement park, and the Reliant Park complex, which includes Reliant Center, Reliant Stadium and the Astrodome. Other area landmarks include facilities of international recognition, such as Hermann Park, the Houston Zoo and the Hermann Golf Course.

Demographics

Population in Medical Center area is expected increase by 1,840 residents by 2025. Total employment is anticipated to increase by nearly 8,900 workers during this period.

Population	2000	2025	Growth	Percent Growth
Regional Growth	4,669,627	7,661,571	2,991,944	64.1 percent
Medical Center	4,610	6,450	1,840	39.9 percent
Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
Medical Center	55,722	64,608	8,886	15.9 percent

Traffic Analysis

Congestion within most of the Medical Center complex is tolerable to moderate during morning and afternoon commutes. Holcombe Street and Outer Belt Drive register serious levels of congestion during the morning commute. During afternoon hours, parts of Holcombe and North MacGregor Drive show serious LOM, as does Main Street from Holcombe to Kirby.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	0.2	0.3	29.1 percent
Percent of Roads Congested	5.9 percent	18.8 percent	221.7 percent

Safety

A number of crashes have occurred within the TMC corridor, and recent data indicates that safety countermeasures are warranted along several major arterials. The most recent fatalities occurred in the vicinity of Almeda and Ewing. The most frequently occurring vehicle/pedestrian crashes

occurred near Almeda and Southmore, and Hermann and Crawford. However, the area directly to the north of this corridor has a lot of pedestrian and bicycle crashes. If bicycle facilities are expanded, then safety design must be an important factor.

Future Improvements

The city of Houston and METRO have begun an ambitious renovation of Fannin and Main streets, including improvements to the associated underground utilities and center median, as well as rebuilding all center lanes. Additional plans are being developed to ensure future access to all of the TMC components. .

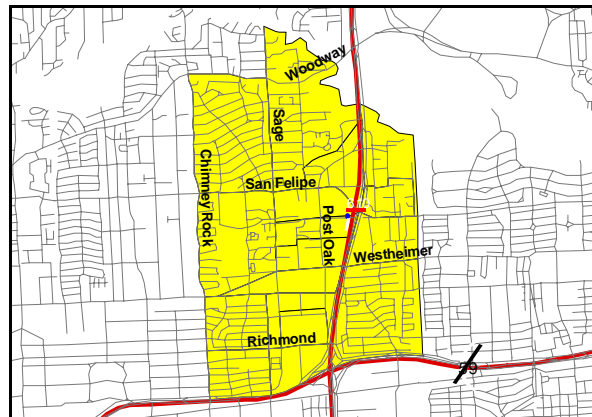
Future corridor improvements also include:

- Extending existing north-south streets for improved collection/distribution.
- Extending Bertner Avenue southward
- Connecting Cambridge Street to North MacGregor Drive via new bridges.
- Providing continuity on east-west streets for linkage to other campus facilities.
- Extending and connecting Herman Pressler Street to Galen Drive.
- Reinforcing Fannin Street as the area's primary arterial.
- Creating a "Gateway Plaza" at Holcombe, Fannin, and Main.
- Eliminating grade separations at the intersections of Holcombe and Fannin, and Holcombe and Main

Uptown/Galleria

Overview

The Uptown Houston area is a unique urban subset of Houston. It is centrally located, approximately five miles west of the Houston CBD. This area is approximately 2.5 square miles and bound by Chimney Rock to the west, Woodway to the north, Southern Pacific Railroad to the east, and Westpark to the south. A major longitudinal freeway facility, Loop 610, traverses the area and provides regional mobility and local access.



Land Use

Uptown's existing land use features several single and multi-family residential clusters, a small grouping of public institutional facilities, 23 million square feet of current office space, 4 million square feet of current retail space, 23 hotels, and 5,300 hotel rooms.

Major Attractors

Major area landmarks include facilities of significant recognition, such as the Galleria, Williams Tower (formerly Transco Tower) and Four Oaks Place.

Transit

METRO operates eight commuter routes and two express routes within the Uptown area. The Uptown area does not have any park and ride facilities or a transit center. However, there are two facilities, the Northwest and Hillcroft Transit Centers, nearby.

Demographics

Population in the Uptown area is expected to increase by 66 percent (nearly 12,700 residents) by 2025 and total employment is anticipated to grow by nearly 17,600 workers during this period.

Population	2000	2025	Growth	Percent Growth
<u>Regional Growth</u>	4,669,627	7,661,571	2,991,944	64.1 percent
Uptown	19,154	31,839	12,685	66.2 percent

Employment	2000	2025	Growth	Percent Growth
Regional Growth	2,178,265	3,469,327	1,291,062	59.3 percent
Uptown	77,166	94,722	17,556	22.8 percent

Traffic Analysis

Congestion within the Uptown/Galleria area ranges from tolerable to severe during morning and afternoon commutes. The major highways, U.S. 59 South and I-610 West, register severe levels of congestion. Portions of Woodway and the section of South Post Oak from Woodway to San Felipe also show severe congestion during both commute periods. Congestion on Westheimer increases to severe levels during afternoon hours. Arterials intersecting the major highways, including Rice, Chimney Rock, Post Oak and Richmond, experience serious to severe LOM upon meeting with those freeways.

Travel Data	2000	2025	Percent Change
Daily VMT (in millions)	1.1	1.5	35.9 percent
Percent of Roads Congested	16.9 percent	39.4 percent	133.8 percent

Safety

Safety is a problem for pedestrians due to the lack of a clearly defined pedestrian network. In 1998, there were 11 motor vehicle crashes with injuries within the area that involved pedestrians. The crashes occurred mostly along Westheimer (7 crashes), but also along Sage, Yorktown and Post Oak Boulevard. There were no bicycle-vehicle crashes reported in 1998 in the area, but if a bikeway is developed, safety has to be a major component.

Future Improvements

The Uptown Development Authority has initiated a comprehensive plan to improve overall mobility in the area. The plan has five basic components and describes, in detail, a systematic approach for creating a more efficient street grid and pedestrian network, improving many of the existing streets, intersections and transit routes, as well as implementing a parking management plan. Additionally, the authority lists the widening of San Felipe from Yorktown to I-610, pedestrian enhancements, the Westpark Toll Road and a Post Oak Boulevard to Westpark improvement as high priority projects.

Two transit projects are planned, including an Uptown Shuttle for Post Oak Boulevard and an Uptown Connector to connect the Northwest Transit Center to a proposed Southwest Transit Center. In addition to the proposed alternative modal projects previously mentioned, the Uptown Development Authority has developed plans to introduce a full range of transportation management services. The transportation management plan includes an Advanced Traveler Information System (ATIS) that uses a regional computerized traffic signal system (RCTSS), closed circuit television, static and changeable message signing, and telecommunications.

Chapter 5

Preservation, Maintenance, and Rehabilitation

National transportation policy has prioritized the need to maintain existing infrastructure for more than a decade. In the context of shrinking resources for new facilities and aging transportation systems it is imperative for regional transportation plans, like the 2025 RTP, to prioritize activities that preserve and maintain the current systems.⁵

Preservation maintenance and rehabilitation (PM&R) is the process of maintaining infrastructure, whether it is roadways, traffic signals, lighting, buses and rail cars, or airport and port facilities. It is a continual and major activity that is required to keep the transportation system functioning. Typically, bridges last 30-40 years; freeways last 20-30 years; and arterials last 20-30 years.⁶ In addition, preventive maintenance (essentially, repaving a road) is typically implemented every 7-10 years while routine maintenance is an on-going activity.

TxDOT uses three categories to describe PM & R. First, they identify roadway preventive maintenance and rehabilitation expenditures (category 1). Second, they identify bridge structures replacement and rehabilitation and railroad-grade crossing rehabilitation (category 6). Third, they identify several maintenance categories including routine maintenance and contracted routine maintenance. In the following analysis, routine maintenance will be accounted for in the Operations and Maintenance estimates for the RTP since it is an on-going activity.

Over the years, TxDOT and local municipalities have become increasingly proactive in the maintenance and rehabilitation of existing roadway infrastructure. A key component involves a pavement management system whose primary purpose is to monitor the condition of Texas pavement. The *Pavement Management Information System (PMIS)* is the primary system currently being utilized by TxDOT to program, budget, schedule, and prioritize preventive maintenance and other life extension activities for existing roadway facilities.

TxDOT reports on the condition of Texas pavements in an annual report. The annual report provides a general overview of the status of Texas pavements over a three to four year period. The report provides pavement ratings and/or scores on a county level basis and performs a needs estimate analysis. The accounting period for the information used in this analysis is FY 2004.

Three primary scores are calculated using ride quality measurements and distress ratings stored in the PMIS database. The calculated output is a series of three scores: ride, distress, and condition. Ride scores are indicative of the quality or roughness of the pavement surface. The indices range for 0.1 (rough) to 5.0 (smooth). Distress scores represent the level of visible surface deterioration. This index varies from 1 (most distress) to 100 (least distress). PMIS condition scores combine ride quality and pavement distress data into a single description of overall pavement condition. The values range from 1 (worst condition) to 100 (best condition).

Pavement Condition

⁵ The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA 21) prioritized maintenance of existing infrastructure.

⁶ Paul E. Guenwald, "Estimating useful lives for capital assets". *Governmental Accounting Focus*, May 2002. <http://www.gfoa.org/services/nl/GAAFRmay-2002-focusarticle.pdf>;

Overall pavement conditions in the eight county TMA showed a slight improvement in FY 2004 when compared to FY 2003. This improvement was primarily attributed to improved average distress and condition scores. The next table provides a summary of PMIS scores for each maintenance section in the Houston District. Average condition, distress, and ride scores for FY 2004 are 81.43, 85.91, and 3.55 respectively.

Houston District PMIS Scores						
	Condition		Distress		Ride	
AREA	2003	2004	2003	2004	2003	2004
N. Brazoria	79.9	80.2	81.6	81.6	3.7	3.7
S. Brazoria	80.7	84.9	82.5	86.6	3.7	3.8
Galveston	81	81.2	85.3	85.5	3.6	3.6
Fort Bend	83.6	79.5	86.4	82.4	3.6	3.7
Montgomery	85.9	86.4	87.7	88.4	3.7	3.8
S. Harris	82.8	79.1	89.3	87.8	3.3	3.2
Waller	87.4	89.5	87.7	89.8	3.9	4
W. Harris	80.9	80.5	88.6	88.2	3.3	3.4
E. Harris	76.9	80.7	81.5	85.6	3.3	3.4
N. Harris	89.8	89.7	94	94.1	3.4	3.5
Central Harris	59.3	64	72.3	75	2.8	3
Average	80.75	81.43	85.17	85.91	3.48	3.55

Approximately 74% of Houston District lane miles are in good condition (PMIS condition score of 70 and above). The table below details the per cent of lane miles in good condition for each maintenance section.

Percent Lane Miles in Good Condition		
AREA	FY 2003	FY 2004
N. Brazoria	75.6	73.6
S. Brazoria	71.3	76.2
Galveston	71.1	71.9
Fort Bend	75.7	63.2
Montgomery	81.3	81.1
S. Harris	79.8	73.2
Waller	80	80.2
W. Harris	71.4	73.4
E. Harris	68.4	73.8
N. Harris	88.7	86.9
Central Harris	50.4	55.6
Average	73.97	73.55

Condition scores are an integral part of the maintenance and preservation function and serve as an important first step in determining the level of financial investment required to rehabilitate and reconstruct the extensive network of roadway. In FY 2003 the Houston District of TxDOT had

approximately 3,400 lane miles of roadway that needed some form of repair based on overall roadway condition scores.

Nevertheless, in spite of slight increases in PMIS condition scores, State roadway condition has been declining in the Houston District. Using an estimate of the percentage of lane miles in good or better condition (condition score of 70 or higher), the percentage fulfilling the above condition dropped from 77.3 percent in 2001 to 73.6 percent in 2004. Unless this trend is reversed, serious deterioration in the State roadway system within our region can be expected, a situation that is common throughout the nation.⁷

Current and Needed Funding Levels

The following information was obtained from the FY 2005 Statewide Preservation Program and confirmed by the Houston District staff. In the Houston District, the current appropriation (FY 2005) for maintenance is \$254 M and projected estimates for years 2006, 2007 and 2008 are \$211 M, \$290 M, and \$246 M respectively based on the Statewide Preservation Program FY 2005–2008 estimates. These include approximately \$109 million for roadway rehabilitation (category 1), \$78 million for bridge and railroad-grade crossing rehabilitation (category 6), and \$67 million for routine and contracted maintenance. The table below provides a breakdown of preservation appropriations for the Houston District by funding categories for FY 2005.

Statewide Preservation Program FY 2005 - Houston District						
Category 1		Category 6		Maintenance		
Preventive Maintenance	Rehabilitation	Bridge	RR Grade Separation	Routine	Contracted	Total
15,445,000	93,160,000	15,433,988	63,154,417	31,106,472	35,936,155	254,233,032

Pavement Condition Goals

In August 2001, the Texas Transportation Commission set a goal to have 90 percent of Texas pavement lane miles in “Good or better” condition by 2011. “Good or better” was defined as a PMIS Condition score of 70 or above. In July 2002, the TxDOT Administration established specific two- and ten-year goals for each district using the 2002 PMIS results as the baseline.

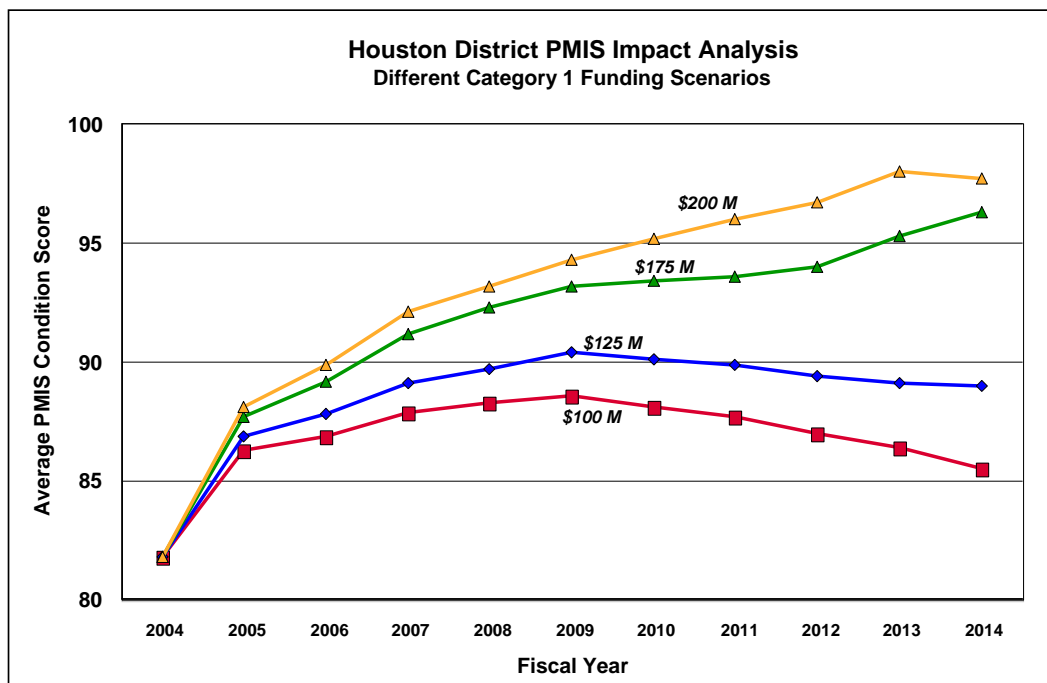
To evaluate fulfillment of this goal, H-GAC and TxDOT staff ran a PMIS analysis using several yearly pavement budgets for a ten year period assuming a baseline average condition score of 82. The basic question was, “What would be the required expenditure in preventive maintenance and rehabilitation (category 1) for the Houston District to maintain the future network at or above a condition score of 90”? The results of this analysis are depicted in the figure below which shows modeled category 1 rehabilitation expenditures.

The figure models expenditure levels of \$100 M, \$125 M, \$175 M, and \$200 M for the time period 2004–2014.⁸ Thus, based on Houston District area engineers estimated needs, and in attempting to meet and maintain an average condition score between 90 and 95, it can be

⁷ American Public Works Association, “Why manage pavement maintenance?”
<http://www.apwa.net/About/SIG/MicroPaver/index.asp?disp=manage>

⁸ The expenditures were based on estimated Houston District pavement cost and does not include bridge and drainage items.

concluded that at least \$ 175 M per year would be needed in the Houston District to meet the statewide goal.



Although \$109 M is programmed for category 1 roadway rehabilitation in 2005 (see table above), approximately \$48 M in expenditures is allocated for non-pavement items such as ITS, traffic system and mobility, leaving \$61 M (\$109 M - \$48 M) for pavement-related items. Thus, the District will only receive approximately 35% (\$61 M ÷ \$175 M) of its pavement maintenance expenditure need in 2005. Budgeted years for 2006-2008 show similar shortfalls. Additionally, if all TxDOT roadways in the Houston District were raised to a condition score of 100 in 2005, it would require approximately \$1 billion.⁹ Thus over a 25-year planning horizon at least \$25 B would be required to bring every section of roadway up to an absolute or very good standard (PMIS condition score of 100) for safe and functional pavement.

Funding of Preservation

Since that standard would not be financially viable, the 2025 RTP recommends a more conservative allocation consistent with the TxDOT -Houston District goals. That local goal is based on the area engineers' needs and attempting to keep an average condition score between 90 and 95 within the 10 year window. Approximately 175 million would be needed per year.

To do this will require about \$225 million a year in actual roadway rehabilitation funding for just the State roadway system (\$175 million for the pavement system and about \$50 million for non-pavement expenditures). In addition, because the number of lane miles on State road facilities will grow by about 1% a year through 2025, allowance is made for the growth of rehabilitation expenditures at a 1% rate.

⁹ Texas Department of Transportation, Pavement Management Information System Executive Summary September 23, 2004.

Independent estimates have been made of need to bring the local road system up to a reasonable condition. The following discusses the expenditure categories for system preservation. There are four categories:

Roadway PM & R (subdivided into State and local roadways)
Bridge Rehabilitation
Transit System PM & R
Port and Airport PM & R

Roadway PM & R

As mentioned above, roadway repairs have not kept pace with the level of roadway deterioration on existing facilities. Simply stated, the current level of funding is not adequate to maintain the existing road system, least of all bring it up to the standards set for the State as a whole by the Texas Transportation Commission. To bring the State road system up to the State goal will require about \$8.8 billion in total rehabilitation expenditures. At current funding levels, the unmet needs gap is about \$4.5 billion.

The City of Houston estimates current roadway rehabilitation needs at \$1.5 billion. If analysts were to assume that other municipalities have \$1.0 billion in PM & R needs, then the total for all local governments in the region is approximately \$2.5 billion. Given all assumptions, the magnitude of total PM & R needs for local governments is approximately \$4 billion. The estimated level of PM & R funding for local roads is about \$1 billion, leaving an unmet needs gap of about \$3 billion.

Uncertainty over long-term roadway PM & R funding

The reality of inadequate funding is likely to get worse over the next few years for the following reasons. First, the funding formula for allocating rehabilitation dollars to the State system has been revised. The TxDOT-Houston District will receive less funding under the new formula. Second, rehabilitation of Intelligent Technologies Systems (ITS) technology is increasing, requiring a larger percentage of PM & R funds. Although Congestion Mitigation Air Quality funds (CMAQ) paid for the initial installation of the systems, the maintenance of ITS systems comes out of rehabilitation funds. In the current year, approximately \$12 million is being spent on ITS rehabilitation. Thus, the increasing share of technology-based expenditures will likely exacerbate the discrepancy between rehabilitation need and available funds over the planning horizon.

Bridge Rehabilitation

Texas leads the nation in the number of bridges totaling 48,500. Two-thirds of the supply of bridges is on state maintained facilities and one-third are on county and city roads. Many of these bridges were built 30 or more years ago. According to the National Bridge Inventory for 2000, 21 bridges in our region are either structurally deficient or functionally obsolete. More than 28 percent of bridges in the region are considered deficient compared to 21 percent statewide. In addition, there are 120 bridges in the eight county region with a low sufficiency rating (FHWA, Office of Bridge Technology; 2000).

The 2025 RTP highlights \$1,893 million for bridge rehabilitation. TxDOT-Houston District estimates that the bridge rehabilitation need for the next 10 years will be \$50 million a year, or

about \$1,150 billion for the period. For local governments, without information to the contrary, H-GAC assumed that bridge rehabilitation needs would be in proportion to the total roadway rehabilitation cost.

Transit System PM & R

Preventive maintenance and rehabilitation of the public transportation system is an important component of transit funding. Federal Transit Authority (FTA) formula funds (section 5307) and other local funds are dedicated to the preservation of the existing infrastructure, which includes Park & Ride and Transit Center facilities, replacement of existing buses, and bus operating facilities (garages). Bus maintenance costs typically increase with vehicle age and cumulative miles. Capital investment in bus replacement, partially funded by FTA grants, is based on federal vehicle replacement guidelines, and varies depending on vehicle type and size. Also, the introduction of light rail will eventually require higher capital appropriations for replacement, preventive maintenance, and rehabilitation of rail facilities and other rolling stock. Transit system PM & R is estimated to cost \$2,885 million over the lifespan of the 2025 RTP or approximately \$125 million per year.¹⁰

Airport and Port PM & R

Airport capital expenditures were based on estimates for the existing capital programs for Bush Intercontinental and Hobby Airport, plus a study involving a 20-year expansion of Hobby Airport. The goal of these programs is an expansion of the physical capacity for both airports. Other capital improvement program and reoccurring expenditures for major maintenance and replacement of plant and facilities were classified as capital preservation.

Planned developments for the Bayport and Texas City Terminals were considered capital additions for capacity enhancement of the referenced ports. All other capital improvement program items were considered PM & R. In summary, H-GAC estimates that approximately \$2.4 billion will be spent on PM & R, and about \$4.85 billion will be spent on operations and maintenance for the airport and cargo port systems through 2025.

Summary of System Preservation Costs

The table below summarizes the current estimates of *preservation maintenance and rehabilitation* needs through 2025. It does not include routine and contracted maintenance which are accounted for in Operations & Maintenance. The estimates assumed the following:

1. The year 2003 is the baseline for all estimates;
2. The current level of State roadway preservation funding in the Houston District is \$129 million a year (in current dollars). This was estimated from the State Preservation Report for 2005 (TxDOT funding category 1);
3. The current annual preservation need for State roads in the Houston District is \$225 million a year (in current dollars). This was estimated by Houston District staff;
4. To estimate the preservation need for Chambers and Liberty Counties, H-GAC staff used the proportion of rehabilitation projects in the RTP database accounted for by those two counties. This turns out to be \$613 million for the 23 year period.

¹⁰ Source: Metropolitan Transit Authority of Harris County 2025 METRO Solutions Transit Plan.

5. The annual preservation need for State roads will grow by 2.7 percent a year, consistent with the growth of State lane miles. This was estimated from the growth of State lane miles.
6. The current level of bridge rehabilitation funding (TxDOT funding category 6) averages about \$60 million a year. This level will drop somewhat due to completing existing bridge rehabilitation projects.
7. Over the next 23 years, however, the current annual bridge rehabilitation needs for State roads will be \$50 million a year. This was estimated by Houston District staff;
8. Local preservation needs were estimated from the City of Houston and Harris County based on a list of their needed rehabilitation;
9. Transit replacement needs were estimated by Metro; and
10. Port and airport rehabilitation needs were taken from their capital improvement program. In these cases, without information to the contrary, the current spending levels were assumed to cover the needs.

Using these assumptions, the gap between the current level of preservation funding and the amount necessary to meet preservation goals will be substantial, accounting for about \$7.5 billion over the 23 year period.

Estimated PM & R Needs: 2002-2025
(\$Million)

	Preservation Needs	Rehab Needs Bridges	Total preservation & rehab Needs	Current preservation estimate	Unmet needs
State	7,659	1,150	8,809	4,348	4,461
Local	3,344	743	4,087	1,091	2,996
Total Roads	11,003		12,896	5,439	6,844
Transit	2,885		2,885	2,885	0
Port & Airport	4,206		4,206	4,206	0
Total	18,094	1,893	19,987	12,530	7,457

Chapter 6

Travel Forecasting Procedures

1 Introduction

This chapter presents the underlying theory and basis for the structure, formulation, and application of each model component. Also described is the series of steps that were followed to enhance and implement the revised regional mode choice model set, as well as the calibration and validation procedures performed to verify the accuracy and acceptability of the complete model set.

Two key sets of data are input to the model: demographic, socioeconomic, and land use information; and the multimodal transportation network level-of-service (LOS) data. In the first stage of the modeling process--trip generation--estimates are developed for eight trip purposes:

- Home-based work person trips (HBW);
- Home-based school person trips (HBSCH);
- Home-based shopping person trips (HBSHP);
- Home-based other person trips (HBO);
- Non-home-based person trips (NHB);
- Truck and taxi vehicle trips (TRTX);
- External-local vehicle trips (EXTL);
- External-through vehicle trips (EXTHR).

2 Trip Generation

Trip generation is performed with a trip production model and a trip attraction model for each trip purpose. These models use the zonal demographic data to estimate the overall magnitude of trip making, that is, the total number of trip ends (trip productions and trip attractions), for each of the 2,666 detailed traffic analysis zones.

2.1 Trip Production

The HGAC trip production models use cross-classification trip production rates developed from the HGAC 1985 Travel Survey data. These rates were developed from a set of three-way cross classification models using household size, household income, and vehicle availability which were subsequently combined to yield a two-way cross classification model of household size by household income. Individual cell values in the two way cross classification table were derived by computing the weighted average of the three-way rates using regional distributions of households by vehicle availability for the two way cells as the weights. The dependent variable is trips per household. The objective of the cross-classification model is to develop a set of relationships that can be used to identify all of the household characteristics generating statistically different trip rates and, simultaneously, to minimize the number of individual cells in the matrix. Using disaggregate data reduces the number of errors due to zonal averaging and the

cross-classification methodology. It also allows for the nonlinearity of the model with respect to the independent variables.

The trip production model determines the relationship between trips generated per household and household income in combination with household size. Thus, trip production rates are stratified by household income and household size for each trip purpose.

Two enhancements have recently been incorporated to the 1990 trip generation model:

- the use of income quintiles
- a non-resident trip purpose

Earlier 1990 model validation efforts were based on five distinct income ranges; the current 1990 model incorporates revised 1985 household survey trip rates for income quintiles. These revised rates are shown by trip purpose in Tables 1-6.

Due to the high concentration of hotels, motels, and seasonal housing in the Galveston Island area, a non-resident trip purpose was developed to address the model's historical under-reporting of assigned volumes in the area. Based on area specific monthly hotel/motel occupancy rates an average rate was applied against the number of units in the Galveston Island area to estimate occupied rooms; this estimate of rooms was multiplied by a NHB trip rate to determine the number of non-resident hotel/motel NHB trips. Likewise, an occupancy rate for seasonal housing factored by a NHB trip rate yielded seasonal housing non-resident NHB trips.

Table 1
Home-Based Work Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	0.518	0.676	1.262	1.463	1.511
2	0.937	1.052	1.606	1.810	1.910
3	1.171	1.682	1.843	2.058	2.226
4	1.297	2.070	2.126	2.336	2.661
5+	1.308	2.100	2.177	2.376	2.749

Source: HGAC

Table 2
Home-Based School(1) Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	0.000	0.285	0.851	1.509	2.391
2	0.000	0.289	1.008	1.795	2.814
3	0.000	0.210	1.026	2.035	3.127
4	0.000	0.115	0.955	2.296	3.398
5+	0.000	0.090	0.930	2.350	3.460

Source: HGAC

Table 3
Home-Based School (2) Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	0.111	0.012	0.042	0.082	0.125
2	0.031	0.017	0.053	0.095	0.153
3	0.052	0.010	0.060	0.114	0.168
4	0.111	0.003	0.053	0.127	0.187
5+	0.000	0.000	0.050	0.130	0.190

Source: HGAC

Table 4
Home-Based Shopping Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	0.680	0.838	0.898	0.945	1.110
2	0.540	0.999	1.096	1.181	1.329
3	0.536	1.040	1.168	1.272	1.442
4	0.530	1.123	1.425	1.557	1.748
5+	0.530	1.180	1.510	1.650	1.850

Source: HGAC

Table 5
Home-Based Other Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	0.956	1.789	2.134	2.456	2.983
2	1.117	2.012	2.432	2.875	3.578
3	1.200	2.002	2.627	3.103	3.989
4	1.206	1.927	3.013	3.949	652
5+	1.220	1.890	3.120	240	850

Source: HGAC

Table 6
Non-Home Based Person Trip Rates

Household Size	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	1.136	1.675	1.939	2.098	2.299
2	1.622	2.304	2.478	2.752	2.938
3	1.851	2.697	3.080	3.469	3.773
4	2.125	3.059	3.788	284	769
5+	2.150	3.110	3.910	420	950

Source: HGAC

2.2 Trip Attraction

Since the disaggregate household survey data collected provide information primarily relevant to trip production, aggregate techniques were used to calibrate trip attraction models, with aggregations large enough to ensure statistical stability. Regression analysis is performed at the district level to predict trip attractions and the equations developed are modified to apply at the zonal level for some trip purposes (HBW, HBSHP, NHB, TRTX). For other trip purposes (HBSCH, HBO), the models can only be applied at the district level. Separate zonal-level allocation models are provided to estimate zonal -level trips from district totals.

The primary strategy for the trip attraction model is to determine the relationship between district-level trip attractions and the land use variables using linear regression. These relationships are basically standard, between work attractions and employment and between shopping attractions and retail employment. Following are the trip attraction models by purpose:

Home-Based Work Person Trips

$$\text{HBW Attractions} = 1.24(\text{Total Zonal Employment})$$

Home Based School (1) Person Trips (Grades 12 and under)

$$\text{HBSCH(1) District Attractions} = 1.332 (\text{District HH's with 2+ Persons})$$

$$\text{Zonal Allocation Model} = 11.66 (\text{Zonal Educational Employment for Grades 12 and under})$$

Home Based School (2) Person Trips (Colleges and Universities)

$$\text{HBSCH(2) Zonal Attractions} = 0.744 (\text{Enrollment})$$

Home Based Shop Person Trips

CBD Model

$$\text{HBSHP Zonal Attractions} = 0.299 (\text{Zonal Retail Employment})$$

Non-CBD Model

$$\text{HBSHP District Attractions} = 0.714 (\text{District HH's}) + 1.278 (\text{District Retail Employment})$$

$$\text{Zonal Allocation Model} = 3.517 (\text{Zonal Retail Employment})$$

Home Based Other Person Trips

HBO District Attractions = 1.959 (District HH's) + 0.3 (District Industrial Emp.) + 0.637 (Other District Emp.*)

Zonal Allocation Model = 0.74 (Zonal HH's) + 0.3 (Zonal Industrial Emp.) + 2.172 (Other Zonal Emp.*)

* Excludes Medical Employment in Major Medical Centers

Non Home Based Person Trips

CBD Model

NHB Zonal Attractions = 0.524 (Zonal HH's) + 2.593 (Zonal Retail Emp.) + 0.212 (Zonal Office Emp.) +
0.212 (Zonal Industrial Emp.) + 2.454 (Other Zonal Emp.*)

Non-CBD Model

NHB Zonal Attractions = 0.74 (Zonal HH's) + 3.659 (Zonal Retail Emp.) + 0.30 (Zonal Office Emp.) +
0.30 (Zonal Industrial Emp.) + 3.464 (Other Zonal Emp.*)

Excludes Medical Employment in Major Medical Centers

2.3 Trip Generation Results

Table 7 summarizes the trip generation estimates by trip purpose. The 11% increase in person trips is consistent with the 11% increase in regional households from 1990 to 1995. The number of truck trips is based on employment estimates and households. The 14% increase is consistent with the regional increase in employment and households.

Table 7
Regional Trip Estimates by Purpose

Purpose	1990 Trips	1995 Trips	Percent Change
Home-Based Work Person Trips	2,198,932	2,442,603	11.1
Home-Based School Person Trips	1,313,498	1,458,525	11.0
Home-Based Shopping Person Trips	1,469,996	1,626,775	10.7
Home-Based Other Person Trips	3,334,568	3,695,360	10.8
Non-Home-Based Person Trips	3,789,295	4,311,532	13.8
Truck and Taxi Vehicle Trips	645,318	751,409	16.4
External-Local Vehicle Trips	184,890	224,281	21.3

Source: HGAC Model Application Results

3 Trip Distribution

The trip distribution models are applied at the detailed TAZ level. These models link or connect trip ends estimated in the trip generation model, determining trip interchanges between each pair of zones. In addition to estimates of the magnitude of activity in each TAZ, the models consider the effects of impedance and accessibility on destination choice. The trip distribution models receive direct feedback from trip assignment, a lower model component.

3.1 Person Trip Table Development

The Disaggregate Trip Distribution Model, or Atomistic Model, is used for trip distribution modeling in the Houston-Galveston TMA. This model is used to produce six trip tables for the HBW, HBSCH, HBSHP, HBO, NHB, and TRTX purposes. A modified version of the Atomistic model is used to produce external-local vehicle trip tables, while the external-through trip tables are provided by TxDOT. The underlying assumption in the Atomistic model is that trips occur between small parcels of land (atoms) rather than the defined zone structure; thus by dividing existing zones into atoms a more realistic interchange of intrazonal trips and short (less than five minutes) trips among adjacent zones is defined. In application, a gravity model analogy determines the number of trip interchanges between atoms and subsequently sums the trips to derive both intrazonal trips and zonal interchange volumes. The basic atomistic model formulation is:

$$T_{ij} = \frac{\sum_{v=1}^{M_i} \sum_{q=1}^{M_j} p_{iv} a_{jq} F_{dq} K_{Sij}}{\sum_{x=1}^N \sum_{n=1}^{M_j} \sum_{m=1}^{M_x} p_{in} a_{xm} F_{dnm} K_{Six}} P_i$$

where:

- T_{ij} = trips produce in zone I and attracted to zone j
- P_{iv} = trips produced by atom v of zone I
- P_i = total trips produce in zone I such that:

$$P_i = \sum_{m=1}^{M_i} p_{im}$$

- a = relative attraction factor atom q of zone j
- A = relative attraction factor for zone j such that:

$$A_j = \sum_{m=1}^{M_j} a_{jm}$$

- F = relative trip length factor for estimated separation between atom pair vq
- K = bias factor for sector pair containing zones I and j
- N = number of zones
- M_y = number of atoms in zone y

In addition to the zonal trip productions and attractions produced in the trip generation process, the trip distribution model requires the zone-to-zone travel times for the estimated minimum time paths on the highway network with 24-hour speeds. The model also requires:

- estimated zonal radii values
- a set of F-factors defining trip length frequency distributions by purpose
- any necessary bias factors (K-factors) by trip purpose

Since the Atomistic Model uses a gravity model analogy that considers travel opportunities within a zone to be spatially distributed rather than concentrated at a single theoretical point (the zone centroid), the spatial dimension of zones is represented by 400 atoms with zonal productions and attractions uniformly distributed among all 400 atoms. The model requires that the distance from the center of a zone to the perimeter be defined in minutes - a zonal radii value. These radii values in conjunction with skimmed travel times determine the spatial distribution of atom pairs for all zonal pairs.

The initial set of F-values was derived from the 1985 model output. For the 1990 model these values were normalized and constrained to be continually decreasing F-factors. The F-factors were further adjusted for the 1995 validation to increase the average trip lengths. The calibrated F-factors by purpose are shown in Table 7

K-factors historically, have been used to improve model performance in addressing two natural barriers within the Houston-Galveston TMA: the Houston Ship Channel and the separation between Galveston Island and the mainland. These physical barrier K-factors are included in the 1990 model for both work and non-work trip purposes.

Distinct socio-economic and land use characteristics that require introduction of K-factors are the under-representation of both HBW attractions to the Houston CBD and intra-county HBW trips for the surrounding seven counties. In addition to the CBD, three other major activity centers, (Greenway area, Galleria-Post Oak, and Texas Medical Center) also required K-factors. In the current 1990 model, the original 1985 model K-factors have been retained except in Brazoria County. Additional K-factors refinements were subsequently made for Brazoria County in conjunction with a county roadway planning effort.

Table 7
Calibrated F-Factors by Trip Purpose

Time (minutes)	Friction Factors					
	HBW	HBSCH	HBSHP	HBOTH	NHB	TRTX
1	395.6175	247.7223	285.9380	273.6457	274.3966	330.6837
2	281.1024	239.1555	274.1349	254.2001	238.5437	257.3456
3	184.3762	193.4948	200.8767	193.8018	180.1995	202.5782
4	128.8990	136.8472	139.5320	137.4398	130.6176	141.1374
5	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
6	80.7778	75.1785	74.6164	76.6473	79.1192	76.5243
7	67.5164	57.5150	56.7002	60.4661	63.9114	60.2787
8	58.7785	44.3846	43.5581	48.3646	51.9846	47.6846
9	51.1780	34.4501	33.3664	38.7053	42.1792	37.8305
10	45.1390	26.7285	25.4969	31.2965	34.1950	30.1390
11	40.7565	20.9052	19.9157	25.4560	28.1265	24.5255
12	36.0878	16.2834	15.6512	20.6210	23.2758	20.2218
13	32.8361	12.7904	12.3234	16.8214	19.5424	17.1839
14	29.5630	10.2214	9.7286	13.8188	16.5202	14.5934
15	27.2632	8.0874	7.5872	11.2809	14.0998	12.5993
16	24.8975	6.2370	5.9314	9.1985	11.8983	10.8090
17	22.7531	4.7903	4.6567	7.5690	10.0894	9.2452
18	20.7472	3.7165	3.6877	6.2588	8.6132	7.9974
19	18.6522	2.9259	2.9474	5.2111	7.3788	6.9358
20	17.1059	2.3293	2.3785	4.3705	6.3974	6.0758
21	15.5056	1.8615	1.9161	3.6737	5.5490	5.3250
22	14.2836	1.4844	1.5462	3.1216	4.8373	4.6752
23	12.9664	1.1915	1.2611	2.6566	4.2397	4.1569
24	11.9146	0.9650	1.0360	2.2625	3.7635	3.7524
25	11.0148	0.7772	0.8542	1.9445	3.3679	3.3971
26	10.0954	0.6308	0.6990	1.6876	3.0088	3.0533
27	9.4284	0.5143	0.5662	1.4696	2.6942	2.7447
28	8.6201	0.4133	0.4584	1.2681	2.3805	2.4488
29	8.0108	0.3279	0.3713	1.0944	2.1228	2.1963
30	7.4678	0.2620	0.3031	0.9383	1.8849	1.9671
31	6.8941	0.2106	0.2486	0.8045	1.6547	1.7452
32	6.4064	0.1670	0.2039	0.6900	1.4637	1.5518
33	5.8034	0.1361	0.1671	0.5956	1.2994	1.3833
34	5.3266	0.1130	0.1389	0.5195	1.1617	1.2505
35	4.8941	0.0936	0.1160	0.4533	1.0484	1.1402
36	4.5074	0.0770	0.0958	0.3904	0.9385	1.0375
37	4.1841	0.0627	0.0793	0.3424	0.8385	0.9385
38	3.8274	0.0525	0.0664	0.3002	0.7515	0.8507
39	3.5080	0.0441	0.0551	0.2608	0.6729	0.7756
40	3.2210	0.0364	0.0455	0.2236	0.6015	0.7108

Table 7
Calibrated F-Factors by Trip Purpose
(continued)

Time (minutes)	Friction Factors					
	HBW	HBSCH	HBSHP	HBOTH	NHB	TRTX
41	2.9666	0.0303	285.9380	0.1917	0.5381	0.6599
42	2.7544	0.0250	274.1349	0.1666	0.4884	0.6087
43	2.5414	0.0212	200.8767	0.1476	0.4421	0.5483
44	2.3440	0.0176	139.5320	0.1310	0.3990	0.5020
45	2.1529	0.0144	100.0000	0.1168	0.3624	0.4732
46	1.9596	0.0126	74.6164	0.1019	0.3333	0.4453
47	1.7750	0.0111	56.7002	0.0895	0.3065	0.4116
48	1.6277	0.0096	43.5581	0.0788	0.2778	0.3788
49	1.5064	0.0083	33.3664	0.0693	0.2496	0.3448
50	1.3871	0.0077	25.4969	0.0618	0.2257	0.3081
51	1.2673	0.0072	19.9157	0.0545	0.2031	0.2780
52	1.1908	0.0066	15.6512	0.0486	0.1827	0.2628
53	1.1212	0.0060	12.3234	0.0428	0.1653	0.2488
54	1.0436	0.0054	9.7286	0.0378	0.1490	0.2335
55	0.9701	0.0051	7.5872	0.0332	0.1366	0.2135
56	0.9024	0.0050	5.9314	0.0297	0.1242	0.1957
57	0.8257	0.0045	4.6567	0.0269	0.1135	0.1812
58	0.7716	0.0044	3.6877	0.0248	0.1040	0.1724
59	0.6814	0.0043	2.9474	0.0221	0.0948	0.1633
60	0.6349	0.0042	2.3785	0.0198	0.0861	0.1553
61	0.5695	0.0041	1.9161	0.0176	0.0782	0.1429
62	0.5383	0.0040	1.5462	0.0163	0.0723	0.1315
63	0.5198	0.0040	1.2611	0.0157	0.0661	0.1214
64	0.4802	0.0032	1.0360	0.0143	0.0609	0.1088
65	0.4465	0.0000	0.8542	0.0127	0.0571	0.1020
66	0.4228	0.0000	0.6990	0.0113	0.0529	0.0974
67	0.3922	0.0036	0.5662	0.0107	0.0481	0.0937
68	0.3587	0.0035	0.4584	0.0101	0.0448	0.0878
69	0.3283	0.0034	0.3713	0.0093	0.0413	0.0820
70	0.3083	0.0033	0.3031	0.0086	0.0372	0.0762
71	0.2867	0.0032	0.2486	0.0084	0.0355	0.0750
72	0.2620	0.0031	0.2039	0.0081	0.0338	0.0737
73	0.2572	0.0030	0.1671	0.0078	0.0316	0.0725
74	0.2400	0.0029	0.1389	0.0072	0.0292	0.0712
75	0.2311	0.0028	0.1160	0.0072	0.0284	0.0687
76	0.2217	0.0000	0.0958	0.0071	0.0279	0.0675
77	0.2202	0.0000	0.0793	0.0070	0.0276	0.0627
78	0.2082	0.0000	0.0664	0.0069	0.0271	0.0625
79	0.1807	0.0000	0.0551	0.0068	0.0268	0.0612
80	0.1533	0.0000	0.0455	0.0067	0.0264	0.0609

Table 7
Calibrated F-Factors by Trip Purpose
(continued)

Time (minutes)	Friction Factors					
	HBW	HBSCH	HBSHP	HBO TH	NHB	TRTX
81	0.1425	0.0000	0.0000	0.0066	0.0261	0.0597
82	0.1303	0.0000	0.0000	0.0065	0.0257	0.0594
83	0.1159	0.0000	0.0000	0.0064	0.0254	0.0592
84	0.1049	0.0000	0.0000	0.0063	0.0250	0.0577
85	0.1045	0.0000	0.0000	0.0062	0.0247	0.0574
86	0.1021	0.0000	0.0000	0.0061	0.0245	0.0572
87	0.1020	0.0000	0.0000	0.0060	0.0241	0.0560
88	0.1019	0.0000	0.0000	0.0059	0.0239	0.0017
89	0.1018	0.0000	0.0000	0.0058	0.0235	0.0000
90	0.1017	0.0000	0.0000	0.0057	0.0233	0.0000
91	0.1016	0.0000	0.0000	0.0056	0.0230	0.0524
92	0.1015	0.0000	0.0000	0.0055	0.0227	0.0523
93	0.0943	0.0000	0.0000	0.0054	0.0225	0.0522
94	0.0898	0.0000	0.0000	0.0053	0.0223	0.0521
95	0.0763	0.0000	0.0000	0.0052	0.0220	0.0520
96	0.0693	0.0000	0.0000	0.0051	0.0218	0.0519
97	0.0626	0.0000	0.0000	0.0043	0.0151	0.0518
98	0.0563	0.0000	0.0000	0.0000	0.0000	0.0517
99	0.0478	0.0000	0.0000	0.0000	0.0000	0.0516
100	0.0436	0.0000	0.0000	0.0000	0.0000	0.0515
101	0.0435	0.0000	0.0000	0.0058	0.0203	0.0000
102	0.0434	0.0000	0.0000	0.0057	0.0202	0.0000
103	0.0433	0.0000	0.0000	0.0056	0.0201	0.0000
104	0.0432	0.0000	0.0000	0.0055	0.0200	0.0000
105	0.0431	0.0000	0.0000	0.0054	0.0199	0.0000
106	0.0409	0.0000	0.0000	0.0053	0.0198	0.0000
107	0.0386	0.0000	0.0000	0.0052	0.0197	0.0000
108	0.0349	0.0000	0.0000	0.0051	0.0196	0.0000
109	0.0273	0.0000	0.0000	0.0051	0.0195	0.0000
110	0.0256	0.0000	0.0000	0.0050	0.0194	0.0000
111	0.0230	0.0000	0.0000	0.0049	0.0000	0.0000
112	0.0229	0.0000	0.0000	0.0048	0.0000	0.0000
113	0.0228	0.0000	0.0000	0.0000	0.0000	0.0000
114	0.0227	0.0000	0.0000	0.0000	0.0000	0.0000
115	0.0226	0.0000	0.0000	0.0000	0.0000	0.0000
116	0.0225	0.0000	0.0000	0.0000	0.0000	0.0000
117	0.0224	0.0000	0.0000	0.0000	0.0000	0.0000
118	0.0223	0.0000	0.0000	0.0000	0.0000	0.0000
119	0.0222	0.0000	0.0000	0.0000	0.0000	0.0000
120	0.0221	0.0000	0.0000	0.0000	0.0000	0.0000

Table 7
Calibrated F-Factors by Trip Purpose
(continued)

Time (minutes)	Friction Factors					
	HBW	HBSCH	HBSHP	HBOTh	NHB	TRTX
121	0.0220	0.0000	0.0000	0.0000	0.0000	0.0000
122	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
123	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
124	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
126	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
127	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 8
Average Trip Length by Purpose

Purpose	1990 Average Trip Length	1995 Average Trip Length
Home-Based Work	20.879	20.489
Home-Based School	9.126	9.590
Home-Based Shopping	9.732	10.254
Home-Based Other	12.165	12.681
Non-Home-Based	12.740	12.920
Truck-Taxi	13.006	13.299
External-Local	40.964	39.915

Source: HGAC Model Application Results

4 Mode Choice

Mode Choice models are mathematical expressions used to estimate travel market modal shares given various competing mode's time and cost characteristics and the urban resident's demographic and socio-economic characteristics. Mode choice models predict traveler's decisions to choose a particular mode of travel and are designed to be an integral link in the travel demand chain, with *possible* direct feedback mechanisms to a number of related model components -- auto ownership, trip generation, and trip distribution

4.1 Original Mode Choice Model

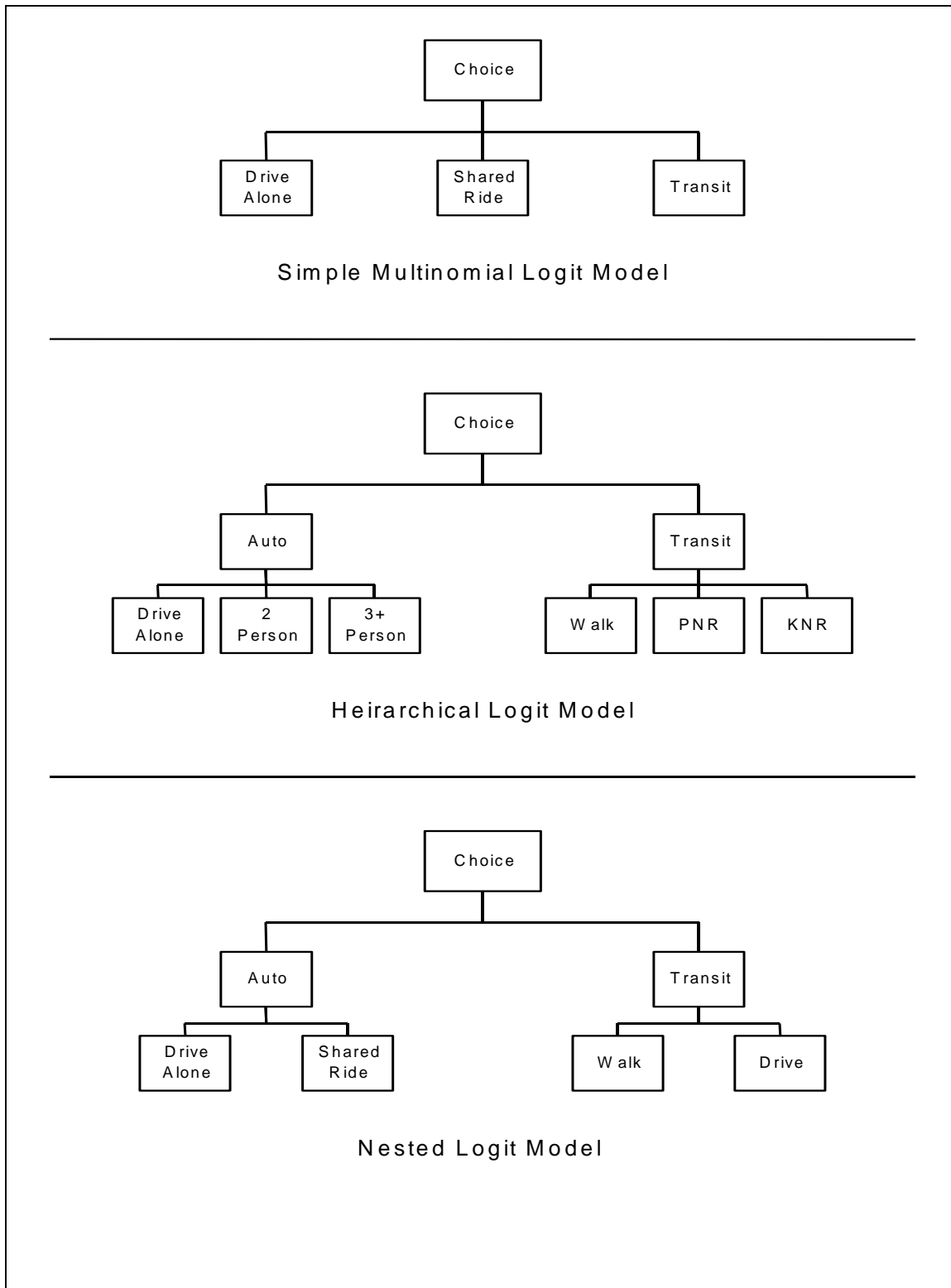
The original Houston mode choice model was a nested logit model that addressed eight separate modes:

- Drive alone
- Two person auto
- Three person auto
- Four-plus person auto
- Transit-walk access Local Bus
- Transit-walk access Commuter Bus
- Transit-drive access Park-and-Ride
- Transit-drive access Kiss-and-Ride

Mode usage is calculated for five income levels and three individual trip purposes (Home-Based Work, Home-Based Non-Work, and Non-Home Based). The model was originally estimated based upon 1985 Home-Interview and On-Board Transit Rider Survey data and was calibrated through the mathematical adjustment of bias constants¹¹ to replicate locally observed travel values.

¹¹ Bias Constants are computed by mode, trip purpose, and income level.

Figure 4-1



The model was subsequently re-calibrated/validated for the 1990 base year¹² based upon updated land use and demographic data and an On-Board Transit Rider survey conducted in the same year. The model accurately responded to the input changes in land use and demographic data inputs (1985 to 1990), and served to clarify the likely impact of forecasting errors in the 1985 input data.

2 Enhanced Nested Logit Mode Choice Model

As part of a Major Investment Study, enhancements were made to the mode choice model. The fundamental approach followed in specifying and implementing enhancements to the mode choice model can be summarized as follows:

- Utilize the existing nested logit mode choice as the starting point for the enhanced model specification;
- Design and specify an expanded nested structure and select additional model coefficients which are reasonable and rational based upon experience in Houston and elsewhere;

A graphical depiction of the enhanced nested logit model structure for each trip purpose is displayed in Figure 4-2. Lower level nests are defined in the diagram for each of the primary modes - auto and public transit.

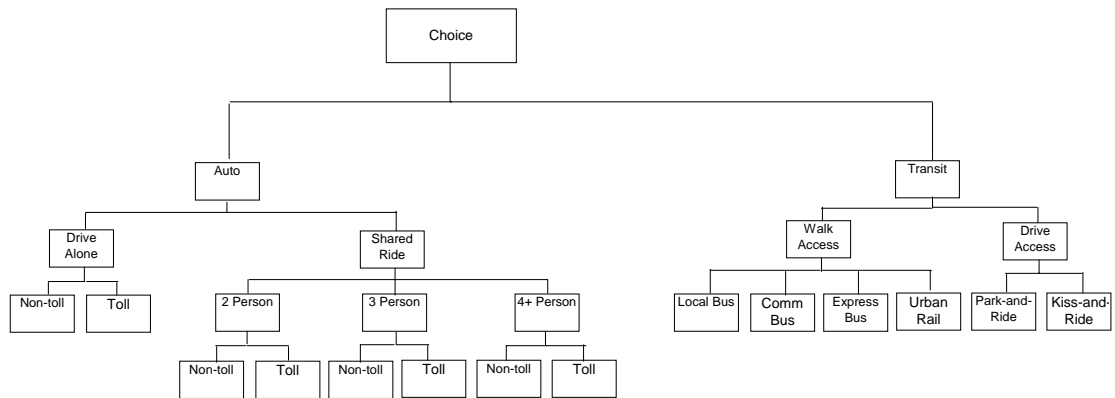
In the case of public transit, the second level nest distinguishes between walk and drive access (as before), while the third level would now differentiate between local bus transit, express bus, commuter bus, and urban rail for walk access and park-and-ride and kiss-and-ride for drive access. Sufficient aggregate ridership data was available on a regional basis to calibrate a set of model bias constants for each of these sub-modes (except urban rail, which currently does not exist in the region in any form). The existing set of variable coefficients will be used for each of the respective transit submodes. The existing model differentiates (using Boolean coefficients) between the Houston downtown and the three remaining major activity centers. In the enhanced version, each of three major activity centers was individually separated.

The highway mode is sub-divided at the second level of the nest into shared ride and drive alone. Shared ride is further sub-divided into 2-person and 3-person vehicles, and 4+ person autos at the third level. This distinction is necessary as many ramp locations and lane configurations within the region may explicitly distinguish between occupancy levels. The single additional variable added at this level of the nest was an HOV time savings variable (as compared to drive-alone travel time) that was preset at 70 percent of in-vehicle time. The inclusion of this variable is based directly upon recommendations stemming from the Shirley Highway Corridor model estimation.¹³ Each of the individual highway sub-modes -- drive-alone, 2-person auto, and 3-person auto, and 4+ person auto -- now include a special path choice nest that differentiates between a toll and non-toll path. Other than a set of modal bias constants, two additional variables are a coefficient on toll cost (stratified by income group) and a coefficient on travel time savings.

¹² "1990 Houston Long-Range Patronage Forecasting Model Validation, Draft Technical Memorandum: Model Validation Methodology and Results", prepared for the Metropolitan Transit Authority of Harris County, by KPMG Peat Marwick, June 21, 1995.

¹³ "Review of the Shirley Highway Corridor Mode Choice Analysis", COMSIS Corporation, October, 1990

Figure 4-2
H-GAC Regional Mode Choice Model - Nested Logit Model Structure



3 Modifications of Mode Choice Model For 1995 Validation

Following the validation of the enhanced mode choice model to the year 1990 and use of the model in several forecast applications, it was noted that upon the conversion of the highway person trips by mode (drive alone, 2 person and 3+ person trips) to highway vehicle trips by mode and assignment of those trip tables, regional VMT was less than expected. An analysis of estimated vehicle occupancy by time separation revealed that the trip tables resulting from the mode choice model predicting continually increasing vehicle occupancies by separation. This result was counter to survey observed vehicle occupancy data for separations longer than 30 minutes. This finding led to the modification of Home-Base Non-Work and Non-Home-Based models in two ways.

First, the way in which auto operating costs were handled was modified. The models were modified to allow the user to specify as to whether auto-operating cost were shared among auto occupants or not. It was observed in survey data that most multi-person (2 or more persons in vehicle) home-based non-work and non-home-based trips are made by persons from the same household. In that sense, auto operating costs are not really a shared-cost as it might be in a shared ride work trip made by persons from two different households.

The second modification was to add an additional household size variable to the model. In this way, the model would be sensitive to the size of a household in determining the probability of a multi-occupant trip. In the case of a 2-person household, the probability for a 3 or more occupant home-based non-work or non-home-based trip is much lower than for a 3 or more person household given that many of these trips are made by members of the same household.

The complete set of coefficient values for the Home-Based Work nested logit model is shown in Table 9. The Home-Based Non-Work and Non-Home Based values are presented in Tables 10 and 11 respectively.

Table 9
Coefficient Values for Home-Based Work Mode Choice Model

Variable	Multinomial Value	Mode
In-vehicle time	-0.02200	All modes
1 Wait less than 5 minutes	-0.05680	Transit
1 Wait over 5 minutes	-0.02200	Transit
Walk	-0.05680	Transit
Transfer time	-0.05680	Transit
Number of transfers	-0.08800	Transit
Transit fare (all)	-0.00614	Transit
Drive to transit time	-0.05680	Transit
Parking cost (all)	-0.01540	Highway
Highway Operating Cost (all)	-0.00614	Highway
Tolls (income group)	-0.00819 -0.00717 -0.00614 -0.00512 -0.00410	Highway
HOV/Toll Time Savings	+0.01542	Highway
Residential Density Indicator	+0.13947	Transit (Walk)
Nesting Coefficients		
Between transit and access	0.75000	Transit
Between access and path	0.60000	Transit
Between single and drive group	0.75000	Highway
Between group and 2/4+	0.60000	Highway
Between 2/4+ and toll/free	0.45000	Highway
Between drive and toll/free	0.45000	Highway

Table 10
Coefficient Values for Home-Based Non-Work Mode Choice Model

Variable	Multinomial Value	Mode
In-vehicle time	-0.01727	All modes
1st Wait time	-0.03454	Transit
Walk	-0.02591	Transit
Transfer time	-0.04318	Transit
Transit fare (all)	-0.00592	Transit
Drive to transit time	-0.02591	Transit
Parking cost (all)	-0.01479	Highway
Highway Operating Cost (all)	-0.00592	Highway
Tolls (income group)	-0.01093 -0.00957 -0.00820 -0.00683 -0.00547	Highway
HOV/Toll Time savings	+0.01270	Highway
Household Size		
2 Person	+0.07427	
3 Person	+0.44870	
4+ Person	+0.75530	Highway
Residential Density Indicator	+0.07767	Transit (Walk)
Nesting Coefficients		
Between transit and access	0.75000	Transit
Between access and path	0.60000	Transit
Between single and drive group	0.75000	Highway
Between group and 2/4+	0.60000	Highway
Between 2/4+ and toll/free	0.45000	Highway
Between drive and toll/free	0.45000	Highway

Table 11
Coefficient Values for Non-Home Based Mode Choice Model

Variable	Multinomial Value	Mode
In-vehicle time	-0.02370	All modes
1st Wait time	-0.04740	Transit
Walk	-0.03555	Transit
Transfer time	-0.03593	Transit
Transit fare (all)	-0.00562	Transit
Drive to transit time	-0.03555	Transit
Parking cost (all)	-0.01404	Highway
Highway Operating Cost (all)	-0.00562	Highway
Tolls (all)	-0.00562	Highway
HOV/Toll time savings	+0.01660	Highway
Nesting Coefficients		
Between transit and access	0.75000	Transit
Between access and path	0.60000	Transit
Between single and drive group	0.75000	Highway
Between group and 2/4+	0.60000	Highway
Between 2/4+ and toll/free	0.45000	Highway
Between drive and toll/free	0.45000	Highway

4 Calibration of Modal Bias Constants

Following specification of additional model variables and coefficient values, a key element in the overall mode choice model development process was to insure that the resulting models were able to accurately simulate travel behavior characteristics and patterns within the Houston region.

It is essential that the mode choice model set be able to estimate observed modal trips within a reasonable degree of accuracy. The models were applied at the aggregate (zone) level and the mode specific constants were adjusted to match observed control values¹⁴. Applying the models at the aggregate level utilizes the full set of network based travel times and costs, zonal level socio-economic and other related data (i.e., parking costs) and the input trip distribution model person trip tables. In this manner, the models are applied as they would be in forecasting future year trips. Tables 12-14 summarize the final set of bias constant values for each trip purpose.

¹⁴ The calibration target values by trip purpose were presented in Table 3.3.

Table 12
Modal Bias Constants - Home Based Work Mode Choice Model

Constant	Income Level				
	1	2	3	4	5
Drive Alone - Toll	002	3.277	2.512	2.203	1.705
2 Person - Toll	5.190	057	3.146	2.337	1.910
3 Person - Toll	5.664	723	116	053	3.829
4+ Person - Toll	6.353	5.454	925	776	466
3 Person Auto	-2.243	-2.329	-2.660	-2.758	-3.149
4+ Person Auto	-3.103	-3.347	-3.938	-193	-450
Shared Ride	-1.937	-2.072	-2.265	-2.466	-2.786
Auto	0.352	0.813	1.502	2.292	2.497
Local Bus	0.513	-0.228	-0.998	-2.362	-5.163
Commuter Bus	-2.687	-192	-2.809	-3.732	-3.175
Express Bus	-1.676	-2.362	-2.121	-2.543	-3.980
Park-and-Ride	-2.332	-1.404	-0.458	-0.103	-0.207
Drive Access	-2.334	-2.019	--1.258	-0.955	--1.099

Table 13
Modal Bias Constants - Home Based Non Work Mode Choice Model

Constant	Income Level				
	1	2	3	4	5
Drive Alone - Toll	2.466	3.223	3.717	234	5.257
2 Person - Toll	1.029	1.646	2.109	2.319	2.873
3 Person - Toll	1.873	2.619	3.008	3.440	221
4+ Person - Toll	2.179	2.972	3.452	3.908	700
3 Person Auto	-2.908	-2.989	-2.989	-3.073	-3.188
4+ Person Auto	-5.149	-5.120	-5.120	-5.177	-5.280
Shared Ride	-0.845	-0.914	-0.914	-0.953	-0.991
Auto	1.578	2.429	3.055	214	5.918
Commuter Bus	-2.341	-2.699	0.291	-2.141	2.355
Express Bus	-1.159	-1.175	-1.100	-1.632	0.102
Park-and-Ride	0.122	-0.383	1.647	0.692	1.566
Drive Access	-3.417	-089	-089	-3.165	-2.873

Table 14
Modal Bias Constants - Non Home Based Mode Choice Model

Constant	Value
Drive Alone – Toll	5.056
2 Person – Toll	1.761
3 Person – Toll	2.475
4+ Person – Toll	1.822
3 Person Auto	-1.246
4+ Person Auto	-1.519
Shared Ride	-1.649
Auto	2.477
Commuter Bus	-1.296
Express Bus	n/a
Park-and-Ride	1.807
Drive Access	-3.813

5 Toll Road Bias Constant Calibration, Target Values, and Time Savings Threshold

Although tabulations from the 1994 Household survey provided an initial estimate of the magnitude of toll road usage, subsequent analysis (comparing assigned volumes to observed toll road volumes) clearly demonstrated that the overall magnitude of toll road travel was significantly higher than these tabulations suggested, ranging from 60-100% higher. Given the small number of observations upon which these values were derived, this was not an unexpected result. The relative distribution of these target values by purpose, auto submode, and income group appeared to be reasonable. Home-Based Work trips comprise about 50% of all toll road trips, with the remaining 50% split quite evenly between Home-Based Non-Work and Non-Home based. However, the initial number of toll trips suggested by the 1994 Home-Interview survey did not yield valid toll road volumes; the resulting assigned volumes were significantly lower than the observed volumes. Thus it became necessary to implement a series of iterative revisions for the three conditions listed above until the assigned volumes adequately matched observed conditions.

In general, the Hardy toll road tends to serve longer-distance work-related travel, while the Sam Houston attracts somewhat shorter trips and a larger portion of non-work travel. The travel time savings threshold value serves to eliminate trip interchanges in which the savings in time provided by the toll path does not exceed a certain minimum value – 2.5 (non-work) or 3 (work) minutes. The absolute value of this time savings parameter is to some extent a function of the accuracy of the network assignment generated travel times (and their relative differences) and the perception by the traveler of the value of this time savings – which could be more accurately described as a reliability factor.

Stratification of the toll cost coefficient values by income had a very positive impact on the ability of the model to match calibration target values and explicitly represent differences in the value of time for different segments of travelers.

The ultimate test, and corresponding motivation for adjusting each of the above parameters from originally proposed or computed levels, was the comparison between observed and assigned volumes on the toll road facilities. These comparisons are presented later in this chapter.

6 Commercial Vehicles

Typically commercial vehicles are directly estimated as vehicle trips at the trip generation stage and included with automobile trips during trip assignment. Generally truck trips tend to comprise between five and 15 percent of internal vehicle travel. A unique feature of the existing model is the inclusion of taxi trips along with commercial vehicle trips; thus the trip purpose is labeled truck and taxi. In the H-GAC region, taxi travel represents a very small fraction of the daily VMT and hence was combined with the truck trips for convenience. The truck-taxi trip generation models were implemented in for the 1985 models. New commercial vehicle models being developed using the 1995 travel surveys are not yet available for modeling applications.

6.1 Truck and Taxi Trip Generation

The existing trip generation model requires that an estimate of total truck trip productions for the entire region be entered as a single value in the trip generation model. Subsequently, zonal truck trip productions and attractions are estimated based on a zone's employment composition. Initially, zonal truck attractions are derived using the following equation:

$$\text{Zonal Attractions} = 0.25 (\text{Zonal Retail Employment}) + 0.22 (\text{Zonal Office Employment}) + 0.39 (\text{Zonal Industrial Employment}) + 0.22 (\text{Other Zonal Employment}) + 0.02 (\text{Zonal Households})$$

Once zonal truck and taxi vehicle trip attractions have been estimated, productions are scaled and set equal to zonal attractions.

6.2 Distribution and Assignment

For distribution and assignment purposes the highway network is used as the truck network; highway travel times represent the purpose impedance. Auto travel times are used in distribution, however a specific trip length frequency curve is determined and input to trip distribution.

7 External Travel

Typically external travel is a small percentage of total regional travel; for Houston, 1990 total external trips amounted to 190,767 or 1.9 percent of total vehicle trips. External trips are categorized into two purposes: external local (external-internal travel) and external through (external-external travel). External trip productions are based upon growth factored average daily traffic (ADT) volumes. To determine the number of external local and external through trips at each external station, historical growth trends and O&D data are used to apportion factored ADTs between the two external trip purposes. These volumes in turn govern development of the local and through trip matrices.

The trip distribution model employs the gravity model form in conjunction with a specified trip length frequency curve. Zonal NHB vehicle attractions are used as relative external local attractions to distribute external productions. External through trip matrices are derived by frataring historical through trip tables based on current estimated external volumes.

8 Trip Assignment

8.1 Highway Trip Assignment Methodology

Using the mode choice model, person trips classified by trip purpose are separated into automobile and transit trips and auto person trips are converted to vehicle trips based on vehicle occupancy factors. These vehicle trip tables are summed and converted to origin-destination format and assigned to the appropriate highway network (base year or forecast year). This is a 24-hour capacity restraint assignment performed at the detailed 2,666 TAZ level. Six iterations of the capacity restraint model precede computation of the final assignment results. The model adjusts link impedance between iterations, based on each link's assigned V/C ratio. The weighted average of the assigned volumes from the preceding iterations is used to calculate the V/C ratio. The impedance adjustment function used in this model is based on the FHWA impedance adjustment function. This function assumes impedance is based on a "zero-volume" link speed. However, since traditional coding of Texas highway networks used a 24-hour speed rather than a zero-volume speed, a modified version of the FHWA impedance adjustment function was developed, which is represented by the following formula:

$$I_{n+1} = \left(0.92 + 0.15 \left(\frac{v}{c} \right)^4 \right) \times I_0$$

Where: I_0 = initial impedance using 24-hour input speed
 I_{n+1} = link impedance for iteration $n + 1$
 v = weighted average link volume from iterations 1 to n
 c = link capacity

The constraint is applied to limit the magnitude of the impedance adjustment, the maximum of which varies by iteration. After the initial assignment, the maximum impedance factor is two (essentially reducing the 24-hour speed by one-half) and is increased by one for each of the subsequent iterations. The final assignment results are computed following the six iterations, using a weighted average of the link volumes from those iterations. The iteration weights specified for the 1990 base year assignment are determined by an equilibrium capacity restraint process, where each trip is assigned the path with the shortest travel time until equilibrium is achieved.

8.2 Comparison to 1995 Counted Volumes

In the 1995 network, there are 25,761 highway links (one-way links) excluding centroid connectors. Of the 25,761, there are 18,535 with count based volume estimates. To demonstrate the validity of the models, comparison of the assigned versus counted VMT is normally summarized to demonstrate the capabilities of the models in matching estimated 1995 base year

conditions. As may be noted, nearly half of the freeway and tollway links have counted volume estimates. Over 90% of the arterial and collector links have counted volume estimates.

Table 15 summarizes the total assigned VMT on all 25,761 links by 5 roadway types. The assigned VMT on the 18,535 links with counted volumes are also summarized by roadway type. The assigned VMT as a percentage of the counted VMT was computed and is summarized for each of the roadway types. As may be observed, the assigned VMT on freeways, principal arterials and minor arterials are within 3% of the counted VMT estimates. Tollways and collectors VMT are within approximately 9% of the counted VMT estimate.

Table 16 summarizes the total assigned VMT on all 25,761 links by 5 area types. The assigned VMT on the 18,535 links with counted volumes are also summarized by area type. The assigned VMT as a percentage of the counted VMT was computed and is summarized for each of the area types. While the CBD Assigned VMT is approximately 85% of counted VMT, this is not unusual for CBD's and is considered within acceptable limits. The assigned and counted VMT in the other area types compare very favorably.

Overall the comparisons of the assigned and counted VMT were considered acceptable and reasonably demonstrate that the models reasonably replace the observed conditions for 1995.

Table 15
1995 VMT by Roadway Type

Roadway Type	Number of Links	Total Assigned VMT (all Links)	Number of Links with Counts	Assigned VMT on Links With Counts	Assigned VMT as Percent of Counted VMT
Freeway	2,179	44,351,305	714	21,948,520	107.4%
Tollway	150	2,548,856	82	1,214,459	109.1%
Prin. Arterial	2,998	12,635,347	3,709	15,061,744	95.3%
Other Arterial	9,970	23,480,254	9,163	24,003,826	99.5%
Collectors	5,297	6,582,035	4,867	6,614,278	92.4%
All Types	25,761	98,339,144	18,535	68,843,016	97.5%

Table 16
1995 VMT by Area Type

Area Type	Number of Links	Total Assigned VMT (all Links)	Number of Links With Counts	Assigned VMT on Links With Counts	Assigned VMT as Percent of Counted VMT
CBD	798	575,082	621	522,547	80.5%
Urban	4,715	19,758,402	3,089	9,848,581	104.1%
Urban Fringe	9,415	40,419,704	6,600	27,784,780	98.5%
Suburban	6,385	23,549,982	4,568	19,261,336	93.1%
Rural	4,448	14,034,942	3,657	11,425,600	94.5%
All Areas	25,761	98,339,224	18,535	68,843,016	97.5%