# EXECUTIVE SUMMARY

Texas has become the nation's second most populated state and added nearly as many new residents over the past decade as California, which is much larger. This high growth rate is likely to continue in the decades to come. Dallas-Fort Worth and Houston are now the ninth and tenth largest metropolitan areas in the nation and are likely to move to higher rankings in coming decades. At the same time, San Antonio and Austin are each home to more than one million residents.

Texas urban areas are among the most rapidly growing. Austin is the second fastest growing of the nation's 49 metropolitan areas over 1,000,000 population, while Dallas-Fort Worth, Houston and San Antonio rank among the top 15. Among all of the nearly 300 metropolitan areas, Laredo ranks as the second fastest growing, McAllen is third and Brownsville is 15th (Austin is sixth). It is expected that 80 percent of growth in Texas over the next 25 years will be in the major metropolitan areas.

As Texas has grown, so also has travel. Texas has expanded its highways to accommodate the growing traffic, which has been generated by a number of factors. The most important driving factor has been the growth in population. But there is more. In recent decades, personal mobility has become more democratized, as women and low income citizens have obtained much greater access to automobiles.

Traffic has grown substantially in Texas urban areas. Yet, generally, Texas has been more effective than other urban areas in its accommodation of increased traffic. The growth that is impending, however, will seriously challenge the ability of state and local governments to provide necessary increases in transportation capacity.

One point of view suggests that there is no point in providing additional highway capacity, suggesting that expansion of highways in itself induces (or creates) a substantial amount of new travel. The evidence does not support this proposition.

Another view is that the need to build new highways can be avoided through the provision of expanded transit and high speed rail systems. Transit, however, provides barely one percent of travel in Texas and even the most aggressive projections for new transit projects by their proponents would not change that figure materially. Annual *growth* alone in Texas street and highway traffic exceeds *total* transit use. Similarly, virtually no planning studies have ever suggested that high speed rail could accommodate more than a small percentage of future demand. And, in the case of both transit and high speed rail, costs per person mile are far higher than that of highway expansions.

Proposals to force more compact urban development ("smart growth") could not be more inappropriate for solving the future traffic volume problems that Texas will face. Higher population, housing and employment densities, which are an objective of smart growth, significantly increase traffic congestion and air pollution.

Texas spends more than $8 billion annually building streets and highways. However, Texas roadway spending has significantly trailed population growth, vehicle miles growth and the growth in licensed drivers. In general, street and highway spending in Texas is now below national averages.

## FINANCING SOURCES

A number of strategies exist for providing the financial resources to make necessary improvements to the Texas highway system. To address the current shortfall of financial resources for the transportation needs of Texas and to satisfy Texas' surface transportation requirements, there are a number of potential tools that could be utilized. These include:

- Continued expansion of toll roads and toll bridges, including High Occupancy Toll (HOT) lanes.

- Use of existing local sales taxes, and expansion where possible, to fund transportation projects that can improve transit access while providing additional highway capacity (such as HOT lanes), particularly those in major metropolitan areas.

- Additional federal grants, especially:

    - Higher funding levels to offset the high cost of highway expansion and maintenance attributable to implementation of the North American Free Trade Agreement (NAFTA).

    - Federal Transit Administration "New Starts" grants for combined Busway/High Occupancy Vehicle (HOV)/HOT lane projects.

- Use of financial leverage programs, such as the State Infrastructure Bank/State Revolving Tax Fund.

- In the longer run, implementation of congestion pricing or electronic road pricing programs that charge drivers and commercial vehicles more directly for road use.

## METROPOLITAN AREAS

The transportation congestion that impacts the largest percentage of state residents occurs and will continue to occur in the largest metropolitan areas. The situation may be potentially the most difficult in fast growing Austin, which already has a highway system insufficient to its present travel demands.

Austin's traffic congestion is steadily growing worse as a result of its rapid growth. At recent rates, Austin's traffic congestion in 2025 could be worse than that presently experienced by Los Angeles. Because it was not a large city when the national interstate highway program was designed, Austin has only a single interstate highway and has a much more modest freeway system than virtually all other metropolitan areas of more than one million population. Local public agencies, however, have often opposed road construction, in the hopes that by not expanding the system, automobile use would be discouraged. Austin's traffic volumes, however, have continued to rise, even as the required capacity improvements have not been provided.

Recently, the local public transit agency's (Capital Metro) proposal to build a light rail system was rejected by the electorate. The proposed light rail system would have had virtually no impact on traffic congestion, and had been adopted by local officials despite the much greater potential of bus based improvements that could have not only improved transit, but also car pool access and access by single occupant vehicles paying tolls. Currently Capital Metro collects a full one-cent sales tax and is banking substantial reserves. With a program of savings, Capital Metro could operate on a one-half cent sales tax, which would make the other one-half cent available for highway and bus based transit purposes. Such a strategy would make it possible to provide a region-wide bus rapid transit system, while providing additional toll and car pool highway capacity. It is estimated that such a program could substantially reduce what would otherwise be high levels of traffic congestion in the next 25 years.

The rapid growth in Dallas-Fort Worth provides such significant challenges to regional local planners that it is projected that 43 percent of lane miles in the area will experience traffic congestion in 25 years. This is up from the present 30 percent.

Houston's growth presents similar problems. Regional authorities indicate that the area will fall approximately $50 million short of the annual revenues that would be required to meet projected needs.

Planners in San Antonio project a doubling of traffic congestion over the next 25 years, because insufficient resources are planned for commitment to highways. San Antonio, however, is the only major metropolitan area in the state that could raise an additional one-half cent sales tax for transportation.

Each of the major Texas metropolitan areas is expected to experience

significant population and employment growth. Little of the employment growth is projected for downtown areas. It will thus be challenging for public transit to retain even its minuscule market shares. In each of the major metropolitan areas, significant resources could be obtained for highway capacity increases through federal transit capital funds and implementation of identified transit system efficiencies. At the same time, more innovative user fee strategies could provide additional funding for expansion.

## BORDER AREAS

Enactment of the North American Free Trade Agreement (NAFTA) has brought both greater prosperity and disruption to border communities in Texas. Texas has received a lesser amount of federal funding for border infrastructure than would appear to be equitable based upon its comparative trade volumes.

The Texas-Mexico border is now home to large international metropolitan areas. Ciudad Juarez-El Paso is now approaching two million population, McAllen-Reynosa-Rio Bravo exceeds one million and Nuevo Laredo-Laredo has approximately 500,000 residents. Projections indicate that these fast growing communities will continue to grow as trade continues to expand.

Approximately 80 percent of truck and rail traffic between the United States and Mexico travels through Texas ports of entry. NAFTA has brought at least a 50 percent increase in truck traffic along the Texas border and a doubling of rail traffic. This has brought new prosperity to border communities at the same time as it has imposed burdens. Traffic congestion has increased on highways and at railway crossings. Air pollution has increased, especially in El Paso and Laredo.

There are plans to substantially improve transportation in border communities, with a $1.8 billion state program over 10 years. There are also plans to construct a new interstate highway (I-69), with two or three legs, from Houston to the lower Rio Grande Valley and Laredo.

But not all transportation problems relate to insufficient infrastructure capacity. The United States Government Accounting Office has noted that insufficient federal inspection staffing, multiple inspections, lack of automation and lack of performance data also add to the problems of congestion on the border.

The real beneficiaries of increased trade are consumers throughout the nation. Yet, it appears that an undue burden is placed upon border communities and the state to pay for the incremental costs of some infrastructure related to border crossings. At the same time, there is not a broadly accepted consensus on the extent of future infrastructure needs.

It is recommended that a “blue ribbon” *Border Futures Commission* be convened

for the purposes of identifying reasonable infrastructure needs, incremental costs and financing strategies. This commission would be instructed to emphasize user fee funding mechanisms.

**Laredo:** Laredo, which is by far the busiest port of entry on the entire U.S.-Mexico border, has experienced a near doubling of truck traffic since 1994 and more than a doubling of rail traffic. Laredo has effectively dealt with its challenges by constructing new facilities. The Columbia-Solidarity Bridge was opened in 1991 and is served by a toll road, providing substantial additional capacity well outside Laredo. The new World Trade Bridge has diverted a large share of truck traffic outside the downtown area.[1] Soon a new limited access roadway will connect this facility with Interstate 35.

The state is preparing to widen the Bob Bullock Loop and build an outer loop. These roadways will make it possible for trucking facilities to locate in areas further outside the residential core of the city, further reducing traffic. However, Laredo continues to be bisected by more than 100 railway grade crossings and the continued increase in rail traffic will exacerbate traffic conditions.

It is recommended that a "blue ribbon" *Texas Transportation Futures Commission* be convened for the purposes of identifying reasonable infrastructure needs, based upon reasonable criteria (such as cost per passenger mile). The *Commission* would also identify financing strategies and propose high priority projects that might be funded by debt. This commission would be instructed to emphasize user fee funding mechanisms and coordinate its activities with those of the proposed *Border Futures Commission*.

## THE FUTURE OF TRANSPORTATION IN TEXAS

TxDOT estimates that present resources are able to finance barely 30 percent of optimal future needs. This does not include the substantial funding challenges faced by local governments across the state.

There is a need to develop urban roadway standards to assist the state and urban areas in determining the extent of roadway needed in newly developing areas so that future traffic congestion is minimized.

Innovative strategies such as surface expressways, metroroute tunnels, truck freeways and additional double decking could provide opportunities to improve traffic flows in the largest metropolitan areas.

At the same time, developments in the market could be helpful in solving future transportation needs. These include technological advances such as on-board navigation systems and collision avoidance systems and behavioral trends such as increased telecommuting and the personal choices people make to locate their residences more conveniently to employment locations.

Nonetheless, more funding is likely to be needed. However, increased general taxation or gasoline taxation is not likely to be the answer. It makes greater sense to require more direct user funding of transportation improvements. This would be accomplished by greater reliance on toll roads and HOT lanes. In the long run, electronic road pricing and competitive franchising of roadways may offer significant improvements.

# SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

## KEY FINDINGS

### Population and Traffic Congestion Growth

- Texas has become the nation's second most populated state and added nearly as many new residents over the past decade as California, which is much larger. This high growth rate is likely to continue in the decades to come.

- Projections indicate that Texas will continue to grow at rates well above the national average. By 2025, Texas is likely to add another 55 percent to its population to reach more than 32 million. The U.S. Census Bureau projects that Texas will grow 60 percent faster than the nation from 2000 to 2025.

- The great majority of the growth – 89 percent – is likely to be in eight metropolitan areas that will each have more than 500,000 residents in 2025.

- Texas urban areas are among the most rapidly growing. Austin is the second fastest growing of the nation's 49 metropolitan areas over 1,000,000 population, while Dallas-Fort Worth, Houston and San Antonio rank among the top 15.

- It is expected that 80 percent of growth in Texas over the next 25 years will be in the major metropolitan areas.

- Nearly 70 percent of the daily street and highway travel in Texas is in the four largest urbanized areas (Dallas-Fort Worth, Houston, San Antonio and Austin).

- From 1960 to 1997, while population was increasing 102 percent, travel on Texas streets and roads increased 375 percent. This resulted from significant increases in automobile usage by women and lower income residents.

- TxDOT estimates that present resources are able to finance barely 30 percent of optimal future needs. This does not include the substantial funding challenges faced by local governments across the state.

- From 1982 to 1997, Dallas experienced the greatest traffic congestion increase, ranking 29th. Austin ranked 37th, San Antonio 47th and Houston last. Houston is only one of two urban areas that have

experienced a reduction in traffic congestion since 1982.

- Austin's traffic congestion is steadily growing worse as a result of its rapid growth. At recent rates, Austin's traffic congestion in 2025 could be worse than that presently experienced by Los Angeles.

- The rapid growth in Dallas-Fort Worth provides such significant challenges to regional local planners that it is projected that 43 percent of lane miles in the area will experience traffic congestion in 25 years. This is up from the present 30 percent.

- Houston's growth presents similar problems. Regional authorities indicate that the area will fall approximately $50 million short of the annual revenues that would be required to meet projected needs.

## Current Spending on Roads

- Texas roadway spending has significantly trailed population growth, vehicle miles growth and the growth in licensed drivers.

- Texas currently ranks fourth to last of the fifty states in state highway expenditures per capita.

- Spending per capita in Texas has fallen 34 percent since 1980, and now trails the national average by 12 percent.

- Spending per vehicle mile traveled in Texas is now 68 percent below the 1960 figure, and 18 percent below the national average.

- Overall state and local highway revenues (user fees, taxes and tolls) are generally lower than average in Texas. In 1998, Texas ranked 30th at $0.0199 in state and local tax and toll revenues per passenger mile.

- Texas state and local spending on highway construction is greater as a proportion of total spending than most other states (Texas ranks 13th). This is a result of the fact that federal funding represents a lower share of street and local spending than in most other states.
- Motor fuel taxes are currently the single largest revenue source for Texas state highway funding, amounting to 38.61 percent of the total funds for the five-year period, FY95-FY99.

- Texas allocates 34.7 percent of state motor fuel taxes to non-highway uses, the third-highest of the fifty states and far higher than the median value for all states (approximately 8 percent). Of the total 1999 taxes and fees paid on vehicles of $6.5 billion, $2.7 billion, or approximately 42 percent, goes for transportation purposes, with the remaining $3.8 billion, or 58 percent, going for other purposes.

## Challenges for Texas Border Cities

- Enactment of NAFTA has brought both greater prosperity and disruption to border communities in Texas. Texas has received a lesser amount of federal funding for border infrastructure than would appear to be equitable based upon its comparative trade volumes.

- Approximately 80 percent of truck and rail traffic between the United States and Mexico travels through Texas ports of entry. NAFTA has brought at least a 50 percent increase in truck traffic along the Texas border and a doubling of rail traffic.

- An undue burden is placed upon border communities and the state to pay for the incremental costs of some infrastructure related to border crossings.

- Laredo, which is by far the busiest port of entry on the entire U.S.-Mexico border, has experienced a near doubling of truck traffic since 1994 and more than a doubling of rail traffic. Laredo has effectively addressed its challenges by constructing new facilities and infrastructure.

- 79 percent of all U.S.-Mexico trucks crossed the border at Texas ports of entry, with 40 percent of the Northbound trucks traversing Texas for destinations outside Texas (U.S. and Canada).

- 18.9 percent of Texas highway mileage, carry almost 90 percent of all NAFTA traffic in Texas, with IH-35 alone accounting for 31.6 percent of this total.

- Texas, with 79 percent of the U.S.-Mexico border crossings, received only 26 percent of the Coordinated Border Infrastructure Program grant funding.

- Mexico's border population is expected to double to more than 20 million over the next 20 years. At the same time, the Texas portions of the international metropolitan areas are likely to grow more than 80 percent over the next 25 years.
- It is expected that the border metropolitan areas will grow at approximately 1.5 times the rate of other major Texas metropolitan areas over the next 25 years, and five times the rate of the rest of the state.

- The four large border metropolitan areas have 44 percent less annual income per capita than the state of Texas, and 48 percent lower than the nation. Because of the lower incomes in border communities,

extraordinary expenses related to supporting border activities consume a higher proportion of personal income than would be the case in average income metropolitan areas.

- Increased border trade has impacted border communities in the following negative ways:

  - increased traffic congestion
  - increased air pollution
  - increased freight rail traffic, which exacerbates traffic congestion

- Texas has spent much more of its own money on border infrastructure than other states, with the federal government having provided a much larger share elsewhere. Federal expenditures in relation to truck traffic volumes have been from 2.7 to 34 times that of Texas in Arizona, California and New Mexico.

- There are workforce and management issues that contribute to border congestion in the following ways:

  - Insufficient staffing by federal agencies, such as the U.S. Customs Service, U.S. Department of Agriculture and U.S. Food and Drug Administration, result in lane closures (75 percent at times as reported by the State Comptroller), which reduce the capacity of border facilities to deal with traffic.
  - Threat of air quality non-attainment status.
  - Multiple inspections by government agencies slowing the speed of traffic.
  - Numerous border procedures remain to be automated.
  - Little, if any, current data on average delay times for truck inspections at border crossings. The longer term management of border crossings should include goals and standards with respect to average truck delays.
  - Insufficient cooperation with border authorities in Mexico.

- Border communities receive disparate economic benefits from this increased traffic. However, it is likely that the incremental cost of needed border transportation improvements exceeds the incremental revenues.

- Border impacts are not the result of border community actions, they are also not the result of state actions. Theoretically, at least, the greater burden placed on border communities by NAFTA can, from a state perspective, be viewed as a federal responsibility.

- It is inequitable to expect either the border communities or the state of Texas to finance what are in essence national infrastructure facilities. This would be akin to requiring border states to finance local immigration and nationalization service activities or to have required the

state of Alaska to finance defense activities within the state during the Cold War. The incremental costs of border activities should be, therefore, paid by the nation as a whole.

- The Laredo area accounts for the largest amount of border truck traffic of any port of entry on the Mexican border. Second and third ranking San Diego-Tijuana and Ciudad Juarez-El Paso handle less than one-half the volume of Laredo. In 1998, Laredo handled approximately one-third of all cross-U.S./Mexico border truck movements, and more than one-half of movements across the Texas-Mexico border. Moreover, Laredo accounts for nearly 45 percent of cross-border railcars.

## Building Our Way Out of Congestion

- It is often stated that the mere provision of additional road capacity causes people to drive more. This is referred to as "induced demand," a conclusion that has led to the view that it is impossible to "build our way out of congestion." This theory has been soundly refuted.

- At least three Texas urbanized areas have increased their roadway systems at a rate faster than traffic volumes have increased: Houston, Corpus Christi and Laredo.

- There is a rather weak and insignificant relationship between roadway expansion and the increase in vehicle miles traveled per capita. It is possible to build sufficient highway capacity to accommodate demand.

## Innovative Financing Options

- The Transportation Infrastructure and Innovation Act (TIFIA) of 1998 allows USDOT to make direct federal loans, federal loan guarantees, and/or standby letters of credit for up to 33 percent of the costs of approved major surface transportation projects, including roads and bridges.

- The Federal Transit Administration "New Starts" program (49 USC 5309) can be utilized, in some cases, for HOV/Busway projects.

- The best example of this in the U.S. is the network that has been constructed by the Metropolitan Transit Authority of Harris County (Metro). Metro has received $500 million of federal funding for its network of 111.2 miles of Busway/HOV lanes (88.8 miles now in service). Metro's six HOV lanes move the same volume of passengers as 19 freeway lanes, and move them at over twice the average speed. The success of this approach to increasing the carrying capacity is remarkable. Despite its high level of population and economic growth, Houston is the only major urban area that showed an improvement in

traffic congestion conditions from 1982 to 1997, according to Texas Transportation Institute statistics. While Houston's two percent improvement may not appear significant, and no one would argue that traffic conditions in Houston are now ideal, when Houston's performance is compared to that of the nine U.S. cities that implemented light rail during or just before this period (Baltimore, Buffalo, Dallas, Los Angeles, Portland, Sacramento, Saint Louis, San Diego, and San Jose), the comparison to their 36 percent worsening of traffic congestion index is remarkable. During this period, Houston moved up in the rankings from next to last out of 34 (beating only Los Angeles) in 1982 to tied for 13th best in 1997.

- By 1998, Dallas Area Rapid Transit (DART) boardings had increased 10 million since the year before light rail was opened (1995). At the same time, operating costs rose nearly $50 million, for a cost per new boarding of $4.97. Over the same period, Metro experienced a 15.6 million increase in boardings, while operating costs rose $18.1 million, for a cost per new boarding of $1.16, less than one-quarter that of DART. If capital costs were added to this figure, Houston's cost advantage is actually greater because of the inordinately high capital cost of light rail and the tendency of rail openings to artificially inflate ridership figures.

- The added cost of Busway improvements to roadways ranges from $2 to $4 million per mile. The *maximum* average cost per mile of a Busway/HOV/High Occupancy Toll (HOT) lane is $18 million, approximately 30 percent of the cost per mile of light rail. However, the Busway/HOV/HOT lane carries more than eight times the travel volume as light rail.

- A Busway/HOV/HOT system would provide additional important advantages:

    - Average speeds would be higher than light rail, making the system more attractive to downtown automobile commuters.
    - Busway/HOV/HOT systems provide better utilization of right-of-way space, carrying many more people than is practically possible by light rail.
    - Because they are open to car pools and single occupant automobiles paying a toll, Busway/HOV/HOT lanes reduce traffic congestion on adjacent freeway lanes.
    - By building high-occupancy toll roads, there is the ability to charge for the capacity not utilized by buses and car/vanpools. This can be an important additional source of funding, both for matching funds for federal transit grants and for general purpose freeway funding purposes.

- Some local transit authorities, including those of Houston and Dallas, have utilized portions of local sales taxes for roadway improvements.

Besides its successful Busway/HOV programs, Houston Metro has also had a direct grant program for street improvements to local government units. Austin's Capital Metropolitan Transit Authority (Capital Metro) has also recently announced such a program.

## Role of Transit in Reducing Congestion

- Some have proposed that the need to build new highways can be avoided through the provision of expanded transit and high speed rail systems. Transit, however, provides barely one percent of travel in Texas and even the most aggressive projections for new transit projects by their proponents would not change that figure materially.

- Annual *growth* alone in Texas street and highway traffic exceeds *total* transit use.

- Where population densities are very high, and activities centralized, transit competes much better for urban travel market share. For example, transit market shares in Asia are nearly 20 times that of the U.S., while population densities are 15 times as great.

- Virtually no planning studies have ever suggested that high speed intercity or urban light rail could accommodate more than a small percentage of future travel demand.

- In the case of both transit and high speed rail, costs per person mile are far higher than that of highway expansions.

- Transit can provide a choice that is competitive with the automobile only to large employment areas with very high densities. The largest downtowns in Texas have rather modest transit work trip market shares, 16 percent in Houston and 14 percent in Dallas.

- The most dense one percent of the four major Texas metropolitan areas was 9,000 to 12,000 per square mile in 1990, averaging one eighth that of New York and one third or less that of the next most dense areas, San Francisco, Chicago and Los Angeles. The most dense 10 percent of the four major Texas metropolitan areas was 6,000 to 7,000 per square mile, less than one-half Los Angeles, San Francisco and Chicago and one-quarter that of New York.

- If transit use were to double overnight, the gain would be canceled out by the normal increase in automobile usage in as little as three months.

- Even in Dallas, where an aggressive, debt funded rail building program is

planned for the next two decades, the most optimistic projections would place 2020 transit market share at little more than the 1990 level.

- It is estimated that the highest volume section of DART's light rail system reduces adjacent freeway traffic during peak hours by less than 15 percent of a ***single*** freeway lane.

- Based upon an analysis of Austin traffic and optimistic light rail projections, it is estimated that the presence of light rail will reduce traffic volumes on IH-35 and MoPac by only 0.8 percent by 2025. At the same time, traffic volumes are expected to increase more than 60 percent.

- Urban rail transit systems are comparatively expensive, averaging seven times the cost per person mile of new urban freeways.

- Using national survey data for former automobile commuters attracted to light rail, the cost per light rail trip is $18.90, or $8,600 annually, sufficient to lease a $54,000 Lexus 400LS. Further, the cost per new annual commuter is approximately 60 percent higher than the annual cost of educating a student in Texas elementary and secondary schools.

- Because transit has so little potential to reduce the rate of growth in automobile traffic, it is not an effective strategy in the campaign to reduce air pollution.

- Texas ranks seventh in state and local tax revenues per transit passenger mile, at $0.649. This is 33 times the amount of state and local revenue per person mile for streets and highways.

- The Federal Railroad Administration estimated that the proposed Texas Triangle high speed rail system (Dallas-Fort Worth-Austin-San Antonio-Houston) would remove only five percent of intercity highway traffic.

- High speed rail is not an efficient or effective alternative to air transportation. Building high speed rail is at least five times more costly per passenger than building new airport capacity.

# RECOMMENDATIONS

Policy makers should give serious consideration to the following mechanisms to increase roadway capacity:

## New Transportation Innovations and Funding Options

- Pursue technological advances such as on-board navigation systems and collision avoidance systems and behavioral trends such as increased telecommuting.

- Seek additional federal grants, especially:

  - Higher funding levels to offset the high cost of highway expansion and maintenance attributable to implementation of NAFTA.
  - Federal Transit Administration "New Starts" grants for combined Busway/HOV/HOT lane projects

- Expand the State Infrastructure Bank program to include more than the four pilot states, thus increasing the ability of this program to assist disadvantaged counties with significant projects, as well as, potentially, other types of projects in other geographic areas.

- Encourage local transportation agencies to better cooperate to develop minimum roadway capacity standards for the travel demands that occur in varying urban and suburban densities and land use configurations.

- Convert surface arterials in congested areas to surface expressways which limit grade crossings to signalized intersections and forces left turns to the right on access roads.

- Build new limited access bypass roadways to relieve congestion on surface arterial streets in developing areas. These can be grade separated and have entrance and egress controls.

- Build metroroute tunnels – a single tunnel carrying two decks of automobile (only) traffic. Such tunnels are far less costly per person mile than new light rail systems.

- Pursue double decked freeways – double decking makes it possible to add up to six lanes of traffic without taking additional right-of-way (examples are Interstate 35 in Austin and Interstate 10 in San Antonio).
- Build truck freeways – exclusive roadways built above congested freeway corridors for commercial traffic, largely trucks.

- Build reversible lanes – lanes adjusted during peak periods to better accommodate demand.

- Remove bottlenecks – removing bottlenecks at the nation's 18 most congested freeway interchanges would significantly reduce local mobile source air pollution, while saving commuters traveling through these interchanges an average of nearly 40 minutes per day.

- Deploy automated tolling systems – toll roads in the state can be converted to full electronic tolling. All tolls are collected through electronically read cards on windshields. License plates of cars that do not have the electronic cards are photographed and users are billed through the mail. Elimination of toll booths would reduce traffic congestion, speed travel, and decrease pollution in the local area.

- Utilize electronic road pricing – as increasing population continues to drive increases in traffic volumes, more comprehensive approaches should be considered, such as electronic road pricing. Use peak period and mileage-based user charges to finance roadway system improvements. Higher user charges during peak travel periods would encourage some diversion of vehicle travel to less congested periods.

## Building New Road Capacity with Transit Funds

- Make available for either mixed transit/general use (chiefly Busway/HOV/HOT lanes as discussed above) or "pure" general use transportation projects the significant unutilized portion of the one percent sales tax going to local governmental units.

- Use federal transit grants to build additional roadway capacity:

    - The Federal Transit Administration "New Starts" program (49 USC 5309) can be utilized, in some cases, for HOV/Busway projects.
    - The §5309 discretionary capital grant program can be used for bus system improvements and Fixed Guideway Modernization for Busway/HOV lanes, providing a useful level of funding for capital and maintenance.
    - §5307- intended primarily for capital renewal and replacement, with local agencies given very wide discretion as how to utilize the funds within broad limits. It is perfectly proper to utilize such funds for capital additions.
    - Congestion Management Air Quality (CMAQ) grants can be utilized for transit capital improvements, including Busways/HOV/HOT lanes, and for the operating costs of new transit service for the first three years.
    - Surface Transportation Program (STP) grants can be used for many of the same purposes as CMAQ with the exception of operating costs.

- Use existing local sales taxes, and expansion where possible, to fund transportation projects that can improve transit access while providing additional highway capacity (such as high occupancy vehicle and toll lanes), particularly those in major metropolitan areas.

    - Austin's Capital Metro collects a full one-cent sales tax and is banking substantial reserves. With a program of savings, Capital Metro could operate on a one-half cent sales tax, which would make the other one-half cent available for highway and bus based transit improvements.
    - Transit authorities in Houston and Dallas have an extensive HOV construction program utilizing portions of local sales taxes for roadway improvements. Besides its successful Busway/HOV programs, Houston Metro has also had a direct grant program for street improvements to local government units.

- Use a portion of local tax funds available for transit for expenditures on roadway improvements, thus greatly increasing federal matching funds for those improvements. When transit agencies use local taxes to build light rail (or busways), they most often receive a 50 percent match from the Federal Transit Administration. If these same funds are used for the purposes of building general purpose freeway lanes, they are eligible for an 80 percent match from the Federal Highway Administration. When these funds are used to build busway/HOV/HOT lanes, the toll revenues generated from the HOT can be used to produce additional federal matching funds. This combined strategy yields a federal funding match that is twice that of light rail alone and provides for building more than five times the lane miles of infrastructure, which can be a mixture of general purpose lanes and transit fixed guideways (busways and HOV/HOT lanes).

- Avoid looking to transit to solve congestions challenges. In future planning, transit, like any other mode, should be employed only where its costs are lower than that of the alternatives on a passenger mile or passenger hour basis.

- Consider intercity passenger rail as an alternative to highways as in the case of transit only where the total cost per passenger mile or passenger hour is less than that of highways.

- Consider building HOV lanes as *bi-directional* lanes rather than the common one-directional, reversible lanes. For example, 139 miles of the planned 225 mile high occupancy vehicle lane system in Dallas is planned to be one-way (reversible). With the continuing dispersion of jobs and residences, commuting patterns tend to be less one directional, with similar volumes in both directions. The one-way (reversible) HOV lanes should be constructed as two way lanes.

## Border

- Make "real time" border delay data immediately available, making it more feasible for southbound trucks to alter their routes based upon waiting times.

- Upgrade U.S. Route 57 to four lanes (Eagle Pass to Interstate 35 south of San Antonio) which connects to Mexico Federal Route 57 connecting Saltillo and Mexico City to Piedras Niegras.

- Appoint a "blue ribbon" *Border Futures Commission* for the purposes of identifying reasonable infrastructure needs, incremental costs and financing strategies. This commission should be instructed to emphasize user fee funding mechanisms.

- The goals of the *Border Futures Commission* should be:

    - To review the costs and benefits of border transportation activities and their impacts on specific border communities the extent to which costs exceed benefits (incremental costs).
    - To propose the specific border transportation projects, management procedures and intelligent transportation system (ITS) strategies that would be required to mitigate the incremental impacts of border transportation activities on Texas border communities.
    - To propose methods of finance with an emphasis on user financing, as opposed to general or statewide funding sources. In particular, the *Border Futures Commission* should be charged with a thorough review of any potential mechanisms by which border traffic could be assessed the full incremental cost of needed border improvements. Obviously, such a financing mechanism would require federal legislation and concerted advocacy among states along the borders with both Mexico and Canada. Dedicated revenues from such a financing source could be directly transferred to state departments of transportation, which would administer state mandated programs and allocate appropriate funding to local needs.
    - To propose objectives with respect to border crossing performance in cooperation with United States and Mexico officials and to propose information systems that would allow "real time" notification to truckers of conditions at border crossings. This would allow truckers to select the most convenient routes to cross the border.

## Statewide Strategic Planning

- Appoint a "blue ribbon" *Texas Transportation Futures Commission* for the

purposes of identifying reasonable infrastructure needs, based upon reasonable criteria (such as cost per passenger mile). The Commission should also identify financing strategies and propose high priority projects that might be funded by debt. This commission should be instructed to emphasize user fee funding mechanisms and coordinate its activities with those of the proposed *Border Futures Commission.* Additional responsibilities of the *Transportation Futures Commission* would be:

- To project the extent of transportation demand throughout the state over the next 25 years.
- To assess the highway transportation needs in the state of Texas over the next 25 years, based upon the objective of sustainably obtaining free flow operating conditions throughout the state.
- To review the ability of present funding resources and strategies for meeting the identified needs.
- To develop a program of projects intended to minimize traffic congestion in the state, based upon traffic volume-to-capacity ratios that achieve virtual free flow in all urban areas and throughout the state. The Commission should be directed to make its prioritized recommendations based upon reasonable criteria, such as costs per person mile of improvements.
- To identify any high priority needs that justify completion in advance of new revenues, especially through debt financing.
- To propose funding and service delivery strategies that would deliver the proposed level of service, with particular emphasis on innovative user financing.

# I. THE TRANSPORTATION SITUATION IN TEXAS

Texas faces serious challenges in meeting the transportation needs resulting from its rapid growth. The purpose of this report is to assess the extent of future transportation needs and strategies for financing these needs.

Texas is now the nation's second most populous state, having passed New York during the last decade. Texas is experiencing rapid growth. The 2000 United States Census indicates that Texas has a population of 20,852,000, up 23 percent from the 1990 figure of just under 17 million. During the 1990s, Texas increased over 75 percent faster than the national rate from 1990, and its 2000 census count exceeded the U.S. Census Bureau estimate by more than three percent. Texas added 3.9 million residents, slightly less than much larger California's 4.1 million. Among the other 48 states, only Florida added more than one-half the amount of new Texas population (Table 1). Texas added from nearly 40 to over 1,000 times the population gain of the slowest growing states (Table 2).

At the same time, Texas has some of the nation's largest and fastest growing metropolitan areas. From 1990 to 1999,[2] Austin was the second fastest growing metropolitan area in the nation of over 1,000,000 population, growing 35.4 percent. Dallas-Fort Worth grew 21.6 percent and ranked 10th. Houston ranked 12th, while San Antonio, the only other Texas metropolitan area with more than 1,000,000 ranked 15th. Only Los Angeles and Atlanta added more residents than Dallas-Fort Worth, which grew by 872,000 (Table 3).

Smaller metropolitan areas grew rapidly as well. Laredo was the nation's second fastest growing metropolitan area (of all sizes), McAllen-Edinburg-Mission ranked third and Brownsville-Harlingen-San Benito ranked 15th (Table 4).[3]

**Table 1**
**10 States Adding the Most Population: 1990-2000**

| Rank | State | 1990 | 2000 | Change | % |
|---|---|---|---|---|---|
| 1 | California | 29,760,021 | 33,871,648 | 4,111,627 | 13.8% |
| **2** | **Texas** | **16,986,510** | **20,851,820** | **3,865,310** | **22.8%** |
| 3 | Florida | 12,937,926 | 15,982,378 | 3,044,452 | 23.5% |
| 4 | Georgia | 6,478,216 | 8,186,453 | 1,708,237 | 26.4% |
| 5 | Arizona | 3,665,228 | 5,130,632 | 1,465,404 | 40.0% |
| 6 | North Carolina | 6,628,637 | 8,049,313 | 1,420,676 | 21.4% |
| 7 | Washington | 4,866,692 | 5,894,121 | 1,027,429 | 21.1% |
| 8 | Colorado | 3,294,394 | 4,301,261 | 1,006,867 | 30.6% |
| 9 | Illinois | 11,430,602 | 12,419,293 | 988,691 | 8.6% |
| 10 | New York | 17,990,455 | 18,976,457 | 986,002 | 5.5% |

Source: U.S. Census Bureau.

**Table 2**
**10 States Adding the Least Population: 1990-2000**

| Rank | State | 1990 | 2000 | Change | % |
|---|---|---|---|---|---|
| 41 | Hawaii | 1,108,229 | 1,211,537 | 103,308 | 9.3% |
| 42 | Montana | 799,065 | 902,195 | 103,130 | 12.9% |
| 43 | Alaska | 550,043 | 626,932 | 76,889 | 14.0% |
| 44 | South Dakota | 696,004 | 754,844 | 58,840 | 8.5% |
| 45 | Maine | 1,227,928 | 1,274,923 | 46,995 | 3.8% |
| 46 | Vermont | 562,758 | 608,827 | 46,069 | 8.2% |
| 47 | Rhode Island | 1,003,464 | 1,048,319 | 44,855 | 4.5% |
| 48 | Wyoming | 453,588 | 493,782 | 40,194 | 8.9% |
| 49 | West Virginia | 1,793,477 | 1,808,344 | 14,867 | 0.8% |
| 50 | North Dakota | 638,800 | 642,200 | 3,400 | 0.5% |

Source: U.S. Census Bureau.

**Table 3**
**15 Most Rapidly Growing Metropolitan Areas over 1,000,000: 1990-1999**

| Rank | Metropolitan Area | 1999 | 1990 | Change | % |
|---|---|---|---|---|---|
| 1 | Las Vegas, NV-AZ MSA | 1,381,086 | 852,646 | 528,440 | 62.0% |
| **2** | **Austin-San Marcos, TX MSA** | **1,146,050** | **846,227** | **299,823** | **35.4%** |
| 3 | Phoenix-Mesa, AZ MSA | 3,013,696 | 2,238,498 | 775,198 | 34.6% |
| 4 | Atlanta, GA MSA | 3,857,097 | 2,959,500 | 897,597 | 30.3% |
| 5 | Raleigh-Durham-Chapel Hill, NC MSA | 1,105,535 | 858,516 | 247,019 | 28.8% |
| 6 | Orlando, FL MSA | 1,535,004 | 1,224,844 | 310,160 | 25.3% |

**Table 3**
**15 Most Rapidly Growing Metropolitan Areas over 1,000,000: 1990-1999**

| Rank | Metropolitan Area | 1999 | 1990 | Change | % |
|---|---|---|---|---|---|
| 7 | Denver-Boulder-Greeley, CO CMSA | 2,417,908 | 1,980,140 | 437,768 | 22.1% |
| 8 | Charlotte-Gastonia-Rock Hill, NC-SC MSA | 1,417,217 | 1,161,546 | 255,671 | 22.0% |
| 9 | Portland-Salem, OR-WA CMSA | 2,180,996 | 1,793,476 | 387,520 | 21.6% |
| **10** | **Dallas-Fort Worth, TX CMSA** | **4,909,523** | **4,037,282** | **872,241** | **21.6%** |
| 11 | West Palm Beach-Boca Raton, FL MSA | 1,049,420 | 863,503 | 185,917 | 21.5% |
| **12** | **Houston-Galveston-Brazoria, TX CMSA** | **4,493,741** | **3,731,014** | **762,727** | **20.4%** |
| 13 | Nashville, TN MSA | 1,171,755 | 985,026 | 186,729 | 19.0% |
| 14 | Salt Lake City-Ogden, UT MSA | 1,275,076 | 1,072,227 | 202,849 | 18.9% |
| **15** | **San Antonio, TX MSA** | **1,564,949** | **1,324,749** | **240,200** | **18.1%** |

Source: U.S. Census Bureau.

**Table 4**
**15 Most Rapidly Growing Metropolitan Areas: 1990-1999**

| Rank | Metropolitan Area | 1999 | 1990 | Change | % Change |
|---|---|---|---|---|---|
| 1 | Las Vegas, NV-AZ MSA | 1,381,086 | 852,646 | 528,440 | 62.0% |
| **2** | **Laredo, TX MSA** | **193,180** | **133,239** | **59,941** | **45.0%** |
| **3** | **McAllen-Edinburg-Mission, TX MSA** | **534,907** | **383,545** | **151,362** | **39.5%** |
| 4 | Boise City, ID MSA | 407,844 | 295,851 | 111,993 | 37.9% |
| 5 | Naples, FL MSA | 207,029 | 152,099 | 54,930 | 36.1% |
| **6** | **Austin-San Marcos, TX MSA** | **1,146,050** | **846,227** | **299,823** | **35.4%** |
| 7 | Fayetteville-Springdale-Rogers, MSA | 285,017 | 210,939 | 74,078 | 35.1% |
| 8 | Phoenix-Mesa, AZ MSA | 3,013,696 | 2,238,498 | 775,198 | 34.6% |
| 9 | Provo-Orem, UT MSA | 346,997 | 263,590 | 83,407 | 31.6% |
| 10 | Atlanta, GA MSA | 3,857,097 | 2,959,500 | 897,597 | 30.3% |
| 11 | Wilmington, NC MSA | 222,109 | 171,269 | 50,840 | 29.7% |
| 12 | Raleigh-Durham-Chapel Hill, NC MSA | 1,105,535 | 858,516 | 247,019 | 28.8% |
| 13 | Fort Collins-Loveland, CO MSA | 236,849 | 186,136 | 50,713 | 27.2% |
| 14 | Yuma, AZ MSA | 135,614 | 106,895 | 28,719 | 26.9% |
| **15** | **Brownsville-Harlingen-San Benito, TX MSA** | **329,131** | **260,120** | **69,011** | **26.5%** |

Source: U.S. Census Bureau.

Projections indicate that Texas will continue to grow at rates well above the national average. By 2025, Texas is likely to add another 55 percent to its population to reach more than 32 million. The U.S. Census Bureau projects that Texas will grow 60 percent faster than the nation from 2000 to 2025. The great majority of the growth – 89 percent – is likely to be in eight metropolitan areas that will each have more than 500,000 residents in 2025 (Table 5). These areas, which today account for under 70 percent of the state's population, will comprise 76 percent in 2025 (Table 6). Dallas-Fort Worth is expected to grow from 5.1 million to 8.7 million, adding more than 1.5 times the population of metropolitan Portland. Houston is expected to grow from 4.7 million to 7.5 million, adding a population equal to that of metropolitan Cleveland (Table 7).[4]

**Table 5**
**Projected Major Metropolitan and Other Growth in Texas to 2025**

| Category | 2000 | 2025 | Change |
|---|---|---|---|
| Major Metropolitan Areas | 14,449,000 | 24,537,000 | 10,088,000 |
| Outside Major Metropolitan Areas | 6,403,000 | 7,695,000 | 1,292,000 |
| **Texas** | **20,852,000** | **32,232,000** | **11,380,000** |

Major Metropolitan: Areas over 500,000 in 2025
Source: Estimated based upon Texas State Data Center estimates and projections.

**Table 6**
**Projected Metropolitan and Other Growth in Texas to 2025**

| Category | Share of Population: 2000 | Share of Population: 2025 | Share of Population Growth |
|---|---|---|---|
| Major Metropolitan Areas | 69.3% | 76.1% | 88.6% |
| Outside Major Metropolitan Areas | 30.7% | 23.9% | 11.4% |
| **Texas** | **100.0%** | **100.0%** | **100.0%** |

Major Metropolitan: Areas over 500,000 in 2025
Source: Estimated based upon Texas State Data Center estimates and projections.

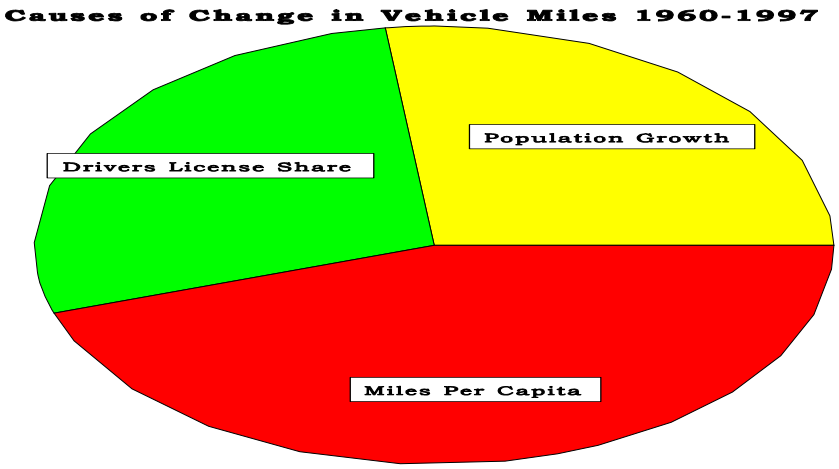
**Table 7**
**Projected Metropolitan and Other Growth in Texas to 2025**

| Metropolitan Area | 2000 | 2025 | Change | % | Share |
|---|---|---|---|---|---|
| **Austin** | **1,193,000** | **2,294,000** | **1,101,000** | **92.3%** | **9.7%** |
| **Brownsville** | **335,000** | **589,000** | **254,000** | **75.8%** | **2.2%** |
| **Dallas-Fort Worth** | **5,124,000** | **8,683,000** | **3,559,000** | **69.5%** | **31.3%** |
| **El Paso** | **722,000** | **1,242,000** | **520,000** | **72.0%** | **4.6%** |
| **Houston** | **4,687,000** | **7,525,000** | **2,838,000** | **60.6%** | **24.9%** |
| **Laredo** | **205,000** | **502,000** | **297,000** | **144.9%** | **2.6%** |
| **McAllen** | **560,000** | **1,324,000** | **764,000** | **136.4%** | **6.7%** |
| **San Antonio** | **1,623,000** | **2,378,000** | **755,000** | **46.5%** | **6.6%** |
| Balance of State | 6,403,000 | 7,695,000 | 1,292,000 | 20.2% | 11.4% |
| State | 20,852,000 | 32,232,000 | 11,380,000 | 54.6% | 100.0% |

Source: Estimated based upon Texas State Data Center estimates and projections.

## TRAVEL ON STREETS AND HIGHWAYS

Texas has been growing at well above the national rate for decades. Since 1960, Texas has more than doubled in population. The rate of increase in street and highway travel has been even greater. From 1960 to 1997, while population was increasing 102 percent, travel on Texas streets and roads increased 375 percent. Most of this increase was attributable to the increase in population (27 percent) and the expansion in the share of population with access to automobiles (28 percent). Since 1960, the share of Texas residents holding drivers licenses has risen more than 50 percent, generally reflecting the national trend. Over that period, women have gained virtual parity with men with respect to automobile accessibility, while lower income residents have experienced a significant increase in automobile ownership. This democratization of mobility[5] is at least partially attributable to greater affluence. It has not only led to greater automobile access, but also to increases in average daily travel per capita (Figure 1).




Nearly 70 percent of the daily street and highway travel in Texas is in the four largest urbanized areas (Dallas-Fort Worth, Houston, San Antonio and Austin).[6] However, because these areas represent only 1.5 percent of the total state land area, the preponderance of traffic congestion occurs in these areas. Traffic intensity (traffic volumes per square mile) in these urban areas are many times that of other areas (Table 8).

And, because of existing development and higher land costs, expansion of highway facilities is much more expensive in the larger urbanized areas. For example, interstate highways can be readily expanded in most rural areas by simply adding a lane in each direction in the existing median (right-of-way). This is comparatively inexpensive and typically requires little or no modification of overpasses. It is different, however, in urban areas. Most readily available land for highway expansion was long ago used within urban areas.

**Table 8**
**Major Metropolitan & Statewide Traffic Intensity**

| Urban Area | Daily Vehicle Miles | Area in Square Miles | Vehicle Miles per Square Mile |
|---|---|---|---|
| **Austin** | **18,277** | **314** | **58,207** |
| **Dallas-Ft. Worth** | **108,543** | **1,712** | **63,401** |
| **Houston** | **91,925** | **1,537** | **59,808** |
| **San Antonio** | **31,281** | **485** | **64,497** |
| Subtotal | 250,026 | 4,048 | 61,765 |
| Elsewhere | 116,767 | 257,877 | 453 |
| State | 366,793 | 261,925 | 1,400 |

Source: Calculated from Federal Highway Administration data.

Texas urbanized areas have experienced some of the largest volume increases in traffic. Among the 68 U.S. urbanized areas studied by the Texas Transportation Institute, Austin ranks second in traffic volume increase from 1982 to 1997, with a 65 percent increase. Laredo ranks sixth, while Brownsville ranks 18th. Other Texas urbanized areas rank much lower, such as Houston at 52nd, Beaumont at 59th and Corpus Christi at 63rd. Nonetheless, even these areas experienced significant traffic volume increases of 40 to 56 percent (Table 9).

But much of the travel growth in Texas urbanized areas is the result of strong population growth. Texas areas tend to rank somewhat lower in their average travel per capita. Austin ranks the highest, at ninth, while Fort Worth ranks 22nd. Again, Houston Beaumont and Corpus Christi experienced less per capita travel growth than most areas, all ranking 56th or higher (Table 10).

In some Texas urbanized areas, roadway expansion has been at a greater rate than the increase in travel. For example, from 1982 to 1997, Houston expanded its freeway and arterial system by 71 percent, while travel increased only 56 percent.[7] Roadway expansion was also greater than the increase in traffic in Laredo and Corpus Christi. But in other areas, traffic grew faster than roadways were expanded. Dallas and San Antonio, for example, experienced travel increases double that of the roadway expansion rate.[8]

**Table 9**
**Daily Vehicle Miles (000)**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 1 | Las Vegas NV | 5,815 | 20,300 | 249.1% |
| 2 | Atlanta GA | 31,925 | 95,110 | 197.9% |
| **3** | **Austin TX** | **7,100** | **18,850** | **165.5%** |
| 4 | Charlotte NC | 6,745 | 16,580 | 145.8% |
| 5 | Orlando FL | 11,645 | 28,300 | 143.0% |

**Table 9**
**Daily Vehicle Miles (000)**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| **6** | **Laredo TX** | **900** | **2,185** | **142.8%** |
| 7 | Tucson AZ | 5,405 | 12,460 | 130.5% |
| 8 | Portland-Vancouver OR-WA | 13,170 | 30,000 | 127.8% |
| 9 | Bakersfield CA | 3,000 | 6,530 | 117.7% |
| 10 | Fresno CA | 4,800 | 10,350 | 115.6% |
| 11 | Nashville TN | 10,165 | 21,900 | 115.4% |
| 12 | San Bernardino-Riverside CA | 14,130 | 30,400 | 115.1% |
| 13 | St. Louis MO-IL | 28,690 | 58,000 | 102.2% |
| 14 | Norfolk VA | 12,635 | 25,400 | 101.0% |
| 15 | Tampa FL | 9,960 | 20,000 | 100.8% |
| 16 | Indianapolis IN | 15,050 | 29,875 | 98.5% |
| 17 | Columbus OH | 12,460 | 24,685 | 98.1% |
| **18** | **Brownsville TX** | **890** | **1,750** | **96.6%** |
| 19 | Kansas City MO-KS | 20,005 | 39,310 | 96.5% |
| 20 | Seattle-Everett WA | 25,860 | 49,600 | 91.8% |
| 21 | Tacoma WA | 6,945 | 13,100 | 88.6% |
| 22 | Phoenix AZ | 27,455 | 51,100 | 86.1% |
| 23 | Minneapolis-St. Paul MN | 29,905 | 55,200 | 84.6% |
| 24 | Memphis TN-AR-MS | 11,590 | 21,370 | 84.4% |
| 25 | Washington DC-MD-VA | 44,960 | 81,620 | 81.5% |
| 26 | Sacramento CA | 15,180 | 27,300 | 79.8% |
| 27 | Salem OR | 1,750 | 3,145 | 79.7% |
| 28 | Baltimore MD | 24,465 | 43,245 | 76.8% |
| 29 | Ft. Lauderdale-Hollywood-Pompano Bch FL | 18,640 | 32,750 | 75.7% |
| **30** | **El Paso TX-NM** | **6,585** | **11,485** | **74.4%** |
| **31** | **Fort Worth TX** | **20,700** | **36,000** | **73.9%** |
| 32 | Albany-Schenectady-Troy NY | 7,470 | 12,940 | 73.2% |
| 33 | Albuquerque NM | 7,255 | 12,530 | 72.7% |
| **34** | **San Antonio TX** | **17,810** | **30,600** | **71.8%** |
| 35 | Salt Lake City UT | 11,175 | 19,200 | 71.8% |
| 36 | Louisville KY-IN | 13,900 | 23,800 | 71.2% |
| **37** | **Dallas TX** | **38,445** | **65,000** | **69.1%** |
| 38 | Cincinnati OH-KY | 19,640 | 33,015 | 68.1% |
| 39 | Omaha NE-IA | 6,900 | 11,480 | 66.4% |
| 40 | Rochester NY | 8,870 | 14,700 | 65.7% |
| 41 | Los Angeles CA | 165,395 | 270,430 | 63.5% |
| 42 | Chicago IL-Northwestern IN | 95,810 | 155,880 | 62.7% |
| 43 | San Jose CA | 22,045 | 35,750 | 62.2% |

**Table 9**
**Daily Vehicle Miles (000)**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 44 | Hartford-Middletown CT | 9,505 | 15,400 | 62.0% |
| 45 | Oklahoma City OK | 16,095 | 26,060 | 61.9% |
| 46 | Eugene-Springfield OR | 2,435 | 3,935 | 61.6% |
| 47 | Jacksonville FL | 13,785 | 22,240 | 61.3% |
| 48 | Miami-Hialeah FL | 23,300 | 37,470 | 60.8% |
| 49 | Boulder CO | 1,080 | 1,725 | 59.7% |
| 50 | San Diego CA | 35,850 | 56,100 | 56.5% |
| 51 | Buffalo-Niagara Falls NY | 12,850 | 20,100 | 56.4% |
| **52** | **Houston TX** | **54,085** | **84,395** | **56.0%** |
| 53 | San Francisco-Oakland CA | 52,605 | 82,000 | 55.9% |
| 54 | Milwaukee WI | 20,545 | 32,000 | 55.8% |
| 55 | Cleveland OH | 24,985 | 38,505 | 54.1% |
| 56 | New Orleans LA | 11,740 | 17,900 | 52.5% |
| 57 | Spokane WA | 4,180 | 6,365 | 52.3% |
| 58 | Denver CO | 26,810 | 39,305 | 46.6% |
| **59** | **Beaumont TX** | **2,675** | **3,905** | **46.0%** |
| 60 | Philadelphia PA-NJ | 51,480 | 74,900 | 45.5% |
| 61 | Colorado Springs CO | 5,200 | 7,495 | 44.1% |
| 62 | Detroit MI | 61,990 | 87,620 | 41.3% |
| **63** | **Corpus Christi TX** | **5,315** | **7,450** | **40.2%** |
| 64 | Providence-Pawtucket RI-MA | 12,640 | 17,650 | 39.6% |
| 65 | New York NY-Northeastern NJ | 183,850 | 252,940 | 37.6% |
| 66 | Boston MA | 43,650 | 58,285 | 33.5% |
| 67 | Pittsburgh PA | 26,700 | 35,600 | 33.3% |
| 68 | Honolulu HI | 8,755 | 11,500 | 31.4% |

Source: Texas Transportation Institute.

**Table 10**
**Daily Vehicle Miles per Capita**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 1 | Atlanta GA | 19.8 | 36.9 | 85.9% |
| 2 | St. Louis MO-IL | 15.5 | 28.6 | 84.2% |
| 3 | Albany-Schenectady-Troy NY | 14.9 | 25.9 | 73.2% |
| 4 | Portland-Vancouver OR-WA | 13.0 | 22.4 | 71.7% |
| 5 | Rochester NY | 13.9 | 23.7 | 71.1% |
| 6 | Nashville TN | 20.3 | 34.8 | 71.0% |
| 7 | Indianapolis IN | 17.5 | 29.6 | 69.0% |
| 8 | Columbus OH | 14.9 | 24.3 | 63.0% |
| **9** | **Austin TX** | **18.7** | **29.9** | **60.1%** |
| 10 | Tucson AZ | 12.0 | 19.2 | 59.6% |

**Table 10**
**Daily Vehicle Miles per Capita**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 11 | Kansas City MO-KS | 18.4 | 29.0 | 58.1% |
| 12 | Buffalo-Niagara Falls NY | 12.0 | 18.7 | 56.4% |
| 13 | Louisville KY-IN | 18.1 | 28.2 | 56.0% |
| 14 | Salem OR | 10.9 | 17.0 | 55.4% |
| 15 | Norfolk VA | 16.4 | 24.9 | 51.8% |
| 16 | Milwaukee WI | 17.0 | 25.5 | 50.2% |
| 17 | Charlotte NC | 19.3 | 28.8 | 49.6% |
| 18 | Cincinnati OH-KY | 17.4 | 26.0 | 49.6% |
| 19 | San Bernardino-Riverside CA | 15.0 | 22.4 | 49.5% |
| 20 | Omaha NE-IA | 13.8 | 20.5 | 48.6% |
| 21 | New Orleans LA | 10.9 | 16.0 | 47.0% |
| **22** | **Fort Worth TX** | **19.1** | **27.7** | **45.2%** |
| 23 | Memphis TN-AR-MS | 15.3 | 22.0 | 44.5% |
| 24 | Chicago IL-Northwestern IN | 13.5 | 19.5 | 44.3% |
| 25 | Cleveland OH | 14.3 | 20.6 | 44.2% |
| 26 | Hartford-Middletown CT | 16.8 | 24.1 | 43.0% |
| 27 | Eugene-Springfield OR | 12.8 | 18.3 | 42.8% |
| 28 | Washington DC-MD-VA | 16.7 | 23.6 | 41.5% |
| 29 | Minneapolis-St. Paul MN | 17.1 | 24.1 | 41.1% |
| 30 | Seattle-Everett WA | 18.0 | 25.3 | 40.9% |
| **31** | **Laredo TX** | **9.5** | **13.2** | **39.8%** |
| 32 | Baltimore MD | 14.4 | 20.1 | 39.8% |
| 33 | Orlando FL | 19.1 | 26.4 | 38.5% |
| 34 | Fresno CA | 13.9 | 19.2 | 37.8% |
| 35 | Las Vegas NV | 12.9 | 17.7 | 36.6% |
| 36 | Albuquerque NM | 16.5 | 22.2 | 34.5% |
| 37 | Miami-Hialeah FL | 13.5 | 18.1 | 34.4% |
| 38 | Tacoma WA | 16.5 | 22.2 | 34.3% |
| 39 | Detroit MI | 16.3 | 21.8 | 34.1% |
| 40 | New York NY-Northeastern NJ | 11.0 | 14.7 | 33.6% |
| 41 | Bakersfield CA | 13.0 | 17.4 | 33.5% |
| **42** | **San Antonio TX** | **18.7** | **24.9** | **32.7%** |
| **43** | **Dallas TX** | **21.2** | **28.0** | **31.9%** |
| 44 | Los Angeles CA | 16.7 | 22.0 | 31.6% |
| 45 | San Francisco-Oakland CA | 16.0 | 21.0 | 31.5% |
| 46 | Tampa FL | 18.4 | 24.1 | 30.6% |
| 47 | Salt Lake City UT | 16.4 | 21.3 | 29.8% |
| 48 | Pittsburgh PA | 14.8 | 19.0 | 28.7% |
| **49** | **El Paso TX-NM** | **14.6** | **18.8** | **28.7%** |

**Table 10**
**Daily Vehicle Miles per Capita**

| Rank | Urbanized Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 50 | Providence-Pawtucket RI-MA | 15.3 | 19.6 | 28.0% |
| 51 | Spokane WA | 15.2 | 19.3 | 26.9% |
| 52 | Boston MA | 15.3 | 19.3 | 26.2% |
| 53 | Ft. Lauderdale-Hollywood-Pompano Bch FL | 17.5 | 21.8 | 24.7% |
| **54** | **Brownsville TX** | **9.9** | **12.1** | **22.0%** |
| 55 | Sacramento CA | 18.3 | 22.1 | 20.9% |
| **56** | **Houston TX** | **22.5** | **27.2** | **20.8%** |
| 57 | Jacksonville FL | 22.4 | 27.0 | 20.3% |
| 58 | San Jose CA | 18.4 | 22.1 | 20.1% |
| **59** | **Beaumont TX** | **23.3** | **27.9** | **19.9%** |
| 60 | Boulder CO | 13.5 | 15.7 | 16.2% |
| **61** | **Corpus Christi TX** | **21.3** | **24.0** | **13.0%** |
| 62 | Philadelphia PA-NJ | 12.6 | 14.2 | 12.4% |
| 63 | Phoenix AZ | 19.2 | 21.3 | 10.9% |
| 64 | Denver CO | 19.9 | 21.8 | 10.0% |
| 65 | San Diego CA | 20.1 | 21.5 | 6.7% |
| 66 | Honolulu HI | 15.4 | 16.3 | 6.2% |
| 67 | Oklahoma City OK | 25.1 | 25.8 | 2.6% |
| 68 | Colorado Springs CO | 18.6 | 18.1 | -2.8% |

Source: Calculated from Texas Transportation Institute data.

**Table 11**
**Urban Areas Ranked by Roadway Congestion Index[1]**

| Rank | Urban Area | Roadway Congestion Index: 1997 |
|---|---|---|
| 1 | Los Angeles CA | 1.51 |
| 2 | San Francisco-Oakland CA | 1.33 |
| 2 | Washington DC-MD-VA | 1.33 |
| 4 | Chicago IL-Northwestern IN | 1.28 |
| 5 | Miami-Hialeah FL | 1.26 |
| 5 | Seattle-Everett WA | 1.26 |
| 7 | Boston MA | 1.24 |
| 8 | Atlanta GA | 1.23 |
| 9 | Portland-Vancouver OR-WA | 1.22 |
| 10 | Detroit MI | 1.18 |
| 11 | San Bernardino-Riverside CA | 1.15 |
| 11 | Tacoma WA | 1.15 |
| 13 | Sacramento CA | 1.14 |

**Table 11**
**Urban Areas Ranked by Roadway Congestion Index[1]**

| Rank | Urban Area | Roadway Congestion Index: 1997 |
|---|---|---|
| 14 | Phoenix AZ | 1.13 |
| 14 | Minneapolis-St. Paul MN | 1.13 |
| 16 | San Diego CA | 1.12 |
| 17 | New York NY-Northeastern NJ | 1.11 |
| 18 | Cincinnati OH-KY | 1.08 |
| 18 | Denver CO | 1.08 |
| 18 | San Jose CA | 1.08 |
| 18 | Ft. Lauderdale-Hollywood-Pompano Bch FL | 1.08 |
| 22 | Las Vegas NV | 1.07 |
| 22 | Tampa FL | 1.07 |
| **22** | **Houston TX** | **1.07** |
| 25 | Honolulu HI | 1.06 |
| 26 | Baltimore MD | 1.05 |
| 26 | Albuquerque NM | 1.05 |
| 26 | Philadelphia PA-NJ | 1.05 |
| 26 | Indianapolis IN | 1.05 |
| 30 | Columbus OH | 1.04 |
| **30** | **Dallas TX** | **1.04** |
| 30 | Salt Lake City UT | 1.04 |
| 30 | Charlotte NC | 1.04 |
| 30 | Louisville KY-IN | 1.04 |
| 35 | St. Louis MO-IL | 1.03 |
| **35** | **Austin TX** | **1.03** |
| 37 | Cleveland OH | 1.01 |
| 37 | Milwaukee WI | 1.01 |
| 39 | Omaha NE-IA | 1.00 |
| 39 | Tucson AZ | 1.00 |
| 41 | New Orleans LA | 0.99 |
| 42 | Norfolk VA | 0.97 |
| 43 | Memphis TN-AR-MS | 0.96 |
| 43 | Nashville TN | 0.96 |
| 45 | Orlando FL | 0.93 |
| 45 | Jacksonville FL | 0.93 |
| **47** | **San Antonio TX** | **0.92** |
| **48** | **Fort Worth TX** | **0.91** |
| 49 | Hartford-Middletown CT | 0.90 |
| **49** | **Beaumont TX** | **0.90** |
| 49 | Fresno CA | 0.90 |

**Table 11**
**Urban Areas Ranked by Roadway Congestion Index[1]**

| Rank | Urban Area | Roadway Congestion Index: 1997 |
|---|---|---|
| 52 | Providence-Pawtucket RI-MA | 0.87 |
| **53** | **El Paso TX-NM** | **0.86** |
| 54 | Oklahoma City OK | 0.85 |
| 55 | Eugene-Springfield OR | 0.84 |
| 56 | Salem OR | 0.82 |
| 57 | Spokane WA | 0.81 |
| 58 | Boulder CO | 0.80 |
| 59 | Rochester NY | 0.78 |
| 60 | Colorado Springs CO | 0.77 |
| 61 | Pittsburgh PA | 0.76 |
| 61 | Kansas City MO-KS | 0.76 |
| 63 | Albany-Schenectady-Troy NY | 0.75 |
| 63 | Bakersfield CA | 0.75 |
| 65 | Buffalo-Niagara Falls NY | 0.72 |
| **65** | **Corpus Christi TX** | **0.72** |
| **67** | **Brownsville TX** | **0.71** |
| **68** | **Laredo TX** | **0.61** |

Source: Texas Transportation Institute.

[1] The Roadway Congestion Index (RCI) is a measure of the total traffic volume of an urban area compared to the total roadway capacity (freeways and arterials). The RCI is calculated every year by the Texas Transportation Institute of Texas A&M University for the Federal Highway Administration. A value above 1.00 means that the roadway system is operating at above capacity, while a value below 1.00 means that the roadway system is operating at below capacity.

**Table 12**
**Change in Roadway Congestion Index: 1982-1997**

| Rank | Urban Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 1 | Columbus OH | 0.61 | 1.04 | 70.5% |
| 2 | Indianapolis IN | 0.62 | 1.05 | 69.4% |
| 3 | Minneapolis-St. Paul MN | 0.70 | 1.13 | 61.4% |
| 4 | Sacramento CA | 0.71 | 1.14 | 60.6% |
| 5 | Las Vegas NV | 0.67 | 1.07 | 59.7% |
| 6 | Bakersfield CA | 0.47 | 0.75 | 59.6% |
| 7 | San Bernardino-Riverside CA | 0.73 | 1.15 | 57.5% |
| 8 | Albany-Schenectady-Troy NY | 0.48 | 0.75 | 56.3% |

**Table 12**
**Change in Roadway Congestion Index: 1982-1997**

| Rank | Urban Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 9 | Eugene-Springfield OR | 0.54 | 0.84 | 55.6% |
| 10 | Portland-Vancouver OR-WA | 0.79 | 1.22 | 54.4% |
| 11 | Ft. Lauderdale-Hollywood-Pompano Bch FL | 0.70 | 1.08 | 54.3% |
| 12 | Salt Lake City UT | 0.68 | 1.04 | 52.9% |
| 13 | Albuquerque NM | 0.69 | 1.05 | 52.2% |
| 14 | Tacoma WA | 0.77 | 1.15 | 49.4% |
| 15 | Omaha NE-IA | 0.67 | 1.00 | 49.3% |
| 16 | Oklahoma City OK | 0.57 | 0.85 | 49.1% |
| 17 | Rochester NY | 0.53 | 0.78 | 47.2% |
| 18 | Atlanta GA | 0.85 | 1.23 | 44.7% |
| 19 | Louisville KY-IN | 0.72 | 1.04 | 44.4% |
| 20 | Salem OR | 0.57 | 0.82 | 43.9% |
| 21 | Orlando FL | 0.65 | 0.93 | 43.1% |
| 22 | San Jose CA | 0.76 | 1.08 | 42.1% |
| 23 | Denver CO | 0.77 | 1.08 | 40.3% |
| 24 | San Diego CA | 0.80 | 1.12 | 40.0% |
| 25 | Boston MA | 0.91 | 1.24 | 36.3% |
| 26 | Chicago IL-Northwestern IN | 0.94 | 1.28 | 36.2% |
| 27 | Kansas City MO-KS | 0.56 | 0.76 | 35.7% |
| 28 | Nashville TN | 0.71 | 0.96 | 35.2% |
| **29** | **Dallas TX** | **0.77** | **1.04** | **35.1%** |
| 30 | Cleveland OH | 0.75 | 1.01 | 34.7% |
| 31 | Baltimore MD | 0.78 | 1.05 | 34.6% |
| 32 | Washington DC-MD-VA | 0.99 | 1.33 | 34.3% |
| **33** | **Beaumont TX** | **0.67** | **0.90** | **34.3%** |
| **34** | **Brownsville TX** | **0.53** | **0.71** | **34.0%** |
| 35 | Cincinnati OH-KY | 0.81 | 1.08 | 33.3% |
| 36 | Milwaukee WI | 0.76 | 1.01 | 32.9% |
| **37** | **Austin TX** | **0.78** | **1.03** | **32.1%** |
| 38 | Hartford-Middletown CT | 0.69 | 0.90 | 30.4% |
| **39** | **El Paso TX-NM** | **0.66** | **0.86** | **30.3%** |
| 40 | Miami-Hialeah FL | 0.97 | 1.26 | 29.9% |
| 41 | Norfolk VA | 0.75 | 0.97 | 29.3% |
| 42 | San Francisco-Oakland CA | 1.04 | 1.33 | 27.9% |
| 43 | St. Louis MO-IL | 0.81 | 1.03 | 27.2% |
| 44 | Tucson AZ | 0.79 | 1.00 | 26.6% |
| 45 | Spokane WA | 0.64 | 0.81 | 26.6% |
| 46 | Memphis TN-AR-MS | 0.76 | 0.96 | 26.3% |
| **47** | **San Antonio TX** | **0.73** | **0.92** | **26.0%** |

**Table 12**
**Change in Roadway Congestion Index: 1982-1997**

| Rank | Urban Area | 1982 | 1997 | Change |
|---|---|---|---|---|
| 48 | Boulder CO | 0.64 | 0.80 | 25.0% |
| **49** | **Fort Worth TX** | **0.73** | **0.91** | **24.7%** |
| 50 | Colorado Springs CO | 0.62 | 0.77 | 24.2% |
| 51 | Honolulu HI | 0.86 | 1.06 | 23.3% |
| 52 | Detroit MI | 0.98 | 1.18 | 20.4% |
| 53 | Phoenix AZ | 0.94 | 1.13 | 20.2% |
| 54 | Seattle-Everett WA | 1.05 | 1.26 | 20.0% |
| 55 | Buffalo-Niagara Falls NY | 0.60 | 0.72 | 20.0% |
| 56 | New York NY-Northeastern NJ | 0.94 | 1.11 | 18.1% |
| 57 | Tampa FL | 0.91 | 1.07 | 17.6% |
| **58** | **Laredo TX** | **0.52** | **0.61** | **17.3%** |
| 59 | New Orleans LA | 0.89 | 0.99 | 11.2% |
| 60 | Fresno CA | 0.81 | 0.90 | 11.1% |
| 61 | Jacksonville FL | 0.84 | 0.93 | 10.7% |
| 62 | Providence-Pawtucket RI-MA | 0.79 | 0.87 | 10.1% |
| 63 | Los Angeles CA | 1.39 | 1.51 | 8.6% |
| **64** | **Corpus Christi TX** | **0.67** | **0.72** | **7.5%** |
| 65 | Philadelphia PA-NJ | 0.98 | 1.05 | 7.1% |
| 66 | Pittsburgh PA | 0.72 | 0.76 | 5.6% |
| **67** | **Houston TX** | **1.09** | **1.07** | **-1.8%** |
| 68 | Charlotte NC | 1.08 | 1.04 | -3.7% |

Source: Texas Transportation Institute.

Despite these great challenges, Texas has performed comparatively well in the provision of urban roadways. In 1997,[9] Houston ranked 22nd in traffic congestion, according to the Texas Transportation Institute Roadway Congestion Index (RCI). Dallas ranked 30th, Austin 35th and San Antonio 47th. Laredo ranked last among the 68 urban areas analyzed, with the lowest level of traffic congestion (39 percent below capacity) (Table 11).

Further, Texas urban areas have not experienced the traffic congestion increases typical of the most congested areas. From 1982 to 1997, Dallas experienced the greatest traffic congestion increase, ranking 29th. Austin ranked 37th, San Antonio 47th and Houston last. Houston is only one of two urban areas that have experienced a reduction in traffic congestion since 1982 (Table 12).

But the growth that is occurring and expected to occur in Texas will require at

least as much effort as in the past if levels of congestion are to be manageable.

## SHOULD MORE HIGHWAYS BE BUILT?

In recent years it has become popular to suggest that expansion of roadways is inappropriate, for two reasons.

- First, it is claimed that building of roadways in itself creates more traffic. This theory of "induced" traffic concludes that it is futile to build more roadways.

- The second reason follows from the first – that alternatives to roadways are a more effective way to provide for additional demand.

## HIGHWAYS AND INDUCED TRAFFIC

The conclusions of two studies are typical of the "induced traffic" theory.

- A study by Hansen and Huang,[10] which found that the percentage increase in freeway traffic is 90 percent of the percentage increase in freeway lane mileage. This is, effectively, a finding that the mere provision of additional capacity causes people to drive more. This is referred to as "induced demand." This type of conclusion has led to the view that it is impossible to "build our way out of congestion."

- A report[11] by the Surface Transportation Policy Project (STPP) purported to show that from 1982 to 1996 there was little difference in change in traffic congestion between analyzed urban areas that added more roadway and those that added less.

The Hanson-Huang study, however, was limited to freeways and did not quantify the impact of freeways expansion on adjacent arterials and other surface streets. It is to be expected that when faster roadways, such as freeways, are opened, drivers will switch from slower arterials. It is likely that a large percentage of the "induced demand" found by Hanson and Huang was simply demand that was transferred from other roadways.[12]

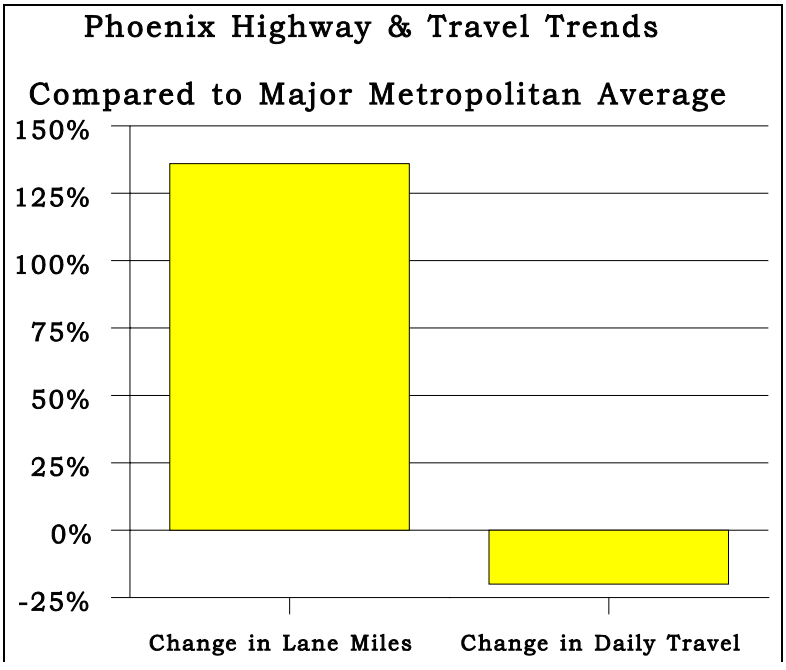
The STPP report failed to note that the RCI in urbanized areas that built less roadway increased one-third more than where more roadway was built. Moreover, STPP failed to account for differences in population growth – the urbanized areas that built more roadway grew 15 percent more than the areas that built less.

If the mere provision of additional highway capacity were a primary generator of additional traffic, then it would be expected that per capita street and highway travel would have increased significantly more in urbanized areas that expanded their highway systems at a greater rate. This, however, is not the case. From 1982 to 1996:[13]

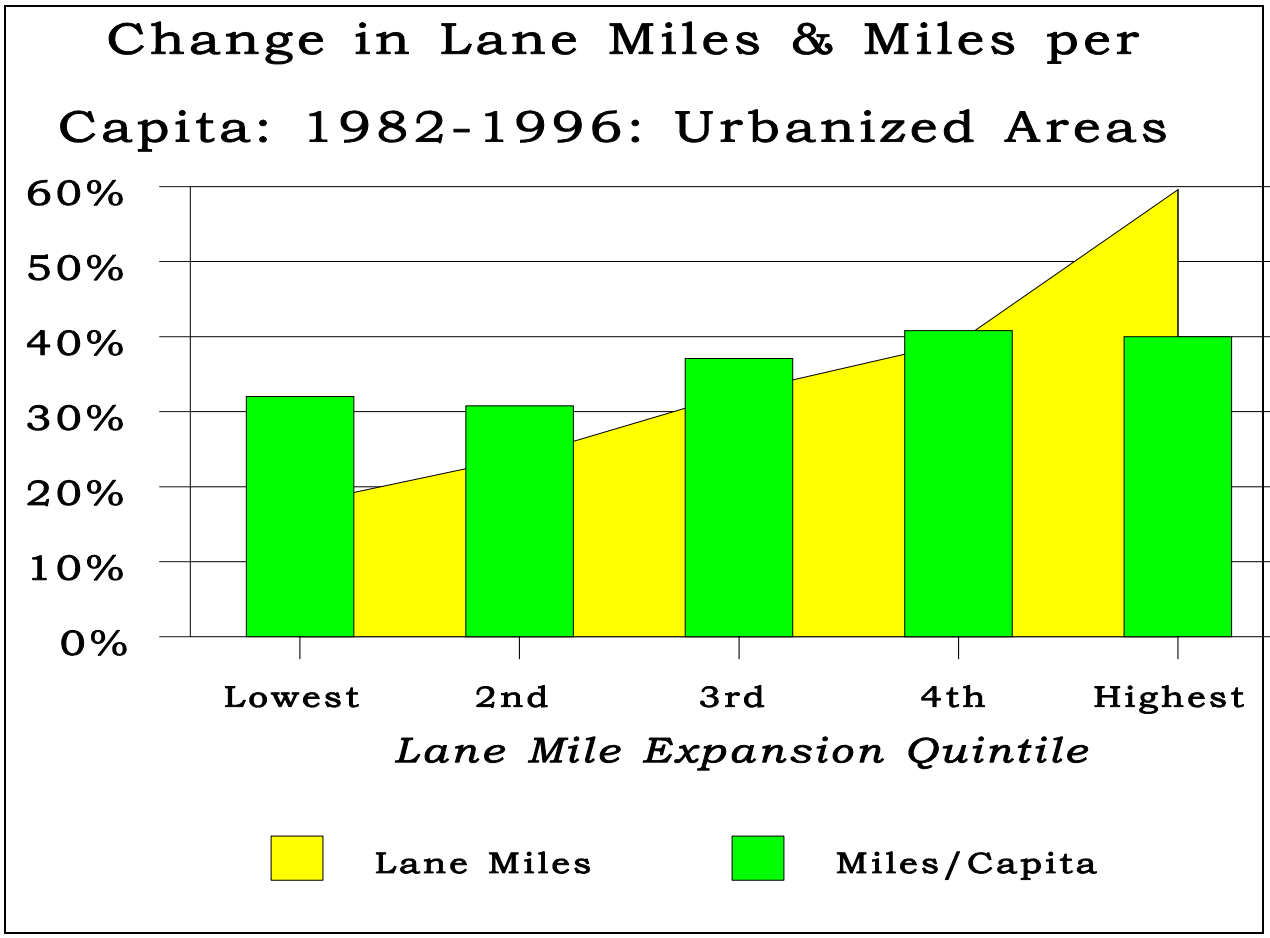
- Urban areas that expanded highways the most did so 240 percent more than that of the urban areas that expanded highways the least.

- High expansion urban areas (top quintile) experienced street and highway travel per capita increases of only 24 percent more than the low expansion urban areas (bottom quintile) – barely one-tenth the 240 percent rate of roadway expansion (Figure 2).

The experience of Phoenix confirms the fact that highway construction has little to do with the generation of traffic. For years, the Phoenix metropolitan area provided little new freeway capacity as a matter of policy. By 1982, Phoenix was served by a freeway system with 75 percent fewer lane miles per capita than other major metropolitan areas (and the lowest among such areas). Nonetheless, average daily vehicle miles traveled in the Phoenix area were 15 percent above average. In the mid-1980s, Phoenix began adding to its freeway system. If freeway construction were the cause of increased highway travel, then it would be expected that the highway construction in Phoenix would be associated with a relative increase in daily travel. In fact, the opposite occurred. Vehicle miles per capita in Phoenix declined 20 percent relative to the major metropolitan average (Figure 3).[14]



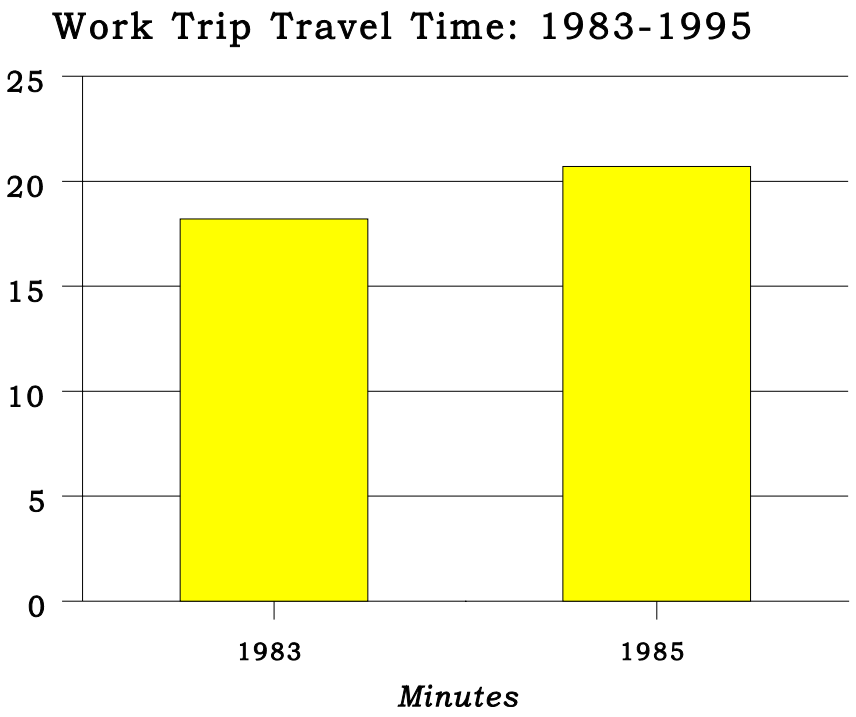

At least three Texas urbanized areas have increased their roadway systems at a rate faster than traffic volumes have increased: Houston, Corpus Christi and Laredo (above).




There is a rather weak and insignificant relationship between roadway expansion and the increase in vehicle miles traveled per capita.[15] It is possible to build sufficient highway capacity to accommodate demand. This does not, however, guarantee that there is the political will to do so.

This is not to suggest that there may be a small increase in miles traveled as a result of new roadways. Faster roadways make it possible for people to gain access to more distant locations without increasing their travel time, which could encourage longer trips. But the actual *time* traveling is not likely to increase. This is illustrated by the fact that the average journey to work time has changed little in recent years, despite a large increase in traffic volumes (Figure 4).[16] As traffic congestion becomes worse, people make adjustments so that their travel times do not materially increase.

The fact is, however, that traffic volumes tend to increase as the population increases, independent of road construction. Failure to provide additional roadway capacity will surely increase congestion. To suggest that highways create a substantial amount of additional traffic is akin to blaming population growth on hospital maternity wards.




## ALTERNATIVES TO HIGHWAYS

It is often claimed that alternatives to highways, such as public transit (especially light and commuter rail systems) and high speed rail could reduce traffic congestion. In fact both of these alternatives are capable, at best, of only the most marginal traffic relief and at costs well above that of providing additional highway capacity.

**Public Transit and Urban Rail:** Around the nation a number of metropolitan areas have built or are planning to expand public transit services by building urban rail (especially light rail and commuter rail) systems. Dallas has opened both a light rail and commuter rail system, and systems have been proposed for Houston, San Antonio and Austin. A major factor in the expansion of urban rail has been the availability of billions in federal funding, at attractive local matching rates.[17]

One of the leading reasons for the emphasis on transit is to provide people with an alternative to driving – providing a transportation choice. The theory is that people will use public transit if it is a reasonable alternative in time and convenience to the automobile. There is no disputing this.

Where population densities are very high, and activities centralized, transit competes much better for urban travel market share (Figure 5). For example, transit market shares in Asia are nearly 20 times that of the U.S., while population densities are 15 times as great. A one-quarter acre lot in the suburbs would need to accommodate 40 people, instead of the less than three

person household typical of the United States. Population densities in Europe are four times as great, while transit's market share is six times as great as in the United States.[18] Texas urban areas are even less dense than average and peak at comparatively low densities.

- The most dense one percent of the four major Texas metropolitan areas was 9,000 to 12,000 per square mile in 1990, averaging one eighth that of New York and one third or less that of the next most dense areas, San Francisco, Chicago and Los Angeles.

- The most dense 10 percent of the four major Texas metropolitan areas was 6,000 to 7,000 per square mile, less than one-half Los Angeles, San Francisco and Chicago and one-quarter that of New York (Table 13).

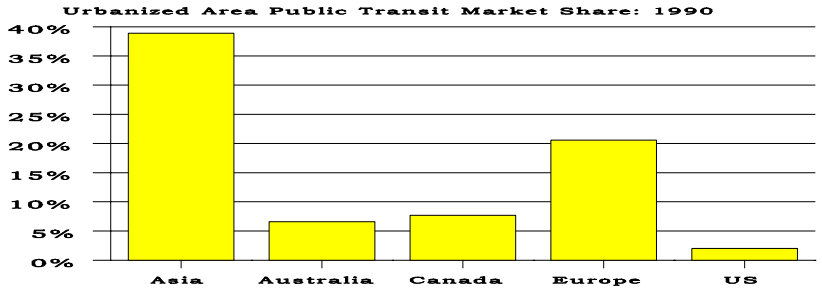



**Table 13**
**Density of Metropolitan Areas: 1990**
**(Population per Square Mile)**

| Metropolitan Area | Highest Density Portion of Urban Land Area | | | Average |
|---|---|---|---|---|
| | 1% | 10% | Rank* | |
| New York | 93,782 | 29,464 | 1 | 5,184 |
| Los Angeles | 34,204 | 18,415 | 2 | 6,062 |
| San Francisco-Oakland | 37,948 | 17,200 | 3 | 4,311 |
| Chicago | 34,414 | 15,035 | 4 | 3,525 |
| San Jose | 17,468 | 12,251 | | 4,401 |
| Portland | 11,384 | 7,322 | | 2,738 |
| **Houston** | **10,726** | **6,965** | | **2,547** |
| **San Antonio** | **9,372** | **6,916** | | **2,769** |
| **Dallas-Fort Worth** | **10,855** | **6,509** | | **2,346** |
| **Austin** | **11,615** | **6,309** | | **2,068** |

Based upon land area of census tracts within metropolitan areas with minimum population densities of 500 persons per square mile.
Source: Calculated from 1990 U.S. Census Bureau data.[19]
* Only the top four cities were ranked in this study.

In some major metropolitan areas that have especially large downtown areas, public transit moves a majority of workers to the central area. For example,

approximately 75 percent of the nearly 2 million employees in Manhattan's central business district (CBD) use public transit. On the other hand, in the much lower density suburbs that surround New York, more than three times as many jobs exist, and transit accounts for less than five percent of commuting. Nowhere in the nation does transit provide a significant portion of commuter travel except to the largest downtown areas.

Transit can provide a choice that is competitive with the automobile only to large employment areas with very high densities. Transit is not able to provide the no-transfer, quick services that are required to other, less dense, parts of the urban area, because to do so would require exorbitant expenditures. Even so, the largest downtowns in Texas have rather modest transit work trip market shares, 16 percent in Houston and 14 percent in Dallas.[20] At these modest market shares, even if all traffic on nearby freeways were work traffic headed to or from downtown, transit would account for considerably less than a single freeway lane's volume.[21] Even high capacity rail expansions make little difference. It is estimated that the highest volume section of Dallas Area Rapid Transit's (DART) light rail system reduces adjacent freeway traffic during peak hours by less than 15 percent of a single freeway lane.[22] Urban rail transit systems are comparatively expensive, averaging seven times the cost per person mile of new urban freeways.[23]

At the same time, to duplicate the rather modest downtown market shares throughout the urban area would be exceedingly costly. Most of DART's more than $200 million in annual operating costs are committed to services that provide no-transfer or auto-competitive service only to downtown. Downtown, at barely three square miles, represents approximately 1/500th of the developed land in the Dallas-Fort Worth area.

Currently, transit accounts for approximately one percent of travel in the state's four largest urban areas. Transit market shares have dropped 25 percent in the same areas since 1990 (Table 14). At the same time average roadway travel is increasing at an annual rate of 3.8 percent. This means that even if transit use were to double overnight, the gain would be canceled out by the normal increase in automobile usage in barely three months. In 1994, transit agencies in the state projected a 25 percent increase in ridership through 2014.[24] This would represent an increase over fourteen years of approximately 170,000 one way daily trips.[25] While this may appear to be a substantial number, it is the equivalent of the number of trips taken in 12 minutes in Dallas-Fort Worth *alone* in 2000.

Even in Dallas, where an aggressive, debt funded rail building program[26] is planned for the next two decades, the most optimistic projections would place 2020 transit market share at little more than the 1990 level and well below one percent. It is not plausible to expect that a mode of transport with one percent of the market can play a material role in meeting the needs of a transportation system that is experiencing annual increases of nearly four percent. Further, because transit has so little potential to reduce the rate of growth in

automobile traffic, it is not an effective strategy in the campaign to reduce air pollution.

**Table 14**
**Change in Transit Market Share: 1990-1998**
**Major Metropolitan Areas**

| Metropolitan Area | 1990 | 1998 | Change | Average Annual Change: Transit | Average Annual Change: Vehicle Miles Traveled |
|---|---|---|---|---|---|
| **Austin** | **1.78%** | **1.10%** | **-38.5%** | **-5.9%** | **5.4%** |
| **Dallas-Ft. Worth** | **0.68%** | **0.59%** | **-13.5%** | **-1.8%** | **3.9%** |
| **Houston** | **1.32%** | **1.18%** | **-10.8%** | **-1.4%** | **3.2%** |
| **San Antonio** | **1.49%** | **1.09%** | **-27.2%** | **-3.9%** | **2.7%** |
| Average | 1.32% | 0.99% | -25.2% | -3.6% | 3.8% |

Source: Estimated from Federal Highway Administration and Federal Transit Administration data.

Nonetheless, Texas state and local governments spend a large amount of tax funding on public transit. Texas ranks seventh in state and local tax revenues per transit passenger mile, at $0.649 (Table 15). This is 33 times the amount of state and local revenue per person mile for streets and highways.[27] It is also approximately three or more times the state and local transit funding commitment that exists in the more highly transit dependent states of New York, New Jersey and Illinois.

At the same time, transit has an important role. Transit provides primary mobility for a large number of urban residents who do not have access to automobiles. Nationally, seven out of ten transit riders do not have access to automobiles,[28] and it is likely that the figure is even higher in Texas.[29] Approximately one-seventh of transit spending in Texas now goes to services for the disabled, where the cost per trip is approximately $20. This may seem like a large amount, but is similar to the cost per new trip for some new rail systems.

In future planning, transit, like any other mode, should be employed only where its costs are lower than that of the alternatives on a passenger mile or passenger hour basis. Given the very small numbers of automobile drivers that are attracted to new transit projects, and the high costs of such projects, this is not likely to be the case. On average, urban rail operating and capital costs are more than seven times the cost of new freeways per passenger mile.[30]

**Table 15**
**User Fee and Tax Revenue per Passenger Mile**

**Table 15**
**User Fee and Tax Revenue per Passenger Mile**

| Rank | Jurisdiction | Transit | | Highways | | Transit Compared to Highways Total | Transit Compared to Highways: State & Local |
|---|---|---|---|---|---|---|---|
| | | Total | State & Local | Total | State & Local | | |
| 1 | Montana | $2.280 | $1.329 | $0.0309 | $0.0196 | 73.8 | 68.0 |
| 2 | Alabama | $2.013 | $1.062 | $0.0185 | $0.0155 | 108.8 | 68.6 |
| 3 | Delaware | $1.206 | $0.872 | $0.0467 | $0.0393 | 25.8 | 22.2 |
| 4 | Oregon | $1.826 | $0.828 | $0.0247 | $0.0192 | 73.9 | 43.2 |
| 5 | New Mexico | $0.971 | $0.780 | $0.0174 | $0.0129 | 55.8 | 60.6 |
| 6 | Mississippi | $1.662 | $0.736 | $0.0210 | $0.0178 | 79.1 | 41.3 |
| 7 | West Virginia | $1.391 | $0.707 | $0.0354 | $0.0281 | 39.3 | 25.1 |
| 8 | Alaska | $1.061 | $0.695 | $0.0785 | $0.0512 | 13.5 | 13.6 |
| 9 | Michigan | $1.018 | $0.690 | $0.0197 | $0.0160 | 51.8 | 43.2 |
| 10 | Massachusetts | $1.057 | $0.686 | $0.0371 | $0.0272 | 28.5 | 25.2 |
| 11 | Washington | $1.023 | $0.659 | $0.0308 | $0.0261 | 33.3 | 25.2 |
| **12** | **Texas** | **$1.233** | **$0.649** | **$0.0229** | **$0.0199** | **53.9** | **32.7** |
| 13 | Wyoming | $1.571 | $0.646 | $0.0301 | $0.0209 | 52.2 | 30.9 |
| 14 | Colorado | $1.074 | $0.645 | $0.0307 | $0.0270 | 35.0 | 23.9 |
| 15 | Pennsylvania | $1.021 | $0.621 | $0.0303 | $0.0256 | 33.7 | 24.3 |
| 16 | Iowa | $1.489 | $0.614 | $0.0346 | $0.0296 | 43.0 | 20.7 |
| 17 | South Dakota | $1.289 | $0.597 | $0.0420 | $0.0305 | 30.7 | 19.6 |
| 18 | Utah | $1.822 | $0.593 | $0.0308 | $0.0268 | 59.1 | 22.1 |
| 19 | Oklahoma | $1.035 | $0.572 | $0.0276 | $0.0240 | 37.5 | 23.8 |
| 20 | Maine | $1.723 | $0.515 | $0.0279 | $0.0227 | 61.8 | 22.7 |
| 21 | Ohio | $0.910 | $0.514 | $0.0222 | $0.0185 | 40.9 | 27.8 |
| 22 | Kentucky | $0.864 | $0.492 | $0.0209 | $0.0172 | 41.3 | 28.6 |
| 23 | Nebraska | $1.111 | $0.456 | $0.0347 | $0.0304 | 32.1 | 15.0 |
| 24 | Minnesota | $0.857 | $0.456 | $0.0344 | $0.0310 | 24.9 | 14.7 |
| 25 | Maryland | $0.927 | $0.451 | $0.0205 | $0.0164 | 45.3 | 27.4 |
| 26 | Vermont | $1.258 | $0.450 | $0.0270 | $0.0189 | 46.6 | 23.8 |
| 27 | North Carolina | $0.863 | $0.443 | $0.0223 | $0.0178 | 38.6 | 24.9 |
| 28 | Connecticut | $0.846 | $0.431 | $0.0290 | $0.0223 | 29.2 | 19.3 |
| 29 | North Dakota | $1.497 | $0.427 | $0.0332 | $0.0214 | 45.0 | 19.9 |
| 30 | New Hampshire | $0.962 | $0.427 | $0.0278 | $0.0229 | 34.6 | 18.6 |
| 31 | Idaho | $0.983 | $0.417 | $0.0245 | $0.0190 | 40.0 | 22.0 |
| 32 | Wisconsin | $0.733 | $0.403 | $0.0285 | $0.0248 | 25.8 | 16.2 |
| 33 | Kansas | $0.818 | $0.403 | $0.0322 | $0.0279 | 25.4 | 14.4 |
| 34 | Rhode Island | $1.240 | $0.403 | $0.0269 | $0.0208 | 46.1 | 19.3 |

**Table 15**
**User Fee and Tax Revenue per Passenger Mile**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 35 | Missouri | $0.777 | $0.402 | $0.0204 | $0.0170 | 38.0 | 23.7 |
| 36 | California | $0.709 | $0.396 | $0.0241 | $0.0211 | 29.4 | 18.8 |
| 37 | Florida | $0.743 | $0.391 | $0.0276 | $0.0246 | 26.9 | 15.9 |
| 38 | Tennessee | $0.897 | $0.379 | $0.0159 | $0.0118 | 56.3 | 32.1 |
| 39 | Arizona | $0.723 | $0.366 | $0.0216 | $0.0182 | 33.5 | 20.2 |
| 40 | Georgia | $0.622 | $0.338 | $0.0161 | $0.0136 | 38.6 | 24.9 |
| 41 | District of Columbia | $0.730 | $0.295 | $0.0379 | $0.0217 | 19.3 | 13.6 |
| 42 | Arkansas | $0.737 | $0.291 | $0.0212 | $0.0152 | 34.8 | 19.2 |
| 43 | Virginia | $0.595 | $0.284 | $0.0283 | $0.0246 | 21.0 | 11.6 |
| 44 | Indiana | $0.668 | $0.278 | $0.0186 | $0.0148 | 35.8 | 18.7 |
| 45 | Louisiana | $0.590 | $0.276 | $0.0303 | $0.0264 | 19.5 | 10.5 |
| 46 | New York | $0.545 | $0.235 | $0.0421 | $0.0374 | 12.9 | 6.3 |
| 47 | Illinois | $0.492 | $0.223 | $0.0237 | $0.0199 | 20.8 | 11.2 |
| 48 | Hawaii | $0.358 | $0.216 | $0.0282 | $0.0177 | 12.7 | 12.2 |
| 49 | New Jersey | $0.484 | $0.168 | $0.0348 | $0.0306 | 13.9 | 5.5 |
| 50 | South Carolina | $0.531 | $0.077 | $0.0139 | $0.0105 | 38.1 | 7.3 |
| 51 | Nevada | $0.665 | $0.068 | $0.0232 | $0.0192 | 28.7 | 3.6 |
| | National | $0.694 | $0.347 | $0.0270 | $0.0217 | 25.7 | 16.0 |

Some significant amounts DC, state and local transit expenditures are from Maryland and Virginia. Smaller amounts of out-of-state and local funding are reported in states with interstate transit authorities (such as Missouri).
Source: Calculated from Federal Highway Administration and Federal Transit Administration data.

**Intercity Passenger Rail:** There is also a continuing interest in high speed rail as an alternative for accommodating new travel. High speed rail operates at from 150 to 200 miles per hour and has been built in Japan, Europe and is under construction in Korea and Taiwan. High speed rail's potential, however, is little with respect to the urban traffic congestion that is the state's greatest transportation challenge. It is best understood as a competitor to intercity airline service for shorter trips such as under 300 miles. Even so, the projections of promoters indicate little potential for reducing intercity highway congestion. This is generally less a problem and less difficult and expensive to address than *intra*city travel, which will be the dominant Texas transportation problem in the upcoming decades. The Florida high speed rail system, for example, was projected to reduce traffic levels by barely 10 percent at the lowest freeway volume point.[31] The Federal Railroad Administration estimated that the proposed Texas Triangle high speed rail system (Dallas-Fort Worth-Austin-San Antonio-Houston) would remove only five percent of intercity highway traffic.[32] Even in France, where the cost of tolls and gasoline are generally higher than high speed rail fares, the impact on highway volumes has been minimal.[33] Slower rail systems, with maximum operating speeds under 120 miles per hour would have even less impact. Slower rail systems, which

would use existing tracks and rights-of-way, are being studied in a number of states. One of the risks is that new passenger rail services could interfere with rail freight traffic or limit its growth, diverting additional freight traffic to highways. This would cause traffic congestion to increase more rapidly and more intensively, since the addition of a truck to the traffic flow consumes much more highway space than the addition of a car.[34]

Finally, high speed rail is not an efficient or effective alternative to air transportation. Building high speed rail is at least five times more costly per passenger than building new airport capacity. [35] High speed rail has little potential to reduce airport congestion. The Federal Railroad Administration projected that the Texas Triangle system would attract only 26 percent of airline passengers. Inasmuch as air travel to Texas high speed rail destinations represents only 15 percent of commercial traffic to and from Dallas-Fort Worth area airports,[36] they would be relieved only to the extent of approximately four percent. This is only slightly above the annual growth rate in air travel from Dallas-Fort Worth area airports.[37] However, given the very competitive nature of airlines in Texas, even that figure seems highly optimistic. Slower intercity rail systems (under 120 miles per hour) would have a significantly smaller impact, since less than one percent of Dallas-Fort Worth area airport commercial traffic serves destinations within two hours of rail travel at such speeds. It can be expected that the airlines would respond aggressively to market threats from high speed rail.

This is not to suggest that high speed rail would not be a welcome addition to the transportation system if it were financed by passenger fares and related commercial revenues. The economics, however, of high speed rail are such that no serious proposals for commercial, non-subsidized development have ever proceeded very far. Unlike the airline industry, which operates on passenger fares and commercial revenues, the airports, which are built with dedicated fees paid by airport users, and intercity highways, which are built with highway user fees, high speed rail would require very heavy non-user subsidies in the United States. The Federal Railway Administration projected that no proposed system would cover more than 55 percent of its costs out of passenger fares and other commercial revenues and that the Texas system would require taxpayer subsidies of nearly 60 percent.[38]

As in the case of transit, intercity passenger rail should be considered as an alternative to highways only where the total cost per passenger mile or passenger hour is less than that of highways. With respect to the Florida high speed rail system that was canceled in 1999, costs per passenger mile would have been many times that of providing additional freeway capacity.[39]

**Smart Growth:** In recent years, continuing concern about suburbanization has led to adoption of so-called “smart growth” strategies to limit urban growth. These strategies largely rely upon densification of development. While promoted as means to better control traffic congestion, virtually all of the evidence indicates a strong relationship between higher densities and greater traffic

congestion (and air pollution). As a result, implementation of smart growth strategies is likely to make the traffic situation in Texas urban areas worse (Appendix A).

## PRESENT FINANCIAL COMMITMENT

While Texas spends more than $8 billion annually to build and maintain highways,[40] the financial commitment is dropping relative to a number of measures relating to construction spending (1997).

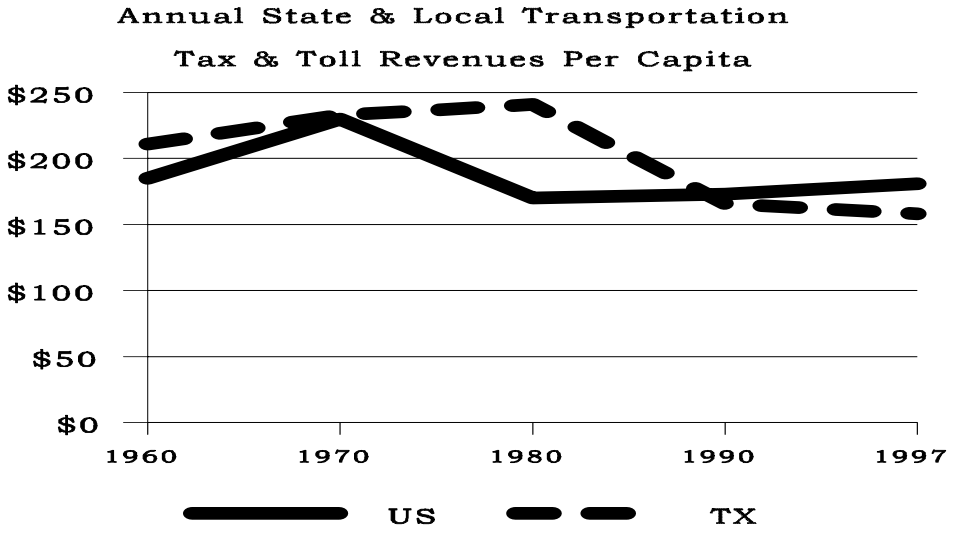
- Spending per capita has fallen 34 percent since 1980, and now trails the national average by 12 percent (Figure 6).

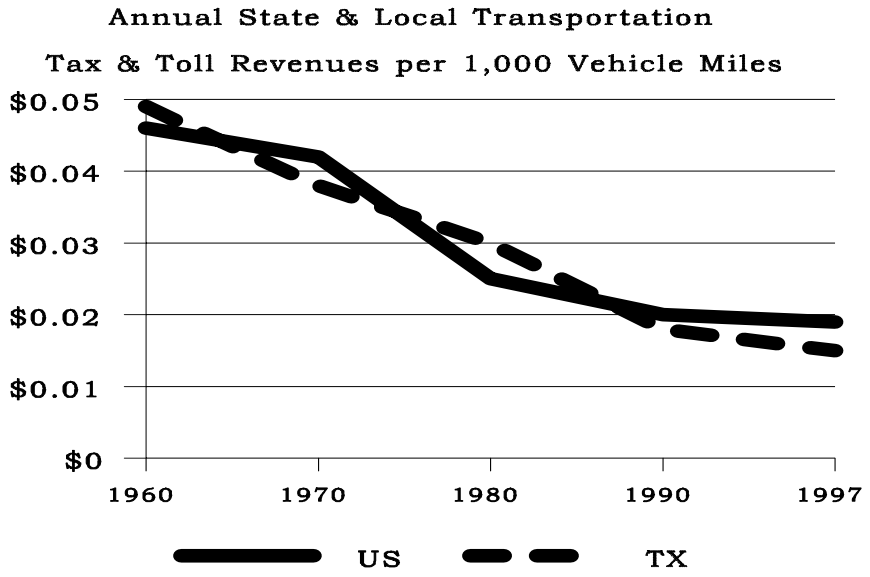
- Spending per vehicle mile traveled is now 68 percent below the 1960 figure, and 18 percent below the national average (Figure 7).

- Spending per licensed driver has fallen 51 percent since 1960, and is now 12 percent below the national average (Figure 8).

The latter two indicators reflect the substantial increase in driving by women that has occurred since 1960. While women drove much less than men in 1960, there is little difference now.

Overall state and local highway revenues (user fees, taxes and tolls) are generally lower than average in Texas. In 1998, Texas ranked 30th at $0.0199 in state and local tax and toll revenues per passenger mile (Table 16).[41] This is slightly more than one-half the rate of New York and below the rate of some other large states such as New Jersey, Massachusetts, Pennsylvania, Florida and California. Further, Texas state and local spending on highway construction is greater as a proportion of total spending than most other states (Texas ranks 13th). This is a result of the fact that federal funding represents a lower share of street and local spending than in most other states.





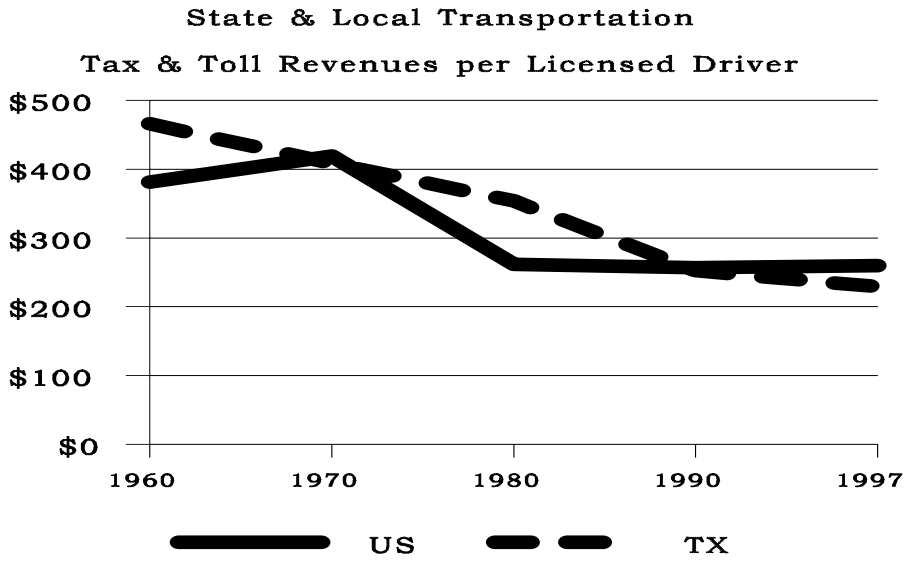




**Table 16**
**State & Local Highway Revenue per Person Mile Ranked by State**

| Rank | Jurisdiction | Total Revenue per Person Mile | State & Local Revenue per Person Mile | Percentage State & Local Funding | Ranking: State & Local Funding Percentage |
|---|---|---|---|---|---|
| 1 | Alaska | $0.0785 | $0.0512 | 65.2% | 47 |
| 2 | Delaware | $0.0467 | $0.0393 | 84.3% | 19 |
| 3 | New York | $0.0421 | $0.0374 | 88.9% | 3 |
| 4 | Minnesota | $0.0344 | $0.0310 | 90.0% | 1 |
| 5 | New Jersey | $0.0348 | $0.0306 | 87.9% | 5 |
| 6 | South Dakota | $0.0420 | $0.0305 | 72.6% | 43 |

**Table 16**
**State & Local Highway Revenue per Person Mile Ranked by State**

| Rank | Jurisdiction | Total Revenue per Person Mile | State & Local Revenue per Person Mile | Percentage State & Local Funding | Ranking: State & Local Funding Percentage |
|---|---|---|---|---|---|
| 7 | Nebraska | $0.0347 | $0.0304 | 87.7% | 6 |
| 8 | Iowa | $0.0346 | $0.0296 | 85.7% | 15 |
| 9 | West Virginia | $0.0354 | $0.0281 | 79.6% | 34 |
| 10 | Kansas | $0.0322 | $0.0279 | 86.6% | 14 |
| 11 | Massachusetts | $0.0371 | $0.0272 | 73.3% | 42 |
| 12 | Colorado | $0.0307 | $0.0270 | 88.0% | 4 |
| 13 | Utah | $0.0308 | $0.0268 | 87.0% | 9 |
| 14 | Louisiana | $0.0303 | $0.0264 | 87.0% | 10 |
| 15 | Washington | $0.0308 | $0.0261 | 84.8% | 16 |
| 16 | Pennsylvania | $0.0303 | $0.0256 | 84.5% | 18 |
| 17 | Wisconsin | $0.0285 | $0.0248 | 87.2% | 8 |
| 18 | Florida | $0.0276 | $0.0246 | 89.3% | 2 |
| 19 | Virginia | $0.0283 | $0.0246 | 87.0% | 11 |
| 20 | Oklahoma | $0.0276 | $0.0240 | 86.9% | 12 |
| 21 | New Hampshire | $0.0278 | $0.0229 | 82.5% | 27 |
| 22 | Maine | $0.0279 | $0.0227 | 81.4% | 29 |
| 23 | Connecticut | $0.0290 | $0.0223 | 77.1% | 38 |
| 24 | District of Columbia | $0.0379 | $0.0217 | 57.3% | 51 |
| 25 | North Dakota | $0.0332 | $0.0214 | 64.4% | 48 |
| 26 | California | $0.0241 | $0.0211 | 87.4% | 7 |
| 27 | Wyoming | $0.0301 | $0.0209 | 69.4% | 46 |
| 28 | Rhode Island | $0.0269 | $0.0208 | 77.5% | 36 |
| 29 | Illinois | $0.0237 | $0.0199 | 84.3% | 20 |
| **30** | **Texas** | **$0.0229** | **$0.0199** | **86.9%** | **13** |
| 31 | Montana | $0.0309 | $0.0196 | 63.3% | 49 |
| 32 | Oregon | $0.0247 | $0.0192 | 77.6% | 35 |
| 33 | Nevada | $0.0232 | $0.0192 | 82.8% | 26 |
| 34 | Idaho | $0.0245 | $0.0190 | 77.4% | 37 |
| 35 | Vermont | $0.0270 | $0.0189 | 70.0% | 45 |
| 36 | Ohio | $0.0222 | $0.0185 | 83.1% | 25 |
| 37 | Arizona | $0.0216 | $0.0182 | 84.2% | 21 |
| 38 | North Carolina | $0.0223 | $0.0178 | 79.8% | 32 |
| 39 | Mississippi | $0.0210 | $0.0178 | 84.7% | 17 |
| 40 | Hawaii | $0.0282 | $0.0177 | 62.8% | 50 |
| 41 | Kentucky | $0.0209 | $0.0172 | 82.2% | 28 |

**Table 16**
**State & Local Highway Revenue per Person Mile Ranked by State**

| Rank | Jurisdiction | Total Revenue per Person Mile | State & Local Revenue per Person Mile | Percentage State & Local Funding | Ranking: State & Local Funding Percentage |
|---|---|---|---|---|---|
| 42 | Missouri | $0.0204 | $0.0170 | 83.1% | 24 |
| 43 | Maryland | $0.0205 | $0.0164 | 80.4% | 31 |
| 44 | Michigan | $0.0197 | $0.0160 | 81.4% | 30 |
| 45 | Alabama | $0.0185 | $0.0155 | 83.7% | 23 |
| 46 | Arkansas | $0.0212 | $0.0152 | 71.6% | 44 |
| 47 | Indiana | $0.0186 | $0.0148 | 79.6% | 33 |
| 48 | Georgia | $0.0161 | $0.0136 | 84.2% | 22 |
| 49 | New Mexico | $0.0174 | $0.0129 | 74.0% | 40 |
| 50 | Tennessee | $0.0159 | $0.0118 | 73.9% | 41 |
| 51 | South Carolina | $0.0139 | $0.0105 | 75.7% | 39 |
| | National | $0.0270 | $0.0217 | 80.4% | |

Source: Calculated from Federal Highway Administration data.

Compared to other states, the main differences in Texas funding sources (those where the difference between the U.S. and Texas percentages vary by more than one percent) appear to be:

- For *all* road and highway projects state-wide (state *and* local):[42]
    - Texas has a significantly (for the purposes of this report, "significantly" means a difference of greater than two percent) lower portion of the total revenues from federal highway user tax revenues, 14.53 percent (TX) to 19.06 percent (U.S.)
    - Texas has significantly less road and crossing tolls, 2.79 percent (TX) to 4.21 percent (U.S.)
    - Texas has significantly more general fund appropriation, 18.92 percent (TX) to 13.68 percent (U.S.) (see, however, discussion below on allocations of highway use fees and taxes to non-transportation purposes)
    - Texas governments contribute more in property taxes to highways than other states, 9.33 percent (TX) to 5.07 percent (U.S.)
    - Texas has significantly less "other imposts," 0.80 percent (TX) to 4.33 percent (U.S.)
- For state programs *only*, the main differences are:[43]
    - Texas gets a significantly higher share from motor fuel taxes, 38.61 percent (TX) to 33.35 percent (U.S.)

- Texas gets a significantly higher share from motor vehicle and motor carrier taxes, 23.76 percent (TX) to 17.05 percent (U.S.)
- Texas gets a significantly lower share from road and crossing tolls, 1.33 percent (TX) to 5.04 percent (U.S.)
- Texas gets a significantly lower share from general fund appropriations, .55 percent (TX) to 2.58 percent (U.S.)
- In the largest single difference in this analysis, Texas gets a significantly lower share from bond issue proceeds, zero (TX) to 9.77 percent (U.S.)
- Texas gets a significantly higher share from the Federal Highway Administration, 27.33 percent (TX) to 24.13 percent (U.S.)

Some of the above differences such as the lower share from tolls are due, in part, to differences in geography and terrain. Many other states have major metropolitan areas near large bodies of water where toll bridges became a common method of financing major bridges and tunnels, such as the greater New York City and San Francisco Bay areas. Others differences are due to conscious funding decisions, such as that of Texas, to not utilize bonding for TxDOT road projects.

# II. FUNDING RESOURCES

To address the current shortfall of financial resources to satisfy Texas' surface transportation requirements, there are a number of potential tools that could be utilized.

## STATE INFRASTRUCTURE BANK (SIB)

Texas is one of thirty-four states and the Commonwealth of Puerto Rico designed by the U.S. Secretary of Transportation to participate in the State Infrastructure Bank program authorized by the Federal National Highway System Designation Act of 1995, and was one of the ten States authorized in the original pilot program.[44] In 1997, the Texas Legislature created the State Infrastructure Bank, under the Texas Transportation Commission. The program allows states with SIBs to transfer up to ten percent of designated federal appropriations, match them with state funds, and use the balance to create a self-sustaining revolving fund for what has generally been utilized for loans (including below market rate loans) and/or other types of credit to be utilized, most commonly, for counties to finance small projects. In some cases, SIB loans are one of the only ways that less financially advantaged counties can provide the required financial participation for needed projects.

Unfortunately, the Federal Transportation Equity Act of 1998 created a new type of SIB pilot program, for which Texas was not selected. Since this legislation also disallowed the use of post-1998 federal funding for "old" SIB purposes, there has been no additional federal capitalization of the Texas SIB program. This limits the amount of credit the Commission can grant.

Expansion of the "new" SIB program to include more than the four pilot states as soon as possible would increase the ability of this program to assist disadvantaged counties with significant projects, as well as, potentially, other types of projects in other geographic areas.

## EVALUATION OF USER TAX, AND BONDING ALTERNATIVES AND OTHER FUNDING GROWTH AND LEVERAGE OPTIONS

For many years, it has been well recognized that, not only is the level of funding for Texas transportation needs not insufficient to improve current conditions, but it is insufficient to even maintain the status quo (below). Texas currently ranks fourth to last of the fifty states in state highway expenditures per capita.[45]

Many proposals to increase funding availability have been presented. In this section, an inventory of the more prominent and potentially useful strategies will be provided.

**Fuel Tax Increase:** Simplifying somewhat, there are two general forms of proposals for increasing fuel tax revenues for highway purposes: (1) an increase in the fuel tax rate per gallon, and (2) reallocation of motor fuel taxes now going for other purposes to highways, leaving the resulting shortfall in the other programs to be replaced via other means.

Motor Fuel Taxes are currently the single largest revenue source for Texas state highway funding, amounting to 38.61 percent of the total funds for the five-year period, FY95-FY99.

Texas' current level of fuel taxes is 20¢, the median value for the fifty states, which have fuel taxes that range from 7.5¢ (Georgia) to 33¢ (Connecticut) per gallon. However, Texas allocates 34.7 percent of state motor fuel taxes to non-highway uses, the third-highest of the fifty states and far higher than the median value for all states of approximately 8 percent. Of the total 1999 taxes and fees paid on vehicles of $6.5 billion, $2.7 billion, or approximately 42 percent, goes for transportation purposes, with the remaining $3.8 billion, or 58 percent, going for other purposes.[46]

The motor fuel tax was last changed in 1991, when the Legislature increased it from 15¢ to 20¢, with 25 percent of the increase, or $1.25 per gallon, amounting to approximately $150 million (all dollar figures in this section are 1999 values), allocated to the Available School Fund by state Constitutional requirements. In addition, at the same time, the Legislature allocated about $350 million from the Highway Fund to the Department of Public Safety (DPS). Finally, in the same year, the Legislature allocated $100 million from the Highway Funds to counties in order to compensate for reclaiming the 5 percent of vehicle sales tax that was formerly allocated to the counties to the General Fund. The net effect of all of these events was a nickel increase in the motor vehicle tax paid per gallon and no change in Highway Fund revenues.
The DPS allocation of motor fuel taxes and revenues is also interesting. TxDOT identified eleven DPS programs, totaling over $69 million per year, which "appear to be tenuously related, at best, to policing public roadways." Also, the $204 million of annual fees for motor vehicle inspection fees, driver license fees, and driver record information fees are returned to the General Fund.[47]

Overall, the net impact was a significant increase in total state tax revenues through taxes on vehicles and vehicle use, but no change in revenues available for state transportation purposes.

**Toll Roads/Bridges/HOT Lanes:** *Tolls* can be an important additional source of funding for roadway expansion because toll roads and bridges can be fully or partially self-financing. For toll facilities with sufficient projected demand, future toll revenues can serve as the sole backing for the sale of bonds, thus relieving overburdened tax revenues. Even if projected toll revenues are not sufficient to secure 100 percent debt financing, they may provide backing for a significant portion of the original construction cost or, alternatively, provide an on-going stream of revenues after project completion that can be utilized to finance other transportation projects.

*Toll roads and bridges* have been growing in use and importance in Texas in recent years. Toll roads have a long history in Texas, including the Dallas-Fort Worth Turnpike (on which tolls were long ago removed) and many Texas-Mexico toll bridges. In more recent years, besides the growth of Mexico border bridges, there has been significant tollway construction and operation in the Dallas and Houston areas.

The *Central Texas Turnpike Project* is a $3.2 billion, 122-mile turnpike through four counties including four interconnected elements on SH 45, Loop 1, US 183A, and SH 130, financed by a particularly interesting and innovative package. Besides the TIFIA financing discussed above, the financial plan is specifically designed to *combine* toll and non-toll revenues to produce a comprehensive package. Such combined financing packages are an excellent opportunity to gain maximum leverage of traditional tax revenues that are likely to become more important in the upcoming decades.

*High Occupancy Toll (HOT) lanes* are a variation on the theme of combining toll and non-toll revenues to finance projects and are likely to increase in importance in upcoming years. "Exclusive" HOT lanes, such as the SR91(Riverside Freeway) HOT lane in Orange/Riverside Counties in Southern California, can be constructed through public-private partnerships to provide additional freeway/parkway capacity at no or minimal public sector costs. The I-15 HOT lane in Northern San Diego County is an example of a more productive use of a previously underutilized HOV lane.[48]

When HOT lanes are combined with HOV lanes, allowing carpools to use the lane at no cost, and single passenger occupancy vehicles to pay for use, it would be exceptional for the HOT revenues to totally cover the construction costs, but this does represent a significant funding source, perhaps providing 25-50 percent of the total construction costs in certain potential corridors.

HOT lanes have received something of a bad reputation in certain quarters. The SR91 facility has been subject to considerable objections on the grounds that the state of California agreed to not increase freeway capacity, even through safety improvements, because this would constitute competition for the for-profit HOT lane. There have also been considerable questions regarding plans to restructure the financing of the project. Another HOT lane proposal in

Orange County has been criticized due to environmental impacts, although the HOT lane aspects of these objections are largely incidental. HOT lanes have also been characterized as "Lexus Lanes," built exclusively for the benefit of the rich.

Some of these criticisms are valid and should be responded to in future HOT lane planning and development. The rights of the public to have safe roads with needed capacity enhancements should certainly not be compromised. HOT lanes are, of course, subject to the same environmental requirements as any other transportation project. The "Lexus Lane" criticism is generally best responded to by pointing out that the transfer of vehicles from general purpose to HOT lanes releases capacity for "free" users and, in the absence of HOT lanes, there would be no capacity improvements for *anyone's* benefit.

One important aspect of combined Busway/HOV/HOT lanes is that, in federal air quality non-attainment areas, it is possible that general purpose freeway lane expansion can be prohibited or restricted. In extreme enforcement cases, HOV lanes are generally still possible. With HOT lanes as a significant portion of the financial package, HOV/HOT lanes could be the *only* permissible means to increase highway capacity.

**Federal Transit Funding:** The Federal Transit Administration has three components (49 USC 5309): "New Starts," Bus and Fixed Guideway Modernization.

- *"New Starts"* - The New Starts program can be utilized, in some cases, for HOV/Busway projects. The best example of this is the network that has been constructed by the Metropolitan Transit Authority of Harris County (Houston). Houston Metro has received $500 million of federal funding[49] for its network of 111.2 miles of Busway/HOV lanes (88.8 miles now in service).[50] Metro's six HOV lanes move the same volume of passengers of 19 freeway lanes, and move them at over twice the average speed. The success of this approach to increasing the carrying capacity is remarkable. Despite its high level of population and economic growth, Houston is the *only* major urban area that showed an improvement in traffic congestion conditions from 1982 to 1997, according to Texas Transportation Institute statistics. While Houston's 2 percent improvement may not appear significant, and no would argue that traffic conditions in Houston are now ideal, when Houston's performance is compared to that of the nine U.S. cities that implemented light rail during or just before this period (Baltimore, Buffalo, Dallas, Los Angeles, Portland, Sacramento, Saint Louis, San Diego, and San Jose), the comparison to their 36 percent *worsening* of traffic congestion index is remarkable. During this period, Houston moved up in the rankings from next to last out of 34 (beating only Los Angeles) in 1982 to tied for 13th best in 1997.[51]

(The authors have previously commented in detail on the relative productivity of Busways/HOV/HOT lanes in several previous papers for the Texas Public Policy Foundation, available at www.tppf.org.)

- *Bus* – 20 percent of the total program funding is dedicated for bus usage. This funding is generally earmarked by Congress for projects under $10 million per year, generally in smaller urbanized areas, although there are some programs in larger cities every year.
- *Fixed Guideway Modernization* – This program begins to provide funding on a formula basis after a new or expanded transit fixed guideway (which includes rail transit as well as dedicated busways and certain shared use bus lanes, including Busway/HOV lanes) has been in service for seven years. While it is often difficult to utilize these funds for system expansion, this program does provide a useful level of funding for capital maintenance. Because it is primarily designed for high-maintenance cost rail lines, the formula often provides more funding than is required for maintenance of Busways/HOV/HOT lanes, even after considering the costs of bus replacement.

Besides the §5309 "New Starts" program, there are many other federal transportation grant programs that can be utilized for Busway/HOV/HOT lane constructions, including:

- §5307 - This is the main federal "formula" transit grant program ("formula" grant program funds are allocated to states and/or localities on the basis of a pre-existing formula using various data, such as population, miles of service operated, etc., rather than on a "discretionary" basis, where the funding is allocated on a competitive basis or earmarked by the legislative process), intended primarily for capital renewal and replacement, with local agencies given very wide discretion as how to utilized the funds within broad limits. It is perfectly proper to utilize such funds for capital additions, and this has been done as part of the funding program for various rail projects.

- Congestion Management Air Quality (CMAQ) – This is one of the two main "flexible" funds allocated via formula to urbanized areas. Its funds can, at the election of the local decision makers, be utilized for transit capital improvements, including Busways/HOV/HOT lanes, and for the operating costs of new transit service for the first three years.

- Surface Transportation Program (STP) – This is the other main federal flexible formula funding program. Its potential uses are similar to those of CMAQ, except that these funds cannot be utilized for operating costs.

(Of the above, only the § 5309 funds are "new" money that would not be allocated to the urbanized areas if the project existed or not; the other funding sources are distributed on the basis of formulas. While it is generally perfectly

legal to utilize formula and flexible funds for capital expansion purposes, it must be recognized that use of these funds for system expansion may shortchange the important maintenance and replacement of the pre-existing transit/transportation capital assets.)

There are several urbanized areas in Texas that are currently well situated to follow Houston's lead in funding the concrete and asphalt elements of local surface transportation, including Austin (see detailed commentary below) and San Antonio. The transit agencies in both cities have recently seen light rail plans defeated and are now restudying their options. This is the time to study Busways/HOV/HOT lanes as a significant component of local surface transportation planning.

There are other urban areas that also have high potential for applying for such funds, but have made local decisions that preempt such applications. The general rule is, the federal programs will generally only fund one guideway project per urbanized area at a time. This rule was intended to limit the number of expensive rail projects that any one area could have underway at one time (it has obviously not been applied to the Houston Busway/HOV network, where construction on several segments on different freeways was often underway at one time).

The Dallas-Fort Worth area has elected to apply for "New Starts" funds for the DART light rail system, making it difficult for it to also apply for federal discretionary transit grant funding of Busways/HOV/HOT lanes. Houston has also devoted major efforts to gain "new starts" funds for its light rail line, including "trading in" some funds originally granted for busways (as of this writing, federal funding for the Houston light rail line is unsettled).

Because the construction, and particularly the operating, costs of Busways/HOV/HOT lanes are generally far less than those of light rail and other rail modes, and the carrying capacity and operating speeds are so much higher, "rubber tire" guideway projects generally compare very well to rail projects in objective selection criteria, both on a local corridor-specific and on a national competitive basis.

**Local Option Transportation Sales Taxes:** Under Texas statute, local transit authorities and other local governmental units have the authority to impose sales taxes, up to one percent, for local purposes, including transportation. As of January 1, 2001, the following Metropolitan Transit Authorities (MTA) and city transit departments (CTD) have imposed sales and use taxes[52] (for the MTA's, the taxing region includes several adjoining political jurisdictions besides the named core city):

| MTA/CTD | Percent |
|---|---|
| Austin MTA | 1 |
| Corpus Christi MTA | ½ |
| Dallas MTA | 1 |

| | |
|---|---|
| El Paso CTD | ½ |
| Fort Worth MTA | ½ |
| Houston MTA | 1 |
| Laredo CTD | ¼ |
| San Antonio MTA | ½ |

Some local transit authorities, including those of Houston and Dallas, which have an extensive HOV construction program, have utilized portions of these local sales taxes for roadway improvements. Besides its successful Busway/HOV programs, Houston Metro has also had a direct grant program for street improvements to local government units. Capital Metro has also recently announced such a program.

In certain cases, there is a significant unutilized portion of the one percent sales tax going to local governmental units that could be made available for either mixed transit/general use (chiefly Busway/HOV/HOT lanes, as discussed above), or "pure" general use transportation projects. For example, in San Antonio, VIA current collects a ½¢ sales tax, having failed, in May 2000, to gain approval for the increase to 3/4¢ to fund a light rail program. While the light rail proposal failed 70/30 percent, a proposal linking "rubber tire" transit improvements with general purpose transportation improvements could prove more successful, especially since key groups that opposed the VIA light rail plan would likely support it.

Austin's Capital Metro collects the "full" 1¢ sales tax, but is currently making expenditures at a far lower level, using the excess of revenues over expenditures to accumulate funding for the start of light rail construction. Although the local electorate rejected the light rail proposal in November 2000, and Capital Metro has announced that it will be allocating funds to Austin and other local jurisdictions for road improvements, there is still a significant untapped net annual cash flow, plus cash in hand in excess of $140 million, that is currently unprogrammed. It is widely expected that Capital Metro will attempt to continue with its light rail plans. Again, "rubber tire" transportation projects appear to provide far more productive, cost-effective, and faster-to-complete projects (see discussion of Austin below).

**State Revolving Tax Fund:** Dallas County Judge Lee Jackson has proposed a State Revolving Tax Fund.[53] While this proposal is, of course, subject to considerable modification if it continues to be developed, the original proposal would be initiated by the Legislature placing a constitutional amendment before the voters in November of 2001. If successful, all new transportation revenues authorized by the 77th Legislative Session would be placed in this fund, rather than the state highway fund. Bonds, either revenue or general obligation, would then be authorized, up to the maximum amount supported by the revenues currently statutorily stipulated, plus any funding added by future Legislative action. (Note: While it is generally relatively easy to *add* a funding source to such a fund, once one is added, it can be difficult, or impossible, to delete it at a later date if there are bonds outstanding. Once

debt has been issued, backed by specific revenue sources, the bondholders have an extremely high degree of protection against any of these funds being removed or reduced while the debt is still outstanding. To the extent that there are excess funds after the debt service requirements are met on an annual basis, such funds are generally available for such use as the Legislature may direct, on an annual basis. The exact workings of such restrictions are subject to the case-by-case details of statutory and case law; this discussion should not be regarded as more than a general overview of the most common situation.) The distribution of the bond proceeds could be in accordance with the existing TxDOT allocation process, or as otherwise directed by the Legislature and referendum ballot issue.

# III. MAJOR METROPOLITAN AREAS

The majority of Texas residents who experience recurring traffic congestion live in the major metropolitan areas. Their continued rapid growth means that the greatest traffic challenges will continue to be in these metropolitan areas.

## AUSTIN: THE TRANSPORTATION SITUATION

Austin area residents and visitors are currently experiencing increased difficulty in local travel conditions, due to a variety of factors that combine in their negative impact on surface transportation:

- Rapid population growth.
- The desirable local climate, life-style, and work, intellectual, and recreational opportunities that is attracting more and more residents and jobs.
- The relatively small population of Austin during the period when the Interstate Highway system was being designed, which led to only one Interstate (IH-35) through Austin.
- The present freeway system is not yet a network, with no complete interchange open between intersecting roadways.
- The location of only a relatively small share of student housing for the University of Texas on campus and the relatively small number of off-campus student housing options close to the campus, necessitating a relatively large number of lengthy home-to-campus commutes.
- As the capital of the state of Texas, the large number of direct and indirect jobs created in the core area of the city of Austin that are not generally available for relocation to other areas, either within or outside the Austin area.
- The hilly topology of the area, combined with the Colorado River and lakes, which makes it difficult to construct arterials and other surface roads along a grid pattern. This detracts from total system capacity and performance and makes capacity expansion and enhancement technically difficult. As the desirable and hilly western side of the area increases in population, more and more traffic is funneled on to already inadequate East-West roadways.
- An attitude of, “If we don’t build it, they won’t come,” for roadway expansion, which has proven non-viable as the number of residents and jobs has increased despite the lack of transportation system capacity to handle the resulting travel demand.

In short, Austin's population and transportation requirements have expanded many fold over past decades, outpacing the relatively minor attempts to keep pace by expanding the capacity of the systems, limiting growth, and increasing the utilization of alternative transportation means, mainly transit and paratransit.

The experience of the past decades has conclusively shown, both in Austin and elsewhere, that travel volumes increase whether or not new highways are built. And, with regard to the inevitable highway volume increases, there is no substitute for expansion of roadway system capacity. Attempts at growth limits have not proven successful. It appears extremely unlikely that the public transit market share will ever remotely approach 5 percent of total trips (currently, transit carries approximately 2.1 percent of Austin area trips,[54] with nothing in either Capital Area Metropolitan Planning Organization [CAMPO] or Capital Metro plans indicating a significant increase in modal share in upcoming decades). Other actions to reduce travel (such as telecommuting) and making higher use of existing capacity (flexible hours, car- and vanpooling) can make a contribution, but cannot and will not substitute for growth in the capacity of the general purpose surface transportation system.

Austin could be poised for much worse traffic congestion. If the trend of the last 15 years is applied to the next 25, it is possible that Austin's roadways could be operating at nearly 64 percent above capacity.[55] This would be considerably worse than the present situation in Los Angeles, which at 51 percent above capacity, has the most congested roads in the nation. At this traffic congestion level, it is likely that the average time lost because of traffic congestion during peak hours will increase by 150 percent, an additional one hour and 15 minutes per day per capita.[56] The actual additional delay per driver would be even greater.

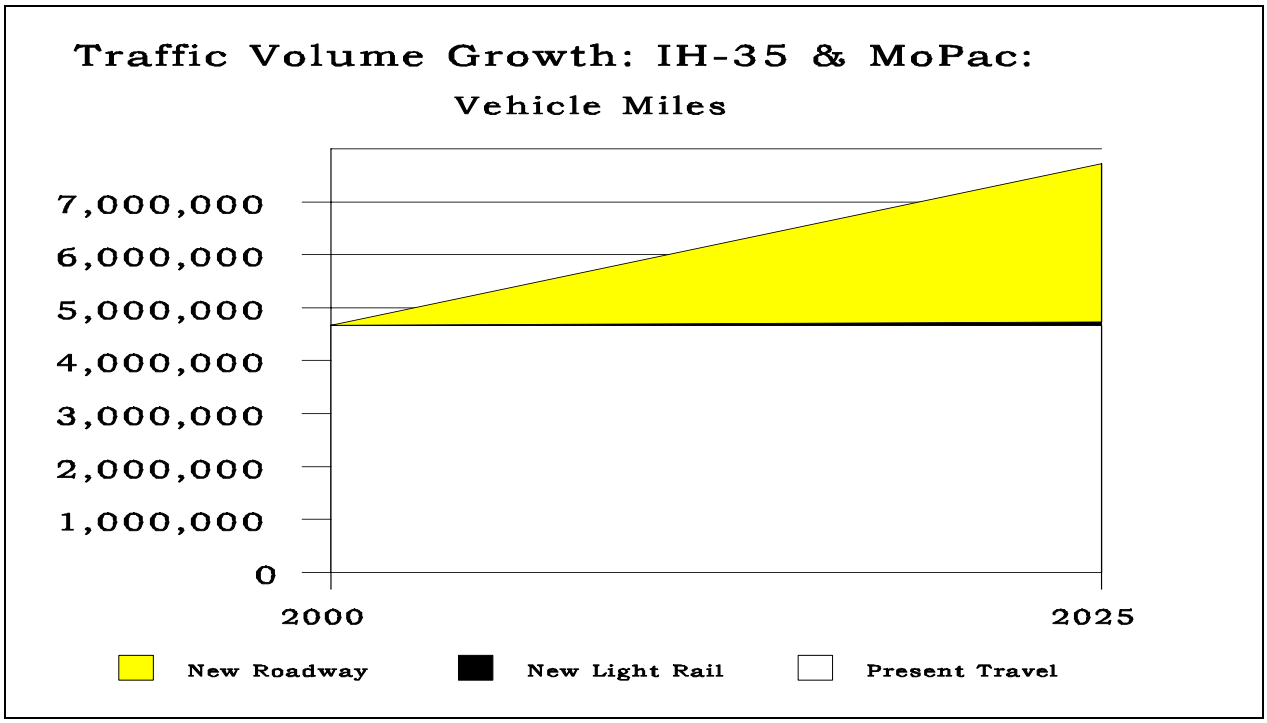
## THE CAPITAL METRO LIGHT RAIL PROPOSAL

For well over a decade, the Capital Metropolitan Transportation Authority (Capital Metro) has been studying light rail as an answer to the surface transportation requirements of the Austin area. Last November local voters were asked to approve Capital Metro's light rail plan.

The proposed light rail system would ultimately involve a 52 mile route[57] mainly paralleling I-35 and MoPac, the two major expressways. Despite operating in an area with considerably lower population density than cities such as Los Angeles or Denver, and much slower than many lines in other cities, Capital Metro projected a 2007 opening year ridership of 43,200, an unrealistically high estimate that is far larger than that of any recent light rail line opening in the U.S.

Capital Metro projected a cost per new rider of $11.70 (each way), or approximately $5,265 annually[58] - more than sufficient to lease a Ford Taurus for each rider.[59] Using national survey data for former automobile commuters

attracted to light rail,[60] the cost per light rail trip is $18.90, or $8,600 annually, sufficient to lease a $54,000 Lexus 400LS for each new rider. Further, the cost per new annual commuter is approximately 60 percent higher than the annual cost of educating a student in Texas elementary and secondary schools.[61]




While the air quality benefits of light rail have been forwarded as a reason for its construction, as to the actual reduction in emissions, "It would probably be in the more than one percent range,"[62] and that is based on Capital Metro's ridership and related assumptions.[63] Karen Rae, Capital Metro's General Manager, indicated that "*...nothing we do will reduce congestion.*"[64]

Light rail will not even make a perceivable difference on adjacent freeways. Based upon an analysis of Austin traffic and optimistic light rail projections it is estimated that the presence of light rail will reduce traffic volumes on IH-35 and MoPac by only 0.8 percent by 2025. At the same time, traffic volumes are expected to increase more than 60 percent (Figure 9).[65]

CAMPO published the 25 year transportation plan[66] before the November election. Generally, the plan favors rail options to transit improvements that would involve better bus service which are generally more effective (See the Texas Public Policy Foundation's *Trolley Folly – A Critical Analysis of the Austin Light Rail Proposal*, http://www.tppf.org/transit/trolley/toc.html and *Options Ignored, Opportunities Lost: An Analysis Of Affordable Transportation Options For Austin* http://www.tppf.org/transit/options/toc.html).[67]

- The Austin light rail's peak "transportation work" capacity – the number of passenger-miles that can be carried during the peak travel hour – is approximately 45 percent of a single bi-directional pair of general

purpose freeway lanes.

- By requiring two dedicated surface lanes to be removed from "rubber tire" service on city streets for light rail tracks, along with imposing obstacles to crossing automotive and pedestrian traffic and left turns, and space for stations, it is very questionable if light rail adds more passenger throughput capacity on arterial streets than it removes.

- Busway/HOT/HOV lanes have the capability to carry over three times as many people per hour at almost triple the speed of the light rail system proposed for Austin, for a total transportation work value of almost nine times that of the proposed light rail line.

- The cost per mile of the proposed light rail system was, using the assumptions most favorable to rail, approximately $46 million, and would likely be far higher. The average cost per mile of Busway/HOT/HOV lane in the Austin urban area would likely be a fraction of this. Even the most technically difficult sections, such as IH-35 crossing the Colorado River near the Austin CBD, would likely not approach the $46 million per mile of light rail, and there are many long sections of roadway, such as the MoPac median, where the costs are likely to be well under $10 million per mile, perhaps under $5 million.

Although light rail was defeated, Capital Metro continues its light rail efforts and has decided to complete the $3.7 million light-rail engineering study it started before voters rejected the project.[68] This is unfortunate, since there are reasonable and more effective alternatives to light rail.

Because of their greater potential, bus ("rubber tire") transportation solutions should be seriously studied for the greater Austin area. Light rail should also be studied, but through a fair and independent process, with adequate external oversight.

The first major components of an integrated system could be dedicated Busway/HOT lanes on the Mo-Pac and Interstate 35 freeways. They could be supplemented (fed) by surface busways on East-West arterials. This would allow buses to travel at speeds of 55 mph, or higher on the freeway portions. Since buses are not limited to fixed guideway (train) tracks, different routes can begin by neighborhood "collector" service and then enter the freeway at various points and fully utilize the Busway without requiring their passengers to wait for, and transfer to, another vehicle. Where and if justified, off-line freeway bus stops can be constructed, serving major destinations, park-and-ride lots, or major transfer points. The buses continue to their "cross" street in the central Austin area, exit the busway and freeway, operate on the surface streets dropping off and picking up passengers.

On the surface components of their travel, bus speed can be improved via traffic signal preference and limited stops (such as one stop per mile or half

mile, as opposed to the normal one stop every few blocks for local bus service). In Los Angeles, "Rapid Bus" service using these two tools has added 23-29 percent to the average bus speed and increased ridership by 26 percent on two heavily utilized bus lines in just 90 days.[69] Not surprisingly, riders are very happy with this new service.

With these significant speed improvements, and one-vehicle origin-to-destination service (and, where required, better transfers between buses), transit can be time-competitive with the single occupant automobile and can offer opportunities for suburban job destinations for people without access to cars and for the disabled.

These "rubber tire" improvements will have greater impact on mobility and travel speeds than will light rail. Even the Greater Austin Chamber of Commerce, in its White Paper *supporting* light rail, admitted this, "The Capital Metro LRT proposal is not likely to have a substantial impact on traffic congestion and air quality in the short term; in fact there are more cost-effective means of addressing these issues in the near term. High occupancy vehicle and high-occupancy toll lanes (HOV/HOT), road expansion, improved bus systems, and intelligent transportation strategies are good examples of such strategies."[70]

## COMPARATIVE TRANSPORTATION GUIDEWAY CAPACITIES AND COSTS

Managed freeway lanes, such as Busway/HOV/HOT lanes, can accommodate many times the volumes of light rail lines. During peak hours, it is estimated that a Busway/HOV/HOT lane open to three or more person "free" car pools would, conservatively, accommodate the following average passenger volumes during peak hours in Austin:

- 35 buses, each carrying an average passenger load of 25
- 750 high occupancy vehicles (minimum of three passengers per vehicle), each with an average of three passengers
- 750 vehicles paying tolls, each with an average of 1.25 passengers (See the Texas Public Policy Foundation's *Trolley Folly – A Critical Analysis of the Austin Light Rail Proposal*, http://www.tppf.org/transit/trolley/toc.html) [71]

In total, this hypothetical lane would carry 4,138 passengers at an average speed of 55 mph (Table 19).

Such a Busway/HOV/HOT lane would produce far more transportation benefit to the Austin area than the proposed light rail transit system, carrying approximately 8.8 times the volume of light rail (measured in "transportation work" terms of passenger-miles per peak hour).

**Table 19**
**Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvements**

| | Light Rail | Roadway Rapid Transit | | | |
|---|---|---|---|---|---|
| | | Buses | High Occupancy Vehicle (HOV) Lane | Toll (HOT) Lane | Total: Roadway Rapid Transit |
| Vehicles/Hour | 18 | 35 | 750 | 750 | 1,535 |
| Additional Capacity (Autos Removed from "General Purpose" freeway lanes) | < 750 | <750 | 750* | 750 | 2250 |
| Average Passenger Load | 72 | 25.00 | 3.10 | 1.25 | 2.70 |
| Hourly Passenger Volume | 1296 | 875 | 2,325 | 938 | 4,138 |
| Average Travel Speed | 20 | 55 | 55 | 55 | 55 |
| Passenger Mile Equivalents | 25,920 | 48,125 | 127,875 | 51,563 | 227,563 |
| Freeway Lane Equivalents | 0.45 | 0.84 | 2.22 | 0.90 | 3.96 |
| Light Rail Person Mile Equivalents | 1 | 1.86 | 4.93 | 1.99 | 8.78 |

Light Rail: 6 trains with 3 cars per peak hour.
High Occupancy Vehicle Lanes require three persons per car.
* To the extent that HOV encourages higher levels of carpooling, the number of vehicles removed could be greater.

According to Capital Metro, the capital cost of the currently proposed light rail will run from approximately $920 million to $1,200 million for the first twenty miles, or approximately $46 million to $60 million per (bi-directional) mile of route. For the full 52-mile system Capital Metro projects a cost of $1.9 billion to $2.2 billion, or approximately $37 million to $42 million per route mile.[72]

Busway/HOV/HOT lanes are generally more costly than general purpose freeway lanes. At a minimum, for HOV-only lanes, this can be limited to little more than special lane markings and signage. At the other extreme, there may be special entry and exit ramps, bus transfer stations, park-and-ride lots and toll facilities. The added cost of Busway improvements ranging from $2 to $4 million per mile, yields a maximum average cost per mile of $18 million for a Busway/HOV/HOT lane. This is approximately 30 percent of the cost per mile of light rail. Thus, the highest likely cost for the most expensive sections of a Busway/HOV/HOT ($44 million per mile) is approximately the same as the

lowest possible cost for light rail ($46 million).[73]

However, the Busway/HOV/HOT lane carries more than eight times the travel volume as light rail. The higher volumes make the cost advantage of the Busway/HOV/HOT lane even greater. We estimate that light rail capital costs are more than 22 times as great as that of a Busway/HOV/HOT lane per person mile (Table 20).

**Table 20**
**Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvement**
**Capital Costs per Person Mile**

| | Light Rail | Roadway Rapid Transit |
|---|---|---|
| Capital Cost per Bi-directional Mile (Millions) | $46 | $18 |
| Light Rail Person Mile Equivalents | 1.00 | 8.78 |
| Capital Cost per Light Rail Person Mile Equivalent | $46.00 | $2.05 |

Finally, a Busway/HOV/HOT system would provide additional important advantages:

- Average speeds would be far higher than light rail, making the system more attractive to downtown automobile commuters. Because of their higher operating speeds, busways are considered rapid transit, unlike street-running light rail. Moreover, many other travelers to locations other than downtown would benefit from the higher speeds of the Busway/HOT lanes, whether in car pools, single occupant automobiles paying tolls or such new non-downtown bus services as may be established.

- Busway/HOV/HOT systems provide better utilization of right-of-way space, carrying many more people than is practically possible by light rail.

- Because they are open to car pools and single occupant automobiles paying a toll, Busway/HOV/HOT lanes reduce traffic congestion on adjacent freeway lanes. The HOT lane on Route 91 in Southern California reduced traffic congestion enough to reduce the period of daily traffic congestion by one hour.[74]

Other bus strategies can also be used to effectively improve transit service costs.

**Bus Malls**: Bus transit malls have been successful in the United States. One of the best examples in the U.S. is in Portland. It operates on a pair of bus-only streets, with semi-enclosed bus stops with electronic displays showing the arrival times for the next bus on each route. While the Portland light rail

system has gained considerable national publicity, few members of the public, and even relatively few transit professionals, recognize that the bus transit mall carries far more passengers to and from downtown Portland. Indeed, in 1994, eight years after the East Side (Banfield) light rail line opened, light rail accounted for approximately 10,000 daily downtown boardings and alightings, compared to 66,000 on the bus mall.[75]

A bus mall could be operated in Austin by allowing Capital Metro buses sole use of designated lanes on selected streets. It could be difficult to designate such a lane for bus-only use, given the impacts of such designations on parking, delivery, and drop-offs. However, at least the same level of inconvenience would be created by the light rail system. It appears that there is no reason why bus transit malls could not receive similar consideration, particularly since they could carry far more passengers.

There is the potential to establish a rapid transit *network*, with lanes on IH-35 and MoPac and connecting East-West surface busways (and, in later years, additional miles of such high speed guideways). This would provide for high-speed, single vehicle transit trips to the downtown area for a large number of existing and potential Capital Metro bus passengers. It would also provide for very productive, cost-effective routing and scheduling of buses. This type of busway operation would be significantly faster than light rail, cutting the origin-to-destination total travel time by up to half for many users.

As in the case of Portland, a bus mall in Austin would provide higher transit capacity than light rail. Based upon bus operating characteristics, it is estimated that buses could provide four or more times as much capacity as light rail.[76] This theoretical figure is confirmed by the experience of the Ottawa (Canada) downtown busway, which carries 9,500 people per hour in the peak direction.[77]

Further, a bus mall has far more growth capacity than a light rail transit mall. Given the length of the North-South blocks in the Austin CBD, approximately 270 feet, three car trains are the longest that can be operated.[78] Based on the experience in other street-running light rail cities, it does not appear that service frequencies of greater than five minutes could be operated (twelve trains per hour in peak direction). The bus mall capacity could easily be double, even triple, the light rail transit mall capacity.

With the planned six trains per hour of the Austin light rail system, there will be ten minutes between trains in each direction, and longer during non-peak hours. This under-utilization of road space could become a political issue, as drivers in congested conditions note the comparatively empty light rail lanes. On the other hand, a bus mall serving the same transit corridor could accommodate seven to eight times as many vehicles (buses) over the same period.

Bus transit malls, properly designed and implemented, can produce significant

advantages for both bus passengers, automotive travelers, pedestrians, and businesses. By separating buses, with their frequent stops, from automotive traffic, the speed of travel can be increased for both. Moreover, bus based strategies can reduce travel time for transit commuters because service would be more frequent than on light rail, and waiting times would be reduced. Also, many more destinations would be directly served, so fewer transfers would be required.

Bus transit malls have a significant capital cost advantage over light rail transit malls. Both require certain changes to the auto traffic patterns, signage, signaling, etc. Both also require stations or stops, although those for bus can be far simpler than those for light rail, depending upon the specifics of the operating plans ("paid" boarding areas and high-platform boardings, such as those necessary for most light rail lines, would significantly increase such costs and be difficult to fit into downtown Austin's narrow sidewalks). There are many expensive requirements for light rail that are not required for bus malls, such as the rails, special trackwork, and power supply system, as well as ticket vending machines. It is not unlikely that a difference in cost over $100 million in the downtown section alone might occur.

**FINANCE**

If the "rubber tire" option is tested, there are significant financial resources that can be brought into play.

First, Capital Metro currently has approximately $140 million in reserves that can be applied to long term transportation improvements.

Second, Capital Metro is collecting a full 1¢ sales tax, but is not currently spending at this level. Capital Metro indicates that it is reserving approximately one-fourth of sales tax revenues annually, or approximately $30 million a year, for future light rail construction and operations.[79] It is also recommended that there is a careful study of Capital Metro's current operations and administrative costs, and particularly its multi-million dollar expenditures for light rail planning, to find ways to add more transit service on the street, or use funds for other transportation purposes, without increasing taxes. Also, as many of the suggestions above are designed to make transit time-competitive with single occupant autos for long commute trips, premium fares for premium service will allow significant increases in Capital Metro's traditionally very low farebox recovery ratio.

Third, Capital Metro was planning on applying for Federal Transit Administration § 5309 "New Starts" discretionary capital grants for light rail. As has been discussed above in the case of Houston, these same funds can be utilized for the construction of Busway/HOV lanes and the procurement of buses to operate on them (there are no federal transit grant programs that can be utilized for light rail that cannot be utilized for "rubber tire" projects, but there are programs that can be utilized for "rubber tire" programs that cannot

be utilized for rail). Because "rubber tire" guideway transit projects tend to be far more cost-effective and productive than rail projects, chances are good that such grant proposals, properly prepared and presented, would score highly on the various rating criteria. Current federal procedures generally allow the utilization of Federal Transit Administration grant funding, and of "flexible" roadway/transit funds such as CMAQ and STP, for transit guideways and related assets, where there is also general purpose transportation use, where it can be shown that there are substantial transit benefits. Given that the transit-*only* benefits of a well-utilized Busway/HOV/HOT lane/surface bus mall/traffic signal preference system can be far larger than those of light rail, and at a significantly lower total cost, it would appear that, if light rail can be funded, then an improved high-capacity "rubber tire" transportation would appear to have at least an equal chance of success.

Fourth, by adding high-occupancy toll roads, there is the ability to charge for the capacity not utilized by buses and car/vanpools (below). This can be an important additional source of funding, both for matching funds for federal transit grants and for general purpose freeway funding purposes.

By using these funding sources for certain general purpose surface transportation purposes, scarce general purpose funding can be saved for utilization on other projects.

If needed, both the Capital Metro sales tax and the HOT lane revenues can be used as the backing for revenue bonds.

## REALISTIC FUNDING ALTERNATIVES

*The 1999 Capital Metropolitan Opportunity Analysis* found that Capital Metro could provide its current level of service at one-half its current tax rate (one-half cent sales tax).[80] The other one-half cent Capital Metro tax could be committed to more effective mobility options, such as roadway rapid transit and roadway expansion. A preliminary analysis indicates that much greater transportation benefits are likely to be achieved through such a strategy.

If the excess one-half cent Capital Metro tax were committed to building a 52 mile (104 one-way lane miles)[81] Busway/HOT system (rather than a 52 mile light rail system), funding would remain that could be used to build new general purpose lanes.[82] These tax funds could also be augmented by tolls to expand the general purpose freeway system.[83] These two funding sources could finance an estimated 439 additional miles of general purpose freeway lanes in addition to the 104 one-way miles of Busway/HOT, for a total of 543 total lane miles.[84] This would reduce traffic congestion from the projected 64 percent above capacity in 2025 to one percent below capacity (RCI of 0.99), assuming continuation of recent road expansion and population growth trends.[85] It is estimated that this would reduce per capita daily peak hour travel delays throughout the Austin area 65 percent compared to building light rail, approximately one hour per capita per week.[86]

If the excess one-half cent Capital Metro tax were committed only to the expansion of general purpose freeway lanes, approximately 452 new lane miles could be constructed. This would reduce traffic congestion from the projected 64 percent above capacity in 2025 to six percent above capacity (RCI of 1.06), assuming continuation of recent road expansion and population growth trends. It is estimated that this would reduce per capita daily peak hour travel delays throughout the Austin area 58 percent compared to building light rail, approximately one hour per capita per week (Tables 21 and 22).

**Table 21**
**One Way Miles of Usable Transportation Capacity: Preliminary Estimates**

| | Light Rail | Busway/ HOT | Freeway |
|---|---|---|---|
| Light Rail | 104 | 0 | 0 |
| Busway/HOT | 0 | 104 | 0 |
| General Purpose Freeway Lanes | 0 | 439 | 452 |
| Total Freeway Lane Mile Equivalent | 0 | 543 | 452 |
| Roadway Congestion Index | 1.63 | 0.99 | 1.06 |
| Contribution to Reduction of Traffic Congestion | -0.6% | -39.4% | -35.1% |

**Table 22**
**Sources and Uses of Capital Funding: Preliminary Estimates**
**In Millions**

| **Sources:** | Light Rail | Busway/ HOT | Freeway |
|---|---|---|---|
| Capital Metro (Sales tax) | $950 | $950 | $950 |
| Federal Transit Match | $950 | $468* | $0 |
| HOT Lane Toll Revenues | $0 | $440 | $0 |
| Federal Highway Match | $0 | $2,151 | $2,217 |
| Total Sources | $1,900 | $4,009 | $3,167 |
| **Uses**: | | | |
| Light Rail | $1,900 | $0 | $0 |
| Busway/HOT | $0 | $936 | $0 |
| General Purpose Freeway Lanes | $0 | $3,073 | $3,167 |
| Total Uses | $1,900 | $4,009 | $3,167 |

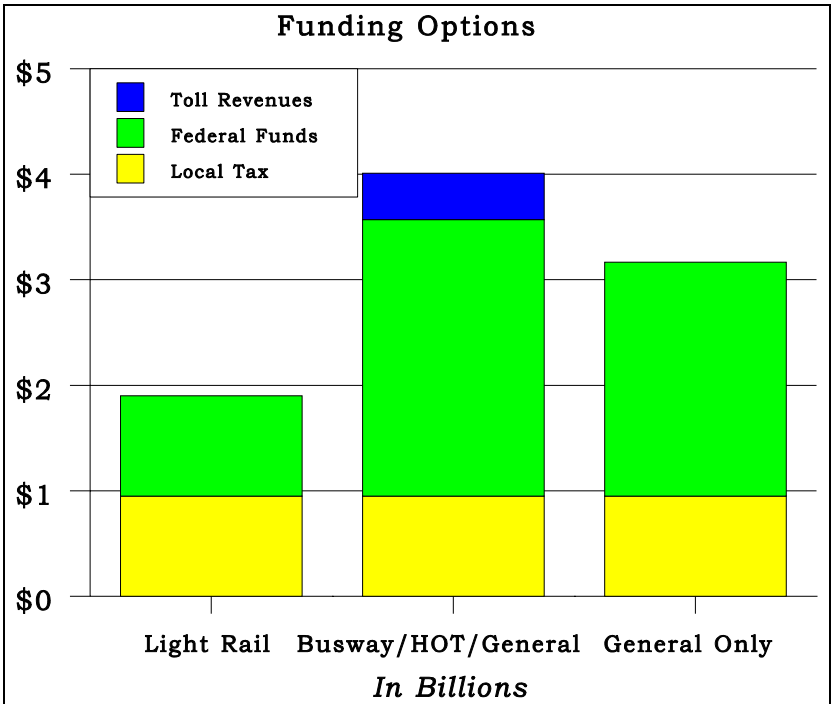
* Building Busway/HOT lanes equivalent in length to light rail (52 bi-directional, 104 one-directional lane miles) can be done at approximately one-half the per mile cost of light rail. Therefore, while the federal transit matching funds are one-half that of light rail (reflecting lower capital costs), the remaining local tax funds are available for general purpose lanes which also

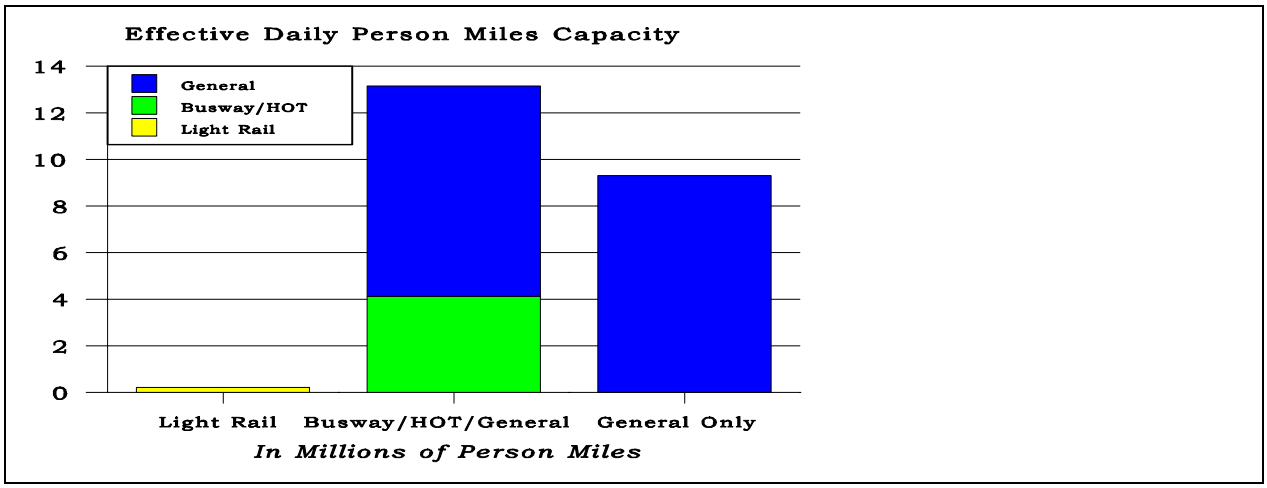
receive a federal highway funds match.

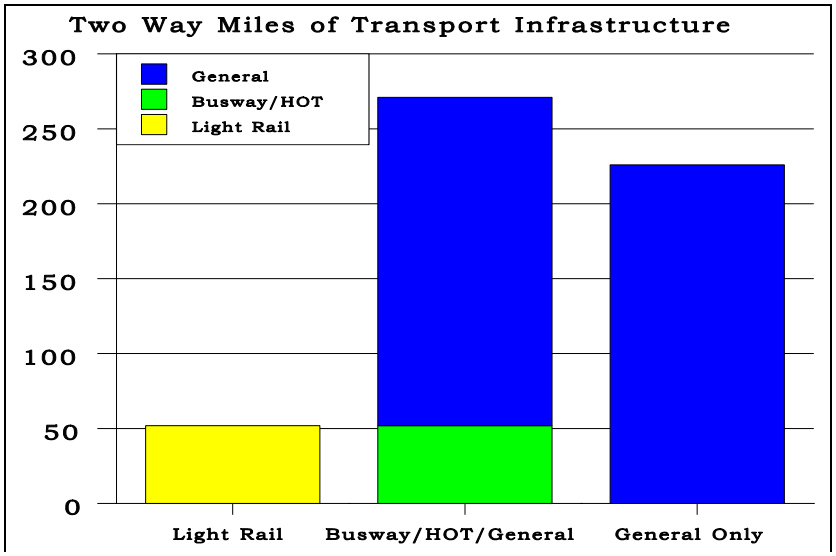
Subsidies to *operate* light rail will be over a billion dollars over the life of the project. The costs to operate and maintain freeway lanes are a small fraction of this, and HOT lanes will actually cover their own operation and maintenance costs, as well as generate cash flow for other purposes, such as bonding or pay-as-you-go expenditures to add transportation capacity.

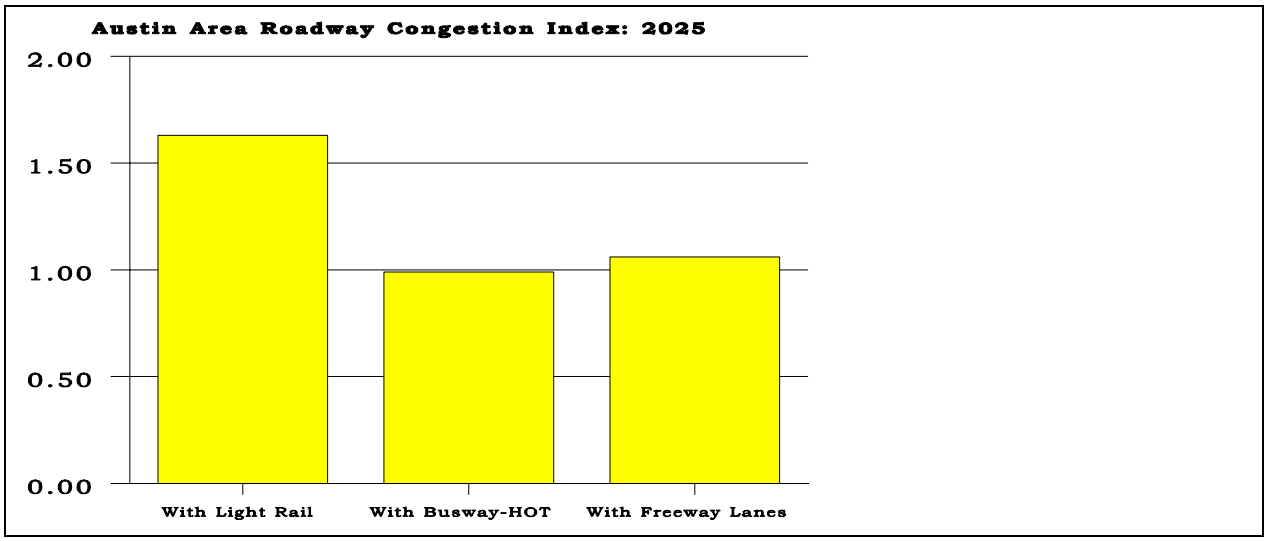
Under either of these alternatives, it may be possible to use some of the funding to build the planned State Route 130 roadway for operation without tolls.

There is a limited amount of federal funding for Texas, and adding and shifting local or state funds for highway purposes will not, with a few exceptions, increase the amount of federal funding coming to the state. To the extent that one of the criteria of the funding allocation is a local match, then, if one locality increases its allocation of local funding for highway purposes, over a period of time more federal funding may be allocated to that region. If more federal funding is going to one region than there was before, and the grand total does not change, then there will be less funding going to other regions (Figures 10, 11 and 12).






These traffic congestion improvements compare to the approximately 0.5

percent congestion impact of light rail projected by CAMPO.

The extent and intensity of the traffic congestion could be significantly less with roadway rapid transit and roadway improvements (Figure 13). Finally, these preliminary estimates are theoretical and are not accompanied by detailed proposals for roadway expansions. Whether the associated roadway expansions that could significantly reduce traffic congestion are technically or politically feasible is a question that would be addressed in more detailed planning. The important factor, however, is that a comprehensive mobility and access analysis be completed that considers all potential measures to minimize traffic congestion including Busway/HOT lanes and freeway expansion.

Finally, it has been estimated that up to $235 million in savings could be obtained by more efficient operation of the Capital Metro transit system over the next 10 years (See the Texas Public Policy Foundation's *1999 Texas Transit Opportunity Analysis: Capital Metropolitan Transit Authority (Austin)*, http://www.tppf.org/transit/capital/tran3.html).[87] This would mean that Capital Metro could operate using only one-half of the present sales tax. Capital Metro has demonstrated a tendency toward less cost effective projects, such as light rail. This is counter productive with respect to the future of transportation in the Austin area. As was noted above, the Austin area faces very serious transportation problems. There are already indications that employers are choosing or could choose to expand their operations outside the Austin area because of the already difficult transportation problems. Solving Austin's transportation challenges will require cost effective approaches – the criteria must be the cost effectiveness of usable additions to transportation capacity. The Austin area needs to have its transportation funds administered based upon such criteria. As a result, it would be desirable to repeal one-half cent of the Capital Metro sales tax and make the funds instead available for allocation to the most cost effective local transportation projects (based upon factors such as cost per new passenger mile).

## OTHER MAJOR METROPOLITAN AREAS

As was noted above, the large Texas metropolitan areas have been among the fastest growing in the nation. This growth will likely continue, and, in consequence, traffic volumes will likely increase substantially as well. The strategic position of each of the other large metropolitan areas is reviewed below.

**Dallas-Fort Worth:** The Dallas-Fort Worth area has become one of only nine metropolitan areas in the nation to exceed five million population.

The Dallas-Fort Worth 25 year transportation plan[88] projects an increase of nearly 80 percent in vehicle miles traveled by 2020. The majority of this growth is expected to be in single occupant automobiles. The regional transportation plan projects that downtown Dallas will represent less than four percent of metropolitan employment, compared to five percent today. More than 98 percent of job growth is expected to occur outside the downtown area. The overwhelming majority of new peak period travel will, as a result of the more dispersed pattern of commercial development, be single occupant automobile. Transit will continue to carry less than one percent of regional travel, despite obtaining one-third of regional transportation expenditures. One potential source of revenue is transit cost reductions, the potential for which exceeds $700 million over the next decade (while retaining present service levels)(See the Texas Public Policy Foundation's *1999 Texas Transit Opportunity Analysis: Dallas Area Rapid Transit (DART)*, Texas Public Policy Foundation, http://www.tppf.org/transit/dallas/tran4.html.)[89] At the same time, because of limited resources, local planning officials are planning for higher levels of traffic congestion than would be necessary if more resources were available for commitment to roadways. It is projected that 43 percent of area freeway lane miles will experience congestion in 2020, up from the present 30 percent.

As was noted above, it is possible to use Federal Transit Administration capital funding to improve the overall transportation of the area, through commitments to HOV and HOT lanes. These facilities have two principal advantages:

- They make it possible for users to be attracted from a much wider range of employment locations, instead of simply the downtown locations to which transit is largely limited for automobile competitive service. Express bus services can be established to serve major employment centers throughout the region. Car pools can use these facilities to serve employment locations throughout the area, not just the major centers.

- Because they are available to single occupant drivers, HOT lanes offer the potential to improve mobility throughout the region for those willing to pay.

It is clear that the Dallas-Fort Worth area will require additional investments and strategies if traffic congestion is to be improved over the next 25 years. For

example, 139 miles of the planned 225 mile high occupancy vehicle lane system is planned to be one-way (reversible). With the continuing dispersion of jobs and residences, commuting patterns tend to be less one directional, with similar volumes in both directions. The one-way (reversible) HOV lanes should be constructed as two way lanes.

To improve traffic conditions in the Dallas-Fort Worth area will require the commitment of additional resources to streets and roads. With the difficulty of raising general taxes or gasoline taxes, the sources are limited to the better use of transit capital resources, transit savings and more innovative user fee financing (below).

**Houston:** Like Dallas-Fort Worth, Houston is one of the nation's fastest growing metropolitan areas and now ranks 10th in the nation. Houston could reach 7.5 million residents by 2025. Daily vehicle miles traveled are expected to increase by more than one third by 2020 according to the regional transportation plan.[90]

While transit provides a very small share of travel in the Houston area, the local transit system, the Metropolitan Transit Authority of Harris County (Metro), has been a leader in using bus strategies to improve transit service.

Metro is well along in its implementation of a bus rapid transit program (the Regional Bus Plan). The Regional Bus Plan involves development of approximately 40 additional miles of busway/HOV lanes and a major expansion of Metro's express and park and ride bus services. This will increase Houston's HOV one-way lane mileage to over 220 miles. New park and ride services will be provided from virtually every fixed guideway corridor to Uptown, Greenway and the Texas Medical Center. Through 2010, the Regional Bus Plan is expected to cost $1 billion and is projected to have the lowest cost per new passenger of any rapid transit program implemented with federal funding.[91]

Even before full implementation of Metro's fixed guideway system (Regional Bus Plan), Metro has increased ridership much more cost effectively than Dallas-Fort Worth, which has opened both light rail and commuter rail systems since 1995.

- By 1998, Dallas (DART) boardings had increased 10.0 million since the year before light rail was opened[92] (1995). At the same time, operating costs rose nearly $50 million, for a cost per new boarding of $4.97.

- Over the same period, Metro experienced a 15.6 million increase in boardings, while operating costs rose $18.1 million, for a cost per new boarding of $1.16, less than one-quarter that of DART.[93] If capital costs were added to this figure, Houston's cost advantage is actually greater because of the inordinately high capital cost of light rail and the tendency of rail openings to artificially inflate ridership figures.[94]

The overwhelming proportion of job growth is expected to be outside downtown Houston, which means that there is little potential for transit's small market share to grow. Over the next 20 years, approximately 25 percent of regional transportation spending will be for transit, which carries barely one percent of travel. The potential for cost reductions in transit has been estimated at more than $550 million over a ten year period (without reducing service levels) (See the Texas Public Policy Foundation's *1999 Texas Transit Opportunity Analysis: Metropolitan Transit Authority of Harris County (Metro)*, http://www.tppf.org/transit/metro/tran5.html.)[95]

As in Dallas, Houston's mobility needs are greater than its resources. It is estimated that the area will fall more than $50 million short of meeting its needs on an annual basis through 2025. Also, as in Dallas, much of the HOV lane system is or will be reversible one-way lanes. These lanes should be developed for two-way operation (those segments of the system that are closest to the traditional CBD are likely to retain the traditional "morning-in, afternoon-out" commute pattern and, therefore, are less likely to require change to bi-directional operation in the foreseeable future).

As in the Dallas-Fort Worth area, improving mobility will require the commitment of additional resources to streets and roads. The most promising sources are more efficient use of federal transit capital funds, transit savings and more innovative user fee financing (below).

**San Antonio:** Metropolitan San Antonio is expected to increase in population from 1.6 million to 2.3 million by 2025. Traffic volumes are projected to rise more than 50 percent. The regional transportation plan projects a doubling of traffic congestion over the next 25 years.[96]

Most new jobs are projected to be in areas outside downtown. This means that employment will be more dispersed than today, as also will be traffic volumes. Transit is likely to carry a smaller market share than today, despite the fact that downtown San Antonio has the lowest transit work trip market share of any major Texas CBD. With an overall market share of barely one percent, the regional transportation plan commits more than 40 percent of spending to transit through 2025. There are substantial opportunities to reduce transit costs, with an estimated saving of nearly $250 million over ten years (See the Texas Public Policy Foundation's *1999 Texas Transit Opportunity Analysis: VIA Metropolitan Transit Authority (VIA): An Update*, http://www.tppf.org/transit/via/tran2.html),[97] without reducing service and while restoring the pre-1997 passenger fare level.[98]

VIA Metropolitan Transit Authority, the transit service provider for the Greater San Antonio area, proposed a light rail system that would have served downtown from suburban areas. This proposal was rejected by the voters in May 2000 by a 70 to 30 percent margin.

Based upon current projections, it appears that new resources will be required to maintain current traffic congestion levels or to improve traffic over the next quarter century. San Antonio is the only major metropolitan area that does not collect the full one-cent sales tax available to transportation. Based upon the fact that virtually all new demand over the next quarter century will be roadway demand,[99] it would seem reasonable that any transportation tax increase should be used to solve what is the principal transportation problem in the area – growing roadway congestion. In addition more effective use of transit capital subsidies, savings from more efficient transit and more innovative user fee financing could represent an important source of revenues.

# IV. BORDER AREAS

The North American Free Trade Agreement (NAFTA) has had a major impact on the Texas economy. The gross state product attributable to trade has risen from six percent in the middle 1980s to 14 percent today,[100] reflecting sharp gains in cross-border commerce. This has significantly impacted the Texas transportation system:[101]

- 79 percent of all U.S.-Mexico trucks crossed the border at Texas ports of entry, with 40 percent of the Northbound trucks traversing Texas for destinations outside Texas (U.S. and Canada).

- NAFTA truck traffic comprised 16.5 percent of all Texas truck traffic, with 75 percent of this on rural interstate and other rural roads.

- Thirteen highway corridors, which make up 18.9 percent of Texas highway mileage, carry almost 90 percent of all NAFTA traffic in Texas, with IH-35 alone accounting for 31.6 percent of this total.

- The direct annual costs of highway improvements to maintain the existing level of service is projected at $150.9 million per year, with the optimal-need cost projected at $349.8 million per year.

- Cross border truck traffic has risen more than 50 percent. At the same time, freight rail traffic has doubled.[102]

- The "social costs" of the increase in NAFTA traffic, including congestion, accidents, air and noise pollution, and related costs is projected at $560.8 million per year.[103]

There is no doubt that the increase in economic activity due to NAFTA has had far greater beneficial impacts on Texas than any other state. Indeed, it appears that almost half of all U.S.-Mexico truck traffic is between Texas and Mexico. However, even taking into account the significant amount of Texas-Mexico NAFTA truck traffic, the NAFTA traffic *through* Texas is significantly more than the *total* traffic through any other border state. This "through" traffic promotes very large benefits for the entire nation, with Texas taxpayers paying for infrastructure improvements benefitting others, and with Texas drivers and residents shouldering the added congestion and related disadvantages.

The Federal "National Corridor Planning and Development Program and Coordinated Border Infrastructure Program"[104] can be utilized to pay for certain of the costs generated by NAFTA-related transportation impacts. However, while Texas received the largest share of such funds, these only amounted to $32.31 million for FY99 and FY00 combined.[105] If funding from these programs is split in half for each program, then Texas, with 79 percent of the U.S.-Mexico border crossings, received only 26 percent of the Coordinated Border Infrastructure Program grant funding.[106]

Increased federal assistance in responding to the NAFTA-related costs would appear to be justified. With the change in administrations in Washington, there is reason to believe that there may be a greater understanding of the importance to both Texas and the nation of increased federal highway funding due to NAFTA impacts. The next major chance for increased federal funding will be when TEA-21 is up for reauthorization in 2003, although there will be some opportunities for increased federal participation in the near term, both legislative and administrative. At the same time, it is unlikely that new federal highway legislation would dedicate a significant portion of new funding to border needs.

## DEMOGRAPHIC SITUATION

The Texas border contains two of the nation's three fastest growing metropolitan areas, Laredo and McAllen-Edinburg-Mission (McAllen). From 1990 to 1999, Laredo grew 45 percent, while the McAllen area grew 40 percent (Table 23). At the same time, the largest Texas border metropolitan area, El Paso, grew 19 percent, slightly faster than the state of Texas as a whole and double the rate of the nation. Strong population growth is expected to continue, as discussed above. McAllen and Laredo are projected to grow 1.5 times the rate of Austin through 2025, which is expected to have the third fastest growth rate among the state's major metropolitan areas. Brownsville and El Paso are expected to be the fourth and fifth fastest growing areas respectively. All four major border metropolitan areas are expected to grow substantially faster than the state as a whole.

Moreover, the border metropolitan areas are international. While not normally considered in census data because of their international nature, a number of

international metropolitan areas have developed through the years, the largest of which are Ciudad Juarez-El Paso, with a population of 1.9 million and McAllen-Reynosa-Rio Bravo with nearly 1.1 million (Table 24).[107] Border areas in both nations have grown at a substantially greater rate than other areas, including non-border areas in Texas. Mexico's border population is expected to double to more than 20 million over the next 20 years.[108] At the same time, the Texas portions of the international metropolitan areas are likely to grow more than 80 percent over the next 25 years.[109]

While population projection information is not available for Mexican metropolitan areas, the current rate of growth could raise 2025 populations to more than four million in Ciudad Juarez-El Paso, two million in McAllen-Reynosa-Rio Bravo, 1.5 million in Matamoros-Brownsville and one million in Nuevo Laredo-Laredo. It is expected that the border metropolitan areas will grow at approximately 1.5 times the rate of other major Texas metropolitan areas over the next 25 years, and five times the rate of the rest of the state (Table 24).

**Table 23**
**Population Change in The Texas-Mexico International Metropolitan Areas**

| Metropolitan Area | 2000 | 1990 | Change |
|---|---|---|---|
| CIUDAD ACUNA-DEL RIO | 155,806 | 95,057 | 63.9% |
| United States | 46,088 | 38,721 | 19.0% |
| Mexico | 110,388 | 56,336 | 95.9% |
| CIUDAD JUAREZ-EL PASO | 1,939,492 | 1,389,709 | 39.6% |
| United States | 721,674 | 591,610 | 22.0% |
| Mexico | 1,217,818 | 798,099 | 52.6% |
| CUIDAD MIGUEL ALEMAN-RIO GRANDE CITY | 120,224 | | |
| United States | 54,820 | 40,518 | 35.3% |
| Mexico | 65,404 | | |
| MATAMOROS-BROWNSVILLE | 751,171 | 563,413 | 33.3% |
| United States | 334,743 | 260,120 | 28.7% |
| Mexico | 416,428 | 303,293 | 37.3% |
| MCALLEN-REYNOSA-RIO BRAVO | 1,083,974 | 760,221 | 42.6% |
| United States | 560,297 | 383,545 | 46.1% |
| Mexico | 523,677 | 376,676 | 39.0% |
| NUEVO LAREDO-LAREDO | 515,174 | 352,807 | 46.0% |
| United States | 204,897 | 133,239 | 53.8% |
| Mexico | 310,277 | 219,568 | 41.3% |
| PIEDRAS NIEGRAS-EAGLE PASS | 177,218 | 134,563 | 31.7% |
| United States | 49,320 | 36,378 | 35.6% |
| Mexico | 127,898 | 98,185 | 30.3% |

Source: U.S. Census Bureau & Instituto Nacional de Estadistica Geografia e Informatica, Mexico data.

**Table 24**
**Border Metropolitan Area Growth Rates Compared to Balance of the State**

| Category | 2000 | 2025 | Change | % | Share |
|---|---|---|---|---|---|
| Border Metropolitan Areas | 1,822,000 | 3,657,000 | 1,835,000 | 100.7% | 16.1% |
| Non-Border Metropolitan Areas | 12,627,000 | 20,880,000 | 8,253,000 | 65.4% | 72.5% |
| Total Metropolitan | 14,449,000 | 24,537,000 | 10,088,000 | 69.8% | 88.6% |
| Outside Major Metropolitan Areas | 6,403,000 | 7,695,000 | 1,292,000 | 20.2% | 11.4% |
| Texas | 20,852,000 | 32,232,000 | 11,380,000 | 54.6% | 100.0% |

The border metropolitan areas (Texas portion) have high relative poverty rates and low per capita income. On average, the four large border metropolitan areas have 44 percent less annual income per capita than the state of Texas, and 48 percent lower than the nation (Table 25). Because of the lower incomes in border communities, extraordinary expenses related to supporting border activities consume a higher proportion of personal income than would be the case in average income metropolitan areas.

**Table 25**
**Per Capita Annual Income:**
**Border Metropolitan Areas**

| | 1998 Per Capita Income | Compared to Texas | Compared to the United States |
|---|---|---|---|
| Brownsville | $13,766 | -45.7% | -49.4% |
| El Paso | $16,359 | -35.5% | -39.9% |
| Laredo | $13,870 | -45.3% | -49.0% |
| McAllen | $12,759 | -49.7% | -53.1% |
| Texas | $25,369 | 0.0% | -6.7% |
| United States | $27,203 | 7.2% | 0.0% |

Source: U.S. Department of Commerce.

## TRANSPORTATION SITUATION

Texas is pivotal to U.S.-Mexico trade. As noted above, nearly 80 percent of U.S.-Mexico truck traffic travels through Texas ports of entry. This is reflective of the fact that Texas ports of entry are the most convenient for more than 80 percent of the U.S., 75 percent of Canada and 90 percent of Mexico (Table 26). Moreover, the 2000 U.S. Census indicates little change in the national population distribution as regards convenience of Mexican border crossing

points, so it is likely that Texas will continue to handle a similar share of trade in the future. Texas' strategic position with respect to cross border rail freight is also strong, with a nearly 80 percent share.[110] Further, Monterrey, with a population of more than 3.2 million, is by far the largest metropolitan area (third largest in the Mexico) close to the U.S. border, approximately 150 miles from Laredo and the lower Rio Grande Valley.

**Table 26**
**Location of Population Most Convenient to Texas Border Crossings**

| Nation | % of State or Provincial Population | % of Major Metropolitan Area Population (Non-Border) |
|---|---|---|
| Canada | 76.7% | 75.0% |
| Mexico | 91.4% | 83.3% |
| United States | 80.2% | 81.3% |

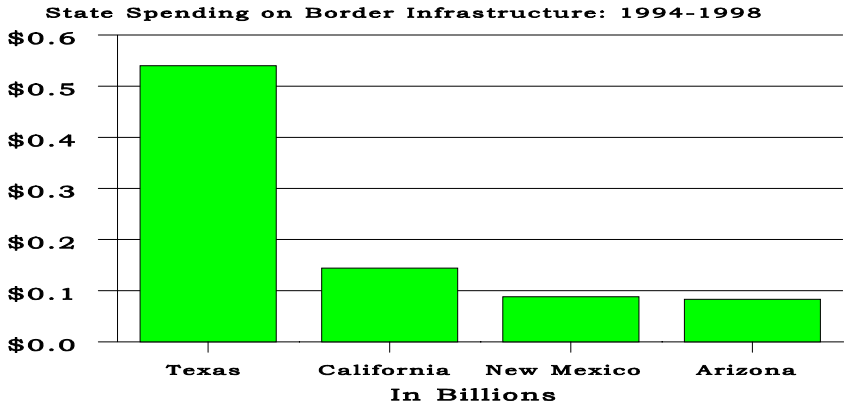
Major metropolitan areas are over 1,000,000 population.
Sources: Calculated from U.S. Census Bureau, Statistics Canada and Instituto Nacional de Estadistica Geografia e Informatica, Mexico data.

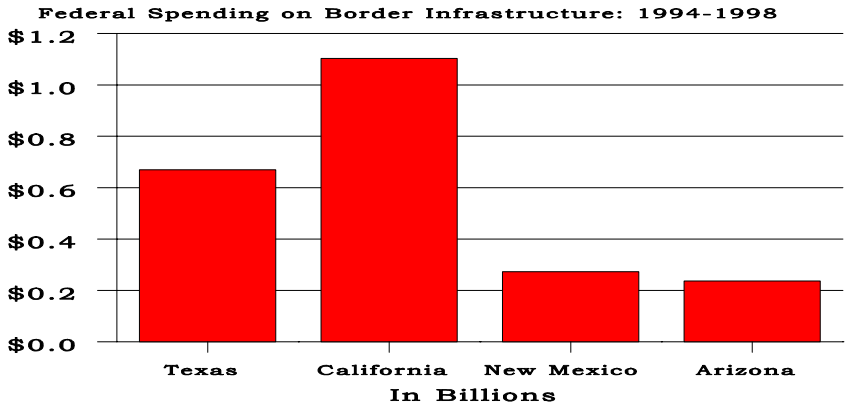
Texas' border communities benefit significantly from this increase in trade. Both population and employment have increased substantially. From 1990 to 2000, it is estimated that the Texas portions of the international metropolitan areas have increased in population by nearly 30 percent. Large numbers of new jobs have been created to serve the new trade. Commercial and residential construction has expanded, also creating new jobs.

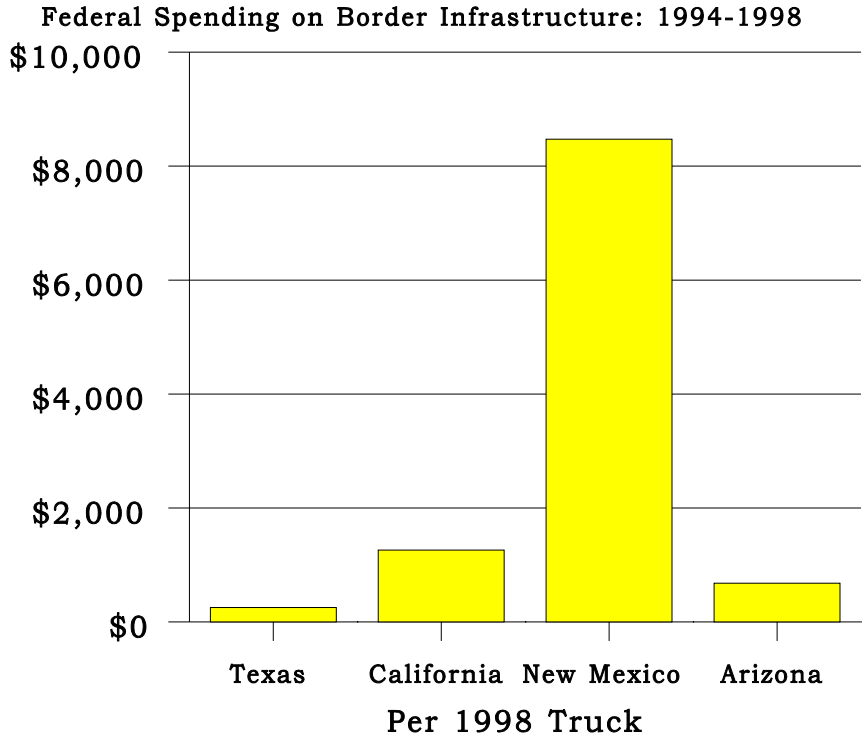
At the same time, the increased border trade has had negative impacts on border communities.

- Border communities are faced with increasing traffic congestion and idling vehicles as truck traffic increases.
- Air pollution levels are higher as a result of the traffic congestion and idling.
- Freight rail traffic has increased, further exacerbating traffic congestion where tracks cross city streets at grade (without overpasses or underpasses).
- Increased traffic congestion has made environments less safe for both automobiles and pedestrians.
- Some communities report strains on their downtown economies, as tourists find it difficult to reach parking areas because of the increased traffic congestion.

These demands have led to major spending programs in border states, with both Texas and California expending $1.2 billion on infrastructure projects from 1994 to 1998 (Figure 14).[111] Other states have spent considerably less. However, Texas has spent much more of its own money on border infrastructure than other states, with the federal government having provided a much larger share elsewhere (Figure 15). Federal expenditures in relation to truck traffic volumes have been from 2.7 to 34 times that of Texas in Arizona, California and New Mexico (Figure 16).




Federal Spending on Border Infrastructure: 1994-1998
$10,000
$8,000
$6,000
$4,000
$2,000
$0
Texas
California
New Mexico
Arizona
Per 1998 Truck

Recently, the Texas Transportation Commission approved more than $1.0 billion in additional border infrastructure projects, which combined with existing commitments, represents a $1.8 billion investment program.[112] The program is to be completed over a ten year period. The Texas Border Infrastructure Commission, made up of public officials from border communities, has urged that the program be completed over a five year period instead.[113]

While not included in the recently adopted program, there are also plans to develop a new interstate highway corridor (Interstate 69) from Sarnia, Ontario/Port Huron, Michigan to the border with Mexico. The route, Interstate 69, is open from Port Huron to Indianapolis. Interstate 69 would travel in Texas from Texarkana to Houston and from there to the border. Two to three corridors might be developed, with routes to Laredo, McAllen and Brownsville under consideration. There is strong local (metropolitan) support for each of the corridors. Development of the Interstate 69 Rio Grande Valley corridors (McAllen and Brownsville) could provide significant additional capacity for growth, which could result in a more even distribution of trade volumes in relation to Laredo.

Another need not addressed in the current plan relates to the route to Eagle Pass/Piedras Niegras. The government of Mexico has designated the Federal Route 57 corridor from Saltillo and Mexico City to Piedras Niegras as a priority corridor for development. On the U.S. side, however, there are no current plans to upgrade U.S. Route 57 to four lanes (Eagle Pass to Interstate 35 south of San Antonio). Increased traffic along this route could compromise safety in the long run. Further, development of a higher capacity route to Eagle Pass could accommodate some of the increased traffic that might be otherwise bound for more congested crossings.

But not all border crossing issues are related to the provision of additional infrastructure. The U.S. General Accounting Office (GAO) has noted management issues that contribute to border congestion, including:[114]

- Insufficient staffing by federal agencies, such as the U.S. Customs Service, U.S. Department of Agriculture and U.S. Food and Drug Administration. Staffing shortages result in lane closures, which reduce the capacity of border facilities to deal with traffic. It is ironic that El Paso and Laredo are threatened with air quality non-attainment status, which would mean an interruption of federal highway funding, at the same time that the failure of federal agencies to sufficiently staff border stations is a significant contributor to the air quality problems. The State Comptroller reports that it is not unusual for more than 75 percent of lanes to Mexico to be closed due to staffing shortages.[115]

- Multiple inspections by government agencies slowing the speed of traffic.

- Numerous border procedures remain to be automated.

- Little, if any, current data on average delay times for truck inspections at border crossings. The longer term management of border crossings should include goals and standards with respect to average truck delays.

- Insufficient cooperation with border authorities in Mexico.

GAO further indicates that insufficient truck processing and delay data is maintained. Both immediate and longer term trend data are required for effective planning and management of border crossings. This is likely to become more important as additional route options open to truckers, such as the Interstate 69 corridors with its two or three approaches to the border. Making "real time" border delay data immediately available could make it more feasible for southbound trucks to alter their routes based upon waiting times.

The problem of border congestion is thus not simply a matter of infrastructure capacity. Issues that are generally much less expensive to address, such as border staffing and coordination and data availability also play an important role. Managing long term border congestion problems will require an appropriate mix of capacity increases, traffic management and border processing strategies.

## PROJECTIONS

Trade with Mexico is expected to continue to increase, though there are substantially conflicting projections. For example, the Laredo Urban Transportation Study (LUTS) 25 year plan projects an increase in truck volumes of more than 443 percent by 2025 at Laredo crossings. In contrast, the Texas Border Infrastructure Coalition has projected that large truck traffic will increase by a much more modest 85 percent by 2025.[116] It is clear, however, that truck traffic will increase by a large margin over the next quarter century. Rail traffic is expected to increase 238 percent at Laredo by 2025 according to LUTS.

## FINANCING BORDER NEEDS

The growing volume of border traffic indisputably places significant burdens on communities with border crossings. There is no doubt that these burdens are far greater than would be experienced if the significant level of trade did not exist.

Despite a number of planning efforts on future border transportation needs, a broadly accepted definition of specific needs (projects) does not appear to exist. TxDOT has, as is appropriate, adopted a program of projects within the constraints of financial resources that are likely to be available. Other review efforts by the Texas Border Infrastructure Commission and the Senate Committee on Border Affairs have described the extent of financial need. There is a need for a thoroughly vetted assessment of long term transportation needs

with respect to border transportation.

At the same time, border communities receive disparate economic benefits from this increased traffic. However, it is likely that the incremental cost of needed border transportation improvements exceeds the incremental revenues. There are various views with respect to revenue sources for incremental improvements:

- Border communities perceive the increased burdens to be not of their own making and understandably believe that additional funding should come from other sources, state and/or federal.

- Just as border impacts are not the result of border community actions, they are also not the result of state actions. Theoretically, at least, the greater burden placed on border communities by NAFTA can, from a state perspective, be viewed as a federal responsibility.

- While it is generally understood that NAFTA creates a federal obligation, it is clear that federal programs may not be sufficient to meet the need. Moreover, there are equity problems with the present federal program, as evidenced by the small allocation of funding to Texas compared to its overall share of border crossing activity. Given the difficulty of increasing federal revenue, especially for needs that, at least politically, might be considered regional, it is possible that increased federal funding is not likely to provide a major source of new income for border infrastructure.

There is no question, however, that the nation as a whole gains from the increased trade under NAFTA and that it is inequitable to expect either the border communities or the state of Texas to finance what are in essence national infrastructure facilities. This would be akin to requiring border states to finance local immigration and nationalization service activities or to have required the state of Alaska to finance defense activities within the state during the Cold War. The incremental costs of border activities should be, therefore, paid by the nation as a whole.

**A Border Futures Commission:** It is recommended that a high level study commission be empaneled (perhaps by the Governor) to review border infrastructure needs and financing sources (referred to as the *Border Futures Commission* in this report). The mandate of the *Border Futures Commission* would be:

· To review the costs and benefits of border transportation activities and their impact on specific border communities. The purpose of this charge would be to identify the extent to which costs exceed benefits (incremental costs).

· To propose the specific border transportation projects, management

procedures and ITS strategies that would be required to mitigate the incremental impact of border transportation activities on Texas border communities.

- To propose methods of finance for the program of projects, with an emphasis on user financing,[117] as opposed to general or statewide funding sources. In particular, the *Border Futures Commission* should be charged with a thorough review of any potential mechanisms by which border traffic could be assessed the full incremental cost of needed border improvements. Obviously, such a financing mechanism would require federal legislation and concerted advocacy among states along the borders with both Mexico and Canada. Dedicated revenues from such a financing source could be directly transferred to state departments of transportation, which would administer state mandated programs and allocate appropriate funding to local needs.

- To propose objectives with respect to border crossing performance in cooperation with United States and Mexico officials and to propose information systems that would allow "real time" notification to truckers of conditions at border crossings. This would allow truckers to select the most convenient routes to cross the border.

Later in the report, a statewide planning effort – *Texas Transportation Futures Commission* – is proposed. It would be important to coordinate the mandates and activities of these two commissions.

## LAREDO CASE STUDY

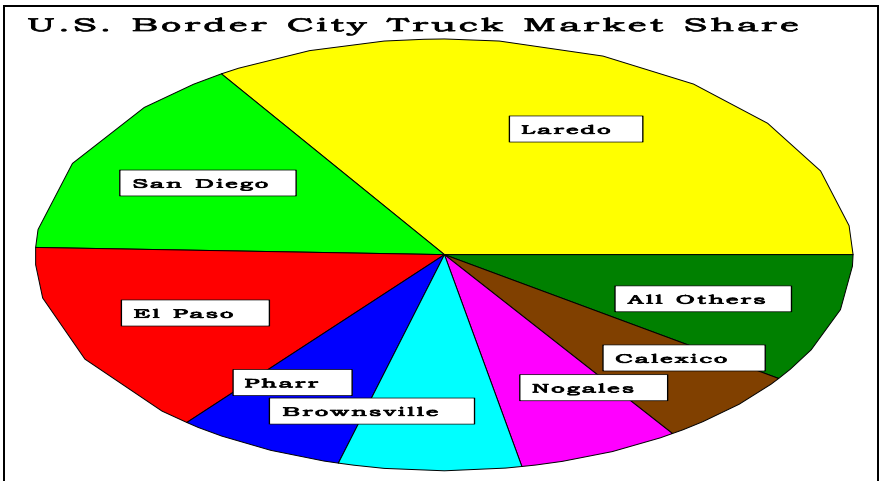
**Demographic Situation:** Laredo has been the nation's second fastest growing metropolitan area (above), with a 45 percent increase in population from 1990 to 1999.[118] Only Las Vegas, at 62 percent, has grown more rapidly. Laredo is estimated to have a population of 205,000 in 2000. Combined with Nuevo Laredo, across the border, the international metropolitan area is home to an estimated 515,000, up from 353,000 in 1990. Like other border metropolitan areas, Laredo has a higher poverty rate than the rest of the state and average income 45 percent below the state and 49 percent below the nation (above).

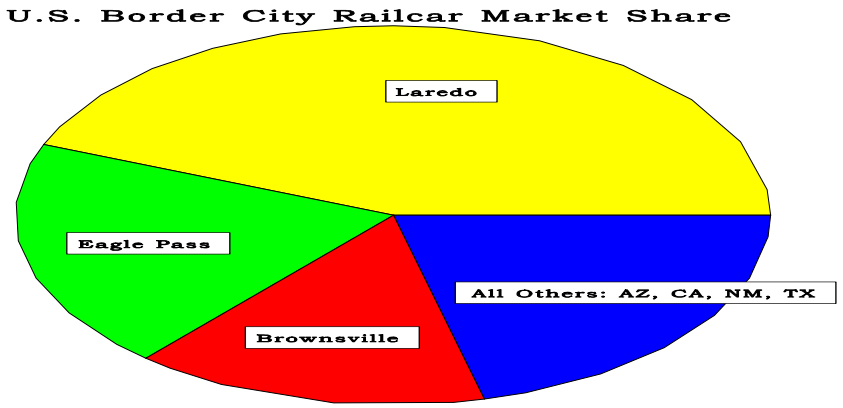
**Transportation Situation:** The Laredo area accounts for by far the largest amount of border truck traffic of any port of entry on the Mexican border. Second and third ranking San Diego-Tijuana and Ciudad Juarez-El Paso handle less than one-half the volume of Laredo. In 1998, Laredo handled approximately one-third of all cross-U.S./Mexico border truck movements, and more than one-half of movements across the Texas-Mexico border. Moreover, Laredo accounts for nearly 45 percent of cross-border railcars (Figures 17 and 18).[119] Since 1994, loaded truck volumes have increased 91 percent at Laredo crossings, while railcar volumes have increased 108 percent (Figures 19 and 20). These represent 11 percent and 13 percent annual increases, respectively. As was noted above, LUTS projects a 443 percent increase in truck traffic over

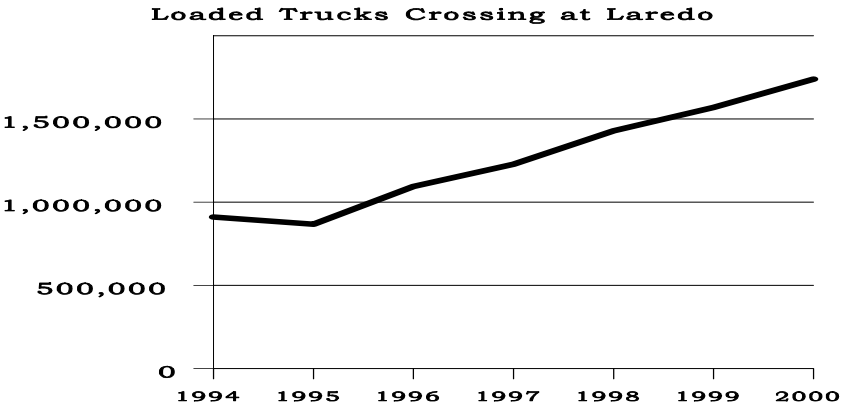
the next 25 years, which represents only a seven percent annual increase. The LUTS railcar projection of 239 percent represents a five percent annual growth rate, also well below the rate of recent years.

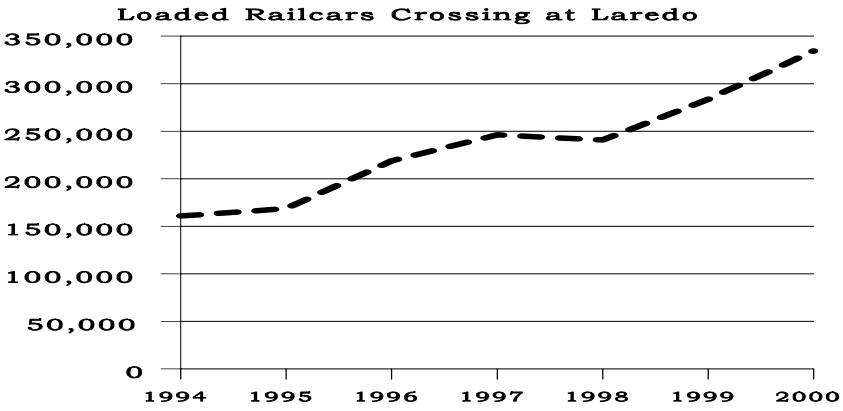
Laredo has benefitted from the new trade. The annual value of building permits appears on a trend to rise more than 60 percent in 2000 compared to 1994.[120] Employment has risen approximately 15 percent over the same period.

As in other border communities, traffic congestion has worsened as a result of the increased NAFTA trade. Until a few months ago, long lines of trucks divided the city's commercial core in two as they waited for clearance to cross the border. At the same time, the increased rail traffic has increased the time spent by trucks and automobiles waiting at the city's more than 110 railway crossings. Two main line railways intersect Laredo, the Union Pacific (from San Antonio) and the Texas Mexico Railroad (from Corpus Christi).






But, conditions have materially improved recently in Laredo. The city of Laredo built a new toll bridge (the World Trade Bridge) in the northwestern sector of the city. Once opened, truck traffic was prohibited from the former downtown crossing. The result has been to divert virtually all border truck traffic from Interstate 35 and the city streets leading to the downtown border crossings. Laredo bonded and used the State Infrastructure Bank to complete this facility, which includes not only the bridge but also a large truck staging area to reduce traffic congestion on feeder routes. The state and city are also cooperating to develop high quality access roads from Interstate 35 directly to the new border crossing, along the Bob Bullock Loop (Loop 20).

Another border crossing opened in 1991, the Columbia Solidarity Bridge, which crosses the border approximately 20 miles northwest of the city into the state of Nuevo Leon. The city of Laredo built this toll bridge with bond funds. This bridge is connected by a private toll road to Interstate 35 at a junction approximately 15 miles north of Laredo. This crossing, however, is not yet served by a high quality connecting road in Mexico and has suffered a substantial loss in volume since the opening of the World Trade Bridge. Loaded truck volumes dropped 49 percent from March to October 2000, while the Columbia Solidarity Bridge's Laredo market share dropped from 41 percent to 22 percent. The Columbia Solidarity Bridge and toll road, however, will make it possible for the Laredo area to accommodate considerable additional growth.

Despite these new bridges, truck traffic remains a problem in the Laredo area. Trucking companies maintain warehouses throughout the area, so that trucks traveling to and from the border operate over city streets and in city neighborhoods, though at smaller volumes than before. As the Bob Bullock Loop is widened and the Outer Loop is built, it can be expected that more warehouses will locate outside the area of current urban development, which will help reduce truck traffic in those areas.

**Public Transit:** It is estimated that approximately 1.4 percent of travel in the Laredo area is by public transit.[121] This is higher than the estimated share for each of the four largest metropolitan areas in Texas (Dallas-Fort Worth, Houston, San Antonio and Austin) and more than double that of Dallas-Fort Worth (above). Nonetheless, this represents a very small transit market share. Transit does, however, serve an important welfare need. The average household income of people who commuted to work by transit was 51 percent below the Laredo metropolitan average, which would indicate a lower level of automobile availability. Transit's market share is very small even for commutes to the downtown area, where the market share is five percent, made up mostly of people without automobiles.[122] Downtown is by far the strongest market for transit. With such a small market share, it is likely that transit usage has virtually no impact on traffic congestion because most transit users do not have access to an automobile.[123]

**Transportation Needs:** Despite the substantial transportation improvements recently and soon to be implemented in the Laredo area, there are other needs. Municipal officials perceive the need to widen the Bob Bullock Loop (Loop 20) and construct an Outer Loop (Loop 820). These improvements will improve access to new sites that can be developed by transportation companies for new warehouse facilities. This will reduce the traffic burden on residential and commercial streets. At the same time, trucks will be able to more readily access the border because they will operate in less congested conditions. A further development could lighten the load on local streets. Implementation of the NAFTA provisions that would allow the trucks of both nations to travel in both countries could lead to a lessened need for warehouse facilities in Laredo. This could reduce local truck traffic, at the same time that through truck traffic continues to increase at a substantial rate.

The TxDOT plan calls for building railroad grade separations in the city. However, even after these are built, more than 100 railroad grade crossings will remain, creating both safety and traffic problems. With a more than 200 percent increase in rail traffic projected (above), the problems of safety and traffic congestion will be exacerbated along the two rail rights-of-way. A more comprehensive railroad grade separation program could represent the most important need for which funding has not yet been identified.

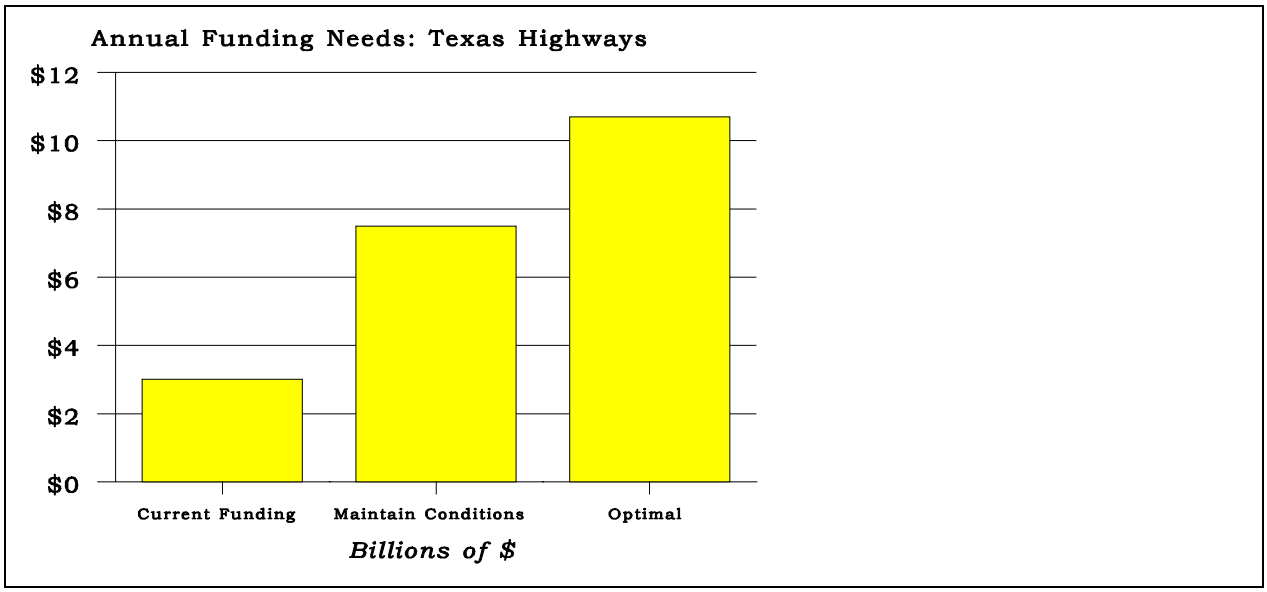
The Texas Transportation Commission's recent programming of additional funding for border areas (above) will play a large part in improving the situation in Laredo. Over the next 10 years, both the Bob Bullock Loop widening and Outer Loop construction will be completed. The plan also includes railway grade crossings.

It appears, however, that the Laredo area is well positioned for the future as a result of the actions taken by the city and TxDOT. There is an excess of bridge crossing capacity and the inner and outer loop improvements are likely to lead to reductions in truck traffic in the city. The longer term relationship between growing demand and facilities at the border should be quantified through an effort such as the *Border Futures Commission* recommended above.

# V. THE FUTURE OF TRANSPORTATION IN TEXAS

In 1997, the Texas Department of Transportation estimates that available financial resources are less than 30 percent of the amount required to optimally meet the future highway needs of the state (Figure 21).[124] Moreover, present funding levels were found to be 60 percent below the level required just to maintain current conditions. A 2000 update of the state highway needs assessment found a similar situation.[125]

But that is just the beginning. Local governments face similar problems in funding necessary arterial (thoroughfare) and highway improvements. As noted above, these needs are most evident in metropolitan areas, where most of the population increase is likely to be accommodated. While an appropriate mix of bonding and "pay-as-you-go" financing with existing resources will finance important transportation improvements (above), the need is much greater.




## URBANIZATION AND ROADWAY CAPACITY

An important need relates to identifying the extent of roadway system that is required to minimize traffic congestion in newly developing urban areas (as urban areas continue to expand). To provide sufficient roadway capacity requires an understanding of the roadway capacity levels that are required to adequately support various forms of development. The local transportation agencies should cooperate to develop minimum roadway capacity standards for the travel demands that occur in varying urban and suburban densities and land use configurations. For example, at residential densities of 5,000 per square mile, more road space will be required than at densities of 1,500. Any number of additional factors might be considered, such as employment densities, location of major traffic generating facilities, etc.

These standards could be used by growing communities to ensure that sufficient roadway capacity is provided as development occurs. The imposition of roadway capacity standards in already developed areas will, of course, be difficult, but a full review of options requires an examination of what would be required to accommodate current and future demand.

## INNOVATIVE ROADWAY STRATEGIES

Higher capacity might be provided using more advanced roadway technologies. In addition to toll roads and the HOT lanes that are discussed above, there are additional innovative strategies.

- **Surface Expressways:** Surface arterials can be converted into "surface expressways" which limit grade crossings to signalized intersections and forces left turns to the right on access roads. New Jersey pioneered this strategy decades ago on surface roadways such as U.S.-1 and U.S.-22. A slightly different concept is used on major arterials in the Detroit area,

which forces left turns through median, signalized u-turn lanes (portions of U.S.-12 and U.S.-24 are examples). Las Vegas has considered a similar concept called "super streets," which use limited grade separation.

- **Limited Access Commercial Bypasses:** As new retail and employment centers continue to be built in developing areas, the surface arterials on which they are located become congested. Traffic congestion could be relieved by building new bypass roadways, which may or may not be grade separated, but control entrance and egress. These arterials would be similar to the New Jersey surface expressways described above.
- **Metroroute Tunnels:** A minimally intrusive mechanism for expanding roadway capacity is the Metroroute, which is a single tunnel carrying two decks of automobile (only) traffic. Limiting access to automobiles allows the tunnel to have a smaller diameter, which makes it considerably less costly. Paris, with the western world's most intensely developed urban rail system, will build 60 miles of under city tunnels to alleviate traffic congestion. The first of these is already under construction. This represents a recognition that, despite exceedingly high costs, additional capacity must be provided for growing travel demand. The under construction A-86 Metroroute tunnel will cost $40 million per lane mile. Even at this high cost, a highway improvement is less costly per person mile than new light rail systems (government highway construction and maintenance cost for highways compared to public capital and operating subsidy for light rail), assuming San Antonio average traffic volumes (the lowest major metropolitan freeway traffic volume in Texas). In Paris, as might be the case in the busiest Texas corridors, the exceedingly high cost of construction could be financed by tolls. Similarly, the city of San Francisco is considering underground toll expressways. This is an important development since San Francisco has been considered the "birthplace" of citizen movements opposing freeways. Currently, the potential is being considered for adding capacity by tunneling under the LBJ Freeway in Dallas.

- **Double Decking:** Texas has pioneered the development of advanced freeway double decking, which makes it possible to add up to six lanes of traffic without taking additional right-of-way (examples are Interstate 35 in Austin and Interstate 10 in San Antonio). Single pillar facilities are built in the shoulder on each side of the freeway. Such an approach could be used to expand the capacity of high volume freeways in other corridors throughout the state.

- **Truck Freeways:** Exclusive roadways can be built above congested freeway corridors for commercial traffic, largely trucks. Such a system has been proposed for the Los Angeles area and would be financed by tolls.

- **Reversible Lanes:** A number of cities have streets with reversible lanes that are adjusted during peak periods to better accommodate demand.

This comparatively low cost strategy should be considered for other arterial roadways. While this tactic can be very useful for improving capacity on roads with traditional morning-in, afternoon-out peak period travel, such as almost all CBDs, it is less useful in the growing suburb-to-suburb commute pattern where there are often no major differences in travel direction by peak period.

- **Removal of "Bottlenecks:"** Traffic "bottlenecks" should be removed. For example, removing bottlenecks at the nation's 18 most congested freeway interchanges would significantly reduce local mobile source air pollution, while saving commuters traveling through these interchanges an average of nearly 40 minutes per day.[126]

- **Automated Tolling:** Toll roads in the state can be converted to full electronic tolling, similar to the system used on the Route 407 beltway in Toronto. All tolls are collected through electronically read cards on windshields. License plates of cars that do not have the electronic cards are photographed and users are billed through the mail. Elimination of the toll booths would reduce traffic congestion, speed travel, and improve air pollution in the local area.

**PEOPLE AND MARKETS**

At the same time, continuing changes in behavior and technology are likely to assist in reducing traffic congestion. For example:

- **Navigation Systems:** Computerized navigation systems are now being installed in automobiles and other vehicles. As technology improves, these systems will provide traffic information to drivers. This will assist in guiding drivers to alternate routes to avoid traffic congestion.

- **Collision Avoidance Systems:** On-board safety systems that provide collision warnings to drivers or even prevent collisions are likely to be available in the near future. Such systems will reduce accidents, and thereby the traffic congestion that they cause. Texas Transportation Institute data indicates that 60 percent of freeway delays are due to incidents such as traffic accidents.[127]

- **Transportation Demand:** As the information technology revolution continues, expanded use of the Internet, personal computers, mobile telephones and other communications technologies are moderating travel demand by facilitating "telecommuting."

  Some companies are "hoteling," a strategy by which employees who spend considerable time outside the office are assigned temporary instead of permanent offices.

  Telecommuting is increasing and it is likely to increase even more in the

future. From 1995 to 1997 telecommuting increased nearly 30 percent. In 1990 it was projected that telecommuting would remove between 50 billion and 150 billion passenger miles nationally from roadways by the year 2000. By 1997 there were indications that the lower projection for 2000 had already been achieved.

Telecommuting is also likely to be expanded to the extent that land use regulation expands (through the adoption of "smart growth" policies).[128] If urban areas are constricted in their physical growth, traffic congestion will increase at a greater rate, creating incentives to avoid the work trip altogether and convert to telecommuting. Moreover, as people continue to express their preferences for less dense housing patterns, much more rapid development of larger lots is likely to take place outside the urban area, which would lead to increased telecommuting.

- **Market Resilience:** Finally, people change their commuting and travel habits in response to changes in development and traffic. This is illustrated by the comparatively stable national data on work trip travel times. From 1983 to 1995, the average work trip increased from 18.2 to 20.7 minutes, an increase of 14 percent.[129] This is in spite of the fact that roadway expansion was less than the increase in travel demand (the RCI increased 24 percent). This has occurred because commercial locations have been sited throughout the expanding urban areas, such as "edge cities." Further, to some extent, people have tended to locate their residences closer to employment locations.

## THE NEED FOR FUNDING

But more innovative projects and the best mix of current funding strategies cannot alone compensate for the fact that the future highway needs of the state of Texas are greater than the resources.

At the same time, it seems unlikely that there will be any increase in federal or state gasoline taxes sufficient to finance the level of transportation improvement required in the state. Indeed, the use of such large revenue bases would tend to disadvantage areas that require the most intense and expensive improvements.

· At the federal level, it can be expected that any formula adopted will not provide the higher proportionate levels of revenue to states that are growing fast, such as Texas. The political reality is that Texas has been and is likely to continue to be a "donor" state. It will be difficult for Texas to obtain its fair share because members of Congress from smaller and slower growing areas are unlikely to provide the necessary support.

· Despite the state's fast growth, some areas are growing much faster than others. Through 2025, it is expected that major metropolitan areas in the state will grow at approximately 3.5 times that of the rest of the state. A

> statewide increase in the gasoline tax would encounter political demands to over-invest while more rapidly growing areas fail to receive enough funding. More localized mechanisms that better match the demand for new investment to the growth in demand are more appropriate.

Yet, based upon TxDOT projections, there is little question that more funding will be needed to provide the transportation capacity that Texas will require. It is assumed, as TxDOT indicates, that with anticipated revenues expected to be 60 percent short of requirements, then major changes will be required to meet our future transportation needs. The most equitable approach for financing additional infrastructure is to use mechanisms that are more closely tied to the use of new facilities and which are paid for by the users. The toll roads and HOT lanes described above can be important strategies for development and improvement of particular corridors.

**Electronic Road Pricing:** As increasing population continues to drive increases in traffic volumes, more comprehensive approaches should be considered, such as electronic road pricing. Electronic road pricing would use peak period and mileage-based user charges to finance roadway system improvements. Higher user charges during peak travel periods would encourage some diversion of vehicle travel to less congested periods. Electronic road pricing would expand the Toronto Route 407 technology to a wider range of roadways. Similar technology is already used on a larger network in Singapore and a more comprehensive system is to be implemented in central London over the next few years. Conversion to such a system would be complex, as a major part of the roadway system would continue to be financed through the more conventional gasoline tax revenues.

**Competitive Franchising of Roadways:** There is also the potential to improve the provision of roadways through a combination of electronic road pricing and competitive franchising.

In contrast with roadways, there is not a crisis with respect to infrastructure provided by the private sector. The traditional commercial user pay system of financing the building and operation of infrastructure continues today with respect to those services provided by the private sector, generally water service, telecommunications, electricity[130] and natural gas. Companies in these businesses have the advantage of operating with little or no political interference in their commercial decisions. As a result, the financing crises that typically plague governments generally have less impact on privately provided infrastructure. The situation is similar to other private commercial sectors, where companies price and provide services and products largely in response to the market. As a result, in both private infrastructure and the remainder of the private sector, there is normally no shortage of goods or services and no cost crisis.

The private or competitive model can be applied in the provision of roadways.

Government can harness the competitive market to control costs and ensure effective supply of infrastructure services. The competitive procurement process minimizes the political manipulations that can make it difficult for government to provide what is essentially a consumer service.

As a result of the automated tolling and electronic road pricing advances (above), it is now theoretically possible to competitively franchise roadway systems, thereby de-politicizing roadway provision, while improving efficiency and effectiveness. This could be accomplished by a competitive procurement in which a community specifies various standards, such as average speeds, levels of service, safety considerations and capacities. Fees for roadway use could be broadly regulated using rates awarded through the competitive process and inflation adjustments. Competitive franchising of local or regional roadways would reduce or eliminate political interference that might otherwise lead to less than optimal roadway investments.

In the metropolitan areas, competitive franchising could be used as the financial mechanism for increased capacity in segments of the community. Geographical sectors could be competitively franchised, with contract awardees committed to providing roadway infrastructure and services consistent with broad specifications established by the appropriate public agency or agencies (such as volume-to-capacity ratios and measures of traffic delay).

Competitive franchising could provide depoliticized funding mechanism for improving the roadway system in Texas. At the same time, so long as the present federally dominated highway funding system is in operation, recipient agencies would apply that funding to roadway segments not competitively franchised (such as the freeway system).

## ASSESSING NEEDS AND REQUIRED RESOURCES

Finally, while there are great needs and a variety of potential funding strategies, there is the need for a clearer vision of future Texas highway needs – intercity, border and metropolitan. A "blue ribbon" panel could be established (perhaps appointed by the Governor), with sufficient staff resources to prepare a statewide transportation vision for the next quarter century. The mandate of this *Texas Transportation Futures Commission* would be:

- To project the extent of transportation demand throughout the state over the next 25 years.

- To assess the highway transportation needs in the state of Texas over the next 25 years, based upon the objective of sustainably obtaining free flow operating conditions throughout the state.

- To review the ability of present funding resources and strategies for meeting the identified needs.

- To develop a program of projects intended to minimize traffic congestion in the state, based upon traffic volume-to-capacity ratios that achieve virtual free flow in all urban areas and throughout the state. The *Commission* should be directed to make its prioritized recommendations based upon reasonable criteria, such as costs per person mile of improvements.

- To identify any high priority needs that justify completion in advance of new revenues, especially through debt financing.

- To propose funding and service delivery strategies that would deliver the proposed level of service, with particular emphasis on innovative user financing.

As noted above, it would be important to coordinate the mandates and activities of the *Texas Transportation Futures Commission* with the proposed *Border Futures Commission*.

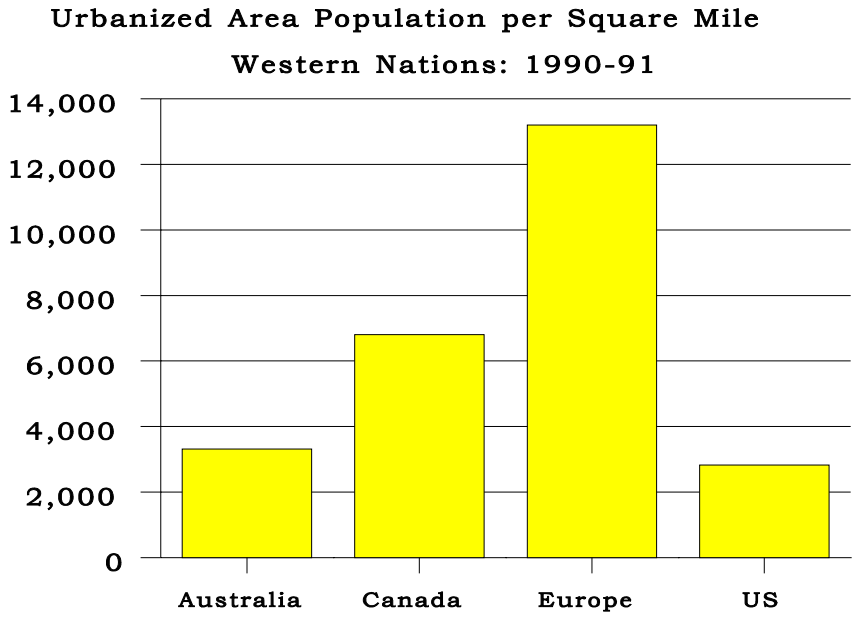
## APPENDIX A: SMART GROWTH

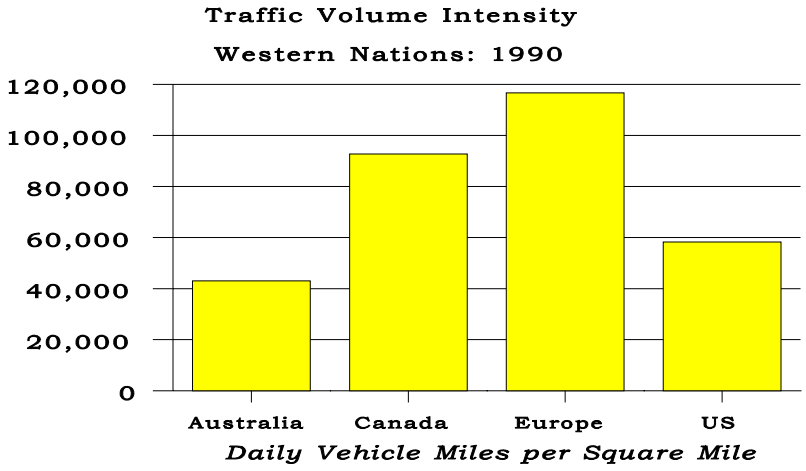
In recent years concern has been raised about the continuing low density suburbanization that is occurring in U.S. urban areas. Since 1950, major urbanized areas (developed areas) have grown approximately 90 percent while expanding their land areas 250 percent.[131] This phenomenon has been refereed to as "urban sprawl," and has drawn significant criticism in recent years. Some concerns are comparatively unfounded. For example:[132]

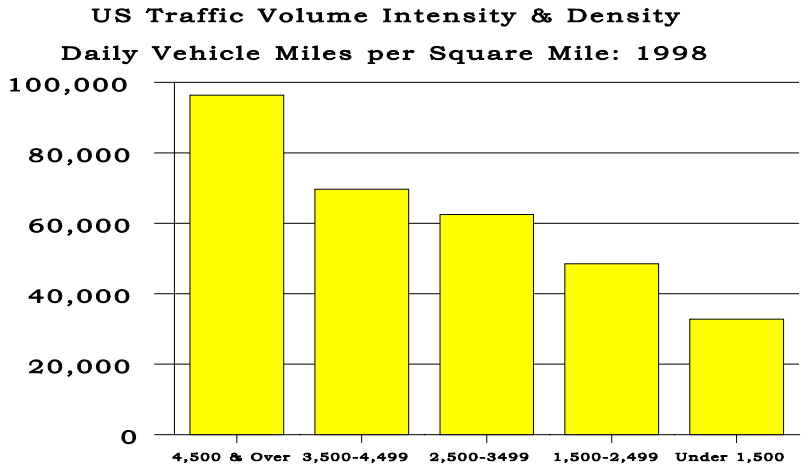
- Urban development in the United States covers barely four percent of the land area (excluding Alaska). Since 1950, the unprecedented expansion (suburbanization) of major urban areas in the United States has consumed land at less than 10 percent of the rate of agricultural abandonment. Overwhelmingly, the land taken out of agricultural production has been returned to open space, due to improved productivity.[133]

- While the nation's older central cities have lost population, only 15 percent of suburban growth is attributable to the exodus from the cities. Most suburban growth has been due to simple population growth and the movement of people from rural areas to suburban areas. In fact, virtually all urban areas in the affluent world are suburbanizing and core city areas have been declining in population for decades. For example, Copenhagen has lost 40 percent of its population and Paris 25 percent.

The anti-sprawl movement has embraced a series of policy strategies called "smart growth," to control the expanding city. Smart growth policies rely on, among other things, higher population densities and development boundaries ("urban growth boundaries" or "growth areas") inside of which all development must occur. While the advocates of smart growth generally claim that these strategies to develop a more compact city will improve traffic congestion and air pollution, the evidence suggests just the opposite. International data shows that traffic intensity (vehicle miles per square mile) is higher where population densities are higher.[134] The higher density European urban areas (Figure 22), for example, experience traffic intensities approximately double that of U.S. urban areas (Figure 23). Even in the United States, higher population densities are associated with higher levels of traffic (Figure 24).[135] Among U.S. urban areas, Portland has embraced smart growth policies most enthusiastically. In the process, Portland has experienced one of the largest increases in traffic congestion and is now among the nation's most congested urban areas (above).




Advocates of smart growth are right to claim that the average travel per person tends to be less in higher density urban areas. The problem is that the larger numbers of people in more dense areas and their travel overwhelm the modest reductions in average travel. Areas with population density of 4,000 to 9,999

per square mile have average travel per capita 7.5 percent below that of areas with densities in the range of 1,000 to 3,999. However, because of the larger number of people, vehicle miles traveled per square mile is 160 percent higher. Each 100 percent increase in population density generates an 88 percent increase in traffic. The comparison of the over 10,000 category to the 4,000-9,999 category is much less unfavorable. Each 100 percent increase in population density generates a 40 percent increase in traffic. Even so, however, this represents a significant increase in traffic volume (Table 27).

**Table 27**
**Difference in Vehicle Miles Traveled by Population Density**

| Population per Square Mile | Compared to Next Lower Density Category | | | |
|---|---|---|---|---|
| | Change in Population Density | Change in Population | Change in Total Vehicle Miles Traveled | Ratio of Vehicle Miles Change to Population Change |
| 250-999 | -7.6% | 841.5% | 770.4% | 0.92 |
| 1000-3999 | -13.4% | 235.3% | 190.5% | 0.81 |
| 4000-9999 | -7.5% | 181.5% | 160.5% | 0.88 |
| 10,000 | -37.7% | 167.2% | 66.6% | 0.40 |

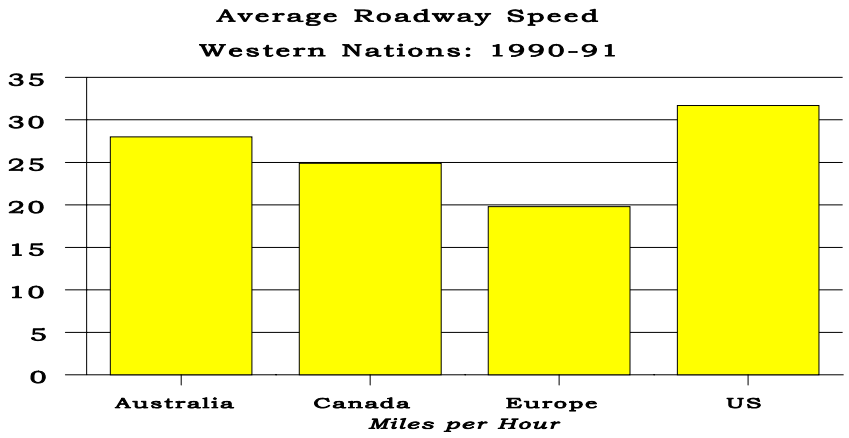
Source: Calculated from Catherine E. Ross and Anne E. Dunning, "Land Use and Transportation Interaction: An Examination of the 1995 NPTS Data," and U.S. Census Bureau data.

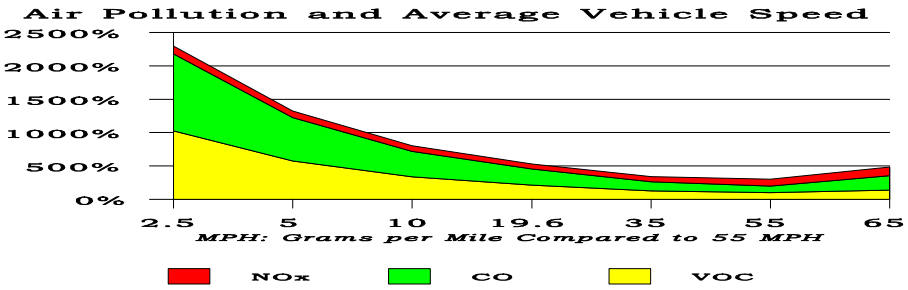
Greater amounts of traffic congestion mean that average operating speeds are lower, and that there is more "stop and go" traffic. The higher European densities and greater traffic intensity evidence themselves in slower operating speeds (Figure 25). These conditions tend to increase air pollution emissions (Figure 26), which is evident in the higher NOx production of European urban areas (Figure 27).[136] As a result, the implementation of smart growth strategies can be expected to lead to deteriorating air quality.[137]

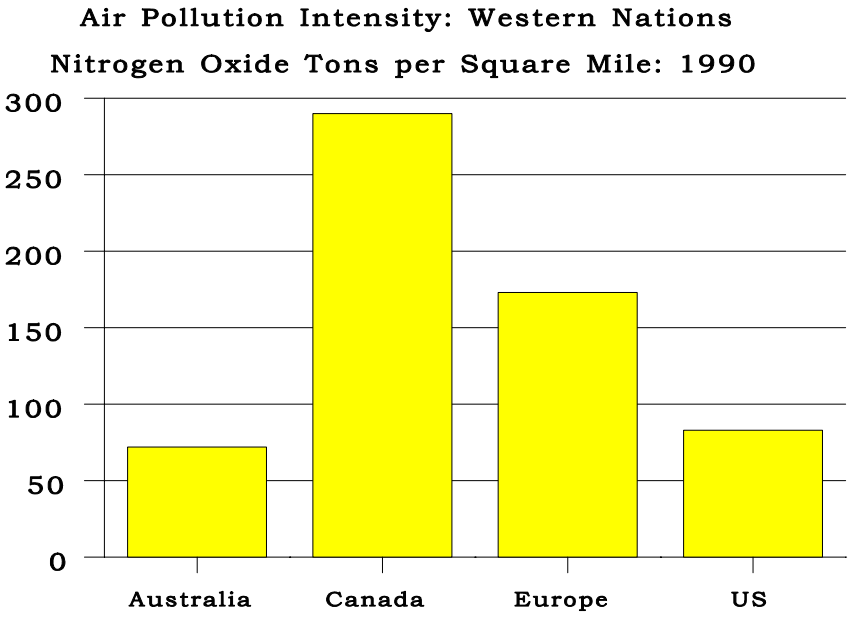
For example, the transit oriented development around the Ballston, Virginia (Washington, DC) subway station is five times as dense as neighboring communities and generates four times as many vehicle trips per acre.[138] Not only is traffic congestion worsened around the transit oriented development, but air pollution is in order of magnitude worse because of the inevitably slower average speed of vehicles in the area.

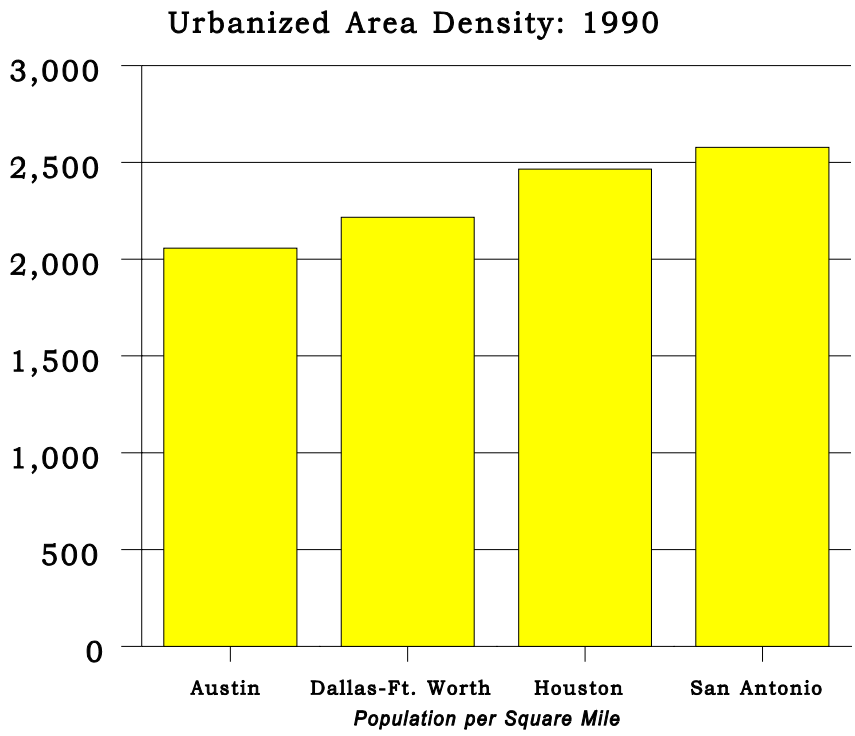
Urbanized areas in Texas are generally low density, averaging from 2,000 to 2,600 per square mile (Figure 28). Urbanized areas of this density face very unfavorable prospects for traffic intensification from higher densities (above). To maintain present levels of traffic congestion would still require construction of significant additional capacity within currently developed areas (including both freeway and arterial expansion). This is unlikely to occur because of community opposition and the very high cost of roadway expansion in developed areas.

It would thus seem preferable for Texas urbanized areas to continue their suburbanization, so that new street and highway capacity can be provided as development occurs. This will minimize traffic intensity and air pollution, while making it more feasible for the required road capacity to be provided.




Urbanized Area Density: 1990
3,000
2,500
2,000
1,500
1,000
500
0
Austin
Dallas-Ft. Worth
Houston
San Antonio
Population per Square Mile

# ENDNOTES

1 Although there is still substantial traffic to pre-existing terminals and warehouses.

2 Metropolitan area data not yet available for the 2000 Census.

3 Austin ranked 6th among metropolitan areas of all sizes.

4 2000 population estimates based upon State Data Center estimates, scaled upward to account for higher statewide 2000 Census total reported by the U.S. Census Bureau. The 2025 projection uses the estimated 2000 population and scales it upward based upon Texas State Data Center's metropolitan population projections (average percentage increase of the Scenario 1.0 and Scenario 1990-98).

5 Alan E. Pisarski, *Cars, Women and Minorities: The Democratization of Mobility in America*, (Washington: Competitive Enterprise Institute) 1999.

6 An urbanized area is a continuously built up (or developed) area. Metropolitan areas, by contrast, are larger because they are based upon county boundaries and include significant expanses of non-urban land.

7 Based upon freeway equivalent freeway lane miles of freeways and arterials using Texas Transportation Institute data.

8 Calculated from Texas Transportation Institute data.

9 Latest available data.

10 Mark Hansen and Yuanlin Huang, "Road Supply and Traffic in California Urban Areas," *Transportation Research A*, 1997, Volume 31.

11 *An Analysis of the Relationship Between Highway Expansion and Congestion in Metropolitan Areas: Lessons from the 15-Year Texas Transportation Institute Study*, (Washington: Surface Transportation Policy Project), November 1998.

12 One advantage of building freeways is improved safety. In 1994, fatalities per 100 million passenger miles were 60 percent lower on freeways than on the rest of the roadway system (calculated from Federal Highway Administration data).

13 Analysis of Texas Transportation Institute RCI data, 1982 to 1996, urban areas of more than one million population.

14 1982 and 1997 data for all 40 urbanized areas with more than 1,000,000 population in 1997, according to the Texas Transportation Institute.

15 Lane miles per capita is used to factor out the traffic volume increasing impact of larger population. A regression analysis found the relationship between lane miles added and the change in vehicle miles per capita to be not statistically significant in urban areas of more than one million population ($r^2$ of 0.009).

16 In 1983 the average journey to work travel time was 18.2 minutes, which increased to 20.7 minutes in 1995 (Nationwide Personal Transportation Study).

17 The most common federal grant program proposed for new rail projects is

Federal Transit Administration §5309 "New Starts," which has at best a nominal 75 percent federal share and a 25 percent "local" share (which could include state, private, or other funding sources). Other U.S. Department of Transportation grant programs that can be utilized for new rail projects have nominal federal shares of 80 percent, or even higher in a few cases. However, the competition for New Starts funds is so heated that most new rail projects are fortunate to achieve a nominal 50 percent federal share. However, there are many costs that are excluded from federal financial participation and, most important, there is virtually never any federal participation in the very large project cost overruns that are common to most rail transit projects. Also, proponents of certain new rail projects include the use of federal "formula" funds, such as FTA §5307, CMAQ, and STP (these will be discussed in more detail below), which will be coming to specific areas for local transportation uses whether or not the rail project is built. In such cases, showing such costs as "federal" participation in funding projects, while technically correct, is extremely misleading because this is really only showing the results of decisions to use already existing funding for specific purposes. Since certain of these funds can be utilized for general purpose streets and roads and/or more productive transit uses, their use for non-productive rail projects may be extremely contra-indicated.

[18] Internet: www.demographia.com/dbx-intlair.htm

[19] Latest available data. 2000 data to be available within the next year.

[20] Calculated from U.S. Census Bureau data, 1990.

[21] For example, to remove a single lane of traffic on a downtown oriented freeway with eight lanes (four in each direction) would require that transit reduce traffic by 25 percent. This would require a transit market share well above 25 percent, because less than one car per rider is likely to be removed. The alternative form of commuting for many transit riders would be car pools.

[22] Internet: www.publicpurpose.com/ut-dartpkhr.htm

[23] Internet: www.publicpurpose.com/hwy-tr96$.htm

[24] Texas Department of Transportation, *Transportation Needs and Revenue Assessment*, 1997.

[25] Assumes a transfer rate of 25 percent (national average, based upon passenger journeys also known as linked trips). Nationwide Personal Transportation Survey, 1995.

[26] In November 2000, Dallas voters approved a plan to spend $2.6 billion in additional long-term bond interest to open its $4 billion light rail program an average of five years earlier than would have been the case under a short-term debt and "Pay-As-You-Go" financing method.

[27] State and local funding is considered together, because states establish differing mixes of transit taxes. In Oregon, Colorado and Texas, for example, virtually all transit taxes are local. In Michigan, on the other hand, there is a dedicated state funding source, and less local funding.

[28] Nationwide Personal Transportation Survey, 1995.

[29] The lower than average work trip market shares in Texas would tend to indicate that the low income market component of transit ridership is higher in Texas.

[30] Internet: www.publicpurpose.com/hwy-tr96$.htm

[31] Wendell Cox, *Evaluation of the FDOT-FOX Miami-Orlando-Tampa High-Speed Rail Proposal*, James Madison Institute, April 1997.

[32] *High Speed Ground Transportation for America*, U.S. Department of Transportation, Federal Railroad Administration, September 1997 (FRA Report).

[33] Wendell Cox, *Evaluation of the FDOT-FOX Miami-Orlando-Tampa High-Speed Rail Proposal*, James Madison Institute, April 1997.

[34] Europe has long been renowned for its higher level of intercity passenger rail service. The shorter distances between major centers, plus the more comprehensive local transit systems, makes this more feasible than in the United States. However, the high level of passenger service makes rail freight service much less attractive. As a result, truck traffic levels are much higher in Europe than in the United States. In the United States in 1997, 31 percent of U.S. freight ton miles were on highways, compared to 73 percent in Europe (Internet: www.publicpurpose.com/tfb-euusjp97-goods.htm).

[35] Wendell Cox, *Evaluation of the FDOT-FOX Miami-Orlando-Tampa High-Speed Rail Proposal*, James Madison Institute, April 1997.

[36] Dallas Fort Worth International Airport and Love Field.

[37] Based upon 10 year passenger growth rate.

[38] *High Speed Ground Transportation for America*, U.S. Department of Transportation, Federal Railroad Administration, September 1997 (FRA Report).

[39] Wendell Cox, *Evaluation of the FDOT-FOX Miami-Orlando-Tampa High-Speed Rail Proposal*, James Madison Institute, April 1997.

[40] Besides $21.9 billion spent on construction and maintenance by TxDOT from 1995 to 1999, an additional $14.2 billion was spent by Texas cities, counties, and other transportation agencies. Federal Highway Administration, *Highway Statistics*, 1995 to 1999, Tables SF-1, "Revenues Used by States for Highways" and HF-1, "Revenues Used for Highways, All Levels of Government."

[41] User fees and general taxation.

[42] Federal Highway Administration, *Highway Statistics*, 1995 to 1999, Table HF-1, "Revenues Used for Highways, All Levels of Government."

[43] Federal Highway Administration, *Highway Statistics*, 1995 to 1999, Table SF-1, "Revenues Used by States for Highways."

[44] USDOT, *TEA-21 – Transportation Equity Act for the 21st Century – Fact Sheet – State Infrastructure Bank Program*, September 14, 1998.

[45] Robert Nichols, Member, Texas Transportation Commission, presentation graphics, undated – cited as "*Nichols.*"

[46] *House Transportation*, *Nichols*.

[47] Senate State Affairs, House Transportation.

[48] Peter Gordon/James E. Moore, Jr./Robert W. Poole, Jr./Thomas A. Rubin, *Improving Transportation in the San Fernando Valley*, Reason Public Policy Foundation Policy Study 249, January 1999.

[49] USDOT, *Annual Report on New Starts – Proposed Allocations of Funds for Fiscal Year 2001 – Report of the Secretary of Transportation to the United States Congress Pursuant to 49 USC 5309(o)(1)*.

[50] MTA, *Metro Facts* and *Guide to Using Houston's High Occupancy Vehicle Lanes*.

[51] Wendell Cox Consultancy, *Roadway Congestion Index in US Urban Areas over 1,000,000: 1982-1997*.

[52] Carole Keeton Rylander, Texas Comptroller of Public Accounts, "Transit Sales and Use Tax" (Comptroller web site).

[53] *A New Transportation Bond Fund for Texas*, testimony presented to the Senate State Affairs Committee, August 21, 2000.

[54] Calculated from CAMPO total trip data.

[55] Assumes the 1982-1997 roadway construction to population increase ratio, annualized, to 2025. An attempt was made to obtain present and 2025 lane mile information from CAMPO to prepare a more reliable estimate of future traffic relative to roadway supply. CAMPO was unable to provide this information. It would seem reasonable for preparation of this type of information to have been a part of the process leading to the adoption of the CAMPO *2025 Plan* on June 12, 2000. It appears that the regional planning agency has no idea of the future traffic implications of its own plan.

[56] Estimated from a regression analysis of the relationship between the RCI and hours of peak hour delay per capita from 1997 Texas Transportation Institute data.

[57] Two way route miles (approximately 104 miles of one-way track).

[58] Assumes 225 days of two-way commuting per year, eliminating vacation, holiday, sick days, etc.

[59] This comparison is made for comparative purposes only, not as an alternative proposal.

[60] Comprehensive ridership surveys administered by U.S. transit agencies show that an average of 28 percent of light rail riders are former automobile commuters. The majority are former bus transit riders, for whom the public now pays more to carry on a different transit mode that may or may not be faster or otherwise superior for the passengers, chiefly due to the greater travel time, fewer access points, and generally greater number of transfers. However, the above calculation is based on Capital Metro's unique assumption that 46 percent of light rail riders would be former automobile commuters, assuming a very high 1.4 average auto occupancy.

61 *Snapshot '99*, Texas Education Agency, www.tea.state.tx.us.

62 Dr. Brian Bocher, Senior Research Engineer, head of the TTI Center for Air Quality Studies, Greater Austin Chamber of Commerce, June 9, 2000 Hearing Transcript, page 18.

63 Greater Austin Chamber of Commerce, *Light Rail Blue Ribbon Task Force Report*, August 2000. The Chamber noted, however, light rail might reduce traffic congestion in the future. As is outlined below, no local planning projections or assumptions are consistent with this view. Even by 2025, light rail will, according to local projections, have no perceivable impact on traffic congestion, with overall traffic volumes projected to increase by more than 100 percent in the area.

64 *Austin American-Statesman*, August 16, 2000.

65 Assumes average national light rail trip length of 4.1 miles (1998 National Transit Database).

66 *CAMPO 2025 Transportation Plan – The Capital Area Metropolitan Planning Organization Transportation Plan to the Year 2025*, June 12, 2000.

67 Wendell Cox and Thomas A. Rubin, *Trolley Folly – A Critical Analysis of the Austin Light Rail Proposal*, Texas Public Policy Foundation, September 2000 http://www.tppf.org/transit/trolley/toc.html and, Wendell Cox and Thomas A Rubin, *Options Ignored, Opportunities Lost: An Analysis Of Affordable Transportation Options For Austin*; *Technical Appendix A: Exaggerating Benefits – A Critique of the Hickling Lewis Brod Decision Economics, Inc. Analysis of Congestion Management Benefits of Light Rail*, Texas Public Policy Foundation, 2000, http://www.tppf.org/transit/options/toc.html.

68 Kelly Daniel, "Cap Metro to Resume Study on Light Rail; Board Must Decide What to do with $140 Million Reserve Saved Primarily for Light Rail," *Austin American-Statesman*, December 9, 2000.

69 Los Angeles County Metropolitan Transportation Authority, *Draft Long Range Transportation Plan for Los Angeles County*, January 2001, pp. 2-26/45. There appears to be an even higher demand for service on these lines, because, as MTA continues to add buses to the lines to relieve overcrowding, total ridership continues to increases.

The total ridership on the Wilshire-Whittier Corridor, including new "Rapid Bus" Line 750, as well as the reduced service on the pre-existing local routes on the same streets, is now up to 86,550. This is well in excess of the ridership of any light rail line in the nation and more than many heavy rail lines carry.

70 Greater Austin Chamber of Commerce, *"Light Rail Transit White Paper*," page 2.

71 As is explained in Texas Public Policy Foundation's *Trolley Folly: A Critical Analysis of the Austin Light Rail Proposal: Appendix A*, http://www.tppf.org/transit/trolley/toc.html these are intended as representative values for carrying capacity, not precise projections for a specific lane in Austin. The actual value could be significantly higher or lower. For example, if the lane was opened to HOV-2 travel, then the carrying capacity of each HOV vehicle would drop, but the number of HOV vehicles might increase. If the number of buses, and/or their carrying capacity, were to increase, then

the total carrying capacity could significantly increase. For example, on the El Monte Busway/HOV lane serving downtown Los Angeles along the San Bernardino (I-10) Freeway, there are currently 75 buses per hour, over double what is assumed for Austin. In other cities, such busways carry hundreds of buses per hour, but it is highly unlikely that there is a level of transit demand in Austin to justify this level of service.

72 All of these projected costs are significantly below the average of other light rail systems proposed for federal funding, which is approximately $70 million per mile. U.S. Department of Transportation, *Annual Report on New Starts – Proposed Allocation of Funds for Fiscal year 2001 – Report of the Secretary of Transportation to the United States Congress Pursuant to 49 USC. 5309(o)(1)*, March 6, 2000.

73 In this comparison, if operating costs and revenues were considered, light rail would fare poorly. Freeway express bus services generally have some of the highest farebox recovery ratios of all transit modes.

74 "Express Lanes Hit Break Even," *Public Works Financing,* Vol. 120 (July/August 1998).

75 Young Park, Tri-County Metropolitan Transportation District of Oregon Rail Corridor Planner, "Portland Transit Mall Findings Report" (Final Draft Report), American Public Transportation Association Rapid Rail Conference, page 35.

76 It is assumed that all trains and buses will have a peak load equal to a common maximum scheduled load for each vehicle type. For light rail, passenger loads equal to 200 percent of seated load are assumed (72), or 144 per light rail car. With 18 cars per hour per direction, this equals 2,592 boardings per hour. (This level of ridership is almost certainly significantly overstated, but, since a common peak load factor is being used for both light rail and bus, the relative degree of overload should be roughly equal).

It is assumed that each bus will be the standard 40-foot, 102" wide vehicle, with 40 seats (Capital Metro operates a mixed fleet, with 40-foot buses ranging from 38 to 49 seats - (American Public Transportation Association, 1999 Transit Vehicle Data Book, page 50). 40 is less than the simple average. A 150 percent load factor is assumed, or 60 passengers per bus. Therefore, to carry the same 2,592 boardings, 44 buses would be required.

This amounts to one bus every 82 seconds in the peak direction, or 1 minute and 22 seconds. This is actually a low level of service for a busway. For a properly designed busway, three, to four buses per minute can be easily accommodated and higher volumes are not impossible, if needed. However, it is extremely doubtful if Austin will require 240 buses per hour at any time in the foreseeable future.

77 John Kain, Ross Gittell, Amrita Daniere, Sanjay Daniel, Tsur Somerville and Liu Zhi, *Increasing the Productivity of the Nation's Urban Transportation Infrastructure* (Washington, DC: Federal Transit Administration, 1992).

78 Author's measurement, measured from the "inside line" for pedestrian walkways. Note that this is a slight overmeasurement for certain blocks, which makes it somewhat questionable if "standard" sized light rail vehicles, which are nominally 90 feet, can be operated in three car trains. If shorter cars, such as 80 feet, are the longest that will "fit," the train carrying capacity would be

significantly lowered. For example, the 80 foot vehicles utilized by Denver Regional Transit District on its light rail line (Siemens) have 64 seats, vice the 72 assumed above.

79 Kelly Daniel, "Cap Metro to use Light-Rail Money in Communities," *Austin American-Statesman*, December 12, 2000.

80 *The 1999 Texas Transit Opportunity Analysis: Capital Metropolitan Transit Authority (Capital Metro)*, Texas Public Policy Foundation, February, 1999, www.tppf.org/tran3.html.

81 A cost of $18 million per two way lane miles is projected. 52 two way miles converts to 104 lane miles.

82 Assumes a 50 percent federal funding match rate.

83 Toll revenues are estimated at one-half the rate of the Route 91 HOT lane in southern California. Based upon Edward Sullivan, *Evaluating the Impacts of the SR-91 Variable Toll Express Lane Facility Final Report*.

84 Assumes a cost of $7 million per one-way lane mile and a federal match rate of 70 percent, which is below the 80 percent match rate for such projects.

85 Applies Texas Transportation Institute Roadway Congestion Index formula. In order to properly model the impacts of changes in surface transportation systems, it is first necessary to quantify the flows and capacities of the entire transportation network, including surface streets as well as freeways, in a transportation model, along with large quantities of additional data, such as population, demographics, travel patterns, etc. The computations herein are not, in any way, intended to imply that such detailed modeling is not required. However, for the current purposes of this analysis, the applied methodology clearly shows that the addition of Busway/HOT lanes and general purpose freeway lanes appear to be many times as effective as light rail in adding transportation capacity in Austin. This proves the contention that it is clearly wrong to implement light rail without first testing the impact of such well-proven options as these.

Only a comprehensive planning and modeling process, fairly applied to all feasible options, can determine the most productive and cost-efficient options to be implemented in any transportation corridor or urbanized area. This includes, for example, ensuring that the capacity of the entire system is studied to ensure that such classic errors as increasing freeway capacity without ensuring that the surface streets can handle the added traffic flow are not made.

86 Estimated using linear regression analysis for 68 urban areas estimating the relationship of traffic congestion to average delay per eligible driver in 1997 ($r^2$=.74).

87 Wendell Cox, *1999 Texas Transit Opportunity Analysis: Capital Metropolitan Transit Authority (Austin)*, Texas Public Policy Foundation, February 1999, http://www.tppf.org/transit/capital/tran3.html.

88 *Mobility 2020: The Regional Transportation Plan,* North Central Texas Council of Governments, 1997.

89 Wendell Cox, *1999 Texas Transit Opportunity Analysis: Dallas Area Rapid Transit*

*(DART)*, Texas Public Policy Foundation, June 1999, http://www.tppf.org/transit/dallas/tran4.html.

90 *Vision 2020: Metropolitan Transportation Plan,* Houston-Galveston Area Council, 1997.

91 Analysis of U.S. Secretary of Transportation, Annual Report on New Starts - Proposed Allocation of Funds (for various recent fiscal years).

92 Commuter rail was opened in 1997.

93 Calculated from National Transit Database.

94 By forcing riders to transfer more from one vehicle to another.

95 Wendell Cox, *1999 Texas Transit Opportunity Analysis: Metropolitan Transit Authority of Harris County (Metro)*, Texas Public Policy Foundation, June 1999, http://www.tppf.org/transit/metro/tran5.html.

96 *Mobility 2025,* San Antonio & Bexar County Metropolitan Transportation Plan (December 1999).

97 Wendell Cox, *1999 Texas Transit Opportunity Analysis: VIA Metropolitan Transit Authority (VIA): An Update*, Texas Public Policy Foundation, February 1999, http://www.tppf.org/transit/via/tran2.html.

98 San Antonio transit riders average particularly low income and are particularly sensitive to fare increases. When the base fare was increased 87.5 percent in 1995, the annual ridership was reduced by 9.6 million, over 20 percent. Federal Transit Administration, National Transit Database.

99 A fact conceded even by proponents of greatly increased transit service.

100 Texas Comptroller of Public Accounts, *Paving the Way: A Review of the Texas Department of Transportation*, January 2001.

101 *Effect of the North American Free Trade Agreement on the Texas Highway System*, Louis Berger & Associations, Inc. in conjunction with Dye Management Group, Inc., for TxDOT, December 1998.

102 Calculated from Texas Border Infrastructure Coalition Report, 2000.

103 *Effect of the North American Free Trade Agreement on the Texas Highway System*, Louis Berger & Associations, Inc. in conjunction with Dye Management Group, Inc., for TxDOT, December 1998.

104 Although these two programs are authorized by different sections, 1118 and 1119, of TEA-21, and have different purposes, they share a common fund of $140 million per year for the five year period, FY99 to FY03.

105 FHWA, *National Corridor Planning and Development Program and Coordinated Border Infrastructure Program – Program Information*, March 22, 1999 and *House Transportation.*

106 *House Transportation.*

[107] Mexico Census 2000, Texas A&M 2000 population estimate, scaled based upon variation from 2000 state population.

[108] U.S. Government Accounting Office, *U.S.-Mexico Border: Better Planning, Coordination Needed to Handle Growing Commercial Traffic*, 2000

[109] Based upon projection methodology described above.

[110] U.S. Government Accounting Office, *U.S.-Mexico Border: Better Planning, Coordination Needed to Handle Growing Commercial Traffic*, 2000.

[111] U.S. Government Accounting Office, *U.S.-Mexico Border: Better Planning, Coordination Needed to Handle Growing Commercial Traffic*, 2000.

[112] Texas Department of Transportation, *Border Trade Transportation Task Force Report*, October 28, 1999.

[113] Texas Border Infrastructure Coalition Report, 2000.

[114] U.S. Government Accounting Office, *U.S.-Mexico Border: Better Planning, Coordination Needed to Handle Growing Commercial Traffic*, 2000.

[115] *Paving the Way.*

[116] Texas Border Infrastructure Coalition Report, 2000.

[117] The federal gasoline tax is not recommended as a source of additional funding, given the difficulty of increasing that user fee rate and the extent to which political considerations could interfere in an equitable distribution of funding.

[118] U.S. Census Bureau.

[119] U.S. Government Accounting Office, *U.S.-Mexico Border: Better Planning, Coordination Needed to Handle Growing Commercial Traffic*, 2000.

[120] *Laredo Monthly Economic Indicators*, October 2000. 2000 figure projected based upon 10 months data.

[121] Estimated using National Transit database and Federal Highway Administration data (in passenger miles).

[122] Transit market share data from the 1990 U.S. Census.

[123] The Nationwide Personal Transportation Survey found that 70 percent of transit riders nationally do not have access to automobiles (1995). In a community with lower income, such as Laredo, it is likely that more than 70 percent of transit riders do not have access to automobiles.

[124] Texas Department of Transportation*, Transportation Needs Revenue Assessment*, 1997.

[125] The *Transportation Needs Revenue Assessment* indicates slightly different figures for overall needs relative to resources for overall transportation needs. These data refer to highway needs.

[126] American Highway Users Alliance, *Unclogging America's Arteries: Prescriptions for*

*Healthier Highways*, 1999.

127 Calculated from Texas Transportation Institute 1997 data.

128 Smart growth policies are not recommended because they exacerbate traffic congestion and air pollution (above).

129 Los Angeles has long had the highest level of road congestion in the U.S. and, as such, may be viewed as something of a predictor as to what future surface travel conditions in other areas that do not manage intracity travel may become. From 1967 to 1995, seven surveys at various time intervals found that the average home-to-work commuting time went up one minute, from 24 minutes in 1967 to 25 minutes in 1995. The total range was very tight, from a low of 22.8 minutes (1985) to a high of 26 minutes (1990, although another survey the same year reported 23.8). Source: Gordon/Richardson, *The Facts About "Gridlock" in Southern California*," updated by Thomas A. Rubin, *Environmental Justice and Transportation Decisions – the Los Angeles Experience*, 2000. (There is actually some evidence that average home-to-work commute times have remained relatively constant at approximately 25 minutes all the way back to Roman times because individual travelers tend to change their travel patterns when travel conditions exceed their levels of tolerance.)

130 The current electricity crisis in California is a direct result of poorly conceived and executed changes in government regulation and intervention in the market.

131 Urbanized areas with more than 1,000,000 population in 1990.

132 Calculated from the U.S. Department of Agriculture National Resources Inventory for 1997 and previous years (1997 is the latest available year). Data is from the corrected figures issued in January 2001.

133 Calculated from U.S. Census Bureau and U.S. Department of Agriculture data.

134 International comparisons are based upon data from Jeffrey Kenworthy and Felix Laube, *An International Sourcebook of Automobile Dependence in Cities: 1960-1990*, University Press of Colorado, 2000.

135 A notable exception is Atlanta, one of the nation's lowest density urban areas. Atlanta has failed to develop a suburban arterial or thoroughfare system, with much traffic forced to operate on formerly rural two lane roads without shoulders, turn lanes or spaces for transit buses and school buses to stop along the road. Atlanta has some of the nation's worst traffic congestion, but its overall traffic intensity (vehicle miles per square mile) is only average. Atlanta's traffic congestion is largely a result of its failure to build sufficient suburban arterial (non-freeway) roadway.

136 Another reason for caution with respect to implementing smart growth policies is the impact on housing affordability. By rationing the land available for development and limiting competition between builders, smart growth tends to reduce housing affordability. For example, from 1991 to 2000, housing affordability (measured in terms of the percentage of houses that can be afforded by the median income household) dropped more than 50 percent in Portland. This is more than twice as much as the decline in any other major metropolitan area. Over the same period, housing affordability improved in most metropolitan areas (Internet: www.i2i.org/SuptDocs/Enviro/Housing/Affordability.htm).

137 While there are legitimate concerns about air pollution in U.S. urban areas, significant progress has been made in recent decades. From 1970 to 1997, Carbon Monoxide (CO) emissions dropped 43 percent, Volatile Organic Compound (VOC) emissions fell 60 percent and Nitrous Oxide (NOx) emissions were reduced five percent. At the same time, total vehicle miles traveled increased more than 130 percent (Figure ). Even in Los Angeles, which has had the worst air pollution in the nation, significant progress has been made, with a nearly 70 percent decline in annual days that federal ozone standards were violated from 1976 to 1998. This is despite a more than 75 percent increase in traffic volumes.

138 "Transit Oriented Development (TOD): Vision and Reality," *Innovation Briefs*, May-June 1999.