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16. Abstract

While transportation impacts are often masked by heavy growth in corridor traffic and latent travel demand, modeling enables measuring the real transportation impacts of rail projects. Rail transit is both safe and environmentally friendly. Rail systems expand mobility and reduce household investment in transportation. However, as regions implement rail systems, they must take care to consider the full range of rider impacts so that environmental justice issues do not emerge.

The largest body of research relates to the economic impact of rail. These impacts are strongest in station areas, as access to rail increases property value on nearby property. The positive impact of rail on property values does not hold true for property directly adjacent to the rail line however.

State Departments of Transportation have played a variety of roles in rail development, ranging from funding initial planning and operating services. TxDOT has authority to participate in rail development but no funding has been appropriated by the legislature. TxDOT could more actively participate in commuter rail projects if the agency was afforded greater flexibility in application of funds and the right to own rolling stock.

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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SECTION 1: INTRODUCTION AND BACKGROUND

The purpose of this report is to document the research and findings for the work accomplished on Research Management Committee (RMC) Project 0-5652: Transportation, Social and Economic Impacts of Light and Commuter Rail in Metropolitan Areas.

RMC Project 0-5652 contained two key elements. The first element involved identifying, through research, the transportation, social, and economic impacts of light and commuter rail. The purpose of this element was to document measures and methodologies that have been employed in assessing light and commuter rail impacts.

The second element involved identifying potential TxDOT roles in planning, developing, funding, and operating these rail systems. For this second task, researchers tied measured impacts identified in the first element of the study to the strategic goals of TxDOT, demonstrating the degree to which rail development might assist TxDOT in reaching those goals. Researchers then identified a range of roles that departments of transportation (DOTs) play nationally in light and commuter rail development.

BACKGROUND

The Texas population is projected to continue growing at a rate faster than the United States' average growth rate. Indeed, per U.S. Census data, in every decennial U.S. census since the Civil War, the population growth rate in Texas has exceeded that of the United States. The U.S. Bureau of Census estimated the population of Texas as approximately 22,860,000 in 2005, making it the second most populous state (behind California). By 2040, that population is projected to grow to 51,700,000.

TxDOT is challenged with meeting the mobility needs of this growing population. This will require maximizing the mobility benefit for every dollar the state invests in transportation infrastructure. TxDOT has historically been at the forefront of innovative approaches to enhance the productivity of their transportation system. They pioneered the creation of High Occupancy Vehicle lanes in freeway corridors to increase those corridors' person-carrying capacity. TxDOT also championed one of the nation's earliest integrated traffic management centers in Houston, enabling quick and holistic response to freeway incidents that throttle roadway capacity.

The purpose of this research is to provide information regarding another approach to moving people efficiently—rail transit. Specifically, this study will examine the variety of impacts of light rail and commuter rail projects. Further, the research team will document the role(s) that other states have played in the planning, designing, developing, and operating light rail and heavy rail. The research will examine current TxDOT policies associated with their participation in such projects. Finally, the research effort will link potential impacts to TxDOT agency goals and identify any legislative or administrative changes that would be needed in order to permit TxDOT to participate in rail projects.

LIGHT AND COMMUTER RAIL

Rail transit projects are typically classified into one of three broad categories—heavy rail, light rail, and commuter rail. While heavy rail is not included in the subject of this research, it is useful to understand the differences between these three categories of rail.

Heavy Rail

Heavy rail has been developed in a limited number of U.S. cities. Heavy rail is characterized by the so-called third rail that provides power to the vehicles. Because the power is being delivered at the same grade as the rail, heavy rail systems operate in their own separated, exclusive rights of way. Heavy rail systems typically feature significant subway sections. Examples of heavy rail systems in the U.S. include the New York City subway system; and the rail systems in Washington D.C., Atlanta (MARTA), and San Francisco Bay Area (BART) (Figure 1).

Figure 1. Bay Area Rapid Transit (BART).

Light Rail

Light Rail (LRT) evolved as a term in the 1970s as transit systems sought to achieve some of the benefits of a rapid transit system, such as heavy rail, but at a lower cost. Light rail typically receives its power from an overhead wire. This makes it possible to operate light rail at street level and without exclusive rights of way (although light rail vehicles can operate in subways as well). The term "light" refers to the relatively lighter passenger loads that these systems can accommodate compared to heavy rail and not to the relative weight of the vehicles themselves.

The Dallas Area Rapid Transit (DART) and Metropolitan Transit Authority of Harris County (Houston METRO) urban rail systems are light rail systems (Figure 2). These systems operate much like traditional bus service in major activity centers, with stops located every few blocks. Outside of these centers, the LRT systems operate with more limited stops than local bus routes, providing faster overall travel times.

Figure 2. Houston METRORail, Houston, Texas.

Commuter Rail

Commuter rail typically operates in an existing freight rail right of way and carries commuters from suburban locations to city centers. Because they often share their right of way with freight trains, commuter rail services usually offer less frequent service than LRT systems, but their vehicle consists (group of vehicles operated under a single driver) have higher capacity. The Trinity Railway Express (TRE), operating between Fort Worth and Dallas, is the only commuter rail line currently operated in Texas (Figure 3).

Figure 3. Trinity Railway Express, Dallas-Fort Worth Metropolitan Region.

Table 1 compares salient aspects of light, commuter, and heavy rail. Although light and commuter rail varies considerably, they have about the same typical number of average weekday passenger volumes. Heavy rail, operating in its own right of way, can run long consists at high frequency, supporting much higher ridership levels. Commuter rail often integrates with light rail to permit distribution of passengers within the urban area.

Table 1. Characteristics of Light Rail and Commuter Rail (*1*).

	Light Rail	Commuter Rail	Heavy Rail
Type of Right of Way	Non-exclusive fixed rail	Exclusive fixed rail, may share with freight rail	Exclusive fixed guideway
Motive Power	Electric, often trolley	Diesel or electric	Electric
Network	Local	Regional or local	Local
Typical Distance between Stops	0.25 to 1 mile	Several miles	1 mile
Minimum Peak Scheduled Headway	2 to 15 minutes (average 6.2 minutes)	30 minutes	2 to 8 minutes (average 4.5 minutes)
Average Operating Speed	8 to 35 miles per hour (average 20 mph)	30 to 50 miles per hour	20 mph
Average Fare	$0.68	$2.00 to $4.00	$1.00
Average Weekday Passenger Volumes	62,900	62,700	728,800

SECTION 2: LIGHT AND COMMUTER RAIL IMPACTS

This section of the report contains a summary of research on the transportation, social, and economic impacts of light and commuter rail. Section 2 also includes information on how these analyses were conducted and how agencies that fund rail projects assess the merits of proposals.

FEDERAL TRANSIT AUTHORITY (FTA) AND RAIL IMPACTS

The Federal Transit Authority (FTA) is a major funding source for U.S. passenger rail projects. In order to receive FTA funding, local agencies must follow procedures established by the FTA for grant funding. Funding is provided under Section 5309 – Major Capital Investments (New Starts and Small Starts). The Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) authorization of 2005 modified some of the parameters for justifying rail projects as well as creating a category for projects with federal funding requests of less than $75 million and net project costs of under $250 million, called Small Starts. Small Starts are to have a more streamlined grants process than New Starts.

New Starts/Small Starts

Acquiring New Starts funding is a highly competitive process with many cities entering the set of prospective grantees over the last decade. Therefore, FTA must rate proposals; the agency has established a set of criteria under which they will score and rank proposals. These criteria reflect the impacts that the federal government believes merit investment in major rail infrastructure and include the following:

- mobility improvement;
- environmental benefits;
- cost effectiveness;
- operating efficiencies;
- transit-supportive existing land use, policies, and future patterns; and
- other factors.

In July 2007, FTA issued guidance on the criteria that would be used in evaluating FY09 proposals. The specific measures enumerated are as follows (*2*):

- **Cost Effectiveness.** FTA measures cost effectiveness using the new indicator of cost per hour of user benefit. Costs include annualized capital and operating costs, and user benefit is usually a result of travel time savings. This new indicator replaces the prior measure of incremental cost per new rider and recognizes that rail projects may benefit existing riders as well as new riders. FTA also feels that operational efficiencies are reflected in this indicator and therefore do not measure operational efficiencies separately.

FTA ranks proposals' cost effectiveness according to the following scale (2007 levels; updated annually):

- High $11.99 and under
- Medium-high $12.00 - $15.49
- Medium $15.50 - $23.99
- Medium-low $24.00 - $29.99
- Low $30.00 and over

- **Transit-Supportive Existing Land Use, Policies, and Future Patterns.** FTA measures the degree to which current land use, policies, and future patterns are supportive of a major transit investment within a corridor. This evaluation is somewhat qualitative, with scores of 1 through 5 assigned in each of the following areas:

    - Degree to which existing land use and pedestrian environment support rail project;
    - Presence of growth management/land conservation policies supporting density appropriate to rail;
    - Plans/policies in rail corridor are supportive, including pedestrian planning and land use plans;
    - Zoning is supportive of rail investment;
    - Tools are in place or being developed to support public-private partnerships in station area development;
    - Transit-supportive development is occurring in the corridor; and
    - Available property and supportive policies exist to permit development in the station areas.

The factors leading to a specific ranking vary based upon the stage of the rail project development. All scores are averaged to determine the ranking, from High to Low, in this category. Note that transit operators and FTA have been in dialogue regarding the selection of land use as an evaluation criterion. Land use decisions are typically outside the scope of transit agencies.

- **Mobility Improvements.** FTA uses four distinct factors to measure mobility improvements that a rail project is expected to generate.

    - **User Benefits per Passenger-Mile.** Travel time savings are divided by a normalizing factor, passenger-miles, representing the intensity of the system use.
    - **Number of Transit Dependent Individuals Using the Project.**
    - **Transit Dependent User Benefit per Passenger-Mile.** These two measures evaluate the degree to which the proposed project will benefit the transit dependent portion of the market. Each is determined and FTA assigns a single combined score for the two measures.

- **Share of User Benefits Received by Transit Dependents Compared to Share of Transit Dependents in the Region.** This factor measures the equity of distribution of user benefits over the transit dependent market.

This final factor is averaged with the single score generated by combining the two previous factors, resulting in a single ranking associated with transit dependency. This ranking, in turn, is averaged with the ranking for user benefit per passenger-mile to arrive at the final score for mobility improvement:

Final Score = 0.5[User Benefit/Pssgr.-Mile] + 0.5[0.5({No. transit dependent users+ Transit dependent benefit/Pssgr.-Mile}/2) + 0.5(Share of benefit by transit dependent compare to share of transit dependent in region).

- **Environmental Benefits.** This scoring does not reflect necessarily the degree to which the specific project will improve air quality. Instead, projects in non-attainment areas are rated High and all others are rated Medium.

- **Other Factors.** FTA will consider other aspects of the project, with particular interest in how the project will support economic development.

With SAFETEA-LU, FTA introduced a separate tier for funding of smaller fixed guideway projects called Small Starts. In order to qualify under Small Starts, the total capital cost of the project must be less than $250 million, and the Section 9 funding request must be less than $75 million. The FTA issues interim guidelines for the evaluation of Small Starts project while going through the final rulemaking process. FTA recommended funding in 2008 for four Bus Rapid Transit projects under Small Starts.

FTA also introduced a Very Small Starts program that would be funded through the Small Starts funding allocation. Very Small Starts projects must have a total capital cost of under $50 million with a maximum fixed guideway cost per mile of $3 million (excluding rolling stock). Very Small Starts do not go through the Alternative Analysis process that is required as New Starts and Small Starts. In summary, the FTA New Starts evaluation criteria focus on the transportation, social, and economic impacts as illustrated in Table 2.

Table 2. Rail Impacts Reflected in FTA New Starts Evaluation Criteria.

Impact Category	Impact	Measure
Transportation	Cost Effectiveness	Cost per hour of user benefit
Transportation	Travel Time Savings	User benefits per passenger mile
Social	Meet Needs of Transit Dependent	Number of transit dependent individuals using project
Social	Meet Needs of Transit Dependent	Transit dependent benefit per passenger mile
Social	Equity	Share of user benefits received by transit dependents compared to share of transit dependents in the region
Social	Environmental	Non-attainment status of region
Developmental	Supportive Land Use	Existing land use and pedestrian environment
Developmental	Supportive Land Use	Supportive development is occurring in corridor
Developmental	Supportive Policies	Presence of growth management/land conservation plan
Developmental	Supportive Policies	Presence of supportive land use plan
Developmental	Supportive Policies	Presence of supportive zoning
Developmental	Supportive Policies	Tools in place to support public-private partnerships in station area development

These criteria can be succinctly summarized as follows:

- Rail project should save passengers time—both existing and new passengers;
- Rail project should serve transit dependent as well as non-transit dependent markets; and
- Rail project should be located in corridors with supportive existing and proposed land uses, zoning, and development opportunities.

Note that the transportation benefits are tied to the rail system users' experience. There is no consideration of the transportation impacts on non-users such as decreased delay to motorists in the corridor.

Before and After Studies

With the enactment of the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), FTA codified the requirement that all recipients of full funding grant agreements prepare Before and After studies on their projects (*3*). Rail project funding is typically secured through full funding grant agreements. The plan for the study is to be developed during the final design of the project and must be approved by FTA. The study plan must include data collection and data analysis sections.

At a minimum, the study must include the expected costs and impacts of the project on the transit network's service levels, capital costs, operating costs, and ridership. These elements should be measured two years after opening of the new fixed guideway project; the results should be compared to the expected values, and differences should be explored. FTA is required to report the results of Before and After studies each year to Congress prior to the first Monday of August.

The Before and After studies have two purposes:

- to "…expand insights into the costs and impacts of major transit investments;" and
- to "improve the technical methods and procedures used in planning and development of those investments."

The requirement became effective and part of grant agreements from April 20, 2001. There have been relatively few projects with full funding grant agreements that were signed after April 20, 2001, were completed, placed in operation, and operated two years. In fact, FTA noted that their September 2007 report to Congress was the first time they shared information from a completed Before and After study (*4*).

That study pertained to the Utah Transit Authority's (UTA) Medical Center extension to their TRAX light rail system. The full funding grant agreement, which was signed in May 2002, contained the requirement for a Before and After study. The state of that study reflects several key challenges. It was the first agreement to contain that provision and the FTA had not yet fully established the program. UTA had not previously archived all the information required to conduct a complete Before and After study to current FTA standards but reportedly spent considerable time and effort to re-assemble as much data as possible. Further, the Medical Center Extension was planned as part of a new east-west line. Therefore the costs, service design, and ridership estimates developed during planning did not reflect the final project and required considerable allocation of planned project data to arrive at estimates for the single extension.

As a result, the UTA Before and After study did not provide supportable analytical conclusions. However, it did make clear the need for FTA to provide more specific guidance. FTA subsequently issued guidance on preservation of data for Before and After studies.

Dallas Area Rapid Transit completed a detailed Before and After study on their North Central (NC) Corridor. This study reflects an expansion on the FTA concept, looking beyond the specific areas of concern that FTA noted in their requirement. Note that DART entered into a full funding grant agreement in 1999, prior to the time when Before and After studies became a mandated part of such agreements.

The DART report provides very detailed descriptions of the differences between the original plans and the constructed project. These changes highly influenced the variance between planned and realized costs, service level, and ridership. Per the report, changes in the number of vehicles and increases in the number of stations, extent of service, and amount of double tracking combined to create the large difference between planned capital costs and actual capital costs. Similarly, the larger extent of the NC line as compared to the original planned extent led to higher annual operating and maintenance costs.

Ridership by station in 2004 was comparable to 2010 ridership projections. Some stations are already exceeding 2010 projection levels. Stations that appear to be significantly underperforming projections are currently being impacted by construction in those station areas.

Overall bus and rail ridership increased 30 percent within the corridor. However, the report does not make it clear whether that increase is based upon increased linked or unlinked trips. Unlinked trips or boardings will often increase when transit systems feed bus routes to rail lines, requiring two boardings to complete a trip that could be completed with only one boarding pre-rail.

Mobility impacts were misestimated with average daily traffic (ADT) along the North Central Expressway traffic volumes exceeding 2010 projected volumes in 2004. In fact, the ADT on North Central Expressway at Park Boulevard in 2004 was nearly 50 percent more than the estimated 2010 volumes at that location. This increased traffic is linked to high growth rates in population and employment.

DART added an evaluation of the change in the demographics of DART riders between 1998 and 2005. The expansion of rail into suburban areas resulted in the following changes to the demographics of rail riders in 2005 compared to rail riders in 1998:

- The percentage of "choice" riders increased from 60 percent to 85 percent.
- The percentage of rail riders with college degrees increased from 22 percent to 33 percent, and those with post-graduate degrees increased from 8 percent to 17 percent.
- The percentage of riders with annual incomes of less than $15,000 decreased from 39 percent to 17 percent, while the percentage of riders with incomes of $50,000 or more increased from 23 percent to 41 percent.

Comparing the demographics of 2004 rail riders to bus riders reveals the following:

- Choice riders comprise 82 percent of rail riders and 59 percent of bus riders.
- Twenty-one percent of rail riders have a high school education or less compared to 41 percent of bus riders; while 50 percent of rail riders have a college diploma or more compared to 29 percent of bus riders.
- Riders with an average annual income of less than $15,000 comprise 17 percent of rail riders and 39 percent of bus riders.

The DART report suggests the following findings regarding impacts of rail:

- Transportation: increase in transit ridership of 30 percent in corridor.
- Transportation: rail did not reduce freeway congestion in the primary corridor.
- Transportation: lack of parking constrained ridership growth.
- Social: rail increased the percentage of choice riders having higher income and educational levels than those who road rail initially, and higher income and educational levels than those who ride DART buses.

- Economic: rail was the "motivation" behind several new real estate developments.
- Economic: many factors influencing the success of the rail are outside the hands of the transit agency, including overall economic conditions and the type of development constructed near stations.

RAIL IMPACTS: TYPOLOGY AND GENERAL FINDINGS

As the major funding source for United States rail projects, the impacts identified by FTA as critical to supporting funding requests are important to and shared by transit systems across the nation. However, these systems must also generate local backing for the project. Systems often must achieve voter approval to either generate the local funds to match the federal grant funds or to approve issuance of certain debt instruments. As public bodies, transit systems depend upon the political support of elected officials, business leaders, and the community at large.

The research team conducted extensive literature review and contacted transit systems to identify the kinds of impacts that have been used to generate that public support. This section of the report contains the findings listed in general planning reports and documents. The following section of the report contains findings listed in specific project reports.

Impact Typologies

Economists argue that all benefits are ultimately economic, at least in that all benefits are measurable in economic terms. Certainly the paradigm of benefit/cost analyses requires that all benefits and all costs ultimately be dollarized. While this aspect of the benefit/cost process is sometimes regarded as its Achilles heel, it also provides a sound starting place for evaluation of an investment.

In "Measuring Economic Value of Transit," economist Dr. David Lewis of HLB Decision Economics Inc. (now part of HDR) posited that the economic value of transit investments were derived in three categories of benefits *(5)*:

- **Congestion Management:** Increased use of transit generates economic benefit through reduced congestion, more reliable travel times, decreased cost of accidents, and decreased emission damages.
- **Affordable Mobility:** Increased use of transit by low income individuals freed up money in their budget for other uses.
- **Land Use:** Transit facilities can lead to improved property value and a higher quality of life.

The typology incorporated into the title of this research project in fact directly links to the Lewis typology. Congestion management benefits are transportation benefits; affordable mobility benefits are social benefits, and land use benefits are economic benefits.

Dr. Lewis conducted an analysis of a proposed light rail line in Cincinnati, Ohio. Based upon that analysis, he found that the economic value of that rail proposal was split by benefit category as follows:

- Congestion Management: 63 percent
- Affordable Mobility: 18 percent
- Land Use: 19 percent

Todd Litman of the Victoria Transport Policy Institute enumerated the benefits of rail investment in "Rail Transit in America: A Comprehensive Evaluation of Benefits" (*6*). Litman did not create a typology but listed benefits with supporting documentation. The benefits identified in Litman's report were the following.

Increased Transit Ridership and Decreased Automobile Traffic

Rail attracts a larger percentage of choice riders than bus; therefore, it is effective in reducing automobile traffic. Supporting documentation includes:

- Incremental increases in rail service results in about eight times more shift to transit for commute purposes than the same incremental increase in bus service.
- Transit mode share losses between 1970 and 2000 were 20 percent to 23 percent in rail cities compared to 60 percent in bus-only cities.
- Transit engenders land use changes, particularly transit-oriented development (TOD). Research indicates that transit use increased in 103 TODs between 1970 and 2000. Further, households in TODs have lower per capita automobile ownership and lower annual vehicle miles traveled in their vehicles than the average household in their region.

Congestion Impacts

Cities with significant rail systems have a slower rate of per capita congestion growth than cities with small rail or no rail. Traffic volume and congestion are non-linear. On highways, traffic can maintain high speeds over a broad range of traffic densities. However, when densities reach and exceed design levels, speeds drop suddenly. Therefore, it is possible for relatively small reductions in traffic volumes to generate large improvements in speed. Supporting arguments include the following *(6)*:

- Increases in rail mileage reduce congestion costs while increases in bus mileage increase congestion costs based upon regression analyses conducted by The Brookings Institute.
- When major rail systems fail, the congestion level on highways and arterials increases. By inference, that incremental increase reflects the congestion reduction impact of the transit system.

Cost Effectiveness

Litman *(6)* argues that most analyses comparing rail, bus, and automobile costs are biased in favor of auto travel because many costs associated with auto travel are ignored or are not borne by the government, while transit costs are usually very clearly enumerated in agency financial documents.

Road and Parking Cost Savings

These are a sub-set of the benefits associated with reducing traffic congestion and automobile ownership. There is no objective support for this savings category, although Litman does estimate cost savings in large rail and small rail cities by converting rail passenger-miles into equivalent avoided roadway and parking costs.

Consumer Financial Impacts

Persons in rail cities spend less annually on transportation than persons in cities with bus-only transit. The Bureau of Labor Statistics reported in 2003 that residents of large rail cities incurred annual per-capita transportation expenses of $2803 (excluding New York City) compared to about $3350 in small rail and bus-only cities. Residents of the large rail cities also enjoyed a 7 percent higher average annual income and have longer commutes, which would typically increase the total cost of transportation. Thus, the investment in rail results in a lower portion of household income going to transportation.

Safety Impacts

Accidents result in property damage, medical, and legal costs. Litman used FTA accident data and plotted traffic fatality rates against annual per capita transit passenger-miles. The graph (Figure 4) indicates that as annual per capita transit passenger-miles increase, fatality rates decrease. Further, the cities with the highest per capita transit passenger-miles were large rail cities. Large rail cities enjoy a lower crash fatality rate than other cities. This relationship also exists among a dataset including European, Canadian, and Australian transit systems.

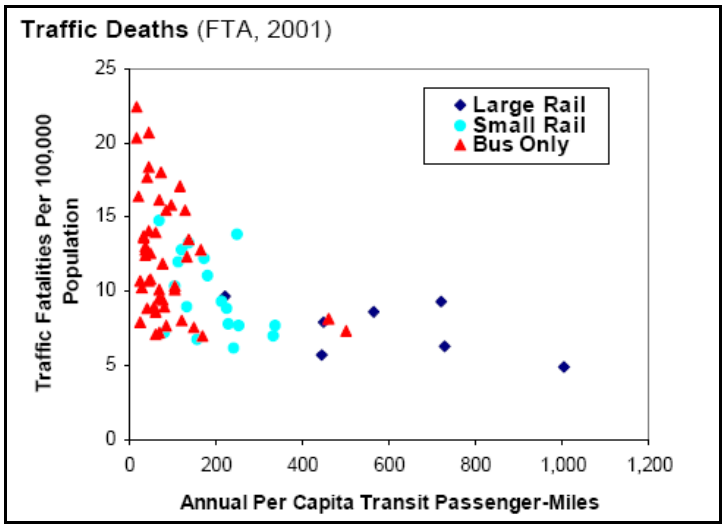

Figure 4. Traffic Fatality Rates versus Transit Utilization.

Energy and Emission Reductions

Rail transit achieves energy use reductions and lowers emissions in two ways. First, rail transit consumes less energy (in British Thermal Units of BTU) per passenger-mile than bus or automobile traffic (Figure 5). Electrically powered trains have extremely low emissions compared to diesel or gasoline vehicles. Second, since rail transit reduces congestion, it leverages even further reduction in fuel use and emissions associated with non-rail travel.

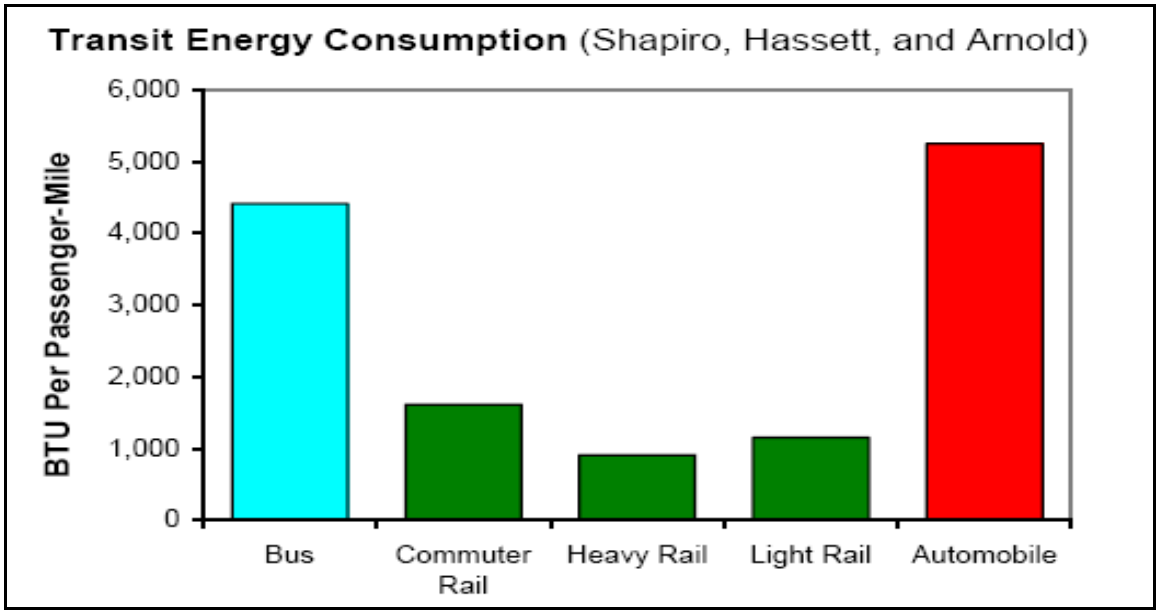

Figure 5. Energy Consumption by Mode.

Economic Benefits

Many of the economic benefits listed in the Litman report are redundant, tying back to benefits already documented (i.e., roadway and parking savings). New benefit areas include the following:

- **Increased property values:** Rail generally results in an increase in property values around station areas.
- **Community redevelopment:** Rail serves as a catalyst to renewal of communities in proximity to rail since the increased accessibility of those areas makes them more attractive.

Other Benefits

Litman includes a list of ancillary benefits that rail can achieve, including the following:

- Improving accessibility for non-drivers;
- Avoiding the need to be chauffeured;
- Providing people an option that they might not currently need but may need in the future;
- Creating a more livable community; and

- Improving public health due to the need to walk or cycle to connect to transit.

Litman's list of benefits can fit into the typology suggested by Lewis and enrich it. Table 3 arrays the benefits enumerated by Litman against the study typology.

Table 3. Benefit Typology.

Benefit	Typology
Increased transit ridership and decreased automobile traffic	Transportation
Congestion impacts	Transportation
Cost effectiveness	Transportation
Road and parking cost savings	Transportation
Consumer financial impacts	Social
Safety impacts	Transportation
Energy and emission reductions	Transportation
Increased property values	Economic
Community redevelopment	Economic
Improving accessibility for non-drivers	Social
Avoiding the need to be chauffeured	Social
Providing people an option that they might not currently need but may need in the future	Social
Creating a more livable community	Economic
Improving public health	Economic

In summary, general research on rail impact has identified a range of possible transportation, social, and economic impacts. These impacts are summarized as follows:

- **Transportation:** Rail encourages increased transit usage and is more attractive to choice riders than bus service. Increased transit utilization may lead to reduced traffic congestion, reduced air pollution, reduced fuel use, and improved traffic safety.
- **Social:** Rail provides an economical alternative, allowing people to reduce the percentage of their household budget required for transportation. Further, those who are unable physically and fiscally to use a car have convenient transportation.
- **Economic:** Rail projects have led to increased property value.

RAIL IMPACTS: PROJECT PLANS AND REPORTS

The planning requirements associated with receiving federal funding for a rail project establish a list of impacts that must be estimated for any rail project that depends upon federal funding. Although the FTA can pay up to 80 percent of capital costs, competition for scarce federal dollars has resulted in local entities providing an "overmatch" in order to increase their project's competitive position. An overmatch means that the project will incorporate more than the 20 percent local share for their rail project; a de facto standard has been 50 percent local funding with 50 percent federal funding.

Attaining and retaining public support is therefore an increasingly important part of rail implementation and funding. Local entities, including transit agencies, regional planning agencies, and departments of transportation have prepared planning documents and post-implementation evaluations that contain project impact analyses. Appendix A contains a

matrix of impacts associated with both individual project plans and with general planning documents that have been discussed above.

As noted, general transportation impacts have been difficult to isolate in the face of rapid population and employment growth in communities building rail. The FTA, in fact, does not use congestion reduction as a measure to evaluate rail candidate projects, but rather isolates the benefits to transit users. While there have been global analyses such as the Litman study discussed above, individual project reports do not tend to look at regional mobility impacts as an evaluative criterion. Research is focused on how well the rail attracts new riders and increases mode share.

Social impacts are given even less attention than transportation impacts in the research. However, ignoring social impacts may prove dangerous. In 1994, the Los Angeles Metropolitan Transportation Authority (LAMTA) was sued for discriminatory application of federal funds. LAMTA opened its first rail line, the Long Beach Blue Line in 1990. In order to increase ridership on the Blue Line, LAMTA began eliminating bus routes along parallel corridors and forcing former local riders onto the rail. A proposal to increase fares and eliminate monthly passes that were heavily utilized by local bus riders was the catalyst to filing of the suit.

The Bus Riders Union formed in 1992 to fight a two-tier transit system. The 1994 suit filed by the National Association for the Advancement of Colored People claimed the following:

- The LAMTA was spending 70 percent of its operating subsidy dollars on rail, which was serving only 6 percent of its riders.
- Bus riders were comprised of ethnic minority population (81 percent of riders were Black, Hispanic, or Asian) and poor people (60 percent having incomes below $15,000 annually).
- Over the previous ten years, LAMTA reduced their peak bus requirement from 2200 to 1750 and now subsidize rail users eighteen times more than bus riders (*6*).

A federal district court found that the LAMTA had indeed been inequitable in its use of federal funds. In a consent decree in 1996, LAMTA was directed to invest a total of $1 billion over 10 years to enhance the bus system (*7*). These enhancements have included development of Bus Rapid Transit (BRT) lines. The BRT project combines infrastructure, routing, and traffic operations improvements in corridors to create a bus line that operates similarly to a light rail line.

This lawsuit was the first time Title VI of the Civil Rights Act of 1964 was used to change a transit operator's operating and capital planning and implementation processes. As a result of the lawsuit, the Southern California Association of Governments developed a detailed methodology for evaluation of transportation equity in future plans.

Economic and Developmental Impacts

The largest body of research on project-specific rail impacts is associated with economic and developmental impacts. There are two basic approaches to the majority of these analyses—hedonic modeling and matched pair comparison. While being capable of producing similar results, these two methods use substantially different research approaches.

Residential and commercial properties are heterogeneous in nature having many physical characteristics, such as lot size, size of improvements, number of bathrooms, parking/garage features, proximity to transit rail services, and other factors. In addition, there are psychometric attributes such as crime rates, architectural features, and particular neighborhoods that also contribute to the market value of real estate. Hedonic modeling estimates the relative average impact any attribute contributes to property valuations while *statistically* holding all other variables constant using one of several mathematical forms of a multivariate regression equation. Hedonic modeling is very data intensive, meaning that it requires very large data sets, with each variable being accurately measured. In addition, failure to include even one or two meaningful characteristics in the model can potentially bias the results of the analysis. However, when executed properly hedonic modeling offers a lot of information about the relative contribution of property characteristics on the value of real property.

Matched pair comparison also controls for the heterogeneous nature of real property valuations, but uses a *research methods* approach for isolating the contribution of a particular characteristic, such as proximity to a transit rail station. In this approach, the study sample or census of properties is divided into paired groups with each pair sharing similar market characteristics with the exception of the presence of a nearby transit rail station. It is assumed that the similar market characteristics balance each other out leaving the presence of rail transit to explain average valuation differentials between the control group (matched pair) and the experimental group (properties close to a transit rail station). The method requires careful matching for the control-group properties but does not require gathering data specifically defining the value of each characteristic for every individual property in the study area. In practice, while the matched pair comparison approach does not allow the analyst to explicitly compare the impact of rail transit versus a particular other attribute, such as lot size, it does produce similar overall results to hedonic modeling while being less vulnerable to measurement error and bias from leaving important characteristics out of the model.

The University of North Texas conducted assessments of the impact of DART's rail system on property values. One assessment used the hedonic modeling technique and the other used the matched pair technique. In addition, an analysis of transit-oriented development (TOD) used a more traditional research methodology. A brief description of each follows.

DART Rail Case Study: Hedonic Modeling

In determining the economic impact light rail has on surrounding real estate, the statistical tool of a hedonic model is very useful as it allows for the separation and

analysis of specific attributes associated with real estate properties. With this specificity, a hedonic model can be designed to estimate the impact location relative to light rail (and transit stations) has on property value.

In 2007, the hedonic price approach was taken to evaluate the impact the DART light rail system had on real estate values in Dallas County (*8*). Twenty-three station areas and 18,164 properties within 3,000 feet from their respective transit stations were included in the study area. Properties included in the study area were limited to single-family residences (SFR) and multi-family residences (MFR). Multi-family residences were limited to duplexes or condominiums; no rental properties (apartment buildings) were examined. A handful of stations in Dallas' Central Business District (CBD) and ones in Collin County were not included. In the case of the CBD, too many other factors outside of transit development were found to have influenced property values, while in Collin County, properties were subject to different accounting procedures in terms of assessments. Once the study area was established, property valuations were assessed via the Dallas County Central Appraisal District and distances from the rail line and transit stations were established for each property through spatial analysis afforded by GIS software.

The next step in analysis looked at the study area in terms of Dallas County's large geographic footprint. On closer examination, the study area could be broken into four corridors, each with differing housing composition and a portion of either the Red or Blue DART Rail lines: North Central Corridor (NC-Red), Northeast Corridor (NE-Blue), Southwest Corridor (SW-Red), and South Central Corridor (SC-Blue). The northern corridors were distinguished by many station areas and comparatively lower numbers of residential dwellings. Land use patterns were dominated by commercial and industrial concerns. In contrast, the southern corridors have fewer stations, but are predominantly residential in nature and occupy a smaller geographic area than the northern corridors.

Size, value, and quality of housing also vary between the northern and southern corridors. Homes in the northern corridors are generally larger, valued higher in terms of $\$/ft^2$, and have higher CDU (condition, desirability, and utility) appraisal ratings than ones in the southern corridors. Additionally, along with housing variations, the income levels of a corridor's population were analyzed. It was found that income levels mirrored the distinct housing variations between the northern and southern corridors with southern corridors consisting of a lower income population in comparison.

After analyzing the study area and constructing hedonic models to address each variable's impact on housing value, a complete picture of how the DART light rail system affected housing values was developed. Looking first at proximity to rail line, there was a consistent negative impact on all properties. The gradient range was a loss of $50 to $104 in property value for every 30 feet closer to the rail line. MFR housing withstood the greatest financial impact, while SFR property values fared slightly better.

The opposite was found to be the case when considering transit stations. The gradient range was a gain of $31 to $77 in property value for every 30 feet closer to a transit

station. The disparity between MFR and SFR housing was not as pronounced in this model.

When further analysis was completed, slight variations within the four corridors were discovered. Across the board, property values in the northern corridor (where there is a dominance of MFR housing) increased the closer to a transit station; this was not uniformly true in the lower income, southern corridors where subtle variations were encountered. However, when controlling for three especially economically distressed station areas, it was found that the lower income SC-Blue Corridor actually had the highest appreciation rates in all four corridors.

The findings of this study are in line with similar research completed on other LRT systems across the country. It should be noted, though, that the gradients were weaker for DART than in other metropolitan areas. This may be due to the fact that the DFW area, while quickly adapting to rail transit, is still predominantly an auto-centric culture with access to extensive highway infrastructure.

DART Rail Case Study: Matched Pairs

When considering real estate valuations, a study was completed in 2002 to ascertain whether or not the DART light rail system affected real estate values near its transit station locations (*9*). To accomplish this, a matched pair comparison analysis was utilized. The first step was to determine the study area analysis. All properties within 0.25-mile radii around 23 stations outside of Dallas' Central Business District were selected. Those stations (and their corresponding radii) inside the CBD were not considered as the amount of tax increment financing in that area was thought to be potentially damaging to the statistical integrity of the analysis.

Once the study area was established, a corresponding control area, with 23 matching locations, was developed. For both the study and control areas, property values were obtained for each property via the Dallas County Appraisal District for the years 1997 and 2001. Median property valuations were assessed and the following was observed. Between 1997 and 2001, the medial value of residential properties in the light-rail study area increased 32.1 percent while properties in the control group only saw a 19.5 percent increase. For office properties, the study area increased 24.7 percent while the control group only rose by 11.5 percent. For industrial properties, only a negligible difference between the study and control groups was apparent. These findings are similar in nature to those from across the country that point to real estate valuations being higher when closer to a transit station.

DART Transit Oriented Development Impacts

Fiscal impacts resulting from light rail transit deal primarily with the resulting effects of transit-oriented development taking place primarily at transit stops. The DART light rail system has been leveraged successfully for TOD opportunities resulting in significant fiscal impacts on the jurisdictions surrounding many DART transit stations. In 2007, a study was completed to measure these impacts. A several step process was used with the

initial step consisting of data gathering. By using secondary sources such as newspapers, business and trade publications, websites, and personal communication with key informants, a matrix was constructed listing all projects that were either announced, under construction, or finished in conjunction with DART Rail TOD locations.

Accepting that the possibility existed for a project to be overlooked, the further step was taken of analyzing DART Rail TOD locations through visual means. By utilizing an online mapping tool provided by the Greater Dallas Chamber of Commerce, aerial photographs of DART Rail TOD locations from 1997 to 2005 were examined. Any structures that appeared in the 2005 photos that were not apparent in the 1997 photos were then noted, checked against the existing matrix of projects, and if not accounted for, were then subject to direct field observation in order to further detail the project.

Once all structures were accounted for and documented, the next step consisted of deciding which projects "would have happened anyway." This process examined each project for a direct tie to a DART Rail TOD location. In the case of a standalone, big box retail store such as Best Buy being built in proximity to a "kiss and ride" station, that project would be stricken from the matrix as not being a direct result of TOD. Conversely, a project like the W Hotel in the Victory Park development of downtown Dallas was assessed and found to have a partial link to the adjacent DART Rail TOD project. Discussion with a representative of the hotel found that the nearby transit station did aid in employee recruitment and retention, but had no impact on the guests or residents. In this instance, the value of the project was reduced to a third of what was published.

Once the matrix of TOD activity was completed with values assessed for each project (announced, in development, completed), the final step was to assess the taxable value of the properties. By using information provided by county appraisal districts, assessments were made for the amount of tax revenue that would be generated by taxes related to real property as well as business personal. In addition, consideration was given to the amount of sales tax that would be generated by the retail aspects of the projects considered. This methodology yielded the following results.

- The total value for all current and projected TOD projects near DART Rail stations is estimated at $4.9 billion.
- After considering projects that "may have happened anyway" and were not directly attributable to the presence of DART Rail, the figure was adjusted to $4.26 billion.
- After further adjusting for tax exemptions and the value of public buildings, $2.84 billion is the resulting tax base from which to make estimates.

Based on this figure, potential yearly property tax revenues include $6.6 million for Dallas and Collin counties and $16.8 million for DART member cities. Area school districts may gain over $46 million each year in new revenues. Community college districts in Dallas and Collin counties would benefit from $2.3 million per year, while Parkland Hospital may benefit from $6.7 million in new revenues yearly. When all retail components of the TOD projects were considered and analyzed using a standard fiscal

planning model, $660 million in annual taxable retail sales was projected. These sales will produce more than $48 million in sales tax revenue for local municipalities and the State of Texas. In total, more than $127 million yearly in state and local tax revenue will potentially be raised by DART Rail TOD projects.

As demonstrated, there are sizable economic impacts relating to the DART light rail system and the corresponding TOD projects it fosters. Both in terms of real estate valuations and fiscal concerns, DART Rail is a positive catalyst in Dallas and Collin counties. The speed at which these economic impacts have grown is telling of a broader picture. In 2005, a study considering the fiscal impacts of DART Rail TOD projects yielded announced and estimated values 50 percent lower than what the recent 2007 study found. Granted, some of the discrepancy may be due to research techniques, but such a large increase in values in just two years is more likely indicative of the fact that TOD projects in North Texas are being announced and started in an accelerated fashion. "Riding the rails" is more and more a part of the social fabric of North Texas and the built environment is following suit. Through qualitative research performed for a previous study, it was found that local governmental representatives are looking at TOD as a way to stimulate local growth, especially in aging, downtown core regions. It is important to keep this focus while the state continues to look at ways to facilitate efficient public transportation systems. As evidenced by this DART Rail case study, light rail needs to be considered not only as a key to long-term regional growth in Texas, but also as a way to financially benefit both local municipalities and the state via TOD projects.

Commuter Rail and Economic Impacts

In America, there are far more miles of commuter rail than light rail, yet most studies concerned with rail transit impacts on real estate valuation are concerned with the effects of light rail. Beginning in the early 1980s with a light rail system, the "Trolley," which now encompasses 47 miles of track, San Diego County developed successful versions of both modes of rail transportation. In 1996, the commuter rail line the "Coaster" began full-service operations with its 43-mile trip from the wealthy northern community of Oceanside to downtown San Diego. During its first year of operation, the Coaster transported 700,000 riders; by 2006, ridership increased to 1.5 million boardings. Even with the success of commuter and light rail in San Diego County, economic impact studies completed concerning the area have only looked at light rail. Not until 2003 was the commuter rail line analyzed for its economic impact on the region, the specific impact being effects of transit rail and stations on adjacent housing valuations (*10*).

As with many studies concerning transit and housing valuations, the hedonic price approach was taken, and several hedonic models were created. This statistical tool allows for the separation and analysis of specific attributes associated with real estate properties. With this specificity, a hedonic model can be designed to estimate the impact location to commuter rail (and stations) has on property value. The study area was limited to transit stations only and quarter to half mile radii around them. The creation of the radii was facilitated by utilizing GIS technology for spatial analysis.

Property information was culled from Metroscan, a proprietary database available from First American Real Estate Solutions. The database records information on all real-estate transactions recorded by county assessors on a monthly basis. Both residential and commercial properties were considered with single-family residences, multi-family residences, condominiums, and commercial properties all addressed in a separate manner statistically. The number of parcel records examined in the study area was 26,295. Along with price information, attributes considered included structure size, year built, accessibility to employment opportunities for residential properties, and accessibility to households for commercial properties.

Once the study area was fully defined and the hedonic price models developed, results for several different categories were compiled. For multi-family residences, which were predominantly apartment complexes, closer proximity to a Coaster station resulted in a negative effect on price. This negative association between location and price might exist due to commuter rail primarily serving professional workers who often own their own dwellings, leaving rental properties at a competitive disadvantage.

Condominiums help support this line of reasoning as higher premiums were associated with increasing proximity to a Coaster rail station. The average value-add was approximately $85,000. Similar results were found in terms of single-family housing. Properties within a half mile of Coaster stations gained in value significantly. On average, the value-add for a single-family residence was $78,000. Results regarding commercial properties were mixed. While proximity to a downtown Coaster station was positively reflected in commercial property premiums (91.1 percent), locations within a half-mile radius of non-downtown Coaster stations reflected a negative correlation with proximity to station. This disparity possibly exists due to the fact that the Coaster is providing transportation for a professional workforce commuting from an upscale community to downtown office buildings for work.

SUMMARY

Rail systems have resulted in documented transportation, social, and economic impacts. Transportation impacts are often masked by heavy growth in corridor traffic and latent travel demand. Modeling is an important tool that enables measuring the real transportation impacts of rail projects. Rail systems expand mobility and reduce household investment in transportation. However, as regions implement rail systems, they must take care to consider the full range of rider impacts so that environmental justice issues do not emerge.

The largest body of research relates to the economic impact of rail. These impacts are strongest in station areas, as access to rail increases property value on nearby property. The positive impact of rail on property values does not hold true for property directly adjacent to the rail line however.

SECTION 3: RAIL AND THE ROLE OF DEPARTMENTS OF TRANSPORTATION

The research team sought to identify the various strategies, roles, and organizations that state Departments of Transportation may engage in to support passenger rail. In particular, the team examined the participation of state DOTs in the support and development of light rail and commuter rail.

Light and commuter rail projects are typically developed within highly urbanized areas where population and employment densities can support high capacity transit services. Light rail projects initially develop in the urban core. The Metropolitan Planning Organization (MPO) and local transit authority therefore lead the associated planning and development activities. Construction and operation are governed by local municipal zoning and permitting requirements.

In these instances, the role of state DOTs in light rail is minimal (with the exception of states with statewide transit such as Delaware). If the light rail interfaces with state facilities, the state DOTs will have a design review/approval role as they would in any infrastructure project. State DOTs also have safety oversight responsibility for light rail projects.

As light rail systems mature, services extend out from the core base and reach into suburban areas. The characteristics of the light rail often change to reflect the change in development patterns and densities. For example, the distance between stations is usually longer in the suburban areas of a light rail line than in the core areas.

Commuter and intercity rail with suburban service has even greater spacing between stops. Commuter rail stations are also more likely to have park and ride lots at the stations because they act as collection points for areas even farther from the urban central business district. Further, commuter and intercity rail is designed to meet regional needs and typically serve multiple jurisdictions. Therefore, state DOTs are more likely to have an interest in these projects than in light rail projects.

RELEVANT STATE DOT ROLES

To identify relevant practices, the research team screened all of the states in continental North America with existing or planned light rail or commuter rail. There are 21 LRT systems in 16 states with an additional 10 light rail systems proposed. There are 20 commuter rail systems in 16 states, with an additional 17 commuter rail projects proposed.

The states where commuter and/or light rail systems are neither in existence or proposed were excluded from the comparisons. Although many of these states have intercity rail service with Amtrak, the service is often too dissimilar to commuter and light rail efforts related to this research project. A comparison on state DOT involvement in intercity rail was examined in TxDOT Research Project 0-4723 on state-supported intercity passenger

rail corridors *(23)*. This report offers valuable profiles of state DOT organization used in rail development.

Some states have what is commonly referred to as statewide transit. These are the northeastern states of Delaware, Maryland, and New Jersey. In Massachusetts, the Massachusetts Bay Transportation Authority (MBTA) is under the direction of a board chaired by the state's transportation secretary and approximates the same statewide transit model in many ways.

For states with statewide transit, the state DOT's role is unique in that the state DOT owns and operates the public transportation system within the state. In this type of governance, transit operation is one of the state DOT's core functions. In contrast, most state DOTs do not own or operate the local and/or regional public transportation systems. This transit role by a statewide DOT contrasts with the transit role of many other state DOTs (including Texas). Statewide transit can provide greater opportunities for a state DOT to coordinate, plan, and develop rail transit.

Other northeastern states such as New York and surrounding New England states did not offer relevant examples for DOT rail involvement based on their very dissimilar demographic characteristics and transportation system size differences to Texas. States where DOT involvement methods in commuter and light rail were more transferable to TxDOT occurred generally in the south, southwest, and western states.

The descriptions below represent a range of state DOT involvement in light rail transit, commuter rail, and intercity passenger rail. In most cases, an example state, region, or organization is provided within each general description.

State Operated Transit –Transit as a Core DOT Function

As mentioned above, statewide transit occurs in Delaware, Maryland, and New Jersey. Although this type of organizational structure is much different than the prevalence of urban and metropolitan transit agencies in Texas, the prominence of transit within a state DOT provides for more integrated transit planning in the overall statewide transportation system planning process.

- The Delaware Transit Corporation is a division of the Delaware Department of Transportation and operates DART First State public transportation service.
- The Maryland Transit Administration is a subdivision of the Maryland Department of Transportation led by the state's transportation secretary.
- New Jersey Transit is a state corporation where the transportation commissioner serves as chairman of the board for New Jersey Transit's board of directors.

Statewide Rail Agency

Statewide rail agencies are separate agencies from the state DOTs. These types of agencies typically promote, plan, and fund freight and passenger rail across their state. In the case of the Commonwealth of Virginia, the Rail Division of the Virginia Department of Rail and Public Transportation (VDRPT) plans and funds rail projects. The VDRPT is

a separate state agency from the Virginia Department of Transportation (VDOT). VDRPT is charged by the state to plan for freight and passenger rail as well as non-rail modes of public transportation. VDRPT completed and published both a state rail plan and a rail needs assessment during 2004.

State DOT Rail Division

State DOT rail divisions are a part of the state DOT, as opposed to the separate entity described as a statewide rail agency. The Division of Rail within the California Department of Transportation (Caltrans) coordinates the state-supported intercity passenger rail program in the state of California. Through Caltrans, the State of California provides capital grants and support for station and track improvements (including signaling), locomotives and cars, connecting Amtrak bus service, and operating assistance for three corridors: The Pacific Surfliners, the San Joaquins, and the Capitols. California was one of the first states to partner and fund Amtrak intercity service along congested corridors.

State-Level Rail Passenger Program

The Georgia Rail Passenger Program is an example of a state DOT partnering with separate organizations to promote and support rail initiatives. The Georgia Rail Passenger program is a joint program of the Georgia Department of Transportation (GDOT), the Georgia Rail Passenger Authority (GRPA) and the Georgia Regional Transportation Authority (GRTA). The aim of the program is to revive rail passenger service in Georgia using existing railroad corridors to the maximum extent possible.

Regional Transit Districts and Authorities

A regional transit district or authority is typically comprised of several cities and/or counties in a single metropolitan area. The district typically has some form of taxing authority to fund projects. These authorities are multimodal and include passenger bus rail and commuter services. The role of the DOT in these types of organizations is frequently a reserved board member seat to ensure regional and/or statewide coordination and consultation goals are met.

The Utah Public Transit District Act of 1969 allows individual communities to address transportation needs by forming local transit districts. The Utah Transit Authority (UTA) was founded in March 1970 when the cities of Sandy, Salt Lake, and Murray voted to form a transit district. UTA's service area is over 1,400 square miles and covers six counties. UTA is governed by a 16-member Board of Trustees appointed by the member city and county governments that fund UTA with a local option sales tax. One ex-officio seat is reserved for a member of the State Transportation Commission, which is part of the Utah Department of Transportation.

Regional Rail Authorities

Regional rail authorities are similar to transit authorities except their focus is usually on intercity and commuter rail service. Recently, Florida passed legislation that transformed the Tri-County Commuter Rail Authority into the South Florida Regional Transportation

Authority (SFRTA), expanding its mission from a commuter rail-focused agency to a broader multimodal regional transportation authority. In the case of SFRTA, the Florida DOT has a seat on the governing board and the DOT's role consists of contributing project funds, financial compliance and oversight with respect to grants and administration, and project coordination.

Interstate Authorities

Interstate authorities are similar to most other rail or transportation authorities where the metropolitan service area stretches across state boundaries. One of the largest of these is the Port Authority of New York and New Jersey which operates ports, airports, and rail transit. The Port Authority is one of several partners in the New York Transportation Federation that also includes the New York DOT, New York State (NYS) Thruway Authority, NYS Bridge Authority, NYS Department of Motor Vehicles, New York City Department of Transportation, and Metropolitan Transportation Authority. In this case, the DOT is a peer organization to the Port Authority within the Federation.

Regional Mobility Authorities

The Texas Legislature authorized the creation of Regional Mobility Authorities (RMAs) in 2001 under Senate Bill 342. RMAs are a political subdivision formed by one or more counties to finance, acquire, design, construct, operate, maintain, expand, or extend transportation projects. RMAs can also build, operate, and maintain passenger and freight rail, along with many other modes and transportation projects. For some regions, the RMA provides an opportunity to pursue transportation projects important to their region. RMA board members may not be employees of TxDOT.

The Texas Transportation Commission has oversight responsibilities of RMAs, and may:

- authorize creation of RMAs;
- approve projects connecting to the state highway system or rail facility;
- establish design and construction standards for projects connecting to the state highway system or rail facility;
- establish audit and reporting requirements;
- establish ethical standards for directors and employees;
- authorize RMAs to enter into contracts with Mexico;
- approve addition or withdrawal of counties;
- approve dissolution of an RMA; and
- approve RMA applications for federal highway or rail funds.

Joint Powers Agreement/Authorities

A joint powers agreement is a contract between a city, a county, and/or a special district in which the city or county agrees to perform services, cooperate with, or lend its powers to the special district or authority. Several rail initiatives used this kind of multi-agency agreement. The strength of a joint powers agreement is that the various transportation development partners can contribute their individual strengths and assign governmental functions to one collaborative organization.

For example, the Northstar Corridor Development Authority (NCDA) is a joint powers board made up of counties, regional railroad authorities, cities, and townships along the 82-mile Northstar Corridor that runs along Highways 10 and 94 from downtown Minneapolis to St. Cloud/Rice. Most of the counties, cities, and townships provide funding support, but other members have administrative and technical responsibilities. NCDA has an executive committee consisting of five members responsible for approving invoices within approved contract amounts, addressing personnel issues, and performing other duties set forth in NCDA's bylaws.

The NCDA's purpose is to "analyze the feasibility and environmental impacts of integrated transportation improvements along the Highway 10 Corridor, including highway improvements, commuter and freight rail, recreational trails, safety, and related land issues." The Minnesota Department of Transportation (Mn/DOT) and the NCDA studied transportation options for the corridor and recommended commuter rail. This corridor's projected capital cost is $289 million that includes 50 percent federal, 33 percent state, and 17 percent local contributions.

The Anoka County Regional Railroad Authority (ACRRA) is a member of the NCDA and a component of Anoka County (also a member of NCDA). ACRRA is the lead agency in efforts to develop major transportation initiatives in Anoka County, including the Northstar commuter rail line, and has been involved in contracts relating to the Northstar Corridor project. Anoka County is responsible for the accounting and monitoring of the ACRRA. ACRRA is governed by a seven-member board consisting of the Anoka County Commissioners and has the power to levy taxes, issue bonds, and enter into contracts.

Mn/DOT monitors all NCDA contracts that utilize federal and state funds for the Northstar Project. Such contracts include consulting, engineering, studies, design, legal contracts relating to the development of the Project, and contracts relating to public involvement.

Another example of a joint powers agreement is the Capitol Corridor Joint Powers Authority (CCJPA) in Northern California for the Interstate 80 Corridor from San Jose to Sacramento. The CCJPA manages operations and infrastructure planning for the Capitol Corridor trains on behalf of Caltrans. Local control has increased ridership and service levels compared to previous operations that were managed at the state level. The state remains an active funding, planning, programming, and purchasing partner in the authority but gives control to the local agency.

Cooperative, Interagency, and Interlocal Agreements

A cooperative, interagency, or interlocal agreement may be made between transportation authorities to pool and/or share transportation resources for the purposes of providing a service or project. State DOTs frequently enter into agreements with local transit authorities for studies or services.

The Trinity Rail Express is an example of a cooperative agreement between two transit authorities. It was established by an interlocal agreement between DART and The Fort Worth Transportation Authority (The "T"). Each transit authority owns a 50 percent stake in the joint rail project and contracts operations to the Herzog Transit Services.

Commuter Rail Districts

A rail district is typically established for the development and operation of rail within a single specific corridor or line. Two examples of rail districts are provided—one old and one new.

In 1977, the Indiana General Assembly created the Northern Indiana Commuter Transportation District (NICTD) to rescue the ailing South Shore line as it was known. The South Shore line railroad had been operated by various private owners since the 1900s. The line runs along the south shore of Lake Michigan connecting Northern Indiana and Chicago. The purchase was funded with contributions from Indiana, Illinois, and the federal government. These actions rescued the South Shore from the brink of discontinuance. NICTD is governed by an 11-member Board of Trustees representing the four Indiana counties served by the South Shore Line as well as three representatives appointed by the Governor.

The Indiana Public Mass Transportation Fund (PMTF) provides NICTD with an annual set-aside percentage (12.34 percent) of the total PMTF amount available ($35.6 million in 2008 in the PMTF) for operating and capital needs. NICTD is the owner/operator of the South Shore rail passenger service. The PMTF is a dedicated revenue fund created by the 1980 Indiana General Assembly to assist public transportation in the state. The PMTF receives 0.76 percent of the state's 6 percent general sales and use tax. The Indiana Department of Transportation administers the fund.

The Austin-San Antonio Inter-city Commuter Rail District is a relatively new rail district for the purpose of planning regional commuter rail service along the Union Pacific (UP) Corridor between Austin and San Antonio that currently carries UP freight and Amtrak trains. Passenger service on these tracks could eventually connect Georgetown, Round Rock, Austin, Buda/Kyle, San Marcos, New Braunfels, and San Antonio. The Rail District has made applications to the federal government to provide future funding for the design, engineering, and construction of a passenger rail system for the Austin-San Antonio Corridor.

TxDOT, the City of Austin, and the City of San Antonio initiated a commuter rail study of the corridor in 1999. Subsequently, the District was formed. The District's board of directors is composed of elected and private sector officials who represent the following member cities and counties:

- Capital Area Metropolitan Planning Organization;
- San Antonio-Bexar County Metropolitan Planning Organization;
- Capital Metropolitan Transportation Authority;
- VIA (San Antonio) Metropolitan Transit;

- Capital Area Rural Transportation System;
- Alamo Rural Transit; and
- Representatives of small cities, business communities, and the public.

TxDOT does not have representation on the District's board.

Multi-State Rail Initiatives

The Midwest Regional Rail Initiative (MWRRI) is an example of a multi-state collaboration by several state departments of transportation that has been used to develop the needs for passenger rail in Missouri. The MWRRI is a collaborative effort among nine Midwest states (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin), Amtrak, and the Federal Railroad Administration.

Another example of a multi-state rail initiative is the Pacific Northwest Corridor (PNWC). Intercity passenger rail programs, development, and operations along the PNWC are supported by the Rail Office of the Division of Rail and Public Transportation at the Washington State Department of Transportation and the Rail Division of the Oregon Department of Transportation. These two states are working jointly to make capital and operational improvements to the freight rail corridor between Eugene, Oregon, and Vancouver, British Columbia, via Seattle, Washington.

Flexible Funding

State DOTs can exercise flexibility using a number of funds, most significantly Surface Transportation Funds (STP), for either highway or transit projects. The most common uses of "flexed" funds have been for the purchase of vehicles such as buses and rail cars. For example, Virginia state law mandates that a percentage of its flexible funding be used for public transportation. Congestion Mitigation and Air Quality (CMAQ) Program funds are also able to be "flexed"; however, these funds are sub-allocated by formula to MPOs and not directly under state DOT control. CMAQ funds are frequently used for transit projects by local authorities.

State Supported New Starts Program

FTA will typically fund no more than half the capital cost of new starts projects and typically favors projects where the non-federal share of the costs is significantly greater than half. Demonstration of a strong local financial commitment is a key factor in securing FTA funding. By increasing the local share with state matching funds, a state can improve the ranking of a local or regional project when competing for Federal New Starts Program.

The Florida New Starts Program (NSTP) provides transit agencies with up to a dollar-for-dollar match of the local (non-federal) share of project costs for transit fixed-guideway projects and facilities that qualify under the FTA New Starts Program. Eligible projects include rail transit and bus rapid transit (BRT) systems. The Florida NSTP allows transit projects from that state to have a competitive advantage relative to other projects nationally. (This program also allows a dollar-for-dollar match of local funds towards project costs for projects funded with state and local funds only.)

Statewide Transportation Planning

State DOTs are required to prepare a statewide transportation plan. The statewide plan and the statewide planning process involve a range of required activities including: a plan document, a planning process, public involvement, and a statewide transportation planning program. The range of statewide plans and planning processes vary greatly among state DOTs because there has been great flexibility provided in past and current federal planning guidance and rules. As a result of this flexibility, opportunities for involvement by state DOTs in commuter and rail transit are available through the statewide planning process and statewide plan development.

Statewide Corridor Planning

The statewide planning process in some states uses a combination of multiple corridor visions and plans. For example, the Colorado Department of Transportation (CDOT) developed 350 corridor vision plans with the involvement of local entities. Some of the CDOT corridor visions include goals for passenger rail.

Statewide Passenger Rail Planning

Many statewide plans address specific modes such as passenger rail. In addition to local corridor visions mentioned above, CDOT statewide plan contains a statewide passenger rail planning element. One corridor planning example is The North Front Range Feasibility Study that examined transportation alternatives for the corridor, including passenger rail. The Study was jointly funded by CDOT, The North Front Range Transportation and Air Quality Planning Council, The Upper Front Range Regional Planning Commission, and the Denver Regional Council of Governments. In another example, The Texas Rail System Plan describes the existing rail conditions and the role rail plays in statewide transportation planning.

Statewide Rail Corridor Preservation

State DOTs have been preserving rail rights of way to protect rail corridors from encroachment and limit incompatible land use. State DOTs have been developing inventories of rail assets and identifying abandoned routes. In New Jersey, these inventories are used to develop plans to reinitiate transit and freight service. Numerous states (Table 4) and cities are involved in preserving rail corridors, purchasing abandoned rail lines or shared rights, and supporting rails-to-trails conversions. As noted in NCHRP 374 *(13)*, North Carolina, Ohio, and Pennsylvania have a long and successful history of rail corridor preservation. Other states with corridor preservation efforts include New York, California, Illinois, Indiana, Minnesota, Washington, and Wisconsin.

Other states and cities are involved in preserving rail corridors purchases of abandoned rail lines or shared rights and rails-to-trails conversions (also see NCHRP 374).

Table 4. States with Rail Plan Inventories Reviewed in NCHRP Report 374.

State	Year	State	Year
Alabama	2001	New Jersey	2007
California	2005	North Dakota	2007
Florida	2006	Oregon	2001
Georgia	2001	Pennsylvania	2003
Idaho	1996	South Dakota	1997
Indiana	2002	Tennessee	2003
Kansas	2006	Texas	2006
Kentucky	2002	Vermont	2006
Louisiana	2002	Virginia	2004
Montana	2000	Washington	2006
New Hampshire	2001	Wisconsin	2004

Table from presentation made to AASHTO Standing Committee on Rail Transportation by David Hunt, Cambridge Systematics, Inc. 2007; Also see NCHRP Report 374.

Statewide Rail Relocation Fund

The 2005 Texas Legislative Session passed two bills (HB 1546 and HJR 54) establishing the Rail Relocation and Improvement Fund. House Bill 1546 amends the Transportation Code to provide for the administration and use of the Texas rail relocation and improvement fund and the issuance of bonds and other public securities to finance the relocation, rehabilitation, and expansion of freight or passenger rail facilities, including commuter rail, intercity rail, and high speed rail. This legislation directed the Texas Transportation Commission to administer the fund and provide a method of financing the relocation and improvement of privately and publicly owned passenger and freight rail facilities.

House Joint Resolution 54 enabled this bill to take effect contingent on voter approval of a constitutional amendment. Voters approved Proposition 1 in 2005 creating the Rail Relocation and Improvement Fund. While the fund has been created, no appropriations have been made to the fund at this time. Additional research on rail relocation is available from TxDOT Research Project 0-5322 *(14)*.

SECTION 4: CASE STUDIES OF STATE DOT INVOLVEMENT IN SUPPORTING LIGHT AND COMMUTER RAIL

Case studies were used to identify the circumstances and characteristics of state DOT involvement that could be transferable to TxDOT in the planning, development, and operation of commuter and light rail. Case studies are also used to identify potential policy needs and guidance.

The research team first identified states where the state DOT played a noteworthy role in the development of light and commuter rail projects. In selecting case studies of state DOT involvement in commuter and light rail development, researchers screened all of the states in continental North America where light rail or commuter rail was in existence or planned. The states where commuter and/or light rail systems are neither in existence or proposed were excluded from the case study selection pool.

For states with statewide transit, the state DOT's role is unique in that the state DOT owns and operates the public transportation system within the state. In this type of governance, transit operation is one of the state DOT's core functions. In contrast, most state DOTs do not own or operate the local and or regional public transportation systems. These states were removed from consideration for case study since their governance structure differed significantly from Texas. Other northeastern states such as New York and surrounding New England states did not offer relevant examples for DOT rail involvement based on their very dissimilar demographic characteristics and transportation system size differences to Texas and other states.

States where DOT involvement methods in commuter and light rail were more transferable to TxDOT were located generally in the south, southwest, and western states. Researchers narrowed the list of potential state DOTs for case study to 12. In concert with the TxDOT project management team, five states were selected for case study, as follows:

- California;
- Florida;
- Georgia;
- Minnesota; and
- Virginia.

The descriptions below represent a range of state DOTs involved in light rail transit, commuter rail, and intercity passenger rail.

CALIFORNIA

Transportation in California is guided by the California Department of Transportation (Caltrans). The *GoCalifornia* vision: "Improve mobility and accessibility for people, goods, services, and information through a safe, integrated, multimodal, world-class transportation system that achieves the "3-Es":

- Prosperous Economy,
- Quality Environment, and
- Social Equity.

GoCalifornia's **goal** is: "Mobility that continues to attract capital investment in California to generate jobs. *GoCalifornia's* **objectives** in its 10-year investment plan for mobility are:

- Address 20-year needs and reduce congestion below today's levels.
- Deploy demand-management strategies, use existing capacity more efficiently, and expand capacity.
- Build a world-class transportation system that incorporates the best research and technology.

The Department's Intercity Passenger Rail Vision supports the *GoCalifornia* vision; the Department's mission and goals contain the following elements:

- Provide relief to highway and airway congestion.
- Provide a rail transportation alternative to other travel modes.
- Improve air quality, conserve fuel, and contribute to efficient and environmentally superior land use.

State Agency with Planning Authority

Caltrans provides capital grants and support for station and track improvements (including signaling), locomotives and cars, connecting Amtrak bus service, and operating assistance for three corridors: The Pacific Surfliners, the San Joaquins, and the Capitols (Figure 6). The Division of Rail (DOR) within Caltrans manages and coordinates the state-supported intercity rail program. Caltrans is required by California state law to update its 10-year State Rail Plan for both passenger and freight rail every two years.

Caltrans supports intercity rail operations in three corridors. This support includes operations funding and capital improvement projects. California's fiscal year 2006 budget included $1.315 billion in funding for Amtrak, including $780 million for capital projects (which includes $280 million maximum for debt service), $495 million for operations, and $40 million for efficiency incentive grants.

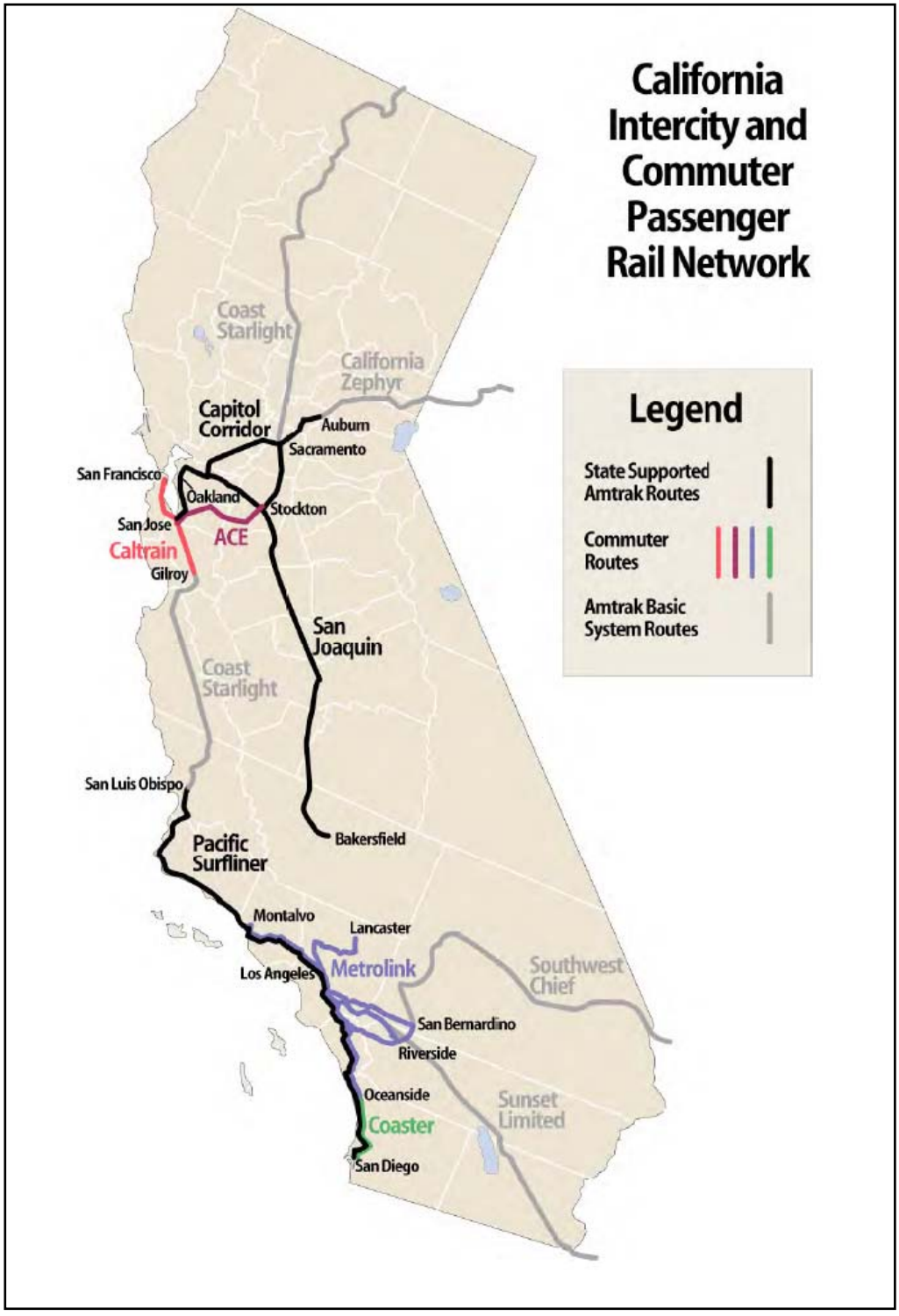

Figure 6. California Intercity and Commuter Rail Network.

DOR manages two state-supported routes operated by Amtrak and financially supports a third, as follows:

- The *San Joaquins* operates six round trips from Oakland or Sacramento to Bakersfield. The San Joaquin route connects the Bay Area with the state capital area in Sacramento via Stockton and extends southward through the San Joaquin Valley to Bakersfield with connecting bus service on to Los Angeles.
- The *Pacific Surfliners*, the second most popular route in the country, has 11 weekday and 12 weekend round trips from San Diego to Los Angeles. The Pacific Surfliner route serves the southern California coast between San Diego and San Luis Obispo, north of the Los Angeles Metro area.
- The Capitol Corridor connects San Jose and Oakland to the Sacramento area and on to Roseville and Auburn in the east.

DOR performs long-range planning, coordinates with Amtrak on operations issues, administers the state rail program marketing contract ($5 million annually), procures and manages the rehabilitation of equipment, and works with local agencies to manage the capital program for projects on the *Capital Corridor, San Joaquin* and *Pacific Surfliner* routes, including track and signal projects to result in increased train frequencies, reduced travel times, and improved on-time performance. Amtrak supports the state's marketing efforts.

In addition to sponsoring these rail routes, the state also subsidizes an extensive feeder bus route system. The feeder routes are contracted to private operators. These services "extend" the rail, providing opportunity to make connections between the commuter rail line and other area services and developments. Caltrans pays any net operating losses to Amtrak for the feeder buses and views them as a means of building ridership for future service expansion.

The Caltrans Division of Rail provides operations funding to the *Capitol Corridor Joint Powers Authority,* which oversees the Amtrak *Capitol Corridor* trains running between San Jose/Oakland and Sacramento/Auburn. In addition, Caltrans assists that service by pursuing state funding, requesting project programming, procuring rolling stock, and managing track and signal projects.

The Capitol Corridor Joint Powers Authority (CCJPA) provides local control of operations on the route. Caltrans apportions a percentage of its funding on to CCJPA, which is dependent upon these funds for all of its support outside those generated by the route itself.

State-Level Funding Sources

Funding to support intercity rail in California comes from a variety of sources. Currently, the State of California and Amtrak share operational costs (although the Amtrak portion has diminished to cover only their overhead today, with the state covering all direct costs) for the three state-supported routes. The state is the main funding source for capital improvements directly related to intercity rail services. Additional capital funding

support for rail projects is received from many sources including local governments, which may pay for station improvements and the railroad companies who may also benefit from rail infrastructure projects. California has also used federal grants and loans for rail capital improvements.

Over $2.8 billion has either been invested or reserved for capital funding for California intercity rail passenger service since 1976. The state has provided about 62 percent of that funding. Local entities, the federal government, Amtrak, and the private railroads have also made contributions.

The California State Rail Plan outlines the funding sources available to Caltrans for intercity passenger rail projects. Each funding source is discussed below.

Public Transportation Account (PTA)

The Public Transportation Account (PTA) is the only source for intercity operating funds, and it is also a potential source for capital projects. PTA funding primarily comes from sales and excise taxes on fuel. In 2005-06, total PTA revenue from these sources was $571 million, and included:

- Sales Tax on Diesel Fuel – The 4.75 percent portion of the 7.25 percent state sales tax on diesel fuel, which in 2005-06 was $287 million.
- Sales Tax on Gasoline – The 5.0 percent portion of the 7.25 percent state sales tax on gasoline. In 2005-06, the first year of the Tax Increment Financing (TIF) transfer to the PTA, the amount transferred was $136 million.
- Sales Tax on Gasoline (Spillover) – Based on the statutory formula, gasoline spillover is available when revenues from the gasoline sales tax at the 4.75 rate exceed revenues from all taxable sales at the 0.25 percent rate, shifting revenues to the PTA when gas prices increase faster than overall retail sales. In 2005-06, the spillover was $381 million, but the full amount was retained by the General Fund.
- Sales Tax on a Portion of the Excise Tax on Gasoline (Proposition 111) – A portion equal to 4.75 percent on nine cents of the state's 18 cent per gallon excise tax on gasoline goes to PTA. In 2005-06, this source was $67 million.
- Traffic Congestion Relief Program (TCRP)/Proposition 42 Funding –The TCRP was established by Chapter 91, Statutes of 2000 (AB 2928, Torlakson). The California financial crisis in 2001 delayed payments from the fund through 2007-08. A commitment to pay $83 million per year to TCRP from the Transportation Deferred Investment Fund for nine years was later enacted.
- State Highway Account (SHA) Non-Article XIX Revenues – The TCRP Program (Chapter 91, Statutes of 2000) authorized the annual transfer of all Article XIX unrestricted SHA revenues from the SHA to the PTA. These revenues are derived from the sale of documents, charges for miscellaneous services to the public, rental of state property, etc. and are from state sources only and unrestricted. In 2005-06, this source was $81 million.

State Highway Account: Restricted Funds

The State Highway Account predominantly goes to support California's state highway system; however, a portion of the account has been set aside for rail projects that appear in the Statewide Transportation Improvement Program (STIP) documents approved by MPOs and the state. The SHA receives its funds from state gasoline and diesel fuel taxes, state vehicle weight fees, and reimbursements from the Federal Trust Fund for federal-aid projects. The SHA restricted funds cannot be used for mass transit vehicle acquisition or maintenance, or mass transit operating costs.

State Bond Funds

The public approved two very substantial state bond proposals in 1990, which have provided program stability. The Passenger Rail and Clean Air Bond Act (Proposition 108) contained over $1 billion in rail transportation bonds of which $225 million was designated for intercity rail capital projects. The second bond act passed in 1990 was the Clean Air and Transportation Improvement Act of 1990 (Proposition 116) that included a one-time source of funding for rail and transit capital projects of $1.99 billion of which $382 million was specifically designated for intercity rail. According to the state's rail plan, by 2004 most of the funds from both of these bond programs had been allocated.

State General Funds

In addition to long-term bonding programs, Caltrans has also been able to benefit from several "one-time" appropriations from the state's general fund.

Local Funds

Local funds have been used to offset expenditures of state funds by using them to purchase or construct support facilities that cannot be as easily funded by existing state or federal level funding programs. For example, local STIP funding controlled by an MPO or other local funding sources at the city level may be used to construct or enhance stations that local government entities own. Additionally, grade crossing signal improvements and track improvements related to commuter rail projects that are funded at the local level can also benefit intercity rail operations. This has been especially true on California's Pacific Surfliner route where the Metrolink commuter rail in the Los Angeles area and the Coaster commuter rail in the San Diego area have invested for their own operations, but the infrastructure upgrades have also facilitated better state-supported intercity rail operations.

Federal Funds

Although they are not actually state level funds, a few federal level funding sources are passed along to the states that allocate them to specific public transportation projects. In California, funding from Federal Transit Administration (FTA) Section 5307 and Section 5309 funds have been used to assist in station projects that benefit intercity rail. These funds are most often designated to local entities for specific projects in their project planning documents.

Amtrak Funds

In California, Amtrak and the state have partnered to bring increased frequencies and improved service along the state-sponsored routes to augment the standard national system routes operated by Amtrak in the state. Amtrak's main funding assistance comes in the form of capital improvements to maintenance facilities and through the purchase of rolling stock.

Railroad Funds

Funding from the private freight railroad companies has also been used to make improvements to the routes that are state-supported. Each route travels largely over rail lines either owned by or operated by private rail firms. Often when additional projects are undertaken that either add freight rail capacity or improve rail safety, the state will ask the railroad company to participate financially in supporting the project since those improvements will also benefit the private railroad's operations.

Noteworthy Practices

The State of California programs reflect the following noteworthy practices:

- long history of funding support and leadership from state DOT;
- long history of statewide rail planning;
- strong local support and involvement;
- state DOT as partner with regions in rail development; and
- use of joint powers authority.

FLORIDA

All FTA projects require matching funds from the local sponsoring agency. FTA will typically fund no more than half the cost of the project and typically favors projects where the non-federal share of the costs is significantly greater than half. By increasing the non-federal share with state matching funds, a state can increase a project's competitive advantage when seeking the Federal New Starts Program. Demonstration of a strong local financial commitment is a key factor in securing FTA funding.

Florida enacted a number of important transportation-related policy initiatives in recent years that influence growth and development and in particular, transportation, transit, and transportation funding requirements. As an outgrowth of the Florida Transportation Plan, the Florida Department of Transportation (FDOT) recommended development of a decision-support program to help guide investments in transit services and infrastructure, and to leverage the maximum capture of available federal transit discretionary funding. FDOT's primary objectives are to:

- advance infrastructure to support growth management and concurrency objectives;
- use state transit funding to maximize the amount of FTA discretionary funding captured for Florida projects;
- advance transit projects expeditiously to meet strategic and regional transportation needs; and

- advance transit projects expeditiously to best allocate and use available state transit funds.

In addition to the Florida Transportation Plan, growth management legislation affected transportation development. The 2005 Growth Management Act (SB 360) provided significant policy direction and funding for how Florida will grow for decades to come.

Two new and strategic transportation policy initiatives created by SB 360 include the New Starts Transit Program (NSTP) and the Transportation Regional Incentive Program (TRIP). The primary purpose of the NSTP is to provide funding support to build the transportation infrastructure required to move Florida into the future. The TRIP program was created to encourage and fund regionally significant transportation investments.

The NSTP provides transit agencies with up to a dollar-for-dollar match of the local (non-federal) share of project costs for transit fixed-guideway projects and facilities that qualify under the New Starts Program. Eligible projects include rail transit and bus rapid transit (BRT) systems. This program also allows a dollar-for-dollar match of local funds towards project costs for projects funded with state and local funds only. The Florida New Start allows their transit projects competitive advantage relative to other projects nationally.

TRIP created as part of SB 360, the Growth Management Act, provides 50 percent matching grants to improve regionally significant facilities in regional transportation areas. Regional transportation areas are defined by law as:

- two or more contiguous Metropolitan Planning Organizations (MPOs);
- one or more MPOs or counties;
- multi-county regional transportation authority;
- two or more contiguous counties not members of an MPO; and
- MPOs comprised of three or more counties.

Florida DOT's concept is to focus transit investment decisions to yield the greatest return on investment. This involves setting transit project technical requirements and leveraging state and local funds to maximize the capture of federal funds. Decision-making by the FDOT on transit projects includes consideration of:

- compliance with federal and state policies and guidelines;
- coordination with regional projects and programs;
- consistency with local plans and programs;
- local financial and land use and growth management policy commitments; and
- potential to leverage federal transit discretionary funding.

The State of Florida has several additional regionally oriented programs that support judicious development of transit infrastructure.

Strategic Intermodal System

The Strategic Intermodal System (SIS) is the statewide network of strategic intermodal facilities and services of regional significance. This system is comprised of transportation hubs of ports and terminals and the highways, railroads, and waterways

connecting these hubs. Projects that are part of the SIS network or that expand and improve the SIS network may be eligible for special funding.

The FDOT uses three processes for updating the SIS designation:

1. A Comprehensive SIS Review of all criteria every five years;
2. An annual Systemwide SIS Data and Designation Review of activity levels of all facilities using established criteria; and
3. An ongoing process for responding to partner requests for designation changes.

The SIS is determined through objective criteria and thresholds and is based on quantitative measures of transportation and economic activity. These criteria and thresholds are used to designate both existing and planned facilities.

County Incentive Grant Program

The County Incentive Grant Program provides up to 50 percent grants to counties for the construction of transportation facilities and services, including transit, to relieve congestion on the State Highway System.

State Infrastructure Bank

State Infrastructure Bank (SIB) is a program of revolving low interest loans and credit enhancement programs to assist projects eligible under the TRIP and other programs. The SIB funded in FY2006 with $100 million.

Noteworthy Practices

The State of Florida programs reflects the following noteworthy practices:

- FDOT assists local and regional transportation authorities in competing for federal funding with the state's own "New Starts" funding.
- FDOT offers a variety of additional strategic state funding opportunities for transit infrastructure.
- FDOT developed programs that emphasize enabling of more local and regional investment in transit development.
- FDOT developed policies encouraging collaboration among local and regional entities.
- Project funding is contingent upon its consistency with state and regional plans.
- FDOT funds programs encouraging intermodal facility development for connectivity between bus and light rail.

GEORGIA

During the 1990s, several public agencies began studying commuter and intercity rail options in Georgia. These agencies include the Georgia Department of Transportation (GDOT), the Georgia Rail Passenger Authority (GRPA), and the Georgia Regional Transportation Authority. The Georgia Rail Passenger Program combined the results of previous studies into a single document emphasizing the following themes:

- **Existing Corridors -** An existing network of high quality freight tracks is in place, feeding into the center of the region.
- **lntermodal Integration -** The existing rapid transit and bus system would allow rail commuters to make connections from the train to and from their jobs.
- **Local Commitment -** Public policy commitments have been made to invest in the Five Points area, the proposed downtown commuter rail station and transfer complex.
- **Long-Term Planning -** The area has a history of making farsighted investments to preserve transportation mobility, evidenced by the extensive highway system, Hartsfield airport, and the MARTA rapid transit system.

Organized in 1999, the Georgia Rail Passenger Program (GRPP) was a joint effort to revive rail passenger service in Georgia using to the maximum extent possible existing railroad corridors (Figure 7). The GRPP contained seven commuter rail lines, seven lines of intercity rail, and the Multi-Modal Passenger Terminal (Figure 8).

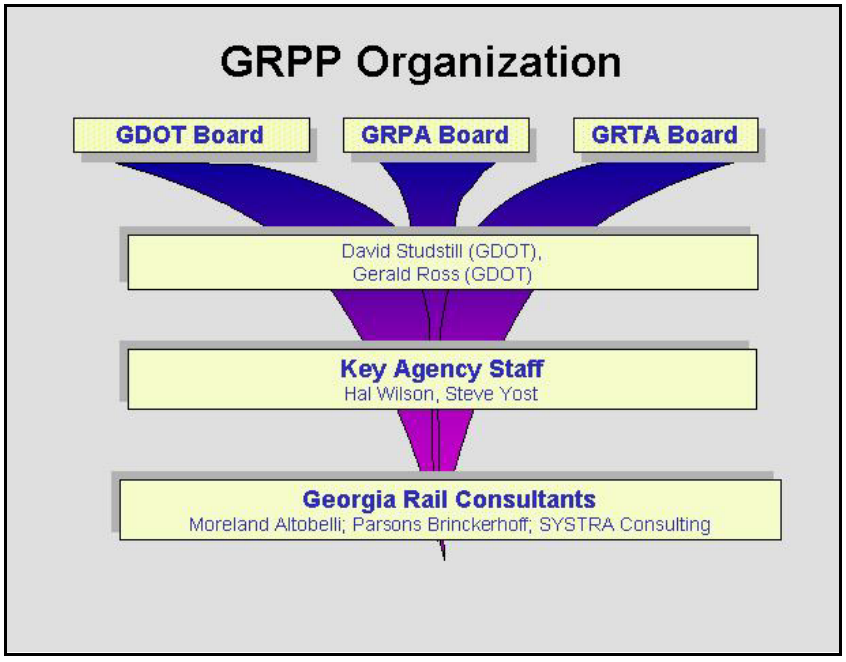

Figure 7. Georgia Rail Passenger Program Organization.

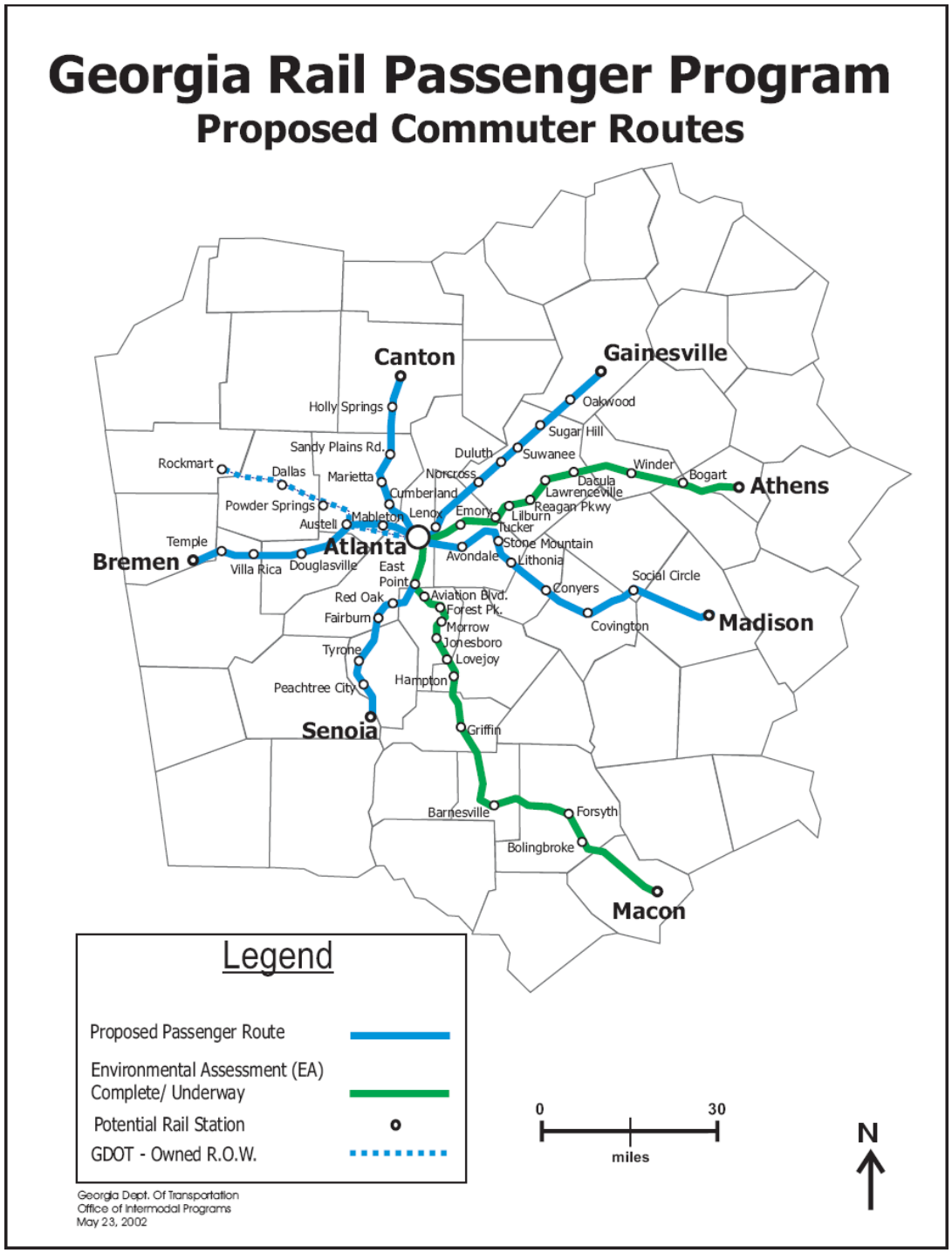

Figure 8. Georgia Rail Passenger Program.

The Program Management Team (PMT) for GRRP was comprised of two members each of the following entities: GRPA, the Georgia Regional Transportation (GRTA), and the State Transportation Board. The PMT Chairman was appointed by the Governor. Each participating agency named a staff person as representative Rail Program Managers to oversee daily coordination through the RPM Committee (RPMC). This committee oversaw the work of the Rail Program Consultant.

GDOT was responsible for:

- planning, design, and construction of rail infrastructure improvements;
- agreements with USDOT, Federal Railroad Administration, Environmental Protection Agency, etc.;
- financial planning;
- infrastructure improvement ownership; and
- incorporating GRRP project into the State Transportation Plan (STP), and Statewide Transportation Improvement Program (STIP).

GRPA was responsible for:

- station location and design and construction;
- design standards for rolling stock and maintenance facilities;
- operating agreements with owner railroads; and
- train operations and service levels.

GRTA was responsible for:

- integrating land use and zoning decisions with GRPA and passenger service;
- working with local governments and MPOs on TOD and multimodal coordination; and
- assisting local governments with financing, planning, and design.

The Georgia Rail Passenger Coordinating Committee (GRPCC) served as advisory committee to the PMT. The GRPCC was comprised of representatives from GDOT, GRPA, GRTA, host railroads, and federal, state, and local public and private organizations with an interest or responsibility in the program.

The GRRP stopped meeting during 2004 due to internal strife, and the organization has been unstaffed since 2006. Implementation of the commuter and intercity rail plan has fallen solely to GDOT. GDOT has focused on one commuter rail line running from Atlanta to Lovejoy. The Georgia State Transportation Board endorsed the project in April 2008 and approved the formation of a new Intermodal Program Division at GDOT.

Noteworthy Practices

The State of Georgia programs reflect the following noteworthy practices:

- emphasis on local commitment and participation in rail development;
- attempted regional implementation organization;
- long-term vision and planning effort – planning since the early 1990s;
- integration and compatibility with other local and regional transportation plans for a multimodal planning effort; and
- emphasis on developing intermodal facilities for connectivity to bus and light rail.

MINNESOTA

Commuter rail activities began when the 1997 Minnesota Legislature directed the Minnesota Department of Transportation (Mn/DOT) to determine the feasibility of commuter rail service for the Minneapolis-St. Paul metropolitan area. The subsequent study found six corridors proved feasible out of 19 rail corridors studied. Those six corridors were divided into two tiers, with the Tier One corridors representing the highest priority. The three Tier One corridors are:

- Northstar Corridor (St. Cloud/Rice Area to Minneapolis),
- Red Rock Corridor (Hastings to Minneapolis through St. Paul), and
- Dan Patch Corridor (Minneapolis to Northfield).

The Northstar Corridor is an 82-mile transportation Corridor that runs along Highways 10 and 94 from downtown Minneapolis to the St. Cloud/Rice area. Mn/DOT and the Northstar Corridor Development Authority (NCDA) studied transportation options for the Corridor. After analyzing all possibilities, they recommended Northstar Commuter Rail as the best transportation alternative for the Corridor.

The Northstar Corridor represents the region's most advanced corridor and consists of an initial 40-mile line with six stations and eventually 82 total miles with 11 rail stations (Figure 9). The estimated cost for the entire corridor is $302 million, 50 percent of which is projected to come from the federal government. The federal money would be available if the local governments raise the remaining 50 percent, or $151 million. This is planned to include $123.2 million in state bonding and $27.8 million from local governments. NCDA's goal is to have the railway operational by 2009. The capital costs of the project are estimated to be $289 million (funding to be provided would include 50 percent federal, 33 percent state, and 17 percent local).

The NCDA is a joint powers board made up of counties, regional railroad authorities, cities, and townships along the corridor. The stated purpose of the NCDA is to "analyze the feasibility and environmental impacts of integrated transportation improvements along the Highway 10 Corridor, including highway improvements, commuter and freight rail, recreational trails, safety and related land issues."

A joint powers agreement is a contract between a city, a county, and/or a special district in which the city or county agrees to perform services, cooperate with, or lend its powers to the special district or authority. The strength of a joint powers agreement is that the various transportation development partners contribute their individual strengths and established governmental functions to one collaborative organization.

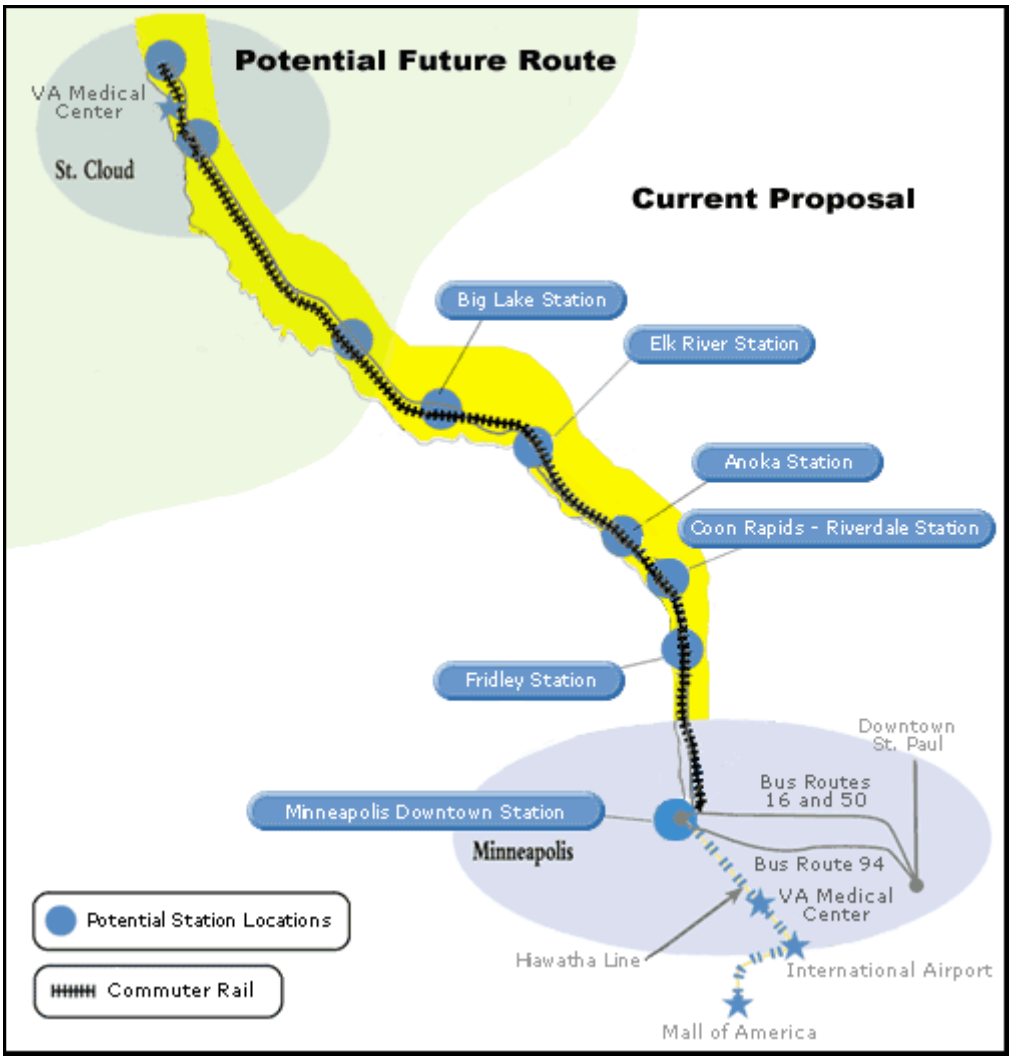

Figure 9. Minnesota Northstar Corridor.

NCDA has an executive committee consisting of five members responsible for approving invoices within approved contract amounts, addressing personnel issues, and performing other duties set forth in NCDA's bylaws. The Anoka County Regional Railroad Authority (ACRRA) is a component unit of Anoka County governed by a seven-member board consisting of the Anoka County Commissioners and has the power to levy taxes, issue bonds, and enter into contracts. ACRRA is the lead agency for the Northstar commuter rail line. Anoka County is responsible for the accounting and monitoring of the ACRRA.

Mn/DOT monitors all NCDA contracts that utilize federal and state funds for the Northstar Project. Such contracts include consulting, engineering, studies, design, legal contracts relating to the development of the Project and contracts relating to public involvement.

Northstar cleared its final financial hurdle in December 2007, when it received a commitment for $156.8 million in federal matching funding for construction and trains

via the Full Funding Grant Agreement. This also triggered the release of $97.5 million in state bonding funds dedicated to the project. The state and federal funding, combined with the commitment of the regional rail authorities for Anoka, Hennepin, and Sherburne counties, as well as contributions from the Metropolitan Council and the Minnesota Twins, allowed Northstar construction to get fully underway.

Mn/DOT is funding 33 percent of the construction cost and will share the funding of operating deficits (after application of fares and federal 5307 capital funds) with local entities.

The NCDA claims the project as the most effective transportation alternative in the corridor and points to the following benefits and advantages:

- Northstar will be built on existing rail tracks, meaning the construction costs are significantly lower than other alternatives. It will cost much less to build than a dedicated busway or highway upgrades.
- Highway expansion would be nearly four times as expensive and adding a dedicated busway would cost nearly six times more than commuter rail per passenger trip.
- Northstar will save commuters 900,000 hours in travel time every year, compared to the next best alternative of bus transit.
- Northstar will take 5,000 cars off the road during morning and evening rush hours and will have the capacity to carry the equivalent of nearly 1.5 lanes of highway traffic at peak travel times.
- Northstar can quickly adapt to increased demand, adding more cars, and running more trains as demand rises.

Noteworthy Practices

The State of Minnesota programs reflect the following noteworthy practices:

- joint powers agreement leverages existing organizations' strengths;
- ability to pass taxing authority and broad local/regional participation; and
- strong connection to statewide and metropolitan transportation plans and plan performance measurement.

VIRGINIA

In the case of the Commonwealth of Virginia, the Rail Division of the Virginia Department of Rail and Public Transportation (VDRPT) plans and funds rail projects. The VDRPT is a separate state agency from the Virginia Department of Transportation (VDOT) (Figure 10). VDRPT is charged by the state to plan for freight and passenger rail as well as non-rail modes of public transportation. VDRPT completed and published both a state rail plan and a rail needs assessment during 2004.

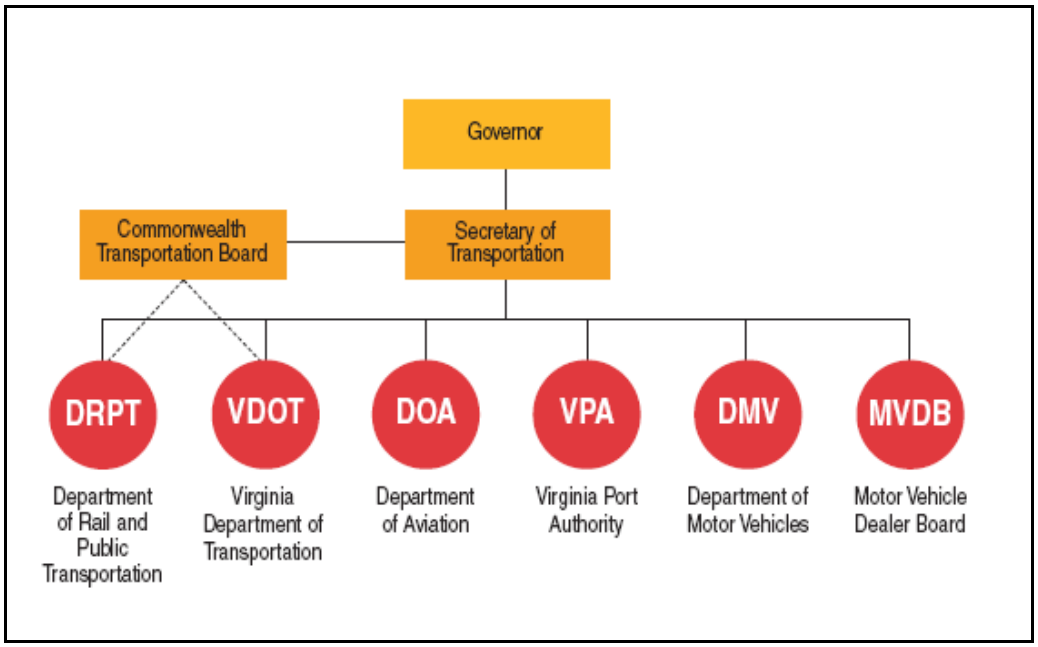

Figure 10. Virginia DOT Organization.

Statewide Transportation Plan

VTrans2025 *(15)*, the Commonwealth of Virginia's statewide long-range multimodal transportation plan was developed by the Secretary of Transportation through the four state transportation modal agencies: Department of Aviation, VDRPT, the Virginia Port Authority, and VDOT.

Virginia's Rail Enhancement Fund

The Rail Enhancement Fund (REF) is a dedicated source of funding for passenger and freight rail improvements in Virginia. Legislation creating this fund was signed in July 2005 to support improvements for passenger and freight rail transportation throughout the state. The REF receives a portion of the taxes on rental vehicles in the state.

The REF is administered by VDOT's Director of the Department of Rail and Public Transportation (VDRPT) for "…acquiring, leasing, and/or improving railways or railroad equipment, rolling stock, rights-of-way or facilities, or assisting other appropriate entities to acquire, lease, or improve railways or railroad equipment, rolling stock, rights-of-way or facilities, for freight and/or passenger rail transportation purposes…"

The legislation requires that projects be limited to those that will result in public benefits that are equal to or greater than the investment of funds. Eligible projects shall include a minimum of 30 percent cash or in-kind matching contribution from a private source, which may include a railroad, a regional authority, a local government source, or a combination of such sources.

The Program Policy Goals establish the criteria for project funding. Compliance with these minimum criteria must be demonstrated for a project to be considered. The goals are as follows:

1. Projects will provide an additional or accelerated investment in Virginia rail projects, which are determined to have a substantial public benefit equal to or greater than the public investment.
2. Projects will address the needs identified in the applicable state, regional, and/or local plans, developed in consultation with public and private partners.
3. Projects will encourage competition and economic development by promoting, or not precluding, access by more than one rail operator and whenever possible joint access by freight and passenger operators to optimize the Commonwealth's investment.
4. The use of Rail Enhancement Funds will evolve from a focus on quick turn-around, high impact projects to a multi-year strategic program of projects that leads to an integrated six-year rail (passenger/freight) improvement program.
5. The Program will limit long-term Commonwealth funding liability through the development of achievable project schedules and budgets. Consideration will be given to funding major projects over a period of several years.
6. Where feasible, projects will optimize public benefits by leveraging funds from sources other than the Rail Enhancement Fund.
7. Projects will protect the Commonwealth's public interest in private facilities.
8. Projects will contribute to the effectiveness of the entire transportation system.
9. At least 90 percent of program funds will be spent on capital improvements.

Roles and Program Implementation

The Rail Enhancement Fund Program is administered by the Director of the Virginia Department of Rail and Public Transportation in accordance with policy decisions of the Commonwealth Transportation Board. The Director of VDRPT consults with and obtains the advice and recommendations of the Rail Advisory Board in preparation of an annual program of projects for implementation.

Role of the Commonwealth Transportation Board

The Commonwealth Transportation Board (CTB) is the policy board for the VDRPT and VDOT. Members of the 17-member Board are appointed by the governor. Their role includes the formulation and adoption of program development guidelines, policies, procedures, and allocation of funds for programs of projects. The CTB must determine that Rail Enhancement Fund projects result in public benefits to the Commonwealth or to a region of the Commonwealth that are equal to or greater than the level of investment of Rail Enhancement funds.

Role of the Virginia Department of Rail and Public Transportation

The VDRPT is responsible for the analysis of projects and proposals and development of information necessary to assess the proposals. The agency is also responsible for developing the program of projects, implementing the program, and providing periodic

progress reports to the Rail Advisory Board RAB and CTB. The Director will consult with the RAB to obtain advice and recommendations. The agency is responsible for executing necessary agreements and ensuring program compliance for projects, including compliance with applicable environmental review and public involvement requirements.

Role of the Rail Advisory Board

The Rail Advisory Board consists of nine members appointed by the Governor for terms of four years. One of the nine appointees is an at-large member of the CTB. The role of the RAB is to develop recommendations, in consultation with the Director of VDRPT, to be presented to the CTB regarding all proposed allocations of funds from the Rail Enhancement Fund. The RAB also works cooperatively with the Director of VDRPT and with any affected railroad in identifying, developing, and advocating projects and policies to enhance the quality and utility to the public of rail transportation in the Commonwealth. The Director of VDRPT consults the RAB on an as-needed basis.

Relationship to Transportation Plans

Rail Enhancement Fund Program development includes the coordination of projects to address the needs identified in applicable statewide, regional, and/or local transportation plans. In addition, VDRPT is developing statewide rail plans, and upon completion these plans will help guide the selection of future projects.

Noteworthy Practices

The State of Virginia programs reflect the following noteworthy practices:

- Virginia has a state Department of Rail and Public Transportation in addition to the Department of Transportation.
- Virginia established a dedicated state rail enhancement fund.
- The state funding program supports a strong connection to statewide and metropolitan transportation plans.
- The state designated a required flex funding percentage for public transportation.

SECTION 5: COMMUTER RAIL CASE STUDIES

Research indicates that state DOTs are more likely to participate in development of commuter rail projects than light rail projects. Light rail in Texas is developed by the local transit authority, and TxDOT's role is usually limited to review of any interface a light rail project has with a TxDOT facility. Therefore, the research team focused on commuter rail and developed four additional case studies of commuter rail projects.

Over the past decade, several non-traditional rail cities in Western and Southern states have implemented new commuter rail systems through a variety of methods and with varying involvement levels from their state department of transportation. Nationally, most commuter rail system development has remained in the realm of local urban or regional transit agencies due to the availability and use of federal funds through the FTA New Starts Program.

Access to these funds is highly competitive due to the limited amount of funds appropriated each year to the program and the increasing number of agencies seeking New Starts funding for their projects. The regulatory and bureaucratic requirements for participating in the New Starts program are also demanding, and as a result, several states and/or transit agencies have begun to seek funding alternatives outside the federal system such as public-private partnerships (using only locally generated public funding sources) and/or alternative delivery methods such as Design-Build or Design-Build-Operate-Maintain in order to avoid the delays and restrictions associated with accepting and administering federal funding.

The following case studies will outline some of the issues that have been encountered in development of commuter and suburban intercity passenger rail routes in the Denver, Colorado; central New Mexico (Albuquerque to Santa Fe Corridor); Nashville, Tennessee; and Salt Lake City/Ogden, Utah, regions. The different steps taken by the implementing agencies in each of these regions is instructive in how differing project requirements result in alternative approaches and analysis to address specific needs.

DENVER FASTRACKS PLAN-COMMUTER RAIL CORRIDOR ELEMENTS (FIGURE 11)

Implementing Agency:	Denver Regional Transportation District (RTD)
Type of Agency:	Regional Transit Agency
State DOT Role:	Support role- provision of right-of-way (ROW), roadway access

Figure 11. Denver RTD Commuter Rail System.

Background/History

The Denver FasTracks Plan is a program to develop a comprehensive system of improved light rail transit, commuter rail, and bus rapid transit corridors for the Denver region approved by the voters in 2004. According to the most recent annual progress report of the RTD to the Denver Regional Council of Governments (dated December 2007), the FasTracks Plan original plan consisted of:

- nine rail corridors (new or extensions);
- one bus rapid transit (BRT) corridor;
- the redevelopment of the Denver Union Station (DUS) with associated yard and station improvements; and
- three maintenance facility projects: one each for light rail, commuter rail, and buses.

Current plans have replaced light rail with commuter rail in one of the corridors due to safety concerns raised by the Class I freight railroads in whose right-of-way the new line is to be operated. Each of the commuter rail corridors, in which state DOTs typically have involvement, are described in more detail below. Descriptions and statistics for each line are taken directly from the most recent report by the RTD to the Denver Regional Council of Government, dated December 2007 (*16*).

Description

The East Corridor (Figure 12) consists of 23.6 miles of double-track DUS to Denver International Airport. A significant change this year was the selection of Electric Multiple Unit (EMU) as the commuter rail technology in July 2007 and the selection of the East Corridor for FTA's Public-Private Partnership Pilot Program (Penta-P or P3). Public-private partnerships are a procurement delivery mechanism that allocates risks and rewards of project development among public agencies and private companies. The Penta-P project offers the opportunity for a streamlined and expedited project development process under the federal New Starts capital funding program. The East Corridor is scheduled for completion in 2014.

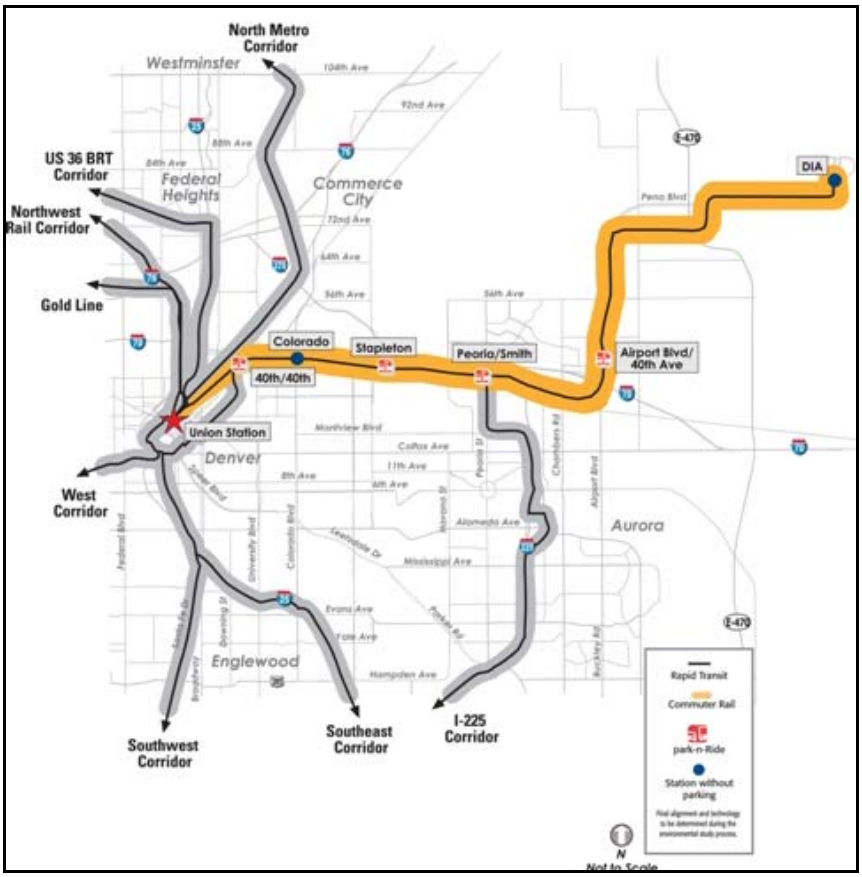

Figure 12. East Corridor.

Summary Statistics

- **Length:** 23.6 miles (1.5 miles from Denver Union Station to 40th at 40th are shared with the North Metro Corridor);
- **Mode:** Commuter Rail/EMU;
- **Costs:** $1,141.6 million—2007, Year of Expenditure (YOE)$; ($702.5 million—2006, YOE$);
- **Method of Delivery:** Design-Build-Finance-Operate-Maintain (DBFOM); P3;
- **Status:** Draft Environmental Impact Statement (EIS) in final review;
- **Tasks Remaining:** Final EIS; Record of Decision (ROD); P3 procurement; Design, Construction, Operation, and Maintenance; and
- **Scheduled Completion:** 2014.

Description

The Gold Line (Figure 13) is 11.2 miles of mostly double-track from DUS to Ward Road. A significant change in this corridor was to commuter rail technology, rather than light rail, which was originally planned. During the EIS process, the railroads expressed concerns regarding safety and the incompatibility of light rail with freight operations. As with the East Corridor, EMU was selected as the commuter rail technology on July 24, 2007. The Gold Line was also selected into the Penta-P Program by FTA.

Figure 13. Gold Line.

Summary Statistics

- **Length:** 11.2 miles (3 miles from DUS to Pecos are shared with the Northwest Rail Corridor);
- **Mode:** Commuter Rail/EMU;
- **Costs:** $552.5 million—2007, YOE$; ($463.2 million—2006, YOE$);
- **Method of Delivery:** DBFOM; P3;
- **Status:** Draft EIS in final review;
- **Tasks Remaining:** Final EIS; ROD; P3 procurement; Design, Construction, Operation, and Maintenance; and
- **Scheduled Completion:** 2015.

Description

The North Metro Corridor (Figure 14) begins at DUS and extends north 18 miles to 162nd Avenue. On October 16, 2007, Diesel Multiple Unit (DMU) was selected as the preferred technology for this commuter rail corridor. Also of note is the increase in budget from $437.7 million in 2006 (YOE$) to $637.2 million (YOE$) in 2007. This almost $200 million dollar increase was due to the need for additional retaining walls and structures, a change in the alignment to avoid the Sand Creek Junction (a junction of the Union Pacific and the Burlington Northern-Santa Fe railroads), and increased utility relocation and environmental mitigation costs along the planned route.

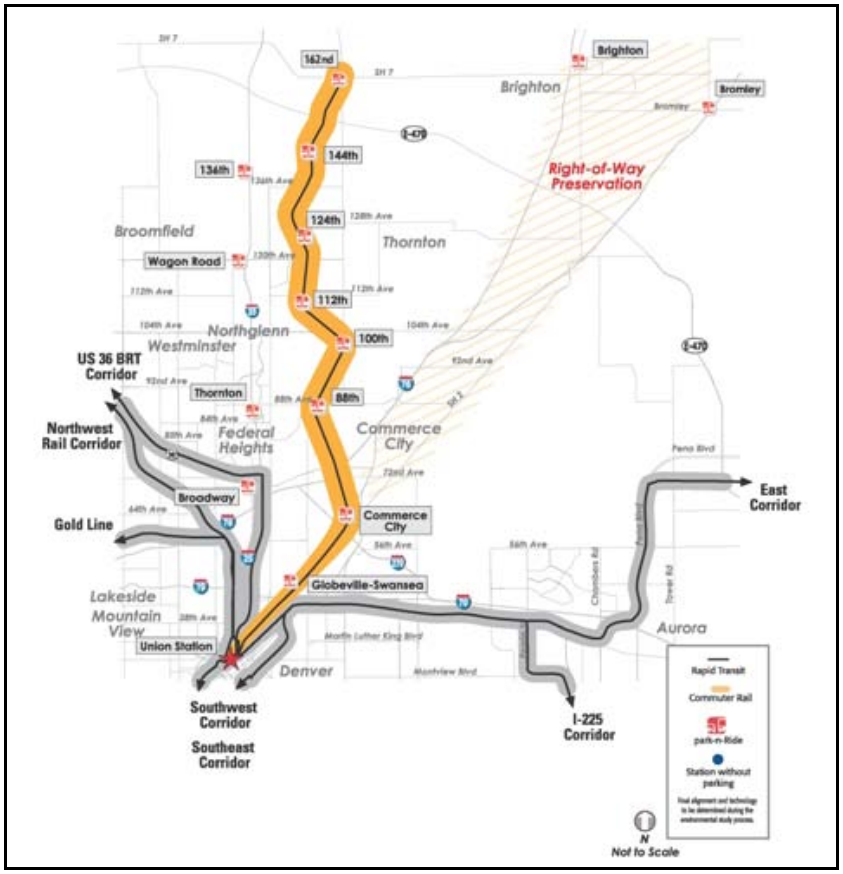

Figure 14. North Metro Corridor.

Summary Statistics

- **Length:** 18 miles (1.5 miles from DUS to 40th at 40th are shared with the North Metro Corridor);
- **Mode:** Commuter Rail/DMU;
- **Costs:** $637.2 million—2007, YOE$; ($437.7 million—2006, YOE$);
- **Method of Delivery:** Design-Bid-Build;
- **Status:** The Draft EIS, which was initiated in August 2006, has progressed through scoping, station planning, preferred technology screening, selection, and adoption by the RTD Board of a preferred vehicle technology. The alternatives analysis is now underway and release of the Draft EIS for public comment was available for public review in June 2009;
- **Tasks Remaining:** Completion of Draft EIS; Final EIS; obtaining a ROD; Final Design; Construction; Operation and Maintenance; and
- **Scheduled Completion:** 2015.

Description

The Northwest Rail Corridor (Figure 15) consists of 41 miles of commuter rail (DMU) that originates at DUS and extends northwest to downtown Longmont. Significant changes that have occurred in 2007 on this corridor include extending the corridor to downtown Longmont (additional 2.9 miles) and the selection of DMU as the preferred alternative for commuter rail technology. The corridor was extended from the original end-of-line station at Twin Peaks Mall. This location was problematic due to upgrades that would be required to the surrounding roadway network to satisfy traffic concerns. The extension to 1st and Terry Streets was found to be cost-neutral when compared against the roadway upgrades that would have been required in the vicinity of Twin Peaks Mall. Increased costs of $118.4 million over the original FasTracks budget resulted from:

- the decision to extend the line from the original Twin Peaks terminus to downtown Longmont;
- the change from a trench to a flyover at Utah Junction;
- the need to consider additional requirements for pedestrian bridges at stations;
- the need for additional wetlands impact mitigation; and
- other changes.

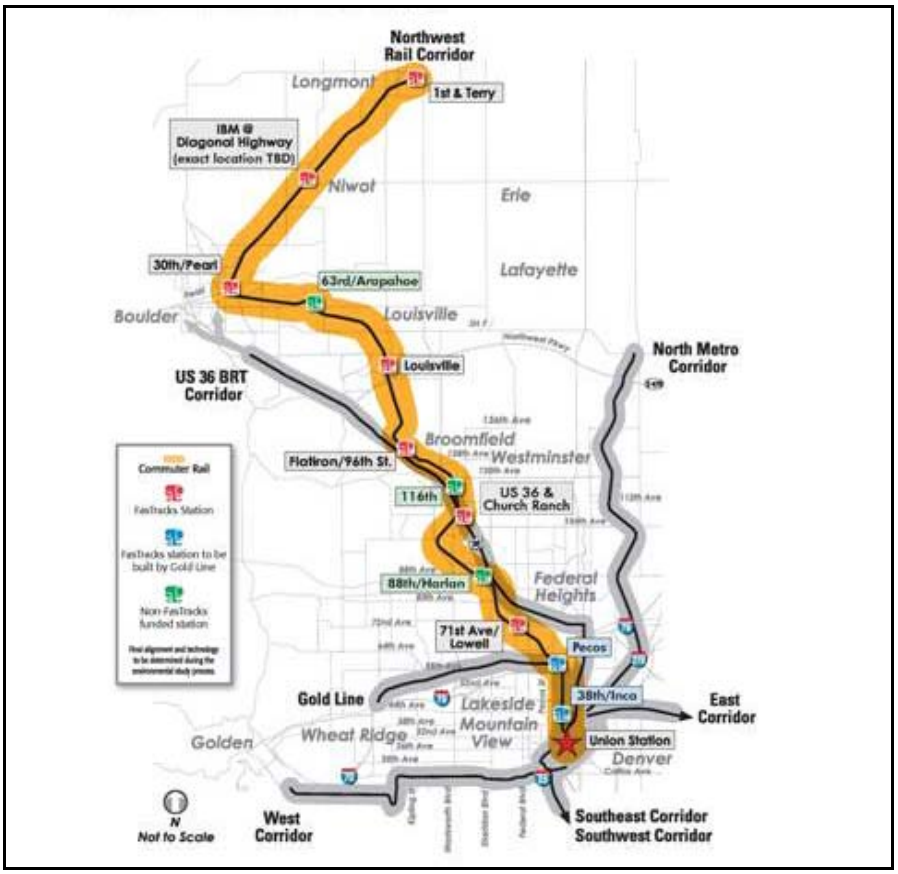

Figure 15. Northwest Rail Corridor.

Summary Statistics

- **Length:** 41 miles (3 miles from DUS to Pecos are shared with the Northwest Rail Corridor);
- **Mode:** Commuter Rail/DMU;
- **Costs:** $684.4 million—2007, YOE$; ($566.0 million—2006, YOE$);
- **Method of Delivery:** Design-Bid-Build;
- **Status:** Environmental Evaluation and Preliminary Engineering underway (to be completed end of 2009);
- **Tasks Remaining:** Final Design and Construction; Operation and Maintenance; and
- **Scheduled Completion:** 2014.

Involvement of State DOT

The involvement of the Colorado Department of Transportation (CDOT) in the commuter rail components of the FasTracks plan is very limited at this stage due to the strong involvement of the regional transit district staff and the funding methodologies being considered for the commuter rail lines. Because the RTD has a history of receiving funds directly from the FTA on past projects and is participating in the new FTA Penta-P program, it is likely that the federal funds will continue to flow directly from the federal government to the RTD, requiring minimal oversight by the state DOT. CDOT is

involved with planning the locations where commuter rail corridors will cross state and federal system highways.

Although CDOT is not directly involved in the commuter rail aspects of the FasTracks plan, there is a role for CDOT in several other aspects of the FasTracks plan. For example, CDOT is involved in several of the corridor plans that require ROW along existing and/or planned highway infrastructure such as the proposed light rail transit service along I-225 east of the Denver area and in the proposed bus rapid transit (BRT) route along U.S. 36. CDOT's role could include purchase or donation of ROW along with funding of some other infrastructure capital improvements such as station access to stations located in the median of the existing roadway. Both BRT and LRT are more likely to be compatible with existing highway rights of way as compared to placement of these modes in existing freight rail rights of way. The current FRA and FTA safety rules prohibit the use of either LRT or BRT in existing rail corridors or shared ROW when operating at the same time periods.

Cost escalations for rail construction materials and difficulty in negotiating ROW usage and/or purchase from UP caused several problems during the period covered by this research project. Costs of rail materials and construction estimates were much higher than those anticipated when the project was first approved by the voters in 2004. Just as railroad opposition to locating LRT or BRT in its ROW resulted in the RTD changing the Gold Line to commuter rail, rising costs forced RTD to re-evaluate all of the proposed modes for each of its lines. Some lines may be converted from locomotive-hauled commuter rail to electric commuter rail based upon these new calculations. Additionally, phasing and construction of the project may be delayed or scaled-back to deal with the funding shortfalls (*12*).

Lessons for TxDOT

While commuter rail may be considered the most likely mode in which the state DOT would have a large role, in some large metropolitan areas with advanced, multimodal transit planning, such as the Denver FasTracks Plan, the state DOT's role may be more a support role than an active, developmental one. Large urban areas with established transit agencies or regional transit districts may be more likely to receive direct federal funding or use their own funding for rail project construction and turn to the state DOT for other types of assistance. Examples of this would be assistance in acquiring ROW or providing roadway access to new stations, especially when those stations are in close proximity to existing state or federal highway routes.

NASHVILLE MUSIC CITY STAR

Implementing Agency:	Nashville Regional Transportation Authority (RTA)
Type of Agency:	Regional Transportation Authority/Metropolitan Transit Agency
State DOT Role:	Support role- provision of matching funds for capital grant and some initial operating support, working in partnership with RTA and other local agencies

Background/History

The current Music City Star commuter service (Figure 16) is the first of five planned commuter rail lines for the Nashville, Tennessee, urban area. The five corridors that are planned to link to downtown Nashville according to the 2003 Tennessee Rail Plan are:

- Northeast: Briley Parkway-Hendersonville-Gallatin;
- East: Hermitage-Mt. Juliet-Lebanon;
- Southeast: Hickory Hollow-LaVergne-Smyrna-Murfreesboro;
- South: Brentwood-Cool Springs-Franklin; and
- West: Belle Meade-Bellevue-Kingston Springs (*18*).

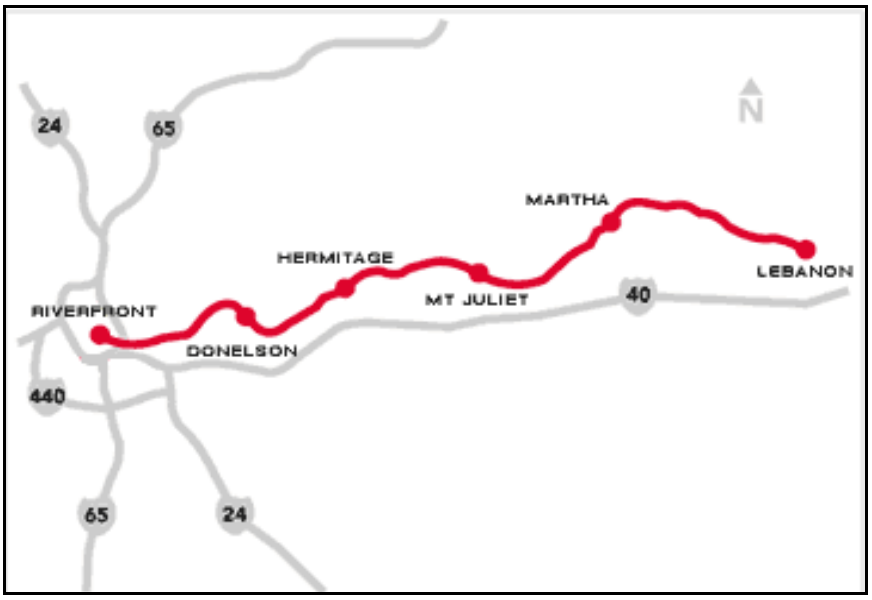

Figure 16. Nashville RTA Commuter Rail Map.

A sixth corridor to the north of Nashville into Robertson County is now also listed in RTA's plans (*14*).

The 32-mile East Corridor was along an existing, publicly owned rail ROW, greatly reducing the construction costs and time to implement commuter rail in this corridor. These favorable circumstances were primary reasons that the East Corridor was selected to be the first project developed.

The train operates over the tracks of the Nashville and Eastern Railroad, which had to be upgraded from Track Class 2 (25 mph operations) for freight trains to Track Class 4 (up to 79 mph) operations for passenger rail operations including the addition of Centralized Traffic Control railroad signaling. The budget for the project was limited from the beginning, resulting in a series of cost-saving decisions regarding the commuter rail technology to be used and the system features upon start-up. Operations began in September 2006 (*20*).

Summary Statistics

- **Length:** 31.2 miles;
- **Mode:** Commuter Rail/Locomotive-hauled coaches;
- **Cost:** $40 million; and
- **Status:** Operational since September 2006.

Involvement of State DOT

The Tennessee Department of Transportation (TDOT) served a financial support role in this project. The project received a federal grant of $40 million dollars that had to be matched at an 80 percent federal/20 percent local basis. The 80 percent federal share of the project cost ($30.1 million) consisted of 61 percent FTA New Starts fixed guideway discretionary grant funding and 19 percent Federal Highway Administration Surface Transportation Program grant funding. The remaining 20 percent match of $7.5 million was to be provided by TDOT ($3.7 million or 10 percent) and by the local jurisdictions ($3.7 million or 10 percent). Local jurisdictions consist of Davidson (through the Metropolitan Government of Nashville-Davidson County) and Wilson Counties, Mt. Juliet, Lebanon, and the Nashville and Eastern Railroad Authority (*21*).

In addition to providing half of the 20 percent matching funds, TDOT also was to provide cash flow assistance through initial operating funding at the rate of $0.94 per passenger mile that were taken into account in the RTA's operations and maintenance funding plan (*22*). TDOT also provided analytical support as a member of the RTA board. An example of such support was TDOT's funding of studies to analyze the financial risks that both TDOT and RTA were taking in implementing the initial commuter rail corridor in the Nashville area.

In spite of extensive financial and operational studies, the Music City Star commuter rail project came to a financial crisis in the summer of 2008 following lower than projected ridership and higher than expected operating costs. These aspects have been primarily attributed to the lack of a downtown terminal near workplaces in the CBD and to unanticipated rises in fuel costs, among other factors, respectively. A state comptroller report was highly critical of the financial practices of the Nashville RTA and noted a shortfall of approximately $1.7 million.

TDOT's interest in protecting its prior investments in the commuter rail line and its motivation to see it succeed resulted in TDOT granting an additional $1 million to the project. Ultimately the management and operation of the Music City Star were transferred to the leadership team of the Nashville-area Metropolitan Transit Agency (MTA)—the operator of Nashville's urban bus transit system—for a three-year period while more stable funding is identified for the RTA. This arrangement was adopted on October 23, 2008, to be effective December 1, 2008 (*18*). While the MTA leadership team will take over day-to-day operations, the RTA board will stay in place. Potential sources for providing the remaining funds to address the shortfall have been an increase in the gas tax, an increase in vehicle registration or driver license fees or an alcohol tax. The funding question will be addressed in the next state legislative session (*19*).

Lessons for TxDOT

One of the most vital roles that a state DOT can play in helping a transit agency begin commuter rail service is the provision of capital and/or operating funds. In this case, TDOT provided 10 percent or one-half of the 20 percent match to the federal grants for this project. Because the overall capital costs were fixed from the beginning, TDOT could know with certainty what its costs would be in this case. If similar opportunities presented themselves in Texas, TxDOT could use its available funding to allow a regional transit agency to implement its project without having to invest the entire capital cost for the system. Limited initial operating support could also give a commuter rail project the boost that it needs to become successful, allowing those funds to be reduced and diverted to another worthy project elsewhere in the state. Program coordination as a partner with local agencies and funding of analytical studies is also another important role that could be played by the state DOT. Lessons from the financial crisis and its management suggest the importance of accurate ridership and revenue estimates before state funds are committed. The importance of having a stable funding source is also reiterated.

NEW MEXICO RAILRUNNER

Implementing Agency:	Mid-Region Council of Governments (MRCOG) and New Mexico Department of Transportation
Type of Agency:	Regional COG/State Department of Transportation Regional Transit Agency
State DOT Role:	Direct state funding for capital and operational support**;** Provide acquisition and project management oversight; and Coordinate purchase of existing rail ROW for Phase I (Figure 17) and use of I-25 median for Phase II (Figure 18).

Figure 17. New Mexico RailRunner Map-Phase I.

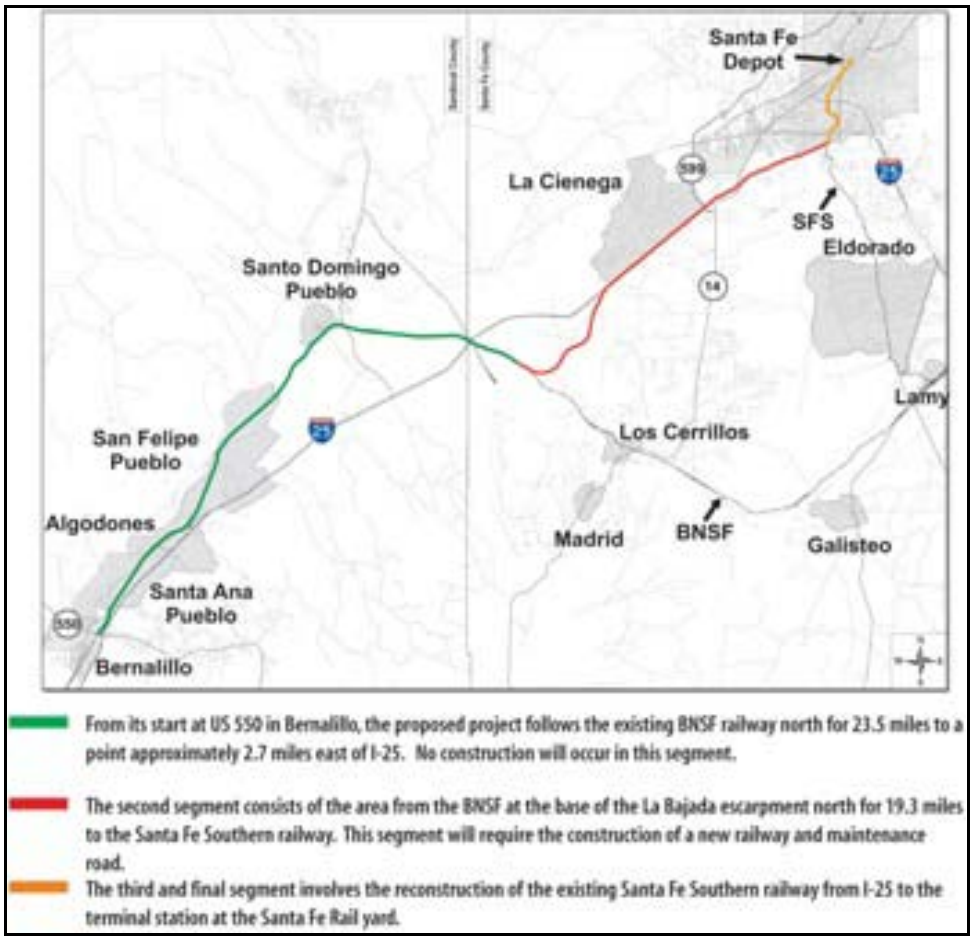

Figure 18. RailRunner Map-Phase II.

Background/History

This project is of specific interest due to its rapid implementation and the role that the state DOT played in its development at the direction of the state's governor. In August 2003, Governor Bill Richardson announced that his administration was going to pursue the implementation of commuter rail in the Belen to Santa Fe, New Mexico, corridor (*20*). This corridor between the Albuquerque and Santa Fe urban areas was selected for commuter rail due to the following reasons (*21*):

- I-25 is the only major highway connecting the two urban areas.
- The 2005 traffic level of 38,000 vehicles per day is expected to grow to 80,000 vehicles per day by 2030 between the urban areas.
- Travel times are expected to increase from 75 minutes to 112 minutes between the urban centers if nothing is done.
- There is a high percentage of work commuter and tourist traffic in the corridor.
- Commuter rail costs are projected to be much less than driving between the two urban areas.
- Commuter rail provides reliable travel times that are unaffected by weather or accidents.

The Governor's Office provided the New Mexico Department of Transportation (NMDOT) and Mid-Region COG (MRCOG) with grants of $1 million to start implementation of the project prior to a special session of the New Mexico Legislature in September 2003 that passed House Bill 15 funding this project and several others. In total, the transportation improvements bill, now know as Governor Richardson's Investment Partnership (GRIP), is a $1.6 billion package in total (*20*).

MRCOG and NMDOT subsequently developed a two-phase implementation plan with Phase I extending from Belen (south of Albuquerque) to Bernalillo and Phase II from Bernalillo to Santa Fe. The project began limited operations on Phase I in July 2006 and over the entire Phase I Corridor by mid-2007. Phase II was completed and operational in December 2008 (*25*). This rapid implementation was made possible due to the joint efforts of MRCOG and NMDOT who partnered in many aspects of acquisition (rail line, ROW, rolling stock, etc.), safety (crossing improvements, signal upgrades, etc.), and public awareness campaigns (public meetings, signage, etc.) The involvement of the state DOT will be described further below. The rapidity of completing the project was also a result of the state and project managers choosing not to seek federal funding assistance for the initial capital expenses.

Summary Statistics

- **Length:** Phase I: 51 miles Phase II: 48 miles Additional rail to CO state line purchased by state: 170 miles;
- **Mode:** Commuter Rail/Locomotive-hauled passenger coaches;
- **Costs:** Phase I: $75 million Phase II: $250 million (est.);
- **Status:** Phase I began operations in July 2006, Phase II under construction;
- **Tasks Remaining:** Completion of Phase II to Santa Fe; and
- **Scheduled Completion:** Phase II scheduled to begin operations by December 2008.

Involvement of State DOT

The involvement of the New Mexico Department of Transportation (NMDOT) in this project is substantial. While the MRCOG is the designated lead agency, the NMDOT, acting on behalf of the state, has been instrumental in seeing the initial phases of this project come to fruition. NMDOT's primary role has been to assist by issuing joint Requests for Proposals with MRCOG for acquisition of necessary services and capital purchases such as an operations contractor, rolling stock purchasing consultant (locomotives and passenger coaches), and contractors to construct needed track improvements.

NMDOT was also key in applying funds from the state transportation investment bill, the GRIP, to project elements. NMDOT was at the forefront of negotiations between the MRCOG and the Burlington Northern Santa Fe Railway (BNSF) that resulted in the decision for the state to purchase the underutilized line over which the service is to operate from the BNSF rather than the state purchasing capacity to operate over the freight line. As a result, the state now controls the operations and sets priorities over the line with BNSF freight train operations as a tenant of the state. NMDOT is also choosing

to direct a portion of the CMAQ funding that it receives from FHWA and distribute to MRCOG on an annual basis to support operational costs of the RailRunner.

After a series of negotiations over a two-year period, the State of New Mexico was able to arrange for the purchase of the entire BNSF line from Belen to the Colorado state line for a total of $75 million. Two of the three closings necessary for this transaction have been completed–$50 million for the segment (including adjoining ROW and spur tracks) from Belen to Bernalillo and $20 million for the segment from Bernalillo to Lamy. The remaining $5 million closing is scheduled for December 2008 to purchase the section from Lamy to the Colorado state line. Specific maintenance and dispatch procedures are in place for each section and have been included in the agreement between the state and BNSF (*20*). This cost equates to an average cost of approximately $250,000 per mile for the track on this project as compared to a cost of well over $1 million per mile for new track construction in rural areas and in the tens of millions of dollars per mile for track in urban areas. State ownership also resulted in a reduced cost of track improvements from approximately $30 million to approximately $10 million, due to the state having less stringent requirements.

In addition to funding and acquisition assistance, NMDOT also participated in public awareness events, grade crossing safety improvements, local first responder emergency training events, and provided additional signage around the stations. NMDOT, acting on behalf of the state, was very successful in seeing Phase I through to completion in record time.

Now NMDOT and MRCOG then turned their sights to Phase II, which is estimated to cost approximately $250 million. This phase follows the existing tracks to a point 23.5 miles north of Bernalillo where new tracks transitioning into the median of I-25 were built in order to more directly serve the Santa Fe urban area. The final segment involved reconstruction of the existing Santa Fe Southern railway to the terminal station at the Santa Fe railyard (*25*). NMDOT has played a vital role in allowing for the design of this phase of the project to use existing highway ROW by coordinating its use with the FHWA and developing access plans in and around stations located within the I-25 ROW. Throughout the alternatives analysis, NMDOT has worked cooperatively with MRCOG to investigate and select the route included in these final plans. This project phase was completed in December 2008. The state is purchasing the remaining portion of the BNSF line from Lamy to the Colorado state line, largely to preserve the line for future use. No commuter rail projects are currently being planned along the line north of Santa Fe.

Lessons for TxDOT

The State of Texas and TxDOT, in particular, can learn much from the aggressive steps taken to successfully implement of commuter rail service by NMDOT and its partners between the Albuquerque and Santa Fe urban areas. TxDOT must also be aware, however, because special conditions existed in the New Mexico situation that may not apply in Texas. For example, the existing freight rail line that connected the two cities was a line that was underutilized by the BNSF Railway following its merger in 1995. BNSF's emphasis had turned to east-west movement along its transcontinental route

through New Mexico with many fewer trains operating north-south along the line that was desired for commuter rail service. As a result of negotiations with the railroad, the best possible solution for both parties became state purchase and ownership of the line with the BNSF freight rail operations remaining as a tenant on the line.

While the idea of state ownership with tenant freight rail service is certainly one that must be explored, the amount of freight traffic along the lines connecting major urban areas in Texas would indicate that it would be much more difficult to get a Class I railroad to sell its track and ROW between urban areas. An exception to this may be on the fringes of large urban areas where operations may be consolidated; however, most of the intercity routes in Texas would be too costly for the state to purchase outright. The fact that the state and the railroad negotiated openly and in good faith to reach the most effective solution should be a part of future railroad negotiations by TxDOT.

This case study also points out that the state DOT can work cooperatively with local MPOs, in this case a Council of Governments, to carry out the objectives of a statewide, legislatively mandated program of transportation improvements. NMDOT's application of funding (as originally directed by an executive order and later enabled by appropriated funds) resulted in implementation of this project in record time. Use of existing DOT connections and processes to streamline acquisition of rolling stock, perform necessary studies, and carry out public involvement activities should also be exemplary to TxDOT.

UTAH TRANSIT AUTHORITY FRONTRUNNER NORTH PROJECT

Implementing Agency:	Utah Transit Authority (UTA)
Type of Agency:	Regional Transportation Authority
State DOT Role:	Support role- assisted regional authority in advance ROW purchases and preservation, provision of transportation corridor ROW revolving fund

Background/History

The UTA FrontRunner (Figure 19) project began construction in 2006 following the approval of a U.S. DOT Fully Funded Grant Agreement to the UTA for $486 million (80 percent federal share of the total estimated cost of $581 million) (*27*). The line goes north-south between Pleasant View/Ogden and Salt Lake City. The line runs mainly along the UP freight rail right-of-way. UTA negotiated the purchase of some UP trackage and adjacent ROW in the corridor north and south of Salt Lake City in 2002 following UP's merger with Southern Pacific. Additional ROW along the track was also purchased by the public sector and held until construction funding could be secured. UTA constructed 38 miles of new track in the adjacent ROW. UP and the FrontRunner share track between Ogden and Pleasant View. Operations between Ogden and Salt Lake City began in May 2008 with the last six miles between Ogden and Pleasant View being operated by bus until October when rail service was begun (*28*).

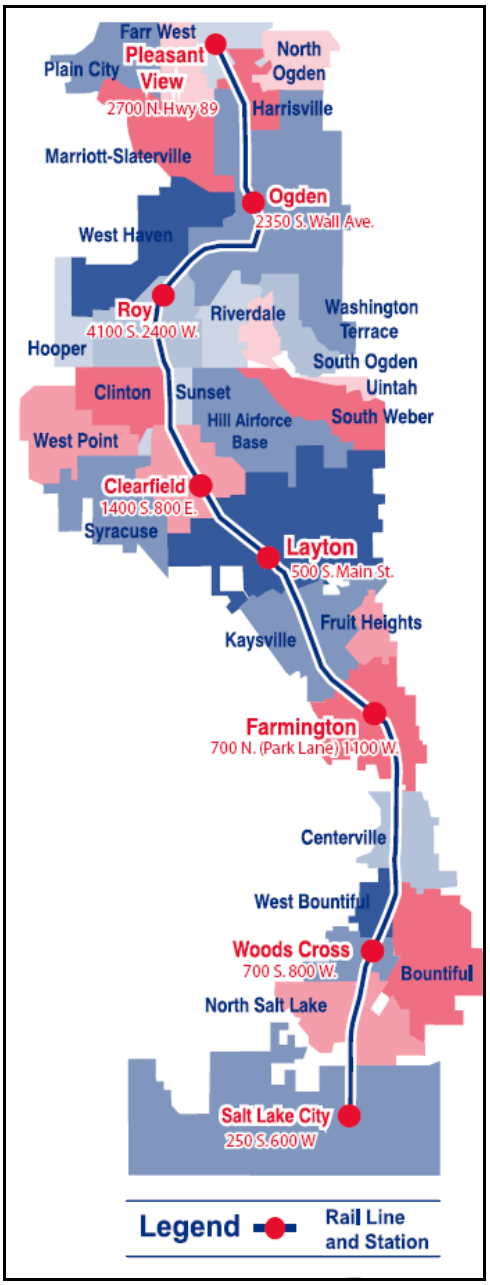

Figure 19. UTA FrontRunner Map.

Summary Statistics

- **Length:** 44 miles in northern segment (additional southern route planned as second phase);
- **Mode:** Commuter Rail/Locomotive-hauled coaches;
- **Cost:** $581 million; and
- **Status:** 38 mile start-up segment operational since May 2008; final six miles on northern end became operational October 2008.

Involvement of State DOT

The involvement of the Utah Department of Transportation (UDOT) in the UTA FrontRunner project was largely limited to acting in a support role for the regional transit agency. The UTA had previously been successful in dealing with the UP to purchase excess post-merger rail lines in construction of its light rail service within Salt Lake City. In this case, the UTA wanted to work out an agreement with the UP to build itself an additional track in the ROW alongside the existing rail line. UDOT's role was largely its assistance in helping UTA to acquire and hold the ROW while planning and federal funding commitments could be secured. UDOT also supported the efforts to pass and enacted provisions of Utah legislation to create a Corridor Preservation Advisory Council and a Transportation Corridor Revolving Loan Fund (*29*).

Lessons for TxDOT

In large cities where the regional transportation authority or local transportation agency has a history of purchasing existing rail lines or working directly with the railroads, it may be best for the state DOT to allow the local agency to continue in this role. The DOT can assist by administering funding programs authorized by the legislature or assisting with advance ROW acquisition. Preserving these corridors for some time period may be necessary in order to allow time for a project to advance and/or receive funding from a federal program such as the New Starts program or another funding source.

SECTION 6: LIGHT AND COMMUTER RAIL IN TEXAS

Metropolitan Planning Organizations (MPOs) are required by state and federal law to plan for transportation facilities and services within their urban areas. This includes light and commuter rail projects developed by local transit authorities. The MPO planning process requires the development and adoption of a long-range metropolitan transportation plan for each urban area, prioritization of transportation projects in the plan, and that specific funding sources and dollar amounts be identified from known, available revenues. These prioritized projects are contained in the Transportation Improvement Program adopted by each MPO and forwarded to the state for inclusion in its State Transportation Improvement Program (STIP).

TxDOT districts work closely with the state's MPOs and transit authorities to coordinate projects within each metropolitan area. The primary functions of both TxDOT district personnel and local and regional government agencies involved with rail planning are to monitor local rail transportation needs and, when necessary, initiate rail development projects by either working directly with the railroad or contacting the TxDOT district or division rail planning staff for assistance and/or guidance.

EXISTING AND PROPOSED COMMUTER RAIL SYSTEMS

Passenger rail service in Texas is currently provided at the regional/intercity level by the National Railroad Passenger Corporation (Amtrak) and at the commuter level by Dallas Area Rapid Transit (DART) and Fort Worth Transportation Authority (the "T"). There are also two light rail systems owned and operated by transit agencies in the Dallas-Fort Worth and Houston urban areas. The existing and proposed light and commuter rails are briefly described below.

Trinity Railway Express—Dallas and Fort Worth

The Trinity Railway Express (TRE) commuter rail service is a service provided by DART and the "T." The map in Figure 20 shows the TRE system. Phase one of the TRE (10 miles) was opened in December 1996, providing service between Dallas and Irving. The system now covers approximately 35 miles serving nine permanent stations and one special event station at the American Airlines Center sports arena.

The TRE represents one of the most significant joint services between the two largest metroplex cities. The lines were sold by Union Pacific and could provide links to Denton, Sherman, and Rockwall. DART has no current plans to extend service to these locations, but maintaining the option to expand their network will become increasingly important as the metroplex continues to grow. DART already owns lines to Duncanville, Fort Worth, and Wylie. The lines run parallel to major roadways in the region (I-35, U.S. 75, and I-30) and commuter rail may someday be an option for expanding capacity along these corridors.

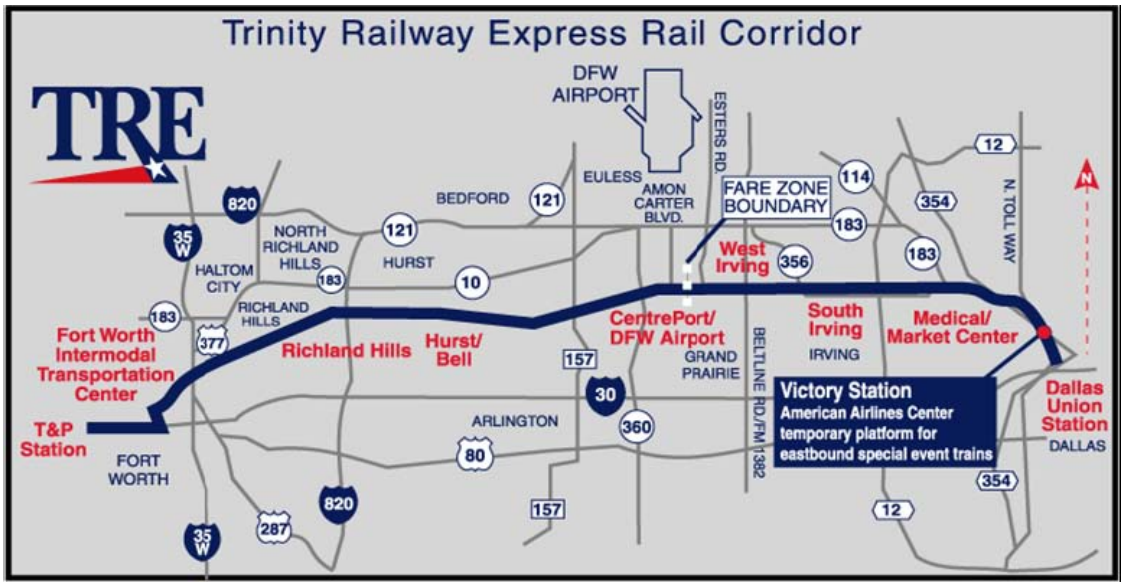

Figure 20. Trinity Railway Express Route Map.

Commuter and Light Rail Planning in the NCTCOG Area

The North Central Texas Council of Governments (NCTCOG) has been extremely active in the past several years in planning for the expansion of its existing light and commuter rail systems to provide additional transportation options to address the rapid population growth expected in the area between now and 2030. In late 2004, the NCTCOG *Regional Rail Corridor Study* was completed (30). This study identified 10 potential rail corridors that could be developed. A map of these corridors is shown in Figure 21. Most of these corridors follow existing rail rights of way in the DFW area or abandoned freight rail rights of way that may have been acquired by the public sector.

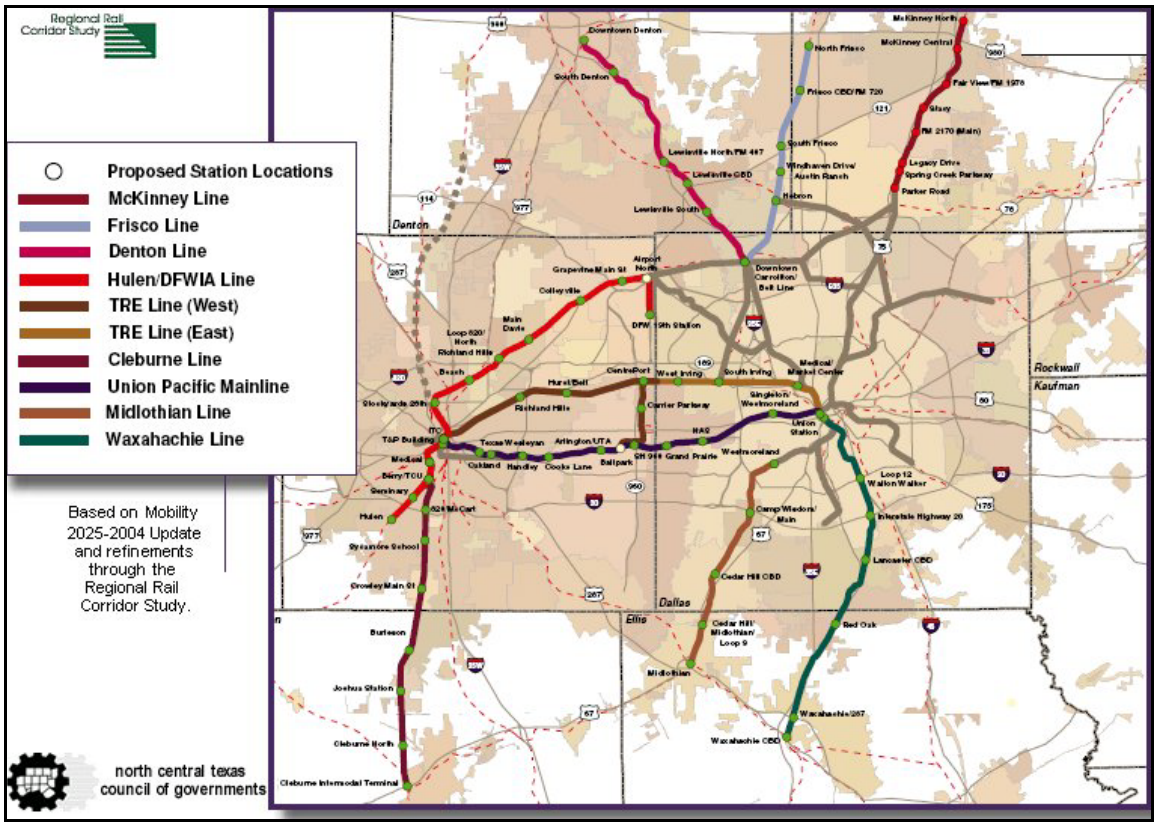

Figure 21. Corridors Identified by the 2004 NCTCOG Regional Rail Corridor Study.

Since Dallas, Fort Worth, and Denton had already created transit agencies that were using some or all of the one cent tax per dollar allotted to transit from the general sales tax, it quickly became apparent that funding the development of such an expansive passenger rail network would require a new funding source or additional capacity to expand the sales tax beyond the statutory 8.5 percent limit in those areas. Other regional cities were also at the sales tax limit; however, their sales tax funding was already committed to economic development or other designated uses. Attempts by local leaders within the DFW area to raise the sales tax limit for the region for the specific purpose of transit improvements in both the 2005 and 2007 legislative sessions failed. As a result, a new approach was being attempted in the 2009 Texas Legislature when this report was submitted.

Originally, the NCTCOG put forth the *Rail North Texas* plan as a means to seek several additional avenues to fund rail service expansion in the NCTCOG area. A map of the Rail North Texas corridors under consideration for passenger rail is shown in Figure 22. It shows that several additional corridors in addition to those identified in the previous *Regional Rail Corridor Study* are currently being assessed for future rail service. The map also shows that while some of the corridors have identified funding, there are still approximately 251 miles of corridor that do not have a funding source and are in danger of being dropped.

The *Rail North Texas* proposal includes a menu of funding options (i.e., new citizen impact fees, auto registration fees, taxes, etc.) that would have to be approved by each local municipality by a vote before adoption. At the time of this report, the proposal is still under consideration by the legislature and has been changed in name to the "Texas Local Option Transportation Act" since several other large urban regions in the state have expressed support for the initiative. Much like toll road funding, creative approaches such as the Rail North Texas plan will need to be put in place in order for passenger rail system development to continue.

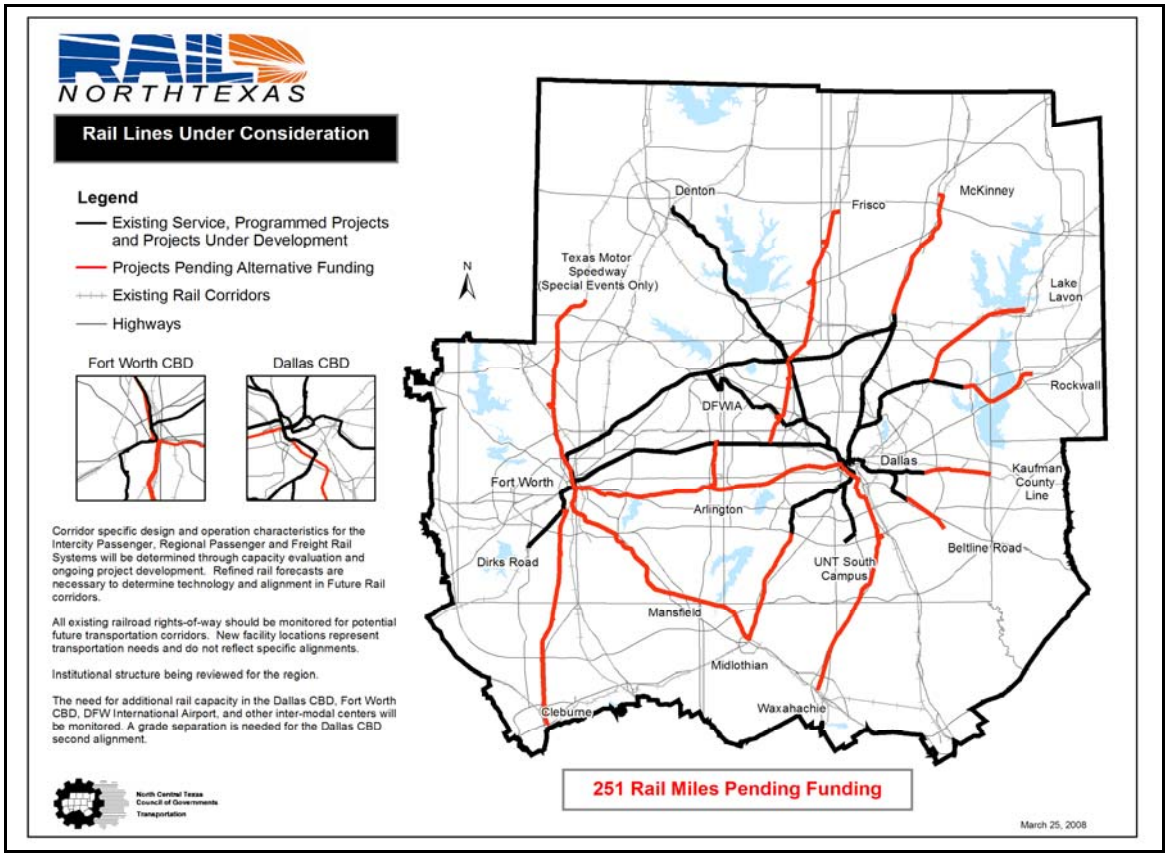

Figure 22. Map of NCTCOG *Rail North Texas* Rail Lines under Consideration.

Austin-San Antonio Intermunicipal Commuter Rail District

In 1997, the 75th Texas Legislature passed a law allowing the creation of an "intermunicipal commuter rail district" to study and, if desired, create and operate a commuter rail system in the corridor between Austin and San Antonio. The legislation allowed a Commuter Rail District to be formed if the cities of Austin and San Antonio as well as Travis and Bexar Counties adopted resolutions calling for district formation.

Other cities and counties along the route were also permitted to join the district. In 1999, an initial feasibility study concluded that commuter rail in the corridor was both technically and financially feasible based upon the premise that construction of a second mainline track would be constructed for the commuter rail service in the existing Union Pacific freight rail right of way. The estimated cost for this route and configuration was $475 million in 1998 dollars *(31)*.

The Austin-San Antonio Intermunicipal Commuter Rail District (ASA-ICRD) was formed in November 2002 with a 14-member board representing regional transportation planning entities. The federal government provided $5.625 million in funding for preliminary engineering and planning studies along the corridor and to update the 1999 feasibility study in order to reflect current regional desires on how best to develop such a system (Figure 23).

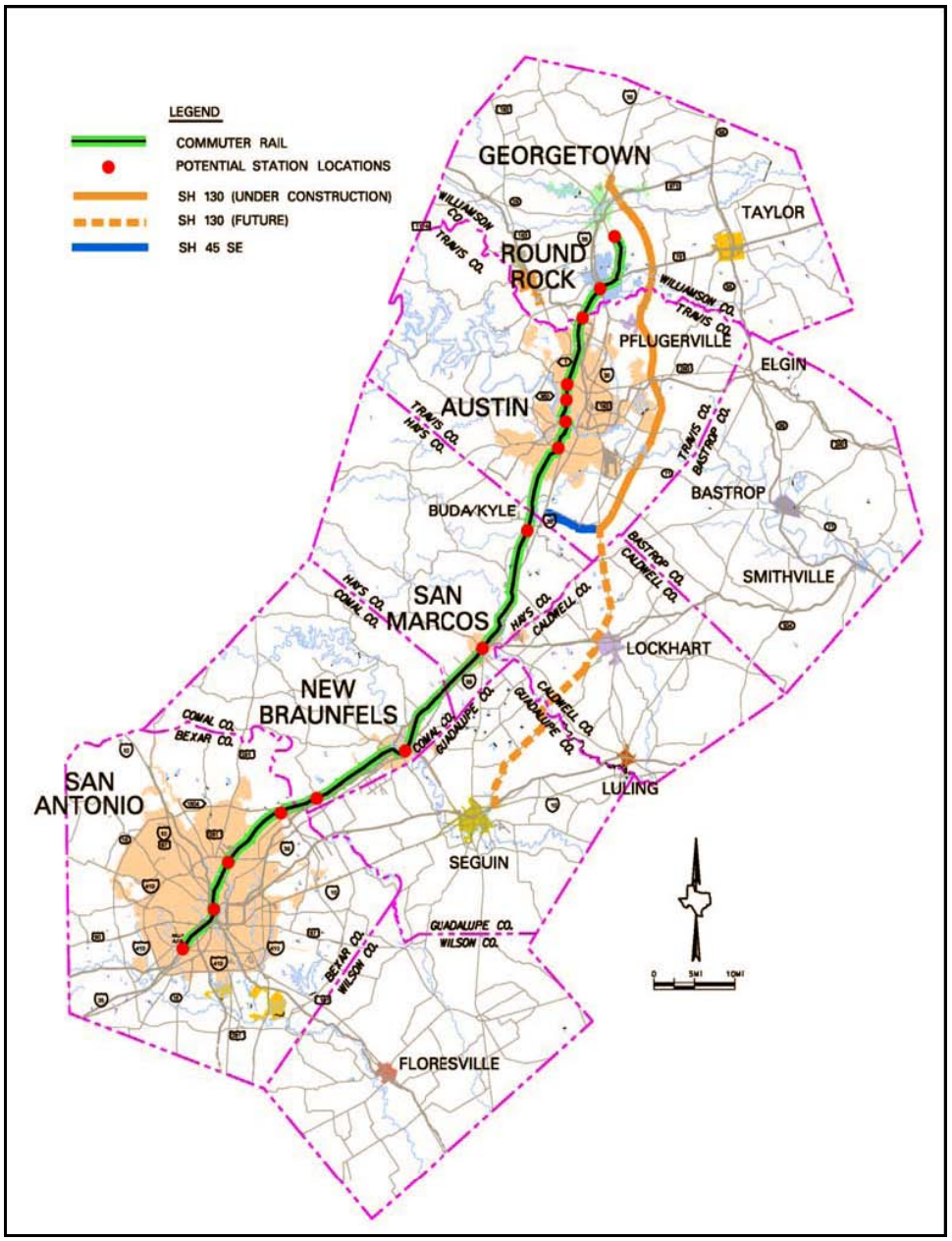

Figure 23. The Austin-San Antonio Intermunicipal Commuter Rail District.

Both the Capital Area Metropolitan Planning Organization (CAMPO) and the San Antonio-Bexar County Metropolitan Transportation Planning Organization have included consideration of a commuter rail system between Austin and San Antonio as a component of their 2025 long-range transportation plans and have approved the locally preferred alternative presented by the ASA-ICRD. Consultants for the ASA-ICRD updated the feasibility study in 2004 and are preparing the necessary planning and preliminary engineering documentation in order to submit a New Starts application to the Federal Transit Administration.

Capital Metro's Urban Commuter Rail Line

In November 2004, Capital Metro received voter approval to develop a commuter rail line in the Austin metropolitan area (Figure 24). The Urban Commuter rail line is part of Capital Metro's "All Systems Go" transit projects, a long-range vision for the region that combines rail and bus solutions to address the area's transportation challenges. The urban commuter rail service will initially operate on Capital Metro's existing 32-mile Northwest Line. Capital Metro sought public input to the All Systems Go plan prior to the voter referendum, and is coordinating planning, facilities, and services with TxDOT, the Austin San Antonio Intermunicipal Commuter Rail District, and the Central Texas Regional Mobility Authority.

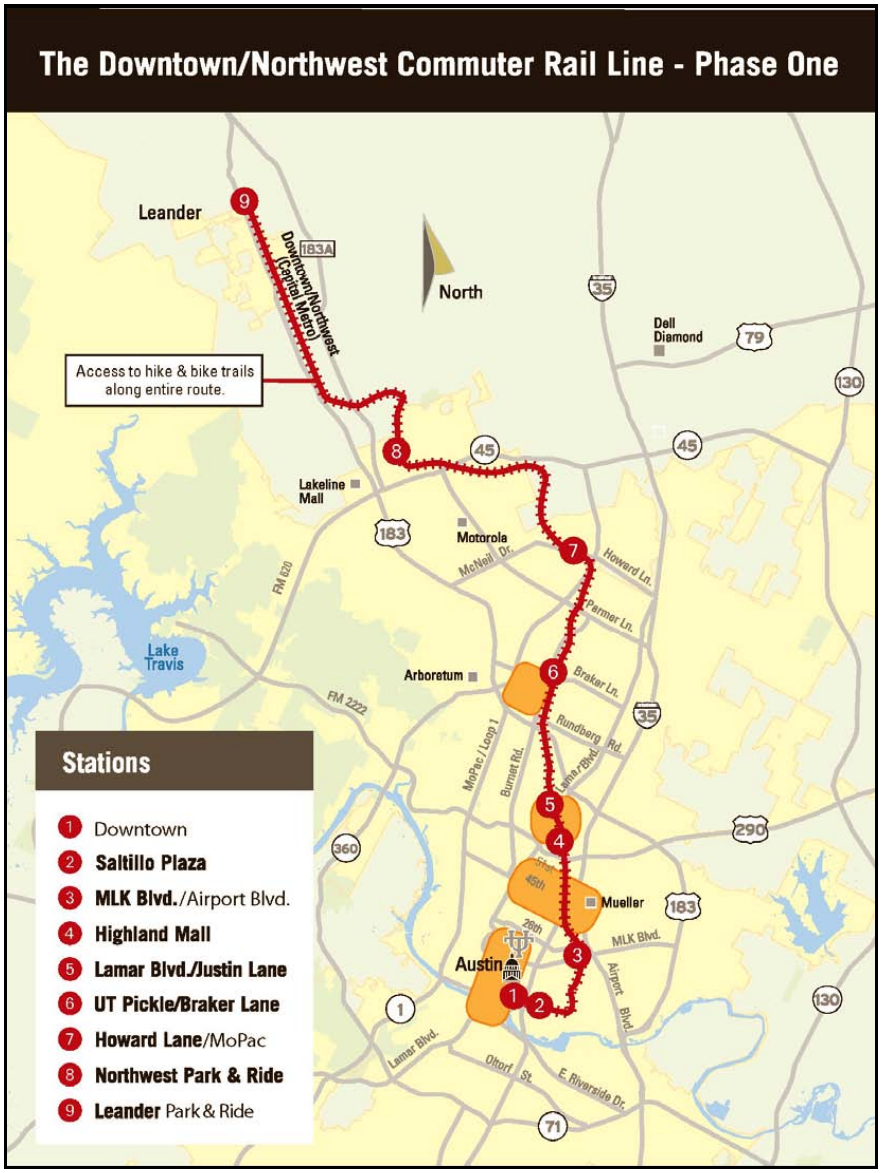

Figure 24. Capital Metro Commuter Rail Line.

Houston-Rosenberg Commuter Rail Feasibility Study

The Houston-Galveston Area Council (H-GAC), in cooperation with the TxDOT Houston District and Transportation Planning and Programming Division initiated a commuter rail feasibility study along the U.S. 90A Corridor, which travels from Houston into Fort Bend County through the cities of Stafford, Missouri City, Sugar Land, Richmond, and Rosenberg. The eastern end of the study corridor could link-up with the southern end of Harris County Metropolitan Transit Authority's METRORail light rail project near the Astrodome and Reliant Stadium. This corridor has seen dramatic increases in congestion over the past decade, with average vehicle speeds in the afternoon averaging around 15 mph. The study was completed in April 2004 and discusses the feasibility of five alternatives to implement commuter rail services on UP's "Sunset Route" between Houston and Rosenberg, which generally parallels U.S. 90A.

Harris County Commuter Rail Analyses

The TxDOT Houston District commissioned a major investment study (MIS) for the U.S. 290 Corridor which was completed in January 2003. This was the first MIS in Texas to include a rail component in its preferred alternative. The Harris County Public Infrastructure Department then commissioned a preliminary study to explore the potential for developing commuter rail systems along both the U.S. 290 and S.H. 249 Corridors in northwestern Harris County. That study was completed in December 2003, and its primary focus was to examine the physical, operational, and relative cost characteristics of commuter rail operations in those corridors as well as the U.S. 90A Corridor. The study determined that the existing rail network in these corridors could be revamped to consolidate freight operations in a more efficient manner and allow the development of commuter rail services to improve Houston's mobility.

H-GAC conducted a follow-up study on commuter rail. Published in 2008, "Regional Rail Connectivity Study" looked at all commuter rail opportunities in the region *(32)*. The study recommended advancing five commuter rail corridors into advanced planning (Figure 25). The conceptual plan would cost $3 billion to develop the five identified lines.

Source: "Regional Rail Connectivity Study," H-GAC, 2008

Figure 25. H-GAC Conceptual Regional Rail Plan.

LIGHT RAIL SERVICES

Currently local light rail services in the state are limited to the cities of Dallas and Houston with passenger rail services in these cities operated by the local transit agencies.

Dallas Area Rapid Transit (DART)

The DART light rail system has two lines: the Red Line and the Blue Line. DART's Red Line operates along the North Central Expressway from Plano to Westmoreland in western Oak Cliff. The Blue Line runs south from downtown Garland to Ledbetter in southern Oak Cliff. Both lines serve all downtown Dallas stations. The DART system also connects to the TRE commuter rail line. The system consists of 44 miles of rail serving 34 stations (Figure 26). The fleet is comprised of 95 light rail vehicles, and ridership totals approximately 13.5 million passenger trips per year. The average weekday ridership was 55,000 passengers in 2004.

The current long-term funding program will provide light rail lines to Fair Park and Market Center by 2010; Love Field, Pleasant Grove, Carrollton and Farmers Branch by 2011; and Las Colinas and Dallas/Fort Worth International Airport by 2014.

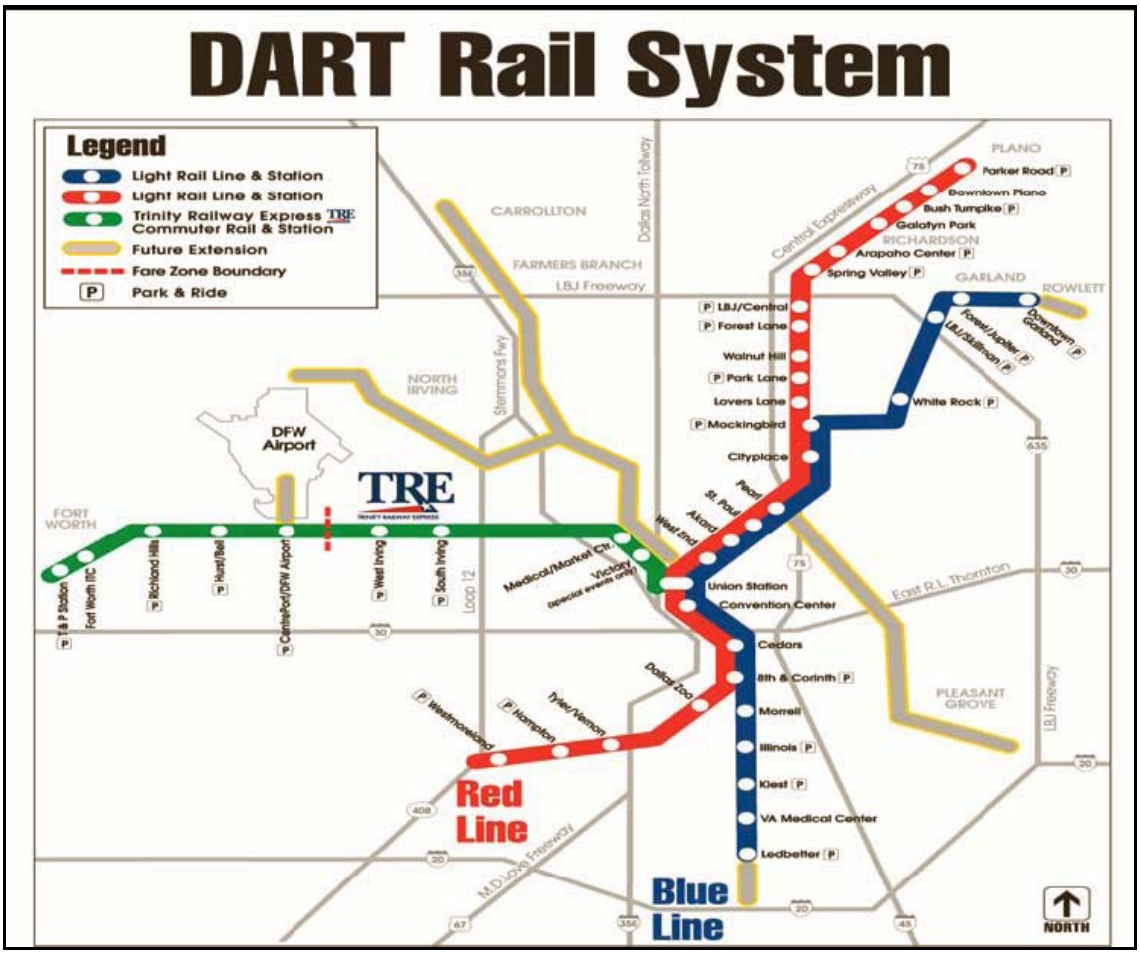

Figure 26. DART Rail System Map.

Houston/Harris County Metropolitan Transit Authority Light Rail System

The Metropolitan Transit Authority of Harris County, Texas (METRO) opened a 7.5-mile light rail project in January 2004 that provides service from downtown to just south of the Astrodome and Reliant Park in Houston (Figure 27). The line has 16 stations and uses 18 electric light rail vehicles with a capacity of 200 riders each. Average weekday ridership for service during June 2005 was 34,770, a 30 percent increase from the same month in 2004 and a 187 percent increase over METRORail's opening month figures.

METRO is also studying three additional corridors for advanced transportation options in its 2025 Mobility Plan. The METRO Solutions Transit System Plan, adopted in August 2003, calls for expanding light-rail service to a total of 16.3 miles to serve Uptown/Galleria, Westpark, East End, Magnolia, Gulfgate, and Houston and Texas Southern universities. Phase II of the METRORail system would also develop 28 miles of commuter rail. METRO's plans include seeking approval for approximately $700 million to fund improvements to the rail system.

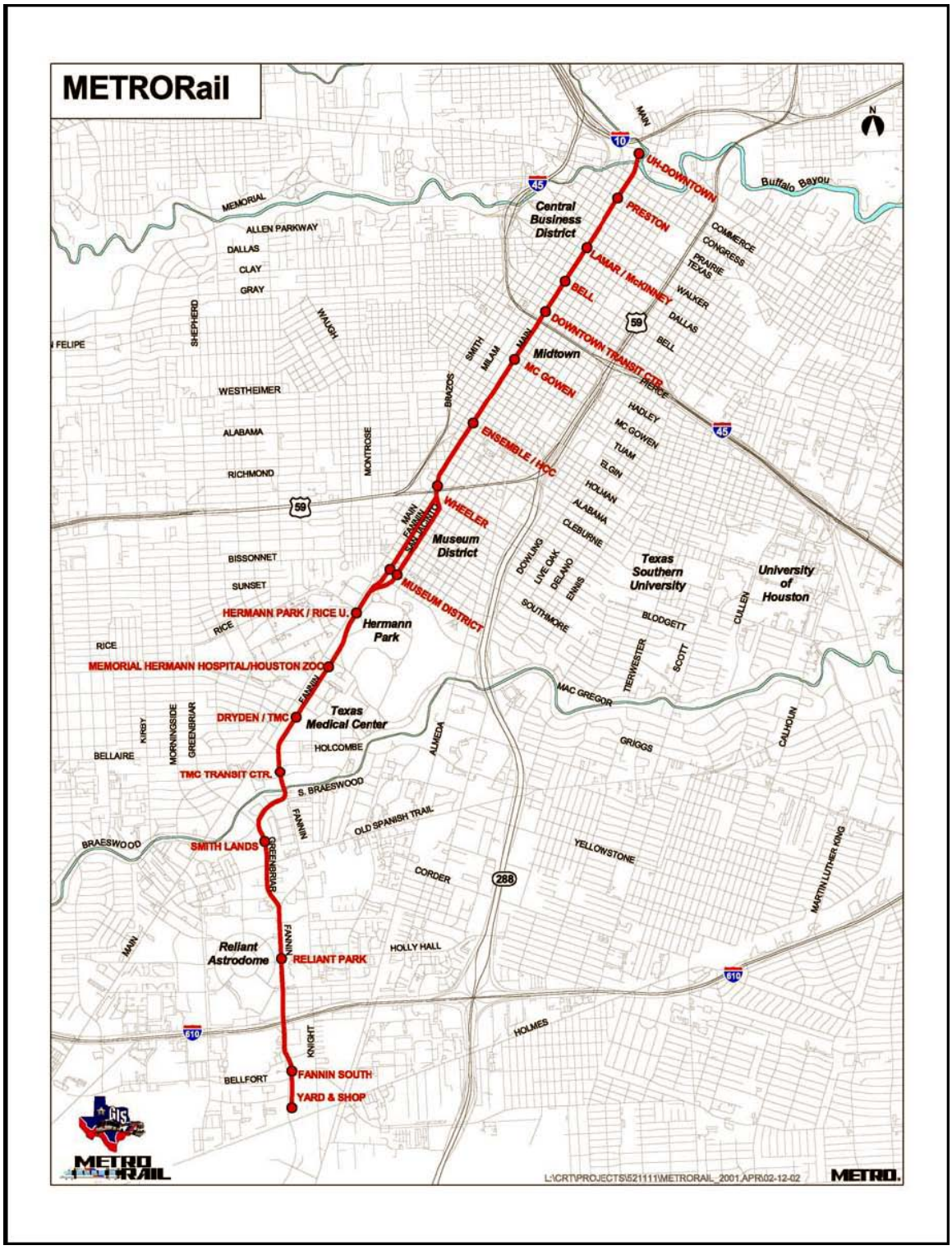

Figure 27. Houston METRORail System Map.

SECTION 7: TXDOT AND RAIL PLANNING/FUNDING

According to TxDOT's Texas Rail System Plan, the most significant current issues facing Texas rail and transportation providers are:

- safety,
- freight efficiencies,
- congestion relief, and
- corridor availability.

TxDOT's immediate rail program is focused on improving rail freight efficiencies, optimizing the public benefits of rail transportation projects, and preserving transportation corridors for future services and connectivity to future facilities. The current program relies on:

- new legislative tools;
- potential significant corridor development; and
- potential public benefits of public-private partnerships with freight railroads to relocate through freight traffic in key areas of the state.

The 78th and 79th Texas Legislatures passed legislation that enhances TxDOT's ability to improve transportation safety and infrastructure in Texas. The major rail issues addressed by this legislation are:

- TxDOT assumes all powers and duties related to railroads from the Texas Railroad Commission;
- TxDOT will be allowed to acquire, finance, construct, maintain, and operate freight or passenger rail;
- TxDOT will administer most federal funding used on construction or maintenance of rail infrastructure;
- TxDOT may enter into Comprehensive Development Agreements for rail projects; and
- TxDOT may enter into agreements with public or private entities using pass-through fares for reimbursement of facility expenses.

This legislation increases TxDOT's involvement in rail projects and the further development of the state's multimodal transportation system via proposed new systems and railroad relocation projects.

The Railroad Relocation and Improvement Fund should enable TxDOT to plan, design, and implement passenger and freight rail relocation and improvement projects that support the objectives and supporting actions of the Texas Rail Plan. Table 5 is a list of plan objectives.

Table 5. Texas Rail System Plan Objectives.

OBJECTIVES:	ACTIONS:
Reliable Mobility	• Assist local and regional efforts to expand or implement passenger rail systems as a transportation alternative.
	• Determine the benefits of utilizing rail transport to reduce Vehicular Miles Traveled (VMT).
	• Encourage public involvement in rail issues and rail system development to assure awareness of the benefits of rail transportation for goods and people.
Improved Safety	• Determine key rail corridors where through freight rail services can be relocated or improved to ensure safety of large urban populations from hazardous materials shipments.
	• Partner with communities, railroads and rail safety inspectors to ensure the safety and integrity of the rail system of Texas.
	• Emphasize public education regarding safety at rail-highway crossings.
	• Maintain, evaluate and upgrade grade crossings on the state highway system.
System Preservation	• Analyze specific freight and transportation corridors in the state to identify freight bottlenecks and determine possible multimodal alternatives that will improve freight flows.
	• Assist rail freight carriers in maintaining or improving services in specific corridors through applicable federal and state programs.
	• Encourage rail preservation by Rural Rail Transportation Districts (RRTDs) and provide evaluation, analysis, and assistance with RRTD programs.
	• Support ports, rail carriers and intermodal facilities with access and infrastructure issues wherever possible.
	• Create local awareness of rail issues and rail benefits. Work with metropolitan areas to develop rail studies, programs, and funding sources.
Economic Vitality	• Continue the development of the Trans-Texas Corridor, through coordination with other agencies as well as development of public/private partnerships to finance, build, and operate the corridor.
	• Work with railroads to evaluate, improve and expand services as appropriate.
	• Promote continued development of rail connections through monitoring and evaluating freight rail traffic flows and connectivity.

The state rail plan documents consist of a standalone Texas Rail System Plan Summary and the Texas Rail System Plan (TRSP). The TRSP Summary was developed at the direction of the Texas Transportation Commission (Commission). The detailed TRSP is a comprehensive document that addresses the railroad system of Texas and is structured according to federal guidelines. Both documents are available online at the TxDOT website or by contacting the Multimodal Section of the Transportation Planning and Programming Division of TxDOT.

TxDOT Rail Freight Studies

TxDOT has been working with several engineering consulting firms over the past three years to conduct detailed regional studies of freight rail system engineering and capacity needs in major urban areas and regions of the state. These studies are focused on improving freight flows and identifying areas where rail lines could potentially be consolidated or relocated to reduce traffic impacts and, at the same time, improve freight rail flows. As a secondary consideration, projects identified in the freight rail studies could also potentially free up capacity in existing rail corridors allowing for the introduction of commuter or light rail transit service or for other transportation uses. Reports on the Houston-Galveston area and the San Antonio Region as well as a study examining the possibility of relocating freight rail through trains in Central Texas between San Antonio and Taylor have been completed and are posted on TxDOT's website. Studies are currently underway in East Texas, West Texas, the Corpus Christi area, and the Dallas/Fort Worth area. A future planned study area is the Rio Grande Valley region in south Texas.

TxDOT's involvement in these studies and their support for regional studies sponsored by NCTCOG and other regional planning agencies is crucial to the future planning of light and commuter rail systems in the urban areas of the state. This is especially true in the Dallas/Fort Worth area where the Tower 55 area rail study is currently underway to examine freight rail congestion at this major national rail intersection located in downtown Fort Worth. TxDOT's ongoing study team and the NCTCOG study team are working together to identify solutions that will not only solve the freight rail problems but also provide for future capacity to address light rail, commuter rail, and even intercity passenger rail needs. TxDOT is also considering even longer term solutions, along with city and regional planners that may divert some of this rail freight traffic outside the urban areas to an alternative, bypass route.

RAIL FUNDING

This section focuses on the sources of rail transportation funding potentially available to TxDOT.

Federal Sources

Almost all federal funding for transportation projects comes from the U.S. Department of Transportation. Within this department, several different agencies exist that have the potential to fund rail projects out of distinct funding categories. Rail projects are most likely to be funded through FRA, FTA, and FHWA.

Possible federal sources for funding rail projects include programs under previous transportation authorizations and the latest reauthorization enacted under SAFETEA-LU. The federal programs that can fund rail projects include:

- *National Highway System (NHS) Funds* – These funds can be used to improve almost any highway network link on the designated NHS to accommodate intermodal movements. Selected rail projects that are part of highway construction plans may be eligible for NHS funding.
- *Surface Transportation Program (STP)* – This program allows the use of federal funds to make highway improvements in order to accommodate a rail line, including increasing bridge clearances, upgrading crossing signals, and improving highway-rail crossing surfaces.
- *Congestion Mitigation and Air Quality (CMAQ) Improvement* – These funds are available for projects that reduce congestion and/or improve air quality. These funds are available only in those metropolitan planning areas that have been designated as federal air quality "non-attainment" areas. MPOs around the U.S. have used these funds to upgrade rail yards, construct intermodal transfer facilities, rehabilitate branch-lines, add sidings and spur tracks, and improve bridge clearances to allow double-stack container service.
- *Transportation Infrastructure Finance and Innovation Act* – This act allows the federal government to make loans and loan guarantees available for major transportation investments of national significance, including intermodal facilities. Examples of how this funding source has been used include construction of an intermodal transfer center, construction of an international airport, and expansion and refurbishment of a train station for intermodal use.
- *National Corridor Planning and Development* – This program provides funds for planning, project development, and construction of high priority corridors throughout the United States, but all funds are supplied through congressional appropriations.
- *Coordinated Border Infrastructure Program* – This is a formula program that provides funding for transportation and safety infrastructure improvements, operational improvements, and inspection improvements in border states to facilitate international trade and transportation.
- *Transportation and Community and System Preservation Pilot Program* – These funds are available to achieve locally determined goals such as improving transportation efficiency; reducing the negative impacts of transportation upon the environment; providing access to jobs, services and trade centers; reducing the need for costly future infrastructure; and revitalizing underdeveloped and brownfield sites.
- *Transportation Enhancement Program* – These funds are designated for projects that are designed to strengthen the cultural, aesthetic, and environmental aspects of the nation's intermodal system.

The funds available from these programs vary by year according to the level of funding provided by Congress and the amount of those funds that are flexible and not strictly obligated to highway projects. FHWA and FTA project the amount of funds likely to be available in order to administer these programs in an efficient and timely basis.

New Capital Assistance for Intercity Passenger Rail

The FRA is administering a new grant program: Capital Assistance to States – Intercity Passenger Rail Service Program. The grant program provides the first ever federal-state funding partnership to improve and expand intercity passenger rail service and began accepting applications on March 18, 2008. The $30 million capital grant program requires a 50-50 funding match like most other transportation investments. Projects that demonstrate an on-time performance standard of 80 percent or greater, reduce travel time, increase service frequency, or enhance service quality for intercity rail passengers will receive favorable consideration for funding.

Eligible projects include but are not limited to: upgrading existing track to permit higher maximum operating speeds, adding or lengthening passing tracks to increase rail line capacity, improving track switches and signaling systems to advance reliability and safety, and purchasing new passenger rail cars to enhance the travel experience. Individual or multiple States working together can submit applications.

The full Notice of Funding Availability can be found at: http://www.fra.dot.gov/statecapitalgrants.

Rail Funding in SAFETEA-LU

The current federal transportation authorization legislation, SAFETEA-LU included an important new funding tool and some modifications that may affect Texas rail projects:

- *Sec. 9001 – High Speed Rail Corridor Development*. This section reauthorized the Swift Rail Development Act but made some technical amendments to the legislative language. The Act now pertains to corridor development only, removing the possibility of funding planning activities. The Act provides $100 million per year from FY 06 – FY 13. Seventy percent will be applied to corridor development and 30 percent will be applied to new technology development.
- *Sec. 9002 – Capital Grants for Rail Line Relocation Projects*. This new section establishes a grant program to provide financial assistance for local rail line relocation and improvement projects. For a state to be eligible for these funds an improvement construction project must either:
    - mitigate the adverse effects of rail traffic on:
        - safety;
        - motor vehicle flow;
        - community quality of life, including noise mitigation or economic development; and
        - freight and passenger rail operations; or
    - involve the lateral or vertical relocation of any portion of the rail line.

- The fund provides $350 million per year for FY 06 – FY 09. Eligible entities will be required to pay at least 10 percent of the project costs, which can come in the form of real property, in-kind services, or previous money spent on the project before the application was filed. States may seek financial contributions from private entities that would benefit from the projects.

- *Sec. 9003 – Rail Rehabilitation and Improvement Financing (RRIF).* This program provides loans and loan guarantees for projects such as rail relocations, acquisition, development, improvement, or rehabilitation of intermodal and rail equipment or facilities, or projects that will enhance service and capacity in the national transportation system. Changes were made to the program, which had been criticized for having too many obstacles to participation. Projects are prioritized based on the following criteria:
    - included in state transportation plan(s),
    - enhance safety,
    - enhance the environment,
    - enhance or preserve service to small communities or rural areas,
    - enhance service and capacity in the national transportation system,
    - promote economic development, and
    - promote U.S. competitiveness.
- The RRIF program offers opportunities for implementing a wide variety of railroad projects and meeting some of the critical capital investment needs of the rail industry. Under the RRIF program, FRA may provide direct loans and loan guarantees. The funding may be used to:
    - acquire, improve, or rehabilitate intermodal or rail equipment or facilities, including track, bridges, yards, buildings, and shops;
    - refinance outstanding debt incurred for the purposes listed above; and
    - develop or establish new intermodal or railroad facilities.

Eligible borrowers include railroads, state and local governments, government sponsored authorities and corporations, and joint ventures that include at least one railroad. A total of $35 billion is authorized under this program with a cap on funds available to Class I railroads of $7 billion. Changes were also made to possible restrictions based on available collateral and a requirement that the borrower must have been previously turned down by a private lending institution.

State Sources

TxDOT is limited in its ability to expend funds on rail projects without specific legislative appropriations. However, the 78th and 79th Texas Legislatures passed legislation that would enhance TxDOT's ability to improve transportation safety and infrastructure in Texas. Current rail funding sources permitted under HB 3588 (78th Legislature) and HB 2702 (79th Legislature) include:

- non-dedicated funds from the State Highway Fund;
- bonds secured by the Texas Mobility Fund for passenger rail projects;
- donations;
- loans from the State Infrastructure Bank (SIB);
- pass-through fares; and
- grants or loans from the federal government, public or private entities that finance design, acquisition, construction, maintenance, or operation of a rail facility or system. Funds utilized for a specific rail facility or project will be allocated by the Commission based upon project specific eligibility or by legislative appropriations.

The current focus of rail issues at the district and local level is identifying rail needs and securing funding for necessary studies. TxDOT district offices in air quality non-attainment areas can work with their local MPO to attempt to utilize CMAQ funds for local rail studies. Toll credits may also be used for the local match.

At the state level, TxDOT is working to develop criteria and processes to allow the use of the Texas Mobility Fund for rail studies. Rail projects must prove a benefit to the highway system or public transit in order to utilize the Mobility Fund. Studies are necessary at all levels in order to apply for federal funds for actual rail projects and improvements.

SECTION 8: POTENTIAL TXDOT ROLES IN RAIL DEVELOPMENT

Based on the findings of the case studies described in the previous section, the research team determined that the state DOT is usually directly involved in longer distance, intercity commuter rail projects. In large, urbanized areas where the entire or most of the proposed route is contained within a single jurisdiction (MPO or regional/local transit agency), the local agency usually takes a more important role than the DOT in development of the project. Most MPOs/transit agencies in areas of this type have experience administering FTA funding for bus systems and having them take a lead role in commuter rail programs within their area helps make sure that the new rail route acts as a system with existing transit services.

While the state DOT may have a limited role in shorter distance commuter rail and urban LRT development, we also found that there is a definite DOT role in interregional/ intercity passenger rail where the "commuter rail" service may connect two or more urban centers—acting as a regional transportation interface. We identified three broad areas in which the state DOT could play a primary role: financial support, planning assistance, and operational support. Tables 6, 7, and 8 outline some of the roles the DOT can play in each of these areas.

Appendix B outlines a potential brochure communicating the impacts of light and commuter rail.

Table 6. Potential TxDOT Financial Roles.

Potential Role	Description	Action Needed
Fund project studies	State could fund feasibility, environmental impact, preliminary and final engineering studies for the project.	No additional authority needed; need to identify funding source(s).
Grant /loan capital	State could provide direct funding through a general funding program for passenger rail or from specific appropriations from state or federal level.	No additional authority needed; need to identify funding source(s).
Grant/loan operations/ maintenance	State could provide financial assistance to support passenger rail operational and maintenance costs not covered by farebox revenue.	No additional authority needed; need to identify funding source(s).
Purchase of rolling stock	State could purchase rolling stock (locomotives and passenger coaches) for use by the system. This is advantageous because rolling stock is an asset that has market value that could be sold to recoup a portion of the state investment if necessary.	Repeal of prohibition in state law (Transportation Code Sec. 227.026)
Fund infrastructure construction	State could fund capacity improvements: longer siding tracks, new track/sidings, improved bridges, new structures, signals, grade crossing safety equipment, etc.	No additional authority needed; need to identify funding source(s).
Acquire ROW /use existing highway ROW for rail	State could acquire ROW or allow use of state highway ROW for rail use and/or ask FHWA to allow ROW use for rail in federally funded highway corridors.	No additional authority needed; need to identify funding source(s).
Preserve rail line/corridor	State could purchase or otherwise preserve abandoned freight rail or highway corridors for passenger rail use.	No additional authority needed; need to identify funding source(s).
Relocate or reuse freight rail corridor	State could work with railroad companies to relocate through freight services to alternative corridors leaving existing rail corridors for re-use as passenger routes.	No additional authority needed; need to identify funding source(s).
Own right-of-way for tax advantages/tax abatement	State (or RRTD) could own rail ROW and infrastructure relieving the private company of the property tax burden.	Legislation possibly required to compensate local governmental entities for removal of property from local tax rolls.

Table 7. Potential TxDOT Planning Assistance Roles.

Potential Role	Description	Action Needed
Provide contracting expertise	State DOT could assist local/regional authorities with contracting experience and/or contacts at the private railroad companies.	No additional authority needed.
Provide direct DOT contracting	State DOT could contract with the railroad company directly on behalf of the state in a multi-party agreement including the local/regional authority.	None known.
Coordinate statewide rail/ intermodal planning	State DOT could act in an advisory role to ensure that a local/regional project is coordinated well with other on-going state rail planning efforts such as the state rail planning document or other proposed inter-regional plans in other modes.	No additional authority needed.
Coordinate planning across institutional boundaries/regions	State DOT could assist local regional agencies in harmonization of planning efforts across jurisdictional and institutional boundaries and/or form a special commission made up of stakeholders to oversee the project.	No additional authority needed.
Assist with quiet zone/other rail safety planning initiatives at state level	State DOT could provide expertise in highway-rail grade crossing safety improvements needed to accommodate higher speed passenger rail routes or to implement a quiet zone where train horns would be eliminated based upon installation of other safety measures.	No additional authority needed.
Liaison with state/federal level agencies	State could act as liaison/single point-of-contact for the project with U.S. DOT agencies (FHWA, FRA, and FTA). State DOT could also coordinate with other state and federal agencies in the areas of land management, air quality, historic preservation, etc.	No additional authority needed.

Table 8. Potential Operations/Support Roles for TxDOT.

Potential Role	Description	Action Needed
Fund/build/operate rail system as highway construction mitigation project	Some states have constructed passenger rail systems or added passenger rail in freight rail corridors initially as highway construction mitigation projects, later converting them to a separate project under a local/regional transit agency once the construction project was complete.	Consider rail components in major highway project development.
Act as single-point negotiations agent	State DOT would negotiate contractual issues and standardize agreements so that the railroad companies would not have to work out a separate agreement with each municipality along a proposed passenger rail corridor.	Establish/develop standard agreements.
Oversee contract negotiations/re-negotiations	Similar to the previous entry, the State DOT would act as an intermediary between local agencies/municipalities and the railroad companies.	Establish/develop standard agreements.
Encourage/support commuter rail or LRT development	State DOT could work to have beneficial legislation for funding and operations of intercity, CR, and LRT development within the state.	Support rail legislation through GPA Division.
Address liability concerns of both passenger and freight rail operators	State DOT could support legislative action to limit liability of freight railroads for allowing passenger service over their lines and on their corridors and for the passenger rail operators themselves. This could encourage additional services throughout the state by reducing insurance costs of each project.	Seek legislative changes to limit railroad liability for passenger rail projects on private railroad corridors.
Operate intercity/commuter rail system that would interface with local rail and bus transit systems	State DOT could directly pay for or operate a rail system.	Support changes to Transportation Code Section 227.023.

RAIL REGULATIONS AND TXDOT

Appendix B displays a listing of code, policy, and regulations pertaining to TxDOT and rail development and operation. Most of the regulations govern the roles and responsibilities of TxDOT and railroad companies with respect to managing grade crossings, adjacent roadway repair, and safety.

There are many current policies that support TxDOT participation in passenger rail development in Texas. For example, HB 3588 and HB 2702 by the 78th and 79th Texas Legislatures enabled the expenditure of funds by TxDOT for rail projects. These and other legislative initiatives allow for increased TxDOT involvement in rail projects.

Possible changes to some current policies would enhance TxDOT's ability to advance passenger rail projects. The possible changes are noted below.

Line Item Appropriation

HB 3588 and HB 2702 also established rail funding guidelines for TxDOT. These guidelines limit TxDOT's flexibility to expend funds. Specifically, HB 2702 provides that the department may not spend money from the general revenue fund for rail projects except pursuant to a line item appropriation (Section 1.05, 91.071). Although many projects like commuter or intercity rail are legislatively driven and funded, changing this limitation would provide the department with more funding flexibility.

Rolling Stock Ownership

HB 3588 prohibits TxDOT from owning rolling stock (Sec. 91.005 and 227.206). Other state DOTs have the ability to own rolling stock. For example, California purchases rolling stock for intercity rail lines operated by Amtrak. California owns a fleet of 88 cars and 17 locomotives and has spent over $300 million on equipment since the early 1990s with the majority of funding from bonds. One important benefit to department ownership of rolling stock is that it allows state money to go into an asset that can be sold or transferred for more than one project.

Funding Rail Relocation and Improvement

HB 1546 and HJR 54 established the rail relocation and improvement fund. Although the fund has been created, it has not been capitalized and therefore precludes TxDOT's ability to fund relocation and improvement projects.

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APPENDIX A: LISTING OF RAIL IMPACTS

System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CA			LRT COM	Ridership impact of offices near transit	887 self-reported surveys on commute trips	2006	Up to 20% ridership with closer office buildings, employer contributions, and good connections	Developmental	Cervero (2006)
CA: Sacramento	RT		LRT	Impact of LRT on property values	Statistical Inference Analysis which uses various data points to determine the impacts of a series of independent variables (housing characteristics) on a single dependent variable (price per sq ft). Over 1,300 property sales records in areas survey	2005	The presence of a nearby light rail station or line does not have a significant measurable impact on the value of nearby properties.	Economic	Jaiyeoba and Quinn (2005)
CA: San Diego	Green Line		LRT	Change in mode of trip	On-Board survey/ internet survey		26% of formerly infrequent transit riders now ride frequently (1-4 times a week); and 40% ride every day	Transportation	Bates, Jabonski (2007)
CA: Santa Clara	All rail		LRT COM	Impact of TOD on commercial values	Hedonic price approach	2000	Land values up 23% in commercial business district, up 120% near Caltrans stations	Economic	Cervero and Duncan (2002a)
CA: Santa Clara	Central Expwy		LRT	Air quality emissions (CO, PM10, and ozone precursors [ROG, NOx])	O3 and PM10 emissions calculated by multiplying EMFAC 2001 model emission factors by VMT impacts of LRT alternative; CO by receptors near intersections	2005	Standard threshold: net increase in pollutant emissions of 80 pounds per day or 15 tons per year of ROG, NO_X, or PM10 -- or -- localized CO concentrations in excess of 9 ppm averaged over 8 hours / 20 ppm averaged over 1 hour	Environmental	Santa Clara Valley Transportation Authority (2005)

LRT – Light Rail; COM – Commuter Rail; HVR – Heavy Rail; AGT – Automated Guideway

System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CA: Santa Clara	Central Expwy		LRT	Electromagnetic field exposure	Electric field strength is measured in units of volts per meter (V/m); field strength increases as voltage rises. Magnetic field strength has several units of measure. The most commonly used are milligauss (mG) and microTesla (mT); 10 mG equal 1 mT. DC produces stronger EMFs than alternating current (AC). Consequently, EMF strength is measured in terms of mG.	2005	LRT alternatives may result in substantial adverse effects related to EMFs if they would result in DC magnetic fields that exceed the guidelines of American Conference of Governmental Industrial Hygienists: routine occupational exposures should not exceed 600,000 mG for the whole body; 6,000,000 mG for limbs on a time-weighted average basis; or for persons with cardiac pacemakers and similar medical electronic devices, wearers should not be exposed to DC magnetic field levels exceeding 5,000 mG	Environmental	Santa Clara Valley Transportation Authority (2005)
CA: Santa Clara	All rail		LRT COM	Impact of TOD on residential values	Hedonic price approach	1999	In terms of commuter rail transit stations, within a 1/4 mile radius, ALL residential parcel values increased, however land value premiums (20%+) were significantly lower than when compared to light rail stations. For light rail transit stations, values ONLY increased for 5+ unit apartment buildings in the same radius. Land value premium effects for large apartment properties were 45% within the 1/4 mile radius of a light rail transit station. Within a 4 mile radius, effects for all properties were 28%.	Economic	Cervero and Duncan (2002b)
CA: Santa Clara	All rail		LRT	Impact of LRT on residential values	Hedonic price approach		Properties that lie within 1/2 mile of a light rail station command a higher lease rate than other properties in the county. When controlling for highway access, the rail proximity was maintained, and it was shown that highway coverage is so dense that there are no particular locational advantages associated with highway coverage.	Economic	Weinberger (2001)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CA: San Diego	Trolley, Coaster	All	LRT COM	Residential and commercial property value	Hedonic price approach	1999/ 2000	For multi-family housing, within a 1/2-mile radius of an East Line Trolley transit station (LRT), an apartment project was worth on average $100,000 more than those in the control area. Other Trolley line transit stations had positive effects but none that were statistically significant. Commuter rail transit stations saw a negative effect in valuation. Commuter rail transit stations had a positive effect on condominiums with the average value-add being $85,000. LRT transit stations were less of an influence with units near Trolley transit stations only gaining between less than 4% - 6.4% premium. Single-family housing values suffered near Trolley line transit stations, while they increased near commuter rail stations on average over $78,000. Effects on commercial properties were varied spatially with ones near downtown commuter rail transit stations receiving the highest premiums. LRT transit stations on the Mission Valley Line also realized large premiums. Other transit stations either had only slight positive benefits or significant disbenefits as was the case for non-downtown commuter rail stations.	Economic	Cervero, 2003
CA: Bay Area	BART	All	COM	Land use changes over twenty year period.	Regression, matched pair comparison	1973	Between 1973 and 1993, BART has played a fairly modest, though not inconsequential, role in shaping metropolitan growth in the San Francisco Bay Area. Its impacts have been highly localized and uneven.	Economic Developmental	Cervero and Landis (1997)
CA: Bay Area	BART	Pleasant Hill	COM	Residential property value			Within 1 mile area, average home prices decline by about $1,578 for every 100 ft further from station.	Economic	Lewis - Workman and Brod (1997)

LRT – Light Rail; COM – Commuter Rail; HVR – Heavy Rail; AGT – Automated Guideway

System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CA: Bay Area	BART	All	COM	Apartment rents, household and social characteristics	Matched pair comparison, hedonic price approach	1996	There is a 10-15% premium for rental properties closer to transit stations. Households near transit stations tend to be smaller but with roughly the same number of vehicles per capita compared to households in surrounding census tracts. Rail-based housing projects averaged younger occupants than in control areas and have significantly less children. Whites and Asians were represented proportionally more in rail-based housing (64% and 19.6% respectively compared to 56.3% and 15.6% in control areas). Managerial, professional, clerical, and accounting workers represented nearly 75% of all rail-based respondents compared to 50% in the control areas. Incomes of rail-based households were higher as well: 60% earned annual incomes of $40k+ compared to 30% in the control households.	Economic	Cervero (1996a)
CA: Bay Area	BART	All	COM	Developmental impacts on Bay Area region		1970	A study of San Francisco BART rail transit development impacts after 20 years (1970-1990) clearly indicated that regional growth was more pronounced in non-BART service areas, despite BART's role in anchoring downtown core areas (San Francisco and Oakland). However, BART stations attracted businesses employing professional, technical, and executive workers (e.g., FIRE and consumer services) at a rate 15-20% higher than other locations. BART played a role in the emergence of 3 suburban centers as important nodes of commercial and office development (Walnut Creek office concentration, Pleasant Hill apartments, and Fremont mixed use). Rent premiums were identified in apartments near BART. The study concludes that BART, rather than create growth, has acted to redistribute growth.	Economic Developmental	Cervero (1995)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CA: Bay Area	BART, CalTrain	All	COM	Residential and commercial property value		1990	1990 single family home prices decline by $1.00 to $2.00 per meter of distance from a BART station in Alameda and Contra Costa Counties. Found no effect for commercial property. In terms of CalTrain, did not find a significant impact on house values from proximity to a rail station; however, houses within 300 meters of a CalTrain right-of-way sold at a $51,000 discount.	Economic	Landis, et al. (1995)
CA: Bay Area	BART	All	COM	Impact of rail line on resident mobility	Data collection and analysis via survey		Residents near aerial trackways, which maximize local environmental costs, had greater preferences for outward mobility. Residents near stations, which maximize the service's local benefits, had the highest reports of inward mobility.	Social	Baldassare, Knight, and Swan (1974)
CA: Los Angeles	Metro Rail	Entire corridor	COM	Commercial property value	Matched pair comparison	1980	Commercial space within 1/2-mile of the rail corridor had an additional $31 increase in mean sale price per square ft over the mean sales price of a comparable control group outside of the rail corridor between 1980 and 1990.	Economic	Fejarang (1994)
CO: Denver	SW Corridor	Englewood City TOD	LRT	Apartment values	Matched pair comparison	2003	Incremental $5,000 to $10,000 per unit increase	Economic	FasTracks Executive Summary (2003)
CO: Denver	SE Corridor	Belleview Station	LRT	New development	Developer reported plans	2003	2.5M sf office, retail, hotel, and MF residential	Developmental	FasTracks Executive Summary (2003)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
CO: Denver	FasTracks		LRT COM	Economic impact on region	RIMS II	2005	The 12-year design/construction period is estimated to create 6,213 jobs annually. During peak years of construction activity (2011-2014), 10,299 jobs will be created annually. The direct and induced jobs resulting from the project will generate $2.9B for the metro Denver economy. Resulting consumer spending is estimated at $2.4B. $90M in state income taxes, and $46.1M in state and local sales taxes are anticipated. Operating and maintaining the system will cost $1.258B from 2017-2025 with 2,573 jobs per year due to direct, indirect, and induced impacts. These jobs will add over $150M annually in wages and salaries to the metro Denver economy. The anticipated impact of the system on business in metro Denver and CO will be much larger than what is spent creating the system.	Economic	The Adams Group, Inc., 2004
D.C.	Metrorail	All	LRT	Multi-family residential rent rates	Hedonic price approach	1992	Inverse relationship exists between distance from a Metro station and rent price	Economic	Benjamin and Sirmans (1996)
D.C.	Green Line	West Hyattsville TOD	COM	Return on public invest	Model all potential development revenues, development costs, and resulting land residual values after $16M public investment	2003	With enhanced parking plan, yields $41M return	Economic	West Hyattsville TOD Strategy (2003)
FL: South Florida Tri-Rail		West Palm Beach TOD	COM	Dedicated annual revenue, ad valorem tax yield, number of residential units for sale and rent, and retail and office square footage.	Matched pair comparisons, GIS maps, tax maps, Downtown Master Plan, interviews, studies, and analyses concerning downtown West Palm Beach	2004	Dedicated annual revenue projected as $44.9M - $67.2M; Ad valorem tax yield projected as: $11.1M to $11.6M; 850 residential units to sale, and 850 residential units to rent; 50,000 - 57,000 sq ft of retail proposed; 751,000 - 849,000 sq ft of office space proposed.	Fiscal	West Palm Beach, FL TOD Study (2004)
FL: Miami MetroRail		1 sq mile around 8 stations	LRT	Residential property value	Hedonic price approach, repeat sale indices, database of second sale homes between 1971-1990	1993	LRT station had little or no impact on values	Economic	Gatzlaff and Smith (1993)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
GA: Atlanta	MARTA	3 elevated stations	COM	Residential property value	Hedonic price approach	???	Only weak support for hypothesis that proximity to stations in question increases property values	Economic	Nelson and McCleskey (1992)
GA: Atlanta	MARTA	8 station sample	COM	Residential property value, crime, and retail employment	Hedonic price approach, various statistical models	2001	In terms of housing, homes closest to the station sell for 19% less then ones 3 miles and beyond. Homes between 1 and 3 miles from the station have a value significantly higher than those further away. This significance is of more importance in high income than low income neighborhoods. Negative crime effects are centralized in downtown stations with parking lots. Rail stations have a positive impact on retail activity farther from the CBD.	Economic Developmental Social	Bowes and Ihlanfeldt (2001)
GA: Atlanta	MARTA		COM	Commercial property value			Price per square meter falls by $75 for each meter away from transit stations. Price rises by $443 for location within special public interest districts.	Economic	Nelson (1998)
IL: Chicago	CTA/METRA		HVR COM	Single family dwelling unit. cost	Hedonic modeling and interviews		Single family home values increase 1% for every 100 ft closer to station	Economic	Gruen, Jeans (2008)
IL: Chicago	CTA/METRA		HVR COM	Apartment rents	Hedonic modeling and interviews		Rents and higher and occupancy levels higher at apartments near stations	Economic	Gruen, Jeans (2008)
MA: Boston	to Arborway		LRT	Transit travel time	Before/after transit travel time between fixed points		After travel time is same or less	Transportation	Lewis (2006)
MA: Boston	to Arborway		LRT	Average auto delay	Modeled delay for stopped buses using incident/lane blockage model		No significant change in average delay	Transportation	Lewis (2006)
MN: Minneapolis	Hiawatha Line	4 - not specified	LRT	Quality of life	Random survey of local residents		"Low" quality of life response doubled from 6% to 12%	Social	Center for Transportation Studies (2006)
MO: St. Louis	MetroLink	All stations	LRT	Residential property value	Hedonic price approach	1998	For homes sold between 1998-2001 that are within 1 mile of a MetroLink station, values rise for every 10 ft closer to a station up until 1,460 ft away from a station. From 1,480 ft to 2,300 ft from the station, home values also rose as the distance away from the station increased, however, not at a rate as great as the increase in values from 1,460 ft to 0 ft.	Economic	Light-Rail Transit in America / Federal Reserve Bank of St. Louis / Garrett (2004)

LRT – Light Rail; COM – Commuter Rail; HVR – Heavy Rail; AGT – Automated Guideway

System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
MO: St. Louis	MetroLink	All	LRT	Maximum distance from LRT station to experience property value escalation	Controlled property values by universe of variables; isolate effects of distance from LRT station and LRT line	2001	2,800 ft from LRT station	Economic	Garrett (2004)
MO: St. Louis	MetroLink	All	LRT	Price premium for location within maximum distance from LRT station	Controlled property values by universe of variables; isolate effects of distance from LRT station and LRT line	2001	$12.14 for every 10 ft from LRT station, from 2,300 to 2,800 ft	Economic	Garrett (2004)
MO: St. Louis	MetroLink	All	LRT	Price premium for location within maximum distance from LRT station	Controlled property values by universe of variables; isolate effects of distance from LRT station and LRT line	2001	$139.92 for every 10 ft closer to LRT station beginning at 1,460 ft	Economic	Garrett (2004)
MO: St. Louis	MetroLink	All	LRT	Price premium for location within maximum distance from LRT station	Controlled property values by universe of variables; isolate effects of distance from LRT station and LRT line	2001	$69.50 for every 10 ft from LRT station from 1,490 to 2,300 ft	Economic	Garrett (2004)
MO: St. Louis	MetroLink : Metro South Extension		LRT	Environmental/ economic impact on region	Qualitative data gathering at public meetings, analysis of previously published literature, market assessments	2000	Study found that the public felt neighborhood displacement, economic development opportunities, and service to existing and future employment centers needed to be considered during planning process. The study also assessed that approximately 2,700 households, 440 commercial jobs, and 4,100 office jobs could be drawn to transit stations if the Metro South LRT line was completed. When looking at residential property values, a 5% projected increase is assigned to areas within a 1/2 mile walking distance of a MetroLink station, for those properties that are near to the line or within 1/4 mile of a new park-and-ride lot there will be no increase in value. Commercial property values have a projected increase of 8% within 1/2 mile of stations.	Economic Social	U.S. Department of Transportation, Federal Transit Association, and East-West Gateway Council of Governments, 2005
New Jersey	Hudsen-Burgen Line		LRT	Change in land use	Area survey		Estimated $6B in new residential development	Social	Robins, Wells (2007)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
New Jersey	Hudsen-Burgen Line		LRT	Increase in ridership	Ridership evaluation		From June 2006 to June 2007, ridership up 30.5%	Transportation	Robins, Wells (2007)
New Jersey	Hudsen-Burgen Line		LRT	Reduction in commuting time			Travel time to Manhattan decreased with LRT project	Transportation	Robins, Wells (2007)
New Jersey	Hudsen-Burgen Line		LRT	Expanded access to shopping/ recreation				Social	Robins, Wells (2007)
New Jersey	Hudsen-Burgen Line		LRT	Peak trips	Rt 139 Survey Vehicle trips		Percent of auto trips decreased 68% from 2000 to 2004	Transportation	Robins, Wells (2007)
NY: Buffalo	NFTA	All downtown locations	LRT	Residential property value	Hedonic price approach	2002	Typical home located within 1/4 mile of a rail station can earn 2-5% of the city's median home value. However, after considering all control factors, location to rail station is at best weak in Buffalo.	Economic	Hess and Almeida (2007)
OR: Portland	Westside MAX		LRT	Tax Values	Regression		31% higher value within 1/2 mile of announced station and 10% higher within mile	Economic	Knaap, Ding, Hopkins (2001)
OR: Portland	Eastside MAX	East Burnside	LRT	Residential property value	Hedonic price approach	1993	10.6% greater within 500 meters of the transit	Economic	Al-Mosaind (1993)
OR: Portland		Orenco, Lloyd, Beaverton, Gresham	LRT	TOD impact on ridership	Census (1990&2000), transit agency data, and urban form analysis, longitudinal	2005	Ridership transit up 2.5%; auto down 2.5%	Developmental	Schlossberg (2005)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in Residential Density - urban areas	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	3.0% net DECREASE (in density) -- in other words, NEW development involved larger units and/or lesser units per square acre	Economic	Dueker and Bianco (1999)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in Residential Density - suburban areas	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	5.0% net INCREASE (in density)	Economic	Dueker and Bianco (1999)

LRT – Light Rail; COM – Commuter Rail; HVR – Heavy Rail; AGT – Automated Guideway

System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in residential housing value for distance from LRT station	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	1.9% mean DECREASE (in value) for every 200 ft from an LRT station	Economic	Dueker and Bianco (1999)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in Rail Transit mode share vs. Bus Transit - urban areas	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	0.76% mode shift rail for every 1.0% mode shift bus	Transportation	Dueker and Bianco (1999)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in Rail Transit mode share vs. Bus Transit - suburban areas	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	1.26% mode shift rail for every 1.0% mode shift bus	Transportation	Dueker and Bianco (1999)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in ridership on LRT	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	4.5% annual increase in ridership	Transportation	Dueker and Bianco (1999)
OR: Portland	Eastside MAX	Study area: parallels to I-84 and Burnside Street	LRT	Percent change in freeway AADT with presence of LRT	Ex-post-facto multiple-group pretest-posttest design; 10 year comparison of rail | bus control group	1999	0.2% freeway AADT less with LRT	Transportation	Dueker and Bianco (1999)
OR: Portland	Eastside MAX		LRT	Residential property value	Matched pair comparison		LRT has modest positive influence on single-family property values. As distance from the rail line decreases, property values increase. Within 200 ft of a transit station, however, values are highest. Transit use was found to increase in LRT corridor households (as opposed to the non-LRT area control group) and growth of 2+ car households was found to be significantly slower in the LRT corridor.	Economic Social	Dueker and Bianco, 1999

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
OR: Portland	MAX (Eastside)		LRT	Residential property value	Hedonic price approach, GIS analysis		Essentially, an update of the work Al-Mosaind et al. (1993) performed examining the competing effects LRT has on residential property values; however, the area of examination was extended to 1000 meters (1/2 mile). Again, this study took into consideration the positive effect of accessibility to a LRT transit station as well as the nuisance effect of proximity to a LRT rail line. When analyzing home values, the positive effect was shown to outweigh the negative effect with every meter away from a transit station (starting at 100 meters distance as a baseline) decreasing average home prices by $32.20.	Economic	Chen, Ruflo, and Dueker, 1998
OR: Portland	MAX (Eastside)	7 station sample	LRT	Residential property value	Hedonic price approach		The study took into consideration the positive effect of accessibility to a LRT transit station as well as the nuisance effect of proximity to a LRT rail line. Homes within a 1/4 mile area of seven transit stations were considered. The positive effects of homes being close to LRT stations outweighed the negative effects of homes being close to a LRT line; thus, for every 100 ft nearer to a LRT station, home values rose $663.	Economic	Al-Mosaind, Dueker, and Strathman, 1993
PA: Philadelphia	Phila - Linwood		COM	Residential property value	Hedonic price approach		The Linwood Line did have a significant impact on residential property values, as indicated by the travel-savings model; there was very little anticipation by the real estate market of the start of the Line; the impact is more apparent in lower-income neighborhoods; the increase in property values in the impact corridor appears to be compensated by a relative decrease in values in an adjacent control corridor.	Economic	Mudge (1974)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
TX: Austin Cap MetroRail	Northwest Line		LRT	Socio-economics/ Environmental justice	EIFS was used to anticipate the effects of the proposed alternatives on the ROI. The rational threshold value (RTV) model from EIFS was then used to assess the potential significance of these effects.	2005	Construction of the proposed commuter rail system would result in an increase of the total sales volume by $201M with an estimated 400 employees (at $35,000/yr) needed for construction. Employment would increase by 0.17% in the region of influence (ROI) due to construction. Total income in the ROI would increase by approximately 0.19% as a result of the construction activities. The economic impact due to construction would be expected for the initial two years or during the construction phase of the project. Operation and maintenance of the commuter rail facility would result in a long-term positive economic impact in the ROI. Annual operation and maintenance by 100 employees (at $35,000/yr) would result in an increase of the total direct and indirect sales volume by $47.9M in the ROI with total income increasing by 0.04%.	Economic	CapMetro Final EA (2005)
TX: Austin/San Antonio	ASA Inter-municipal	All	COM	Financial benefits to the users; Financial benefits to the citizens of the State of Texas; Financial benefits to the freight railroads; Economic development benefits to the region and State of Texas	Data gathering includes government and association reports. Tax projections based on estimated values in government and association reports multiplied by current tax rates in effect.	2012	For the years 2012-2030, the following is estimated: **Financial benefits to users:** $293.2 M- 332.9M; **Financial benefits to the citizens of the State of Texas:** $1B; **Financial benefits to the freight railroads:** $37.8M - 104.4M; **Economic development benefits to the region and State of Texas:** Employment increase 3,300 - 4,000 perm jobs; Gross state product increase $37.8M - 104.4M; Personal income increase $1.62B - 1.75B; Taxable sales within station areas increase $10.7B; Property values increase $2B; State tax revenue increase $742M - 752M ; Regional tax revenue increase $311M – 319M; Local gov't and school district prop tax revenue increase by $747M	Economic	Financial and Economic Benefits Study / ASA Intermunicipal Commuter Rail / Prepared by Carter & Burgess, Inc. (2007)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
TX: Austin/San Antonio	ASA Inter-municipal	All	COM	Potential economic impact of proposed transit stations	Results based upon 30% of the tax increment revenue over 25 years that results from development around the stations.	2005	Total revenue potential from property tax increments of $161.1M based on an increase in assessed value of $3.99B, over the next 25 years. The average increment in value is $265.9M per station, but the increment ranges from $547.2M at the Seaholm Station in downtown Austin to $1.3M at the station located near KellyUSA. Stations located at Greenfield locations have more potential for value enhancement, while redevelopment infill locations offer fewer opportunities due primarily to the presence of existing single-family neighborhoods within the 1/4-mile radius. The most notable exception to this rule is at the Seaholm Station in downtown Austin, where several dense infill developments are planned in close proximity to the station platform. Most of the sites in the corridor are infill/redevelopment sites; however seven of the 15 stations are Greenfield locations.	Economic	Executive Summary: Economic Impact Analysis Passenger Rail Station Areas / ASA Intermunicipal Commuter Rail / Prepared by Carter & Burgess, Inc. (2006)
TX: Austin/San Antonio	ASA Inter-municipal	All	COM	Feasibility update	Update was conducted by using current, available data relative to the ridership, engineering, mapping, and cost estimates. Data was gathered from similar projects around the country. In addition, various statistical methods and modeling procedures were used to estimate economic developmental benefits and potential ridership.	1997, 2000	Operation of a commuter rail system within this corridor is STILL feasible, both from a technical and financial perspective. Significant government support has emerged since the initial 1999 study. Based on the new-track option, the overall construction costs would be about $394M in 2004 dollars. Due to UP merger, initial options of rail line usage have had to be reassessed, with UP being open to possible negotiation of rerouted rail activity. In terms of economic development aspects, the presence of a regional passenger rail system is offered as a factor important to explaining a rapid rate of per capita growth in the community and a significant aspect in a region's overall portfolio of factors related to economic growth and development.	Economic Developmental	Austin-San Antonio Commuter Rail Project / 2004 Feasibility Report Update / ASA Intermunicipal Commuter Rail (2005)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
TX: Austin/San Antonio	ASA Inter-municipal	All	COM	Feasibility	Study was conducted by using current, available data relative to the ridership, engineering, mapping, and cost estimates. Data were gathered from similar projects around the country and from the professional experience of the Carter & Burgess Team. In addition, substantial assistance was received from various agencies represented on the Steering Committee.	2000	Operation of a commuter rail system within this corridor is feasible, both from a technical and financial perspective. Based on the new-track option, the overall construction costs would be about $475M in 1998 dollars. It could be financed with 50% federal TEA-21 (Transportation Equity Act for the 21st Century) funds (or funds from a subsequent transportation act) supplemented with a regional sales tax of about 0.11 cents (just over one tenth of a cent) for construction and 0.015 cents (less than two hundredths of a cent) for operations after the construction bonds are paid off. Should the position of the Union Pacific Railroad (UP) change and permit sharing of tracks between UP freight service and commuter rail passenger service, a lower cost alternative may be possible.	Developmental	Texas Department of Transportation / Austin San Antonio Commuter Rail Study / Prepared by Carter & Burgess, Inc. (1999)
TX: Dallas	DART	All	LRT	Value of TOD developments completed, underway, or planned; Taxable property values (both real and potential); Potential sales tax revenues	Data gathering includes secondary sources such as newspapers, business and trade publications, web sites, personal communications with key informants, and field observations. Tax projections based on estimated values multiplied by current tax rates in effect.	1999	Total value for all current and projected developments near DART rail stations is $4.9B. Value of taxable real and business personal property associated with these projects exceeds $2.84B. The retail component of TOD projects will generate over $660M in annual taxable retail sales.	Economic	Weinstein, Clower, and Seman (2007b)
TX: Dallas	DART	All	LRT	Annual tax revenue due to TOD	Applying previously published values for completed, underway, or planned TOD projects, the amount of annual tax revenue for cities, school districts, and counties was assessed by multiplying values by the average tax rates for municipalities, counties, and school districts.	2006	$3.3B of new valuations associated with TOD is producing (or will produce) $78M in annual receipts for area cities, counties, and school districts. Local ISDs are receiving more than half of these new revenues.	Economic	Weinstein and Clower (2007a)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
TX: Dallas	DART	All	LRT	Residential and commercial property value	Matched pair comparison	1997	Between 1997-2001, median values of residential properties increased 32.1 percent near the DART rail stations compared to 19.5 percent in the control group areas. For office buildings, the increase was 24.7 percent for the DART properties versus 11.5 percent for the non DART properties. However, proximity to DART rail does not appear to have a significant differential impact on retail and industrial property valuations.	Economic	Weinstein and Clower (2002)
TX: Dallas	DART	All	LRT	Commercial property value	Matched pair comparison	1994	The average percent change in land values from 1994-1998 for retail and office properties near DART stops was 36.8% and 13.9%, respectively; for "control" parcels, the average changes were 7.1% and 3.7%, respectively. For retail uses, it is suggested that a value-added 30% premium is apparent.	Economic	Weinstein, Clower, and Gross (1999)
TX: Dallas	DART	Stations outside of Dallas' CBD and Collin County	LRT	Residential property value	Hedonic price approach	2000, 2005	Study area was set-up as 3,000 ft radii around 23 DART Rail transit stations. Stations in the Dallas CBD were excluded due to external development factors influencing valuations while stations in Collin County were not included due to different accounting procedures. Due to locational variations, the resulting stations were grouped and divided into four areas. In terms of proximity to rail line, the gradient range was a loss of $50 to $104 in property value for every 30 ft closer to the rail line. Multi-family housing withstood the greatest financial impact, single-family housing fared slightly better. Transit station proximity resulted in the opposite. The gradient range was a gain of $31 to $77 in property value for every 30 ft closer to a transit station.	Economic	Leonard, 2007
TX: Dallas	North Central Corridor		LRT	Increase ridership	Ridership evaluation	2004	2004 ridership is greater than projected 2010 ridership (for most stations)	Transportation	DART (2007)
TX: Dallas	North Central Corridor		LRT	Service levels increase	Headways	2004	Projected headways of 20 minutes, 10 minute headways at opening reduced down to 4-6 minute headways	Transportation	DART (2007)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
TX: Dallas	North Central Corridor		LRT	Ridership demographics	Ridership survey	2004	The number of college degrees and above passengers has increased on rail.	Social	DART (2007)
TX: Dallas	North Central Corridor		LRT	Ridership demographics	Ridership survey	2004	The ethnicities have changed to include a larger percentage of Caucasian passengers and a smaller percentage of African Americans on rail.	Social	DART (2007)
TX: Dallas	North Central Corridor		LRT	Ridership demographics	Ridership survey	2004	Rail riders' income level has grown at a faster rate than non-rail riders' income.	Social	DART (2007)
TX: Dallas	North Central Corridor		LRT	Ridership demographics	Ridership survey	2004	Percentage of Choice riders has increased on LRT by 22%.	Social	DART (2007)
TX: Houston	University Corridor		LRT	Short term impact of new construction funding on output	RIMS II output multipliers multiplied by new capital expenditure for each build alternative	2007	Short term impact of new construction funding would provide approximately $449M - $868M in output (2007 dollars) depending on DEIS build alternative. Possible earnings were calculated as $164M to $317M (2007 dollars) depending on DEIS build alternative. Potential job creation is estimated to be 4,400 - 8,600 person-year jobs for the Houston MSA.	Economic	Houston Univ Corridor DEIS (2007)
TX: Houston	Metrorail		LRT	Percent decrease in ridership during Houston Texans seasons	Reported percentage of game patrons claiming to have arrived by METRORail; automatic passenger counter and adjustment factor by manual point checks	2004 - 2006	1.52% annual decline absolute mode share from 2004 (7.2%), 2005 (4.7%), to 2006 (3.7%)	Transportation	METRO (2007)
TX: Houston	Red Line	Reliant Park	LRT	Ridership	Evaluation of ridership vs. attendance at Houston Texans football games	2006	Percent of rail riders to football games (of attendance) dropped from 7.2% in 2004 preseason to 3.7% in 2006 season	Transportation	Houston METRO (2007)
TX: San Antonio	Via Metro		LRT	Regional impact of modal change (auto to mass transit)	RSRC PC I-O Model used to estimate change in regional income, assuming 1% decrease in VMT	1999	A proposed regional income increase of $2.9M	Economic	Miller (1999)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
Washington D.C.	System		HVR	"Savings" for motorist vs. rail operating subsidy (Annualized weekday service)	Logit-based choice model		Motorists save $454M vs. op. subsidy of $110M	Transportation	Nelson, Baglino et al.(2007)
Washington D.C.	System		HVR	Project peak hour highway speed	Logit-based choice model		Average speed on I-395 North with rail is 33 mph vs. 39 mph without rail	Transportation	Nelson, Baglino et al.(2007)
Washington D.C.	System		HVR	Value of trip benefit by income group	Logit-based choice model		Per capita benefits for lowest income group is $41 vs. $663 for highest income group	Social	Nelson, Baglino et al.(2007)
WI: Kenosha-Racine-Milwaukee	KRM		COM	Economic impact on region	RIMS II output multipliers, available data (and projections) relative to the housing, population, and transit characteristics of the areas observed.	2005	Impact during construction estimated at 4,700 jobs created with a $560M impact on the area economy. During project operations and maintenance 126 jobs will be created with a $24M annual impact on economy. Property values, if estimated at an intermediate 10% premium for a one-mile corridor along the KRM rail line would represent a $2.1B increase in the three KRM counties. Potential TODs within one-half mile of the nine KRM stations are projected to include 23,000 residential units, 7.6M sq ft of retail space, 4.7M sq ft of office space, 71,000 jobs, and a $7.9B increase in property value. If the rail line is not built, 20-50% of the TOD potential would not take place. The rail line is also looked upon as a potential boost to the areas already successful tourism market. If the line provides only a 1% increase in tourism, the three KRM counties may generate $20M in expenditures $12M in wages, $3M in state and local government revenue, and 500 jobs.	Economic	Institute for Survey & Policy Research and University of Wisconsin-Milwaukee, 2007

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
MISC: Nationwide				Effective strategies for encouraging mixed-income housing near transit in Boston, MA; Portland, OR; Denver, CO; Twin Cities, MN; and Charlotte, NC	Study was conducted by using current, available data (and projections) relative to the housing, population, and transit characteristics of the areas observed.	2000	Case study results: Residents of transit zones: 3 times as likely to take transit to work than residents of the region as a whole; 3+ times likely to bike or walk to work than are residents of the region as a whole. As transit system size increases, transit ridership increases. Nationally, 42% in transit zones use cars for work commute vs. 82% elsewhere. Pedestrian and bike mode shares in transit zones 3-7 times higher than regional averages. Households near transit are smaller, with lower incomes than the region as a whole. As transit systems grow in size, though, household composition and income more closely resemble regional averages. Within 1/2 mile of transit 54% are more likely to rent than own homes. Demand for housing near transit will more than double by 2030. It is important to have strong government leadership for development of TOD. Public-private partnerships can yield impressive results and there are many differing ways to leverage both public and private funding in order to secure affordable housing in TOD projects.		Realizing the Potential: Expanding Housing Opportunities Near Transit / Reconnecting America (2007)
MISC: Nationwide			LRT	Potential national demand for housing in transit zones through 2025	GIS analysis was then applied to metropolitan and transit zone typologies. The results were combined with household projections and then preference assumptions.	2000	In the next 20 years, 14.6M households will be looking to rent or buy housing within a half mile of fixed-guideway transit stops.	Developmental	Hidden in Plain Sight / Reconnecting America (2004)

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
MISC: Nationwide			LRT COM	Residential and commercial property value	Various statistical analysis procedures including hedonic price approach and matched pair comparison		19 recent studies in 10 major U.S. regions: Homes in communities with rail transit sold at a 6-8% premium per sq ft. Prices rose with increased distance from line but fell with distance from station. Rapid and commuter rail systems have a greater impact on property values than LRT due to larger "sphere of influence" (e.g., higher speeds and increased regional access). Home price premiums decline by $32-2300 with each additional 100 ft distance from the station. The highest values were found near NYC and SF rapid rail stations with LRT typically declining $80 or less per 100 ft. Rent premiums declined by 0.5% per 100 ft. Commercial rates had negligible to $30 premiums per sq ft within 0.5 miles of a station, with premiums decreasing by up to $2 with each 100-ft move away from the station.	Economic	Brinckerhoff (2001)
MISC: Nationwide			LRT	Economic impacts of LRT	Various		LRT has enhanced residential property values 2-18% in Portland, Sacramento, San Diego and Santa Clara, with larger changes in cities with commuter rail systems. Premiums of 4–30% exist for office, retail, and industrial buildings located near rail transit in Santa Clara, Dallas, Atlanta, San Francisco, and Washington, D.C. In St. Louis, LRT development activity has been valued at $1B. Portland has seen $3B in real estate and overall economic development taking place near MAX LRT stations. Within five years after MAX was constructed, over 7M sq ft of new development valued at over $900M occurred adjacent to LRT. In San Francisco, properties near transit stations average a premium of 20-25% over comparable non-transit sites. In downtown San Diego, where the trolley, buses, and commuter rail lines converge, there are 4,000 new apartments and 4,000 condominiums under construction or in the approval process.	Economic	American Public Transportation Association, 2008

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System	Line	Station	Mode	Measure	Measurement Technique	Bench mark	Value	Impact Type	Source
MISC: Nationwide			LRT COM	How land-use environments, and mixed uses in particular, affect commuting behavior	Matched pair comparison	1985	The relative proximity of mixed-use development matters greatly. If retail shops are within 300 ft, or several city blocks, from a dwelling unit, workers are more likely to commute by transit, foot, or bicycle. Beyond this distance, however, mixed-use activities appear to induce auto-commuting. Neighborhood density and mixed land-uses tended to reduce vehicle ownership rates and were associated with shorter commutes, controlling for other factors such as household income. In combination, the effects of reducing auto-commuting, commute distances, and vehicle ownership rates suggest that moderate-to-high density, mixed-use neighborhoods average less vehicle-miles-traveled (VMT) per capita than lower density, exclusively residential ones.	Social	Cervero (1996b)
Vancouver B.C.	SkyTrain		AGT	Change in mode of trip	Customer survey	2004	Percent of rail riders show formerly drove alone: 42%	Transportation	Litman (2006)
Vancouver B.C.	West Coast Express		COM	Change in mode of trip	Customer survey	2004	Percent of rail riders who formerly drove alone: 49%	Transportation	Litman (2006)
England: Sheffield	Supertram		LRT	Residential property value	Hedonic price approach	1988	In 1988 (announcement), properties closer to the station were marginally more expensive, by 1993 (building) that trend reversed; in 1996 (completion), there was no significant difference in property values.	Economic	Henneberry (1998)

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APPENDIX B:
FEDERAL AND STATE POLICIES, PRACTICES, AND AUTHORITIES AFFECTING RAIL DEVELOPMENT

This section lists statutes and policies pertaining to operations between TxDOT and railroad companies at highway-railroad grade crossings.
(See entire rail manual at: http://onlinemanuals.txdot.gov/txdotmanuals/tfe/tfe.pdf.)

FEDERAL

The *Federal-Aid Policy Guide (FAPG)* Title 23, CFR Part 140, Subpart I and 23 CFR, Part 646, Subpart A & B. All projects undertaken by TxDOT and agreements with railroads where federal funds will be used shall meet the requirements of the *FAPG*.

Railroad Practices

TxDOT complies with the following practices:

- *Association of American Railroads, Communication and Signal Division, Signal Manual of Recommended Practice*, Volume 1, Section 3, "Highway Grade Crossing Warning Systems."
- The *Railroad-Highway Grade Crossing Handbook — Second Edition*,

U.S. Code (http://www.gpoaccess.gov/uscode/index.html)

Railroads operating within the state of Texas shall comply with the safety requirements contained in or adopted under the following statutes:

- 49 United States Code, Subtitle III, §§5101, et seq.;
- 49 United States Code, Subtitle V, §§20101, et seq.;
- 49 USC §5330 - safety program plan for fixed guideway mass transportation system
- Texas Civil Statutes, Article 6448a; and
- Texas Civil Statutes, Article 6492a.

STATE OF TEXAS

Railroad Operations

- **Maintenance Responsibilities.** In Texas, the road authority and railroad company assume both separate and joint maintenance responsibilities at highway-rail grade crossings. The track and signals are always maintained by the rail operator, because they are located within railroad right-of-way.
- **Working on Railroad Right-of-Way.** An agreement between TxDOT and the operating railroad company must be in place giving TxDOT permission to enter into and perform work on railroad right-of-way.
- **Railroad Payment** The state normally reimburses the railroad for force account work, except where an existing highway is crossed by a new railroad. For new railroads, most crossing agreements provide for the railroad to assume the entire cost. The railroad bears the expense and responsibility of maintaining crossing warning signal systems, crossbuck signs, and crossing surfaces.

Texas Policies
The following policy instruments pertain to railroad grade crossings:

- **Texas Transportation Commission Minute Order No. 74227**, dated March 27, 1978. Re-authorized the annual state funded grade crossing protection program.
- **Texas Transportation Commission Minute Order No. 106784**, dated March 28, 1996. Authorized use of federal railroad signal program funds to make roadway and operational improvements.
- **Texas Transportation Commission Minute Order No. 107279**, dated September 25, 1997. Established goals for TxDOT's railroad safety program and all projects involving the upgrade of highway-rail intersections.
- **The *Texas Manual on Uniform Traffic Control Devices (TMUTCD)***. Applicable portions include (but are not limited to) Part VIII, "Grade Crossings."

Texas Attorney General Opinions
The following Texas Attorney General opinions pertain to railroad grade crossings:

- **Texas Attorney General Opinion No. M-525**. Re: Authority of TxDOT to make expenditures request to qualify for projects under 23 U.S.C. Section 405, dated February 13, 1976.
- **Texas Attorney General Opinion No. M-108**. Re: Validity of appropriation to TxDOT to construct and maintain railroad protective devices, dated July 24, 1967.

Texas Governing Statutes (excerpts from TxDOT Rail manual)
Also see Texas Statutes: http://tlo2.tlc.state.tx.us/statutes/index.htm

- ***Art. 6320, V.T.C.S. Streams of Water.*** RR pays for crossing roadways
- ***Art. 6327, V.T.C.S. Crossings of Public Roads.*** TxDOT pays to cross RR
- ***Transportation Code, Section 471.002: "Signs at Cross-roads."*** RR erect a signs
- ***Transportation Code, Section 471.004: "Warning Sign Visibility at Railroad Grade Crossings."*** Requires TxDOT to reflectorized signs
- ***Transportation Code, Section 471.005: "Dismantling of Railroad Grade Crossing Warning Signals Located on an Active Rail Line."*** Requires short line RR operators to obtain a permit from the responsible road authority.
- ***Transportation Code, Section 545.252.*** Gives TxDOT and local governments specific statutory authority to place traffic control devices at grade crossings on the roads they maintain, but no duty or minimum standards are imposed.
- ***Transportation Code, Section 471.003: "Telephone Service to Report Malfunctions of Mechanical Safety Devices at Crossings."*** Requires TxDOT to furnish and install railroad signal malfunction signs providing the telephone number.

Texas Statutes

The following Texas statutes relate to rail development and operations. For detail, go to : http://tlo2.tlc.state.tx.us/statutes/index.htm.

TITLE 5. RAILROADS
- CHAPTER 91. RAIL FACILITIES
- CHAPTER 171. FREIGHT RAIL DISTRICTS
  - SECTION 171.002. APPLICABILITY OF RURAL RAIL TRANSPORTATION DISTRICTS LAW
  - SECTION 171.051. APPLICABILITY TO CERTAIN COUNTIES
  - SECTION 171.052. CREATION BY COUNTIES AND MUNICIPALITIES
  - SECTION 171.053. INTERMUNICIPAL COMMUTER RAIL DISTRICT POWERS
- CHAPTER 471. RAILROAD AND ROADWAY CROSSINGS
- CHAPTER 317. ELIMINATION OF GRADE-LEVEL STREET CROSSINGS BY RAILROAD LINES IN MUNICIPALITIES WITH POPULATION OF MORE THAN 100,000
  - ARTICLE 4008b. STREET RAILWAYS

TITLE 6. ROADWAYS
- CHAPTER 452. REGIONAL TRANSPORTATION AUTHORITIES
  - SECTION 452.064. LIGHT RAIL SYSTEM: REGULATORY EXEMPTION
  - SECTION 452.065. ELECTRIC POWER FOR RAIL SYSTEM: CERTAIN AUTHORITIES
- CHAPTER 455. GENERAL POWERS AND DUTIES OF DEPARTMENT OF TRANSPORTATION REGARDING MASS TRANSPORTATION
  - SECTION 455.005. RAIL FIXED GUIDEWAY MASS TRANSPORTATION SYSTEM SAFETY OVERSIGHT

TITLE 112. RAILROADS
- CHAPTER 1. CHARTER AND AMENDMENTS
- CHAPTER 6. RIGHT OF WAY
- CHAPTER 7. OTHER RIGHTS OF RAILROAD CORPORATIONS
- CHAPTER 8. RESTRICTIONS, DUTIES AND LIABILITIES
- CHAPTER 9. COLLECTION OF DEBTS AND RIGHTS OF EMPLOYEES
- CHAPTER 10. LIABILITY FOR INJURIES TO EMPLOYEES
- CHAPTER 11. RAILROAD COMMISSION OF TEXAS
- CHAPTER 13. MISCELLANEOUS RAILROADS
- CHAPTER 15. VIADUCTS

- CHAPTER 451. METROPOLITAN RAPID TRANSIT AUTHORITIES
- CHAPTER 452. REGIONAL TRANSPORTATION AUTHORITIES
- CHAPTER 453. MUNICIPAL TRANSIT DEPARTMENTS
- CHAPTER 454. MUNICIPAL MASS TRANSPORTATION SYSTEMS
- CHAPTER 456. STATE FINANCING OF PUBLIC TRANSPORTATION
- CHAPTER 457. COUNTY MASS TRANSIT AUTHORITY
- CHAPTER 458. RURAL AND URBAN TRANSIT DISTRICTS
- CHAPTER 460. COORDINATED COUNTY TRANSPORTATION AUTHORITIES
- CHAPTER 471. RAILROAD AND ROADWAY CROSSINGS

Texas Administrative Code
(For agency Rules: http://www.sos.state.tx.us/tac/index.shtml)

Title 43 TAC, Transportation Part 1

Chapter 7, Rail Facilities
- Subchapter A General Provisions
- Subchapter B Contracts
- Subchapter C Abandoned Rail
- Subchapter D Rail Safety

Chapter 31, Public Transportation
- Subchapter F – Rail Guideway System State Safety Oversight Program

RAIL SAFETY

Federal Rail Safety

Both the Federal Railroad Administration (FRA) and the Research and Special Programs Administration (RSPA) of the U.S. Department of Transportation (DOT) have established federal regulations pertaining to rail safety. These rules set standards that must be observed by all railroads dealing with the interchange of railroad cars and equipment and all passenger-carrying railroads (excluding light-rail facilities). The state's rules on rail safety are under the jurisdiction TxDOT.

The passage of the 1970 Federal Railroad Safety Act includes:

- broad regulatory authority to address all areas of railroad safety;
- strong emphasis on national uniformity of safety standards;
- effective sanctions, including the ability to address emergency situations; and
- state participation in enforcement of National standards.

Texas Railroad Safety

The Texas Railroad Safety program began in 1983. The rail safety program is primarily concerned with the enforcement of state and federal rail safety standards for track, locomotives, freight cars, signal and train controls, operating practices of employees, and the transportation of hazardous materials.

Rail Line Abandonment

The adoption of the Stagger's Rail Act in the early 1980s allows railroads to more easily either sell marginal routes to short line operators or petition for abandonment. The NETEX RRTD purchased the Cotton Belt rail line between Wylie and Greenville, northwest of Dallas corridor with funds appropriated by the 77th Texas Legislature through TxDOT to prevent the loss of the right of way. See: 43 TAC Chapter 7, Subchapter C – Abandoned Rail, and Transportation Code, Chapter 91, which authorizes the department to acquire abandoned rail facilities.

Rural Rail Transportation Districts

The Texas Legislature passed legislation allowing the formation of Rural Rail Transportation Districts (RRTDs). RRTDs were given the power of eminent domain as well as the authority to issue bonds to assist in their efforts to preserve rail infrastructure and promote economic development in the state. RRTDs are formed by action of one or more county commissioner's courts under rules outlined in Vernon's Texas Civil Statutes Title 112, Chapter 13, Article 6650c.

APPENDIX C:
OUTLINE OF COMMUNICATIONS BROCHURE

The following assumes a six-sided communications piece.

PAGE 1

Catch interest with title "Working on the Rail & Road."

Photo of TRE.

Smaller subtitle: What can rail do to move Texans?

PAGE 2

Header: Transportation Benefits of Rail.

Text: Discuss general concept of rail benefits: increase person-carrying capacity of corridor.

Quote transportation benefits:

- Rail attracts people out of cars: 85% of DART rail riders are "by choice" – North Central LRT Extension Before and After Study," DART, 2006;
- Rail mitigates roadway congestion: Cities with significant rail systems have a slower rate of per capita congestion growth than cities with small rail or no rail - "Rail Transit in America: A Comprehensive Evaluation of Benefits," Victoria Transport Policy Institute, 2006; and
- Rail is safe: Table of accident rate per capita, by mode.

PAGE 3

Header: Social Benefits of Rail.

Text: Discuss general concept: increased access to transit frees up family budgets.

Quote social benefits:

- Even with gas prices coming down, Dallas commuters can save an estimated $8233 annually by riding transit – American Public Transportation Association, Transit News, November 6, 2008; and
- Transit provides basic mobility to people who are unable to drive – because they lack a car, have health concerns, are too young, or cannot afford a vehicle.

Picture of person in wheelchair boarding bus.

PAGE 4

Header: Economic Benefits of Rail.

Text: Discuss general concept: Rail supports development, economic opportunity, and creating livable communities.

Quote economic benefits:

- Rail can increase nearby property values – Between 1997 and 2001, the median value of residential properties in the light rail study area increased 32.1%; the property valued in the control group rose 19.5% - "An Assessment of DART LRT on Taxable Property Valuations and Transit Oriented Development," Center of Economic Development and Research, University of North Texas, 2002.
- Commuter rail impacts commercial property value - Proximity to a downtown Coaster station was positively reflected in commercial property premiums (91.1%) - "Effects of Light and Commuter Rail on Land Prices: Experiences in San Diego County," *Journal of Transportation Research Forum*, 2004.
- Rail promoted transit-oriented development (TOD) - More than $127 million yearly in state and local tax revenue will potentially be raised by DART Rail TOD projects. – Center of Economic Development and Research, 2002

PAGE 5

Header: How Other DOTs Help.

Series of short sentences and photos for different systems:

Caltrans (California) manages and finances operation of two intercity rail lines and helps finance the operation of a third line.

Florida DOT provides local match funds for rail projects statewide that are consistent with local and regional transportation investment objectives.

Georgia DOT is developing a commuter rail line in the Atlanta metropolitan region.

Minnesota DOT is a catalyst in planning and funding commuter rail in the Minneapolis-St. Paul region.

PAGE 6

For more information see:

TRANSPORTATION, SOCIAL AND FINANCIAL IMPACTS OF LIGHT AND COMMUTER RAIL

Jeffrey C. Arndt, Curtis Morgan, John H. Overman, Terry L. Clower, Ph.D., Michael Seman, M.S. and Bernard L. Weinstein, Ph.D.

URL: http://tti.tamu.edu/documents/0-5652-1.pdf