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16. Abstract Railroads continue to play an important role in the Texas transportation system. This study addresses the potential for implementing a rail planning process in the Texas Department of Transportation. The study is documented in three reports, produced in coordinated and parallel efforts by the Center for Transportation Research and the Texas Transportation Institute. This report documents the work performed by TTI, whereby a rail planning framework is presented which formalizes the planning process and presents the keys elements as a series of discrete and logical steps. These steps may be used to guide TxDOT in the formation of goals, identification of issues and affected parties, selection of appropriate analytical methodologies, location of data sources, and implementation of results. The report also presents an in-depth discussion of several key issues facing transportation agencies. These include rail line abandonment, intermodal service planning, and urban rail rationalization. A discussion of the Texas rail system covers the Class 1 railroads, shortline railroads, Amtrak, and the Mexican rail system.					
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THE RAILROAD SYSTEM OF TEXAS: A COMPONENT OF THE STATE AND NATIONAL TRANSPORTATION INFRASTRUCTURE

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IMPLEMENTATION STATEMENT

This interim report represents a resource document detailing passenger and freight rail service in the state of Texas, and identifies information and data sources that describe the rail transportation industry at both the state and national levels. The information provided in this report will be implemented within TxDOT's Multimodal Section of the Planning and Programming Division in the form of a rail planning process.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the findings and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation (TxDOT), or the Federal Highway Administration (FHWA). This report does not constitute a standard, specification, or regulation.

ACKNOWLEDGMENT

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EXECUTIVE SUMMARY

INTRODUCTION

Industry and commerce in Texas is heavily dependent on the railroads operating in the state for reliable and cost-effective transportation of goods and material. Railroads provide a particularly efficient means of moving bulk commodities. They are better suited than other land transportation modes for moving heavy loads long distances, and, when compared to trucks, they are more fuel efficient.

Texas has an extensive and robust freight railroad network. The state currently has three Class I railroads operating within its borders (Union Pacific, Burlington Northern-Santa Fe, and Kansas City Southern) and many smaller regional and shortline operators serving the transportation needs of shippers. Internationally, Texas serves as a gateway to Mexico and supports over 75% of the rail freight between the U.S. and Mexico. Texas is in a unique position in regard to cross-border trade with Mexico. With 18 border crossings, including five rail crossings, Texas has as many ports of entry with Mexico as the rest of the border states combined.

RESEARCH OBJECTIVES

Among their many distinctions, freight railroads in the U.S. are typically privately owned, financed, and operated. The private nature of rail transportation creates unique challenges and opportunities for the agencies charged with protecting the public's transportation interests. State Departments of Transportation have all too often viewed (and consequently ignored) rail as an inaccessible and uncooperative feature of the transportation landscape. But these attitudes are changing. Transportation has entered a period of resource scarcity with public agencies looking at every facet of the equation to optimize the "transportation system" in a manner that matches up well against growing demand for transportation infrastructure, services, and resources.

A significant early step toward this end is to develop a *rail planning process*. Virtually every state involved in rail planning produces a rail plan document that describes its statewide rail network, provides an inventory of services, and delineates existing problems. These rail planning processes are developed in response to individual states' needs and vary according to organizational structures, planning methodologies, funding programs, statutory limitations on spending, and economic and cultural considerations.

The Texas Department of Transportation (TxDOT) has sponsored this research to better prepare itself to work effectively with, and for rail transportation in Texas. The two year study was carried out jointly by the Texas Transportation Institute (TTI) and the University of Texas' Center for Transportation Research (CTR). Each research agency addressed a specific facet of the how best to position TxDOT to respond to the rail planning issues facing the state. For its part, CTR has undertaken a detailed examination of the rail planning functions found in other states. Two reports have resulted from these efforts. The first year report, titled *State Rail Policies, Plans, and Programs* detailed the programs and mechanisms found in 32 state rail programs. The year-two report, titled *Exemplary State Rail Programming and Planning: Case Studies of California, Florida, North Carolina, and Washington State*, focused on programs of particular interest to Texas, as identified by the Project Director.

The purpose of TTI's research was to define the steps and deliverables required to provide TxDOT the relevant data and processes needed to implement an effective rail planning program within the Multimodal Section of the Planning and Programming Division. TTI's first year activities focused on Amtrak operations and Texas' Shortline Railroads. The first year report was not published, but formed a portion of the basis for this comprehensive final report, which documents both freight and passenger operations in the state, identifies the information and data resources necessary for rail planning, and addresses issues of concern facing both TxDOT and rail operators providing service in the state.

The rail planning process presented is intended to formalize state rail planning by introducing a logical framework to help define program goals, identify issues and stakeholders, and provide resources and analytical tools. The framework is intended to serve as a starting point for TxDOT's emerging role in rail transportation issues and it should evolve as the State's role evolves, becoming more focused with the accumulation of knowledge and experience.

STEPS IN THE RAIL PLANNING PROCESS

A state rail planning process often concentrates on rail considerations involving either branch lines or the system-wide network. A branch line planning process is, in many cases, a reaction to a perceived need to retain rail service in the likelihood of potential rail abandonment. On the other hand, a system-wide planning process may take a much broader view of rail operations in the state, treating the rail system as a component of the overall transportation network. The rail planning process steps detailed in this report can serve rail planners both from a branch line or

statewide perspective.

Chapter 1 of this report addresses and describes a proposed rail planning process for Texas. The steps in the rail planning process identified through this research are:

- Step 1 - Goal definition in explicit terms such that progress toward specific objectives can be measured;
- Step 2 - Identification of major rail issues of concern to the state;
- Step 3 - Identification of affected parties or interests impacted by rail planning decisions;
- Step 4 - Development of rail service requirements or needs as perceived by affected interests or stakeholders;
- Step 5 - Determination of information and data requirements necessary to evaluate rail service options;
- Step 6 - Identification or development of appropriate analytical or methodological tools for data analysis or impact evaluation;
- Step 7 - Development rail service options and policy alternatives and the determination of evaluation factors upon which to compare options or alternatives;
- Step 8 - Comparison of rail service options or policy alternatives including the “do nothing” scenario;
- Step 9 - Formulation of a preliminary rail plan; and,
- Step 10 - Development of the means by which the plan is implemented.

The rail planning process, as outlined above, may be considered a framework for both tactical and strategic rail planning decisions; tactical decisions being limited to specific, isolated issues which may or may not impact the overall state program and strategic decisions, which help chart the state’s course as it pertains to global state policies and programs.

RAIL ISSUES AFFECTING TEXAS

Rail plays an important role in the overall state transportation system and will continue to do so in the future. Many rail issues affect Texas. Railroad mergers have reduced the number of Class I carriers in the state giving rise to a more important role for shortline operations. Changes in the regulations governing railroad operations have allowed many low density or unprofitable lines to

be abandoned. Containerization of freight and double stack operations have made intermodal connections more important to the economics of transportation and to the efficiency and productivity of freight movement operation - rail, truck, waterborne, and air.

While not all of the important future issues pertaining to rail transportation can be anticipated, Chapter 2 of this report addresses, in some detail, those likely to be central to the state's interests in the years to come.

THE APPLICATION OF THE RAIL PLANNING PROCESS: A CASE STUDY OF URBAN RAIL RATIONALIZATION

The rail planning process can be viewed as a problem solving approach, tailored to each specific circumstance. In Chapter 3, an example of *urban rail rationalization* is used to demonstrate how ordered and logical processes contribute to the solution of one rail-related issue facing public entities. The case study is drawn from recent work by TTI in Bryan and College Station, Texas, where TTI pursued an evaluation of the options available to the community to reduce or eliminate the safety, transportation, and community development problems created by an active rail line bisecting the area.

CHARACTERIZATION OF THE RAIL SYSTEM OF TEXAS

Chapter 4 describes the Texas rail system. Attention is given to the Class 1 railroads, Texas' shortlines, Amtrak operations within the state, and the U.S.- Mexico rail relationship. The material in this section of the report is intended to give the reader an overview of these features of rail transportation in Texas and provide some insight into the issues affecting the state.

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CHAPTER 1. RAIL PLANNING PROCESS FOR THE STATE OF TEXAS

INTRODUCTION

Characteristics of the Texas Rail Industry

Industry and commerce in Texas are heavily dependent on the railroads operating in the state for reliable and cost-effective transportation of goods and material. Railroads provide a particularly efficient means of moving bulk commodities. They are better suited than other land transportation modes for moving heavy loads long distances, and, when compared to trucks, they are more fuel efficient.

Texas has an extensive and robust freight railroad network. The state currently has three Class I railroads operating within its borders (Union Pacific, Burlington Northern-Santa Fe, and Kansas City Southern) and many smaller regional and shortline operators serving the transportation needs of shippers. Texas is near or at the top of several lists of railroad statistics. For example, as of 1995, Texas had more track in service than any other state and was second in the number of railroad employees. Texas was also second both in wages paid railroad employees and the number of rail carloads handled.

Internationally, Texas serves as a gateway to Mexico and supports over 75% of the rail freight between the U.S. and Mexico. Texas is in a unique position in regard to cross-border trade with Mexico. With 18 border crossings, including five rail crossings, Texas has as many ports of entry with Mexico as the rest of the border states combined. The recent consolidations in the rail industry, specifically the Burlington Northern-Santa Fe merger and the acquisition of Southern Pacific by Union Pacific, have reduced the number of railroads operating in Texas, but there remain significant corporate commitments to new rail infrastructure and market development in the state.

The state of Texas was introduced to rail in 1853 when the Buffalo Bayou, Brazos, and Colorado Railroad linked the port of Harrisburg with Stafford's Point, 20 mi (32 km) southwest. By then, almost 13,000 mi (21,000 km) of track were in use in the rest of the U.S., and Chicago was already linked to the East Coast. Although rail was late coming to Texas, the post Civil War period saw dramatic growth in railroad construction. During the 1880s more miles of main line were built in Texas than in any decade before or since. Over 6,000 mi (9,600 km) of new track were laid, tripling

the length of the state's rail lines. By 1905, Texas had more miles of railroad than any other state; a distinction it still holds today. In the U.S., railroad construction had peaked by 1916, but continued in Texas until 1932, when the state had more than 17,000 mi (27,000 km) of track. Since then, abandonments have exceeded new construction in every decade so that, by 1991, Texas had lost 28 percent of the rail network it had in 1932 (Texas Transportation Institute, 1995). The current Texas rail network, which constitutes approximately 7 percent of the total national rail miles, can be seen in Figure 1.

As the top ranking state in total rail kilometers and one of the leaders in the nation in terms of freight hauled, the railroad industry in Texas continues to play a large role in the economy of the state. The top commodity groups originating by rail in Texas are depicted in Table 1. Chemicals and nonmetallic metals make up the bulk of commodities accounting for 53 percent of all rail tonnage originating in the state. The other major commodities shipped from Texas are petroleum or coal products, mixed freight, and food products (the percentages shown do not equal 100 percent, as lesser commodities such as pulp and paper products or lumber and wood products are not displayed).

Table 1. Top Commodities Originating in Texas - 1995

Commodity Group	Carloads	Tons (millions)
Chemicals	236,000	20.6
Nonmetallic Minerals	208,000	19.9
Hazmat	217,000	15.9
Petroleum or Coal Products	65,000	5.1
Mixed Freight	381,000	6.7
Food Products	71,000	4.1

Source: (AAR Waybill Statistics, 1996)

As displayed in Table 2, the top commodities terminating in Texas are coal and nonmetallic minerals. These two commodities account for 43 percent of all freight terminating in Texas. Other major commodities terminating in Texas are farm products, chemicals, and food products. Not surprisingly, petroleum is not a significant import to the state. As with the table displaying commodities originating in Texas, Table 2 does not sum to 100 percent.

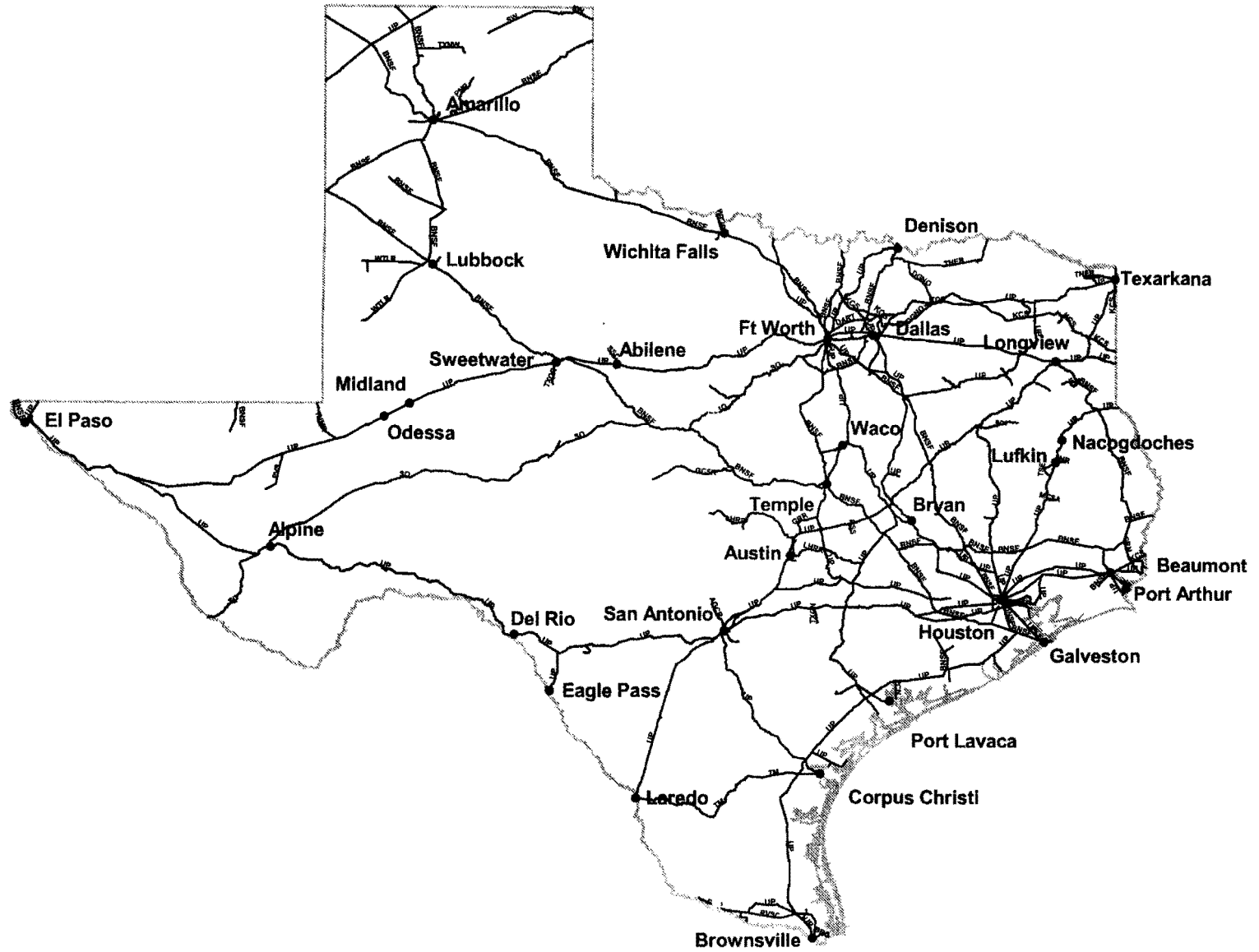


Figure 1. Texas Rail Network

Table 2. Top Commodities Terminating in Texas - 1995

Commodity Group	Carloads	Tons (millions)
Coal	471,000	48.9
Nonmetallic Minerals	245,000	23.5
Farm Products	210,000	19.8
Hazmat	177,000	11.7
Chemicals	122,000	10.6
Food Products	152,000	9.8

Source: (AAR Waybill Statistics, 1996)

Further demonstrating Texas' position as a leader in the nation in regard to the freight rail industry are key railroad statistics describing the state's ranking compared to other states in the union. Table 3 displays the rank Texas holds for such important indicators (among others) as carload handled and total freight carried.

Table 3. Ranking Texas on Key Statistical Indicators - 1995

Key Indicator	Statistic	Rank
Total Rail Kilometers/Miles	17,320 / 10,758	1st
Rail Carloads Handled	5,859,790	2nd
Total Megagrams/Tons Carried	248,895,316 / 274,416,032	5th
Total Railroad Employment	15,046	2nd
Total Wages of Rail Employees	\$742,879,600	2nd
Average Wages Per Rail Employee	\$49,374	-
Average Fringe Benefits Per Rail Employee	\$18,582	-
Railroad Retirement Beneficiaries	42,900	5th
Payments to Railroad Retirement Beneficiaries	\$441,036,000	5th

Source: (AAR Policy, Legislation and Economics Department, 1995)

As can be seen in Table 3, Texas ranks no lower than fifth on such important rail industry statistics as carloads handled, freight carried, and total wages paid to rail employees.

RESEARCH OBJECTIVES

Among their many distinctions, freight railroads in the U.S. are privately owned, financed, and operated. The private nature of rail transportation creates unique challenges and opportunities for the agencies charged with protecting the public's transportation interests. State Departments of Transportation have all too often viewed (and consequently ignored) rail as an inaccessible and uncooperative feature of the transportation landscape. But these attitudes are changing. Transportation has entered a period of resource scarcity with public agencies looking at every facet of the equation to optimize the "transportation system" in a manner that matches up well against growing demand for transportation infrastructure, services, and resources.

To its credit, the Texas Department of Transportation (TxDOT) is one such agency that has begun to approach transportation as an optimization problem. This is evidenced by recent reorganizations, the widespread use of continuous improvement processes, and the addition of the Multimodal Section of the Planning and Programming Division. A major charge of Multimodal Operations is to integrate railroads and rail planning into the larger planning process.

Texas serves as a major crossroad for national and international rail freight movements. Its geographic location adjacent to Mexico means that North-South movements intersect with significant East-West trade to make Texas a major junction for national and international trade. NAFTA is serving to increase the volume of both rail and truck traffic moving between Mexico and U.S. markets in the midwest creating significant policy questions within TxDOT regarding how best to accommodate commercial traffic on Texas-financed roadways. The traffic mitigating role of freight movement by rail is, therefore, of increasing importance to the department and planning efforts must be construed to effectively consider the role of railroads.

A significant early step toward this end is to develop a rail planning process. Virtually every state involved in rail planning produces a rail plan document that describes its statewide rail network, provides an inventory of services, and delineates existing problems. These rail planning processes are developed in response to individual states' needs and vary according to organizational structures, planning methodologies, funding programs, statutory limitations on spending, and economic and cultural considerations. A portion of this research, performed by the University of Texas' Center for Transportation Research (CTR), has focused on this aspect of the rail planning process—identifying and documenting the activities of other states and highlighting exemptory

programs. This work is documented under a separate cover titled “*State Rail Policies, Plans, and Programs: A Policy Research Project.*”

The purpose of this portion of the research is to define the steps and deliverables required to provide TxDOT the relevant data and processes needed to implement an effective rail planning program within the Multimodal Section of the Planning and Programming Division. In partial fulfillment of this goal, this report documents both freight and passenger operations in the state of Texas, identifies the information and data resources necessary for rail planning, and addresses issues of concern facing both TxDOT and rail operators providing service in the state. To help with the understanding of terminology used in the railroad industry, a glossary of terms is provided in Appendix A.

The rail planning process presented is intended to formalize state rail planning by introducing a logical framework to help define program goals, identify issues and stakeholders, and provide resources and analytical tools. The framework is intended to serve as a starting point for TxDOT’s emerging role in rail transportation issues. It should evolve as the state’s role evolves, and it should become more focused with the accumulation of knowledge and experience.

A FRAMEWORK FOR RAIL PLANNING

Compared to the planning functions for other transportation modes, the state rail planning process in Texas has been limited in scope. The reasons for this are varied, but reduce principally to the private nature of rail transportation.

Because rail carries so much freight in Texas and reduces so drastically the number of trucks on Texas’ roads, integration of rail into the statewide transportation plan is important to developing a balanced transportation system in Texas. A balanced transportation system, rather than one with principal dependance on only one mode, optimizes resources by taking advantage of the strengths of each type of transportation system; road, rail, water, and air. In this undertaking, there is an implicit understanding that each mode is different, with differing requirements, constraints, and constituencies. Some of the unique considerations pertaining to planning for rail transportation are presented below:

- Rail transportation is largely a private-sector transportation service and thus integrating rail into a statewide planning process requires an understanding of the goals and constraints affecting railroad management;

- Different interests are affected by railroad service, many dependent on the low rates afforded by rail transportation, and each valuable to the planning process;
- Rail planning technical issues are different, particularly when it comes to analyzing the costs and benefits associated with rail issues facing shippers, railroads, and the state; and,
- State concerns regarding rail issues have historically been questions regarding the retention of existing rail service and facilities, rather than that of improving service – this may be changing.

As stated above, rail operations in the U.S. are almost entirely controlled by private-sector interests. Planning by the private rail companies traditionally has concentrated on network considerations, facilities, maintenance, types and level of service provided, pricing, and marketing policy. Rail planning from the perspective of the railroad companies is, of necessity, primarily concerned with enhancing the economic viability of the enterprise. The role of the state in the rail planning process must then, by definition, consider the relationships between rail service and the economic and social well-being of its citizens. A basic requirement of the state rail planning process is the formulation of a mechanism by which an assessment can be made as to the interests of state government regarding rail operations in light of social, economic, and environmental considerations. In order to achieve this, a major component of any rail planning process should be a rational and factual analysis of rail operations in the state and its impact on shippers, carriers, and other affected interests. The kind of impacts evaluated should focus on each specific circumstance. The rail planning process outlined in this report will assist TxDOT in determining an appropriate focus.

Rail services are, and will continue to be, of vital importance to the effective functioning of the Texas economy. It is essential for the rail planning process to recognize and respond to the many needs implied by this relationship in an organized manner. The purpose of this document is to present an overview of the key steps in the planning process for rail transportation at the state level. The steps proposed represent only the basic foundation required to initiate and implement a comprehensive, ongoing rail planning process. Building on this foundation will require from TxDOT, a commitment of resources, time, and experience with the complex rail issues affecting our state.

STEPS IN THE RAIL PLANNING PROCESS

A state rail planning process often concentrates on rail considerations involving either branch lines or the system-wide network. A branch line planning process is, in many cases, a reaction to a perceived need to retain rail service in the likelihood of potential rail abandonment. On the other hand, a system-wide planning process takes a much broader view of rail operations in the state, treating the rail system as a component of the overall transportation network. The rail planning process steps detailed in this document can serve rail planners both from a branch line or statewide perspective.

The steps in the rail planning process identified through this research are:

- Step 1 - Goal definition in explicit terms such that progress toward specific objectives can be measured;
- Step 2 - Identification of major rail issues of concern to the state;
- Step 3 - Identification of affected parties or interests impacted by rail planning decisions;
- Step 4 - Development of rail service requirements or needs as perceived by affected interests or stakeholders;
- Step 5 - Determination of information and data requirements necessary to evaluate rail service options;
- Step 6 - Identification or development of appropriate analytical or methodological tools for data analysis or impact evaluation;
- Step 7 - Development of rail service options and policy alternatives and the determination of evaluation factors upon which to compare options or alternatives;
- Step 8 - Comparison of rail service options or policy alternatives including the “do nothing” scenario;
- Step 9 - Formulation of a preliminary rail plan; and,
- Step 10 - Development of the means by which the plan is implemented.

At this point it is important to make the distinction between the rail planning process and the development of a distinct plan to respond to rail-related transportation needs. A specific plan is developed methodically, with the best data available and considering important issues by using the process outlined in this section. The process is a logical sequence of steps that determines or uses

pre-existing goals, consults with affected parties, and gathers and evaluates information, all to make the best possible choice for the combined constituencies.

A comprehensive assessment of global state needs, using the rail planning process, may contribute on the other hand, to the development of a statewide rail plan by identifying many individual plans, projects, or initiatives. This research will frequently discuss the steps of the planning process in the context of a single assessment. However, it should be understood that the process encompasses both strategic and tactical activities.

The state railroad planning process may involve a large number of participants. An important requirement for a successful planning process is the identification of a lead agency and the clear definition of the mechanisms and relationships by which other affected state agencies participate in the planning process. Additionally, the process framework must be constructed so that rail plan objectives are compatible with public policies in other areas, such as other modes of transportation, economic development initiatives, and environmental policies. A rail planning process needs to draw upon a wide range of sources, not only for information and data, but for the different perspectives they will contribute toward the undertaking. In its simplest form, a rail planning process is schematically displayed in Figure 2.

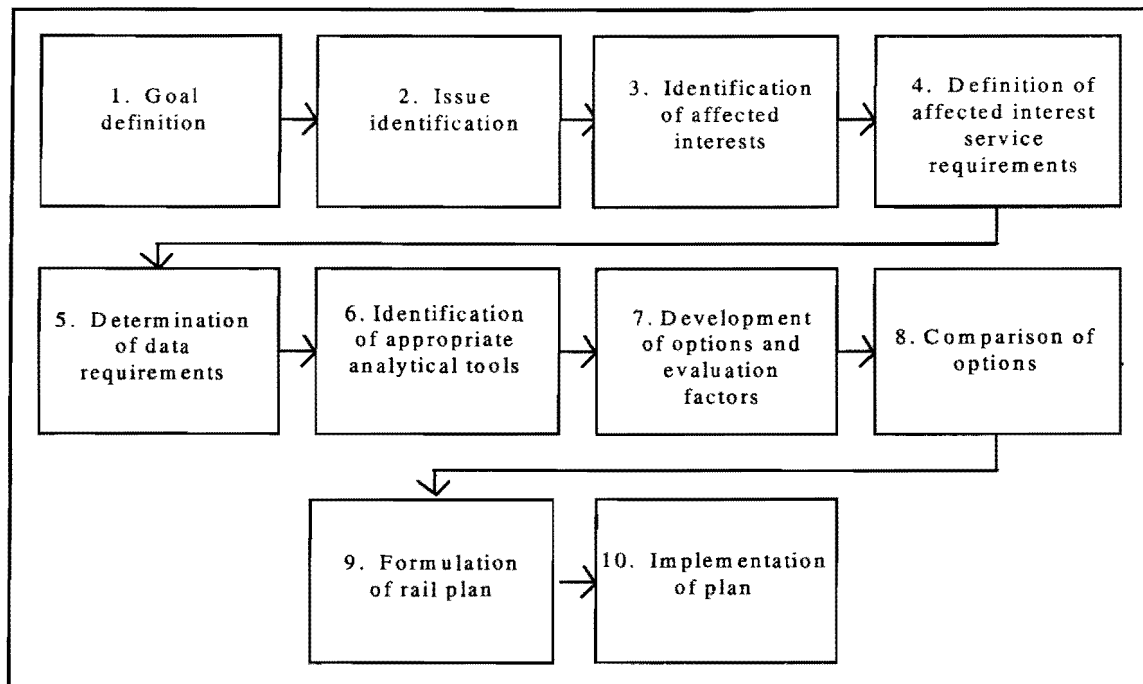


Figure 2. State Rail Planning Process

Step 1. Goal Definition

Well-defined goals provide the targets for state rail planning. As such, they should be developed in a participatory atmosphere, early in the rail planning process. These goals should be precise definitions of desirable future characteristics and should be related to the performance characteristics of facilities, systems, and programs which affect, or are affected by, the state rail system.

A goal generally indicates the direction in which one should strive to do better. An example of a broad overall goal is to “improve intermodal terminal access.” Such a broad goal provides little, if any, insight into which of a number of alternative programs may be best or even worthwhile to pursue. It does, however, provide a critical starting point for specifying the issues, affected parties, and ultimately, the options to pursue.

Goal identification is often tied to the principal issues currently under discussion in the state. Major state and regional issues represent useful starting points for the identification of potential rail planning goals. Such issues should be identified, and any basic documentation which describes them, and in particular, which defines positions taken on them by various agencies and organizations, should be reviewed to determine their relevance to rail planning. Where appropriate, such positions and statements should be phrased as potential rail planning goals, and made available for modification by key participants in the goal formulation process. For example, indications that the agricultural economy of a region in the state is declining (e.g., farms failing, unemployment rising), and that this decline should be reversed, may be important to the extent that the rail system can play a role in a more sound regional economy. The issues to be analyzed in the formulation of a draft set of goals are those matters in a region or in the state which play a role in, or are influenced by, the rail transportation system.

One approach to establishing planning goals is to engage participants, such as representatives of government agencies, business, industry, agriculture, and other interested groups, in the formulation of a basic set of goals. Seeking goal definition guidance from local governments, regional authorities, private groups, associations, and individuals is particularly important for it allows the planning process to address unique needs and opportunities in many sectors, and thus be more broadly representative of the varied constituencies involved.

Guidelines for Goal Definition

There are a few general guidelines to help ensure that the goals defined during the rail planning process are relevant, comprehensive, and useful.

Identifying and Developing Goal-related Materials Overall goals for the state rail planning process may come from a variety of sources. Sources such as written documents, public statements, and records of recent decisions can serve as valuable resources. An understanding of needs developed through the active participation of the constituencies involved in rail transportation (i.e., railroads, shippers, rail districts, and the department), will result in goals of sufficient depth and breadth to provide meaningful state participation.

What Goals Represent Goals should directly specify the desired future characteristics of the rail system. A goal is a global state or condition that the program seeks to achieve.

Goal Comprehensiveness In developing goals, it is important to consider the interests of all relevant rail constituencies in the state, and not just those directly involved in transportation. Goals should focus on the needs of existing rail service while addressing the possibility of initiating new rail services. Additionally, provisions for goals related to issues not under current discussion, but likely under future consideration, will ensure that the planning process is acceptably forward looking.

Goal Formulation Process

Solicit Goals Initiation of the state rail planning process should be announced publicly in order that appropriate interest groups can participate in goal formulation. Interested parties and agencies should be encouraged to submit goals and problem statements.

Review Goal-related Materials Official documents, legislation, previous rail studies and papers, and goals received from solicitation need to be reviewed for potential use as draft goal statements.

Draft Goal Statements Based on all goal-related information collected previously, goal statements can be developed. Goal conflicts and duplication should not be eliminated in the draft as these may signal goal areas of particular concern or priority.

Develop Goal Structure Organizing goal statements into a rail planning goal hierarchy is useful in that it provides a logical format for presenting the goals to the public, and makes goal duplication and conflict more evident. The basic structure should be that of a few key goals and a large number of more specific sub-goals.

Refine Goals After having structured the goals in a hierarchy, the interrelationships among them become more clear, allowing goal refinement into a form that is more meaningful to the planning process. At this point, any goal conflicts should be resolved and duplication eliminated from the structure.

Develop Initial Goals An initial set of goals should be prepared and issued as a public information document associated with the rail planning process. This document will serve to inform groups of interest as to the direction the planning process is taking. The report should detail the process by which goals were formulated and credit all contributors to the process.

Distribute Initial Goals The initial goals report should be distributed to all interested parties. Recipients of the report should be encouraged to comment on the goals and make modifications. A questionnaire can be included with the distributed report in order that the respondents might have a more structured means of communicating their suggestions.

Revise Goals Following distribution of the goals report, responses received should be reviewed as potential input to goal refinement and modification. If the responses received contain a large amount of conflicting goal sentiment, it may be necessary to repeat the process of goal distribution. The product of this step is a final specification of initial goals as well as a precise definition of goal priorities.

Monitor Rail System The final specification of goals should not be viewed as “set in stone.” During the planning process it may become apparent that needs or opportunities within the state have changed, or that the rail system within the state itself has changed. It is important to continuously monitor relevant aspects of the rail environment and, if necessary, modify goals accordingly.

Issue Goal Reports As the rail planning process is evolving, periodic reports on goals and goal attainment should be distributed to interested parties in the state. These reports should be distributed in accordance with the goal formulation process procedures discussed previously. Comments should be encouraged as with earlier report distributions.

The entire goal formulation process is displayed schematically in Figure 3.

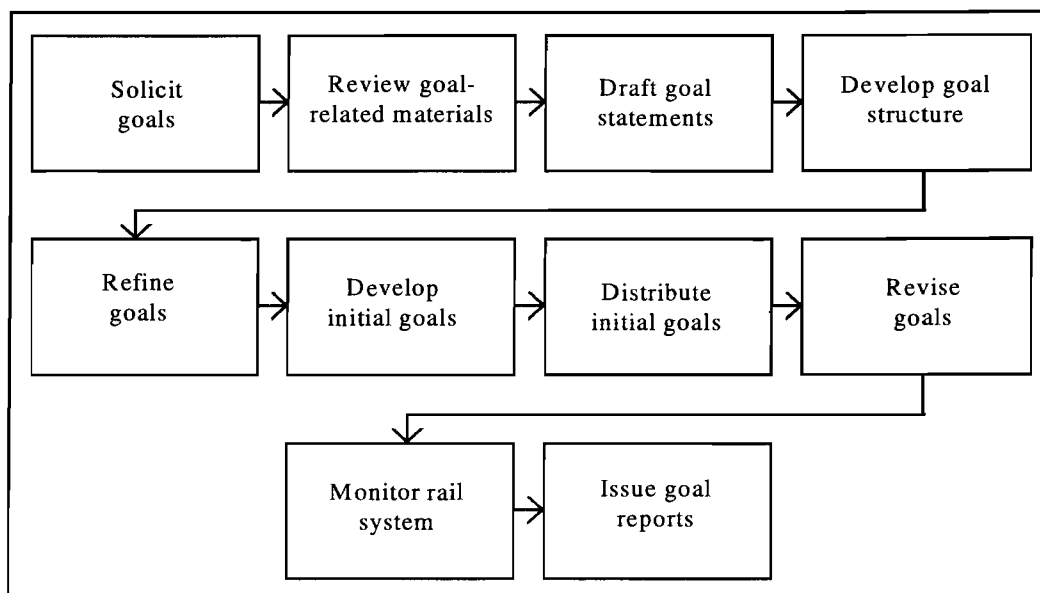


Figure 3. Goal Formulation Process

An important source of input for goal development and formulation is other state agencies, particularly those involved with transportation, economic development, natural resources, agriculture, and land use. However, the goals associated with a successful state rail planning process must necessarily be formulated from sources outside of state government. The goal formulation process must seek input and information from beyond state agencies, as represented by local governments, regional authorities, shippers, and individuals. This was a guiding principle of the original Rail Reorganization Act of 1973, and is still appropriate today for rail plan development.

Table 4 lists a set of goals that could conceivably serve as a nucleus for an initial set of rail plan goals. While the list is not exhaustive, it will provide a basis for goal formulation in rail impact areas such as economics, transportation, state development, resource management, and the community.

Table 4. Examples of Goals for State Rail Planning

GOALS	AFFECTED PARTIES			
	State	Carrier	User	Community
<u>ECONOMIC GOALS</u>				
Increase Revenues/Solvency of Carriers	•	•		
Reduce Carrier's Costs		•		
Decrease Cost to Shipper/Receiver/User	•	•	•	
Reduce State Expenditures	•			
<u>TRANSPORTATION GOALS</u>				
Reduce Total Travel/Shipping Time	•	•	•	
Increase Reliability of Shipment		•	•	
Facilitate Intermodal Transfer	•	•	•	
Increase Passenger Comfort/Convenience		•	•	
Maintain Rail Services to Localities	•		•	•
Encourage Reasonable Competition	•		•	
Maximize Use of New Technology/Management Techniques	•	•		
<u>STATE DEVELOPMENT GOALS</u>				
Promote Economic Growth	•	•	•	•
Encourage Settlement Patterns Constant with State Development Plan	•			
Maintain Options for Future Access to Freight Generating Activities	•			
Reduce Dependence on Highways	•			•
Reduce Excessive Truck Volumes on Highways	•			•
<u>RESOURCE GOALS</u>				
Conserve Energy	•	•		
Conserve Scarce Resources (open space, scenic areas, wildlife, historic sites)	•			•
Minimize Adverse Environmental Impacts (air, water, noise, wildlife)	•			•
<u>COMMUNITY GOALS</u>				
Maintain Economic Base of Localities	•		•	•
Minimize Physical Dislocations	•		•	•
Increase Safety	•	•	•	•

Step 2. Issue Identification

One of the first steps in a railroad planning process is the identification of key issues of concern to the state. These could include:

- Issues relating to the unique characteristics of the state rail system (e.g., cross-border traffic with Mexico, the centralized location of Texas);
- Current authority of state agencies with respect to railroads;
- Rail safety;
- Railroad mainline and branch line service quality;
- Passenger service or lack thereof;
- The role of the state in abandonment proceedings; and,
- Issues of concern to specific state agencies, such as agricultural, natural resources, or economic development.

A broad definition of “issue identification” would involve any serious problems with rail transportation in the state, and the decisions regarding alternative actions that a state may take to address those problems. Issues, as problems, could be exemplified as any instance of inadequate performance in relation to a stated goal. Such a definition emphasizes the importance of proper goal formulation. Problems associated with unreliable rail service, for example, impact the achievement of goals related to improving customer service options. Other issues might involve whether or not to subsidize passenger rail service or maintain operations on a branchline slated for abandonment.

As with goal formulation, issue identification is likely to be most successful if the process involves constituencies within the state that have a significant stake in rail transportation. Examples of such constituencies or interest groups could include:

- Utility companies;
- Rail companies;
- Rail freight shippers and receivers;
- Trucking associations;
- Environmental groups;
- Local governments or rail districts;
- Regional planning agencies; and,
- Railroad labor unions.

There are many ways to contact representatives of each interest group. Personal contact may be the most effective. Although personal contact is labor intensive, it is time well spent in this early stage of the rail planning process as it will help ensure that, as a comprehensive list of current issues is developed, fruitful working relationships may be formed.

Step 3. Identification and Involvement of Affected Interests

Railroad planning must consider who would be affected by plan alternatives, and how they would be affected. The key groups to be involved in the planning process would include the rail carriers, rail users, government agencies, the trucking industry, waterborne carriers, rail service dependents, and the general public. The participation of these affected interest groups is particularly critical for railroad planning because of the private ownership and nonpublic nature of the forum in which decisions are made regarding rail service within the state. In developing the rail plan, the state must take steps to ensure that a mechanism is in place which allows each affected interest the opportunity to provide input.

Evolving from the input derived from affected interests would be the development of a statement of service requirements and needs. This would stem from an analysis of the major issues identified by each of the affected interest groups, as well as their reactions to preliminary goals and objectives statements. Needs to be considered could include desired levels of passenger or freight service, and the characteristics required of this service. Each of the interest groups involved in the planning process can make the following types of contributions to state rail planning activities:

- Statements on rail service issues, needs, and problems;
- Information with respect to current plant and equipment utilization and service levels, as well as proposed plans for rail abandonment or service improvements;
- Suggestions concerning the form and content of the state rail plan;
- Impact analyses of plan options, and of the plan finally proposed for adoption; and,
- Provide continuous feedback and evaluation on the extent to which the state rail system meets state rail needs.

Step 4. Definition of Service Requirements

This step provides a preliminary formulation of state rail needs, derived principally from an analysis of the major issues identified by each of the affected interest groups, as well as their reactions to goals and objective statements. Needs to be considered may include passenger and freight level of service, infrastructure investment programs, line rehabilitation, and any other programs aimed at achieving desired system characteristics.

Step 5. Determination of Data Requirements

One of the most important steps in a rail planning process is the determination of the information and data requirements necessary to evaluate and compare rail service options. In addition, it is crucial that the appropriate analytical and methodological tools be identified for analyzing data, preparing forecasts, and determining social, economic, and environmental impacts. These tools and techniques include those necessary for the analysis of freight and passenger service characteristics and needs, the potential for movement of rail traffic by alternative modes, and the relative cost and benefit of rail plan options.

Statewide railroad planning involves the analyses of the highly complex railroad system and its interrelationships with the population, the economy, the overall transportation system, and the environment of the state. In order to undertake such analyses, information is required. It is important that the rail planning process identify procedures to facilitate the collection, analysis, and reporting of that information. Although not exhaustive, the following represent excellent sources of information for developing a state rail plan.

- The Federal Railroad Administration;
- The Surface Transportation Board;
- Association of American Railroads;
- Railroad regulatory agencies;
- Railroad companies;
- State government agencies;
- U.S. Bureau of the Census;
- Shipper surveys;
- U.S. Geological Survey; and,
- Highway traffic data.

Table 5 provides a list of data items required to successfully support a rail planning process.

Table 5. Data Items Supporting the Rail Planning Process

DATA ITEM	ANALYSIS PHASE					POTENTIAL SOURCE (S)			
	STUDY DESIGN	DATA COLLECTION	IMPACT ANALYSIS	IMPLEMENTATION PLANNING	MONITORING	SHIPPER SURVEY	CARRIER RECORDS	SECONDARY SOURCES	FIELD INSPECTION
PHYSICAL AND OPERATING									
1. Length of rail line	•	•	•	•	•		•	•	
2. Annual one-way locomotive trips			•		•		•		
3. Average grade per mile segment			•				•		
4. Average curve per mile segment			•				•		
5. Average running speed			•				•		
6. Number of defective cross-ties				•			•		•
7. Number of defective rails				•			•		•
8. Quantity of ballast required				•			•		•
9. Terrain type			•					•	
10. Traffic density and adjoining truck lines			•				•		
11. Capital cost and salvage values								•	
a. ties									
b. rail									
c. ballast									
SHIPPER/CONSIGNEE CHARACTERISTICS									
(For each shipper/consignee)									
1. Identification		•	•			•			
a. name									
b. address									
c. phone no.									
2. Private siding/team track			•			•			
3. Distance to nearest alternate team track			•			•			
4. Estimated job losses due to:			•			•			
a. plant closing									
b. transfer of operations									
c. reduced production									
5. Nature of business (SIC type)			•			•			
6. Annual sales volume (\$)			•		•	•			
7. Total present employment of firm			•		•	•			
8. Estimated annual sales loss (if aband.)			•			•			
9. Estimated annual wage loss (if aband.)			•			•			
10. Annual property tax; tax jurisdictions			•					•	
11. Anticipated capital investment due to abandonment			•			•			
12. Radius of firms market (selling area)			•			•			
13. Mode to be used in the event of abandonment			•			•			

Table 5. Data Items Supporting the Rail Planning Process

DATA ITEM	ANALYSIS PHASE					POTENTIAL SOURCE (S)			
	STUDY DESIGN	DATA COLLECTION	IMPACT ANALYSIS	IMPLEMENTATION PLANNING	MONITORING	SHIPPER SURVEY	CARRIER RECORDS	SECONDARY SOURCES	FIELD INSPECTION
TRAFFIC FLOW DATA									
1. For each shipper/consignee currently using rail service by commodity (STCC):			•		•	•			
a. annual no. of carloads									
b. annual tonnage									
c. shipment origin									
d. shipment destination									
2. Average weight per carload by commodity			•			•		•	
3. Revenue/car-mile by commodity			•				•	•	
4. Overhead traffic density	•		•				•		
CARRIER DATA									
1. System and branch operating expenses	•						•		
a. maintenance of way and structures									
b. maintenance of equipment									
c. traffic									
d. transportation rail line									
e. miscellaneous operations									
f. general									
g. taxes									
2. System and branch revenue	•				•		•		
3. System and branch operating statistics							•	•	
a. train-miles					•		•		
b. locomotive-miles									
c. car-miles									
d. gross ton-miles									
e. train-hours									
f. locomotive-hours									
4. Freight car costs:					•		•		
a. per diem rates									
b. capital cost									
5. Railroad crew size			•				•		
6. Railroad wage rates			•				•		
7. Transshipment (loading & unloading) cost by region			•				•		
DIRECT AND INDIRECT IMPACTS									
1. Number of employees by industry type for each impact area			•		•			•	
2. Average wage by county			•					•	
3. Average wage of secondary sector employees			•					•	

Table 5. Data Items Supporting the Rail Planning Process

DATA ITEM	ANALYSIS PHASE					POTENTIAL SOURCE (S)			
	STUDY DESIGN	DATA COLLECTION	IMPACT ANALYSIS	IMPLEMENTATION PLANNING	MONITORING	SHIPPER SURVEY	CARRIER RECORDS	SECONDARY SOURCES	FIELD INSPECTION
4. Per capita income from sources other than wages, salaries, and proprietor's income			•					•	
5. Average household size			•					•	
6. Weekly unemployment payments by wage class; total payments			•					•	
7. Average period of employment			•					•	
8. Public assistance payments by household size			•					•	
9. Political boundary locations		•	•					•	
10. Total new employment claimants-previous year			•					•	
11. Federal and state income tax rates by salary level			•					•	
12. Exhaust emission factors for locomotive and trucks			•					•	
13. Identification of critical air basins within the state			•					•	
14. Ambient pollutant levels			•					•	
15. Environmentally sensitive areas			•					•	
16. Historic sites			•					•	
<u>ALTERNATE MODE CHARACTERISTICS</u>									
1. Local highway condition ratings			•						•
2. Pavement serviceability index by highway segment			•						•
3. Construction cost per mile by highway type			•						•
4. Maintenance cost per mile by highway type			•						•
5. Design term by highway segment			•						•
6. Highway license, fuel, and use taxes			•						•
7. Highway bridge conditions and weight restrictions			•					•	•
8. Trucking costs per ton by region			•					•	
9. Trucking wage rates			•				•		

Information (Data)

The Shipper Survey A shipper survey is one of the most important and useful components of the process of collecting data for railroad system analysis. The purpose of the survey is to provide

data for freight flow analysis, social and economic impact analysis, and current or future rail service needs. An example of a shipper survey may be found in Appendix B.

In the past, three techniques have been used for conducting shipper surveys: the on-sight interview, the telephone interview, and the mailback survey. The on-sight interview requires that each shipper be interviewed through personal contact. It is the most expensive survey technique, but yields the most accurate and detailed information. A telephone interview is less expensive than the on-sight interview but has disadvantages in that the questions asked are fewer and less detailed, and there may be less cooperation among shipper respondents. The mailback survey is the cheapest of the survey techniques, but is hampered by low response rates, and by the fact that the questions must be relatively brief and lacking in detail. Telephone follow-ups to mailback surveys are often required due to incomplete responses.

Regardless of the survey technique used, the most important design consideration of the survey is that the questions asked are pertinent to the survey goals and unambiguous. Examples of common questions asked are:

- Identification of the company, annual sales, annual payroll, number of employees, and a characterization of the company's rail facilities;
- Current and projected freight tonnage patterns as represented by origins and destinations of major commodities received and shipped, as well as the mode of transportation;
- Impact of improved rail service, with emphasis on the type of improvement desired, as well as input regarding competition between rail transport and alternate routing patterns; and,
- Impact of service discontinuance, focusing on the extent of adverse consequences on jobs, sales volume, and the availability of other modes of transportation.

Following formulation of shipper survey questions, the survey instrument should be tested on a specific group of subject matter experts familiar with freight transportation. Because the shipper survey provides such valuable information, it is recommended that the analyst attempt to obtain a 100 percent sample of the population under study.

National Transportation Atlas Databases: 1998 The Intermodal Surface Transportation Efficiency Act of 1991 created the Bureau of Transportation Statistics (BTS), the newest operating administration of the U.S. Department of Transportation. Its mission is to compile, analyze, and make accessible information on the nation's transportation systems; to collect information on intermodal transportation and other areas as needed; and to enhance the quality and effectiveness of the Department of Transportation's statistical programs through research, the development of guidelines, and the promotion of improvements in data acquisition and use. The primary contact for the National Transportation Atlas Databases can be found in Appendix C.

National Transportation Atlas Databases: 1998 is the current release by BTS of a national geographic database of transportation facilities. Included in this database are geographic descriptions of transportation modal networks and intermodal terminals along with a series of "background" files, primarily boundaries, that can be used in conjunction with the facility files. This information provides the data infrastructure to support research, analysis, and decision making across all modes of transportation. The database is designed primarily to meet the needs of the Department of Transportation at the national level, but will have major applications at state and local levels throughout the transportation community.

An important driving force in BTS data compilation and analysis activities is the need for extensive geographic data on transportation facilities and networks, the activities they serve, and the surroundings they affect. The emphasis on geographic data and analyses reflects the central purpose of transportation: to connect separate locations and accommodate the flow of people and goods. This requires refinement and application of analytical methods based on geographic information systems (GIS) technology. GIS provides a practical and realistic method for measuring and understanding the extent, use, performance, and consequences of the transportation system. The National Transportation Atlas Databases: 1998 is the compilation of the infrastructure of GIS databases necessary to support transportation planning and policy initiatives. The Atlas databases are designed to be used within GIS software, although the files are provided in ASCII format and can be used in any database, spreadsheet, or other software package that can accommodate the amount of information within any given file. The Atlas databases were compiled from many parts of the Department of Transportation, Oak Ridge National Laboratory, the U.S. Army Corps of Engineers, and the National Park Service.

The National Transportation Atlas Databases are organized into three types of information. The Transportation Networks represent the location and physical characteristics of highways, railroads,

waterways, fixed guideway transit, pipelines, and commuter rail. The Transportation Terminals represent the location and physical characteristics of intermodal terminals including airports, truck/rail terminals, port facilities, and Amtrak stations. The Background Information includes data of use to the transportation community that are published and maintained by others. Examples include political boundaries, geographic names, and information relating to Canada and Mexico. Where available, the different network and background files are provided at two base-map scales: 1:100,000 and 1:2,000,000.

Databases of particular interest in rail planning included as part of the Atlas are as follows:

- Railway network, including commuter networks and Amtrak terminals, as well as the railway networks of both Mexico and Canada;
- Trailer-on-flat-car (TOFC) and container-on-flat-car (COFC) rail/highway intermodal terminals, as well as transfer facilities containing auto loading ramps;
- Fixed-Route Transit Networks and Terminals;
- National Highway Planning Network;
- U.S. Army Corps of Engineers Navigable Waterways Network; and,
- Water ports and facilities.

U.S. DOT-AAR Grade Crossing Inventory The U.S. DOT-AAR National Rail-Highway Crossing Inventory was developed in the early 1970s through the cooperative efforts of the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), Association of American Railroads (AAR), individual states, and the individual railroads. The inventory contains data on the location of the crossing, amount and type of highway and train traffic, traffic control devices, and other physical elements of the crossing. The FRA voluntarily serves as custodian of the national inventory file. Data in the inventory are kept current through the voluntary submission of information by the states and railroads.

The data maintained in the inventory is very comprehensive. As well as identifying the precise location of the crossing, additional information as to the ownership of the line is provided. Maintained also is the crossing type (whether private or public) and whether or not the crossing is at grade. Included in the inventory are the typical number of train movements, the speed of trains at the crossing, the type and number of tracks, the type of warning devices, and whether or not commercial power is available. Physical characteristics of the crossing are also available in the

inventory such as the type of development around the crossing (industrial, rural, etc.), the smallest crossing angle, the number of traffic lanes crossing the railroad, the crossing surface, and whether or not the highway is paved and the type of pavement markings. Information specific to the highway exists in the form of whether or not the highway is part of the state highway system, what the estimated Average Annual Daily Traffic (AADT) is, and what percentage of traffic consists of trucks.

Information regarding accidents or incidents at a crossing is detailed such as the accident history associated with the crossing as well as the precise location of each event. Specific information regarding the incident is provided such as the speed of the highway user, the position of the highway user (e.g., stalled on track), and the nature of the incident (e.g., train struck automobile). The environment at the time of the accident or incident is described in terms of the temperature, visibility, and weather. In addition, specific text is included in the inventory describing damage costs, number of injured or killed, and motorist behavior leading to the incident. The primary contact for the U.S. DOT-AAR Grade Crossing Inventory is found in Appendix C.

Carload Waybill Sample The waybill sample identifies originating and terminating freight stations, the names of all railroads participating in the movement, the point of all railroad interchanges, the number of cars, the car types, the movement weight, the commodity, and the freight revenue.

The waybill sample data is exhaustive, with each record consisting of over 200 fields of information. Table 6 below contains a sample of the Waybill data. Waybill sample data can be used as input to many projects, analyses, and studies. Federal agencies such as the Department of Transportation and the U.S. Department of Agriculture use the data as part of their information base and, as it relates to this proposed research, states have viewed the waybill sample as a major source of information for developing transportation plans. Other uses of waybill sample data have to do with market analysis, estimation of rail equipment requirements, economic analysis and forecasting, and academic research. Supporting the waybill sample data are a number of industry references, such as the Standard Transportation Commodity Codes (copyrighted by the Association of American Railroads), and the Continental Directory of Standard Point Location Codes (copyrighted by the National Motor Freight Traffic Association).

Two kinds of waybill sample data are available for distribution: a public sample and a confidential sample. In the public sample, the names of the shipper and consignee are not included in the data.

Other data that might disclose a railroad's significant customers and the rate at which it transports the traffic, such as the origin and destination Freight Station Accounting Code (FSAC) and the Standard Transportation Commodity Code (STCC), is proprietary and protected from general release to the public. To receive waybill sample data that contains sensitive information such as this, it is necessary to make a specific request to the Surface Transportation Board.

Table 6. Waybill Sample Data Menu

1 Unique Serial Number	55 Reporting Period Length	111 First Railroad Distance
2 Waybill Number	56 Car Owner's Mark	▼
3 Waybill Date (MM/DD/YY)	57 Car Lessee's Mark	120 Tenth Railroad Distance
4 Accounting Period (MM/YY)	58 Car Capacity	121 Total Distance
5 Number of Carloads	59 Nominal Car Capacity	122 Origin State Alpha
6 Car Initial	60 Tare Weight of Car	123 First Junction State Alpha
7 Car Number	61 Outside Length	▼
8 TOFC/COFC Plan	62 Outside Width	131 Ninth Junction State Alpha
9 Number of TOFC/COFCs	63 Outside Height	132 Termination State Alpha
10 TOFC/COFC Initial	64 Extreme Outside Height	133 Origin BEA Area
11 TOFC/COFC Number	65 Type of Wheel Bearings & Brakes	134 Termination BEA Area
12 Commodity Code (STCC)	66 Number of Axles	135 Origin FIPS Cod
13 Billed Weight	67 Draft Gear	136 Termination FIPS Code
14 Actual Weight	68 Number of Articulated Units	137 Origin Freight Area
15 Freight Revenue	69 Pool Code Number	138 Termination Freight Area
16 Transit Charges	70 AAR Car Type	139 Origin Freight Territory
17 Miscellaneous Charges	71 Mechanical Designation	140 Termination Freight Territory
18 Inter/Intra State Code	72 Licensing State (TOFC)	141 Origin SMSA
19 Transit Code	73 Maximum Weight on Rail	142 Termination SMSA
20 All Rail/Intermodal Code	74 Origin SPLC	143 Origin NET3 Number
21 Type Move (Import/Export)	75 Destination SPLC	144 First Junction NET3 Number
22 Type Move Via Water	76 STCC w/o Hazardous (49) Codes	▼
23 Substituted Truck For Rail	77 First Railroad Alpha	152 Ninth Junction NET3 Number
24 Shortline Miles	▼	153 Termination NET3 Number
25 Rebill Code	86 Tenth Railroad Alpha	
26 Stratum Identification	87 Junction Frequency	<i>State through indicators:</i>
27 Sub-sample Code	88 Expansion Factor	154 Alabama
28 Intermodal Equipment Flag	89 Routing Error Flag	155 Arizona
29 Calculated Rate Flag (MRI Only)	90 ICC Car Type	156 Arkansas
30 Waybill Identifier (MRI Only)	91 Unique Serial Number	▼
31 Reporting Railroad	92 AAR Error Codes	202 Wyoming
32 Origin FSAC	93 Deregulation Date	203 All areas: Alaska, Canada,
33 Origin Railroad	94 Deregulation Flag	Mexico, and others
34 Interchange #1 Rule 260	95 Service Type	
35 First Bridge RR	96 Expanded Carloads	
▼	97 Billed Weight in Tons	
50 Interchange #9 Rule 260	98 Expanded Tons	
51 Termination Railroad	99 Expanded Trailer/Container Count	
52 Termination FSAC	100 Expanded Total Revenue	
53 Population Count	101 First Railroad Split Revenue	
54 Stratum Count	▼	
	110 Tenth Railroad Split Revenue	

Interpreting statistics derived from the waybill sample must be performed with an awareness of certain practices that characterize the collection of railroad waybill data. In particular, analyses

involving freight revenue and carload volumes of intermodal traffic should proceed with caution and a full understanding of the value, and limitation, inherent in the data. Four areas of concern are detailed below:

- **Reported Revenue.** Beginning in 1996, as a result of railroad industry concerns about the release of sensitive contract rate information, the ICC allowed the railroads to disguise their contract revenues by modifying them at the three digit STCC level. For example, although the actual contract revenue for a shipment of STCC 021 was \$1,000, the railroad might report revenues of \$1,100 in the sample. Such revenue modification may vary above or below the actual contract revenue value. The magnitude of the modification is exceedingly confidential and is known only to the Surface Transportation Board and the reporting railroad. This method of modifying revenue is referred to as the calculated rate flag method of data security and tends to have the effect of overstating revenue figures.
- **Billed Versus Actual Weight.** Billed weights as opposed to actual weights make up the weight statistics in the waybill sample. Fewer than 14 percent of the sample weight statistics consist of actual weights. Although it is true that the differences between billed weight and actual weight are relatively minor, it would be inappropriate to perform freight weight analyses at too great a level of precision.
- **Freight Mandatory Rule 11.** This accounting rule is increasingly being used by the rail industry to rebill deregulated traffic. Rebilling traffic allows for quicker revenue settlement. One effect of rebilling is to understate length of haul statistics and, unless care is exercised with the data, can lead to double counting of megagram figures. For example, a shipment from New York to Los Angeles may appear in the sample as two waybills due to the shipment being rebilled in Chicago.
- **Intermodal Carloadings.** The waybill sample tends to overstate the number of intermodal cars moved. This is due to the one box/one car billing of single unit prices that characterizes most intermodal traffic. The one box/one car statistics are present in the waybill records even if the car has multiple platforms. The AAR has developed a methodology to adjust the number of intermodal cars in the sample by using the UMLER (Universal Machine Language Equipment Register) car-type designation on the waybill record

and applying the number of platforms from the UMLER Specification Manual.

Step 6. Identification of Appropriate Analytical Tools

Software

TransDec (Transportation Decision Analysis Software) Investment decisions involve multiple conflicting interests and policy objectives. Transportation projects are typically evaluated in regard to multicriteria such as financial viability, environmental impacts, health and safety, and socioeconomic concerns. The multicriteria analytical framework is a methodology for incorporating financial measures, externalities such as pollution or noise, and incommensurable data such as acres or decibels into a structure that resolves investment conflicts among citizens, elected representatives, and transportation professionals in a way that assures arrival of an “optimum” solution. TransDec eases the management of this process by guiding the transportation practitioner through the multimodal, multicriteria analytical framework, and by systematizing the mechanics of performing the analysis.

TransDec was designed to provide an easy to use tool for performing multimodal, multicriteria investment analysis. The system provides the ability to link to Microsoft EXCEL, perform complicated data manipulations in the spreadsheet, and then import the resultant calculations back into TransDec. TransDec allows the transportation practitioner to define, structure, and evaluate transportation investment alternatives based on multiple objectives and measures. TransDec guides the decision-making process through a hierarchical formulation of broadly defined project goals tied to specific objectives, with each objective operationalized by a value measure. This organization serves to add consistency and structure to the process of selecting the best alternative from several possible alternative projects or courses of action. Every TransDec investment analysis project is characterized by the following steps:

- Identify overall transportation policy goals;
- Identify project evaluation objectives for each goal;
- Assign a measure to each objective;
- Assign a rating scale to each objective’s measure;
- Identify investment alternatives;
- Attach a weight to each of the objectives;

- Normalize the data; and,
- Perform sensitivity analysis.

By following these steps, TransDec provides a framework within which to define the problem, select measures appropriate to the problem, and evaluate the results based on the weighted emphasis placed on project objectives.

The multicriteria, multimodal analytical framework, along with the TransDec software system, represents an improvement in the tools available to the transportation practitioners responsible for evaluating and recommending how the agency should allocate its resources to achieve organizational objectives. Conventional benefit-cost approaches focus on evaluating a single investment option at a time. The results are usually computed separately for individual projects irrespective of the aim of developing a comparative ranking among them. In contrast, the multicriteria analysis evaluates a given set of decision alternatives over a common set of evaluation objectives and the results of the analysis are indicative of such a comparative evaluation. Transportation planners, engineers, and agency administrators will be able to use this framework and the TransDec software system to design program plans, investigate investment strategies, and devise policies to solve selected transportation problems. Appendix F provides an example Application of TransDec. More information on TransDec can be found by contacting: Texas Transportation Institute, Rail Research, Texas A&M University System, College Station, TX, 77843-3135, (409) 845-5817.

RAILDEC The Federal Railroad Administration (FRA) developed RAILDEC for intermodal investment decision support for rail and rail-related investments. The software model adopts standard benefit-cost and financial analysis techniques which are currently used by the private and public sector to evaluate investment alternatives. By conducting benefit-cost and financial analysis simultaneously, the model compares the public and private rates of return of a rail or rail-related intermodal investment. This comparison promotes public/private, partnering, and innovative financing arrangements when “worthwhile” projects are identified.

The financial rate of return is the appropriate measure of private returns because, from the perspective of company shareholders, the generation of *net income* from investments is one of the key measures of benefit. The economic rate of return is appropriate for measuring public returns because it captures a wider range of benefits which accrue to users of the transportation system and society as a whole (e.g., traveler time savings and pollution cost savings).

RAILDEC forecasts the transportation and non-transportation effects of a rail or rail-related intermodal investment and estimates the economic value of these effects over the useful life of the project in dollar terms. A project's estimated rate of return is calculated by comparing the time-stream of expected economic benefits with the time-stream of investment-related costs, after adjusting for the opportunity cost of capital. Known as discounting, this adjustment enables decision makers to inspect future benefits and costs in terms of their present-day value. This is a standard way of giving due weight to nearer-term versus distant (thus less valued) outcomes.

RAILDEC's underlying methodology is consistent with the current benefit-cost methodologies employed by United States Department of Transportation agencies (Federal Highway Administration, Federal Transit Administration, and Federal Aviation Administration) and with the recent Executive Order which governs the principles for federal infrastructure investments. The model is transparent in all its assumptions and model inputs are readily accessible to users who may wish to adjust model inputs to reflect local circumstances.

RAILDEC is developed in a risk analysis framework which provides decision makers with benefit-cost and financial analysis results to account for uncertainty in model inputs. Rather than developing single estimates for model inputs, users supply the model with a range for input estimates which reflect uncertainty in market or operating characteristics. The range for these estimates represents the 80 percent confidence level for model users (i.e., the range where users are 80 percent sure that a value lies between an upper and lower bound). Model outputs are also reported in probabilistic terms. For example, a typical model result would be: there is an 80 percent probability that the economic rate of return on investment will be at least 15 percent.

RAILDEC is designed to minimize the data needs and the technical expertise required of the user while at the same time providing credible benefit-cost and financial analysis results. It is a project level model which provides the analytic evidence for decision makers to screen investment alternatives in a timely manner. With information related to the type of investment (i.e., intermodal facility construction) and the range of demand associated with the investment the model user generates preliminary benefit-cost and financial analysis results for a given confidence interval. This is accomplished through the use of an extensive default database which has been developed for the model. Depending on the information available, the user has the option to select default data in the analysis or replace it with more project-specific or localized data. In this way, RAILDEC functions both as a high-level preliminary model as well as a micro-level localized model.

The default data included with this software have been collected expressly for this model. It represents the most current data available on transportation, travel, and emissions costs, as well as on freight and passenger rail operating costs and revenues. The data has been collected from a wide range of sources including: Association of American Railroads, Federal Railroad Administration, Federal Highway Administration, Federal Transit Administration, and the vast collection of transportation studies which have been conducted in this area. In most cases, the default data is reported at the national level and often reflects national averages. As users conduct state and local studies over time and gather project-specific data, they will in effect create their own localized models which reflect local operating and demand characteristics. For additional information on RAILDEC contact: Hickling Lewis Brod Inc., 1010 Wayne Avenue, Suite 300, Silver Spring, MD. 20910, (301) 565-0391.

Geographic Information Systems A geographic information system (GIS) is a tool for organizing and analyzing data that can be referenced spatially--that is, data that can be tied to physical locations. Many types of data have a spatial aspect, including demographics, accidents within a city transportation network, and population density. A GIS is useful in that it helps to analyze data in the context of its location. Specifically, a GIS is a data management system which can:

- Collect, store, and retrieve information based on its spatial location;
- Identify locations within a targeted area which meet specific criteria;
- Explore relationships among data within the area;
- Analyze the related data spatially as an aid to making decisions about that area;
- Facilitate selecting and passing data to analytical models capable of assessing the impact of alternatives on the chosen area; and,
- Display the selected area both graphically and numerically either before or after analysis.

Collectively, these capabilities give decision makers an enhanced ability to manipulate and use data more effectively. Graphical presentations are especially powerful for conveying information. The capability to produce maps or engineering drawings showing particular combinations of features for selected geographic areas at appropriate scales is a major feature of the technology's value.

While many fields outside transportation (e.g., land records management, urban planning, natural resource management) have successfully applied GIS technology, it has only recently been applied to transportation problems. The application of GIS to transportation activities is now commonly known as GIS-T. Because of the indivisible relationship of transportation and geography, GIS-T and related information technologies stand unique in their potential application to the current transportation environment. The ability to use geographic locations and spatial relationships to manage transportation data offers opportunities unavailable in the past. Geographic reasoning, as incorporated in a GIS-T, has the potential to become the new paradigm for transportation computing. Two GISs will be discussed: ARC/INFO and SAS/GIS.

ARC/INFO ARC/INFO is the leader in Geographical Information System solutions with over 100,000 users worldwide. ARC/INFO enables you to perform tasks that would otherwise require many products from many different vendors. ARC/INFO integrates all these data types with tabular DBMS data: vector, raster, photographs, scanned documents, satellite images, CAD drawings, and sound/video.

With ARC/INFO, you can design and build the exact system you need using a built-in scripting language for standard development tools like Visual Basic and C++. Such flexibility allows for numerous options for customization and application. ARC/INFO demonstrates additional flexibility by allowing data to be entered from a variety of sources. ARC/INFO accepts data from scanners, global positioning systems (GPS), digitizers, and commercial and government sources in more than 35 standard data formats. ARC/INFO allows you to create and maintain geographic information, manage large, multi-user spatial databases, integrate multiple data types, perform sophisticated spatial analysis, produce high-quality maps for publication, and create turnkey GIS applications for end users. More information about ARC/INFO can be obtained from: ESRI, 380 New York Street, Redlands, CA. 92373-8100, (800) 447-9778.

SAS/GIS 6.0 GIS packages excel at performing spatial operations, but in many cases they only compute a few simple statistics. SAS/GIS 6.0 allows SAS software systems to deal with geographic data. Many universities, agencies, large firms, and consultants have used SAS for years to prepare sophisticated analyses and to perform a variety of statistical computations. In the past, however, these studies were limited to geographic variables contained in the available tabular data—for example, the tract, zip-code boundaries, or Metropolitan Statistical Areas in the Census Standard Tape File format. To integrate data from cross-cutting areas or to compare such data to a list of consumer addresses meant that SAS data needed to be exported to a GIS or desktop mapping

package, revised to include a spatial component, and then reimported to SAS. Now SAS/ GIS allows all of these analyses to be completed within SAS.

SAS/GIS has several basic tools to merge spatial and attribute data. Selection tools allow the user to define a circle, square, or polygon and select all points, lines, or polygons that are completely or partially within the selection zone. The location of a retail store could be the circle's center, and all census tracts within five miles could be selected. The demographic data from these tracts then could be statistically analyzed and compared to the profile of another store in another location. SAS/GIS also has robust address-matching/geocoding capabilities. Moreover, it has interactive and batch file address matching with useful probability matching. If some, but not all, address elements match, the resulting address can have a probability of an address match linked to each address. This capability allows the user to deal with incomplete addresses. When only a zip-code matches, the software returns the centroid of the zip-code area. Resulting geocoded values then serve as the basis for the center of a selection or a selection by area, or the user can perform point-in area/polygon comparisons.

SAS/GIS has a useful suite of thematic map capacities. Values (e.g., income level) associated with polygons can be divided into equal ranges, or user-defined break points can be assigned and different colors associated with each. A broad range of "actions" can be associated with geographic features; for example, clicking on property can display a photograph or document associated with the location. These "actions" also are the ways in which the user implements many other SAS operations. For example, attribute data can be subsetted according to a spatial query, a statistical operation can be started, or a spatial "drill-down" can load other map layers. SAS/GIS allows maps to be displayed in a wide range of different projections. Output from the mapping operations can be exported into the native SAS/GRAPH format and included with other SAS graphic displays and hard copy.

There is strong support for linkage with other attribute data. SAS uses its own structure to link to several external databases and formats. Other SAS tools allow linkages to remote databases and other powerful external data access options. Full Structured Query Language capabilities are present, augmented by several spatial operators. During the years, SAS has evolved a comprehensive data analysis and manipulations structure and language. SAS/GIS fully uses these structures. Like other SAS products, SAS/GIS can be used in the extensive SAS programming environment to create a variety of executive decision support modules.

SAS/GIS is a product for the sophisticated user who specializes in quantitative analysis and prediction and has the technical staff to learn and use the full suite of software. Its use, along with other SAS products, means that sophisticated statistical analyses that were once difficult to perform on mapped data are now much easier. Additional information on SAS/GIS can be obtained by contacting: SAS Institute Inc., SAS Campus Drive, Cary, NC. 27513, (919) 677-8000.

HIRIIDE (Highway/Rail Intersection Integrated Database) HIRIIDE, developed by ATTVenture Limited, is a software system that provides FRA grade crossing information as well as unique supplemental information. The system works not only as an inventory program, but also provides accident prediction modeling, cost analysis, project tracking, and reporting options. The program can be designed to tie in with data stored in different formats on different platforms, either by linking or importing the required information. Inventory information required by FRA to update the national inventory program (GX) can be modified directly from HIRIIDE and an update file produced that is accepted by FRA for GX updating. The software's corridor capabilities allow accident prediction rankings in designated areas, and its cost analysis ability allows estimation of costs associated with the installation and maintenance of warning devices.

Accident Prediction Calculator The Accident Prediction Calculator provides ranked accident ratings allowing selection of crossings best suited for warning device upgrades. The model gives "what if" capabilities, allowing new accident prediction ratings if the devices are upgraded, train counts changed, or highway traffic increased. Five years of accident history are used to determine the accident prediction rating and a database is provided to manage the accident information. Accident prediction ratings can be grouped according to county, city, or other selection allowing corridor studies. The Accident Prediction Calculator is an automated version of FRA's accident prediction model and is used by the U.S. DOT and the Transportation Safety Board. Additional information regarding HIRIIDE and the Accident Prediction Calculator may be found by contacting: Richards & Associates, P.O. Box 10350, College Station, TX 77842, (409) 690-1408.

PCAPS (PC Accident Prediction System) PCAPS is a Windows-based system that provides accident prediction reports for any grade crossing in the United States (that is, grade crossings that are maintained in the DOT-AAR Grade Crossing Inventory). With PCAPS, it is possible to produce a prediction report or browse inventory data selected at the following drill-down levels:

- A single crossing;
- All crossings within a state, county, or city (or any combination thereof);

- All crossings for one or more railroads; and,
- All crossings for one or more railroads within one or more specified states.

Additionally, PCAPS provides a selection query capability that allows accident predictions to be displayed for crossings that, for example, have AADTs in excess of 1,000. For information on PCAPS contact: AMB Associates Inc., 818 Roeder Road (Suite 500), Silver Spring, MD. 20910, (301) 587-9439.

PC*RAIL PC*RAIL, available from ALK Associates, Inc., is a software system providing point-to-point rail routing and distance. Its North American rail network contains over 338,000 km of rail line, over 53,000 freight stations, and over 580 rail carriers. PC*RAIL provides rail routes and distances for rate determination and negotiation, equipment management, rail car distance auditing, and carrier selection.

PC*RAIL generates routes and determines distances between any two rail-served locations in North America. Each location can be identified by city name and state abbreviation, or by commonly used geographic codes. With the software, quick calculations of the shortest route or the “practical” route (based on historical operations) can be made between any two points. Specification of interline junctions can be made or the software can choose junctions by weighing location versus gateway importance. Routings of intermodal, coal, or grain trains are also included. PC*RAIL can be used to:

- Improve cost estimates and rating with access to practical and shortline routes and distances;
- Determine alternate routes on over 580 railroads;
- Minimize empty haulage costs by tracking empty and loaded distance by rail car, carrier, and state; and,
- Improve fleet utilization by determining advantageous routings for empty equipment.

For additional information on PC*RAIL contact: ALK Associates, Inc., 1000 Herrontown Road, Princeton, NJ 08540.

WAYSYS (Railroad Waybill Analysis System) Railroad waybill data contains a wealth of information, providing decision makers with much of the data they need to develop statewide

transportation plans, to assess the impact of railroad mergers, as well as assisting in determining the role the rail industry plays in area and regional economies. WAYSYS provides the transportation professional with a Windows-based computerized system for analyzing railroad waybill data that contains the tools necessary to engage in a wide variety of data analysis and data management activities. Analytical and data management tools available to the transportation professional include:

- Analysis capability in the form of descriptive statistics generation, frequency distributions, and correlations;
- A sophisticated report writer for generating report listings of information in the database; and,
- Multi-year analysis capability for comparisons across time.

WAYSYS provides the transportation professional with a powerful, yet easy to use, analysis capability. The analyst can select the database variables desired, determine for what subsets of the database statistics are to be calculated, select from a wide assortment of statistics to be applied, perform the analysis, and then save the designated report specifications for future generation of similar reports, perhaps on annually updated data. In addition to ease of analysis, WAYSYS provides a database management system that allows for the creation of additional new variables from the variables included in the waybill database, lets users modify existing variables, and contains an export engine for exporting WAYSYS information to a spreadsheet or a form easily imported by a range of database systems. The contact for additional information on WAYSYS is: Woodharbor Associates, P.O. Box 137311, Fort Worth, TX 76136 (817) 236-6841.

METHODS FOR CALCULATING KEY IMPACT MEASURES FOR LEVEL OF RAIL SERVICE

The following section presents a set of worksheets for the rail planning practitioner that can be used to guide the evaluation of key measures of impact pertaining to the level of rail service. The measures include:

- Transportation costs of alternatives to rail service;
- Primary job losses;
- Secondary job losses;
- Wage and salary losses;
- Unemployment compensation;

- Personal income losses;
- Property tax losses;
- Increased highway construction and maintenance costs;
- Energy consumption;
- Air pollution; and
- Noise pollution.

Each worksheet has been developed to show the practitioner the:

- inputs required;
- sources for those inputs;
- outputs; and,
- procedures for calculations.

In addition, each worksheet contains an example calculation to illustrate the application of the impact assessment methods employed. Alternative calculations are possible and short-cut methods may be used where data is unobtainable or its validity is in question.

Transport Costs of Alternatives to Rail Service

Abandonment of rail lines or loss of rail service, a major issue facing State Departments of Transportation, usually requires the use of alternate modes of freight transport by industries which previously relied on rail. This may result in a cost differential, either an increase or decrease, between the substitute modes for handling freight and the rail service previously provided. If an increase, the added transport costs could cause some firms to transfer their operations elsewhere or to close. Other firms will remain at their existing locations, but may be forced to reduce profits, increase profits, increase prices, and reduce production or employment. The increase in transport costs experienced by these latter firms must be estimated. A worksheet to estimate transportation costs of alternatives to rail service is provided in Table 7.

The physical location of existing shippers with respect to rail service and rail terminals, as well as their current shipping practices, can have a significant influence on the magnitude of transport cost increases that may occur. Information is required regarding the shipper's current freight volumes carried by rail and by competing modes, the ground distances between shipper's locations and the nearest continuing rail service, and whether the plant is served by a private siding or a team track.

Table 7. Transportation Costs of Alternatives to Rail Service

INPUT		SOURCE				
1. Identity of shippers and receivers currently using rail service (each line): a. Annual carloads and tons of each commodity shipped/received, categorized by STCC code. b. Decrease (or increase) in rail distance from shipper's location to nearest alternative railhead.		1. Shipper survey. a. Same as above. b. Same as above. System maps, track charts, freight routings.				
2. Transshipment (loading and unloading) rates for the county or region under study.		2. Local trucking firms, shipper survey.				
3. Trucking costs for the county or region under study.		3. Local trucking firms, or estimated, based on: a. Estimated average operating speed. b. Estimated vehicle operating costs. c. Estimated wage rates.				
OUTPUT						
1. Independent estimate of increased transportation costs.						
PROCEDURE						
1. For each firm estimate increased transportation (truck) costs. Increased transportation (truck) costs = Annual tonnage (tons) x truck cost per ton (\$/ton/mi.) x increment or decrement in distance (mi.) to nearest railhead + Transshipment costs (\$/ton) (for firms presently using private siding only) = (Input 1.a) x (Input 3) x (Input 1.b) + (Input 2)						
2. Increased transportation cost for each firm = Sum, for all commodities, of (Step 1).						
3. Total increased transportation cost = Sum, for all firms, of (Step 1).						
Note: If survey responses indicate plant closings, reduction in production, or transfers by certain shippers, the estimated increased transportation costs for those shippers should be deducted from the above total, to avoid double counting impacts.						
EXAMPLE						
	(A)	(B)	(C)	(D)*	(E)*	
Firm	STCC Code	Annual Tonnage	Change in Distance to Nearest Railhead (in miles)	Trucking Cost @ \$30/ton/mi. = (B) x (C)	Transshipment Cost @ \$.50/ton	Increased Transportation Cost = (D) + (E)
1	086 281	54 52	4.2 4.2	\$68 66	\$0 0	\$68 66 Firm Total \$134
2	112 142 281 299 402	237 19,621 783 248 5,057	11.4 11.4 11.4 11.4 11.4	\$811 67,103 2,678 848 17,295	\$118 9,811 392 124 2,529	\$929 76,914 3,070 972 9,824 Firm Total \$91,709
3	112	1,008	11.0	\$3,326	\$0	\$3,326 Firm Total \$3,326
4	242 265 301 327 349 352 373	58 27 102 1,626 122 45 36	3.1 3.1 3.1 3.1 3.1 3.1 3.1	\$54 81 306 4,878 37 135 33	\$29 14 51 813 61 23 18	\$83 95 357 5,691 98 158 51 Firm Total \$6,532

5	201 265	2,274 132	13.7 13.7	\$9,346 542	\$1,137 66	\$10,483 608
						Firm Total \$11,091
						All firms \$112,793
* Trucking and transshipment costs are for illustrative purposes only, and are not meant to reflect actual costs in the state of Texas. These costs should be obtained from the most recent study of trucking costs in Texas.						

The effects of increased transport costs in individual shippers will depend on the type of business or industry experiencing the increase, the internal economics of the particular firm, the absolute and relative amounts of the increase, and the ease or difficulty of transferring operations to a new location. Data regarding the nature of the firm's business and the specific types of commodities being shipped or received is normally obtained through a shipper survey (see Appendix B).

Regardless of the analytical procedure chosen, certain basic assumptions and features are common to different methods. These are:

1. Given the preponderance of bulk commodities shipped relatively long distances and originating or terminating on the light rail density lines, the alternative to current shipment by rail will most likely be a combination of trucking to or from the nearest alternate railhead together with rail for the major portion of the haul. Two exceptions sometimes occur. For relatively short distances, no more than 200 - 400 miles (320 - 650 km), shipment entirely by truck may be a more feasible alternative. Also, areas within reasonable distance of the inland waterway system may regard the combination of trucking terminals located on that system for transshipment by barge as an acceptable alternative to trucking to the rail system.
2. The key aspect of the alternative procedures is their treatment of local trucking costs and longer haul costs if complete trucking substitution is anticipated. Such costs are primarily a function of commodity type, distance transported by truck, handling time and equipment requirements, backhaul assumptions, and local labor rates. Procedures vary depending upon the degree to which the above variables are explicitly considered. The simpler procedures tend to use average costs rather than costs computed on a commodity basis. As would be expected, large variations do occur between

commodities. Handling costs and trucking costs can vary dramatically for different commodity classifications.

3. Changes in the rail component of any transport cost increase will be very small, if not negligible. Given the relatively small reduction in the total length of the haul by rail and the general “equalization” of rates that occurs within a geographic area, computation of rail transport cost savings needs to be done.
4. Usually, the assumption is made, at least initially, that shipments will continue to be made to or from the same markets or suppliers. This assumption should be re-examined on a shipper-by-shipper basis if the calculated transport cost increases are high, the commodity being shipped is readily available from other suppliers, or commodity substitution appears possible.
5. Where possible, it is desirable to obtain individual shipper estimates of anticipated increases in their transport costs as well as to prepare independent estimates. This will serve as a useful cross-check on the answers obtained from the analysis procedures.

Primary Job Losses

Job-loss impacts associated with rail transportation are usually associated with the abandonment of rail lines. Historically this has been branch or low density lines. Some shippers along these lines will be unable to absorb or pass on the transport cost increases that loss of rail service can cause. Subsequent job losses may occur, due to reduced production, transfer of operations, or plant closings. In addition, railroad employees may be laid off, although this impact is likely to be very small. In contrast, some potential employment gains may be experienced by the local trucking industry resulting from the shift of freight from rail to truck.

The nature of the business or industry currently using rail service will have a significant influence on its probable reaction to loss of rail service. Most retailers or wholesalers who receive shipments by rail will suffer little impact, with the possible exception of coal dealers and lumber yards. However, the effects of termination of service could be substantial for certain kinds of manufacturing firms and for extractive industries.

The relative impact of job losses on the local economy may be determined from census data or state labor department data regarding current labor force populations and unemployment. The shipper survey, supplemented by data from other sources, provides the best data source for determining potential job losses. Alternatively, job losses may be estimated from the anticipated impact of various types of businesses currently using the line or from secondary data (e.g., job loss coefficients relating employment losses and carloads of specific commodities originating and terminating on the line). The disadvantage of secondary data is that it does not account for the difference in economic viability among individual plants and thus should be used only if primary data are not available. Table 8 provides a method to primary job loss determination.

Table 8. Primary Job Losses

INPUT		SOURCE			
1. Estimated railroad job losses.		1. Railroad company estimates.			
2. Increased transportation costs for shippers switching to truck.		2. Shipper survey.			
3. Type of firm or business:		3. Shipper survey.			
a. Manufacturing firm.					
b. Retailer, wholesaler, grain shipper or construction firm.		4. Shipper survey.			
c. Mining or logging operation.		5. Shipper survey.			
4. Total annual sales of firm.		6. Shipper survey.			
5. Total employment of firm.					
6. Computed loss in business volume.					
OUTPUT					
1. Primary Job Losses					
PROCEDURE					
1. The procedure utilized relates the ratio of increased transport costs to total sales and to anticipated impact on the firm's employment. This is assumed to vary depending on the type of firm.					
EXAMPLE					
	Increased Transport Costs	Type of Firm	Total Annual Sales	Total Employment	Loss in Business Volume
Firm #1	\$ 289	Manufacturing	\$ 750,000	10	-
Firm #2	131,835	Manufacturing	8,000,000	109	-
Firm #3	3,207	Hay Dealer	1,200,000	40	\$40,000
Firm #4	9,646	Manufacturing	700,000	65	-
Firm #5	17,434	Manufacturing	3,500,000	60	-

Firm #1:	$\frac{\$289}{\$750,000}$	= 0.0004 (less than 1%; impact on employment = 0)
Firm #2:	$\frac{\$131,835}{\$8,000,000}$	= 0.0165 (greater than 1%: assume a 5% decrease in employment for every 1% increase in price in excess of 1%)
Firm #3:	$\frac{\$40,000}{\$1,200,000}$	= 0.0333
Firm #4:	$\frac{\$9646}{\$700,000}$	= 0.0138 (1.38 - 1.00) x (0.05) x (65) = 1.24, or 2 losses
Firm #5:	$\frac{\$17,434}{\$3,500,000}$	= 0.0050 (less than 1%; impact on employment) = 0
Primary Job Losses = (0) + (4) + (2) + (2) + (0) = 8		

Secondary Job Losses

Any primary job losses, resulting from the discontinuance of rail service, are likely to produce a reduction in local wages and personal income. This reduction in jobs, wages, and income may induce a drop in the number of employees in service and service-related industries (local government, retail trade, insurance, public utilities) that the community is now able to support. Thus, additional job, wage and income losses may occur. The magnitudes of these secondary losses and impacts will depend on the mix of “basic” and “non-basic” industries in the community impact area. Basic industries are those which produce goods or services for non-local consumption. These include most manufacturing enterprises, many state and most federal activities, most agriculture, forestry and fisheries, and tourist or recreational attractions. Non-basic industries include most service industries, local government, most retail and wholesale trade, most finance, insurance and real estate, and public utilities. Secondary job losses are computed from job losses occurring to basic industries. The standard methodology for predicting the extent of such losses involves the use of a multiplier which is the ratio of employment in non-basic industries divided by basic industry employment within a particular labor market. The ratio of secondary to primary job losses can vary substantially between labor markets within a state; values may generally be expected to range from 0.5 to 3.0.

The method described in Table 9 includes both the calculation multipliers and the resulting estimation of secondary job losses. The analysis assumes that the secondary job losses will be proportional to primary losses.

Table 9. Secondary Job Losses

INPUT		SOURCE	
1. Number of communities, municipalities utilizing rail service.*	1. System maps, track charts (abandonment filing).		
2. Population of municipalities.	2. Census publications.		
3. Distances (road miles) between municipalities and commercial center of community.	3. County highway maps (state DOT database).		
4. Secondary income losses. These equal primary income losses times the income multiplier.	4. Shipper survey.		
5. Total wages and salary income of community residents employed in secondary sector.	5. Census publications.		
6. Number of community residents employed in secondary sector.	6. Census publications.		
*Communities are defined as consisting of one or more "core" municipalities on a rail-line which may be abandoned, along with any surrounding municipalities which are economically oriented toward the core.			
OUTPUT			
1. Expected number of persons holding jobs which will be eliminated as a result of secondary impacts.			
PROCEDURE			
1. Utilizing maps of the community and nearby municipalities, and census data containing figures on the population of the minor civil divisions and incorporated places within and around the community, calculate the income multiplier as follows: $My = 0.5 \text{ plus } \frac{Pc/50}{\max (P_m/D_m)} \quad (\text{not to exceed } 1.5)$ Where Pc = population of the largest incorporated place or township in the community, P_m = population of some incorporated place or township not in the Pc but within 50 miles of it, and D_m = the minimum distance (in road miles, Source 3) between P_m and Pc .			
2. Multiply primary income losses times the income multiplier to obtain secondary income losses.			
3. Divide the secondary income losses obtained above by the total wage and salary income of community residents employed in the secondary sector. Square the result.			
4. Multiply (Step 3) above by the number of community residents employed in the secondary sector to obtain the expected number of persons holding jobs which will be eliminated as a result of secondary impacts.			
EXAMPLE			
Incorporated Place or Township	Population	Distance to Center of Community	P_m/D_m
Place 1	4,619	center of community	—
Place 2	4,319	8.1 miles	533.2
Place 3	2,711	within community	—
Place 4	2,915	within community	—
Place 5	3,042	23.8 miles	127.8
Place 6	3,762	14.9 miles	252.5
$My = 0.5 + \frac{4,619/50}{533.2} = 0.5 + \frac{92.4}{533.2} = 0.67$			
Employed Residents = 4,159 Employed Residents (Secondary Sector) = 1,872 Wage and Salary Income (Secondary Sector) = \$13,506,480			

2. Secondary income losses = $(\$101,000)^1 \times (0.67) = \$67,670$
3. (Secondary income losses/Wage and salary income of secondary sector) ² = $(\$67,670/\$13,506,480)^2 = 0.000025$
4. Expected number of persons holding jobs which will be eliminated as a result of secondary impacts = Secondary impacts = $(0.000025) \times (1,872) = 0.05$, or no losses

NOTE: The above procedure assumes that the relative secondary impact on earned income must be appreciable if a significant employment impact is to exist. This is due to the many small proprietor-operated establishments that exist in the retail and service sectors of the small-town economy. Such establishments will have no employees who can be dismissed and their owners will likely accept substantial reductions in their personal incomes before closing.

Wage and Salary Losses

Primary and secondary job losses generated by the discontinuance of rail service will be accompanied by a parallel reduction of annual wages and salaries. The magnitude of this reduction may be derived directly from data on average salaries obtained through a shipper survey or from state labor department data on average earnings by county and industry. Table 10 provides a method of calculating wage and salary losses.

Table 10. Wage and Salary Losses

INPUT	SOURCE
1. Categorization of basic and non-basic industries: a. Basic industries: agriculture, mining, metal industries, machinery, textile industries, chemical industry, lumber industries, food and kindred products, various other manufacturing, and federal government. b. Non-basic industries: contract construction; printing, publishing, and allied industries; transportation, communication, and public utilities; wholesale and retail trade; finance, insurance, and real estate; various other services; and state and local government.	1. Federal, State, or Local Planning Organization 2. Business Census 3. Local Tax Assessor
2. Primary wage and salary losses in basic and non-basic industries.	4. Shipper survey.
3. Basic and non-basic employment within county or impact area.	5. State industrial census data, county economic profiles.
4. Transportation cost increases experienced by shippers.	6. Shipper survey, or as computed in Table 7.
5. Percentage of local trucking costs contributed by wages and salaries (estimated).	7. Local trucking firms.
6. Market radii of firms affected.	8. Shipper survey.
OUTPUT	
1. Total annual wage and salary losses.	
PROCEDURE	
1. Obtain primary wages and salary losses of all firms from shipper survey, and perform the following	

additional steps for basic firms:

- a. The County Multiplier (CM), used in Step 1 below, is obtained by dividing non-basic employment of county or impact area by basic employment.
 - b. Multiply primary wage and salary losses by the above multiplier to obtain secondary wage and salary losses.
 - c. Multiply the increased transportation costs of shippers in basic industries switching to truck (either obtained from survey or estimated) by the percentage of local trucking costs contributed by wages and salaries. This equals wage and salary gains for trucking firms.
 - d. Based on the market radii of the firms in basic industries experiencing increased transportation costs, estimated the amount of such cost increase absorbed locally by the firms.¹
 - e. Multiply the above figure by the county multiplier. The result equals wage and salary losses resulting from absorbed transport cost increases.
2. Total annual wage and salary losses equal all primary and secondary wage and salary losses, plus wage and salary losses resulting from absorbed transport cost increases, minus wage and salary gains for trucking firms.

¹ Firms with a large market area (greater than 50 mi.) will pass most cost increases outside the subject community while those with small market areas will inevitably pass cost increases mainly to community residents.

EXAMPLE

1. Primary wage and salary losses of all firms = \$101,000
 - a. Non-basic employment of county = 7987
Basic employment of county = 6335
Multiplier = $7987 \div 6335 = 1.26$
 - b. Secondary wage and salary losses = $(\$101,000) \times (1.26) = \$127,260$.
 - c. Trucking wage and salary gains = $(\$156,504) \times (0.55) = \$86,077$.
 - d. Transportation cost increase absorbed locally, (from Analysis 2-15) = \$15,650.
 - e. Wage and salary losses resulting from absorbed transportation cost increase = $(\$15,650) \times (1.26) = \$19,719$.
2. Total annual wage and salary losses = $(\$101,000) + (\$127,260) + (\$19,719) - (\$86,077) = \$161,902$

Increased Unemployment Compensation and Public Assistance Payments

Any primary and secondary job losses are likely to cause the disbursement of transfer payments from the government sources which include state unemployment compensation benefits and public assistance payments. Unemployment compensation depends upon rates established in relation to base salary and family size and the typical duration of unemployment which, in turn, depends on the availability of other job opportunities in the community and region. Public assistance payments are usually made only if the maximum allowable payment in the county involved exceeds the unemployment compensation available and only in the amount of that excess. Details of public assistance policies must be obtained from local communities as well. Total unemployment benefits are calculated using the procedure provided in Table 11.

Table 11. Increased Unemployment Compensation

INPUT		SOURCE	
1.	Total unemployment compensation benefits paid out by the state during previous year.	4.	State department of labor.
2.	Total number of claimants registered during previous year.	5.	State department of labor.
3.	Total number of primary and secondary job losses.	6.	Shipper survey and subsequent calculations (Tables 8 and 9).
OUTPUT			
1.	Total unemployment compensation benefits.		
PROCEDURE			
1.	Divide total unemployment compensation benefits paid by the state in the previous year by the total number of claimants during the year, to obtain the average payment per claimant.		
2.	Multiply (Step 1) times the total number of primary and secondary job losses. The result is then multiplied by 1.5 to obtain estimated total unemployment compensation benefits. This assumes that the typical term of unemployment associated with layoffs resulting from rail service discontinuance will be roughly 50 percent greater than that associated with normal unemployment.		
The above method does not include provision for estimating public assistance payments. These are assumed to be quite small, if not negligible.			
EXAMPLE			
1.	Total benefits paid	=	\$183,000,000
	Total number of new claimants	=	262,000
	Average payment per claimant	=	$\$183,000,000 \div 262,000 = \$698$
2.	Primary Job Losses (Table 8)	=	8
	Secondary Job Losses (Table 9)	=	0
	Total unemployment compensation benefits	=	$(\$698) \times (8 + 0) \times (1.5) = \$8376$

Personal Income Losses

The actual reduction in personal incomes experienced by a community will be a function of the wage and salary losses resulting from rail service discontinuance, offset by any transfer payments that are disbursed to individuals. The analysis in Table 12 considers out-migration and income from sources other than wages, salaries, and proprietor's income.

Table 12. Personal Income Losses

INPUT		SOURCE	
1.	Number of initial primary job losses.	1.	As previously computed (Table 8).
2.	Number of initial secondary job losses.	2.	As previously computed (Table 9).
3.	Population of community.	3.	U.S. Census Population.
4.	Population of MCDs within the community closer to other rail lines.	4.	U.S. Census Population.
5.	Total number of community residents working in secondary sector.	5.	U.S. Census Population.
6.	Total decrease in wages/salaries of primary employees.	6.	Shipper survey.

7. Loss in personal income of secondary employees.	7. Previously computed (Table 9).
8. Per capita income of community employees from sources other than wages, salaries, and proprietors' income.	8. U.S. Census Population.
9. Total income of all residents employed in secondary sector.	9. As previously computed (Table 10).
PROCEDURE	
1. Compute the <u>net</u> decrease in primary employment. a. Calculate the number of people losing primary jobs who will leave the area (outcommutation): $\text{Outcommutation (primary)} = (.9(\text{Input 4})/(\text{Input 3}))^2 \times (\text{Input 1})$ b. Subtract outcommutation from initial primary job losses: $\text{Net decrease in primary employment} = \text{Number of initial primary job losses} - \text{Outcommutation (primary)} - (\text{Input 1}) - (\text{Step 1.a})$ 2. Compute the <u>net</u> decrease in earned income of primary employees. $\text{Net decrease in earned income of primary employment} = \text{Total decrease in wages (salaries) of primary employment} - .9 \times \text{average wage (salary) of primary employees} \times \text{Outcommutation (primary)} = (\text{Input 6}) - .9 \times (\text{Input 6}/\text{Input 1}) \times (\text{Step 1.a.})$ 3. Compute the <u>net</u> decrease in secondary employment. a. Calculate the number of persons losing secondary jobs who will leave the area. $\text{Outcommutation (secondary)} = (.9(\text{Input 4})/(\text{Input 3}))^2 \times (\text{Input 2})$ b. Subtract outcommutation from initial secondary job losses: $\text{Net decrease in secondary employment} = \text{Number of initial secondary job losses} - \text{Outcommutation (secondary)}$ 4. Compute the total decrease in community employment. $\text{Total decrease in community employment} = \text{Net decrease in primary employment} + \text{Net decrease in secondary employment} = (\text{Step 2.b}) + (\text{Step 3.b})$ 5. Compute net loss in earned income of secondary employees. $\begin{aligned} \text{Net loss in earned income of secondary employees} &= \text{Total decrease in personal income of secondary employees} \\ &- .9 (\text{Total community resident income from secondary employment}) \\ &\quad (\text{Total secondary employment}) \times \text{Outcommutation (secondary)} \\ &= (\text{Input 7}) - \frac{.9(\text{Input 9})}{(\text{Input 5})} \times (\text{Step 3.b}) \end{aligned}$ 6. Compute the total decrease in earned income. $\text{Total decrease in earned income} = \text{Net decrease in earned income of primary employment} + \text{Net decrease in earned income of secondary employment} = (\text{Step 2}) + (\text{Step 5})$ 7. Compute the net outmigration of community residents. $\text{Net outmigration of community residents} = 0.2 \times \text{Total loss of community residents} = 0.2 \times (\text{Step 4})$ 8. Compute the net loss of personal income of community residents. $\begin{aligned} \text{Net loss of personal income} &= \text{Total decrease in earned income of community residents} \\ &+ \text{Per capita income of community residents from sources other than wages, salaries, and proprietors' income} \\ &= (\text{Step 6}) + (\text{Input 8}) \times (\text{Step 7}) \end{aligned}$	

EXAMPLE

Inputs:

Number of initial primary job losses	=	12 jobs	
Number of secondary job losses	=	23 jobs	
Population of community	=	21,368 persons	
Population of MCDs within the community closer to other rail lines	=	2,178 persons	
Total number of community residents working in secondary sector	=	1,872 persons	
Total decrease in wages/salaries of primary employees	=	\$101,000	
Loss in personal income of secondary employees	=	\$146,979	
Per capita income of community employees from sources other than wages, salaries and proprietors' income	=	\$700	
Total income of all residents employed in secondary sector	=	\$13,506,480	
1. Net decrease in primary employment:			
Outcommutation (primary)	=	$(.9(2178)/(21,368))^2 \times 12 \text{ jobs}$	
	=	0.1 jobs (negligible)	
Net decrease in primary employment	=	12 jobs - 0 jobs = 12 jobs	
2. Net decrease in earned income of primary employees	=	$\$101,000 - .9(\$101,000/12 \text{ jobs}) \times 0 \text{ jobs}$	
	=	\$101,000	
3. Net decrease in secondary employment:			
Outcommutation (secondary)	=	$(.9(2178)/(21,368))^2 \times 23 \text{ jobs}$	
	=	0.2 jobs (negligible)	
Net decrease in secondary employment	=	23 jobs - 0 jobs = 23 jobs	
4. Total decrease in community employment	=	12 jobs + 23 jobs = 35 jobs	
5. Net loss in earned income of secondary employees	=	$\$146,979 - .9(\$13,506,480) \times 0 \text{ jobs} =$	
		\$146,979 (1872 jobs)	
6. Total decrease in earned income	=	$\$101,000 + \$146,979 = \$247,979$	
7. Net outmigration of community residents	=	0.2 (35 jobs) = 7 jobs	
8. Net loss of personal income of community residents	=	$\$247,979 + \$770 \text{ per employee (7 employees)}$	
	=	\$253,369	

Property Tax Losses

Abandonment of light density rail lines can cause a decline in property tax revenues, due to plant abandonments or an accompanying reduction in the attractiveness of adjacent land for industrial or commercial development. The specific impacts on the tax base of the community may include:

- a) The reduction in assessed value of abandoned railroad property and industrial plants may result in a loss of property tax revenues for counties, municipalities, and school districts.
- b) Land along the railroad right-of-way may become less desirable for commercial or industrial uses, resulting in a reduction in its market and assessed values, and a further loss of tax revenues. Prospects for future industrial development in the community may be jeopardized.

- c) In extreme cases, abandonment of large, basic industrial plants could result in possible closings or transfers of smaller non-basic and service industries, further reducing tax revenues.

Estimates of tax revenue losses resulting from the latter two occurrences are very difficult to predict. However, a number of studies have used survey data on potential plant closures and transfers with local assessment data, to estimate anticipated property tax losses resulting from the first occurrence. The described procedure in Table 13 provides an estimate of annual tax losses and percentage decline in assessments.

Table 13. Property Tax Losses

INPUT		SOURCE
1. Names of firms which will close or transfer in the event of abandonment. *		1. Shipper survey.
2. Jurisdictions (counties, municipalities, school districts) to which the above firms and the railroad pay taxes.		2. Shipper survey, local tax assessors county auditors.
3. Property tax assessment for above firms, and for the railroad, for each jurisdiction.		3. Shipper survey, local tax assessors county auditors.
4. Total property tax assessment for each jurisdiction.		4. Local tax assessors, county auditors.
* Since shippers may dramatize the expected impacts of abandonment, careful interpretation of shipper survey results will be needed to yield accurate estimates of closings.		
OUTPUT		
1. Annual county, municipal, and school property tax losses.		
2. Percentage decline in assessments.		
PROCEDURE		
1. From a survey of rail users, determine which firms are expected to close or transfer in the event of abandonment.		
2. Determine the jurisdiction to which each of the above firms, and the railroad, pay taxes.		
3. From local tax assessors or county auditors obtain for each firm expected to close, the relevant property tax assessments for each jurisdiction. Also obtain the amount of property taxes collected by each jurisdiction annually.		
Note:Assessment procedures on railroad property will vary from state to state. Property may be partially or wholly exempt, while in other cases the railroad may be in default on its taxes. This should be accounted for in the analysis.		
4. Sum the relevant assessments for each jurisdiction for all closing firms to obtain total anticipated losses in county, municipal, and school property tax revenues. (This is based on the assumption that closing firms will no longer pay significant amounts of property tax.)		
5. Divide the total anticipated losses in each jurisdiction by the total property taxes collected by that jurisdiction to obtain the percentage decline in assessments.		
EXAMPLE		
1. Only Firm #1 is expected to close.		
2. Jurisdictions:	County	Municipality School District
3. Assessments:		
County:	\$369 ÷ \$38,777,432 = negligible	Municipality: \$276 ÷ \$ 1,427,614 = negligible
School District:	\$455 ÷ \$ 8,463,712 = negligible	

Increased Highway Construction and Maintenance Costs

Firms relying on rail service for freight shipments and receipts will be required to truck their products to and from the nearest alternative railhead in the event of discontinuance of service. This excludes firms which close, relocate, or elect to haul entirely by truck. The last case will increase local truck traffic to the nearest state primary or Interstate route. Increased local truck traffic, resulting from truck and truck-rail combinations, may cause additional wear and tear on road pavements, reducing their service life expectancy and necessitating more frequent resurfacing and increased maintenance costs.

The magnitude of increased costs will depend on a number of variables, including the type of truck configurations used, axle loadings, routings, absolute and relative volumes of increased traffic, and type and condition of pavement. In addition, local highway conditions may dictate the need for initial improvements of some roads and bridge structures.

An increase of truck traffic may also result in additional highway revenues generated by license and fuel taxes. Where possible, these should be subtracted from the anticipated increases in construction and maintenance costs to estimate a net cost difference. Increased costs of highway maintenance and increased highway revenues are estimated in Table 14.

Table 14. Increased Highway Maintenance Costs

INPUT	SOURCE
1. Increase in annual truckloads resulting from discontinuance of rail service.	1. Shipper survey.
2. Alternative mode selection: a. Truck to nearest alternative railhead. b. Truck entire length of haul.	2. Shipper survey.
3. Alternative mode routings: a. Routes to nearest alternative railhead. b. Routes to nearest major state highway or Interstate system.	3. Shipper survey, county highway maps.
4. Engineering data on above highways. a. Design data and highway sufficiency and condition ratings.	4. State DOT or highway department.
5. Type of truck(s) likely to be utilized (or a standard type assumed); e.g., farm tractor with wagon, pick-up with trailer, straight truck, tractor-trailer.	5. Determined from commodities shipped/received.
6. Traffic equivalence factors.	6. <u>AASHTO Guide for Design of Pavement Structures.</u>
7. Design term. This is an indicator of the effective thickness of surface, base, and sub-base on a road.	7. <u>AASHTO Manual of Instructions for Pavement Evaluation Survey.</u>

8. Pavement Serviceability Index (PSI). This is an indicator of the surface roughness of the highway.	8. State DOT or highway department.
9. Resurfacing and maintenance costs per mile, by type of highway.	9. State DOT or highway department.
10. License, use, and fuel taxes, estimated from tonnage and mileage of increased trucking.	10. Rates obtained from state motor vehicle department.
11. Load limits on bridge structures.	11. State DOT or highway department.
OUTPUT	
1. Increased costs of highway maintenance. 2. Increased highway revenues.	
PROCEDURE	
1. For each shipper transferring to truck or truck-rail combination, determine total annual truckloads of freight, by STCC commodity code. a. STB Bureau of Accounts, <u>Freight Commodity Statistics</u>, can be used to convert rail carloads of each commodity, to estimated tonnage, to estimated truckloads. 2. Determine alternative mode. a. Direct data from shippers' survey. 3. Determine highway routings, for all commodities and shippers. a. For truck-rail combinations, routes should be determined to the nearest alternative railhead. b. For long haul trucking, routes should be determined to the nearest state primary highway or interstate system. 4. For routes determined above, obtain following data a. Pavement type. b. Design term. c. Slab thickness. d. Number of lanes. e. Pavement Serviceability Index (PSI). (Note: These data may not be available, particularly if the route involved is not a state highway. It may be necessary to estimate this based upon other secondary records and/or physical inspection.) 5. Determine type of truck likely to be utilized for each commodity. A standard type may be assumed. 6. Based on the gross weight and axle loading of the truck used, and the slab thickness and type of pavement of the route used, determine the number of 18-KIP equivalent loads each truck will apply to the pavement. a. The above may be determined from tables contained in the <u>AASHTO Guide for Design of Pavement Structures</u>. 7. Based on the design term and pavement serviceability index, determine the total number of actual 18-KIP (1000 lbs) loads each route can withstand. a. The above may be determined from tables contained in the <u>AASHTO Manual of Instructions for Pavement Evaluation Survey</u>. 8. Calculate the actual number of passes by the selected truck that the route can sustain. This equals (Step 7) divided by (Step 6). 9. From the state DOT, obtain resurfacing and annual maintenance costs, per mile, or the various pavement types. 10. Calculate resurfacing and annual maintenance costs per truck mile. This equals (Step 9) divided by (Step 8). 11. Based on actual truckloads and the lengths of the alternate highway routings used, calculate the estimated increase in annual resurfacing costs and annual maintenance costs. 12. Determine if any bridge load limits are exceeded by added vehicles (See Step 6). 13. Obtain estimates of bridge reconstruction (if any) from independent sources. 14. Based on the estimate of increased annual traffic mileage, estimate the increase in annual revenues from license and fuel taxes, if any. (Additional vehicles may not be needed despite increases in mileage; local conditions may need to be assessed on a case-by-case basis. 15. Subtract the increase in revenues from the increase in costs to determine the net increase (or decrease) in costs resulting from additional highway maintenance.	

EXAMPLE							
(Note: for brevity, the procedure is performed here only for truck traffic generated by one firm)							
1. Business	Commodity (Code)	Shipped/ Received	Total Tons	Tons/ Truckload	Total Trips		
Firm #2	112	R	237	24.0	10		
	142	R	19,621	21.1	930		
	281	S	783	17.6	44		
	299	S	248	23.7	10		
	402	S	5,057	17.9	283		
2. Alternate mode: truck rail.							
3. Business	Commodity	Route	From	To	Miles	Yearly Truck Volume	Yearly Truck Miles
Firm #2	112,142	Road #	plant	Road #	1.2	1277	1,532
	281,299	Road #	Road #	Road #	9.3	1277	11,876
	402	Road #	Road #	RR Sta.	0.9	1277	1,149
4. Route	Pavement Type		Design Term	Slab Thickness	# of Lanes	PSI	
Road #	Secondary Constructed AC		5.0	6"	2	2.0	
Road #	Secondary PCC		8.5	8"	2	2.0	
Road #	Secondary Constructed AC		5.0	6"	2	2.0	
5. Truck type: 5 - Axle Tractor with Tandem - Axle Trailer.							
6. Gross weight distribution:							
Tractor Axle Load = Gross Total x (0.1507) Each Trailer Double Axle Load = Gross Total x (0.4247) Gross Total = 12 tons (tare) + 20 tons (avg. payload) = 32 tons = 64,000 lbs. Tractor Axle Load = (64,000) x (0.1507) = 9,640 lbs. Each Trailer Double Axle Load = (64,000) x (0.4247) = 27,180 lbs. Pavement 18-KIP Equivalent Loads Flexible (0.081) + (0.437) + (0.437) = 0.955 Rigid (0.071) + (0.756) + (0.756) = 1.583							
7. The number of 18-KIP loads each route can withstand:							
<u>Route</u>				<u>18-KIP Loads</u>			
Road #				1,629,000			
Road #				5,112,000			
Road #				1,629,000			
8. Actual number of passes by the required costs per mile:							
<u>Route</u>				<u>Number of Passes</u>			
Road #				1,706,000			
Road #				3,229,000			
Road #				1,706,000			
9. Resurfacing and annual maintenance costs per mile:							
<u>Route</u>	<u>Pavement Type</u>	<u>Resurfacing Cost/Mile</u>	<u>Annual Maintenance Cost/Mile</u>				
Road #	Secondary Constructed AC	33,800	\$2,850				
Road #	Secondary PCC	33,800	\$1,121				

Road #	Secondary Constructed AC	33,800	\$2,850
10. Resurfacing and maintenance costs per truck - mile:			
<u>Route</u>	<u>Resurfacing Cost/Truck-Mile</u>	<u>Annual Maintenance Cost/Truck-Mile</u>	
Road #	\$ 0.0198	\$ 0.0017	
Road #	\$ 0.0105	\$ 0.0003	
Road #	\$ 0.0198	\$ 0.0017	
11. Increased annual resurfacing and maintenance costs:			
<u>Route</u>	<u>Annual Resurfacing Cost</u>	<u>Annual Maintenance Cost</u>	
Road #	(\$0.0198) x (1532) = \$30	(\$0.0017) x (1532) = \$3	
Road #	(\$0.0105) x (11876) = \$125	(\$0.0003) x (11876) = \$4	
Road #	(\$0.0198) x (1149) = \$23	(\$0.0017) x (1149) = \$2	
12. No bridge load limits are exceeded.			
13. No bridge reconstruction is needed.			
14. Increased annual revenues from license and fuel taxes:			
<u>Fuel taxes</u> *:			
a. fuel tax rate = \$0.12/gallon			
b. fuel consumption rate = (5.6 miles/gallon) - (0.085 mi/gallon/ton) x			
where x = commodity weight			
= (5.6 miles/gallon) - (0.085 x 20 tons)			
= 3.9 mi/gallon			
c. annual vehicle-miles = (1532) + (11876) + (1149) = 14,557 miles			
Increased fuel tax revenue = (\$0.12) x $\frac{(14557 \text{ miles})}{(3.9 \text{ mi/gallon})}$ = \$448			
*Fuel consumption of tax rates needs to be obtained from up-to-date sources.			
<u>License Fee Collections</u> :			
a. license fee = \$222/vehicle (tractor-trailer)			
b. number of vehicles required = $\frac{\text{annual truckloads}}{260 \text{ days}} \div 4 \text{ daily trips/vehicle}$			
= $\frac{1277}{260} \div 4 = 1.23$, or 2 vehicles			
Note: The number of daily trips each vehicle can make is based on an assumed ½ hour load and unload time, and an average speed of roughly 25 mph.			
Increased license fee collections = (\$222) x (2) = \$444			
15. Increase in highway resurfacing and annual maintenance costs = \$187			
Increase in license and fuel tax revenues = \$892			
Net decrease in costs = <u>\$705</u>			
A variation of the procedure, requiring fewer calculations, is to perform the analysis only on those routes estimated to experience increases in truck traffic of more than 10 percent.			

Energy Consumption

Diversion of freight from rail to truck will produce changes in the amount of fuel consumed. Energy savings will result from the cessation of relatively low-volume shipments associated with most light density lines. Additional consumption of energy will occur as increased local and intercity truck traffic becomes necessary to transport such freight. Table 15 provides a worksheet which estimates both current rail locomotive fuel consumption along with future trucking fuel consumption.

Table 15. Energy Consumption

INPUT		SOURCE				
1. Number of annual rail carloads per customer.		1. Shipper survey.				
2. Number of railcar pick-up and set-outs per trip per customer.		2. Shipper survey.				
3. Expected increase or decrease in carloads per customer year.		3. Shipper survey.				
4. Maximum track distance from point of abandonment to farthest customer per year.		4. Rail line operator.				
5. Locomotive used by rail line operator to service route.		5. Rail line operator.				
6. Distance between each customer and the nearest railroad TOFC yard.		6. Shipper survey, state DOT, maps.				
7. Rail carloads to be diverted to delivery directly to shipper's customers by truck.		7. Shipper survey.				
OUTPUT						
1. Annual fuel consumed by rail locomotives in current operations.						
2. Expected annual fuel consumption for future trucking operations.						
LOCOMOTIVE FUEL CONSUMPTION (Gal/Hr)						
Service	GP7	GP9	GP30	GP38	Average	
Line Haul	28.7	32.7	37.3	36.2	33.7	
Switching	10.7	11.4	13.6	11.5	11.8	
TRACK FUEL CONSUMPTION (Gal/Mi)						
Average truck fuel consumption is 0.2 gallons per mile.						
TRUCKLOADS REQUIRED PER RAILCAR LOAD						
The Association of American Railroads has determined through extensive published studies that an Average loaded railcar requires two and four tenths trucks to carry the equivalent materials. The 85 mile rail line under consideration has five shipping customers. The operating railroad has a Maximum Operating Track Speed of 45 MPH on the line. Two of these shippers indicate on their Shippers Survey they will ship exclusively by truck and the remaining three indicate they will ship using trucks to the nearest rail yard accepting Trailer On Flat Car (TOFC) shipments, with shipper mileage as indicated. The rail line operator indicates the average time spent at each shipper on the line is 30 minutes to perform pick-ups and set-outs.						
SHIPPER SURVEY DATA						
Shippers	Abandonment Distance	Annual Carloads	Weekly Req't. Deliveries	TOFC Transfer	Req's - Rail	Req's - Truck
No. 1	8 Mi.	84	2 / 1	Y	X	53 miles
No. 2	27 Mi.	62	1 / 1	N		68 miles
No. 3	27 Mi.	48	1	N		109 miles
No. 4	39 Mi.	124	2 / 3	Y	X	91 miles
No. 5	58 Mi.	75	1 / 2	Y	X	110 miles
CALCULATIONS						
Calculate the number of rail trips required to service the shippers on this route prior to abandonment. (RT_A) A. From the Shipper Survey, shipper Deliveries per week (W_D) req'ts. times Weeks per year. (RT_A) - (W_D) x 52 weeks per year = 1 x 52 = 52						

Calculate the number of switching events required on the route per year. (SE_A) B. Regardless of the number of cars delivered or picked up at each shippers location, only one switching event is required per shipper location per delivery. $(SE_A) = \sum [(W_D)_i \times (RT_A)] = (1 \times 52) + (1 \times 52) + (1 \times 52) + (1 \times 52) + (1 \times 48) = 256 \text{ annual switching events}$
Calculate the Annual Time the rail line operator spends on switching events per year. (T_A) C. The annual switching time is the number of switching events times the average time per event. $(T_A) = (SE_A) \times (\frac{1}{2} \text{ hr. per event}) = 256 \times (\frac{1}{2}) = 128 \text{ hours}$
Calculate the annual locomotive running time on the route, excluding the switching time. (LT_A) D. The annual locomotive running time is determined by the Maximum Operating Track Speed times the Route Length plus 10 minutes per shipper for braking and acceleration of the train times the number of rail trips per year. $\begin{aligned} (LT_A) &= [(58 \text{ miles} \div 45 \text{ MPH}) + [(10 \text{ min.} \div 60 \text{ min./hr}) \times (S_i)]] \times (RT_A) \\ &= [(1 \text{ hr. } 17 \text{ min.}) + (1/6 \text{ hr.} \times 5)] \times 52 \text{ trips/year} \\ &= [(1 \text{ hr. } 17 \text{ min.}) + (50 \text{ min.})] \times 52 \text{ trips/year} \\ &= (2 \text{ hr. } 7 \text{ min.}) \times 52 \text{ trips/year} = 108 \text{ hrs./year} \end{aligned}$
Calculate the annual locomotive fuel consumption used to service the route. (LCF_A) E. The annual fuel consumption is the sum of the fuel consumed in switching operations and the running fuel consumption. $\begin{aligned} (LCF_A) &= (\text{Average Line Haul Locomotive Fuel Consumption} \times (LT_A)) + (\text{Average Switching Locomotive Fuel Consumption} \times (T_A)) \\ &= (33.7 \text{ gal. / hr} \times 108 \text{ hrs.}) + (11.8 \text{ gal. / hr.} \times 128 \text{ hrs.}) = (3,640 \text{ gal.}) + (1,510 \text{ gal.}) \\ &= 5,150 \text{ gallons} \end{aligned}$
Calculate the number of truck loads required to replace the anticipated rail shipments to be lost through the abandonment. (TS_i) F. The number of rail carloads are determined by summing the (CS_i) multiplied by the rail carload to truck load factor (2.4) and rounding each value to the next integer. $\begin{aligned} (TS_i) &= \sum [(CS_i) \times (2.4)] = (84 \times 2.4) + (62 \times 2.4) + (48 \times 2.4) + (124 \times 2.4) + (75 \times 2.4) \\ &= 202 + 149 + 116 + 298 + 108 = 945 \text{ Truck Loads} \end{aligned}$
Calculate the accumulated mileage for each shipper to ship product to the new location. (M_A) G. The accumulated mileage is the summation of the number of truck loads required multiplied by the mileage to the new destination. In order to ascertain the mileage from the shipper to the new destination, the shipper must provide the mileage in the Shipper Survey. The total mileage is determined by multiplying the appropriate shipper truck loads in F above by the mileage to the new destination. $\begin{aligned} (M_A) &= \sum [(CS_i) \times (YDS_i)] \\ &= [(202 \text{ truck loads} \times 53 \text{ mi.}) + (149 \times 68 \text{ mi.}) + (116 \times 109 \text{ mi.}) + (298 \times 91 \text{ mi.}) + (180 \times 110 \text{ mi.})] \\ &= (10,706 \text{ mi.}) + (10,132 \text{ mi.}) + (12,644 \text{ mi.}) + (27,118 \text{ mi.}) + (19,800 \text{ mi.}) = 80,400 \text{ miles} \end{aligned}$
Calculate the annual truck fuel consumed to service the shippers. (TFC_A) H. The annual truck fuel consumption is the product of the total annual truck mileage times the truck fuel consumption factor per mile. $\begin{aligned} (TFC_A) &= (\text{Truck Fuel Consumption Factor per mile} \times (M_A)) = (0.2 \text{ gal. / mile} \times 80,400 \text{ miles}) \\ &= 16,080 \text{ gallons} \end{aligned}$
Calculate the additional fuel consumption due to the proposed abandonment. (FC) I. The difference between the truck fuel consumption and the locomotive fuel consumption represents the additional fuel used if the value is positive, however, if the value is negative, a fuel savings is indicated for the switch using trucks. $(FC) = (TFC_A) - (LCF_A) = 16,080 \text{ gal.} - 5,150 \text{ gal.} = 10,930 \text{ gallons}$

Many factors will influence the net change in fuel consumption that occurs. Distance traveled, maximum allowable track speed, number of customers served per trip on the line, the number of pick-ups and set-outs, the train assembly time required at the point of origin, the delivery time required at the destination, the train size (both origin and destination), type of locomotive(s) used, and the physical geometry of the line will effect the amount of fuel consumed by rail operations. Track fuel consumption will depend on the load carried, the type of terrain traversed, the distance traveled, the equipment used and the average speed of travel.

Selection of the appropriate procedure for estimating the energy costs of rail service discontinuance depends upon the level of detail being sought and the availability of data.

The average time required to perform a pick-up and set-out move for the railroad operator is 30 minutes, regardless of the number of cars in the cut. The cumulative shipper stops per week are summed to account for the switching time of the trip and switching fuel consumption is calculated for this operating period. The average locomotive hourly fuel consumption should be used when the analyst cannot confirm the operating railroads locomotive equipment used on the line to be abandoned.

Air Pollution

The transfer of freight from rail to truck, resulting from the discontinuance of rail service, is likely to produce a net change in the amounts of air pollutants generated. In particularly sensitive areas, even small increases may be significant enough to merit identification.

The magnitude of anticipated pollution changes will be dependent on the level of increased fuel consumption by additional truck traffic, reduced by the decrease in fuel consumption caused by the abandonment of rail service. The relative effect of such a change in pollution will depend on the level of existing concentrations within the impact area.

Recent government legislation concerning air pollution requires states to establish air quality implementation plans for the purpose of monitoring pollution levels. As a result, states have identified specific air basins, located in areas of high population density or heavy industrial development, where continuous monitoring of air quality is maintained. The procedure in Table 16 involves a broad analysis of the overall impact of rail service discontinuance on such air basins,

followed by a microlevel analysis of localized impacts where the percentage change in pollution levels may be significant. It requires estimates of energy consumption by rail and truck as input data.

Table 16. Air Pollution

INPUT		SOURCE				
1. Annual locomotive branchline fuel consumption.		1. As previously computed (Table 15).				
2. Annual truck branchline fuel consumption		2. As previously computed (Table 15).				
1. Emission factors for locomotives and trucks.		3. U.S.E.P.A., <u>Compilation of Air Pollution Emission Factors</u> (April, 1973). <u>Locomotive Emission Study, California Air Resources Board</u> ; Booz-Allen & Hamilton, Inc. (January, 1991). U. S. E. P. A., 1998 Heavy Duty Truck Emissions Standards.				
4. Critical air basins within the state. These are defined as areas where federal primary and secondary air quality standards are exceeded.		4. State air quality implementation plans, state environmental protection agency. Federal Air Quality Standards and EPA Regulations.				
5. Base values of existing pollutants within the critical air basins.		5. Same as above.				
6. Base values of existing concentrations of pollutants within the critical air basins.		6. State air quality implementation plans, state environmental protection agency, US EPA.				
OUTPUT						
1. Net change, in pounds of pollutants per year, generated by rail service discontinuance.						
2. Percentage change in pollutants generated by rail service discontinuance.						
3. New levels of concentrations of pollutants generated by rail service discontinuance.						
PROCEDURE						
1. Multiply the appropriate locomotive and truck emission factors times the annual locomotive and truck branchline fuel consumption, to obtain the pounds of pollutants generated before and after rail service discontinuance. Determine the net change, in pounds of pollutants per year, to be expected if service is discontinued.						
2. For each critical air basin, perform the following steps:						
c. Obtain base values of existing pollutants within the basin.						
d. Obtain base values of existing concentrations. These base values will be for the worst case in the branch line vicinity.						
e. Calculate net increase or decrease of pollutants due to branch line abandonment as described above.						
f. Estimate the impact of this increase using the following equation:						
$\frac{\text{existing emissions} + \text{new emissions}}{\text{existing emissions}} \times \text{existing concentrations} = \text{new concentration.}$						
EXAMPLE						
1. Emission Factors (lb./1000 gallons):						
	HC	NOx	CO	PM	SOx	
Locomotives (local trains)	24.1	535	76.8	11.5	40	
Trucks	8.9	170	67.0	4.0	---	
Total Emissions (pounds of pollutant):						
	Fuel (gallons)	HC	NOx	CO	PM	SOx

Locomotives	5,150	124.1	2,755.3	395.5	59.2	206.0
Trucks	16,080	143.1	2,733.6	1,077.4	64.3	---
Net Change	10,930	+ 19.0	-(21.7)	+ 681.9	+ 5.1	---
2. Sand Lake air Basin: a. Base values of existing pollutants: HC : 161,322 tons/year Nox : 114,205 tons/year CO : 741,369 tons/year b. Base values of existing concentrations: HC : 0.20 PPM (3 hr. concentration) Nox : 0.03 PPM (annual arithmetic mean) CO : 7.5 PPM (8 hr. concentration) c. Net increase of pollutants: HC : 19 lb. = 0.0095 tons Nox : (21.7) lb. = (0.0109) tons CO : 681.9 lb. = 0.341 tons d. New concentrations: HC : $\frac{161,322 + 0.095}{161,322} \times 0.20 = 0.20$ PPM Nox : $\frac{114,205 + (0.0109)}{114,205} \times 0.03 = 0.03$ PPM CO : $\frac{741,369 + 0.341}{741,369} \times 7.5 = 7.5$ PPM The impact of the net increase in pollutants is expected to be negligible in all cases.						

Noise Pollution

Rail service discontinuance is likely to produce a net change in the magnitude and distribution of noise pollution. The cessation of daily train movements on light density lines and the discontinuance of switching operations will reduce noise levels in the vicinity of the rail lines. Any major increases in truck traffic are likely to increase highway noise levels.

The change in perceived noise level is of critical importance. Even a major increase in the volume or frequency of sound generated may be of little significance in a very sparsely populated area. Consequently, the location of populations with respect to the existing rail lines and the anticipated new truck routes should be considered.

The procedure for calculating noise pollution provided in Table 17 requires much data and is quite complex. Consequently, it is useful to establish order-of-magnitude guidelines to indicate when impacts will be serious enough to justify application of the procedure. Suggested guidelines are:

1. If existing peak period truck traffic is greater than 40 trucks per hour and rail abandonment generates fewer than 40 trucks in the peak period, impact will be negligible.
2. If existing peak period truck traffic is less than 40 trucks per hour:

Ratio of Generated to Existing

Truck Traffic

0-0.15

0.15-0.5

0.5-1.0

Noise Impact

negligible

slight

further analysis required

Table 17. Noise Pollution

INPUT	SOURCE
1. Truck routes to be utilized after discontinuance of rail service. For all such routes, obtain the following data: a. Existing peak hour traffic volume. b. Existing peak hour truck volume. c. Estimated increased peak hour truck volume. d. Length of the portion of such routes in urban areas (i.e., within city, village, and other more densely populated areas) paralleling the branch. e. Length of the portion of such routes in rural areas paralleling the branch. f. Average number of residences per mile located within 800 feet of parallel highways located within urban areas. Calculated to be 197.2 residences per mile in Wisconsin. g. Average number of residences per mile located within 800 feet of parallel highways in rural areas. Calculated to be 1.1866 residences per mile in Wisconsin.	1. County highway maps, system maps. a. Estimated from state D.O.T. <u>Highway Sufficiency Ratings</u>. b. Same as above. c. Estimated from increased daily truck traffic. d. County highway maps. e. Same as above. f. Aerial photographs. g. Same as above.
2. Light-density lines on which service may be discontinued. For all such lines, obtain the following data: a. Average number of daytime train operations. b. Average number of nighttime train operations. c. Length of the portion of the line located within urban areas. d. Length of the portion of the line located within rural areas. e. Average number of residences per mile located within 800 feet of the portions of rail branch lines lying in urban areas. Calculated to be 173.9 residences per mile in Wisconsin. f. Average number of residences per mile located within 800 feet of the portions of rail branch lines lying in rural areas. Calculated to be 2.6072 residences per mile in Wisconsin.	2. AAR data package. a. Same as above. b. Same as above. c. County highway maps. d. Same as above. e. Aerial photographs. f. Same as above.

OUTPUT		
1. Noise Pollution Index: A measure of the total number of people experiencing a change in noise pollution of different levels of significance.		
PROCEDURE		
1. Based on traffic volumes on anticipated truck routes before and after abandonment, and utilizing procedures described in NCHRP #117, <u>Highway Noise, A Design Guide for Engineers</u> and in NCHRP #144, <u>Highway Noise, A Field Evaluation of Traffic Noise Reduction Measures</u> , calculate the L_{10} highway noise levels at 100 feet, before and after abandonment. 2. Using above results, establish significance levels for highway noise before (S_B) and after abandonment (S_A) as follows:		
S_B, S_A	Highway L_{10} Noise Level at 100 Feet	Significance of Noise Pollution Impacts
0	less than 45 dBA	of no importance
1	45 dBA to 54 dBA	of some importance
2	55 dBA to 69 dBA	significant
3	70 dBA and above	highly significant
The variables S_B and S_A take on the values 0, 1, 2, and 3 depending upon the highway noise levels before and after abandonment.		
3. Based on the average number of daytime and nighttime train operations before and after abandonment, establish significant levels for rail noise before (N_B) and after abandonment (N_A) as follows: $N = \text{Average Daily Equivalent Number of Operations} = N_d + 10N_n$ where $N_d = \text{the average number of daytime train operations}$ $N_n = \text{the average number of nighttime train operations}$ Nighttime operations are given 10 times the weight of daytime operations which on a decibel scale (logarithmic) is equivalent to adding 10 dBA to the nighttime noise level.		
N_B, N_A	Average Daily Equivalent Number of Train Operations (N)	Significance of Noise Pollution Impacts
0	$0 \leq N \leq 1$	of no importance
1	$1 < N \leq 2$	of some importance
2	$2 < N \leq 40$	significant
3	$40 < N$	highly significant
4. Based on truck route and rail line data referred to earlier, calculate the number of residences located within 800 feet of the highway (P_H) and within 800 feet of the railroad (P_R) as follows: $P_H = M_{UH} \times F_{UH} + M_{NH} \times F_{NH}$ and $P_R = M_{UR} \times F_{UR} + M_{NR} \times F_{NR}$ where $M_{UH} = \text{Input 1 (d)}$ $F_{UH} = \text{Input 1 (f)}$ $M_{NH} = \text{Input 1 (e)}$ $F_{NH} = \text{Input 1 (g)}$ $M_{UR} = \text{Input 2 (c)}$ $F_{UR} = \text{Input 2 (e)}$ $M_{NR} = \text{Input 2 (d)}$ $F_{NR} = \text{Input 2 (f)}$		
5. Calculate the index used to evaluate the noise impacts of abandoning the line as follows: Noise Pollution Index = $(S_A - S_B)P_H + (N_A - N_B)P_R$		

EXAMPLE				
NOTE: For brevity, the procedure is performed here only for truck traffic generated by Firm #2.				
1.	Route	L_{10} (before)		L_{10} (after)
	Route #1	52		57
	Route #2	58		60
	Route #3	57		62
2.	Route	S_B	S_A	$(S_A - S_B)$
	Route #1	1	2	1
	Route #2	2	2	0
	Route #3	2	2	0
3. Annual round trips = 50 Average daily round trips = $50/260 = 0.2$ Average daily operations = $(2) \times (0.2) = 0.4$ Assuming no nighttime train operations, $N(\text{before}) = (0.4) + (10)(0) = 0.4$ $N(\text{after}) = 0$ $N_B = 0$ $N_A = 0$				
4.	Route	Length	Length in Urban Areas Paralleling Branch	Length in Rural Areas Paralleling Branch
	Route #1	1.2 mi.	0	1.2
	Route #2	9.3 mi.	1.2	8.1
	Route #3	0.9 mi.	0.9	0
	Rail line	18.5 mi.	2.4	16.1
P_H (Route #1) = $(0) \times (197.2) + (1.2) \times (1.1866) = 0 + 1.4 = 1.4$ P_H (Route #2) = $(1.2) \times (197.2) + (8.1) \times (1.1866) = 236.6 + 9.6 = 246.2$ P_H (Route #3) = $(0.9) \times (197.2) + (0) \times (1.1866) = 177.5 + 0 = 177.5$ P_R = $(2.4) \times (173.9) + (16.1) \times (2.6072) = 417.4 + 42.0 = 459.4$				
5. Noise Pollution Index = $(S_A - S_B)P_H + (N_A - N_B)P_R$ $(S_A - S_B)P_H = (1)(1.4) = 1.4$ (route #1) $(S_A - S_B)P_H = (0)(246.2) = 0$ (route #2) $(S_A - S_B)P_H = (0)(177.5) = 0$ (route #3) Noise Pollution Index = $(1.4) + (0)(459.4) = 1.4$				

Step 7. Develop Evaluation Factors

In addition to the identification of what information needs to be acquired and the types of analyses to be performed, a comprehensive set of evaluation factors need to be developed to allow for comparison between alternative rail plan elements. The concerns of the various groups who would be affected by the rail plan should be related to these factors. Each of the factors represented in Table 18 as performance measures, must be developed so as to be measurable (either quantitatively

or qualitatively). In addition, both short-term and long-term impacts should be considered. Measurement of factors requires an understanding of what data are available or can be made available economically. Techniques for using these data to describe the factors will need to be developed if they are not currently accessible.

Table 18 lists a set of goals that could conceivably serve as a nucleus for an initial set of rail plan goals. The list is not exhaustive, but will provide a basis for goal formulation in rail impact areas such as economics, transportation, state development, resource management, and the community.

Table 18. Performance Measure Formulation

GOALS	OBJECTIVES	PERFORMANCE MEASURES
<u>Economic</u> Increase revenues, solvency of carriers	Increase freight shipped Increase rate of return on equity	- Annual carloads per mile Annual ton-miles - Annual revenue/total cost ratio
Reduce carrier's costs	Reduce capital cost Reduce operating cost Reduce maintenance cost	- Capital cost/ton-mile - Operating cost/ton-mile - Maintenance cost/ton-mile
Decrease cost to shipper, receiver, user	Decrease freight rates	- \$
Reduce state expenditures	Minimize rail line acquisition Minimize subsidies Minimize rehabilitation work Minimize unemployment and public assistance payments	- \$ - \$ - \$ - \$
<u>Transportation</u> Reduce total travel/shipping time	Decrease line haul time Decrease train load assembly time	- Time, operating speeds - Time
Increase reliability of shipment	Improve on-time performance Decrease damage Reduce equipment breakdowns	- Deviation from scheduled time of arrival - \$, incidence of claim - Percent of vehicles for service
Facilitate intermodal transfer	Increase number of intermodal transfer points Decrease transfer time	- Number of transfer points - Transfer time
Increase passenger comfort, convenience	Reduce interior noise levels Increase space per passenger	- dBA - Square feet per passenger
Maintain, increase rail service to localities	Increase availability of service Maintain rail facilities Maintain frequency of service	- Number of access points (team tracks, etc.) - Miles of rail line abandoned - Number of trains/week
Encourage reasonable competition	Maintain intercity competition	- Number of competing rail lines
Maximize use of new technology, management techniques	Introduce cost, time, energy- saving techniques	- Number of techniques introduced

GOALS	OBJECTIVES	PERFORMANCE MEASURES
<u>State Development</u> Promote economic growth	Reduce unemployment Increase gross state product	- Unemployment rate - State or regional product (\$) - Number of jobs created
Maintain options for future access to freight-generating activities	Bank abandoned R.O.W.	- Miles R.O.W.
Reduce dependence on highways	Maintain or increase modal alternatives	- Percentage of industrial jobs at plants having rail access
Reduce excessive truck volumes on highways	Decrease truck VMT	- Truck VMT
<u>Resource Goals</u> Conserve energy	Decrease operating speed where service requirements permit Decrease energy consumption in line-haul operation	- BTU/ton-mile - BTU/ton-mile
Conserve scarce resources (open space, scenic areas, wildlife, historic sites)	Minimize takings of open space land Minimize impact on ecological resources	- Acres of land - Number of sites, acres impacted
Minimize adverse environmental impacts	Minimize air pollution Minimize noise pollution	- Grams of CO, HC, No _x per ton mile - Number of persons in 70 d BAL ₁₀ band
<u>Community</u> Maintain economic base of localities	Maintain tax base Minimize job/wage losses Minimize out-migration of residents	- \$ of assessed valuation - Personal income loss (\$), job losses - Number of out-migrations
Minimize physical dislocations	Minimize displacement of residences and businesses	- Number of dwelling units, businesses displaced
Increase safety	Upgrade track standards Minimize derailments Minimize injuries and fatalities	- FRA track class - Number of derailments - Injuries, fatalities

Each goal is listed with a set of objectives. The objectives serve to “operationalize” the goals, in that they define a specific measurable outcome that indicates goal achievement. Every objective is also tied to a specific performance measure by which the objective can be quantifiably measured. For example, if a specific goal of a state rail plan was “Increase revenue and solvency of rail carriers,” one objective to reach in achieving this goal would be an increase in freight shipped. A measure of this objective would be annual carloads per mile and annual ton-miles. Each goal should have specific objectives that reflect attainment, and the objectives should be quantified by specific unit measurements.

Step 8. Comparison of Options

A systematic comparison of alternatives in light of the analyses performed and the evaluation factors selected, is necessary to achieve an objective decision on desirable levels of state participation in ensuring an adequate rail system. Major alternatives should be compared as fully as possible in terms of capital requirements, and social, economic, environmental, and energy impacts. TransDec, described in a previous section is an excellent tool to accomplish this end. It is crucial that affected interests participate at this point in the comparison process, since many of the criteria by which rail service alternatives must be compared are at odds with one another and require that compromises be made.

The comparison procedure should be structured to consider, on each affected interest group, the impact of each important factor, of each alternative. The time and cost associated with this element could become prohibitive unless the entire evaluation procedure is kept in perspective. The precision required for comparisons, many of which may be qualitative, should be assessed for each type of comparison made. Data and analytical techniques can be matched to prove meaningful comparisons at minimum cost and delay.

Step 9. Formulation of a Preliminary Plan

A preliminary plan emerges as the culmination of all the preceding steps outlined in the current research. Options evaluated in Step 8 should lead to a finite number of reasonable actions that the state can pursue leading to the desired objectives and supporting one or more of the broad goals defined early in the process. With Step 9, as with the entire process, review and re-evaluation should be an integral part of the process, with program reassessment scheduled on a regular interval.

Step 10. Implementation

Implementation can be the most difficult portion of the process outlined in this research. However, through the inclusion of as many of the affected parties as possible, most of the barriers to implementation can be overcome within the context of the process itself. Political and institutional obstacles to various courses of action are often the result of an initial polarization of views that are not addressed at the beginning stages of a process. Through cooperative or coordinated goal formation, issue identification, and evaluation, most implementation challenges reduce to issues of timing and finances.

CHAPTER 2. RAIL ISSUES AFFECTING TEXAS

INTRODUCTION

Many rail issues affect Texas. Rail plays an important role in the overall state transportation system and will continue to do so in the future. Far from being a static feature of the transportation landscape, railroads have and are changing in response to altered regulatory and economic pressures. Railroad mergers have reduced the number of Class I carriers in the state giving rise to a more important role for shortline operations. Changes in the regulations governing railroad operations have allowed many low density or unprofitable lines to be abandoned. Containerization of freight and double stack operations have made intermodal connections more important to the economics of transportation and to the efficiency and productivity of freight movement operation -- rail, truck, waterborne, and air.

While not all of the important future issues pertaining to rail transportation can be anticipated, Chapter 2 addresses, in some detail, those likely to be central to the state's interests in the years to come. Abandonment of rural rail lines will continue to be an important consideration in state rail planning as Texas attempts to maintain a sufficient capacity to move ever-increasing quantities of freight. The impact of rail operations on urban areas will also be of concern as railroads move more freight on more and longer trains through growing population centers. Chapter 2 covers these and other topics to provide TxDOT with additional background and resources to formulate the state's response. This chapter covers:

- abandonment issues,
- urban rail rationalization,
- intermodal planning issues,
- national defense considerations,
- yard operations, and
- car availability.

RAIL LINE ABANDONMENT

Abandonment Issues

Rail abandonment can greatly affect the areas which lose rail service. The loss of rail service to a community can be significant. The creation of a single mode transportation system greatly limits the future growth and direction of the community by hindering economic expansion and development opportunities. This includes the ability to attract certain types of industries which depend on rail service. Quality of life within the community may also deteriorate as pollution levels and roadway degradation increase with increased truck traffic.

A list of negative impacts on a community may include:

- loss of jobs,
- loss of businesses,
- loss of population,
- reduced ability to attract certain types of industries,
- loss of tax revenues with the possibility of the reduction of local services or an increase in taxes,
- increase in local street and road traffic and increased maintenance expenses,
- reduced economic development opportunities,
- increased levels of noise and air pollution, and
- reduced property values.

These potential impacts resulting from the abandonment of light density lines are demonstrated in Figure 4.

Businesses are especially vulnerable to negative impacts associated with the loss of rail service to an area. To them, the loss of rail service may become a question of survival. The amount of dependence on rail service will dictate the overall effects on a specific business, but any business may experience secondary impacts regardless of their reliance on rail.

Firms using rail service to any extent have three choices: 1) use trucks for all freight requirements; 2) relocate to an area where rail service is available; or 3) go out of business. Those firms able to shift all their transportation needs to trucks may experience an increase in freight rates, reduction in revenues, and loss of market. Reduction may occur in employment opportunities and in the profitability of the business. In addition, these firms become “captive” to one mode and lose their negotiating position.

In a survey done by the United States General Accounting Office, it was found that on the average the shipping and related costs to a firm having lost rail service, due to abandonment, increased 19 percent (GAO, 1990). In addition, almost 41 percent of the firms reported a loss of market and 13 percent of the firms indicated that they found it necessary to relocate their business as a direct result of the abandonment.

The state of Texas also has legitimate concerns about the loss of rail service to different areas. These concerns are both economic and social in character and encompass the following areas:

- **Economic development:** Without a balanced freight transportation system economic development objectives of the state may be difficult to achieve.
- **Regional development:** Certain regions of the state will undoubtedly be at a distinct disadvantage in their efforts to grow and remain economically viable.
- **Competitive prospects:** Both the state and some areas may find that their competitive position as it relates to other states is diminished.
- **Quality of life:** Certain quality of life considerations are lost or diminished when an area loses rail freight service. While these may be difficult to quantify they are no less valid and need to be recognized when confronting a possible line abandonment.

STB Policies and Procedures

The following discussion is taken from the STB publication titled Overview: Abandonments & Alternatives to Abandonments. The document discusses the abandonment process, exceptions to the process, alternatives to abandonment, and alternative uses of rail rights-of-way.

In 1995, Congress enacted the “ICC Termination Act” (Act) which abolished the Interstate Commerce Commission and established the Surface Transportation Board (STB) to handle rail abandonments, *inter alia*. According to the Act, a railroad may abandon a line only with the STB’s permission. Under the detailed abandonment application process for active lines, STB balances the economic burden of continued operation against the public’s need for the service. The Board indicates that permission usually will be given to abandon lines on which there are significant operating losses. But, the carrier’s ability to earn more money by disinvesting from a line and reinvesting its assets elsewhere usually is not sufficient to allow abandonment in the face of a strong public need for service.

A rail carrier may take advantage of certain exemptions to the abandonment process. Lines over which no local traffic has moved for two years without any formal complaint have been exempted from traditional regulatory scrutiny and can be abandoned simply by filing a notice with the STB. These abandonments are still subject to appropriate labor protection and environmental conditions.

The Feeder Railroad Development Program makes it easier for states and private parties to preserve rail service by enabling any financially responsible person to force a rail carrier to sell the designated rail line. This applies to a line that has been designated for possible abandonment, even though no abandonment application has been filed. Similarly, once an abandonment application is filed for a line, financially responsible parties can offer to subsidize the carrier’s service or force the railroad to sell them the line for continued service. To encourage the continuation of rail service, the STB has frequently exempted the parties from many regulatory requirements.

The Board also provides several opportunities to preserve abandoned rail rights-of-way through rail banking, meaning that the right-of-way is preserved for potential future use as a railroad. Interested parties are given the opportunity to negotiate voluntary agreements to use a railroad right-of-way that otherwise would be abandoned for recreational or other public use, such as a commuter rail service or a highway.

Steps in the Abandonment Process

In any abandonment case, the STB must determine whether the “present or future public convenience and necessity require or permit” the abandonment. In making this determination, the STB balances two competing factors. The first is the need of local communities and shippers for continued service. That need is balanced against the broader public interest in freeing railroads from financial burdens that are a drain on their overall financial health and lesson their ability to operate economically elsewhere.

The railroad first must show how continued operation of the line would be a burden to it. The abandonment will be denied if it can not establish this. If the railroad does demonstrate a burden, then evidence of the public’s need for continued service along with environmental impacts are examined. Parties opposing abandonment should present information on the effect on local businesses, surrounding communities, the local economy, and the environment and should also challenge the railroad’s financial data.

The Act establishes strict filing and procedural requirements for abandonment applications. The steps for rail abandonment include the following:

System Diagram Map According to the Act, rail carriers are required to maintain a map of all its rail lines. A Class III carrier may choose to prepare a narrative description of its lines instead of a map. On this system diagram map or in its narrative report, the carrier must identify separately, (1) any line for which it expects to file an abandonment application within the next three years and, (2) any line that it considers to be a potential candidate for abandonment. The Board will reject an abandonment application if any part includes a line that has not been identified as a category 1 (abandonment application within three years) for at least 60 days before the carrier filed the abandonment application. A carrier must publish its system diagram map or narrative in a newspaper of general circulation in each county containing a rail line in category 1, and publish all subsequent changes to its system diagram map.

Thus, the first indication that a railroad intends to abandon a line comes at least 60 days before the carrier’s application is filed. This time is very important because it gives shippers, local and state governments, and interested citizens an opportunity to meet to weigh possible opposition to abandonment, and to consider alternative means of continuing rail operations by the current railroad or another operator.

A line need not have been listed in category 2 (potentially subject to abandonment) prior to abandonment.

Notice of Intent The Board indicates that in addition to the system diagram map requirement, the railroad must file a “Notice of Intent” to abandon. This notice must be published once a week for three consecutive weeks in general circulation newspapers in each county where the line is located, send it to each of the significant shippers on the line, send it to the state agency responsible for rail transportation planning, and post it at each agency station and terminal on the line. All these notice requirements must be fulfilled 15-30 days before the application is filed at the STB.

The notice describes when and how to file a protest to the proposed abandonment. It also explains how to obtain information on possible subsidy or purchase of the line. Once the Notice of Intent to abandon is received, shippers, communities, and interested citizens should organize their activities concerning the abandonment and prepare to present their position to the STB and the railroad.

Abandonment Application According to the STB, the abandonment application must contain detailed information about the costs and revenues on the line to be abandoned and the overall financial condition of the carrier. A copy of the application is available from the carrier for any interested person, and those interested in participating should examine the information carefully.

Opponents of the abandonment should make an effort to verify and, if appropriate, recalculate and reconcile key information. State rail planning officials should be contacted for assistance in this area if the interested parties lack the expertise.

A railroad may ask the STB to waive certain information requirements. However, the STB may rescind the waiver and require the information if an opponent shows the information is necessary.

Protests or Comments to the Proposed Abandonment Once an application is filed, protestants have only 45 days to submit protests. However, oral hearing requests must be filed within 10 days of receipt of the application. Protestants can address the impact abandonment would have on the area by computing, (1) markets that would be lost without rail service, (2) the number of business failures or relocations and lost jobs that would result from abandonment, and (3) the number of current or future ventures that depend upon continued rail service. Local shippers should be able to present testimony concerning past and future use of the rail line. Reasons for the low

levels of past rail shipments, such as sporadic business fluctuations, drought, or other local disaster, should be explained. If shippers are expecting increased rail shipments, based on sound and defensible business forecasts, this should be documented.

Besides the economic impact of the proposed abandonment, protestants may also point out any effect that the abandonment would have on the environment. For example, increased use of alternative modes of transportation, such as trucks, might adversely affect noise levels in congested areas or pose safety problems. The environmental consequences of abandonment are assessed by the STB's Section of Energy and Environment (SEE).

The Board indicates that to be successful, protestants should not only present the harm that they will suffer from abandonment, but they should also attempt to discredit the railroad's evidence of losses or burden from operating the line. This should include evaluation of the railroad's financial data. The railroad will attempt to show that, (1) it is not receiving, and cannot reasonably expect in the future to earn, sufficient revenues from the line; and/or, (2) it expects to face significant costs on the line in the future that it will not be able to recover. Normally, the past revenue generated by the line can be determined fairly accurately based on carrier and shipper records. Other data are subject to interpretation by the parties, however. These include:

- projecting the revenues for the line;
- isolating the historical expenses of operating and maintaining the line, and projecting future operating, maintenance, and rehabilitation expenses; and ,
- calculating the opportunity costs of operating the line.

Protestants who can critically evaluate this data will have a better chance of success. Even if there is insufficient time or money to analyze the financial data thoroughly, there are a number of key issues that should be examined.

Railroads are required to include in the abandonment applications projections of their revenues and costs on the line for a "forecast year" – the 12-month period beginning the first day of the month the application is filed. To project future revenues and costs, the railroad must necessarily make assumptions. Those assumptions should be evaluated critically. Nobody can predict the future with certainty, and in many instances the protestants may be in as good or better position than the railroad to make accurate predictions. For example, a substantial component of revenues usually consists of the number of shipments originating or terminating on the line. Shippers on the line presumably

know their own businesses and future transportation needs and may be able to dispute the railroad's projections of future traffic. Wherever possible, protestants should provide specific facts and figures to support their own projections.

Of course, projections as to the future usually are based upon prior experience. Thus, the railroad's historical data should also be examined. Again, there are some issues that can be explored even if a rail cost analyst or other expert is not available.

First, confirm that all the data are from the relevant periods. Historical cost and revenue data must be submitted for a so-called "base year." The base year is the most recent 12-month period for which data have been collected at the branch level, ending no earlier than 6 months prior to the filing of the application.

Second, be alert to circumstances that may make the historical data unrepresentative. For example, was the carrier's ability to meet requests for service impaired by a shortage of rail cars? Or was there a recession or drought that resulted in lower, unrepresentative traffic volumes and revenues?

Third, confirm that actual cost and revenues are used where required by the regulations. Maintenance-of-way expenses usually can not be estimated by prorating expenses from a larger section of track; actual expenses incurred on the line sought to be abandoned are normally required. Similarly, depreciation of equipment, the return on investment for locomotives, and fuel costs must be based upon the type of locomotive and freight cars actually used on the line. The use of summary data based upon "Road" and "Yard" categories is generally unacceptable, because it tends to overstate costs when, as is often the case, a local or way train serves the branch line.

Fourth, if there are high rehabilitation or deferred maintenance costs, a qualified individual should examine the railroad's work papers and physically inspect the properties. It may be possible to further defer maintenance-of-way expenses for yet another year, taking those costs out of the forecast year. Usually only those rehabilitation costs necessary to meet Federal Railroad Administration minimum Class I standards are allowed. As a rule of thumb, rehabilitation costs and maintenance-of-way expenses vary inversely. That is, if rehabilitation costs are high, then maintenance-of-way costs should be low.

Fifth, as with the actual and projected revenue and cost information, the railroad's claimed opportunity costs should also be examined thoroughly by an analyst. Even if this is not possible, several key components of opportunity costs can be examined.

For example, land values are usually an important factor in calculating opportunity costs. Protestants should check with the Register of Deeds to make sure the land included in the railroad's calculations is and would still be owned by the railroad in the event of an abandonment. In some cases, ownership of the land reverts automatically to adjoining landholders. In addition, local bankers and real estate agents can supply accurate information on land values that may contradict the railroad's estimate of the value of its land holdings. Protestants should also, (1) verify the tons of track material that will result from salvaging the lines, (2) obtain a estimate of the scrap value in dollars per ton, and (3) see whether the cost of dismantling the track was deducted from the railroad's estimated sales proceeds.

It should be noted that a carrier may either calculate its own (pre-tax) cost of capital or use the industry-wide (pre-tax) cost of capital figure that is determined annually by the STB.

Finally, the railroad's projected gains and losses on its rail assets should be examined. Local real estate agents or brokers can check projections of changes in value for land, and the railroad's projections can also be compared to the index price series for historical sales of rail assets maintained by the STB. The railroad must justify departures from these trends.

Modified Procedure and Oral Hearings The Board will either set the proceeding for an oral hearing or, more often, what is called "modified procedure." Modified procedure means that no oral hearing is held, and all evidence is filed in writing. Oral hearings are for the primary purpose of cross examining witnesses who have filed verified statements in the proceedings.

After receiving the protests and the carrier's reply, the STB must issue its decision within 110 days after the application is filed.

Appeals If a party is dissatisfied with a director's decision, it may ask the STB to reconsider the matter. A party that is dissatisfied with a decision of the full Board may seek judicial review of the STB's decision by filing a petition for review in the appropriate United States Court of Appeals.

Exceptions to the Abandonment Process

The ICC Termination Act gives the STB a broad grant of authority to exempt carriers, services, and transactions from almost any and all kinds of STB regulation. According to the Act, the STB must exempt a carrier, service, and transaction from regulation if it finds the following:

- That continued regulation is unnecessary to carry out the national rail transportation policy of 49 U.S.C 10101; and,
- That *either* the transaction or service is of limited scope *or* application of the regulatory scheme is unnecessary to protect shippers from an abuse of market power.

The Board retains the authority to revoke exemptions that it has issued if and when the STB finds that its regulation is indeed necessary.

The STB and the ICC before it have both used broad exemption authority to facilitate the abandonment of lines where it believes that closer regulatory scrutiny is unnecessary, through both class exemptions and individual line exemptions. As a class, the STB has exempted the abandonment of lines over which no local traffic has moved for at least two years without formal complaint about a lack of service. Where a line has generated traffic within the last two years, the railroad may seek to persuade the STB that an exemption is nevertheless appropriate for that individual line.

Class Exemption: Out-of-Service Lines To invoke the class exemption for out-of-service lines, a carrier must file a notice at the STB certifying the following:

- No local traffic has moved on the line for the past two years;
- Any overhead traffic that has moved over the line can be rerouted over other lines; and,
- No formal complaint about the lack of service is pending or has been decided in favor of the shipper.

Unlike the traditional application process, no Notice of Intent to abandon or system diagram map or narrative notice is required. However, 10 days before filing the exemption notice with the STB, the

railroad must notify the affected state of its intention to do so. The railroad must also send an advance environmental notice to the state.

Within 20 days after the exemption notice is filed, the STB will publish it in the Federal Register. Thirty (30) days after the Federal Register notice, the railroad may abandon the line, unless the STB stays the exemption.

According to the STB, stay requests that raise transportation concerns must be filed within 10 days after the exemption notice is published in the Federal Register. Stay requests based on environmental or historic preservation concerns may be filed at any time but must be filed sufficiently in advance of the effective date for the STB to consider and act on the petition before the notice becomes effective. Offers to subsidize or purchase the line must be filed within 30 days after the Federal Register publication.

In addition, parties may ask the STB to reject the notice or reconsider the exemption as it applies to a particular line. Petitions to reject or reconsider may be filed within 20 days after the Federal Register notice. After the exemption takes effect, parties may ask the STB to revoke the exemption. Petitions to revoke may be filed at any time. Petitions to revoke or reconsider should raise environmental concerns, public need for continued service, and other issues, but the STB will disallow the exemption only in extraordinary cases.

If use of the class exemption is disallowed for a line, the railroad is still free to apply for abandonment of the line under the regular application procedures or seek individual exemption.

Individual Exemptions As with the out-of-service lines exemption, no Notice of Intent to abandon or system diagram map or narrative notice is required when a request for an individual exemption is filed. The only notice a railroad must give before filing an individual exemption request is an environmental notice to the designated State agency in each state where abandonment is proposed. The Board must publish notice of the proposed exemption in the Federal Register 20 days after it is filed.

A petition for an exemption generally will include only a brief description of the relevant facts. It need not be, and typically is not, accompanied by detailed financial or other information.

Persons opposing an exemption must file an opposition within 20 days after publication of the Federal Register notice. Offers to purchase or subsidize the line must be filed 120 days after the filing of the petition of exemption or 10 days after the service of the STB's decision granting the exemption, whichever occurs first.

Petitions to stay the effective date of the decision may be filed in either "Petition" (Individual exemption) or "Notice" (class exemption cases). The STB notes that administrative agencies, like the courts, have developed firm criteria for staying administrative action. To justify a stay, a petitioner must strongly demonstrate all the following:

- there is a *strong* likelihood that it will prevail on the merits;
- it will suffer irreparable harm in the absence of a stay;
- other interested parties will not be substantially harmed by the issuance of a stay; and,
- the public interest supports the granting of the stay.

Protests and petitions for reconsideration of individual exemptions should include essentially the same kind of facts that would be included in a regular abandonment case. To the extent possible, protestants also should try to critically evaluate any financial information and traffic projections submitted by the railroad.

As with the class exemption, the carrier is free to file for authority to abandon under the regular application procedures if the STB denies the request for an exemption.

Alternatives to Abandonment

At the first sign a carrier may be contemplating abandonment, users and interested parties should consider alternatives to abandonment. The fact that the existing railroad believes the line is no longer economically viable does not necessarily mean the line cannot continue operations under other arrangements. Congress and the STB have made it easier to preserve rail service by acquiring or subsidizing rail lines.

Forced Sales and Subsidies Congress and the STB have adopted procedures that make it possible to force the sale or subsidy of lines slated for abandonment where the parties cannot agree

on the price or terms of a subsidy. This is to encourage continued service for (1) lines approved for abandonment, and (2) lines potentially subject to abandonment.

Lines Approved for Abandonment The STB states that under the offer of financial assistance (OFA) procedures, any financially responsible party seeking to continue service on a line approved for abandonment (or exempted) may compel the railroad to sell or conduct subsidized operations over the line.

As soon as the Notice of Intent to abandon is filed, parties may request data on subsidy and acquisition costs from applicants in abandonment proceedings. This includes, (1) an estimate of the minimum purchase price or annual subsidy needed to keep the line in operation, (2) reports on the physical condition of the line, and, (3) traffic and other data necessary to determine the amount of annual financial assistance needed to continue service. This information should be requested immediately to begin a thorough feasibility study. Often the state will assist the railroad by providing substantial money for rehabilitation of the line.

In class exemption cases, where the railroad files a Notice of Exemption, Offers of Financial Assistance must be filed within 10 days of the publication of the Notice of Exemption in the Federal Register. In individual exemption cases where the carrier files a Petition for Exemption and in cases where the carrier files a full abandonment application and OFA must be filed within 10 days of the service date of the STB's order granting the exemption or abandonment application or within 120 days after the application or petition for exemption is filed, whichever comes first.

Each OFA is reviewed by the STB to determine whether the offeror is financially responsible and whether the offer itself is reasonable. A copy of the offeror's annual report or other financial statements should be submitted with the offer to show its financial responsibility. The STB assumes a state or local government entity to be financially responsible.

As to the reasonableness of the offer, a subsidy should cover the railroad's avoidable operating losses on the line, plus a reasonable return on the value of the line. An offer to purchase should equal the acquisition cost of the line (the net liquidation or going concern value of the line, whichever is higher). The offeror should explain how its offer was calculated and explain any disparity between its offer and the carrier's estimate. If the STB finds that the offeror is financially responsible and the offer is reasonable, it will postpone the abandonment and give the parties an opportunity to negotiate.

If negotiations are successful and the parties voluntarily enter into a purchase (or subsidy) agreement which will result in continued rail service, the STB is required to approve the transaction and dismiss the abandonment application.

Should the parties fail to agree on the amount or terms of subsidy or purchase, either party may ask the STB (within 30 days after the offer is filed) to establish terms and conditions. The Board must issue a decision setting the terms and conditions, within 30 days after the request is made. The offeror then has 10 days to accept or reject the STB's terms and conditions. If the offeror chooses to accept them, then the railroad by law is forced to comply with them.

When a railroad receives more than one OFA, it can select the offeror with whom it wishes to transact business. Moreover, if the STB establishes terms and conditions at the request of an offeror who subsequently withdraws, then any other qualified offeror may take its place, forcing the railroad to go through with the subsidy or sale under those terms and conditions.

Certain conditions apply to sales according to the STB. A purchaser may not transfer the line or discontinue service over the line for at least two years after consummation. After that time period, the purchaser may transfer the line back to the selling carrier, but it must wait at least five years before it can sell the line to others.

According to the STB, the financial assistance provisions also apply where the STB exempts an abandonment from the formal application process with a few differences in timing.

Purchase of Lines Potentially Subject to Abandonment The STB states that the feeder railroad development program was designed as an alternative to abandonment. Congress envisioned it as a method of allowing shippers, communities, or other interested parties to acquire rail lines *before* an abandonment application is filed. If a rail line has been listed on a carrier's system diagram map as potentially subject to abandonment, a financially responsible person can *compel* the STB to require a railroad to sell it the line. The price for such a sale is either agreed to by the parties or set by the STB.

In short, a proceeding commences upon the filing of a feeder line application with the STB. The applicant must show, among other things, that it can (1) pay the net liquidation value of the line or its going concern value, whichever is higher, and (2) provide adequate service for at least three years. The Board has 15 days to reject the application if it does not contain the prescribed information or

to accept it by filing a notice in the Federal Register no later than 30 days after the application is filed. Within 30 days after the application is accepted, any other interested party may file a competing application to acquire all or any portion of the same line. The owning railroad and other interested parties may submit verified statements containing their evidence and arguments within 60 days after the initial application is accepted. Within 80 days after the initial application is accepted, offerors may file verified replies. The STB must publish its decision in the Federal Register. Within 10 days of the service date of the decision, the offeror must file a notice with the STB and the owning railroad whether accepting or rejecting the STB's terms. If two or more offerors accept the STB's terms, the owning railroad has 15 days from the service date of the STB's decision to select the offeror with whom it wishes to transact business and to notify the STB and offerors. If the parties agree on the price then that price will be the final sale price.

Voluntary Sales and Operations The STB has exempted voluntary purchases of a line proposed for abandonment or any active rail line from regulation. This makes lines that might otherwise be abandoned more attractive to potential buyers. This includes situations where 1) class exemptions and 2) individual exemptions exist.

Class Exemptions According to the STB, voluntary purchases of lines subject to abandonment are almost always consummated under exemptions to the formal acquisition procedures. These exemptions fall under three statutory standards found in 49 U.S.C. 10901, 10902, 11323.

Section 10901 applies only when (1) a non-carrier acquires a rail line, and (2) an existing carrier acquires an inactive line (a line is already lawfully abandoned). To invoke the class exemption, the acquiring party must file a verified notice including general information about the transaction, and a caption summary which will be used to provide public information about the transaction. The exemption procedures differ depending on the carrier's size (in terms of gross revenue). If the transaction will create a Class III (smallest size) railroad, the exemption will be effective seven days after the notice is filed. Most non-carrier acquisitions and operations are now exempt from formal regulation under Section 10901, as are all carrier acquisitions of abandoned lines. When a Class II or Class III carrier acquires a line, it is governed by 49 U.S.C. 10902.

Acquisitions of active rail lines by existing carriers fall under Section 11323. The most important transactions under this Section are (1) acquisition of a line which has already been approved for abandonment and would not constitute a major market extension, (2) acquisition of nonconnecting

lines, and (3) acquisition of trackage rights. To invoke these exemptions, the carrier must file a verified notice, at least one week before the transaction is to be consummated, containing the information listed in the STB's regulations at 49 CFR 1180.4(g)(1). To qualify for an exemption for acquisition or renewal of trackage rights agreements, a caption summary must be filed as well.

Individual Exemptions The STB states that where no class exemption applies, an individual exemption may be sought for almost any small rail acquisition or operation, under the STB's general exemption authority at 49 U.S.C. 10502. Such requests for individual exemptions should be tailored to the participation situation involved.

The statute itself exempts some types of rail operations and transactions from STB regulation. The acquisition or use of spur, industrial, team, switching, or side tracks is exempt under 49 U.S.C. 10906. These statutory exemptions are defined narrowly and the facts of each situation must be carefully examined to determine if the exemption applies.

Alternative Uses for Rail Rights-of-Way

The ICC Termination Act and the National Rails to Trails Act, along with the STB's regulations give interested parties the opportunity to negotiate *voluntary* agreements to use a railroad right-of-way that otherwise would be abandoned for recreational or other public use, such as a commuter rail service or a highway. These methods of preserving a railroad corridor are known as "rail banking" meaning that the right-of-way is preserved for potential future use as a railroad. Many railroads do not own the land on which their tracks lie. Rather, they have easements over the land of adjoining property owners. Unless those easements are "rail-banked" by converting them to a trail or other public use, they are extinguished. Some rights-of-way which were "banked" have been reactivated. The rules for filing a request for a public use condition are slightly different from those which apply to the filing of a trail use request. Proponents often ask for both conditions in the same request in order to take advantage of the benefits of each type of condition.

Interim Trail Use According to the STB, to begin the trail use process, a trail proponent must file a trail use request in the proceeding initiated by the railroad to abandon the line. A trail use request has no effect on the STB's decision whether to give a railroad permission to abandon. It is considered only after the STB has decided to permit the abandonment.

The trail use request must include:

- 1) A map which clearly identifies the rail corridor (including mileposts) which is proposed for trail use;
- 2) A statement of willingness to accept financial responsibility which indicates the proponent's willingness to manage the trail, pay property taxes on the trail and accept responsibility for any liability arising from the use of the rail corridor as a trail;
- 3) An acknowledgment that trail use is subject to the user's continuing to meet the above obligations, and the possibility of future reactivation of rail service on the corridor; and,
- 4) A "Certificate of Service" indicating that a copy of the trail use request has been served on the carrier seeking abandonment at its address of record.

The trail use condition will only be imposed if the railroad consents. If the railroad does agree, then a condition is imposed which prohibits the rail carrier from otherwise disposing of the rail corridor for 180 days while the parties negotiate an agreement. The Board has granted an extension of that 180 day period in cases where the parties jointly request it indicating that they are close to an agreement.

Timing is very important with the trail use condition request. In an abandonment application, trail use requests must be filed within 45 days of the filing of the application i.e., 25 days after the publication of the application in the Federal Registry. The rail carrier seeking abandonment authority then has 15 days to notify the STB whether and with whom (if more than one proponent has submitted a request) it intends to negotiate a trail use agreement. In class exemption cases, a trail use request must be filed with 10 days of the appearance of the notice in the Federal Registry. In an individual exemption case (petition), a trail use request must be filed within 20 days of the appearance of the Federal Registry notice. In both types of exemption cases the carrier has 10 days after the trail use request is received to notify the STB whether and with whom it intends to negotiate a trail use agreement.

Railroad rights-of-way that have been approved for abandonment and railbanked to preserve them for future use are specifically subject to possible future reconstruction and reactivation of rail service. The STB may vacate, as in past cases, an existing Notice of Interim Trail Use (NITU) if a rail carrier seeks to reactivate service.

Public Use Condition The Board states under the terms of the ICC Termination Act, when it approves or exempts an abandonment it must determine whether the rail line is suitable for alternative public use, such as highways, other forms of mass transit, conservation, energy production or transmission, or recreation. If it is, the STB may prohibit the railroad from selling or otherwise disposing of the rail corridor for up to 180 days after the effective date of the decision or notice authorizing abandonment. During the 180 day period, interested persons may negotiate with the railroad to acquire the property for public use. The railroad's consent is unnecessary for the imposition of this negotiating period. If the parties fail to reach an agreement within the 180 day period, the STB must allow the railroad to fully abandon the line and dispose of its property. It cannot *require* the railroad to sell its property for public use.

The Board will only impose a public use condition when it has received a request to do so pursuant to 49 CFR 1152.28. The request must:

- 1) state the condition sought;
- 2) explain the public importance of the condition;
- 3) state the period of time for the condition (which cannot exceed 180 days) and provide justification for the requested period of time; and,
- 4) provide a "Certificate of Service" indicating that a copy of the public use request has been served on the carrier seeking abandonment at its address of record.

Timing is important. In an application for abandonment, the public use proponent must file the request within 45 days of the filing application, i.e., 25 days after the notice of the application appears in the Federal Registry. In exemption cases, whether the exemption is a class exemption (notice) or an individually sought exemption (petition), the public use condition request must be filed within 20 days after the Federal Registry publication appears.

In a recent Texas case involving the city of Denton, the issue of when full abandonment occurs received considerable attention in the STB's final decision in the case. In this instance, the city requested an extension of time beyond the 180-day NITU period. The railroad involved agreed that there should be an extension in order for negotiations to continue. The STB ruled that since the railroad was not "fully abandoned" and both parties wished to continue negotiations, the extension of time, beyond the 180 days, was granted. A dissenting commissioner argued that the jurisdiction

of the line still remained with the STB since the railroad had not fully abandoned the line. Further, the commissioner argued that under the Trails Act a railroad is permitted to:

“Fully abandon the line if no agreement is reached 180 days after the NITU is issued. Implicit in this language,” continues the commissioner, “is the notion that the original 180-day negotiating period provided for in the NITU has ended; the abandonment certificate has become fully effective; and the railroad is free to fully abandon at any time.”

In concluding the dissenting arguments, the commissioner raised important questions that must be taken into consideration in efforts to preserve either rail service or the right-of-way for future rail use purposes. The commissioner suggests that parties may come before the commission seeking an extension of the 180-day period for one of three reasons. First, they may wish to prevent the railroad from consummating the abandonment. However, after 180 days, the railroad is free to fully abandon the line; it is unclear whether extending the negotiating period prevents a railroad from doing so at any time before the expiration of the extension period. Second, parties may wish to prevent the property from reverting to any reversionary owners. But how is a reversionary owner to know of the abandonment and the intentions of the negotiating parties? The commissioner points out that under current STB procedures neither the STB decisions nor the negotiating parties pleading before the commission are required to be made available to the reversionary owners. Third and finally, does the extension of the negotiating period mean that the parties are now given authority to conclude the negotiations and reach an agreement?

The Texas Interagency Abandoned Rail Corridor Committee has adopted a policy which requires TxDOT and TPWD to file with the STB a request for the issuance of an NITU on every abandonment application involving the state of Texas. Further, the committee has adopted a procedure by which it will determine whether or not to negotiate with the owning railroad for a “public use” agreement for the rail corridor. During the 180-day NITU period, the committee can formally withdraw from the proceedings. The question that remains is that of continued state interest in the preservation of rail service. For example, who makes the decision as to when the state’s interest in the preservation of rail service in the corridor ceases and during what period of time is this decision process operable? Is it valid only through the 180-day period or can the state request an extension of the 180-day period to continue negotiations until a final agreement is reached between all parties?

Right-of-Way Suitability Analysis The study period provided by the STB allows interested parties to evaluate potential uses of the abandoned right-of-way. This suitability analysis includes the following steps: (1) list possible uses, (2) inventory suitability characteristics, and (3) suitability assessment.

List possible uses The first step in suitability analysis is to identify the uses to which an abandoned railroad right-of-way might be put. These uses include recreation, transportation, conservation/open space, and utility. Table 19 shows a list of possible uses.

Table 19. Possible Uses for Abandoned Rights-of-Way

Possible Uses for Abandoned Rights-of-Way			
Recreation	Transportation	Conservation/Open Space	Utility Uses
• Special use trails • Hiking/jogging trails • Backpacking trails • Bicycle trails • Bikeway (transportation) • Equestrian trails • Excursion trains	• Freeways • Arterial streets • Scenic parkways • Collectors • Local streets/roads • Scenic roads • Busways/truckways • Fixed rail • Bikeways (transportation)		• Electric power transmission lines • Electric power distribution lines • Above ground communication lines • Buried communication lines • Oil and gas pipelines • Water and sewer pipelines

Inventory suitability characteristics The second step is to obtain data on those characteristics of each line that make it suitable for particular uses. Among the important characteristics which determine whether a particular right-of-way will be suitable for a given new use includes length, width, topography, adjoining land uses, and accessibility to the public. These plus additional characteristics are included in Table 20.

Table 20. Suitability Characteristics

Suitability Characteristics		
	Category	Sub-categories/Measures
Development/Maintenance Cost Indicators	1) Title	b. Fee simple c. Easement or other
	1) Bridges	a. Condition b. Number c. Location
	1) Presence of Track	a. Y/N
	1) Presence of Flooding	a. Y/N
Physical Discriminants	1) Length	a. Miles
	1) Width	a. Feet
	1) Land Use	a. Wetlands b. Prairies/grassland c. Sensitive ecosystem d. Forest e. Recreation land f. Stable ecosystem g. Agriculture h. Rangeland i. Rural industrial parks j. Mining k. Residential l. Residential/light commercial m. Heavy commercial n. Industrial o. Dense residential
	1) Topography	a. Plains b. Hills c. Mountains
Demand Indicators	1) Interest Expressed	a. Y/N
	1) Points of Interest	a. Natural b. Historic c. Cultural d. Recreational
	1) Accessibility	a. Distance to highway

Suitability assessment The suitability assessment is an evaluation in regard to multicriteria such as financial viability, environment impacts, health and safety, and socioeconomic concerns. The multicriteria analytical framework is a methodological structure that assures that the “optimum” solution is arrived.

TransDec, described earlier in the report, was designed to provide an easy to use tool for performing multicriteria investment analysis. It guides the transportation practitioner through the multicriteria analytical framework along with systemizing the mechanics of performing the analysis. The framework provided by TransDec will allow an “optimum” solution for the use of a railroad right-of-way by selecting measures appropriate to the problem and evaluating the results based on the weighted emphasis placed on project objectives.

Texas Railroad Abandonment History

The 1978 Texas Rail Plan identified 33 line segments which were; 1) anticipated to be the subject of an abandonment application within three years; 2) lines being studied for potential abandonment; 3) lines where an abandonment petition was pending; and 4) lines abandoned between February 1976 and July 1978. In total these line segments accounted for more than 1,000 miles (1,600 km) of railroad service to Texas. Table 21 provides a summary of the rail miles approved for abandonment during the period from 1981 to May 1999. Also listed in the table are line segments identified for abandonment as of May 1999. Appendix D is a comprehensive listing of the abandonments by railroad and line segment. During the period (1981-mid-1999), approximately 2,720.90 miles (4,380 km) of track were involved in this loss of rail service. While most of the abandonments involved Class I railroads others were by shortlines that had purchased the line in an attempt to continue service over the line but failed in the effort.

It should be noted that Table 21 does not necessarily reflect all of the abandonment petitions which may have been filed during the period. Nevertheless, the data indicate that the rail system of the state has and continues to undergo significant change in both rail miles operated and the types of carriers providing service.

Figure 5 shows the current rail system of Texas and the lines which are no longer in service.

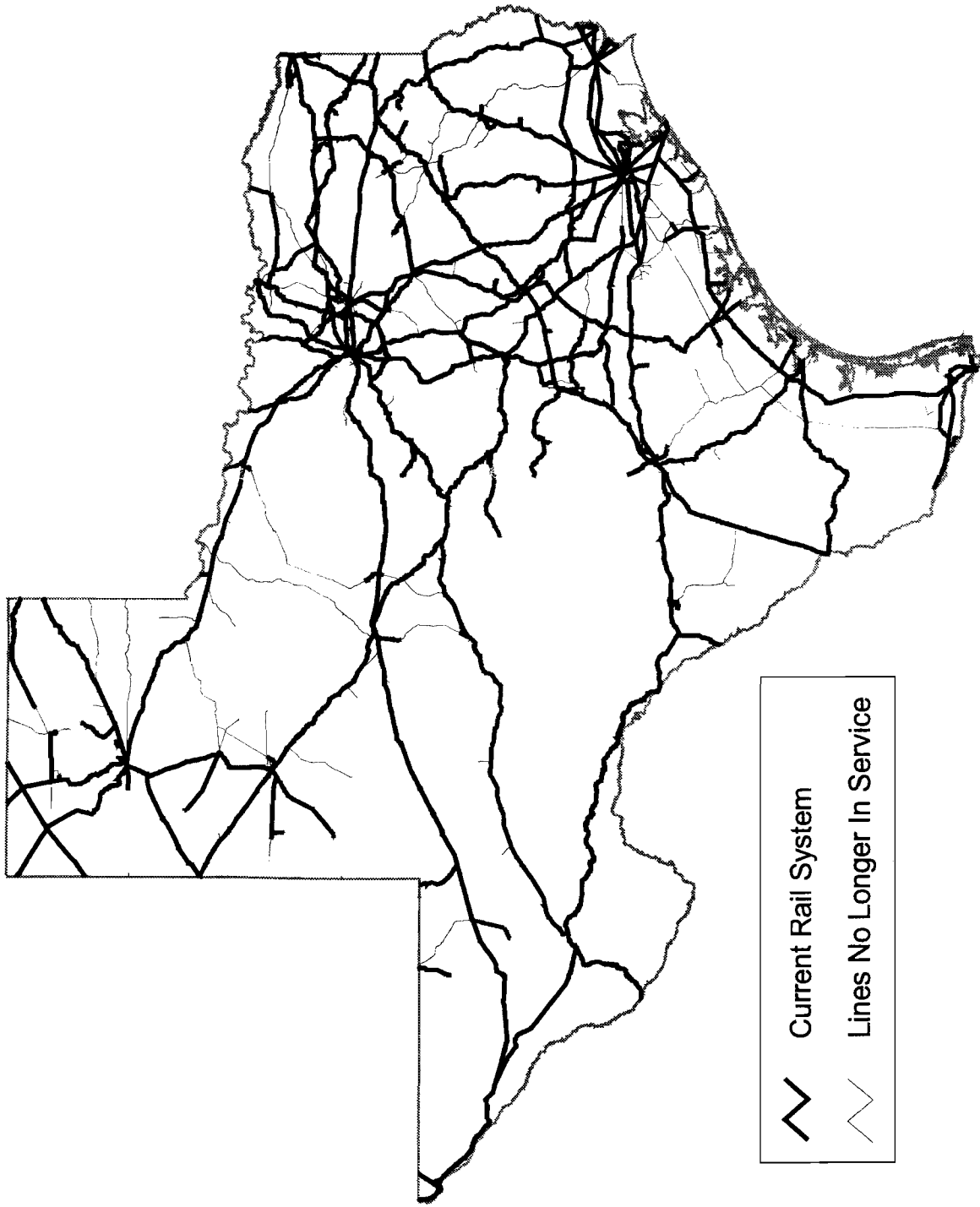


Figure 5. Texas Abandoned Rail Lines

Table 21. Miles of Rail Line Approved for Abandonment 1981-1993

Year	Mile of Track
1981	274.57
1982	264.50
1983	125.73
1984	42.60
1985	39.62
1986	40.27
1987	126.11
1988	142.47
1989	27.60
1990	143.60
1991	148.18
1992	120.10
1993	209.68
1994	172.39
1995	338.18
1996	101.07
1997	71.75
1998	327.15
1999 (May)	5.33
TOTAL	2,720.90
Pending Abandonment Cases	27.64

Texas Railroad Planning Involvement

On August 26, 1991, the governor of Texas signed into law House Bill 9 which created the TxDOT. Among other things this legislation directed TxDOT to develop a statewide transportation plan that will include all modes of transportation. Specifically, the legislation directs that “railroads and high-speed railroads” as a transportation mode are to be included in the planning process. In addition, during the planning and programming process, TxDOT is required to “seek opinions and assistance from other state agencies and political subdivisions of the state with responsibilities for the modes of transportation listed in the legislation.” The law also authorizes TxDOT to enter into a memorandum of understanding with other state agencies or political subdivisions regarding the planning of transportation services.

The legislation creating TxDOT requires the department to be organized into divisions reflecting different functions and duties assigned to the department. In addition, the law states that:

“It is the specific intent of the legislature that separate divisions be established to accomplish the department’s duties in the following areas:

- 1) aviation;
- 2) highways and roads;
- 3) public transportation;
- 4) motor vehicle titles and registrations; and ,
- 5) other divisions the board deems necessary to accomplish the duties assigned to the department.”

It is to be noted that railroads and high-speed railroads are not specifically mentioned in this section of the legislation. Whether or not the rail mode could be included under item (5), above, is a matter of interpretation.

Role of the Metropolitan Planning Organizations (MPOs)

There are 25 MPOs in Texas, each having an urban population in excess of 50,000. Officials of local governments and representatives of the transportation industry serving the area, provide assistance in the preparation of regional transportation plans and programs. ISTEA has vested more responsibility with MPOs by emphasizing the need to preserve existing systems and to improve operational efficiency of the existing transportation system.

First, under ISTEA and continuing under TEA-21, MPOs have more responsibility for determining how some federal funds are allocated to transportation projects. In fact, MPOs can now cause some projects to be implemented. ISTEA made more transportation projects eligible for funding and increased the flexibility for using a variety of funds. As a result of these added responsibilities, MPOs became more active in the planning process. This has required changes in organization, staffing, and training of MPO staff. MPOs now work toward the implementation of statewide intermodal planning.

Rural Rail Transportation Districts

In 1981, the 67th Legislature of the state of Texas, under the Rural Rail District Act (RRD Act), authorized the establishment of “rural rail transportation districts.” The RRD Act provides that two or more Texas counties may jointly create and operate a rural rail transportation district. In 1997,

the 75th Legislature reduced the number to one or more counties. Any Texas county is eligible to participate in the district if it contains a rail line that is to be, or has been, abandoned. The commissioners courts of one or more eligible counties that create a district or provide for the re-creation of a district by the addition of counties must declare the boundaries of the district, designate a district name, designate the board members (not less than four), and set forth procedures for board appointment. To be eligible for board membership, a person must be a resident of the county governed by the commissioners court that makes the appointment. The appointment is for a two-year term. The board will have three officers; a president, vice-president, and secretary. It will meet at least once a month to conduct district business.

An amendment to the RRD Act, relating to the creation, re-creation, administration, powers and duties, and dissolution of districts (TX73RSB 968), was signed into law by Governor Ann Richards on May 29, 1993. The effective date of the amended law is August 30, 1993. Section 1 of the RRD Act sets forth the legislative findings that led to the enactment of this unique method for the preservation of rural rail service in Texas. The legislative findings include the following:

- 1) The state contains many rural areas that are heavily dependent on agriculture for economic survival;
- 2) Transportation of agricultural and industrial products is essential to the continued economic vitality of rural areas;
- 3) The rail transportation systems in some rural areas are threatened by railroad bankruptcies and abandonment proceedings that would cause the cessation of rail services to the areas;
- 4) It is in the interest of all citizens of the state that existing rail systems be maintained for the most efficient and economical movement of essential agricultural products from the areas of production to the local, national, and export markets;
- *5) Rural rail transportation districts are appropriate political subdivisions to provide for the continued operation of railroads, which are declared by Article X, Section 2, of the Texas Constitution to be public highways; the creation, re-creation, financing, maintenance, and operation of rural rail transportation districts and facilities acquired by the districts under this RRD Act will help develop, maintain, and diversify the economy of the state, eliminate unemployment or underemployment, foster the growth of enterprises based on agriculture, and serve to develop and expand transportation and commerce within the state under the authority granted by Article III, Section 52-a, of the Texas Constitution; and,

- *6) Financing by rural rail transportation districts provided by the RRD Act is a lawful and valid public purpose.

*Added by 1993 amendment and numbered as shown.

Powers and Duties of the District The district is a public body and a political subdivision of the state. Under Texas law the district is a “local governmental unit” having all the powers necessary to carry out the RRD Act establishing districts. The district has the power of perpetual succession. It may lease, purchase, and receive real and personal property for the purpose of the operating a railroad. The district may plan, acquire, construct, own, operate, and maintain a rail system inside or outside the participating counties. It may use streets, alleys, roads, highways, and other public ways of any municipality, county, or political subdivision to construct or relocate roads, streets, railroads, electrical lines, communication lines, pipelines, and other facilities. It has the right and power of eminent domain. The district may enter into agreement with other public or private organizations and acquire by purchase any land, property rights, right-of-way, franchises, easements, and other properties that are necessary for the construction and operation of a railroad facility. A district may enter into a joint ownership agreement with any person. Rents, or other forms of compensation may be established by the district for the use of the rail facilities owned by the district.

The district may sell, lease, convey, or dispose of its rights, interests, and properties not needed for railroad operating purposes. It has the power to adopt rules and regulations regarding the use of rail facilities. The district may lease or contract part or all of the railroad system to private enterprise. It may contract with other political subdivisions to provide rail transportation service to an area outside its boundaries. Federal and state grants as well as private bonds and notes may be accepted by the district. It may issue revenue bonds and notes for operation and maintenance of the rail system. To secure payment of bonds or notes the district may pledge revenues, mortgage properties, and prescribe provisions and terms of bonds and notes. These bonds and notes are legal and authorized investments of the district. And, finally the district is exempt from both state and local taxes.

Alternate Financing The 1993 amendments to the Rural Rail District Act authorizes districts to use the provisions of Chapter 271, Local Government Code, to finance rail facilities. However, the district is not authorized to levy or collect ad valorem taxes. According to the amended RRD Act, the district may “issue nonnegotiable purchase money notes, payable in installments and secured by the property being acquired or constructed, to acquire or construct rail

facilities. A district may also secure the obligation of the notes by a pledge or undertaking to issue bonds or bond anticipation notes.”

Reporting The legislation places no reporting requirements upon the district to file with state agencies other than a requirement that each district created or recreated will file with the Railroad Commission of Texas (RRCT) a certified copy of the orders creating or re-creating the district. The 75th Legislature added a requirement that each newly-formed district notify the Texas Transportation Institute of its formation.

Railroad Commission of Texas

In late 1970, the governor of Texas designated the Railroad Commission of Texas (RRCT) as the agency responsible for The Texas State Rail Plan and the continuing rail planning process. According to RRCT staff, the current philosophy, goals and objectives of the RRCT’s acceptance of the responsibility for state rail planning are stated in Chapter of the RRCT’s Texas Railroads 1984-1985. The statement is as follows:

“The state of Texas realizes that its rail system is of vital importance to the economic and social life of its citizens. Therefore, the economic strength, social responsiveness, and operating efficiency of the Texas rail system must be enhanced. The operational efficiencies and productivity of the system can be enhanced in a variety of measures to upgrade the physical plant, conserve energy, improve service, and ensure the safe movement of goods.”

In designating the RRCT as the agency responsible for the Texas State Rail Plan and the continuing rail planning process, the state recognized the necessity for developing in-house planning staff capabilities in an organization whose responsibilities had heretofore been primarily regulatory. The addition of a broad rail planning capability to the commission has been viewed as a valuable asset in assisting the commission in arriving at various regulatory judgments within the context of its long-range system development goals.

Two of the goals relating directly to rail planning are:

- (1) to promote the development of rail transportation within the context of a balanced and competitive transportation system for all modes of transportation within the state; and
- (2) to promote improved railroad safety.

Two policies intended to achieve the stated goals are:

- (1) to evaluate all lines that are now or might be proposed by the railroads for abandonment or extension in order to determine the probable social, economic, energy, and environmental impact on affected communities and regions if abandonment or extension is approved; and
- (2) to develop the facts and professional skills necessary to determine the commission's position with respect to each potential abandonment or extension of rail line and what action should be taken, if any.

RRCT Activities The initial Texas State Rail Plan was published in March 1979. The major contribution of that plan was the highly detailed line segment analysis for 21 branch lines that had been officially designated by the owning railroads as probable abandonment candidates. In a recent interview with RRCT planning staff, it was found that "state rail planning in Texas continues to be guided by the philosophy, goals and objectives outlined in the original plan. However, recognition of changing federal legislation and changing circumstances have since led to an emphasis on different priorities." For example, Local Rail Service Assistance Act of 1978 (LRSA), and later the Local Rail Freight Assistance Act (LRFA), contributed significantly to the commission's decision to focus on providing financial assistance to selected rail lines as a means of preventing the abandonment of the line. This federal legislation established a partnership between the FRA and the RRCT by providing an alternative means for ensuring the continuation of rail service through the combined efforts of both public and private resources.

The RRCT has applied this one-time financial assistance to selected rail lines in Texas through a well-defined program of rehabilitation. Rehabilitation is defined as:

"Replacing or upgrading the track and other facilities needed to provide service on a line, to the extent necessary to permit adequate and efficient rail service."

According to RRCT philosophy, financial assistance to the operating carrier, in the form of matching rehabilitation grants, provides for the removal of a critical constraint impeding the continued rail operation and assists the carrier in “turning the operation around.” In short, the commission believes that “rehabilitation funding is a means — physical restoration — to an end — viability. And, by itself, rehabilitation will not turn a sure loser line into a winner; but, in conjunction with good management, sufficient traffic, etc., it can be the key to success.”

The RRCT staff from 1980 to 1999 was active in administering more than \$13 million in rail line rehabilitation funds. A total of over 200 miles (320 km) of essential railroad in Texas would now be out of operation were it not for this program. The geographic distribution of the rehabilitation projects suggests that the RRCT is engaged in a statewide effort to preserve rail service to all Texas citizens. However, with no allocation of funds to the LRFA since 1994, the RRCT will use the remaining federally available funds toward a rehabilitation project set to be completed in July 1999.

In addition to the rail planning requirements determined by the State of Texas, the 68th Texas Legislature (September of 1983) authorized the RRCT to implement a railroad safety program in conjunction with the Federal Railroad Administration (FRA). The commission now has one of the largest state rail safety programs in the nation concentrating on state and federal safety standards, hazardous materials handling, and highway/railroad grade crossing safety regulation and education.

The commission has adopted federal standards concerned with railroad track, equipment, operating practices, signals and train control, and hazardous materials. Inspectors are assigned to headquarters across the state in areas of dense railroad activity. Investigations of accidents and complaints occur on a statewide basis. Railroad safety inspectors are to ascertain compliance with state and federal laws, regulations, rules and standards, and to conduct and report on accident and complaint investigations.

Defective conditions found by inspectors are reported to the carrier and the pertinent safety regulations are explained. Once the defect has been recorded, the carrier is required to correct the problem. Failure to correct defects within prescribed time limits can result in FRA allocated civil penalties.

Although the enforcement of state and federal safety standards is the rail safety program’s primary concern, highway/railroad grade crossing safety regulation and education has become increasingly important. The commission participates in the Texas Operation Lifesaver program. The mission

of Operation Lifesaver is to prevent and reduce crashes and fatalities at Texas highway-rail grade crossings. Education, Engineering, and Enforcement, (the three E's) of traffic safety, form the basis of the Operation Lifesaver program. The program is presented to schools, driver education classes, community groups, industry audiences, school bus drivers, and trucking industry personnel. Grade crossing collision data is analyzed to help identify geographic locations where additional public education may be needed from Texas Operation Lifesaver.

The highway/railroad safety program also targets railroad rights-of-way. The program prescribes that railroad rights-of-way be cleared of vegetation and unnecessary signs for a distance of 250 feet from the centerline of the crossing. The rule applies only to grade crossings that are not equipped with active warning devices and is meant to eliminate obstructions to a motorist's view of approaching trains.

Railroads in Texas are required by law (Title 16, Texas Administrative Codes, Section 5.802) to report every grade crossing collision to the RRCT within 30 days of the end of the month in which the incident occurred. This law also requires the immediate reporting to the commission of any incident or occurrence involving any railroad on-track equipment which results in the death of any railroad passenger or railroad employee; or any two or more persons; or involves a passenger train; or a commodity classified under 49 Code of Federal Regulations - Part 172, as a hazardous material (RRCT Homepage).

Each year, the commission collects hazardous materials routing information from railroads. The report places site-specific rail hazardous materials transportation data in the hands of local emergency responders. The information assists local jurisdictions to focus training and preparedness exercises on incidents involving the hazardous commodities that predominantly traverse their jurisdiction. Procedures to contact railroad dispatchers and operating officials are also in the report to facilitate industry and local response coordination.

Texas Department of Transportation

Requirements of both state and federal legislation have recently placed statewide transportation planning with the TxDOT. With the assistance of an External Advisory Committee and a working relationship with several state agencies, TxDOT has prepared the state's first multimodal transportation plan. According to policies established by TxDOT, the agency supports continued rail service to rural areas. This policy also permits TxDOT to acquire rail right-of-way for public

transportation purposes, e.g., certain segments of the South Orient Railroad line. First, TxDOT will provide technical assistance to communities, business and other organizations seeking help in evaluating the impact of rail line abandonment. TxDOT will cooperate with other state agencies in providing information regarding highway impact and energy use changes resulting from abandonment of rail service. TxDOT will assist in the evaluation of public use requirements for rail facilities over which service has been abandoned. Second, TxDOT may also provide financial assistance in the preservation of the lines operation. Under certain conditions, TxDOT may acquire rail right-of-way for “highway purposes.” The right-of-way can then be licensed to a public agency, e.g., a rural rail transportation district, for use as a railroad facility. Through both federal and state grade crossing safety improvement programs, TxDOT can provide financial assistance for upgrading both warning devices installed at roadway crossings and the surface of the crossing.

Texas Department of Agriculture

Although it does not have a specific program for providing technical and financial assistance to communities and agricultural business seeking to preserve rail service, the Texas Department of Agriculture (TDA) does have a policy to “support local communities in their efforts to enhance their rural economics.” Technical assistance is available to assist rural communities in promoting products, improving production and improving the economy. Financial assistance is available to stimulate agribusiness including the construction and expansion of agricultural product processing facilities. The TDA may intervene in abandonment proceedings and may also conduct impact studies related to rail line abandonment, e.g., the Orient Line study funded by TDA. The TDA subscribes to the principal that “the effective use of abandoned rail corridor within a community should be analyzed by that community to see what uses of the right-of-way will best enhance its economy.”

Texas Department of Economic Development

Similar to the TDA the Texas Department of Economic Development has no specific program for rail line preservation. However, the Commerce Department has programs that provide both technical and financial assistance to local communities and businesses desiring to locate or expand business activity in a specific area. Technical assistance is available from the commerce department for use in plant location decisions, marketing and distribution studies, employment analysis and industrial development opportunities. Financial assistance is available for construction or expansion of railroad facilities to serve a plant site or industrial park. Through its international division, the

commerce department can be a major contributor to efforts of shortline railroads or communities seeking access to U.S./Mexico rail gateways.

Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) has a major responsibility for ensuring that rail rights-of-way are preserved for future use. Although this responsibility begins with the decision not to preserve rail service on the line, without a procedure to determine the need for preserving the right-of-way, the corridor would be eliminated from consideration in meeting the state's future transportation requirements. As owner, manager, and/or operator of a public use corridor, the TPWD should play an important role in statewide transportation planning and policy decisions.

Other Involved Agencies

There are other state agencies that should have some role in the preservation of rail service. These include the Texas Historical Commission, the Public Utility Commission of Texas, the General Land Office and the Office of the Attorney General.

URBAN RAIL RATIONALIZATION

Historically many cities developed as rail centers with freight service, passenger service, and yard operations near or within their core areas. This structure was necessary in the early stages of urban growth when industrial facilities and business activities were concentrated near the urban core and when other transportation modes (primarily highways) were not highly developed.

Today the situation has greatly changed. Industries, originally dependent on rail service, have moved to suburban locations or have shifted to other modes. Rail operations have been reduced or eliminated. An extensive rail system is no longer justified within most urban areas. Rather than being an asset, under-used rail facilities are often viewed as a liability, inhibiting economic growth or redevelopment. Outdated urban rail facilities also slow through train movements and reduce operating efficiency.

The analysis of urban rail facilities and the planning of alternatives to the existing land use and transportation structure is known as "urban rail rationalization." Typical problems can be categorized as:

- *Highway-Related:* Traffic delays due to train blockage at railroad grade crossings, accidents involving trains and motor vehicles or pedestrians.
- *Rail-Related:* Delays to local and through train movements caused by speed restrictions or limits on time that grade crossings can be blocked, unused or under-used railroad facilities and land that could be redeveloped for more profitable use, inefficient operations due to obsolete or duplicate yard facilities.
- *Community-Related:* Presence of a physical barrier that divides a community, interferes with business activities and weakens neighborhood cohesiveness; intrusion of rail noise, vibration, air pollution, and visual blight into sensitive residential areas.

Probably no urban area will experience all of these problems; some occur frequently and others less often. Studies for any area must be designed to meet the specific local situation.

There are no specific legislative requirements or programs for planning urban rail rationalization projects. States or local jurisdictions may initiate their own programs. Past rail rationalization studies have been financed in part by the FRA, and by the Department of Housing and Urban Development. In each case, the planning effort was considered to be a special study. There are no specifically designated funding sources for planning or implementing urban rail rationalization projects, with the exception of FHWA grade crossing improvement funds. Nevertheless, the problems are real and states may find it advantageous to support affected localities in their attempts to develop solutions (Rail Planning Manual, pp. 4-79).

Urban Rail Rationalization Planning Process

The urban rail rationalization planning process can be divided into four tasks: (1) problem identification, (2) option identification and analysis, (3) alternative selection, and (4) implementation of selected alternatives. Within each major task, a number of sub-tasks must be performed.

The urban rail rationalization planning process will be discussed in more detail in Chapter 3. In that chapter, the application of the planning process will be demonstrated in a case study involving railroad operations in the Bryan-College Station, Texas, area, including the campus of Texas A&M University.

INTERMODAL OPERATIONS STUDY PROCESS

Intermodalism describes an approach to planning, building, and operating a transportation system that emphasizes the optimal utilization of transportation resources and connections between modes. Some of the many benefits of intermodalism are:

- Lowering transportation costs by allowing each mode to be used for the portion of the trip for which it is best suited,
- Reducing the burden on overstressed infrastructure,
- Generating higher returns from public and private infrastructure investments, and
- Reducing energy consumption and contributing to improved air quality and environmental conditions.

Intermodal transport of freight involves the movement of standard highway trailers (trailers-on-flatcar or TOFC) or containers (containers-on-framecar or COFC) by some combination of rail, truck, or waterborne transport. Intermodal freight transportation accelerated in the mid-1980s, when ocean carriers and railroads cooperatively developed doublestack rail container service. Doublestack rail container service consists of stacking two shipping containers on specialized railcars for greater efficiency. Since this system was introduced to the railroads, growth in intermodal transportation of containerized freight has been explosive, attracting a significant share of the extremely competitive freight transport market.

Constraints exist in what a state can do to plan for, or help in facilitating intermodal container services. Implementation of intermodal services are usually initiated by railroads or individual motor carriers, motivated by potential economic gain. The service is the responsibility of the private-sector. Additionally, intermodal services do not lend themselves well to state-level concern, due to the fact that the distances involved in profitable intermodal service usually preclude strictly intra-state operations.

Traditionally, states have taken a non-intervention strategy toward intermodal operations. This position is changing as states begin to recognize that intermodal transport can be cheaper, faster, more energy efficient, and less offensive to the environment than truck or conventional rail service. States, acting separately or together, are finding that intermodal service offers potential cost savings

and efficiencies to their shippers. This discussion will outline the planning process techniques by which potential market estimates can be made for an intermodal service study.

Process Framework for Intermodal Planning

The process, or sequence of tasks, in an intermodal study can be found in Figure 6. The 17 tasks can be broadly grouped into three major activities: (1) developing base year and forecast year freight flow data, (2) determining service and cost parameters associated with each mode, and (3) estimating the amounts of traffic which can be diverted from other modes to the intermodal service. This process framework for intermodal service planning is applicable to corridor studies, network studies and, to a lesser extent, single or multiple branch lines.

Freight Flow Data A necessary input to a study of intermodal service operations is a detailed determination of existing freight flow movements. This flow movement data should contain information on quantity (tons, carloads), commodity (STCC), and the origin and destination of the movements. A primary source of this data can be found in the Surface Transportation Board's carload waybill sample.

Containerization Factors Not all freight is physically suitable for containerization (e.g., bulk commodities). Quantities of commodities which are suitable can be measured in container equivalents using appropriate conversion factors such as tons per container or containers per carload. Containerization factors need to be developed for all STCC commodities represented in the freight flow data.

Suitability Constraints There are certain factors which can remove a particular freight movement from intermodal consideration. An example of such a factor would be an origin-destination pair which is less than 200 miles (320 km) apart. It is doubtful that a shipping distance this short could be economically served by intermodal transportation. Another example would be a volume of commodity which falls below some minimum economic threshold for containerized freight.

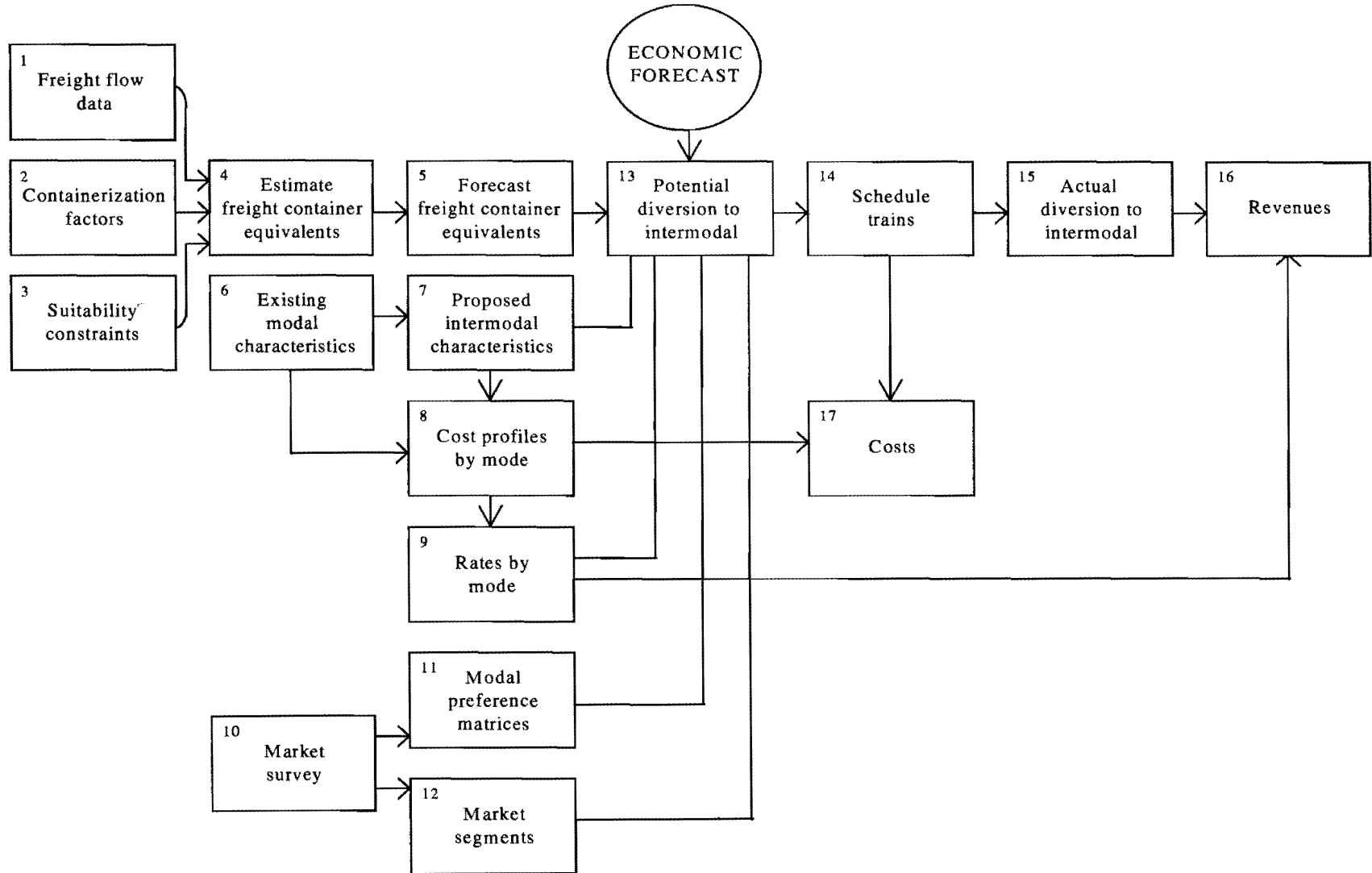


Figure 6. Intermodal Service Studies - Activity Flow

Estimate Base Year Freight Container Equivalents After applying the suitability constraints the remaining freight traffic (already categorized into 20 foot equivalent units, or TEUs) is potentially available for intermodal transport. Potential TEUs should be ordered by source (i.e., common carrier truck, private truck, rail carload, TOFC) to facilitate the diversion analysis that will occur later in the study.

Forecast Freight Container Equivalents An estimation of the potential of intermodal service should be based on estimated traffic for one or two forecast years. Container equivalence forecasts can be determined in conjunction with other rail studies, and may be based on a shipper survey.

Determine Existing Modal Characteristics An intermodal operations study is dependent on an understanding of the modes which compete with it. This includes a knowledge of such characteristics as dock-to-dock shipping times, rates, frequency of service, equipment availability, commercial arrangements, and pickup and delivery times for each origin-destination pair involved. All modal characteristics that impact cost profiles must be determined.

Proposed Intermodal Service Characteristics A set of service parameters for intermodal operations will need to be developed in relation to the service offered by competing modes. Alternative routings, speeds, terminal systems, and carriers should be examined.

Develop Cost Profiles Realistic cost factors must be developed for all modes of transportation. Cost factor categories include line haul labor, line haul operations, vehicle ownership, overhead (such as insurance, damage, and general administration), and cost associated with rights-of-way. Many of the cost categories can be estimated using actual unit costs applied to projected work units. Variable costs (costs that vary with traffic) should be distinguished from fixed costs. Some of the input parameters needed for this analysis are: origin-destination, mileage, year, average line haul speeds, service variations, and vehicle sizes.

Rates by Mode A rate per TEU can be constructed by applying an appropriate rate of return to a previously developed cost profile. This rate schedule by mode can be adjusted as the intermodal study progresses.

Market Survey The market survey (a survey of the region's largest shippers) is used to establish a time distribution of shipments in the region. This information will allow for the estimation of train scheduling and dock-to-dock transit times.

Modal Preference Matrices The information provided in the shipper survey may also be used to determine how shippers choose a mode of transport or choose to shift from carload shipments to containerized shipments. Given various cost reductions and improved transit times associated with improved intermodal service, shippers can provide information that will allow the construction of modal-preference matrices that define the breakpoints associated with diversion to other modes of transport. Table 22 shows one such matrix for diversion percent to intermodal service.

Table 22. Diversion to Improved Intermodal Service (%)

From Rail Carload Transit Time						
.....slower.....			faster.....			
Transportation Costs	+ 2 days	+ 1 days	BASE	- 1 days	- 2 days	- 3 days
Plus 10%						20%
Plus 5%				20%	30%	40%
Present			40%	50%	60%	70%
Negative 5%	30%	50%	55%	60%	70%	80%
Negative 10%	50%	60%	65%	70%	80%	90%

* Source: Rail Planning Manual

Market Segments An intermodal operation must be designed to optimize service to specific market segments. A plan for intermodal service must take into account the competitive factors in freight transport in order to design a service with potential market penetration. One area of market segmentation involves the service requirements of shippers. Next day delivery requirements and time of day constraints are factors that must be attuned to for optimal intermodal service. Shipping distances are also of importance. For transit distances greater than 500 miles (800 km), intermodal service can be highly competitive with truck transport. Once market segments have been determined, separate mode diversion estimates can be made for each.

Potential Diversion to Intermodal Based on the modal preference matrices developed from the shipper survey and the rates and transit times to the various market segments, it will be possible

to estimate the number of TEUs that will divert to intermodal service. This traffic is then assigned to trains.

Schedule Trains Train schedules which provide optimal service need to be developed for the diverted traffic while at the same time be economically feasible. Development of the train schedule often brings to light the fact that economical service to some market segments is not possible. In this case, the diverted traffic estimates will have to be adjusted.

Actual Diversion to Intermodal The finalized train schedule represents the actual traffic that is diverted to intermodal service. The actual diverted traffic is often less than original market estimates.

Revenues Yearly revenue estimates can be computed from the number of units transported and the rate schedules applied to the intermodal service. The number of units transported is derived from the train schedule.

Costs From the mode cost profiles and the projected level of service, the cost of intermodal operations can be derived. Profit or loss can be estimated by comparing costs with revenues.

Summary

The private-sector has spearheaded the move toward intermodal freight transportation, making the U.S. the world's leader in intermodal technology and innovation. Intermodal transportation, and freight transportation in general, has often been ignored by local jurisdictions and MPOs due to the narrow focus of their political mandates. This situation is changing as public entities recognize the value intermodal transportation provides to their citizens and resident businesses. Even given this new climate, there are serious impediments to implementing successful intermodal service. Existing track infrastructure may not allow train speeds that are competitive with trucks and rehabilitation of track to higher standards is expensive. Additionally, there are huge costs associated with the building of efficient intermodal systems. These impediments must be addressed by planners of intermodal operations.

NATIONAL DEFENSE CONSIDERATIONS IN THE RAIL PLANNING PROCESS

U.S. military strategy requires that U.S. armed forces be able to mobilize and deploy rapidly in a conflict. For the Army, this capability relies heavily on the ability of its active and reserve forces to move from their mobilization stations to assigned aerial and sea ports of embarkation. To accomplish this, and to reduce wear and tear on public highways and military equipment, mobilization and deployment activities are to use commercial transportation to the maximum extent possible. Army policy dictates that vehicles not well suited for highway movement (such as tanks and other tracked vehicles) are not to be driven more than 75 miles (120 km) on highways. Since many mobilization stations are more than 75 miles (120 km) from their ports of embarkation, the Army is heavily dependent on commercial transportation to accomplish its moves. The Army has traditionally relied on rail transport to support the deployment of its equipment because rail is considered to be well suited to moving high volumes of large, heavy equipment.

The Military Traffic Management Command (MTMC) is responsible for military shipments using land transportation. Its mission is to provide transportation planning support to Department of Defense (DOD) agencies and commands. The MTMC is the agency which plans for and operates defense rail shipments. One of its primary missions is to ensure the consideration of national defense rail needs in the plans and programs of the Federal Railroad Administration, the states, and the individual railroads. A state rail planning process must include the needs of defense facility rail services.

STRACNET

In 1975, the DOD charged the MTMC with the development of the Railroads for National Defense Program. The initial effort of this program was the analysis of railroad corridors important to national defense. The purpose of this effort was the designation of a strategic rail corridor network (STRACNET) for peacetime and contingency requirements.

Rail lines important to national defense include mainlines, clearance lines, and access lines. Mainlines are strategically important because they provide an interconnected system for deployment of forces, materials, and equipment throughout the country. Clearance lines are used in the shipment of oversized or overweight cargo. Examples of such cargo are combat tanks, tank retrievers, bridging equipment, cranes, and parts of major weapons systems. Not all rail lines can accommodate such shipments. Clearance requirements are a primary determinant in the inclusion of a particular

rail segment in STRACNET. Access lines are connectors between the mainline system and defense installations. Access lines were investigated primarily in terms of the mobilization mission of defense activities, and the availability of alternative modes of transportation.

Candidate rail lines for STRACNET were evaluated on volume, clearance, and contingency analyses. These analyses resulted in the MTMC designating the national STRACNET configuration in the late 1970s. MTMC has regularly updated STRACNET through the years. The current strategic rail network in Texas can be seen in Figure 7. It has not changed since it was originally designated by MTMC.

From the west, STRACNET in Texas follows the UP rail line from El Paso to Sierra Blanca where it diverges into two UP lines, one route northeast through Sweetwater to Fort Worth, and the other southeast through Alpine to San Antonio. In the panhandle, STRACNET consists of four BNSF rail lines converging on Amarillo, with the southeast line leading to Fort Worth. STRACNET is connected to Oklahoma immediately north of Fort Worth by the BNSF line to Gainsville. East of Fort Worth, STRACNET follows the UP line through Dallas and then turns sharply north at Marshall on the UP line to Texarkana. North of San Antonio, the strategic rail network follows the UP line through San Marcos and Austin to Temple, at which point it continues to Fort Worth on the BNSF line. Also intersecting at Temple is the BNSF line southeast from Rosenberg. East of San Antonio, STRACNET follows the UP line through Flatonia and Houston, and intersects the Texas border at Orange (this line serves the Port of Beaumont). South of Houston, STRACNET follows the UP line in order to access the ports of Galveston and Corpus Christi.

INTERNAL RAIL OPERATIONS ON TEXAS MILITARY BASES

Only three military bases in Texas maintain their own internal rail operations: Fort Hood in Killeen, Fort Bliss near El Paso, and the Red River Army Depot near Texarkana.

Fort Hood

The Fort Hood rail system operates 8.5 miles (13.7 km) linked directly with the Burlington Northern Santa Fe. Fort Hood was unusual in the fact that it had two railheads, 25 miles (40 km) apart; one at north Fort Hood, and the other on main Fort Hood. The Cotton Belt, which ran to north Fort Hood, abandoned its branch line from Waco to Gatesville in 1972, and the railhead at north Fort Hood was dismantled.

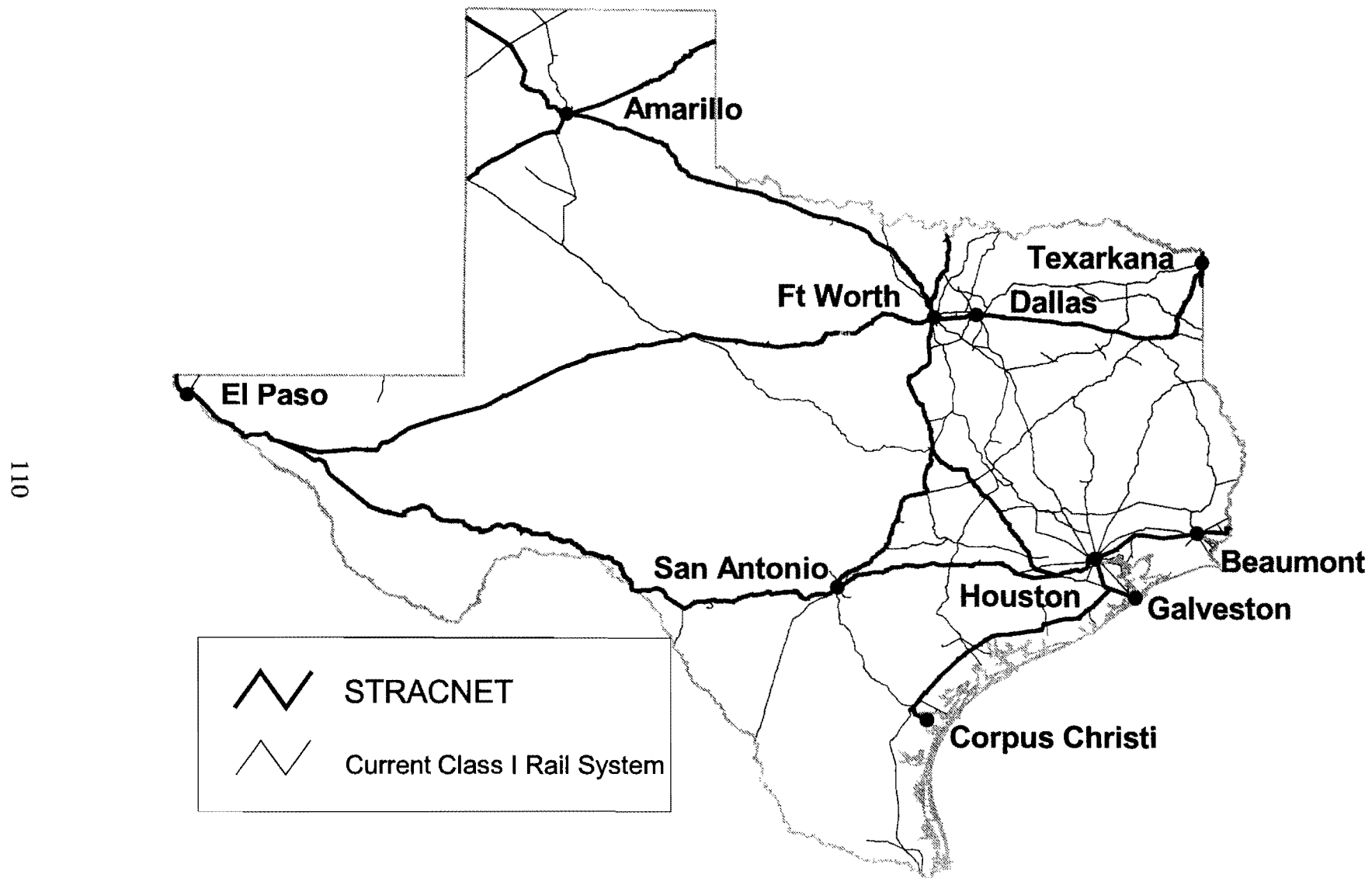


Figure 7. STRACNET Map

Using two GP10 locomotives, Fort Hood regularly moves from one to 97 cars at a time, for an annual total of between 6,000 and 8,500 cars a year. This represents one of the highest volumes of rail traffic for any military base in the country. The crew consists of a rail operations supervisor, an engineer, soldiers on temporary assignment, and a mechanic who also serves as a conductor and engineer. Reservists from the 757th Transportation Battalion (Railway) in Milwaukee, Wisconsin, have also been assigned for two-week tours to support rail operations.

After Operation Desert Storm, the Department of Defense took notice that its rail operations were in a state of disrepair, especially when it came to track quality and locomotive reliability. Fort Hood rail operations fared well during Desert Storm, but since then there have been some improvements to rail infrastructure on the base. In 1991, the track was rebuilt to 90 pounds on storage tracks, and 115 pounds on running tracks, and No. 10 switches were installed.

Fort Bliss

Fort Bliss operates 15 miles (24 km) of track connecting with the Union Pacific by U.S. Highway 54. The rail system operates from Monday through Friday, and occasionally on weekends, in support of the U.S. Army Air Defense Artillery School and other miscellaneous freight movements. The track weight ranges from 90 to 115 pounds, and there are five locomotives on base (two BLH RS4TCs, two GP18s, and a GP10). There has been a recent proposal to extend the rail system out to the artillery ranges in order to mitigate road damage caused by trailers used to carry heavy air defense weaponry.

In a 1992 General Accounting Office report detailing problems in rail deployment, Fort Bliss was one of the mobilization stations that was singled out as having constrained outloading operations during Operation Desert Shield. In particular, the report cited drainage problems at Fort Bliss that forced trains carrying equipment to use tracks that were under water in places, and that trains were restricted to slow speeds so as to avoid derailments.

Red River Army Depot

The Red River Army Depot operates 52.57 miles (84.60 km) of track. Additionally, 21.6 miles (34.8 km) of track are operated at the adjoining Lone Star Army Ammunition Plant. Located 18 miles (29 km) west of Texarkana, the base uses its rail system primarily to haul supplies and ammunition. The base rail system connects with the Union Pacific, and operates Monday through Thursday. The rail

infrastructure is built with 85 pound rails. Three locomotives support rail operations on base; two 80-ton GE locomotives, and a BLW RS4TC.

STATE PARTICIPATION IN DEFENSE RAIL PLANNING PROCESS

Defense rail planning is a coordinated and continuing process. State rail planning contributes to this process in several important ways, such as:

- Sending current state rail plans to the Military Traffic Management Command (MTMC),
- Monitoring the condition of defense essential rail lines (STRACNET and access lines),
- Informing MTMC of any change in status of defense essential lines, and
- Maintaining liaison with MTMC.

State participation in defense rail planning initially begins with a request being made to MTMC regarding Department of Defense (DOD) rail shipment origins and destinations, DOD installations in the state, the configuration of STRACNET and access rail lines in the state, and military clearance requirements. MTMC will respond to the request by providing state specific information on STRACNET corridors and access rail line inventories, state military installations, and rail shipment characteristics as well as the clearance standards they require. The state will need to inform MTMC about any potential abandonment proceedings involving STRACNET impacted rail lines, as well as provide any information regarding state plans to subsidize or rehabilitate these lines. Additionally, it is important that the state inform MTMC about any highway overpass construction plans that involve the strategic rail network. During this process, MTMC provides any needed coordination between the state and military installation commanders. As the state rail plan evolves, the state will share this information with MTMC to ensure that defense-related rail needs are being met. Critical to the process is the understanding by both defense and state planners that successful implementation will require continual updating of information from all participants. State participation in the defense rail planning process is displayed in Figure 8.

Conclusion

The U.S. military must plan in peacetime how it will meet its deployment objectives when mobilized. An integral part of this planning process is ensuring that the necessary transportation,

both military and commercial, is available to move units to their ports of embarkation. The Department of Defense's Military Traffic Management Command is responsible for determining whether the military's transportation systems, including its use of commercial assets, can meet mobilization needs. Working closely with state rail planners is one way that the MTMC can accomplish this goal.

In the last decade, the Army has experienced a renewed recognition of the importance of military railroad service in the strategic defense role. Transportation is the core of strategic mobility, and rail operations are the backbone of any major deployment. The strategic importance of a particular rail corridor is a function of:

- relative use,
- the commodities being moved,
- the alternative modes of transportation available, and
- the mobilization mission of the defense activity.

State rail planners need to consider the strategic requirements of the nation when formulating rail policy and planning processes. Assurance must be made that a state's rail plans or programs include consideration of rail services needed by defense facilities, not just in their states but also in adjacent states.

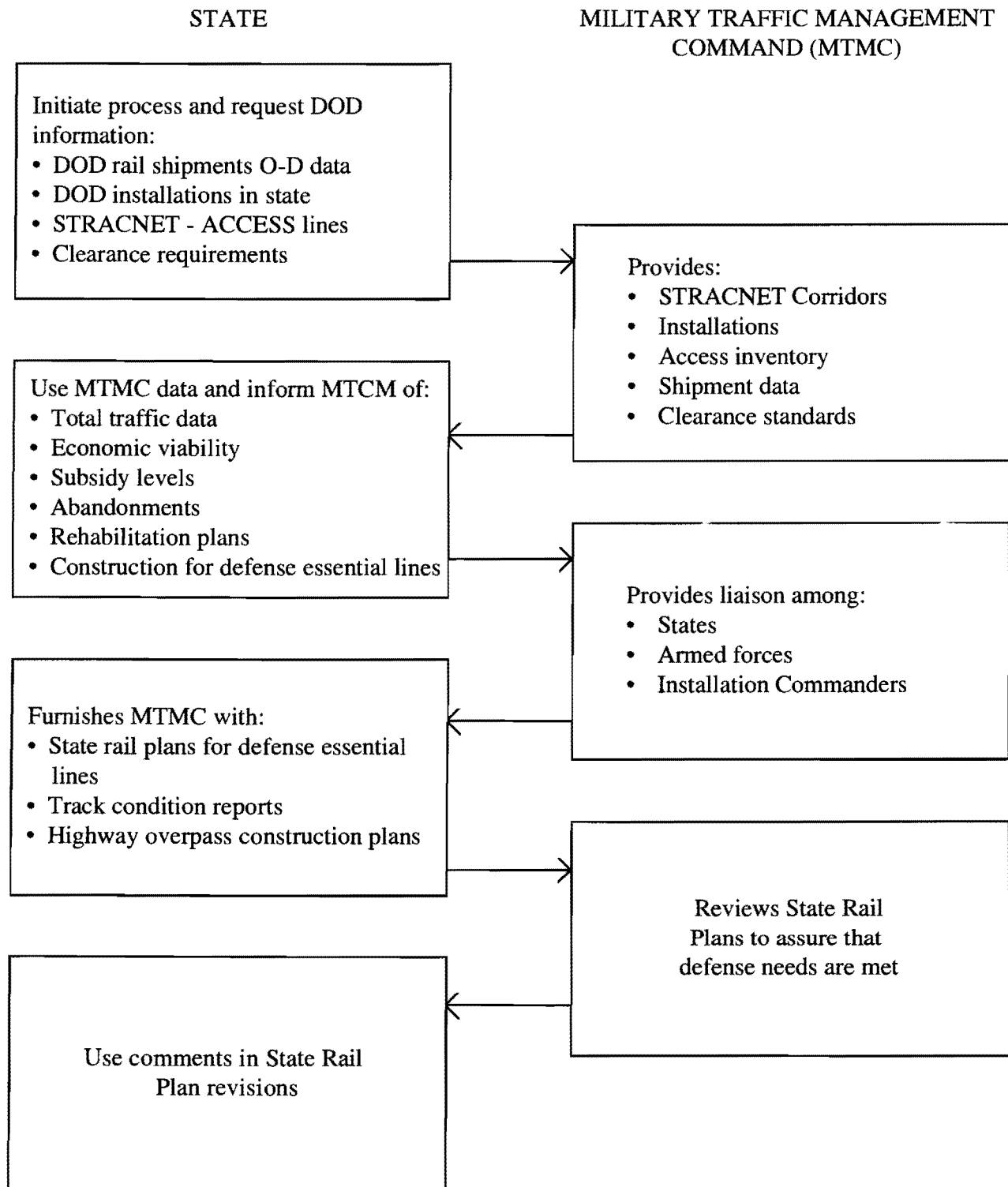


Figure 8. State Participation in Defense Rail Planning Process

TERMINAL AND YARD OPERATIONS

The Rail Planning Manual provides the following discussion regarding terminal and yard operations.

Overview

Railroad yards are the crossroads of the rail system and provide the means for assembling and classifying rail cars into trains. The yards differ by function and frequently provide ancillary services such as car inspection, washing, repair, and weighting. Yard operations do not generally produce revenue, yet consume great amounts of time, manpower, and capital. Therefore, improvements in the efficiency of rail yard operations can increase productivity significantly.

The over 4,000 railroad yards in the U.S. are known as classification yards, industrial yards, intermodal yards, and interchange yards. Frequently known as “terminals,” the approximate 1,200 classification yards are the most important group for they break down, sort, and assemble road trains. Industrial yards are used as central collection points for classifying freight cars into local trains serving industrial sidings. Some industrial yards also provide support services such as car inspection, repair, weighing, and cleaning. Intermodal yards, have loading and unloading trailers or containers and generally are located away from other yards or intermediate classification yards. Interchange yards provide the means for exchange of cars between connecting railroads. These are usually flat yards with complex track configurations and signal systems. They may be composed of a series of yards.

Rail terminals and yards may be owned by the individual railroads or by separate organizations known as terminal companies. Such companies are typically owned by the connecting railroads, and provide the switching engines and car management needed for large scale operations. In almost all cases, rail yards are privately owned and operated. The state and local government role is therefore limited to assisting in coordination among the railroad companies, the shippers, the government bodies, and the different modes. No federal funds are available for yard planning and operation. Since the yards are so important, however, it is helpful for the states and localities to be aware of their problems and potential.

Moving freight in a rail car is a complex and labor-intensive process requiring frequent transfers and handling of the car. When the shipper places an order for a freight car, railroad officials locate such a car and deliver it to the shipper using an industrial switching engine. The shipper has a limited

time period for loading the car, after which he is charged a demurrage fee. When notified, the railroad moves the car from the industrial siding and begins the process moving the car through a series of yards to a classification yard where it is grouped with other cars to form a train. As part of a train, it passes through other intermediate yards, to the final classification yard, and to its destination.

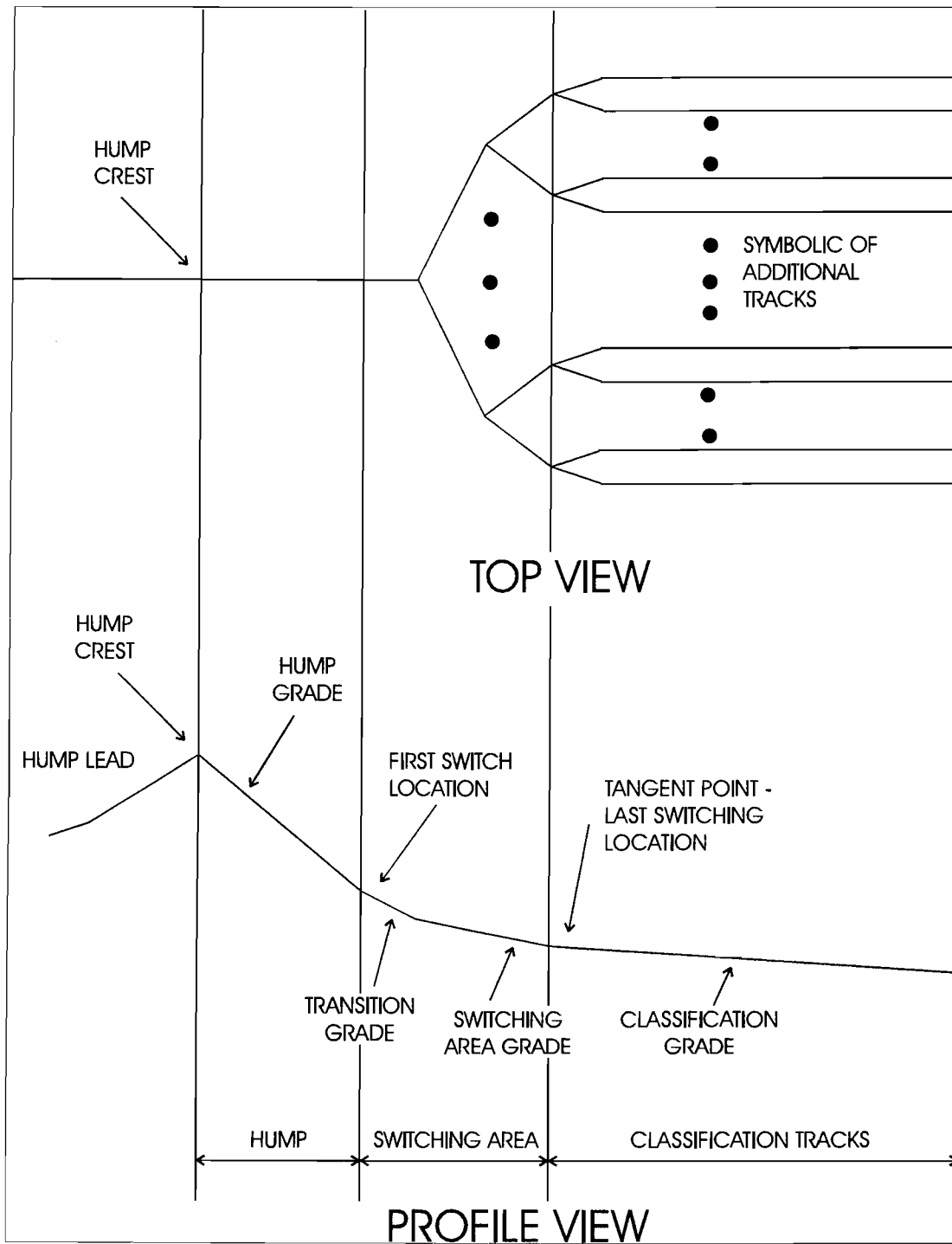
This process can take a long time and can be the cause of delays in the delivery of the car. A 1974 DOT study found that the “typical” freight car had a 25.6 day cycle, of which 3 days (29 percent) were spent in terminal yards, 8.5 days (33 percent) in intermediate yards, and only 2 days (7 percent) in actually hauling of freight in revenue producing operations. The report also notes that over 62 percent of the total time was involved in yard switching operations, 23 percent in consignee-consignor operations, and 14 percent in the line haul of which one-half produces revenue and the remainder is a return haul.

Classification yards typically are located in urban areas and use either flat track configurations or “hump” yards. All car movements are made with switching engines in a flat yard. Hump yards use gravity for a large proportion of car movements, thus decreasing the number of engines needed. A hump yard uses retarding mechanisms to slow rolling cars to a speed which is safe for coupling. A typical classification yard will have a track configuration similar to that depicted in Figure 9.

After the train arrives, the locomotive is detached and serviced and the cars are inspected. Switch engines are used to move the cars to the hump or switch from which they roll, or are moved, onto tracks where other cars of similar destination are being accumulated for a road train. A make-up engine is used to pull the cars from classification track to the departure track where a road engine is attached and the train is inspected.

A key factor in shipper decisions is the reliability of the transported freight arriving on time. Yard operations were found to significantly delay more than 69 percent of rail car shipments, thus decreasing the reliability of rail transportation in the shipper’s view. Operational delays are caused by:

- Unavailability of switching engines — a temporary or lasting condition caused by fluctuations in the number of cars to be classified or moved.
- Bad order cars — must be removed from the train due to mechanical defects discovered during inspections.



* Source: Rail Planning Manual

Figure 9. Top View and Profile View of a Hump Yard

- Reswitching — due to erroneous initial car classification and movement of bad order cars.
- Equipment failures — switches, retarders, air compressors, signals and engines fail, and delay traffic movements.
- Personnel problems — worker attentiveness and productivity are affected by high turnover, alcoholism, drug abuse, union rules, and poor training.
- Bad weather — floods, snowstorms, fog, and tornados disrupt yard operations.
- Hazardous materials handling — propane, chlorine, explosives, and other chemicals require special handling in classification yards under FRA rules. These cars are classified separately and require extra care by crews.
- Priority handling — causes temporary disruptions due to the nature of the cargo (e.g., perishables).
- Paperwork — lost waybills cause confusion and expense.
- Derailment and accidents — interrupt yard operations and cause safety hazards.

Each of these problems is magnified by the following:

- Vandalism — unfenced yards are vulnerable to pranksters and thieves.
- Inadequate information flow between railroads — car-by-car information is not always forwarded promptly.
- Misuse of terminals for storage — bad order cars must be stored somewhere and often get in the way.
- Government safety regulation.
- Overflow traffic — when one yard is overloaded, it sends its overload to the next yard, progressively creating system inefficiency.
- High capital costs of yards — yards may cost many millions of dollars and the application of new technology to old yards is expensive.
- Canceled trains — the greatest single cause of delay.
- Restrictive labor agreements.
- Requirements and incentives provided by inefficient car hire and service rules (Government and AAR).

These operational problems can be seriously affected by the railroad's operating policies. Railroad policies on receiving, classification, make-up, and scheduling all affect the efficiency of terminal and system operations. Operating policies frequently are based on tradition or upon an operations analysis study, and vary among railroad companies. The policies which can affect terminal and yard operations are:

- Receiving policy — governs the order of classification of trains, such as First In - First Out (FIFO), traffic priority and minimization of missed connections.
- Classification policy — determines destination labeling given to each track; 24 cars per destination need one track, with “swing” tracks provided for flexibility.
- Make-up policy — determines which cars or blocks of cars are placed on which outbound trains, and is usually up to the yardmaster. AAR service guidelines apply to these operations.
- Scheduling policy— dispatching determines when the train will depart as determined by timetable, subject to train length, engine availability, train and crew availability, lateness of inbound connection, minimum gross tonnage (e.g., 2,000 gross tons), or minimum length (e.g., 50 cars). Train cancellations are caused by schedule changes.

These operational problems and railroad policies create various issues which the states and localities might want to address, such as:

- Yard security (fences, lighting, and patrol),
- Coordination of terminal location decisions among railroads,
- Grade-crossing safety,
- Application of noise reduction technology in rail yards, and
- Emergency preparedness planning for accident and disasters.

In particular, local governments should be concerned about emergency planning and security of the yards to prevent vandalism. Local planners should know the types of hazardous materials transported in the yards and should become acquainted with the railroad yardmaster and his staff to learn what must be done in emergency situations. This is particularly important in planning for fire and rescue services which may be called upon in emergencies. Where poisonous materials are transported and handled frequently, special plans should be made for control of substance dissipation

or evacuation of the nearby population. Other issues of interest to state and local government agencies include yard redevelopment, shipper views of service, and industrial location near yards. These topics will be addressed in the next section.

Potential Role of States and Localities

Terminal and yard operations, planning, and construction are primarily the responsibility of the railroad companies. The tremendous costs, the engineering details, and the operating requirements are best known and understood by the railroad companies. At the same time, state and local governments may have an interest in encouraging and expediting efficient terminal operations.

Terminals and associated yards occupy significant tracts of land. In Omaha, yard consolidation and redesign could affect over 290 acres of downtown land, owned by the railroads. When terminal planning involves consolidation or reorganization (thus freeing land for other uses), local planners, zoning officials, assessors, and highway officials should be involved. In such cases, the relevant issues will be:

- Present value of land,
- Proposed zoning changes,
- Impact on zoning change on tax base,
- Automobile traffic movement, and
- Housing, sewage, and utilities for redevelopment.

Each issue should be examined to determine the impacts upon the community.

Major terminal reconstruction and consolidation is rare, however, and is not part of the State Rail Planning Process. Funds are not available from the federal government, except in rare cases involving demonstrations. Generally, federal funds are not available for operational planning which may involve changes in yard policies or labor agreements.

This situation forces the states and localities to seriously examine their participation in planning for yards and terminals. There are several options available to the state and local governments. Each of these options has been used by different states. These are:

- Authorize the state DOT to “study” the issues.

- Offer the “good offices” of state, local, or regional planning agencies to provide coordination and forum management.
- Active study and implementation of relocation and operational options with state or local funds.
- Do nothing.

There are several reasons why a state or local government may want to become involved in a terminal operations study. Primary among these would be the economic development potential and employment opportunities in the region due to such changes. This is particularly true when industries depend on rail service which could move without improvements, thus threatening unemployment and loss of taxes.

RAIL CAR AVAILABILITY

The concern for car availability is usually voiced by branchline shippers who often do not receive the proper type or quantity of cars. According to the Rail Planning Manual, rail car supply is inherently a railroad management responsibility, but states logically become concerned when their economic interests are affected adversely. Car supply problems can influence the viability of rail service over light density lines.

Basic Issues

Improving freight car availability will require changes of fleet size, utilization, and cooperation among regulatory agencies, railroads, and shippers. These topics are discussed briefly below.

Fleet Size

Railroads cannot be expected to maintain a car fleet to meet peak demands; to do so would not represent sound economic investment. However, they are obligated to meet reasonable demands. Much concern has been expressed over the general decline in the overall ownership of freight cars. The decline in equipment ownership has been reflected mainly in a shortage of general-purpose boxcars, although covered hoppers and gondolas are likewise often in short supply. The Interstate Commerce Commission over the years supported legislation that would assist railroads in acquiring freight cars. These legislative measures included incentive per diem charges and even direct government purchase or loan guarantees. Car ownership is the largest single expense on the railroad

after transportation labor. Thus purchasing or leasing and maintaining rail cars remains an immense expense to the railroad.

Utilization

The largest possible freight car fleet will not be adequate if it is used inefficiently. Improving car utilization is an obvious action, especially during a time of acute car shortages. During such periods in the past, the Interstate Commerce Commission found it necessary to issue service orders to provide for an equitable distribution of the available car supply, to prevent unnecessary delays in the movement of cars, and to attach penalties, where necessary, to promote the most efficient utilization of the available car supply. Railroads obviously must attempt to secure the maximum use of their car fleets. They are expected to enforce their tariffs, to observe mandatory car service rules (to the extent not modified), and to comply with outstanding car service orders. The shipper also has important obligations in facilitating better car utilization. Shipper responsibilities include ordering cars at appropriate times and in sufficient quantities to meet their needs, loading cars and furnishing shipping instructions promptly, avoiding circuitous routing which prolongs transit time, unloading cars expeditiously at the destination, removing all debris connected with the inbound load, and advising the carrier promptly that the cars are available. All of the above measures are expedients designed to make the best out of an undesirable situation. A more fundamental change is improving normal operations to reduce car turnaround time. If the car fleet were used more efficiently, the impact could be one of adding capacity with little or no added investment. To this end, efforts have been made to reduce free time and increase demurrage charges to a level that will discourage user retention of cars for storage, rather than use as a transportation vehicle. Other related programs by railroads include instituting improved computer-based information or control systems, changes in per diem rates, development of effective methods for forecasting demand, and development of minimum car service standards.

Cooperation

There is no one approach — legislative, judicial, administrative, or proprietary — to solving the freight car supply problem. The problem must be viewed as a continuing responsibility of the railroads, shippers, and regulatory agencies. Under these circumstances, there is a continuing need for close cooperation among affected parties.

State Rail Planning Response

Basically, car supply is not a problem which can be resolved within the context of a state rail program. Not only is the problem national in scope, but it essentially impinges upon the duty of railroads to provide and furnish transportation upon reasonable request. The basic solution must originate with the industry.

State rail planning agencies may, from time-to-time, receive complaints about car supply problems. In times of car shortages, shippers understandably become very sensitive to any hint or impression that a competitor may be getting more than a fair share of equipment. While the types of accusations can be varied, two are especially prominent: (1) shortline shippers are being discriminated against in favor of Class I shippers, and (2) one railroad receives more cars than another. Such complaints should be referred to the appropriate regulatory agency for resolution, as railroad companies are responsible for devising their own car allocation procedures with the only legal requirement being that these procedures be "just and reasonable" and nondiscriminatory.

Occasionally, it may be suggested that continuation of light density line service might be assured if the state would supply the freight cars needed by shippers. Whether supplying cars might be a better solution than subsidizing continued operations is a decision which must be made on an individual case basis. Key factors involved are: the availability of state funds for this purpose, state ownership of the light density line, past problems in obtaining cars from connecting railroads, the types and uses of the equipment being considered, and shipper guarantees to continue using rail service if car supply problems were alleviated through governmental ownership of rolling stock.

The most fruitful area for state involvement lies in systematically altering railroads to car needs, based upon expected crop production and other indicators of economic performance. This requires developing a working relationship with the railroad personnel involved in freight car management and supplying them with information upon which car needs can be predicted. In this situation, the designated state agency might act as a clearinghouse for state and local information, preferably obtained on a county or rail line basis. With more detailed information from which to estimate car supply needs, the railroads will be better able to meet those needs by diverting equipment from elsewhere on the system or in the county.

THE IMPACT OF RAILROAD MERGERS IN TEXAS

The past several years have seen several railroad mergers in Texas. In 1980, Texas had seven Class I carriers; the MKT (the Katy), the Rock Island, the Missouri Pacific, the Southern Pacific, the Burlington Northern, the Atchison-Topeka and Santa Fe, and the Kansas City Southern.

Today these seven railroads have been merged to combine just three Class I carriers in the state. The “family-trees” of these remaining railroads are shown below:

	<u>Union Pacific</u>	<u>Burlington-Northern Santa Fe</u>	<u>Kansas City Southern</u>
1982	UP - MOPAC		KCS
1988	UP - MKT		
1995			
1996	UP - SP	BN-SF	

The merger of the Burlington Northern and Santa Fe in 1994 has been described as a classic end-to-end merger. That is to say that there was relatively little overlay or route duplication between these two systems. Union Pacific attempted a last minute buy-out of Santa Fe in an effort to keep SF from merging with BN and thus forming what was, at the time, the largest railroad system in the country. UP’s failure in this bid, while driving up the cost of SF by more than \$1 billion, left them with only one remaining partner in the west – Southern Pacific – a formidable system that by 1995 was in decline and in financial trouble.

Burlington Northern’s traffic base was dominated by coal from the Powder River Basin in Wyoming. Santa Fe’s traffic base was best characterized by high-speed intermodal service. The route structure of the BN and SF systems in Texas is shown in Figure 10.

The impact of the BN and SF merger in Texas was considered minimal. There were no significant abandonments that resulted and, since the two merging systems largely operated in different markets, the loss of competition was not a factor.

Based on these considerations, and others, the STB, in 1995, approved the combination of these two systems. This merger set the stage for the combination of Union Pacific and Southern Pacific – a merger with far greater impact on Texas’ railroad network.

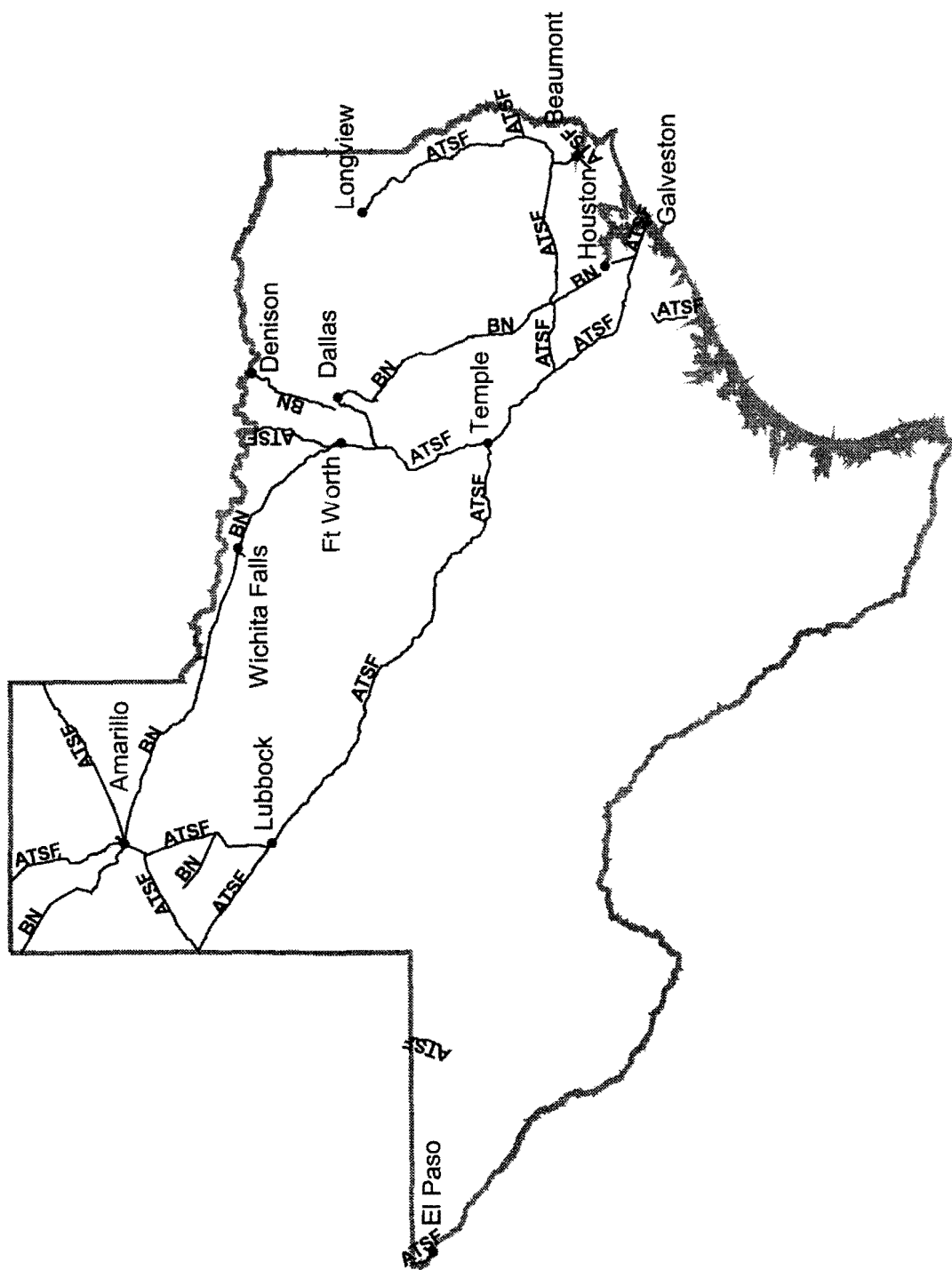


Figure 10. BNSF Rail Lines

The UP/SP Merger

The merger of UP and SP in 1996 combined two of the industry's giants. The Texas route structure of the UP and SP systems is shown in Figure 11. It merged two systems with long and distinguished histories and traditions. Both have their roots in the 19th century and each could boast of significant accomplishments operating over their extensive territories through the high points of American railroading. Yet the two railroads' recent fortunes were quite different. Union Pacific has continued to thrive, with abundant coal traffic operated with high-efficiency unit trains paving the way to leadership in the West. Reinvestment in plant and equipment and a market-oriented business philosophy has kept UP healthy and growing. UP's 1995 acquisition of the Chicago & North Western encountered early start-up problems, but has led to important new routes and additional markets.

Southern Pacific, on the other hand, was in decline through the latter half of the 1980s and into the first half of this decade. With a traffic base dependent principally on collection and distribution functions over long routes, SP developed a business strategy that is best characterized as "holding on." Assets were sold, capital was kept low, and revenue was reinvested only to the extent required by its current operations. Generally, much of the existing SP physical plant was well maintained, but deferred locomotive maintenance became an increasingly severe constraint on its operations. At 15 percent, "bad orders" on SP locomotives were higher than any other railroad in the industry. More important, however, was the shortage of capital for the strategic investment in infrastructure needed to keep pace with customer growth and expectations. As SP physical plant lagged in capability and capacity, profitability suffered.

Predicted Benefits of the UP/SP Merger

Union Pacific, in its merger application, posted an array of benefits that would accrue to the public and to shippers as a result of combining the UP and SP systems. These public benefits were predicted to amount to more than \$750 million per year. It is important to note that there was an implicit recognition in the merger application that the realization of these benefits would take time. The plan identified a five-year implementation period with the maximum level of predicted benefits, referenced as a 'normal year,' occurring in year five. The gradual projected realization of benefits appeared reasonable.

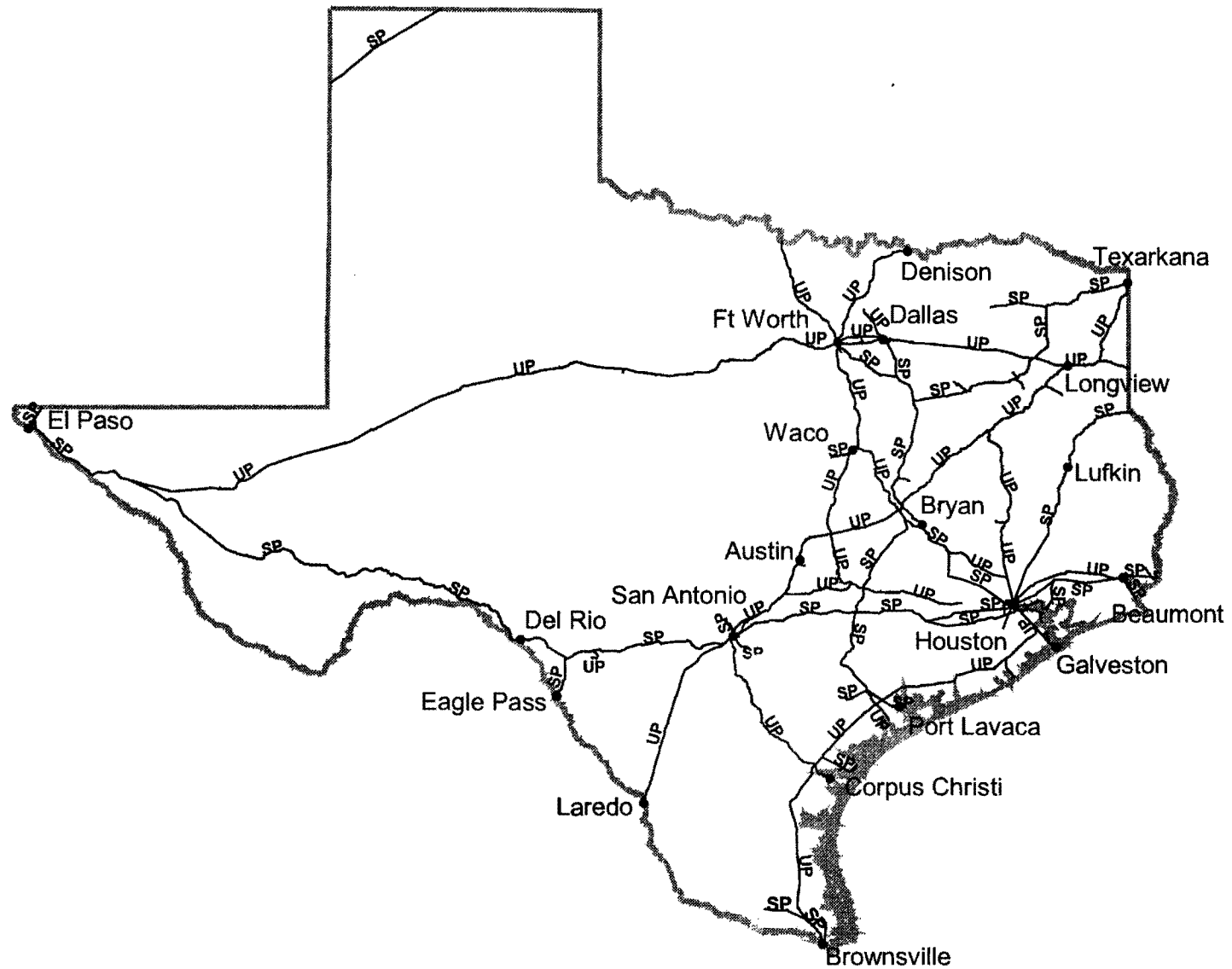


Figure 11. UP and SP System Map

The projected benefits were itemized as follows: more than \$580 million in benefits were to be in the form of operating efficiencies and cost savings, \$90 million in benefits were to be in the form of shipper logistics savings, and \$76 million in net revenues from diverted traffic. Some capital expenditures were cited as prerequisite to the realization of these gains, but few specific projects were identified for the Texas and Gulf Coast region.

Subsequent to the merger, UP/SP carried forward on a routine infrastructure investment program in Texas that focused on track rehabilitation and maintenance. In 1997, the Texas program consisted of bridge, track and tie, yard, and signal improvement projects totaling more than \$120 million. Projects of a similar nature, with emphasis on directional running, planned for the 1998 period, totaled another \$114 million.

CHAPTER 3. THE APPLICATION OF THE RAIL PLANNING PROCESS: A CASE STUDY OF URBAN RAIL RATIONALIZATION

OVERVIEW

As it has been described in other sections of the report, the rail planning process can be viewed as a problem solving approach, tailored to each specific circumstance. In this chapter, an example of *urban rail rationalization* is used to demonstrate how ordered and logical processes contribute to the solution of one rail-related issue facing public entities. The case study is drawn from recent work by TTI in Bryan and College Station, Texas. TTI, in concert with the consulting firm DMJM of Houston, pursued an evaluation of the options available to the community to reduce or eliminate the safety, transportation, and community development problems created by an active rail line bisecting the area. Figure 12 shows the rail line that divides the Texas A&M University campus.

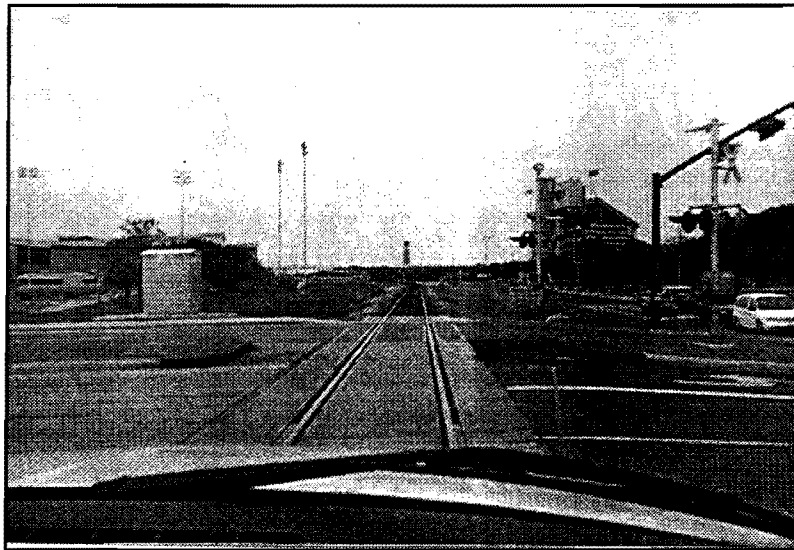


Figure 12. Rail line dividing the Texas A&M University Campus

Funded by Texas A&M University, the research initially focused on grade crossing elimination. The study examined more than a dozen potential solutions and discovered through this analysis that rail relocation was the most effective approach and a feasible option to pursue. Contact was made with Union Pacific Railroad early in the investigation to inform them of the study goals and to assess the potential for solutions which met their strategic needs. The success of this early and open contact speaks to a central point to be made in the current research – a recommendation that when planning

publically funded, rail-related initiatives, working with the railroads to understand their goals in not only desirable but often mandatory to ensure productive results.

The urban rail rationalization planning process may be divided into four discrete steps: (1) problem identification, (2) option identification and analysis, (3) alternative selection, and (4) implementation. The following case study analysis addresses the approach taken by TTI in each of these four areas and attempts to offer this example as typifying urban rail rationalization since it focuses on mitigating the impact of an active rail line on the community by relocating the line to a less intrusive site. Figure 13 shows a schematic of the analysis, as undertaken.

STEP 1: IDENTIFY PROBLEMS

The first step in the process involves the identification of the problems associated with urban rail operations. These problems may include a wide variety of transportation issues affecting rail or highway operations, or community and land use. In Bryan and College Station, the tremendous growth and development that the university and the surrounding communities have experienced in recent years has dramatically increased vehicular and pedestrian traffic over the railroad and, as a result, public safety has become a major concern. The increased potential for train-motor vehicle and/or train-pedestrian accidents at the highway-rail intersections (HRIs) brought about by this development was the initiating factor in the search for alternatives to current operations.

In addition to the concerns for traffic safety at the HRIs, there was also a concern that a major rail accident could occur that could adversely impact the corridor. The proximity of the railroad places it in the heart of the Texas A&M University campus, which houses over 50,000 students, faculty and staff. Concerned Texas A&M University officials, working with various agencies and community development groups, have repeatedly sought solutions to the issues relative to the presence and operations of the railroad on the campus. Seven major studies have been conducted over recent years to investigate, analyze and develop solutions for Texas A&M University, the railroads and the public for the transportation and safety issues relevant to the railroad. Development of solutions that would satisfy most of the requirements of Texas A&M University, the railroads and the surrounding communities was hindered or severely limited due to the lack of funding, public issues, and the competitive business between the former Union Pacific Railroad and the Southern Pacific Railroad. The barriers to developing a comprehensive, viable solution or alternative were significant.

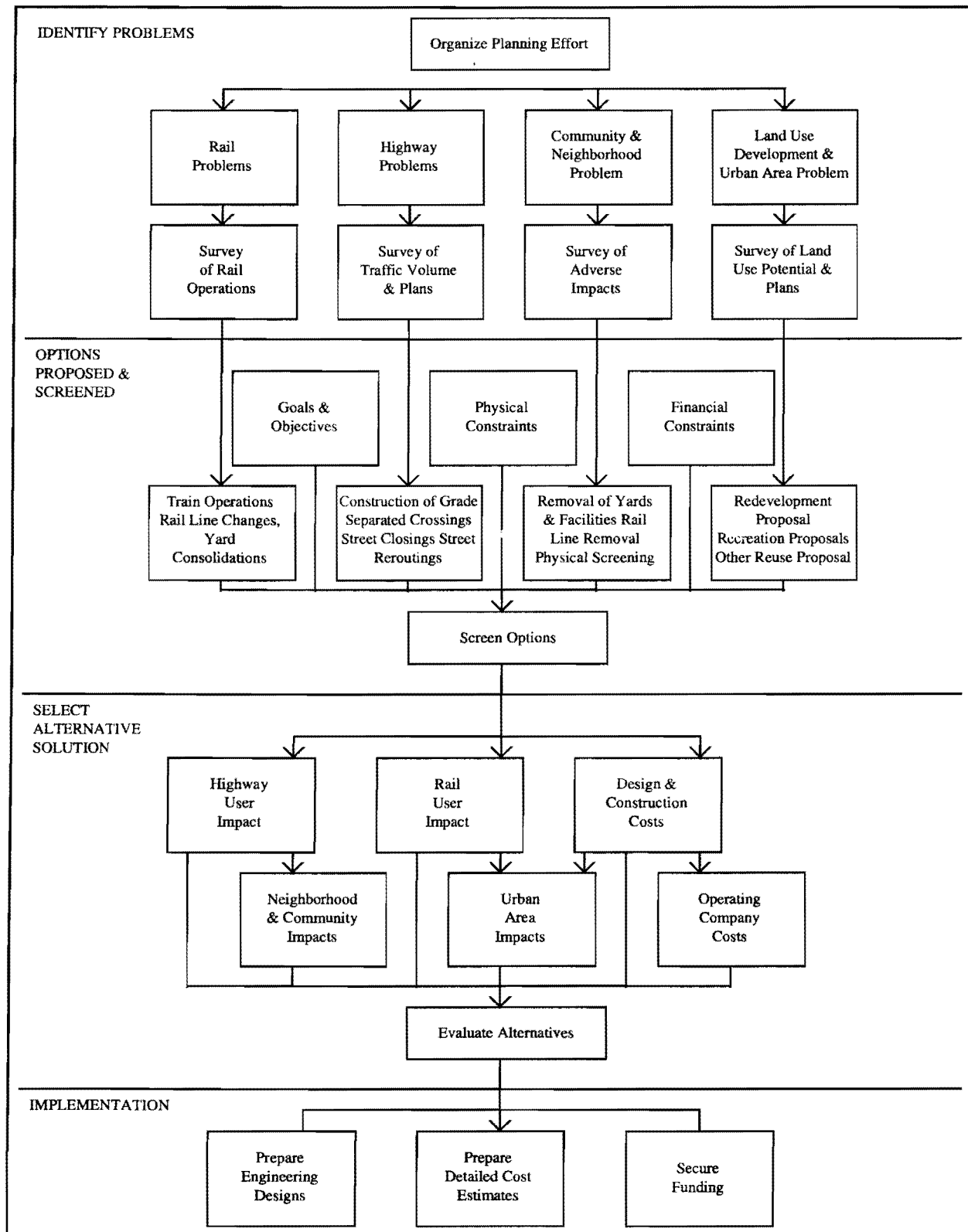


Figure 13. Urban Rail Rationalization

Recognition of Opportunities for Change

Several major events provided an opportunity to develop and implement a solution to satisfy all or most of the involved parties. In 1997, the United State Department of Transportation's Federal Highway Administration (FHWA) and the Federal Railroad Administration (FRA) established a nationwide program to reduce the more than 270,000 HRIs by 25 percent by the year 2000. This program has brought national attention to the magnitude of the transportation and safety issues associated with the train-motor and vehicle-pedestrian risk at grade crossings and provided a new impetus to investigate alternatives.

In addition to the national crossing reduction program, three other significant events, occurring since the previous studies, provided the university, surrounding communities, and the railroad with a "window of opportunity" to develop an optimum solution to the railroad issue. These events included the merger of the Union Pacific Railroad and Southern Pacific Railroad, the cessation of Amtrak service to the Bryan-College Station area, and the establishment of federal funding programs, such as contained within ISTEA, for improvements to transportation corridors. The merger of Union Pacific and Southern Pacific removed a regional rail competition obstacle and provided operating alternatives heretofore unavailable. The departure of Amtrak eliminated them as a project constituent and consequently simplified the issues requiring discussion. Finally, the development of funding programs through ISTEA provided the potential for significant project capital and funding assistance, through federal agencies or the state, for implementation and completion of a major project.

Define Rail Problems

Bryan-College Station, due to the single line through town, represents a capacity bottleneck to UP. Train traffic from multiple lines converge on the single line that extends from Bryan, through College Station and Texas A&M University, to Navasota, Texas. The single track, in conjunction with a near ninety degree curve in Bryan dramatically reduces speed and capacity through the communities. Plans for additional traffic and the ultimate possibility of double-tracking the line added impetus to identifying a solution to urban operations that satisfied the needs of all involved parties.

Survey of Rail Operations

The railroad, bisecting Bryan, College Station, and the Texas A&M University campus, is a former Southern Pacific Railroad (SP) mainline with few local shippers and customers. The merger of UP and SP resulted in the consolidation of former competing track systems and operations in the area. Railroad traffic along this track system was likely to increase in the future as a result of the merger and the logistical significance of the line to Union Pacific Railroad (UP). Increases in railroad traffic along the newly merged system would increase the potential for train-vehicle accidents and deaths, train-pedestrian accidents and deaths, and major derailments.

As discussed earlier, Amtrak has implemented a program that has dramatically reduced its intercity rail passenger service nationwide. As part of the reduction program, Amtrak no longer provides services along the former SP lines to the Bryan - College Station (B-CS) area. Given Amtrak's budgetary and operating concerns, it is highly unlikely that passenger rail service will be restored to the area in the near future.

Document Highway Problems

Highway-rail intersections are a dangerous feature of the transportation landscape. Bryan-College Station contains more than 60 such intersections with only two grade separations. The entire study corridor, from Hearne, Texas, to Navasota, Texas, contains more than 100.

In addition to being a safety hazard, HRIs present a daily impediment to the movement of traffic. Cross-corridor mobility is constrained by train traffic that may occur at any time of the day or night. Motorist delay, vehicle emissions, and emergency vehicle access are adversely impacted on a continuing basis. Bryan also contains one passing siding that routinely holds trains awaiting conflicting train traffic. The location of the siding creates additional blockage of at least two intersections.

Last year more than 4,000 motor vehicle-train collisions occurred nationally at HRIs resulting in more than 2,500 deaths or injuries. Concurrently, pedestrian-train accidents, which are those accidents where individuals are trespassing on railroad property, killed more than 600 persons. The state of Texas currently has more HRIs than any other state in the nation with over 11,700 active crossings. According to the latest statistics published (1995 data), Texas ranked first nationally with more than 400 motor vehicle-train accidents and 244 resulting casualties.

Survey of Traffic Volume and Plans

Investigation into plans within the community revealed there was a grade separation project scheduled in the “corridor” that was to be undertaken in the near future. The Villa Maria grade separation project in Bryan would require considerable capital funds to complete, and while freeing traffic delays at one major intersection, would have a limited effect on the overall HRI problem. The relocation of the track system conceived during this project would eliminate the railroad component from TxDOT’s cost/benefit analysis for the project and could, consequently, bring the desirability of a grade separation project into question.

Document Community and Neighborhood Problems

In addition to the problems associated with HRIs, there are other community and neighborhood problems that result from urban rail operations. The requirement that railroads provide an auditory warning at HRIs means that the train horn is sounded at each intersection as a train moves through town. Train horns are required to be at least 95 decibels in intensity and the resulting warning may travel miles beyond the target intersection. Residences or businesses in proximity to the rail-line suffer constant interruption due to train whistles. Other railroad noise, from locomotives, wheels, or equipment also negatively impacts adjacent neighborhoods or businesses.

The rail-line, by bisecting the community, effectively blocks the development of utilities on one side of town or the other. Water and sewage pumping stations must be engineered to allow movement of these services across the railroad and the expense of this undertaking may lead to reduced development on one side of the rail line. In the case of Bryan-College Station, most of the development in the community has occurred to the east.

STEP 2: OPTIONS PROPOSED AND SCREENED

Once the problems associated with urban rail operations have been identified and described, data collected, and impacts cataloged, the options for urban rail rationalization may be proposed and screened. In the case study being described, the continued growth of Texas A&M University and the possibility of increased post-merger rail traffic elevated Texas A&M University’s concerns for train operations relative to motor vehicle and pedestrian safety and the potential for a catastrophic train accident. Seven major studies, sponsored by various agencies, including Texas A&M University, have been conducted over the past 18 years to investigate the public safety issues and

traffic conflicts of this multimodal corridor that bisects Bryan, College Station, and the Texas A&M University campus. All of the previous studies investigated alternatives that would address Texas A&M University's concerns and afford some potential solutions. Each study identified alternatives that would satisfy Texas A&M University's goals and requirements, but none met fiscal requirements and satisfied both competing railroads.

Determine Goals and Objectives

Texas A&M University commissioned the TTI team to develop viable, implementable alternative solutions to the railroad issue to take advantage of new developments and a window of opportunity that emerged with the combination of the Union Pacific and Southern Pacific Railroads. The study was to identify and investigate the new alternatives and opportunities that may be available to meet the requirements of all of the participants and interested parties. The major participant's goals and objectives were:

Texas A&M University Goals & Objectives

- Improve overall motor vehicle and pedestrian safety on campus,
- Reduce the potential or eliminate the possibility of a major train derailment or catastrophe on campus,
- Reduce or eliminate noise, vibration and other environmental effects to the campus,
- Reduce or eliminate motor vehicle-train and pedestrian-train interface on campus,
- Develop alternatives and solutions that are economically and financially viable for Texas A&M University,
- Develop alternatives and solutions that satisfy the requirements of the UP,
- Develop alternatives and solutions that satisfy the requirements of the public, and
- Develop alternatives and solutions that are viable and "doable."

Railroad Goals & Objectives

- Improve overall system safety,
- Maintain or improve operating capacity,

- Prevent significant adverse impact to the customer base,
- No significant adverse impact to the operating/capacity ratio,
- Develop alternatives and solutions that are economically and financially acceptable,
- Develop alternatives and solutions that satisfy the requirements of Texas A&M University, and
- Develop alternatives and solutions that satisfy the requirements of the public.

Public Goals & Objectives

- Develop alternatives and solutions that comply with existing statutes and laws,
- Improve public safety,
- Maintain or improve motor vehicle traffic flow,
- Improve quality of life,
- Decrease environmental impacts such as noise, vibration, etc.,
- Maintain or improve economic viability of affected communities,
- Favorable public funds investment,
- Develop alternatives and solutions that are amenable to community planning programs, and
- Develop alternatives and solutions that meet the requirements of Texas A&M University and the UP.

Establish Physical Constraints

Solution of the problem of an active rail line through B-CS was, as are all urban rail rationalization challenges, subject to key physical constraints which limit the options available. The location of the existing rail lines to the northwest and southwest of B-CS meant that an eastern bypass of the city was not feasible since that direction would add significant mileage to the railroad's operation and eliminate them as a project supporter. Community development, which was the greater to the east also meant that line relocation in that direction would conflict with many, already established residences and businesses. These factors suggested that a relocation to the west was the more feasible option.

Establish Financial Constraints

Rail line relocation is an expensive undertaking with many participants, beneficiaries, and detractors. No single entity could afford, on its own, to initiate and complete a project of this magnitude. It was therefore imperative to include all the parties benefitting from the relocation in the financing package. The beneficiaries of the B-CS relocation included:

- 1) Union Pacific Railroad,
- 2) Texas A&M University,
- 3) Bryan, Texas, and
- 4) College Station, Texas.

These participants, along with federal and state funding, moved the concept of relocation toward a financially feasible project.

Proposed Alternative Solutions

During the relocation study being described, 14 potential solutions were identified that met some, or most, of the participants' goals and requirements. Six of the "alternatives" were eliminated from detailed analysis due to undesirable or unacceptable "fatal flaws" that were identified. Two of the alternatives required future study. Three of the alternatives were modified and merged to create one alternative. The "Do Nothing" solution was eliminated from further consideration because it failed to address the requirements of Texas A&M University, the railroad, and the public.

To properly evaluate those alternatives made feasible by the new developments identified, several major items were investigated, including:

- 1) a detailed identification/analysis of the public HRIs impacted,
- 2) public impact/considerations,
- 3) railroad operational and commercial impacts,
- 4) environmental considerations, and
- 5) capital improvements/requirements and funding.

Partial Remediation

In the context of the project being described, partial remediation referred to any number of mitigating strategies short of grade separation or line relocation which reduced the impacts of rail operation on Bryan-College Station or Texas A&M University. Among the measures evaluated were fencing, pedestrian overpasses, and limitations to the time of day within which rail operations took place. It was determined that most partial solutions could be implemented and that there would be some value for Texas A&M University. However, these alternatives did not meet all of Texas A&M University requirements previously outlined and they offered few, if any, benefits to UP or the public. Furthermore, it was determined that these alternatives would not be candidates for funding through transportation funding programs. Texas A&M University would have had to provide the bulk of the project capital. Once these findings were established, there was no additional analysis of partial remediation measures.

Construction of Grade Separated Crossings, Street Closings, Street Rerouting

One solution to most rail problems is the construction of separated grade crossings at the HRIs. Overpasses or underpasses can be constructed to physically separate the railroad track system from the road system. However, the high cost of constructing each grade separated crossing and the tremendous amount of funding that would have been required to mitigate the present number of HRIs severely limited the number of candidate sites that could be realistically addressed. The analysts attempted to identify those HRIs where, in the near term, grade separations were likely. These were evaluated to understand the potential for reduced traffic congestion at key points within the cities, where grade separation structures to be built.

Grade Separation in Texas A&M University Corridor

The potential for grade separations in Bryan-College Station was analyzed in past studies and the study being described did not re-evaluate, in detail, the merits of these solutions. The study did examine the possibility for funding assistance not existing in prior years and the conclusion was reached that transportation funding programs at the state or national level could be a viable source of capital to finance a grade separation program.

In net, however, grade separations were not considered a comprehensive solution to the communities' problems. The major deficiencies identified with a grade separation program included the following:

- The use of selective grade separation projects did not eliminate all motor vehicle – train and/or pedestrian – train interfaces in the community.
- The use of selective grade separation projects did not significantly reduce the potential for catastrophic train accidents.
- The use of selective grade separation projects did not mitigate environmental impacts such as noise and vibration.
- The relatively high cost associated with this solution did not significantly mitigate the problem – not much “bang” for the buck.
- Funding requirements were not acceptable to Texas A&M University, UP nor the public.

Railroad Relocation

The two alternatives for relocation of the rail line developed in this study are described below:

BNSF Reroute - The BNSF Reroute alternative was developed to take advantage of the recent UP/SP merger. It was to involve the routing of UP traffic west of Bryan-College Station along the former SP line from Hearne to Caldwell, Texas, and then allow traffic to operate over the BNSF line from Caldwell to Navasota, Texas. While satisfying many of the requirements of Texas A&M University, UP and the public, the initial analysis of this alternative exposed several concerns which did not make this alternative solution viable. The concerns included the following:

- The alternative would require a complex operating agreement for overhead trackage rights with the BNSF Railroad that might be extremely difficult to negotiate.
- The route would add more than 20 miles (32 km) to the existing UP operations which would increase UP's operating cost.
- The alternative would require a sizable capital investment (approximately \$96 million) for double track (paralleling the BNSF track), signal and bridge construction, and other costs.
- The alternative has a smaller net HRI reduction.

- It appeared more difficult to obtain funding for this alternative.

It was determined that, due to the number and degree of problems anticipated with this concept, there would be no further analysis of this alternative.

Brazos River Route - The Brazos River Route alternative, based upon initial analysis, appeared to be a more viable solution and worthy of additional investigation and analysis. The Brazos River alternative involved the construction of approximately 20 miles (32 km) of new track along the eastern banks of the Brazos river in Brazos county. The new track would depart the existing UP alignment to the northwest of Bryan and follow a course that paralleled the Brazos river. In so doing, the new alignment would effectively free the community of the negative impacts of rail operations while still allowing the railroad to service the few industrial sites requiring access. Figure 14 presents a map of the proposed Brazos River Route.

The advantages of this alternative included, but were not limited to, the following:

- Elimination of approximately 33 miles (53 km) of railroad and potentially more than 88 grade crossings,
- Elimination (or in the case of north Bryan, drastic reduction) of UP operations through Bryan, College Station, and the Texas A&M University campus,
- Significant improvement in public safety, especially on the Texas A&M University campus,
- Significant improvement in motor vehicle traffic flow in the area,
- Improvement in safety and operating capacity and operations and maintenance costs for the UP,
- Improved environmental conditions, such as noise and vibration in the Bryan - College Station - Texas A&M University corridor,
- Eliminate the need for grade separated crossing projects in Bryan, College Station and the Texas A&M University campus,
- Promote “westward” development in Bryan-College Station and Texas A&M University, and
- Considered a viable project to obtain federal funding support from TEA 21 type programs.

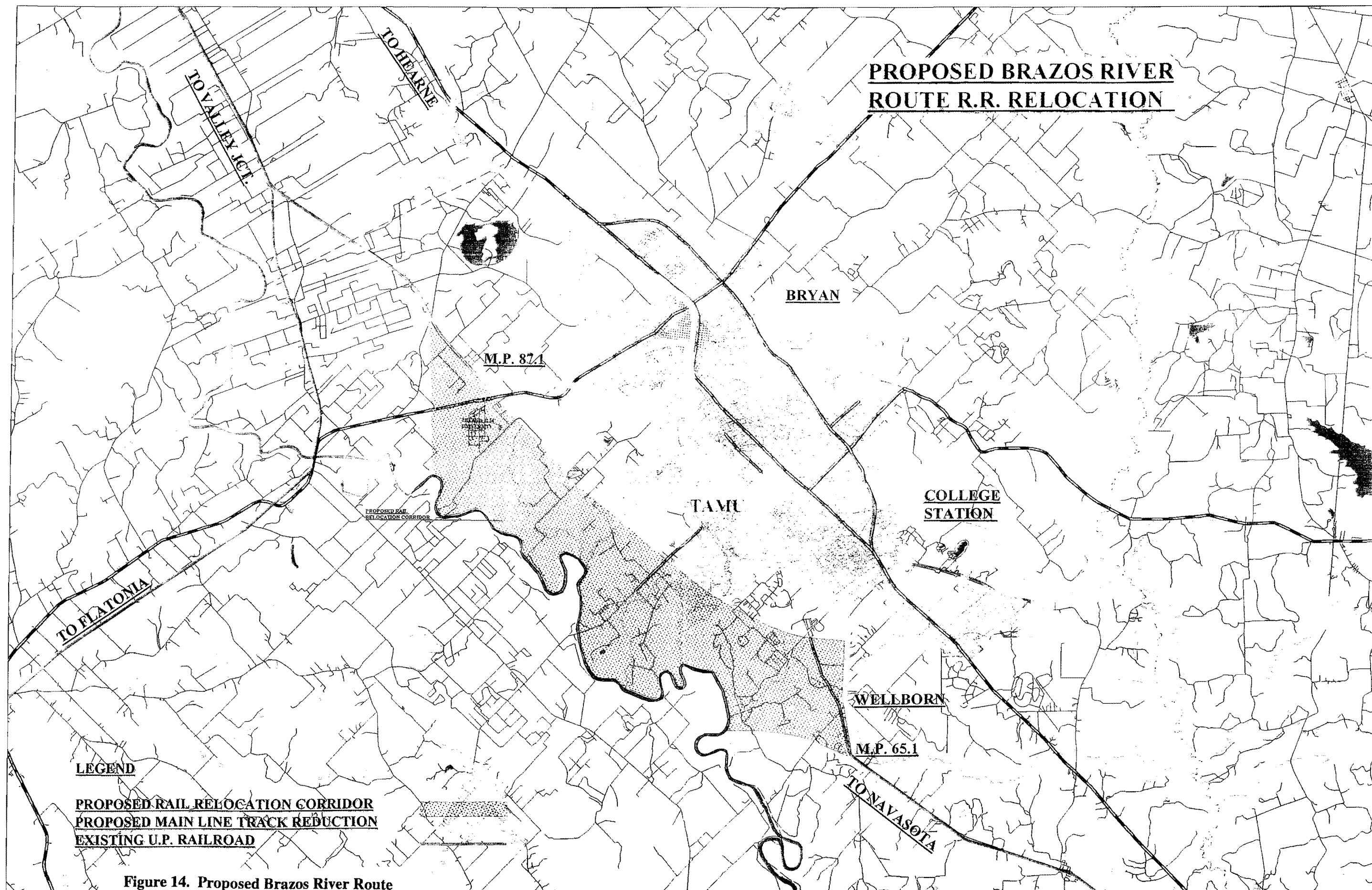


Figure 14. Proposed Brazos River Route

STEP 3: SELECT ALTERNATIVE SOLUTION

Urban rail rationalization is a complex task with many constituencies, pro and con. The relocation of a major rail line as one means of rationalizing urban rail operations, potentially impacts the community, businesses, traffic, land owners, and many others. To select a list of the alternative solutions, these impacts must be identified and evaluated to ensure that the cure for identified problems is not worse than the problems themselves.

Assess Highway User Impacts

The impact of the relocation of the UP to the Brazos River Route on grade crossings identified in previous sections of this report was significant. The number of crossings in the corridor, Hearne to College Station on both the UP and former SP, and College Station to Wellborn on the former SP, totals 101. By relocating the line to the Brazos River and abandoning the segments from Hearne to Bryan to Wellborn, 88 crossings were eliminated.

Safety is a key motivation in any crossing elimination program. The elimination of the 88 identified crossings in this study had the effect of reducing accident potential from an estimated 3.3 per year to 0.18. This estimated value is based on the Federal Railroad Administration's Accident Prediction Model, which considers both train and motor vehicle traffic, number of roadway lanes, roadway condition, warning system, and previous accident experience. Vehicle exposure is another measure of safety at highway-rail grade crossings and may be calculated as the product of trains and average daily traffic. Vehicle exposure was reduced from over 3.4 million per day to under 40,000 per day.

Assess Rail User Impacts

Railroad records indicated that there were approximately 24 rail-served businesses and several team tracks on the lines proposed for retirement as a result of the Brazos River relocation proposal. The Bryan area is a relatively large consuming area for aggregate paving materials. Two paving companies in Bryan received a total of 600,000 tons of material in a normal year (approximately 6,000 carloads), although that number declined to about 360,000 tons in 1997.

Another three of these 25 businesses used rail access with some frequency, primarily to receive bulk or raw materials such as fertilizers and grain. These businesses generated an estimated 350 carloads of primarily inbound rail traffic for the UP annually, or less than one car per day. These businesses

shipped outbound via truck, and also received bulk and raw materials inbound via truck as well. The effects of a potential elimination of rail service to these businesses needed to be quantified and addressed to the satisfaction of the UP and the affected businesses. In addition, there were some anecdotal indications that rail freight rates for some of these customers were increasing, adding an incentive to convert to truck.

Given the magnitude of the aggregate market in the Bryan area, the relocation proposal had to accommodate the retention of a spur serving Bryan and Industrial Park from Mumford. This still allowed the removal of train traffic from College Station, but would decrease the number of at-grade crossings eliminated under the proposal. In addition, retention of this track reduced the UP's estimated benefits for maintenance-of-way (MOW) savings and operating efficiencies by an undetermined amount.

Assess Neighborhood and Community Impacts

As with any major transportation project, the public is impacted in both positive and negative ways. Consequently, a careful and thorough evaluation of the public considerations was an integral part of the initial assessment of this project's merits.

In this case, it was determined that the benefits to the public far outweighed the associated costs or problems. The elimination of grade crossings is only one among several significant benefits to be cited, but is important in that crossing elimination has the multiple effects of improving safety, enhancing transportation efficiency, and adding to the aesthetic and environmental quality of life in Bryan-College Station. Relocation of the UP rail line has the added benefit of eliminating a growth-constraining impediment that effectively slows development to the west of the UP railroad. Utilities and transportation will be more easily installed, maintained, and operated in the absence of the existing UP rail line.

A third area of public consideration involves the safety issues associated with living and working around an operating railroad. The concerns expressed by Texas A&M University officials regarding the risks to university students, employees, and visitors need not be restated here, but the small likelihood of a railroad accident impacting Texas A&M University remains an important issue. Removal of the railroad was the only total solution to the problem of potentially catastrophic accidents.

Public opposition to the relocation has been restricted to those individual landowners most directly impacted. The proposed route is particularly attractive in that, by paralleling the Brazos River, potential impacts are held to a minimum. A preliminary assessment suggested that much of the proposed route was through agricultural areas and Texas A&M University property. The remaining portion of the route could affect some individual property owners; however, final designs will attempt to hold the impact to an absolute minimum. If this can be accomplished, the resulting new alignment will benefit far greater numbers of citizens than are adversely impacted.

Several environmental issues and concerns were assessed for the various alternatives considered in this study. The impacts to human health and the environment that might arise for any railroad modification, relocation, or construction project include:

- Noise;
- Vibration;
- Air Quality;
- Water Quality;
- Wetlands;
- Sensitive Receptors;
- Threatened and/or Endangered Species;
- Historical/Archeological Resources;
- Recreational Resources;
- Natural Resources; and,
- Hazardous Materials/Substances.

Given this level of potential impact, an EIS must be generated for any project where federal funds are used. An EIS may also be required to obtain Corps of Engineer permits for wetlands, stream encroachments (bridges), etc. Alternative projects employing grade separations and modifications to the existing track system should have fewer environmental issues.

Investigate Operating Company Costs

The financial impacts of the relocation proposal on the UP were assessed by determining the impacts on UP's operating activity in two general categories: "in-the-ground" and "above-the-ground." "In-the-ground" activity related to the disposition and maintenance of UP's right-of-way and track

structure, while “above-the-ground” related to the physical movement of freight along the right-of-way.

The proposal impacted “in-the-ground” activity in the following three areas:

- 1) Track abandonment and associated salvage value impacts on capital expenditures,
- 2) Track upgrades for lines proposed to handle higher volumes, and associated capital cost, and
- 3) Maintenance-of-way due to proposed changes in traffic densities.

Proposed changes to the track network also affected the cost and efficiency of UP’s “above-the-ground” or freight movement operations, due to changes in:

- 4) Distance traveled, which impacts transportation costs,
- 5) Transit times, which affect cycle times and productivity of UP’s power and equipment – impacted by altered transit times on the affected track network,
- 6) Track grades which impact transportation costs, and
- 7) Number of at-grade intersections with highway and city streets, affecting UP casualty costs.

Each of the seven assessments listed above were identified as to the type of financial impact it would have (i.e., income statement or balance sheet). It was determined that Items 1 and 2 are capital cost and balance sheet related items. Items 3, 4, 6, and 7 were determined to be income statement items. Item 5, the change in equipment productivity resulting from changes in transit or cycle times, could be viewed as either impacting the need for more or less equipment (balance sheet impact); or an opportunity to generate more or less revenue and operating income (income statement impact). In practical rail operating terms, it was determined that UP would most likely respond to such changes by increasing or decreasing revenue and operating income rather than resizing the fleet, thus Item 5 was measured as to its income statement effect.

In summary, it was expected that the proposed change to UP’s route structure under the Brazos River option would have a modest positive financial impact on the UP. Assessed values for Items 1 through 5 are likely to have a neutral to small positive impact to UP’s net operating income and balance sheet, such that UP’s net present value, or shareholder value, will go unaffected should this

proposal be enacted. Individual elements of UP's financial picture that would be most impacted include:

- Track Capital, which would realize a one-time savings of \$0.6 million;
- Distance-related transportation expenses, which would decrease \$0.3 million per year; and,
- Maintenance-of-way expenses should fall \$0.4 million per year.

Evaluate Alternatives

The Brazos River alternative essentially accomplished all of the requirements and goals set forth. The major advantages of the recommended alternative included the following:

- Dramatically Improve Public Safety - Eliminates approximately 88 HRIs in the cities of Bryan and College Station and the Texas A&M University campus. This alternative also eliminates the potential for a major derailment and/or catastrophic accident in the corridor and on the campus.
- Improve Safety and Operations on the Union Pacific Railroad - The project received the endorsement and support of Union Pacific Railroad.
- Reunify the Physical Properties of the Cities, Communities and University - This project would eliminate barriers to westward expansion and development of Bryan, College Station, and Texas A&M University.
- Dramatically Improve Quality of Life - The project would dramatically improve traffic flow, public mobility, and environmental factors such as noise, vibration, etc. and should receive public support.
- Project Fundability - The project received a \$25 million earmark in the federal transportation bill.

The proposed and recommended alternative solution had the elements needed to proceed to the next step and make the project a reality. Unlike alternatives developed in the past, this project was physically and financially feasible, had the cooperation and full support of Texas A&M University, the Union Pacific Railroad, and the local communities.

STEP 4: IMPLEMENTATION

After careful review of the potential solutions developed in the previous studies and the development and analysis of the new alternatives made available by recent events, it appeared that the “Brazos River Route” alternative was the most desirable and realistically viable solution. The Brazos River Route appeared to satisfy the majority of the requirements of Texas A&M University, UP, and the public. Some of the major advantages of this alternative included the following:

- Elimination of approximately 88 grade crossings and dramatic improvement in public safety in the Bryan – College Station – Texas A&M University corridor;
- Dramatic improvement in traffic flow and public mobility;
- Elimination of the potential for a major derailment and/or catastrophic accident in Bryan, College Station, and especially on the Texas A&M University campus;
- Improvement in UP’s railroad operations in the area;
- Reunification of the physical properties of the cities of Bryan and College Station and Texas A&M University campus, and elimination of any physical barriers or restraints to westward development; and,
- Eligible and viable candidate for available public funding.

Based upon the analysis of the Brazos River Reroute alternative proposal and favorable endorsement of the project concept by UP, TTI strongly recommended that Texas A&M University pursue the project. TTI further recommended that an aggressive schedule be formulated and pursued by Texas A&M University to meet with the local MPO, TxDOT, and critical public and political officials.

Prepare Engineering Designs

The Brazos River Route alternative would require capital improvements to efficiently handle current and future UP train traffic. The new line would require right-of-way property on the east bank of the Brazos River between Smetana and Wellborn. A 100 foot (30 m) right-of-way was included for 16 miles (26 km) and a 200 foot (60 m) right-of-way (grading requirements) was included for 4 miles (6 km). The 1997 new construction estimate for a 60 mph (97 kph), Centralized Train Control (CTC) passing track was \$65 million. The estimate included property, earthwork, bridges, utilities, trackage, signals, engineering, and miscellaneous.

Prepare Detailed Cost Estimate

Table 23 presents a detailed cost estimate for the Brazos River Route alternative.

Table 23. Proposed Brazos River Route Cost Estimates

Item	Description	Quantity	Unit	Unit Cost	Extended
1	Right-of-way	100	AC	\$10,000	\$1,000,000
		200	AC	\$2,500	\$500,000
	Exceptions	1	LS	\$2,500,000	\$2,500,000
2	Clear & Grub	100	AC	\$5,000	\$500,000
		200	AC	\$2,500	\$500,000
3	Utility Relocation	1	LS	\$750,000	\$750,000
4	Earthwork	800,000	CY	\$9	\$7,200,000
		1,500,000	CY	\$3	\$4,500,000
5	Subballast	120,000	CY	\$12	\$1,440,000
6	Soil Stabilization	1	LS	\$1,000,000	\$1,000,000
7	Fence	212,000	LF	\$2	\$424,000
8	Railroad Bridges	2,000	TF	\$3,000	\$6,000,000
9	Culverts Large	1,500	TF	\$150	\$225,000
	Small	1,800	TF	\$150	\$90,000
10	Minor Roadway Grade Separation	12	EA	\$300,000	\$3,600,000
11	Major Grade Separation	2	EA	\$8,000,000	\$16,000,000
12	Track Mainline	105,072	TF	\$150	\$15,760,800
	Siding	10,000	TF	\$125	\$1,250,000
	Switches	4	EA	\$80,000	\$320,000
13	Signal (CTC) Communications, etc)	20	TM	\$300,000	\$6,000,000
14	Shipper Mitigation	1	LS	\$1,000,000	\$1,000,000
Subtotal					\$70,559,800
Engineer 4%					\$2,822,392
Contingency 4%					<u>\$2,822,392</u>
TOTAL					\$76,204,584

Secure Funding

As shown in Table 24, the capital required to relocate the UP track system to the Brazos River Route, abandon the existing track system, and ultimately eliminate 88 grade crossings in Bryan, College Station, and the Texas A&M University campus was estimated to cost approximately \$76 million. The cost estimate included approximately \$65 million to construct the new 20 mile Brazos River Route track system and abandon the existing system, and approximately \$10 million for other

expenses including relocation/restitution of existing UP customers, potential extraordinary right-of-way issues, and other costs expected but not identifiable.

Public, private, and political support has been essential to the success (to date) of this project and for the procurement of public funding. Support on the local level was paramount. The local Metropolitan Planning Organization (MPO) served as the funding platform and should ultimately become the recipient of federal and state funds for the project. It was imperative that the TTI project team and Texas A&M University officials obtain the participation and support of the local MPO officials and the communities affected by the project.

This was accomplished through numerous meetings, briefings, and letters to key officials. Local and state political leaders, as well as Texas' U. S. Representatives and senators were informed of the project and their support was solicited. These efforts culminated in an earmark in the current transportation bill dedicated to rail relocation in the Bryan-College Station area.

U.S. Senator Gramm was instrumental in placing a \$25 million line item in the "TEA 21" bill which subsequently passed both houses of Congress. With a portion of the funding secure, the task remains to identify other funding, sufficient to accomplish the relocation. It is expected that both Union Pacific Railroad and Texas A&M University will contribute to the relocation in amounts commensurate to the benefits they derive from relocation. The affected communities, Bryan and College Station, will be the other possible contributors, as will the state.

CHAPTER 4. CHARACTERIZATION OF THE RAIL SYSTEM OF TEXAS

Chapter 4 presents an overview of the components of the rail system in Texas. It addresses the Class I railroads, the shortlines, Amtrak, rail interactions with Mexico, and commodity flow information. Maps of the 25 TxDOT districts displaying railroads, highways, cities, and counties are provided in Appendix G.

DESCRIPTION OF CLASS I RAILROADS

Texas currently has three Class I railroads operating within its borders; the Union Pacific Railroad (UP), headquartered in Dallas, Texas, the Burlington Northern Santa Fe Railroad (BNSF), headquartered in Fort Worth, Texas, and the Kansas City Southern Railroad (KCS), headquartered in Kansas City, Missouri. The Class I rail system within Texas is shown in Figure 15.

Recent consolidations in the rail industry, specifically the Burlington Northern-Santa Fe and the Southern Pacific (SP) - Union Pacific mergers have reduced the number of railroads operating in Texas, but not the demand for rail freight service. Texas experienced a 13 percent increase in exports in 1997 and the demand for rail transportation is currently at an all time high. Class I railroads carry large volumes of freight in Texas and provide an important link in the state's transportation system. Industry and port activity in Texas would be seriously curtailed without the freight capacity provided by rail. Several commodities, most notably petrochemicals, coal, and aggregates, rely on this capacity and the relatively low rates provided by the railroads for economic transportation services.

Table 24 shows the amount of freight moved by Texas Class I railroads across standard commodity classifications. The quantities are shown by originating, terminating, and overhead categories. Were it not for rail transportation in Texas, these volumes would represent the equivalent of 30 to 40 million additional truck loads on Texas' roadways.

Importantly, Texas serves as a major crossroads for national and international rail freight movements. The state's geographic location adjacent to Mexico means that North-South movements intersect with significant East-West trade to make Texas a major junction for national and international trade. NAFTA is serving to increase the volume of both rail and truck traffic moving

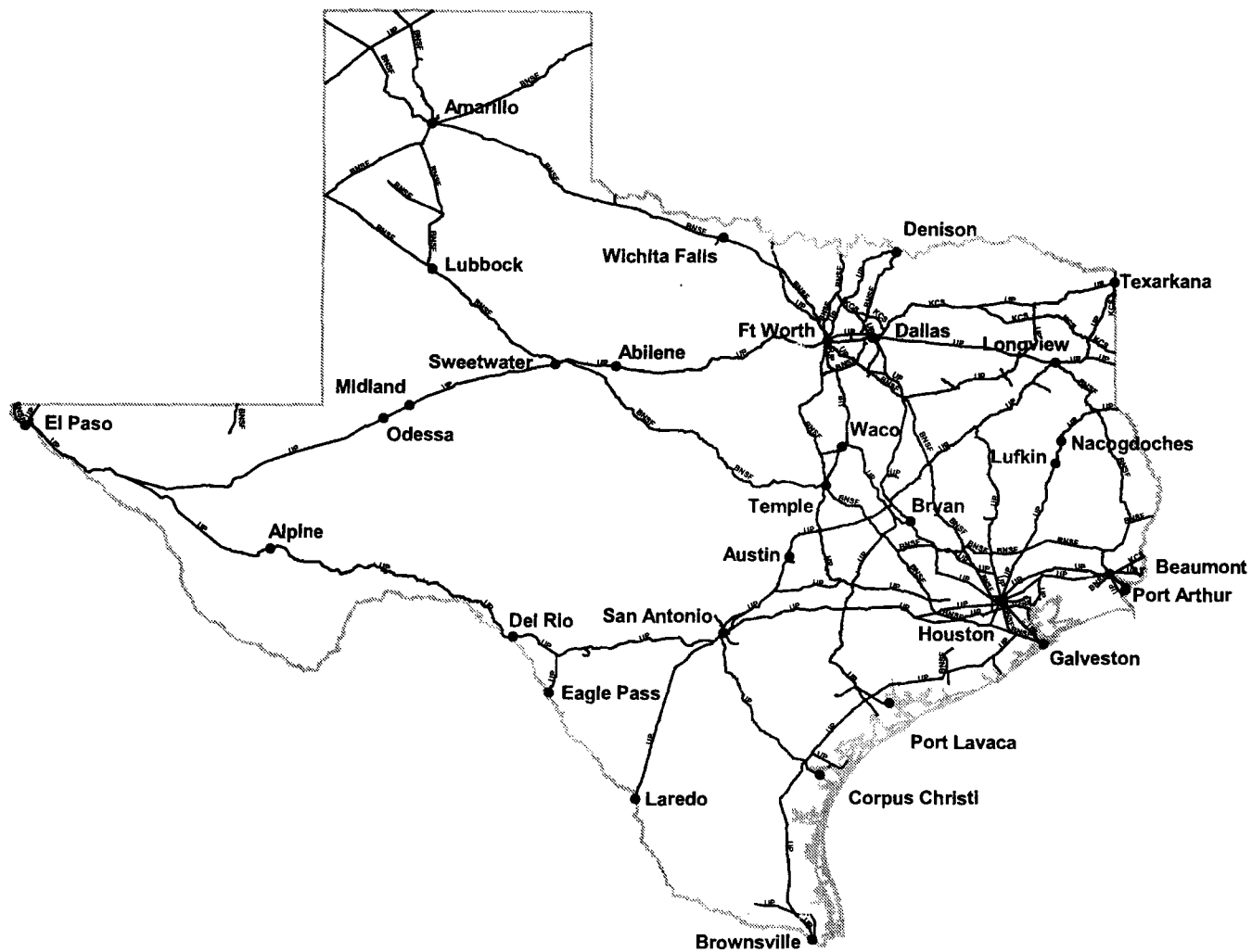


Figure 15. Texas Class I Railroad System

between Mexico and U.S. markets in the Mid-west creating significant policy questions within TxDOT regarding how best to accommodate commercial traffic on Texas-financed roadways. The traffic mitigating role of freight movement by rail is therefore of increasing importance to TxDOT and planning efforts must be construed to effectively consider the role of railroads.

Table 24. Total Revenue of Freight - All Class I Railroads

Code	Commodity	Originating Freight		All Other Freight		Terminating Freight	
		Carloads	Tons	Carloads	Tons	Carloads	Tons
1	Farm products	48,061	3,950,085	317,424	27,800,777	138,037	13,243,334
8	Forest products	14	739	1,133	51,090	482	11,295
9	Fresh fish and other marine products	20	795	2,149	99,146	189	8,227
10	Metallic ores	4,762	452,939	20,945	2,024,865	4,822	470,519
11	Coal	15,578	1,541,762	458,613	47,950,443	323,944	33,954,289
13	Crude PETRO, NAT gas & NAT GSLN	2,445	204,764	2,553	242,533	13	1,095
14	Nonmetallic minerals except fuels	190,905	18,399,701	125,278	11,624,302	134,441	12,716,038
19	Ordinance and accessories	147	7,735	738	53,487	151	10,323
20	Food and kindred products	68,924	4,238,031	306,370	17,209,630	82,281	5,488,118
21	Tobacco products	126	4,947	290	6,394	112	2,462
22	Textile mill products	343	6,602	3,947	82,636	850	13,699
23	Apparel and other finished textile PRD. INC knit	1,173	34,141	9,731	275,323	1,120	29,820
24	Lumber and wood products, except furniture	24,654	1,796,867	73,350	5,059,567	26,846	1,896,126
25	Furniture and fixtures	925	17,362	12,585	238,324	1,128	21,802
26	Pulp, paper, and allied products	30,113	1,433,701	128,222	6,951,248	29,702	1,633,525
27	Printed matter	334	6,276	11,597	233,900	1,773	41,855
28	Chemicals and allied products	394,448	34,465,263	311,456	26,126,915	118,539	10,415,586
29	Petroleum and coal products	119,253	8,884,237	87,554	6,700,273	71,584	5,387,812
30	Rubber and misc. plastic products	9,822	194,122	27,727	631,272	3,912	88,737
31	Leather and leather products	23	487	551	11,013	24	365
32	Stone, clay, glass and concrete products	53,469	4,599,508	77,415	5,943,340	29,032	2,366,584
33	Primary metal products	41,838	3,379,019	121,988	9,053,311	50,244	4,183,147
34	Fabr Metal Prd. Exc Ordn. Machy and Transp	2,368	88,085	12,796	305,328	1,653	48,061
35	Machinery, except electrical	1,809	43,466	10,896	288,195	1,788	63,672
36	Elec. machinery, equip., and supplies	8,819	132,770	35,715	619,307	2,731	68,219
37	Transportation equipment	132,688	2,319,006	398,177	8,430,297	103,027	1,861,805
38	Instruments, PHOT and optical GD, watches and clocks	129	2,649	1,365	21,321	360	3,724
39	Misc. products of manufacturing	1,835	35,069	12,381	259,365	1,973	35,174
40	Waste and scrap materials	42,481	3,010,383	57,520	3,639,902	30,161	2,195,150
41	Misc. freight shipments	25,464	261,744	41,050	712,844	5,561	146,412
42	Containers, shipping, returned empty	40,830	144,340	63,385	234,503	36,051	93,067
44	Freight forwarder traffic	13,936	240,439	159,183	2,570,720	6,423	94,270
45	Shipper association or similar traffic	973	33,820	8,834	241,022	704	17,272
46	Misc. mixed ship. Exc Fwdr & Shpr Assn	294,159	6,573,514	1,589,940	30,668,286	209,443	4,079,994
48	Waste, hazardous matl. or subst	977	58,731	3,058	206,555	215	17,933
	Grand Total	1,573,845	96,563,099	4,495,916	216,567,434	1,419,316	100,709,511

(Source: State Statistics, Annual Report, submitted by the railroads to the Railroad Commission of Texas)

Since the merger of the UP and SP in 1996, Texas rail service has been dominated by UP. The combination of these two railroads formed the largest rail network in the state, with more than 6,300 miles (10,100 km) of track. UP, also by virtue of this merger, became the largest railroad in the country with more than 38,000 miles (61,000 km) of track spanning the western U.S. from the Mississippi River to the Pacific Ocean. Service problems encountered by UP following the merger with SP have served to highlight the importance of rail freight transportation to Texas and to the nation as a whole. There remains a heated debate among both public and private-sector critics of the merger and the UP and its supporters concerning the level of rail competition in the state and its impact on rates, service, and investment. With the recent announcement by the U.S. DOT that it does not support forced sale of UP lines, only time will tell if the UP/SP merger is to the ultimate benefit of Texans.

Like the merger of UP and SP, the merger of Burlington Northern and Santa Fe in 1995 led to the formation of a large, contiguous rail system. BNSF owns approximately 2,700 miles (4,300 km) of line in Texas and operates over an additional 1,971 miles (3,127 km) of track under trackage rights agreements. Nationwide, BNSF operates in 28 states over 34,000 route miles (55,000 km) in much the same territory as UP — west of the Mississippi to the Pacific Ocean.

The dominance of UP in route miles within Texas translate into dominance of the business statistics that describe the Class Is in the state. In 1995, the combined operating revenues for UP/SP exceeded \$1.5 billion, more than twice that of KCS. UP/SP's gross profit during the same time period more than doubled the combined in-state profit of BNSF and KCS.

Table 25 presents these numbers in addition to revenue ton-miles, locomotive miles, and carloads.

Rail Consolidations and Abandonments - A Changing Rail Industry

Between 1988 and 1995, Texas was served by five Class I railroads; the UP; the SP; the BN; the AT &SF; and the KCS. The consolidation of Texas' railroads mirrors the trend seen throughout the U.S. over the last 18 years. In 1980, there were more than 40 Class I railroads in the U.S. This number has declined to seven today, with an additional reduction imminent as the eastern railroads, NS and CSX, implement the splitting up of Conrail.

Table 25. Class I Railroad Profitability, Revenue Ton-Miles, Locomotive Miles, and Carloads

Profitability of Class I Carrier Operations in Texas (thousands)							
Railroad	Operating Expenses					Operating Revenues	Gross Profit
	Transportation Operations	Maintenance of Equipment	Maintenance of Way	General and Administrative	Total Operating Expenses		
UP	574,814	337,526	199,673	110,549	1,222,562	1,596,920	374,358
BNSF	280,859	168,866	103,629	53,656	607,010	765,855	158,845
KCS	22,452	12,548	9,435	6,510	50,945	69,777	18,832

Operating Revenues Per Ton-Mile in Texas for Class I Carriers			
Railroad	Operating Revenues (thousands)	Ton-Miles Freight (thousands)	Revenue Per Ton-Mile
UP	1,596,920	65,168,048	0.0245
BNSF	765,855	33,802,226	0.0227
KCS	69,777	2,085,137	0.0335

Locomotive and Train Mile Information for Class I Railroads in Texas						
Railroad	Locomotive Miles					
	Road Service	Train Switching	Yard Switching	Total Locomotive Unit Miles	Total Train Miles	Total Freight Ton-Miles (thousands)
UP	51,391,777	2,155,591	10,728,499	64,275,867	23,144,482	65,168,048
BNSF	32,664,068	941,425	1,843,009	35,448,502	10,902,829	33,802,226
KCS	2,181,665	47,574	449,066	2,678,305	865,236	2,085,137

Total Carload Traffic								
Railroad	Originating Freight		All Other Freight		Terminating Freight		Total Traffic	
	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons
UP	1,089,617	69,069,048	1,998,300	108,794,08	496,734	33,377,658	3,087,917	177,863,13
BNSF	380,479	21,068,981	2,175,639	85,383,368	735,114	54,086,747	2,556,118	106,452,34
KCS	103,749	6,425,070	321,977	22,389,981	187,468	13,245,106	425,726	28,815,051
TOTAL	1,573,845	96,563,099	4,495,916	216,567,43	1,419,316	100,709,511	6,068,761	313,130,53

(Source: State Statistics, Annual Report, submitted by the railroads to the Railroad Commission of Texas)

The Staggers Rail Act of 1980, passed during President Reagan's administration, set the stage for deregulation of the rail industry and forced railroad management to confront free-market forces. The state of the rail industry in 1980 was abysmal. Regulation and fierce competition from the trucking industry had driven many railroads to the brink of bankruptcy and some, most notably the Penn Central and the New York Central, over the edge. The failure of these two eastern railroads and the subsequent bail-out by the U.S. Government, a process which gave birth to Conrail, cost taxpayers more than \$7 billion and highlighted the importance of a healthy rail industry to the state economies which they serve. Deregulation eliminated government rate controls and streamlined the process whereby railroads could abandon unprofitable lines.

The resulting market-driven environment brought about a period of rapid and unprecedented change in the industry. Shipping rates were made more competitive and railroads began to reclaim some of the business lost to an intercity trucking industry, which had been launched in the 1960s by the interstate highway system and soared to freight dominance in the 70s and 80s. At the same time, the abandonment of under-used or unprofitable rail lines increased to disturbing levels. Between 1980 and 1986, 18,000 miles (29,000 km) of rail line was removed from the nation's rail system. Between 1981 and 1993, Texas lost more than 2,000 miles (3,200 km) of railroad.

The abandonment of unprofitable rail lines has had several affects, both nationally and in Texas. One affect has been the dramatic growth in the shortline rail industry. There are now more than 500 such carriers in the U.S., and they transport a significant quantity of freight that would otherwise be relegated to public highways. Another affect of rail abandonments has been the loss of service to rural shippers, who have been forced to use trucking as the only viable, alternative mode. This has increased costs to shippers, some of whom have been forced to cease business or relocate, and to taxpayers in the form of higher highway maintenance expenses.

UNION PACIFIC RAILROAD

Company Profile

Union Pacific Railroad was founded in 1862 and was one of the first railroads to link eastern markets to the growing western part of the nation. Its route structure as of 1930 was restricted to the mid-continent region of the U.S. with eastern terminus in Chicago and St. Louis. Providing east-west shipping in Kansas, Nebraska, Colorado, and Wyoming, the UP reached to Los Angeles, San Francisco, and north to Washington State. Historically considered a relatively small western

railroad, UP has thrived on the shipping of coal and survived timely acquisitions to become a dominant, rail transportation provider. Other than a short-lived appearance in the state in the 1880s, with the acquisition of the Denver and Gulf Coast Railroad, Union Pacific made its permanent appearance in Texas with the 1983 acquisition of the Missouri Pacific (MOPAC). The MOPAC added markets in Texas, Oklahoma, Kansas, Arkansas, and Louisiana, significantly expanding the reach, resiliency, and profitability of the system. Union Pacific Railroad established a larger presence in Texas when it acquired the Missouri-Kansas-Texas Railroad (MKT) in 1988. Following this addition, UP operated in most major Texas markets including Houston, Dallas-Ft. Worth, Austin, San Antonio, and El Paso.

Today, Union Pacific is the largest railroad in the U.S., with operations in 22 states. Recent reorganization of the company, partially in response to service problems encountered following the merger with Southern Pacific Railroad, has split UP into three operating regions. These regions, headquartered in Houston, Omaha, and Los Angeles, will decentralize operations and maintenance and place day-to-day decision-making closer to field units.

Route Characteristics and Commodity Movements

UP's principal route structure blankets the eastern one-third of Texas, with major lines along the Gulf Coast. UP also has a significant presence in Dallas and Houston. Figure 16 shows the current UP route structure from a statewide perspective.

The tonnage chart for UP depicts annual tonnage across principal lines within Texas. These are shown in Figure 17. This map, provided by the railroad, also includes data regarding the weight of rail and track categories as defined originally by the Interstate Commerce Commission (ICC) and now maintained by the Surface Transportation Board (STB) of the U.S. Department of Transportation.

The commodities moved by UP in Texas are displayed in Table 26. A review of the table confirms the role UP plays in many markets, particularly the Gulf Coast Petro-Chemical market.

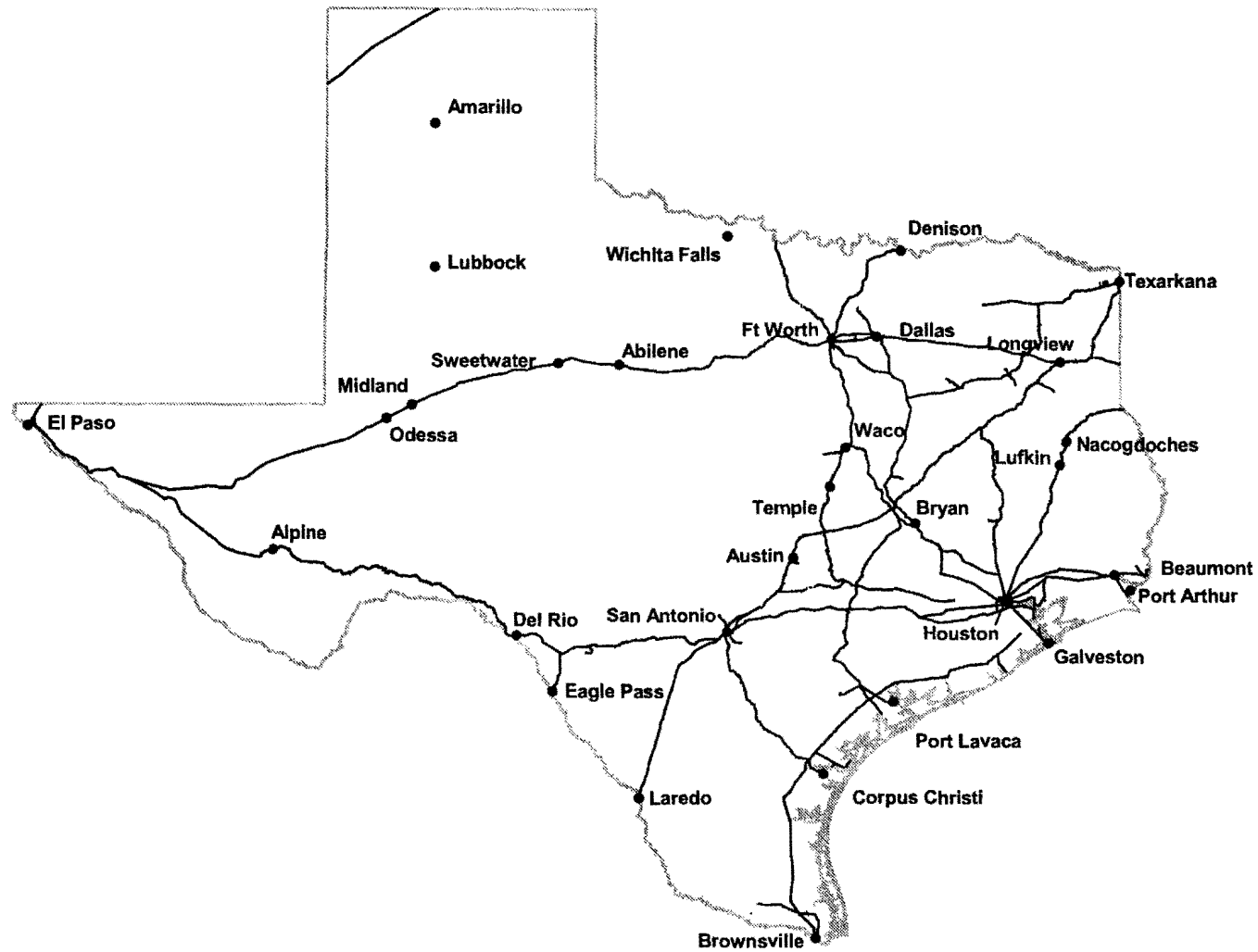


Figure 16. UP System Map for Texas

This sector of the Texas economy, perhaps more than any other, is dependent on rail transportation for economic viability. In 1996, UP moved more than 26 million tons of chemicals to markets across the country. Coupled with more than 16 million tons of non-metallic minerals (sand, crushed rock) and the delivery of coal to the Texas utility industry, UP provides an irreplaceable transportation fixture in the state.

Table 26. Revenue Freight Carried in Texas - UP 1996.

Code	Commodity	Originating Freight		All Other Freight		Terminating Freight	
		Carloads	Tons	Carloads	Tons	Carloads	Tons
1	Farm products	15,025	1,176,844	162,706	15,670,701	27,202	2,630,952
8	Forest products	14	739	272	5,587	28	960
9	Fresh fish and other marine products	20	795	2,138	98,676	187	8,063
10	Metallic ores	3,690	349,782	18,143	1,757,406	4,161	410,748
11	Coal	2,941	275,642	137,823	14,305,722	33,459	3,495,828
13	Crude PETRO, NAT gas & NAT GSLN	1,842	148,241	495	43,761	11	900
14	Nonmetallic minerals except fuels	171,321	16,612,630	76,571	7,265,126	86,916	8,219,328
19	Ordinance and accessories	71	4,703	336	19,861	93	5,646
20	Food and kindred products	40,248	2,323,885	140,759	9,512,500	22,036	1,522,131
21	Tobacco products	125	4,928	58	1,879	26	882
22	Textile mill products	228	4,381	1,300	40,150	215	5,320
23	Apparel and other finished textile PRD. INC knit	807	28,030	7,644	247,007	710	23,380
24	Lumber and wood products, except furniture	12,880	989,638	37,264	2,682,163	8,629	643,318
25	Furniture and fixtures	447	7,658	5,168	139,497	214	5,510
26	Pulp, paper and allied products	14,463	747,677	61,876	3,622,161	14,797	894,472
27	Printed matter	135	2,917	3,271	77,639	512	18,575
28	Chemicals and allied products	302,733	26,551,635	176,457	14,780,657	60,207	5,274,840
29	Petroleum and coal products	64,565	4,828,603	50,220	3,753,380	24,769	1,810,168
30	Rubber and miscellaneous plastic products	8,653	172,827	14,068	401,301	1,867	56,109
31	Leather and leather products	21	466	327	7,433	8	151
32	Stone, clay, glass & concrete products	34,979	3,121,579	41,946	3,336,712	11,270	958,814
33	Primary metal products	26,023	2,043,140	63,907	5,079,177	32,316	2,683,291
34	Fabr Metal Prd. Exc Ordn. Machy and Transp	1,843	76,142	5,482	177,954	586	23,981
35	Machinery, except electrical	1,438	34,891	5,057	166,630	507	20,535
36	Electrical machinery, equipment, and supplies	6,984	107,049	15,943	387,783	1,765	51,044
37	Transportation equipment	124,417	2,212,342	277,747	5,782,199	52,761	788,309
38	Instruments, PHOT and optical GD, watches and clocks	97	2,086	361	10,670	26	580
39	Misc. products of manufacturing	1,478	30,875	6,068	174,704	976	21,443
40	Waste and scrap materials	32,902	2,345,721	34,800	2,314,868	19,276	1,469,818
41	Misc freight shipments	23,942	215,692	33,008	490,527	3,407	92,809
42	Containers, shipping, returned empty	25,171	94,939	23,313	79,381	12,823	5,442
44	Freight forwarder traffic	1,564	22,782	8,753	149,570	31	1,234
45	Shipper association or similar traffic	951	33,439	5,501	188,614	220	8,445
46	Misc mixed shipment Exc Fwdr & Shpr Assn	167,233	4,476,818	577,944	15,903,163	74,723	2,224,632
48	Waste, hazardous matl or subst	366	19,532	1,574	119,526	0	0
	Grand Total	1,089,617	69,069,048	1,998,300	108,794,085	496,734	33,377,658

(Source: State Statistics, Annual Report, submitted by the railroads to the Railroad Commission of Texas)

Facilities

Terminals:

Major: El Paso, Fort Worth, and Houston

Others: Angleton, Baytown, Beaumont, Bloomington, Brownsville, Corpus Christi, Dalhart, Dallas, Dayton, Eagle Pass, Freeport, Galveston, Harlingen, Hearne, Laredo, Longview, Odem, Orange, San Antonio, Taylor, Texarkana, Tyler, Victoria, and Waco

Intermodal Facilities:

Dallas (Miller Yard & Mesquite), El Paso, Houston (Settegast, Englewood, & Barbour's Cut - Strang Yard), Laredo, and San Antonio (SoSan & East Yard)

Storage-In-Transit (SIT) Facilities:

Baytown, Beaumont (Amelia), Dayton, and Houston (Spring - Lloyd Yard)

Automotive Facilities:

Houston (Spring - Lloyd Yard) and Midlothian

Maintenance Facilities:

Major Diesel Locomotive Repair: El Paso and Fort Worth

Major Car Repair: Palestine

Others: Dallas, Hearne, and Houston

Crew Station:

Big Sandy, Childress, Dalhart, Dallas, El Paso, Fort Worth, Hearne, Houston, Longview, Marshall, San Antonio, Sweetwater, Toyah, and Tyler

International Gateways:

Brownsville, Eagle Pass, El Paso, and Laredo

Port Access:

Beaumont, Brownsville, Freeport, Corpus Christi, Galveston, Houston, Orange, Port Arthur, and Port Lavaca

Employees

Union Pacific, as the state's largest railroad, has more than 8,700 employees in Texas. This translates into a payroll of \$522 million per year. In addition, UP impacts the Texas economy by purchasing goods and material on the order of \$350 million per year.

BURLINGTON NORTHERN SANTA FE RAILROAD

Company Profile

Burlington Northern (BN), prior to its merger with the Santa Fe, had a relatively minor role in Texas. Its lines were restricted to the northwestern portion of the state, Amarillo, Texas, to Fort Worth being one segment of the line, and Fort Worth to Houston and on to Galveston being the other. In addition, there was a major connection from Tulsa, Oklahoma, into Dallas. BN had a significant role in moving agricultural products to and from the north and northwestern portion of the State to the port facilities on the Gulf Coast. It also had, and still has as BNSF, a major portion of the coal traffic into the Houston area.

With the merger of BN and the SF, significant new lines were brought under one umbrella in Texas. The new BNSF was, at the time of the merger, the largest rail system in the country with more than 34,000 route miles (54,000 km). Santa Fe added capacity and routes to BN in the Texas panhandle via connections in Oklahoma, it added routes into the Dallas-Ft. Worth metroplex, it added a route from Lubbock to Galveston, and it provided north-south trackage from Longview to the Orange-Beaumont region of the state, plus connections east from Navasota to Conroe and Conroe to Orange. The new markets, capacity, locomotives, and personnel made BNSF a formidable transportation force in Texas and played a key role in encouraging UP to merge with SP the following year.

Route Characteristics and Commodity Movements

A review of the major BNSF corridors in Texas, presented in Table 27, along with daily train activity, reveals six main segments carrying significant traffic. These corridors connect major cities located statewide as seen in Figure 18.

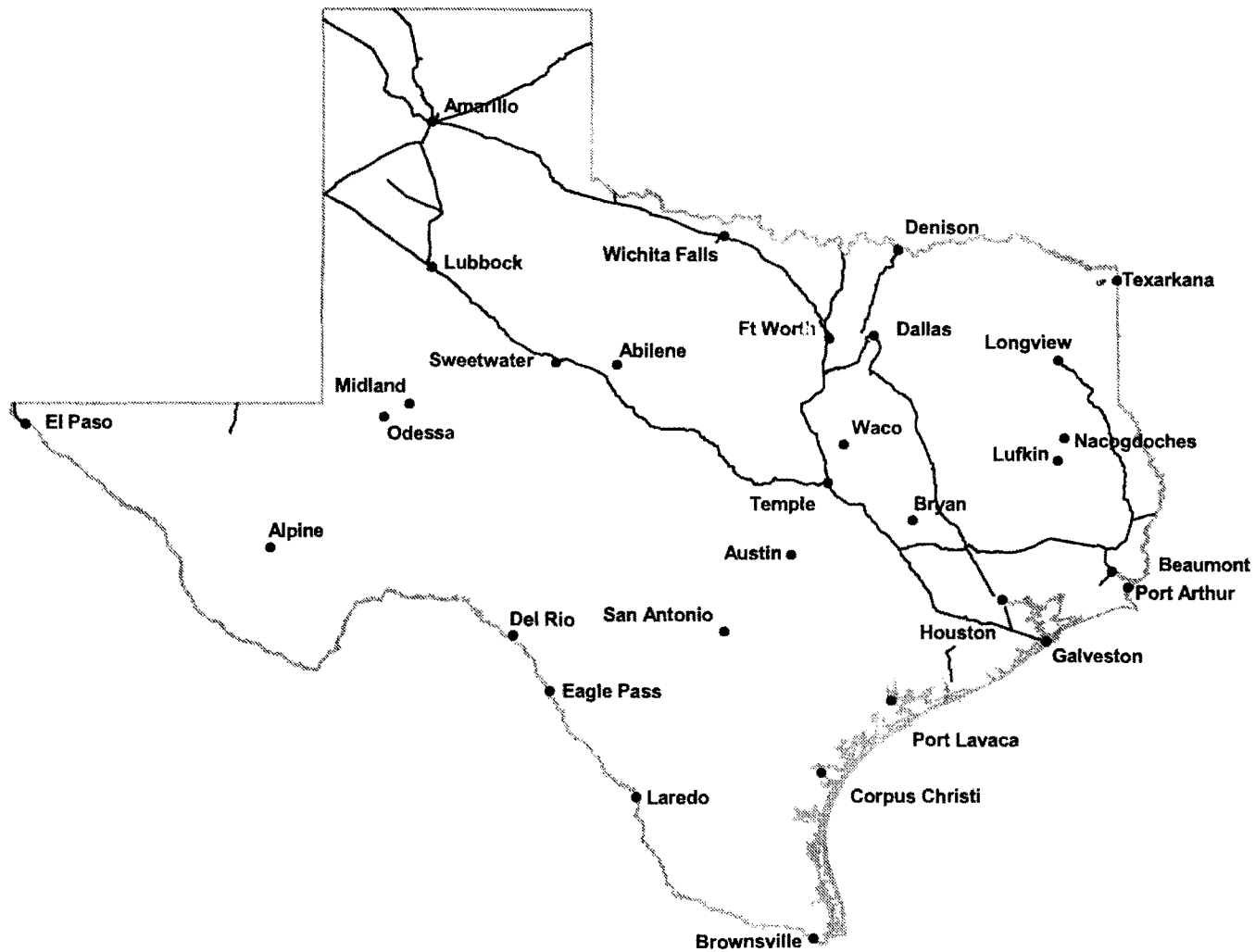


Figure 18. BNSF System in Texas

Table 27. BNSF Major Corridors in Texas

BNSF Corridor	Trains Per Day
From Clovis, New Mexico (NM) through Amarillo toward Kansas City	73
From Clovis, NM through Lubbock to Temple	24
From Denver, through Amarillo and Wichita Falls to Ft. Worth	24
From Ft. Worth through Teague to Houston	14
From Gainesville, through Ft. Worth to Temple	36
From Temple, through Sealy to Galveston	34

BNSF plays a principal role in the transport of coal to Texas utilities. As can be seen in Table 28, BNSF delivers more than 24 million tons of coal from the Powder River Basin in Wyoming and other suppliers to Texas. The railroad also plays a key role in the movement of agricultural commodities, as evidenced by the delivery of more than 9 million tons of farm products to the state in 1996.

Facilities

Terminals:

Amarillo, Beaumont, Bellville, Borger, Brownwood, Caldwell, Conroe, El Paso, Fort Worth (Fort Worth, Alliance & Saginaw), Gainesville, Galveston, Hereford, Houston, Longview, Plainview, Silsbee, Somerville, Sweetwater, Teague, Temple, and Wichita Falls

Intermodal Facilities:

Amarillo, Borger, El Paso, Fort Worth (Alliance), Houston (Houston & Pearland), and Laredo

Storage-In-Transit (SIT) Facilities:

Fort Worth and Houston (Pearland)

Automotive Facilities:

Fort Worth (Alliance) and Houston

Maintenance Facilities:

Amarillo and Fort Worth

Table 28. Revenue Freight Carried in Texas - BNSF 1996

Code	Commodity	Originating Freight		All Other Freight		Terminating Freight	
		Carloads	Tons	Carloads	Tons	Carloads	Tons
1	Farm products	32,789	2,753,987	122,175	9,410,619	95,573	9,296,932
8	Forest products	0	0	235	20,217	1	50
9	Fresh fish and other marine products	0	0	11	470	2	164
10	Metallic ores	1,072	103,157	2,406	232,271	641	59,333
11	Coal	1	25	247,746	26,203,501	227,702	24,128,631
13	Crude PETRO, NAT gas & NAT GSLN	0	0	15	1,015	0	0
14	Nonmetallic minerals except fuels	19,087	1,740,755	35,384	3,116,235	45,374	4,295,988
19	Ordinance and accessories	71	3,014	336	25,527	58	4,677
20	Food and kindred products	26,772	1,852,827	145,065	6,780,939	51,597	3,577,460
21	Tobacco products	0	0	146	2,935	0	0
22	Textile mill products	80	1,502	1,777	29,767	28	897
23	Apparel and other finished textile PRD. INC knit	162	2,056	1,787	23,874	154	2,673
24	Lumber and wood products, except furniture	10,934	754,316	20,301	1,212,070	13,275	944,125
25	Furniture and fixtures	403	8,658	7,220	96,437	791	14,880
26	Pulp, paper and allied products	9,982	383,357	33,003	1,496,900	7,078	416,694
27	Printed matter	172	2,891	8,041	151,074	982	18,374
28	Chemicals and allied products	79,946	7,002,276	95,552	8,037,098	45,235	4,146,126
29	Petroleum and coal products	16,137	1,184,456	21,959	1,719,933	10,997	862,860
30	Rubber and miscellaneous plastic products	484	10,554	10,955	186,697	766	10,080
31	Leather and leather products	2	21	207	3,352	0	0
32	Stone, clay, glass & concrete products	15,818	1,450,786	23,959	1,831,890	13,796	1,254,796
33	Primary metal products	12,164	992,635	54,080	3,658,768	17,291	1,471,284
34	Fabr Metal Prd. Exc Ordn. Machy and Transp	299	9,621	7,109	120,565	992	22,607
35	Machinery, except electrical	265	7,166	5,422	111,712	1,223	41,870
36	Electrical machinery, equipment, and supplies	1,741	24,406	19,320	224,420	695	12,452
37	Transportation equipment	7,935	99,098	118,756	2,607,760	49,229	1,058,963
38	Instruments, PHOT and optical GD, watches and clocks	15	257	875	8,083	295	2,415
39	Miscellaneous products of manufacturing	212	2,462	5,709	74,957	509	6,995
40	Waste and scrap materials	7,987	551,599	17,006	1,009,401	9,713	689,837
41	MISC freight shipments	1,342	39,662	6,408	171,843	1,849	47,231
42	Containers, shipping, returned empty	13,946	47,604	36,800	151,564	22,306	86,026
44	Freight forwarder traffic	12,336	217,038	150,135	2,416,969	6,376	92,815
45	Shipper association or similar traffic	20	340	3,193	49,997	361	6,737
46	Misc mixed shipment Exc Fwdr & Shpr Assn	107,694	1,783,256	971,062	14,107,479	110,010	1,494,842
48	Waste, hazardous matl or subst	611	39,199	1,484	87,029	215	17,933
	Grand Total	380,479	21,068,981	2,175,639	85,383,368	735,114	54,086,747

(Source: State Statistics, Annual Report, submitted by the railroads to the Railroad Commission of Texas)

Crew Station:

Amarillo, Fort Worth, Gainesville, Galveston, Houston, Silsbee, Teague, Temple, and Wichita Falls

International Gateways:

Brownsville, Eagle Pass, and El Paso

Port Access:

Beaumont, Corpus Christi, Galveston, Houston, and Orange

Employees

BNSF has more than 6,600 employees in Texas. This is almost 40 percent of its national workforce. Of these employees, 2,191 are exempt and 4,453 are union. Its payroll in Texas is more than \$393 million per year.

KANSAS CITY SOUTHERN**Company Profile**

The Kansas City Southern, Texas' third Class I carrier, operates a system of less than 3,000 miles (4,800 km) that focuses on the movement of agriculture commodities from the Midwest to the Gulf of Mexico. One of only two small, independent Class I's left in the U. S. (Illinois Central being the other), KCS still operates the shortest route from Kansas City to the Gulf. With facilities on the Missouri River and at Port Arthur, Texas, KCS gained access to New Orleans and Dallas, Texas, in 1939 with the acquisition of the Louisiana & Arkansas railroad.

Serving six states, KCS has limited operations in Texas compared to UP and BNSF. Figure 19 shows the KCS operation in Texas. In 1993, KCS acquired the Mid South Railroad adding 1,200 miles (1,900 km) to its system and single line service from Dallas to Birmingham, Alabama. Two years later, in 1995, KCS purchased a 49 percent share of the 167 mile (269 km), Texas Mexican Railway and, with trackage rights won during the UP-SP merger allowing it to operate from Beaumont to Corpus Christi, established access to Laredo and the Mexican markets, south.



Figure 19. KCS Operations in Texas

These steps in conjunction with its 50-year concession to operate the Northeast line of Ferrocarriles Nacionales de Mexico (TFM) gives KCS a new NAFTA-related traffic base from Laredo to Monterrey and into Mexico City. The Mexican line serves two ports and carries 40 percent of Mexico's rail traffic.

Route Characteristics and Commodity Movements

Table 29 displays the commodity movement figures for KCS in Texas for the year 1995. Delivering over 6 million tons of coal, KCS also has significant petroleum traffic both into and out of the state. The available shipment statistics fail, however, to reflect the effects of many of the recent changes to routes, interchange locations, and increases in Mexican traffic. Soon-to-be available 1997 waybill data should provide an indication of the impact of these changes on KCS's Texas Operations.

Facilities

Intermodal Facilities:

Dallas and Port Arthur

Port Access:

Beaumont, Galveston, and Port Arthur

Employees

KCS employs a total of 2,700 people throughout the entire system.

Table 29. Revenue Freight Carried in Texas - KCS 1995

Code	Commodity	Originating Freight		All Other Freight		Terminating Freight	
		Carloads	Tons	Carloads	Tons	Carloads	Tons
1	Farm products	247	19,254	32,543	2,719,457	15,262	1,315,450
8	Forest products	0	0	626	25,286	453	10,285
9	Fresh fish and other marine products	0	0	0	0	0	0
10	Metallic ores	0	0	396	35,188	20	438
11	Coal	12,636	1,266,095	73,044	7,441,220	62,783	6,329,830
13	Crude PETRO, NAT gas & NAT GSLN	603	56,523	2,043	197,757	2	195
14	Nonmetallic minerals except fuels	497	46,316	13,323	1,242,941	2,151	200,722
19	Ordinance and accessories	5	18	66	8,099	0	0
20	Food and kindred products	1,904	61,319	20,546	916,191	8,648	388,527
21	Tobacco products	1	19	86	1,580	86	1,580
22	Textile mill products	35	719	870	12,719	607	7,482
23	Apparel and other finished textile PRD. INC knit	204	4,055	300	4,442	256	3,767
24	Lumber and wood products, except furniture	840	52,913	15,785	1,165,334	4,942	308,683
25	Furniture and fixtures	75	1,046	197	2,390	123	1,412
26	Pulp, paper and allied products	5,668	302,667	33,343	1,832,187	7,827	322,359
27	Printed matter	27	468	285	5,187	279	4,906
28	Chemicals and allied products	11,769	911,352	39,447	3,309,160	13,097	994,620
29	Petroleum and coal products	38,551	2,871,178	15,375	1,226,960	35,818	2,714,784
30	Rubber and miscellaneous plastic products	685	10,741	2,704	43,274	1,279	22,548
31	Leather and leather products	0	0	17	228	16	214
32	Stone, clay, glass & concrete products	2,672	27,143	11,510	774,738	3,966	152,974
33	Primary metal products	3,651	343,244	4,001	315,366	637	28,572
34	Fabr Metal Prd. Exc Ordn. Machy and Transp	226	2,322	205	6,809	75	1,473
35	Machinery, except electrical	106	1,409	417	9,853	58	1,267
36	Electrical machinery, equipment, and supplies	94	1,315	452	7,104	271	4,723
37	Transportation equipment	336	7,566	1,674	40,338	1,037	14,533
38	Instruments, PHOT and optical GD, watches and clocks	17	306	129	2,568	39	729
39	Miscellaneous products of manufacturing	145	1,732	604	9,704	488	6,736
40	Waste and scrap materials	1,592	113,063	5,714	315,633	1,172	35,495
41	MISC freight shipments	180	6,390	1,634	50,474	305	6,372
42	Containers, shipping, returned empty	1,713	1,797	3,272	3,558	922	1,599
44	Freight forwarder traffic	36	619	295	4,181	16	221
45	Shipper association or similar traffic	2	41	140	2,411	123	2,090
46	Misc mixed shipment Exc Fwdr & Shpr Assn	19,232	313,440	40,934	657,644	24,710	360,520
48	Waste, hazardous matl or subst	0	0	0	0	0	0
	Grand Total	103,749	6,425,070	321,977	22,389,981	187,468	13,245,106

(Source: State Statistics, Annual Report, submitted by the railroads to the Railroad Commission of Texas)

TEXAS SHORTLINE RAILROADS

Shortline railroads, defined as non-Class I railroads, operating in the United States steadily declined from 1,009 in 1916 to only 238 in 1970 (Levine, 1982). This trend was reversed in the 1970s and 1980s following significant changes in the railroad industry. Bankruptcies among Class I railroads

created opportunities for shortline development and modifications to federal transportation policy served to stimulate shortline creation. Congressional action such as the 3-R Act (1973) and 4-R Act (1976) as well as the Local Rail Service Assistance Act (1978) all worked to encourage shortline formation by including provisions for operating subsidies and rehabilitation for light density branchlines. Additionally, the increased competitive environment fostered by the Staggers Rail Act of 1980 and the Motor Carrier Act of 1980 resulted in Class I railroads selling or leasing branchlines to shortline operators as a cost reduction strategy (Babcock and Prater, 1995).

Passage of the Staggers Act amended decades of railroad regulation. The act eliminated state regulation of railroads except in matters of safety, and stripped the Interstate Commerce Commission (ICC) of most of its authority over railroads. By making mergers and abandonments easier, the Staggers Act cleared the way for a cycle of railroad consolidation which continues today. This consolidation has often meant abandoning the less-used, less-profitable branch lines. Abandoning track frees up cars and locomotives for use on the main lines, and allows train crews to spend more time operating trains and less time on layovers.

The 40 Class I railroads that existed in 1980 have been reduced through a series of mergers, acquisitions, and bankruptcies, to only nine today. Note that upon final approval by the STB the acquisition of Conrail by CSX and NS would reduce the number of Class I railroads in the United States to eight. These mergers and acquisitions, and the consolidation they represent, have, according to some experts, made an estimated 20,000 mi (32,200 km) of branch line available for conversion to shortline service or, if no buyer is found, a candidate for abandonment.

Unfortunately, the action of abandoning a rail line segment, taking up track, removing bridges and structures, and salvaging crossties and roadbed materials is essentially a nonreversible decision. Where rail right-of-way is returned to abutting landowners through reversionary agreements, any future public use of the corridor is severely restricted. In addition, the loss of industrial sidings for business breaks the link to long haul rail service, forcing businesses to ship by truck with the adverse consequence of increased road damage and pollution or, if truck transport is impractical, to go out of business altogether. Therefore, it is essential that any rail line segment being considered for abandonment be subjected to a detailed evaluation as to its role in the current and future transportation system. State agency resources should be made available to help facilitate private ownership by a shortline railroad or, if the current rail service provided on the line is deemed unessential, then the rail corridor can be placed in interim public use until such time that a public need to restore rail service no longer exists. Shortline railroads serve the industry by continuing operations on lines deemed unprofitable by the large railroads. By performing this service, shortlines

preserve the right-of-way and provide a vital link between affected industries and long haul service. Small railroad companies such as these represent efficient, low cost alternatives to line abandonment.

Typically, shortlines are low-cost businesses, buying and operating older, used locomotives and cars. They tend to pay locally prevailing wages and are usually free from restrictive work rules allowing fewer workers to run the railroad. Shortlines cater to the needs of short haul customers with custom schedules, and are often highly specialized, carrying only one type of cargo such as agricultural products.

Texas Shortline Route Characteristics

The following section will provide an overall map of Texas indicating where each shortline is located within the state and also individual maps of each shortline. The DeskMap Systems, Inc. "U.S. Railroad Map Database" provided railroad information current to March 1998. For purpose of this study, the term "shortline" also refers to local, switching, and terminal railroads.

Figure 20 displays the overall map of Texas providing a list and an indicator of location within the state of the current shortlines. Figures 21 through 59 display the individual shortlines along with surrounding cities, highways, and counties.

Texas Shortlines

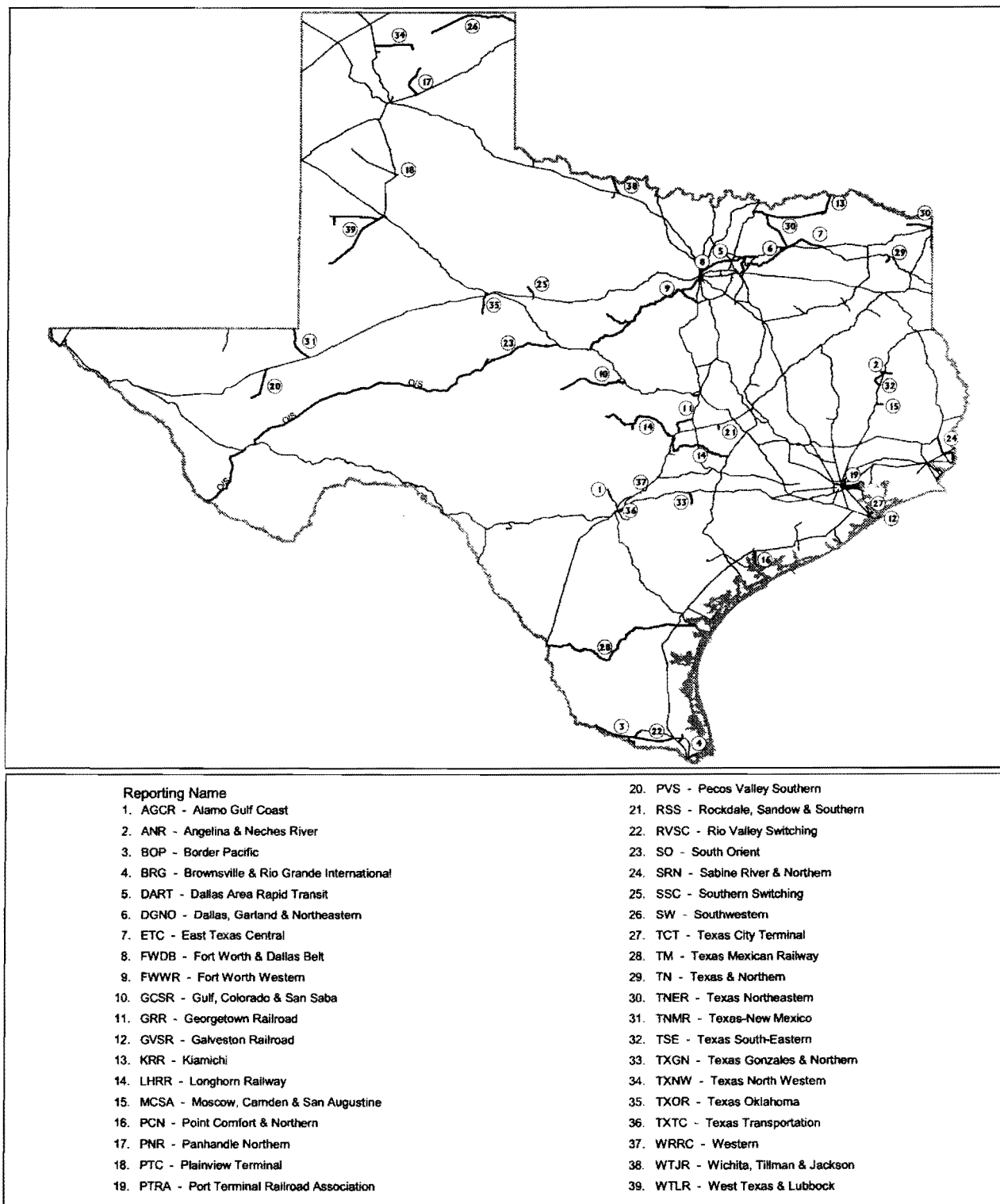


Figure 20. Shortline Railroads Operating in Texas.

AGCR - Alamo Gulf Coast

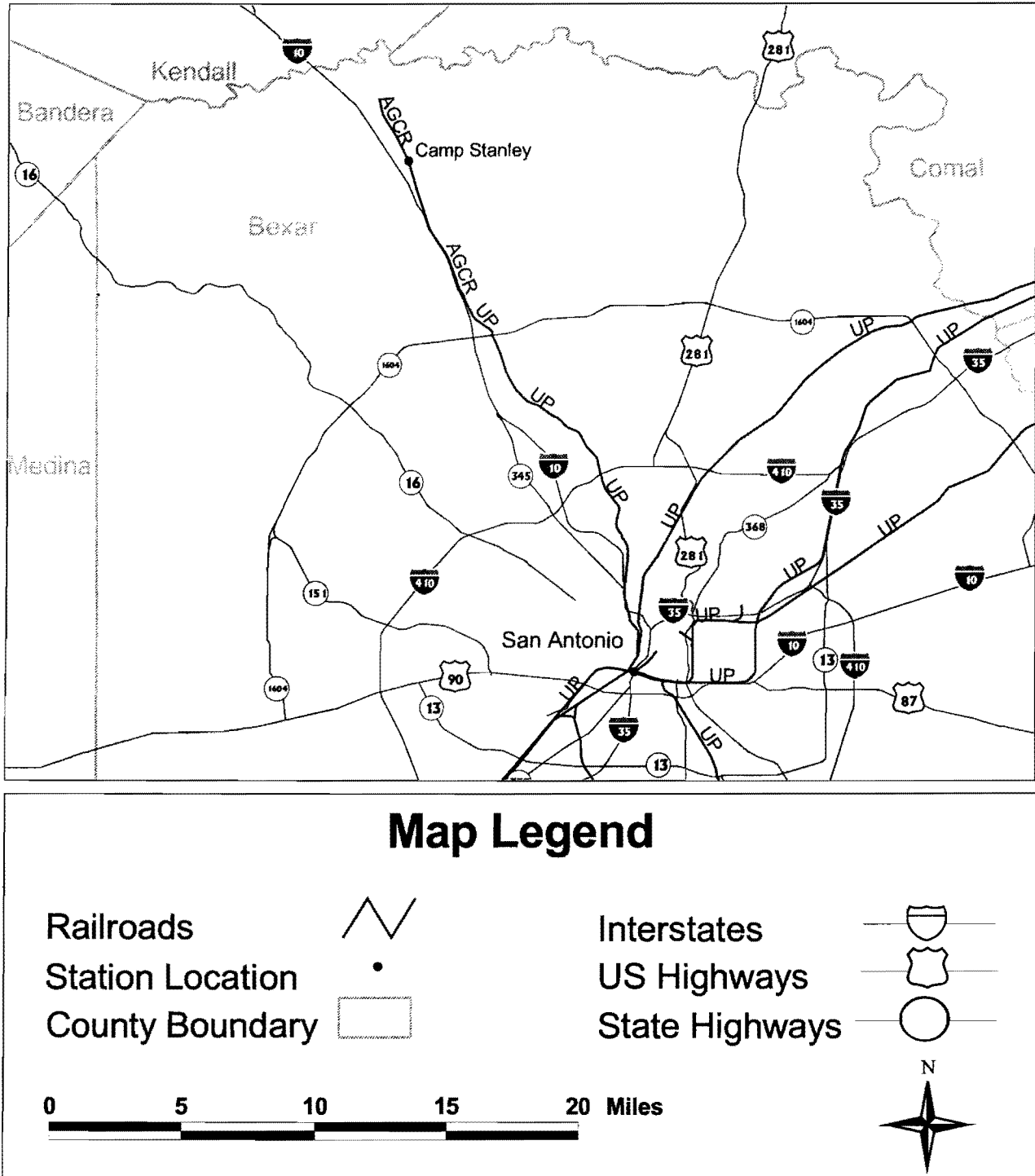


Figure 21. AGCR - Alamo Gulf Coast

ANR - Angelina & Neches River

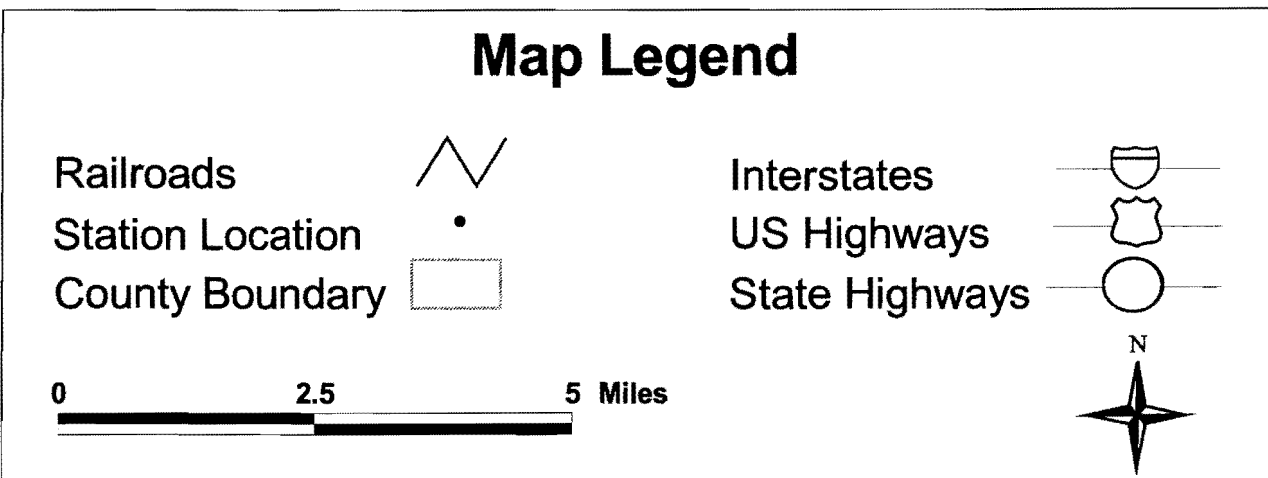
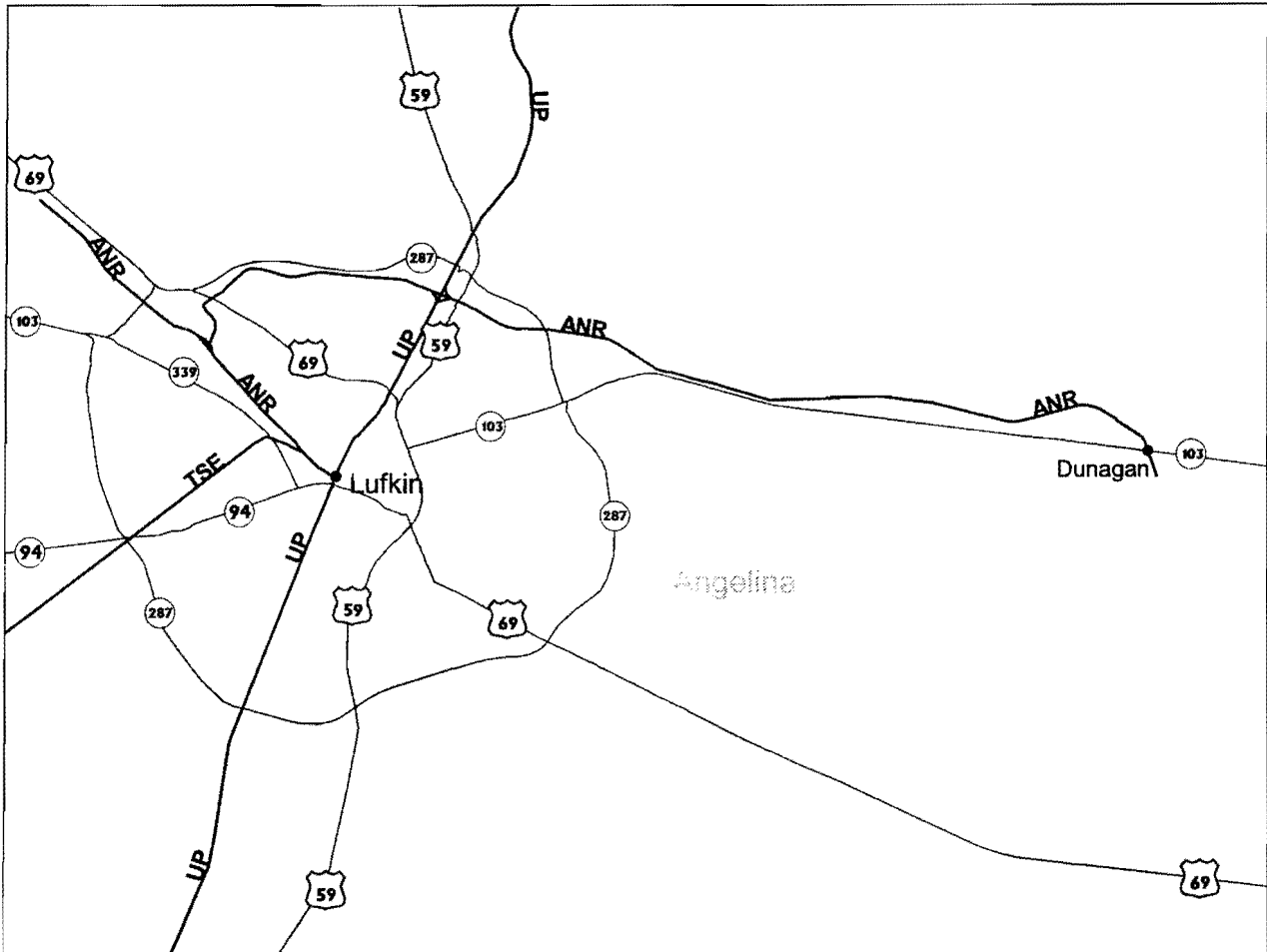


Figure 22. ANR - Angelina & Neches River

BOP - Border Pacific

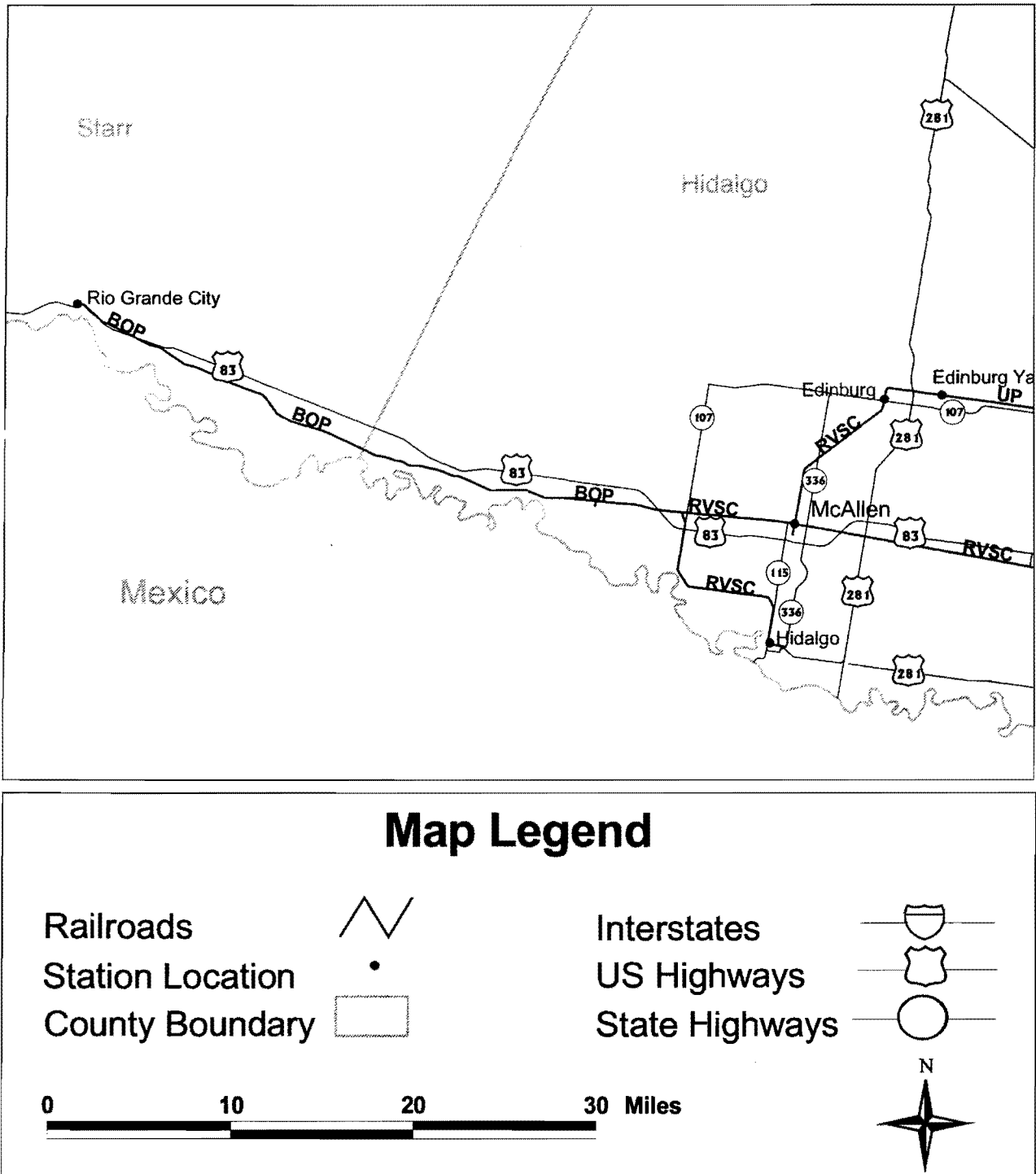


Figure 23. BOP - Border Pacific

BRG - Brownsville & Rio Grande International

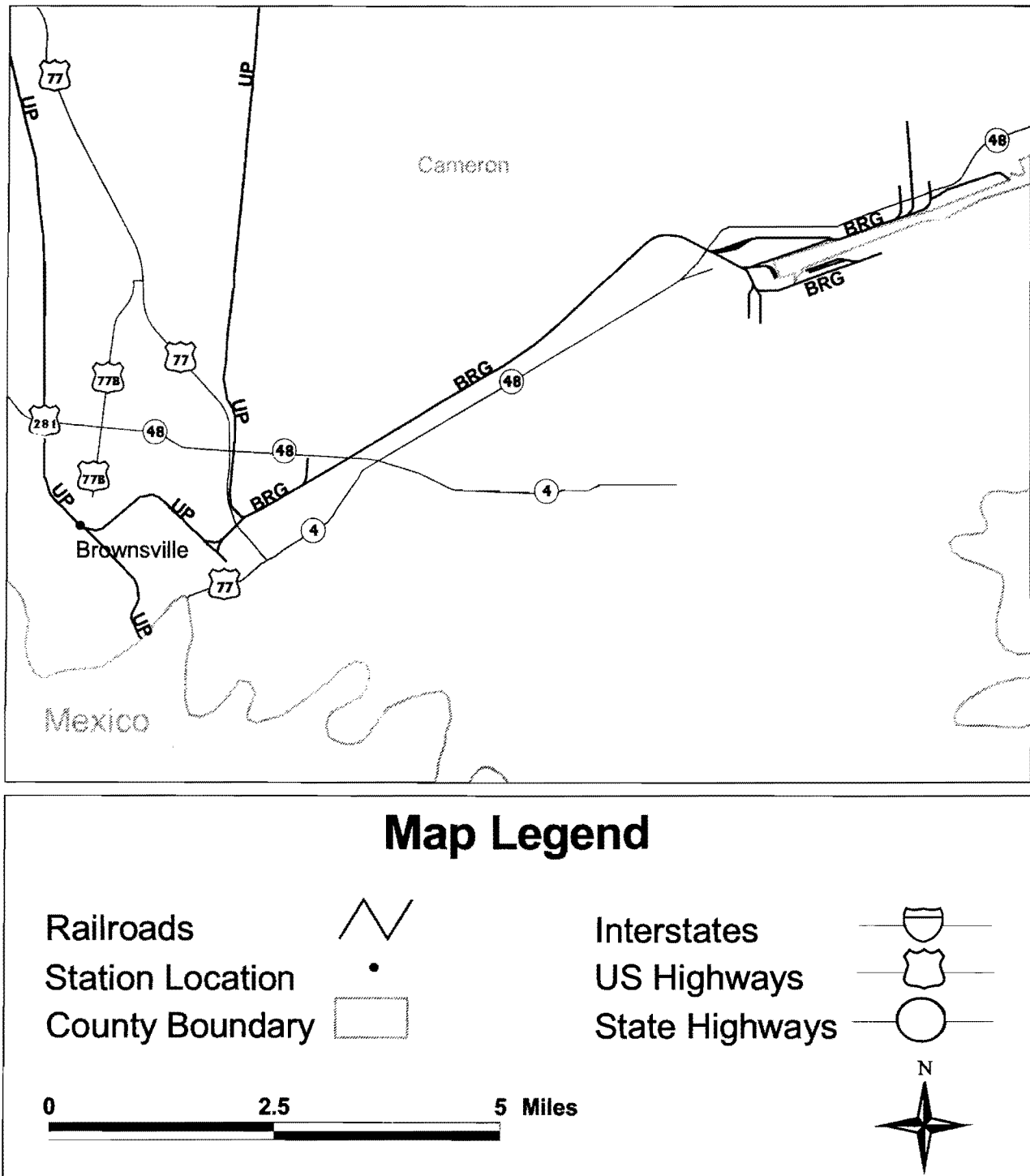
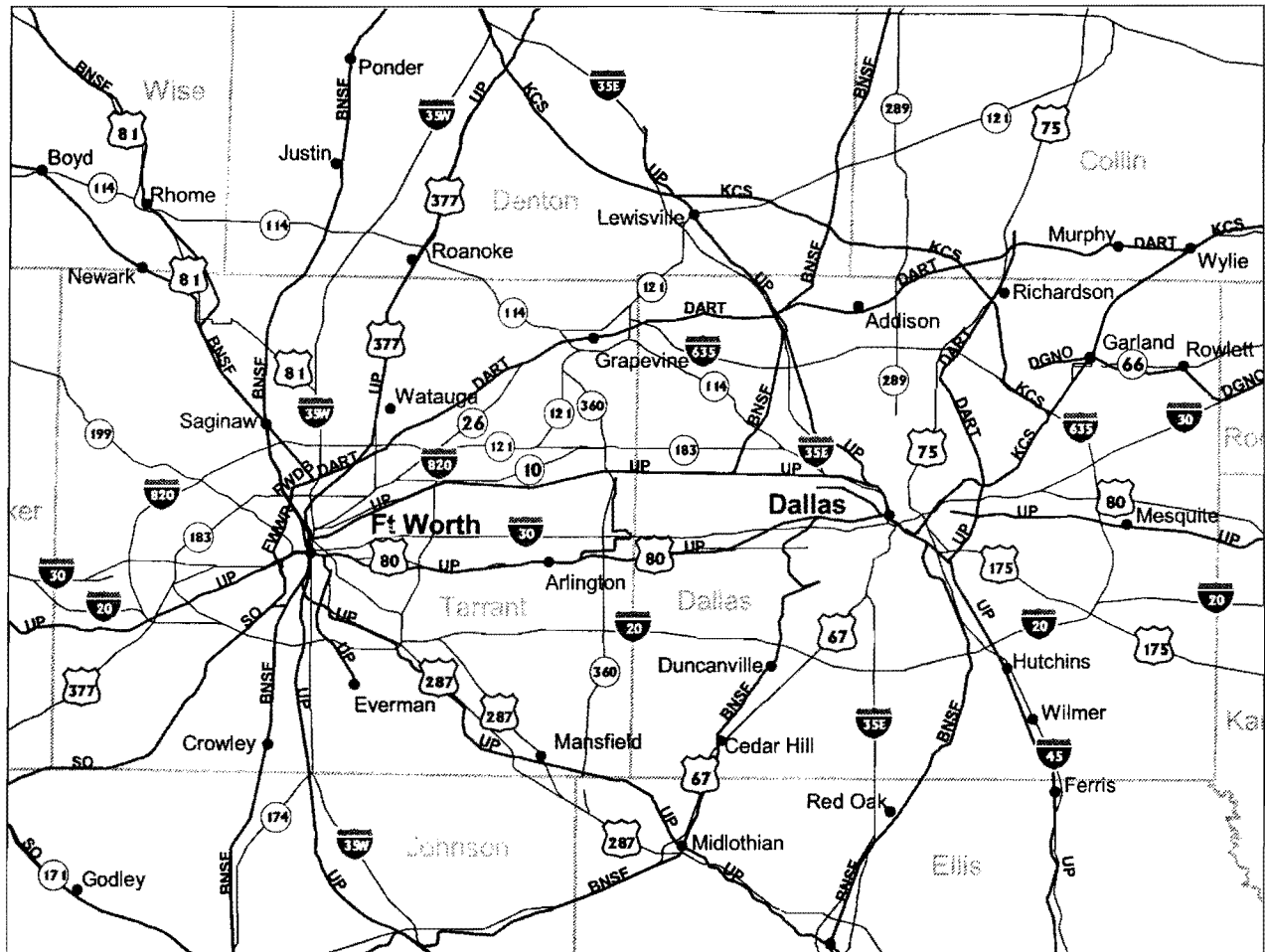


Figure 24. BRG - Brownsville & Rio Grande International

DART - Dallas Area Rapid Transit



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 10 20 30 Miles



Figure 25. DART - Dallas Area Rapid Transit

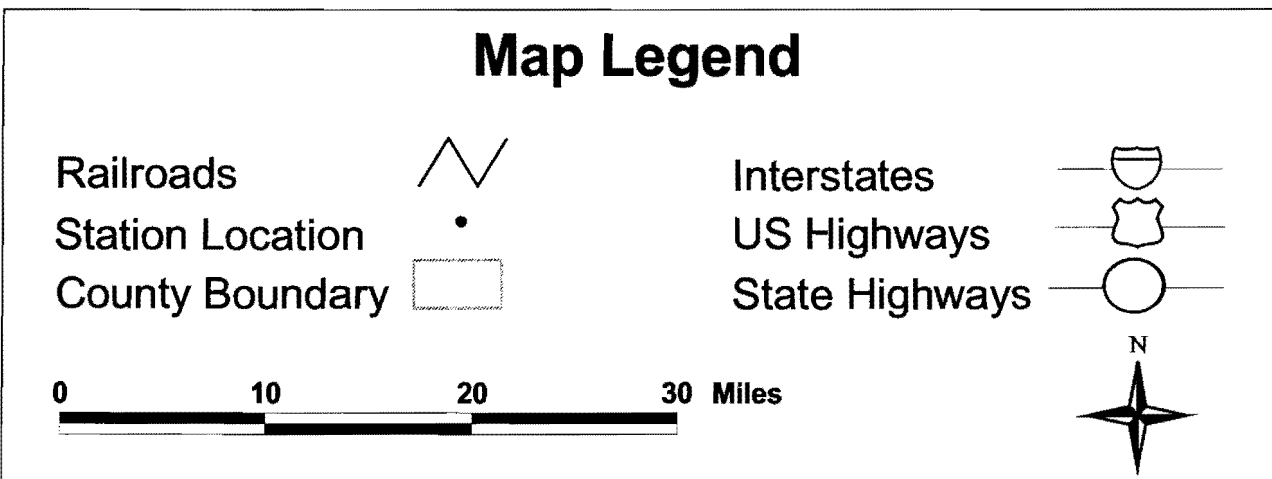
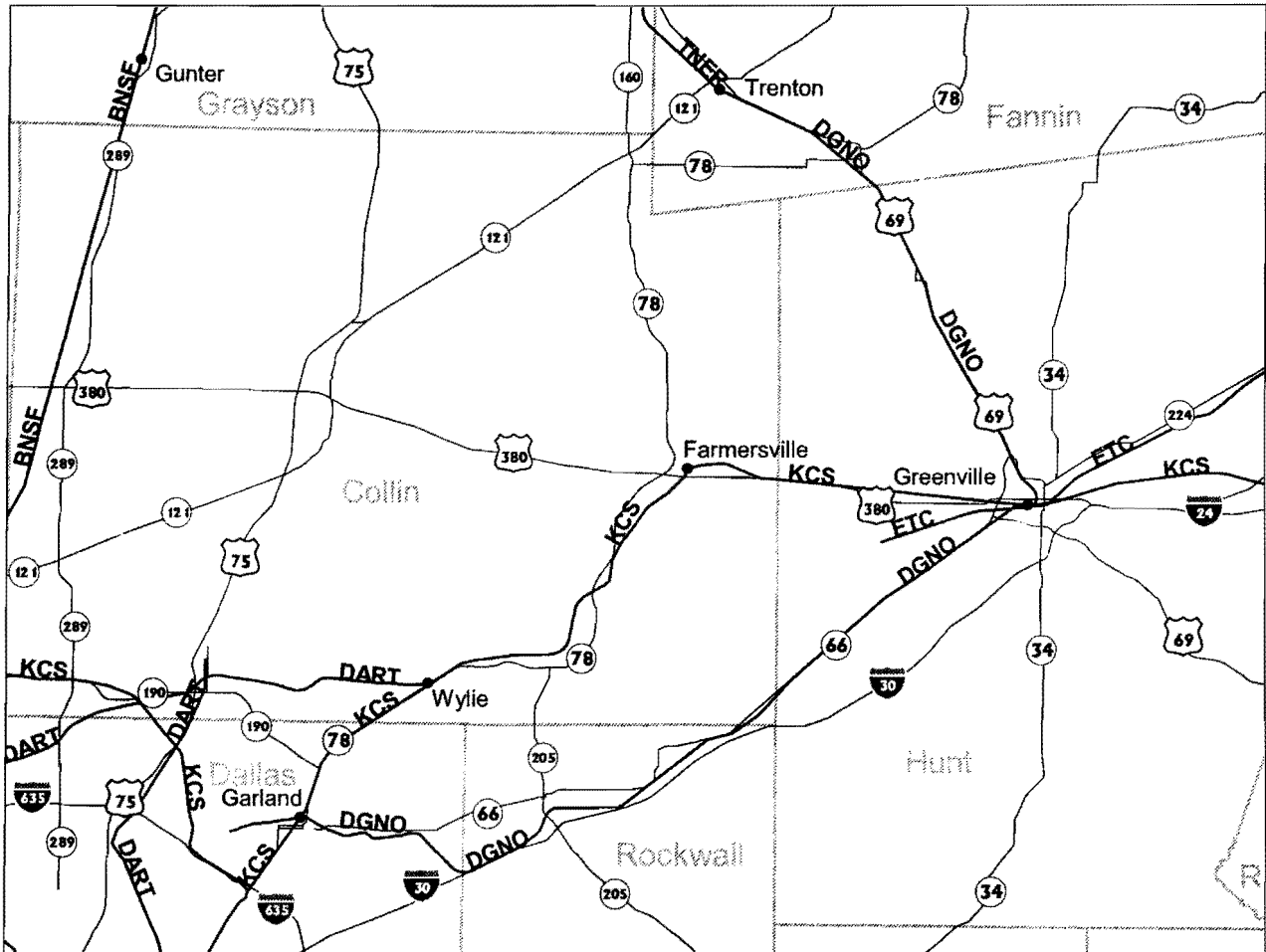


Figure 26. DGNO - Dallas, Garland & Northeastern

ETC - East Texas Central

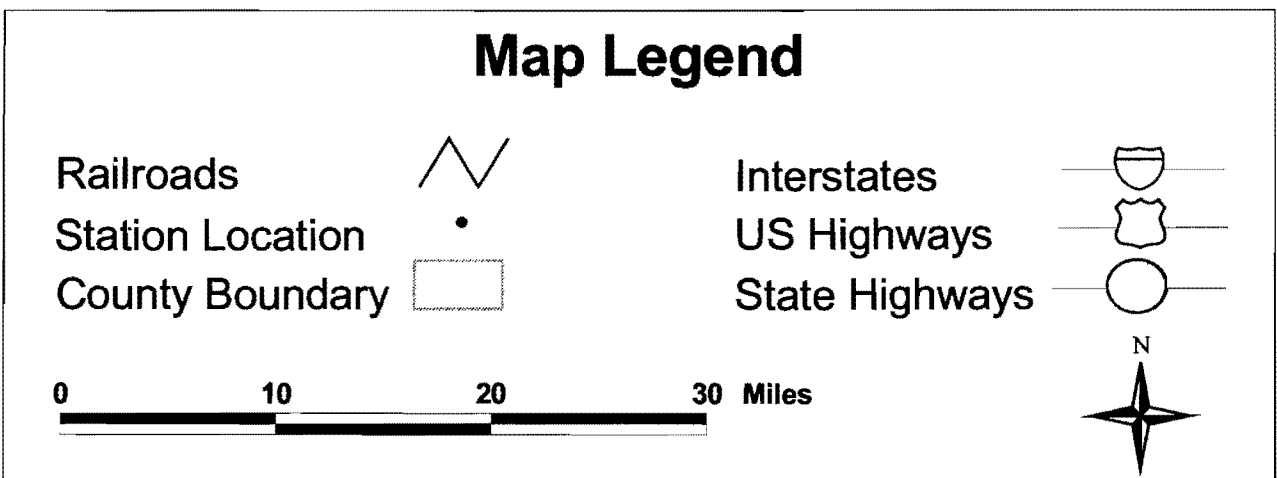
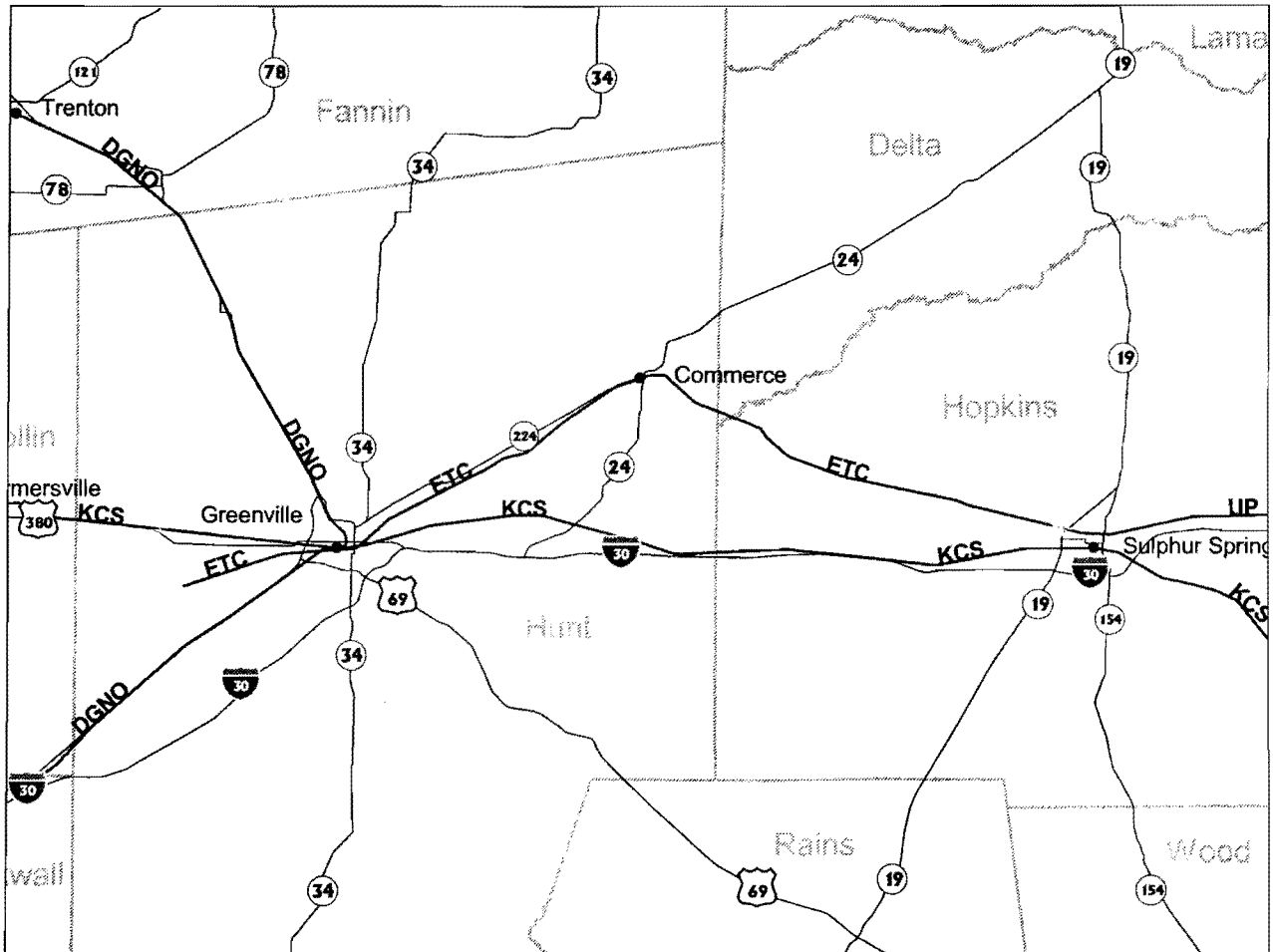
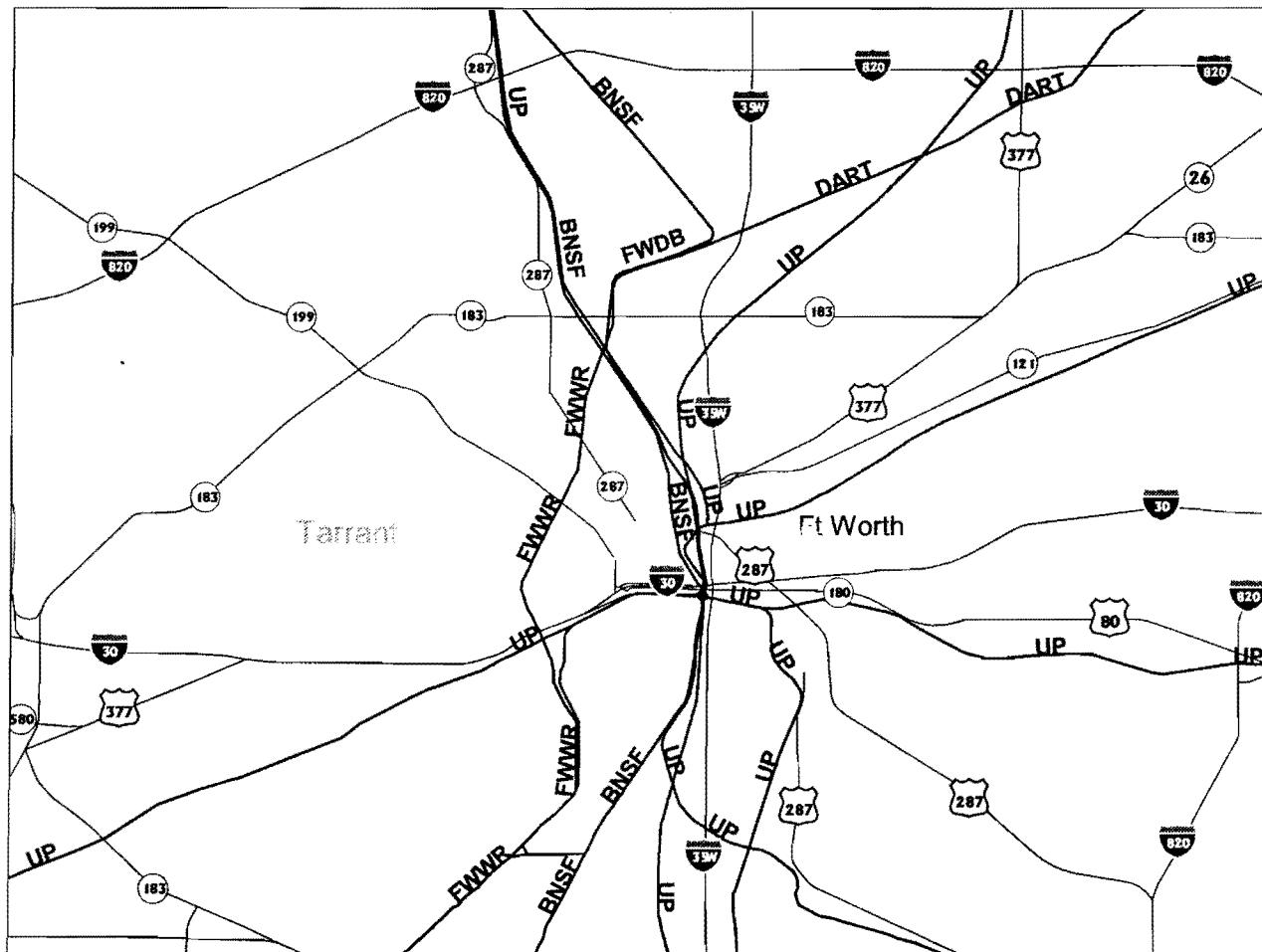


Figure 27. ETC - East Texas Central

FWDB - Fort Worth & Dallas Belt



Map Legend

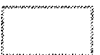
Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways

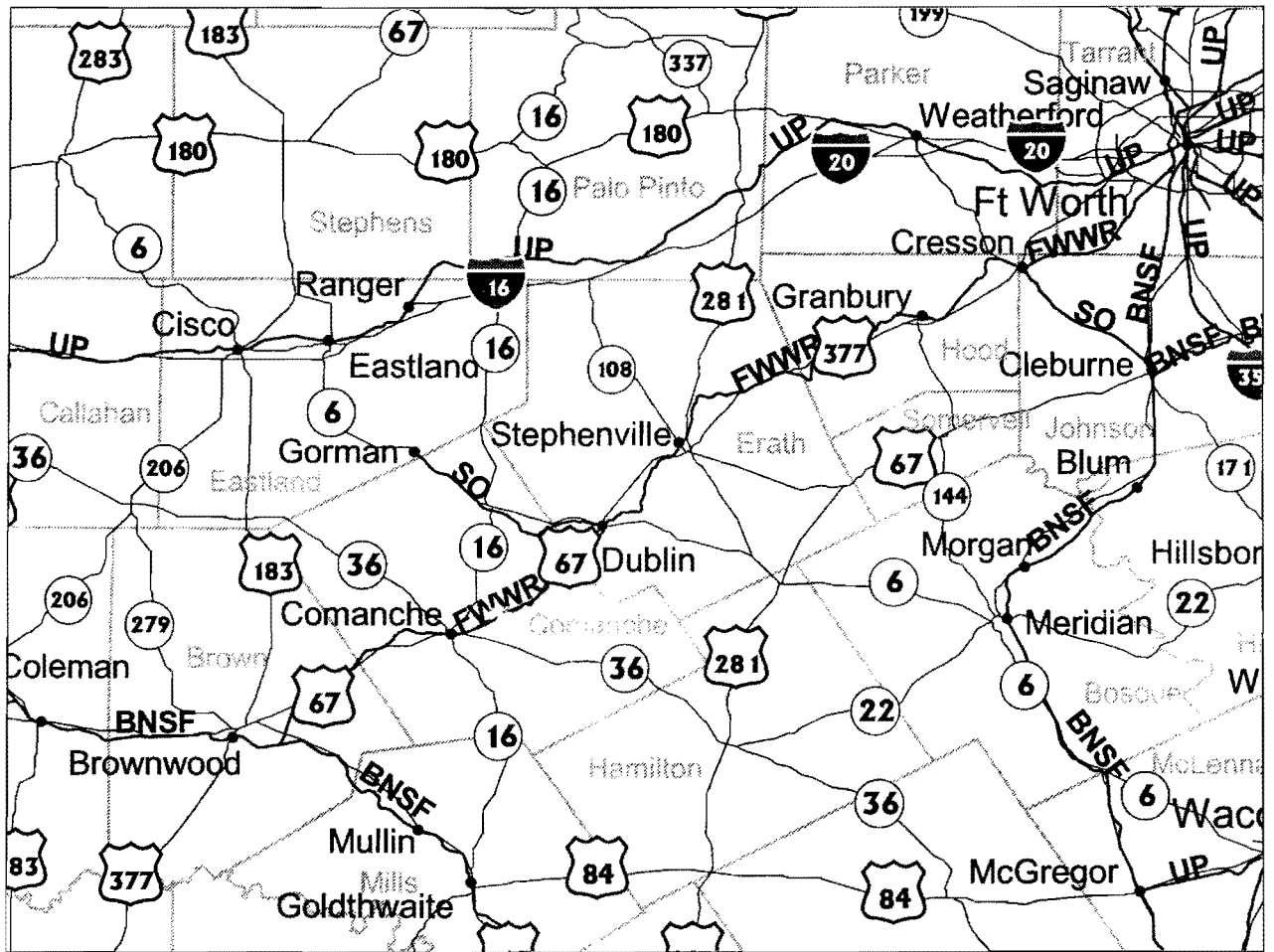


0 2.5 5 Miles



Figure 28. FWDB - Fort Worth & Dallas Belt

FWWR - Fort Worth Western



Map Legend

Railroads		Interstates	
Station Location		US Highways	
County Boundary		State Highways	

0 25 50 75 100 Miles



Figure 29. FWWR - Fort Worth Western

GCSR - Gulf, Colorado & San Saba

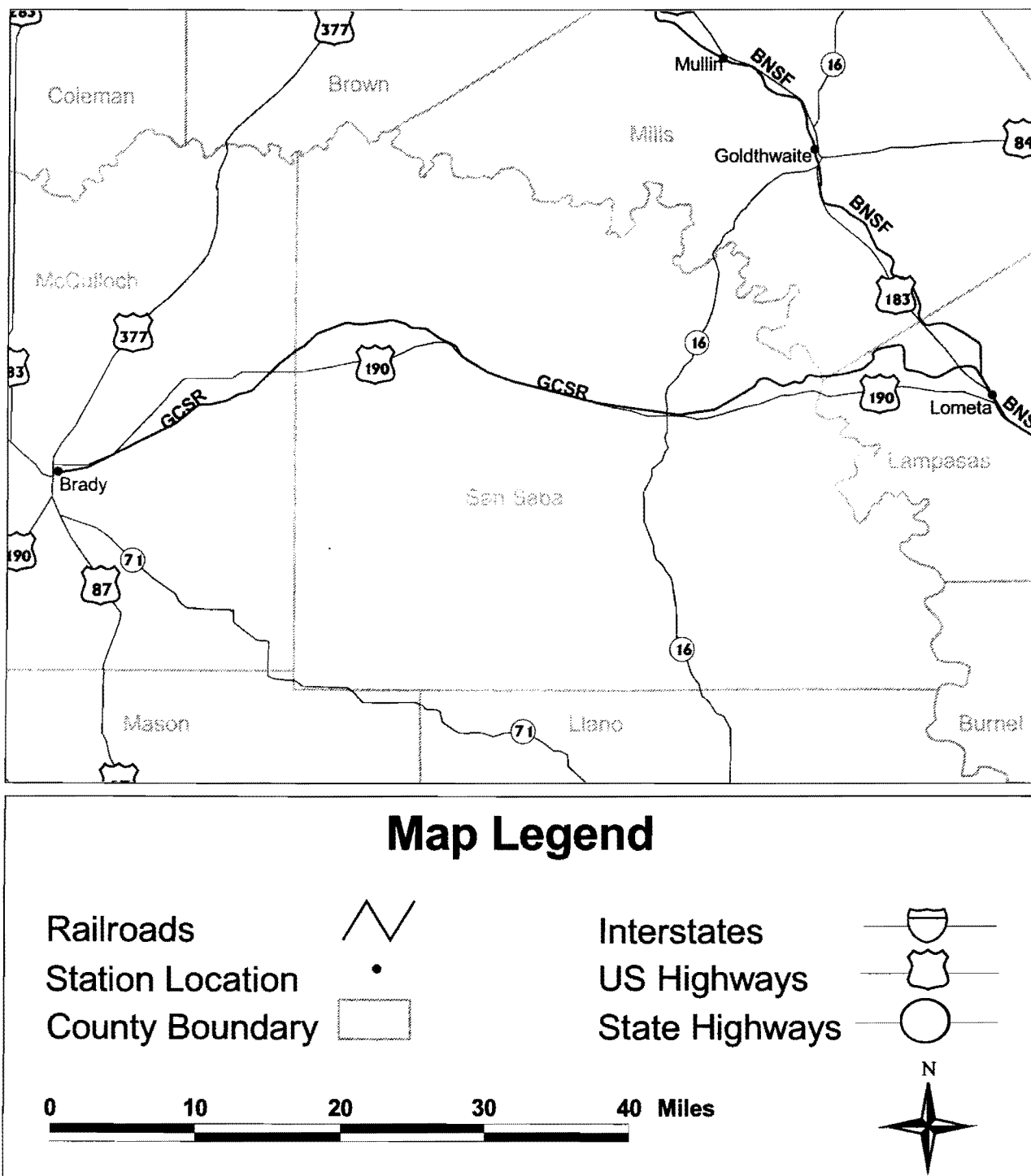


Figure 30. GCSR - Gulf, Colorado & San Saba

GRR - Georgetown Railroad

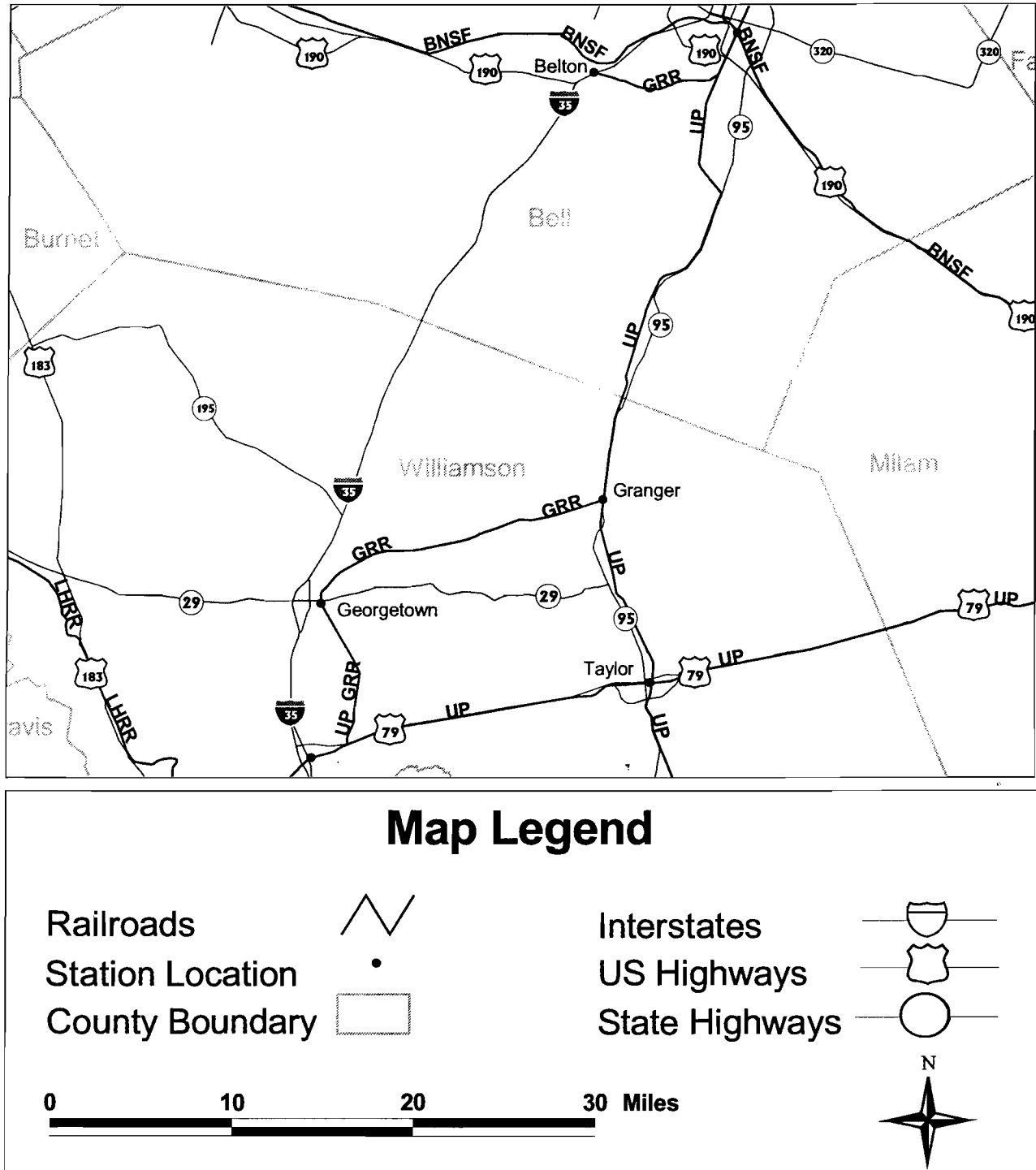


Figure 31. GRR - Georgetown Railroad

GVSR - Galveston Railroad

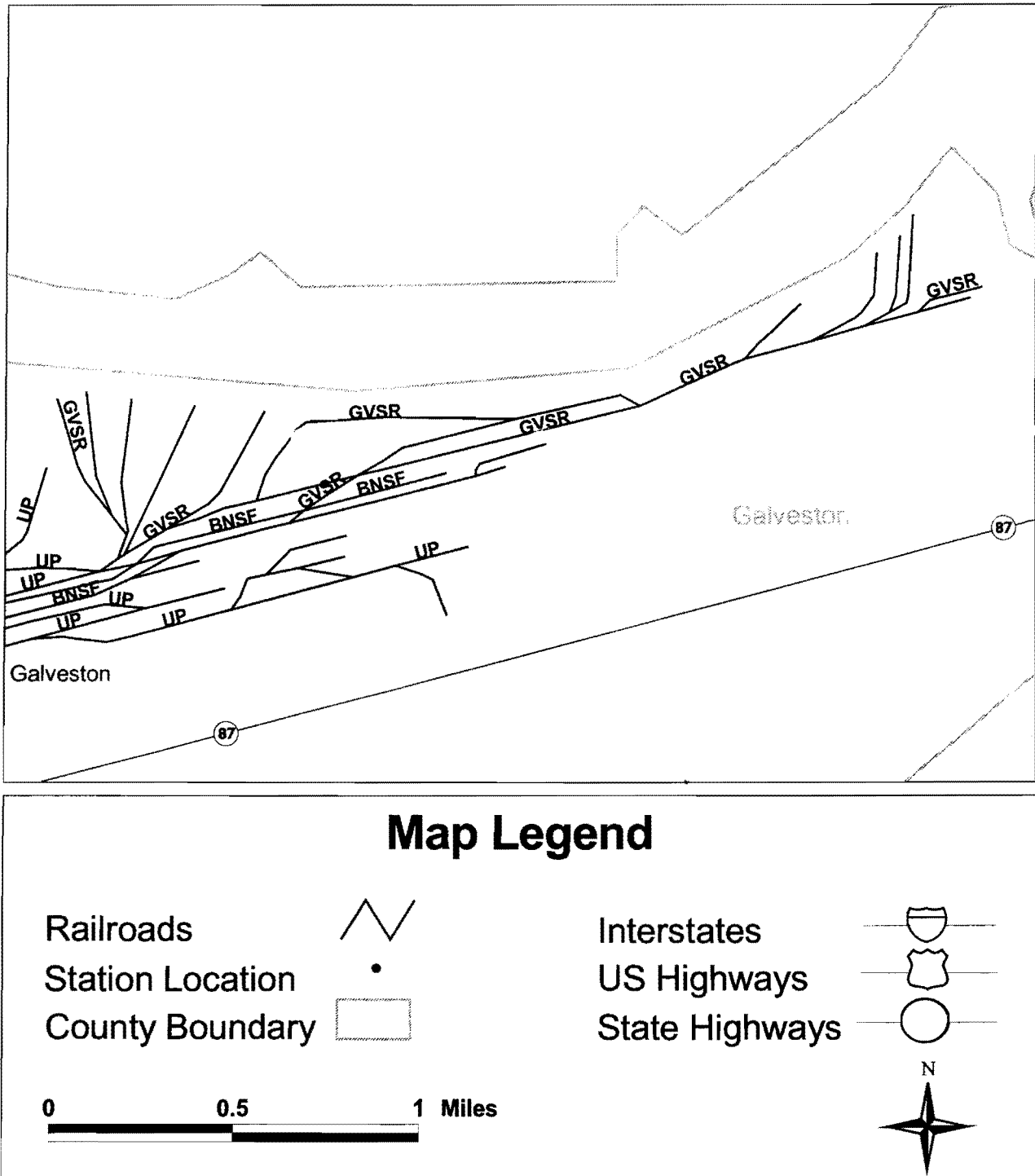


Figure 32. GVSR - Galveston Railroad

KRR - Kiamichi Railroad

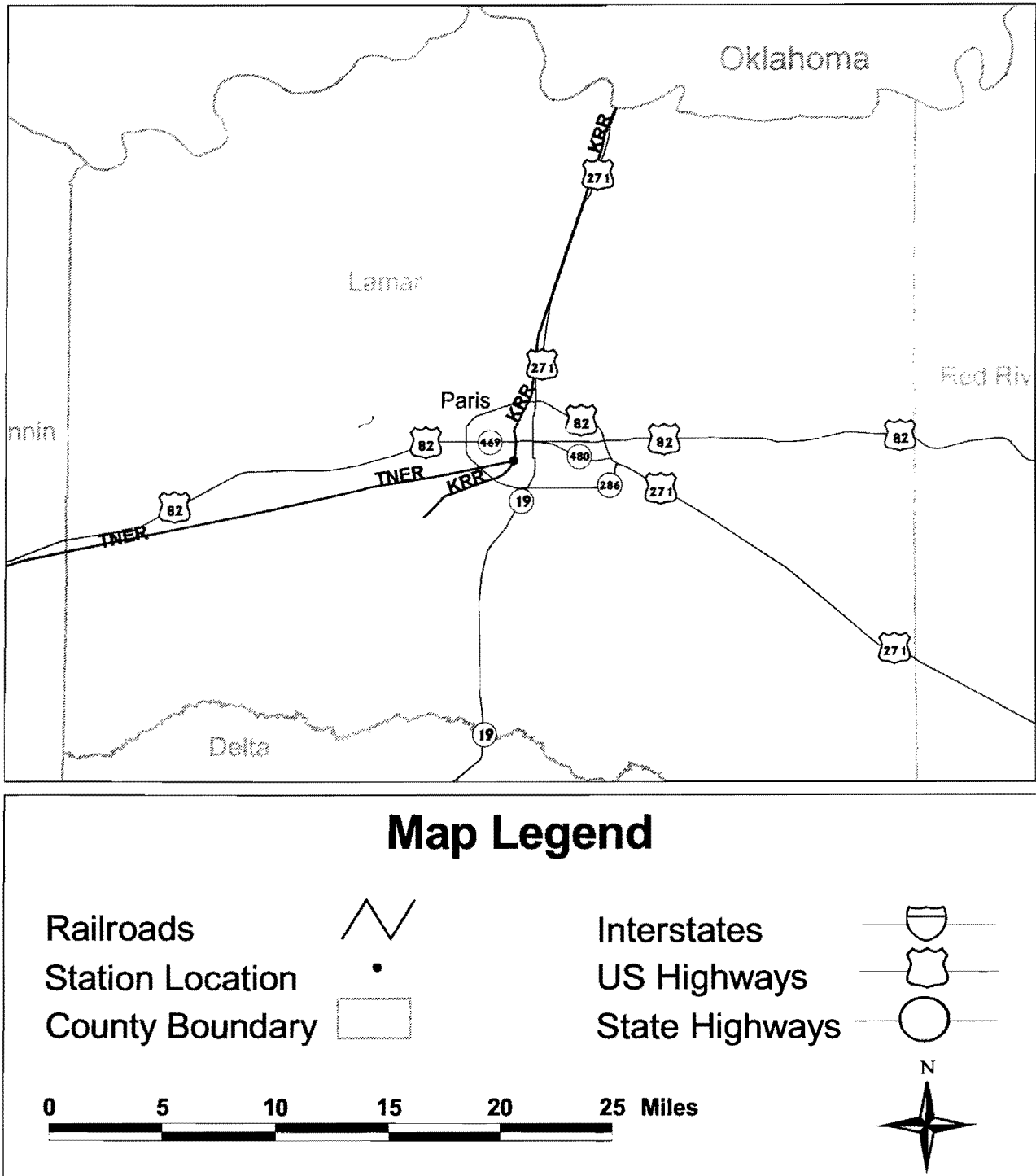
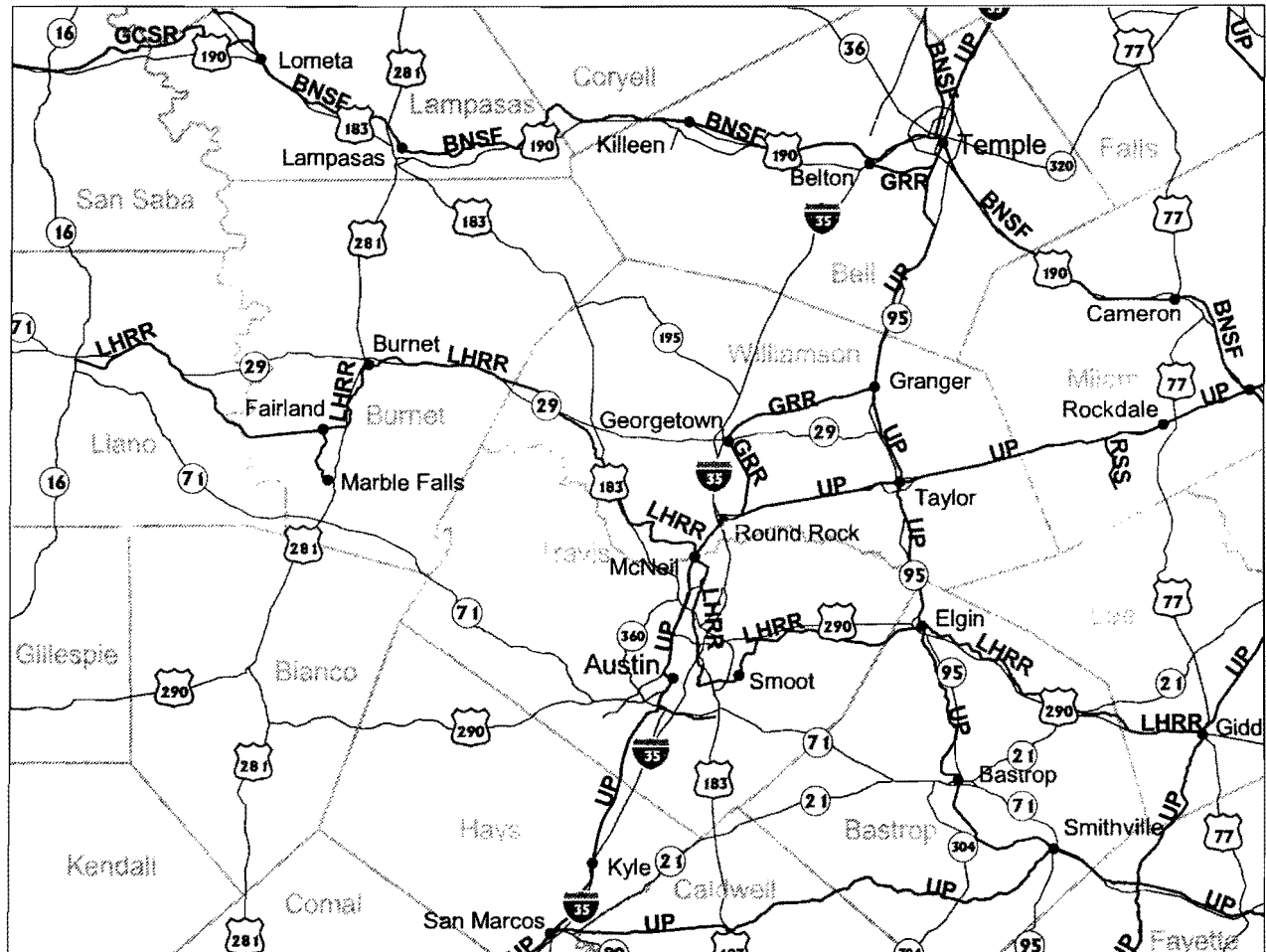


Figure 33. KRR - Kiamichi

LHRR - Longhorn Railway



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways

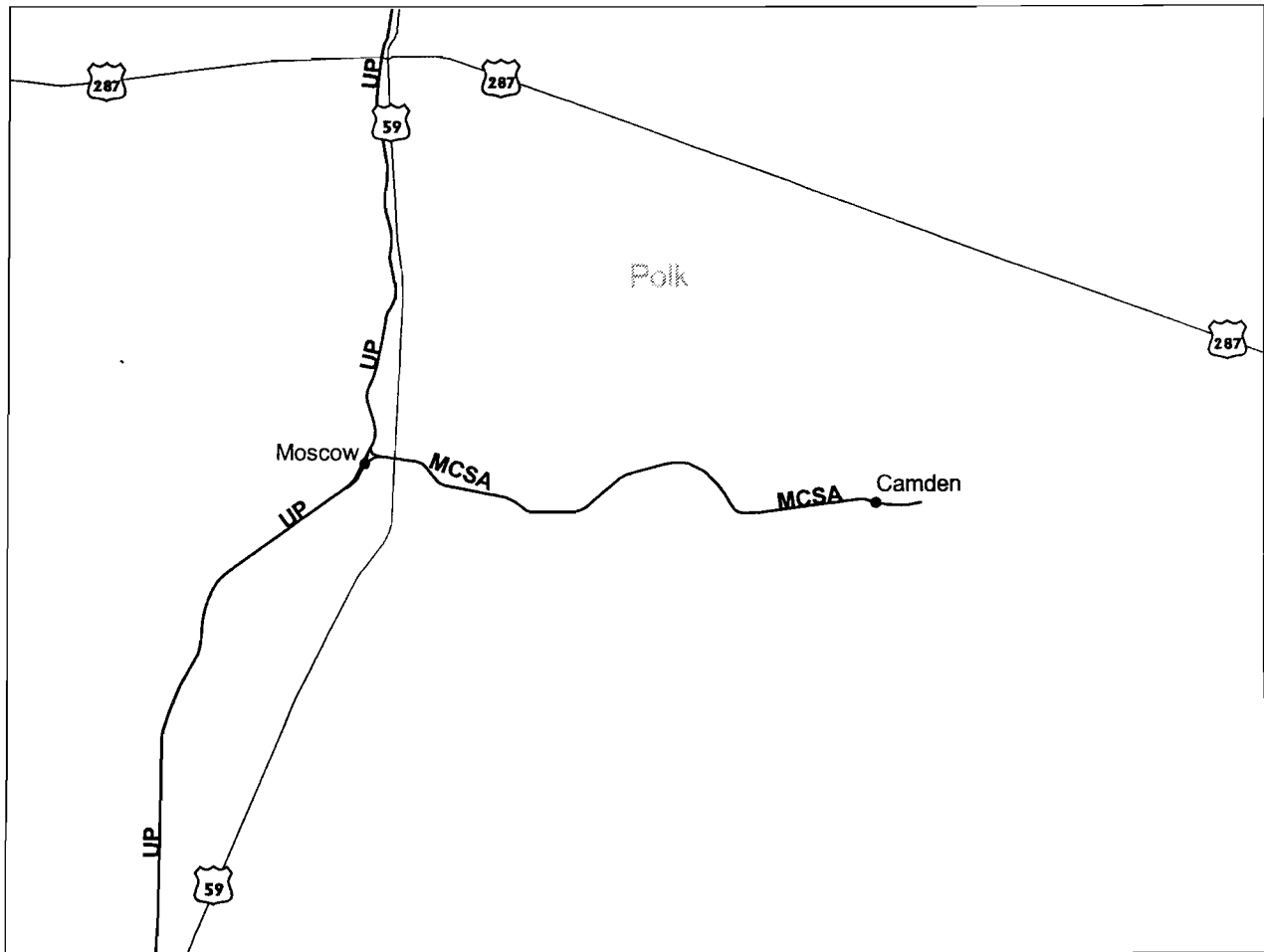


0 25 50 Miles



Figure 34. LHRR - Longhorn Railway

MCSA - Moscow, Camden & San Augustine



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 2.5 5 Miles



Figure 35. MCSA - Moscow, Camden, & San Augustine

PCN - Point Comfort & Northern

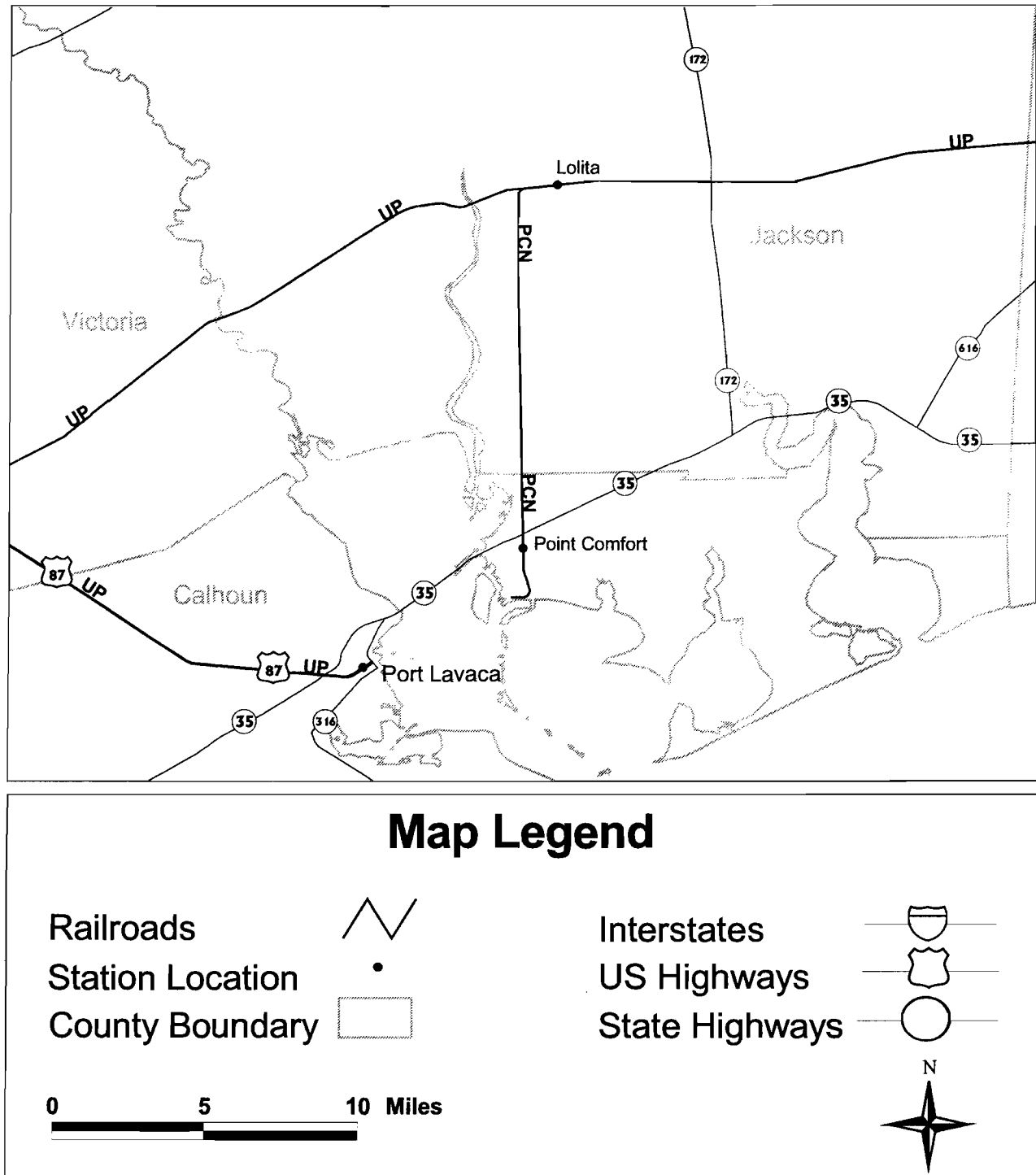


Figure 36. PCN - Point Comfort & Northern

PNR - Panhandle Northern

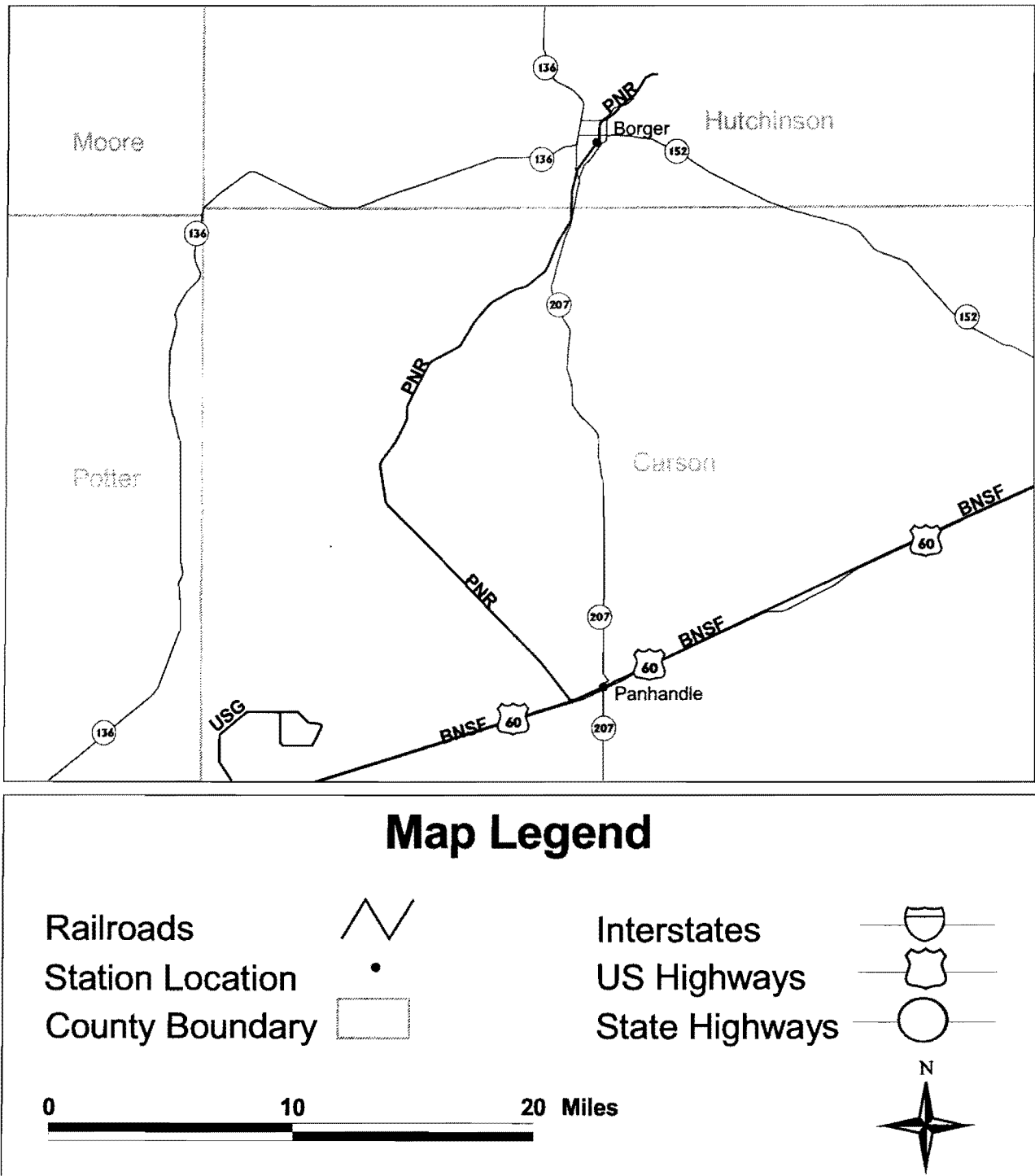


Figure 37. PNR - Panhandle Northern

PTC - Plainview Terminal

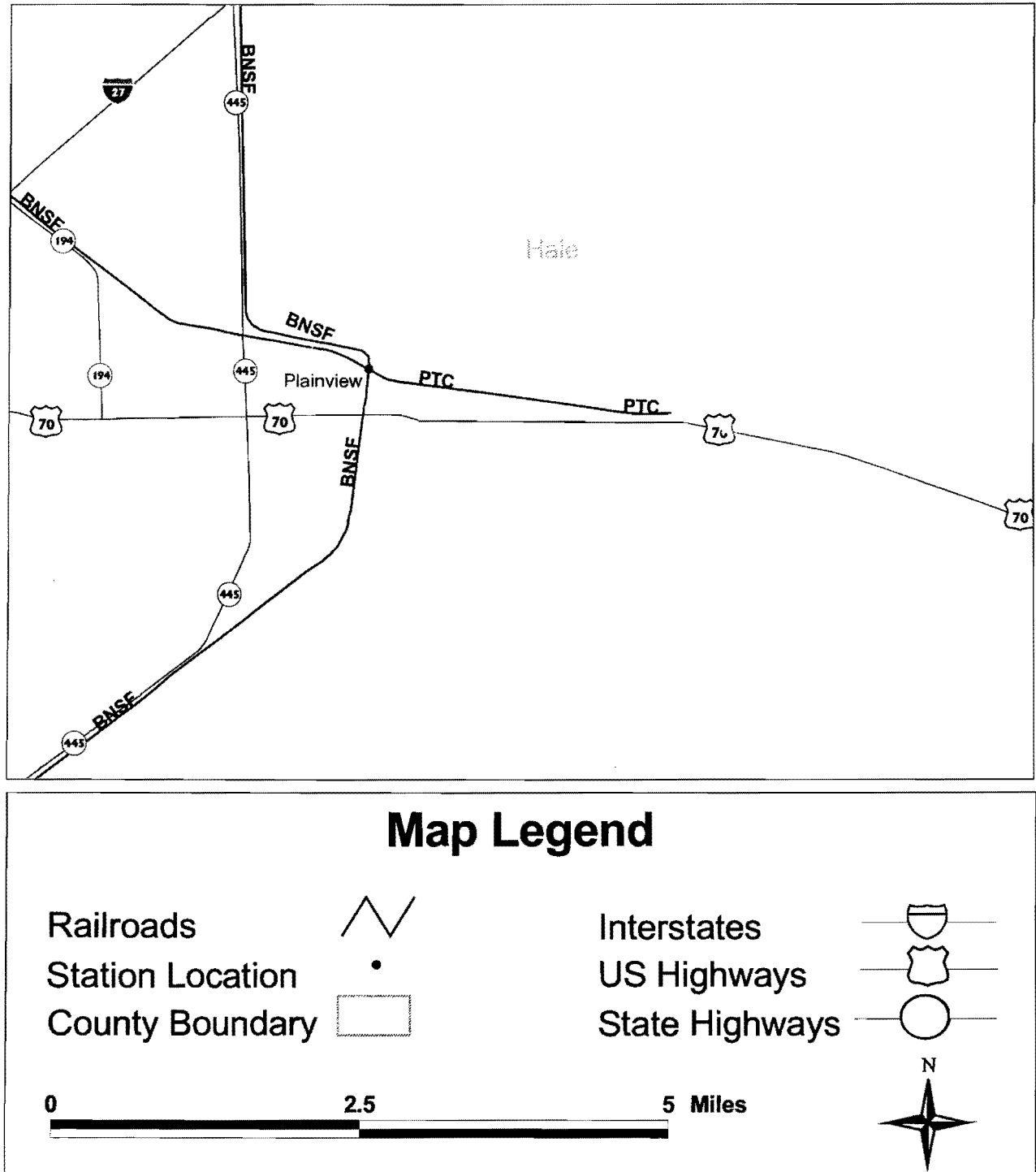


Figure 38. PTC - Plainview Terminal

PTRA - Port Terminal RR Assoc.

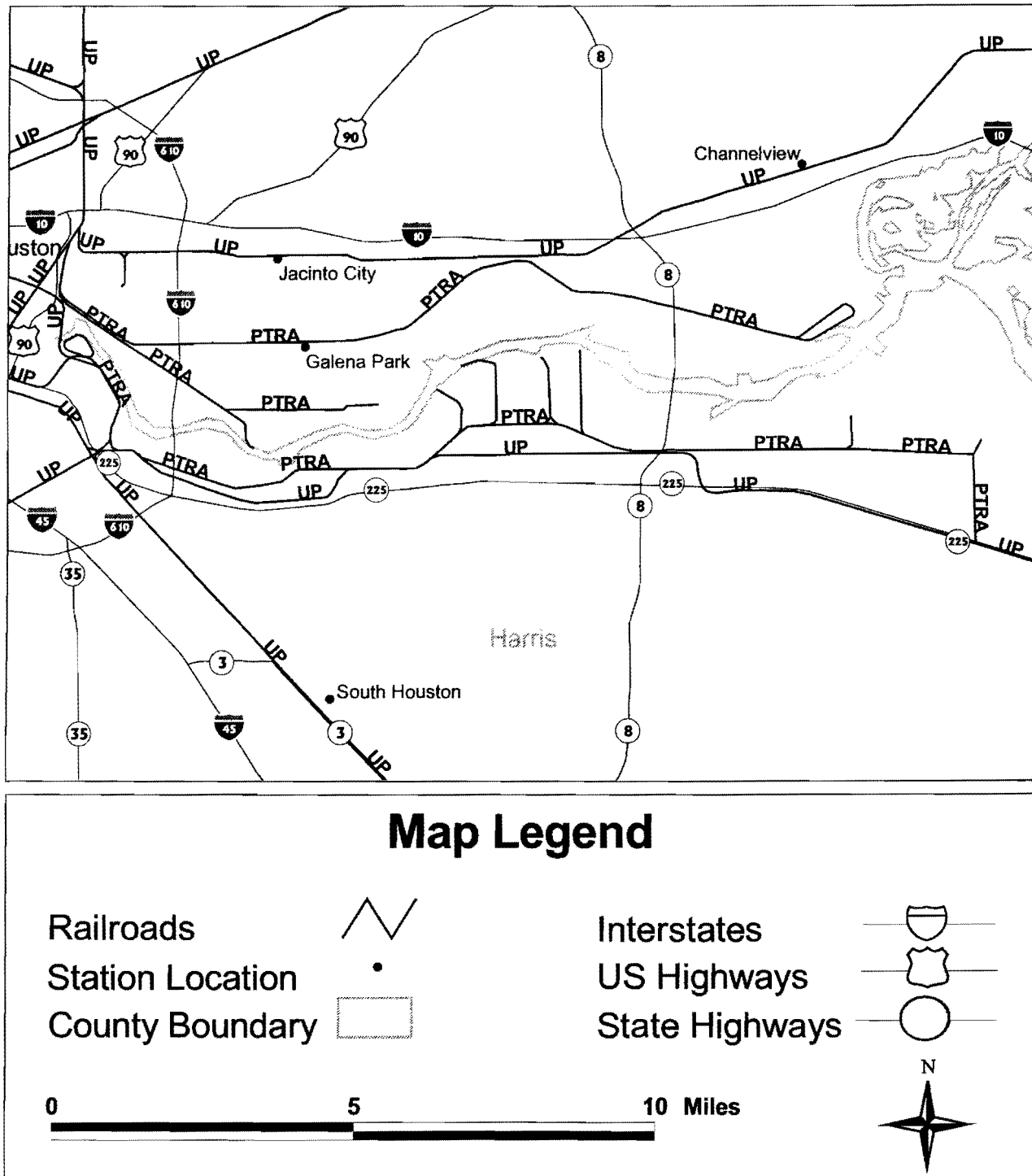


Figure 39. PTRA - Port Terminal Railroad Association

PVS - Pecos Valley Southern

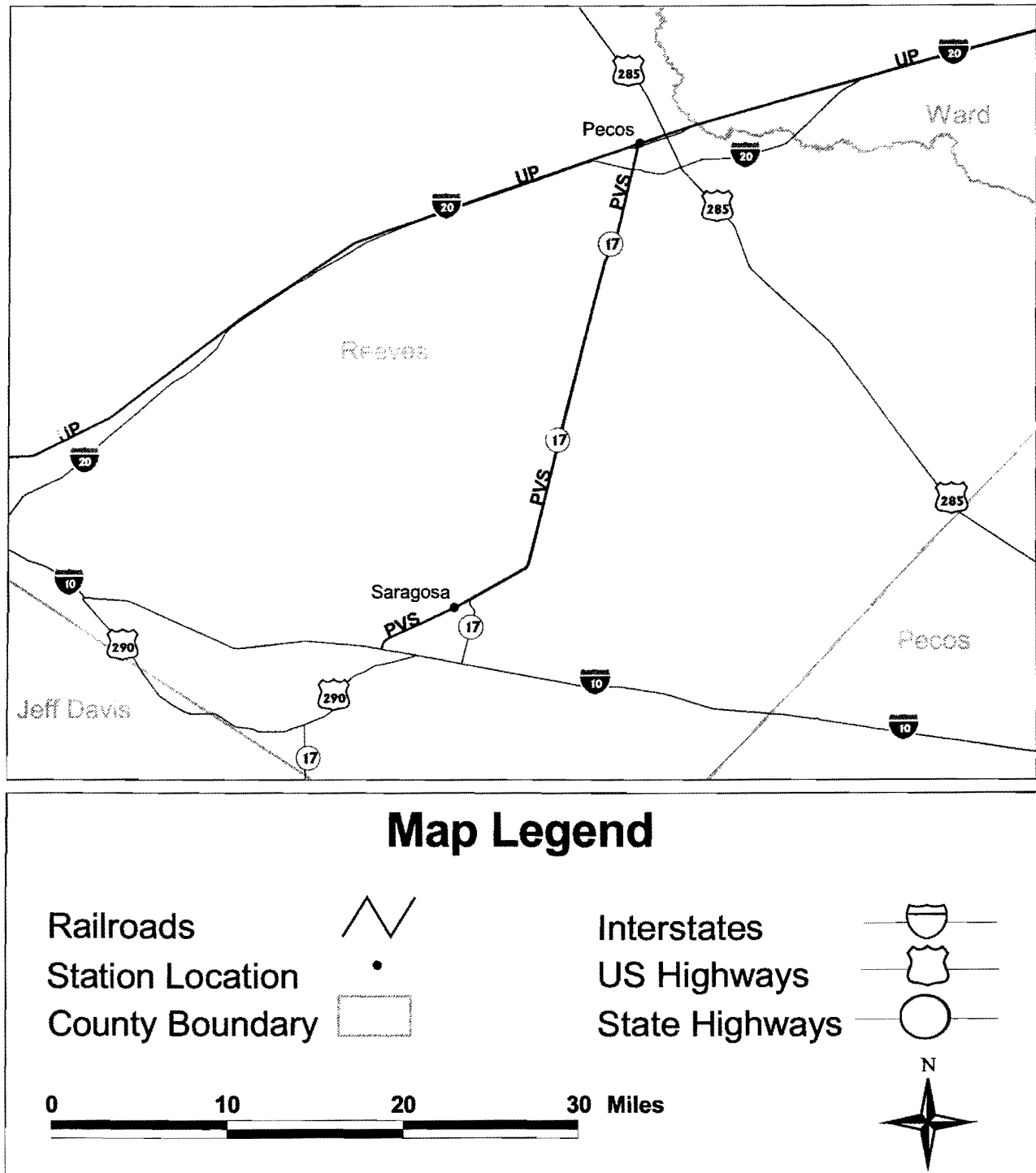


Figure 40. PVS - Pecos Valley Southern

RSS - Rockdale, Sandow & Southern

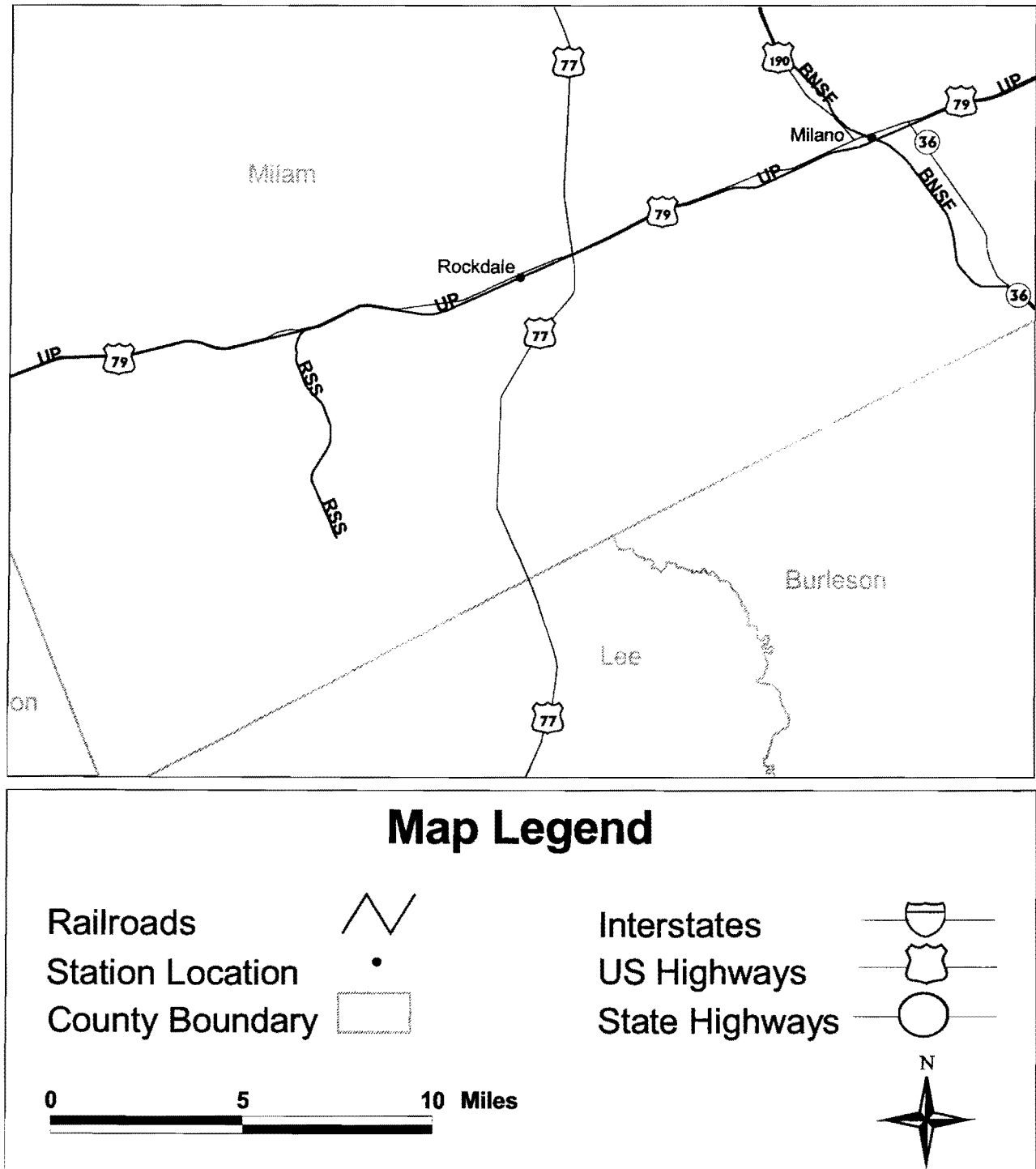


Figure 41. RSS - Rockdale, Sandow & Southern

RVSC - Rio Valley Switching

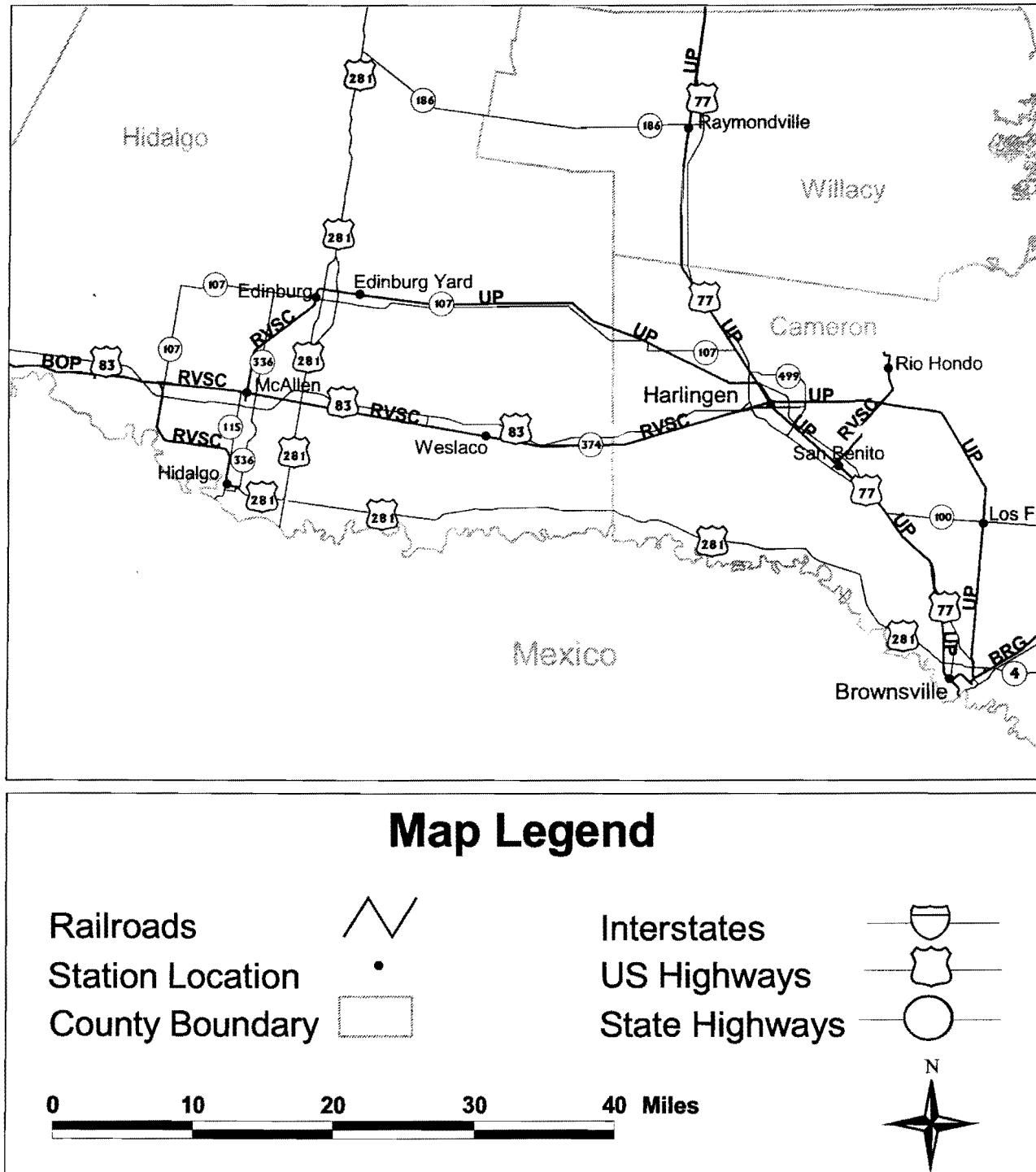


Figure 42. RVSC - Rio Valley Switching

SO - South Orient

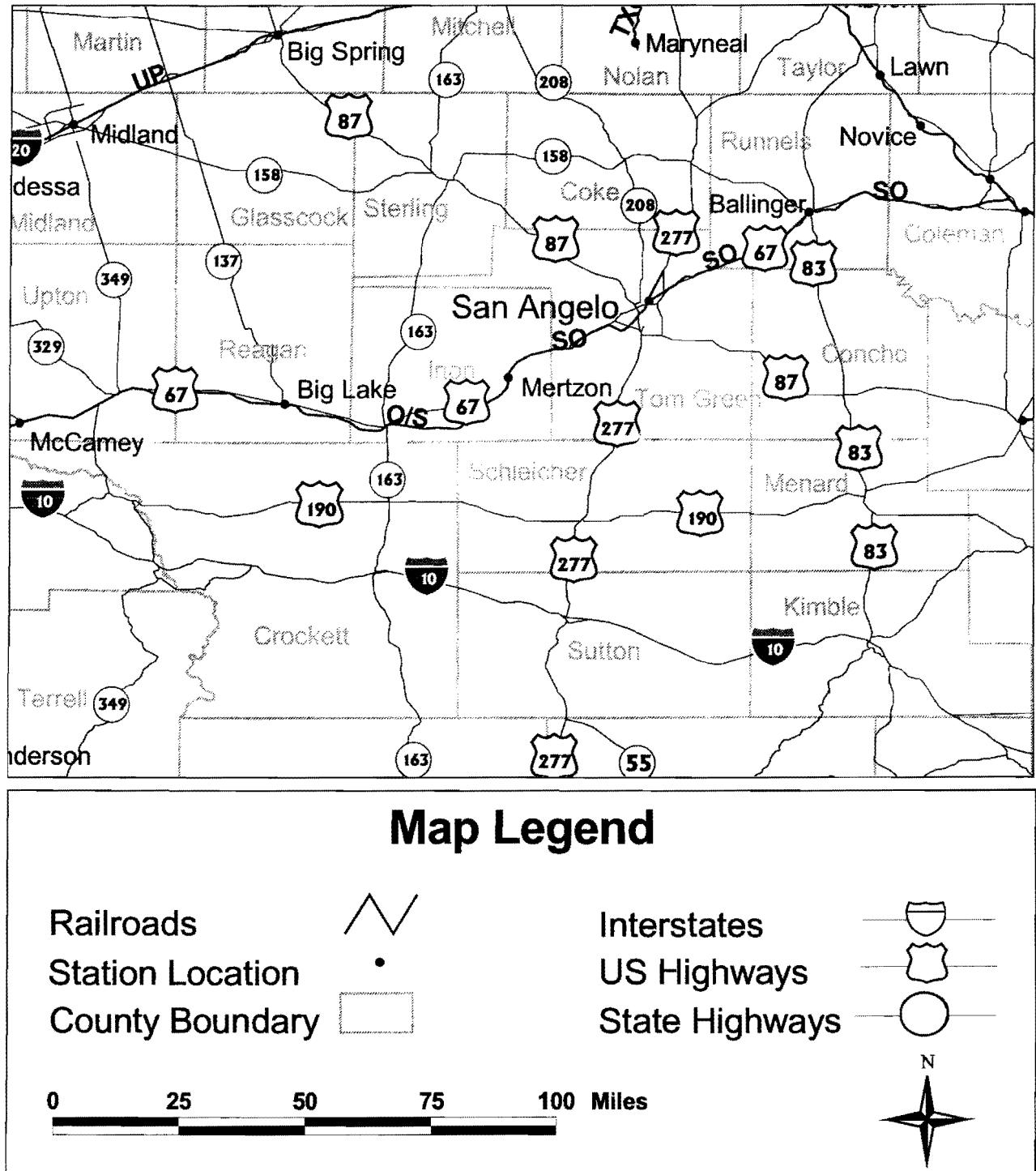


Figure 43. SO - South Orient

SRN - Sabine River & Northern

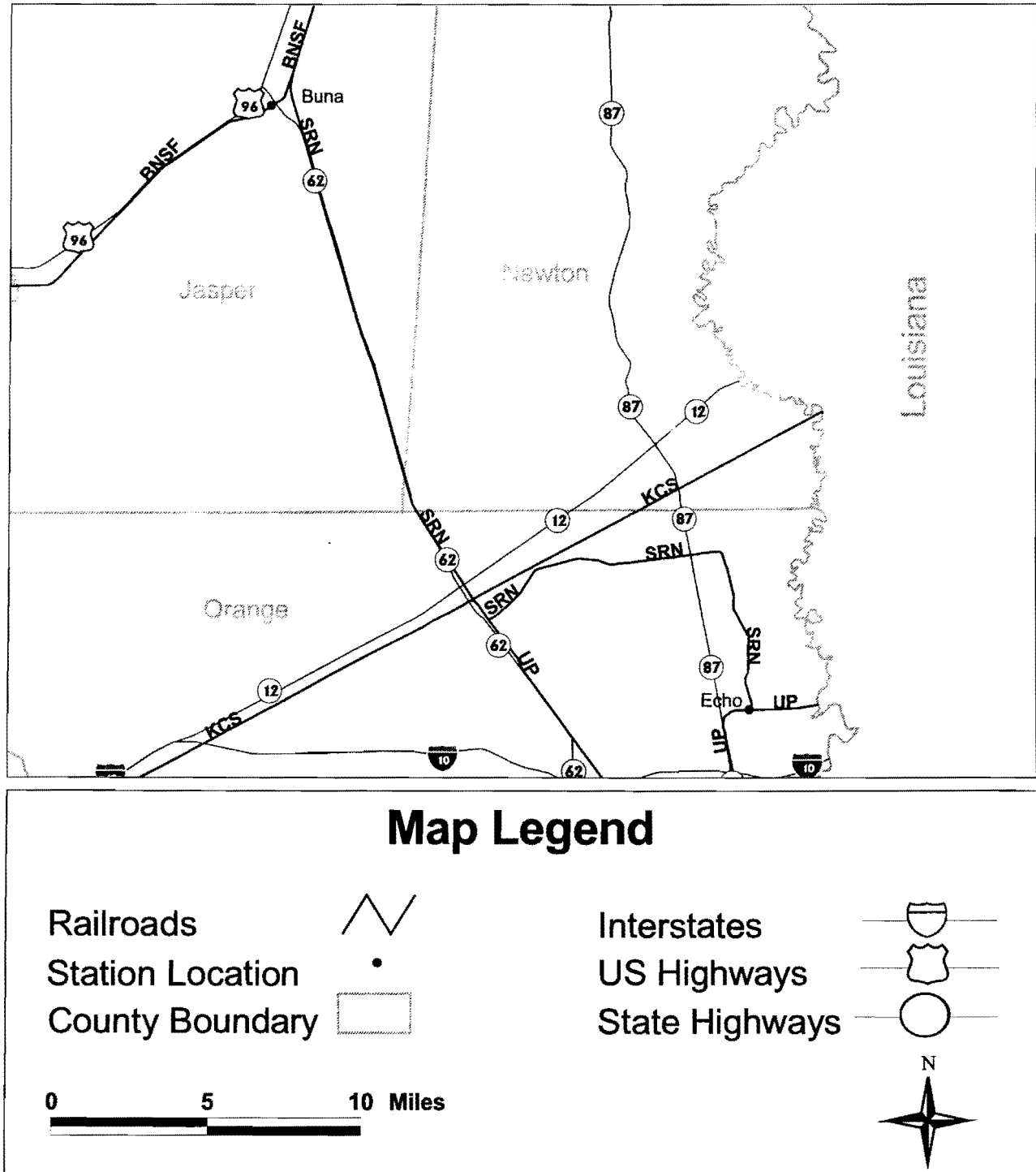


Figure 44. SRN - Sabine River & Northern

SSC - Southern Switching

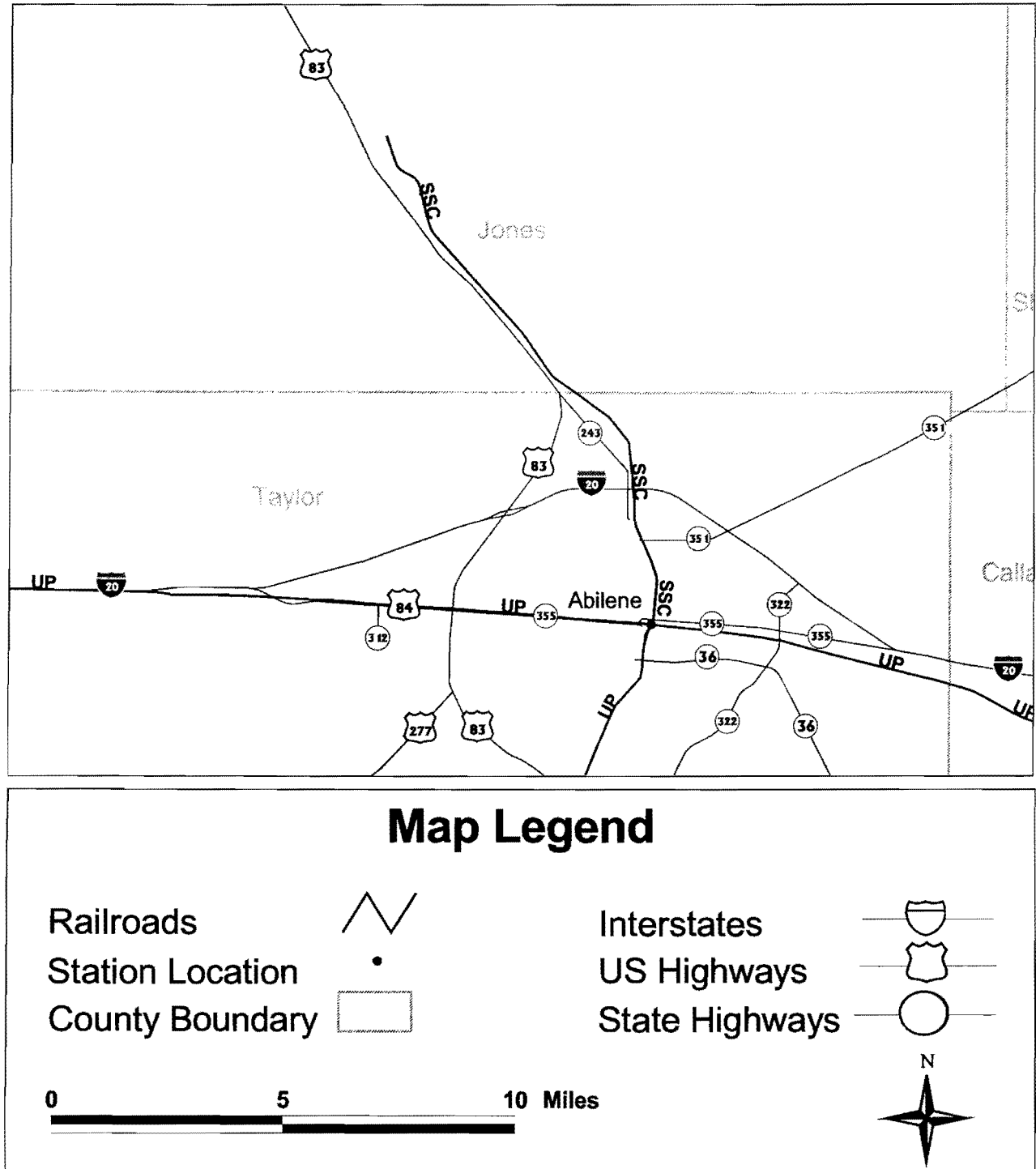


Figure 45. SSC - Southern Switching

SW - Southwestern

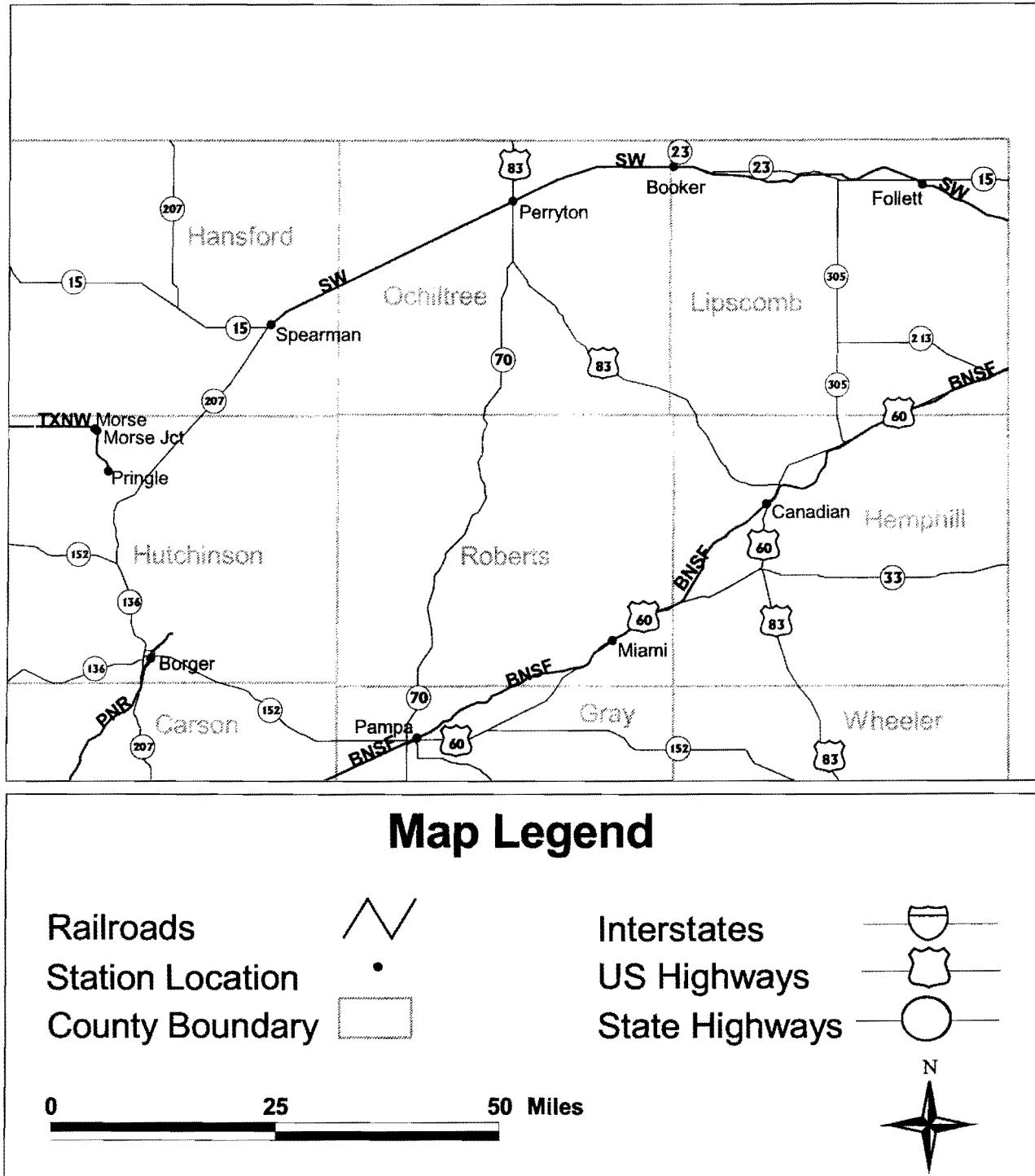


Figure 46. SW - Southwestern

TCT - Texas City Terminal

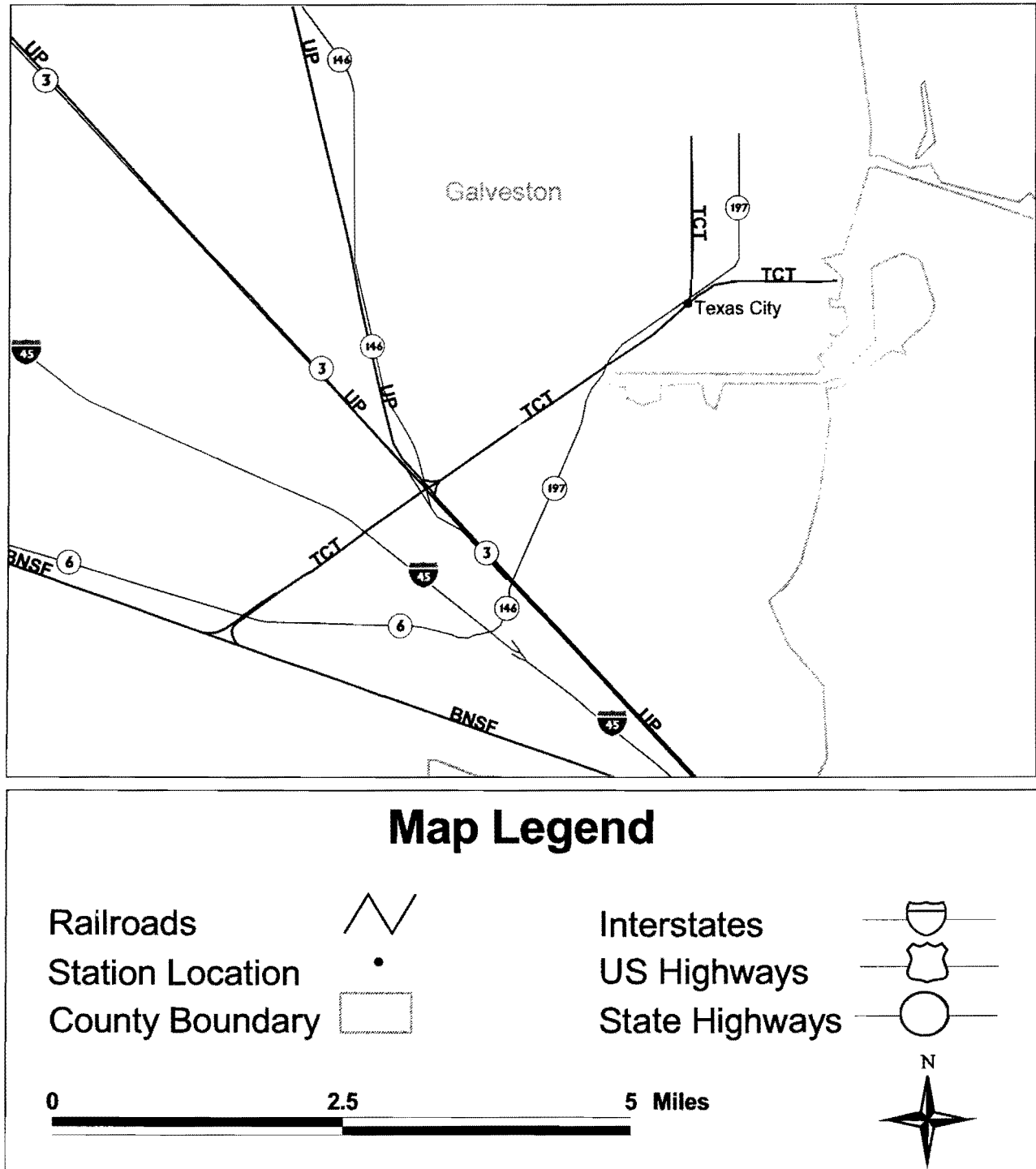


Figure 47. TCT - Texas City Terminal

TM - Texas Mexican Railway

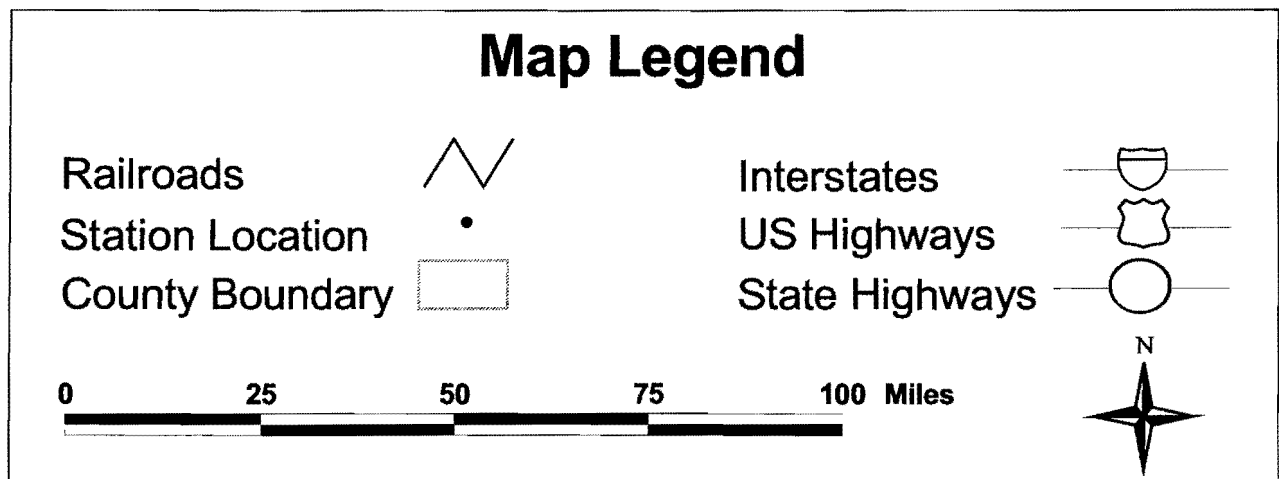
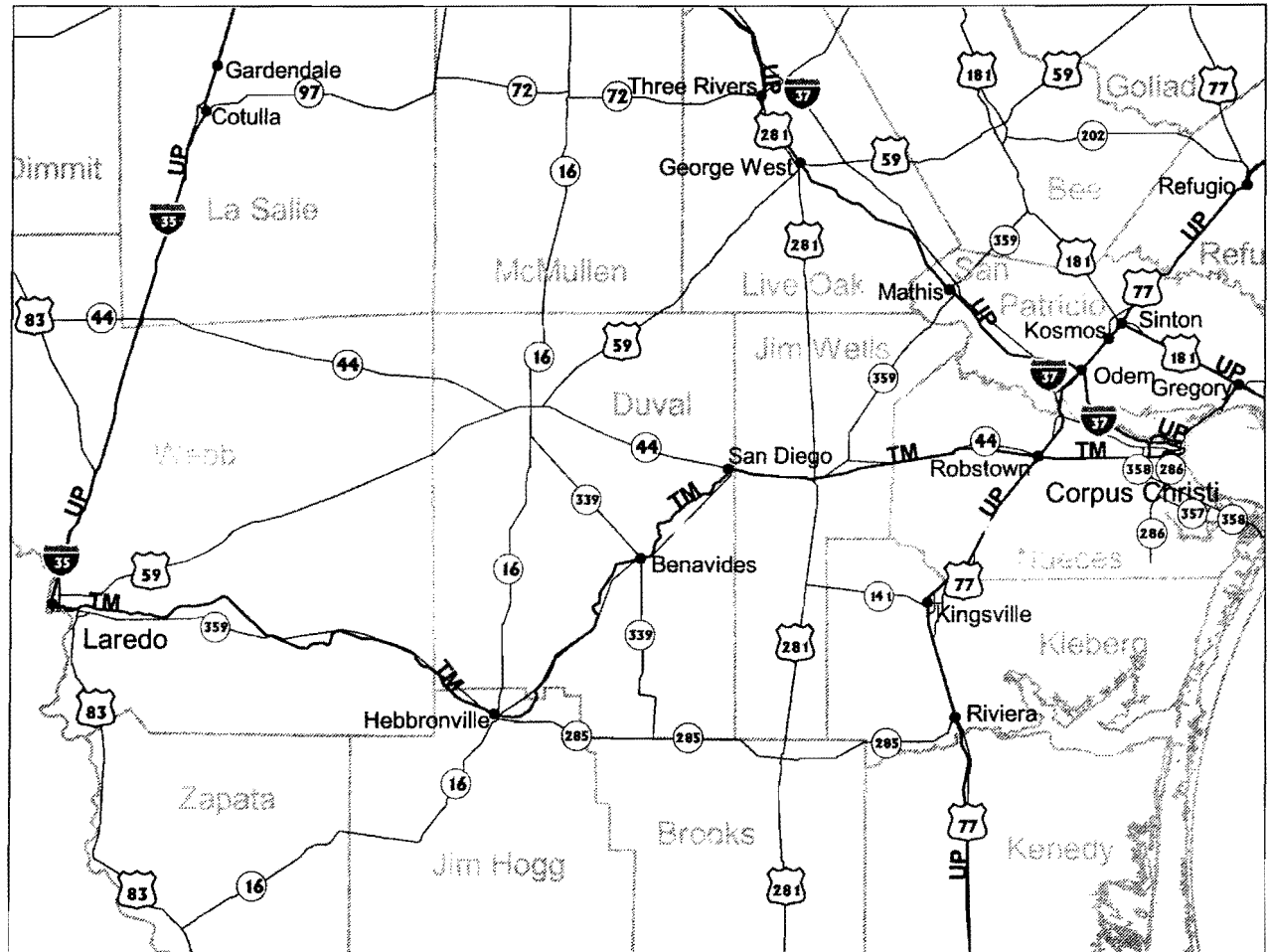


Figure 48. TM - Texas Mexican Railway

TN - Texas & Northern

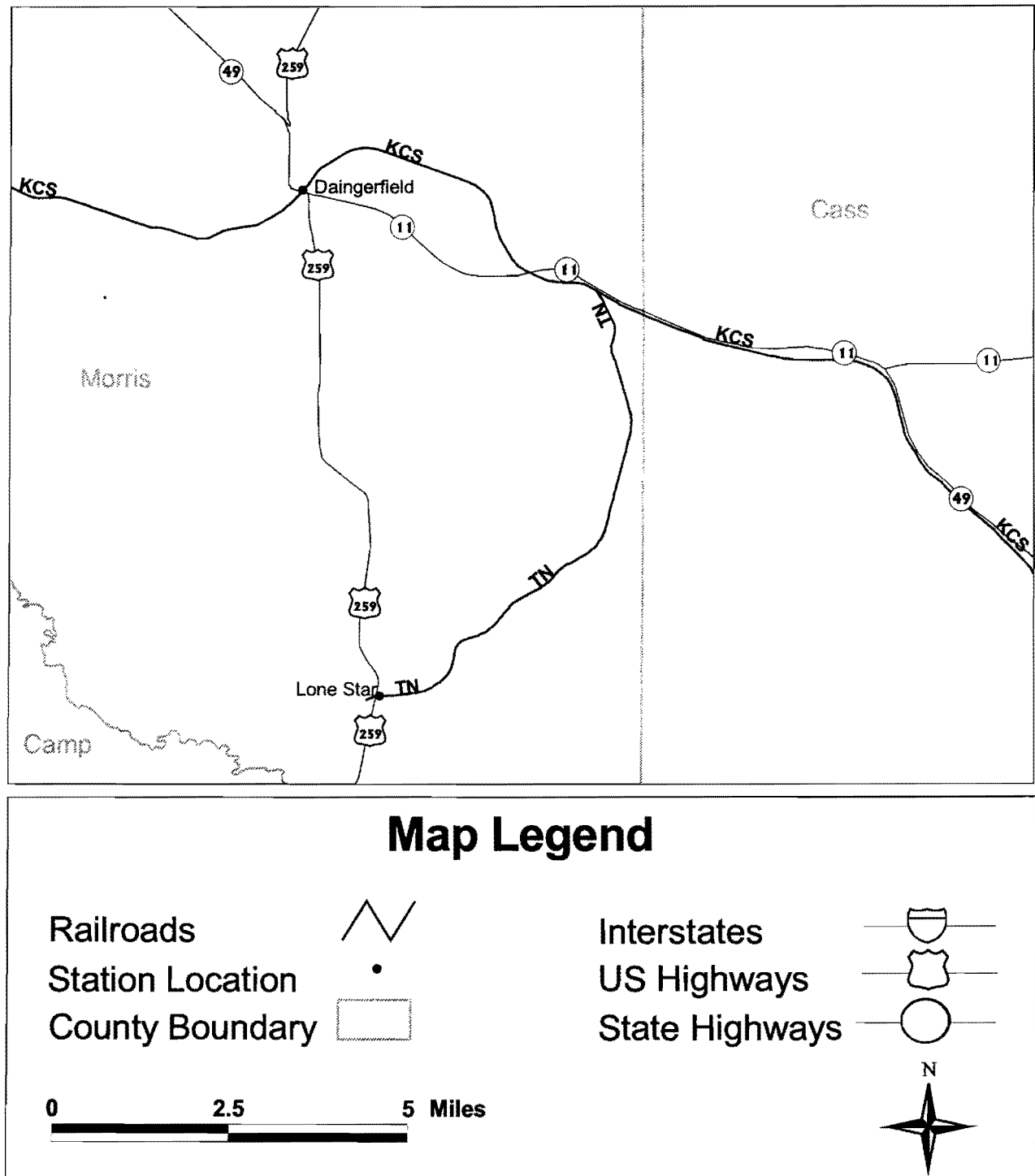


Figure 49. TN - Texas & Northern

TNER - Texas Northeastern

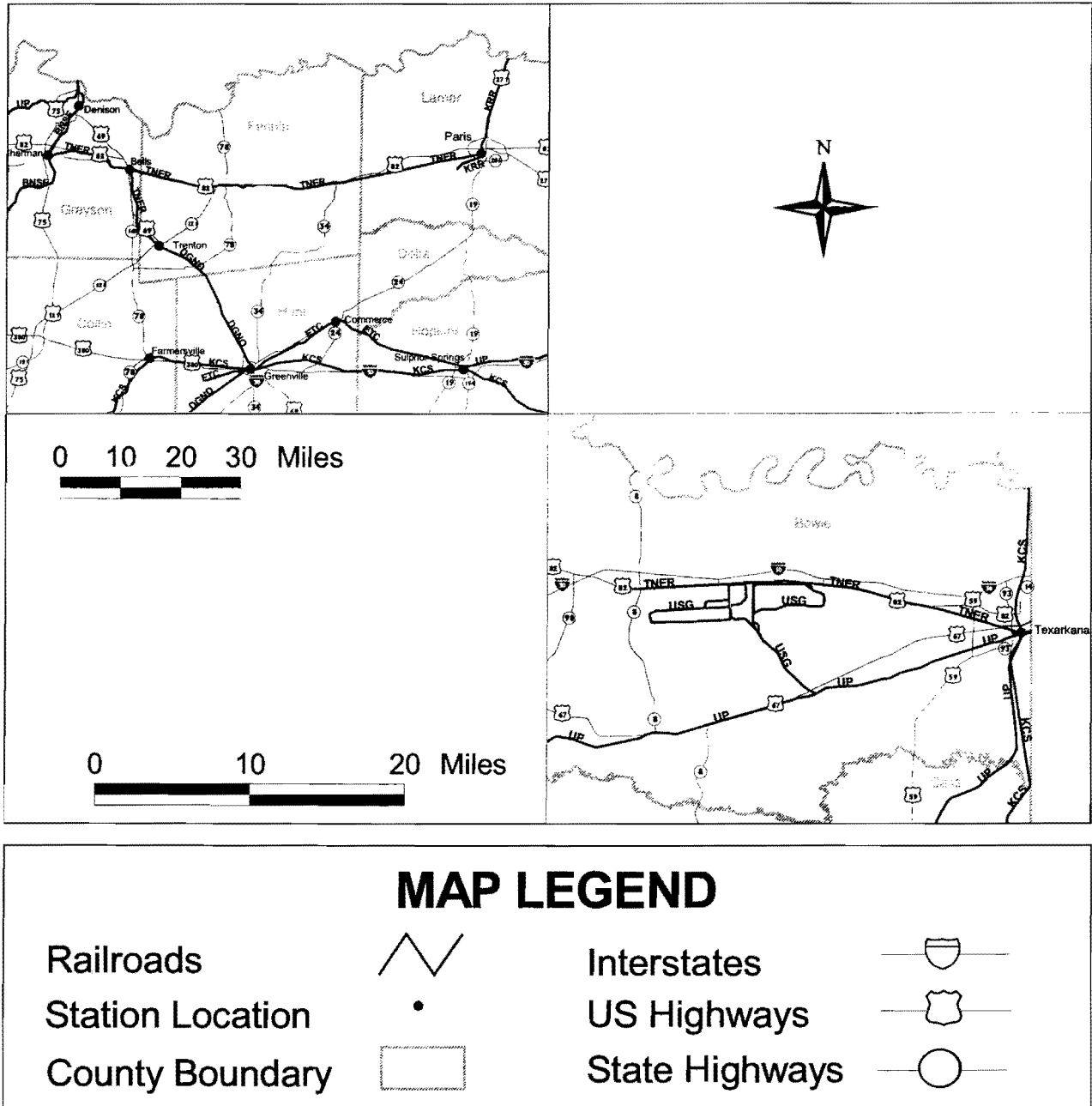


Figure 50. TNER - Texas Northeastern

TNMR - Texas-New Mexico

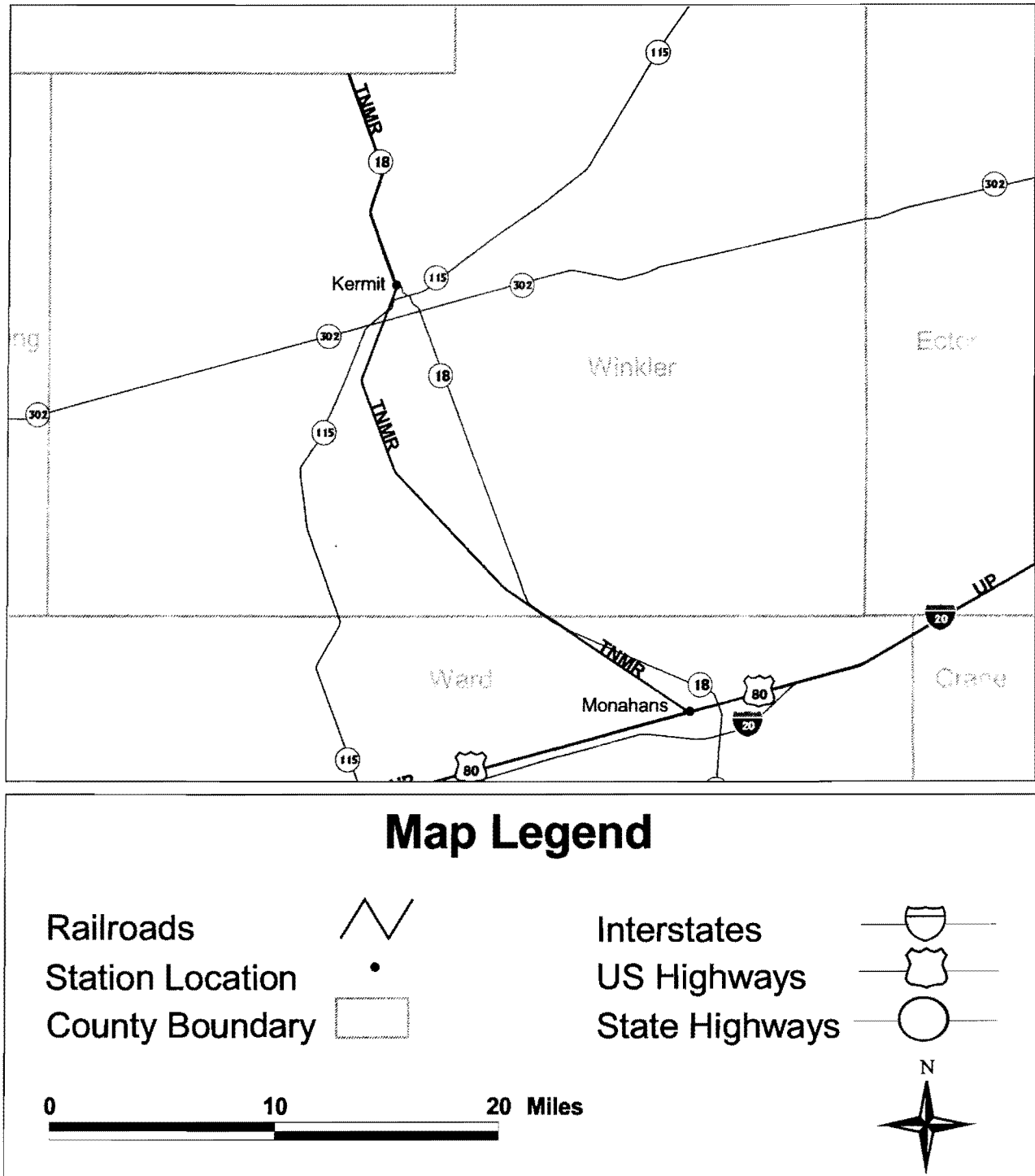


Figure 51. TNMR - Texas - New Mexico

TSE - Texas South-Eastern

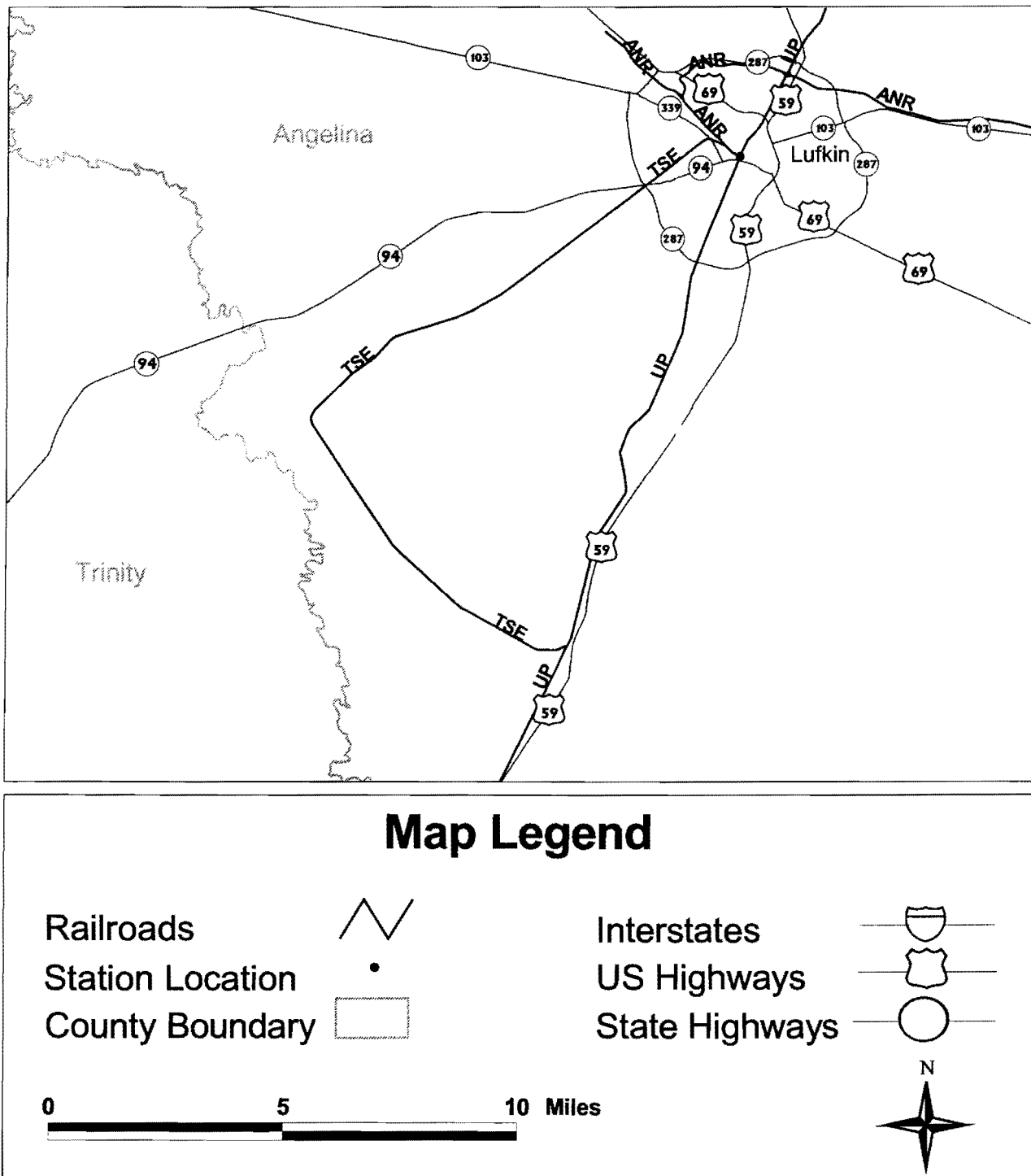
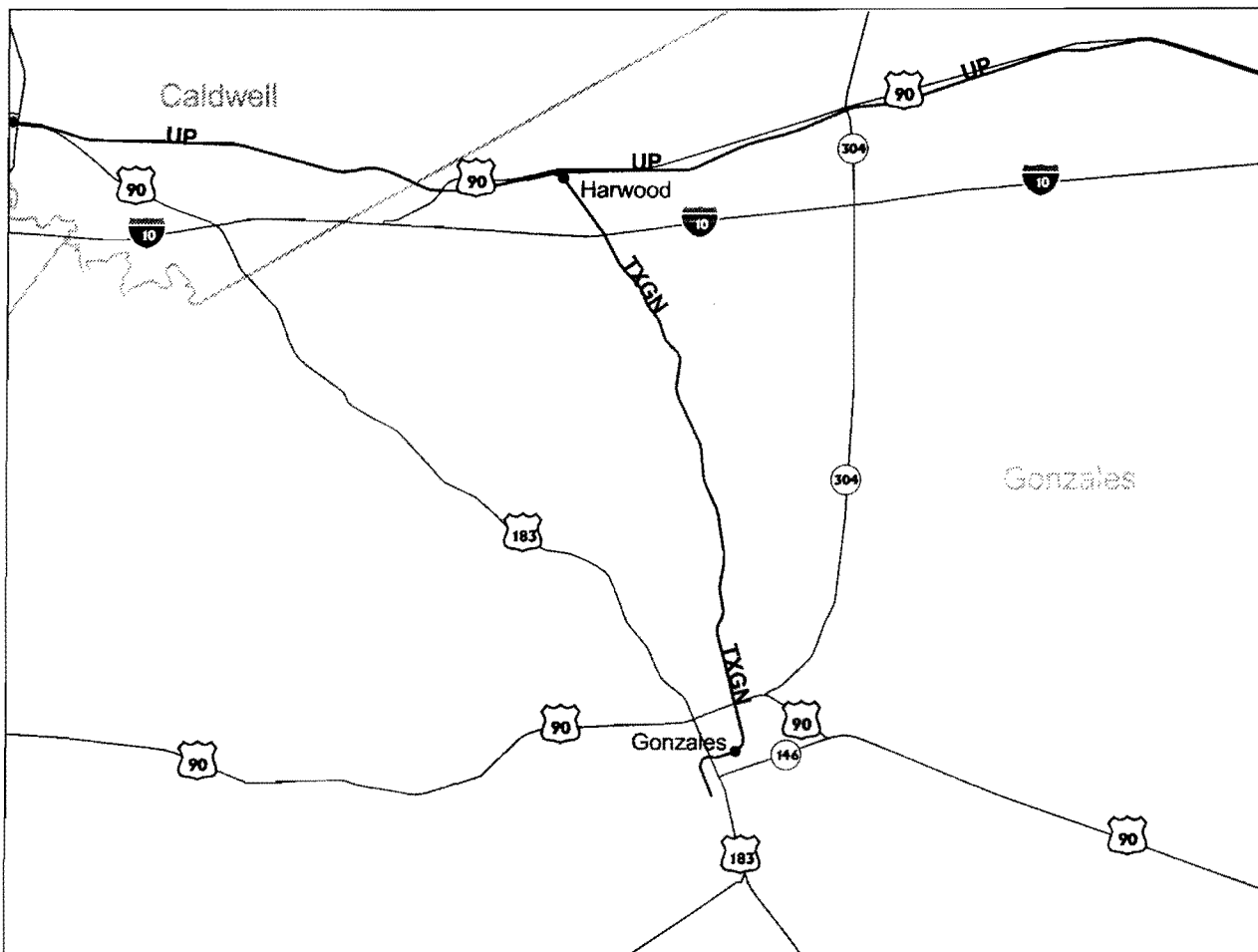


Figure 52. TSE - Texas South-Eastern

TXGN - Texas Gonzales & Northern



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 5 10 Miles



Figure 53. TXGN - Texas Gonzales & Northern

TXNW - Texas North Western

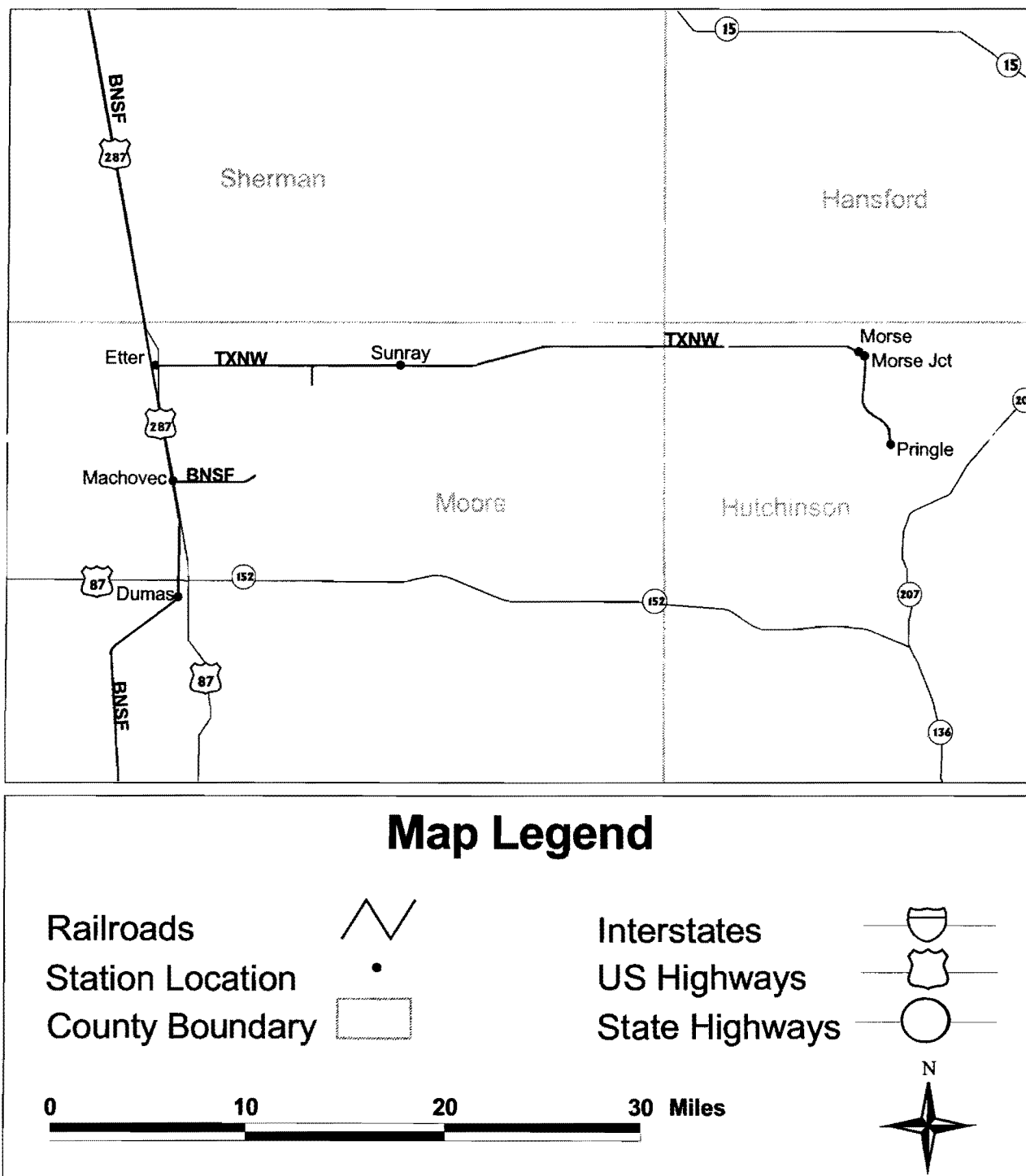


Figure 54. TXNW - Texas North Western

TXOR - Texas & Oklahoma

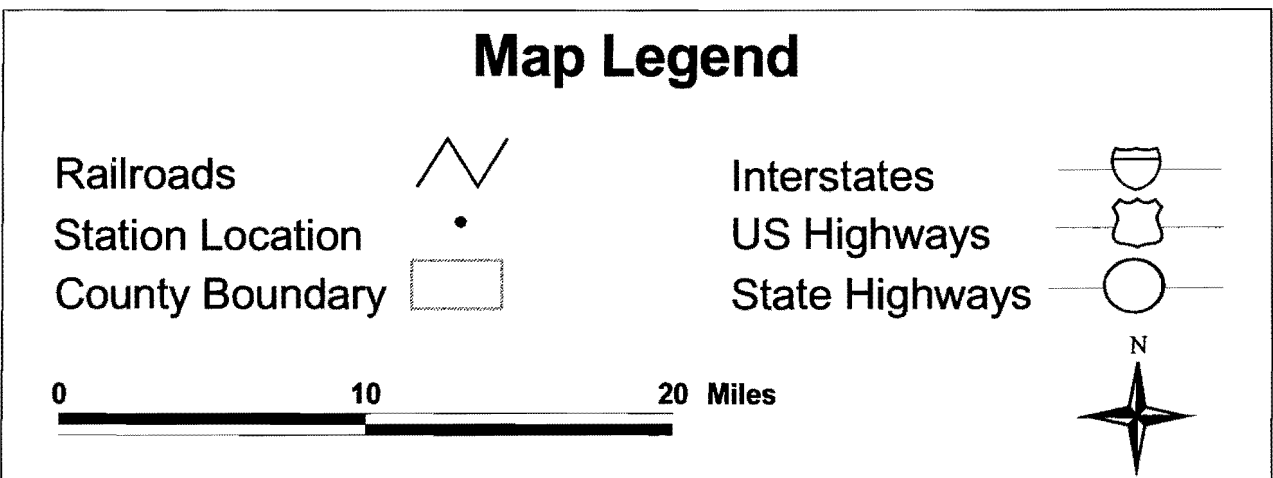
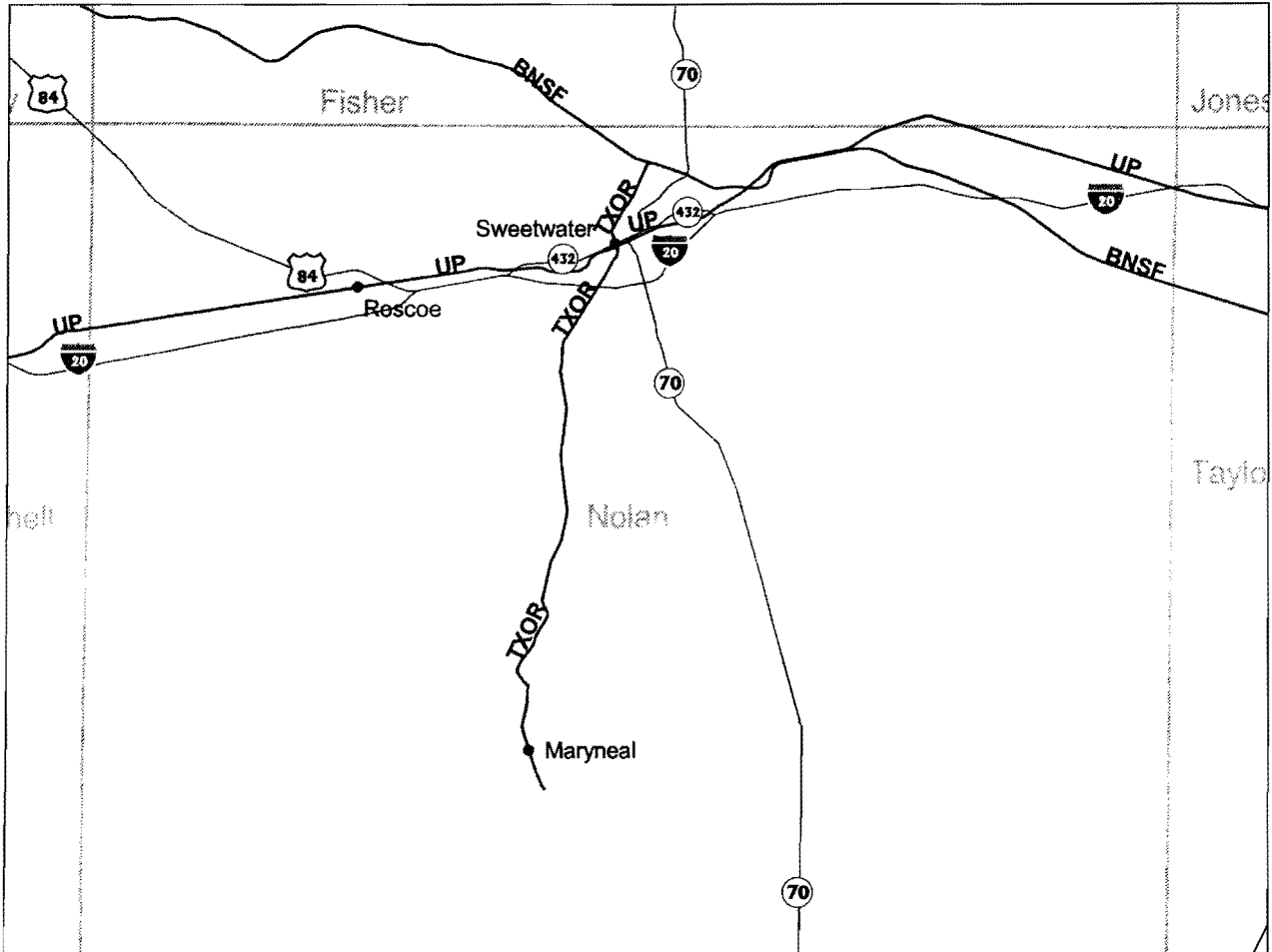


Figure 55. TXOR - Texas & Oklahoma

TXTC - Texas Transportation

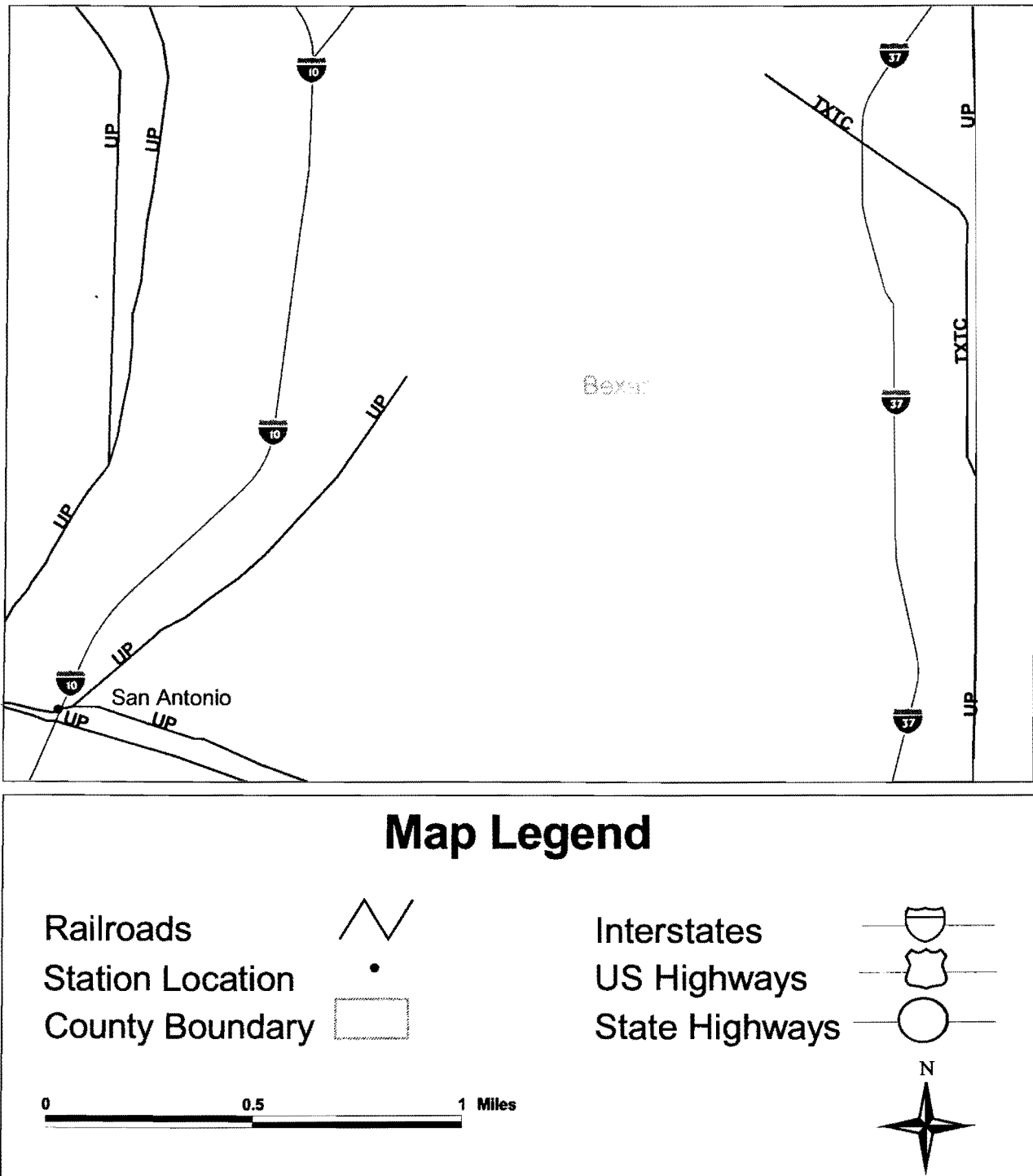


Figure 56. TXTC - Texas Transportation

WRRC - Western

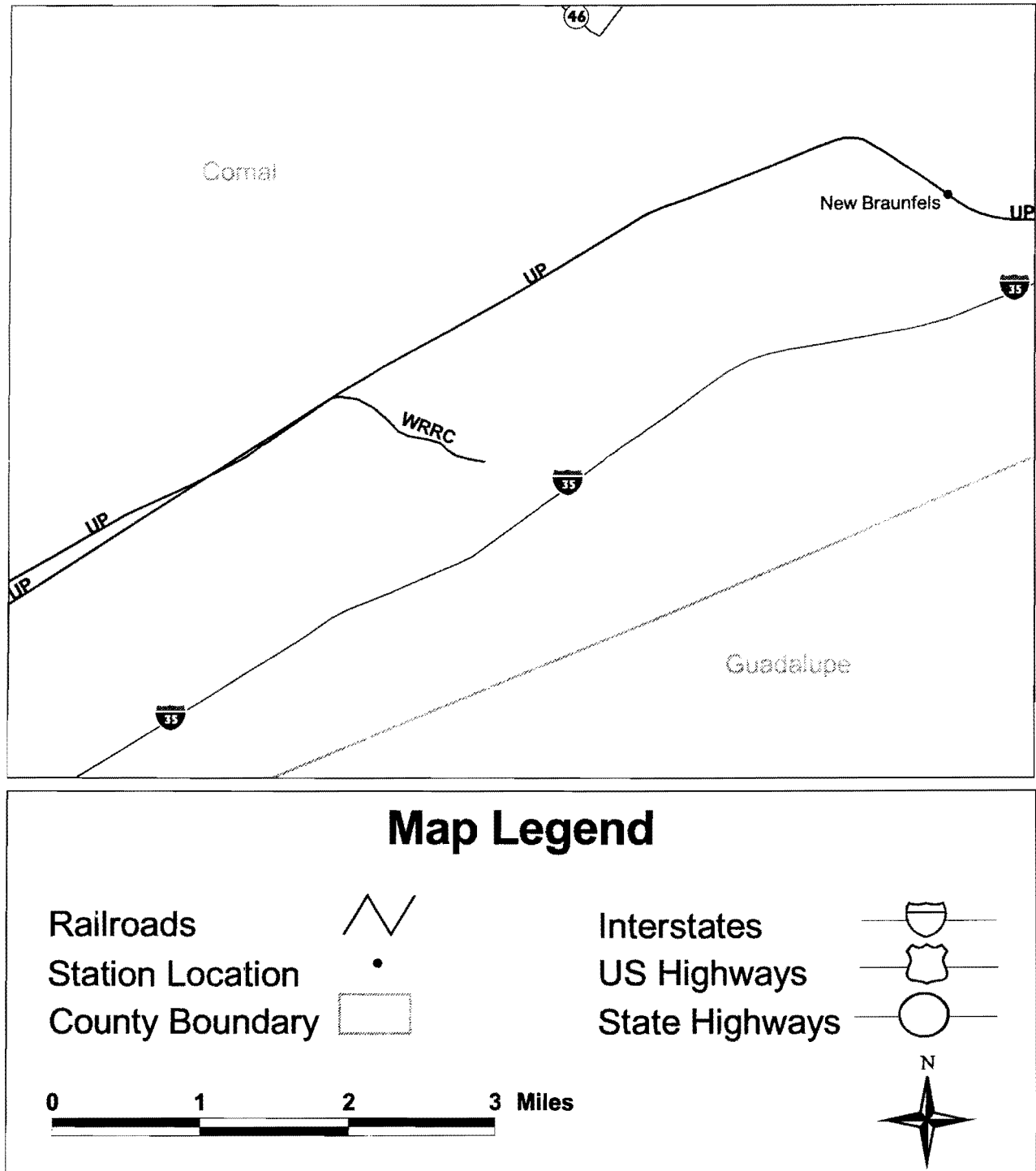


Figure 57. WRRC - Western

WTJR - Wichita, Tillman & Jackson

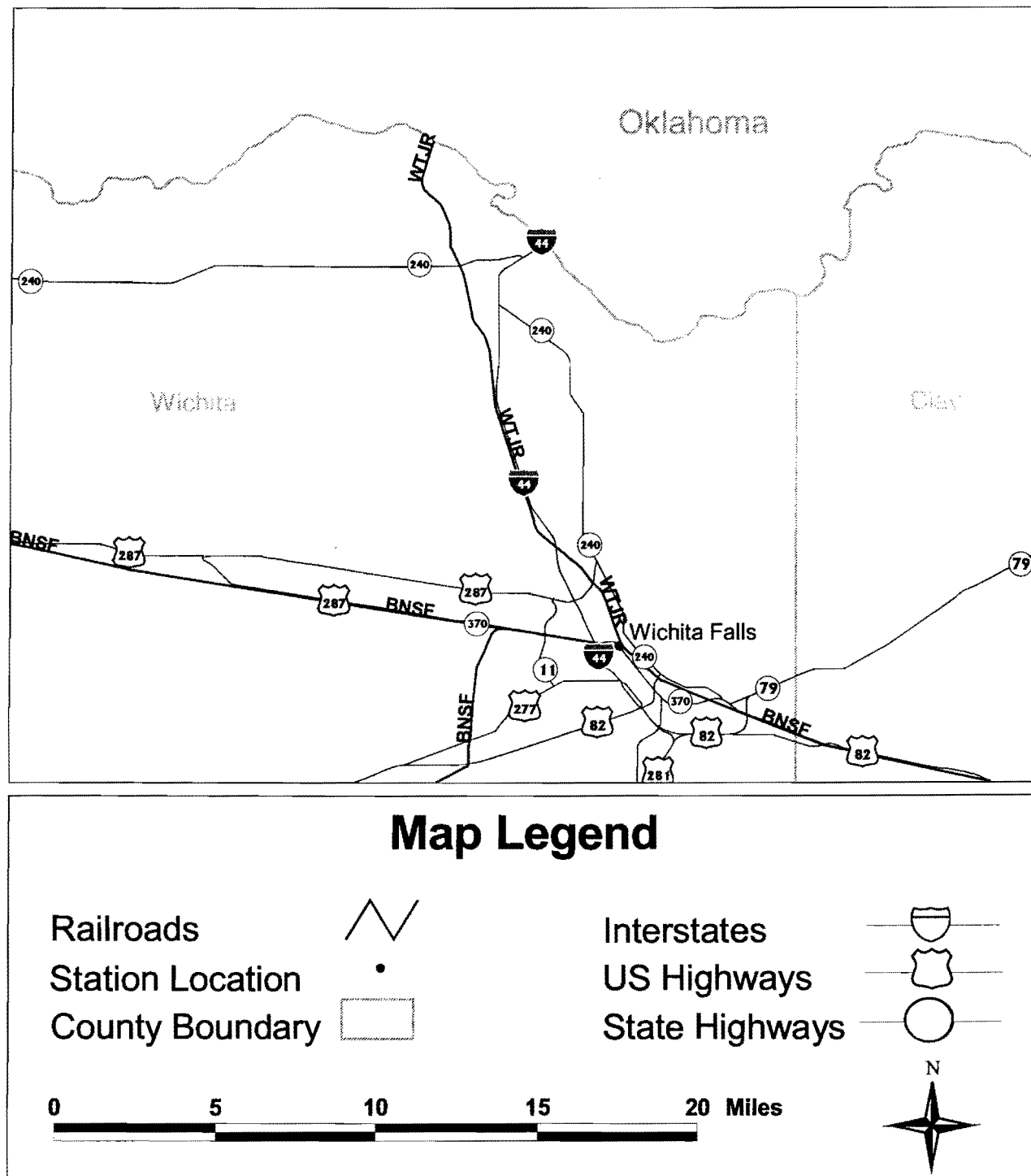


Figure 58. WTJR - Wichita, Tillman & Jackson

WTLR - West Texas & Lubbock

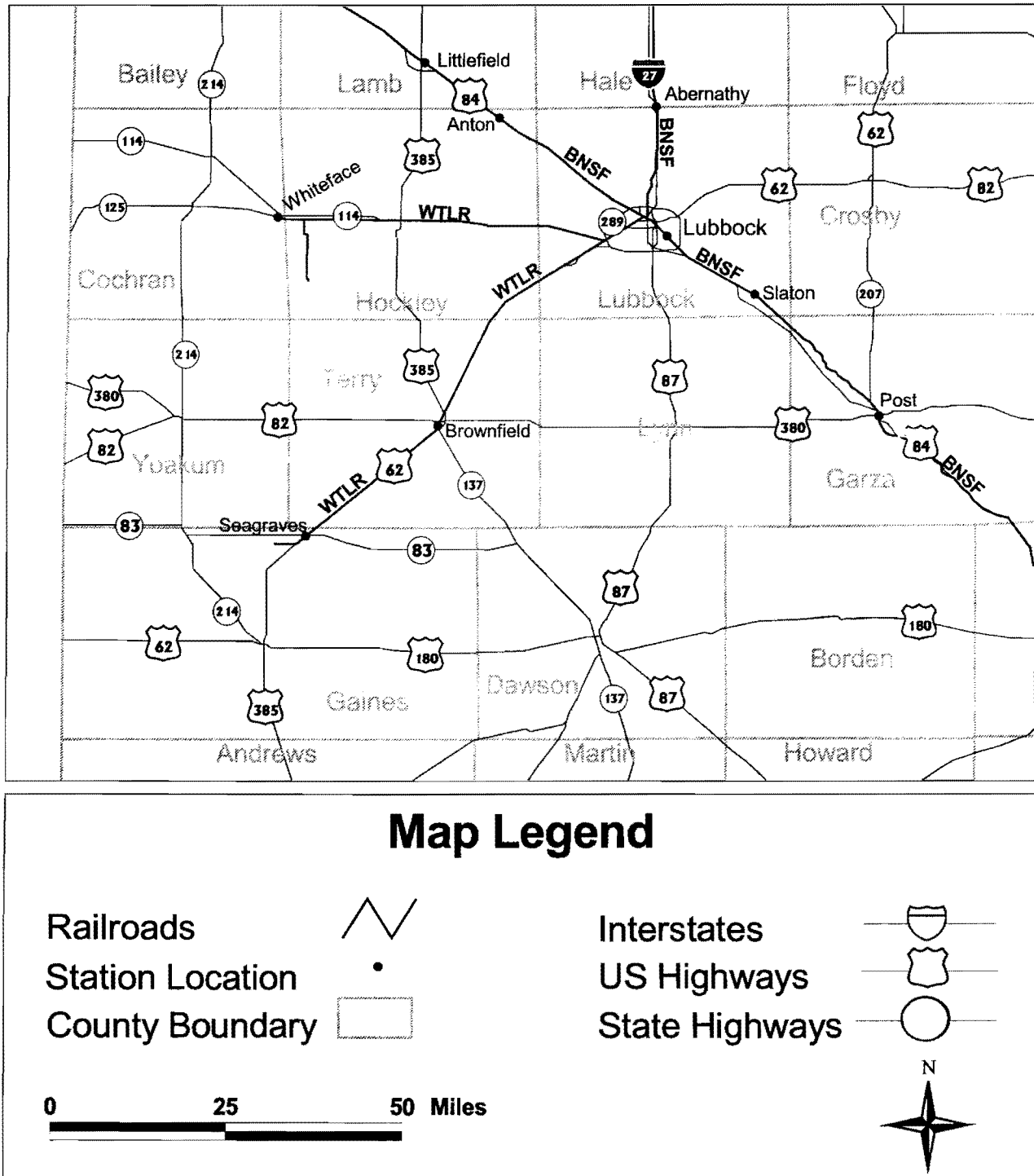


Figure 59. WTLR - West Texas & Lubbock

THE SHORTLINE RAILROAD SURVEY

Thirty-six shortline railroads operating in Texas were surveyed as to their outlook on new business opportunities, their plans for capital investment, whether they envisioned traffic growth or decline in their future, and how their company had been impacted by the BN/SF and UP/SP mergers. Additionally, they were asked to comment upon and rate the importance of issues facing their railroad such as rail car availability, access to markets, competitive joint rates, and public/private partnerships for capital investments.

Thirty-three percent, or 12 railroads, responded to the survey. Their responses to the questions traversed the entire spectrum of possible answers, from extreme optimism about the future of their railroad, to pessimism about their ability to stay in business with complaints about uncooperative Class I railroads. One shortline operator went so far as to state that “shortlines need all the help they can get.”

New Business Opportunities

In stating their outlook for new business opportunities, 56 percent of the respondents indicated a positive attitude toward the future. Reasons given for the positive attitudes were optimism associated with the newly privatized Mexican Railroads, growth in the area in which they operated, and the fact that recent efforts in trade development appeared to be effective in attracting potential new business.

Forty-four percent of the respondents indicated little or no opportunities for new business. The answers to this question ranged from a simple “none” to explanations detailing aspects such as the small size of their facility limiting both short-term and long-term growth opportunities. One shortline railroad indicated that its only opportunity for new business would have to come from the acquisition of additional trackage or operating rights over Class I trackage. Another reason given for lack of new business was that the railroad served only one customer, the company that owned them.

Capital Investment

Capital investment in infrastructure by a railroad is a necessary component for staying viable. Often, the lack of capital investment is a sign that the financial well-being of a railroad is questionable.

When asked the short-term and long-term outlook for their company as measured by capital investment, only 22 percent indicated that they were planning, or had already engaged in, significant capital investments. One railroad indicated that even though their track was leased they had invested large sums to upgrade all the track to Class I status, feeling that increases in new business warranted the investment.

Of those shortline railroads not indicating significant capital investments, 44 percent indicated they had no plans to invest in infrastructure or physical plant, and 33 percent stated that the short-term and long-term outlook for their company as measured by capital investment would only be in the area of minor improvements to facilities and minimal maintenance of track and equipment. Figure 60 displays capital investment outlook graphically.

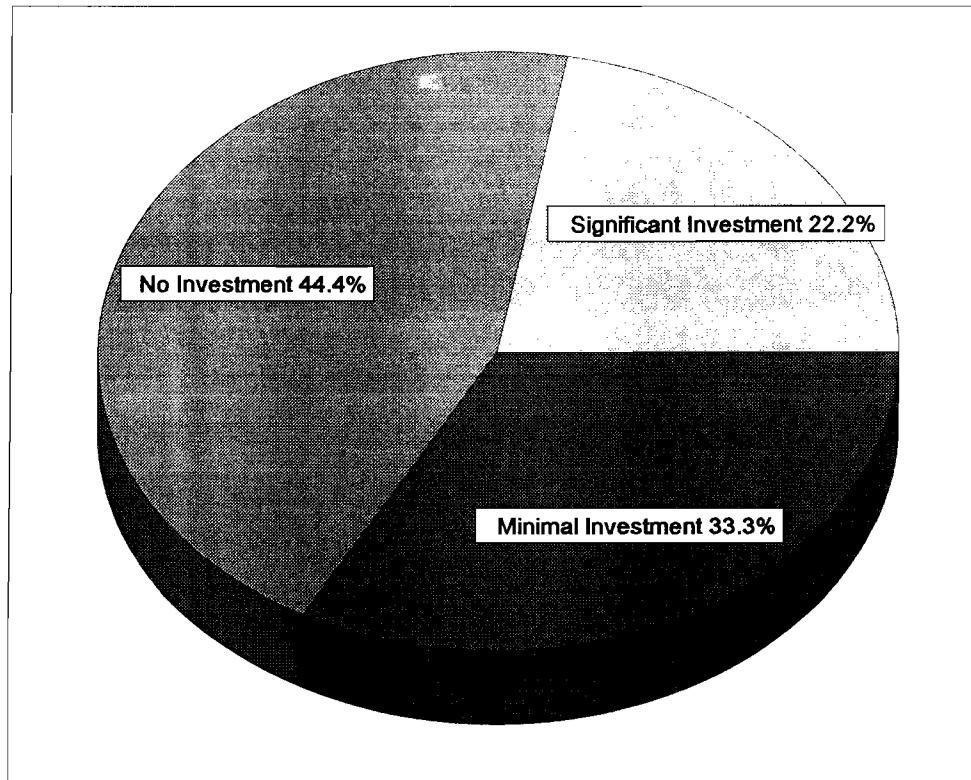


Figure 60. Future Outlook as Measured by Capital Investment

Traffic Growth or Decline

Most of the shortline survey respondents expressed optimism regarding future traffic growth (in one case, extreme optimism). Sixty percent indicated that they expected traffic to grow for the short term and long term, citing factors such as expected increases in trade to and from Mexico (as long as the Mexican economy remained stable), or that they had no real competition to interfere with such growth. That 60 percent would indicate confidence in future growth is surprising in light of the fact that over 75 percent of the respondents indicated that they had minimal plans or no plans at all for near-term or long-term capital investment.

Thirty percent responding to the survey indicated that they foresaw no real change in future traffic growth. Only 10 percent predicted a decline, stating that the decline was already occurring with most of the lost traffic “gone to Houston.” Figure 61 graphically displays the short-term and long-term outlook for the responding shortline railroads, as measured by traffic growth and decline.

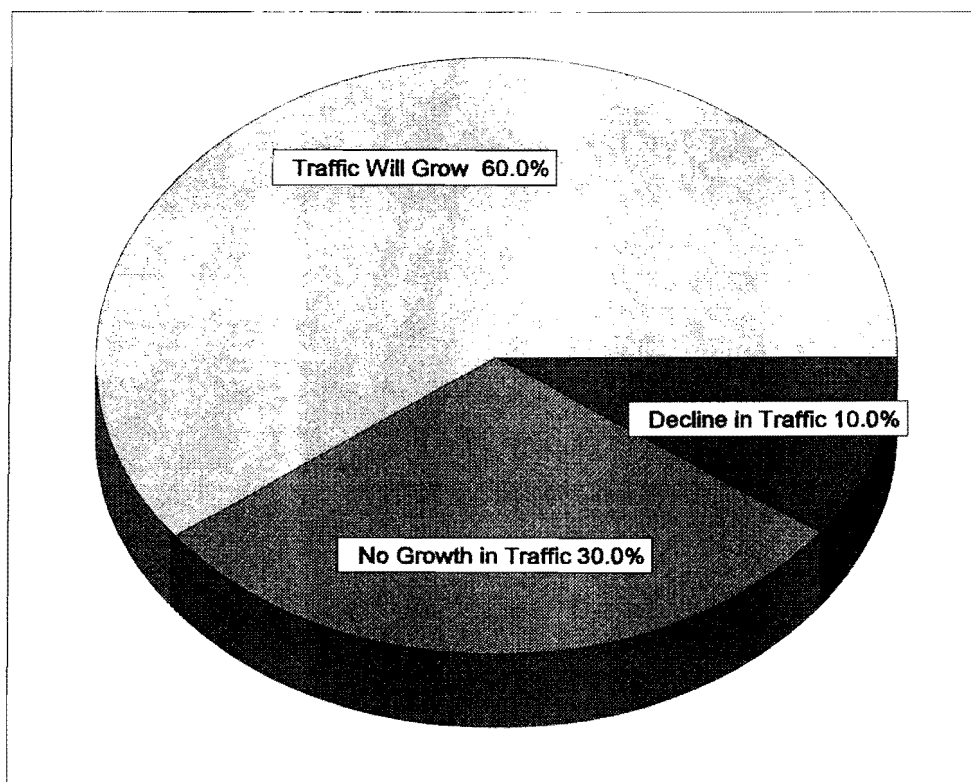


Figure 61. Outlook for Traffic Growth or Decline

Operational Issues

Operational issues discussed in the responses to the surveys tended to either indicate no real concern about such issues or that any issues that cropped up would be dependent on the actions of the Class I railroads. One respondent did indicate some uncertainty related to the major mergers taking place, remarking that the Class Is were now in a better position to exert more influence on small operations.

Impacts of BN/SF and UP/SP Merger

When asked how the shortline railroads had been impacted by the BN/SF and UP/SP mergers, the respondents were split evenly as to whether or not an impact could be felt. Of those respondents who indicated no impact, the only qualifier was the accountability of more kinds of cars.

For those 50 percent of the respondents indicating that the mergers had resulted in an impact, only one indicated that the impact had been positive, this due to the Class I railroad fast becoming a single-line entity, helping when it came time to quote rates and share information. The rest of the impacts reported were negative, some quite so. The negative responses tended to focus on the poor service they were receiving from the Class I railroads. The indications were that service was slower, often late, that some services had stopped, and the need for equipment had increased because of long turnaround times. One in particular indicated that since the merger, the Class I railroad providing service to them had become much more difficult to deal with.

Railroad Service and Investment Issues

Each of the shortline railroads was asked to provide comments on the following service and investment issues: rail car availability, competitive joint rates with other railroads, market access, and public/private partnerships for capital investments. They were also asked to rate each of these issues in terms of importance to their railroad. A five-point scale was used, with one meaning little importance and five meaning very important.

Rail Car Availability

The importance of rail car availability was rated very high by the shortline railroads, averaging 4.12 on the five-point scale. Half of the shortlines commenting on this issue indicated that there was a shortage of rail cars (primarily box cars).

Competitive Joint Rates with Other Railroads

The shortlines rated this issue as moderately important, averaging 3.38 on the five-point scale. While it may be surprising that this issue was not rated higher, the accompanying comments have an air of resignation associated with the fact that the shortlines feel at the mercy of the Class I railroad servicing them. One railroad expressed concern that if the current increase in rates demanded by the Class I continued they would be forced out of business.

Market Access

The importance of market access was rated relatively low, averaging 2.88 on the five-point scale. One of the reasons for the low rating could be the limited nature of business that characterizes many shortline operations. For example, one survey respondent indicated that 99 percent of their business was aggregates and that they shipped no more than 400 miles (640 km) away.

Public/Private Partnerships for Capital Investments

The importance of public/private partnerships for capital investments was rated highest of the four issues by the survey respondents, averaging 4.14 on the five-point scale. Most of the respondents commented they were not eager to see a strong public investment in the industry, reasoning that this would give a competitive advantage to operations able to secure public funding over operations which had to use return on investment for capital. Only one shortline viewed public/private partnerships for capital investments in a positive light, indicating that some of their plans called for large amounts of ISTEA related capital.

The rating results on railroad service and investment issues are displayed graphically in Figure 62.

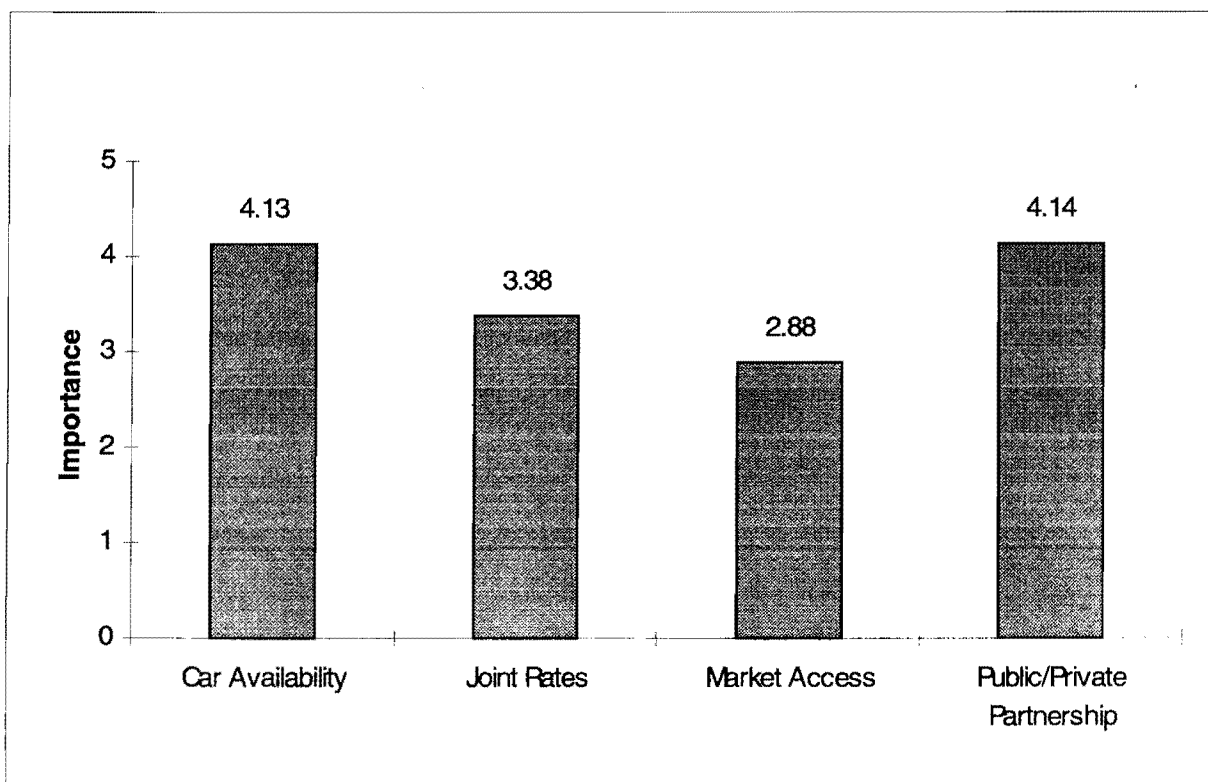


Figure 62. Importance of Railroad Service and Investment

The fact that market access was rated lowest in importance is indeed surprising. Ultimately, the majority of shortline railroads depends on the cooperation of Class I railroads in providing market access. The attitude of Class I railroads toward the shortline industry is critical to its survival.

Texas Shortline Railroad Survey

What is the short-term and long-term outlook for your company, as measured by:

New business opportunities:

Capital investment (equipment, track, facilities):

Traffic growth/decline and new or strengthened competition:

Operational issues:

Please comment upon and rate in terms of importance the following issues that may be facing your railroad (1=Little Importance 5=Very Important)

Rail car availability (please comment)	Importance (1-5)
Competitive joint rates with other railroads (please comment)	Importance (1-5)
Market access (please comment)	Importance (1-5)
Public/Private partnerships for capital investments (please comment)	Importance (1-5)

How has your company been impacted by the BN/SF merger? What do you expect the impacts to be in the future?

How has your company been impacted by the UP/SP merger? What do you expect the impacts to be in the future?

NATIONAL RAILROAD PASSENGER CORPORATION (Amtrak)

Amtrak was created by the Rail Passenger Service Act of 1970 to operate and revitalize intercity passenger rail service. Prior to Amtrak's creation, intercity passenger rail service was provided by private railroads, which had continually lost money after World War II. Congress gave Amtrak specific goals, including:

- Providing modern, efficient intercity passenger service,
- Helping to alleviate the overcrowding of airports, airways, and highways, and
- Giving Americans an alternative to automobiles and airplanes to meet their transportation needs.

According to the GAO, through fiscal year 1997, the federal government had invested over \$19 billion in Amtrak (through direct capital and operating subsidies). In 1995, Congress required Amtrak to eliminate its federal operating subsidy by the year 2002.

The issue of this subsidy and Amtrak's financial performance has been a subject of controversy since the system's inception. Although all transportation modes in the U.S. receive subsidies, Amtrak's

subsidies have been subjected to unusually intense debate. The intensity of the debate may in part be due to the fact that Amtrak subsidies are an easy target. Subsidies for other transportation modes such as road and water are scattered among national, state, and local budgets. The bulk of Amtrak's subsidy comes from the federal government alone.

In order to understand Amtrak's current subsidy situation, it is necessary to view it in an historical perspective. The Amtrak system was created after an extended period of disinvestment in passenger trains. Any system that must compensate for years of past neglect will inevitably suffer a period of disproportionately high costs. Given Amtrak's unfortunate history, the system's financial picture in the past decade shows some quite positive aspects. Operating revenues have increased almost every year. From the 1980s through 1994, operating revenues grew by approximately 229 percent, while expenses grew by only 126 percent. In 1993, Amtrak's ratio of operating revenues to expenses was 0.80, the highest level achieved in Amtrak's history. Even with this high ratio of operating revenues to expenses, Amtrak will continue to need financial assistance to cover the cost of capital equipment (Nice, 1996).

Amtrak's main response to improving its financial position has been to try to increase revenues through ticket price changes (mainly fare increases) and to cut costs by reducing service. The cuts are primarily designed to reduce costs more than revenues. The strategy could threaten Amtrak's survival as a nationwide system if its service, routes, and frequency of service are scaled back excessively. The political will to federally fund Amtrak might evaporate if its route network traversed fewer and fewer states. For example, Senator Lott of Mississippi, now majority leader, has stated that if service through his state were ended, he might not support federal funding for Amtrak (Williams and Warren, 1997).

CORPORATE MANAGEMENT STRUCTURE

In 1995, Amtrak's management undertook a major corporate restructuring and developed a Strategic Business Plan. The restructuring divided Amtrak's intercity passenger service operations into three distinct operating units ("strategic business units").

- Northeast Corridor - responsible for operations on the East Coast between Virginia and Vermont, including the high-speed (120 mph / 193 kph) Metroliner services between Washington, D.C., Philadelphia, and New York.

(The high-speed operation is presently being extended to Boston by the Northeast Corridor Improvement Project.)

- Intercity Unit - responsible for most of the nation's intercity rail passenger service, including most long-distance, cross-country trains (for example, the Sunset Limited and Texas Eagle).
- Amtrak West - responsible for services in California, Oregon, and Washington, this unit operates only one long-distance passenger train (The Coast Starlight).

Many of Amtrak West's trains receive state financial support; the business unit has entered into significant agreements with the states of California and Washington for new and innovative services, including the development of a high-speed rail corridor in the Pacific Northwest. Each strategic business unit develops its own plan and manages its own operations, under the direction of the corporate parent in Washington, D.C. The corporate entity also provides business services, such as legal support (General Accounting Office, 1997).

Amtrak business units providing primarily "corridor" services (i.e., Amtrak West and Northeast Corridor) are engaged in creation of new state partnerships (e.g., Washington State DOT), major equipment purchases (e.g., acquisition of high-speed trainsets for the Northeast Corridor), and substantial capital investment in infrastructure (e.g., extension of the high-speed territory north to Boston).

AMTRAK SERVICE IN TEXAS

Currently, Amtrak has two service routes through Texas: the Texas Eagle and the Sunset Limited. The Texas Eagle originates in Chicago, Illinois, and continues southbound to San Antonio, Texas, where it connects with the Sunset Limited. The Texas Eagle serves the following Texas cities:

• Texarkana, AR/TX	• McGregor (Waco)
• Marshall	• Temple (Fort Hood, Killeen)
• Longview	• Taylor
• Minneola	• Austin
• Dallas	• San Marcos
• Fort Worth	• San Antonio
• Cleburne	

The Sunset Limited operates in an East-West direction from Orlando, Florida, to Los Angeles, California. Through service is provided to other major U.S. cities including Phoenix, New Orleans, Mobile, and Tallahassee. The Texas stations include Beaumont (Port Arthur), Houston (Galveston), San Antonio, Del Rio, Sanderson, Alpine (Big Bend National Park), and El Paso.

Sleeping car accommodations, coach seating, a dining car, a sightseer lounge car, entertainment, and smoking accommodations are listed services for the Sunset Limited and Texas Eagle. A trails and rails program on the Sunset Limited, in a collaboration between Amtrak and the National Park Service, narrative along the route is provided by an interpretive guide.

Figure 63 shows the current stations serviced by Amtrak and the routes in Texas.

Sunset Limited

There are currently two Sunset Limited trains: train number 1, westbound from Orlando, Florida, and train number 2, eastbound from Los Angeles, California. The Texas service schedule (as of October 25, 1998) for the Sunset Limited may be found in Table 30.

Table 30. Sunset Limited Schedule for Texas

Sunset Limited Train #1		Sunset Limited Train #2	
City	Time	City	Time
<i>Departs Wed, Fri, Sun</i>		<i>Departs Mon, Wed, Sat</i>	
Beaumont	8:08 p.m. CT	El Paso	3:05 p.m. MT
Houston	11:35 p.m. CT	Alpine	7:50 p.m. CT
<i>Departs Thur, Sat, Mon</i>		Sanderson	9:41 p.m. CT
San Antonio	5:35 a.m. CT	<i>Departs Tue, Thur, Sun</i>	
Del Rio	8:30 a.m. CT	Del Rio	12:07 a.m. CT
Sanderson	11:05 a.m. CT	San Antonio	4:35 a.m. CT
Alpine	12:58 p.m. CT	Houston	9:53 a.m. CT
El Paso	4:37 p.m. MT	Beaumont	11:38 a.m. CT

Source: (Amtrak, 1998)

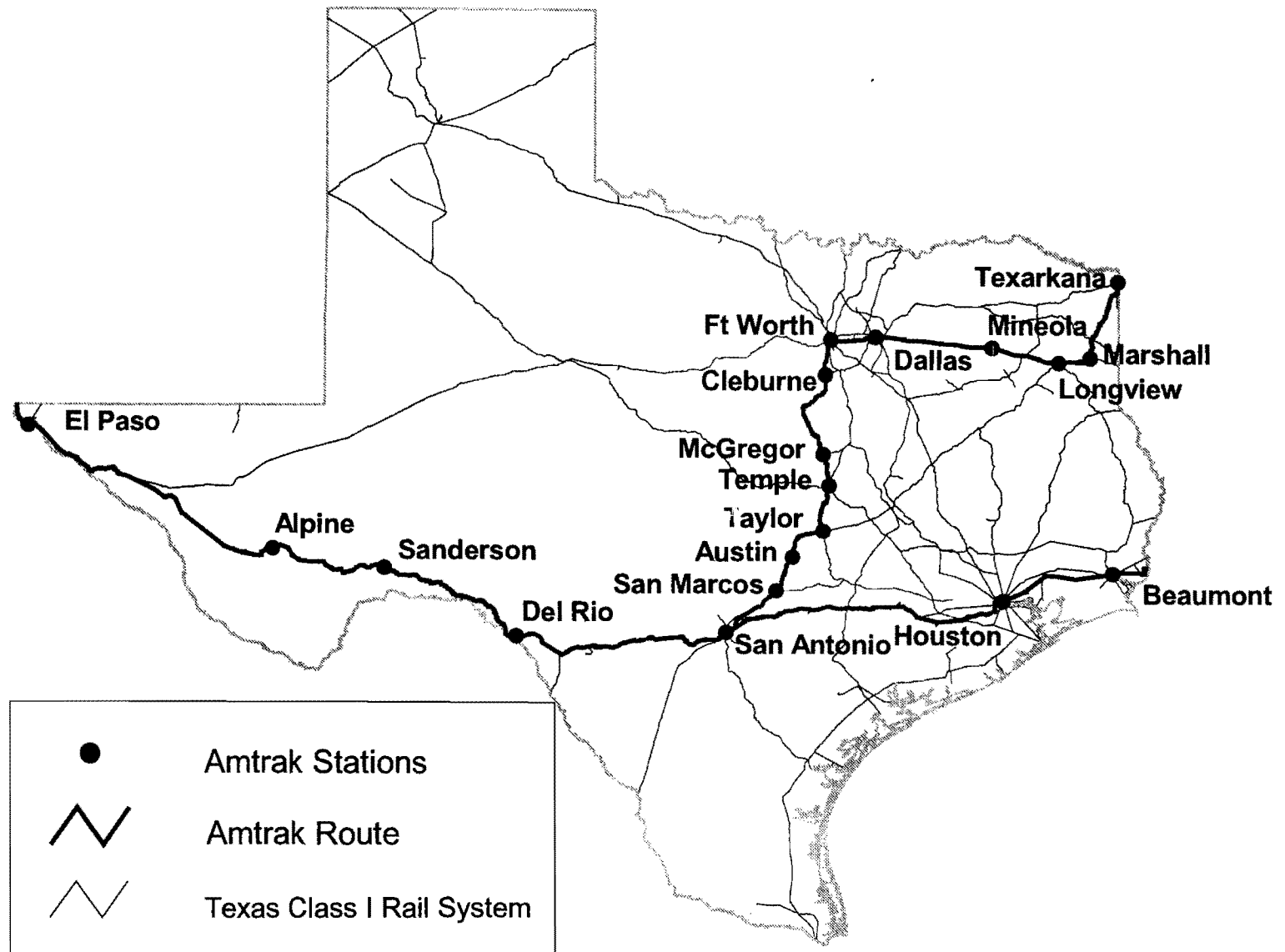


Figure 63. Current Amtrak Route in Texas

Texas Eagle

In a loan agreement between TxDOT and Amtrak in 1997, Amtrak would receive \$5.6 million for continuation of the Texas Eagle service through Texas. The loan agreement to support continuation of the Texas Eagle is found in Appendix E. There are currently two Texas Eagle trains: train number 21, southbound from Chicago, Illinois, and train number 22, northbound from San Antonio, Texas. The Texas service schedule (as of October 25, 1998) for the Texas Eagle may be found in Table 31.

Table 31. Texas Eagle Schedule for Texas

Texas Eagle Train # 21 Departs Wed, Fri, Sat, Sun		Texas Eagle Train # 22 Departs Tue, Wed, Thu, Sun	
City	Time	City	Time
Texarkana	9:58 a.m. CT	San Antonio	8:00 a.m. CT
Marshall	11:13 a.m. CT	San Marcos	9:50 a.m. CT
Longview	11:48 a.m. CT	Austin	10:41 a.m. CT
Mineola	12:35 p.m. CT	Taylor	11:32 a.m. CT
Dallas	2:56 p.m. CT	Temple	12:40 a.m. CT
Fort Worth	4:39 p.m. CT	McGregor	1:09 a.m. CT
Cleburne	5:31 p.m. CT	Cleburne	2:21 p.m. CT
McGregor	6:39 p.m. CT	Fort Worth	3:50 p.m. CT
Temple	7:22 p.m. CT	Dallas	5:15 p.m. CT
Taylor	8:15 p.m. CT	Mineola	6:47 p.m. CT
Austin	9:09 p.m. CT	Longview	8:00 p.m. CT
San Marcos	9:51 p.m. CT	Marshall	8:33 p.m. CT
San Antonio*	11:59 p.m. CT	Texarkana	9:56 p.m. CT
* Arrival time indicated; Depart on Sunset Limited 5:35 a.m. CT			

Source: (Amtrak, 1998)

Characteristics of Amtrak Stations in Texas

The available amenities at Amtrak stations in Texas cover the full range of service. Table 32 details the characteristics of each station served by Amtrak in Texas, and enumerates station features such as ticket sales, access to local transit, provision for the handicapped, station ownership, availability

Table 32. Characteristics of Texas Stations Served by Amtrak

TEXAS STATIONS	Station Ownership	Tracks & Platforms	Ticket Sales	Checked Baggage	Help with Luggage	Handicap Access	Enclosed Waiting Area	Restrooms	Pay Telephones	Food Service	ATM Bank Machine	Daily Parking	Overnight Parking	Rental Cars	Taxi	Local Transit
Alpine	RR	UP				✓	✓		✓			Free	Free	On Call		
Austin	RR	UP	✓	✓		✓	✓	✓	✓	Vending		Free	Free		On Call	✓
Beaumont	RR	UP				✓	✓	✓	✓			Free	Free		On Call	
Cleburne						✓						Free				
Dallas	C	UP	✓	✓	✓	✓	✓	✓	✓	Vending		Cost	Cost	On Call	On Call	✓
Del Rio	C	UP				✓	✓	✓	✓			Free	Free		On Call	
El Paso	C	UP	✓	✓		✓	✓	✓	✓	Vending		Free	Cost		✓	✓
Ft. Worth	P	BNSF	✓	✓	✓	✓			✓	Vending					On Call	✓
Houston	RR	UP	✓	✓		✓	✓	✓	✓	Vending		Free	Free		✓	✓
Longview	RR	UP	✓	✓		✓	✓	✓	✓	Vending		Free	Free		On Call	
McGregor	RR	BNSF				✓			✓			Free	Free		On Call	
Marshall	P	UP				✓						Free	Free		On Call	
Mineola	C	UP				✓	✓		✓	Vending	✓	Free	Free		On Call	
San Antonio	C (T)	UP	✓	✓		✓	✓	✓	✓	Vending		Free				
San Marcos	C	UP				✓						Free	Free		On Call	
Sanderson	RR	UP				✓	✓	✓	✓			Free	Free			
Taylor	RR	UP				✓						Free	Free			
Temple	RR	BNSF				✓	✓	✓	✓	Vending		Free	Free		On Call	✓
Texarkana	P	UP	✓	✓		✓	✓		✓	Vending		Free	Free		On Call	

Note: C = City T = Transit UP = Union Pacific Railroad RR = Railroad P = Private BNSF = Burlington Northern Santa Fe Railroad

of parking and rental cars, type of waiting area, availability of restrooms, and the existence of food service. The information displayed in Table 32 was provided by Amtrak.

AMTRAK RIDERSHIP IN TEXAS

Total ridership figures for Amtrak operations in Texas (for the years 1988-1996) are displayed in Figure 64. Seen in the figure, ridership declined dramatically following 1993. From a high of around 300,000 in the early nineties, ridership had declined to less than 150,000 by 1996.

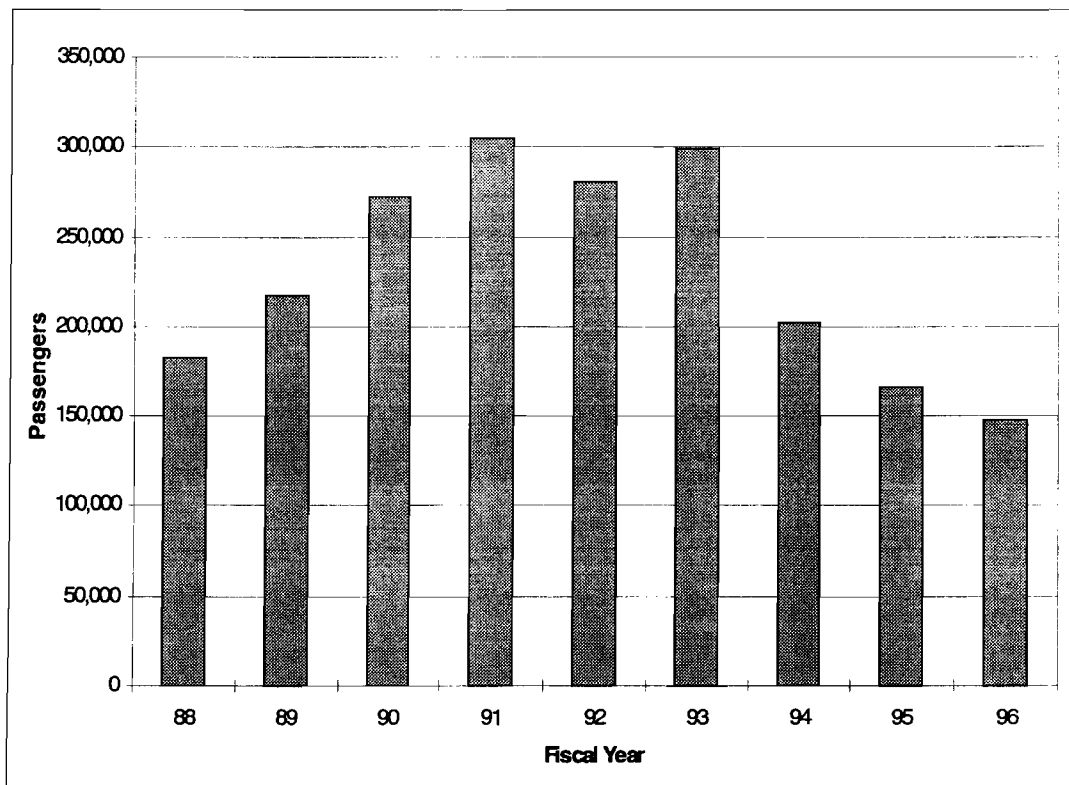


Figure 64. Total Amtrak Ridership in Texas - 1988-1996

Care should be taken when interpreting ridership numbers. Often the numbers are confused with “station counts.” Station counts are the total of passengers boarding (on) added to passengers alighting (off). It is an indication of how busy an individual station is. Ridership is the number of trips made. It tells you how busy an individual train is. It does not account for round-trip or multi-segment travelers. This can lead to what appears to be counting round-trip passengers twice, but it is a standard convention for passenger counts for all transportation modes. The airlines report

ridership statistics the same way, with the understanding that there is some portion of the riding public who are double-counted when considering round-trip transportation.

A comparison of 1988-1996 ridership numbers for the Texas Eagle and the Sunset Limited is displayed in Figure 65. As can be seen in the figure, ridership for the Sunset Limited constituted approximately one-third of the total Amtrak ridership in Texas. Although the trend in 1988-1996 ridership advances-and-declines for the Sunset Limited roughly follows that of the Texas Eagle. The ridership figures for the Sunset Limited were more stable over the nine-year period.

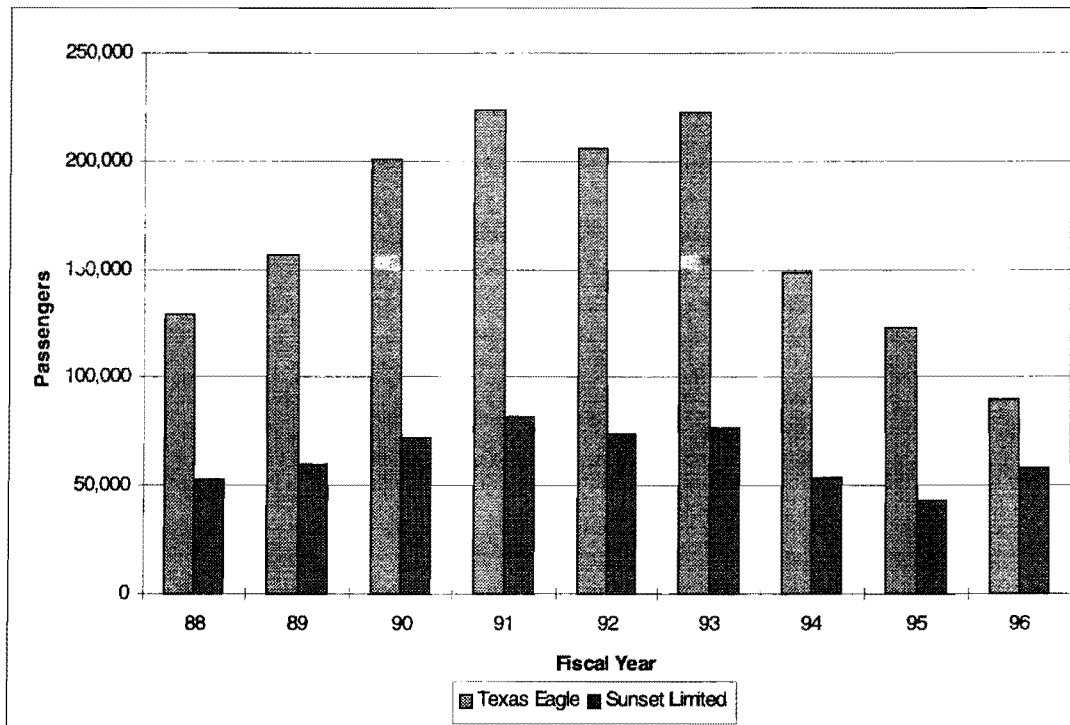


Figure 65. Texas Eagle and Sunset Limited Ridership - 1988-1996

The ridership numbers making up the graphic displayed in Figure 65 are shown in Table 33.

Table 33. Texas Eagle and Sunset Limited Ridership - 1988-1996

	1988	1989	1990	1991	1992	1993	1994	1995	1996
Texas Eagle	129,180	156,527	200,507	223,759	206,346	222,766	149,099	122,990	89,414
Sunset Limited	52,887	60,225	72,014	81,637	74,270	76,317	53,313	42,847	57,930
Total	182,067	216,752	272,521	305,396	280,616	299,083	202,412	165,837	147,344

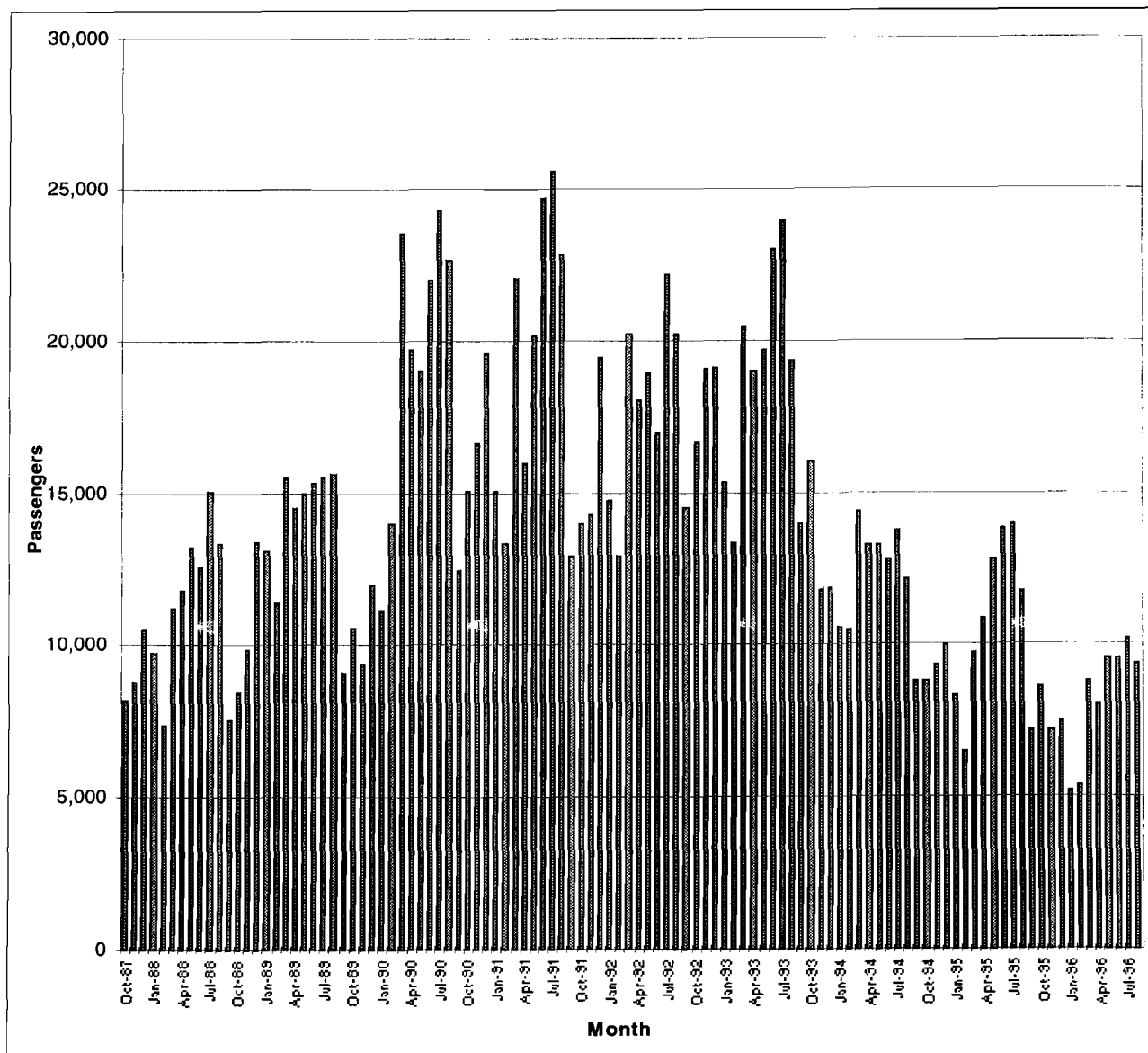


Figure 66. Monthly Texas Eagle Ridership - 1987-1996

Seasonal variation in ridership (Texas Eagle only) through the years is evident in Figure 66. As displayed in the figure, monthly ridership for the years 1988-1996 shows a (not surprisingly) distinct peak during the summer months of each year.

Passenger miles are the number of trips made multiplied by the total number of miles represented by those trips. It is the preferred utilization number, allowing different modes of transportation to be compared and contrasted since the units are exactly the same. As you would expect, ridership and passenger miles are highly correlated ($r=0.984$). Figure 67 displays this relationship graphically.

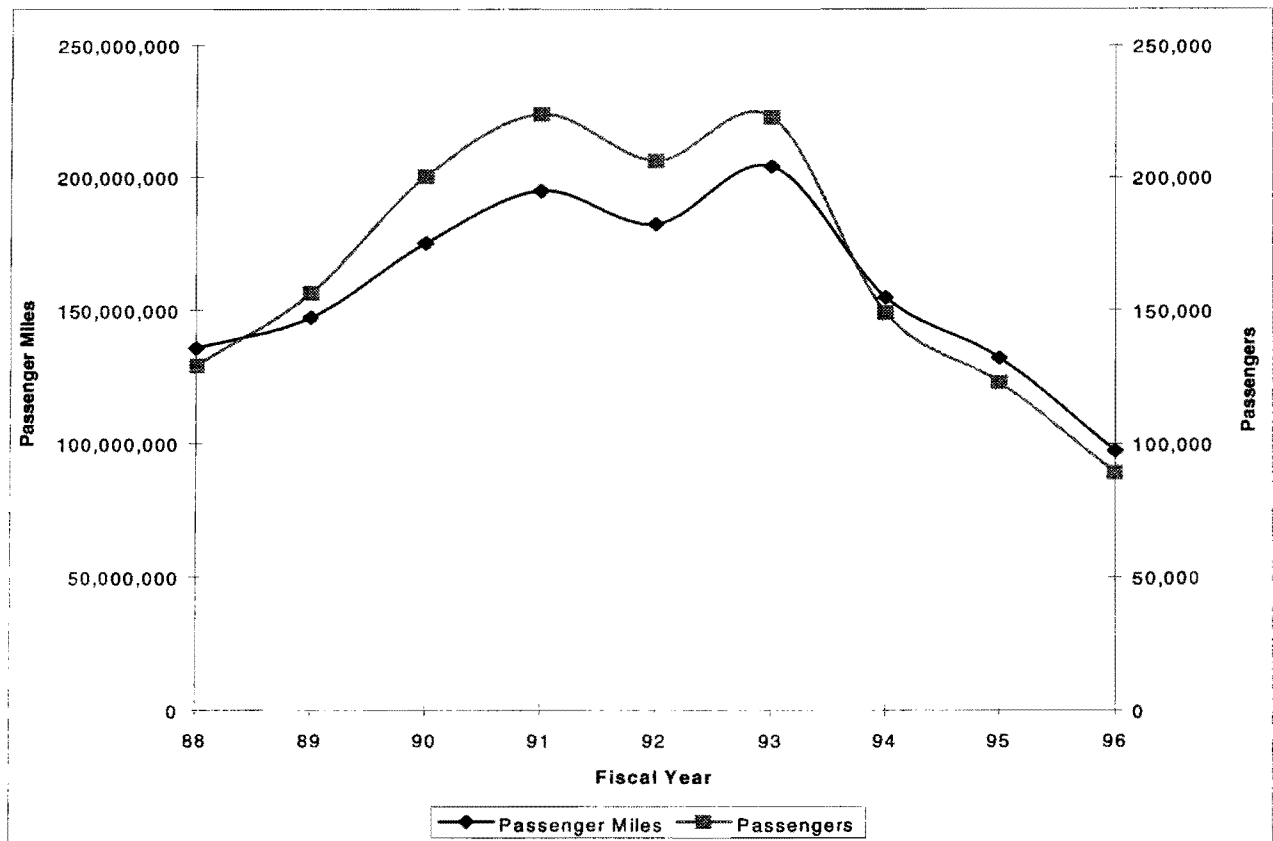


Figure 67. Texas Eagle Passenger Miles and Ridership (Passengers)

Amtrak Passenger Counts at Texas Stations

Passenger counts at the 21 Texas Stations are detailed in tabular form in Table 34. From this table it is possible to discern changes in service levels and frequencies (e.g., scheduled service changing from daily operations to tri-weekly). For example, the passenger counts at the Austin terminal dropped significantly from 20,290 in 1993 down to 13,211 in 1994 following a change in service schedule. This pattern is consistent throughout the data.

Table 34. Amtrak Texas Ridership - 1988-1996

CITY	1996	1995	1994	1993	1992	1991	1990	1989	1988
Alpine	2,284	2,503	2,746	2,873	2,312	1,718	1,754	2,008	1,720
Austin	10,112	10,449	13,211	20,290	19,633	22,795	18,913	11,973	15,621
Beaumont	2,483	2,578	2,362	2,671	2,945	3,026	3,677	4,058	5,010
Cleburne	616	669	859	1,865	2,350	2,845	3,579	1,939	2,302
CS/Bryan	No Service	No Service	4,287	10,603	10,687	10,582	8,370	7,090	new
Corsicana	No Service	No Service	889	1,985	2,110	2,141	2,380	3,143	new
Dallas	23,301	36,673	46,139	74,680	69,062	76,695	64,350	54,982	33,035
Del Río	1,207	1,383	1,444	1,245	1,122	1,136	1,235	1,745	1,598
El Paso	14,977	17,729	22,099	22,193	19,300	18,591	19,676	22,656	26,516
Fort Worth	9,643	10,064	12,577	21,773	22,607	23,926	23,623	14,049	15,565
Hearne			289	374					
Houston	21,453	32,186	35,274	50,332	48,480	55,297	47,514	45,370	22,151
Longview	18,297	7,442	7,556	11,429	10,422	11,431	9,519	7,069	6,759
Marshall	3,274	4,147	4,870	7,985	8,389	8,349	6,901	4,537	2,308
McGregor	1,301	1,278	1,692	3,203	2,670	3,202	3,099	1,955	4,203
Mineola	1,312								
San Antonio	32,202	33,443	38,839	51,730	46,217	48,667	43,186	22,691	31,272
San Marcos	793	869	1,264	2,067	1,805	2,541	2,211	1,621	2,652
Sanderson			365	313	297	380	413	952	665
Taylor	1,351	1,439	1,617	3,317	3,214	4,596	4,626	3,723	4,732
Temple	2,738	2,985	4,033	8,155	6,994	7,478	7,495	5,191	5,958

AMTRAK FINANCIAL PERFORMANCE IN TEXAS

According to figures supplied by Amtrak, passenger operations in the state of Texas have lost an average of almost \$20 million annually since 1988. As can be seen in Figure 68, losses were greatest for the years 1990-1993.

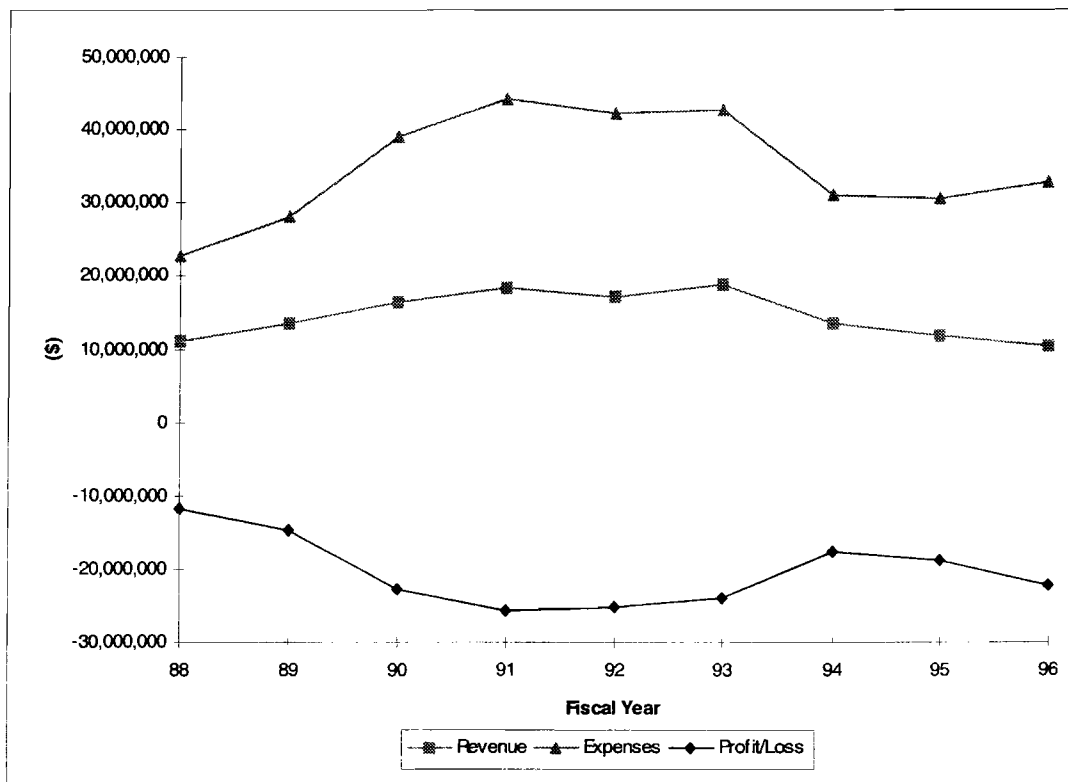


Figure 68. Amtrak Revenue, Expense, and Profit/Loss - 1988-1996

Following 1993, Amtrak's losses decreased even in the face of falling revenue. This was due, in part, to a dramatic decrease in expenses in 1994. From 1994, though, falling revenues coupled with increasing expenditures have led to an acceleration of losses for 1995 and 1996.

Figures 69 and 70 display the relationship of revenue and expenses to passenger miles.

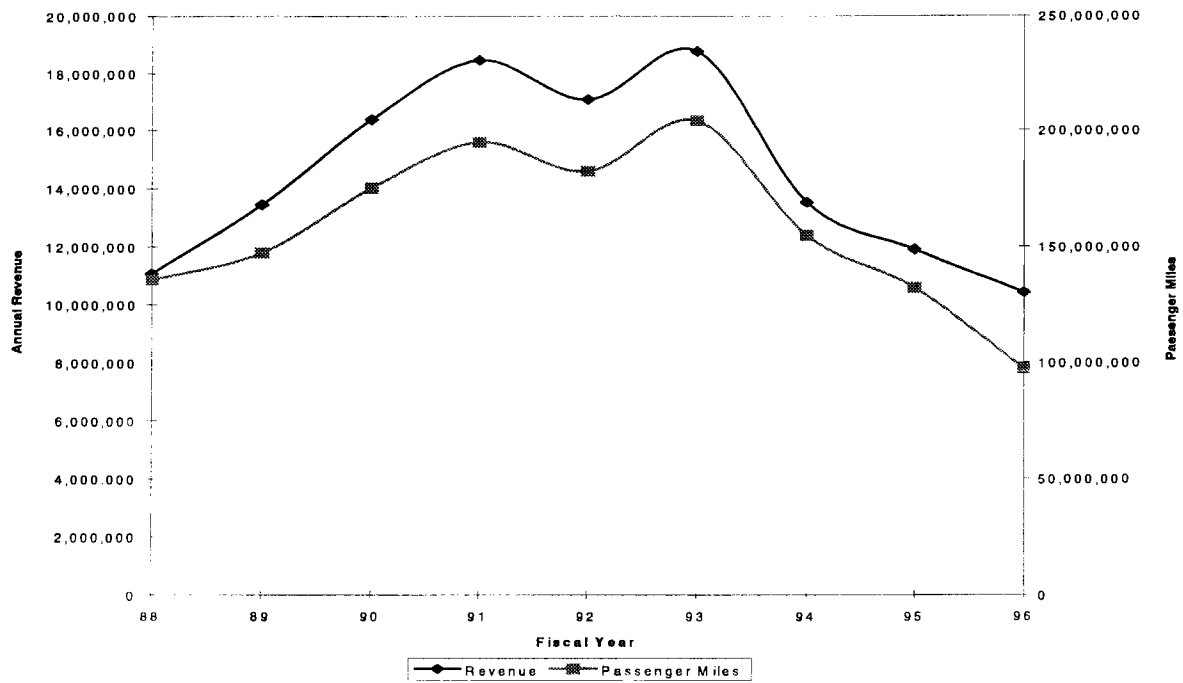


Figure 69. Annual Revenue and Passenger Miles (Texas Eagle)

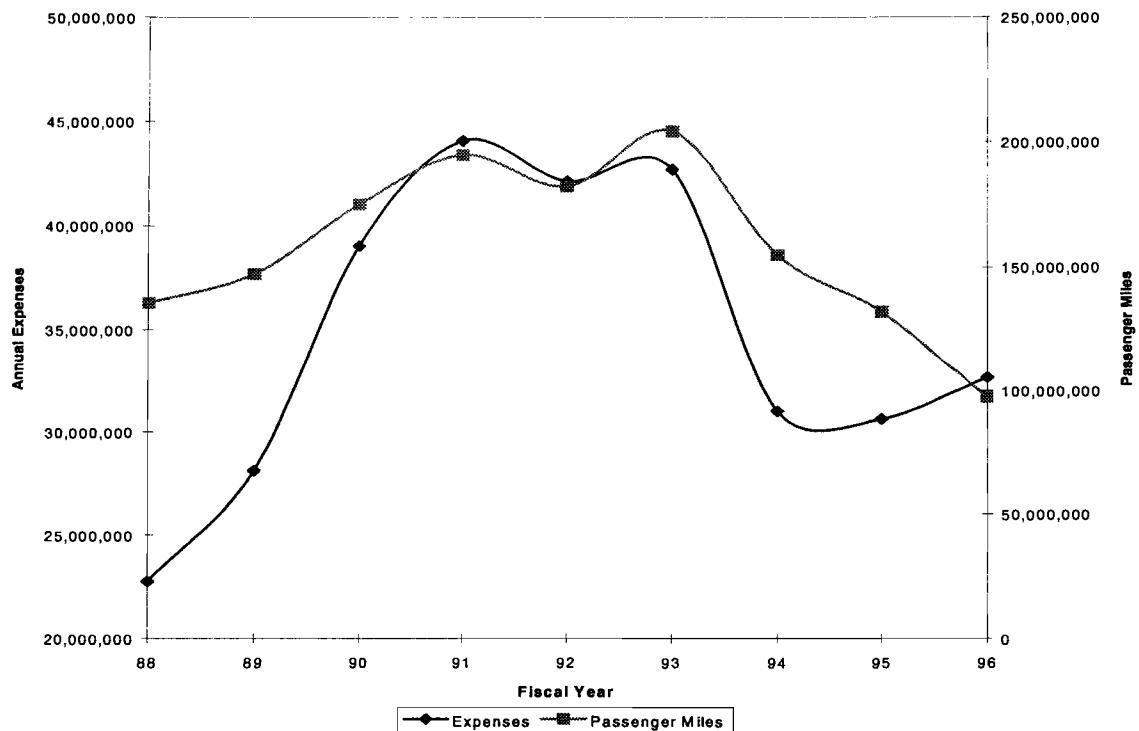


Figure 70. Annual Expenses and Passenger Miles (Texas Eagle)

The relationship between passenger miles, expenses, and revenue generation in terms of the profit or losses associated with Amtrak operations in Texas is graphically displayed in Figure 71. What is interesting to note is that for the years 1989 through 1994 profit/loss and passenger miles are “related,” in that as passenger miles increase, losses also increase. Beginning in 1994, as passenger miles plummet, losses incurred on the Texas Eagle increase.

The trend shown for the years 1994 through 1996 could be interpreted with alarm. With increasing passenger miles comes increased revenues, at least providing a firm revenue base from which to plan and operate. Figure 71 indicates that not only are passenger miles falling precipitously (to their lowest level in nine years), but losses are also accelerating.

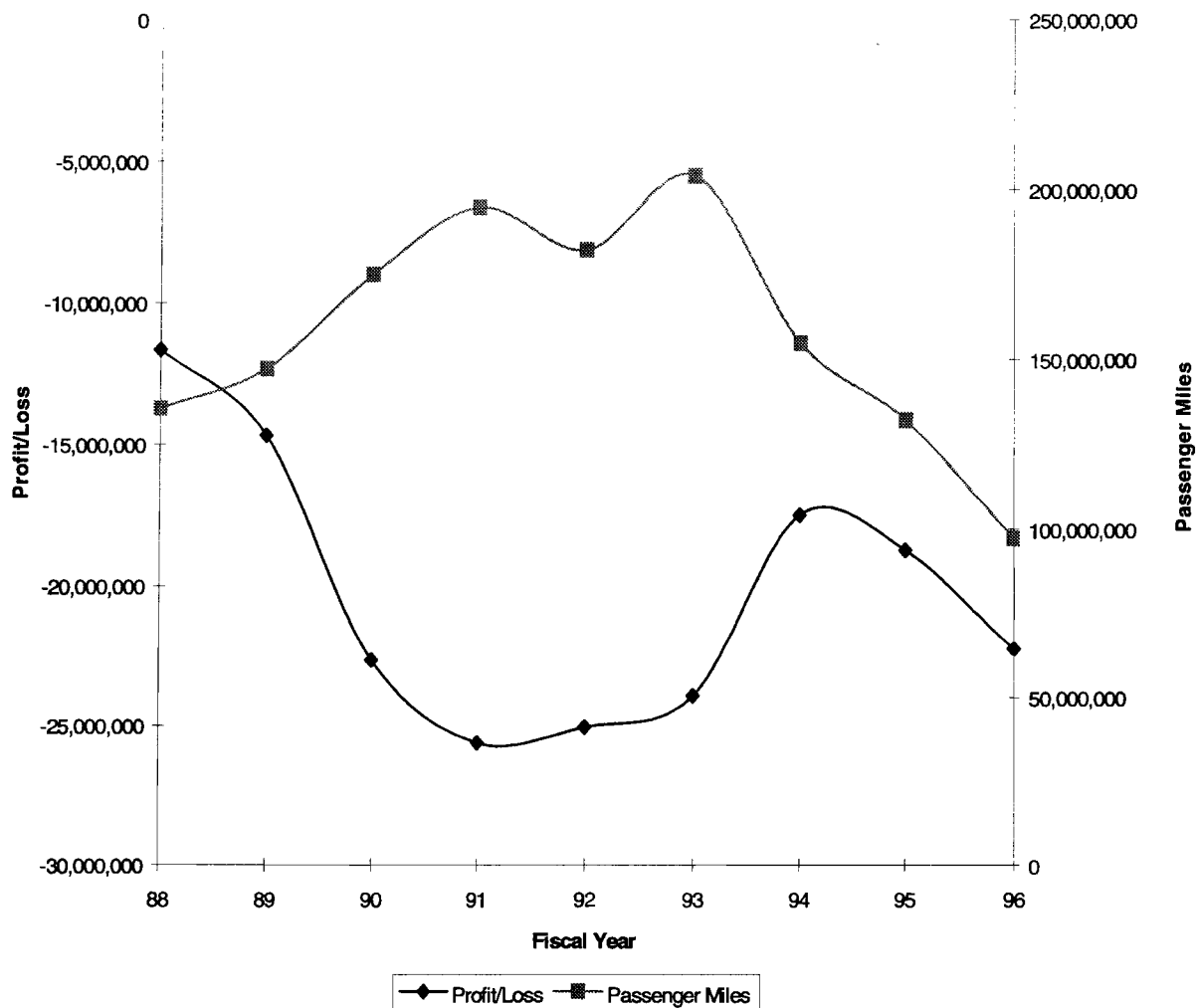


Figure 71. Annual Profit/Loss and Passenger Miles (Texas Eagle)

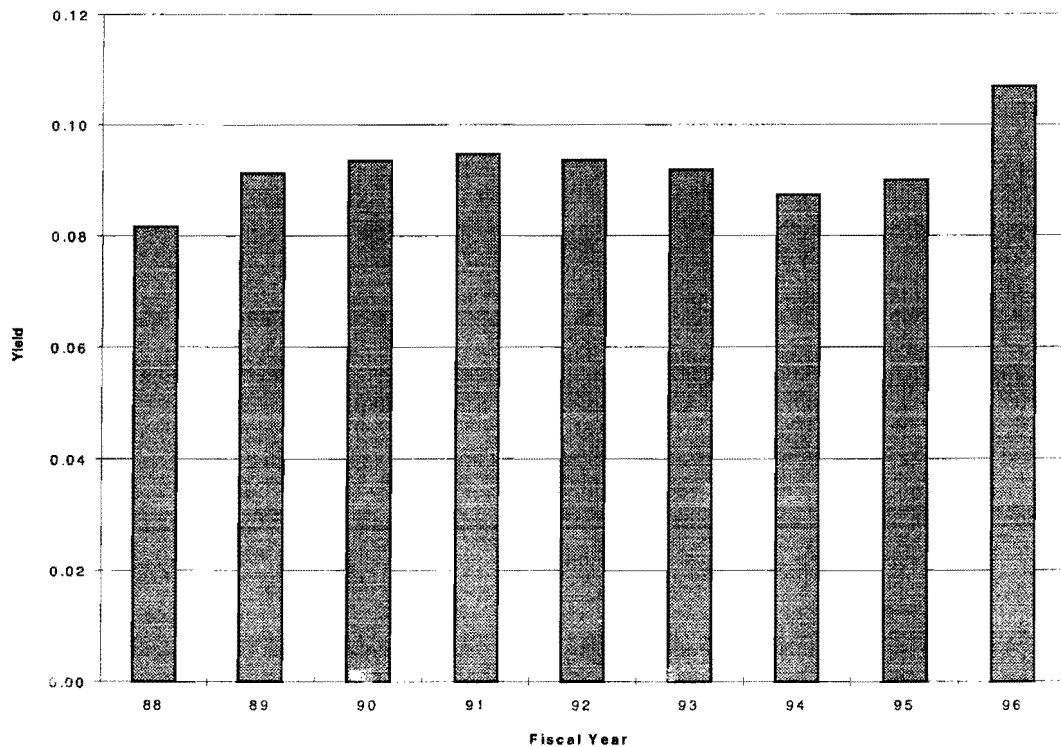


Figure 72. Revenue (Yield) Per Passenger Mile (Texas Eagle)

Yield is a measure of revenue generated per passenger mile. As can be seen in Figure 72, Amtrak annual yield from 1988 to 1995 for the Texas Eagle has remained relatively consistent, ranging from \$0.082 a passenger mile in 1988 to \$0.090 a passenger mile in 1995. Yield increased markedly in 1996 to \$0.107 a passenger mile. This amount compares favorably with the yield reported by Greyhound Lines Inc., which reported a yield of \$0.097 a passenger mile for the last nine months ending September 30, 1996.

Amtrak Impacts on the Texas Economy

According to information supplied by Amtrak, since 1988 the direct economic impact (in terms of procurement and contracts) of Amtrak operations in Texas exceeded \$35 million. Table 35 details Amtrak expenditures in Texas and, where possible, identifies the city where the bulk of the annual expenditures were spent. Note that the total expenditure for each year exceeds the sum of the expenditures reported by city. This is due to the fact that Amtrak was unable to provide enough information to fully allocate total expenditures in every city where they were spent.

Table 35. Amtrak Expenditures in Texas - 1988-1996

	1988	1989	1990	1991	1992	1993	1994	1995	1996
Alpine					759,530		629,910		842,007
Austin								141,739	105,735
Dallas	1,421,999	633,248	2,000,000		432,394			169,821	597,227
Fort Wayne							502,038		
Fort Worth					825,874				
Grand Prairie					2,690,608	2,416,812	5,690,757	721,635	41,127
Houston					921,916	364,036	1,035,159	486,635	149,100
Plano					433,310	712,880		303,601	244,314
San Antonio					323,047				
Texarkana					1,536,200		416,704		
TOTAL	2,300,000	1,600,000	4,600,000		8,100,000	5,300,000	8,500,000	1,900,000	2,190,000

GENERAL ACCOUNTING OFFICE ASSESSMENT OF AMTRAK'S FINANCIAL VIABILITY

In recent years, the U.S. Congress has relied heavily upon the General Accounting Office (GAO) to study and report on Amtrak's financial situation. In March 1997, in testimony before the Congress, the GAO reported that Amtrak's financial condition is still very precarious and heavily dependent on federal operating and capital funds. In 1995 and 1996, in response to its deteriorating financial condition, Amtrak developed strategic business plans designed to increase revenues and reduce cost growth.

In the past two years, passenger revenues, adjusted for inflation, have generally declined, and in fiscal year (FY) 1996, the gap between operating deficits and federal operating subsidies began to grow again to levels exceeding that of FY 1994, when the continuation of Amtrak's nationwide passenger rail service was severely threatened. At the end of FY 1996, the gap between the operating deficit and federal operating subsidies was \$82 million.

Capital investment continues to play a critical role in supporting Amtrak's business plans and ultimately in maintaining Amtrak's viability. Such investment will not only help Amtrak retain revenues by improving the quality of its service but will be important in facilitating the revenue growth predicted in the business plans. In 1995 and 1996, GAO reported that Amtrak faced

significant capital investment needs to, among other things, bring its equipment and facilities system-wide and its tracks in the Northeast Corridor into a state of good repair and to introduce high-speed rail service between Washington and Boston.

Amtrak will need billions of dollars in capital investment for these and other projects. It will be difficult for Amtrak to achieve operating self-sufficiency by the year 2002 given the environment within which it operates. Amtrak is relying heavily on capital investment to support its business plans, which envision a significant increase in capital funding support — possibly from a dedicated funding source, such as the Highway Trust Fund. While such a source may offer the potential for steady, reliable funding, the current budget environment may limit the amount of funds actually made available to Amtrak.

Amtrak is also relying greatly on revenue growth and cost containment to achieve its goal of eliminating federal operating support. The economic and competitive environment within which Amtrak operates may limit revenue growth, and Amtrak will continue to find it difficult to take those actions necessary, such as route and service adjustments, to reduce costs.

SUMMARY

Amtrak's present financial crisis is the outcome of factors that have existed since the passenger railroad's creation in 1971. While Amtrak has always faced an unstable and uncertain future, its financial condition has worsened dramatically since the early 1990s. This is not to say that Amtrak is not attempting to find creative solutions to their financial problems. The management of the Intercity Business Unit is considering, and has implemented, diversification through new and innovative commercial opportunities. Initiatives pursued include:

- Contracts to operate commuter rail services,
- New mail and express contracts with the U.S. Postal Service,
- Contracts to transport express freight cargo,
- New train services targeted at specific tourist markets and destinations, and
- New or expanded partnerships with the states (a very successful strategy in Illinois and other states.

Sustaining a national system of intercity rail passenger service is critical to Amtrak's future. The existence of a national system has been politically crucial to Amtrak's survival since its inception.

Failure or collapse of the national system would erode Amtrak's political support in Congress and threaten all Amtrak services.

U.S. - MEXICO RAIL RELATIONSHIP

Trade Characteristics

Historically, Mexico has been a closed economy with high tariff barriers and little dependence on foreign trade. This was due in part to an abundance of oil which was exported to create the necessary foreign exchange and protect the Mexican economy. When the world price of oil dropped dramatically in 1981 and 1982, Mexico's oil could not be sold for enough dollars to buy the same amount of U.S. products that had been previously purchased. As a result of the oil crisis, Mexico was forced to devalue the currency (peso). During this time U.S. exports fell from \$17.79 billion in 1981 to \$9.08 billion in 1983 (see Table 36). A similar result could obtain from the peso devaluation that occurred in December of 1994.

Table 36. 1977 - 1994 U.S.-Mexico Trade and Average Yearly Export and Import Trade Growth (Billions of U.S. Dollars).

Year	U.S. Exports to Mexico	Export Growth	U.S. Imports from Mexico	Import Growth
1977	4.82		4.77	
1978	6.68	1.86	6.20	1.43
1979	9.86	3.18	9.0	2.80
1980	15.15	5.29	12.84	3.84
1981	17.79	2.64	14.01	1.18
1982	11.82	-5.97	15.77	1.76
1983	9.08	-2.74	17.02	1.25
1984	11.99	2.91	18.27	1.25
1985	13.64	1.64	19.39	1.13
1986	12.39	-1.24	17.56	-1.83
1987	14.58	2.19	20.52	2.96
1988	20.47	5.89	23.53	3.01
1989	24.97	4.50	27.59	4.06
1990	28.38	3.41	30.80	3.21
1991	33.28	4.90	31.89	1.09
1992	40.60	7.32	35.19	3.30
1993	41.58	0.98	39.92	4.73
1994	50.84	9.26	49.94	9.58
TOTAL	367.92	46.02	388.97	44.72
AVERAGE YEARLY GROWTH		2.71		2.63

Source: International Rail Freight Transportation in South Texas: Decreasing Fuel Consumption, Roadway Damage & Hazardous Materials Movement on Texas Roadways.

After the oil crises in 1981 and 1982, Mexico changed its national policy to that of becoming an internationally competitive economy. Actions were taken which stimulated the growth of U.S.-Mexico trade. In 1986 Mexico joined the General Agreement of Tariffs and Trade (GATT). Under the GATT, Mexico removed many of its required trade permits and reduced tariffs. This resulted in a substantial growth of U.S.-Mexico trade from \$12.39 billion of U.S. exports and \$17.56 billion of U.S. imports in 1986 to \$33.28 billion of exports and \$31.89 billion of imports in 1991. Trade growth has been further stimulated since 1991, first by the negotiations for the North American Free Trade Agreement (NAFTA), and then by its implementation, which further reduced tariffs and other trade restrictions when it was implemented on January 1, 1994. Table 37 presents an estimate of trade volumes (in billions of dollars) for the year 2000.

Table 37. U.S.-Mexico Trade Estimates for the Year 2000

Trade Direction	1994	2000	% Change
Southbound - U.S. Exports	50.84	71.74	41
Northbound - U.S. Imports	49.94	73.37	48

Source: International Rail Freight Transportation in South Texas: Decreasing Fuel Consumption, Roadway Damage & Hazardous Materials Movement on Texas Roadways.

Cross Border Issues

Growth in trade necessarily leads to growth in traffic. Since most of the movement of goods across the border is accomplished by surface transportation (i.e., trucks and railroads), concern has been generated about transportation problems that could result from significant increases in trade between the U.S. and Mexico. This apprehension was expressed by government officials and private-sector groups in a 1991 U.S. General Accounting Office study that identified the following major concerns:

- The existing U.S. border inspection facilities cannot adequately accommodate the current flow of commercial traffic. Additionally, current capital improvement programs did not anticipate increased traffic that could result from NAFTA, and no long-range planning process exists for designing, constructing, or renovating border inspection facilities.
- Traffic across the border remains congested, even after U.S. and Mexican Customs have introduced new automated and simplified procedures to speed the flow of commercial traffic.

- U.S. inspection agency staffing along the border has not kept pace with the increase in traffic. Staffing cannot adequately handle existing traffic.
- Adequate transportation infrastructure is required on both sides of the border in order to facilitate the flow of commerce between the countries.
- Most border cities were not designed to handle the existing and expected commercial traffic. The commercial traffic uses city streets that were never intended to handle such traffic, resulting in congestion, accidents, and accelerated pavement deterioration.

Getting rail traffic from one country to another has improved greatly since the passage of NAFTA. Despacho Previo, essentially a means of process improvement, was implemented first at Laredo and has since been put in place at a number of other crossings. Under the program, the U.S. railroad notifies the customshouse brokers in advance that a shipment is en route. The broker then has 72 hours to pre-file for customs clearance. The pre-filing includes payment of import duties, receipt of Mexican customs authority, and notice to the Mexican railroad of authority to cross. Implementation of Despacho Previo reduced Union Pacific's traffic moving south from Laredo by a full day from the time a car is received until the time it is delivered to the Mexican railroad.

Unfortunately, traffic delays are still a common experience owing to the multiplicity of government agencies operating on both sides of the border. Delay is exacerbated by shipments being physically unloaded and inspected as many as four times, paperwork duplication, inconsistent procedures among various ports of entry, and abrupt implementation of new rules.

An example of an abrupt implementation of a new rule was related by a U.S. customs official in Laredo about the administrator on the Mexican side of the border (the second one in a month, demonstrating another problem – high turnover of personnel) arbitrarily instituting a tier system for truck crossings. Designated trucks had to cross into Mexico at a specific time of day, or face a delay in being reassigned to another time window. The effect of this new rule has been heightened congestion due to truckers, fearful of missing their time window, lining up to cross hours earlier than necessary. The interviewed customs official could see no rationale for the implementation of the tier system.

Cross-Border Logistics

Border activities involving truck and rail crossings are very complicated because of the policies and practices of both nations. Clearance processes involving U.S. and Mexican customs, customs inspections, U.S. and Mexican customs brokers, the declarations associated with commodity descriptions, import duty assessment, government tax identification, and a hoard of other special documentation all impede the smooth movement of freight transportation between the U.S. and Mexico.

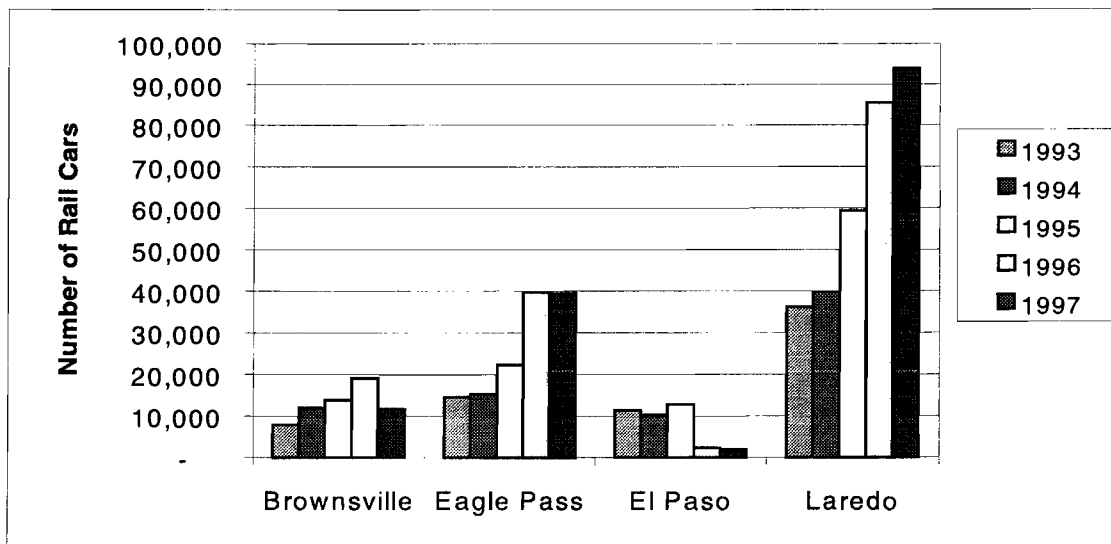
Nevertheless, the number of freight crossings every year is staggering, and continues to grow. Table 38 displays the northbound and southbound traffic for the four major Texas gateways (Brownsville, Eagle Pass, El Paso, and Laredo) for the years 1993 to 1997.

Table 38. Rail Traffic North from Mexico & South from U.S.

City	1993		1994		1995		1996		1997	
	North	South	North	South	North	South	North	South	North	South
Brownsville	7,882	20,531	11,854	31,119	13,789	21,820	19,158	25,389	11,707	30,842
Eagle Pass	14,571	17,171	15,177	18,818	22,331	24,713	39,795	40,929	39,438	52,443
El Paso	11,306	32,366	10,297	31,519	12,903	26,663	2,416	9,739	2,073	6,387
Laredo	36,286	109,574	39,867	121,166	59,377	109,385	85,592	133,314	93,967	152,230
Totals	70,045	179,642	77,195	202,622	108,400	182,581	146,961	209,371	147,185	241,902

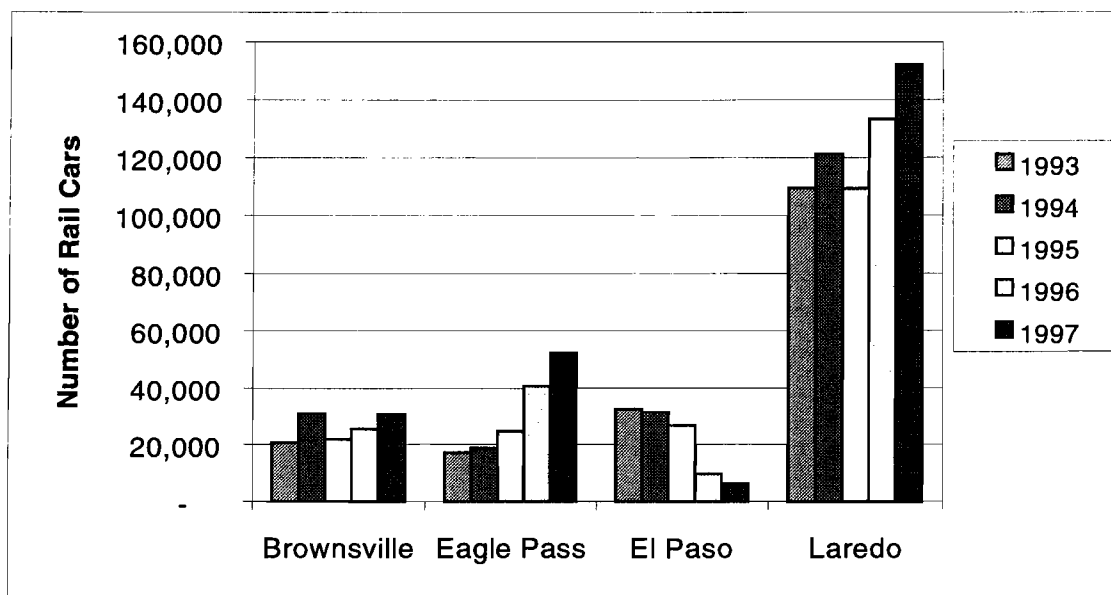
Source: Texas A&M International University, Texas Center for Border Economic and Enterprise Center

From this table, Figures 73 and 74 show the yearly traffic amounts at each crossing. Clearly, Laredo is the major gateway with a northbound traffic amount for 1997 of over 93,000 rail cars and a southbound traffic amount of over 150,000 rail cars during the same period. Figure 75 displays the yearly totals for the northbound and southbound traffic. This figure also shows the increased traffic trend over the time period.



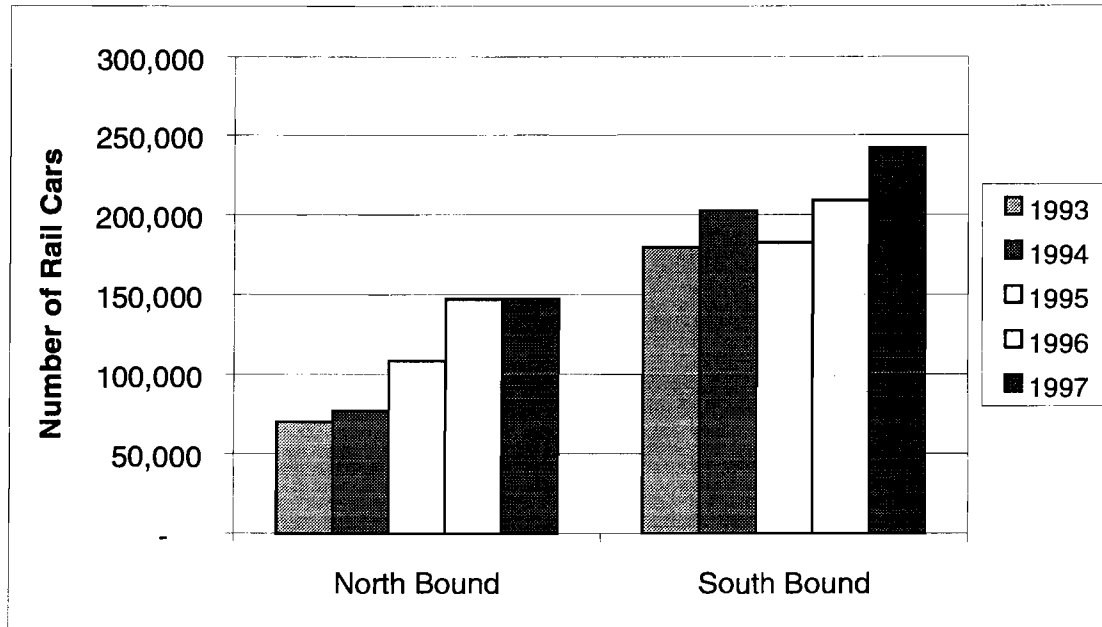
Source: Border Trade Institute, Texas A&M International University, Website, 1998 ([www. Tamui.edu/coba/btil](http://www.Tamui.edu/coba/btil))

Figure 73. Rail Traffic North from Mexico



Source: Border Trade Institute, Texas A&M International University, Website, 1998 ([www. Tamui.edu/coba/btil](http://www.Tamui.edu/coba/btil))

Figure 74. Rail Traffic South from U.S.



Source: Border Trade Institute, Texas A&M International University, Website, 1998 (www.Tamui.edu/coba/btil)

Figure 75. Total Border Rail Traffic

The following discussion will detail the logistics process involved in northbound and southbound trade for both rail and truck transportation. The practices of the rail players involved in cross-border freight transportation are essentially the same.

Logistics Process for Southbound Mexico Shipments - Rail

The process of shipping a commodity to Mexico begins when the customer orders a rail car (or cars) from the originating railroad for loading. The customer then generates a Bill of Lading which consists of the following information:

- Origin and border destination, indicating “for export,”
- Mexico destination,
- Consignee name, address and phone number,
- Mexican broker,
- Quote or contract number,
- Weight of shipment, and
- Seal number(s).

At this point, the customer faxes a copy of the Bill of Lading to the originating railroad for waybill purposes. Additionally, the customer faxes a copy of the Bill of Lading, the commercial invoice, packing list, and any other required certificates to a designated Mexican broker and to the affiliated U.S. freight forwarder or U.S. Customs to begin the clearance process. It is also customary for the customer to send all document originals via overnight express service to the U.S. freight forwarder or customs broker. Failure to supply all proper documents could result in border demurrage and late document charges.

All monies for the Mexican railroad freight charges are rendered by the Mexican customs broker to the Mexican railroad along with the Bill of Lading as well as shipping instructions. The Mexican customs broker then renders per diem charges to the U.S. railroad serving at the border point at the time the car is cleared. Per diem charges do not apply on private equipment or northbound shipments and are ordinarily paid by the Mexican consignee, depending on the agreement that was in effect at the time of sale. The origin railroad is responsible for giving a waybill to the Mexican broker to complete the documentation.

Southbound Documentation The red tape associated with southbound freight transportation is, at best, complicated. The following discussion will enumerate the many transactions necessary to accomplish cross-border freight transport by rail.

U.S. Customs Broker (Freight Forwarder) The U.S. customs broker represents the exporter or importer, depending on the terms of sale. Exportation does not require a licensed U.S. customs broker. Typically, the U.S. customs broker:

- Prepares and files a “shipper’s export declaration” (SED) which will accompany the crossing list given to the U.S. railroad,
 - Receives authority (clearance) from U.S. Customs,
 - Gathers the U.S. certificates required by the importer into a contract to be given to the Mexican customs broker for documentation purposes, and
 - Gives the U.S. railroad a crossing list which is accompanied by the SED, a copy of the Mexican railroad waybill, and a copy of the paid per diem form.
- Inbound shipments do not require a shipper’s export declaration.

Mexican Customs Broker The Mexican customs broker represents the Mexican importer and is the only legal facilitator authorized. The Mexican customs broker is required by law.

Mexican law holds the broker responsible for all declarations, including the description of the commodity, its value, import duty assessment, the commodity's government tax ID number, and special documentation required for certain commodities. Typically, the Mexican customs broker:

- Presents documentation (Pedimento) and duties to the Mexican Customs office,
- Prepares the Mexican railroad shipping instructions and the Bill of Lading,
- Pays applicable per diem charges to the U.S. railroad making the interchange with the Mexican railroad,
- Pays any accrued border demurrage on behalf of the shipper or consignee, depending on the terms of sale, and
- Gives a copy of the Mexican railroad waybill and certified paid per diem form to the U.S. customs broker (or freight forwarder), who will then attach it to the crossing list to be given to the U.S. railroad.

The Southbound Crossing The U.S. railroad gives the list of proposed cars to interchange to the Mexican railroad. The Mexican railroad checks the list against the documentation list and accepts the interchange of cars if they are properly documented.

Logistics Process for Northbound Shipments - Rail

The process of shipping a commodity north of Mexico begins when the customer orders a rail car (or cars) from the Mexican railroad for loading. The customer then generates a Bill of Lading which consists of the following information:

- Origin and border destination, indicating "for export,"
- U.S. destination,
- Consignee name, address and phone number,
- U.S. customs broker, name, phone, and fax number,
- Quote or contract number, and
- Seal number(s).

At this point, the customer faxes a copy of the Bill of Lading, commercial invoice, packing list, and any other required certificates to the Mexican broker and also to the U.S. customs broker to begin the clearance process. It is usually customary for the customer to send all originals via overnight

service to the U.S. customs broker or freight forwarder. Failure to supply all proper documents could result in border demurrage and late document charges. The Mexican broker then forwards all documentation to the U.S. customs broker or freight forwarder for U.S. clearances.

Northbound Documentation The following discussion will detail the many transactions required to accomplish northbound cross-border freight transport by rail.

Mexican Customs Broker The Mexican customs broker represents the Mexican exporter and is the only legal facilitator authorized in Mexico. The Mexican customs broker is required by Mexican law. Typically, the Mexican customs broker:

- Gathers Mexican certificates required by the U.S. importer and forwards them to the U.S. customs broker or freight forwarder,
- Prepares and submits an export declaration to Mexican Customs,
- Receives and acknowledges authorization to exit merchandise, and
- Notifies the Mexican railroad of clearance.

U.S. Customs Broker The U.S. customs broker represents the importer and, for northbound shipments, is the only legal facilitator authorized by U.S. law. The U.S. customs broker protects against U.S. Customs fines by arranging inspections of merchandise, preparing commercial invoices and packing lists, collecting duties from the importer and paying them to U.S. Customs, preparing all required forms, and gathering all required certifications. Typically, the U.S. customs broker:

- Presents documentation to U.S. Customs,
- Prepares the Bill of Lading and shipping instructions,
- Prepares the documentation for shipments entering “inbound” to the U.S., both for shipments that are destined to cross the U.S. for export or are moving to an interior port of entry,
- Prepares the crossing list of cleared rail cars, and
- Delivers U.S. Customs documentation signifying authority to cross to all interested participants.

The Northbound Crossing The Mexican railroad gives the list of proposed cars to interchange to the U.S. railroad. The U.S. railroad checks the list against the documentation list and accepts the interchange of cars if they are properly documented.

U.S. Customs selects approximately 15 percent of import shipments for inspection. Approximately one-half of the 15 percent are inspected in order to insure the products comply with trademark, copyright, labeling, and commercial invoice description regulations. The other half of the 15 percent are inspected for enforcement of smuggling and other indicative reasons. All shipments are subject to selection for U.S. Customs inspection. Some enforcement inspections require complete off-loading of lading. The cost of this is borne by the importer of record.

Cross-Border Truck Logistics

Years of increased trade with Mexico have brought a tremendous number of trucks to the border. In 1993, almost 1.7 million northbound and southbound trucks crossed the border between Texas and Mexico. In the first three quarters of 1994 commercial truck crossings in Laredo were up 40 percent. In 1993, the Laredo customs district, by itself, accounted for 54 percent (22.5 billion dollars) of all exports to Mexico from the United States.

The logistics associated with northbound and southbound truck traffic are, at least from the standpoint of customs and paperwork, essentially the same as that for rail. A major difference has to do simply with the number of entities involved. For rail, you are dealing primarily with a small number of railroad companies. For trucks, you are dealing with hundreds of companies. The other major difference between the cross-border logistics associated with rail and truck has to do with the institutional practice of drayage.

Drayage As described by Molina and Giermanski (1994) the drayage system as practiced in Laredo is as follows. A truck carrying freight destined for Mexico City drops off the trailer on the U.S. side of the border. After the cargo is cleared by customs, a U.S. drayage company picks up the trailer and transfers it to a designated location on the Mexican side of the border where a Mexican carrier takes the trailer on to its final destination in Mexico City. The U.S. drayage truck driver then returns to the U.S. without any cargo. The same drayage activity is practiced for northbound shipments coming from Mexico.

INTERNATIONAL GATEWAYS ALONG THE TEXAS BORDER

Five of the eight rail gateways into Mexico are located on the Texas-Mexico border. The Texas rail gateways of El Paso, Presidio, Eagle Pass, Laredo, and Brownsville are served by four of the five U.S. railroads which enjoy direct access to Mexico. These important rail connections are strategically located with respect to agricultural and industrial regions of the Midwest and Northeast United States.

Railroad access along the Texas-Mexico border is continuing to change. The Burlington Northern Santa Fe (BNSF) and Union Pacific/Southern Pacific (UP/SP) mergers, as well as the Kansas City and Southern (KCS) acquisition of 49 percent of the Texas Mexican Railway (Tex-Mex) have all drastically altered access to Mexico through Texas. However, another fundamental change in railroad access to the border has occurred on the Mexican side. The national railroad of Mexico (FNM) has divided itself into three lines and franchised each to investors.

Four railroads now connect to Mexican railroads at the five different Texas rail gateways. Figure 76 shows the five Texas rail gateways. BNSF owns trackage at El Paso/Ciudad Juarez and also has trackage rights over the UP to Brownsville/Matamoros and Eagle Pass/Piedras Negras. The Tex-Mex carries rail traffic from Laredo/Nuevo Laredo to Corpus Christi where its part owner, KCS, has trackage rights over the UP from Beaumont. The UP has international connections at El Paso/Ciudad Juarez, Eagle Pass/Piedras Negras, Laredo/Nuevo Laredo, and Brownsville/Matamoros.

The South Orient Railroad (SO) extends from Fort Worth to Presidio/Ojinaga over the former Atchison, Topeka and Santa Fe (ATSF) line. In a decision by the Surface Transportation Board (STB), SO was granted the right to discontinue service over the southerly section of railroad, from San Angelo to Presidio. The STB did not grant an abandonment of the line because it wants the line in place in the event increased traffic to and from Mexico requires its use.

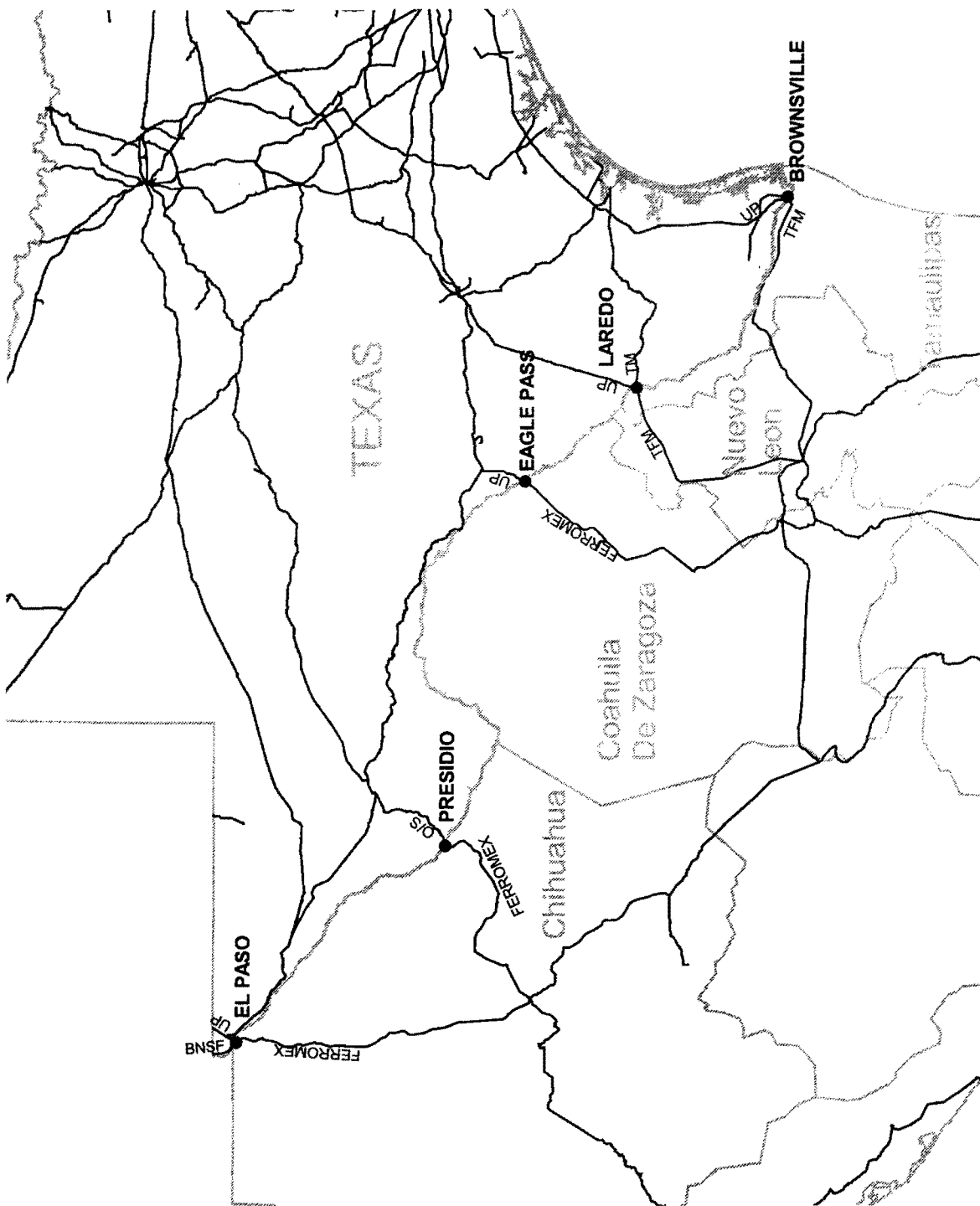


Figure 76. Texas' Rail Gateways

Border Infrastructure

The rail infrastructure along the Texas-Mexico border includes five rail-only bridges and one vehicular-rail bridge. The vehicular-rail bridge connects Brownsville and Matamoros, Tamaulipas. It is a single railroad track, two vehicular lane with a span of 1,050 feet (320 m). The B&M Bridge was originally built in 1909 and reconstructed in 1941. The Brownsville & Matamoros Bridge Company, a subsidiary of Union Pacific Railroad, owns and operates the bridge (TxDOT, 1995). The remaining five bridges are rail-only and do not require connecting highway infrastructure. These bridges are:

- Laredo, owned by the Texas/Mexican Railway Company;
- Eagle Pass, owned by Union Pacific Railway Company and the government of Mexico;
- Presidio, owned by South Orient Rural Rail Transportation District (SORRTD)
- El Paso, owned by BNSF Railway Company and the government of Mexico; and
- El Paso, owned by Union Pacific Railway Company and the government of Mexico.

It should be noted that at the time of this report, ownership of the International Bridge at the Presidio gateway is not clearly understood. However, in a discussion with Mike Jones of the RRCT, it is believed the SORRTD acquired all the improvements along the SO route. Improvements generally include the bridges along the rail line. If the International Bridge is considered as one of the improvements along the route, then ownership would belong to the SORRTD. The bridge is also believed to be solely owned by the United States entity.

According to TxDOT, two combination vehicular-rail bridges are proposed for Brownsville and Mission. The proposed Port of Brownsville Bridge would be a four-lane vehicular, single-track railroad bridge owned by the Port of Brownsville and the government of Mexico. The Presidential Permit application was submitted on October 16, 1991. The Presidential Permit was approved December 29, 1978, for the proposed Mission International Bridge. The bridge would be a four-lane vehicular, single-track bridge owned by the city of Mission and the government of Mexico. Also, Union Pacific Railroad has a Presidential Permit to build a new international rail bridge at Laredo.

Mexican Rail Network

History of the Ferrocarriles Nacionales de Mexico (FNM)

In a discussion to the American Railway Engineering Association, Lorenzo Reyes Retana, director of the Southeast Railway System for FNM, provides some historic background of the Mexican railroad network. The first rail line would link Mexico City to the Port of Veracruz and was completed in 1872. The line was acquired shortly after completion by an English consortium. Interest was very high from both national and foreign groups to build new lines throughout Mexico. Over the period of 10 years from 1874 to 1884, 3,300 miles (5,300 km) of rail were built through concessions. In 1899, the First General Railroad Law went into effect which basically resolved two important issues: 1) how railroad routes would be built and operated, and 2) which lines should be built to complete the railroad network. An additional 6,650 miles (10,700 km) of lines were built between 1885 and 1904 which added to the existing lines, made a total of 10,332 miles (16,627 km). That total was approximately 12,000 miles (19,300 km) by the end of 1910.

By the end of 1910, the railroad had not only become the major transportation mode, but it had also significantly supported the commercial, social, and political growth of the country. According to Retana, the dynamics of railroad transportation were halted by the military engagements during the decade of the Mexican Revolution between 1910-1920, in which time the railroad network was extensively employed. As a result, Mexico's railroads suffered severe damage to both its rails and bridges, and to the moving equipment.

The period between 1911-1950 saw only 2,645 miles (4,256 km) of added line making a total of 14,582 miles. Finally, 2,000 miles (3,218 km) of rail, mainly realignments and new links between existing lines, were built from 1951 to the present. Therefore, Mexico's railroad network is made up of 16,313 miles (26,253 km) of rail, of which 12,625 miles (20,318 km) are main lines, 2,750 miles (4,425 km) are yards and sidings, and 937 miles (1,510 km) are private lines.

Mr. Retana concludes his background by stating a great part of Mexico's rail network was built through concessions to private companies. These private companies were responsible for the rapid growth and expansion of the rail lines and became important railroad companies by buying, selling, leasing, or transferring of concessions.

Privatization of the National Rail System

In 1996, the Mexican government moved to privatize the 16,000 mile (26,000 km) national rail system known as Ferrocarriles Nacionales de Mexico (FNM). The plan was to create three lines and sell them to investors. Although Mexico's railroads are in good shape according to U.S. rail officials, infrastructure, equipment, and operation improvements will be needed to facilitate the rapidly increasing trade between Mexico and the U.S. To make the investment in Mexican railroads more attractive, the Mexican government has set aside \$250 million to help defray the cost of rebuilding and adding the necessary equipment needed to make the system more efficient.

Currently, all three segments have been sold to new firms including partial ownership of two major U.S. railroads, Kansas City Southern (KCS) and Union Pacific (UP). Transportacion Ferroviaria Mexicana S.A. de C.V. (TFM), which includes partial ownership by KCS, won the 50-year concession to operate the Northeast Railway dubbed Mexico's "crown jewel" because of its connections from Mexico City to both Laredo and Matamoros (located across from Brownsville). The Pacific-North Railway, which connects Mexico City with several Pacific Coast ports along with gateways into Texas, Arizona, and California, will be operated by Ferrocarriles Mexicano S.A. de C.V. (Ferromex) including partial ownership by UP. The Southeast Railway has no connections to the United States and will be operated by FerroSur S.A. de C.V (FerroSur). The rail network also includes short line Linea Coahuila Durango S.A. de C.V. and Terminal Ferroviaria del Valle de Mexico (TFVM), the terminal railway serving Mexico City. TFVM is owned equally by TFM, Ferromex, and FerroSur. Figure 77 shows Mexico's current rail system.

Northeast Railway

The first line sold was the Ferrocarril del Noreste SA. The 50-year concession was won by Transportacion Ferroviaria Mexicana (TFM), which includes a joint venture of Transportacion Maritima Mexicana (TMM) and Kansas City Southern Industries (KCSI). TMM, KCSI, and the Mexican Federal Government own 38.5 percent, 37 percent, and 24.5 percent of TFM's stock shares, respectively (Facts about TFM, www.kcsi.com). KCS's internet website (www.kcsi.com) provides information pertaining to characteristics of the Northeast Railway including miles of track, connections, border crossings, intermodal facilities, and other important characteristics. They also describe their future capital investment and operations improvement plans for the network.

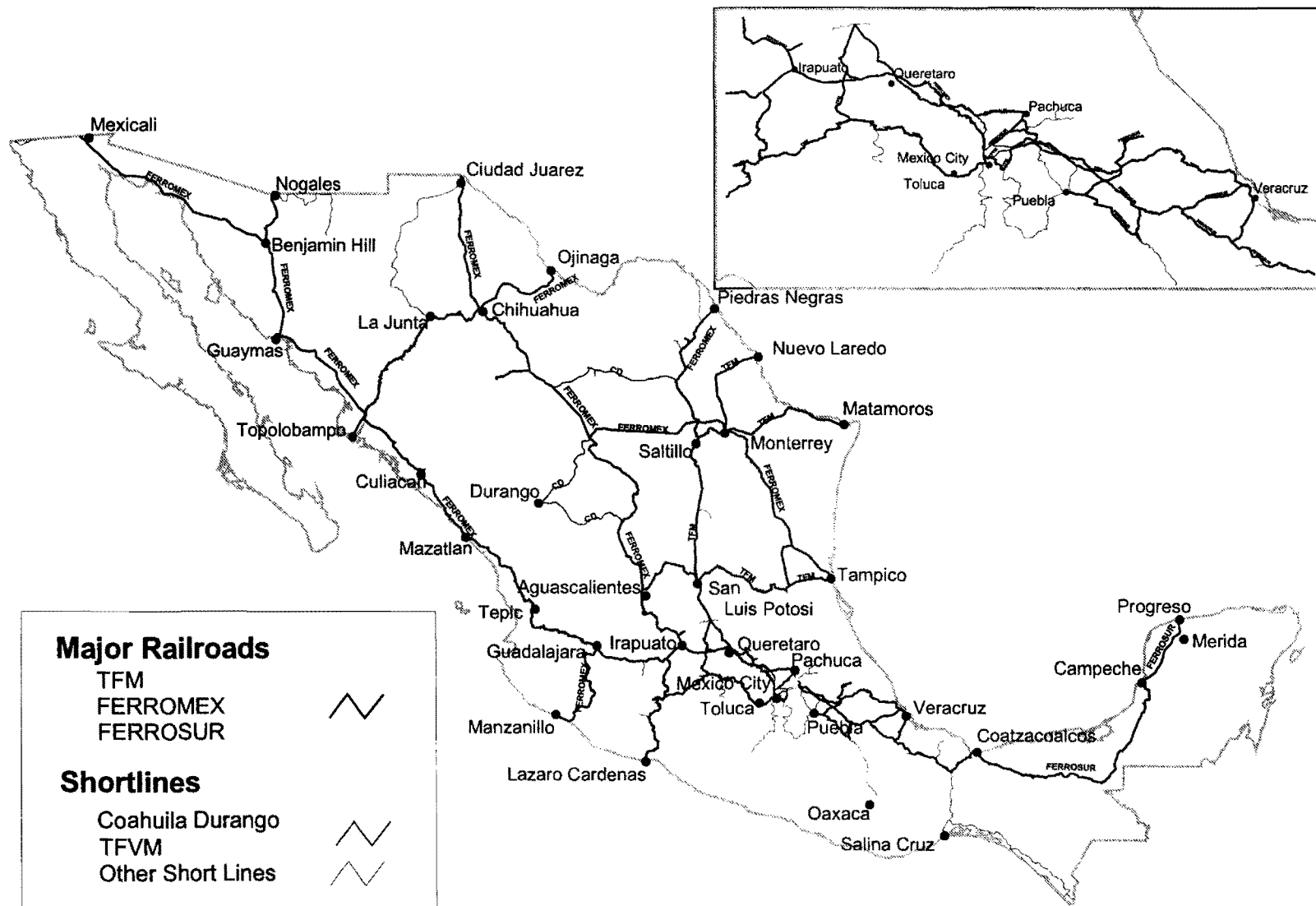


Figure 77. Mexico Rail System

According to KCS's internet website, the Northeast Railway comprises the most actively traveled railroad corridor border-crossing at Matamoros (Brownsville, TX) and Nuevo Laredo (Laredo, TX). Nuevo Laredo is the largest rail freight exchange point of the seven rail gateways. Approximately 53 percent of all rail traffic between the U.S. and Mexico crosses the border at Nuevo Laredo. In comparison, the second busiest border crossing, Piedras Negras (Eagle Pass, TX), handles only 16 percent of the U.S.-Mexico rail traffic.

The Northeast Railway accesses the principal ports of Veracruz and Tampico on the Gulf of Mexico and Lazaro Cardenas on the Pacific Ocean. Its 2,600 mi (4,200 kilometers) represents only 20 percent of the total trackage in Mexico, yet carry approximately 40 percent of the country's rail cargo. Approximately 70 percent of the railroad's 1996 traffic was international, with approximately 88 percent of this traffic originating or terminating in the U.S. At the Laredo border, the Northeast Railway connects with the Tex-Mex Railway and the Union Pacific Railroad. At the Brownsville border, it connects with the Union Pacific Railroad, the Burlington Northern Santa Fe, as well as the Brownsville and Rio Grande International Railroad. The line provides intermodal service with access to three of the four principal ports in Mexico as well as a number of inland intermodal ramps.

KCS lists the following major cities which are served by the Northeast Railway:

• Mexico City	• Monterrey
• Lazaro Cardenas	• Saltillo
• San Luis Potosi	• Aguascalientes
• Veracruz	• Guadalajara
• Toluca	• Tampico-Altamira

TFM believes it has several competitive advantages over its competitors including:

- *Best Route to Mexico City* - The core routes of the Northeast Railway make up the shortest, most direct rail passageway between Mexico and the Southern, Midwestern, and Eastern United States. The Pacific-North Railway is longer, more circuitous, and has steeper elevation grades.
- *Strategic Border-Crossing at Laredo* - The Northeast Railway is the only rail line that serves Nuevo Laredo, the largest freight exchange point between the U.S. and Mexico. Nuevo Laredo has the largest U.S. customs and inspection infrastructure of any border-crossing.

- *Superior Track Structure* - The track structure of the Northeast Railway is superior to that of the other Mexican trunk lines. Consider the following statistics regarding the main line track: 71 percent has 115 lbs./yd. Rails, 75 percent is continuously welded, 72 percent has concrete ties, and the track supports average speeds of 40 to 60 mph (64 to 96 kph).
- *Timing Advantage* - As the first of the Mexican railroad to be privatized, TFM has a significant amount of time in which to establish and refine operations in order to best serve its customers. Also, due to its lead position in the privatization, TFM has been able to seek out and offer employment to the most skilled and experienced FNM employees before their competitors.

TFM plans to make substantial capital investments and improvements to all aspects of operations over its first several years of operation. The key elements of the TFM business strategy and improvement plans are outlined below.

1) Provide Reliable Customer Service

- Employ “off-line” sales reps in U.S. to generate through traffic.
- Designate customer sales territories and create customer service teams to serve a customer or group of customers (similar to KCS’s business unit organization).
- Hire border specialists to streamline the movement of goods across the border.
- Employ a night staff to handle service requests 24-hours a day.
- Adhere strictly to regular train schedules.
- Maintain a centralized computer center to facilitate coordination of train operations and customer service responsiveness.

2) Implement U.S. Railroad Operating Practices

- Computerize operations management systems.
- Rationalize train dispatching systems.
- Undertake extensive employee training program.
- Utilize labor-saving devices such as end-of-train (EOT) devices and wayside detectors.

3) Reduce Labor Costs and Increase Labor Productivity

- Reduce employee headcount to 2,800 by early 1998 (down from 8,700 in July 1996). After 1998, employment is expected to hold steady at 2,800.

- Reduce train crews from six or more members to two or three members per train.
 - Increase employee productivity by 106 percent from the 1997 levels by 1999.
 - Utilize labor-saving devices described above.
- 4) Initiate Capital Expenditure and Improvement Programs
- Acquire new and rebuilt locomotives.
 - Upgrade locomotives and railcars to U.S. rail industry safety standards and permit interchange with U.S. railroads. Such upgrades will allow for the operation of “through” trains originating in Mexico and terminating at points in the U.S. or Canada.
 - Extend sidings up to 10,000 feet (3,000 m) to permit longer trains to pass each other.
 - Enlarge tunnels and raise cantenaries to permit double-stack intermodal traffic.
 - Acquire new and more versatile fleet of railcars.
 - Expand rail yards.
- 5) Exploit Mexican Economic Growth
- Increase revenues as a result of increase trade. Mexican foreign trade is expected to grow 17 percent annually through the year 2000.

TFM believes a substantial portion of the traffic on the Northeast Railway will be intermodal. In preparation for the growth in intermodal traffic, TFM is ramping up its intermodal services all along the line. Currently, intermodal ramps are in operation in Monterrey and Pantaco. There are also private ramps in Queretaro and Encantade.

Service capabilities at Monterrey and Pantaco will be expanded and improved and an additional mechanized ramp is planned for construction in Aguascalientes. Another six locations have been identified as potential sites for intermodal facilities - Nuevo Laredo, San Luis Potosi, Queretaro, Mexico City, and Tampico/Altamira.

Pacific-North Railway

The second line sold includes the only other section of the Mexican rail network with border connections between the U.S. and Mexico. The Pacific-North Railway, called the Ferrocarril del Norte Pacifico, was awarded to the sole bidder Ferrocarril Mexicano (Ferromex). The consortium

is led by Mexican copper mining giant Grupo Mexico SA (74 percent), construction leader Empresas ICA Sociedad Controladora SA (recently sold out to UP), and U.S. rail giant UP (26 percent) (Houston Chronicle Interactive, June, 1997). UP assisted in start-up by forming a subsidiary, UP International Advisors, Inc.

The Pacific-North Railway, with 3,900 miles (6,300 km) of track, links the metropolitan area of Mexico City with Guadalajara and the United States border through the cities of Mexicali/Calexico, California, Nogales/Nogales, Arizona, Ciudad Juarez/El Paso, Texas, Ojinaga/Presidio, Texas, and Piedras Negras/Eagle Pass, Texas. It also has lines to the ports of Manzanillo on the Pacific Ocean and Tampico on the Gulf of Mexico.

Operations of the rail segment began in February 1998, and in its first six months, Ferromex's traffic grew 17 percent over the prior-year period (Vantuono, 1998). Close to 70 percent of Ferromex traffic is domestic with large portions of that including agriculture products, minerals, cement, chemicals, industrial products, automotive, and iron and steel. Lesser traffic comes from fertilizers, petroleum products, coal, coke, and diesel fuel.

The traffic growth over the first six months was greatly influenced by agricultural products. Another growth potential is intermodal. The primary international intermodal corridors at present are the Manzanillo-Guadalajara-Mexico City and El Paso/Ciudad Juarez-Mexico City routes (Vanuono, 1998). Planned investments and expansions include service expansions over the Nogales-Hermosillo and Eagle Pass/Piedras Negras-Salttillo corridors; new service from Eagle Pass to Guadalajara; a new intermodal terminal outside Mexico City; and expansion at the Guadalajara and Manzanillo terminals.

Major industrial opportunities for Ferromex consist of perishables from the Sinaloa area which move mostly by truck to warehouses at Nogales, and motor vehicle traffic from locations like the Ford engine plant in Chihuahua.

Southeast Railway

FerroSur S.A. de C.V., the final main line concession, plans a December 1, 1998, start-up. FerroSur is the holding company of Ferrocarril de Sureste S.A. de C.V., the joint venture of Grupo Tribasa and Banco Imbursa that paid \$311 million for FNM's Southeast Railway.

The Southeast Railway is the shortest of the three networks at 913 miles (1,470 km). It connects Mexico City and Veracruz to the ports of Coatzacoalcos and Salina Cruz through the Isthmus of Tehuantepec, and to the Yucatan peninsula. FerroSur's traffic base consists primarily of grain, cement, industrial products, petrochemicals, and glass products.

FerroSur will attempt to acquire traffic from the Volkswagen Puebla plant where exported vehicles move entirely by truck to the port of Veracruz. FerroSur will also look toward Veracruz for increased intermodal traffic. Veracruz, Mexico's largest port, handles over 350,000 containers a year, a scant 1 percent of which moves by rail (Vantuono, 1998).

Shortlines and Terminals

In addition to the three main lines, the Mexican rail network contains several shortlines and a terminal railroad. Marginal traffic volumes along with uncertain potential has made it difficult to attract operators of the shortlines. The Chihuahua al Pacifico became part of the concession that is now Ferromex after initial bids failed to meet the government's minimum price.

One exception is the 605 mile (973 km) Linea Coahuila Durango which began operations in April, 1998. Two Mexican industrial firms, Grupo Acerero del Norte S.A. de C.V. (GAN), and Industrias Penoles S.A. de C.V., paid \$23 million for the concession. The Coahuila Durango consists of two sections, Monclova-Escalon and Torreon-Durango-Felipe Pescador, connected by 177 miles (285 km) of trackage rights on Ferromex (Vantuono, 1998). Most of Coahuila Durango traffic involves hauling iron ore from Durango and coal from north of Monclova to the GAN subsidiary AHMSA steel mill, and chemical raw materials for Penoles.

Terminal Ferroviaria del Valle de Mexico (TFVM) is the terminal railroad serving Mexico City. TFVM is equally owned by TFM, Ferromex, and FerroSur.

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APPENDIX A: GLOSSARY OF RAILROAD TERMS

ABANDONMENT — Elimination of a segment from a rail network. A proposed abandonment hearing is a regulatory proceeding by which a rail carrier seeks consent of the STB to discontinue service on some portion of its rail network.

AGGREGATED SHIPMENTS — Numerous shipments from different shippers to one consignee that are consolidated and treated as a single consignment, for study purposes.

ASSIGNED SIDING — A sidetrack owned by a transportation line and assigned for the use of one or more firms or individuals in loading or unloading cars. However, user must lease sidetrack to assure continued placement of cars desired.

AUTOMATIC BLOCK CONTROL — System of signals that automatically indicates to trains about to enter a segment of track whether it is occupied by another train. Generally, signals are not in use on light density lines.

AUTOMATIC TRAIN CONTROL (ATC) — A system which enforces the deceleration of a train in compliance with signal speed restrictions as picked up from the rails as a code. ATC is generally not in use on light density lines.

AVERAGE DEMURRAGE AGREEMENT — An agreement made between a shipper and a transportation line whereby the shipper is debited for the time cars are held for loading or unloading beyond a certain period and credited for the time cars are released by him within a certain period, demurrage charges being assessed by the transportation line, usually at the end of the month, for any outstanding debits. (Also, see "DEMURRAGE")

BAD ORDER — Car or locomotive needing repairs.

BALLAST — Selected material placed on the roadbed for the purpose of holding the track in line and surface.

BASING POINT — A point, for which rates to and from are used in constructing through rates between other points.

BELT LINE — A short railroad operating within and/or around a city.

BILL OF LADING — Form of contract between the shippers and the carrier specifying the details of routing, consignor, consignee, commodity, and special terms and conditions or instructions.

— *Straight Bill of Lading* — A non-negotiable document by which a transportation line acknowledges receipt of freight and contracts for its movement. The surrender of the original Straight Bill of Lading is not required by transportation lines upon delivery of the freight, except when necessary for the purpose of identifying the consignee.

— *Order Bill of Lading* — A negotiable document by which a transportation line acknowledges receipt of freight and contracts for its movement. The surrender of the original Order Bill of Lading, properly endorsed is required by transportation lines upon delivery of the freight, in accordance with the terms of the Bill of Lading.

BLIND TRACK — A block of track with no signaling on which operations are controlled by a system of written procedures and special train orders. Such conditions often prevail on light density lines.

BLOCK — A length of track of defined limits, the use of which by trains and engines is governed by block signals, cab signals, or both.

BOX CAR — A closed car used for hauling freight.

BRANCH LINE — The secondary line of a railway.

BRIDGE TRAFFIC — A railroad's traffic which originates and terminates on other railroads, or off-line.

CAB SIGNAL — A signal located on control or operating cab of an engine or other vehicle indicating conditions of the block signal system. Generally, signals are not in use on light density lines.

CAPACITY CONSTRAINTS — Limitations to traffic flow on a segment caused by clearance, rail weight, or other physical constraints.

CARLOAD — The quantity of freight necessary to qualify a shipment for a carload rate.

CARLOAD RATE — A rate applicable to single carloads.

CAR MAN — Mechanical repairman or inspector of railroad rolling stock.

CAR-MILE — (a) A unit used in comparing freight earnings or expenses-the amount earned from, or the costs of hauling a car of freight one mile; (b) The movement of a car one mile.

CAR POOLING — The pooling of car equipment through coordinating the operation under a central control for the joint and proportioned benefit of car owners and users of all cars owned by two or more railroads or by a central agency serving two or more railroads.

CAR RETARDER — A braking device, usually power-operated, built into a railway track to reduce the speed of cars by means of brake-shoes which, when set in braking position, press against the sides of the lower portions of the wheels. This device is used in freight car classification yards.

CARRIER — An individual or company engaged in the operation of a transportation service for hire, classified as a common carrier if serving the public and as a private or contract carrier if not serving the public.

CARTAGE — The charge made for hauling freight on carts, drays, and trucks.

CENTRALIZED TRAFFIC CONTROL (CTC) — A system to control the movement of trains by means of remotely controlled signals and switches from a central location by a dispatcher. Generally, this system is not in use on light density lines.

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY — Authority or certificate granted by the Interstate Commerce Commission to common carriers by railroad, motor vehicle and water to operate in interstate commerce. The certificate is also issued when the STB declares that the present or future public convenience and necessity require or permit abandonment or discontinuance of rail services.

CLAIM — A demand made upon a transportation line for payment on account of a loss sustained through its negligence.

CLASS I RAILROADS — Railroads with gross operating revenues of \$50 million or more annually from railroad operations (prior to 1978, it was more than \$10 million). [Class II railroad's annual gross operating revenues range from \$10-50 million and Class III railroads are those below \$10 million.]

CLASSIFICATION YARD — The place where rail freight cars are segregated by the carriers according to their destinations or deliveries and made ready for proper train movement or delivery.

CLEARANCE CONSTRAINTS — Limitations to traffic flow on a segment for car types which are too long, wide, or high, or where this is a weight limit.

CLEARANCE LIMITS — The dimensions beyond which the size of or projections on a shipment may not extend in order to clear obstructions along railway tracks.

COFC — Container on flat car, see TOFC.

COMMODITY — Any article of commerce; goods shipped.

COMPARTMENTIZER CAR — A box car equipped with moveable bulkheads which can be used to divide the car into separate compartments.

CONCENTRATION POINT — A point at which less than carload shipments are brought together to be reforwarded as a carload.

CONDUCTOR — In charge of the train. He is responsible for the movement of the train. He is to check to see that cars are dropped or set out at the proper points and see that empty or loaded cars are picked up.

CONSIGNEE — The terminator of a shipment.

CONSIGNOR — The originator of a shipment.

CONTRACT — A written agreement between two or more parties specifying terms, conditions, etc., under which certain obligations must be performed. (Specifications are a part of the contract.)

COST — The actual money outlay incurred in acquiring, creating, operating or maintaining a property, including the money value of the services rendered and other considerations involved. This would include contributions by governmental agencies, individuals, and companies toward nonjoint projects.

COST ALLOCATION — Apportioning incurred costs over an entire railroad to segments of that railroad, using cost factors for each cost type (and segment, if required).

COST BASIS — The basis for a cost allocation; for example, gross ton-miles (for fuel).

CROSSTIES — The wooden, concrete, or steel crosspieces that keep the two rails in gage, to provide a guideway.

DEMURRAGE — A penalty charge assessed by carriers for the detention of cars, vehicles or vessels by shippers or receivers of freight beyond a specified free time.

DESTINATION — Road, segment, and/or station to which the freight is delivered.

D.F. CAR (Damage Free Car) — A box car equipped with special bracing material.

DISPATCHER — Directs the movements of trains. Generally reports to a division superintendent.

DIVISION — (a) That portion of a railroad typically assigned to the supervision of a superintendent; (b) for a given railroad, the portion of the total revenue received for a shipment accruing to that railroad, based upon the tariff route.

DUMP CAR — An open car equipped with devices for automatically dumping its contents.

DUNNAGE — The material used to protect or support freight in or on cars and vessels (bracings, false floors, meat racks, sawdust, etc.).

ECONOMIC IMPACT — The jobs, value added, and trade dependent on rail, based on assumed traffic flows, expected traffic retention, and economic impact factors.

ECONOMIC IMPACT FACTOR — For a given type traffic, industry, commodity, and (possibly) segment, the jobs, value added, and trade dependent on rail on a per ton basis.

ENGINEER — The operator of the locomotive.

EN ROUTE — On the way.

EQUIPMENT — Motive power and other rolling stock, floating equipment and highway vehicles used in transportation service.

EQUIPMENT BOND — A bond issued to cover cost of the rolling stock equipment of a carrier. Virtually all railroads are able to finance acquisition of rolling stock in this manner.

EX PARTE — From only one side or party.

FINANCIAL FEASIBILITY — Analysis of revenues and costs as allocated to segments for assumed traffic flows and assumed traffic retention.

FIREMAN - Under standard work rules, assists in the operation of the locomotive.

FLAT SWITCH YARD — A yard in which switching is performed with a locomotive rather than gravity (as in a hump yard).

FOREIGN CAR — Car from another railroad.

FORM R-I — Cost data submitted to the STB by Class I railroads, which are systemwide by cost type.

FORWARDED TRAFFIC — A railroad's traffic which originates on one railroad and terminates on another.

FREIGHT BILL — Document from a common carrier shipment. Gives description of the freight, its weight, amount of charges, taxes, and whether collect or prepaid. Charges paid in advanced are called prepaid freight bills. Charges collected at the destination are called destination or collect freight bills.

FROGS — Heavy metal flangeways that connect track to switches, diamonds, cross-overs and other track structures. Frogs guide wheels from one track structure to another.

FSAC FILE — Freight Station Accounting Code file, maintained in machine-readable form by the Association of American Railroads (AAR), containing about 60,000 station codes — a code for each station on each railroad.

GATEWAY — A point at which freight moving from one territory to another is interchanged between transportation lines. (See "Junction", also "On-Junction.")

GENERAL OPERATING EXPENSES — Generally similar to general and administrative expenses in conventional accounting.

GONDOLA CAR — An open car with sides and ends, used principally for hauling coal, sand, etc.

HOME CAR — A car on the tracks of its owner. (See Foreign Car.)

HOPPER CAR — A railroad car with floor sloping to one or more hoppers through which contents may be unloaded by gravity.

HUMP — That part of a track which is elevated so that when a car is pushed up on "the hump" and uncoupled, it runs down on the other side by gravity.

HUMP YARD — A yard in which switching is performed by gravity. Cars are pushed over a low hill and allowed to roll into individual tracks to be joined with other cars for the same destination or area.

INDUSTRIAL CARRIER: INDUSTRIAL LINE: INDUSTRIAL ROAD — A short railroad owned or controlled by one or more of the principal industries served by it. It may be either a common carrier with all the rights and obligations attached thereto, or merely a private carrier or plant facility. Moreover, it may, whether a common carrier or a plant facility, be separately incorporated or operated merely as a department of the operating company's business.

INDUSTRY SWITCHING — The operation of local pickup and delivery of railroad cars.

INSULATED JOINT — A device which electrically isolates the rails of one section of track from another section of track. Provides for termination of track circuits.

INTERCHANGE POINT — A station at which freight in the course of transportation is delivered by one transportation line to another.

INTERLINE FREIGHT — Freight that moves from point of origin to destination over the line of two or more transportation companies.

INTERLOCKING — An arrangement of signals operated from an interlocking machine and so interconnected by means of mechanical and/or electric locking that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indication.

INTERSTATE COMMERCE ACT — An act of Congress regulating the practice, rates, and rules of transportation lines engaged in hauling interstate traffic.

INVENTORY (noun) — A list in detail of the units (land, roadway, and equipment) comprising the physical property of a carrier as of the date of valuation.

INVENTORY (verb) — The act of counting, computing, compiling, and recording fixed and movable property of a railway.

INVESTMENT IN ROAD AND EQUIPMENT — Account 701: Road and equipment property and Account 702: Improvements on leased property of the general balance sheet accounts, to which the cost of all carrier property, additions and betterments thereto and retirements therefrom are debited and credited (Capital expenditures).

JOINT FACILITY — Railway property which two or more carriers either jointly own, maintain or operate by formal agreement.

JOINT RATE — A rate applicable from a point located on one transportation line to a point located on another transportation line, made by agreement or arrangement between and published in a single tariff under proper concurrence of all transportation lines over which the rate applies.

JOINT TRAFFIC — Traffic moving between stations located on one transportation line and stations located on another transportation line.

JUNCTION — Point at which two or more lines of railroad come together.

LADING — That which constitutes a load. The freight in a car or vessel.

LEVEL OF SERVICE — An index of the relative freedom of traffic movement which considers such factors as: speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort and convenience and operating costs.

LINE-HAUL — The movement of freight over the tracks of a transportation line from one town or city to another town or city (not a switching service).

LOCAL TRAFFIC — Traffic moving between stations located on the same transportation line.

LOCAL TRAIN — A train which stops at all stations on its route.

LOCAL WAYBILL — A waybill covering the movement of freight over a single transportation line.

LOCOMOTIVE — A propulsion engine, using electricity, steam, diesel, or other form of energy, designed to push or pull a railroad train.

L.C.L. — Less than carload lot.

MAIN LINE — The principal line or lines of a railroad.

MAIN TRACK — A track extending through yards and between stations, upon which trains are operated by timetable or train order, or both, or the use of which is governed by block signals.

MAINTENANCE OF EQUIPMENT — Repair and depreciation of rolling stock.

MAINTENANCE-OF-WAY AND STRUCTURE — Maintaining roadway to given standards.

MANIFEST — A document giving the description of the contents of a car or truck.

MERCHANDISE CAR — A car containing several less-than-carload shipments.

MILEAGE ALLOWANCE — An allowance, based on distance, made by carriers to owners of privately owned freight cars.

MILLING-IN-TRANSIT — Freight charged a single rate but which is delivered and then re-carried at a subsequent date. This usually involves "processing" the materials between shipments. Milling-in-Transit can lead to erroneous rates on both shipments.

MINOR SEGMENT — The smallest unit into which a rail system is divided for simulation analysis, based upon such factors as railroad, state, gateway, DOT zone, congressional district, branch line, joint track, or yard.

MODAL SPLIT — The proportioning of trips between travel modes.

MODE — A particular form or method of travel for people or goods.

MULTIPLE UNIT — Two or more locomotives operating from single a control point.

NETWORK — A system of lines of one or more railroads.

OFF-JUNCTION — The point at which forwarded or bridge traffic leaves a railroad.

ON-JUNCTION — The point at which received or bridge traffic enters a railroad.

OPERATING EXPENSES — The expense of furnishing service, including the expense of maintenance and depreciation of the plant used in the service. See STB classification of operating expenses-special instructions.

OPERATING RATIO — The relation of a railroad's operating expenses to operating revenues.

ORIGIN — Road, segment, or station at which the freight enters the continental rail network.

OWNER-OPERATOR — A truck owner and operator. Usually a single truck operator in truckload operations, frequently in competition with railroads.

PEDDLER CAR — A car handled by carriers for less-than-carload shipments from only one consignor over a specified route, the shipments being delivered at points along the route direct from the car to the various consignees.

PENALTY APPLICATION — Automatic unalterable stopping of a train because of an engineer's failure to respond properly to a cab signal indication.

PER DIEM CHARGE — The rent or charge made by one transportation line against another for the use of its cars. The charge is based on a fixed rate per day.

PHYSICAL LIMITATIONS — See "Capacity Constraints."

PICL — Perpetual Inventory of Car Location: a system for maintaining inventory of railroad cars in yards. The system uses a punch card, which is created for each car when it enters the yard. A set of slots representing individual yard tracks serves as a model of the yard. Cards representing cars are moved from one slot to another reflecting car movements in the yard. This generally applies to an individual rail carrier.

PIGGY BACK — An intermodal form of transportation where trailers or containers are carried by rail and truck. (See "TOFC/COFC.")

PLATFORM-STATION — The prepared area adjacent to a station track for handling passengers and baggage, mail, and express, to and from trains.

POINT OF ORIGIN — The point at which freight is received from the shipper.

RAILROAD BOND — A bond issued by a railroad for the purpose of financing improvements, extensions, etc., and generally secured by mortgages on tracks, rolling stock, and other property.

RATE — A unit charge for freight transport service.

RECEIVED TRAFFIC — A railroad's traffic which originates off the railroad and terminates on it.

RECIPROCAL SWITCHING — An arrangement between carriers under which each switches cars to or from the interchange with the other when the switching carrier does not receive a line haul.

REFRIGERATOR CAR — A car equipped with icing and ventilating facilities for protecting perishable freight.

RETARDER — See "CAR RETARDER." [A braking device, usually power operated, built into a railway track to reduce the speed of cars by means of brake shoes which, when set in position, press against the sides of the lower portions of the wheels. This device is used in freight car classification yards.]

RETENTION RATE — Fraction of traffic for each type traffic that would be retained on rail if service at the origin or destination was discontinued.

RETIREMENT — The removal or abandonment of property which for any reason is taken out of service for which it was created or installed; fixed property moved from one valuation section to another.

REVENUE — Income from all sources.

REVENUE ALLOCATION — Distribution of a railroad's revenue to segments (based on mileage, etc.).

REVENUE ATTRIBUTABLE TO A LINE — Revenue and income attributable to branch lines (See 49 CFR 1125.6.).

REVENUE DATA — Basic data record compiled by railroads describing freight flows and the revenues they accrue.

RIGHT-OF-WAY — Lands or rights used or held for railroad operation.

ROADBED — The structure supporting the railroad track.

SALVAGE — Material and its value recovered from property retired or from material used as a construction aid.

SCHEDULE — Table of departure and arrival times for a train.

SEGMENTATION — Process of dividing a railroad's lines into major and minor segments for analysis purposes.

SETTLING FILE — The database stored by a railroad for the purpose of computing divisions.

SHIPPER — The individual or institution that originates a shipment.

SIDE-TRACK — A short track extending alongside often connecting at both ends with main track.

SIDE-TRACK AGREEMENT — Contract between railroad and shipper establishing rights as to use and operation of a siding.

SIDING — A track auxiliary to the main track for meeting or passing trains.

SLOW ORDER — An order to train crews to restrict the speed of operations.

SPLC — Standard Point Location Code file — maintained by the AAR on the same machine-readable file as the FSAC file, with one number for each junction.

SPUR-TRACK — A short track extending out from or alongside, and connecting only at one end with another track.

STANDARD GAGE (GAUGE) (U.S.S.G.) — The established distance between the rails of a railroad, 4 ft. 8 ½ in. Actual gage in place will vary under traffic.

STATION — A place designated on the timetable by name.

STCC — Standard Transportation Commodity Code, maintained by the AAR, which contains commodity codes of up to seven digits.

SWITCH — A track structure between two lines of track to permit cars or trains to pass from one track to another.

SWITCH LIST — Document listing instructions for picking up, delivering, or otherwise locating or assembling freight cars by a switch crew.

TABULATION — A listing of the revenue data, sorted by commodity station, or other data element, with printed subtotals of cars, tons, and revenue.

TANK CAR — A car used for transporting liquid in bulk.

TARE WEIGHT — (a) The weight of a container and the material used for packing; (b) As applied to a carload, the weight of the car exclusive of its contents.

TARIFF ROUTE — The properties of different railroads crossed when shipping from an origin to a destination.

TEAM-TRACK — A track on which cars are placed for the use of the public in loading or unloading freight.

TENDER — The offer of goods for transportation, or the offer to place cars for loading or unloading.

TERMINAL — Terminus of a train run; an assemblage of facilities provided by a railway at a terminus or at an intermediate point for the handling of passengers or freight and the receiving, classifying, assembling, and dispatching of trains.

TERMINAL CARRIER — The transportation line making delivery of a shipment at its destination.

TERMINAL CHARGE — A charge made for services performed in terminals.

TERMINAL SWITCHING — The moving of cars originating at and destined to points within yard or switching limits (See Line-haul Switching.)

TIMETABLE — The authority for the movement of trains and their schedule subject to the general rules and special instructions.

TOFC/COFC — Trailer-on-flatcar/Container-on-flatcar — terms, used for truck/rail intermodal interchanges and the related rail traffic. (See Piggy Back.)

TON-MILE — (a) A unit used in comparing freight earnings or expenses-the amount earned from, or the cost of, hauling a ton of freight one mile; (b) The movement of a ton of freight one mile.

TRACK — An assembly of rails, ties, and fastenings over which cars, locomotives, and trains are moved.

— *Bad Order* — A track on which bad order cars are placed either for light running repairs or for subsequent movement to repair tracks.

— *Classification* — One of the body tracks in a classification yard, or a track used for classification purposes.

— *Connecting* — Two turnouts with the track between the frogs arranged to form a continuous passage between one track and another intersecting or oblique track or another remote parallel track.

— *Crossover* — Two turnouts with track between, connecting two nearby and usually parallel tracks.

— *Hold* — One of the body tracks in a hold yard or a track used for hold purposes.

— *Industrial* — A track serving one or more industries.

— *Interchange* — A track on which cars are delivered or received, as between railways.

— *Passing* — A track auxiliary to the main track for meeting or passing trains. Same as a "Siding".

— *Receiving* — One of the body tracks in a receiving yard or a track used for receiving trains.

— *Side* — A track auxiliary to the main track for purposes other than for meeting and passing trains.

— *Sorting* — One of the body tracks in a sorting yard or a track used for sorting purposes.

— *Spur* — A stub track diverging from a main or other track.

— *Station* — A track upon which trains are placed to receive or discharge passengers, baggage, mail, and express.

— *Storage* — One of the body tracks in storage yards or one of the tracks used for storing equipment.

— *Team* — A track on which cars are placed for transfer of freight between cars and highway vehicles.

TRACKAGE RIGHT — Right obtained by one carrier to operate its trains over the tracks of another carrier.

TRACK CIRCUIT — An electrical circuit, the principal part of which is formed by the rails of the track. The principal purpose of the circuit is to detect the presence of a train or rolling stock on a given section of track incorporated in the track circuit.

TRACK CIRCUIT FREQUENCY — The frequency at which the track circuit is energized using alternating current (A.C.).

TRACK STORAGE — A charge made on cars held on a carrier's track for loading or unloading after the expiration of free time allowed. The charge is generally made in addition to demurrage charges.

TRAFFIC CONTROL SYSTEM — A block signal system under which train movements are authorized by block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

TRAIN — A locomotive with or without cars, displaying markers.

TRAINMASTER — Directs train and switching operations in terminals, on the road, at stations, and at yards. Generally reports to a division superintendent.

TRANSPORTATION — Generally speaking, that part of a railroad's operation which is related to train movements.

TRANSPORTATION EXPENSES — The expenses directly associated with the operations of a railroad. They generally include the expenses of crews, fuel, and other related items.

WAYBILL — Description of goods sent with a common carrier freight shipment. This is a negotiable document.

WAYBILL FILE — Database stored by a railroad on the traffic that has moved on that railroad.

YARD — A system of tracks used for switching cars and which are within defined limits, over which movements may be made subject to prescribed signals and rules, or special instructions.

— *Classification* — A yard in which cars are classified or grouped in accordance with requirements.

— *Departure* — A yard in which cars are assembled in trains for forwarding.

— *Flat* — A yard in which the movement of cars is accomplished by a locomotive without material assistance by gravity.

— *Gravity* — A yard in which the classification of cars is accomplished by a locomotive with the material assistance of gravity.

— *Hold* — A yard for the temporary holding of cars.

— *Hump* — A yard in which the classification of cars is accomplished by pushing them over a summit, beyond which they run by gravity.

— *Retarder* — A hump yard provided with retarders to control the speed of the cars during their descent to the classification tracks.

— *Sorting* — A yard in which cars are classified in greater detail after having passed through a classification yard.

— *Storage* — A yard in which idle equipment is held awaiting disposition.

— *Working* — The number of cars that can be regularly dispatched from the yard in successive 24-hour periods.

APPENDIX B: SHIPPER SURVEY

RAIL USER QUESTIONNAIRE

Company Name: _____

Location: P.O. Box # _____ Street _____

City/Town _____ Zip Code _____

County _____

Phone: Area Code _____ Number _____

Name and Title of Individual Filling Out Questionnaire _____

Principal Line of Business _____
(e.g., warehousing, manufacturing, grain elevator)

The following addresses the transportation mode by which your company has shipped and received goods over the past five years.

INBOUND RECEIPTS

Mode	Principal Commodity	Principal Originating City & State	Average Tons per Car or Truckload	Annual Number of Carloads of Truckloads	
				1993	1997
Rail					
Total					
Truck					
Total					
Other, please specify (air, water, pipeline)					
Total					

OUTBOUND SHIPMENTS

Mode	Principal Commodity	Principal Originating City & State	Average Tons per Car or Truckload	Annual Number of Carloads of Truckloads	
				1993	1997
Rail					
Total					
Truck					
Total					
Other, please specify (air, water, pipeline)					
Total					

The following are some questions about the size and characteristics of your company.

Approximately what were your company's sales in 1997?

\$ _____

How many people were employed by your company in 1997?

Average for the Year _____ Peak _____

What proportion of your employees live in the local community, i.e., town and immediate surrounding area _____% County _____% Rest of State _____%

Excluding payroll and taxes, approximately how much money did your company spend for utilities, supplies, services, and other purchases in 1997 in:

The Local Community \$ _____ County \$ _____

What was the approximate total employee payroll for your company in 1997?

\$ _____

How much was your total county and local tax bill in 1997? \$ _____

If possible, could you provide the following breakdown?

Municipal/Town Name of Community _____ Amount \$ _____
 County Name _____ Amount \$ _____
 School District Name _____ Amount \$ _____
 Special District (if payments were sizable)
 Name _____ Amount \$ _____

What was your total freight bill in 1997? \$ _____

Approximately what proportion of your total sales are accounted for by freight transportation costs?
 _____ %

If you have made significant shifts in usage either from rail to truck or truck to rail, please indicate:

	Please Check If Appropriate	Explain
Shifting markets or suppliers		
Condition of facilities		
Freight Rates		
Car Supply		
Transit Time		
Loss & Damage		
Other		

Have you significantly expanded your operation in the past three years or do you plan to do so in the next three years?

	Yes	No	Type and Purpose of Expansion
Past 3 years			
Next 3 Years			

Please explain the extent, if at all, to which the expansion is dependent upon continued rail service.

APPENDIX C: INFORMATION AND DATA RESOURCES

ACCIDENT FACTS

Mode:

Air, Highway, Rail

Abstract:

This publication is a composition of statistical data on accidental deaths, injuries, and associated costs.

Source of Data:

State vital statistics and health agencies, state traffic agencies, state workers' compensation authorities, state and local safety councils, trade associations, and various federal government agencies.

Attributes:

Geographic Coverage of Data: U.S. totals, 50 states, District of Columbia, worldwide

Time Span of Data Source: Latest year; some time series data

First Developed: 1923

Update Frequency: Annual

Last Update: 1995

Sponsoring Organization:

National Safety Council

Availability:

National Safety Council

Customer Service

1121 Spring Lake Drive

Itasca, IL 60143

Telephone (800) 621-7619; Fax (708) 285-0797

Contact for Additional Information:

National Safety Council, Statistics Department

Telephone (708) 775-2365; Fax (708) 285-0242

AMTRAK ANNUAL REPORT

Mode:

Rail

Abstract:

This publication presents a five-year comparison of Amtrak's performance including passenger-miles, on-time performance, and ridership; operating statistics that illustrate the number of locomotives and train cars, train miles operated, and average age of units; and an overview of financial performance.

Source of Data:

Amtrak

Attributes:

Geographic Coverage of Data: Amtrak
Time Span of Data Source: 5 years to Present
First Developed: 1972
Update Frequency: Annual

Sponsoring Organization:

Amtrak (National Railroad Passenger Corporation)

Availability:

Amtrak
National Railroad Passenger Corporation
60 Massachusetts Avenue, NE
Washington, DC 20002
Telephone (202) 906-3078

ANALYSIS OF CLASS I RAILROADS

Mode:

Rail

Abstract:

This publication contains one year of data for each Class I railroad plus U.S., east, and west totals.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: U.S. totals, summary by east and west

Time Span of Data Source: Current year

First Developed: 1978

Update Frequency: Annual

Last Update: 08/95

Sponsoring Organization:

Association of American Railroads (AAR)

Availability:

Association of American Railroads (AAR)

Publication Order Processing

50 F Street, NW, 5th floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202) 639-2309; Fax (202) 639-2499

CARLOAD WAYBILL SAMPLE

Mode:

Rail

Abstract:

This database contains rail shipment data such as origin and destination points, type of commodity, number of cars, tons, revenue, length of haul, participating railroads, interchange locations, and URCS shipment variable cost estimates. The waybill sample contains confidential information and is used primarily by federal and state agencies. The public-use version of the sample, however, contains aggregated nonconfidential data. Movements are aggregated to the BEA-to-BEA level at the 5-digit STCC level. For a particular commodity, the origin or destination BEA is not included unless there are at least three freight stations in the BEA and there are at least two more freight stations than railroads in the BEA.

Attributes:

Geographic Coverage of Data: U.S. totals, BEA-to-BEA level

Time Span of Data Source: 1991

Update Frequency: Annual

File Format: ASCII

Media: 9-track tape, 6250 bpi; CD-ROM

Significant Features/Limitations:

The waybill sample contains confidential information and is used primarily by federal and state agencies. There is, however, a public-use version that contains aggregate nonconfidential data.

Sponsoring Organization:

Surface Transportation Board

Availability:

DOT/Bureau of Transportation Statistics

400 7th Street, SW, Room 3430

Washington, DC 20590

Telephone (202) 366-3282; Fax (202) 366-3640

Contact for Information:

Surface Transportation Board

Office of Economic & Environmental Analysis

Telephone (202) 927-6196; Fax (202) 927-6225

CLASS I FREIGHT RAILROADS- SELECTED EARNINGS DATA

Mode:

Rail

Abstract:

This publication contains one year of data for each Class I railroad plus U.S., east, and west totals.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: U.S. large railroads

Time Span of Data Source: Current Quarter

First Developed: 1990

Update Frequency: Quarterly

File Size: ~105,000

File Format: ASCII

Media: Diskette, Printed Source

Significant Features/Limitations:

The data remain constant after publication of printed source.

Sponsoring Organization:

Surface Transportation Board

Availability:

Surface Transportation Board

Office of Economic & Environmental Analysis

Washington, DC 20423

Telephone (202) 927-6204

Contact for Additional Information:

Surface Transportation Board

Office of Economic & Environmental Analysis

Telephone (202) 927-6204; Fax (202) 927-6225

CLASS I RAILROAD INFORMATION FILE

Mode:

Rail

Abstract:

This database contains a wide range of financial and operational data from the Class I rail carriers in the nation. Balance sheet, income statement, and supplementary financial data are presented, along with information on tonnage, mileage, employees, transportation equipment, and much more.

Source of Data:

Railroad Annual Report Form R-1 and Railroad Quarterly Report Forms RE&I and CBS.

Attributes:

Geographic Coverage of Data: Twelve Class I rail carriers in U.S.

Time Span of Data Source: Current Year

First Developed: 1987

Update Frequency: Annual

Last Update: 1992

File Size: 5MB

File Format: ASCII

Media: Tape, Diskette

Sponsoring Organization:

Surface Transportation Board

Availability:

Surface Transportation Board

Office of Economic & Environmental Analysis

Washington, DC 20423

Telephone (202) 927-6204

Contact for Additional Information:

Surface Transportation Board

Office of Economic & Environmental Analysis

Telephone (202) 927-6204; Fax (202) 927-6225

COAL TRANSPORTATION STATISTICS

Mode:

Rail, Water

Abstract:

This annual publication contains a detailed analysis of the way coal is transported via rail and water and is presented as a usable historical series. Includes maps of the inland waterway system, the major coal carrying rail systems, a chart depicting railroad holding companies and affiliates, and published rail rates for U.S. exports from mines to port of exit, as well as general rail rate increases on coal. Several graphs illustrate changes that have occurred in the coal transportation industry over the years.

Source of Data:

Association of American Railroads, U.S. Army Corps of Engineers, Energy Information Administration, Lake Carriers' Association

Attributes:

Geographic Coverage of Data: 50 states, District of Columbia

Time Span of Data Source: 1991-1992

First Developed: 1979

Update Frequency: Annual

Last Update: 04/94

Sponsoring Organization:

National Mining Association

Availability:

National Mining Association

1130 17th Street, NW

Washington, D.C. 20036

Telephone (202) 463-9780; Fax (202) 833-9636

Contact for Additional Information:

National Mining Association

Telephone (202) 463-9780; Fax (202) 833-9636

COMPUTER-ASSISTED DEPRECIATION & LIFE ANALYSIS SYSTEM - (CADLAS)

Mode:

Rail

Abstract:

This database contains depreciation data consisting of annual installations, retirements, transfers, and end-of-year balances for all Class I railroads. The database is used to estimate the service lives and depreciation rates of railroad equipment, roadway property, and track accounts. The accompanying programs contain Actuarial and Simulated Plant Record life analyses with high resolution graphics, salvage calculations, and depreciation accrual and calculated reserve estimations. The system can also estimate investment on a replacement or reproduction cost basis.

Source of Data:

Class 1 Railroads

Attributes:

Geographic Coverage of Data: U.S. Class I Railroads

Time Span of Data Source: 1915-1995

First Developed: 1978

Update Frequency: Annual

Last Update: 1995

File Size: 5MB/CADLAS; 40MB/ACV- 159 database

File Format: ASCII

Media: Diskette

Sponsoring Organization:

Surface Transportation Board

Availability:

Dr. S. D. Jensen

STB/Office of Economic and Environmental Analysis

Washington, DC 20423

Price, \$195 including documentation.

Contact for Additional Information:

STB Office of Economic & Environmental Analysis

Telephone (202) 927-6188; Fax (202) 927-6225

FRA NATIONAL RAIL PLANNING NETWORK

Mode:

Rail

Abstract:

This database presents a digital representation of the major continental U.S. railway systems, covering some 305,900 km (190,000 mi) of route. Link attributes include owning railroads, trackage rights railroads, state previous owning railroads, subsidiary railroads, FAA region, passenger service, U.S. Geological Survey (USGS) region, and significance in civil rail lines important to national defense. All links in original USGS data are retained. Links subsequently abandoned are so identified. Node attributes include name (where there is a name), state, standard point location code, and junction code, if any.

Source of Data:

USGS 1:2,000,000 digital line graph

Attributes:

Geographic Coverage of Data: 50 states

Time Span of Data Source: Current

First Developed: 1990

Update Frequency: As required

Number of Records: 11,010 nodes; 15,800 links

File Size: 13MB

File Format: ASCII

Media: Diskette

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Office of Policy Systems

Availability:

DOT/FRA

Office of Policy Systems, RRP-20

400 7th Street, SW

Washington, DC 20590

Telephone: (202) 366-0365; Fax (202) 366-7688

Contact for Additional Information:

DOT/FRA, RRP-23

Telephone (202) 366-0365; Fax (202) 366-7688

FRA NATIONAL RAIL PLANNING NETWORK, CIVIL RAIL LINES IMPORTANT TO NATIONAL DEFENSE

Mode:

Rail

Abstract:

This database presents a digital representation of the major continental U.S. railway system, covering some 305,083 km (189,492 mi) of track. Its development has been sponsored by the Military Traffic Management Command and conducted by the Federal Railroad Administration. The Military Traffic Management Command identifies rail corridors important to national defense (the Strategic Rail Corridor Network (STRACNET)). MTMCTEA designates lines of STRACNET corridors and between STRACNET and defense installations requiring rail service to accomplish their assigned mission. These lines are identified by link attributes in the FRA database.

Source of Data:

Identification of STRACNET corridors through analysis of historical and planned war and peacetime defense traffic

Attributes:

Geographic Coverage of Data: Major U.S. continental railway systems

Time Span of Data Source: 1-3 years First Developed: 1990

Update Frequency: As required

Number of Records: 11,010 nodes; 15,264/links File Size: 13MB

Media: Tape, Printed source

Sponsoring Organization:

Department of Defense, Department of Army, Military Traffic Management Command, Transportation Engineering Agency

Availability:

DOT/Federal Railroad Administration

Office of Policy Systems

400 7th Street, SW

Washington DC 20590

Telephone (202) 366-0368

Contact for Additional Information:

MTMCTEA

Railroads for National Defense

Telephone (804) 599-1163; Fax (804) 599-1560

FREIGHT TRANSPORT TRENDS AND FORECASTS TO 2005

Mode:

Water, Rail, Highway

Abstract:

This report analyzes historical trends and presents detailed forecasts for marine, rail and truck freight traffic, by commodity and sector, and marine vessel movements, up to the year 2005.

Source of Data:

Transport Canada

Attributes:

Geographic Coverage of Data: Domestic, transborder, international, Coast Guard region, Ports Canada facilities, Harbour Commissions, St. Lawrence Seaway and Pilotage Authorities

Time Span of Data Source: 1985-2005

First Developed: pre-1980

Update Frequency: Biennial

Sponsoring Organization:

Transport Canada/ACAC/Economic Analysis/Policy and Coordination

Availability:

Transport Canada/ACAC

Economic Analysis/ Policy and Coordination

Floor 25C, Place de Ville, Tower C

Ottawa, Ontario, Canada K1A 0N5

Contact for Additional Information:

Transport Canada

Telephone (613) 991-6477; Fax (613) 957-3280

GRADE CROSSING INVENTORY SYSTEM (GCIS)

Mode:

Rail

Abstract:

This system contains a record of every public and private crossing in the U.S. along with the accident history of each crossing. Information includes the identification number, railroad, railroad division, subdivision, milepost and branch, state, county, city or nearest city, street or highway, and crossing type. In addition, public grade crossing information such as number of daily train movements, train speeds, type and number of tracks, details of crossing protection both active and passive, crossing angle, number of traffic lanes, daily highway traffic volume, pavement markings, advance warning signs, crossing surface, highway system, and percentage of trucks is available.

Source of Data:

Information is supplied by the railroads and states on an optional basis.

Attributes:

Geographic Coverage of Data: U.S. public and private crossings
Time Span of Data Source: Current year
First Developed: 1973
Update Frequency: Continual
Number of Records: ~600,000
File Size: ~200MB
File Format: Sequential
Media: 9-track tape, Diskette, Printed source

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Data Analysis Branch

Availability:

DOT/FRA
Data Analysis Branch, RRS-22.1
400 7th Street, SW
Washington, DC 20590
Telephone (202) 366-2760; Fax (202) 366-7592
Price, \$35/tape, non-government agencies. No charge to government agencies, railroad, or railroad labor requesters.

Contact for Additional Information:

DOT/FRA, RRS-22
Telephone (202) 366-2760; Fax (202) 366-7592

GRAIN TRANSPORTATION REPORT

Mode:

Highway, Rail, Water

Abstract:

The Grain Transportation Report is a 4-page weekly newsletter citing trends in grain transportation.

Source of Data:

U.S. Army Corps of Engineers, Association of American Railroads, St. Louis Merchant Exchange and Department of Agriculture

Attributes:

Geographic Coverage of Data: Worldwide

Time Span of Data Source: Past 4 weeks & previous year

First Developed: 1980

Update Frequency: Continual

Sponsoring Organization:

Department of Agriculture/Agricultural Marketing Service

Availability:

USDA

Agricultural Marketing Service

Room 1207 South Building, 14th Street and Independence Avenue, SW

Washington, DC 20250

Telephone (202) 690-0331; Fax (202) 690-3616

Contact for Additional Information:

USDA-AMS-TMD

Telephone (202) 690-0331; Fax (202) 690-1340

INTERNATIONAL ACCIDENT FACTS

Mode:

Air, Highway, Rail

Abstract:

This publication is a statistical compendium of accidental deaths and death rates around the world. It contains worldwide comparisons as well as specific information by country, including the leading causes of death. Data include deaths due to preventable causes, such as motor vehicle and occupational accidents. Age and type breakdowns are depicted by clear charts, diagrams, tables, and graphs.

Source of Data:

World Health Organization, International Labour Organization, and statistical agencies of individual countries

Attributes:

Geographic Coverage of Data: Worldwide
Time Span of Data Source: 1982-1992
First Developed: 1994
Update Frequency: Annual
Last Update: 1994

Sponsoring Organization:

National Safety Council

Availability:

National Safety Council
Customer Service
1121 Spring Lake Drive
Itasca, IL 60143
Telephone (800) 621-7619; Fax (708) 285-0797

Contact for Additional Information:

National Safety Council, Statistics Department
Telephone (708) 775-2365; Fax (708) 285-0242

NATIONWIDE PERSONAL TRANSPORTATION SURVEY (NPTS)

Mode:

Highway, Transit, Air, Rail

Abstract:

This system contains data from a nationwide random survey of 22,317 households; 48,385 persons. A total of six files are in the database. NPTS obtains data on travel patterns by collecting information on all trips taken by the respondents on a specific day, combined with longer trips taken over a two-week period. Reports reflect selected information on the data of household compositions, vehicle ownership, household travel patterns, journey-to-work, vehicle utilization, vehicle occupancy, modal split, characteristics of drivers, and travel by women and older persons.

Source of Data:

Household survey of all members five years and older. The 1990 survey was based on a Random Digit Dialing (RDD) telephone sample, using Computer-Assisted Telephone Interviewing (CATI). Prior NPTS surveys in 1969, 1977, and 1983 were conducted by the Bureau using home interviews.

Attributes:

Geographic Coverage of Data: U.S. totals

Time Span of Data Source: 1990, 1969

First Developed: every 7 years since 1969; every 5 years beginning 1990 Last Update: 1990

Number of Records: 275,443

File Size: 32,756

File Format: Tape (EBCDIC or SAS), Diskette (ASCII, 6 files) Media: 9-track tape, 6250 bpi; Diskettes; Printed source

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Federal Highway Administration, National Highway Traffic Safety Administration, Federal Transit Administration, Office of the Secretary of Transportation

Availability:

DOT/RSPA/Volpe Center

Kendall Square Cambridge, MA 02142

Telephone (617) 494-2450; Fax (617) 494-3633

Contact for Additional Information:

DOT/FHWA, HPM-40

Telephone (202) 366-0160; Fax (202) 366-7742

PRELIMINARY REPORT OF RAILROAD ACCIDENTS/INCIDENTS AND RESULTING CASUALTIES

Mode:

Rail

Abstract:

This report contains data on persons killed and injured in train and non-train accidents and accidents per million train-miles, employees on duty, passengers, employees not on duty, nontrespassers, contractor employees, trespassers, casualty rates, and highway grade-crossing casualties and rates.

Source of Data:

Railroad companies submit reports to FRA.

Attributes:

Geographic Coverage of Data: U.S. totals

Time Span of Data Source: Current year

First Developed: 1989

Update Frequency: Quarterly

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Systems Support Division

Availability:

DOT/FRA

Systems Support Division, RRS-22

400 7th Street, SW

Washington, DC 20590

Telephone (202) 366-2760; Fax (202) 366-7592

Contact for Additional Information:

DOT/FRA, RRS-22

Telephone (202) 366-2760; Fax (202) 366-7592

PROFILES OF U.S. RAILROADS

Mode:

Rail

Abstract:

This database contains a survey of approximately 500 freight railroads. Information for each freight railroad includes: name, address, phone number, type of carrier, owner, year established, predecessor(s), states served, number of employees, miles of road operated, number of interchange railroads, top three commodities, and revenue range.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: 500 freight railroads in U.S.

Time Span of Data Source: Current year

First Developed: 1986

Update Frequency: Biannual

Last Update: 09/95

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads

Publication Order Processing

50 F Street, NW, 5th Floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202) 639-2309; Fax (202) 639-2499

RAIL IN CANADA

Mode:

Rail

Abstract:

This publication provides information relating to the size and structure of the Canadian Railway industry. A general overview of the industry for a six-year period is followed by a more in-depth analysis on the economic performance, financial structure, and equipment use for the reference period. Also provided are commodity origin and destination data series supplied by the National Transportation Agency and the number of railway cars, fuel statistics, employment, operating and traffic statistics, tonnage loaded and unloaded, and tonnage to/from the United States.

Source of Data:

Canadian Railway Industry

Attributes:

Geographic Coverage of Data: Canada
Time Span of Data Source: Latest 6 years
First Developed: 1987
Update Frequency: Annual

Significant Features/Limitations:

Data were previously released in General Statistics (Catalogue No. 52-215), Commodity Statistics (Catalogue No. 52-211), and Commodity Origin & Destination Statistics (Catalogue No. 52-214).

Sponsoring Organization:

Statistics Canada, Surface and Marine Transport, Rail Transport

Availability:

Statistics Canada
Publication Sales
Ottawa, Ontario, Canada K1A 0T6
Telephone (800) 267-6677 (in the U. S. and Canada), or (613) 951-7277
Fax (613) 951-1584

Contact for Additional Information:

Statistics Canada, Rail Transport
Telephone (613) 951-2518; Fax (613) 951-0579

RAIL WAYBILL DATA, 1988-1992

Mode:

Rail

Abstract:

This database contains public-use aggregate nonconfidential rail shipment data such as origin and destination points, type of commodity, number of cars, tons, revenue, length of haul, participating railroads, and interchange locations. The data are based on the Carload Waybill Sample, which is a proprietary sample of freight waybills that were submitted to the Interstate Commerce Commission by Class I Railroads.

Source of Data:

Class I Railroads

Attributes:

Geographic Coverage of Data: U.S. Class I Railroads Time Span of Data Source: 1988-1992

First Developed: 1994

Update Frequency: Annual

Number of Records: 396,670

Media: CD-ROM

Sponsoring Organization:

Department of Transportation, Bureau of Transportation Statistics

Availability:

DOT/Bureau of Transportation Statistics

400 7th Street, SW, Room 3430

Washington, DC 20590

Telephone (202) 366-3282; Fax (202) 366-3640

Contact for Additional Information:

DOT/BTS, K-10

Telephone (202) 366-3282; Fax (202) 366-3640

RAILROAD ACCIDENT/INCIDENT REPORTING SYSTEM (RAIRS)

Mode:

Rail

Abstract:

RAIRS contains four databases: rail equipment, injury/illness, grade-crossing accidents, and railroad summary (freight and passenger). These databases include information on all railroad accidents, grade-crossing accidents, railroad employee casualties, and any other injuries on railroad property. These databases provide the basis for accident analyses and assessment as well as annual reports.

Source of Data:

Railroads submit data to DOT/FRA.

Attributes:

Geographic Coverage of Data: U.S. totals
Time Span of Data Source: 1976-present
First Developed: 1975
Update Frequency: Monthly
Number of Records: 6,000/year
File Size: ~5MB
File Format: Sequential, ASCII, DBF
Media: 9-track tape, Diskette, Printed source

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Systems Support Division

Availability:

DOT/FRA
Systems Support Division, RRS-22,
400 7th Street, SW
Washington, DC 20590
Telephone (202) 366-2760; Fax (202) 366-7592

Contact for Additional Information:

DOT/FRA, RRS-22
Telephone (202) 366-2760; Fax (202) 366-7592

RAILROAD EMPLOYEE FATALITIES INVESTIGATED BY THE FRA

Mode:

Rail

Abstract:

This report contains data on railroad accidents such as railroad involved, location, date, description of accident, circumstances involved in accident, applicable rules, analysis, and cause.

Source of Data:

DOT/FRA inspectors collect information at site of accident.

Attributes:

Geographic Coverage of Data: U.S. totals

Time Span of Data Source: Current year

First Developed: Early 1900s

Update Frequency: Annual

Sponsoring Organization:

Department of Transportation, Federal Railroad Administration, Accident Investigations and Analysis Branch

Availability:

DOT/FRA

Accident Investigations and Analysis Branch, RRS-22.2

400 7th Street, SW

Washington, DC 20590

Telephone (202) 366-2760; Fax (202) 366-7592

Contact for Additional Information:

DOT/FRA, RRS-22

Telephone (202) 366-0549; Fax (202) 366-7592

RAILROAD EQUIPMENT REPORT

Mode:

Rail

Abstract:

This publication illustrates railroad freight car ownership, capacity, new cars installed, cars rebuilt, and cars on order for 22 car types. Current year's data include Class I railroads individually, plus non-Class I railroads and private owners as groups.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: North America

Time Span of Data Source: Latest 10 years

First Developed: 1990

Update Frequency: Annual

Last Update: 02/95

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads

Publication Order Processing

50 F Street, NW, 5th Floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202)639-2309; Fax (202) 639-2499

RAILROAD FACTS

Mode:

Rail

Abstract:

This publication is a summary of historic railroad data. Statistics represent Class I railroads, defined by the Surface Transportation Board, for each respective year.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: U.S. totals, summary by east and west

Time Span of Data Source: Most recent 10 years + selected prior years between 1929 & 1980

First Developed: 1923

Update Frequency: Annual

Last Update: 08/95

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads

Publication Order Processing

50 F Street, NW, 5th floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202) 639-2309; Fax (202) 639-2499

RAILROADS AND STATES

Mode:

Rail

Abstract:

This report contains Amtrak and freight railroad statistics by state. Includes state by state statistics, rankings, and maps. Includes carloads, tons, top commodities, railroad employment, and a list of all railroads operating within a state.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: 48 continental U.S. states, Alaska

Time Span of Data Source: Current year

First Developed: 1993

Update Frequency: Biennial

Last Update: 11/93

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads

Publication Order Processing

50 F Street, NW, 5th Floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156.

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202) 639-2309; Fax (202) 639-2499

RAILROAD TEN-YEAR TRENDS

Mode:

Rail

Abstract:

This document contains a comprehensive cross-section of freight railroad industry data in a tabular/graphic format. Includes an overview of the U.S. freight railroad industry; Class I industry-performance, traffic, revenue, financial statistics, employment, plant and equipment, and operations; a list of U.S. freight railroads; and profiles of railroad-related organizations.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: U.S. totals
Time Span of Data Source: Most recent 10 years
First Developed: 1984
Update Frequency: Annual
Last Update: 11/95

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads
Publication Order Processing
50 F Street, NW, 5th Floor COG
Washington, DC 20001
Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department
Telephone (202) 639-2309; Fax (202) 639-2499

RAILWAY CARLOADINGS

Mode:

Rail

Abstract:

This publication presents information on the number of cars and tonnes of revenue freight loaded, by Class I and 11 railways in Canada for 69 commodities. Tables for eastern and western Canada supplemented by a chart portraying the daily average freight loaded are also included.

Source of Data:

Survey of 19 railways operating in Canada

Attributes:

Geographic Coverage of Data: Canada, east/west breakdown

Time Span of Data Source: Current

First Developed: 1924

Update Frequency: Monthly

Sponsoring Organization:

Statistics Canada, Surface and Marine Transport, Rail Transport

Availability:

Statistics Canada

Publication Sales

Ottawa, Ontario, Canada KIA OT6

Telephone (800) 267-6677 (in the U. S. and Canada); Fax (613) 951-1584

Price, \$120/U.S. residents; \$100/Canadian residents; and \$140/other countries.

Contact for Additional Information:

Statistics Canada, Rail Transport

Telephone (613) 951-2518; Fax (613) 951-0579

RAILWAY OPERATING STATISTICS

Mode:

Rail

Abstract:

Information on seven railways, including operating, financial and traffic statistics such as freight car-kilometers, average kilometers of track operated, tonne-kilometers of revenue freight, nonrevenue freight, passenger car-kilometers, tonnage, number of revenue passengers, and total revenue is presented in the publication.

Source of Data:

Survey of seven selected railways operating in Canada

Attributes:

Geographic Coverage of Data: Seven selected Canadian railways

Time Span of Data Source: Current

First Developed: 1921

Update Frequency: Monthly

Sponsoring Organization:

Statistics Canada/Surface and Marine Transport, Rail Transport

Availability:

Statistics Canada

Publication Sales

Ottawa, Ontario, Canada K1A 0T6

Telephone (800) 267-6677 (in the U.S. and Canada), or (613) 951-7277

Fax (613) 951-1584

Contact for Additional Information:

Statistics Canada, Rail Transport

Telephone (613) 951-2518; Fax (613) 951-0579

REPORT OF RAILROAD EMPLOYMENT - CLASS I LINE-HAUL RAILROADS

Mode:

Rail

Abstract:

This database contains information on the monthly count of railroad employees in six categories and the monthly total. The percent of change from prior month and an annual index for the prior three years are also captured. (An annual compilation is also available.)

Source of Data:

Monthly Report of Number of Railroad Employees

Attributes:

Geographic Coverage of Data: U.S. Class I Line-Haul Railroads

Time Span of Data Source: Current month

First Developed: 1990

Update Frequency: Monthly

File Size: ~5,000

File Format: ASCII

Media: Diskette, Printed source

Sponsoring Organization:

Surface Transportation Board

Availability:

STB

Office of Economic & Environmental Analysis

Washington, DC 20423

Telephone (202) 927-6204

Contact for Additional Information:

STB

Office of Economic & Environmental Analysis

Telephone (202) 927-6396; Fax (202) 927-6225

STATE AND METROPOLITAN ANALYSIS FOR REGIONAL TRANSPORTATION (SMART)

Mode:

Highway, Rail

Abstract:

The SMART database is an electronic collection of materials such as reference documents, video clips, software packages, travel models, dissertations, surveys, and data sets generated by metropolitan planning organizations, state DOTs, and various federal agencies.

Source of Data:

Metropolitan Planning Organizations, state DOTs, and various federal agencies

Attributes:

Geographic Coverage of Data: U.S. totals, metropolitan areas, states

Time Span of Data Source: 1994

First Developed: 1994

Update Frequency: Continual

Number of Records: 200

File Size: 646MB

File Format: Various Formats

Media: CD-ROM

Sponsoring Organization:

Department of Transportation, Bureau of Transportation Statistics

Availability:

DOT/Bureau of Transportation Statistics

400 7th Street, SW, Room 3430

Washington, DC 20590

Telephone (202) 366-3282; Fax (202) 366-3640

Contact for Additional Information:

DOT/BTS, K-50

Telephone (202) 366-5081; Fax (202) 366-3640

TRANSPORTATION FILES (TRANS FILES)

Mode:

Rail

Abstract:

This database contains railroad annual report (STB Form R-1) data for all current Class I railroads. In addition to Form R-1 data, the TRANS files also contain data for the STB QCS and wage reports and Association of American Railroads reports CS-54, FCDP-95, and the ULMER file.

Source of Data:

Class I Railroads

Attributes:

Geographic Coverage of Data: U.S. Class I Railroads

Time Span of Data Source: 1978-present

First Developed: 1980

Update Frequency: Annual

Last Update: 1994

File Size: 100 MB

File Format: ASCII

Media: Diskette

Sponsoring Organization:

Surface Transportation Board

Availability:

STB

Office of Economic & Environmental Analysis

Washington, DC 20423

Telephone (202) 927-6204

Contact for Additional Information:

STB, Office of Economic & Environmental Analysis

Telephone (202) 927-6243; Fax (202) 927-6225

TSB ANNUAL STATISTICAL SUMMARY OF RAILWAY OCCURRENCES

Mode:

Rail

Abstract:

This publication presents a summary of the facts and figures pertaining to the accidents and incidents that are reported by railway companies under federal jurisdiction. Information includes a textual statistical overview, a presentation of analytical tables on the frequency, severity, location and cause of the reported occurrences, and appropriate explanations on concepts and terminology.

Source of Data:

Canadian railway companies under federal jurisdiction

Attributes:

Geographic Coverage of Data: Canadian railways under federal jurisdiction

Time Span of Data Source: Latest 10 years

First Developed: 1990

Update Frequency: Annual

Sponsoring Organization:

Transportation Safety Board of Canada (TSB)

Availability:

Transportation Safety Board of Canada

Public Affairs Office

Place du Centre, 200 Promenade du Portage

Hull, Quebec, Canada, KIA IK8

Contact for Additional Information:

TSB, Public Affairs Office

Telephone (819) 953-7812; Fax (819) 997-2239

UNIFORM RAILROAD COST SYSTEM (URCS) PHASE II PROGRAM AND APPLICATIONS

Mode:

Rail

Abstract:

The URCS Phase II program allows the user to develop unit costs for the U.S. Class I railroads. Copies of the URCS Phase II applications produced by the STB are also available for U.S. Class I railroads and two summary regions (east and west).

Source of Data:

Surface Transportation Board (STB)

Attributes:

Geographic Coverage of Data: U.S. Class I Railroads, two summary regions (east and west)
Time Span of Data Source: 1987-present
First Developed: 1980
Update Frequency: Annual
Last Update: 1994
File Size: 20MB
File Format: ASCII
Media: Diskette, Tape

Sponsoring Organization:

Surface Transportation Board

Availability:

STB
Office of Economic & Environmental Analysis
Washington, DC 20423
Telephone (202) 927-6204

Contact for Additional Information:

STB, Office of Economic & Environmental Analysis
Telephone (202) 927-6243; Fax (202) 927-6225

UNIFORM RAILROAD COST SYSTEM (URCS) PHASE III MOVEMENT COSTING PROGRAM AND ANNUAL UNIT COST DATA BASE

Mode:

Rail

Abstract:

The URCS Phase III program allows the user to develop movement cost estimates for U.S. Class I railroads. The URCS Phase III unit cost database contains railroad annual unit cost data for the current Class I railroads and two summary regions (east and west).

Source of Data:

Surface Transportation Board (STB)

Attributes:

Geographic Coverage of Data: U.S. Class I Railroads, two summary regions (east and west)
Time Span of Data Source: 1987-present
First Developed: 1980
Update Frequency: Annual
Last Update: 1994
File Size: IMB
File Format: ASCII
Media: Diskette

Sponsoring Organization:

Surface Transportation Board

Availability:

STB
Office of Economic & Environmental Analysis
Washington, DC 20423
Telephone (202) 927-6204

Contact for Additional Information:

STB
Office of Economic & Environmental Analysis
Telephone (202) 927-6243; Fax (202) 927-6225

UNITED NATIONS STATISTICAL YEARBOOK - RAIL

Mode:

Rail

Abstract:

This database illustrates freight and passenger traffic on all railway lines within each member country.

Source of Data:

All information collected by questionnaire

Attributes:

Geographic Coverage of Data: Worldwide

Time Span of Data Source: 1980-1991

First Developed: 1993

Update Frequency: Annual

Number of Records: 2,346

File Size: 79,990K

File Format: Dbase

Media: CD-ROM, Printed source

Sponsoring Organization:

United Nations, Statistical Division

Availability:

United Nations

Sales Section

2 United Nations Plaza

New York, NY 10017

Telephone (212) 963-8302

Contact for Additional Information:

United Nations, Statistical Division

Telephone (212) 963-4562; Fax (212) 963-3550

WEEKLY RAILROAD TRAFFIC

Mode:

Rail

Abstract:

This report contains carloads by commodity and railroad plus intermodal traffic by railroad. Carload data for 19 commodity groupings for each railroad, intermodal count by trailer and container. Shows traffic originated and received. Railroads in this report originated approximately 93 percent of all U.S. freight carloads, and 99 percent of intermodal units, during 1992.

Source of Data:

Association of American Railroads (AAR)

Attributes:

Geographic Coverage of Data: U.S. rail carloads

Time Span of Data Source: Current week, previous week, same week last year, & cumulative weeks this year and last year.

First Developed: 1989

Update Frequency: Weekly

Sponsoring Organization:

Association of American Railroads

Availability:

Association of American Railroads

Publication Order Processing

50 F Street, NW, 5th Floor COG

Washington, DC 20001

Telephone (202) 639-2211; Fax (202) 639-2156

Contact for Additional Information:

AAR, Economics & Finance Department

Telephone (202) 639-2309; Fax (202) 639-2499

U.S. GEOLOGICAL SURVEY DIGITAL LINE GRAPHS (DLGs)

Mode:

Air, Highway, Rail

Abstract:

General-purpose base cartographic data. Digital representations by points, lines and areas of planimetric information derived from 7.5- and 15-minute scale topographic maps.

Source of Data:

U.S. areas of product coverage for series are indicated in a National Index for 7.5- and 15--minute digital line graphs (DLGs).

Attributes:

Geographic Coverage of Data: United States

Time Span of Data Source: 1950s-present

First Developed: early 1980s; some earlier data

Update Frequency: As needed

Number of Records: Varies

File Size: Varies

File Format: SDTS or DLG; ASCII; available unlabeled or with ANSI-standard label Media:

CD-ROM, Cartridge tape, Magnetic tape, On-Line

Sponsoring Organization:

U.S. Geological Survey (USGS), Earth Science Information Center

Availability:

U.S. Geological Survey

Earth Science Information Center

507 National Center

Reston, VA 2209

Telephone (703) 648-5920, or (800) USA-MAPS; Fax (703) 648-5548

Contact for Additional Information:

U.S. Geological Survey, ESIC

Telephone (800) USA-MAPS; Fax (703) 648-5548

APPENDIX D: TEXAS ABANDONMENT HISTORY

Rail Lines Approved for Abandonment - 1981 - 1993

RR	End Points	Miles	Counties	Date
1981				
QA&P	Paducah-Floydada	67.2	Cottle, Motley, Floyd	2/81
SP	Old Bayshore line (partial)	.99	Harris	1/81
SP	Seagoville-Bonita Jct.	137.0	Dallas, Rusk, Kaufman, Henderson, Cherokee, Nacogdoches	/81
ATSF	Pampa-Okla. Border	56.62	Wheeler, Gray, Hemphill	4/81
MP	Hawdon-Herbert	12.1	Fort Bend	12/81
SP	Oasis-Soumethun	.66	Dallas	8/81
Subtotal 1981		274.57		
1982				
MP	Mission-Hidalgo Industrial	3.1	Hidalgo	N/A
ATSF	San Angelo-Maryneal	53.4	Nolan, Coke, Tom Green	N/A
CRIP	Glenrio-Bushland	100.0	Oldham, Potter, Randall	N/A
CRIP	Texola-Yarnall	91.0	Carson, Gray, Donnelly, Wheeler	N/A
CRIP	Etter-Wilco Spur	17.0	Moore, Hartley	N/A
Subtotal 1982		264.5		
1983				
ATSF	White Deer-Skellytown	10.4	Carson	3/83
SP	Rush-Keltys	43.13	Cherokee, Angelina	3/83
ATSF	Whiteface-Bledsoe	24.2	Cochran	12/83
SP	Briggs (Dallas Co.)	2.8	Dallas	6/83
SP	Gregory-Portland	3.9	San Patricio	10/83
SP	Alice-Falfurrias	39.3	Jim Wells, Brooks	3/83
UP	Houston (Magnolia Belt)	2.0	Harris	/83
Subtotal 1983		125.73		
1984				
RS&P	Roscoe-Snyder	27.4	Nolan, Mitchell, Scurry	4/84
MP	Swan-Thedford	3.2	Smith	9/84
ATSF	Stowell-White's Ranch	12.0	Chambers	6/84
Subtotal 1984		42.6		

RR	End Points	Miles	Counties	Date
1985				
SP	Kosmos-Rockport	7.55	Aransas	11/85
SP	Bay City-Palacious	31.12	Matagorda	11/85
MP	Sugarland Pryor	.95	Fort Bend	1/85
Subtotal 1985		39.62		
1986				
UP	La Pryor-Blewett	22.0	Zavala, Uvlade	6/86
SP	Gay Junction-Guy	15.77	Fort Bend	12/86
UP	Houston (Texas Med. Ctr-IH45)	2.5	Harris	11/86
Subtotal 1986		40.27		
1987				
SP	New Gulf-Bay City	23.511	Matagorda, Wharton	6/87
UP	Hawdon-Rosharon	7.5	Fort Bend, Brazoria	4/87
BN	Acme-Paducah	37.4	Cottle, Hardeman	9/87
SP	Bellaire Branch	1.697	Harris	9/87
TNW	Morse-Hardesty	45.0	Hansford	/87
TNW	Pringle-Stinnett	11.0	Huthcinson	/87
Subtotal 1987		126.11		
1988				
MP	Abilene-Winters	31.2	Taylor, Runnels	7/88
MP	Crystal City-La Pryor	17.1	Zavala	10/88
MP-MKT	Hunter-Ogden	16.7	Comal	6/88
MP-MKT	Denison-Bells	14.8	Grayson	6/88
SLSW	Gresham-Jacksonville	23.6	Smith, Cherokee	12/88
SLSW	Corsicana-Waco	52.87	Navaro, Hill, Limestone, McLennan	6/88
Subtotal 1988		142.47		
1989				
SLSW	Atco-McGregor-Lime City	16.18	Coryell, McLennan	8/89
MP	Huntsville	.36	Walker	1/89
ANRR	Clawson-Keltys	4.0	Angelina	4/89
SP	Elam-Seagoville	7.06	Dallas	9/89
Subtotal 1989		27.6		

RR	End Points	Miles	Counties	Date
1990				
MP	Nena-Italy	10.5	Ellis	6/90
KCT	Newgulf-Smithers Lake	22.0	Wharton, Ft. Bend	8/90
KCT	Raynor Jct.-Garwood	8.5	Colorado	8/90
KCT	Wadsworth-Matagorda	8.5	Matagorda	8/90
Crosbyton RR	Lubbock-Crosbyton	36.14	Lubbock, Crosby	8/90
ATSF	Orla-Pecos	40.1	Reeves	9/90
SWRR	Spearman-Morse	17.86	Hansford, Orchiltee, Lipscomb	12/90
Subtotal 1990		143.6		
1991				
KCT	Sealy-Wharton	47.99	Wharton, Austin, Colorado	2/91
SP	Rusk-Jacksonville	14.44	Cherokee	3/91
BN	Estelline-Plainview	82.95	Hall, Brisco, Floyd, Hale	8/91
SP	Houston Heights Lead	2.80	Harris	6/91
Subtotal 1991		148.18		
1992				
BN	Childress-Wellington	30.81	Collingsworth, Childress	3/92
MP	Sherman-Whitesboro	18.11	Grayson	4/92
MP	Denton-Coors	7.97	Denton	4/92
MP	Italy-Hillsboro	18.23	Ellis, Hill	1992
BN	Lubbock-Sterley	44.98	Floyd, Hale, Lubbock	5/92
Subtotal 1992		120.10		
1993				
MKT/UP	Downtown Dallas-Highland Park	3.0	Dallas	1/93
MP/UP	Everman Branch (near Everman)	1.62	Tarrant	3/93
MP/UP	A & S Branch (near Abilene)	3.0	Taylor	3/93
MP	Near Deny	3.00	Dallas	12/93
SP	Kenedy-Beeville	29.00	Karnes, Bee	11/93
FPRR	Floydada-Plainview	22.4	Hale, Floyd	1/93
SP	Houston-Eagle Lake Jct. (bought by Houston Metro)	57.74	Harris, Fort Bend, Austin, Wharton, Colorado	2/93
SP	Houston-Katy (bought by Texas DOT)	27.92	Harris	/93
SP	Wharton-Victoria	62.00	Jackson, Wharton, Victoria	11/93
Subtotal 1993		209.68		

RR	End Points	Miles	Counties	Date
1994				
MP	Near Swan	0.70	Smith	8/94
SP	Hillister-Loeb	36.72	Tyler, Harden, Jefferson	1994
SP	Hillister-Dolan	32.05	Tyler, Jasper, Angelina	7/94
SP	Rockland Branch (near Dolan)	23.22	???	11/94
SP	Near Kenedy	46.70	Karnes	5/94
SP	Beeville-Sinton	29.00	Bee, San Patricio	8/94
ANRR	Near Dunagan	4.00	Angelina	10/94
Subtotal 1994		172.39		
1995				
SP	McHattie-Wharton	23.30	Fort Bend, Wharton	3/95
SLSW	Simtrott-Wylie	23.20	Collin, Hunt	6/95
SLSW	Lufkin Jct-Branchline	3.54	Smith	12/95
TXOK	TX/OK border-near Sweetwater	156.19	Wilbarger, Hardeman, Foard, Knox, Haskell, Stonewall, Jones, Fisher	9/95
MW	Weatherford-Mineral Wells	21.21	Parker, Palo Pinto	10/95
AUNW	Smoot-Giddings	53.50	Travis, Bastrop, Lee	3/95
DART	Dallas	0.74	Dallas	7/95
CHRC	Paris-Famersville	56.50	Lamar, Delta, Fannin, Hunt, Collin	3/95
Subtotal 1995		338.18		
1996				
MP	New Boston-Clarksville	38.50	Red River, Bowie	12/96
SP	Seabrook-San Leon Line	10.50	Harris, Galveston	8/96
TNER	New Boston-Clarksville	38.50	Red River, Bowie	12/96
Southeastern Int.	Fannett-Stonewall	13.57	Jefferson, Chambers	6/96
Subtotal 1996				
1997				
LHRR	Burnet	0.25	Burnet	4/97
SPLR	Slaton-Lamesa	49.06	Lynn, Dawson	1/97
DART	Tension Park-Plano Pkwy	15.45	Dallas, Collin	5/97
DART	Near Dallas	6.99	Dallas	12/97
Subtotal 1997		71.75		

RR	End Points	Miles	Counties	Date
1998				
Track Tech, Inc.	Amarillo-Bushland	13.90	Potter	2/98
Track Tech, Inc.	Near Lubbock	6.25	Lubbock	2/98
SORR	Mertzon Station-near Presidio (discontinuance of service)	307.00	Brewster, Crane, Crockett, Irion, Pecos, Presidio, Reagan, Tom Green, Upton	10/98
Subtotal 1998		327.15		
1999				
UP	San Antonio	2.16	Bexar	2/99
UP	Near Arcola	3.17	Fort Bend	2/99
Subtotal 1999		5.33		
Pending Abandonment Cases (as of May 1999)				
UP	Brownsville	5.08	Cameron	
Southeastern Int.	Wharton-Lane City	13.76	Wharton	
RVRI	San Benito-Rio Hondo	8.80	Cameron	
Subtotal Pending		27.64		
			Total Miles	2,720.90

**APPENDIX E: LOAN AGREEMENT TO SUPPORT
CONTINUATION OF SERVICE OF THE TEXAS EAGLE**

Loan Agreement to Support Continuation of the Texas Eagle

THIS LOAN AGREEMENT is made between the National Railroad Passenger Corporation, a District of Columbia Corporation with headquarters at 60 Massachusetts Avenue, N.E., Washington, D.C. (hereinafter "Amtrak") and the Texas Department of Transportation, an agency of the State of Texas with offices at 125 E. 11th Street, Austin, Texas (hereinafter "TxDOT"). This loan agreement shall be effective upon execution by authorized representatives of both parties.

WHEREAS, Amtrak currently operates the "Texas Eagle," an intercity rail passenger train between Chicago, Illinois and San Antonio, Texas, via Missouri and Arkansas; and

WHEREAS, Amtrak by letter dated January 24, 1997, notified the Governor of the State of Texas that Amtrak would discontinue the operation of the Texas Eagle, effective May 10, 1997, if necessary financial resources are not provided to Amtrak to continue the service; and

WHEREAS, TxDOT, acting pursuant to enabling legislation in accordance with Texas law, is able to make resources available to support the continuation of the Texas Eagle through September 30, 1997, in accordance with the terms and conditions stated herein;

NOW, THEREFORE, Amtrak and TxDOT agree as follows:

1. Within three (3) business days of the effective date of this agreement, TxDOT shall cause the principal amount of \$5,600,000 to be paid as a loan to Amtrak by wire transfer to an account to be specified by Amtrak. Amtrak agrees to repay the \$5,600,000, plus interest accrued through the date of payment, to TxDOT or other agency of the State of Texas, as designated in writing by TxDOT, on or before July 31, 1999. Interest will accrue monthly on all sums owed under this agreement at the rate of interest earned by the State of Texas on funds invested during that month under Section 404.024 (b), Texas Government Code, as reflected by the records of the Texas Comptroller of Public Accounts' Treasury Operations Division.
2. Amtrak shall execute a Security Agreement, as approved by TxDOT, providing liens and security interests in forty-seven (47) Amtrak passenger cars, as listed on the attachment hereto (together with all proceeds thereof, herein collectively called the "Collateral"), to secure the repayment of principal and interest to TxDOT, as required hereunder. Such agreement shall be filed with the Surface Transportation Board for recordation under 49 U.S.C. Section 11301.

By executing this agreement, Amtrak hereby certifies its ownership of the passenger cars listed on this attachment hereto and that any encumbrance on such cars is subordinate to that granted to TxDOT herein.

Amtrak shall perform all necessary routine and preventative maintenance to ensure the Collateral is maintained at or better than current condition, reasonable wear and tear excepted. While securing this loan, the Collateral shall be kept and/or used in the operating territory in which Amtrak may lawfully conduct rail passenger service pursuant to 49 U.S.C. Section 24101 et. seq. Amtrak will

procure and maintain its normal property insurance with respect to the Collateral, naming TxDOT as an additional insured. Any insurance shall be payable to Amtrak and TxDOT as their interests may appear. In addition, Amtrak shall provide TxDOT with proof of such insurance. In the event that any of the Collateral is substantially damaged or destroyed, Amtrak shall substitute alternate assets (of equal or greater value, less any insurance received by TxDOT as a result of such damage or destruction) for such damaged or destroyed Collateral, which assets shall thereupon become part of the Collateral. The value of the substitute assets shall be determined by an independent appraiser, mutually agreeable to the two parties, commissioned by and at the expense of Amtrak. Should substitution of Collateral become necessary, Amtrak and TxDOT shall execute a revised security agreement. Upon execution, the revised Security Agreement shall be recorded with the Surface Transportation Board pursuant to 49 U.S.C. Section 11301. From time to time at TxDOT's request Amtrak will inform TxDOT of the location, utilization and condition of each collateralized passenger car.

3. Beginning on or about May 10, 1997, through September 30, 1997, Amtrak shall continue the operation of the Texas Eagle, as specified in paragraph 4 below, between San Antonio, Texas, and Chicago, Illinois.

4. From June 6, 1997, through September 30, 1997, the Texas Eagle will operate on no less than a tri-weekly schedule with a train consist of at least seven (7) passenger cars, including three (3) coaches, two (2) sleeping cars, one (1) dining car, and one (1) lounge car. A baggage car will also be included for passengers' checked baggage. Prior to June 6, 1997, a reduced train consist, to be determined based on service demand, shall be acceptable. The Texas Eagle shall continue to serve Missouri and Arkansas stops and all Texas cities now served as of the date hereof between Texarkana and San Antonio, Texas, with maintenance and staffing of stations also as of the date hereof. Pursuant to its contracts with the railroads which own the rail lines and stations required for the operation of the Texas Eagle, Amtrak shall use its best efforts to continue existing train operating speeds and access to and maintenance of all track, stations, platforms, and crossings now used in conjunction with the operation of the Texas Eagle. Amtrak shall continue the operation of Thruway bus service connecting with the Texas Eagle to serve Houston, Texas and other points within the state as business conditions warrant, and may use the loan proceeds for such purposes.

5. Beginning on July 15, 1997, and continuing on the 15th of each subsequent month, with the final report due on November 15, 1997, Amtrak shall provide to TxDOT a detailed accounting of Texas Eagle operating costs and revenues.

TxDOT or any of its authorized representatives, shall have the right of access to any books, documents, papers or other records of Amtrak which are pertinent to this Loan Agreement, in order to make audits, examination, excerpts and transcripts.

6. Notwithstanding the foregoing, Amtrak reserves the following rights and powers in connection with the operation of the Texas Eagle: to operate the number of mail, baggage, and express cars in the consist as Amtrak shall determine; to increase the frequency of operation above tri-weekly, and in the event of such increase to reduce the consist of the train to two (2) coaches, one (1) sleeping

car and one (1) food service car; and to exercise all powers conferred under Federal law to provide for the discontinuance of the Texas Eagle if necessary effective October 1, 1997, or as soon thereafter as Amtrak shall determine. Amtrak shall notify TxDOT reasonably in advance of exercise of rights reserved to increase the frequency of train operation above tri-weekly.

7. Amtrak's operation of the Texas Eagle hereunder shall be subject to suspension as a result of force majeure, which shall include, without limitation, strikes, civil disturbances, orders of civil authority, blockages of the required rail lines or shortages of equipment as a result of accidents and other causes, fire, storm, flood, earthquake, and other acts of God, whether similar or dissimilar to the foregoing. Amtrak shall use its best efforts to provide service on an alternate route or alternate service to minimize inconvenience to passengers.

8. Amtrak will continue to assess possible ways, if any, to continue operation of the Texas Eagle after September 30, 1997, and shall, beginning on July 15, 1997 and continuing on the 15th of each subsequent month, with the final report due on November 15, 1997, inform TxDOT of the results of such assessments.

Further, Amtrak will initiate a marketing campaign to facilitate and maximize Texas Eagle ridership and profitability.

9. Subject to the provisions of this paragraph, TxDOT may declare all amounts owing hereunder, including principal and interest, due and payable before maturity if any of the following circumstances should occur:

(a) Amtrak shall permanently cease operation of the Texas Eagle before October 1, 1997;

(b) all or substantially all of the equity interests in Amtrak are acquired by one or more parties outside of the Federal Government under circumstances involving the cessation of Federal Government support for Amtrak; or

(c) any proceedings shall be commenced by or against Amtrak for any relief under any bankruptcy or insolvency law, or law relating to the relief of debtors, readjustments or indebtedness, reorganization, arrangements, compositions or extensions, and such proceedings shall not have been dismissed, nullified, stayed, or otherwise rendered ineffective.

TxDOT shall give Amtrak written notice that TxDOT is exercising its rights under this paragraph on the basis that one or more of the circumstances set forth in clauses (a), (b) or (c) above has occurred, and if such circumstances continue for thirty (30) days from the date of receipt of such notice, Amtrak shall immediately make full payment of all amounts due in accordance with the terms hereof. Should Amtrak initiate an action under clause (c) above, this notice requirement shall not apply. In such an event, the debt shall be automatically and immediately payable in full, including accrued interest, and TxDOT shall seek recourse against the Collateral for any unpaid amount.

Amtrak hereby expressly waives all notices, except as provided herein, protests and notices of protest, as to any exercise by TxDOT of its rights under this paragraph.

10. Amtrak reserves the right to prepay the principal amount due hereunder in whole or in part, with accrued interest on the amount prepaid on any business day prior to the date due hereunder.

11. Upon receipt of payment in full, TxDOT shall execute and deliver to Amtrak written acknowledgment that the obligation has been satisfied and a release canceling TxDOT's liens and security interests in the Collateral and other such documents as Amtrak may reasonably request.

12. Should Amtrak default on this loan, title to the secured passenger cars shall immediately be transferred to the State of Texas and the secured passenger cars shall immediately be moved to Amtrak's Beech Grove, Indiana, yard or to such other location mutually agreed to by the two parties, where such cars shall be stored and secured for a period not to exceed 180 days from transfer of title at no expense to the State of Texas, pending removal or liquidation by TxDOT. If liquidation is not complete within 180 days of transfer of title, any remaining cars may be kept within the Amtrak facility until removed or liquidated by TxDOT with Amtrak entitled to reasonable compensation for storage and security of such cars.

Should Amtrak default on this loan and the sale of the forty-seven (47) secured passenger cars does not generate sufficient revenue to retire the debt in full, TxDOT reserves the right to seek from Amtrak compensation for the deficient amount (including amounts paid by the municipalities guaranteeing the debt). TxDOT may seek recovery of an amount equal to the amount paid collectively by TxDOT and the municipalities plus TxDOT's legal and administrative expenses (including expenses associated with liquidation of the Collateral, but not costs of storing and securing the Collateral more than 180 days after transfer of title to the State of Texas).

13. Neither TxDOT or Amtrak may assign its rights or delegate performance of its obligations hereunder without the prior written consent of the other party hereto.

14. This agreement constitutes the sole and only agreement between the two parties. This agreement may be amended by mutual consent of the two parties. Except for this agreement, TxDOT shall not be a party to any contract or commitment which Amtrak may enter into or assume in the course of providing the passenger rail service described herein.

15. Any notices hereunder shall be in writing, shall be effective upon receipt, and shall be delivered in hand or deposited as first-class matter in the United States mail addressed as follows:

Mr. Thomas Griebel
Assistant Executive Director
Multimodal Transportation
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701

Ms. Deborah Hare
Senior Director
Government and Public Affairs
Amtrak Intercity
210 South Canal Street
Chicago, IL 60606

or at such other address as either party may in writing prescribe.

16. In the event of a dispute over the terms of this Agreement, or rights and interests of the parties therein, venue shall be in Travis County, Texas.

This agreement was signed on June 3, 1997 by both parties:

NRPC
By: Alfred S. Altschul
CFO

TxDOT
By: Thomas A. Griebel
Assistant Executive Director
Multimodal Transportation

APPENDIX F: TRANSDEC APPLICATION (FAST REPORT)

**A CASE STUDY
on the
APPLICATION OF *TransDec*
in Washington State**

Prepared for the:

Texas Department of Transportation

Multimodal Operations

Prepared by the

**Texas Transportation Institute
Texas A&M University System
College Station, Texas 77843-3135**

August 1998

THE FAST PROJECT

Executive Summary

Background

Highway-rail intersections (HRIs) represent the only locations in the transportation system where two different modes cross at grade. This fact creates a unique set of problems for users of the transportation system as well as for those attempting to design, manage, or optimize the system. Two of these problems, mobility and safety, were of particular interest to the Freight Action Strategy Task Force (FAST) Corridor project; a project aimed at the freight mobility issues confronting the Everett to Tacoma Freight Corridor in Washington State.

Historically, railroads hold the right-of-way at HRIs. In almost every circumstance, highway traffic must yield to trains and is provided either passive warning (e.g., signs) or active warning (e.g., flashing lights and gates) to direct their movement safely through the crossing. As train traffic and train length increases, the delay incurred by highway traffic and HRIs increases as well. In those situations where highway traffic is also heavy, as in the Everett to Tacoma Freight Corridor, the contention and impedance at HRIs become extreme and both mobility and safety suffer a substantial decrement. Reducing impedance under these conditions is difficult due to the expense of physically separating a highway facility from a rail line. Referred to as grade separation structures, these projects either take the form of an overpass or underpass. They are considered by many as the only absolute remedy to the problem of contention at HRIs. Grade separation structures may cost from several million dollars to numbers much larger depending on the size or complexity of the construction challenge.

Study Purpose

The purpose of the FAST Corridor project was to assist in selecting highway-rail grade separation projects to improve freight mobility in the Everett to Tacoma Freight Corridor. The corridor is characterized by a geography bounded on the west by Puget Sound and bounded on the east by the Cascade Mountains. The resulting north-south orientation of communities, industries, highway

transportation facilities, and railways, squeezed between these geographic barriers, has created an area of considerable congestion with limited cross-corridor mobility.

The project impetus, founded on this reality of a very constrained space within which to live and work, was the recognition that delay at rail-highway intersections was growing to unacceptable levels. As a result, the principal focus of the effort was to develop and apply an evaluation methodology which would support a broad strategic approach to overall freight mobility in the corridor. The final product of the effort was a list of 20 projects that could be implemented within the next six years to improve mobility of vehicles in the Puget Sound region.

Participants

The project was sponsored by the Puget Sound Regional Council (PSRC) and the Washington State Department of Transportation's Office of Urban Mobility. Stakeholders who actively participated in the process included the following:

Ports

- Port of Seattle
- Port of Tacoma

Communities

- Everett
- Seattle
- Kent
- Algona
- Sumner
- Tacoma
- Edmonds
- Tukwila
- Auburn
- Pacific
- Puyallup

Agencies

- Regional Transit Authority
- Washington State Department of Transportation Rail Branch
- Washington State Utilities and Transportation Commission
- Washington State Department of Transportation, Office of Urban Mobility

Railroads (Observing/Non-Voting)

- Burlington Northern Santa Fe
- Union Pacific Railroad

Current Situation

Rail traffic in the Everett to Tacoma is expected to increase dramatically in the next ten years.

- The Ports are expected to handle increasing volumes of container traffic. The volume of containers handled by rail is expected to double between now and 2015.
- Amtrak, in cooperation with the Washington State Department of Transportation is working to increase service to as many as 17 trains per day between Seattle and Portland, and 12 between Seattle and Vancouver, BC by the year 2020.
- The Regional Transit Authority will implement a peak-hours service of 19 trains per day starting in the year 2000.

This growth in traffic will have far-reaching effects. It means that in addition to the through train movements detailed above, there will also be additional switching movements to support the building of freight trains and passenger trains. High conflict locations on the corridor could see between 75 and 133 train movements per day. The current range of train counts for these locations is 30 to 85 trains per day.

The potential impact of this at-grade conflict is far-reaching. Additional rail traffic has the potential to impede local mobility by occupying at-grade crossings in downtown areas for extended periods of time, hampering downtown access and the ability of emergency vehicles to respond to fires and accidents. On a regional level, these delays have the potential to impact access by trucks and workers to major industrial facilities as well as the ability of trucks and drays to make use of port facilities.

Project Achievements

Texas Transportation Institute (TTI) assisted WSDOT, PSRC, and the constituency in establishing a regional strategic approach to freight mobility. TTI then worked with the sponsor to develop evaluation criteria which were consistent with the strategic approach and designed to identify high-priority grade separation projects. As a final product, the sponsor provided a list of key crossings to the Washington State Legislature which were recommended for immediate funding consideration. Products of the effort may be summarized as follows:

- A strategic vision program to reduce highway-rail conflict in the corridor,
- A comprehensive database of rail activity and train movements in the Everett to Tacoma rail Corridor,
- A Set of Objectives and Evaluation Criteria developed and agreed upon by the stakeholders,
- A completed evaluation of all the major crossings in the corridor using stakeholder-developed measures,
- A list of 11 crossings ready to construct and fund within two years, and
- A list of nine crossings that can be engineered, funded and constructed within six years.

Evaluation Measures

The stakeholder group agreed on five major evaluation goals and the associated criteria described below:

1. *Improve General Mobility* - measured the proposed grade separation's ability to reduce vehicle delay, reduce vehicle queuing at HRI's, and serve as a major cross-corridor arterial or regionally significant route.
2. *Increase Freight Mobility* - measured the amount of truck traffic and the project's ability to provide operational benefits for rail traffic.
3. *Maintain Safety* - reviewed the number of FRA-reported accidents at the intersection and evaluated the ability of the project to preserve or improve emergency vehicle access.
4. *Enhance Communities and the Environment* - recorded community-supplied values for political support, residential displacement, business displacement and strategic economic value. Vehicle emissions reduction was determined using an index based on whether or not the crossing was located in an EPA-defined non-attainment area.
5. *Maximize Cost-Effectiveness* - a calculated ratio between the capital cost and the potential of the project to reduce vehicle delay.

Results and Benefits

The groups of crossings agreed upon by the stakeholders deliver numerous mobility benefits to the region. Among the benefits of implementing the top 20 crossings:

- Improved Port Circulation and Yard Operations at the Ports of Seattle and Tacoma,
- Cross-Corridor mobility protected by providing grade-separated crossings at intervals of less than three miles in the Kent Valley,
- Grade Separation of new regional highway links in Sumner, Puyallup and Pierce County, and
- Anticipation of traffic growth and development in downtown Seattle and downtown Tacoma.

The preliminary estimate for the total cost of the grade separation program is estimated at \$389 million. The projects ready for funding and construction in two years total \$253 million. The projects ready for funding and construction within six years total \$136 million.

I. PROJECT DETAIL

In September, 1996 the Freight Action Strategy Task Force (FAST) convened the first of several meetings intended to lay the groundwork for a regional consensus on a package of grade separation improvements to help enhance mobility in the Everett to Tacoma rail corridor. Represented were project sponsors from the Puget Sound Regional Council, and the Washington State Department of Transportation Office of Urban Mobility, representatives of the Ports of Seattle and Tacoma, representatives from the communities along the rail corridor, Burlington Northern Santa Fe Railroad, Union Pacific Railroad, and several concerned government entities and citizen groups.

All of the parties at the table expressed concerns related to the accelerating pace of rail traffic in the region. For Burlington Northern Santa Fe (BNSF), the dominant rail carrier in the region, the growth represents a significant contrast to the state of the railroad industry over the past 20 to 30 years. Increased business has forced the railroad to plan capacity expansions and to learn to work with communities that have become accustomed to diminishing rather than increasing rail traffic levels. The most obvious recent example of this conflict can be seen in the dialogue between the City of Auburn and BNSF over the reopening of Stampede Pass.

For the Ports, the issue is one of competitiveness, particularly for intermodal traffic. Aggressive investment in Los Angeles on the Alameda Corridor could potentially shift some of the volume of container traffic away from the Ports of Seattle and Tacoma. The specific concern for the ports is that BNSF, which already possesses an excellent high density route between Seattle and Chicago, might work with shippers to divert more of that traffic to the Los Angeles gateway. If Seattle and Tacoma are unable to handle the additional container traffic effectively, it is possible that BNSF will determine that investments in physical plant in the Pacific Northwest are not worthwhile.

Communities face a range of concerns. Those who have railroad yard facilities within their borders face increasing delays at intersections where trains engaged in switching activities cause vehicle

delays. An additional concern is that the increasing train volumes create the potential for problems with emergency vehicle access and undesirable disruptions to local traffic circulation. In Seattle, Tacoma, and Kent impeded traffic often includes a high percentage of trucks, so the impacts go beyond merely interrupting traffic to interfering with the movement of time-sensitive freight shipments.

Sources of Traffic Growth

The mix of rail traffic in the Everett to Tacoma corridor is at the edge of a massive transformation. The current traffic mix is composed primarily of freight trains operating at fairly low speeds. Freight trains rarely exceed 50 miles per hour and Amtrak only operates six to eight trains per day out of Seattle. A significant amount of switching is carried out on the mainlines and a busy section of track might see an average of 40 trains per day. The region has already seen an increase in intermodal traffic this traffic is expected to continue in its growth. In addition, passenger train traffic will increase dramatically with as many as 19 new RTA commuter trains and 17 additional Amtrak passenger trains being added to the mix by the year 2020.

Community Access and Safety Concerns

Numerous communities ranging from cities with millions of residents to towns with just a few thousand residents participated in the FAST project. The following sections describe concerns articulated by a few of the communities to provide the reader with a sense for the sorts of issues raised by the stakeholders along the corridor.

Seattle Issues

The City of Seattle is home to heavy rail and vehicle traffic. The crossings of interest in the study area include a group of crossings south of the Kingdome in an area that handles Port-related truck traffic, Metro buses, local truck traffic, and vehicle traffic utilizing the Washington State ferries. Peaking is experienced during morning and evening rush hours and in conjunction with sporting events at the Kingdome. Royal Brougham Way, Holgate Street and Lander Street are included in this group of crossings.

Additional crossings of interest are found along the Seattle waterfront north of the central business district. These crossings have less truck and ferry traffic, but they are significant because they provide port access and because they will provide access for future developments that will lead to increased traffic. Broad Street and Galer Street are included in this group of crossings.

In addition to its massive size compared with the other communities along the line, Seattle also is home to some fairly complex rail operations. A large amount of switching is carried out in and around the numerous yards in the city. There are coach transfers between the passenger yard and the King Street station, cuts of cars being positioned on yard leads around the Port of Seattle, and grain trains braking to enter the Pier 86 grain terminal. Many of the turnouts in these facilities are hand-thrown, so trains frequently must stop while occupying intersections to operate the switches, set out cars or perform airbrake tests.

The intensity of this activity already creates noticeable delay at intersections like Royal Brougham Way. The city estimates that current train traffic closes the intersection for more than two hours per day. Under future scenarios, this closure time could exceed five or more hours per day.

In addition to delay problems, there are also safety concerns in the city. Emergency vehicle access is a concern, and excessive delays create the possibility of interference with a response to an emergency. There are also a large number of yard tracks without grade crossing warning devices, and accidents on some of these tracks is a concern, particularly those in the area south of the King Dome. In addition, there are significant problems with pedestrians crawling or climbing around railroad equipment when it is stopped along the waterfront or near the Kingdome. Occasionally these trespassers are injured or killed when the trains move unexpectedly.

Kent Valley Issues

The segment of the corridor which extends between Seattle and Sumner, also known as the Kent Valley has some similarities with Seattle, but many differences. Development is more recent and more sprawled. Rail traffic tends to move more rapidly through this segment of the corridor, but

there are still industries served by switching moves and locations where operational considerations require trains to move slowly. An example of this is the ten miles per hour wye track providing access to the newly opened Stampede Pass line in Auburn.

In Kent, stakeholders expressed concern about the ability to maintain truck access to the large warehousing and distribution center located north of town. Common concerns among these communities include:

- Preserving mobility across the corridor so residents can get from their homes to their jobs and back without being delayed excessively,
- Protecting access to downtown and to new commercial developments,
- Preserving access for fire and emergency vehicles on both sides of the tracks, and
- Ensuring the grade separation of any future arterials on the mainline.

Railroad Issues

The two major railroads serving the area both were represented in the process. Both are faced with concerns relating to competitiveness and traffic growth.

Competition

Early in the process, a number of stakeholders raised the question of whether or not it would be possible to consolidate different traffic types on one rail alignment or the other to better focus investments in grade separation. For example, one theory involved passenger trains operating on the Union Pacific alignment and all others on the BNSF alignment. The subject has also been explored in attempting to solve some mainline access problems at the Port of Tacoma.

Throughout the process, both railroads made it clear that each pursues an independent business strategy. Under current conditions, Union Pacific Railroad is a tenant to BNSF because it operates on BNSF tracks from Tacoma to Portland, Oregon. In addition, UP must cross BNSF at Black River and at Argo. The result of this arrangement is that UP is largely subject to operating decisions made by BNSF personnel. As a competitor interested in maximizing its share of the Seattle container

market (at Union Pacific's expense) BNSF has no incentive to grant any concession to Union Pacific, particularly its share of the Seattle container market.

Union Pacific, as a matter of principle, represents itself as disinterested in direct public investment in its rail infrastructure. This is largely because such an investment could result in a loss of control of the infrastructure by Union Pacific. Union Pacific has indicated that if it does choose to invest in the Seattle market it will do so on its own, using its own resources.

Highway-Rail Intersection Investment Value

Grade separations do not possess the operational benefit necessary for a railroad to consider them a worthwhile investment relative to the cost. They are nearly impossible to justify on a loss-avoidance basis and there are no legal standards compelling a railroad to grade separate. In fact, the legal standard for grade crossings is that railroad equipment always has the right-of-way. Trains are generally not required or physically able to stop for vehicles or obstructions occupying grade crossings.

Because of the existence of this standard and the questionable value of a grade separation as an investment on operational grounds, public agencies by necessity bear a significant responsibility in the evaluation and implementation of grade separation projects.

II. STRATEGIC APPROACH

A significant goal of the FAST project was to gain the involvement and perspective of officials representing the constituencies concerned with future development of the Everett to Tacoma Rail Corridor. There was a recognition from the beginning of the process that the study and the meetings would not have been as useful if it were not possible for the group as a whole to recommend an implementable set of projects. The following sections describe the fundamental issues that shaped the formation of the FAST criteria and the consensus achieved at the end of the process.

The Need to Balance Port and Community Concerns

The most significant undercurrent in the FAST deliberations was the fundamentally conflicting interests of the ports and the communities along the corridor. When meetings began in September 1996, the project appeared to be oriented strictly toward regional freight mobility and improving the competitiveness of the Ports. From the communities' perspective, the downside to busy Ports is heavier rail traffic. The communities along the line made it clear that they found the additional train traffic undesirable. If the FAST group was to achieve consensus, it would have to recommend a package of improvements that would ensure that both Port and Community concerns were addressed to the satisfaction of the stakeholders.

Initial Strategy and Criteria

By November 1996, the group had found some ground for agreement which proved to be the beginning of the corridor strategy adopted by the group. The group moved away from the concept of a fully grade-separated corridor along the lines of the interstate highway model. At a cost of more than \$1 billion, it appeared unlikely that adequate funding could be marshaled to carry out a plan of that scale. In addition, full grade separation would have been of little benefit to communities like Puyallup and Sumner because public officials would not have been able to support a plan that entailed demolition of a number of historically significant homes and businesses within their downtowns.

Mainline Benefits

The freight mobility issues within the Everett to Tacoma Freight Corridor are significantly tied to the operational characteristics of the railroads. Their movement, largely unimpeded by concerns of highway traffic, is determined by the capacity of their respective physical plant or infrastructure. The number and placement of passing sidings, the quantity of double track facilities, the capacity and location of yards and intermodal facilities, and the traffic levels are major determinants of rail operations. Absent among these factors is the distinction between at-grade crossings and fully grade separated crossings. While there are some benefits to railroads, particularly as it pertains to the reduction of accident potential at HRI's, the operational benefits are restricted to slight speed changes and the improved ability to use mainlines as holding positions for trains when yard capacity is limited. This recognition leads planning for freight mobility away from concerns about mainline benefits to a focus on cross-corridor mobility for highway vehicles.

Further, because of the independent business strategies pursued by Union Pacific and Burlington Northern Santa Fe, it was also clear that some form of consolidation of traffic between the two alignments was not feasible. In light of this reality, it was necessary for the group to devise a strategy and sets of objectives and specific measurement criteria that involved grade separations on both the Union Pacific and Burlington Northern Santa Fe alignments.

The principles that TTI used in developing the initial set of criteria included the following:

- Maximize benefit by identifying high-impedance intersections,
- Assure mobility across the corridor at regular intervals and at yard locations,
- Maintain the vitality of communities along the line, and
- Improve the functioning of the ports.

Based on these fundamental principles and technical advice provided at previous meetings, TTI proposed the following major project objectives and supporting criteria measures for each crossing to the group in December 1996.

Improve Mobility (measured by)

- Potential Delay (% impedance * ADT)
- Queue Length (Watson Equation)
- Cross-Corridor Mobility (credit for regional arterials)

Enhance Economy

- Mainline Improvement (assessment based on modeling results)
- Eliminate Drayage Impedance (Yes/No)
- Percent Truck Traffic (estimated by communities)

Maintain Environment/Community

- Safety (HRI accident history)
- Emissions (1x delay in attainment area, 1.5 x delay in non-attainment area)
- Business Displacements (jurisdiction Reported Number)
- Residential Displacements (jurisdiction Reported Number)
- Emergency Access (key emergency vehicle route)
- Public Support (jurisdiction reported rating of public support)

Maximize Cost Effectiveness

- Cost Effectiveness index (potential delay/project cost)

This methodology and results were presented to the stakeholder group. The highly rated crossings were primarily in Port areas or in locations of high conflict elsewhere in the corridor. The majority of the crossings that fared well were in either Seattle or Tacoma. The principal difficulty with the first set of results was that the criteria dealt effectively with the Port-oriented concerns, but not entirely with community concerns. Coupled with inconsistencies in the community-supplied ADT values, it was not possible to evaluate all of the projects in the corridor fairly. The group resolved to revise the criteria, clean up the inconsistencies in the data, and evaluate the candidate crossings in a second iteration.

Revised Criteria

On January 23, 1997, TTI presented a set of criteria and results supportive of the FAST group's interest in an implementable long-term strategy for the Everett to Tacoma rail corridor which protected regional and local needs. The goal of the meeting was a consensus that dealt with the concerns of the communities and the Ports.

Based on stakeholder feedback, the criteria were revised to better reflect the needs of the communities. The revisions to the criteria are summarized in Table 2.1.

Table 2.1 Constituent Revisions to Initial FAST Criteria

Suggestion	Response
Too much Port Emphasis	Drop Drayage, Add ADT*Truck % to estimate locally-generated truck traffic
Inadequate Treatment of Safety	Move to raw value from five year FRA Accident history instead of yes/no measure
Inadequate Concern for Local Economies	Self-Rated Economic Impacts
New Corridors Not Evaluated	Reran evaluation with 2010 ADT's to include future Roadways
Closely-Spaced Proposals Fared Poorly	Communities reconsider which crossings to have evaluated
Corridor Strategy not strongly supported enough	Apply community supplied cross-corridor assessments

The group accepted the methodology and results obtained with the revised criteria. By developing a set of criteria which took into account both port and community concerns, the group was able to achieve the desired consensus quickly.

Benefits derived from the revised evaluation include the retained significance of Port-related crossings, the elevated importance of regionally significant highway links such as the Shaw Road Extension in Pierce County and the assurance of unimpeded cross-corridor access at intervals of less than three miles from Seattle to Tacoma.

III. MODELED RAIL TRAFFIC

A distinguishing aspect of the FAST analysis was its use of a computer simulation tool to estimate train related delay at HRI's in the study corridor. In contrast to previous approaches applied to estimating delay at the region's crossings, the Dispatch Planning Model (DPM) enabled the study team to simulate rail traffic and obtain crossing occupancies that were based not only on the physical braking, acceleration and speed characteristics trains, but also on the basis of speed changes associated with the interactions between the trains as they are dispatched through a congested segment of the railroad.

An additional significant feature of this analysis was the ability of the study team to predict growth in traffic levels by simulating the region's rail network as it is planned for the future. The dynamic nature of highway traffic flows in the region, and the growth of freight rail traffic combined with the infrastructure additions required by RTA suggests patterns of HRI congestion quite different from those which exist today. In order to accurately address HRI congestion and the related evaluation criteria, it was mandatory to work with a railroad scenario that corresponded more closely with the time frames in which the grade separation projects would be undertaken. By gathering data describing the planned additions and alterations to existing rail infrastructure and combining these changes with projected traffic levels, it was possible for TTI to simulate future traffic levels for grade crossing impedance. The assumptions driving the simulation are based on information gathered from railroad personnel through interviews, but neither railroad was able to fully reveal the details of their operations to the study team.

Network Simulation

Exposure to delay at highway-rail intersections is usually calculated as the product of ADT* the number of trains. This measure fails to take into account the speed, speed limits, train performance, train length, and interaction of trains as described in the previous section of this report. Given the complexity of the rail network in the Everett to Tacoma corridor and the variability of operations relative to train type and activity, TTI used the rail operations simulator, DPM, to derive impedance

values. It is important to emphasize that the purpose of the modeling in this study was to sort crossings by the magnitude of impedance that they were capable of generating under future operating patterns in the region. This means that the study has estimated a worst-case scenario for the year 2000 for the purpose of indexing the conflict at HRI's in the region.

Simulation Model

DPM, developed by Berkeley Simulation Software, is used by freight railroads to model freight traffic and mixed freight passenger train operations. The model is generally used to estimate train delay under different physical plant scenarios. Features in the model generate time-distance plots, summaries of delay by train and timetable performance for passenger trains. The model also includes logic which emulates dispatcher decision-making. The model makes an approximation of train performance and estimates delay to trains. In the case of the Everett to Tacoma corridor, the model was customized to capture the amount of time that each grade crossing was occupied by train traffic.

Calculation of Impedance

DPM calculates the time it will take trains to travel between each node defined in the track network. This movement calculation is carried out using established acceleration, braking, and train resistance equations. For each train, the program creates a log of its activity. The log details which links and nodes it has traversed, the speed it has attempted to achieve in each segment as well as calculated values for braking and acceleration. TTI researchers enhanced the output side of the model by developing a separate program to estimate how long each crossing would be occupied by each train based on train length and detailed speed profile information.

In addition to the calculations performed by the model, the impedance numbers were also adjusted for gate warning time and failures. For this analysis, we assumed a constant warning time of 30 seconds on all crossings and a failure rate of one to 2 percent for all mainline crossings. Crossings adjacent to yards or in locations where extensive switching operations were taking place were given a significantly higher failure percentage (as much as 25%) to account for multiple gate activations

associated with trains fouling the circuitry which activates the crossings without actually occupying the roadway.

Table 3.1 TTI Estimated Gate Closures-Everett to Tacoma Corridor

City	Street Name	Average Daily Traffic	Average Daily Trains	Total Crossing Closure Minutes	Average Minutes Per Closure	Average Closures Per Hour
Algona	Ellingson Road - UP	25712	26	48.39	1.8	1.1
Auburn	37 th Street NW	14300	56	66.89	1.2	2.3
Auburn	M Street	26000	15	76.25	5.08	0.6
Auburn	S. 277 th - BNSF	22750	56	85.66	1.5	2.3
Auburn	S. 277 th - UP	22750	26	83.63	3.2	1.1
Auburn	SW 3 rd	30000	54	107.3	1.98	2.3
Auburn	West Main St. - UP	12500	26	50.7	1.95	1.1
Kent	212 th - BNSF	28500	56	94.96	1.7	2.3
Kent	212 th - UP	28500	26	53.76	2.06	1.1
Kent	228 th - BNSF	13000	56	87.37	1.56	2.3
Kent	228 th - UP	15400	26	57.4	2.2	1.1
Kent	James St. -BNSF	26400	56	95.22	1.7	2.3
Kent	James St. - UP	19000	26	53.34	2.05	1.1
Kent	Smith St. - BNSF	16900	56	80.4	1.43	2.3
Kent	Smith St. - UP	16000	26	52.99	2.03	1.1
Kent	Willis St. -BNSF	31900	56	87.11	1.55	2.3
Kent	Willis St. - UP	31900	26	52.62	2.01	1.1
Pacific	8 th St. East - UP	31000	26	50.13	1.93	1.1
Pacific	8 th St. E - BNSF	31000	59	86.33	1.46	2.5
Pierce Cty	70 th Ave. - UP	17500	26	50.29	1.93	1.1
Pierce Cty	Stewart/66 th	5100	59	81.06	1.36	2.5
Puyallup	3 rd St. SE	25200	59	102	1.73	2.5
Puyallup	4 th /5 th Streets	17500	59	102.9	1.75	2.5
Puyallup	Fruitland Ave. Ext.	17300	59	81.06	1.36	2.5
Puyallup	Shaw Rd. Ext.	15570	59	101.6	1.71	2.5
Seattle	Broad Street	17200	83	537.99	6.48	3.5

City	Street Name	Average Daily Traffic	Average Daily Trains	Total Crossing Closure Minutes	Average Minutes Per Closure	Average Closures Per Hour
Seattle	East Marginal Way	15200	15	155	10.33	0.6
Seattle	Holgate Street	13600	92	391.59	4.25	3.8
Seattle	Lander Street	15000	94	397.39	4.23	3.9
Seattle	Military Road	1100	101	262.5	2.6	4.2
Seattle	Royal Brougham	22800	133	617.35	4.65	5.5
Seattle	West Galer Street	9300	85	340.65	4	3.5
Sumner	16 th Street-UP	278	26	51.25	1.96	1.1
Sumner	24 th Street - BNSF	960	59	78.72	1.3	2.5
Sumner	24 th Street - UP	18000	26	51.16	1.96	1.1
Sumner	Main Street	9587	59	86.33	1.46	2.5
Sumner	Maple Street	4530	59	78.56	1.33	2.5
Sumner	Puyallup Street	27000	59	78.54	1.33	2.5
Sumner	Zehnder Street	4128	59	84.87	1.43	2.5
Tacoma	D Street	11400	92	580	1.05	3.8
Tacoma	Lincoln Street	9500	12	96.25	8	0.5
Tacoma	Port of Tacoma Road	8100	12	828	13.8	0.5
Tukwila	S. 180 th	44000	75	121.56	2.02	3.1
Tukwila	Strander	15000	75	123.52	2.05	3.1

Discussion of Results

The amount of impedance calculated for crossings varies substantially across the corridor. These differences can be traced to the type of rail activity on the various segments of track, rather than to the speed limits imposed. As discussed earlier, long freight trains are limited more by their horsepower/ton ratio and braking capabilities than the rated freight train speed limit at a particular location. Passenger trains can be more responsive to speed limit changes than freight trains, but it is the freight trains that contribute to the majority of the delay at the crossing locations in the corridor.

An illustration of how operating conditions influence HRI impedance is illustrated by comparing 37th Street NW in Auburn with M Street in Auburn. M Street has 15 trains estimated, mostly grain trains coming and going from the yard or the ten mile per hour wye junction with the mainline south of downtown Auburn. Average occupancy per train is more than five minutes, largely because trains are long (about 7000 feet) and they tend to travel slowly (ten miles per hour or less). The total estimated 24 hour closure for M Street was 76 minutes. In contrast, 37th Street NW is north of downtown Auburn and located on the mainline. Trains at 37th Street are mostly traveling at about 40 miles per hour and have a variety of lengths. Average occupancy for these trains is a little more than a minute per train. In this case, a total of 56 movements accounted for 66 minutes of closure - 10 minutes less than M Street.

There are several locations in the corridor that have very high impedance estimates, particularly around the Ports of Seattle and Tacoma. These estimates are larger than those predicted in some other evaluations because they include more pessimistic assumptions. Examples of these assumptions include trains fouling the circuits and over length trains being held at signal locations. Even with more optimistic assumptions about operating practices, the ranking of delay at various locations on the corridor does not change radically. The principal difference lies in the magnitude of distinction between the more and less congested locations on the corridor.

IV. PROJECT EVALUATION

The evaluation technique applied to the FAST corridor crossings was stakeholder-driven. In order to rank and select crossings in a meaningful way and to assure the satisfaction of the constituencies represented in the FAST group, the criteria were tailored to balance Port and Community interests. This tailoring process required that the criteria measures range across the objectives and include a diverse assortment of both quantitative and qualitative data elements.

The technique employed is referred to as a multi-criteria analysis. Multi-criteria analysis is useful in evaluation settings where not all of the data to be considered in the decision-making process are easily placed on the same quantitative scale. In many transportation environments, the criteria employed to determine the relative merit of competing projects is financial in nature. This commonality of scale allows the decision-making body to assess costs relative to benefits and develop a benefit-cost ratio that summarizes the desirability of the project. However, when not all of the criteria are conveniently rendered into monetary terms, as in the FAST project, some other approach is required.

Multi-criteria analysis allows the practitioner to combine quantitative and non-quantitative measures, financial and non-financial indices, and subjective with objective data to arrive at an overall score of project desirability. The following sections describe the approach as applied to the selection of candidate grade separation projects within the FAST corridor.

Multi-criteria Project Analysis

The ultimate desire was to select grade separation projects by:

1. Deciding on the global objectives to be achieved,
2. Determining objective criteria which supported the objectives,
3. Establishing appropriate metrics for the criteria,
4. Collecting data to apply to the metrics,

5. Normalizing or scaling the metrics so that the diverse measures were all on a single, comparable scale, and
6. Establishing the relative importance of the measures by selecting a weight to apply to each.

The net result of this evaluation process was an overall score for each candidate grade separation project. This score served as the basis upon which the final recommendations were made to include or to not include the HRI in the list of priority projects.

Description of Measures and Rating Techniques

The development process for the criteria applied in this study is described in detail in Section II. The final list of objectives and criteria is summarized below:

1. *Improve General Mobility* - measured the proposed grade separation's ability to reduce vehicle delay, reduce vehicle queuing at HRI's, and serve as a major cross-corridor arterial or regionally significant route.
2. *Increase Freight Mobility* - measured the amount of truck traffic and the project's ability to provide operational benefits for rail traffic.
3. *Maintain Safety* - reviewed the number of FRA-reported accidents at the intersection and evaluated the ability of the project to preserve or improve emergency vehicle access.
4. *Enhance Communities and the Environment* - recorded community-supplied values for political support, residential displacement, business displacement and strategic economic value. Vehicle emissions reduction was determined using an index based on whether or not the crossing was located in an EPA-defined non-attainment area.
5. *Maximize Cost-Effectiveness* - a calculated ratio between the capital cost and the potential of the project to reduce vehicle delay.

Criteria Detail

The following sections describe the project objectives and the reasoning behind the selection of the individual evaluation criteria as well as essential technical details on the application of the criteria.

FAST Objective: Improve General Mobility

The general mobility objective was intended to measure the ability of a project to preserve and enhance the mobility of vehicles in the region. Specifically, this includes the ability to reduce vehicle delay, and queuing. General mobility also includes the ability to provide cross-corridor mobility to assure the integrity of the regional transportation system.

Criteria: Reduce Vehicle Delay

The reduction of vehicle delay is the FAST version of the traditional exposure measure applied to the evaluation of grade separation projects in the U.S. and other parts of the world. The traditional exposure method is simply a multiplication of the number of daily trains times the ADT for the intersection. Other variants to this method applied in places like Israel and Japan involve relating the train-induced delay to the level of traffic. The study team elected to take the delay-oriented approach by simulating the train-induced impedance and creating a simple estimate of the signal activation impedance.

The train impedance function for each individual activation may be described as:

$$I = T + S,$$

where: I = Impedance in Minutes

T = Modeled train impedance based on train length, weight and performance, and

S = Signal Activation (assumed 30 second warning time).

The sum of all the activations at a given location comprised the delay number. This number was supplemented by an “unintentional activation” factor ranging from two to twenty five percent, depending on the type of traffic normally seen at the HRI. The lower rates were assigned to those crossings where trains usually proceed at speed through the crossing and the higher numbers were assigned to those crossings where numerous switching moves occur.

In practice, a day at an HRI might involve 60 activations of the warning system by trains. One event might involve a train physically occupying the crossing for two minutes. With the inclusion of the constant warning time factor, the total occupancy by the train would be two minutes, 30 seconds.

If we assume there are another 59 events of a similar duration, then the sum of the total occupancy might be around 150 minutes or 2.5 hours. If the crossing is assumed to have a two percent unintentional activation factor, then it would be necessary to add another 2 percent of the total activation time to the daily total. The final total activation time or total delay based on 150 minutes, would be 153 minutes. This final factor was included in the analysis to ensure the consideration of these non-train events.

Having established the impedance measure, the next task is to relate the impedance to expected delay by factoring in the average daily traffic on the intersection. The following expression was used to calculate the index of expected delay:

$$D = (I / 1440) * ADT$$

where: D = Expected Delay

I = Impedance in Minutes

ADT = average annual daily traffic

The formulation considers the number of minutes a HRI could be blocked from traffic as a percentage of the total day. This value is then scaled by the 2010 estimated traffic volume at the HRI to arrive at a number that predicts the level of total delay expected under future conditions within the corridor. The value relates to the number of vehicles each day experiencing delay at a crossing. Using the expression above in an example calculation, an impedance of 153 minutes and an ADT of 25,000 yields an exposure factor of $153/1440 \times 25,000 = 2656.25$. By contrast, a lower ADT (say 10,000) at the same location would yield a lower exposure factor. In this case, $153/1440 \times 10,000 = 1062.5$. For this measure, a higher number would give a project more strength in the evaluation.

Criteria: Queuing

The principle behind the application of the queuing analysis is similar to the one applied to the exposure factor. Delay at intersections is undesirable, and so is the potential for vehicle queues to extend to a level where additional intersections adjacent to the railroad crossing are blocked. The

precise determination of this problem is better suited to a locally-focused circulation study, but for indexing purposes in FAST, this measure was also carried out on a gross level.

Using the ADT and roadway information supplied by the communities, an average queue length per lane was estimated for each crossing on the corridor. The study team used the Watson equation, a commonly accepted traffic engineering tool. The analogy drawn in the application of this equation is that the highway rail intersection is the functional equivalent of a highway to highway intersection. Just as highway intersections require occupants of conflicting roadways to cede the opportunity to cross the intersection based on the indication of a signal, the absolute right-of-way privilege exercised by trains at highway-rail intersections, imposes a red signal or red time on crossing vehicle traffic. The equation is expressed as follows in simplified form:

$$Q = V \times R$$

where:

- Q = Average queue length per lane (vehicles queued per lane per cycle),
- V = Volume (vehicles per hour)
- R = Red Time (seconds per cycle/3600 seconds per hour)

Criteria: Cross Corridor Link

The FAST team relied on jurisdictional assessments of the status of roadways proposed for grade separation as to whether or not the roadway comprised a cross corridor link. In this case, if a road connected a residential area with a commercial area and major north south vehicle routes such as I-5 or SR 167, the community representatives would give the road a score of one. If the link did not fulfill this function, it would receive a score of zero.

FAST Objective: Increase Freight Mobility

Freight mobility is an important part of the FAST program, and two specific measures have been applied. The first is a self-generated estimate by the local communities of the percentage of truck traffic on the roadways with the crossings in question. The second is an assessment based on the outcome of simulation activities of the value of a grade separation to rail operations.

Criteria: Percentage of Truck Traffic

The percentage of truck traffic reported by the jurisdictions was multiplied into a trucking index to reflect truck usage on the affected roadways. For this measure, a higher truck index implied that the route was more important. The indices were reported back by the constituents on a four point scale where 1= 0-9 %, 2 = 10-19%, 3 = 20-29% and 4 = 30+%. For each location the ADT was multiplied by the midpoint of the self-reported range. So if a 25,000 ADT roadway had a self-rated value of 2 , the calculation would be 25,000 x 14.5% or 3,625 as a truck index.

Criteria: Rail Operations Benefit

The rail operations benefit was rated by the TTI team on a one to three scale where a three represented a moderate benefit, two a minimal benefit and, one a negligible benefit. In reality, neither railroad company requires any grade separation to carry out its operations. The reason for assessing this measure is that the public benefits from easy terminal access for trains because trains spend less time occupying locations on and along the mainlines if terminal capacity exists to handle them. In this case, only grade separations in terminal areas were rated as locations with moderate benefits (the highest rating). East Marginal Way and Port of Tacoma Road are examples. In these locations the grade separation was viewed as desirable because in Tacoma, it would ensure that the Tacoma Belt Line yard could be expanded to accommodate longer trains off the mainline. The same is true of the East Marginal Way grade separation.

The majority of the other crossings in the area received a rating of one, consistent with the relatively insignificant impact that at-grade crossings have on freight operations.

FAST Objective: Safety

Based on strong community sentiment that safety receive a high emphasis in the evaluation, two measures were included to emphasize safety. The first was based on FRA accident history for the previous five years for each intersection on the corridor. The second was a self-rated assessment of the importance of the route for emergency vehicle access.

Criteria: FRA Accident History

The Federal Railroad Administration maintains a database of accident history for every public grade crossing in the country. The information contained in the database summarizes the number, type, and characteristics of all accidents reported at the crossings. This database is a partial reflection of accident history at grade crossings, but it does not pick up accidents that are incidental to train activity. An example of such an accident might be a vehicle getting hit or sideswiped while performing a U-turn to avoid waiting in a queue for a train to pass. For this measure, the raw accident value was entered into the evaluation.

Criteria: Emergency Vehicle Access

The ability of jurisdictions along the rail corridor to provide emergency services to their residents in a cost-effective manner is a concern to many. If a crossing location was an important route leading to a hospital or was a sole access to an emergency service area, participants rated the crossing with a one. If the crossing did not fulfill these criteria, it was rated as zero.

FAST Objective: Protect Environment and Community

Environment and Community are both important to residents of the Puget Sound area. In addition to concern about the pollution impacts associated with growth in population and commerce in the region, there is also a need to preserve the historic heritage and aesthetic quality and vitality of communities along the corridor. The following measures address these concerns:

Criteria: Emissions Reduction

A simple assessment of emissions reduction potential was included in the analysis. In this case, any crossing located in an EPA defined non-attainment area for Carbon Monoxide and particulate matter from vehicles received an emissions index of the calculated delay index times 1.5. Areas in attainment were rated at the level equivalent to the delay index only.

Criteria: Community Support

For this measure, the jurisdictions were asked to rate on a scale from one to five, the extent of public support for a grade crossing project. The higher the score, the more support. This measure was intended to give credit to projects that were likely to garner public support. If a project received a low rating for public support, it most likely did so because it had a negative social or aesthetic impact on the surrounding community.

Criteria: Business Displacements

Business displacements were reported by the communities as a way of indexing potential interruption to local economic activity and potential mitigation costs. Raw values were entered into the evaluation and then normalized on a ten point scale as described in the following section.

Criteria: Residential Displacements

Residential displacements were reported by the communities as a way of indexing potential interruption to community life and aesthetics as well as potential mitigation costs. Raw values were entered into the evaluation and then normalized on a ten point scale.

Criteria: Strategic Economic Value

Strategic Economic value was added to the evaluation because of the contention on the part of the local communities that local attractions and industries such as Boeing had a compelling need for representation as assets to the communities from a mobility perspective. Projects were rated by the communities for their ability to enhance access to key facilities. This measure was rated on a scale of 1 to 5 with 1 as a low score and 5 as a high score. An example of a crossing rating a 5 for Strategic Economic Value would be Ellingson Road near Auburn because it provides access to a gravel pit and a Boeing plant.

FAST Objective: Cost Effectiveness

The cost-effectiveness of a project is both an objective and a specific measure. In this analysis, the potential to reduce delay was divided by the capital cost to illustrate minutes of delay eliminated at the crossing per million dollars of capital expenditure.

Normalization of Scores

As can be seen from the previous section of this report, the various criteria-related metrics are of several types and fell along several different scales. These include continuous scales, ordinal measures, and binary ratings. In order to combine the measures into a composite score, it is necessary to translate each unique scale into a common scale that, when weighted, can serve to represent the generally agreed-upon standing for a project considering all of the criteria of interest. The common scale selected for this purpose was a ten-point scale beginning at zero. Each unique scale was mapped to the ten-point scale in a manner that retained the internal consistency of the criteria.

For example, in mapping a 5-point, ordinal scale to the ten-point scale, a simple multiple of two was used. This results in the following translation of scores:

Unique Ordinal Scale	Common 10-point Scale
1	2
2	4
3	6
4	8
5	10

For criteria measures that are continuous and range across many values, such as the delay index, the translation reflects the original measure by mapping to the 10-point scale as real numbers. Thus, for example, if a measure like “number of businesses displaced” ranged from a low value of zero to a high value of 26, then the mapping could take the form shown below:

Unique Continuous scale	Common 10-point Scale
0	0
1	.38
3	1.15
5	1.92
8	3.08
13	5.00
21	8.08
26	10

Weighting

Weights are assigned to represent the relative priority placed on criteria. The usual weighting convention is to distribute weights that sum to 100 among the criteria. When summed, the individual products of weights and criteria values yields a composite score that allows direct comparison of projects. In this analysis, the resulting composite score is also expressed in terms of the normalized, 10-point scale. This composite score, therefore, represents both a consideration of diverse criteria and the differential emphasis placed on that criteria by stake-holders.

Aided by a computer software tool under development by TTI for the purpose of transportation project evaluation, the FAST project team normalized the range of values in each of the measured categories and carried out the project evaluation. This process was executed twice during the course of the FAST project.

On the initial application of the method to the FAST data, the research team applied multiple weighting patterns to the original evaluation scheme with the preliminary data. The results identified those HRI's that were consistently rated high under different weighting patterns. However, due to the lack of clear consensus on the how criteria were to be weighted and the fact that several data

problems were identified, it was determined that a single weighting pattern would better serve that constituency. Following a data re-verification process and an the adjustment of criteria to those described earlier in this chapter, the evaluation was run based on a single set of criteria weights agreed to by the stakeholders. The final distribution of the 100 weighting points is summarized in Table 4.1.

Table 4.1. Weighting Pattern: Final Evaluation

Category	Weight		Measure	Metric
General Mobility	25	10	Potential to Reduce Delay	% Daily Impedance x ADT
		7	Queue Length	veh/hr/lane*sec/cycle/3600
		8	Cross Corridor Arterial	1= major cross corridor arterial, 0=otherwise
Freight and Rail Mobility	15	8	Truck Trips	% truck use *ADT
		7	Mainline Benefit	3= moderate 2= minimal 1= negligible
Safety	15	8	Intersection Safety	5 Year FRA Accident History
		7	Emergency Vehicle Access	1= essential access route 0= otherwise
Community and Environmental Impacts	25	5	Public Support	Self rated 1-5 scale where, 5=high 1=low
		5	Residences Displaced	Number of displacements
		5	Businesses Displaced	Number of displacements
		5	Strategic Economic Value	Self rated 1-5 scale where, 5=high 1=low
		5	Emissions Reduced	attainment area = 1x delay non-attainment area = 1.5 x delay
Cost Effectiveness	20	20	Cost Effectiveness	potential delay/project cost

The outcome of the second evaluation was similar to the preliminary evaluation with the exception of some previously non-evaluated HRI's entering the list of the top 20 crossings. These new crossings were not evaluated during the first iteration because of inconsistencies in their ADT data. Both evaluations emphasized crossings in Port and Urban areas where multiple conflicting train

movements and yard movements generated lengthy impedances. The principal effect of the adjustment to the criteria was to elevate some regionally significant highway links to higher positions in the evaluations. The 11 grade separation projects recommended for immediate funding are summarized in Table 4.2.

Table 4.2. Crossings Recommended for Immediate Funding and Implementation

Crossing	City	Comments	Cost in \$ Millions
Royal Brougham/SR 519-BNSF	Seattle	Port, ferry and sports. Access to I-5 and I-90	102
East Marginal Way-BNSF	Seattle	Major rail spur for intermodal shipments at port	19
South 180 th Street-BNSF	Tukwila	Cross-Valley route with crossing adjacent to most congested intersection in state	12
South 277 th Street-BNSF	Kent/Auburn	Corridor Project in Pre-Design, Connects with I-5	12
South 277 th Street-UP	Kent/Auburn	Same as S. 277 th , BNSF	12
SW 3 rd Street-BNSF	Auburn	Auburn Access to SR 18, Trauma Center Route	22
8 th Street East-BNSF	Pierce County	Lake Tapps Corridor Access	10
Shaw Road Extension-BNSF	Puyallup	New Cross-Corridor Route	15
North Canyon Road Extension-BNSF	Pierce County	New Cross-Corridor Route	6
Port of Tacoma Road	Port of Tacoma	Allows yard expansion on Tacoma Belt Line	22
D Street East	Tacoma	Accommodates future downtown growth	21

Table 4.3 lists the 9 grade separation projects identified for funding within the next 6 years.

Table 4.3. Crossings Recommended for Funding and Implementation within Six Years

Crossing	City	Comments	Cost in \$ Millions
Broad Street-BNSF	Seattle	On National Highway System, Key Oversize Truck Route	25
Either Lander or Holgate Street BNSF	Seattle	Removal of Holgate Crossing would facilitate building a new RTA/Amtrak yard	30
212 th Street-BNSF	Kent	Cross-Valley route with access to I-5	13
212 th Street-UP	Kent	Cross Valley route with access to I-5	13
Willis Street-BNSF	Kent	SR 516 - Cross Valley Route, connects to I-5	10
Willis Street-UP	Kent	SR 516 - Cross Valley Route, connects to I-5	10
8 th Street East-UP	Pacific	Lake Tapps Corridor Access	16
Puyallup Street-BNSF	Kent	New Cross-Corridor Route	12
M Street - BNSF Stampede Pass Line	Auburn	Major arterial, slow trains due to storage yard and wye junction with north-south BNSF mainline	7

V. CONCLUSIONS

The FAST project for the Everett to Tacoma corridor has taken on the task of sorting through a long list of projects, finding enough projects with comparable characteristics to make a meaningful comparison, and then offer a specific list of projects appropriate for funding consideration. Because of the scale of effort and the relatively short time available to complete the task (3 months), some of the benefit of a more comprehensive data collection and analysis effort was beyond the reach of the resources available. Nonetheless, the participation and acceptance of results by a diverse constituency which represents every major community along the corridor as well as the ports, suggests that this effort has achieved reasonable results that the study team hopes will contribute to some tangible action to improve mobility in the region.

The project has offered some useful opportunities to learn about the nature of a corridor strategy for grade separation as well as what is reasonably achievable in future efforts. The following sections detail some of the lessons learned in the Everett to Tacoma Corridor and some conclusions that can be inferred from the effort.

Operational Realities - With respect to the grade separation of the Everett to Tacoma rail corridor, the following observations:

- BNSF and Union Pacific have no need or interest in cooperating or rationalizing infrastructure because both entities intend to pursue independent business strategies.
- If the area ports are to succeed competitively in future years, they must be able to handle increasing volumes of containers in a reliable and timely fashion.
- Regular freight operations do not require any grade separation. FRA speed increases for passenger service do require grade separation for 125 mph passenger service.

Strategic Issues - The FAST project is consistent with several ongoing strategic planning efforts in the State of Washington and breaks new ground in corridor strategy building.

- The strategic approach of selecting key locations in the corridor primarily for the purpose of providing regional links and assuring port viability dovetails with ongoing planning efforts at WSDOT, the Ports, and the communities.

- The strategy delivers short-term and long-term benefits and is incremental in nature. This approach is compatible with the successful and growing WSDOT rail passenger program.
- In contrast with the Alameda and Northeast Corridor Improvement Programs, FAST delivers more significant regional mobility benefits than railroad-specific benefits.

Consensus Building

- It proved beneficial to propose capital expenditures benefitting the Ports and also proposing worthwhile projects for the communities adversely impacted by train traffic associated with increased port activity.

Future Steps

- Communities anticipating increases in rail traffic should communicate with neighboring communities and major traffic generators to establish a common agenda within a defined corridor for grade separation programs.
- Existing rail corridors that are currently abandoned or underutilized should be preserved to accommodate the possibility of future transportation uses. This is particularly true if the corridor already possesses significant grade separations.
- Communities with an interest in predicting grade crossing occupancies for planning purposes should carry out detailed circulation studies around the crossings in question and rely on a combination of historical data and simulation for meaningful results.
- If a fully-grade separated corridor consistent with the interstate model is desired for the region in the future, it will not be one of the existing, operating rail corridors.

The highly rated projects which survived the FAST analysis are both worthwhile and ready to implement. These projects should be completed because they will be highly beneficial to the preservation of regional mobility, primarily vehicular traffic. By separating regionally critical routes and port accesses from the growing volume of rail traffic, the region will be able to make effective use of a significant investment.

APPENDIX G: TXDOT DISTRICT MAPS

Abilene District

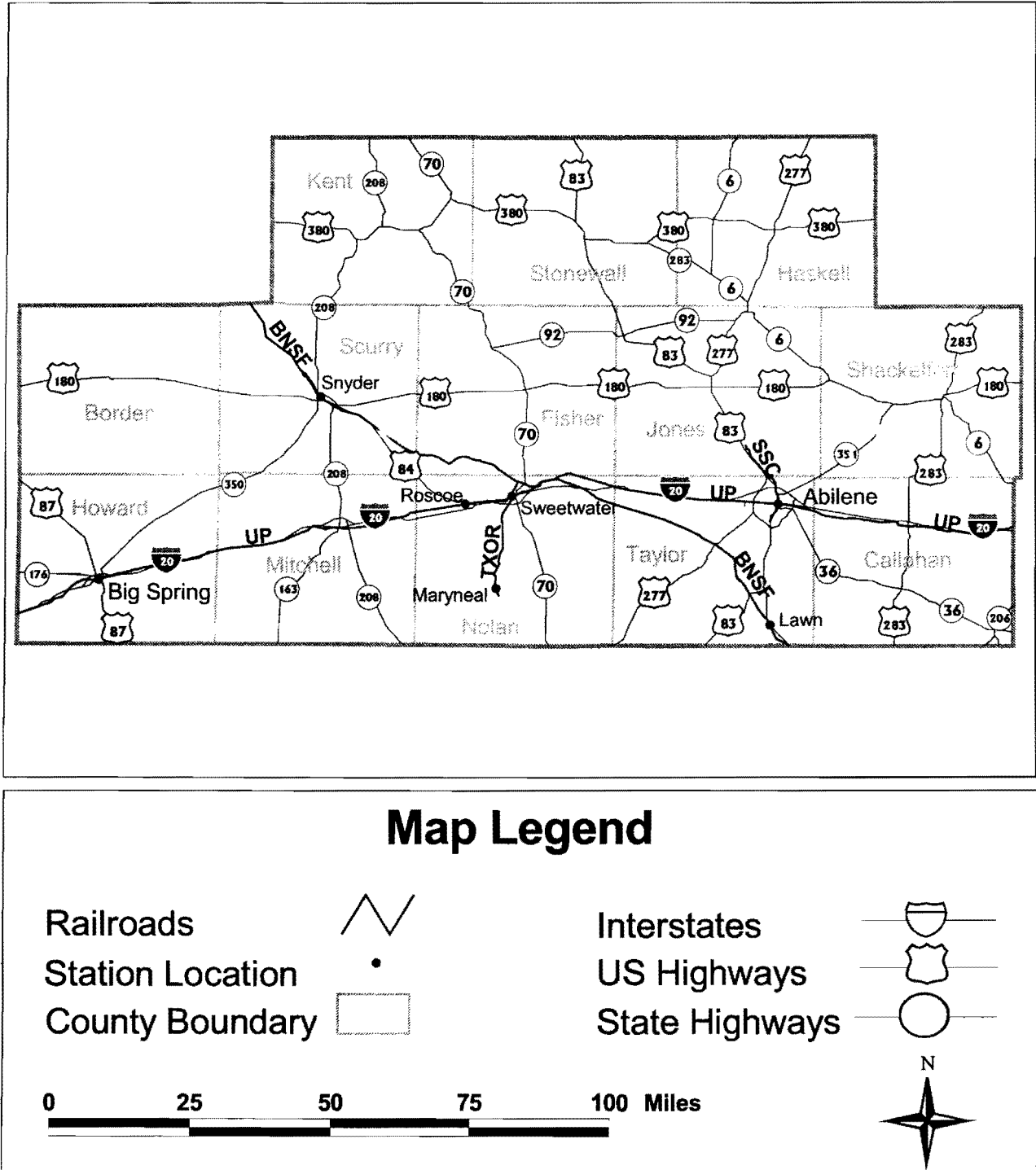


Figure G-1. Abilene District

Amarillo District

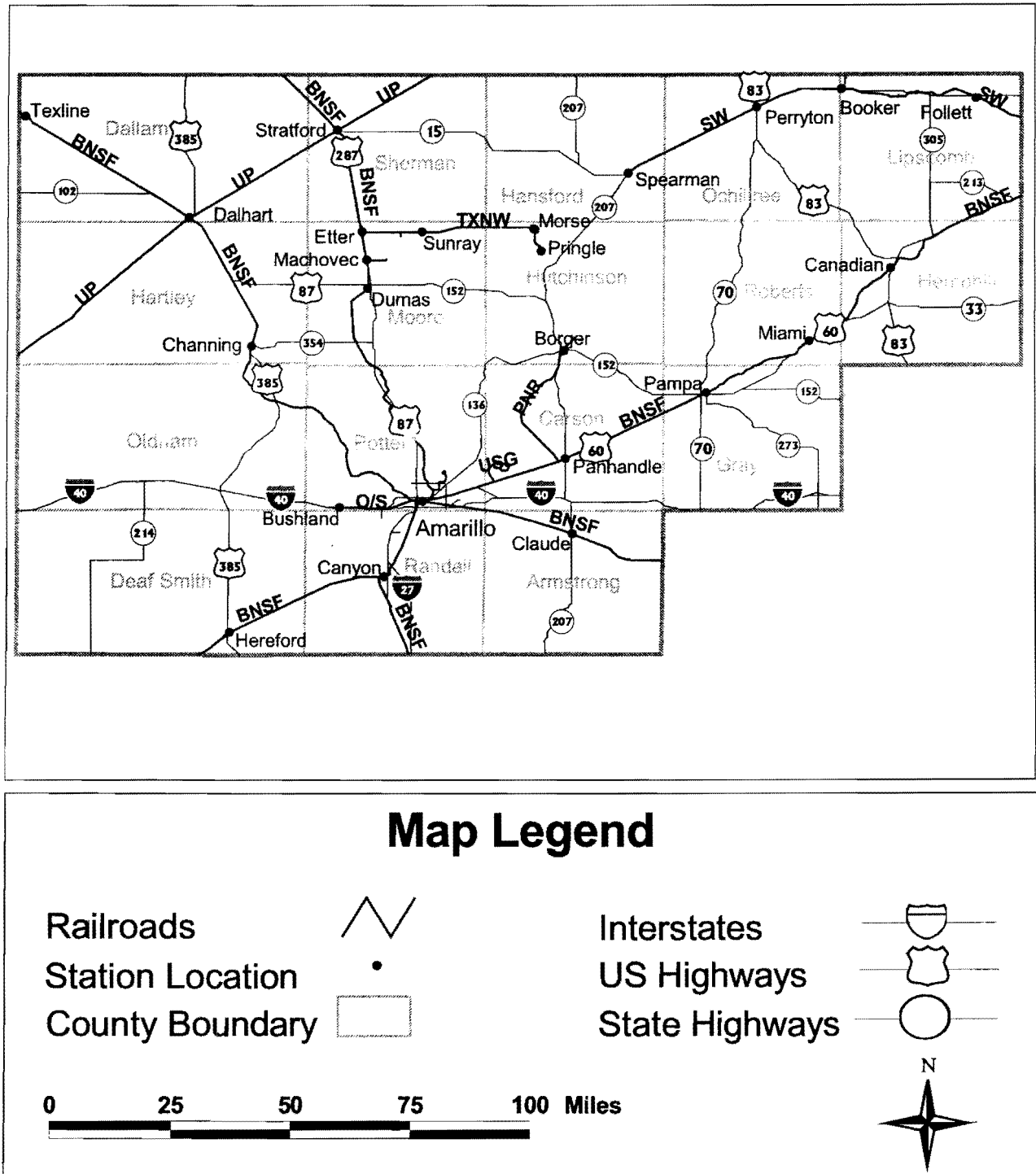
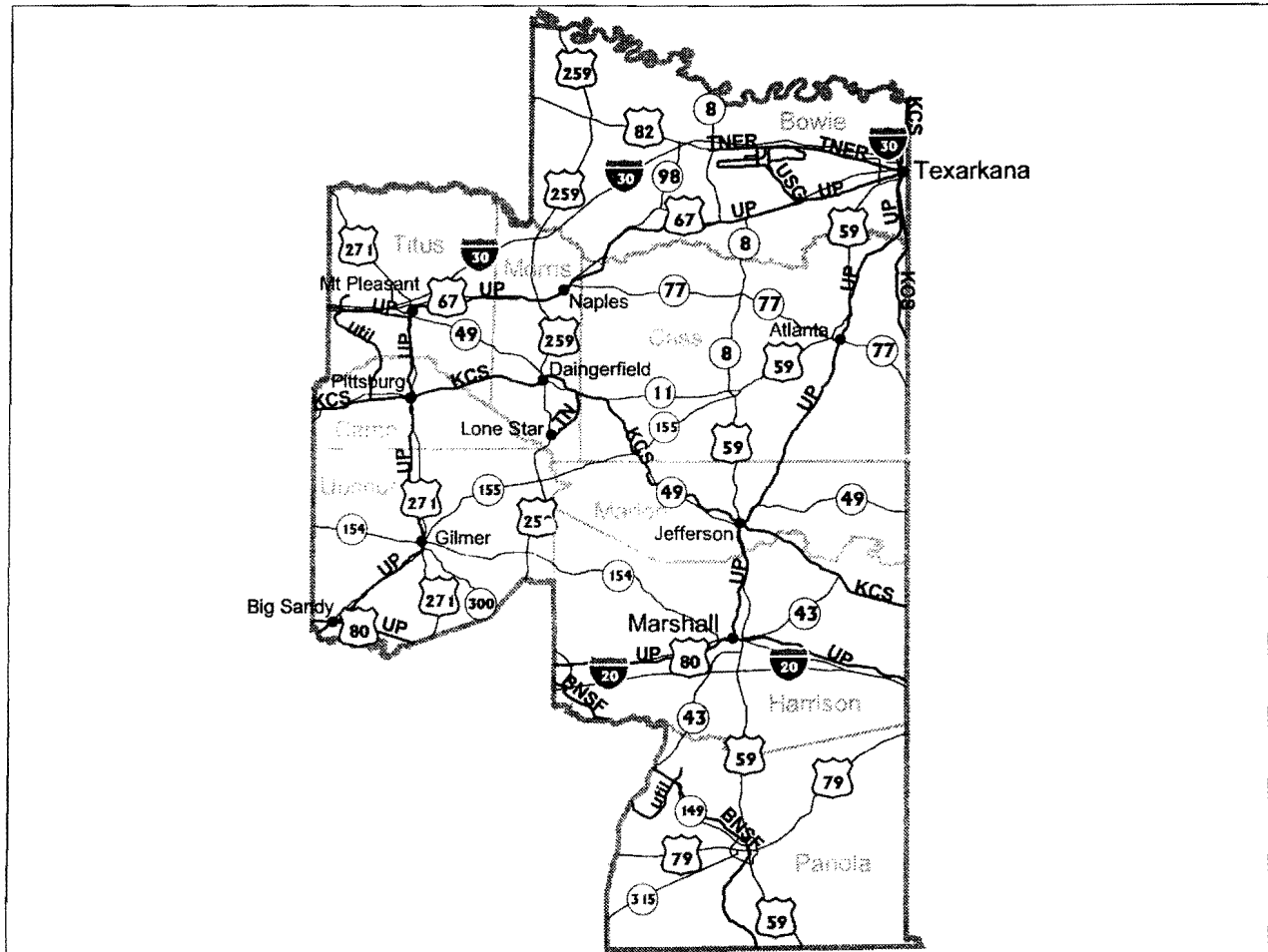


Figure G-2. Amarillo District

Atlanta District



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 25 50 75 100 Miles



Figure G-3. Atlanta District

Railroads

Station Location

County Boundary

Interstates

US Highways

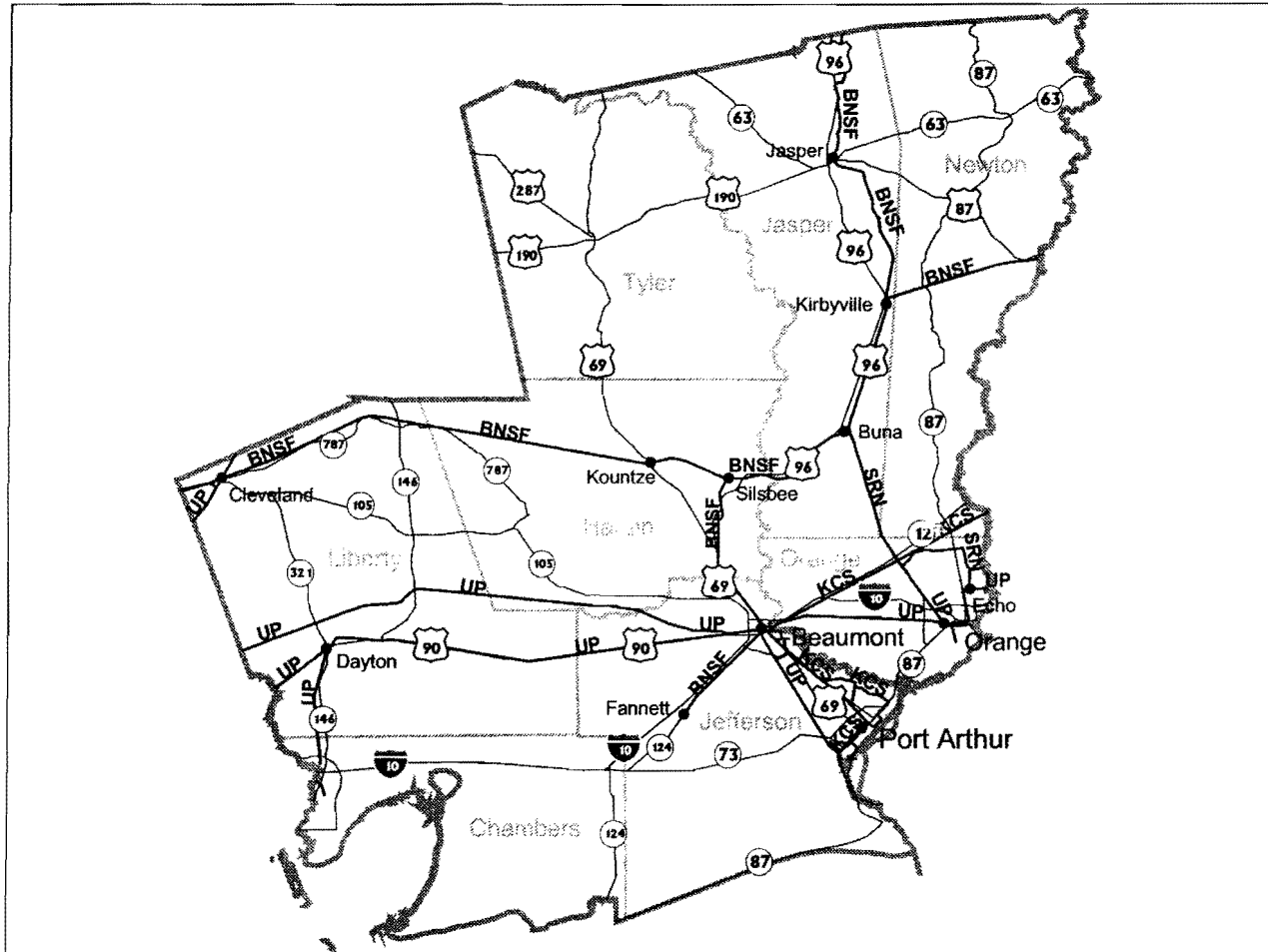
State Highways

0 25 50 75 100 Miles

N

G-6

Beaumont District



Map Legend

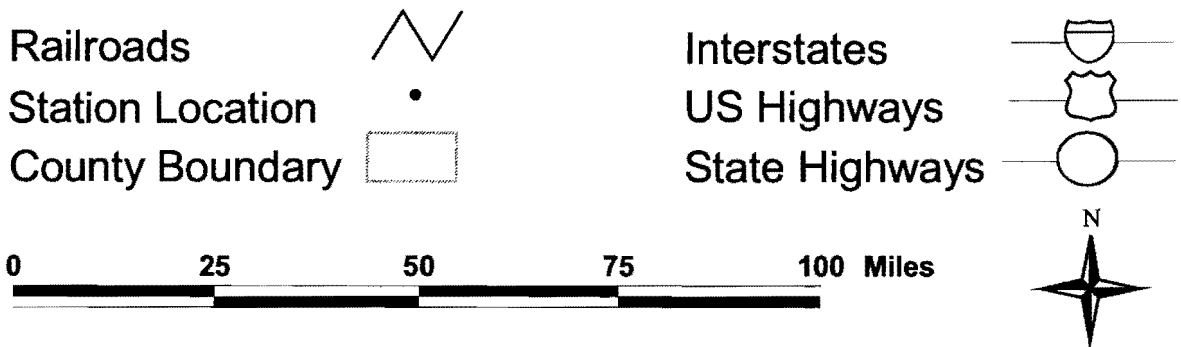


Figure G-5. Beaumont District

Brownwood District

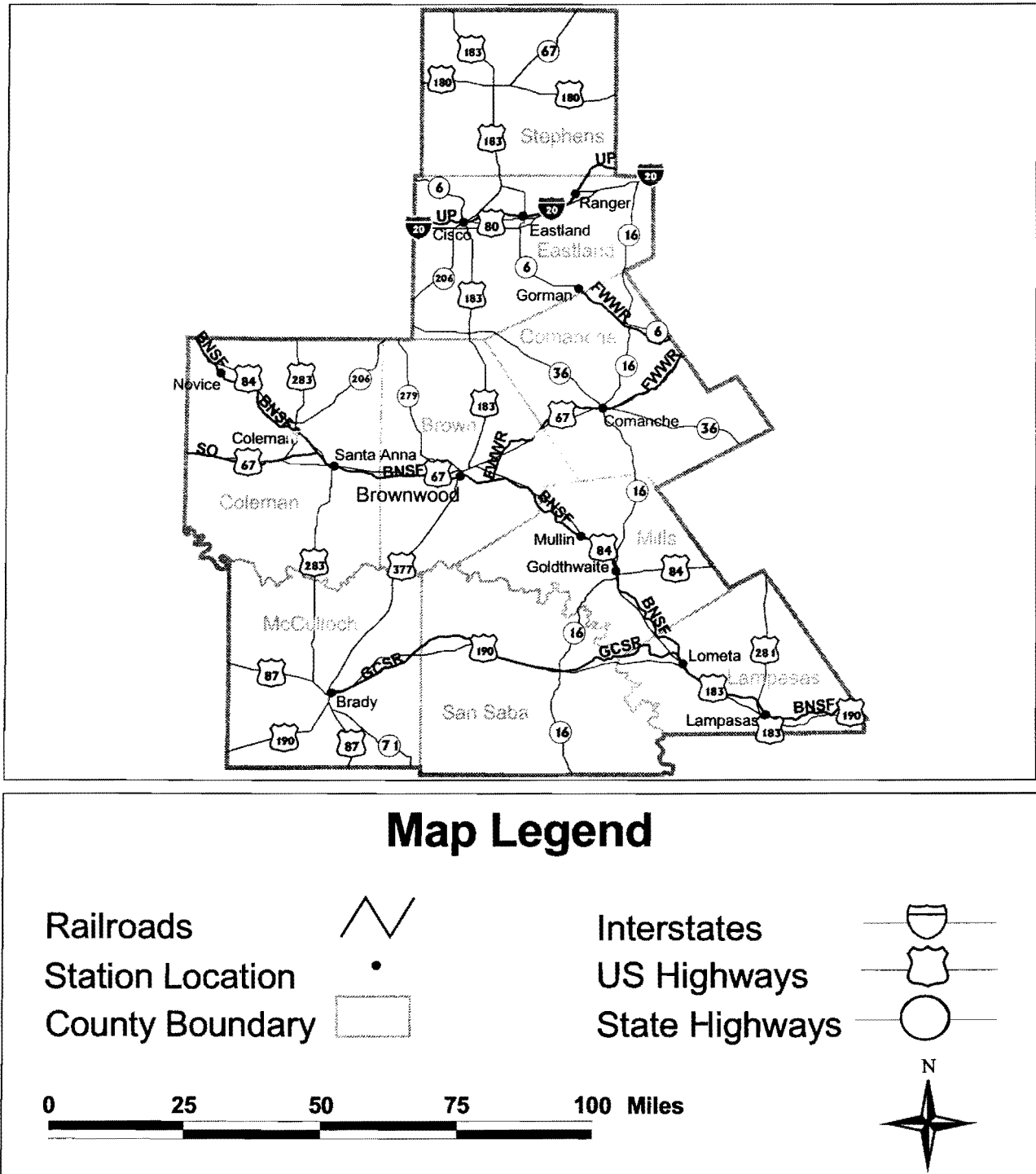
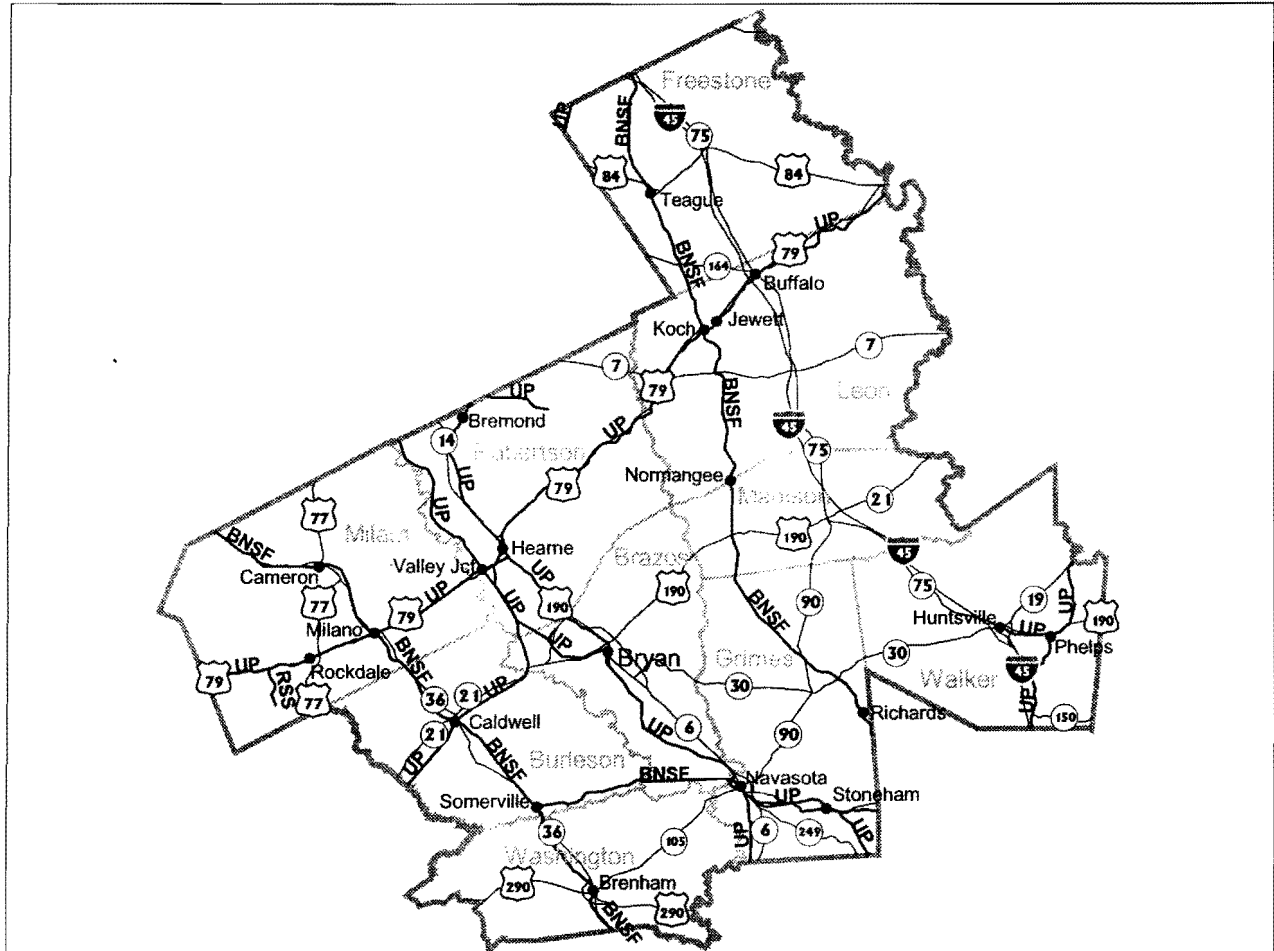


Figure G-6. Brownwood District

Bryan District



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 25 50 75 100 Miles



Figure G-7. Bryan District

Childress District

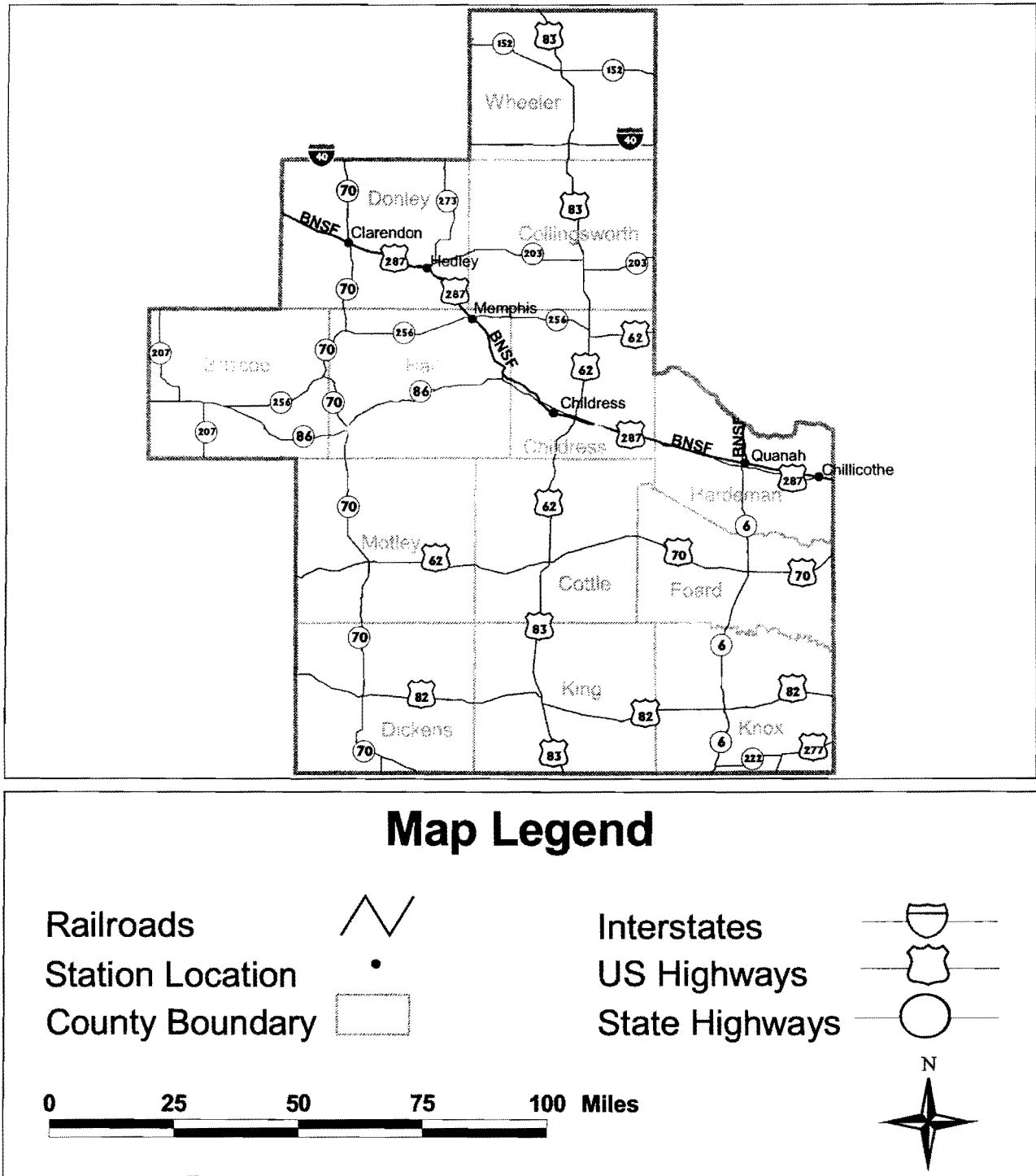


Figure G-8. Childress District

Corpus Christi District

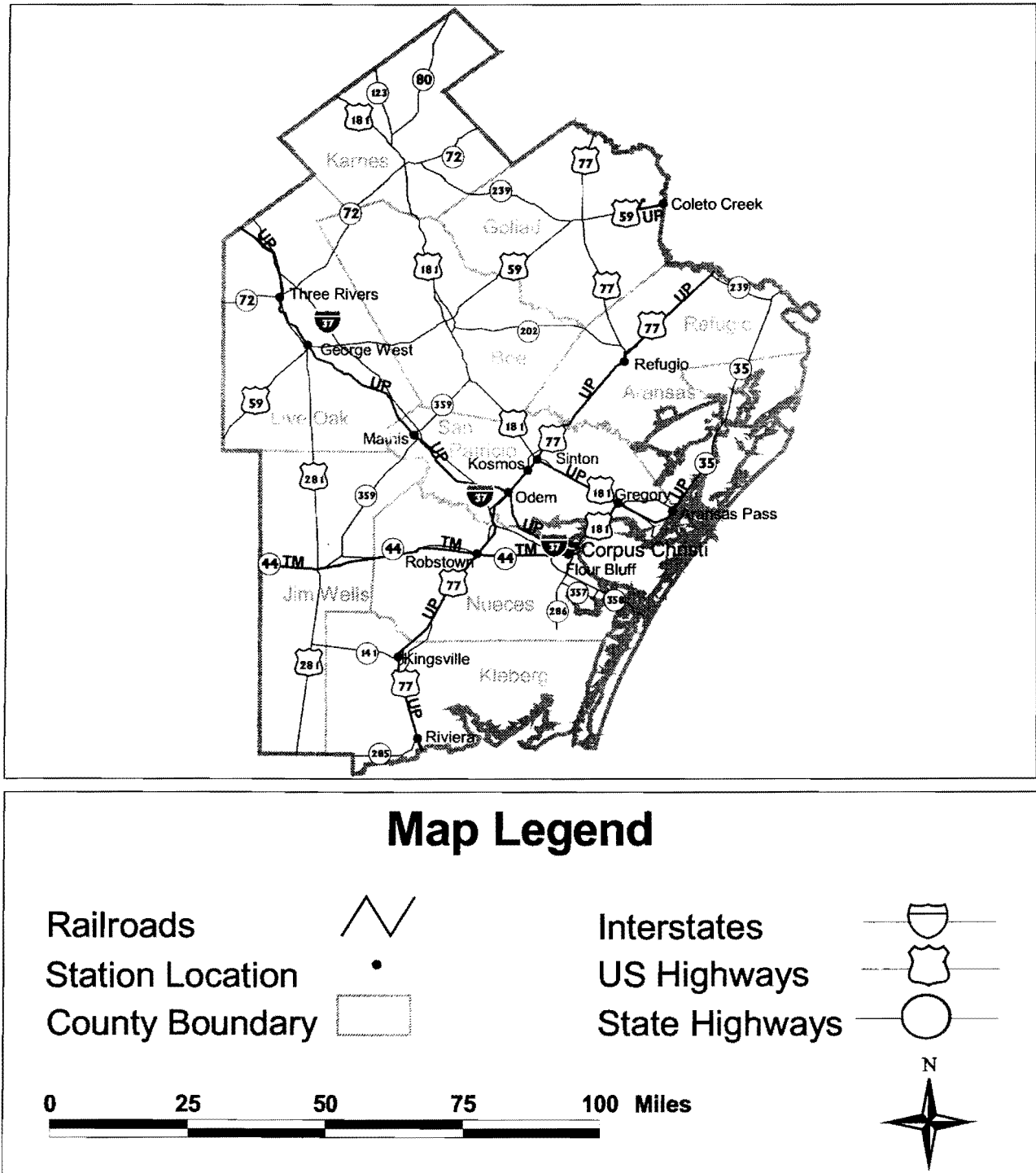
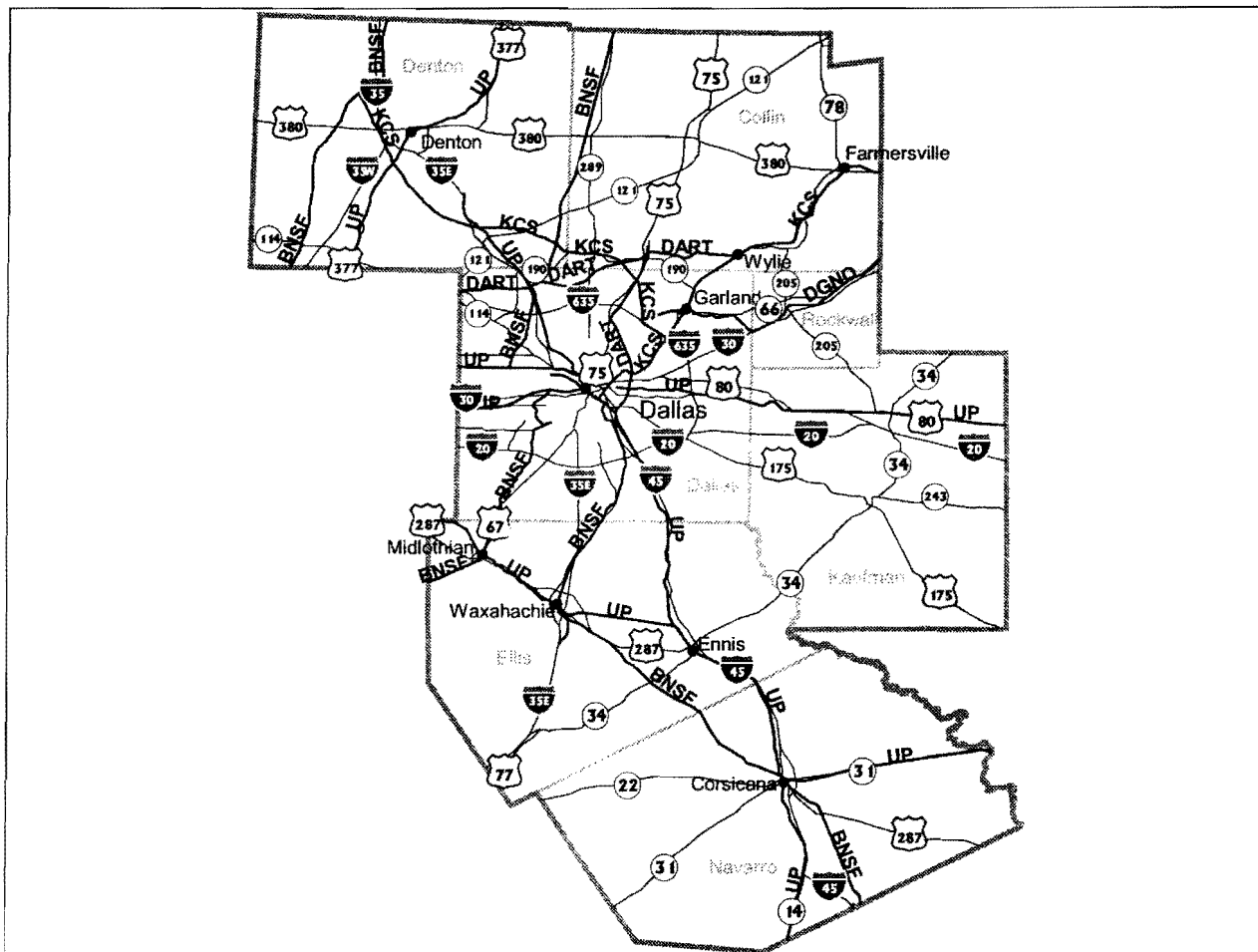


Figure G-9. Corpus Christi District

Dallas District



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 25 50 75 100 Miles



Figure G-10. Dallas District

El Paso District

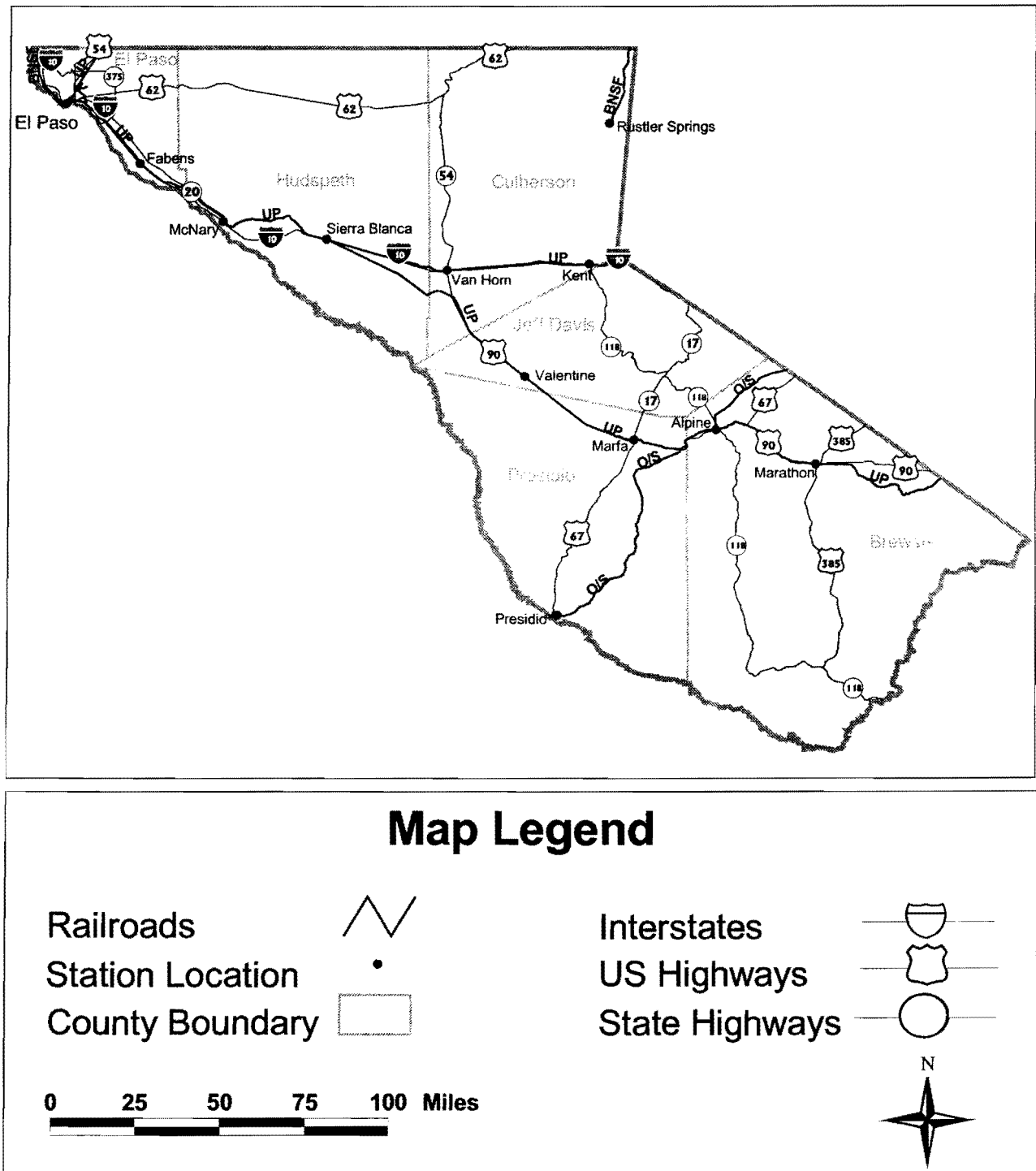


Figure G-11. El Paso District

A detailed map of Texas illustrating the extensive rail network. Major railroads are labeled, including Union Pacific (UP), BNSF, FwyWR, and DART. Key cities are marked, such as Bridgeport, Decatur, Weatherford, Ft. Worth, Saginaw, Arlington, Cresson, Johnson, Granbury, Cleburne, Stephenville, and Dublin. The map also shows various state highways (e.g., 281, 180, 16, 20, 377, 67, 220, 6, 144, 199, 114, 380, 81, 170, 35W, 121, 360, 26, 30, 287, 174, 171, 33W) and county names (Jack, Wise, Parker, Palo Pinto, Erath, Hood, Somervell). The map highlights the density of rail lines, particularly in the eastern and central parts of the state, and shows how these lines connect major urban centers and regional hubs.

Railroads **Interstates**

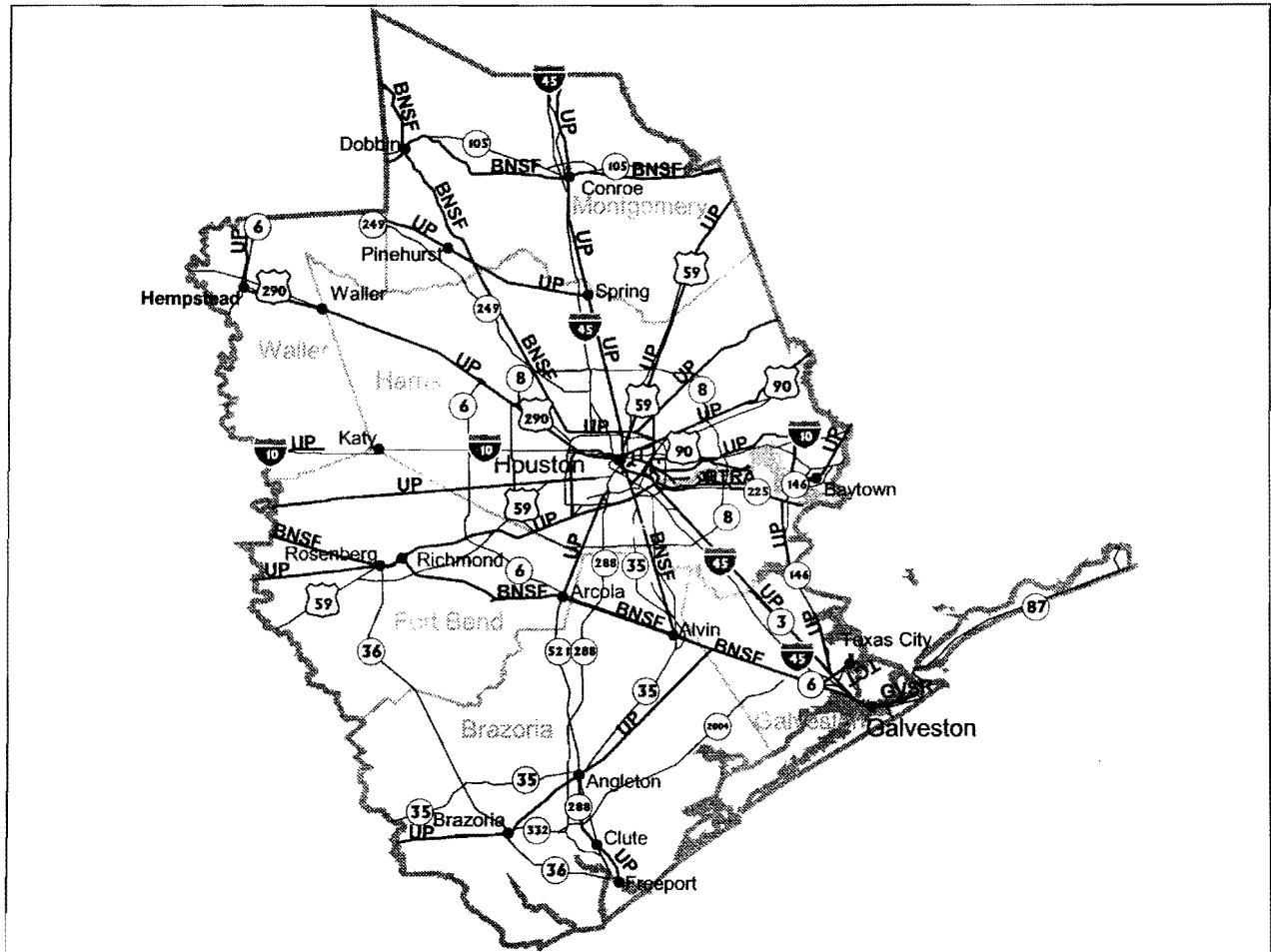
Station Location **US Highways**

County Boundary **State Highways**

0 25 50 75 100 Miles

G-14

Houston District



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways

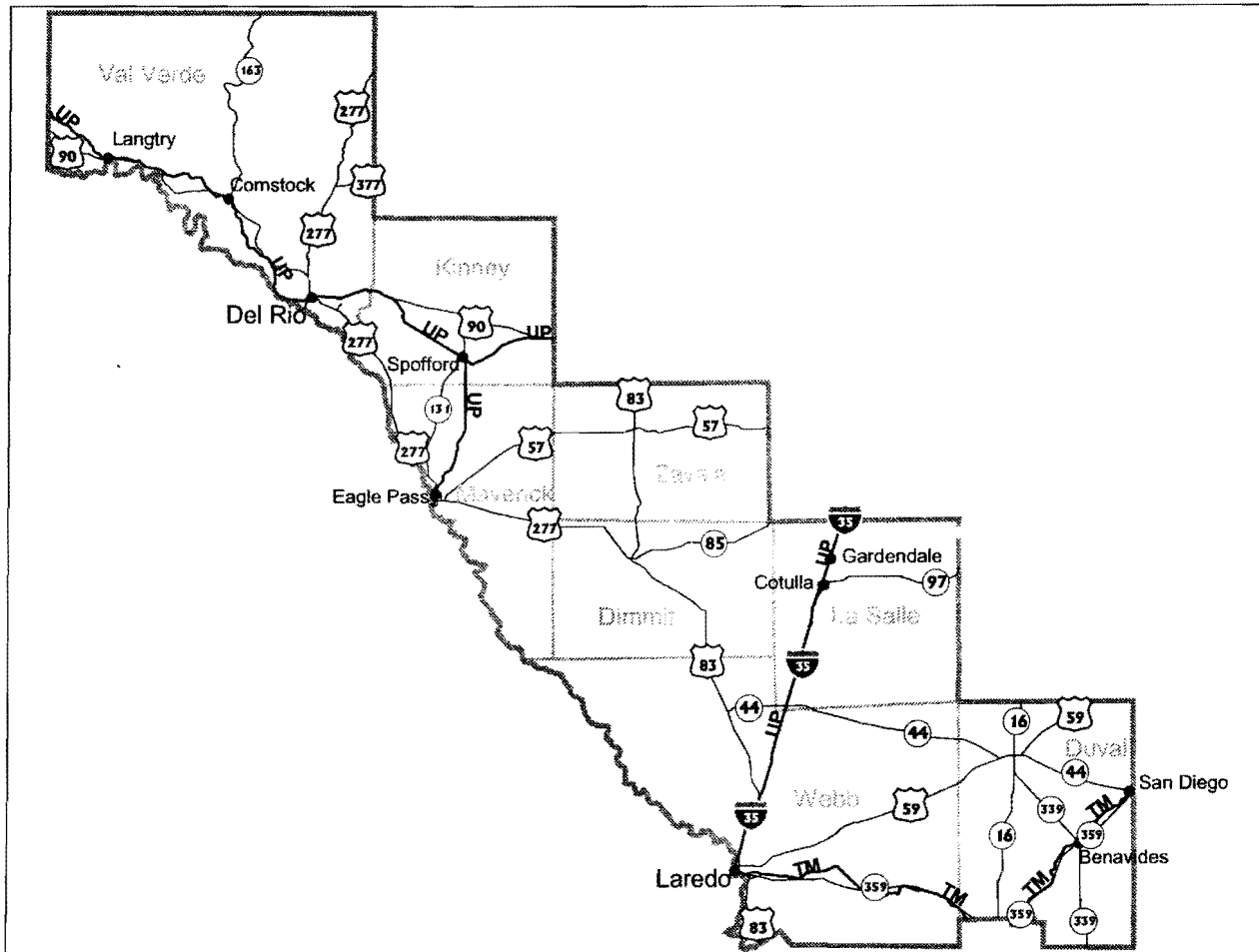


0 25 50 75 100 Miles



Figure G-13. Houston District

Laredo District



Map Legend

Railroads

Station Location

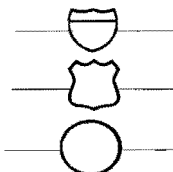
County Boundary



Interstates

US Highways

State Highways

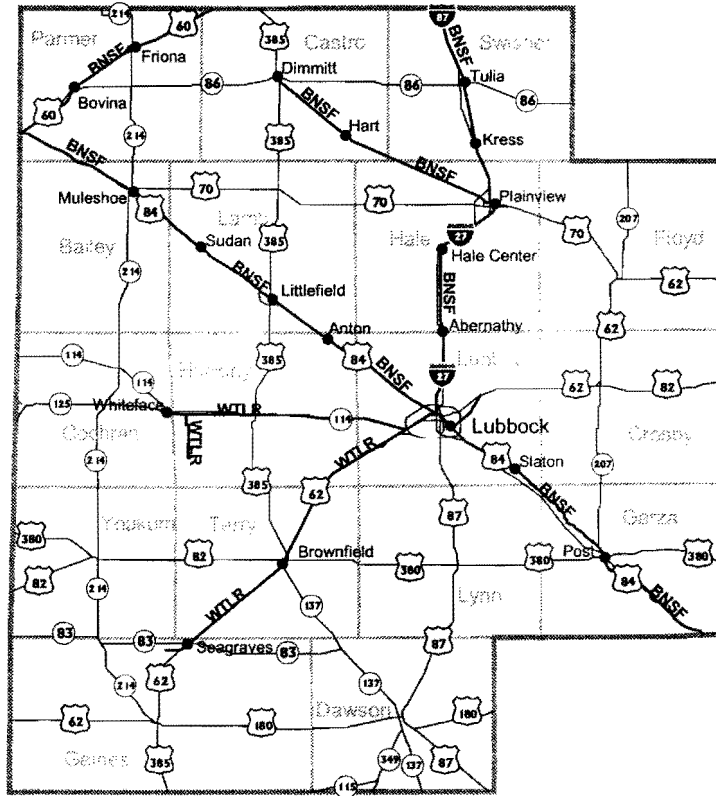


1



Figure G-14. Laredo District

Lubbock District



Map Legend

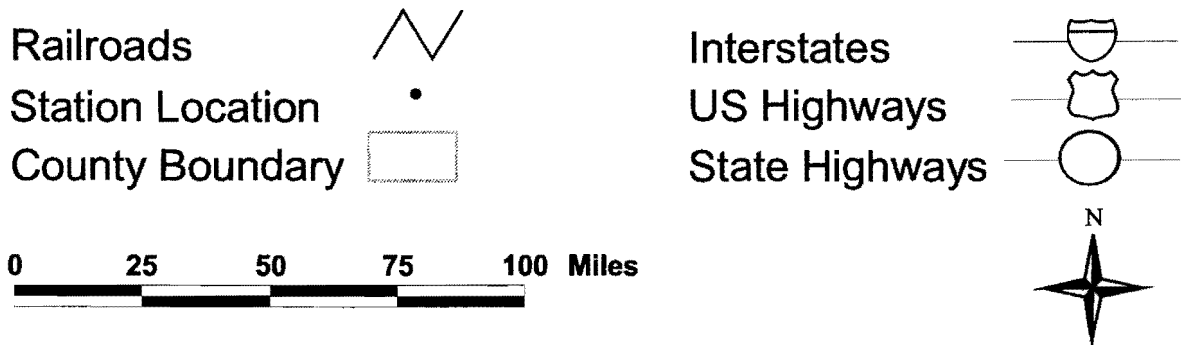


Figure G-15. Lubbock District

Lufkin District

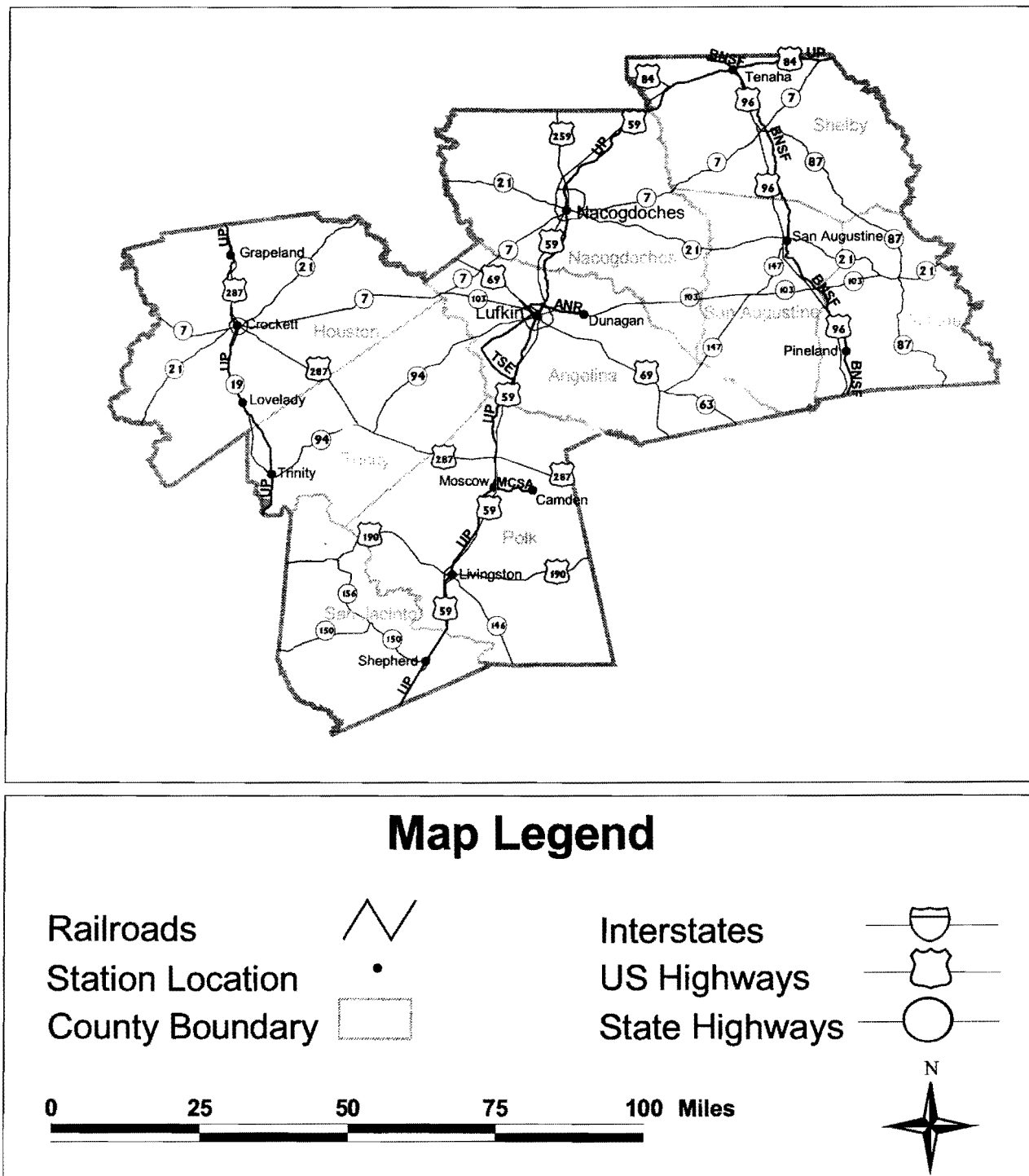


Figure G-16. Lufkin District

A detailed map of the Permian Basin region in West Texas. The map shows a network of major highways, including Interstate 20 (I-20), Interstate 40 (I-40), Interstate 69 (I-69), and various state routes like 285, 385, 115, 176, 137, 349, 174, 337, 158, 302, 119, 18, 302, 19, 349, 67, 190, 349, 90, and 10. Key cities and towns are marked, including Midland, Odessa, Pecos, Saragosa, Ft. Stockton, and Sanderson. The map also shows county boundaries and names such as Loving, Kermit, Andrews, Martin, Midland, Ector, Pecos, Hard, Crane, Upton, and Terrell. The Permian Basin is highlighted with a thick black line, and the surrounding areas are labeled with county names.

Railroads

Station Location

County Boundary

Interstates

US Highways

State Highways

0 25 50 75 100 Miles

N

G-19

Paris District

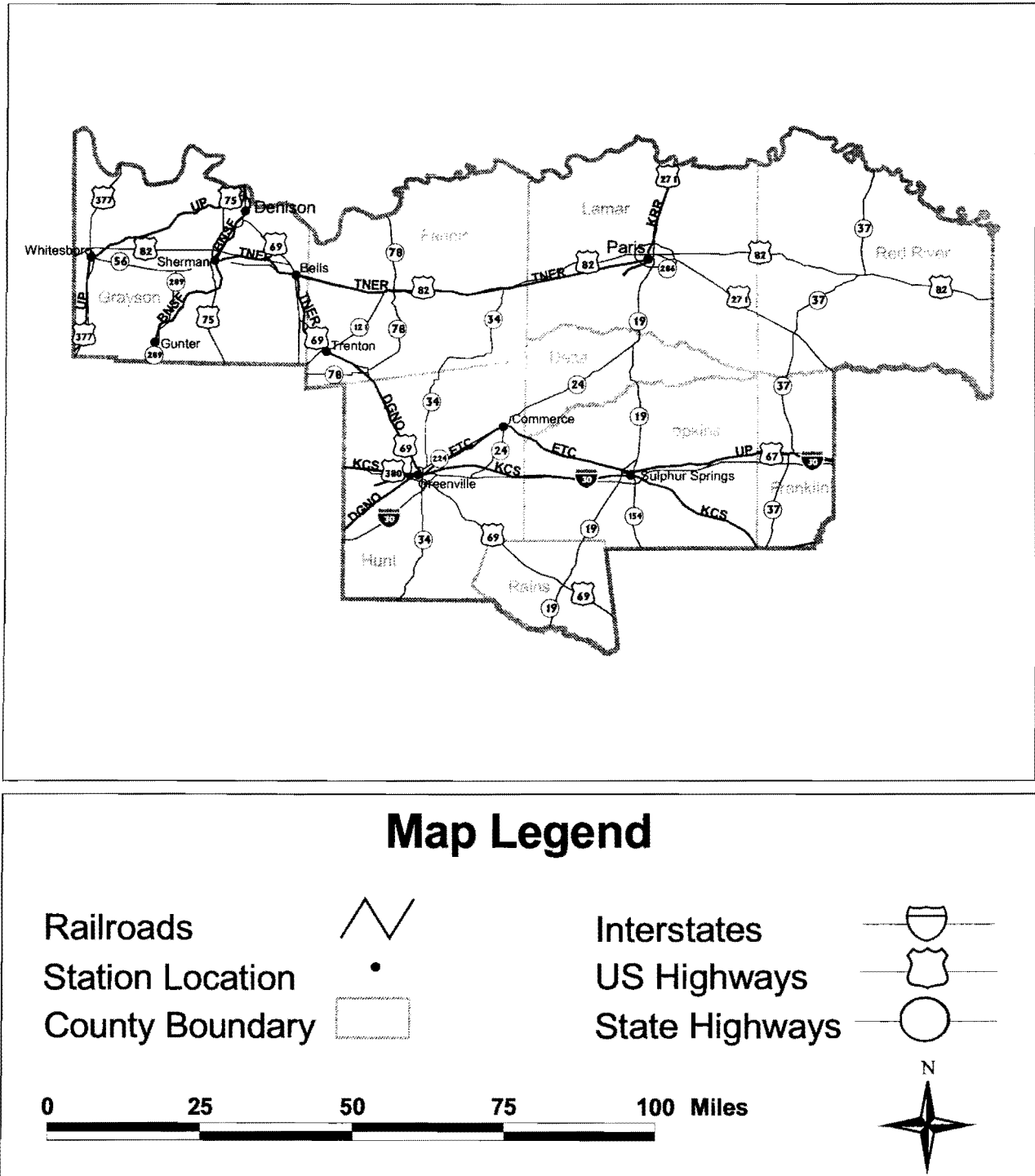
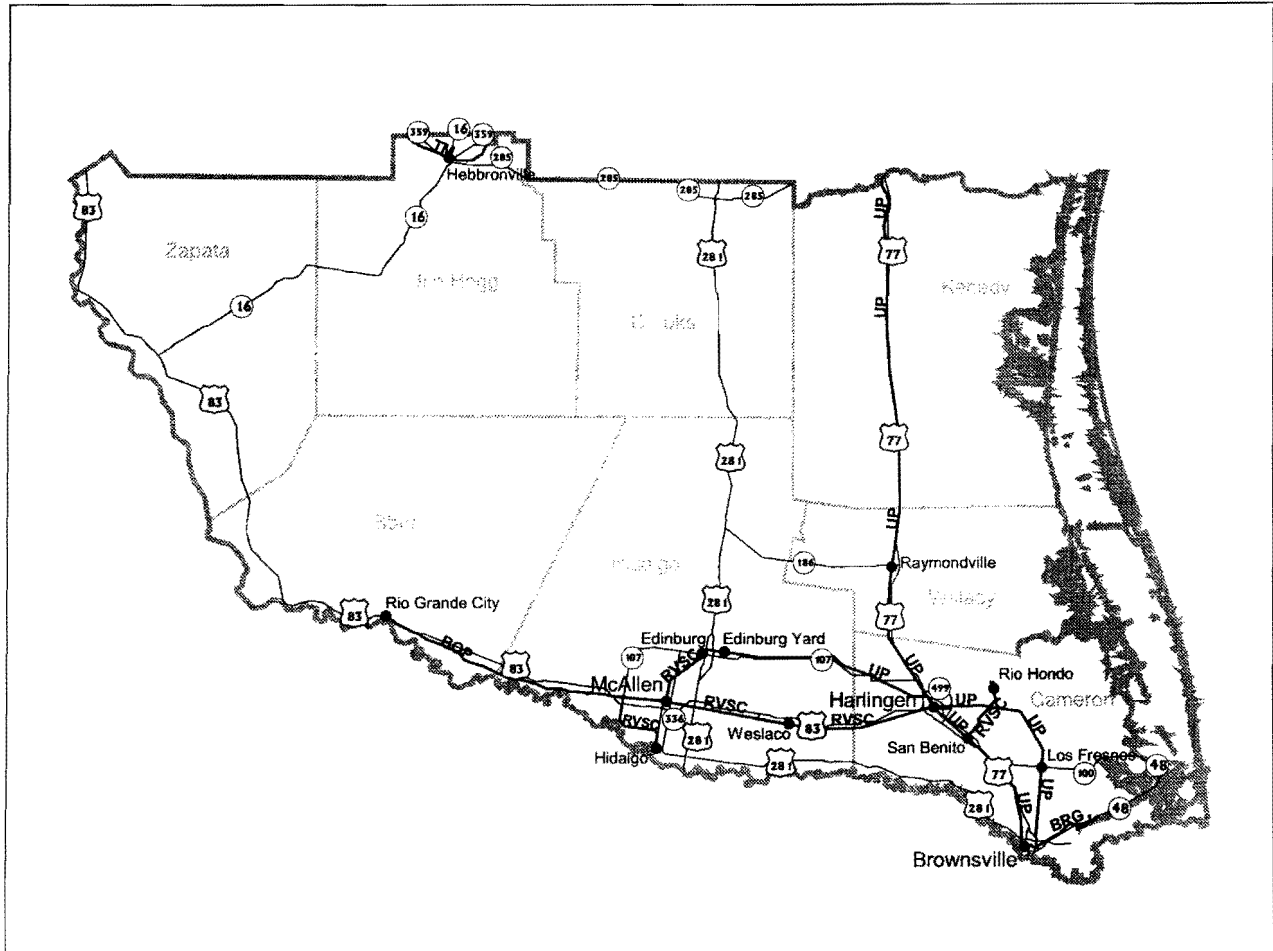


Figure G-18. Paris District

Pharr District



Map Legend

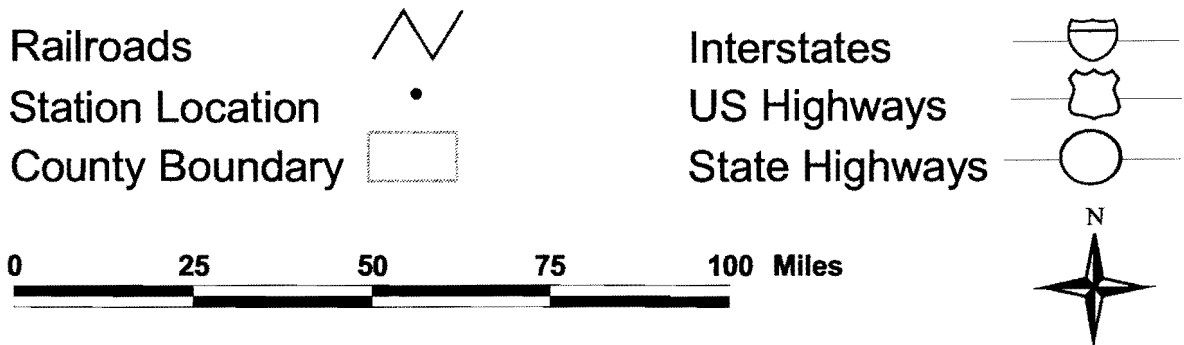


Figure G-19. Pharr District

San Angelo District

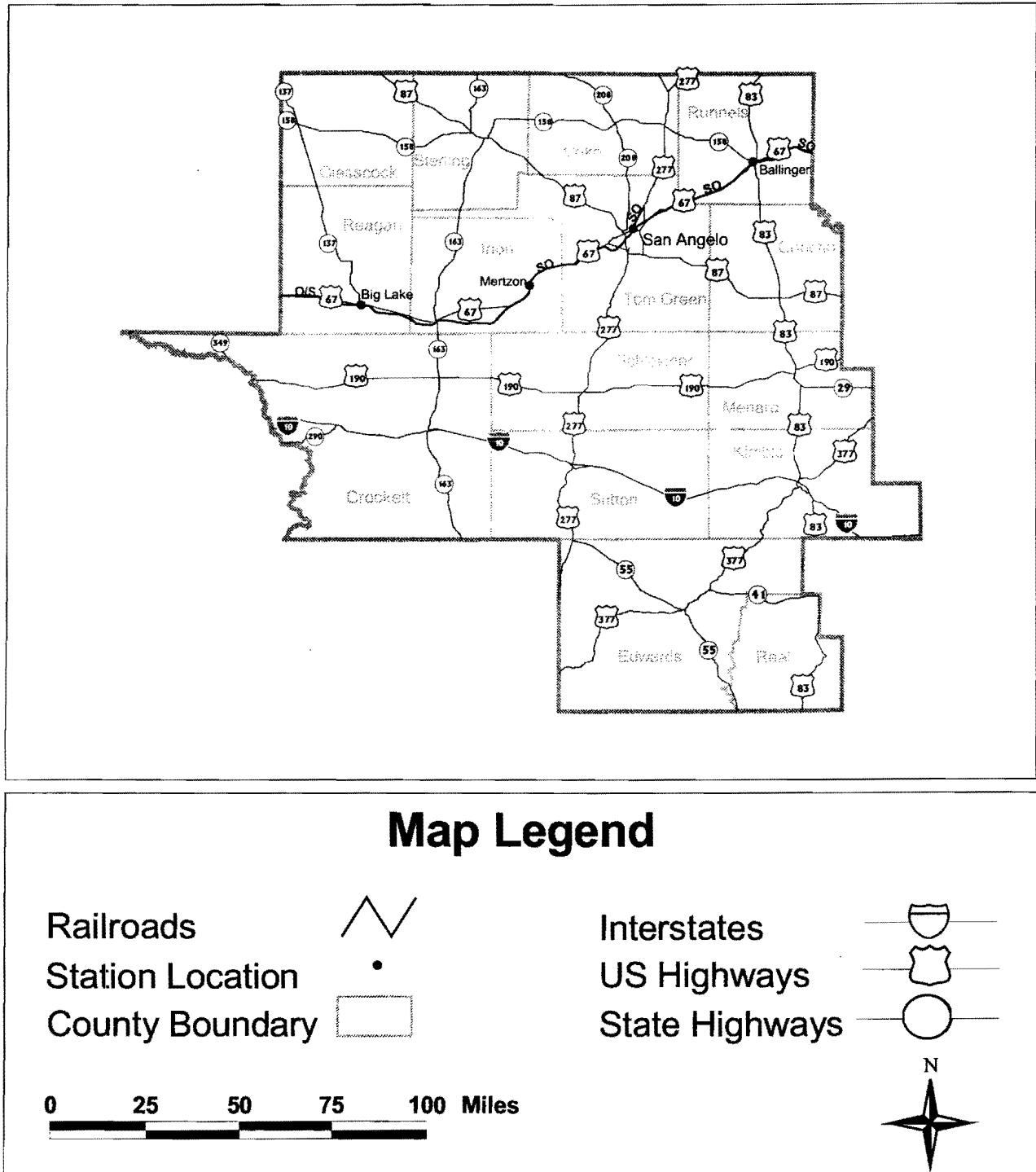


Figure G-20. San Angelo District

San Antonio District

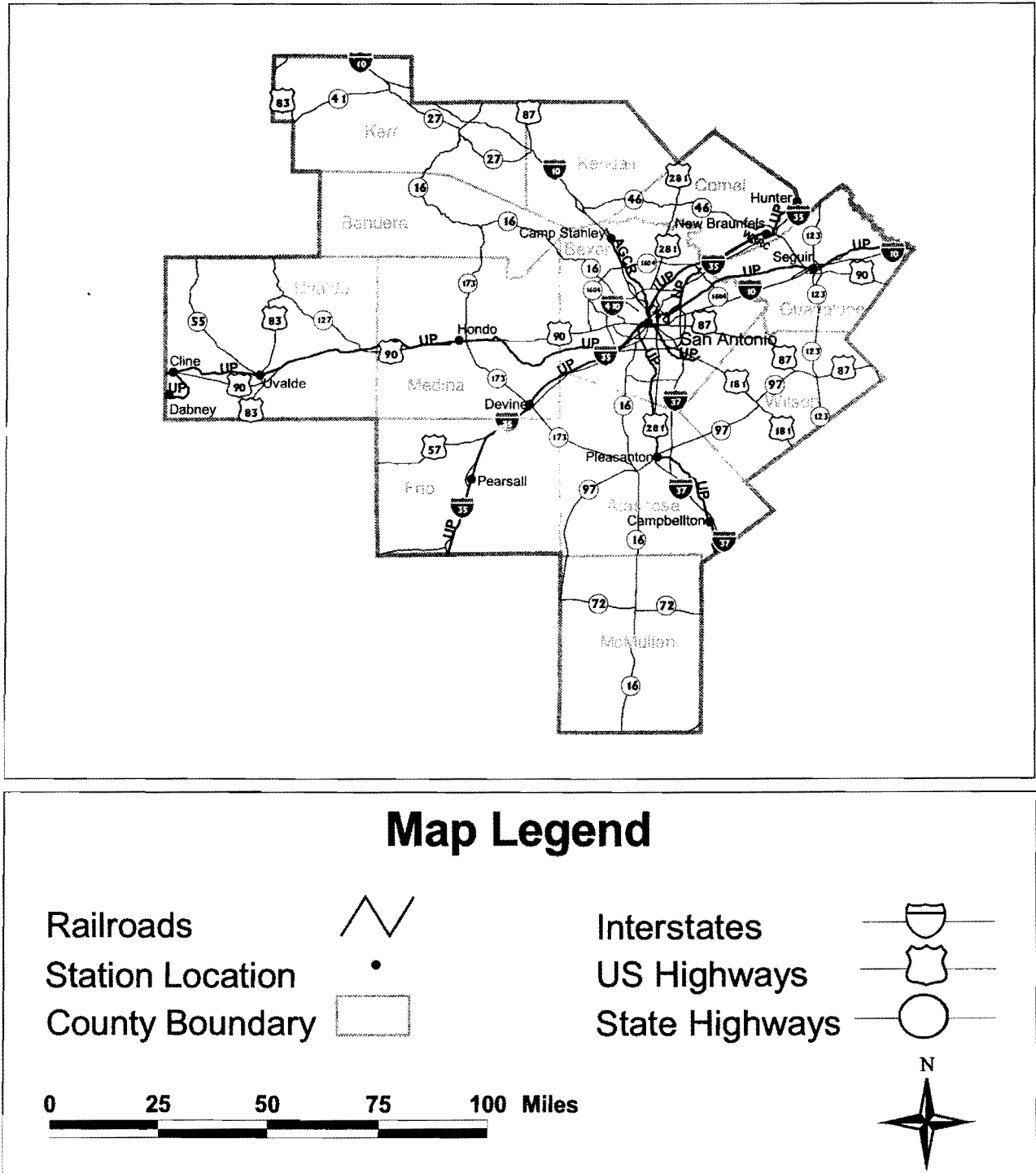
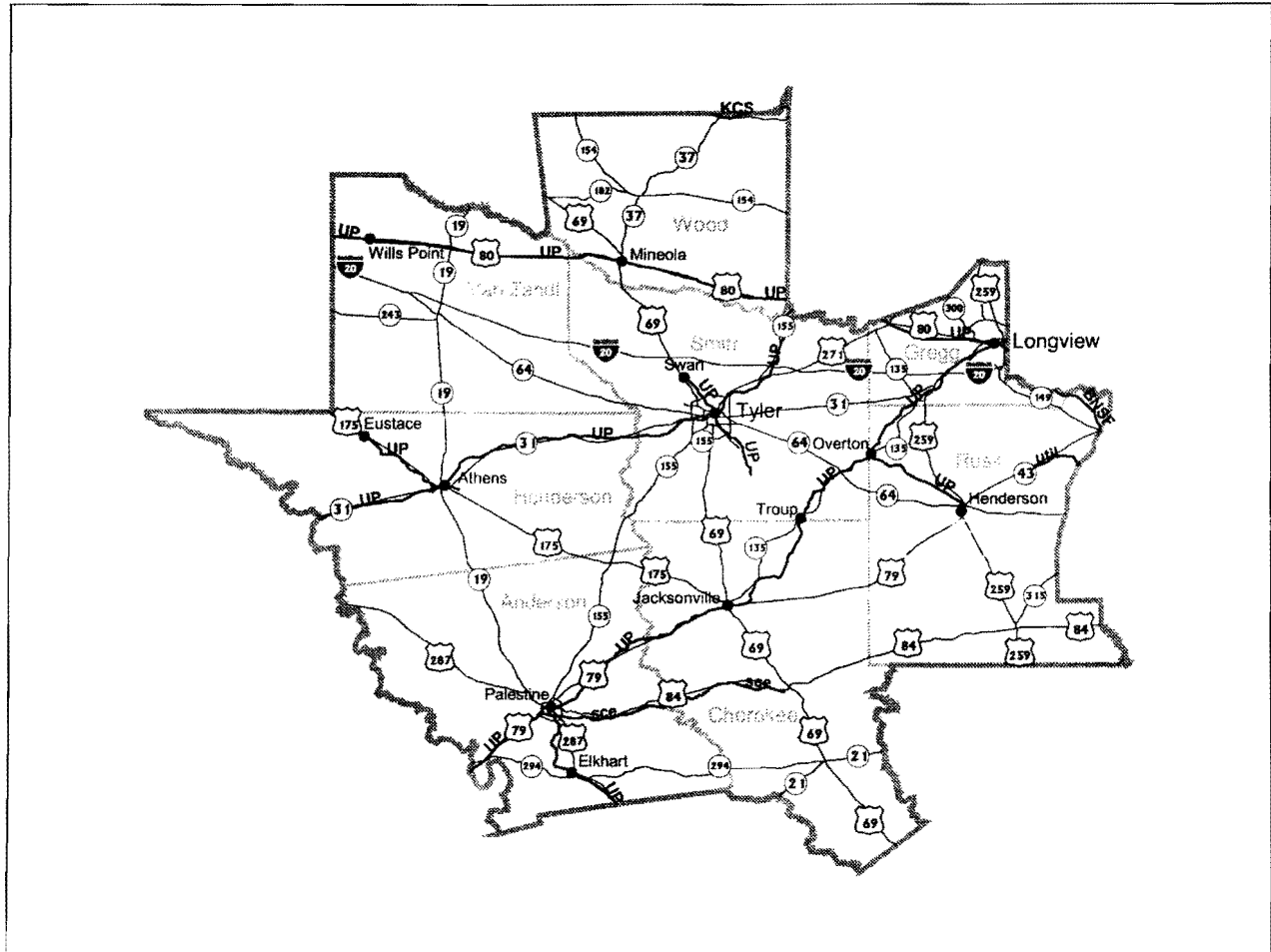


Figure G-21. San Antonio District

Tyler District



Map Legend

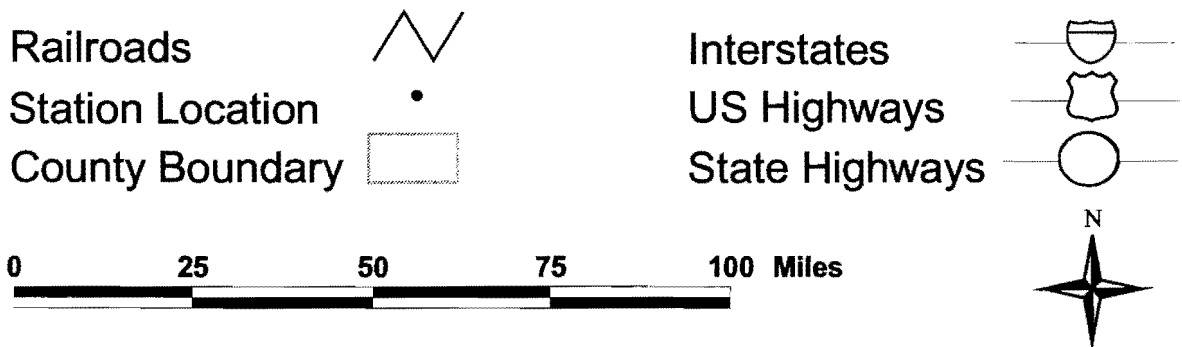
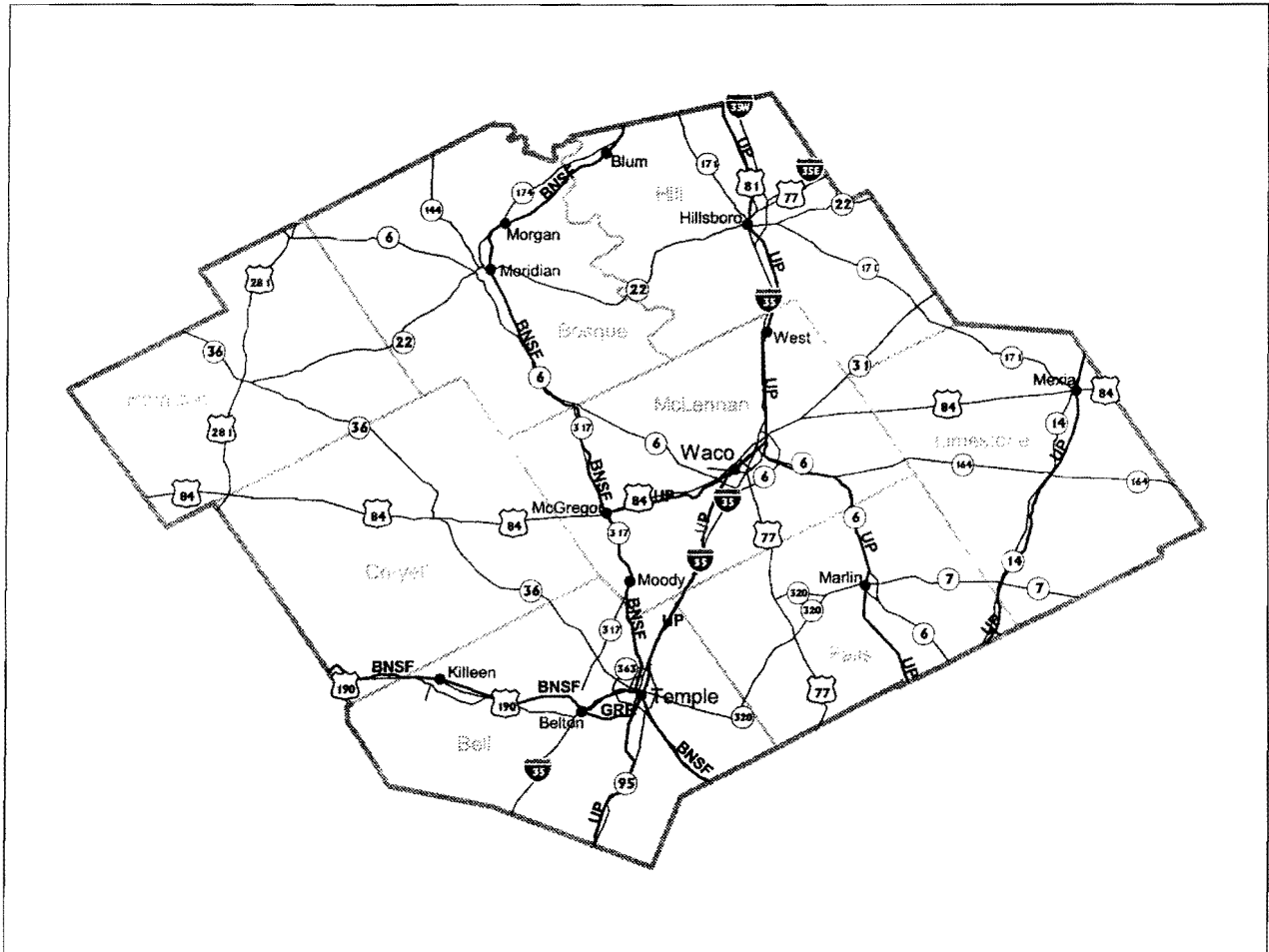


Figure G-22. Tyler District

Waco District



Map Legend

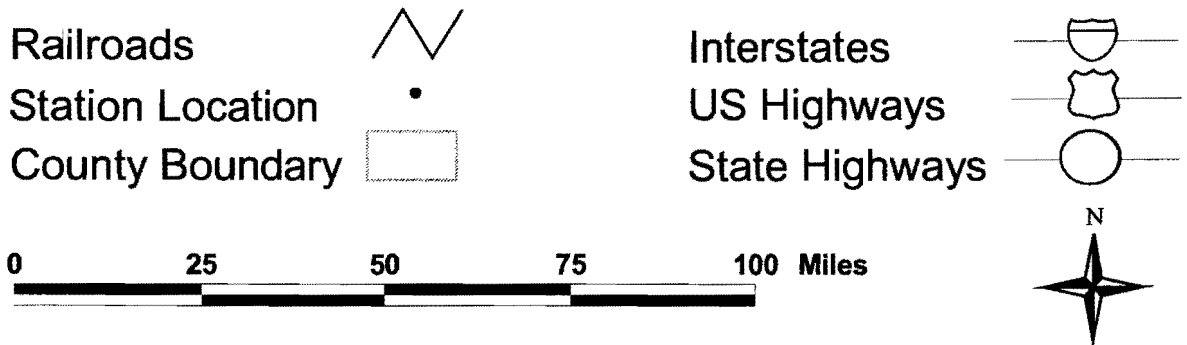


Figure G-23. Waco District

Wichita Falls District

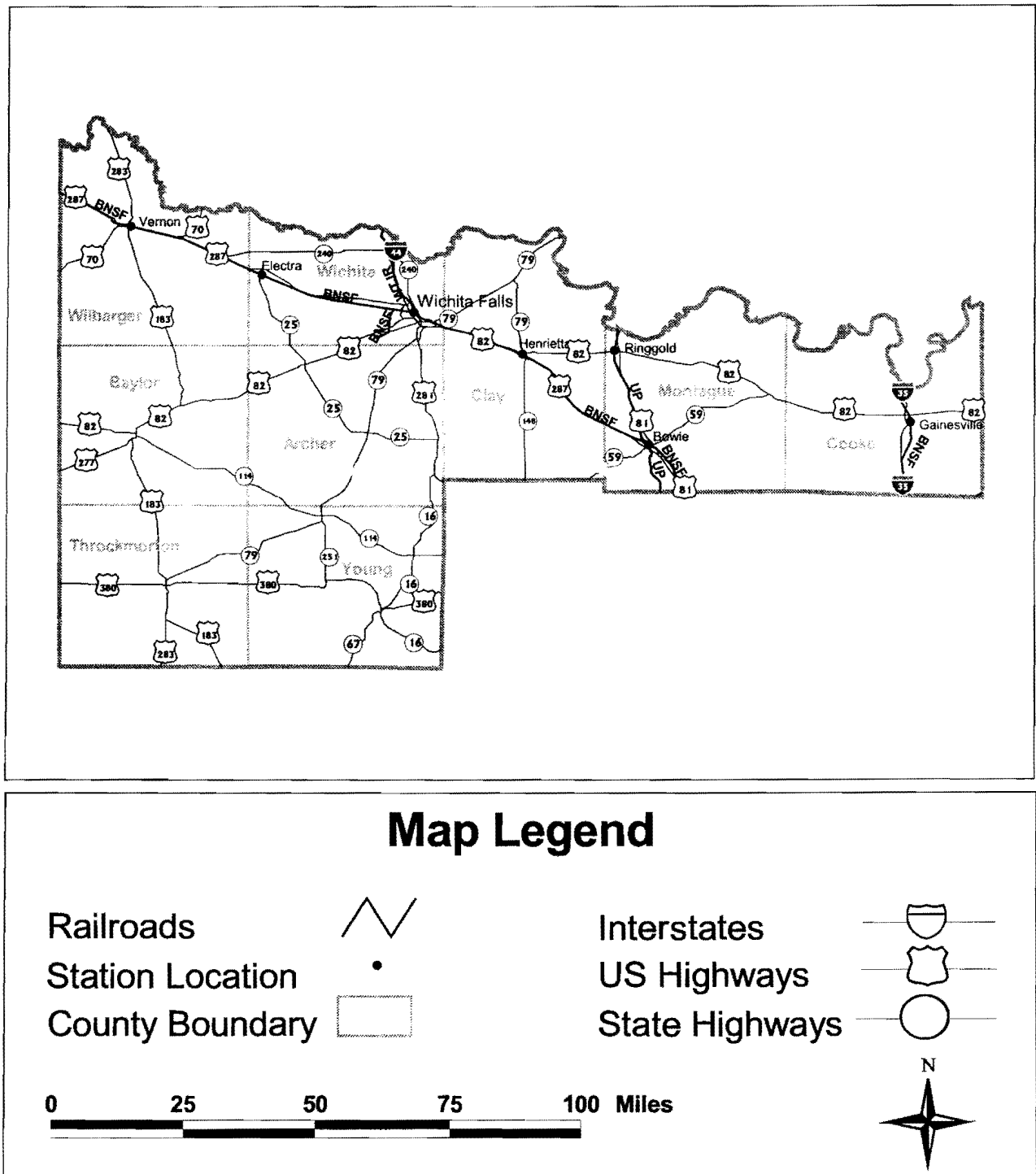
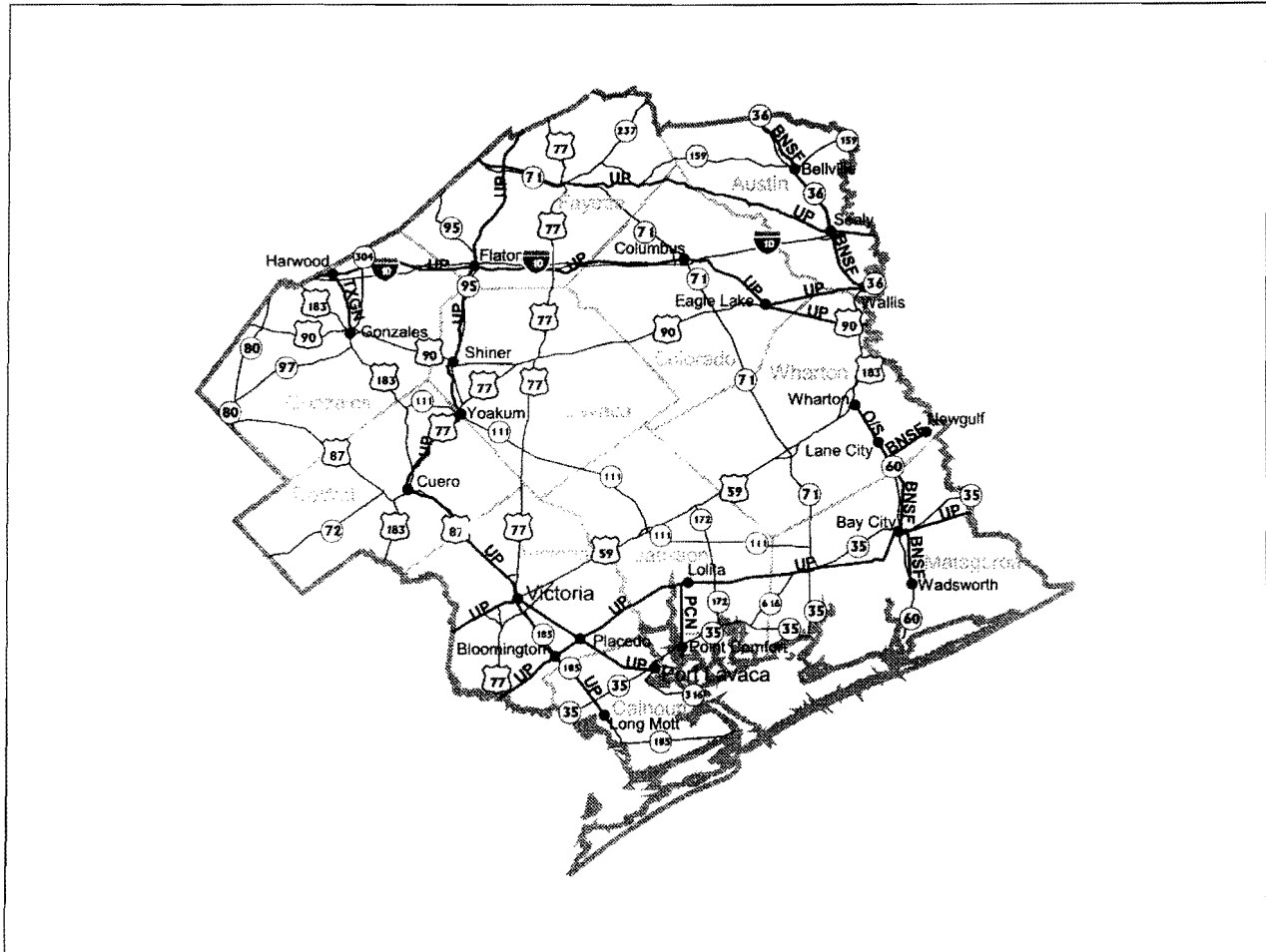


Figure G-24. Wichita Falls District

Yoakum District



Map Legend

Railroads



Station Location



County Boundary



Interstates



US Highways



State Highways



0 25 50 75 100 Miles



Figure G-25. Yoakum District