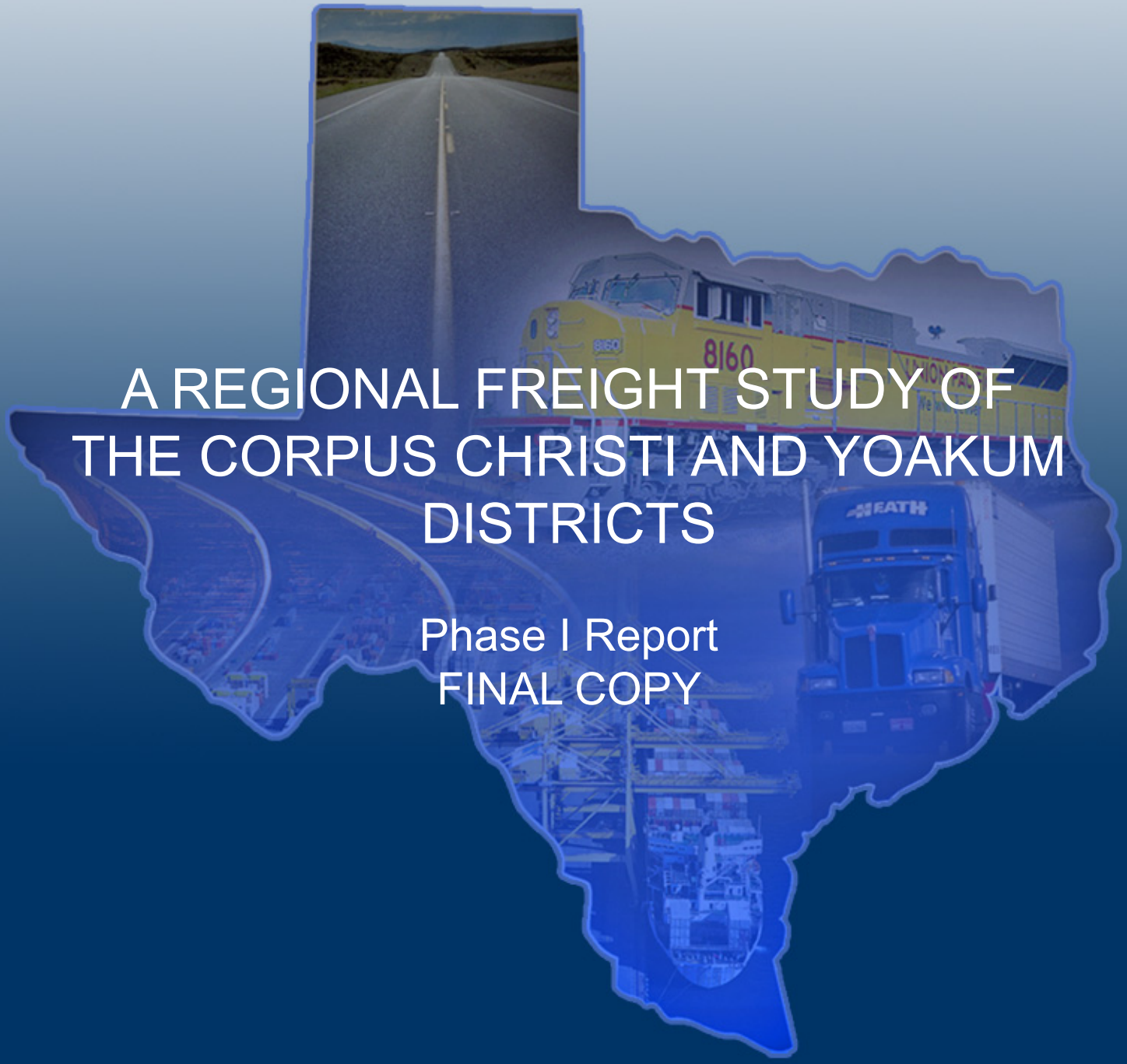

A REGIONAL FREIGHT STUDY OF THE CORPUS CHRISTI AND YOAKUM DISTRICTS

Phase I Report
FINAL COPY

Texas Department of Transportation

JACOBS™

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EXECUTIVE SUMMARY

Project Background

Strategically located as a gateway to interstate and international trade, Texas finds itself facing an unprecedented growth in trade. The ever increasing quantity of goods which move within Texas borders continues to strain the state's transportation infrastructure, already taxed by rapid population growth.

In an effort to understand the present and future impacts that increased trade flowing through Texas will have on the transportation infrastructure, the Texas Department of Transportation (TxDOT), Transportation Planning & Programming Division is conducting a series of studies providing multimodal freight movement analyses. These studies focus on geographic regions containing major trade corridors where such analyses can assist local leadership in identifying opportunities to improve efficiency in goods movement.

The TxDOT Districts of Corpus Christi and Yoakum represent one such area where a greater understanding of freight movements is desired. The combined Study Area is 17,749 square miles in size and a population of 889,862 people based on 2005 census projections. By the year 2025, census projections estimate the population within the region will have grown to nearly one million.

Purpose of Study

The continued growth in the amount of freight passing through Texas places a rapidly increasing demand on the state's transportation infrastructure. To handle this increase in freight traffic, advanced planning on both the state and local levels is required. Such planning requires an understanding of both current and projected freight volumes, as well as where the bottlenecks within the freight transportation network are found. The purpose of this study is to assemble and document such information.

This study is being conducted with the intent of addressing each of the following goals:

- To provide a better understanding of the freight movements within the region
- To assist TxDOT and the local MPO's in prioritizing specific projects
- To help rail carriers identify opportunities to improve operational efficiency
- To assist local ports in preparing for increased freight traffic
- To identify improvements that will increase public safety
- To provide the groundwork for a Regional Master Plan to promote economic growth within the region

The Corpus Christi – Yoakum Regional Freight Study will be conducted in two phases. Phase I consists of conducting an inventory of the existing freight rail network within the Study Area, creating an operational model of freight rail movements, identifying freight rail constraints and examining safety issues regarding rail/road interfaces.

Phase II of the study will focus on identifying potential projects, roadway or railway, that would help overall efficiency in freight movements within the Study Area. Rail system improvement projects will be modeled in order to determine cost/benefit ratios, and the feasibility for all projects will be examined. From this analysis a list of specific projects can be suggested.

Existing System Inventory

Within the Corpus Christi and Yoakum Districts there are approximately 812 miles of active mainline track. Nineteen of the twenty-one counties that comprise the Corpus Christi and Yoakum districts have active mainline rail within their borders. Only Bee and Karnes Counties, both within the Corpus Christi District, do not have an active mainline rail presence.

There are seven different railroads operating in the Corpus and Yoakum Districts including three Class 1 carriers, one Class 2 carrier, and three Class 3, or shortline railroads. The Class 1 carriers operating in the region include the Union Pacific, BNSF Railway and Kansas City Southern. The Texas-Mexican Railway is the lone Class 2 carrier in the region. Shortline railroads include the Point Comfort & Northern, the Texas Gonzales & Northern and the Corpus Christi Terminal Railroad.

The Union Pacific (UP) is the major Class 1 carrier within the Study Area and owns the overwhelming majority of the track found within the Corpus Christi and Yoakum Districts. While UP owns most of the track within the region, all of it was constructed by various predecessor railroads which eventually ended up under UP control.

The individual rail subdivisions owned by the UP within the Study Area include:

- **Brownsville Subdivision** – Single track connecting Brownsville/Mexican border and Bloomington.
- **Angleton Subdivision** – Single track connecting Bloomington and Houston.
- **Corpus Christi Subdivision** – Single track connecting San Antonio and Corpus Christi / Port of Corpus Christi.
- **Port Lavaca Subdivision & Port Lavaca Industrial Lead** – Single track connecting Port Lavaca and Flatonia. Sometimes referred to as the "Cuero Subdivision".
- **Kosmos Subdivision & Kosmos Industrial Lead** – Single track connecting Aransas Pass and Sinton.
- **Coleto Creek Subdivision** – Single track connecting Victoria and Coleto Creek Power Station, a coal fueled power plant.
- **Flatonia Subdivision** – Single track connecting San Antonio and Hearne.
- **Glidden Subdivision** – Single track connecting Flatonia and Houston.
- **Smithville Subdivision** – Single track connecting Katy and Smithville.
- **Seadrift Industrial Lead** – Single track connecting Bloomington and Long Mott.
- **Victoria Industrial Lead** – Single track connecting Bloomington and Victoria.
- **Celanese Industrial Lead** – Single track industrial lead tying into Angleton Subdivision near Bay City.

The UP also possesses trackage rights along the BNSF Galveston Subdivision and the Texas Gonzales & Northern Railroad.

As UP's chief Class 1 competitor within the region, the Burlington Northern Santa Fe (BNSF) Gulf Division provides rail service within and through the Corpus Christi and Yoakum Districts. Most of BNSF's activity within the Study Area is made possible by trackage rights agreements made between UP and BNSF in order to facilitate Surface Transportation Board (STB) approval of the UP-SP merger. As such, BNSF ownership of rail within the Study Area is limited.

The individual rail subdivisions owned by the BNSF within the Study Area include:

- **Galveston Subdivision** – Single track connecting Galveston and Temple.

- **Bay City Subdivision** – Single track connecting Bay City and Wadsworth.
- **Seadrift Industrial Lead** – Separate rail segment from UP's Seadrift Industrial Lead. Single track industrial lead tying into UP's Port Lavaca Subdivision near Kamey.

The BNSF also possesses trackage rights along the entire length of UP's Brownsville and Angleton Subdivisions. Additional trackage rights for BNSF exist along the UP's Corpus Christi Subdivision between Odem and the Port of Corpus Christi and along the Port Lavaca Subdivision between Placedo and Kamey.

Like the BNSF, Kansas City Southern (KCS) ownership of rail within the Study Area is limited. However, bracketing the Study Area, KCS owns two separate rail networks, one in Mexico, and one in the United States. In order to connect these two networks KCS relies on rail lines which pass through the Corpus Christi and Yoakum Districts. KCS owned rail within the Study Area is limited to the Texas Mexican Railway, a Class 2 line connecting Laredo and Corpus Christi.

Trackage rights for the KCS along UP rail include the following segments:

- Between Robstown and Placedo on the Brownsville Subdivision
- Between Placedo and Flatonia on the Port Lavaca Subdivision
- Between Flatonia and Houston on the Glidden Subdivision

The KCS is currently restoring an out of service rail segment between Victoria and Rosenberg which it will use to reduce the length KCS trains must travel along UP track. As of the writing of this report this line is not yet in service.

Three separate Class 3, or shortline, railroads have been identified within the Corpus Christi and Yoakum Districts. All three identified shortlines connect to the UP network. The shortline railroads within the Study Area include:

- **Texas Gonzales & Northern** – Single track connecting Gonzales and Harwood. Connects to UP's Flatonia Subdivision at Harwood.
- **Point Comfort & Northern** – Single track connecting Point Comfort and Lolita. Connects to UP's Angleton Subdivision at Lolita.
- **Corpus Christi Terminal Railroad** – Serves the Port of Corpus Christi. Connects to UP's Corpus Christi Subdivision and KCS/Tex-Mex line.

Amtrak's Sunset Limited route, connecting Houston and San Antonio, passes through the Study Area along UP's Flatonia and Glidden Subdivisions.

Freight Operational Study

A critical component of this Study is the development of a freight rail forecast for these two Districts. This forecast will help TxDOT develop a more detailed understanding of future demand for freight rail services in this region, identify potential infrastructure and operational chokepoints, and develop strategies to improve rail efficiency in the future.

Overall rail trade by tonnage in the study area, including inbound and outbound rail shipments for domestic and cross border trade, is expected to increase 18 percent to near 28 million tons between 2003 and 2035. By value, rail shipments are expected to increase approximately 8 percent, to $10.6 billion.

Shipments to and from the Yoakum District are expected to grow at a much faster pace than shipments to and from the Corpus Christi District, increasing from near 15 to 18 million tons (26%) and from 9 to 9.4 million tons (4%), respectively. Total shipment value is expected to grow 2 percent from $5.3 to $5.4 billion in the Yoakum District and 16 percent from $4.5 to $5.2 billion in the Corpus Christi District.

Through traffic shipments (i.e., neither originating nor terminating in the Districts) are expected to grow most significantly, by both tonnage and value. Between 2003 and 2035, through traffic shipments will grow from 9.1 to 24.5 million tons (170%) and their value is expected to rise from $9.1 to $30.0 billion (228%).

Domestic shipments in tonnage and value represent nearly 100 percent of the overall trade in 2003 and it is expected to remain so in 2035. However, through traffic (both tonnage and value) are predominantly NAFTA flows, and represent almost 80 percent by tonnage and 90 percent by value of total through traffic.

Overall growth in tonnage and value between 2003 and 2035 will be led primarily by inbound commodities. Trade of inbound commodities is forecasted to increase by nearly 32 percent by weight and 78 percent by value during that period. Outbound movements, meanwhile, are expected to decrease by about 8 percent by weight and by 9 percent by value.

Two commodities accounted for 70 percent of total tonnage traded (inbound and outbound flows): coal (40 percent) and chemical and allied products (30 percent). Chemical or allied products are the dominant commodities by value, accounting for over three-fourths of total value.

Wyoming was the region's top trading partner by weight (34% of total weight), due primarily to coal shipments from the Powder River Basin for use in the region's power plants and for export through the Port of Corpus Christi. When shipment value is considered, Texas accounts for 41 percent of total shipment value.

Base Case Operations Model

As part of this report a model simulation of the rail network within the Corpus Christi – Yoakum Districts was performed. Rail model simulation allows a user to test dynamic rail movements on a defined network. Alterations to that network, including track or operating modifications, can also be tested to understand the impact of the changes.

The simulation analysis was performed with the Rail Traffic Controller model (RTC). This model is used by both UP and BNSF for similar rail network analyses. The model performs mathematical calculations that represent trains moving throughout a network of main lines, passing tracks, yards, and junctions. The model considers track speed, train length and weight, motive power, signals, bridges, grades, train priority and other information as trains are dispatched across the network.

The normal procedure for performing a rail model simulation is to create a Base Case as the first step. The Base Case is created using data from existing operations, generally provided by one or more railroads involved in the simulation. A Base Case is created because it is used to validate that the model is accurately reflecting existing operations; it essentially calibrates the model. Generally, validation is performed by the railroad(s) involved. Operational issues that

are not accurately reflected are modified to better represent what railroad managers describe is really happening.

Typically, the information required to populate the Base Case is provided by one or more of the railroads operating the track being examined. Unfortunately, such information was not provided to assist in the preparation of this report, despite repeated requests. As such, the validity of results obtained can not be guaranteed. The results may or may not be representative of all the issues currently being experienced along the rail network within the Study Area.

Without information from the railroads or the Houston and San Antonio models traffic density maps, internet sources, public documents and knowledge of UP's system operations were used to create the operating plan. Research was performed using these various sources, and information was linked together in an attempt to define an overall picture of operations over the network. Conflicting information was rectified based upon an understanding of operations, and common sense regarding the network being studied.

All analysis and observations were based solely on the observed interaction of trains from the simulation as designed from the assumptions made. If actual UP, BNSF or KCS operations are materially different from the operating plan created for the model, the results would possibly vary.

The following paragraphs describe the operating characteristics of certain rail subdivisions and identify the capacity issues related thereto.

Brownsville Subdivision
Primary Operating Characteristics**:** Train operations are bi-directional, with connections at Bloomington to the Victoria and the Seadrift Industrial Spurs; at Sinton to the Kosmos Subdivision; at Odem to the Corpus Christi Subdivision and at Robstown to the KCS Laredo Subdivision. There are small yards serving industrial traffic at Sinton and Odem. There is a classification yard at Bloomington.

Capacity Issues Identified by Simulation: Of all subdivisions estimated to be approaching or at sustainable capacity, the Brownsville Subdivision is by far the most congested on the C-Y (Corpus Christi-Yoakum) simulation network. The Brownsville Subdivision has a Delay Ratio that was calculated to be 51% (Table 5-1). One of the primary causes of the high Delay Ratio for the Brownsville Subdivision (and for the southern portion of the Angleton Subdivision) is the yard at Bloomington. Bloomington was an area of congestion for the following reasons:

- High traffic volumes at Bloomington
- Trains ran slowly past the Bloomington Yard
- Trains stopped to pick up or set out cars or changed crews at Bloomington
- Trains entering or leaving Bloomington Yard cleared the main line slowly because of yard track speed and switch geometry

Angleton Subdivision
Primary Operating Characteristics: Train operations are bi-directional, with connections at Bay City to BNSF's Bay City Subdivision, Celanese Plastics, Abercrombie (Phillips Petroleum), Formosa Plastics, Lolita to Point Comfort and Placedo to Port Lavaca. Traffic from the Cuero Subdivision operates on the Angleton Subdivision between Placedo and Bloomington.

Capacity Issues Identified by Simulation: As shown in Table 5-2, there were minimal capacity issues between Sweeny and Vanderbilt. There were normal meet-pass delays associated with single track, however the CTC (Centralized Traffic Control) system allowed many of these meets to occur with minimal delay to trains involved.

Corpus Christi Subdivision

Primary Operating Characteristics: Train operations are bi-directional, with connections at Odem to the Brownsville Subdivision. There is a connecting track between UP's Corpus Christi Subdivision and KCS's Laredo Subdivision near downtown Corpus Christi that allows BNSF and KCS trains to move between the two subdivisions when moving between Houston and Laredo. There is a yard that serves industrial traffic at Viola.

Capacity Issues Identified by Simulation: The Corpus Christi Subdivision had a Delay Ratio of 28% during the simulation; that level was approaching the estimated sustainable capacity ratio calculated above. The largest number of major delays occurred between Campbellton and Mathis, with another large percentage occurring between Mathis and Viola.

Port Lavaca Subdivision (Flatonia to Placedo)

Primary Operating Characteristics: Train operations are bi-directional, with connections to the Flatonia and Glidden Subs at Flatonia, and the Angleton Subdivision at Placedo. There is also a connection at Victoria with the Victoria Industrial Spur. In the simulation, when traffic on the Cuero Subdivision between Victoria and Placedo became congested because of delays around Bloomington, the Victoria Industrial Spur was used to move trains from Victoria to Bloomington. This route also connects with the Coleto Creek Industrial Spur, where Coleto Creek coal trains diverge to the power plant.

Capacity Issues Identified by Simulation: The Delay Ratio for the Cuero Subdivision was 29%; this figure also approached the percentage associated with estimated sustainable capacity. The D>30 analysis indicated the delays were spread evenly throughout the subdivision.

Flatonia Subdivision (Harwood to Flatonia, Flatonia to Giddings)

Primary Operating Characteristics: Between Harwood and Flatonia, train operations are bi-directional. There is a connection to the Cuero Subdivision and the Glidden Subdivision at Flatonia.

Between Giddings and Flatonia, there is a connection to the Smithville Subdivision at West Point. Between Giddings and West Point, train operations are primarily southbound; many of the southbound trains on the Flatonia Subdivision diverge to the Smithville Subdivision at West Point. Traffic flows are bi-directional between West Point and Flatonia.

Capacity Issues Identified by Simulation: The Flatonia Subdivision had to be broken up into two different segments; first, between Giddings and Muldoon and second between Harwood and Flatonia. The two segments experienced very different traffic, and had very different results in the simulation.

Between Giddings and Muldoon, the Delay Ratio for the Flatonia Subdivision was 25%. Most of the delays were associated with delays entering the Smithville Subdivision at West Point, or waiting to get to the Cuero Subdivision at Flatonia. Since the largest percentage of traffic on this portion of the subdivision was single directional to the south, there were not many train meets to create delays.

Between Harwood and Flatonia, there was a very different traffic mix. The Flatonia Subdivision's Delay Ratio of 38% indicated a segment at or very near to sustainable capacity. For this subdivision, the primary issue is the meet-pass capability of the siding spacing. Sidings on the Flatonia Subdivision between Harwood and Flatonia and on the Glidden Subdivision between Flatonia and Lissie run between 10 and 20 miles apart. The volume of trains using the route, combined with the discrepancy of speeds between the fastest and slowest trains make meets and overtakes an issue. Further, trains entering or leaving the Subdivision at Flatonia (from both the Glidden and the Cuero Subs) had an effect on through movements between Flatonia and Harwood.

Glidden Subdivision (Flatonia to Lissie)

Primary Operating Characteristics: Train operations are bi-directional, with connections to the Cuero and Flatonia Subs at Flatonia. KCS trackage right trains operate from Houston via the Giddings Subdivision to Flatonia, then turn south towards Placedo, Bloomington and Corpus Christi.

Capacity Issues Identified by Simulation: The Glidden Subdivision experienced many of the same delay patterns that the east-west portion of the Flatonia Subdivision experienced. This is not surprising because the two connect to each other at Flatonia; many of the trains from one subdivision continue onto the other. Siding spacing on the Glidden Subdivision is approximately the same as on the Flatonia Subdivision; for the simulation, this developed a Delay Ratio of 33%. This ratio indicates the Glidden Subdivision is also approaching its sustainable capacity.

Galveston Subdivision (BNSF between Wallis and Bellville)

Primary Operating Characteristics: Train operations are bi-directional, with a connection to the Smithville Subdivision at Sealy. Some of UP westbound traffic moving towards San Antonio utilized the Galveston Subdivision between Rosenberg and Sealy, leaving the Galveston Subdivision at Sealy to move towards Smithville.

Capacity Issues Identified by Simulation: The length of the Galveston Subdivision in the simulation was too short to perform any meaningful analysis.

Laredo Subdivision (KCS Matthews to Corpus Christi)

Primary Operating Characteristics: Train operations are bi-directional, with a connection to UP's Brownsville Subdivision at Robstown. Also, a connection to UP's Corpus Christi Subdivision near KCS's Corpus Christi Yard that allows KCS and BNSF trains to move between Odem and Laredo via Corpus Christi. BNSF operates on trackage rights to Laredo on the Laredo Subdivision.

Capacity Issues Identified by Simulation: The Laredo Subdivision had a Delay Ratio of 30%, apparently approaching the estimated value that would indicate that the subdivision was nearing sustainable capacity. The area that experienced the greatest number of delays was between Banquete and the UP crossing at Robstown.

Smithville Subdivision (Smithville to Katy)

Primary traffic flows: Between Katy and West Point, train operations were bi-directional with connections to the Flatonia Subdivision at West Point and BNSF's Galveston Subdivision at Sealy.

Southbound LCRA coal trains and rock trains from the Giddings Subdivision operate eastbound on the Smithville Subdivision from West Point. Some UP westbound trains operate on the BNSF from Rosenberg (south of Wallis) to Sealy and then enter the Smithville Subdivision to operate to San Antonio.

Between West Point and Smithville, trains primarily run westbound from West Point towards Smithville. Many southbound merchandise and intermodal trains from the Giddings Subdivision turned west at West Point to operate to San Antonio and beyond.

Capacity Issues Identified by Simulation: The Delay Ratio for the Smithville Subdivision was 13%. This would indicate there are minimal capacity concerns based upon the way the route is currently operated.

With directional traffic running to the west from West Point, there are few meets and passes. There are more delays between West Point and Sealy, because of the bi-directional traffic moving towards Katy and coming from Sealy. Table 5-8 shows the increase in major delays on that segment; however, the absolute number is still relatively small.

East of Sealy, there is limited capacity to meet or pass a full size train. Locals switching industry between Sealy and Katy held the main line in the simulation; if there was another train destined to Katy, it waited at or west of Sealy. In actual operations, a small local might clear into an industry track to allow a rock train to arrive or depart.

Based upon the simulation performed the following conclusions were developed:

- Capacity improvements could be designed for the Brownsville Subdivision to improve existing rail flows. Two areas should be focused on; the Bloomington Yard and the main line between Inari and Odem.
- The Angleton Subdivision is approaching a level of capacity utilization that may also require mitigation. The southern end of the subdivision would be the area to focus on.
- The east – west portion of the Flatonia Subdivision and the Glidden Subdivision are also approaching a level of utilization that may require mitigation. Projects on these two subdivisions should be tested assuming KCS rebuilds the Rosenberg to Victoria line segment, and moves their Corpus Christi and Laredo traffic onto that line. Removal of that traffic may improve the Flatonia and Glidden Subs to a point where mitigation is not required.
- The other subdivisions in the Corpus – Yoakum Freight Districts are not currently in need of capacity mitigation.
- Some measures of capacity utilization can be misleading without putting in context how the measures were developed. Multiple measurements and thorough analysis of why the numbers developed as they did must be considered before conclusions about capacity utilization can be reached.

Freight Rail and Rail/Roadway Interface Safety Issues

The Texas Legislature first authorized a rail safety program in 1983, with implementation duties residing with the Texas Railroad Commission (RRC). The rail safety program focused on

enforcement of federal and state safety standards covering track, equipment, warning devices, operations, and movement of hazardous materials. Further action by the Texas Legislature transferred these duties from the RRC to TxDOT, effective October 1, 2005.

In addition to the regulatory functions, TxDOT is also actively involved in promoting safety through a variety of public information campaigns such as Operation Lifesaver. Operation Lifesaver is a non-profit organization focused on informing the public as to the dangers of highway-rail crossings, as well as other initiatives to make the railways safer for all.

In order to understand the rail/roadway safety issues within the Corpus Christi and Yoakum Districts, this report examines historical accident data kept by the Federal Railroad Administration. Records for the years 2003 through 2007 were collected and examined for preparation of this report.

During the period from 2003 to 2007, there were 101 highway/rail incidents within the 21 counties that comprise the Study Area. There were 14 fatalities and 52 injuries that resulted from these incidents.

Fifty-three incidents occurred in the Corpus Christi District during the five year study period. Prior to collecting the accident data, it was expected that the highest concentration of incidents would be located in Nueces County since Nueces County contains the largest population within the district, and also has the most grade crossings and greatest length of active mainline track. However, Jim Wells County actually recorded the largest number of incidents, 20 in total. Nueces County ranked second within the Corpus Christi District with 15 incidents reported during the study period. Of the remaining incidents that occurred within the Corpus Christi District, most occurred in Refugio and San Patricio counties, each of which recorded 7 incidents. The counties of Aransas, Bee, Goliad and Karnes experienced no highway/rail incidents during the five year study period. The five year data set does not indicate any continuous trend of highway-rail incidents, neither increasing nor decreasing. Between 2003 and 2007, the number of incidents per year is 8, 14, 8, 16 and 7.

Forty-eight highway/rail incidents occurred in the Yoakum District. Matagorda and Victoria Counties experienced 10 incidents each, which led the Yoakum District. The next largest count of incidents occurred in Colorado County. The remaining 19 incidents are spread relatively evenly across the remaining 8 counties in the district, with each experiencing between 1 and 4 incidents. As with the Corpus Christi District, the five year data set does not indicate a constant increasing or decreasing trend. From 2003 to 2005 the number of incidents were 7, 5 and 7, yet in 2006 the number of incidents jumped to 17. The number of incidents fell to 12 in 2007, still well above the trend observed in the early years of the study period.

Historical data for train accidents has also been collected and studied for this report. As with highway-rail incidents, Texas is also the state in which the most train accidents occurs. There were 29 train accidents in the Corpus Christi District over the 5 year study period. The overwhelming majority of these accidents, 21 of the 29 total, occurred in Nueces County. No accidents were reported in Aransas, Bee, Jim Wells, Karnes and Kleberg Counties. The remaining counties in the district, Goliad, Live Oak, Refugio & San Patricio, experienced 1 to 3 accidents each.

Combined, the 29 accidents which occurred in the district accounted for $2,571,069 in reportable damage, an average of $88,657 per accident. Twenty-six of the 29 incidents involved a derailment. The leading cause of accidents was reported to be the track, which was

listed as the primary cause in 17 of the 29 accidents. Five of the 29 accidents were found to be caused by human error, 1 was related to equipment and 6 related to other causes.

The Yoakum District experienced 44 train accidents over the 5 year study period. Victoria County led the district in number of accidents with 13. Colorado County experienced 8, and Austin and Fayette Counties experienced 7 each. Calhoun, Gonzales, Jackson and Matagorda Counties experienced between 1 and 5 accidents each. Three counties, DeWitt, Lavaca and Wharton, did not experience any train accidents during the study period.

The 44 accidents in the Yoakum District accounted for $5,422,072 in reportable damage, an average of $123,229 per accident. A derailment occurred in 36 of the 44 accidents. Similar to the findings in the Corpus Christi District, the track was found to be the leading cause of accidents in the Yoakum District, accounting for 20 of the 44 accidents. Human error was found to have caused 12 accidents, 6 accidents were caused by equipment and 6 were due to other causes.

Five year historical data for trespasser fatalities and injuries were also collected for this report. Trespasser incidents are tracked separately from highway-rail incidents. Trespasser incidents involve only those persons injured or killed while illegally on private railroad property. The data reflects sporadic incidents with no clear trends. The Yoakum District experienced more fatalities and injuries than the Corpus Christi District, but this is not an unexpected result as the Yoakum District contains more rail than the Corpus Christi District. During the 5 year study period there were 2 deaths and 10 injuries in the Corpus Christi District and 7 deaths and 15 injuries in the Yoakum District.

Rail incidents involving hazardous materials merit special attention due to the dangers posed to the general public as well as first responders. The first responders to such incidents are usually members of the local fire department. Railroads, local governments, industry members and national organizations such as TRANSCAER all provide education and training for first responders. At the local level, every county in the Study Area is involved in a Local Emergency Planning Committee (LEPC) to assist in education and coordination efforts. CHEMTREC (**Chem**ical **Tr**ansportation **E**mergency **C**enter) is a 24 hour hotline dedicated to assisting responders in obtaining emergency response information for chemical releases.

A valuable resource in the handling of HAZMAT incidents is the Emergency Response Guidebook (ERG). The ERG is intended to serve as a quick reference guidebook to assist first responders in identifying the hazardous material involved, and how to protect themselves and the general public during the initial response period of the incident.

During the 5 year study period there has not been a rail-related hazardous material release in either the Corpus Christi or Yoakum Districts. In the Corpus Christi District 14 rail cars carrying hazardous materials have been part of trains involved in rail incidents, with only 1 car being damaged. In the Yoakum District 173 rail cars have been part of trains involved in incidents, with 14 of those cars being damaged.

SECTION 1 - PROJECT BACKGROUND

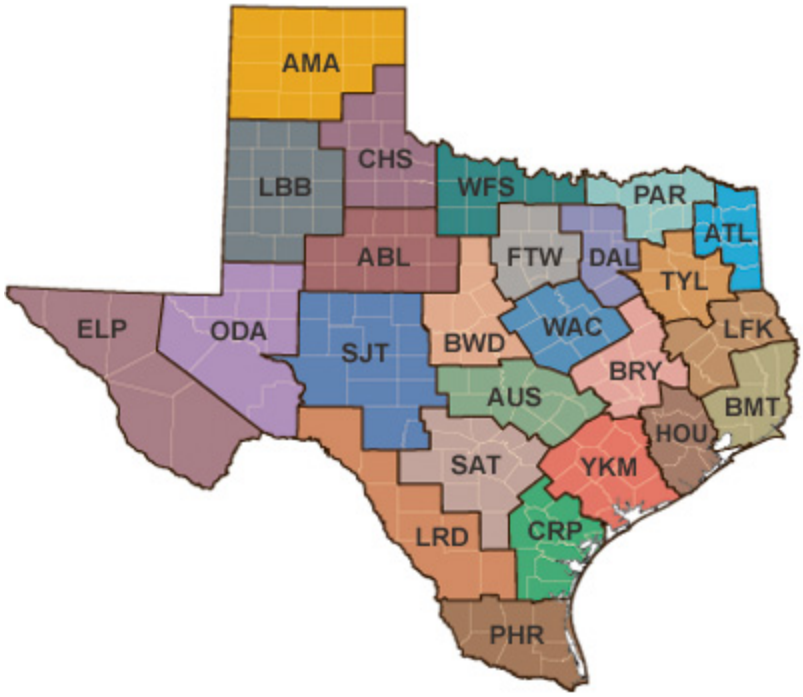
Strategically located as a gateway to interstate and international trade, Texas finds itself facing an unprecedented growth in trade. The ever increasing quantity of goods which move within Texas borders continues to strain the state's transportation infrastructure, already taxed by rapid population growth. According to a TxDOT report delivered to the Texas Legislature, freight tonnage along Texas highways and railroads is projected to grow 85% and 68% respectively over the next 20 years.[1]

In an effort to understand the present and future impacts that increased trade flowing through Texas will have on the transportation infrastructure, the Texas Department of Transportation (TxDOT), Transportation Planning & Programming Division is conducting a series of studies providing multimodal freight movement analyses. These studies focus on geographic regions containing major trade corridors where such analyses can assist local leadership in identifying opportunities to improve efficiency in goods movement.

The TxDOT Districts of Corpus Christi and Yoakum represent one such area where a greater understanding of freight movements is desired. Surrounded by the Gulf of Mexico, Houston, San Antonio, and the Mexican border, the Corpus Christi and Yoakum Districts represent an important crossroads along north-south and east-west trade corridors.

Figure 1-1 shows Texas and the individual TxDOT districts. The Corpus Christi and Yoakum Districts are abbreviated "CRP" and "YKM" respectively.

Figure 1-1 TxDOT District Boundaries



[1] Pg 9, Meeting The Texas Transportation Challenge. Report delivered to 80th Texas Legislature, 2006.

The Corpus Christi District, shown in Figure 1-2, encompasses a 10 county area. The counties making up the district are Aransas, Bee, Goliad, Jim Wells, Karnes, Kleberg, Live Oak, Nueces, Refugio and San Patricio. In 2005, the estimated population within the Corpus Christi District was 559,192. Approximately half of that population resides within the city limits of Corpus Christi, which has a 2005 estimated population of 282,972. Approximately the size of Massachusetts, the Corpus Christi District is 7,806 square miles in size.

Figure 1-2 Corpus Christi District

The Yoakum District, shown in Figure 1-3, consists of 11 counties including Austin, Calhoun, Colorado, DeWitt, Fayette, Gonzales, Jackson, Lavaca, Matagorda, Victoria and Wharton. As of 2005 the estimated population within the Yoakum District was 330,670. The largest metropolitan area within the Yoakum District is the City of Victoria, which in 2005 had an estimated population of 60,603. The Yoakum District is 9,943 square miles in size, approximately the size of Maryland.

Figure 1-3 Yoakum District

The combined Study Area is 17,749 square miles in size and a population of 889,862 people based on 2005 census projections. By the year 2025, census projections estimate the population within the region will have grown to nearly one million.

The anticipated growth in both population and trade within the Corpus Christi and Yoakum Districts has already spurred activity from state, county and local leaders to act in addressing these transportation needs. While roadway projects, ranging in size from improvements to local arterials to the proposed I-69 corridor, tend to be the most commonly thought of solution to transportation problems, freight rail offers several inherent advantages in moving goods when compared to placing additional trucks on the roads.

With six separate Rural Rail Transportation Districts (RRTD's) within the Study Area, the importance placed on rail transportation within the region is evident. Through authority to issue bonds and eminent domain powers, these districts exist to preserve local rail infrastructure through acquisition of lines that may be abandoned or to develop rail to serve industrial parks, intermodal facilities and transloading facilities. Nueces, San Patricio, Calhoun, Matagorda and Live Oak and Karnes have formed RRTD's.

Ports play a vital role in the local economy and the Ports of Corpus Christi, Port Lavaca-Point Comfort and Victoria are all expecting significant growth in trade. Already one of the ten busiest ports in the U.S. (by tonnage), the Port of Corpus Christi is undertaking multiple large scale project initiatives in order to handle increased trade activity.

For the benefit of the region as a whole, a better understanding as to the ability of the transportation infrastructure to handle increased freight volumes is necessary. It is with that intention that the TxDOT Multimodal section has commissioned this study.

SECTION 2 - PURPOSE OF STUDY

The continued growth in the amount of freight passing through Texas places a rapidly increasing demand on the state's transportation infrastructure. To handle this increase in freight traffic, advanced planning on both the state and local levels is required. Such planning requires an understanding of both current and projected freight volumes, as well as where the bottlenecks within the freight transportation network are found. The purpose of this study is to assemble and document such information.

This study is being conducted with the intent of addressing each of the following goals:

- To provide a better understanding of the freight movements within the region
- To assist TxDOT and local Metropolitan Planning Organizations (MPO's) in prioritizing specific projects
- To help rail carriers identify opportunities to improve operational efficiency
- To assist local ports in preparing for increased freight traffic
- To identify improvements that will increase public safety
- To provide the groundwork for a Regional Master Plan to promote economic growth within the region

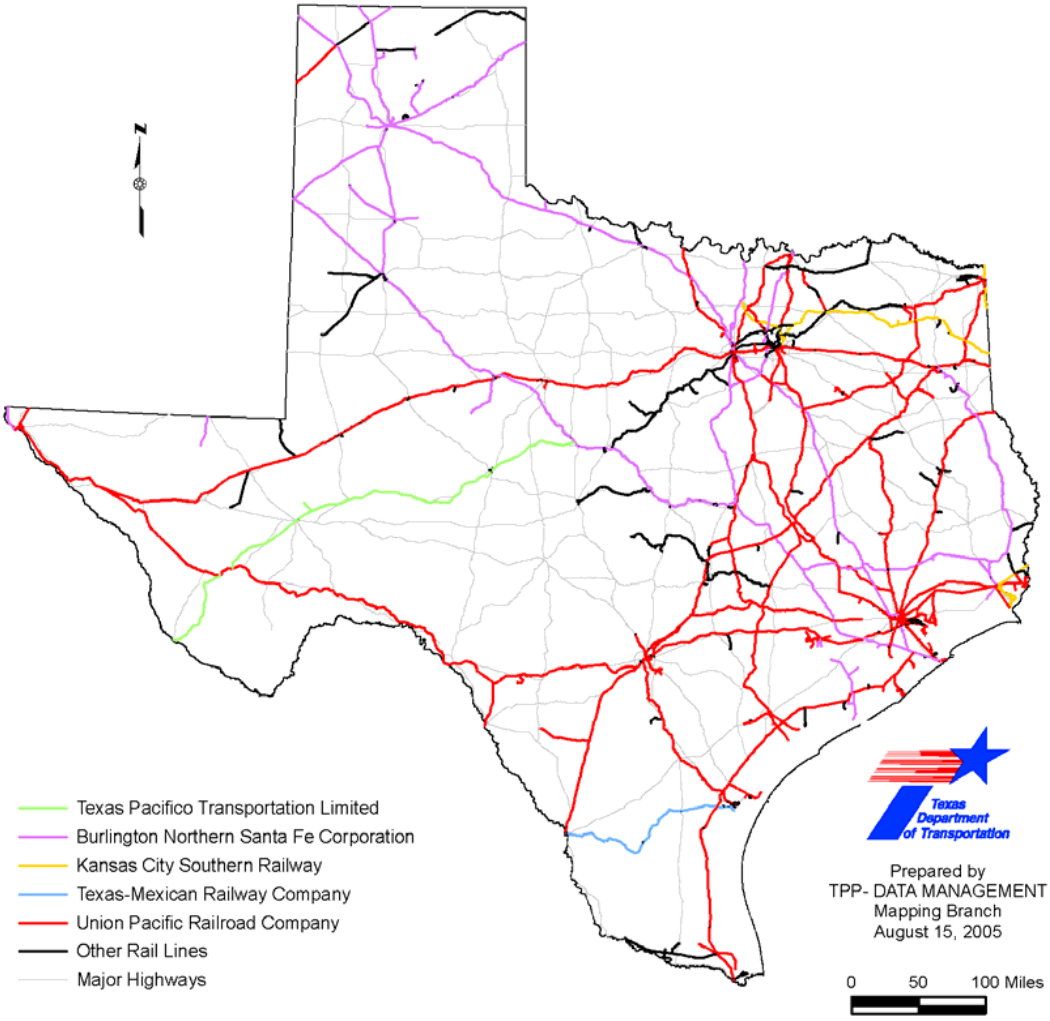
The Corpus Christi – Yoakum Regional Freight Study will be conducted in two phases. Phase I consists of conducting an inventory of the existing freight rail network within the Study Area, creating an operational model of freight rail movements, identifying freight rail constraints and examining safety issues regarding rail/road interfaces.

Phase II of the study will focus on identifying potential projects, roadway or railway, that would help overall efficiency in freight movements within the Study Area. Rail system improvement projects will be modeled in order to determine cost/benefit ratios, and the feasibility for all projects will be examined. From this analysis a list of specific projects can be suggested.

SECTION 3 - EXISTING SYSTEM INVENTORY

The freight rail network within Texas is extensive. There are 10,386 miles of track inside Texas, more than any other state by over 3,000 miles. According to data provided by the American Association of Railroads, in 2005 there were 44 separate railroads operating in the state[2].

Figure 3-1 Texas Rail Network



Source: Texas Rail System Plan

Within the Corpus Christi and Yoakum Districts there are approximately 812 miles of active mainline track. Nineteen of the twenty-one counties that comprise the Corpus Christi and Yoakum districts have active mainline rail within their borders. Only Bee and Karnes Counties, both within the Corpus Christi District, do not have an active mainline rail presence.

Tables 3-1 and 3-2 show the distance of mainline rail by county for both the Corpus Christi and Yoakum districts.

[2] http://www.aar.org/PubCommon/Documents/AboutTheIndustry/RRState_Rankings.pdf

Table 3-1
Mainline Rail by County - Corpus Christi District

County	Mainline Rail
Aransas	2.24
Bee	0
Goliad	3.17
Jim Wells	14.00
Karnes	0
Kleberg	21.38
Live Oak	47.40
Nueces	97.70
Refugio	36.89
San Patricio	76.41
Total	**299.19**

Table 3-2
Mainline Rail by County - Yoakum District

County	Mainline Rail
Austin	71.14
Calhoun	41.52
Colorado	43.12
DeWitt	29.67
Fayette	87.31
Gonzales	38.10
Jackson	24.79
Lavaca	22.90
Matagorda	52.41
Victoria	89.85
Wharton	12.39
Total	**513.20**

There are seven different railroads operating in the Corpus and Yoakum Districts including three Class 1 carriers, one Class 2 carrier, and three Class 3, or shortline railroads. The Class 1 carriers operating in the region include the Union Pacific, BNSF Railway and Kansas City Southern. The Texas-Mexican Railway is the lone Class 2 carrier in the region. Shortline railroads include the Point Comfort & Northern, the Texas Gonzales & Northern and the Corpus Christi Terminal Railroad.

Most of the rail infrastructure found within the Study Area was constructed between the 1880s and the 1900s. In a similar trend to railroad construction history statewide, the rail network was constructed by several different companies. Over the years, buyouts, consolidations and mergers resulted in the network ending up in the hands of a limited number of carriers.

As mentioned previously, there are six RRTD's present within the Study Area. RRTD's are present in Nueces, San Patricio, Calhoun, Matagorda, Live Oak and Karnes Counties.

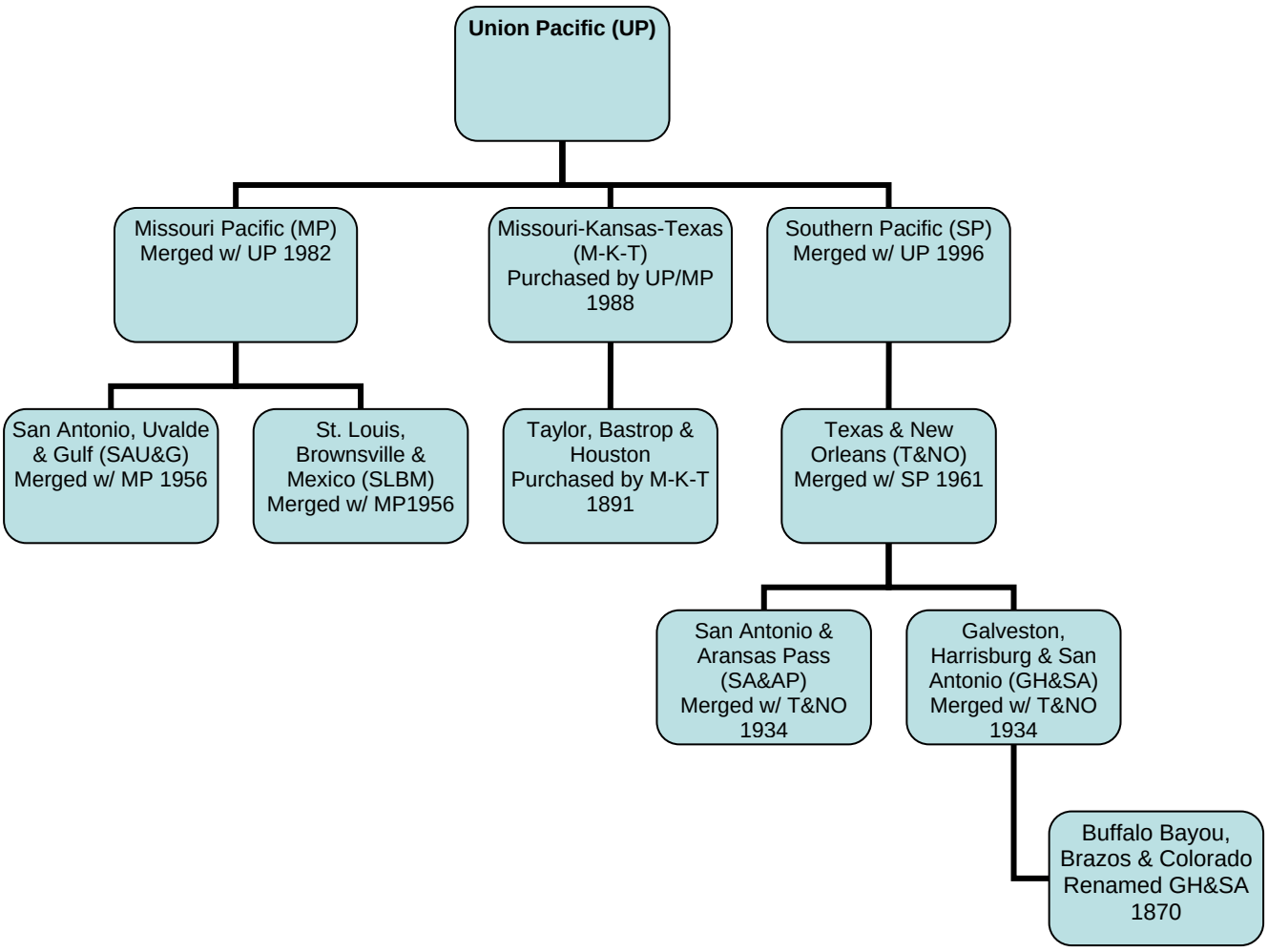
The following sections contain detailed descriptions of the rail infrastructure each separate railroad possesses within the Study Area.

3.1 UNION PACIFIC

The Union Pacific (UP) is the major Class 1 carrier within the Study Area and owns the overwhelming majority of the track found within the Corpus Christi and Yoakum Districts. While UP owns most of the track within the region, all of it was constructed by various predecessor railroads which eventually ended up under UP control.

Figure 3-2 illustrates the relationship between the various predecessor railroads within the region and the year in which those railroads were acquired.

Figure 3-2 Predecessor Railroads of the UP within the Corpus and Yoakum Districts



Discussion of the individual rail segments operated by UP within the Study Area follows in the following subchapters.

3.1.1 Brownsville Subdivision

The Brownsville Subdivision consists of a single mainline track which roughly parallels the Texas coastline. This subdivision is 221 miles in length and originates in Brownsville and runs north to Bloomington, where it meets the Angleton Subdivision. Between Milepost 0.00 and 218.95 this subdivision is part of UP's San Antonio Division. Milepost 218.95 represents a Division Boundary and at that point the line becomes part of the Houston Division. Bloomington Station is at Milepost 221.00 and represents the end of the Brownsville Subdivision. See Figure 3-3 and Appendix D for larger map.

Figure 3-3 Brownsville Subdivision

At Brownsville there are rail connections to Mexico and the Port of Brownsville. These connections and the City of Brownsville itself are outside of the Study Area boundaries, but their identification is relevant to this study in that freight originating at these locations will pass through the Study Area. The adjoining Angleton Subdivision, which begins at Bloomington, continues on toward Houston.

At Robstown the Brownsville Subdivision intersects the Texas-Mexican Railway, a Class II line jointly operated by Class I carrier KCS. A connection to UP's Corpus Christi Subdivision is located in Odem. The Corpus Christi Subdivision provides direct rail access between Corpus Christi and San Antonio. The Kosmos Subdivision, a branch containing several major industrial connections, connects to the Brownsville Subdivision at Sinton Junction. In addition to the connections to other major rail subdivisions, the Brownsville Subdivision also connects to the Seadrift and Victoria Industrial Leads, and multiple industry connections exist along the Brownsville Subdivision itself.

The Brownsville Subdivision enters the Study Area at the Kleberg County line, located at Milepost 101.04, and passes through Kleberg, Nueces, San Patricio, Refugio and Victoria Counties. In total, the Brownsville Subdivision contains 119.96 miles of mainline track within the Study Area. The track making up the Brownsville Subdivision was originally constructed between 1904 and 1906 by the St. Louis, Brownsville and Mexico Railway (SLBM).

Control along the Brownsville Subdivision is generally Traffic Warrant Control, save for two exception areas which operate under Centralized Traffic Control. Those exception areas are between Odem and Sinton Junction, and between Inari and Bloomington.

Between the Kleberg-Kenedy County Line (MP 101.04) and the southern yard limit at Odem (MP 153.00) the speed allowance is 49 mph, with trains being required to slow to 25 mph at Robstown Junction (MP 141.41) where the Brownville Subdivision intersects the Texas-Mexican Railway. This reduced speed area is approximately ¼ mile in length, after which the 49 mph speed allowance resumes. At Odem, the two mile section between Mileposts 153 and 155 operate at a 20 mph speed allowance. North of Milepost 155 a 40 mph speed allowance applies.

Table 3-3 shows relevant features along the Brownsville Subdivision that are found within the Study Area.

Table 3-3 Brownsville Subdivision Features

Milepost Location	Feature
101.04	Study Area Boundary (Kleberg-Kenedy County Line)
111.99 to 112.27	Industry Connection – Kleberg County Farmland Cooperative
114.90 to 120.00	Yard Limits – Kingsville
122.43 to 123.69	Industry Connection & Yard – Hoechst Celanese, Bishop Plant
124.88 to 125.40	Siding – 2700 ft (Bishop)
131.55 to 132.16	Siding – 3200 ft (Driscoll)
137.50	Industry Connection – Terra International
138.59	Industry Connection
140.30	Industry Connection – Petronila Grain Cooperative
140.82 to 142.23	Siding – 7400 ft (Robstown Junction)
141.48	Rail Intersection – Texas Mexican Railway (Robstown)
147.22	Industry Connection – Corpus Christi Filtration Plant
153.00 to 154.60	Yard Limits – Odem
154.46	Rail Intersection – UP Corpus Christi Subdivision (Odem)
154.30 to 155.94	Odem Yard
158.95 to 162.67	Sinton Yard
161.99	Rail Intersection – UP Kosmos Subdivision (Sinton Junction)
179.66	Industry Connection – Woodsboro Farmers Co-Op
180.12 to 181.52	Siding – 7400 ft (Woodsboro)
185.96	Industry Connection - (Refugio)
192.80 to 194.32	Siding – 8000 ft (Greta)
204.35 to 205.95	Siding – 8400 ft (Inari)
209.61	Industry Connection – (McFadden)
218.95	San Antonio / Houston Division Boundary
221.00	Bloomington Yard / Subdivision Boundary, tie to Angleton Subdivision, Seadrift Industrial Lead, Victoria Industrial Lead

3.1.2 Angleton Subdivision

The Angleton Subdivision begins at Bloomington Station and continues to parallel the Texas coastline on a path toward Houston. As with the Brownsville Subdivision, only a portion of the subdivision is located within the Study Area. The portion within the Study Area is 74.83 miles in length and passes through Victoria, Jackson and Matagorda Counties. Milepost 295.83, the Matagorda-Brazoria County Line represents the Study Area boundary for this line. This mainline consists of a single track and was originally constructed by the St. Louis, Brownsville and Mexico Railway between 1906 and 1907. See Figure 3-4 and Appendix D for larger map.

Figure 3-4 Angleton Subdivision

The Angleton Subdivision includes several connections to industries and other rail lines. As mentioned in the previous section, the Victoria and Seadrift Industrial Leads connect to Bloomington. The Port Lavaca Subdivision & Industrial Lead intersects just north of Bloomington at Placedo. The shortline railroad Point Comfort & Northern intersects at Lolita and the BNSF Bay City Subdivision and Celanese Industrial Lead intersect near Bay City.

The normal speed allowance along the mainline track of the Angleton Subdivision is 50 mph. There are three locations where trains must reduce speed, the Garcitas River bridge (MP 234, ¼ mile @ 25 mph), the Colorado River Bridge (MP 277, ½ mile @ 25 mph) and the intersection with the BNSF Bay City Subdivision (MP 284, 1 ½ miles @ 30 mph or lower). Centralized Traffic Control is utilized along the entire length of the Angleton Subdivision.

Table 3-4 denotes significant features found along the Angleton Subdivision within the Study Area.

Table 3-4 Angleton Subdivision Features

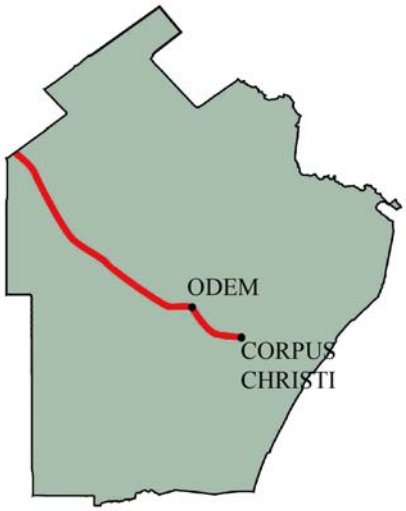
Milepost Location	Feature
221.00	Bloomington Yard / Subdivision Boundary, tie to Brownsville Subdivision, Victoria and Seadrift Industrial Leads
224.28	Rail Intersection – Port Lavaca Subdivision (Placedo)
224.29 to 224.57	Siding – 1500 ft (Placedo)
229.27 to 230.40	Siding – 6000 ft (Keeran)
238.62 to 240.13	Vanderbilt Yard
244.28 to 244.92	Lolita Yard
244.37	Rail Intersection – Point Comfort & Northern RR (Lolita)
247.47	Industry Connection – Formosa Plastics

Milepost Location	Feature
248.30 to 249.85	Siding – 8200 ft (Laward)
263.25 to 264.86	Siding – 8500 ft (Blessing)
273.65 to 275.38	Siding – 9100 ft (Buckeye)
277.26 to 277.94	Celanese Storage Yard
277.45	Rail Intersection – Celanese Industrial Lead
282.34 to 283.50	Siding – 6100 ft (Bay City)
284.08	Rail Intersection – BNSF Bay City Subdivision
289.38	Industry Connection – Bonus Crop Fertilizer
291.48 to 293.06	Siding – 8300ft (Allenhurst)
295.83	Study Area Boundary (Matagorda-Brazoria County Line)

3.1.3 Corpus Christi Subdivision

Connecting Corpus Christi and San Antonio, the Corpus Christi Subdivision passes through Live Oak, San Patricio and Nueces Counties. The general alignment of this subdivision roughly follows I-37. The Live Oak-Atascosa County Line at Milepost 62.03 is where the subdivision enters the Study Area and the track remains within Study Area boundaries to its end at the Corpus Christi Terminal, Milepost 149.54. Total length of mainline track within the Study Area is 87.51 miles. See Figure 3-5 and Appendix D for larger map.

Figure 3-5 Corpus Christi Subdivision



The Corpus Christi Subdivision provides rail access to the Port of Corpus Christi. Rail traffic to and from the Port has direct access to San Antonio along the subdivision, and the Brownsville Subdivision intersects in Odem, Milepost 132.20. The Brownsville Subdivision provides access to Houston as well as the Mexican border.

This rail segment was originally constructed in 1914 by the San Antonio, Uvalde & Gulf Railroad. A line change was completed in 1957 between approximate Mileposts 100 and 113.

The track north of Odem (MP 132.20) has a 25 mph speed allowance, with one exception area at Three Rivers (MP 77.30) where an approximate ¾ mile section has a 20 mph speed allowance. Within the yard limits at Odem the speed allowance is 20 mph. South of Odem the

speed allowance increases to 49 mph, until approximate Milepost 145.50 where the speed allowance drops to 10 mph. Within the Port of Corpus Christi Centralized Traffic Control applies. Near Three Rivers, an approximate 4.5 mile section is governed by Absolute Block. The remaining track is Traffic Warrant Control.
Significant features within the Study Area found along the Corpus Christi Subdivision are detailed in the Table 3-5.

Table 3-5 Corpus Christi Subdivision Features

Milepost Location	Feature
62.03	Study Area Boundary (Live Oak-Atascosa County Line)
63.53	Industry Connection
68.10	Industry Connection
77.01 to 77.62	Industry Connection – Valero Three Rivers refinery (Three Rivers)
88.05 to 89.76	Siding – 9000 ft, Industry Connection – Badger Mining (George West)
112.96	Industry Connection – Mathis Grain (Mathis)
123.95 to 124.69	Siding – 3900 ft (Hubert)
126.34	Industry Connection – Planters Grain Co-Op (Edroy)
130.00 to 133.80	Yard Limits – Odem
131.11 to 132.12	Siding – 5300 ft (Odem)
132.17	Rail Intersection – UP Brownsville Subdivision
140.50 to 149.54	Yard Limits – Viola
145.93	Rail Intersection – Corpus Christi Terminal Railroad
149.54	End Main Line

3.1.4 Port Lavaca Subdivision & Port Lavaca Industrial Lead

Connecting Port Lavaca and Flatonia is the Port Lavaca Subdivision and the Port Lavaca Industrial Lead. The counties through which the Port Lavaca Subdivision & Industrial Lead pass include Calhoun, Victoria, Dewitt, Lavaca, Gonzales and Fayette Counties. See Figure 3-6 and Appendix D for larger map.

Figure 3-6 Port Lavaca Subdivision & Port Lavaca Industrial Lead

The Port Lavaca Subdivision / Industrial Lead is approximately 102 miles long, and consists of a single mainline track. This section of track generally follows a north-south alignment. The southern 14 miles is part of the Houston Division, with the remaining track being part of the San

Antonio Division. The station at Placedo marks the approximate Division Boundary, as well as the separation between the track considered to be the Industrial Lead and the track considered to be the Subdivision.

At Placedo the Angleton Subdivision intersects the Port Lavaca Subdivision providing connections to Corpus Christi and Mexico to the south via the Brownsville Subdivision and Houston to the north. At Flatonia, rail traffic along the Port Lavaca Subdivision has connections to San Antonio and Dallas via the Flatonia Subdivision as well as a second connection to Houston via the Glidden Subdivision.

The track along which the modern day Port Lavaca Subdivision operates consists of two different segments of track originally constructed by different railroads. The section of track between Port Lavaca and Cuero was constructed by the Galveston, Harrisburg and San Antonio Railway in 1888. At Cuero the Port Lavaca Subdivision follows a section of track originally constructed by the San Antonio and Aransas Pass Railway between 1888 and 1890.

During the preparation of this report it was discovered that the Port Lavaca Subdivision is sometimes referred to as the "Cuero Subdivision". This appears to be an informal term used by railroad employees, as all sources of documentation (track charts, communications to/from STB, etc.) uncovered during preparation of this report use the "Port Lavaca" name.

A 10 mph speed allowance governs the track between Port Lavaca and Placedo (MP 14.20). North of Placedo, the speed allowance increases to 40 mph until the outskirts of Victoria are reached. An approximate 3 mile section just south of the yard limits in Victoria has a 20 mph allowance, and within the yard limits a 10 mph allowance applies. Once north of the Victoria yard limits, the speed allowance increases to 40 mph. Exception areas to the 40 mph speed allowance include Cuero (MP 55.10, ½ mile at 20 mph), Yoakum (MP 72.10, 1 mile at 20 mph) and Shiner (MP 83.40, ½ mile at 30 mph). At approximate Milepost 99.25 the speed allowance drops to 20 mph as the line enters Flatonia. The Port Lavaca Subdivision and Industrial Lead operate under Traffic Warrant Control.

Table 3-6 shows the features found along the Port Lavaca Subdivision / Industrial Lead.

Table 3-6 Port Lavaca Subdivision / Industrial Lead Features

Milepost Location	Feature
0.00	Begin Track (Port Lavaca)
0.8 Approximate	Industry connection – Helena Chemical and Farmland Industries
14.24	Rail Intersection – Brownsville Subdivision (Placedo)
14.40	Division Boundary – Houston Division to San Antonio Division
26.60 to 28.00	Yard Limits – Victoria, connections to Coleto Creek Subdivision
40.5 to 42.5 Appx.	Siding – 10500 ft (Thomaston)
54.6 to 55.0 Appx.	Siding – 2100 ft (Cuero)
72.33 to 72.57	Siding – 1300 ft (Yoakum)
74.77 to 76.62	Siding – 9800 ft (Adel)
102.03	End Port Lavaca Subdivision, connections to Flatonia & Glidden Subs

3.1.5 Kosmos Subdivision & Kosmos Industrial Lead

The Kosmos Subdivision consists of 29 miles of mainline track connecting Aransas Pass to Sinton. At Sinton Junction the Kosmos intersects the Brownsville Subdivision (Brownsville Subdivision MP 162.00). Although the Kosmos Subdivision is just 29 miles today, it was constructed in 1890 by the San Antonio and Aransas Pass Railway as part of a much larger network. This track used to be part of a line that connected San Antonio to Rockport. See Figure 3-7 and Appendix D for larger map.

Figure 3-7 Kosmos Subdivision & Kosmos Industrial Lead

Except for a short section now classified as side track, the track north of the intersection with the Brownsville Subdivision is abandoned. The intersection with the Brownsville Subdivision is MP 0.00 on the Kosmos Subdivision, and the mainline track runs to MP 28.98. Extending an additional 0.77 miles beyond the end of the Kosmos Subdivision (MP 29.75) is the Kosmos Industrial Lead.

Between Sinton (MP 0.00) and Gregory (MP 15.20) a 25 mph speed allowance usually applies, with an exception area about 1 mile in length around Taft (MP 7.40) that has a 10 mph allowance. Yard limits in Sinton and Gregory have a 10 mph speed allowance. Between Gregory and the end of line a 20 mph speed allowance applies. The Kosmos Subdivision and Industrial Lead are governed by Traffic Warrant Control.

Table 3-7 identifies significant features along the Kosmos Subdivision.

Table 3-7 Kosmos Subdivision / Industrial Lead Features

Milepost Location	Feature
120.80 to 2.48	Yard Limits – Sinton / Sinton Junction
122.82 = 0.00	Milepost Equation
0.00	Rail Intersection – Brownsville Subdivision (Sinton Junction)
13.80 to 15.25	Yard Limits - Gregory
16.99 to 17.43	Siding – 2300 ft
17.44	Industry Connection – Reynolds Metal Company
19.12	Industry Connection – OxyChem Ingleside Facility

23.73	Industry Connection – Aker Gulf Marine Aransas Pass Facility
26.38 to 26.60	Siding – 1200 ft
28.98	End Subdivision, End Main Line Track
29.34	Industry Connection – Degussa Engineered Carbons
28.98 to 29.75	Kosmos Industrial Lead

3.1.6 Coleto Creek Subdivision

The Coleto Creek Subdivision is a 18.74 mile section of single mainline track located in Victoria and Goliad Counties. This subdivision originates in Victoria and runs southwesterly along US-59 to the Coleto Creek Power Station, located approximately 15 miles outside of Victoria. The Coleto Creek Power Station is a coal fired electric generating facility. See Figure 3-8 and Appendix D for larger map.

Figure 3-8 Coleto Creek Subdivision

The Galveston, Harrisburg & San Antonio Railway originally constructed this segment between 1890 and 1892 as part of a much longer section of track connecting Victoria and Beeville. In 1979 the SP, who owned this rail segment at the time, abandoned the approximate 40 miles of track between Beeville and Coleto Creek.

A constant 25 mph speed allowance is in place along the entire length of the subdivision. This rail segment operates under Traffic Warrant Control.

Table 3-8 identifies the significant features found along this rail segment.

Table 3-8 Coleto Creek Subdivision Features

Milepost Location	Feature
87.00	Begin Track
87.30	Industry Connection – Carlisle Plastics
87.80	Begin Mainline Track
90.74 = 0.00	Milepost Equation
87.80 to 0.90	Yard Limits – Victoria
1.72 to 2.15	Siding – 2300 ft
6.09	Industry Connection – Gifford Hill Pipe Plant, Safety Railway Supply
15.80	End Main Line, Industry Connection – Coleto Creek Power Station

3.1.7 Flatonia Subdivision

The Flatonia Subdivision runs between San Antonio's Kirby Yard and Hearne. From Hearne the track generally runs south until it reaches Flatonia. At Flatonia the subdivision intersects the Glidden and Port Lavaca Subdivisions. The Flatonia Subdivision heads due west to San Antonio, with the Glidden Subdivision heading east toward Columbus and the Port Lavaca Subdivision heading south toward Victoria. See Figure 3-9 and Appendix D for larger map.

Figure 3-9 Flatonia Subdivision

Both Hearne and San Antonio fall outside of the Study Area boundary. The Flatonia Subdivision enters the Study Area at Milepost 69.32, the Fayette-Lee County Line. The track leaves the Study Area at Milepost 146.20, the Gonzales-Caldwell County Line. In total, 54.25 miles of track are within study area boundaries. (There is a milepost equation at Flatonia.)

The rail segment between Hearn and Flatonia was originally constructed in 1890 by the San Antonio & Aransas Pass Railway. The Galveston, Harrisburg & San Antonio Railway constructed the segment between Flatonia and San Antonio between 1874 and 1875.

Between the Study Area boundary at Milepost 69.32 and Muldoon, approximate Milepost 89, signalization is Absolute Block System. At Muldoon signal control switches and the remaining track is Centralized Traffic Control.

Speed allowance along the Flatonia Subdivision changes frequently. Between the Fayette-Lee County Line and the Flatonia Yard the speed allowance ranges from 45 mph to 60 mph. At Flatonia the speed allowance drops to 25 mph. From Flatonia west towards San Antonio a speed allowance of at least 60 mph is in place all the way to the Gonzales-Caldwell County Line.

Table 3-9 identifies the features found along the Flatonia Subdivision.

Table 3-9 Flatonia Subdivision Features

Milepost Location	Feature
69.32	Study Area Boundary (Fayette-Lee County Line)
72.69 to 74.40	Siding – 9000 ft (Winchester)
77.03	Rail Intersection – Smithville Subdivision (West Point UP X-Ing)
87.13 to 89.09	Siding – 10300 ft (Muldoon)
97.04 to 97.36	Flatonia Yard
97.36 = 119.99	Milepost Equation
119.99 to 122.00	Flatonia Yard, Connections to Port Lavaca & Glidden Subdivisions
129.42 to 131.23	Siding – 9600 ft (Waelder)
142.24 to 143.95	Siding – 9000 ft (Harwood)
143.89	Rail Intersection – Texas Gonzales & Northern (Shortline RR)
146.20	Study Area Boundary (Gonzales-Caldwell County Line)

3.1.8 Glidden Subdivision

The Glidden Subdivision completes the San Antonio to Houston route started by the Flatonia Subdivision. Connecting Flatonia and Houston, the Glidden Subdivision enters the Study Area at approximate Milepost 50.93, the Wharton-Fort Bend County Line. Approximate Milepost 120.00 marks the subdivision boundary at which the Glidden Subdivision ties to the Flatonia Subdivision. See Figure 3-10 and Appendix D for larger map.

Figure 3-10 Glidden Subdivision

Construction on the Galveston Subdivision began in 1860 by the Buffalo Bayou, Brazos & Colorado Railway (BBB&C). In 1860 construction extended westward to Alleyton, a small town about 5 miles east of Columbus. The Civil War halted construction until 1865-1866 when the Columbia Tap Railway extended the line to the east bank of the Colorado River. In 1873 the BBB&C, now renamed the Galveston, Harrisburg & San Antonio Railway crossed the Colorado River at Columbus and extended the line westward. In 1874 track construction reached Flatonia.

The Glidden Subdivision operates under Centralized Traffic Control. Speed allowances along the mainline track are generally 60 mph or higher, reaching 75 mph in some locations.

Exceptions to this include a 50 mph section at Flatonia, a separate 50 mph section near Schulenburg, and a 40 mph section crossing the Colorado River.

Table 3-10 identifies the significant features found along the Glidden Subdivision.

Table 3-10 Glidden Subdivision Features

Milepost Location	Feature
50.93 (approx)	Study Area Boundary (Wharton-Fort Bend County Line)
52.16 to 52.86	Siding – 3700 ft
61.52 to 63.32	Siding – 9500 ft (Lissie)
64.20	Industry Connection – Colorado County Rice Mill
68.30	Rail Intersection – Chesterfield Industrial Lead
69.26	Rail Intersection – Arenal Industrial Lead
69.20 (approx) to 71.28	Eagle Lake Yard
71.30	Division Boundary, Houston to San Antonio
73.43 to 74.57	Siding – 6000 ft (Ramsey)
86.30(est) to 89.32	Glidden Yard
98.87	Industry Connection
98.89	Industry Connection
99.02 to 100.97	Siding – 10300 ft (Weimar)
106.93	Industry Connection – Contech
107.53	Industry Connection
119.98	Rail Intersection – Port Lavaca Subdivision
120.00	Subdivision Boundary, tie to Flatonia Subdivision

3.1.9 Smithville Subdivision

Connecting Katy and Smithville, the Smithville Subdivision passes through Austin, Colorado and Fayette Counties. The Smithville Subdivision parallels the Glidden Subdivision approximately 15 to 25 miles north. Approximately 70 miles of track along this subdivision is within the Study Area. See Figure 3-11 and Appendix D for larger map.

Figure 3-11 Smithville Subdivision

The portion of the Smithville Subdivision located within the Study Area was constructed in two separate pieces. In 1887 the Taylor, Bastrop & Houston Railway constructed the eastern half, up to approximate Milepost 108. The Missouri-Kansas-Texas Railway, which had acquired the TB&H, picked up construction in 1893 and completed the western half.

Speed allowance along the Smithville Subdivision is usually 40 mph. Certain sections operate at slightly higher or lower speed allowance of 30 mph is in place between approximate Mileposts 74.50 and 76.50. The rail intersection with the Flatonia Subdivision is a 30 mph crossing. Over a three mile stretch in La Grange (MP 87 to 90) the speed allowance varies between 20 mph and 40 mph. The ten miles of track between Alum (MP 114) and Cat Spring (MP 124) operates at a 49 mph speed allowance, as does the section between Sealy and the Austin-Waller County Line. The Smithville Subdivision operates under Traffic Warrant Control.

Table 3-11 identifies the significant features found along the Smithville Subdivision.

Table 3-11 Smithville Subdivision Features

Milepost Location	Feature
72.93	Study Area Boundary (Fayette-Bastrop County Line)
77.96	Rail Intersection – Flatonia Subdivision
80.37	Industry Connection – Western Sand
82.14	Industry Connection – Texas Tank Car Co.
88.72 to 89.55	LaGrange Yard
95.90	Industry Connection – Sam K. Seymour Power Plant, LCRA
101.68 to 103.54	Siding – 9800 ft (Fayetteville)
112.69 to 113.82	Siding – 6000 ft (New Ulm)
123.45 to 124.63	Siding – 6200 ft (Cat Spring)
135.49	Rail Intersection – BNSF Galveston Subdivision, Sealy Yard
142.73	Study Area Boundary (Austin-Waller County Line)

3.1.10 Seadrift Industrial Lead

The Seadrift Industrial Lead begins at Bloomington Station and runs southeasterly along State Highway 185 to Long Mott. Total length of this branch is 14 miles of single mainline track. At Bloomington, connections to/from the Seadrift Industrial Lead can be made to the Brownsville and Angleton Subdivisions, as well as the Victoria Industrial Lead. See Figure 3-12 and Appendix D for larger map.

Figure 3-12 Seadrift Industrial Lead

Continuous yard limits with a 10 mph speed allowance apply along the entire length of this rail segment.

Originally built in 1910 as part of the SLBM, the Seadrift Industrial Lead is part of the UP's Houston Division.

Table 3-12 identifies the features found along this branch.

Table 3-12 Seadrift Industrial Lead Features

Milepost Location	Feature
0.00	Bloomington Station, connect to Brownsville & Angleton Subdivisions, Victoria Industrial Lead
5.46	Industry Connection – INEOS Nitriles
9.98 to 10.27	Siding – 1500 ft
11.06	Industry Connection – Seadrift Coke LP
Appx 12.00 to 13.50	Multiple Industry Connections – Union Carbide Seadrift Facility
0.00 to 14.00	Yard Limits along entire branch
14.00	End Track

3.1.11 Victoria Industrial Lead

Connecting the Bloomington and Victoria yards, the Victoria Industrial Lead is a 12.42 mile section of track. As with the Seadrift Industrial Lead, continuous yard limits and a 10 mph speed allowance apply. See Figure 3-13 and Appendix D for larger map.

Figure 3-13 Victoria Industrial Lead

The St. Louis, Brownsville & Mexico Railway originally constructed this section of track in 1912. This section of track is part of the San Antonio Division.

Table 3-13 identifies the significant features found along the Victoria Industrial Lead.

Table 3-13 Victoria Industrial Lead Features

Milepost Location	Feature
0.00	Begin Victoria Industrial Lead (Bloomington), connections to Brownsville Subdivision, Angleton Subdivision, Seadrift Ind. Lead
0.22 to 0.80	Bloomington Yard
0.80	Division Boundary – Houston Division to San Antonio Division
3.51 to 4.11	Dernal Yard, Industry Connection – Dupont, Lyondell
11.49 to 11.72	Siding – 2600 ft
12.27	Rail Intersection – Coleto Creek Subdivision (Victoria)
0.00 to 12.37	Continuous Yard Limits
12.42	End Victoria Industrial Lead

3.1.12 Celanese Industrial Lead

Connecting to the Angleton Subdivision approximately five miles west of Bay City, the Celanese Industrial Lead is a 3.71 mile section of track in Matagorda County. This industrial lead services the Celanese Bay City plant, a chemical production facility.

Approximately 1.4 miles of this track is jointly owned with the BNSF, which has a separate industrial lead connecting to its Bay City Subdivision.

A continuous speed allowance of 10 mph applies across this section of track. Research attempts made to identify the type of signal control present along this section of track were unsuccessful. Therefore, it is assumed that this track is not under any type of CTC control.

The Celanese Industrial Lead is part of UP's Houston Division.

3.1.13 Trackage Rights

With the UP owning the overwhelming majority of the track within the Study Area, trackage rights on additional lines for the UP are limited. Most of the trackage rights agreements affecting UP involve the other two Class I carriers having rights to operate on UP lines, namely the BNSF and the KCS/Texas-Mexican Railway.

Trackage rights that UP does possess on lines owned by other carriers, include rights along the BNSF Galveston Subdivision between Rosenberg and Sealy. The UP also has trackage rights along the Texas Gonzales & Northern Railroad. Those rail segments will be discussed later in this section.

3.2 BURLINGTON NORTHERN SANTA FE RAILWAY

As UP's chief Class 1 competitor within the region, the Burlington Northern Santa Fe (BNSF) Gulf Division provides rail service within and through the Corpus Christi and Yoakum Districts. Most of BNSF's activity within the Study Area is made possible by trackage rights agreements made between UP and BNSF in order to facilitate Surface Transportation Board (STB) approval of the UP-SP merger. As such, BNSF ownership of rail within the Study Area is limited. The following subchapters discuss the rail segments along which BNSF operates within the Corpus Christi and Yoakum Districts.

3.2.1 Galveston Subdivision

Heading northwest out of the Houston area, the Galveston Subdivision connects Temple and Galveston. This subdivision passes through Austin County with the rest of the rail segment falling outside Study Area boundaries. Length of mainline rail within Austin County is approximately 40 miles.

At Sealy the Galveston Subdivision intersects UP's Smithville Subdivision. The yard at Sealy is used by both railroads with the BNSF having trackage rights along UP's Smithville Subdivision, and the UP having trackage rights along BNSF's Galveston Subdivision.

Within the Study Area, the Galveston Subdivision operates under Centralized Traffic Control. Speed allowance for this segment is 55 mph, with exception areas at the two rail intersections where a 30 mph allowance applies. See figure 3-14 and Appendix D for larger map.

Figure 3-14 Galveston Subdivision

Table 3-14 identifies significant features along the Galveston Subdivision.

Table 3-14 Galveston Subdivision Features

Milepost Location	Feature
79.54	Study Area Boundary (Austin-Fort Bend County Line)
79.68 to 81.99	Siding – 12200 ft (Wallis)
82.19	Rail Intersection – Abandoned track (formerly UP)
86.55 to 87.60	Siding – 5500 ft (El Plesant)
92.53 to 94.56	Sealy Yard, Rail Intersection – UP Smithville Subdivision
104.57 to 106.44	Bellville Yard
110.17 to 111.52	Siding – 7100 ft (Dant)
119.49	Study Area Boundary (Austin-Washington County Line)

3.2.2 Bay City Subdivision

Connecting Bay City and Wadsworth, both within Matagorda County, is the Bay City Subdivision. Once part of a larger line segment, rail abandonments have reduced the length of this segment to 15.55 miles. See Figure 3-15 and Appendix D for larger map.

Figure 3-15 Bay City Subdivision

Used to provide rail connections to chemical facilities, this line intersects the UP's Angleton Subdivision in Bay City, from which connections to Houston can be made.

The entire length of the Bay City Subdivision operates under restricted limits with a 20 mph speed allowance.

Table 3-15 identifies significant features found along the Bay City Subdivision.

Table 3-15 Bay City Subdivision Features

Milepost Location	Feature
66.95	Begin Subdivision
68.60	Bay City
68.97	Rail Intersection – UP Angleton Subdivision
69.62 to 70.93	Siding – 6900 ft (Bay City)
76.29	Rail Intersection – Celanese Industrial Spur
79.40 to 79.74	Siding – 1800 ft (Wadsworth)
82.11	Industry Connection – Equistar Chemicals
82.50	End Subdivision

3.2.3 Seadrift Industrial Lead

A relatively new rail segment, the Seadrift Industrial Lead, was completed in 2003. Located in Calhoun County, BNSF and Dow Chemical joined in constructing this line to service Dow's facility located in Seadrift. This line is approximately 7.85 miles in length and intersects the UP's Port Lavaca Subdivision near Kamey.[3]

Attempts made to identify the type of signal control present on this section of track were unsuccessful. Therefore it is assumed that this track is not under any such control.

3.2.4 Trackage Rights

Trackage rights along the entire lengths of UP's Brownsville and Angleton Subdivisions allows a connection between Mexico and BNSF-owned rail in the Houston area. These trackage rights are also necessary to connect the Bay City Subdivision to BNSF track in Houston.

The BNSF also has trackage rights along the UP's Corpus Christi Subdivision which allow BNSF access to the Port of Corpus Christi. These trackage rights run from the Port to Odem, where the Corpus Christi Subdivision intersects the Brownsville Subdivision.

Trackage rights along the Port Lavaca Subdivision between Placedo and Kamey allow BNSF access to the Seadrift Industrial Lead.

At the northern end of the Yoakum District, the BNSF has trackage rights along the Smithville Subdivision between Sealy and Smithville.

The UP has trackage rights along BNSF's Galveston Subdivision between Rosenberg and Sealy.

3.3 KANSAS CITY SOUTHERN

Like the BNSF, Kansas City Southern (KCS) ownership of rail within the Study Area is limited. However, bracketing the Study Area, KCS owns two separate rail networks, one in Mexico, and one in the United States. In order to connect these two networks KCS relies on rail lines which pass through the Corpus Christi and Yoakum Districts.

To the north of the Study Area, the network of KCS rail reaches Beaumont. To the south the rail network within Mexico reaches Nueva Laredo. The path to connect these two networks relies on the KCS owned Texas-Mexican Railway, which runs from Laredo to Corpus Christi, and trackage rights along UP lines.

3.3.1 Texas-Mexican Railway

The Texas-Mexican Railway is a Class 2 line that runs from Laredo to Corpus Christi. This line was originally constructed as a narrow gauge line in 1875 by the Corpus Christi, San Diego and Rio Grande Narrow Gauge Railroad Company. The railroad was sold in 1881 and became the Texas Mexican Railway Company, commonly referred to as the Tex-Mex. In 1902 the Tex-Mex was upgraded to standard gauge rail. KCS purchased controlling interest in the line in August 2004 and now operates the line as the Laredo Subdivision. See Figure 3-16 and Appendix D for larger map.

[3] BNSF press release. July 9, 2003 http://www.bnsf.com/media/news/articles/2003/07/2003_07_09a.html

Figure 3-16 Texas-Mexican Railway

In total, the Tex-Mex is approximately 160 miles in length and runs from Laredo to Corpus Christi. Only 48 miles of that distance, located within Jim Wells and Nueces Counties, falls within the Study Area.

The eastern terminal of the Tex-Mex is at the Port of Corpus Christi. The Tex-Mex intersects with the UP's Brownsville Subdivision approximately eight miles west of that terminal at Robstown.

Entering the Study Area, the Tex-Mex track operates under a 40 mph speed allowance. Shortly into the Study Area, the track reaches Alice, and the speed allowance reduces to 25 mph for an approximate length of two miles. Once outside of Alice the speed allowance increases to 30 mph. The 30 mph allowance remains in effect until the Tex-Mex reaches Robstown. At Robstown the speed allowance again drops to 25 mph, save for a 20 mph section at the intersection with UP's Brownsville Subdivision. As the line enters the Port of Corpus Christi, the speed allowance drops to a 10 mph and that allowance remains in effect to the end of line. The Tex-Mex operates under Track Warrant Control.

Table 3-16 illustrates the features found along the Tex-Mex.

Table 3-16 Texas-Mexican Railway Features

Milepost Location	Feature
114.3 (approx)	Study Area Boundary (Jim Wells-Duval County Line)
118.0 to 119.3	Alice Yard
129.3	Industry Connection – grain elevator
129.9	Industry Connection – grain elevator
136.8	Industry Connection – Banquete Grain
137.6	Industry Connection – Banquete Co-Op
142.4 to 143.9	Siding – 8000 ft (Spear)
145.0 to 145.7	Robstown Yard
145.1	Rail Intersection – UP Brownsville Subdivision
146.1 to 147.2	Siding – 6000 ft (Robstown)
152.6 to 153.1	Siding – 2600 ft (Clarkwood)
154.1	Industry Connection – Baker Hughes
154.2 to 155.7	Hopkins Yard
155.9 to 157.2	Corpus Christi Yard
161.85	Terminal

3.3.2 Trackage Rights

As mentioned previously, KCS and the Tex-Mex rely on trackage rights along UP lines in order to connect the Tex-Mex to the KCS rail network in Beaumont. From the Tex-Mex / UP rail intersection in Robstown these trackage rights follow the Brownsville Subdivision to Placedo, and then continue to Flatonia via the Port Lavaca Subdivision. At Flatonia, trackage rights extend east toward Houston along the Glidden Subdivision, leaving the Study Area at the Wharton-Fort Bend County Line.

KCS / Tex-Mex also possess trackage rights along the Corpus Christi Subdivision between Odem and the Port of Corpus Christi.

3.3.3 Victoria-Rosenberg Line

In 2000, KCS acquired an out-of-service rail segment between Victoria and Rosenberg which is approximately 85 miles in length. This line was originally part of the Southern Pacific network and passes through Wharton, Victoria, and Jackson Counties.

KCS has intentions of reopening this line, and in June 2007, placed an application for a RRIF loan to fund the construction effort.[4] Once active, the Victoria-Rosenberg Line will shorten the distance for KCS trains running between Robstown and Beaumont by 67 miles. This line will also reduce the length along which KCS trains must operate on UP rail via trackage rights by approximately 160 miles.

As of the writing of this report, the timeframe in which this rail segment could be brought online is not known.

[4] KCS official news release, June 5, 2007. Available at company website. http://notes.kcsi.com/WebApps/kcspress.nsf/626e6035eadbb4cd85256499006b15a6/cc6c46634cc55d27862572f1005ebfd9?OpenDocument

3.4 SHORTLINE RAILROADS

Three separate Class 3, or shortline, railroads have been identified within the Corpus Christi and Yoakum Districts. All three identified shortlines connect to the UP network. Additional information regarding these railroads is found in the following sections.

3.4.1 Texas, Gonzales & Northern Railway Company

The Texas, Gonzales & Northern Railway Company (TXGN) consists of approximately 12.3 miles of track between Harwood and Gonzales, in north Gonzales County. The TXGN is a handling carrier whose cargo consists mostly of crude oil, grain, animal feed, clay and metal products.[5] The track along which the TXGN operates was once part of the Southern Pacific system.

At Harwood the TXGN connects to the UP's Flatonia Subdivision, from which connections to San Antonio and Houston can be made. The TXGN has been in operation since 1992 and is owned by TNW Corporation.

3.4.2 Point Comfort & Northern Railroad

The Point Comfort & Northern Railroad (PCN) is a 12.7 mile shortline railroad located in Jackson and Calhoun counties. The PCN runs between Point Comfort and Lolita, where the line connects to UP's Angleton Subdivision.

The PCN began operations in 1948 and was primarily owned by Alcoa until 2005. In 2005 the PCN was purchased by RailAmerica. Cargo on the PCN consists of aluminum and chemicals.[6]

3.4.3 Corpus Christi Terminal Railroad

The Corpus Christi Terminal Railroad (CCTR) operates approximately 26 miles of track within the Port of Corpus Christi. CCTR track provides access to all docks within the Port, as well as connections to UP and Tex-Mex lines. BNSF also has access to CCTR rail via trackage rights over UP line. The CCTR's primary function is to perform switching operations with the Class I carriers.

3.5 AMTRAK

While this study is freight focused, it should be noted that Amtrak operates passenger rail service that passes through the Study Area. Amtrak operates passenger trains between San Antonio and Houston via trackage rights along UP's Flatonia and Glidden Subdivisions as part of it's Sunset Limited route. Amtrak does not own any track within the Study Area.

[5] Information regarding TXGN cargo, ownership and operation obtained from UP website. http://www.uprr.com/customers/shortline/lines/tgn.shtml
[6] Information regarding PCN cargo, ownership and operation obtained from UP website. http://www.uprr.com/customers/shortline/lines/pcn.shtml

SECTION 4 - FREIGHT OPERATIONAL STUDY

4.1 INTRODUCTION

Some of the purposes of this freight mobility study are: to identify opportunities to increase freight movement efficiency in the region; determine the physical and financial viability of potential infrastructure and operational improvements; and evaluate potential freight rail connections to the proposed Trans-Texas Corridor (TTC) system. A critical component of this Study is the development of a freight rail forecast for these two Districts. This forecast will help TxDOT develop a more detailed understanding of future demand for freight rail services in this region, identify potential infrastructure and operational chokepoints, and develop strategies to improve rail efficiency in the future.

This technical memorandum documents the freight rail demand forecast for the Corpus Christi and Yoakum Districts to 2035. The following sections of this memorandum:

- Describe our **forecast approach**, including the data sources used to derive the 2035 forecast;
- Describe key **rail trends and issues** that will impact future demand for freight rail movements in the future; and
- Quantify **future freight rail demand** in the region to 2035 including an analysis of top commodities and key trading partners.

4.2 MAJOR FINDINGS

Overall rail trade by tonnage in the study area, including inbound and outbound rail shipments for domestic and cross border trade, is expected to increase 18 percent to near 28 million tons between 2003 and 2035. By value, rail shipments are expected to increase approximately 8 percent, to $10.6 billion.

Shipments to and from the Yoakum District are expected to grow at a much faster pace than shipments to and from the Corpus Christi District, increasing from near 15 to 18 million tons (26%) and from 9 to 9.4 million tons (4%), respectively. Total shipment value is expected to grow 2 percent from $5.3 to $5.4 billion in the Yoakum District and 16 percent from $4.5 to $5.2 billion in the Corpus Christi District.

Through traffic shipments (i.e., neither originating nor terminating in the Districts) are expected to grow most significantly, by both tonnage and value. Between 2003 and 2035, through traffic shipments will grow from 9.1 to 24.5 million tons (170%) and their value is expected to rise from $9.1 to $30.0 billion (228%).

Domestic shipments in tonnage and value represent nearly 100 percent of the overall trade in 2003 and it is expected to remain so in 2035. However, through traffic (both tonnage and value) are predominantly NAFTA flows, and represent almost 80 percent by tonnage and 90 percent by value of total through traffic.

Overall growth in tonnage and value between 2003 and 2035 will be led primarily by inbound commodities. Trade of inbound commodities is forecasted to increase by nearly 32 percent by weight and 78 percent by value during that period. Outbound movements, meanwhile, are expected to decrease by about 8 percent by weight and by 9 percent by value.

Two commodities accounted for 70 percent of total tonnage traded (inbound and outbound flows): coal (40 percent) and chemical and allied products (30 percent). Chemical or allied products are the dominant commodities by value, accounting for over three-fourths of total value.

Wyoming was the region's top trading partner by weight (34% of total weight), due primarily to coal shipments from the Powder River Basin for use in the region's power plants and for export through the Port of Corpus Christi. When shipment value is considered, Texas accounts for 41 percent of total shipment value.

4.3 FORECAST METHODOLOGY

The forecast developed as part of this Study was derived from a TRANSEARCH database developed by Global Insight (GI). This database, also used by TxDOT as part of the NAFTA Study Update (completed 2007), contains domestic and US–Mexico commodity flow information for 2003 drawn from existing proprietary, commercial, and publicly available data sources and is supplemented by economic forecasting techniques. The database also includes a forecast to 2035. Information is provided by weight (in tons), value (in 2003 dollars) by commodity (2-digit Standard Transportation Classification Code [STCC]), and movement type (inbound, outbound, and through traffic).

The TRANSEARCH database- particularly its forecast information- was used as the primary data source to guide the development of the freight demand forecast for the Corpus and Yoakum Districts. But while the TRANSEARCH commodity flow forecast is based on econometric and industry-specific information and projections, it is important to supplement this forecast with other information to ensure that it accurately reflects future rail demand in the region. There are a number of rail trends and issues- regional, national, and international- that will influence future demand for freight rail services in the region. These trends and issues, along with their likely impacts on future freight demand, are described in the following sections.

4.4 KEY RAIL TRENDS AND ISSUES

There are two types of trends and issues influencing future rail system demand:

- Infrastructure improvements, i.e., what rail, port, and roadway infrastructure investments are planned or underway- both within and outside the region- and how will they impact future rail demand in the Corpus Christi and Yoakum Districts?
- Operational improvements, i.e., what operational strategies and techniques are likely to be utilized by the railroads and ports in the region and nationally and how will those improvements impact future rail demand?

The following sections describe several trends and issues in these categories that, individually or collectively, may impact future freight demand for freight rail movements in the Corpus Christi and Yoakum Districts.

4.4.1 Port Infrastructure Improvements

There are a number of planned or recently-completed port infrastructure improvements (both within and outside the region) that will impact the type and volume of rail shipments into and out of the Corpus Christi and Yoakum Districts. It is important to understand the nature of these improvements when assessing future freight rail demand in the region.

4.4.1.1 Port of Corpus Christi

The Port of Corpus Christi has a major impact on the volume and nature of freight moving into and out of the Coastal Bend region. The Port has grown from handling primarily agriculture and petrochemical products to a more diverse array of products. Key commodities include steel products, coal, forest products, automobiles, and an increasing number of containers. Military equipment deployment and cruise ships are also served at the Port. The Port of Corpus Christi is the seventh-largest coal port in the country.

The Port of Corpus Christi has twenty-six miles of port-owned rail lines operated by the Corpus Christi Terminal Railroad, which serves the public docks within the Inner Harbor. Connections to mainline services are provided by three carriers: BNSF, KCS/Tex-Mex, and the UP Railroad. The Port has specially designed rail cars that can handle very heavy petroleum refining equipment. Approximately 1.5 million tons per year are shipped by rail to and from the Port. These shipments include coal, minerals, metallic ores, export grain, and over-sized loads of industrial equipment. An on-dock refrigerated distribution center with rail access is located at the Port. A study was completed by the Port in 2003 to develop a long-range master plan for rail operations at the port. The Port is in the process of identifying funding and methods of implementing the long-range plan.

Among the new significant initiatives at the port include the intermodal container facility on the La Quinta channel. If constructed this 1,100 acre development will provide for transfer of an estimated 400,000 containers from ships to truck or rail before the year 2010. The construction of the Joe Fulton International Trade Corridor will connect US-181 to IH-37 and provide alternative routing for truck and rail traffic that will be more efficient and safe. The Corpus Christi Ship Channel may be deepened from 45 feet to 52, and the corridor also includes nearly 1,000 acres for marine terminal and industrial development.

4.4.1.2 Port of Victoria and Barge Canal

The Port of Victoria serves the Victoria Metropolitan Planning Area and is responsible for the operation of both the Victoria County Navigation District and the Westside Calhoun County Navigation District. The 35-mile Barge Canal connects to the Gulf Intracoastal Waterway (GIWW) and is 12 feet deep and 125 feet wide. The Port and the turning basin area covers over 400 acres and is served by the UP and four-lane divided highways. Deep water access is located at Point Comfort, which is reached via the Barge Canal and GIWW.

In 2005, the Ports of Houston and Victoria signed a Memorandum of Understanding to increase the use of barges for transporting cargo containers between ports along the Texas Gulf Coast. This agreement offers a cost effective alternative to trucking, while decreasing congestion and reducing air pollution. Furthermore, this agreement may enhance the Port of Victoria as a good midpoint freight transfer station on the Gulf Coast.

In 2006, the industrial park at the Port of Victoria was expanded by approximately 1,800 acres, and announced an intention to purchase water rights from the City of Victoria.

The Industrial Park located at the Port has its own rail spur with rail service provided by UP with track agreements with KCS/Tex-Mex, Canadian National Railway (CN), and BNSF.

4.4.1.3 Port of Port Lavaca-Point Comfort

This port, operated by the Calhoun Port Authority, is the site of a recently-completed $65 million expansion. The Port includes a 1,000-foot liquid cargo ship pier, a liquid barge terminal facility, and a 506-foot heavy lift dock. Port facilities are located near the western terminus of the Matagorda Ship Channel. Port expansion was spurred by growth in the regional petrochemical industry.

Rail services are provided by the Point Comfort and Northern Railway (PCN), which operates on 16 miles of rail lines at the port and surrounding area. PCN interchanges with the UP in Calhoun County. Rail infrastructure is limited and rail access is generally considered less than adequate.

4.4.1.4 Panama Canal & Mexican Port Development

The Panama Canal Authority is undertaking a $5.25 billion expansion project that will involve the construction of two lock facilities (one on each side of the Canal); the excavation of new access channels to the new locks and widening of existing channels; and the deepening of the existing navigation channels. Construction began in September 2007 and the new set of locks would begin operation by 2015. In addition to these significant infrastructure investments, the Panama Canal Authority has developed strategic partnerships with key United States ports, including the Port of Houston, to boost trade through the Canal.

The combination of wider navigation channels and locks (to allow post-Panamax ships to navigate through the Canal), coupled with strategic marketing partnerships with key United States ports, will increase demand through the Canal itself and for ports along the Gulf and East Coasts (including the Port of Corpus Christi). Some Asia-based shippers may begin to use the expanded Canal to serve Midwestern and Southeastern U.S. markets.

In addition to Panama Canal expansion, significant investment is being made in port infrastructure along the Mexican Pacific Coast. More than $700 million has been invested in Mexican ports since the late 1990s, particularly at the Ports of Manzanillo and Lazaro Cardenas. Manzanillo is already Mexico's busiest seaport, handling approximately 1 million twenty-foot equivalent units (TEUs) annually. Manzanillo is currently the only port in Mexico offering double-stack service to the U.S. Manzanillo is currently planning to invest $150 million to double its docking capacity, container storage, and transfer space through the development of a new terminal at Laguna de Cuyutlan. Completion of this container terminal will increase its overall footprint to approximately 8,378 acres. The Port of Lazaro Cardenas is currently investing $290 million to expand its capacity to 2.5 million TEUs (up from 180,000 today). Together, these Mexican ports will provide alternative connections to major Midwestern markets, Northeastern markets, and east-west highway and rail corridors, thereby capturing market share from West Coast competitors and East Coast and Gulf Coast ports that rely on Panama Canal traffic.

4.4.2 Rail Infrastructure Improvements

There are also a number of rail improvements that will influence the type and volume of rail freight moving into and out of the region. The most recent Texas Rail System Plan identified a number of developments in the Corpus Christi and Yoakum Districts, including:

- Since the purchase of Tex-Mex by KCS in 2004, KCS has invested significantly in upgrading the Tex-Mex line from Laredo to Corpus Christi, and also plans on restoring

service to the 84.5-mile Victoria–Rosenberg corridor to reduce mileage between Laredo and Houston.

- In December 2004, KCS purchased a controlling interest in one of Mexico's three major rail lines, Grupo TFM, and new holding company, called "NAFTA Rail", was created. The combined company, including trackage rights, consists of approximately 6,000 miles of track in the U.S. and Mexico, with access to 13 seaports, 14 intermodal ramps, and 181 interchange points with other railroads.
- A project at U.S. Naval Station Ingleside in Corpus Christi Bay would provide rail access to developments at the former naval station by building a spur from the UP main line to the station.

In April 2008[7], KCS announced plans to construct an intermodal facility inside Fort Bend County, adjacent to, but outside of, the Study Area. To be located just north of Kendleton, this facility would primarily serve to handle containerized freight, a significant portion of which could pass through the Corpus Christi and Yoakum Districts.

A study investigating the potential for a new inland port facility in Robstown is currently underway. If constructed, the Robstown Trade Processing & Inland Center (RTPIC) would be strategically located at the rail intersection of the UP's Brownsville Subdivision and the KCS / Texas-Mexican line.

In addition, the long-range Metropolitan Transportation Plan (MTP) for Corpus Christi specifies the need to minimize conflicts between rail and trucking with other modes. A 2004 Freight and Hazardous Movement Study for the Corpus Christi MPO identified key issues, major bottlenecks and potential projects for freight transportation. Issues and projects include upgrading US-77, monitoring progress of the proposed La Quinta Intermodal Facility, continuing efforts toward the replacement of Harbor Bridge, identifying improvements to SH 358 (South Padre Island Drive), and reviewing access management policies. Also included in the study were the development of the Joe Fulton International Trade Corridor, the improvements to Port Avenue, the Military Deployment and Joe Fulton rail improvements.

Finally, the Port of Corpus Christi Authority plans to expand its Northside Rail Yard. In 1999, the Authority completed the construction of a loop rail track for loading and unloading of unit trains. This system allows a continuous flow of rail cars past the discharge or loading point without the need to reverse the direction of travel. This project will eventually double the Authority's capacity to handle military unit-trains of equipment from Fort Hood, Fort Bliss, and other bases in Texas and the Midwest. During peacetime, the facility will serve in supporting the trans-loading of commercial, industrial, or agriculture products moving through South Texas.

4.4.3 Impacts of Infrastructure Improvements

The combined impact of these infrastructure improvements will be to increase the overall volume and make-up of rail freight movements into and out of the region. In particular, these improvements will allow the region's port to handle more containerized freight, which often consists of lower-weight, higher-value goods.

[7] Fort Bend Herald, April 2, 2008. KCS press release, April 4, 2008.

The potential impacts of La Quinta Trade Gateway, the Panama Canal Expansion, and Mexican Port development, in particular, are not fully reflected in the TRANSEARCH database used as part of this forecast. As a result, it is likely that the overall growth in freight rail movements- particularly when measured by value- is underreported in this database. TxDOT should consider re-evaluating this forecast with more detailed, current information as this study progresses.

4.4.4 Operational Improvements

In addition to infrastructure investments, operational strategies of both the railroads and the ports serving the region can influence the type and volume of freight rail flows by improving speed, reliability, and efficiency along the system. Key railroad and port-related operational strategies are described below.

4.4.4.1 Railroad Operational Strategies

Railroads, both nationally and within the Corpus Christi and Yoakum Districts, are expanding their use of "hook-and-haul" strategies, moving connections off of main lines, running longer and heavier trains, and making increased use of technology to improve efficiency:

- **Hook and haul strategies** involve picking-up and dropping-off large blocks of railcars, leaving the assembly and disassembly of these blocks to their industrial customers or to short line railroads. This strategy, which increases train velocity by reducing the number of stops the railroads make for individual railcars, is generally performed off of the main lines, on track owned by shippers/industries or short lines, thus freeing the main lines for through trains.
- **Longer and heavier trains** are also being used by the railroads to maximize existing capacity and improve efficiency. For example, the BNSF has mandated that all their international intermodal shipments be handled in 40-foot well cars and all their intermodal trains are 8,000 feet in length. These changes will allow the BNSF to increase the amount of freight that can be handled over its mainlines without increasing the number of trains. However, the longer trains cannot be handled without lengthening sidings to permit trains to meet and pass; and without providing the corresponding yard capacity to assemble and hold the longer trains. Adding sidings and expanding terminals is a major challenge in densely developed urban areas. Railcar weights are also increasing, with many Class I main lines now capable of handling 315,000-pound railcars.
- **Improved routing strategies**. Railroads are moving toward a "hub and spoke" strategy which consolidates and improves their services in critical high-density, higher-profit corridors, and curtailing or eliminating their services in others. In some cases, this is due to the size of their markets, while in others it has more to do with the condition and cost of maintaining and upgrading their infrastructure.
- **Information technology** is being used more frequently to improve efficiency. Communication between customers and railroads is increasingly conducted by computer to computer or by the Internet (as opposed to phone and fax). Freight cars are traced using transponders. While cost savings have been achieved as a result of these technologies, additional improvements can also be realized in areas like yield management and asset optimization. Future improvements may include:
  - **Electronic braking**, which uses a wire or radio electronic signal to set brakes instantly, lowering stopping times and improving overall track capacity;

- **Positive train control (PTC)**, which utilizes global positioning systems (GPS) and continuous data communications to allow trains to be directly controlled, again improving capacity;
- **Remote control switching**, which occurs with a single remote control operator on the ground or riding on the steps of a locomotive or car. Since the operator communicates directly with the locomotive, rather than with another crewmember, this can lead to improvements in both productivity and safety.

4.4.4.2 Port Operational Strategies

There are several strategies being employed by ports and terminals in Texas and nationally to improve overall efficiency. These include:

- **Increasing use of technology for security purposes**. Until 2001, port security concerns were generally focused on controlling theft and reducing the level of contraband that entered the nation, with particular attention paid to the smuggling of narcotics. In the aftermath of 9/11, overall security efforts shifted to the prevention of terrorist attacks and reduction of overall transportation system vulnerability while trying to minimize the impact on the flow of commerce. As a result, ports and terminals have taken steps to strengthen physical security at their facilities, educate their workers and tighten personnel screening, and enhance control and visibility of cargo shipments and vehicle movements through their facilities. In addition, many have employed IT and ITS applications, including
  - **Container and shipment tracking technologies**, which include using Radio Frequency Identification (RFID) tags to ensure the integrity of containers (i.e., they have not been tampered with), alert dispatchers or others in the supply chain via wireless communication if any attempt is made to open the container or tamper with the lock, or improve visibility of shipments throughout the supply and distribution chain.
  - **Non-intrusive inspection devices**, which allow inspectors to evaluate the contents of containers without having to physically open them for inspection. Two forms of passive scanning technology are currently in use: x-rays and gamma–rays. Both technologies provide imagery of the contents of a container, and both are capable of detecting the presence of specific cargos (such as narcotics or explosives). Current gamma-ray based inspection systems are capable of scanning a 40-foot container in six seconds.
  - **Driver and vehicle identification and verification technologies**, which often involve biometric identification systems (e.g., fingerprint, retina, or iris recognition), smart ID cards, transponders affixed to vehicles or license plates, or other technologies. These systems allow ports and terminals to control access to their facilities or to link vehicle or driver information to existing safety and security databases.
  - **Intermodal data exchange systems and initiatives**, which allow various stakeholders to electronically collect, use, and disseminate trade, security, and other data. In many cases, data collected and used by commercial motor vehicle inspection staff could be useful to customs personnel (and vice versa).
- **Increasing use of technology for on- and off-port efficiency**. Ports and terminals in Texas are making significant infrastructure improvements to absorb expected increases

in freight demand, as described earlier. However, some ports are facing an acute shortage of land suitable for development into marine terminals due to both burgeoning cargo volumes at existing facilities and the ecological sensitivity of the marine environment. Many ports are under pressure to resolve their access and capacity problems while minimizing additional environmental and community impacts, often through the use of ITS. There are several types of IT and ITS applications that are being used to mitigate the effects of freight growth at and around port and terminal facilities, including:

- **Web-based freight portals**, which provide information on ship arrivals, cargo status, and in some cases roadway traffic conditions in and around port and terminal facilities. These systems can be effective tools in increasing the amount and visibility of shipment and traffic information available to drayage operators and other transportation service providers, resulting in more efficient port operations.
- **Gate appointment systems**, which allow ports and terminals to manage arrivals and departures at their facilities by requiring trucks to make appointments. In many cases, these appointments are tracked and managed electronically and are coupled with on-port management systems (described below) to enhance overall operational efficiency. In addition, gate appointment systems are also combined with electronic fee collection applications to further streamline gate operations.
- **On-port management systems**, which often involve using advanced technology and communications equipment to manage loaded and empty container positioning, chassis pools, and on-port traffic flows.
- **Empty container repositioning techniques**. Although both imports and exports are growing at ports, imports continue to outpace exports, leading to a demand for empty containers to be filled with finished products and ultimately returned to the U.S. Shipments of empty containers grew by 6.4 percent to 2.3 million TEU in 2006. To reduce costs associated with repositioning and shipping empty containers, some shippers are considering investing in disposable containers.

4.4.4.3 Impacts of Operational Improvements

The combined impact of these operational improvements will increase the efficiency of ports, terminals, and railroads in the region, but will have negligible impacts on the overall volume and type of commodities moved along the regional rail system and the TRANSEARCH dataset used in this forecast accurately reflects their impacts on a system-wide level.

These operational improvements might, however, impact volumes at individual rail or port facilities in the region and it is important that TxDOT continue to monitor the development and deployment of these and other systems as this study progresses.

4.5 COMMODITY FLOW FORECAST

As discussed previously in this section, the TRANSEARCH data was used as the primary data source to guide the development of the freight demand forecast for the Corpus and Yoakum Districts, supplemented by likely impacts of the rail and port trends and issues described above. The following sections provide an overview of total freight flows, key trading partners, and top commodities in 2003 and 2035.

4.5.1 Commodity Flows

4.5.1.1 Overall Trade

Overall trade by tonnage in the study area, including inbound and outbound rail shipments for domestic and cross border trade, is forecasted to increase 18 percent from almost 24 to near 28 million tons between 2003 and 2035. Comparing growth by district, shipments to and from Yoakum District are expected to grow at a much faster pace than shipments to and from Corpus Christi District, increasing from near 15 to 18 million tons (26%) and from 9 to 9.4 million tons (4%), respectively. By value, total rail shipments combining both districts are projected to increase 8 percent from $9.8 to $10.6 billion (in 2003 dollars) between 2003 and 2035. Total commodities value is expected to grow 2 percent from $5.3 to $5.4 billion in Yoakum District and 16 percent from $4.5 to $5.2 billion in Corpus Christi District.

Through traffic shipments are expected to experience the major increase in tonnage and value. Through traffic shipments were determined by selecting all origin and destination pairs for domestic and international trade that in order to get to their destination will likely pass through both districts. This is most probably the case of domestic shipments to and from Hidalgo and Cameron counties and of cross border shipments to and from the north east and center states of Mexico and to and from eastern counties in Texas and eastern states in the U.S. According to TRANSEARCH estimates, between 2003 and 2035 through traffic shipments will grow from 9.1 to 24.5 million tons (170%) and their value is expected to rise from $9.1 to $30.0 billion (228%), as Table 4-1 shows.

Table 4-1 Overall Trade in Tonnage and Value

	Tonnage in Millions				
	Yoakum District	Corpus Christi District	Total	Through Traffic	Total w/Through Traffic
2003	14.6	9.0	23.7	9.1	32.8
2035	18.4	9.4	27.8	24.5	52.3
% Increase 2003-2035	26%	4%	18%	170%	60%
	Value in Billions, 2003 dollars				
	Yoakum District	Corpus Christi District	Total	Through Traffic	Total w/Through Traffic
2003	5.3	4.5	9.8	9.1	19.0
2035	5.4	5.2	10.6	30.0	40.6
% Increase 2003-2035	2%	16%	8%	228%	114%

Domestic shipments in tonnage and value represent practically 100 percent of the overall trade in 2003. This pattern is expected to continue through 2035. Through traffic shipments in tonnage and value are predominantly NAFTA flows. By 2035 cross border trade in tons is expected to represent almost 80 percent of total through traffic and 90 percent of total value, as Table 4-2 shows. This supports the findings of other studies, such as The Texas NAFTA Study Update, which state that Texas is the major entry point of NAFTA shipments, and thus NAFTA through traffic is considerable relative to inbound and outbound NAFTA shipments to and from Texas.

Table 4-2 Domestic and NAFTA Shares by Tons and Value

	Tonnage			Value		
	Domestic	**NAFTA**	**Total**	**Domestic**	**NAFTA**	**Total**
2003	99%	1%	100%	99%	1%	100%
2035	99%	1%	100%	98%	2%	100%
	Through traffic Domestic	**Through traffic NAFTA**	**Total**	**Through traffic Domestic**	**Through traffic NAFTA**	**Total**
2003	39%	61%	100%	19%	81%	100%
2035	22%	78%	100%	10%	90%	100%

4.5.1.2 Inbound and Outbound Flows

Overall growth in tonnage and value between 2003 and 2035 will be led primarily by inbound commodities. As Table 4-3 shows, trade of inbound commodities is forecasted to increase by nearly 32 percent by weight and 78 percent by value during that period. Outbound movements, meanwhile, are expected to decrease by about 8 percent by weight and by 9 percent by value.

Table 4-3 Inbound and Outbound Flows

Tonnage in Millions									
	2003			2035			2003-2035 Difference		
District	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Corpus Christi	**4.0**	**5.1**	**9.0**	**4.7**	**4.7**	**9.4**	**19%**	**-7%**	**4%**
Yoakum	**11.0**	**3.6**	**14.6**	**15.1**	**3.3**	**18.4**	**37%**	**-8%**	**26%**
Total	14.9	8.7	23.7	19.8	8.1	27.8	32%	-8%	18%
Value in Billions, 2003 dollars									
	2003			2035			2003-2035 Difference		
District	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Corpus Christi	**0.9**	**3.6**	**4.5**	**2.0**	**3.2**	**5.2**	**122%**	**-11%**	**16%**
Yoakum	**1.0**	**4.3**	**5.3**	**1.4**	**4.0**	**5.4**	**39%**	**-7%**	**2%**
Total	1.9	7.9	9.8	3.4	7.2	10.6	78%	-9%	8%

It is interesting to note the differences in the make up of inbound and outbound traffic in the region. In 2003, inbound shipments accounted for approximately 63 percent of total commodity flows in the region, though only 19 percent of the overall shipment value. Outbound commodities in tonnage represented 27 percent of total shipments, but accounted for over 80 percent of total shipment value. This disparity can be traced directly to the types of commodities being handled within the region. As will be described in a subsequent section, key outbound commodities include relatively high value goods such as fuel products and chemicals. Growth in these commodities is expected to be slow over the next several decades. Conversely, the key inbound commodity for the region is coal. The region is already home to two coal-fired power plants, Coleto Creek in Goliad County and the Fayette Power Project in Fayette County. Two additional coal-fired plants (both in Calhoun County) could be in place by 2035. These facilities are driving demand for inbound coal shipments.

4.5.2 Key Commodities

Key commodities were analyzed both by weight, in tonnage, and by value, in 2003 dollars, in order to develop a comprehensive understanding of the commodity mix within the region. Key commodities were also analyzed by movement type, inbound vs. outbound.

4.5.2.1 Key Commodities by Weight

As shown in Figure 4-2, two commodities accounted for 70 percent of total tonnage traded, coal (40 percent) and chemical and allied products (30 percent). This is not surprising, given the importance of the oil and gas industry to the region, the major fuel-handling seaports in the region, and the presence of existing and/or planned coal-fired power plants. Other important commodities include metallic minerals (14 percent), farm products (5 percent), and metallic ores (4 percent).

Figure 4-1 Overall Commodity Flows (by Weight and Value) 2003 and 2035

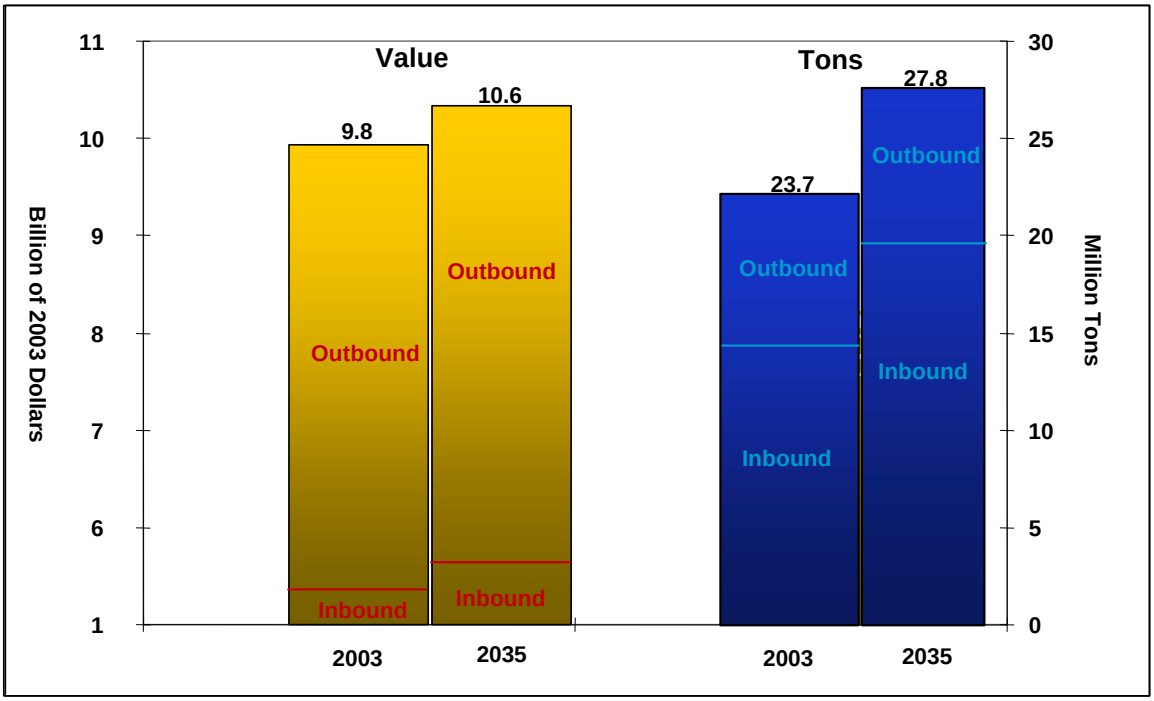
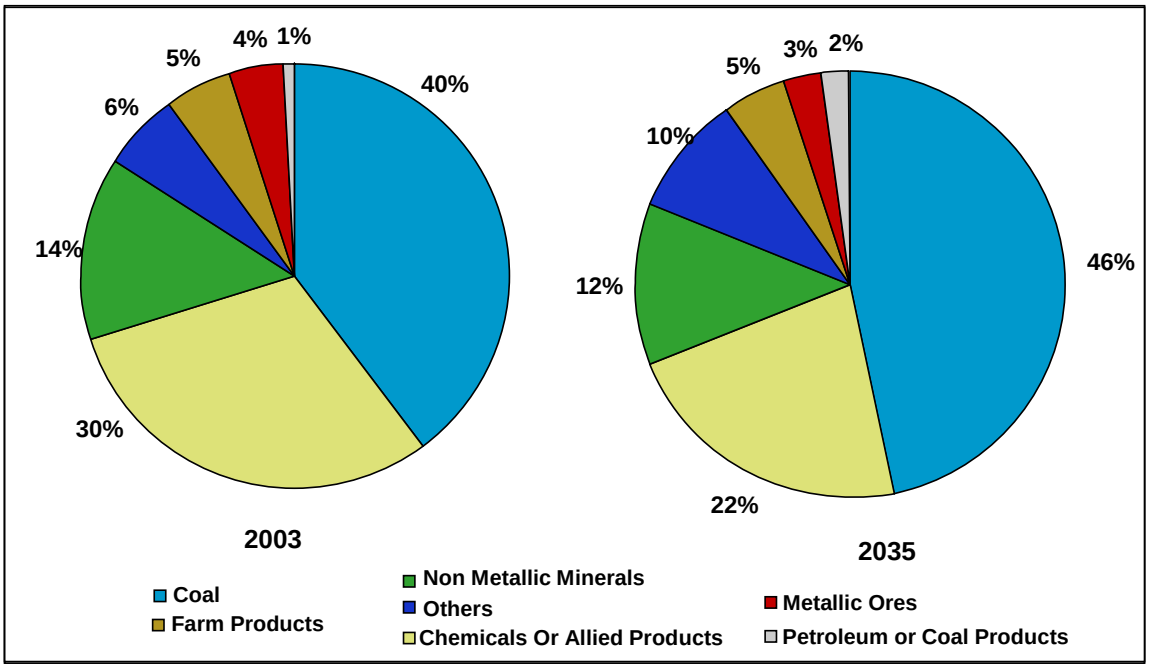


Figure 4-2 Key Commodities (By Weight) 2003 and 2035

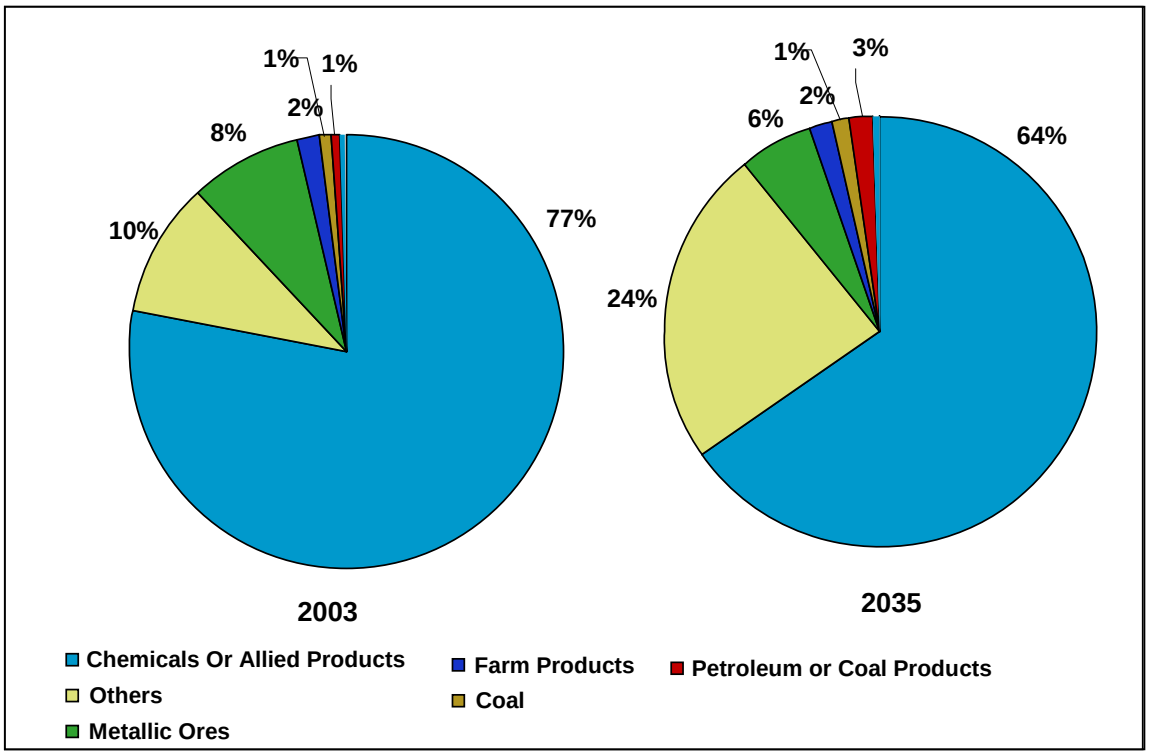


As can be seen in Figure 4-2, coal products are expected to drive overall growth in the region between 2003 and 2035. Between 2003 and 2035 coal is expected to increase its share from 40 to 46% of all commodity movements (by weight). The rest of the commodity mix, with the exception of chemicals, is expected to remain essentially the same.

4.5.2.2 Key Commodities by Value

As shown in Figure 4-3, chemical or allied products are the dominant commodity type (by value), accounting for over three-fourths of total value. Other important commodities include metallic ores (8 percent) and farm products (2 percent).

Figure 4-3 Key Commodities (by Value) 2003 and 2035



As shown in Figure 4-3, the commodity mix (by value) is expected to become more diverse between 2003 and 2035. Chemicals and allied products will still dominate, but their overall share is projected to drop from 77 to 64 percent. 'Other' commodities (which include transportation equipment, electrical equipment, and waste or scrap materials) are projected to increase from 10 to 24 percent, while the relative shares of other commodities will not change appreciably.

4.5.2.3 Key Outbound Commodities by Weight

Outbound commodities are dominated by chemicals or allied products, metallic ores, and non metallic minerals, which combine to account for more than 90 percent of all outbound rail movements. By 2035 with the exception of petroleum and coal products, whose share is expected to reach 8 percent, the composition of outbound commodities is not expected to change significantly, as shown in Figure 4-4.

Figure 4-4 Key Outbound Commodities (by Weight) 2003 and 2035

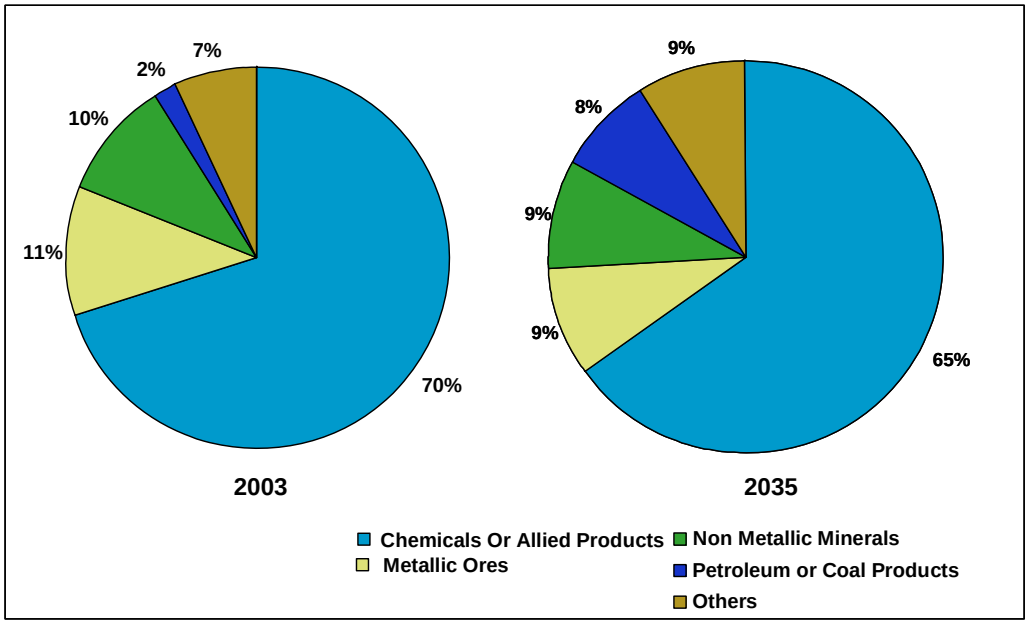


Table 4-4 presents the tonnage of the major outbound commodities for the period 2003 and 2035. The data suggests that metallic ore flows are expected to decrease 25 percent during that period, followed by chemicals or allied products at 15 percent, non-metallic minerals at 10 percent, while petroleum and coal products are forecasted to increase around 230 percent.

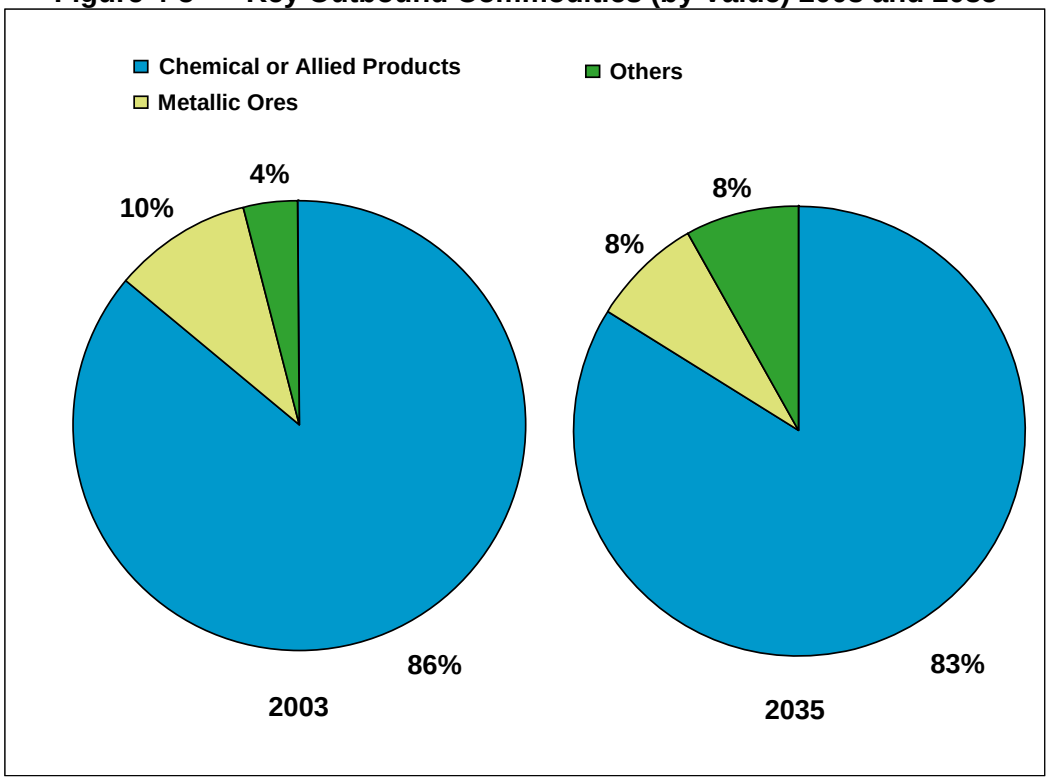
Table 4-4
Growth in Key Outbound Commodities (by Weight) 2003 and 2035

	Tons (millions)		
Commodity	**2003**	**2035**	**Change**
Chemicals Or Allied Products	6.09	5.21	-15%
Metallic Ores	1.00	0.75	-25%
Non Metallic Minerals	0.84	0.76	-10%
Petroleum or Coal Products	0.19	0.65	232%
Others	0.61	0.70	14%
Total	**8.74**	**8.07**	**-8%**

4.5.2.4 Key Outbound Commodities by Value

Key outbound commodities are similar when shipment value is considered. As can be seen in Figure 4-5, chemicals and allied products make up nearly 90 percent of the total value of outbound commodities. Metallic ores and others participated with 10 and 4 percent, respectively. By 2035 both chemical or allied products and metallic ores are expected to slightly reduce their participation to 83 and 8 percent, respectively, while others will increase their share to 8 percent.

Figure 4-5 Key Outbound Commodities (by Value) 2003 and 2035



Note: Values may not add to 100% due to rounding.

As can be seen in Table 4-5, between 2003 and 2035, the dollar value of outbound commodities is forecasted to decrease 9 percent. The drop is explained by a reduction of both chemical or allied products and metallic ores of 11 and 28 percent, respectively. The value of other commodities is expected to increase 97 percent.

Table 4-5
Growth in Key Outbound Commodities (by Value) 2003 and 2035

	In Billions, 2003 dollars		
Commodity	**2003**	**2035**	**Change**
Chemicals Or Allied Products	6.79	6.02	-11%
Metallic Ores	0.82	0.59	-28%
Others	0.31	0.61	97%
Total	**7.92**	**7.22**	**-9%**

4.5.2.5 Key Inbound Commodities by Weight

As shown in Figure 4-6, four commodities (coal, non-metallic minerals, farm products, and chemicals or allied products) accounted for more than 90 percent all inbound commodities by weight in 2003. By 2035 coal is expected to slightly increase its share to 65 percent, while farm products, non metallic minerals, and chemical allied products are forecasted to decrease their participation to 7, 13, and 5 percent, respectively.

Figure 4-6 Key Inbound Commodities (by Weight) 2003 and 2035

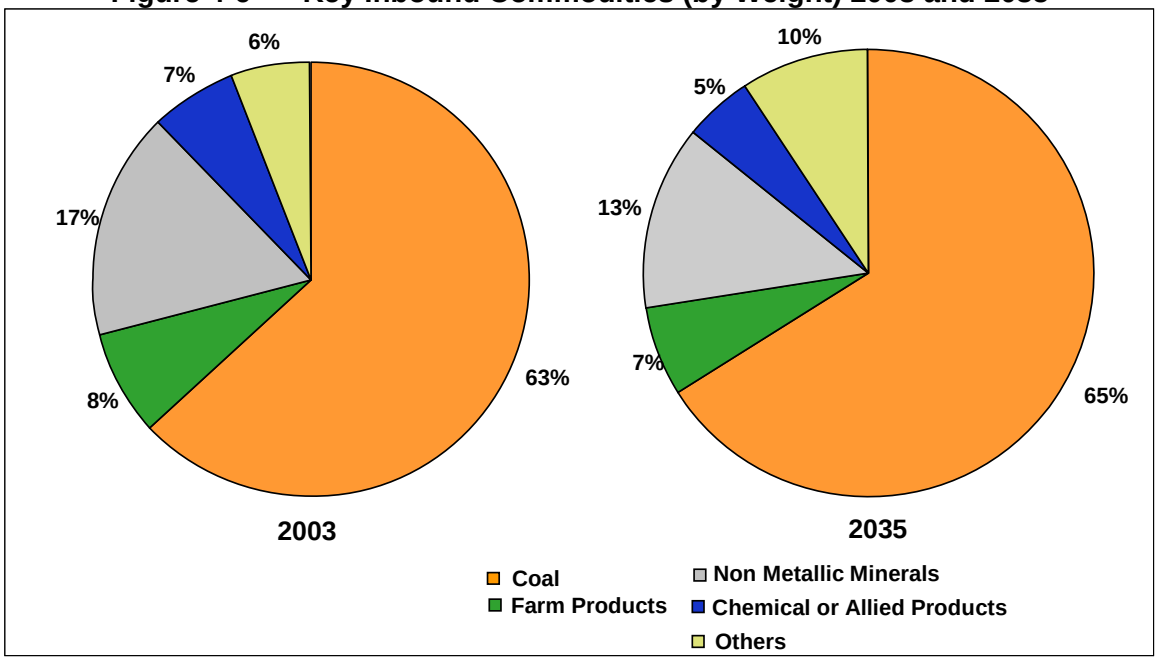


Table 4-6 provides specific growth rates for each of these key inbound commodities between 2003 and 2035. Inbound shipments of coal, to fuel the region's existing and planned power plants, are expected to grow by 37 percent. 'Other' commodities, which include clay, concrete, glass or stone, food or kindred products, and miscellaneous freight shipments, are expected to increase significantly, as well, leading to a more diverse set of inbound commodities by 2035.

Table 4-6
Growth in Key Inbound Commodities (by Weight) 2003 and 2035

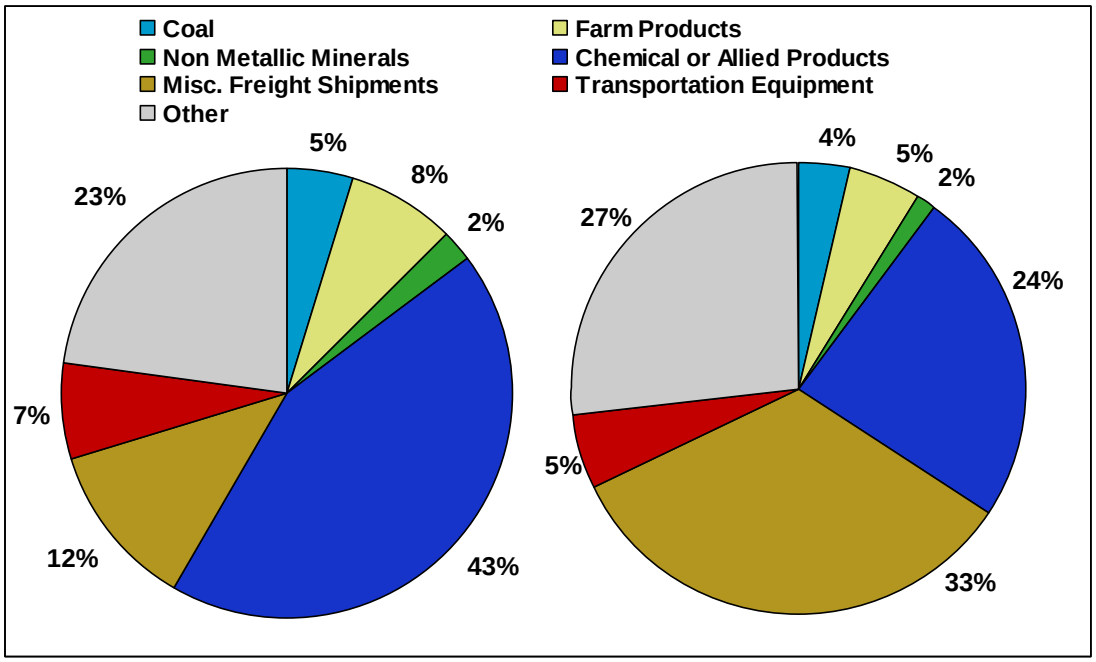
	Tons (millions)		
Commodity	**2003**	**2035**	**Change**
Coal	9.37	12.87	37%
Farm Products	1.16	1.29	11%
Non Metallic Minerals	2.48	2.60	5%
Chemical or Allied Products	1.01	0.97	-4%
Others	0.92	2.05	123%
Total	**14.94**	**19.78**	**32%**

Source: Cambridge Systematics, Inc.

4.5.2.6 Key Inbound Commodities by Value

As shown in Figure 4-7, chemical or allied products accounted for nearly 43 percent of the total value of inbound commodities in 2003. Miscellaneous freight shipments, farm products, and transportation equipment represented 12, 8, and 7 percent of total value, respectively. The rest of the commodities accounted for nearly 25 percent. By 2035 chemical or allied products share is expected to decrease to 24 percent, while miscellaneous freight shipments will increase theirs to 36 percent. Because the TRANSEARCH database often includes intermodal movements within the "miscellaneous freight shipments" category, growth in these types of shipments may point to increased containerized and intermodal activity at the region's major seaports.

Figure 4-7 Key Inbound Commodities (by Value) *2003 and 2035*



As shown in Table 4-7, miscellaneous freight shipments are expected to drive inbound commodity growth between 2003 and 2035. Coal movements and transportation equipment are also expected to increase significantly.

Table 4-7
Growth in Key Inbound Commodities (by Value) 2003 and 2035

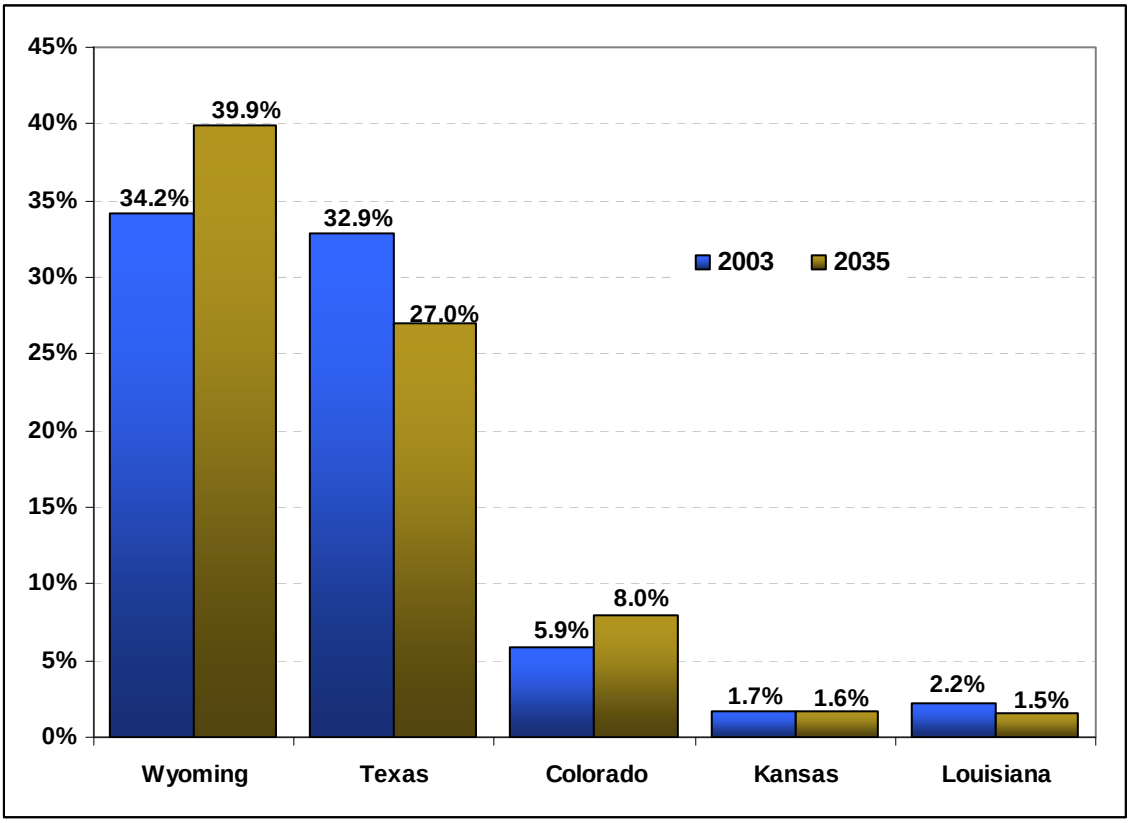
	In Billions, 2003 dollars		
Commodity	**2003**	**2035**	**Change**
Misc. Freight Shipments	0.01	0.02	286%
Coal	0.09	0.13	38%
Transportation Equipment	0.14	0.18	30%
Farm Products	0.15	0.18	17%
Non Metallic Minerals	0.04	0.05	18%
Chemical or Allied Products	0.83	0.82	-2%
Others	0.44	0.93	112%
Total	**1.93**	**3.43**	**78%**

4.5.3 Key Trading Partners

As shown in Figure 4-8, Wyoming was the region's top trading partner (by weight), due primarily to coal shipments from the Powder River Basin for use in the region's power plants and for export through the Port of Corpus Christi, the seventh largest exporter of coal in the U.S.. Nearly one-third of the rail tonnage moving into and out of the region stays within Texas, though much of this is likely shipments to or from the region from major rail facilities in the Dallas-Ft. Worth region.

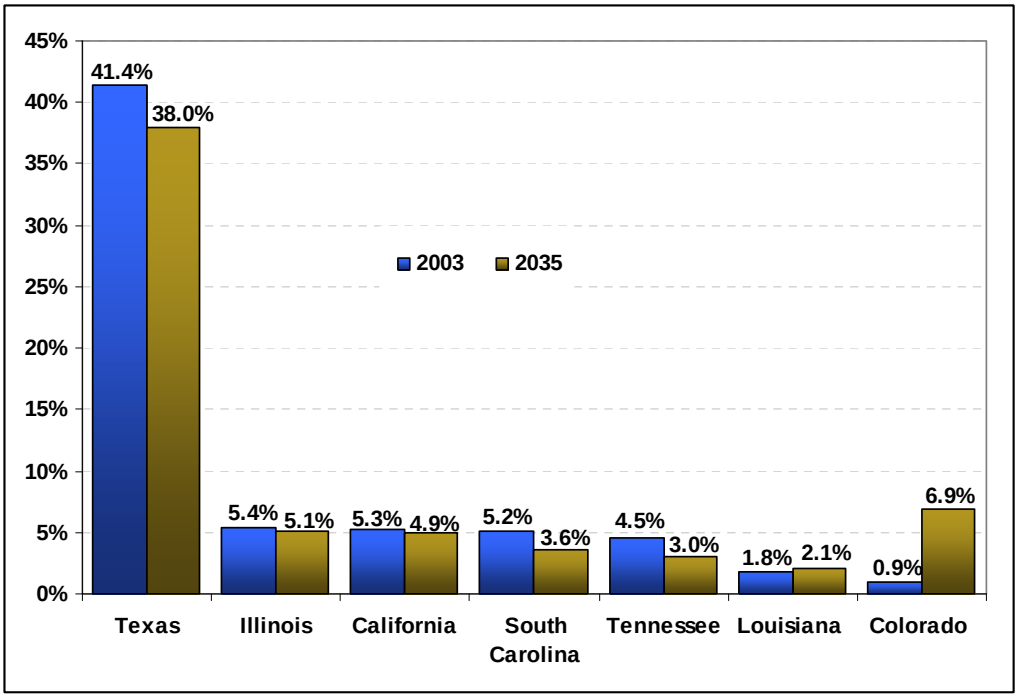
Shipments from Wyoming, driven by demand for coal in the region and through the Port of Corpus Christi, are expected to grow significantly by 2035, accounting for nearly 40 percent of total shipments (by weight).

Figure 4-8 Key Trading Partners (by Weight) 2003 and 2035



When shipment value is considered, the key trading partners are remarkably different. Clearly, trade within Texas is important, accounting for 41 percent of total shipment value in 2003. As mentioned above, this is likely comprised of containerized shipments (containing lower-weight, higher-value goods) moving to and from distribution facilities in the Dallas-Ft. Worth region. Other key trading partners (by value) are located in states that are either major generators of higher-value, lower-weight goods (i.e., California) or are located in states with major rail interchange facilities for these shipments (i.e., Illinois [Chicago], Tennessee [Memphis]). By 2035 Colorado is expected to become a more significant trading partner, increasing its share from 1 to almost 7 percent of the total shipment value.

Figure 4-9 Key Trading Partners (by Value) 2003 and 2035



SECTION 5 - BASE CASE OPERATIONS MODEL

5.1 STUDY METHODOLOGY

5.1.1 Railroad Model Simulation

As part of this report a model simulation of the Corpus Christi – Yoakum Districts was performed to inventory all rail operations throughout the state. Rail model simulation allows a user to test dynamic rail movements on a defined network. Alterations to that network, including track or operating modifications, can also be tested to understand the impact of the changes.

The Corpus Christi – Yoakum (C-Y) simulation analysis was performed with the Rail Traffic Controller model (RTC). This model is used by both UP and BNSF for similar rail network analyses. The model performs mathematical calculations that represent trains moving throughout a network of main lines, passing tracks, yards, and junctions. The model considers track speed, train length and weight, motive power, signals, bridges, grades, train priority and other information as trains are dispatched across the network.

During a simulation, the model identifies every possible route for each train dispatched, and then attempts to run all trains over the routes that create the least "cost" for the network. Cost is defined by a number of factors including mileage, adherence to schedule (primarily for passenger operations which were minor in this simulation) and train priority. When a conflict occurs between two trains, the model evaluates alternatives and applies the solution that creates the least cost to all trains involved.

Operators of RTC have the option to override decisions that the model makes to create a more realistic solution. Rail operations are very complex, and while RTC can perform many of the functions that occur daily, it cannot always simulate every nuance that contributes to rail traffic flow. The model does have limitations, and therefore, review of the initial solution is an important step in the modeling process.

Analysis of the RTC output is also very important to understanding what the model is depicting. The model creates output that can be analyzed to understand that which is occurring across the entire network as trains are dispatched to and from designated destinations. The model generates a line of operating data as each train enters and departs each node that makes up the modeling network.

The data generated consists of basic information, such as train ID and node number, as well as dynamic information such as train delay, train speed, and arrival and departure times of the head and rear ends of train. From these data, total train delay, total miles operated, and total elapsed running times can be extracted by train type and location.

For the C-Y analysis, the raw data RTC created were used to analyze the operations. The C-Y simulation network consisted of approximately 1000 nodes, and the simulation generated approximately 150,000 lines of data. Programs developed to extract the data and standard reports that are generated by the model for each simulation run were used to analyze the simulation and to develop conclusions about the C-Y rail network.

For the C-Y analysis, a 14 day simulation was developed over 16 days. The first day (day 1) was used to "load" the model with rail traffic, and the last day (day 16) was used to allow trains that started on day 15 to complete their operations. The two day warm-up and cool-down days

of the simulation were not analyzed. The fourteen complete intermediate days (days 2 through 15) were analyzed.

5.1.2 Base Case Simulation

The normal procedure for performing a rail model simulation is to create a Base Case as the first step. The Base Case is created using data from existing operations, generally provided by one or more railroads involved in the simulation. A Base Case is created because it is used to validate that the model is accurately reflecting existing operations; it essentially calibrates the model. Generally, validation is performed by the railroad(s) involved. Operational issues that are not accurately reflected are modified to better represent what railroad managers describe is really happening.

After the Base Case is created and validated, future "what if" cases can be created and compared to the Base Case. These cases cannot be validated because they include hypothetical changes to the network, including modified traffic levels, schedules, additional or reduced network trackage, train routing options or other aspects of operations that are desired to be tested. Comparison of operating statistics between the Base Case and the hypothetical cases allows a user to determine if the changes benefit or negatively affect rail flow on a segment of the network, or across the entire network.

Typically, the information required to populate the Base Case is provided by one or more of the railroads operating the track being examined. Unfortunately, such information was not provided to assist in the preparation of this report, despite repeated requests. As such, the validity of results obtained can not be guaranteed. The results may or may not be representative of all the issues currently being experienced along the rail network within the Study Area.

A Base Case was created using alternative sources to railroad input. The Base Case is composed of two major components; the model network and model operations. Each will be briefly described, along with how each was created for this analysis.

5.1.3 Model Network

The model requires the development of a network of main lines, passing tracks, yards, and junctions that accurately represents existing routes. For this study, the network was developed utilizing railroad track charts that indicated the grades, number of tracks (sidings, yards or second main track), signal location and curvature of routes in the Corpus and Yoakum TXDOT Districts. Track charts are created by the railroads for their internal analyses and representation of their networks.

Railroad timetables were also utilized to determine speed limits, operating instructions and specific train restrictions. Additionally, aerial photos of connections, bridges and yards were utilized to create the routes, yards, yard leads and junctions within the simulated network.

The following line segments were included in the Corpus – Yoakum District model network.

- UP's **Angleton Subdivision** from Sweeny to Bloomington, including Placedo.
- UP's **Brownsville Subdivision** from Bloomington to Ricardo, including Sinton, Odem and Robstown.
- UP's **Port Lavaca Subdivision** from Placedo to Port Lavaca.

- UP's **Corpus Christi Subdivision** from Campbellton to Corpus Christi, including Odem.
- UP's **Victoria Industrial Lead** from Victoria to Bloomington.
- UP's **Seadrift Industrial Lead** from Bloomington to Long Mott.
- UP's **Kosmos Subdivision** from Sinton to Gregory.
- UP's **Cuero (Port Lavaca) Subdivision** from Flatonia to Placedo, including Victoria.
- UP's **Flatonia Subdivision** from Giddings to Flatonia to Harwood, including West Point.
- UP's **Glidden Subdivision** from Lissie to Flatonia.
- UP's **Smithville Subdivision** from Katy to Smithville, including Sealy and West Point.
- BNSF Railway's **Galveston Subdivision** from Wallis (north of Rosenberg) to Bellville, including Sealy.
- BNSF's **Bay City Subdivision** from Bay City to Cane Jct., and Bay City to Celanese Storage.
- KCS Railroad's (KCS) **Laredo Subdivision** from Corpus Christi to Matthews, including Robstown.

Additionally, a number of industrial or coal spurs were included in the model network. These included:

- The LCRA coal spur near LaGrange.
- The Coleto Creek coal spur near Victoria.
- The Phillips Petroleum industrial spur near Sweeney.
- The Point Comfort and Northern spur at Lolita.
- The Formosa Plastics industrial spur near La Ward.
- The Celanese Storage industrial spur near Bay City.

Yard tracks were included in the model at Bloomington, Odem, and Corpus Christi. Switching efforts at these locations were minimized because of the lack of information regarding those operations. Trains were held from 20 minutes to 2 hours at the larger yards/terminals to represent crew changes, setouts and pickups.

Rail served industry tracks were represented at locations where there appeared to be existing local rail operations on the track charts. These locations were verified as being in service using aerial photographs. If the siding or industry no longer appeared to receive or forward cars, it was left out of the simulation network.

All connections between railroads and between various subdivisions were researched via aerial photographs. The connections were then checked against the geometry shown in the track charts that were available. Modifications to the connections in the model network were made accordingly.

Figure 5-1 is a high level representation of the model network created for the C-Y simulation. Heavier lines represent main line routes that are part of the C-Y network. Thinner lines represent branch lines and industrial spurs that were also included in the model. The

intersections between railways and between subdivisions are not shown accurately in Figure 5-1, although they are represented correctly in the model.

5.1.4 Model Operations

The model requires detailed operating data to create a viable simulation of rail traffic. This data should include the origin and destination of trains, the type and priority of trains, and the consist (number of locomotives, number of cars) of those trains. It also should include schedule information, including frequency per week and likely starting time of each train. Finally, it should include what work is performed on line by specific train, and whether that work requires main line occupancy or is performed in the clear of other traffic.

Usually, this information is gathered from the railroads participating in the simulation. As previously mentioned, this information was not made available for the preparation of this report. Similar rail models were constructed for the Houston and San Antonio areas. Requests for detailed output data from those models which could have assisted in the preparation of this model were made, but the data was not made available.

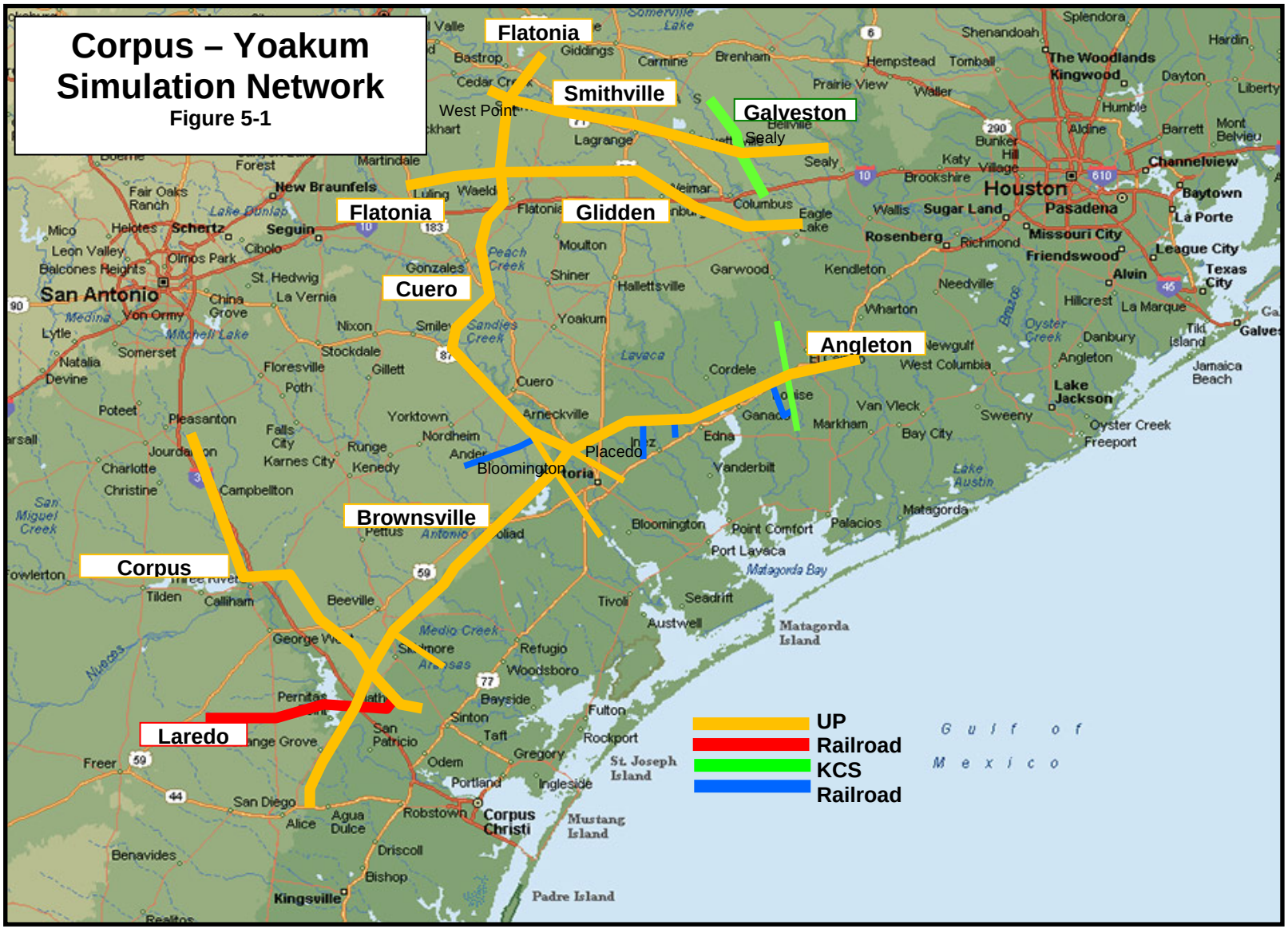
Without information from the railroads or the Houston and San Antonio models traffic density maps, internet sources, public documents and knowledge of UP's system operations were used to create the operating plan. Research was performed using these various sources, and information was linked together in an attempt to define an overall picture of operations over the network. Conflicting information was rectified based upon an understanding of operations, and common sense regarding the network being studied. For example, when a traffic density map indicated that 20 million tons of traffic operated into a junction, but only 15 million tons was recorded departing the junction, analysis was performed to determine if the 5 million tons of traffic terminated (or originated) at the junction. If that did not occur, the additional tonnage was assigned to one of the departing routes based upon the most likely routing of the traffic.

BNSF's and KCS's network also played a minor role in the analysis; so the same sources were utilized to create operations over both those railroads' track networks.

As previously mentioned, one key step in any simulation analysis is validation of the Base Case by the railroads involved in the simulation. For this project, however, with no railroad participation and the model input coming from outside sources, no validation of the Base Case was performed. Therefore, while confident that the findings derived from the model are accurate in a "general" sense, caution should be exercised when attempting to interpret these results at a detailed level. If the assumptions made were to ever be validated by the railroads then the need for such caution would be greatly diminished. However, until such validation occurs there remains a possibility that the railroads will be hesitant in accepting findings derived from this model.

One aspect of the C-Y network is that BNSF and KCS both operate over many of the UP segments within the network. The levels of BNSF and KCS trains were included based upon traffic density charts that were available, research and knowledge of the type of operations that occur. Persons living in or around the subject area that have knowledge of UP's, BNSF's and KCS's operations were also contacted for input.

Figure 5-1 Corpus – Yoakum Simulation Network


Corpus – Yoakum Simulation Network
Figure 5-1
Flatonia
Smithville
Galveston
Flatonia
Glidden
Cuero
Angleton
Placedo
Brownsville
Corpus
Laredo
UP Railroad
KCS Railroad
Gulf of Mexico
San Antonio
Houston
Pasadena
Corpus Christi
Victoria
Bloomington
Yoakum
Cuero
Seguin
Schertz
New Braunfels
Sugar Land
Rosenberg
Missouri City
Friendswood
Alvin
Texas City
La Porte
Baytown
Channelview
Kingwood
The Woodlands
Lake Jackson
Angleton
Freeport
Matagorda Island
St. Joseph Island
Mustang Island
Padre Island
Kingsville
Alice
Beeville
Goliad
Gonzales
Lockhart
Luling
Columbus
Eagle Lake
Sealy
Brenham
Giddings
Bastrop
Carmine
Lagrange
Hallettsville
Shiner
Moulton
Garwood
Kendleton
Needville
Wharton
Cordele
Edna
Vanderbilt
Bay City
Van Vleck
Sweeny
Palacios
Port Lavaca
Point Comfort
Seadrift
Austwell
Tivoli
Refugio
Woodsboro
Bayside
Sinton
Taft
Gregory
Rockport
Fulton
Ingleside
Portland
Odem
Robstown
Driscoll
Bishop
Benavides
San Diego
Freer
Tilden
Calliham
Pleasanton
Poteet
Jourdanton
Charlotte
Christine
Campbellton
Karnes City
Kenedy
Runge
Nordheim
Yorktown
Floresville
Stockdale
Gillett
Poth
Falls City
Somerset
Natalia
Devine
Lytle
Von Ormy
Mico
Leon Valley
Balcones Heights
Olmos Park
Helotes
Cibolo
St. Hedwig
China Grove
La Vernia
Nixon
Smiley
Fair Oaks Ranch
Forest
Martindale
Waelder
Flatonia
Peach Creek
Sandies Creek
Lavaca
Medio Creek
Nueces
San Miguel Creek
Medina
Mitchell Lake
Lake Dunlap
Somerville Lake
Lake Austin
Matagorda Bay
Oyster Creek
Brazos
Jamaica Beach
Tiki Island
Galveston
Hardin
Liberty
Dayton
Mont Belvieu
Barrett
Humble
Aldine
Splendora
Shenandoah
Hempstead
Tomball
Prairie View
Waller
Katy
Brookshire
Wallis
Richmond
Needville
Hillcrest
La Marque
Danbury
West Columbia
Newgulf
Markham
Edna
Ganado
Yoakum
Cuero
Arneckville
Nixon
Pernitas Point
Bruni
Mirando City
Encinal
Freer
Realitos
Benavides
Kingsville
Alice
Agua Dulce
San Patricio
Odem
Portland
Robstown
Corpus Christi
Mustang Island
Padre Island
Bishop
Driscoll
Tilden
Calliham
Beeville
Goliad
Refugio
Woodsboro
Bayside
Sinton
Taft
Gregory
Rockport
Fulton
Ingleside
St. Joseph Island
Port Lavaca
Point Comfort
Palacios
Matagorda
Seadrift
Austwell
Tivoli
Matagorda Island
Bloomington
Victoria
Placedo
Angleton
Lake Jackson
Freeport
Oyster Creek
Danbury
Hillcrest
La Marque
Needville
Wharton
Rosenberg
Richmond
Sugar Land
Pasadena
Houston
Channelview
Baytown
La Porte
League City
Texas City
Alvin
Friendswood
Missouri City
Kingwood
The Woodlands
Splendora
Shenandoah
Hempstead
Tomball
Prairie View
Waller
Katy
Brookshire
Sealy
Columbus
Eagle Lake
Brenham
Carmine
Giddings
Bastrop
Cedar Creek
West Point
Lagrange
Smithville
Flatonia
Martindale
Forest
New Braunfels
Luling
Waelder
Seguin
Schertz
Cibolo
Olmos Park
Fair Oaks Ranch
Helotes
Mico
Leon Valley
Balcones Heights
San Antonio
Von Ormy
Lytle
Natalia
Devine
Somerset
Poteet
Pleasanton
Jourdanton
Charlotte
Christine
Campbellton
Karnes City
Kenedy
Runge
Nordheim
Yorktown
Floresville
Stockdale
Gillett
Poth
Falls City
St. Hedwig
China Grove
La Vernia
Nixon
Smiley
Gonzales
Moulton
Shiner
Hallettsville
Garwood
Kendleton
Cordele
Edna
Vanderbilt
Bay City
Van Vleck
Sweeny
Palacios
Port Lavaca
Point Comfort
Seadrift
Austwell
Tivoli
Refugio
Woodsboro
Bayside
Sinton
Taft
Gregory
Rockport
Fulton
Ingleside
Portland
Odem
Robstown
Corpus Christi
Mustang Island
Padre Island
Bishop
Driscoll
Benavides
Kingsville
Alice
Agua Dulce
San Patricio
San Diego
Freer
Tilden
Calliham
Beeville
Goliad

Certain operations were known that UP, BNSF and KCS currently employ. These were included into the model. Some of these operating concepts were as follows:

- KCS operates on UP trackage rights between Rosenberg, Flatonia, Placedo and Robstown to run trains to/from Corpus Christi and Laredo. Southbound trains diverge at Odem to access KCS's Corpus Christi Yard; trains continuing to Laredo cross the UP main line at Robstown. Northbound trains from Laredo use the connection at Robstown to access UP's main line without entering the Corpus Christi Yard, unless they have work in that yard.
- BNSF operates on UP trackage rights between Giddings (entering UP's Flatonia Subdivision at Caldwell), West Point and Smithville to run trains to San Antonio and Eagle Pass. These trains are routed San Antonio, Flatonia, West Point, and Giddings (to Caldwell) on their return.
- BNSF operates on UP trackage rights between Sweeny and Ricardo to access Brownsville. Some trains diverge at Odem to terminate at Corpus Christi, or to operate on KCS trackage rights to Laredo.
- UP operates on BNSF trackage rights between Rosenberg and Sealy to run some westbound trains towards West Point or Smithville.
- UP operates the Flatonia Subdivision primarily in the southward direction from Giddings. Trains diverge from the Flatonia Subdivision at West Point to move towards Smithville/San Antonio, or they continue south to Flatonia to continue south on the Cuero Subdivision. Some UP trains operate in the opposite direction from the majority of traffic heading northward from West Point towards Giddings. These trains come from the Smithville Subdivision. Trains returning from the Port Lavaca (or Cuero) Subdivision also operate against the majority traffic flow from Flatonia towards Giddings.

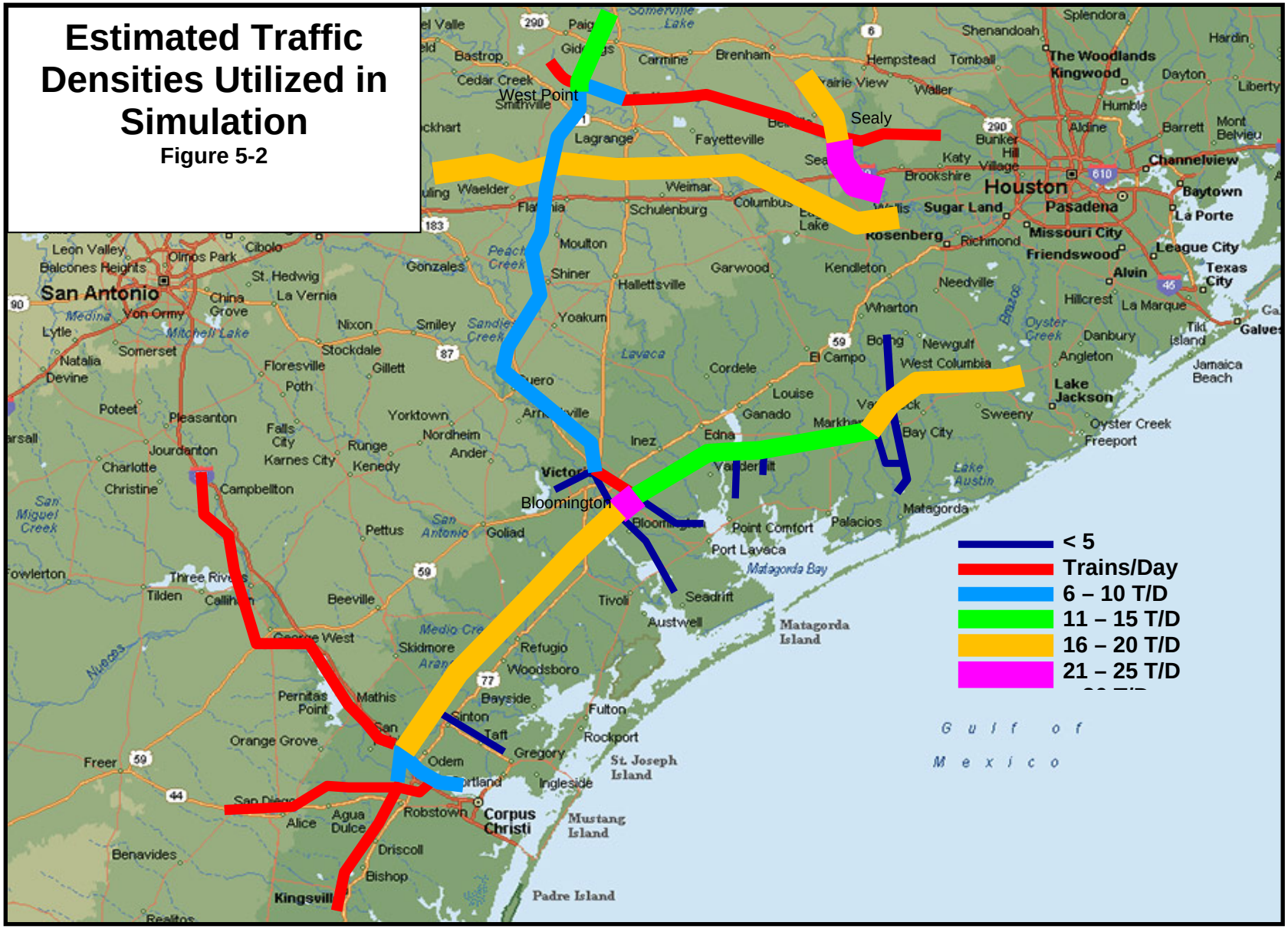
Trains that were included in the model were totaled by line segment. Figure 5-2 is a representation of the trains per day that were included into the model. Locals to industrial spurs and branch lines are included in the representation, as are all the trackage rights trains that operate on the C-Y network.

The most difficult aspect of performing a simulation of this nature without direct railroad input is the local operations. Industries within the network can be served by main line trains that stop and set out/pick up, or they can be served by locals working from established yards, such as Bloomington or Odem. Individuals in the Corpus Christi and south Texas areas were contacted to gather information on local operations, however, little usable information was provided. Based upon that outcome, assumptions for industrial service were created.

An overview of industrial service follows:

- Celanese Storage was assumed to be served by an originating and a terminating UP train from Houston. It was assumed the train delivered cars for storage, and then returned with cars from Celanese for classification and inclusion on trains departing Houston. BNSF also served Celanese, however it was assumed they did so with a local that operated over their Bay City Branch.

Figure 5-2 Estimated Traffic Densities Utilized in Simulation



- Formosa Plastics was also assumed to be served by an originating and terminating UP train. The same assumptions were made as with Celanese Storage. BNSF also had access to this facility with direct trains from the Houston area.
- Phillips Petroleum was also assumed to be served by an originating and terminating train from Houston. The train was estimated to arrive, unload and return towards Houston. 8 to 10 hours were estimated as the time it took to unload the train.
- Coal trains were run every other day to both the LCRA plant near LaGrange and the Coleto Creek plant south of Victoria. Both trains were estimated to unload in 10 to 12 hours; after that dwell time expired, a returning empty train was run from the plant back to its origin point.
- Port Lavaca and Seadrift were assumed to be served by an originating/terminating BNSF train as well as a UP local train from Bloomington.
- The Victoria Industrial Spur was assumed to be served by UP locals from Bloomington. It was estimated that the branch was served twice daily Monday through Friday, and once daily on Saturday and Sunday.
- Point Comfort was served by an originating and terminating Point Comfort and Northern train.
- Industry along the main track between Bloomington and Sinton was assumed to be served by a UP local from Bloomington. Woodsboro, Sinton and McFadden were served by the local. Trains serving the industry held the mainline for a period of time while serving these stations.
- Industry on the Kosmos Subdivision was assumed to be served by a UP rock train from Campbellton and a UP local train from the Corpus Christi area.
- Industry along the main track between Odem and Ricardo was assumed to be served by both main line trains and a UP local from the Corpus Christi area. Robstown, MP 140, Chemcel and Kingsville were served.
- Industry between Campbellton and Corpus Christi was assumed to be served by a UP main line train that ran between Campbellton and Corpus Christi.
- Industry at or around Corpus Christi (both UP and KCS) was assumed to be served by switch engines working out of the railroads' respective Corpus Christi yards. These operations were not modeled to any detail because that was beyond the scope of the project.
- Industry between Lissie and Flatonia was assumed to be served by main line UP trains.
- Industry at Flatonia was assumed to be served by a UP local that ran between Smithville and Flatonia.
- Industry at Katy was assumed to be served by a UP local that ran between Rosenberg and Katy.
- A BNSF local was assumed to serve its Bay City branch, along with access to Celanese Storage.
- KCS and BNSF did not serve other on line facilities. If KCS and BNSF have access to some of these plants (unknown), it was assumed that that traffic would be handled to Houston on a UP train and interchanged to either KCS or BNSF at a designated location outside of the C-Y model network.

Exhibit 5-1 is included with this report. This exhibit lists all the trains that were included in the simulation, their frequency, routing, and the window they were operated in. The windows were chosen by random number generation and then programmed into RTC; the model actually chose the specific times the trains were run each day. No two days of the simulation were exactly alike.

The windows were assigned to each type of train based upon estimated schedule adherence. For the C-Y simulation, intermodal trains were assigned 4 hour windows of operation, because that type of train tends to adhere to schedule. Merchandise trains were assigned 6 hour windows, and coal and grain trains were assigned 24 hour windows. Locals were assigned 2 hour windows; this was done because locals generally operate at the same time each day based upon their bulletined start time.

The RTC model requires some level of train prioritization so it can make decisions as to which trains precede and which trains are delayed when a conflict occurs. Priority was assigned to trains in the following manner.

- Amtrak between San Antonio and Houston was the highest priority train in the simulation.
- UP automotive and intermodal trains where the next highest priority trains.
- UP merchandise trains were prioritized at the same level as BNSF and KCS merchandise trains.
- Unit trains had the same priority as UP, BNSF and KCS merchandise trains.
- Locals and switch engines had the lowest priority in the simulation.
- All trains could have been prioritized at the same level; however it was felt that because UP controls most of the C-Y simulation network, their trains would be given slightly higher priority in high-conflict areas.

5.2 ANALYSES PERFORMED

As previously mentioned, the model generated a large data base of information for the simulation. Previous TXDOT studies were utilized to determine the necessary data for analysis and reporting. The types of analyses that were performed, and the data that was extracted, are discussed in more detail below.

5.2.1 Performance Measurements

The following measurements were recorded and collected for analysis of the Base simulation case.

Train Count: Train count is the number of trains that operate over a section of railroad during a measured period (per day or per week). All trains that operate on a subdivision are counted as one train, even if that train does not operate from one end of the subdivision to the other end. For example, a KCS train operating between Placedo and Bloomington was counted the same as a UP or BNSF train that ran all the way between Sweeny and Bloomington.

Train count provides an indication of how busy a line is. Figure 5-2 breaks down the subdivisions by segments, so the train counts indicated in that graphic are not the same as indicated in Table 5-1.

Delay Ratio: This is a ratio created by dividing delay for a group of trains by the unimpeded elapsed running time of those same trains. Unimpeded elapsed running time is the sum of the hours it would take to operate all trains through the network without any delay. Unimpeded elapsed running time includes any time assigned for dwell; dwell is used in a simulation to represent the process of setting out or picking up cars, crew changes, inspections or other standard railroad operating procedures.

Delay ratio can be measured over the entire network or over segments of the network such as a subdivision. The statistic can be used to compare simulation cases where train counts or routing modifications are tested.

Delay Hours per Day: Delay hours per day are the averaged number of delay hours per day over the 14 day simulation by subdivision. It is a relative measure of which subdivisions experience the greatest summed amount of delay. Since each subdivision has a varying number of trains, Delay Hours per Day cannot be used to compare two simulations that have varying numbers of trains or varied routings for traffic.

Delay Minutes per 100 Train-miles Operated (D/100): Delay per 100 train miles operated is a standard measure in railroad operations. D/100 is calculated by summing all delays within a subdivision of the network and dividing that number by the total number of train miles that were operated over that segment. That figure is then multiplied by 100. The output is a measurement of how many minutes of delay can be expected for every 100 train miles that is operated under those circumstances within that segment of the network. The D/100 measurement allows comparison between cases that have differing number of trains and track configurations.

D/100 is a measure of how congested a segment is under base operations, or how congested (or fluid) it becomes when modifications are made. It does not indicate where the most congested points are located within the subdivision.

Average Velocity: Average velocity is the averaged operating speed of the trains measured in the simulation. The measurement may be over the entire network, or on individual segments of the network such as a subdivision. The average velocity includes delay and dwells assigned to each train in the simulation. Velocity is a statistic that railroads monitor closely to determine the fluidity of their network.

Delays greater than 30 Minutes (D>30): Major delays exceeding 30 minutes were taken from the data during the simulation. While delays are always expected in any railway operation, particularly around complex terminals and industrial areas, repetitive delays that exceed 30 minutes are a very good indication that there is a major choke point.

D>30 provides an indication of where congestion is occurring on a subdivision. The total hours of delay associated with D>30 indicates how severe the congestion is at that location. This statistic is measured to assist with finding when and where congestion occurs; review of the simulation will determine what was causing the delay.

5.3 RESULTS

The following section describes the results of the C-Y simulation. All analysis and observations were based solely on the observed interaction of trains from the simulation as designed from the

assumptions made. If actual UP, BNSF or KCS operations are materially different from the operating plan created for the model, the results would possibly vary.

Table 5-1 is a summary of many of the analysis measurements that were performed following the completion of the simulation. The results have been aggregated to significant subdivisions within the network. Calculated statistics, such as Delay Ratio or Delay per 100 Miles, were developed using an average over the entire 14 analyzed days of simulation. Descriptions of and explanations for the congestion that was observed are provided in this section of the report.

Table 5-1 Statistical Representation of Corpus – Yoakum Simulation Findings

Subdivision	Trains per 2 Weeks	Delay Ratio	Delay Hrs per Day	Delay per 100 Miles	Average Velocity
Angleton	426	30%	12.0	46.9	29.8
Brownsville	498	51%	36.9	112.5	18.1
Corpus Christi	226	28%	12.7	104.0	12.7
Cuero	140	29%	8.7	47.3	28.5
Flatonia (east - west)	562	38%	6.3	44.0	32.8
Glidden	336	33%	11.7	42.2	35.2
Laredo	96	30%	4.1	100.6	13.6
Smithville	244	13%	4.0	32.9	21.2

5.3.1 Trains per 2 Weeks

The measurement of Trains per 2 Weeks indicates that the highest levels of traffic in the C-Y simulation operate on the Angleton, Brownsville and Flatonia Subs. This result can be somewhat misleading, however, as many of the trains on those subdivisions only operate on the subdivision for short distances. For example, on the Flatonia Subdivision, many southbound trains from Giddings diverge from the Flatonia Subdivision at West Point; similarly, many Angleton Subdivision trains enter or diverge at Placedo and only run on the subdivision to/from Bloomington.

Over the course of the 14 day simulation, 1398 trains entered the model and were analyzed. The train schedules were intentionally created to introduce more trains into the simulation on the Thursday, Friday and Saturday of each week to represent what tends to occur in actual railroad network operations.

5.3.2 Delay Ratio and Delays Greater than 30 Minutes

As noted previously, Delay Ratio is the total delay over a subdivision divided by the total unimpeded running time of all trains operating on that subdivision. The number provides a ratio that can be compared between multiple cases that have different levels of traffic or routing options to determine if modifications between cases improved or degraded operating fluidity. Delay can be measured in various ways. One way is to sum only the time a train is stopped because of a conflict or to throw a switch. Dwell time would not be included in this type of delay as dwell is programmed into a train file to represent required work of some kind at a specific location. This type of delay is best described as “stop delay”.

The second type of delay is “true delay”, which not only includes the time the train is actually stopped, but also includes time lost to best performance because the train is slowing to stop or is not running at maximum speed. Trains sometimes operate at less than maximum speed for various reasons; for example, because a train is closely following a train ahead, because the model is “pacing” them to make a more efficient meet with an opposing train, or because the train is running through a siding. Sidings generally have a lower allowable speed than the adjacent main line, so the train loses a small amount of time utilizing that route.

“True delay” is calculated taking the total elapsed running time of each train and subtracting the unimpeded running time for that train. In this analysis, “true delay” was utilized to calculate all the delay related values in Table 5-1.

If “stop delay” is subtracted from “true delay”, the remaining time is “slowing delay”. This represents the time lost to unimpeded time because a train is running at some speed less than maximum authorized main line speed. The RTC model does not account for slowing delay as an actual delay because the train continues to move. However, calculations of how much time an individual train loses to unimpeded run time between origin and destination must include “slowing delay” because it is part of the actual run time of that train.

As a standalone number, the Delay Ratio can be difficult to use to determine whether a line is at or near sustainable capacity. This is better described using actual examples below. Those examples will explain how configuration of a segment and train volumes can affect this ratio, providing somewhat misleading results if an absolute value is chosen to indicate routes approaching sustainable capacity.

However, on many segments, Delay Ratio can be used to indicate an approximate level of congestion on a subdivision. Based on some standard assumptions, calculations can be made to determine approximately what percentage value constitutes a segment of a network that is approaching its sustainable capacity.

To explain how this number is determined, it is assumed that an average crew district for a railroad is approximately 150 miles in length. Utilizing a mix of traffic that operates between 50 and 60 mph (unimpeded intermodal and most merchandise trains) and 10 and 30 mph (unimpeded unit and local trains), an estimate of unimpeded velocity for all trains on the hypothetical average subdivision is 25 mph. Therefore, on an “average” segment of railroad, the unimpeded running time would be approximately 6 hours (150 miles divided by 25 mph). One of the greatest costs of congestion is the cost associated with the federal law that restricts a train crew’s on duty time to 12 hours. Once the 12 hours have expired, a second crew must be used to continue the operation of the train. This restriction is a focus of capacity analysis for many railroads; if the crews cannot make it over their assigned crew district within their allotted on duty time, the railroad cannot be considered to be running fluidly.

One factor of whether a crew can make it across its district is when the crew is called for a train. Calls for crews are imperfect; it is not uncommon for crews to wait multiple hours after they are on duty before their train is ready to depart. It is estimated that an average wait time of two hours can be realistically applied to most crew districts. This number would likely be less for segments without large terminals on one end or the other, and greater for segments that included large terminals.

Between unimpeded run time and average crew wait time, it can be determined that there are four additional hours of crew on duty time that is not accounted for (12 – 6 – 2 = 4). These hours would be the hours that a train could be delayed and still make it to the end of the crew district without having to utilize a second crew. The four hours would be the theoretical maximum allotted delay time; realistically, the actual hours of delay would have to be somewhat less to insure that the railroad was able to achieve fluid operations on a sustainable basis.
To be conservative, it is estimated that between 2 and 2.5 of the remaining hours could be assigned as delay (both stopped and slowing delay) while maintaining a relatively fluid network. Therefore, a Delay Ratio of between 33% and 42% (2/6 and 2.5/6) would approach the upper bounds of sustainable capacity for a subdivision. A ratio exceeding this level would indicate that some percentage of the crews on the subdivision was not completing their run in their allotted hours under normal operating conditions.

If this analysis is applied to the operations created in the C-Y simulation, the Brownsville, Flatonia and Glidden Subs are approaching or have reached the ability to maintain sustainable capacity. The Angleton, Cuero and Laredo Subs also appear to be very close to reaching a delay ratio percentage that indicates congestion.

As has been previously described, Delays Greater than 30 Minutes (D>30) indicate where congestion is occurring when that measure is analyzed by segments within a subdivision. To understand the impact of Delay Ratio and D>30 over the C-Y network, each major subdivision is reviewed in the following section of the report. Analysis of what was seen during the simulation is offered. The conclusions were developed solely on the simulation and the assumptions included into the model.

5.3.3 Brownsville Subdivision (Bloomington to Ricardo) and Angleton Subdivision (Sweeny to Bloomington)

Delays greater than 30 minutes were analyzed to determine locations where congestion occurred on the Bloomington and Angleton Subs (Table 5-2). A similar table has been prepared for all the major subdivisions included in the simulation (tables are below). The tables provide the D>30 findings from the simulation, which led to detailed analysis of the locations where there were heavy levels of congestion. Operating characteristics of each subdivision are provided at the beginning of the description section, to provide context to why the subdivisions were divided into the segments that are analyzed.

Brownsville Subdivision Primary Operating Characteristics: Train operations are bi-directional, with connections at Bloomington to the Victoria and the Seadrift Industrial Spurs; at Sinton to the Kosmos Subdivision; at Odem to the Corpus Christi Subdivision and at Robstown to the KCS Laredo Subdivision. There are small yards serving industrial traffic at Sinton and Odem. There is a classification yard at Bloomington.

Table 5-2 Brownsville and Angleton Subs, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Ricardo - Robstown	10	10.1
Odem - Sinton	74	93.3
Woodsboro - Greta	51	67.4
Inari - Bloomington - Keeran	101	121.4
Vanderbilt - Sweeny	47	39.1

Signaling: Centralized traffic control (CTC) from Bloomington to Inari, and from Sinton to Odem. Dark territory between Inari and Sinton and between Odem and Ricardo

Capacity Issues Identified by Simulation: Of all subdivisions estimated to be approaching or at sustainable capacity, the Brownsville Subdivision is by far the most congested on the C-Y simulation network. The Brownsville Subdivision has a Delay Ratio that was calculated to be 51% (Table 1). One of the primary causes of the high Delay Ratio for the Brownsville Subdivision (and for the southern portion of the Angleton Subdivision) is the yard at Bloomington. Bloomington was an area of congestion for the following reasons:

High traffic volumes at Bloomington: A very high volume of trains passed through or originated/terminated at Bloomington.

Trains ran slowly past the Bloomington Yard: Velocity is a key component of capacity. Slow trains consume a large portion of available single track capacity, which minimizes the number of trains that can use the same track over the course of a day.

Trains stopped to pick up or set out cars or changed crews at Bloomington: On occasion, trains held the main line while crew changes and pick-up/setouts occurred. These operations blocked other through or local operations attempting to utilize the same tracks.

Trains entering or leaving Bloomington Yard cleared the main line slowly because of yard track speed and switch geometry: The slower operations consumed a higher level of capacity.

Table 5-2 confirms that the segments around Bloomington had the highest level of D>30. The delays in this area of the Brownsville Subdivision (and the south end of the Angleton Subdivision described later) supported the high Delay Ratio findings.

South of Bloomington, the Brownsville Subdivision has another restriction that created congestion; no signaling system between Inari and Sinton (approximately 40 miles). There are two long meet-pass sidings on this stretch of track at Greta and Woodsboro, and when meets were set up at either of these locations, large delays were incurred.

With no remotely controlled signals or switches, the train taking the siding had to stop and line the switch to route itself into the siding. When the opposing train arrived, it had to stop and realign the switch for the main line before it could proceed. Finally, the train in the siding had to line itself out of the siding, then wait a period of time before departing. The time the train was held simulated the time it would take for a trainman to realign the switch and walk the length of the train to the locomotives.

These operations add stop and slowing delay to a system that already experienced congestion because of Bloomington Yard.

Another restriction that created congestion on the Brownsville Subdivision was the numerous connections to other subdivisions. Lines to Seadrift and Victoria were served by trains operating out of Bloomington. There are also connections in two directions at Sinton (to Sinton and to Kosmos), two directions at Odem (to Campbellton and to Corpus Christi) and two directions at Robstown (to Laredo and to Corpus Christi for the KCS). The cross traffic and

trains entering or leaving the Brownsville Subdivision at these locations had a congesting effect on through traffic.
One example of how branch line traffic had an effect on Brownsville Subdivision capacity was at Odem, where the Corpus Christi Subdivision connects to the Brownsville Subdivision. In the simulation, there was a unit rock train that came from Campbellton and was destined for Gregory, which is on the Kosmos Subdivision east of Sinton. This train was programmed to enter the Brownsville Subdivision at Odem and move north towards Sinton (and the connection to Gregory).

Because there is no connection in the proper quadrant at Odem to go north from the west, the train had to cross the Brownsville Subdivision moving towards Corpus Christi. Once the train was clear of the diamond, it had to back up around the southeast connection towards Brownsville. Once clear of that connection, it could then pull forward towards Sinton. Returning trains had to make this same move, in reverse.

This type of movement took far more capacity than a direct movement would have. Both the Brownsville and Corpus Christi Subs experienced multiple conflicts when this move occurred. Combined with other movements that departed or entered the subdivision, the opportunity for conflicts along the Brownsville Subdivision was high.

Finally, trains setting out or picking up cars from industries along the main line between Bloomington and Ricardo added delay to the analysis. When trains had to stop to set out or pick up (simulated by stopping the train on the main line for 15 minutes to one hour), other traffic was blocked from proceeding. There were a number of locations where on line work occurred on the Brownsville Subdivision, creating additional congestion.

The segment between Odem and Ricardo experienced only minor delays in the simulation. This is likely due to the fact that many Brownsville Subdivision trains left the subdivision at Odem, moving towards Corpus Christi. With fewer trains on the route, there were fewer opportunities for conflicts. There was some normal meet-pass delay in the segment, along with some conflicts between Laredo Subdivision trains crossing the line at Robstown, but as Table 2 clearly indicates the total delays were minor compared to other segments of the subdivision.

Angleton Subdivision Primary Operating Characteristics: Train operations are bi-directional, with connections at Bay City to BNSF's Bay City Subdivision, Celanese Plastics, Abercrombie (Phillips Petroleum), Formosa Plastics, Lolita to Point Comfort and Placedo to Port Lavaca. Traffic from the Cuero Subdivision operates on the Angleton Subdivision between Placedo and Bloomington.

Signaling: CTC from Sweeny to Bloomington

Capacity Issues Identified by Simulation: As shown in Table 5-2, there were minimal capacity issues between Sweeny and Vanderbilt. There were normal meet-pass delays associated with single track, however the CTC system allowed many of these meets to occur with minimal delay to trains involved.

There were also minimal industries on this segment that were served by trains that held the main line while the location was being switched. There were a number of connections to industrial trackage in this segment, including Celanese Storage, Formosa Plastics, Pt. Comfort and BNSF's Bay City Subdivision. Most of these lines were served directly by UP or BNSF trains that could clear the main line in the simulation, leading to minimal delays for other through

traffic. The BNSF line at Bay City did require a run around move to access the line from Houston; some delays were recorded in this area because of that movement.

The majority of major delays on the Angleton Subdivision occurred between Keeran and Bloomington; these delays were similar to the type of delays the Brownsville Subdivision experienced around Bloomington. Trains attempting to access Bloomington Yard or to go past the yard queued up at Keeran. These delays were aggravated by Cuero Subdivision trains attempting to get onto or off of the Angleton Subdivision at Placedo.

The preceding descriptions indicated the locations and the reasons stopping delay was relatively high on the Angleton and Brownsville Subs, but slowing delay was also a major contributor to the Delay Ratio. On the Brownsville Subdivision, slowing delays accounted for over 100 hours of the delay that was included in the delay ratio, or approximately 10 percentage points of the Delay Ratio. On the Angleton Subdivision, there were 54 hours of slowing delay, which also accounted for 10 percentage points of Delay Ratio.

The high level of total hours of slowing delay is an indication of the level of congestion on the two subdivisions. High levels of slowing delay indicate the model is dealing with a constant flow of traffic over parts of the subdivisions; not only are multiple trains affected by each train that is delayed, but the model is forced to slow traffic or run it on other, less high speed routes to keep all traffic moving.

5.3.4 Corpus Christi Subdivision (Campbellton to Corpus Christi)

Primary Operating Characteristics: Train operations are bi-directional, with connections at Odem to the Brownsville Subdivision. There is a connecting track between UP's Corpus Christi Subdivision and KCS's Laredo Subdivision near downtown Corpus Christi that allows BNSF and KCS trains to move between the two subdivisions when moving between Houston and Laredo. There is a yard that serves industrial traffic at Viola.

Table 5-3 Corpus Christi Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Campbellton - Mathis	39	58.2
Hubert - Viola	28	48.7
Corpus Christi	8	8.2

Signaling: Dark territory between Campbellton and Odem (Brownsville Subdivision crossing), and between Odem and Corpus Christi

Capacity Issues Identified by Simulation: The Corpus Christi Subdivision had a Delay Ratio of 28% during the simulation; that level was approaching the estimated sustainable capacity ratio calculated above. The largest number of major delays occurred between Campbellton and Mathis, with another large percentage occurring between Mathis and Viola.

The reason for the relatively high number of major delays between Campbellton and Mathis was that there are a limited number of sidings on the subdivision. The closest siding west of Odem

is at George West which is 45 miles away. Since unimpeded running time from Odem to George West is slightly greater than one hour, any meet where a train utilized George West created major delays for the subdivision. Even though there was limited daily traffic on the subdivision west of Odem, meets did occur due to the random nature of the schedules that the model created.

The other area subject to major delay was between Hubert and Viola, which includes Odem and Odem Siding. Odem siding saw similar delays to George West; when a train was held in Odem for an eastbound train, large delays were incurred due to the distance between meet points. As mentioned previously, UP, KCS and BNSF trains used the Corpus Christi Subdivision to access Corpus Christi from the Brownsville Subdivision; KCS and BNSF trains also used it to access the KCS route to Laredo. The distance between the junction at Odem and Viola is 11 miles; Viola is the only location where a train could meet another train on this segment.

Trains using this segment of the subdivision experienced delays waiting to enter the Brownsville Subdivision because of high levels of opposing or cross traffic, or they were delayed waiting for trains coming from the Brownsville Subdivision. There were heavier levels of traffic on this segment of the route than between Odem and Campbellton because of the traffic moving to the KCS. The heavier traffic increased the potential for conflicts.

A review of data indicates that only five hours of slowing delays occurred on this subdivision, which would have reduced the Delay Ratio by approximately 1 percentage point. This indicates lighter levels of traffic, and that most delays were stopping delays. This fits with the profile of the subdivision where there were long distances between sidings and lighter volumes of traffic.

5.3.5 Port Lavaca Subdivision (Flatonia to Placedo)

Primary Operating Characteristics: Train operations are bi-directional, with connections to the Flatonia and Glidden Subs at Flatonia, and the Angleton Subdivision at Placedo. There is also a connection at Victoria with the Victoria Industrial Spur. In the simulation, when traffic on the Cuero Subdivision between Victoria and Placedo became congested because of delays around Bloomington, the Victoria Industrial Spur was used to move trains from Victoria to Bloomington. This route also connects with the Coleto Creek Industrial Spur, where Coleto Creek coal trains diverge to the power plant.

Table 5-4 Cuero Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Flatonia - Shiner	16	20.7
Adel - Cuero	16	25.6
Thomaston - Placedo	15	16.3

Signaling: Dark territory between Flatonia and Placedo

Capacity Issues Identified by Simulation: The Delay Ratio for the Cuero Subdivision was 29%; this figure also approached the percentage associated with estimated sustainable

capacity. The D>30 analysis indicated the delays were spread evenly throughout the subdivision.

The main contributor to the Delay Ratio was that the subdivision only has two sidings over the 85 miles of track. The long spacing between sidings created large delays when a meet occurred on the subdivision, similar to the west end of the Corpus Christi Subdivision. Additionally, since the sidings are not signaled, there was the delay associated with hand throw switches as previously described on the Brownsville Subdivision.

Further, it was observed that trains attempting to enter the Angleton Subdivision had to wait 25 miles away from Placedo if an opposing train was leaving the Angleton Subdivision to move towards Flatonia. This long delay is one reason the model used the Victoria Industrial Spur for some through trains; the spur served as a segment of double track that could accommodate meets, minimizing delays.

Similarly, trains waiting to enter the Glidden Subdivision waited 27 miles away from Flatonia for southbound trains moving towards Placedo. Since the nearest Glidden Subdivision siding was 20 miles east of Flatonia (the Flatonia Siding is west of the diamond so Cuero Subdivision trains could not access it), there were a number of long delays recorded for both the Cuero and Glidden Subs.

There were 20 hours of slowing delays on the Cuero Subdivision, or approximately 5 percentage points of the Delay Ratio. Analysis indicates that most of this slowing delay occurred as Cuero Subdivision trains approached either Placedo or Flatonia to enter the Angleton or Glidden Subs. Rather than stopping the train at the junctions, the model paced some of the Cuero trains to minimize conflicts with Angleton/Glidden Subdivision trains that were bypassing the Cuero Subdivision.

5.3.6 Flatonia Subdivision (Harwood to Flatonia, Flatonia to Giddings)

Primary Operating Characteristics: Between Harwood and Flatonia, train operations are bi-directional. There is a connection to the Cuero Subdivision and the Glidden Subdivision at Flatonia.
Between Giddings and Flatonia, there is a connection to the Smithville Subdivision at West Point. Between Giddings and West Point, train operations are primarily southbound; many of the southbound trains on the Flatonia Subdivision diverge to the Smithville Subdivision at West Point. Traffic flows are bi-directional between West Point and Flatonia.

Table 5-5 Flatonia Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Giddings - Muldoon	7	6.0
Flatonia - Harwood	28	31.7

Signaling: CTC Harwood to Flatonia, Flatonia to Muldoon. Automatic Block Signals (ABS) Muldoon to Winchester

Capacity Issues Identified by Simulation: The Flatonia Subdivision had to be broken up into two different segments; first, between Giddings and Muldoon and second between Harwood and Flatonia. The two segments experienced very different traffic, and had very different results in the simulation.

Between Giddings and Muldoon, the Delay Ratio for the Flatonia Subdivision was 25%. Most of the delays were associated with delays entering the Smithville Subdivision at West Point, or waiting to get to the Cuero Subdivision at Flatonia. Since the largest percentage of traffic on this portion of the subdivision was single directional to the south, there were not many train meets to create delays. Table 5-5 confirms that there was not a high level of major delays measured on the segment.

Slowing delays accounted for approximately 7 percentage points of the 25% Delay Ratio. Most of that delay was associated with trains following trains, which causes slowing due to restricting signals. The balance was the model pacing trains into both West Point and Flatonia to minimize impact to other traffic approaching those junctions.

As described previously, Delay Ratio by itself can provide a somewhat misleading measure of the level of capacity of a route. This section of the Flatonia Subdivision was a good example of that; the limited miles that trains were run on the Flatonia Subdivision had the effect of inflating the Delay Ratio. This was caused by the very short unimpeded run times of the trains that ran from Giddings to West Point then diverged to Smithville. The short unimpeded run times made the denominator of the ratio for this section small, which in turn increased the Delay Ratio.

Between Harwood and Flatonia, there was a very different traffic mix. The Flatonia Subdivision's Delay Ratio of 38% indicated a segment at or very near to sustainable capacity. For this subdivision, the primary issue is the meet-pass capability of the siding spacing. Sidings on the Flatonia Subdivision between Harwood and Flatonia and on the Glidden Subdivision between Flatonia and Lissie run between 10 and 20 miles apart. The volume of trains using the route, combined with the discrepancy of speeds between the fastest and slowest trains make meets and overtakes an issue. Further, trains entering or leaving the Subdivision at Flatonia (from both the Glidden and the Cuero Subs) had an effect on through movements between Flatonia and Harwood.

The absolute number of major delays was not large, indicating that the CTC did improve traffic flow. However, the high Delay Ratio indicates that there were a lot of delays on the segment. Slowing delays on the east-west portion of the Flatonia Subdivision were approximately 10 percentage points of the Delay Ratio. This is another indication of the high levels of meets and passes; trains had to slow for meets and one train had to run through the siding during each meet.

5.3.7 Glidden Subdivision (Flatonia to Lissie)

Primary Operating Characteristics: Train operations are bi-directional, with connections to the Cuero and Flatonia Subs at Flatonia. KCS trackage right trains operate from Houston via the Giddings Subdivision to Flatonia, then turn south towards Placedo, Bloomington and Corpus Christi.

Table 5-6 Glidden Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Lissie - Ramsey	10	10.9
Glidden - Flatonia	40	36.7

Signaling: CTC Lissie to Flatonia

Capacity Issues Identified by Simulation: The Glidden Subdivision experienced many of the same delay patterns that the east-west portion of the Flatonia Subdivision experienced. This is not surprising because the two connect to each other at Flatonia; many of the trains from one subdivision continue onto the other. Siding spacing on the Glidden Subdivision is approximately the same as on the Flatonia Subdivision; for the simulation, this developed a Delay Ratio of 33%. This ratio indicates the Glidden Subdivision is also approaching its sustainable capacity.

The CTC does keep the major delays to a minimum; the segment between Lissie and Ramsey clearly shows this. However, between Glidden and Flatonia, the major delays increase. This is because of the KCS trains that enter or come from the Cuero Subdivision. As described earlier, there are frequently long waits for traffic moving between the last Cuero Subdivision siding (Adel) and the first Glidden Subdivision siding going east (Weimar). The spacing between these sidings led to many longer delays.

Slowing delays accounted for 75 hours of delay on the Glidden Subdivision, or 15 percentage points of the Delay Ratio. Again, this appeared to be because with the high number of meets and passes required because of traffic levels and train speed discrepancy. Review of the simulation video confirmed this; many trains were “fleeted” across the subdivision to pass a single train in a siding. “Fleeting” is a railroad operations term used to describe the dispatching technique of holding a group of multiple trains heading one direction on sidings in order to allow a group of multiple trains heading in the opposite direction to pass. The groups of trains are referred to as “fleets”. When fleets are created, the trailing trains often are running on restricted signals, which mean they lose time to ideal unimpeded operations.

5.3.8 Galveston Subdivision (BNSF between Wallis and Bellville)

Primary Operating Characteristics: Train operations are bi-directional, with a connection to the Smithville Subdivision at Sealy. Some of UP westbound traffic moving towards San Antonio utilized the Galveston Subdivision between Rosenberg and Sealy, leaving the Galveston Subdivision at Sealy to move towards Smithville.

Signaling: CTC Wallis to Bellville

Capacity Issues Identified by Simulation: The length of the Galveston Subdivision in the simulation was too short to perform any meaningful analysis.

5.3.9 Laredo Subdivision (KCS Matthews to Corpus Christi)

Primary Operating Characteristics: Train operations are bi-directional, with a connection to UP's Brownsville Subdivision at Robstown. Also, a connection to UP's Corpus Christi Subdivision near KCS's Corpus Christi Yard that allows KCS and BNSF trains to move between Odem and Laredo via Corpus Christi. BNSF operates on trackage rights to Laredo on the Laredo Subdivision.

Table 5-7 Laredo Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Matthews - Aqua Dulce	6	7.1
Banquete - Spear	20	25.3
Robstown - Corpus Christi	7	6.4

Signaling: Dark territory between Corpus Christi and Matthews

Capacity Issues Identified by Simulation: The Laredo Subdivision had a Delay Ratio of 30%, apparently approaching the estimated value that would indicate that the subdivision was nearing sustainable capacity. The area that experienced the greatest number of delays was between Banquete and the UP crossing at Robstown.

The delays that occurred on that section of the subdivision were associated with trains entering the Brownsville Subdivision to move north towards Odem. The single siding at Spear was used not only for meets, but also to hold trains to change crews. The dwell these trains incurred affected other traffic trying to pass that location.

West of Spear, the siding spacing to Matthews also played a role in delay. Again, since the subdivision is dark territory, all switches had to be hand thrown, with the associated delays. There were 13 hours of slowing delay on the subdivision, or approximately 6 percentage points of Delay Ratio. Trains approaching Robstown and the UP crossing accounted for most of this type of delay.

Like the north-south section of the Flatonia Subdivision, the Delay Ratio for this subdivision is slightly misleading. Operations on the route did not indicate that a Delay Ratio approaching sustainable capacity was likely. As with the Flatonia findings, the reason the Delay Ratio for the Laredo Subdivision is so high is that the unimpeded run times for the trains that were measured was quite low. The times were low because the district measured was only 36 miles in length. With a smaller divisor, the ratio appears larger. If the length of the subdivision had been extended towards Laredo, we believe that the Delay Ratio for this subdivision would be much less.

5.3.10 Smithville Subdivision (Smithville to Katy)

Primary traffic flows: Between Katy and West Point, train operations were bi-directional with connections to the Flatonia Subdivision at West Point and BNSF's Galveston Subdivision at Sealy.

Southbound LCRA coal trains and rock trains from the Giddings Subdivision operate eastbound on the Smithville Subdivision from West Point. Some UP westbound trains operate on the BNSF from Rosenberg (south of Wallis) to Sealy and then enter the Smithville Subdivision to operate to San Antonio.

Between West Point and Smithville, trains primarily run westbound from West Point towards Smithville. Many southbound merchandise and intermodal trains from the Giddings Subdivision turned west at West Point to operate to San Antonio and beyond.

Table 5-8 Smithville Subdivision, Delays > 30 Minutes

Segment of Subdivision	Delay Count	Delay Hours
Smithville - West Point	1	0.5
West Point - Sealy	14	24.6
Sealy - Katy	0	0.0

Signaling: Dark territory from Katy to Smithville

Capacity Issues Identified by Simulation: The Delay Ratio for the Smithville Subdivision was 13%. This would indicate there are minimal capacity concerns based upon the way the route is currently operated.

With directional traffic running to the west from West Point, there are few meets and passes. There are more delays between West Point and Sealy, because of the bi-directional traffic moving towards Katy and coming from Sealy. Table 5-8 shows the increase in major delays on that segment; however, the absolute number is still relatively small.

East of Sealy, there is limited capacity to meet or pass a full size train. Locals switching industry between Sealy and Katy held the main line in the simulation; if there was another train destined to Katy, it waited at or west of Sealy. In actual operations, a small local might clear into an industry track to allow a rock train to arrive or depart.

Slowing delay on this segment accounted for approximately 2 percentage points of the Delay Ratio. Light traffic levels combined with partial directional running accounted for the small percentage associated with slowing delay.

5.3.11 Delay Hours per Day

The sum of delays for the two weeks of simulation divided by the 14 days created results as shown in Table 5-1; the Brownsville, Angleton and Corpus Christi Subs had the highest hours per day of delay. It is interesting to note that the Delay Ratio of the Angleton and Corpus Christi Subs appears to be intuitively inconsistent, since the Corpus Christi Subdivision has slightly

more delay hours per day than the Angleton Subdivision, but the Delay Ratio and the Trains per Day is less. Review of the data explains this inconsistency.

The data shows that while the Corpus Christi Subdivision had less trains, trains operated more miles on slower trackage. While the Angleton Subdivision had more trains operating over portions of it, they ran over shorter segments at higher speeds. Therefore, the summed unimpeded run time for the Corpus Christi Subdivision was actually greater than the unimpeded run time for the Angleton Subdivision. The larger divisor in the ratio made the Corpus Christi Delay Ratio smaller.

Similarly, while the Flatonia and Glidden Subs both had less hours of delay per day, they also saw larger Delay Ratios. Review of the data indicated that trains ran for shorter unimpeded times over both subs, primarily due to higher track speeds and a larger mix of higher speed trains (intermodal versus merchandise or unit trains). The lesser unimpeded run times led to a greater Delay Ratio.

This comparison shows the danger of using Delay Ratio as a single measure of congestion. If all subdivisions and trains speeds were approximately equal throughout the network, this measurement would be applicable to determining which areas were most congested and which had less congestion. However, in a network with uneven train mixes and varying lengths and speeds of subdivisions, the ratio by itself can be misleading.

The ratio is far better suited to be used as a comparative measure for two or more simulations. If a short segment in the Base Case is compared to that same segment in a future case, the trend of the Delay Ratio will determine whether the modifications have improved or degraded operations.

5.3.12 Delay Minutes per 100 Miles

Again, the D/100 calculations generally followed the results of the previous statistics; the Brownsville and Corpus Christi Subs experienced the highest minutes of delay per mileage operated over the segment. The main causes of the delays have been described above. Like many other stand alone measures, D/100 provides a partial view of fluidity of any segment on the network. Miles operated has a large influence on the magnitude of the statistic; if there are not a large amount of miles operated, the measurement can be misleading. This is exactly what happened on the Laredo Subdivision; while there weren't many hours of delay, there weren't many miles operated as well. Compared to the Smithville Subdivision (which has virtually the same number of hours of delay per day), the Laredo Subdivision had 3,400 miles operated in the simulation while the Smithville had 10,300 miles operated. The difference in the D/100 clearly shows the impact of miles operated over a segment.

5.3.13 Average Velocity

Average velocity is not only a measure of delay on a subdivision, but it is also a measure of the amount of dwell and the mix of trains on a subdivision. For example, a district that has a major yard such as Bloomington will have a large amount of dwell associated with trains that are simulated to set out or pick up cars. A subdivision such as the Flatonia Subdivision (connecting into the Glidden Subdivision) has minimal dwell associated with the trains, and therefore the velocity will likely be higher on the segments with less dwell.

Similarly, a subdivision that has a high percentage of intermodal traffic will generally have a higher velocity than a subdivision that has more unit or merchandise trains. Unit and

merchandise trains generally operate at slower speeds than intermodal trains; they also usually have less horsepower per trailing tons than intermodal trains. With less horsepower, those trains will sometimes not be able to reach maximum speed, or they will accelerate more slowly as they move from slower trackage to higher speed trackage.

Velocity is best used when comparing alternative simulations. Velocity by subdivision is a key indicator of whether a modification improved or degraded operations. As a standalone number, it has minimal value to determine the results of a simulation.

5.4 CONCLUSIONS

Based upon the simulation performed the following conclusions were developed:

- Capacity improvements could be designed for the Brownsville Subdivision to improve existing rail flows. Two areas should be focused on; the Bloomington Yard and the main line between Inari and Odem.
- The Angleton Subdivision is approaching a level of capacity utilization that may also require mitigation. The southern end of the subdivision would be the area to focus on.
- The east – west portion of the Flatonia Subdivision and the Glidden Subdivision are also approaching a level of utilization that may require mitigation. Projects on these two subdivisions should be tested assuming KCS rebuilds the Rosenberg to Victoria line segment, and moves their Corpus Christi and Laredo traffic onto that line. Removal of that traffic may improve the Flatonia and Glidden Subs to a point where mitigation is not required.
- The other subdivisions in the Corpus – Yoakum Freight Districts are not currently in need of capacity mitigation.
- Some measures of capacity utilization can be misleading without putting in context how the measures were developed. Multiple measurements and thorough analysis of why the numbers developed as they did must be considered before conclusions about capacity utilization can be reached.

SECTION 6 - FREIGHT RAIL AND RAIL/ROADWAY INTERFACE SAFETY ISSUES

As vehicular traffic growth in Texas increases to unprecedented levels, concerns about the safety of the traveling public remain paramount. Every new car, truck, or train that utilizes a Texas roadway or rail line increases the probabilities of an incident occurring.

The Texas Legislature first authorized a rail safety program in 1983, with implementation duties residing with the Texas Railroad Commission (RRC). This program was to be administered in conjunction with the safety programs being administered under the FRA. The rail safety program focused on enforcement of federal and state safety standards covering track, equipment, warning devices, operations, and movement of hazardous materials. Further action by the Texas Legislature transferred these duties from the RRC to TxDOT, effective October 1, 2005.

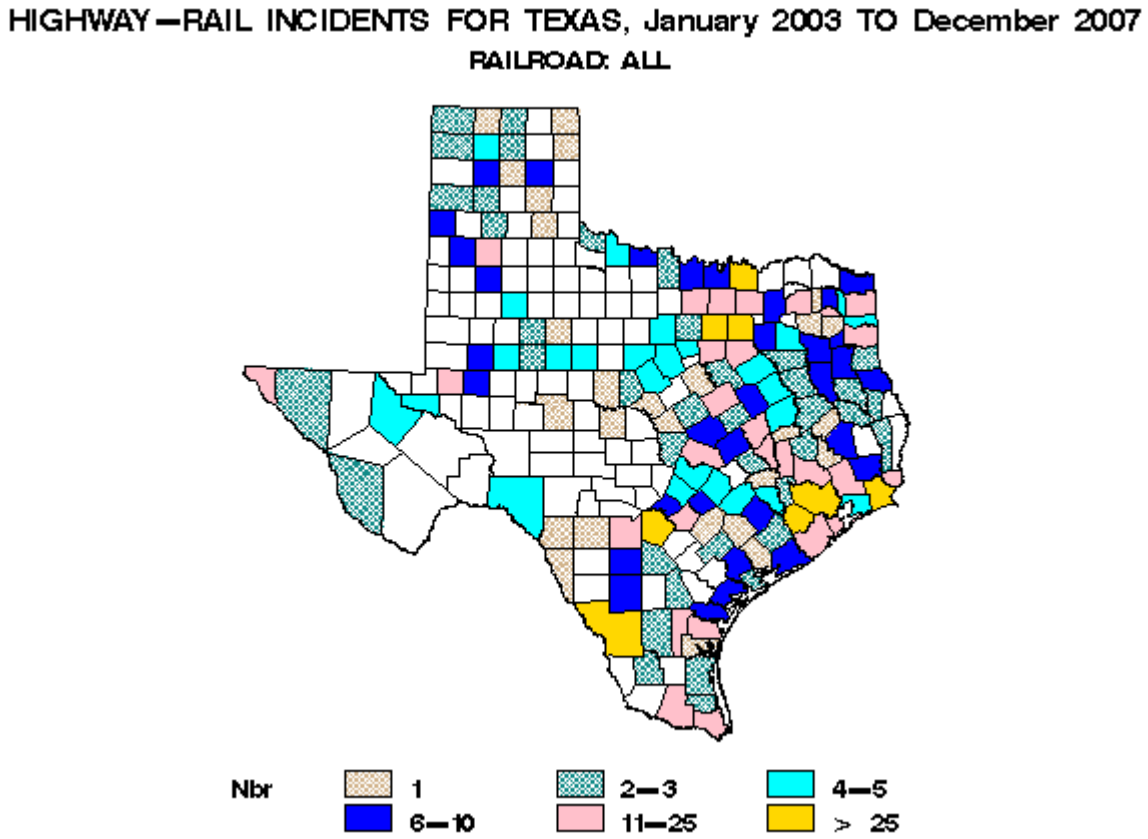
In addition to the regulatory functions, TxDOT is also actively involved in promoting safety through a variety of public information campaigns such as Operation Lifesaver. Operation Lifesaver is a non-profit organization focused on informing the public as to the dangers of highway-rail crossings, as well as other initiatives to make the railways safer for all.

In order to understand the rail/roadway safety issues within the Corpus Christi and Yoakum Districts, this report examines historical accident data kept by the Federal Railroad Administration. Records for the years 2003 through 2007 were collected and examined for preparation of this report.

6.1 HIGHWAY-RAIL INCIDENTS

With more than 10,000 miles of track and over 17,000 grade crossings, Texas experiences more vehicle-train accidents than any other state. Figure 6-1 shows a statewide perspective as to the number of incidents, by county, that have occurred over the 2003 to 2007 study period.

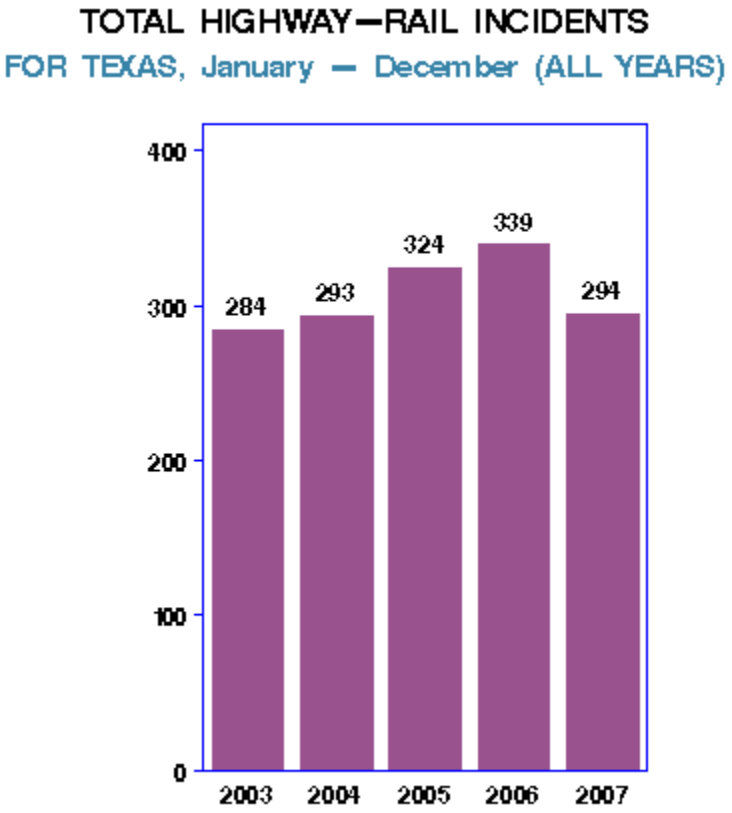
Figure 6-1 Highway-Rail Incidents for Texas, 2003 to 2007



Source: FRA

When examining statewide data for highway-rail incidents, a steadily increasing trend in the number of incidents per year is observed between 2003 and 2006. The number of incidents peak in 2006, and 2007 highway-rail incidents are sharply lower. Figure 6-2 shows highway-rail incidents per year for Texas.

Figure 6-2 Statewide Highway-Rail Incidents, 2003 – 2007



Source: FRA

There are approximately 2,568 at-grade crossings within the 21 counties that comprise the Corpus Christi and Yoakum Districts. This number includes both active and abandoned highway-rail crossings. Tables 6-1 and 6-2 detail the number of grade crossings by county, per district.

Table 6-1
At Grade Crossings by County - Corpus Christi District

County	Crossings
Aransas	32
Bee	87
Goliad	22
Jim Wells	132
Karnes	43
Kleberg	32
Live Oak	69
Nueces	347
Refugio	43
San Patricio	203
Total	**1010**

Table 6-2
At Grade Crossings by County - Yoakum District

County	Crossings
Austin	152
Calhoun	88
Colorado	179
DeWitt	68
Fayette	207
Gonzales	59
Jackson	62
Lavaca	51
Matagorda	240
Victoria	206
Wharton	246
Total	**1558**

During the period from 2003 to 2007, there were 101 highway/rail incidents within the 21 counties that comprise the Study Area. There were 14 fatalities and 52 injuries that resulted from these incidents. Despite the Yoakum District containing approximately 200 more miles of mainline track and approximately 500 more at-grade crossings, more incidents occurred within the Corpus Christi District than in Yoakum. Fifty-three incidents occurred in the Corpus Christi District and 48 in the Yoakum District.

Within the Study Area, there were multiple highway-rail incidents at nine separate grade crossings over the between 2003 and 2007. Five of those crossings are located within the City of Alice in Jim Wells County along the KCS / Tex-Mex line. A listing of these crossings is provided in Table 6-3.

Table 6-3 Multiple Highway-Rail Incident Grade Crossings

Crossing ID (Road)	County	Subdivision	Incidents
743818Y (FM 3013)	Colorado	UP-Glidden	2
746288W (SH 361)	San Patricio	UP-Kosmos	3
746505U (Fordtran Rd.)	DeWitt	UP-Port Lavaca	2
793665J (CR 103/Pearle)	Nueces	KCS / Tex-Mex	2
793811M (Johnson St.)	Jim Wells	KCS / Tex-Mex	2
793812U (Aransas St.)	Jim Wells	KCS / Tex-Mex	2
793815P (Reynolds St.)	Jim Wells	KCS / Tex-Mex	3
793816W (Adams St.)	Jim Wells	KCS / Tex-Mex	2
902597N (private road)	Nueces	CCTR	2

6.1.1 Corpus Christi District

As mentioned in the previous section, 53 incidents occurred in the Corpus Christi District during the five year study period. Prior to collecting the accident data, it was expected that the highest concentration of incidents would be located in Nueces County since Nueces County contains the largest population within the district, and also has the most grade crossings and greatest length of active mainline track. However, Jim Wells County actually recorded the largest

number of incidents, 20 in total. Nueces County ranked second within the Corpus Christi District with 15 incidents reported during the study period.

Of the remaining incidents that occurred within the Corpus Christi District, most occurred in Refugio and San Patricio counties, each of which recorded 7 incidents. The UP-Brownsville and UP-Corpus Christi subdivisions comprise most of the rail within those two counties. The counties of Aransas, Bee, Goliad and Karnes experienced no highway/rail incidents during the five year study period. This is not an unexpected result since those four counties contain a combined total of only 5 miles of active mainline track.

The five year data set does not indicate any continuous trend of highway-rail incidents, neither increasing nor decreasing. Between 2003 and 2007, the number of incidents per year is 8, 14, 8, 16 and 7. The incident data does reflect the statewide trend of a marked increase in incidents in 2006 followed by a significantly lower number of incidents in 2007.

Table 6-4 illustrates the highway/rail incident data for the Corpus Christi District. The number of incidents ("Cnt") and number of persons killed and injured ("Kld", "Inj") is provided for each year for each county within the district.

Table 6-4 Highway/Rail Incidents - Corpus Christi District

	2003			2004			2005			2006			2007			Totals for Period		
County	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**
Aransas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goliad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jim Wells	4	0	1	7	0	4	1	0	0	5	0	1	3	0	0	20	0	6
Karnes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kleberg	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Live Oak	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1	3	0	1
Nueces	1	1	1	2	0	0	3	0	3	6	0	0	3	3	2	15	4	6
Refugio	1	0	0	4	1	2	1	0	0	1	0	0	0	0	0	7	1	2
San Patricio	1	0	1	1	0	0	3	1	1	2	0	2	0	0	0	7	1	4
Total	**8**	**1**	**3**	**14**	**1**	**6**	**8**	**1**	**4**	**16**	**0**	**3**	**7**	**3**	**3**	**53**	**6**	**19**

Source: FRA

6.1.2 Yoakum District

During the 2003 to 2007 study period there were 48 highway/rail incidents which occurred in the Yoakum District. Matagorda and Victoria Counties experienced 10 incidents each, which led the Yoakum District. The next largest count of incidents occurred in Colorado County. The remaining 19 incidents are spread relatively evenly across the remaining 8 counties in the district, with each experiencing between 1 and 4 incidents.

As with the Corpus Christi District, the five year data set does not indicate a constant increasing or decreasing trend. However, the dramatic jump in incidents from 2005 to 2006 and the decrease from 2006 to 2007 that is reflected in the statewide data and Corpus Christi District also occurred in the Yoakum District. From 2003 to 2005 the number of incidents were 7, 5 and

7, yet in 2006 the number of incidents jumped to 17. The number of incidents fell to 12 in 2007, still well above the trend observed in the early years of the study period.

Table 6-5 illustrates the highway/rail incident data for the Yoakum District. The number of incidents ("Cnt") and number of persons killed and injured ("Kld", "Inj") is provided for each year and for each county within the district.

Table 6-5 Highway/Rail Incidents - Yoakum District

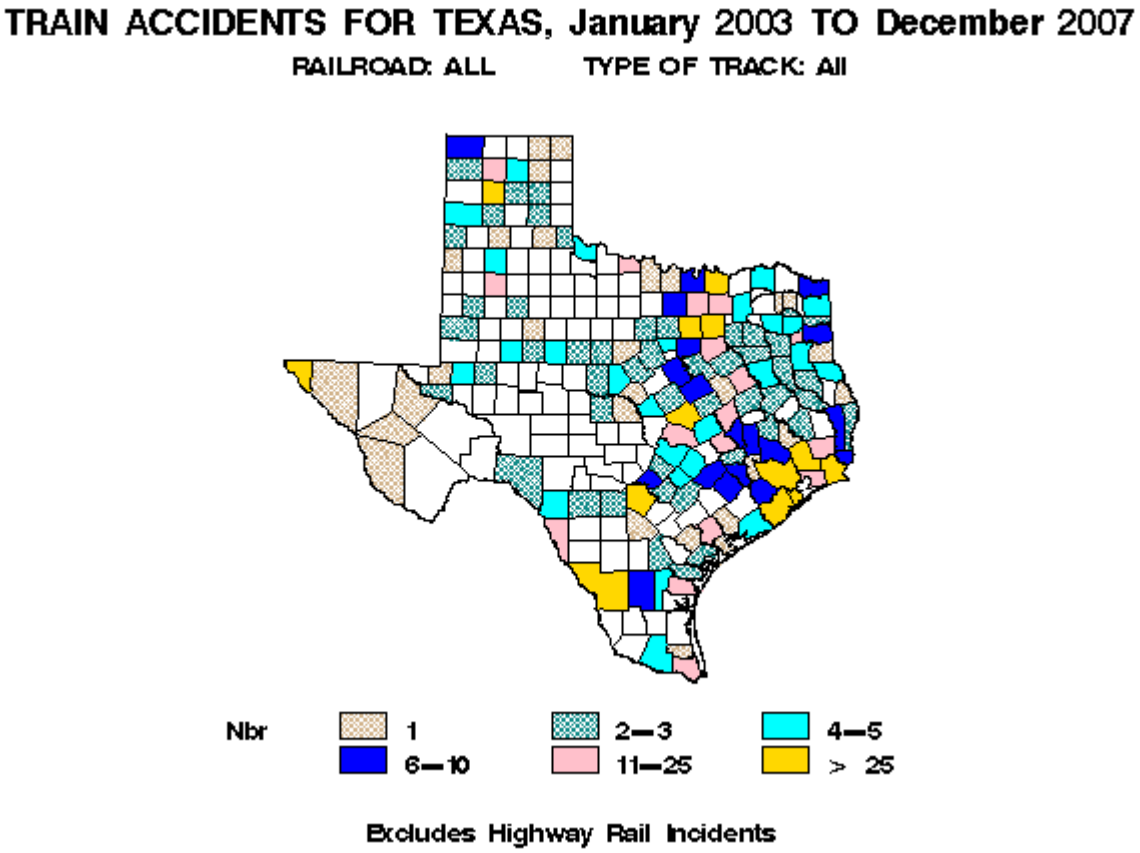
	2003			2004			2005			2006			2007			Totals for Period		
County	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**	**Cnt**	**Kld**	**Inj**
Austin	0	0	0	0	0	0	1	1	0	2	0	0	1	0	0	4	1	0
Calhoun	1	0	0	0	0	0	0	0	0	1	0	2	0	0	0	2	0	2
Colorado	0	0	0	0	0	0	2	0	1	6	1	12	1	0	0	9	1	13
DeWitt	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	3	0	0
Fayette	1	0	1	0	0	0	1	0	1	2	0	1	0	0	0	4	0	3
Gonzales	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Jackson	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Lavaca	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0
Matagorda	1	0	0	3	0	3	2	0	3	1	0	2	3	2	1	10	2	9
Victoria	2	0	0	2	3	0	0	0	0	1	0	1	5	0	4	10	3	5
Wharton	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	3	0	1
Total	**7**	**0**	**1**	**5**	**3**	**3**	**7**	**1**	**5**	**17**	**2**	**18**	**12**	**2**	**6**	**48**	**8**	**33**

Source: FRA

6.2 TRAIN ACCIDENTS

Historical data for train accidents has also been collected and studied for this report. As with highway-rail incidents, Texas is also the state in which the most train accidents occurs. There were 1,729 train accidents between 2003 and 2007 statewide. Figure 6-3 shows the county by county train accidents for Texas over the study period.

Figure 6-3 Train Accidents for Texas, 2003 - 2007



Source: FRA

6.2.1 Corpus Christi District

There were 29 train accidents in the Corpus Christi District over the 5 year study period. The overwhelming majority of these accidents, 21 of the 29 total, occurred in Nueces County. Given the various yards and multitude of switching operations which occur in and around the Port of Corpus Christi, this finding is not unexpected. No accidents were reported in five of the district's ten counties. The counties not reporting any train accidents were Aransas, Bee, Jim Wells, Karnes and Kleberg. The remaining counties in the district, Goliad, Live Oak, Refugio & San Patricio, experienced 1 to 3 accidents each.

Combined, the 29 accidents which occurred in the district accounted for $2,571,069 in reportable damage, an average of $88,657 per accident. Twenty-six of the 29 incidents involved a derailment. The leading cause of accidents was reported to be the track, which was listed as the primary cause in 17 of the 29 accidents. Five of the 29 accidents were found to be caused by human error, 1 was related to equipment and 6 related to other causes.

Table 6-6 provides county by county data for the cumulative total of train accidents over the 2003 to 2007 period.

Table 6-6 Corpus Christi District Train Accidents, 2003 - 2007

County	Totals				Type of Accident			Causes				
	Accs	Kld	Inj	Reportable Damage	Coll	Der	Othr	Eqp	Hmn	Othr	Sig	Trk
Aransas	No Accidents Reported											
Bee	No Accidents Reported											
Goliad	1	0	0	$30,000	-	-	1	-	-	1	-	-
Jim Wells	No Accidents Reported											
Karnes	No Accidents Reported											
Kleberg	No Accidents Reported											
Live Oak	2	0	0	$232,436	-	2	-	-	-	-	-	2
Nueces	21	0	0	$1,930,898	-	20	1	1	4	3	-	13
Refugio	2	0	0	$229,799	1	1	-	-	-	2	-	-
San Patricio	3	0	0	$147,936	-	3	-	-	1	-	-	2
Total	**29**	**0**	**0**	**$2,571,069**	**1**	**26**	**2**	**1**	**5**	**6**	**0**	**17**

Source: FRA

"Accs" = Accidents
"Kld" = Persons Killed
"Inj" = Persons Injured
"Coll" = Collision
"Der" = Derailment
"Othr" = Other
"Eqp" = Equipment
"Hmn" = Human
"Othr" = Other
"Sig" = Signal
"Trk" = Track

6.2.2 Yoakum District

The Yoakum District experienced a much larger number of train accidents than the Corpus Christi District. Over the 5 year period, 44 train accidents occurred in the district. Victoria County led the district in number of accidents with 13. Colorado County experienced 8, and Austin and Fayette Counties experienced 7 each. Calhoun, Gonzales, Jackson and Matagorda Counties experienced between 1 and 5 accidents each. Three counties, DeWitt, Lavaca and Wharton, did not experience any train accidents during the study period.

The 44 accidents in the Yoakum District accounted for $5,422,072 in reportable damage, an average of $123,229 per accident. A derailment occurred in 36 of the 44 accidents. Similar to the findings in the Corpus Christi District, the track was found to be the leading cause of accidents in the Yoakum District, accounting for 20 of the 44 accidents. Human error was found to have caused 12 accidents, 6 accidents were caused by equipment and 6 were due to other causes.

Table 6-7 shows the cumulative totals for train accidents occurring in the Yoakum District between 2003 and 2007.

Table 6-7 Yoakum District Train Accidents, 2003 - 2007

County	Totals				Type of Accident			Causes				
	Accs	Kld	Inj	Reportable Damage	Coll	Der	Othr	Eqp	Hmn	Othr	Sig	Trk
Austin	7	0	2	$1,086,094	-	5	2	-	3	1	-	3
Calhoun	1	0	0	$19,400	-	1	-	1	-	-	-	-
Colorado	8	0	0	$329,566	-	6	2	1	1	1	-	5
DeWitt	No Accidents Reported											
Fayette	7	0	0	$1,083,178	2	4	1	1	3	2	-	1
Gonzales	2	0	0	$94,357	-	2	-	-	1	-	-	1
Jackson	1	0	0	$109,840	-	1	-	1	-	-	-	-
Lavaca	No Accidents Reported											
Matagorda	5	0	0	$239,943	-	5	-	2	-	-	-	3
Victoria	13	0	2	$2,459,694	1	12	-	-	4	2	-	7
Wharton	No Accidents Reported											
Total	**44**	**0**	**4**	**$5,422,072**	**3**	**36**	**5**	**6**	**12**	**6**	**0**	**20**

Source: FRA

"Accs" = Accidents
"Kld" = Persons Killed
"Inj" = Persons Injured
"Coll" = Collision
"Der" = Derailment
"Othr" = Other
"Eqp" = Equipment
"Hmn" = Human
"Othr" = Other
"Sig" = Signal
"Trk" = Track

6.3 TRESPASSER INCIDENTS

Five year historical data for trespasser fatalities and injuries were also collected for this report. Trespasser incidents are tracked separately from highway-rail incidents. Trespasser incidents involve only those persons injured or killed while illegally on private railroad property.

The data reflects sporadic incidents with no clear trends. The Yoakum District experienced more fatalities and injuries than the Corpus Christi District, but this is not an unexpected result as the Yoakum District contains more rail than the Corpus Christi District. Tables 6-8 and 6-9 summarize the number of persons killed and injured for both the Corpus Christi and Yoakum Districts.

Table 6-8 Trespasser Fatalities/Injuries, Corpus Christi District

County	2003		2004		2005		2006		2007		Totals	
	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj
Aransas	No Trespasser Deaths Or Injuries Reported										na	na
Bee	No Trespasser Deaths Or Injuries Reported										na	na
Goliad	No Trespasser Deaths Or Injuries Reported										na	na
Jim Wells	0	0	0	1	0	0	0	0	0	0	0	1
Karnes	No Trespasser Deaths Or Injuries Reported										na	na
Kleberg	0	0	0	1	0	0	0	0	0	1	0	2
Live Oak	No Trespasser Deaths Or Injuries Reported										na	na
Nueces	0	0	0	0	0	0	0	5	0	0	0	5
Refugio	0	0	0	0	0	0	0	0	0	1	0	1
San Patricio	0	0	0	0	0	0	0	1	2	0	2	1
Total	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**6**	**2**	**2**	**2**	**10**

Source: FRA

Table 6-9 Trespasser Fatalities/Injuries, Yoakum District

County	2003		2004		2005		2006		2007		Totals	
	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj	Kld	Inj
Austin	No Trespasser Deaths Or Injuries Reported										na	na
Calhoun	0	0	0	0	0	0	0	1	0	0	0	1
Colorado	0	5	0	0	0	0	0	0	2	0	2	5
DeWitt	No Trespasser Deaths Or Injuries Reported										na	na
Fayette	0	1	0	0	0	0	1	1	0	0	1	2
Gonzales	1	1	0	0	0	0	1	0	0	0	2	1
Jackson	No Trespasser Deaths Or Injuries Reported										na	na
Lavaca	0	1	0	0	0	0	0	0	0	0	0	1
Matagorda	0	0	0	2	0	2	0	0	0	0	0	4
Victoria	0	0	0	1	0	0	0	0	1	0	1	1
Wharton	0	0	1	0	0	0	0	0	0	0	1	0
Total	**1**	**8**	**1**	**3**	**0**	**2**	**2**	**2**	**3**	**0**	**7**	**15**

Source: FRA

6.4 HAZARDOUS MATERIAL INCIDENTS

Rail incidents involving cars carrying hazardous materials (HAZMAT) merit special attention due to the dangers posed to the general public. Whereas any rail incident will pose danger to those persons in the immediate vicinity, an incident involving the release of a hazardous material can pose a threat to those several miles away. Responders to such incidents are also at risk.

Nationwide, the railroads devote extensive resources towards training thousands of emergency responders on how to properly deal with HAZMAT incidents. In addition to internal training programs, the railroads are also active participants in organizations such as TRANSCAER[8] and CHEMTREC. TRANSCAER (an abbreviation for **Trans**portation and **C**ommunity **A**wareness and **E**mergency **R**esponse) is a national outreach program focused on assisting communities in the preparation for, and if necessary the response to, HAZMAT incidents. CHEMTREC[9] (**Chem**ical **Tr**ansportation **E**mergency **C**enter) is a 24 hour hotline (phone 1-800-424-9300) dedicated to assisting responders in obtaining emergency response information for chemical releases.

In addition to the national programs listed above, there are also regional organizations within the Study Area involved in HAZMAT response. Known as Local Emergency Planning Committees (LEPC), these organizations are partnerships between local governments, industries, HAZMAT responders, and other concerned public or private entities. Every county within the Study Area is involved in an LEPC.

The involvement at the local level is crucial as the first responders to rail incidents are usually members of the local fire department. Upon assessing the initial situation, the first responders relay information through proper channels, such as CHEMTREC, whom then assist in identifying and allocating the necessary resources. Clean-up efforts are typically the responsibility of the railroads, which use contracted professionals to handle such efforts.

A valuable resource in the handling of HAZMAT incidents is the Emergency Response Guidebook (ERG). The ERG has been developed through a cooperative effort of the U.S. Department of Transportation with other national governments throughout north and south America. The ERG is intended to serve as a quick reference guidebook to assist first responders in identifying the hazardous material involved, and how to protect themselves and the general public during the initial response period of the incident. The ERG is updated every four years, with the latest revision occurring in 2008[10].

Included with the ERG are several quick reference guides providing important information for various classifications of hazardous materials. For each classification general information is provided as to the potential hazards related to fire or explosion, as well as health related hazards posed by the substance. Also included within these individual reference guides is information regarding recommended protective clothing needed to work around the incident area, as well as instructions for handling the public with regards to possible evacuations.

Tables 6-10 and 6-11 show the five year totals for the number of rail cars with hazardous material cargo which were involved in rail accidents. When reviewing the tables below it should be noted that “Cars Involved” refers to the total number of hazmat rail cars that were part of trains involved in various incidents, not the number of individual incidents. For example, in the Corpus Christi District there were 14 hazmat rail cars that were part of trains involved in incidents, but only 1 of those 14 cars was damaged or derailed.

[8] TRANSCAER website: http://www.transcaer.com
[9] CHEMTREC website: http://www.chemtrec.org
[10] Emergency Response Guidebook, 2008 revision available online at: http://hazmat.dot.gov/pubs/erg/erg2008_eng.pdf

Table 6-10
Rail Cars With Hazmat Cargo Involved In Rail Accidents, Corpus Christi District

County	Totals For All Hazmat Incidents, 2003 - 2007		
	Cars Involved	Cars Damaged or Derailed	Cars Releasing
Aransas	No Hazmat Incidents Reported		
Bee	No Hazmat Incidents Reported		
Goliad	No Hazmat Incidents Reported		
Jim Wells	10	1	0
Karnes	No Hazmat Incidents Reported		
Kleberg	No Hazmat Incidents Reported		
Live Oak	No Hazmat Incidents Reported		
Nueces	4	0	0
Refugio	No Hazmat Incidents Reported		
San Patricio	No Hazmat Incidents Reported		
Total	**14**	**1**	**0**

Source: FRA

Table 6-11
Rail Cars With Hazmat Cargo Involved In Rail Accidents, Yoakum District

County	Totals For All Hazmat Incidents, 2003 - 2007		
	Cars Involved	Cars Damaged or Derailed	Cars Releasing
Austin	78	8	0
Calhoun	No Hazmat Incidents Reported		
Colorado	7	0	0
DeWitt	No Hazmat Incidents Reported		
Fayette	2	0	0
Gonzales	No Hazmat Incidents Reported		
Jackson	No Hazmat Incidents Reported		
Lavaca	1	1	0
Matagorda	11	1	0
Victoria	74	4	0
Wharton	No Hazmat Incidents Reported		
Total	**173**	**14**	**0**

Source: FRA

APPENDIX A – DEFINITION OF TERMS

AAR – American Association of Railroads
CHEMTREC – Chemical Transportation Emergency Center
FRA – Federal Railroad Administration
HAZMAT – Hazardous Material(s)
LEPC – Local Emergency Planning Committee
MPO – Metropolitan Planning Organization
RRC – Texas Railroad Commission
RRIF – Rail Relocation & Improvement Fund
RRTD – Rural Rail Transportation District
STB – Surface Transportation Board
TRANSCAER – Transportation and Community Awareness and Emergency Response

Absolute Block - A length of track in which no train or engine is permitted to enter while it is occupied by another train or engine.

Automatic Block Signal System (ABS) - A series of consecutive blocks governed by block signals, cab signals or both, actuated by a train, engine or by certain conditions affecting the use of a block.

Bad Order - A piece of rolling stock that needs repair.

Block - A length of track between consecutive block signals or from a block signal to the end of block system limits, governed by block signals, cab signals or both.

Boxcar - An enclosed car used for general service and especially for lading which must be protected from weather.

Bulk transfer - The transfer of bulk products, such as plastic pellets or liquid sweeteners, from one mode of transportation to another. Bulk transfer permits off-rail shippers and receivers of varied commodities to combine rail's long-haul efficiencies with truck's convenient door-to-door delivery.

Branch Line - A secondary line of a railroad, not the main line

Capacity - General Capacity - Rail demand or volume. Factors affecting capacity for a railroad are numerous, but include, for example, the availability of train crews, locomotives, equipment, and track.

Line or Track Capacity - Maximum number of trains that can operate safely and reliably in each direction over a given segment of track during a given period of time.

Carload - Shipment of not less than 5 tons of one commodity

Centralized Traffic Control (CTC) - A traffic control system where train movements are directed through the remote control of switches and signals from a central control point. This system enables trains to pass each other at sidings or interlockings without the need for train crews to stop and manually throw switches. The train operates on the authority of signal indications instead of the authority via timetable or train orders.

Class 1 Railroad - A railroad with annual gross operating revenue of $256.4 million or more.

Class 2 Railroad - A railroad with average annual gross revenue between $20.5 and $256.4 million.

Class 3 Railroad - A railroad with average annual gross revenue under $20.5 million.

Classification - Grouping of railcars in a yard in accordance with train movement requirements, usually by destination

Classification Yard - A rail yard in which rail cars are classified and grouped in accordance with their movement requirement such as kind, contents, and/or destination.

Container - A large, weatherproof box designed for shipping freight in bulk by rail, truck or steamship. Typically the box resembles a truck trailer, which is lifted onto a flatcar. Most containers are 20, 45, 48, or 53 feet in length.

COFC - Containers on Flat Cars. Refers to Intermodal shipments where containers are moved on a railroad flat car. The movement is made without the container being mounted on a chassis.

Consist - The make-up of a freight train by types of cars and their contents.

Controlled Point (CP) - A location where switches and/or signals are remotely controlled by a control operator (dispatcher).

Cross-Overs - Track that joins two main tracks. When a train moves from one main track to another it "crosses over."

Cut, to - Separate car(s) from a train

Diamond - The intersection of normally perpendicular tracks where only one track can be used at a time.

Division - A geographical unit of a railroad, the boundaries of which are designated by railroad timetables.

Double Track (DT) - Two main tracks, on one of which the current of traffic is typically in a specified direction, and on the other typically in the opposite direction.

Drill Track - A track connecting with the ladder track, over which locomotives and cars move back and forth in switching.

Flat Car - A freight car that has a floor without any housing or body above. Frequently used to carry containers and/or trailers, or oversized and odd-shaped commodities.

Grade Crossing - The crossing of highways, roadways, pedestrian walks or combinations of these, with railroad tracks at the same level.

Grade Separation - The separation of a Grade Crossing by either an underpass or overpass.

Haulage rights - rights obtained by one railroad to have its trains operated by another railroad over that railroad's tracks.

Hopper - a rail car with pockets, or hoppers, opening on the underside of the car for unloading bulk commodities

House Track - A track entering, or along side a freight house. Cars are spotted here for loading or unloading.

Hump - The part of a gravity classification yard (hump yard) in which rail cars that have been pushed up a summit (hill) are cut off while in motion at the top of the hill. Gravity then pulls the rail cars down the hill switching it onto a predetermined track. The weight of the rail car, distance it must travel to the designated track, and it's location within the train that is being made-up, are all taken into consideration so the speed of the car can be adjusted through a series of retarders, or brakes, as the car moves down the hill toward the intended track.

Hump Yard - A yard in which rail cars are classified and forwarded to final destinations. The three components are a receiving yard, a classification yard in which railcars are pushed over a hump to various classification tracks and a forwarding or departure yard.

Intermodal - Mode of rail transportation that covers the multi-modal transportation of trailers and/or containers by ship, rail, and truck.

Interchange - A track in which various cars are delivered or received from one railroad to another.

Interchange Point - The point at which two or more railroads join. Traffic is passed from one road to another at interchange points.

Interlocking - An arrangement of signal appliances so interconnected that their movements must succeed each other in proper sequence. It may be operated manually or automatically.

Junction - The convergence of two or more railroad lines. Typically a Junction is a Controlled Point as well.

Ladder Track - A diagonal track in a rail yard configuration that typically intersects all tracks, connecting each by means of switches.

Local Train - A train with an assigned crew that works between pre-designated points normally picking up or dropping off railcars to the railroad customer base within the area.

Locomotive - Locomotives are units propelled by any form of energy, or a combination of such units operated from a single control station, used in train or yard service

Main line - Primary rail line over which trains operate between terminals. It excludes sidings, and yard and industry tracks.

Manifest - Train made up of mixed railcars (box, tank, piggyback cars, etc.)

Mile Post (MP) - A post or sign on a pole each mile along the track that shows the distance from a predefined location such as a major rail terminal.

Multiple Main Tracks - Two or more main tracks, the use of which is designated in the timetable. Two main tracks are commonly referred to as double track. The tracks run parallel and may accommodate traffic in either direction. Typically, on one track the current of traffic is typically in a specified direction, and on the other track(s) typically in the opposite direction.

Piggyback - Slang term for the transportation of a highway trailer on a railroad flat car.

Ramp - Slang term for an intermodal terminal where trailers and containers are lifted onto or off of railcars.

Restricted Speed - The maximum operating speed of a train, not exceeding 20 MPH, which will permit the engineer to stop the train within one half the range of sight; short of other trains, engines, railroad cars, stop signals, derails or switches not properly lined, while concurrently being on the look-out for track infrastructure irregularities such as a broken rail. Train movement through rail yards are typically done at restricted speed.

Right-of-way - The property owned by a railroad over which tracks have been laid.

Rip Track - A small car repair facility, often a single track in a small yard. Origination of name is derived from "Repair, Inspect and Paint," however today "Repair in Place" is more applicable.

Running Track - A track, typically not a main track, designated in the timetable upon which movements may be made subject to prescribed signals and rules, or special instructions. Also the name given a track reserved for movement through a yard.

Secondary Track - Any designated track upon which trains or engines may be operated without timetable authority, train orders or block signals. Also a common name given to tracks on railroad branch lines.

Siding - A track auxiliary to a main or secondary track for meeting or passing trains. The timetable will indicate stations at which sidings are located.

Single Track - A main track upon which trains are operated in both directions.

Spur Track - A track extending out from the main track that is usually used to serve rail customers.

Storage-in-Transit (SIT) - Bulk commodities, such as plastic pellets and polyvinylchloride powder, are made in vast quantities to minimize the expenses associated with their manufacture. These commodities are customarily loaded into empty railcars known as covered hoppers, and stored at a point (SIT Yard) located between the point of origin and the point of destination to be shipped at a later date.

Stub Track - A form of side track connected to a running track at one end only and protected at the other end by a bumping post or other obstruction.

Subdivision - A portion of a division designated by timetable. Normally the name given to a main track between two locations as specified in the timetable.

Surface Transportation Board (STB) - An independent governmental adjudicatory body administratively housed within the Federal Department of Transportation responsible for the economic regulation of interstate surface transportation, primarily for the railroad industry, within the United States. The mission of the STB is to ensure competitive, efficient, and safe transportation services are provided to meet the needs of shippers, receivers, and consumers.

Switching - The movement of freight cars between two nearby locations or trains. This typically involves moving cars within a yard or from specific industry locations to a yard for placement of railcars in a train, or vice versa.

Through freight train - an express freight train between major terminals.

Timetable - A written document which establishes the authority for the movement of trains over designated lines of track, subject to the rules established for that track. Typically it describes maximum authorized train speeds for the entire rail line or a portion thereof. The timetable will also include the names and locations of control points for the rail line

Terminal - Railroad facilities established for the handling of passengers or freight, and for the breaking up, making up, forwarding and servicing of trains, and interchanging with other carriers.

TOFC - Trailer on a flat car. Refers to intermodal shipments. Commonly referred to as "piggy-back."

Tower - Prior to the centralization and computerization of switching operations, physical structures, called Towers, were erected in locations where the "Tower Operator" could observe and control the movement of trains within a localized area. The towers were complete with manual switching equipment where the operator would physically move levers back and forth controlling the direction of train travel, selection of track the train would occupy, and the signal indication. Today this function is typically done by a dispatcher at a remote location, although the tower designation of that control point, or junction, remains today even though the physical building may no longer exist.

Trackage Rights - An agreement between railroads where one railroad is authorized to operate its trains, between specific locations, over the tracks owned by another railroad. Typically three is a surcharge for this privilege, and the associated rights are filed with the Surface Transportation Board (STB).

Track Warrant - Track Warrant Control (TWC): A method of traffic control wherein trains are authorized for movement only between specified locations. The form giving a train crew the authority to operate between two locations is called a track warrant.

Train - An engine or more than one engine coupled, with or without cars, displaying a marker and authorized to operate on a main track.

Trim Lead - Track used to move cars from the sorting tracks (bowl) to the departure yard, where sorted cars are coupled into an outbound train.

Trains Spacing - The time spacing in which a terminal/subdivision can effectively handle trains. This could be predicated on the type of method of dispatching authorized for the particular line segment.

Trains Staging - Trains holding at a location awaiting authorization and/or release to move into a terminal.

Turnout - A section of track with movable rails to divert a train from one track to another. Also referred to as a "switch," although technically the switch is only the moving parts of a turnout. Turnouts are referred to by number. For example, a no. 6 turnout spreads one unit for each six units of travel measured from the point of the frog.

Unit Train - A train composed entirely of one commodity, usually coal or mineral, and usually composed of cars of a single owner and similar design, and usually destined for a single destination.

Universal Crossovers - A pair of crossovers, spaced at a predetermined distance, allowing for the movement of a train from one main track to another, and then return to the original track

Wye- A track shaped like the letter "Y", but with a connector between the two arms of the "Y". A wye is used to reverse the direction of trains or cars. A train pulls completely through one leg of wye, the switch is thrown and reverses the direction, allowing the movement across the semi-loop track of the wye, and the train is then headed in the opposite direction.

Yard - A system of tracks, other than main tracks and sidings, branching out from a common track. Yards are typically used for switching, making up trains, and/or storing of railcars.

Yard Limits - The location on a main track in which the main track begins to enter a rail yard. This location is typically designated by a yard limit sign placed along the main track, and is also noted in the timetable.

APPENDIX B – BRIDGE INVENTORY

Union Pacific – Brownsville Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers	101.10	462	Los Olmos Creek
Timber Stringers, Open Deck	102.90	26	Waterway
Timber Stringers	105.20	78	Waterway
Steel Beam Span, Open Deck	106.70	81	Waterway
Rail Girder, Open Deck	108.40	31	Waterway
Rail Girder, Open Deck	109.10	31	Waterway
Prestressed Concrete Slab	109.92	84	Velendenos Creek
Timber Stringers, Open Deck	111.00	138	Jarashanel Creek
Prestressed Concrete Tee	115.30	194	Escondido Creek
Reinforced Concrete Slab	116.40	240	St. Gertrudis Creek
Reinforced Concrete Slab	119.40	128	Tranguitas Creek
Reinforced Concrete Slab	121.60	208	San Fernando Creek
Rail Girder, Open Deck	122.40	10	Waterway
Rail Girder, Open Deck	123.90	36	Waterway
Reinforced Concrete Slab	124.70	176	Carreto Creek
Timber Stringers, Open Deck	125.30	26	Waterway
Timber Stringers, Open Deck	125.40	149	Waterway
Rail Girder, Open Deck	125.50	10	Waterway
Timber Stringers, Open Deck	127.70	13	Waterway
Timber Stringers, Open Deck	128.80	13	Waterway
Rail Girder, Open Deck	130.00	37	Waterway
Rail Girder, Open Deck	130.01	10	Waterway
Rail Girder, Open Deck	130.02	36	Waterway
Prestressed Concrete Slab	130.50	29	Waterway
Timber Stringers, Open Deck	130.80	26	Waterway
Rail Girder, Open Deck	131.00	36	Waterway
Prestressed Concrete Slab	131.04	26	Waterway
Reinforced Concrete Slab	132.70	481	Petronilla Creek
Reinforced Concrete Slab	132.80	128	Waterway
Timber Stringers, Open Deck	134.00	12	Waterway
Reinforced Concrete Slab	135.10	176	Waterway
Timber Stringers	138.00	39	Waterway
Reinforced Concrete Slab	139.20	56	Waterway
Prestressed Concrete Slab	140.30	30	Waterway
Timber Stringers Open Deck	141.10	43	Waterway
Rail Girder, Open Deck	141.80	19	Waterway
Prestressed Concrete Slab	141.90	89	Waterway
Timber Stringers-Glulam, Open Deck	142.60	64	Waterway
Timber Stringers, Open Deck	143.50	64	Waterway
Rail Girder, Open Deck	144.70	10	Waterway
Rail Girder, Open Deck	145.00	9	Waterway
Rail Girder, Open Deck	145.30	9	Waterway
Through Plate Girder	147.40	170	IH – 37
Timber Stringers Reinforced Concrete Tee Through Plate Girder, Open Deck Timber Stringers (TOTAL)	149.80	147 174 100 246 (667)	Nueces River

Union Pacific – Brownsville Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Reinforced Concrete Slab	150.00	1008	Nueces River Overflow
Reinforced Concrete Slab	151.00	719	Waterway
Timber Stringers-Glulam, Open Deck	153.60	38	Waterway
Prestressed Concrete Slab	155.00	222	Peters Swale
Prestressed Concrete Slab	155.95	69	Waterway
Timber Stringers, Open Deck	158.20	139	Peters Swale
Reinforced Concrete Slab (Main) Timber Stringers (Siding)	160.90	39 38	Waterway
Rail Girder, Open Deck	161.40	14	Waterway
Timber Stringers, Open Deck	162.80	282	Waterway
Prestressed Concrete Tee	163.00	82	Waterway
Prestressed Concrete Tee	163.20	112	Waterway
Timber Stringers, Open Deck	165.20	52	Waterway
Prestressed Concrete Slab	165.90	60	Waterway
Prestressed Concrete Slab	166.70	66	Waterway
Prestressed Concrete Tee	168.40	84	Waterway
Timber Stringers, Open Deck	169.70	80	Waterway
Reinforced Concrete Slab Through Plate Girder Reinforced Concrete Slab (TOTAL)	170.20	373 150 114 (637)	Arkansas River
Timber Stringers	170.60	116	Waterway
Timber Stringers	170.80	116	Waterway
Reinforced Concrete Tee	173.40	140	Waterway
Steel Beam Span, Open Deck	174.80	39	Waterway
Prestressed Concrete Box	176.50	19	Waterway
Reinforced Concrete Tee	177.50	196	Waterway
Reinforced Concrete Tee	178.00	224	Waterway
Timber Stringers	178.90	91	Waterway
Reinforced Concrete Slab	181.60	131	Waterway
Timber Stringers	182.10	80	Waterway
Timber Stringers, Open Deck	182.50	69	Waterway
Timber Stringers Timber Stringers, Open Deck (TOTAL)	184.10	66 97 (163)	Waterway
Prestressed Concrete Tee Through Truss Pinned, Open Deck Prestressed Concrete Tee (TOTAL)	184.80	1104 150 440 (1694)	Mission River
Prestressed Concrete Tee	185.00	404	Waterway
Timber Stringers	186.90	131	Waterway
Through Plate Girder	188.30	183	US 77
Prestressed Concrete Tee	188.80	336	Waterway
Prestressed Concrete Tee	195.80	581	Copano Creek
Reinforced Concrete Slab	196.90	25	Waterway
Timber Stringers, Open Deck	198.60	95	Waterway
Timber Stringers, Open Deck	199.80	68	Waterway
Timber Stringers, Open Deck	200.50	67	Waterway
Timber Stringers, Open Deck	201.50	81	Waterway
Timber Stringers, Open Deck	202.30	13	Waterway
Prestressed Concrete Slab	206.43	34	Waterway

Union Pacific – Brownsville Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Reinforced Concrete Tee Through Truss Riveted, Open Deck Reinforced Concrete Tee (TOTAL)	207.00	84 150 76 (310)	San Antonio River
Reinforced Concrete Tee	207.40	765	Waterway
Reinforced Concrete Tee	207.60	742	Waterway
Reinforced Concrete Tee	208.20	413	Waterway
Prestressed Concrete Tee	210.10	258	Waterway
Prestressed Concrete Tee	212.10	135	Waterway
Reinforced Concrete Tee	214.80	464	Waterway
Prestressed Concrete Tee Through Plate Girder, Open Deck Prestressed Concrete Tee (TOTAL)	215.00	457 225 18 (700)	Guadalupe River
Reinforced Concrete Tee	215.40	991	Waterway
Reinforced Concrete Tee	215.60	848	Waterway
Deck Plate Girder, Open Deck Through Plate Girder, Open Deck Deck Plate Girder, Open Deck (TOTAL)	216.00	86 100 86 (272)	Barge Canal
Prestressed Concrete Tee	216.80	360	Black Bayou
Timber Stringers, Open Deck	217.60	68	Waterway
Timber Stringers, Open Deck	218.10	40	Waterway
Timber Stringers, Open Deck	219.80	55	Waterway

Union Pacific – Angleton Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers - Glulam, Open Deck	221.40	108	Waterway
Timber Stringers, Open Deck	222.30	54	Waterway
Timber Stringers, Open Deck	223.00	54	Waterway
Prestressed Concrete Box	224.83	30	Waterway
Timber Stringers, Open Deck	225.45	39	Waterway
Reinforced Concrete Tee	228.60	252	Palo Alto Creek
Prestressed Concrete Box	231.03	87	Waterway
Timber Stringers, Open Deck	232.30	13	Waterway
Timber Stringers, Open Deck Through Truss Pinned, Open Deck Timber Stringers, Open Deck (TOTAL)	234.10	36 180 67 (283)	Garcitas River
Reinforced Concrete Tee	234.40	420	Waterway
Timber Stringers, Open Deck	236.80	27	Waterway
Prestressed Concrete Tee	237.20	140	Waterway
Timber Stringers, Open Deck (Main) Timber Stringers, Open Deck (Siding)	238.97	40 42	Waterway
Timber Stringers	241.52	302	Waterway
Reinforced Concrete Slab Through Plate Girder, Open Deck Reinforced Concrete Slab (TOTAL)	242.70	277 100 490 (867)	Lavaca River
Reinforced Concrete Tee	243.09	970	Waterway
Prestressed Concrete Tee	245.27	101	Cox's Creek
Timber Stringers, Open Deck	247.18	40	Waterway

Union Pacific – Angleton Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck (Main) Timber Stringers, Open Deck (Siding)	248.52	67 70	Waterway
Timber Stringers, Open Deck	251.33	41	Waterway
Reinforced Concrete Tee	252.90	474	West Carancahua Creek
Prestressed Concrete Box	254.68	21	Waterway
Prestressed Concrete Box	255.55	20	Waterway
Prestressed Concrete Box	256.80	29	Waterway
Prestressed Concrete Slab	258.30	30	Waterway
Prestressed Concrete Slab	258.60	40	Waterway
Steel Beam Span, Open Deck	259.83	54	Waterway
Reinforced Concrete Tee	260.67	182	East Carancahua Creek
Steel Beam Span, Open Deck	261.40	39	Waterway
Prestressed Concrete Box	265.10	63	Waterway
Steel Beam Span, Open Deck	266.30	32	Co. Rd. 442
Reinforced Concrete Tee Through Plate Girder, Open Deck Reinforced Concrete Tee (TOTAL)	267.10	192 100 355 (647)	Palacios River
Prestressed Concrete Tee	268.60	123	Briar Creek
Timber Stringers, Open Deck	271.30	56	Waterway
Timber Stringers, Open Deck	271.80	27	Waterway
Timber Stringers	272.92	105	West Wilson Creek
Reinforced Concrete Tee (Main & Siding)	273.78	81	Waterway
Prestressed Concrete Tee	274.63	84	Waterway
Timber Stringers, Open Deck (Main) Timber Stringers, Open Deck (Siding)	274.91	40 41	Waterway
Prestressed Concrete Tee Deck Plate Girder, Open Deck Through Truss Pinned, Open Deck Deck Plate Girder, Open Deck Prestressed Concrete Tee (TOTAL)	276.51	1134 85 200 85 750 (2254)	Colorado River
Prestressed Concrete Tee	277.00	495	Colorado River
Steel Beam Span, Open Deck	278.30	54	Waterway
Timber Stringers	279.02	15	Waterway
Prestressed Concrete Box	279.96	78	Waterway
Prestressed Concrete Tee	281.60	84	Waterway
Reinforced Concrete Tee (Main) Timber Stringers, Open Deck (Siding)	282.87	126 145	Waterway
Timber Stringers	284.20	92	Waterway
Timber Stringers	285.10	92	Waterway
Timber Stringers, Open Deck	285.74	56	Waterway
Timber Stringers, Open Deck	286.94	41	Waterway
Timber Stringers - Glulam, Open Deck	287.30	97	Waterway
Timber Stringers, Open Deck	289.80	68	Waterway
Reinforced Concrete Tee	290.40	584	Hardeman Slough
Timber Stringers, Open Deck	290.97	41	Waterway
Timber Stringers	291.40	196	Caney Creek
Reinforced Concrete Slab	293.50	49	Waterway
Timber Stringers, Open Deck	293.80	40	Waterway

Union Pacific – Angleton Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Reinforced Concrete Slab	294.75	73	Waterway
Timber Stringers, Open Deck	295.60	67	Waterway

Union Pacific – Corpus Christi Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	64.20	152	Waterway
Prestressed Concrete Box	65.10	84	Waterway
Timber Stringers, Open Deck	65.70	54	Waterway
Timber Stringers, Open Deck	66.60	68	Waterway
Timber Stringers, Open Deck	67.40	68	Waterway
Reinforced Concrete Tee Deck Plate Girder, Open Deck Reinforced Concrete Tee (TOTAL)	68.90	56 61 78 (195)	Weedy Creek
Prestressed Concrete Tee	70.00	140	Brush Pen Hollow
Timber Stringers - Glulam, Open Deck	71.80	55	Waterway
Timber Stringers, Open Deck	74.30	81	Waterway
Reinforced Concrete Tee	74.70	140	Hackberry Creek
Timber Stringers, Open Deck	75.35	52	Waterway
Timber Stringers, Open Deck	76.20	222	Waterway
Timber Stringers, Open Deck	78.00	123	Waterway
Prestressed Concrete Box	78.30	193	Waterway
Timber Stringers, Open Deck	78.80	67	Waterway
Prestressed Concrete Tee Deck Plate Girder, Open Deck Prestressed Concrete Tee (TOTAL)	79.00	46 160 566 (772)	Nueces River
Reinforced Concrete Tee	79.60	188	Waterway
Timber Stringers, Open Deck	80.10	96	Waterway
Steel Beam Span Continuous	80.50	104	US 281
Prestressed Concrete Tee	83.80	196	Salt Branch
Timber Stringers, Open Deck	85.20	68	Waterway
Timber Stringers, Open Deck	85.50	68	Waterway
Timber Stringers, Open Deck	86.50	54	Waterway
Timber Stringers - Glulam, Open Deck	87.60	68	McKinzey Creek
Timber Stringers - Glulam, Open Deck	88.60	109	Timon Creek
Prestressed Concrete Tee Deck Plate Girder, Open Deck Prestressed Concrete Tee (TOTAL)	90.10	83 60 78 (221)	Spring Creek
Timber Stringers, Open Deck	90.60	68	Waterway
Timber Stringers, Open Deck	90.80	67	Waterway
Timber Stringers, Open Deck	91.97	39	Waterway
Timber Stringers, Open Deck	92.80	40	Waterway
Timber Stringers, Open Deck	92.90	40	Waterway
Timber Stringers, Open Deck	93.90	67	Waterway
Timber Stringers, Open Deck	94.30	68	Waterway
Prestressed Concrete Tee Deck Plate Girder, Open Deck Prestressed Concrete Tee (TOTAL)	95.40	55 60 55 (170)	Gilden Creek
Timber Stringers, Open Deck	98.20	67	Waterway

Union Pacific – Corpus Christi Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Prestressed Concrete Tee	99.30	112	Waterway
Reinforced Concrete Slab Deck Plate Girder, Open Deck Reinforced Concrete Slab (TOTAL)	101.30	576 160 2088 (2824)	Nueces River
Prestressed Concrete Box	102.77	116	Waterway
Timber Stringers, Open Deck	104.40	110	Waterway
Timber Stringers, Open Deck	105.50	138	Waterway
Timber Stringers, Open Deck	106.00	193	Waterway
Timber Stringers, Open Deck	108.80	83	Waterway
Timber Stringers, Open Deck	110.40	70	Waterway
Timber Stringers, Open Deck	110.70	168	Jack Green Hollow
Prestressed Concrete I-Beam Steel Beam Span Prestressed Concrete I-Beam (TOTAL)	113.60	24 40 24 (88)	SH 359
Timber Stringers, Open Deck	116.90	27	Waterway
Timber Stringers, Open Deck	117.10	54	Waterway
Timber Stringers, Open Deck	117.40	109	Waterway
Prestressed Concrete Tee	117.90	216	Bayou Creek
Rail Girder, Open Deck	118.60	10	Waterway
Timber Stringers, Open Deck	119.50	40	Waterway
Rail Girder, Open Deck	123.30	9	Waterway
Timber Stringers, Open Deck	123.60	13	Waterway
Timber Stringers, Open Deck	124.70	14	Waterway
Timber Stringers, Open Deck	125.40	109	Hondo Creek
Timber Stringers, Open Deck	126.30	40	FM 796
Reinforced Concrete Slab Through Plate Girder Reinforced Concrete Slab (TOTAL)	126.40	40 48 48 (128)	Tupelo Gum Creek
Timber Stringers, Open Deck	130.70	41	Waterway
Prestressed Concrete Tee	136.50	1064	Ricon Bayou
Prestressed Concrete Tee	137.30	196	Waterway
Prestressed Concrete Tee	138.10	896	Waterway
Prestressed Concrete Tee	138.70	852	Nueces River
Timber Stringers, Open Deck	140.80	110	Waterway
Timber Stringers - Glulam, Open Deck	143.30	68	Waterway
Timber Stringers, Open Deck	144.60	27	Waterway
Timber Stringers, Open Deck	145.80	68	Waterway
Timber Stringers, Open Deck	147.80	28	Waterway
Rail Girder, Open Deck	148.10	29	Waterway
Timber Stringers, Open Deck	148.90	41	Waterway

Union Pacific – Port Lavaca Subdivision & Port Lavaca Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	2.65	53	Waterway
Timber Stringers, Open Deck	3.20	30	Waterway
Timber Stringers, Open Deck	4.31	26	Waterway
Timber Stringers, Open Deck	5.59	26	Waterway
Timber Stringers, Open Deck	6.63	13	Waterway
Timber Stringers, Open Deck	6.81	45	Waterway

Union Pacific – Port Lavaca Subdivision & Port Lavaca Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	7.40	45	Waterway
Timber Stringers, Open Deck	8.19	25	Waterway
Timber Stringers, Open Deck	12.72	30	Waterway
Timber Stringers, Open Deck	14.50	26	Waterway
Timber Stringers, Open Deck	16.09	29	Waterway
Timber Stringers, Open Deck	17.57	28	Waterway
Timber Stringers, Open Deck	18.50	28	Waterway
Timber Stringers, Open Deck	19.85	12	Waterway
Timber Stringers, Open Deck	22.12	14	Waterway
Timber Stringers, Open Deck	22.70	14	Waterway
Prestressed Concrete Box	24.97	60	Waterway
Timber Stringers, Open Deck	26.63	28	Waterway
Prestressed Concrete Box	28.55	60	Waterway
Prestressed Concrete Box	30.14	300	Spring Creek
Timber Stringers, Open Deck	33.90	44	Waterway
Timber Stringers, Open Deck	36.74	163	Waterway
Timber Stringers, Open Deck	37.49	28	Waterway
Timber Stringers, Open Deck	38.21	163	Waterway
Timber Stringers, Open Deck	41.61	43	Waterway
Timber Stringers, Open Deck	42.68	118	Waterway
Prestressed Concrete Box	43.12	240	Prices Creek
Timber Stringers - Glulam, Open Deck	45.15	73	Waterway
Timber Stringers, Open Deck	45.66	58	Waterway
Timber Stringers, Open Deck	46.15	58	Waterway
Timber Stringers, Open Deck	47.14	133	Waterway
Prestressed Concrete Box	48.54	240	Irish Creek
Timber Stringers, Open Deck	51.28	103	Waterway
Timber Stringers, Open Deck	51.98	28	Waterway
Timber Stringers, Open Deck	52.45	43	Waterway
Timber Stringers, Open Deck	52.55	28	Waterway
Timber Stringers, Open Deck	52.87	125	Waterway
Reinforced Concrete Slab	54.45	90	Valley St.
Timber Stringers, Open Deck	55.09	43	Indianola St.
Timber Stringers, Open Deck	55.49	73	Waterway
Timber Stringers, Open Deck	56.06	27	Waterway
Timber Stringers, Open Deck	56.29	28	Waterway
Timber Stringers, Open Deck	56.80	19	Cattle Pass
Prestressed Concrete Box	57.78	30	Waterway
Timber Stringers, Open Deck	57.84	13	Waterway
Timber Stringers, Open Deck	57.91	28	Waterway
Timber Stringers, Open Deck	58.02	28	Waterway
Steel Beam Span, Open Deck	58.86	38	US 183 & US 77A
Timber Stringers	59.49	89	Waterway
Timber Stringers, Open Deck	59.95	28	Waterway
Timber Stringers, Open Deck	60.18	59	Cattle Pass
Timber Stringers, Open Deck	62.09	104	Old Yoakum Rd.
Timber Stringers, Open Deck	68.06	88	Waterway
Timber Stringers, Open Deck	68.66	103	Little Brushy Creek
Timber Stringers, Open Deck	71.23	164	Brushy Creek
Steel Beam Span, Open Deck	72.31	50	Morris St.
Steel Beam Span	73.69	94	US 77A

Union Pacific – Port Lavaca Subdivision & Port Lavaca Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	74.07	12	Waterway
Timber Stringers, Open Deck	74.44	59	Waterway
Timber Stringers, Open Deck	77.20	74	Waterway
Timber Stringers, Open Deck	77.40	44	Waterway
Timber Stringers, Open Deck	78.95	23	Cattle Pass
Timber Stringers, Open Deck	79.51	222	Waterway
Timber Stringers, Open Deck	79.76	74	Waterway
Timber Stringers, Open Deck	80.14	58	Waterway
Timber Stringers - Glulam, Open Deck	82.68	195	Waterway
Prestressed Concrete Box	83.59	240	Waterway
Timber Stringers, Open Deck	84.19	14	Waterway
Timber Stringers	86.52	59	Waterway
Timber Stringers	86.79	29	Waterway
Timber Stringers	87.53	134	Waterway
Prestressed Concrete Box	88.45	148	Waterway
Prestressed Concrete Box	91.53	90	Waterway
Timber Stringers, Open Deck	92.10	59	Waterway
Prestressed Concrete Box	92.65	150	Lavaca River
Timber Stringers, Open Deck	93.85	14	Waterway
Timber Stringers - Glulam, Open Deck	94.41	133	Waterway
Timber Stringers, Open Deck	94.73	29	Waterway
Timber Stringers - Glulam, Open Deck	96.00	163	Waterway
Timber Stringers	96.75	74	Waterway
Timber Stringers	97.25	134	Waterway
Timber Stringers	98.81	59	Cattle Pass
Timber Stringers, Open Deck	101.53	43	Waterway
Through Truss Pinned	101.93	60	US 90

Union Pacific – Kosmos Subdivision & Kosmos Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Prestressed Concrete Tee	121.62	15	Waterway
Prestressed Concrete Tee	121.94	10	Waterway
Prestressed Concrete Slab	122.19	30	Chiltipin Creek
(unknown)	2.29	135	Waterway
Prestressed Concrete Tee	2.50	75	Waterway
Prestressed Concrete Tee	2.54	70	Waterway
Through Truss Pinned, Open Deck	4.24	13	Waterway
Through Truss Pinned, Open Deck	5.00	15	Waterway
Through Truss Pinned, Open Deck	6.41	15	Waterway
Through Truss Pinned, Open Deck	6.58	15	Waterway
Through Truss Pinned, Open Deck	7.04	15	Waterway
Through Truss Pinned, Open Deck	9.77	15	Waterway
Through Truss Pinned, Open Deck	10.67	15	Waterway
Through Truss Pinned, Open Deck	12.54	15	Waterway
Through Truss Pinned, Open Deck	12.68	15	Waterway
Through Truss Pinned, Open Deck	13.19	15	Waterway
Through Truss Pinned, Open Deck	13.95	15	Waterway
Timber Stringers, Open Deck	20.24	15	Waterway
Prestressed Concrete Tee	21.43	15	Waterway
Prestressed Concrete Tee	27.34	15	Waterway

Union Pacific – Coleto Creek Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Prestressed Concrete Tee	87.72	75	Waterway
(unknown)	90.33	(unknown)	Laurent St.
Timber Stringers, Open Deck	0.92	60	Wheeler St.
Timber Stringers, Open Deck	0.99	55	DeLeon St.
Timber Stringers, Open Deck Through Truss Riveted, Open Deck Timber Stringers, Open Deck (TOTAL)	1.25	29 180 68 (277)	Guadalupe River
Timber Stringers, Open Deck	1.85	29	Waterway
Prestressed Concrete Tee	2.60	825	Guadalupe River
Prestressed Concrete Tee	2.98	864	Guadalupe River
Timber Stringers, Open Deck	4.80	254	Capardo Creek
Timber Stringers, Open Deck	6.94	73	Boggy Creek
Timber Stringers, Open Deck	7.89	163	Dry Creek
Timber Stringers, Open Deck	8.08	194	Dry Creek
Timber Stringers, Open Deck Through Truss Riveted, Open Deck Prestressed Concrete Box (TOTAL)	10.17	210 200 210 (620)	Clatonia Creek
Timber Stringers, Open Deck	14.49	15	Cattle Pass
Timber Stringers	15.44	44	Waterway
Timber Stringers, Open Deck	15.53	43	Waterway

Union Pacific – Flatonia Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	72.44	29	Waterway
Prestressed Concrete Box Timber Stringers Deck Plate Girder, Open Deck Through Truss Riveted, Open Deck Deck Plate Girder, Open Deck (TOTAL)	74.95	412 201 200 275 38 (1126)	Colorado River
Timber Stringers - Glulam	75.29	540	Colorado River overflow
Timber Stringers - Glulam	75.41	91	Colorado River overflow
Timber Stringers, Open Deck	76.00	104	Waterway
Timber Stringers - Glulam, Open Deck	76.38	299	Waterway
Steel Beam Span, Open Deck	77.85	27	Loop 543
Prestressed Concrete Box	78.42	210	Criswell Creek
Prestressed Concrete Box	83.57	90	Waterway
Timber Stringers Deck Plate Girder Prestressed Concrete Box (TOTAL)	84.80	254 127 79 (460)	Buckner Creek
Timber Stringers - Glulam, Open Deck	85.44	14	Waterway
Timber Stringers	89.49	75	Waterway
Timber Stringers, Open Deck	91.53	87	Pin Oak Creek
Timber Stringers	92.38	90	Waterway
Timber Stringers, Open Deck	92.74	45	Waterway
Timber Stringers	95.71	60	Waterway
Prestressed Concrete I-Beam	96.48	330	I - 10

Union Pacific – Flatonia Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Steel Beam Span (Main & Siding)	97.14	53	US 90
Timber Stringers	122.04	106	Waterway
Timber Stringers	124.10	210	Waterway
Timber Stringers, Open Deck	125.12	241	Waterway
Timber Stringers	125.20	121	Waterway
Timber Stringers	125.34	167	Waterway
Prestressed Concrete Box	125.47	300	unknown creek
Timber Stringers, Open Deck	126.84	527	unknown creek
Timber Stringers - Glulam, Open Deck Through Truss Riveted, Open Deck (TOTAL)	127.06	226 100 (326)	Peach Creek
Timber Stringers	128.20	46	Waterway
Timber Stringers - Glulam, Open Deck	129.17	31	Waterway
Timber Stringers - Glulam, Open Deck	131.73	195	Baldridge Creek
Timber Stringers - Glulam, Open Deck	132.20	89	Davis Creek
Timber Stringers - Glulam, Open Deck	132.73	59	Waterway
Timber Stringers	133.83	75	Waterway
Prestressed Concrete Box	135.29	150	Bee Creek
Timber Stringers - Glulam, Open Deck	135.94	75	Waterway
Prestressed Concrete Box Deck Plate Girder Prestressed Concrete Box (TOTAL)	137.08	28 76 88 (192)	Buck Creek
Timber Stringers - Glulam, Open Deck	139.01	59	Waterway
Prestressed Concrete Box Through Truss Riveted, Open Deck Timber Stringers (TOTAL)	139.98	116 100 45 (261)	Co. Rd. 437 Sandy Fork Creek
Timber Stringers	144.70	45	Waterway
Prestressed Concrete Box	145.41	120	Waterway
Steel Beam Span, Open Deck	145.72	37	US 90

Union Pacific – Glidden Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers - Glulam	50.93	1051	E. Bernard River
Timber Stringers - Glulam, Open Deck	52.92	30	Waterway
Timber Stringers	54.19	30	Waterway
Timber Stringers, Open Deck	54.58	30	Waterway
Timber Stringers, Open Deck	54.92	30	Waterway
Timber Stringers	57.90	45	Waterway
Timber Stringers	59.34	360	W. Bernard River
Timber Stringers, Open Deck	66.37	15	Waterway
Timber Stringers, Open Deck	66.99	15	Waterway
Timber Stringers, Open Deck	68.22	30	Waterway
Timber Stringers, Open Deck	68.94	14	Waterway
Timber Stringers, Open Deck	69.11	75	unnamed creek
Timber Stringers (Main) Timber Stringers, Open Deck (Siding)	69.87	30 15	Waterway
Timber Stringers (Main & Siding)	70.46	30	Waterway
Timber Stringers - Glulam, Open Deck	75.56	75	Waterway
Timber Stringers, Open Deck	75.88	75	Waterway
Timber Stringers - Glulam, Open Deck	76.38	45	Waterway

Union Pacific – Glidden Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	76.70	165	Waterway
Timber Stringers - Glulam, Open Deck	77.19	45	Waterway
Timber Stringers - Glulam, Open Deck	78.31	165	Waterway
Timber Stringers	78.48	90	Waterway
Timber Stringers, Open Deck	78.73	105	Waterway
Timber Stringers, Open Deck	79.06	90	Waterway
Timber Stringers	79.64	150	unnamed creek
Prestressed Concrete Box	80.36	120	Waterway
Steel Beam Span, Open Deck	81.49	148	unnamed creek
Timber Stringers - Glulam, Open Deck	83.10	134	Waterway
Timber Stringers, Open Deck	83.45	360	Waterway
Timber Stringers, Open Deck	83.62	360	Waterway
Through Plate Girder, Open Deck	83.75	70	Old US 90
Timber Stringers, Open Deck Through Truss Pinned, Open Deck Steel Beam Span, Open Deck Steel Beam Span, Open Deck (TOTAL)	84.06	27 600 44 72 (742)	Colorado River
Steel Beam Span, Open Deck	84.74	34	SH 71
Timber Stringers	85.40	525	Waterway
Prestressed Concrete Box	91.29	56	Waterway
Timber Stringers	93.74	60	unnamed creek
Timber Stringers - Glulam, Open Deck	93.97	135	unnamed creek
Through Plate Girder, Open Deck	95.36	158	US 90
Steel Beam Span	97.14	53	Waterway
Steel Beam Span, Open Deck	98.06	45	Co. Rd. 220
Timber Stringers	102.36	90	unnamed creek
Timber Stringers Through Truss Riveted, Open Deck Timber Stringers (TOTAL)	103.41	253 125 210 (588)	E. Navidad River
Timber Stringers - Glulam, Open Deck	103.93	119	Middle Creek
Timber Stringers	103.99	270	Waterway
Timber Stringers, Open Deck	105.19	120	unknown creek
Steel Beam Span, Open Deck	106.98	34	US 77
Timber Stringers, Open Deck	107.87	90	Waterway
Timber Stringers, Open Deck Pony Truss Riveted, Open Deck Timber Stringers, Open Deck (TOTAL)	108.31	27 86 29 (142)	Foster Creek
Timber Stringers	108.63	45	Waterway
Timber Stringers - Glulam, Open Deck Steel Beam Span, Open Deck Timber Stringers - Glulam, Open Deck Steel Beam Span, Open Deck Timber Stringers - Glulam, Open Deck Through Truss Riveted, Open Deck Timber Stringers - Glulam, Open Deck (TOTAL)	108.95	388 18 366 18 286 100 165 (1341)	W. Navidad River
Timber Stringers	109.35	30	Waterway
Timber Stringers, Open Deck	109.79	60	Victor Lane / Co. Rd. 428

Union Pacific – Glidden Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	110.20	44	Waterway
Prestressed Concrete Box	111.49	64	Marty Road / Co. Rd. 330
Timber Stringers	112.38	45	Waterway
Timber Stringers - Glulam	112.88	44	Waterway
Timber Stringers - Glulam, Open Deck	113.36	60	Waterway
Timber Stringers	116.36	60	Waterway
Timber Stringers, Open Deck	116.61	89	Waterway
Timber Stringers, Open Deck	117.11	60	Waterway
Timber Stringers - Glulam	117.62	45	Waterway
Prestressed Concrete Box	118.01	120	unknown creek

Union Pacific – Smithville Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Pony Truss Riveted, Open Deck	74.50	104	Barton Creek
Deck Plate Girder, Open Deck Timber Stringers, Open Deck (TOTAL)	76.00	230 38 (268)	Cedar Creek
Deck Plate Girder, Open Deck	76.60	84	Robinson Creek
Timber Stringers	77.70	84	Waterway
Timber Stringers, Open Deck	78.70	83	Crystal Creek
Timber Stringers, Open Deck	80.30	28	Waterway
Timber Stringers	81.50	56	Waterway
Timber Stringers, Open Deck	82.90	56	Waterway
Timber Stringers	86.80	99	Waterway
Prestressed Concrete Box Through Truss Pinned, Open Deck Through Truss Riveted, Open Deck Timber Stringers, Open Deck (TOTAL)	87.51	54 369 130 281 (834)	Colorado River
Prestressed Concrete Box	87.79	193	Waterway
Timber Stringers, Open Deck	88.80	30	Waterway
Timber Stringers, Open Deck Deck Plate Girder, Open Deck Timber Stringers, Open Deck (TOTAL)	89.90	28 75 45 (148)	Cedar Creek
Timber Stringers, Open Deck	90.90	155	High Hill Creek
Timber Stringers	92.90	165	Rocky Creek
Prestressed Concrete Box	94.88	200	West Duty Creek
Timber Stringers	95.20	177	East Duty Creek
Timber Stringers	97.00	124	Cedar Creek
Timber Stringers, Open Deck	99.20	85	Waterway
Timber Stringers, Open Deck	103.90	124	Allen's Creek
Through Plate Girder, Open Deck Through Truss Riveted, Open Deck (TOTAL)	105.70	84 209 (293)	Cummings Creek
Reinforced Concrete Slab	106.50	64	Waterway
Reinforced Concrete Slab	106.90	136	Boggy Creek
Timber Stringers	107.80	140	Boggy Creek
Timber Stringers	109.10	112	Boggy Creek
Timber Stringers, Open Deck	110.70	69	Waterway
Timber Stringers, Open Deck	116.40	56	Waterway

Union Pacific – Smithville Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	117.00	70	Waterway
Timber Stringers, Open Deck	117.20	70	Waterway
Timber Stringers, Open Deck	117.80	97	Waterway
Timber Stringers, Open Deck	121.40	70	Panther Creek
Timber Stringers, Open Deck	121.90	42	Waterway
Reinforced Concrete Slab	123.10	51	Waterway
Timber Stringers	125.60	57	Waterway
Prestressed Concrete Box	126.80	28	Waterway
Reinforced Concrete Slab	127.20	101	Little Barnard Creek
Timber Stringers	130.40	125	Little Barnard Creek
Reinforced Concrete Slab	131.50	82	Waterway
Timber Stringers, Open Deck	138.50	28	Waterway
Timber Stringers, Open Deck	138.60	13	Waterway
Timber Stringers, Open Deck	141.40	27	Waterway
Through Truss Pinned, Open Deck Through Truss Riveted, Open Deck Timber Stringers, Open Deck (TOTAL)	142.50	200 350 211 (761)	Brazos River

Union Pacific – Seadrift Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck Deck Plate Girder, Open Deck Timber Stringers, Open Deck (TOTAL)	2.12	41 54 55 (150)	Waterway
Timber Stringers, Open Deck	3.55	54	Waterway
Through Truss Pinned, Open Deck	8.60	134	Waterway
Through Truss Pinned, Open Deck	8.70	118	Waterway
Timber Stringers, Open Deck	11.85	54	Waterway

Union Pacific – Victoria Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Timber Stringers, Open Deck	1.10	26	Waterway
Timber Stringers, Open Deck	6.20	26	Waterway
Timber Stringers, Open Deck	6.40	40	Waterway
Timber Stringers, Open Deck	8.00	26	Waterway
Timber Stringers, Open Deck	8.40	26	Waterway
Timber Stringers, Open Deck	8.70	40	Waterway
Timber Stringers, Open Deck	10.00	39	Waterway
Timber Stringers, Open Deck	10.70	25	Waterway
Timber Stringers, Open Deck	11.40	95	Waterway

Union Pacific – Celanese Industrial Lead			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Bridge information not available.			

BNSF – Galveston Subdivision			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
Ballast Deck T-Rail	81.60	14	Waterway
Ballast Deck T-Rail Concrete Abutment	82.19	11	Waterway
Ballast Deck Pile Trestle – Wood	83.32	84	Waterway
Ballast Deck Prestressed Concrete Beam	84.54	84	Waterway
Prestressed Concrete Box Beams	85.18	28	Waterway
Ballast Deck T-Rail	87.72	70	Waterway
Ballast Deck Pile Trestle – Wood, Steel Stringers & Caps	91.30	56	Waterway
Ballast Deck Prestressed Concrete	91.72	42	Waterway
Prestressed Concrete Box Beam	92.15	28	Waterway
Ballast Deck T-Rail	92.73	14	Waterway
Open Deck T-Rail	93.39	14	Waterway
Ballast Deck “I” Beam Concrete Abutments	97.12	20	Waterway
Ballast Deck “I” Beam Concrete Abutments & Piers	97.78	32	Waterway
Ballast Deck Pile Trestle – Wood Ballast Deck Deck Girder Ballast Deck Pile Trestle – Wood (TOTAL)	102.13	113 100 1248 (1461)	Mill Creek
Ballast Deck Trestle – Wood on “H” Pile	102.58	700	Waterway
Ballast Deck Prestressed Concrete Beams	111.78	26	Waterway
Ballast Deck “I” Beam Concrete Abutments	117.07	24	Waterway

Texas-Mexican Railway			
Bridge Type	**Milepost**	**Length (feet)**	**Description**
- no bridges -			

APPENDIX C – LISTING OF REFERENCED REPORTS

The following reports and studies were utilized in the preparation of this report.

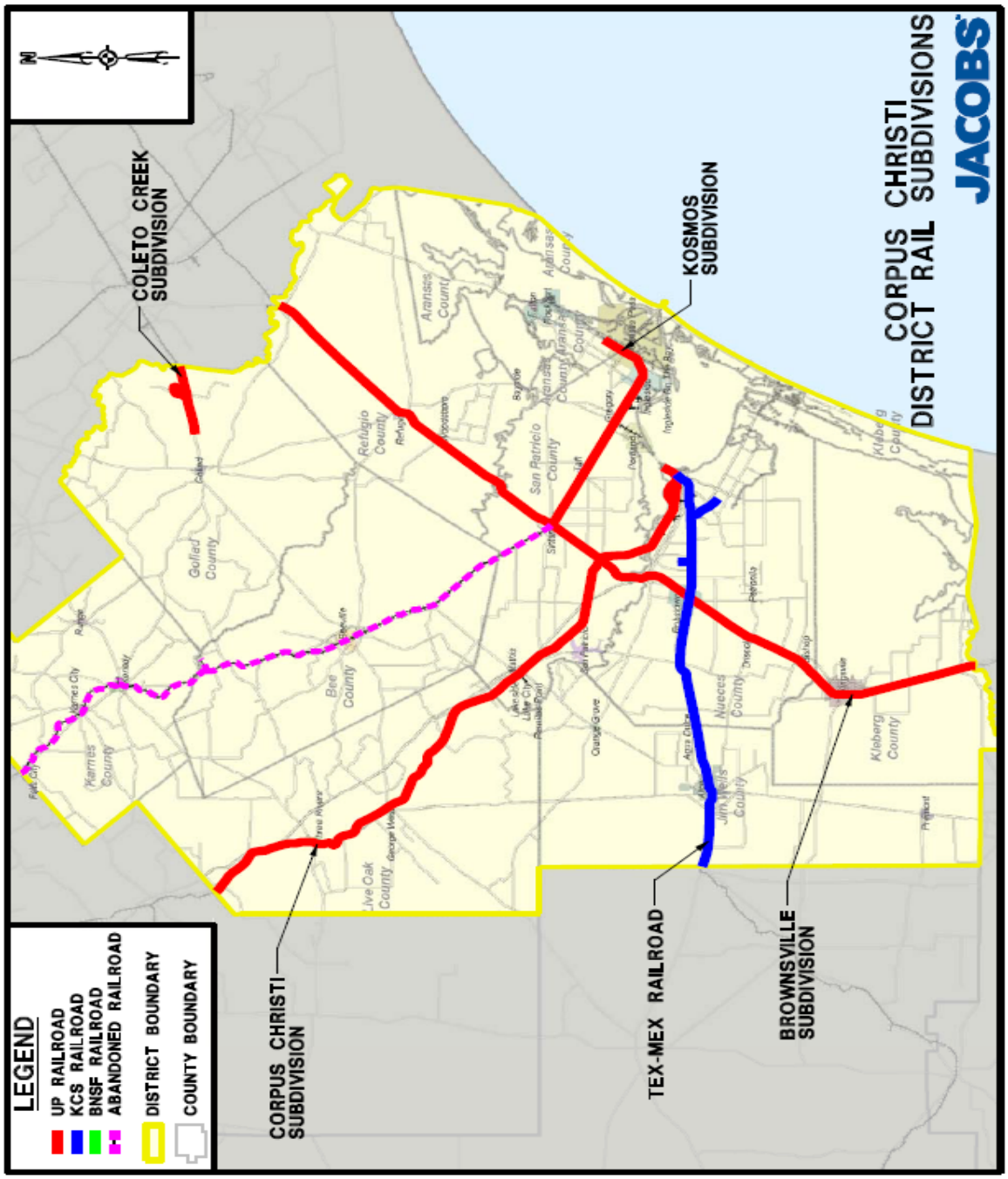
Texas Rail System Plan, Transportation Planning and Programming Division, Texas Department of Transportation, October 2005.

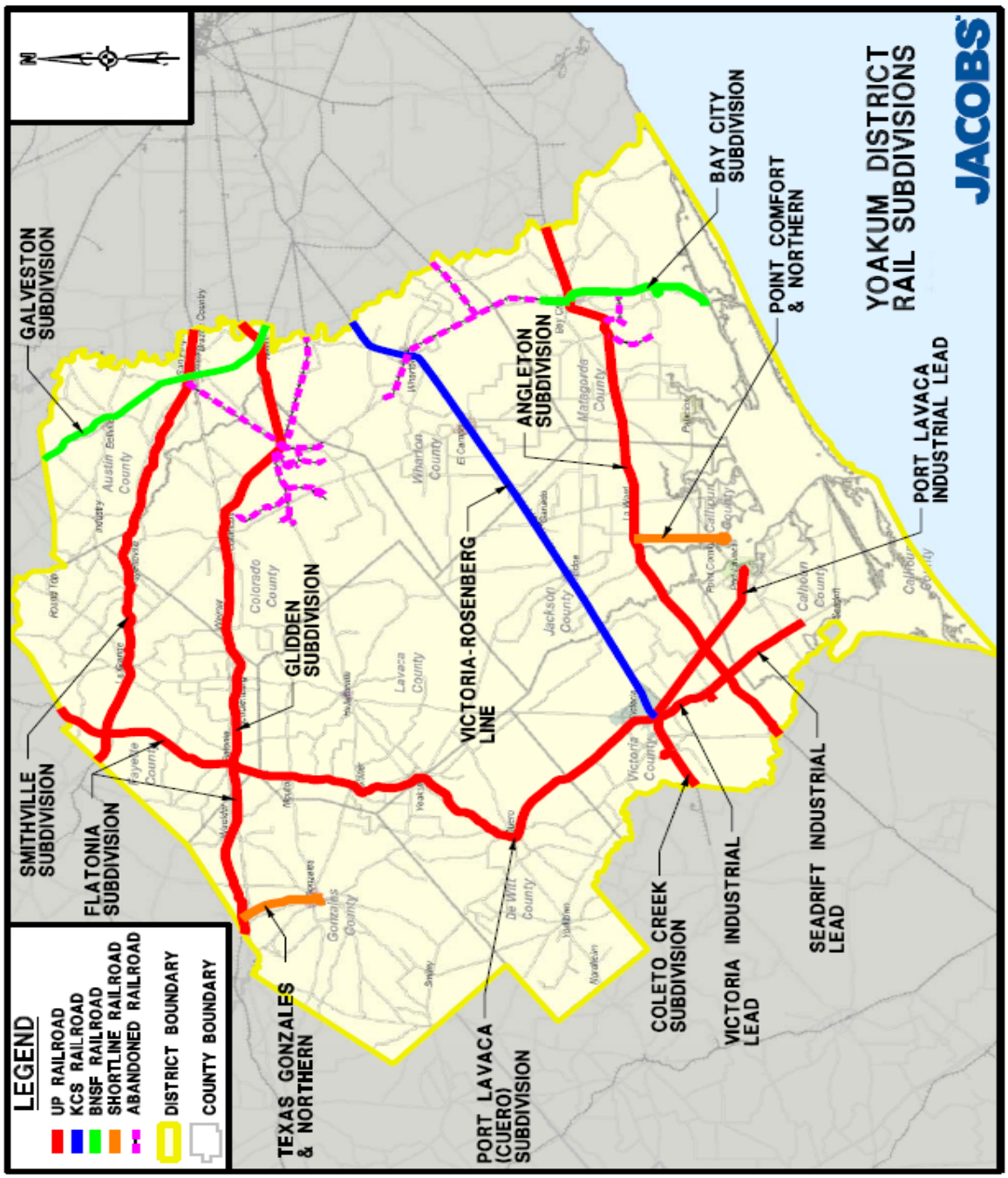
Current and Future Rail Access Needs of Western Gulf Texas Ports, Texas Transportation Institute, November 2003

Freight and Hazardous Materials Movement Study, Corpus Christi Metropolitan Planning Organization, 2004

Port to Port Feasibility Study Report, Texas Department of Transportation, January 2007

APPENDIX D – SUBDIVISON MAPS




YOAKUM DISTRICT
RAIL SUBDIVISIONS
JACOBS
LEGEND
UP RAILROAD
KCS RAILROAD
BNSF RAILROAD
SHORTLINE RAILROAD
ABANDONED RAILROAD
DISTRICT BOUNDARY
COUNTY BOUNDARY
GALVESTON SUBDIVISION
SMITHVILLE SUBDIVISION
FLATONIA SUBDIVISION
GLIDDEN SUBDIVISION
VICTORIA-ROSENBERG LINE
ANGLETON SUBDIVISION
BAY CITY SUBDIVISION
POINT COMFORT & NORTHERN
PORT LAVACA INDUSTRIAL LEAD
TEXAS GONZALES & NORTHERN
PORT LAVACA (CUERO) SUBDIVISION
COLETO CREEK SUBDIVISION
VICTORIA INDUSTRIAL LEAD
SEADRIFT INDUSTRIAL LEAD
Austin County
Colorado County
Lavaca County
Wharton County
Matagorda County
Jackson County
Gonzales County
Victoria County
Calhoun County

APPENDIX E – PROJECT STAKEHOLDERS

The following entities have been identified as being Project stakeholders in the Corpus Christi – Yoakum Regional Freight Mobility Study:

Aransas County
Austin County
Bee County
BNSF RR
Calhoun County
Calhoun County Rural Rail Transportation District
City of Bay City
City of Bellville
City of Corpus Christi
City of Cuero
City of Edna
City of El Campo
City of Port Lavaca
City of Robstown
City of Victoria
City of Wharton
City of Yoakum
Colorado County
Corpus Christi MPO
DeWitt County
Fayette County
Goliad County
Gonzales County
Jackson County
Jim Wells County
Karnes County
KCS RR
Kleberg County
Lavaca County
Live Oak County
Live Oak County Rural Transportation District
Matagorda County
Matagorda County EDC
Matagorda County Rural Rail Transportation District
Nueces County
Nueces County Rail District
Point Comfort & Northern Railway Company
Port of Bay City Authority
Port of Corpus Christi
Port of Port Lavaca – Point Comfort
Port of Victoria
Refugio County
San Patricio County
San Patricio County Rural Rail Transportation District
Texas Gonzales Northern Railway Company
TxDOT Corpus Christi District
TxDOT Transportation Planning & Programming
TxDOT Yoakum District
Union Pacific RR
Victoria County
Victoria EDC
Victoria MPO
Wharton County