BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY

Task 2:

Inventory of Existing and Programmed Binational Transportation Facilities

Summary

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La Empresa

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FINAL DRAFT

Preface

U.S./Mexico Binational Border Transportation Planning and Programming Study implements a significant binational policy making document entitled “Memorandum of Understanding on the Planning Process for Land Transport on Each Side of the Border” signed by the federal governments of Mexico and the United States at the first “NAFTA Transportation Summit” held in Washington, D.C., April 29, 1994.

The purpose of this study is to provide policymakers with information needed to establish a continuous, joint, binational, transportation planning and programming process. A goal of this study is to improve the efficiency of the existing binational policy making, planning procedures and funding criteria affecting our Border Land Transportation Systems (BLTS). The BLTS should be seen as a binational transportation system made of international bridges and border crossings and its land connections to major urban and/or economic centers, principal seaports, airports, and multimodal/transfer stations and, ultimately, to its connections to national transportation facilities.

Disclaimer

The purposes of the Binational Planning and Programming Study and all of its reports were: to investigate current state and national transportation planning processes in both the United States and Mexico, to review available data on border transportation infrastructure and goods movement, and to recommend an ongoing, binational planning and programming process. The information contained in these reports was not developed to serve as the basis for making funding allocation or distribution decisions at either the federal or state level in the United States.

BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY TASK 2 SUMMARY REPORT: INVENTORY OF EXISTING AND PROGRAMMED BINATIONAL TRANSPORTATION FACILITIES

International trade across the U.S.-Mexican border travels by several different modes on various land and sea transportation facilities. This summary report combines both U.S. and Mexican information on the border transportation facilities. The inventory of binational transportation facilities considers five modes of transportation: roadways, railroads, seaports, airports, and pipelines. In addition, the inventory documents the socioeconomic and demographic characteristics of the border region. Two other documents were prepared in conjunction with the Task 2 summary report. One is a detailed inventory report prepared for the Mexican side of the border. The other is a detailed inventory report prepared for the U.S. side of the border.

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2.1 Introduction

According to 1995 data, binational trade between Mexico and the United Sates of America exceeded $100 billion dollars for the second year in a row. The distribution of this trade was $48,645 billion in the southbound direction and $66,283 billion in the northbound direction.

The majority of U.S.-Mexico binational trade occurs across the extensive land border of these countries. Land transportation modes account for 98.2 percent of the total value of freight moved across the border in both directions, the remaining 1.8 percent is moved using various other transportation modes. In 1995, 87.5 percent of bi-directional land transportation was conducted via roadways, while 12.5 percent utilized railroads.

This summary presents a description of the infrastructure for the different transportation modes used in the binational trade of the border zone of both countries. There are five transportation modes used in U.S.-Mexico goods movement: highway, rail, air, sea, and pipeline. The following section discusses binational goods movement and its relationship to the existing transportation infrastructure.

2.1.1 Binational Goods Movement and the Transportation Network Infrastructure

Whether the movement of goods impacts the transportation network or the transportation network impacts the movement of goods is a classic example of the question, “Which came first, the chicken or the egg?” Without a doubt, first came population centers which were followed by food producing and manufacturing centers. The movement of people and goods between these centers ultimately defined the transportation routes and infrastructure.

Why are goods moved?

How far goods are shipped has to do with both economics and peoples’ choices. On the one hand, the cost of moving goods will be lower and the environmental impact less if they are transported shorter distances rather than long distances, and if they are moved by a less expensive and energy-intensive mode of transportation such as a barge or railroad rather than a mode such as air freight.

But sometimes people want to, or must, live in a remote place far from cheap freight transportation. This is a matter of people making lifestyle choices. An activity such as mining or ranching may be carried on in remote locations where freight movement is expensive and difficult. Yet this is a matter of necessity, as mining and ranching can only be carried out where there are the resources to support them.

Actual transportation costs can always be cut by manufacturing and producing goods as close to the end users as possible. However, there still may be a distant company that makes a product such as Levi’s that are of better quality and less expensive that anything made locally. This product therefore requires some mode of transportation to its final market.

For these reasons–peoples’ freedom of choice and economic forces–the worldwide trend is moving toward increasing amounts of freight shipped increasingly long distances. As a consequence, goods movement typically either saves the consumer money, offers greater choices or allows the freedom to live far from the seaports, farms, mines and factories.

2.1.2 Transportation Network Overview

Figure 2.1 shows the major roadway networks of both Mexico and the U.S. As stated above, transportation systems were developed to serve the movement of people and goods between population and manufacturing centers. The locations of these centers are defined by more basic criteria such as topology, climate, available resources (water and raw materials) and historic migration patterns.

The U.S. has a very extensive freeway and highway network which has been developed over the past 50 years. However, the historic patterns of movement have been in the east-west direction and, therefore, the north-south connections have been less fully recognized. Only in recent years have many of the north-south corridors been identified and either constructed or added into the planning and programming process.

In northern Mexico, historic trade and travel patterns have had a north-south orientation in order to serve communication and commerce needs between the State Capitals, larger border cities, and the cities located in the center of the country. This pattern of trade favored the development of the transportation corridors parallel to the mountain ranges that run in the north-south direction throughout the country. Due to the natural barriers and the limited demand for east-west trade between the northern population centers, the east-west transportation corridors have not been highly developed in the northern border region.

Conversely, in central Mexico the roadway network is much more extensive due to the large number of population and manufacturing centers. In this region, the orientation of the roadway system is more balanced, both north-south and east-west oriented. A extensive network of roadways connect the major centers as well as provide a land link from the Gulf of Mexico to the Pacific Ocean.

Rail service, in both countries, shares the same corridors as the roadway networks. In most instances, rail service predates the development of the roadway system. Typically, the rail corridors were created to connect the highest travel and trade corridors in each country. Often rail corridors reflect old connections between trade origin and destination (OD) pairs. In many cases these OD pairs no longer share the same level of trade, requiring rail carriers to adapt their service to new trade corridors. Intermodal facilities are one important tool being used to provide additional flexibility to the rail carriers in an ever changing trade environment.

The merger of rail carriers in the U.S. is creating new opportunities for expanding the use of rail in binational trade. The Union Pacific and the Burlington Northern Santa Fe organizations are both interested in expanding service and increasing the use of intermodal facilities. The privatization of the Mexican national rail system should provide additional service expansion and intermodal opportunities.

Air freight between Mexico and the U.S. is a relatively small portion of the overall trade value. However, air freight provides two valuable services: a safe and efficient way to ship small high value products, and a means to rapidly deliver spare parts for machinery repair. The use and cost effectiveness of air freight is linked to air passenger travel. In corridors where there is high passenger demand and strong competition, capacity for air freight is abundant and the cost to move freight by air is greatly reduced. Where passenger and freight demand overlap, the greatest benefits are derived.

Marine ports also handle a small portion of the overall trade between Mexico and the U.S. This study identified the Mexican ports which have some level of binational trade with the U.S. In the U.S., the study has focused on the California and Texas marine ports which are the primary ports for U.S.-Mexico trade. The Port of Long Beach in Los Angeles demonstrates a unique aspect of

the linkages between ports and land-based trade between Mexico and the U.S. Due to the lack of sufficient land linkages between Mexico's west coast ports and the interior trade centers, Long Beach has become a principal trans-shipment point for materials and products coming from the Pacific rim. From the Long Beach terminal, the goods are moved to Mexico via truck and "land bridge" rail at border crossings as far inland as Laredo-Nuevo Laredo. This port and land bridge combination will continue until improvements are made to Mexico's west coast facilities.

2.1.3 Transportation Network Electronic Data

It is important to note that the roadway, railroad, airport, maritime ports, and pipeline networks are included in the Geographic Information Systems (GIS) of each country. A separate document has been prepared describing the various coverages available in electronic format. This report has been distributed to the appropriate GIS users within each agency participating in the Binational Transportation Planning and Programming Study.

In addition, continuing efforts are underway to create a binational GIS. Figure 2.1 shows the major binational highways of both countries and is one of the initial products of a joint effort between the U.S. Federal Highway Administration (FHWA) and the Mexican Secretary of Communications and Transportation (SCT).

Figure 2.1 Binational Highway Network

2.2 Binational Trade Corridors—Roadways

Figure 2.2 shows the major trade corridors in the two countries that allow for the interchange of commercial goods. There are four major trade corridors, the Western, Midwestern, Northeastern and Southeastern. These corridors are defined as major trade corridors because they carry more than 40,000 trade trucks annually. Certain portions of these corridors do not meet the criteria for major trade corridors (i.e. the Seattle-San Francisco portion of the western corridor). Other corridors of importance to binational trade that do not meet the criteria for major trade corridors at the time of publication of this report, but are expected to increase in importance are the CANAMEX corridor and the northern portion of the I-35 corridor. The CANAMEX corridor runs between Nogales, Tucson, and Phoenix, Arizona; Las Vegas, Nevada and on I-15 to Shelby, Montana and into Alberta, Canada. The northern portion of the I-35 corridor extends from Oklahoma City to Duluth, Minnesota. These corridors are also shown on Figure 2.2.

These corridors primarily follow the interstate highway system in the U.S. and the Federal Highway system in Mexico. Other federal, state, and local roadways provide direct access from these major corridors to the trade origins and destinations within each country. Approximately 86 percent of the binational trade (measured by value of product transported) between Mexico and the U.S. is carried by the roadway network. This network is described below.

2.2.1 West Corridor

The western most trade corridor in the U.S. connects Seattle, Washington with San Diego in Southern California via Interstate 5 (I-5). In Tijuana, one branch of the western corridor continues south into Mexico following Mexican Federal Highway 1D (MX 001D) to Ensenada and then MX 001 on to Los Cabos, Baja California Sur. Any trade in the western corridor bound for the interior of Mexico turns east in either Los Angeles, on I-10, or in San Diego on State Route 94 to Tecate or on I-8, and uses border crossings located in California, Arizona, New Mexico, or Texas.

At the California border crossings of Tecate-Tecate and Calexico-Mexicali, the trade route follows MX 002D into the interior of Mexico. This roadway runs parallel to the border until it connects to MX 015 at Santa Ana. Freight crossing into Mexico at Nogales-Nogales uses MX 015, which runs parallel to the western coast of Mexico, connecting to Hermosillo, Guaymas, Mazatlan and Tepic. Finally, MX 015 turns inland to connect with MX 070, just north of Guadalajara. MX 015 then turns southwest leaving Guadalajara, before going east again below Lake Chapala. MX 015 then continues south into Michoacan, turns east and ends at Toluca, east of Mexico City.

Alternatively, trade between the western U.S. and central Mexico can cross the border at El Paso-Ciudad Juarez or at Laredo-Nuevo Laredo. In addition to the connection to I-10, the El Paso-Ciudad Juarez border crossing also serves trade using I-25, which extends between Denver, Colorado, and the border. This trade corridor continues south through central Mexico as MX 045 connecting to Chihuahua and Jimenez, and as MX 049 to Torreon and Zacatecas. From Zacatecas MX 049 continues to San Luis Potosi, while MX 045 continues to Aguascalientes, Lagos de Moreno, Leon, Irapuato and Queretaro.

Figure 2.2 - Binational Trade Corridors

2.2.2 Midwest Corridor

The midwest corridor connects the central region of the U.S. with the central and northwestern regions of Mexico. From Chicago, Illinois this route follows I-55 to St. Louis, Missouri where it connects with I-44. In Oklahoma City, Oklahoma, the route turns south following I-35 to Dallas, Texas.

From Dallas, there are two trade route options. The first option is I-20 and I-10 to the border crossing at El Paso-Ciudad Juarez . Once in Mexico, this route connects with MX 045, which is described above. The second option is I-35 to the border crossing of Laredo-Nuevo Laredo. In Mexico, this route continues as MX 085, which travels to Monterrey, then continues on MX 040 to Saltillo, and on MX 057 to San Luis Potosi, Queretaro and Mexico City.

An alternate trade route, between San Antonio, Texas and Saltillo, Coahuila, that parallels a portion of the I-35/MX 085 route, consists of U.S. Highway 57 (U.S. 57) in Texas and MX 057 in Mexico. This route uses the Eagle Pass-Piedras Negras border crossing. In Mexico, this route passes through the cities of Sabinas, Monclova, and Saltillo, and continues on the roadway network that serves central Mexico.

2.2.3 Northeast Corridor

This corridor has three large branches within the U.S., two from Canada (Toronto and Montreal), and a third from New York. The three converge in Nashville, Tennessee. The branch that starts in Toronto travels south to Detroit, Michigan and continues as I-75 to Cincinnati, Ohio. It then continues as I-71 to Louisville, Kentucky, and I-65 to Nashville. The branch which begins in Montreal travels south on I-81 and then I-90 to Cleveland, Ohio. It continues as I-71 to Louisville and then as I-65 to Nashville. Finally, the branch that begins in New York as I-80 continues southwest as I-81, ending in Nashville.

In Nashville, where these three main branches join, the corridor continues as I-40 through Memphis, Tennessee to Little Rock, Arkansas, where it becomes I-30, continuing on to Dallas, Texas. From Dallas, as mentioned previously, there are two options, one ending at the border crossing of El Paso-Ciudad Juarez, and the other that connects to Laredo-Nuevo Laredo.

2.2.4 Southeast Corridor

The southeast corridor connects the southeast region of the U.S. with the east coast region of Mexico. From Charlotte, North Carolina, the southeast corridor (I-85) travels southeast through Atlanta, Georgia to Montgomery, Alabama, where it continues as I-65 to Mobile, Alabama, finally connecting to I-10 in Houston.

From Houston, one route to central Mexico uses U.S. 59 to the Laredo-Nuevo Laredo border crossing and continues south on the Mexican side of the border on MX 085. Another route to central Mexico from Houston crosses at Hidalgo-Reynosa using U.S. 59 and U.S. 281. This route continues in Mexico using MX 040 to Monterrey and other points within the interior of Mexico.

In order to access the east coast of Mexico from Houston, the most direct route would be to cross at Brownsville-Matamoros using U.S. 59 to Victoria and then U.S. 77. This option continues in Mexico as MX 180 that follows the coast of the Gulf of Mexico, passing through Tampico and ending at Veracruz. Accessing the central part of Mexico would be accomplished by using MX 101, which passes through Ciudad Victoria, traveling south until it reaches San Luis Potosi.

2.2.5 Binational Border Region Highway Network

While binational trade flows along the above described transportation corridors, this study cannot consider the transportation network at the national level. Therefore, the study will focus on the transportation facilities located within a 100-kilometer zone on either side of the border. More specifically, the study will focus on the major national and state roadways which serve cross border trade.

Figures 2.3 through 2.8 show the binational roadway network for the border region from the Pacific Ocean to the Gulf of Mexico. The primary factor for the selection of the facilities shown was whether they were included in either the FHWA National Highway System or Mexican National geographic information systems. Some state and local facilities have been added to complete the border region roadway network. Detailed descriptions and further data on these facilities are included in the U.S. and Mexican Task 2 reports.

2.2.6 Additional Information

The binational roadway network is included in the Geographical Information System (GIS) developed by FHWA and SCT and is available to the Binational Study. The U.S. portion of the system presently includes the following attributes: roadway name, designation, number of lanes, urban or rural classification, presence of a median, and other related data. In Mexico the GIS includes similar information and operational data such as Average Daily Traffic Volumes (ADTs), levels of service, etc. This information is shown in more detail for each country in the U.S. and Mexican Task 2 reports and GIS *Users Manual*.

Figure 2.3 - Border Region - Zone 1

Figure 2.4 Border Region - Zone 2

Figure 2.5 Border Region - Zone 3

Figure 2.6 Border Region - Zone 4

Figure 2.7 Border Region - Zone 5

Figure 2.8 Border Region - Zone 6

2.3 Binational Transportation Corridors—Railroads

Approximately 12 percent of the binational trade (measured by value of product transported) between Mexico and the U.S. is carried by the railroads of both countries. In the United States, there are 12 railroad companies that cover the country with a 197,090-kilometer rail network. In Mexico, the five railroads of Ferrocarriles Nacionales de Mexico (FNM), the national railroad, have a network consisting of 26,477 kilometers of rail. The combined binational railroad network therefore consists of approximately 225,000 kilometers of rail.

Figure 2.9 shows the location of the eight railroad border crossings: San Diego-Tijuana, Calexico-Mexicali, Nogales-Nogales, El Paso-Ciudad Juarez, Presidio-Ojinaga, Eagle Pass- Piedras Negras, Laredo-Nuevo Laredo, and Brownsville-Matamoros. Table 2.1 lists the rail border crossing facilities and the companies that operate at each location.

Tables 2.2 and 2.3 list the tonnage moved by rail southbound and northbound, respectively. These tables show the evolution of those movements during the 1990 through 1994 period for the entire border as well as for the seven major rail border crossings. These figures are obtained from FNM as no U.S. source is available. The eighth rail crossing at San Diego-Tijuana is not reported since the volume of trade at this location is minimal.

Table 2.1
Railroad Border Crossings

Border States		Border Crossing		Railroad Companies	
Mexico	**U.S.**	**Mexico**	**U.S.**	**Mexico**	**U.S.**
Baja California	California	Tijuana	San Ysidro	FPN	SDIV
		Mexicali	Calexico	FPN	UP
Sonora	Arizona	Nogales	Nogales	FPN	UP
Chihuahua	Texas	Cd. Juarez	El Paso	FPN	BNSF, UP
		Ojinaga	Presidio	FCHP	SO
Coahuila	Texas	Piedras Negras	Eagle Pass	FPN	UP
Tamaulipas	Texas	Nuevo Laredo	Laredo	FNE	TM, UP
		Matamoros	Brownsville	FNE	UP, BNSF

Railroads:

FPN: Pacifico Norte
FCHP: Chihuahua Pacifico
FNE: Noreste
SDIV: San Diego Imperial Valley
BNSF: Burlington Northern Santa Fe
UP: Union Pacific (Southern Pacific)
SO: South Orient
TM: Texas Mexican Railway

With the Union Pacific acquisition of Southern Pacific, the intermodal capabilities of both railroad companies have been consolidated. Intermodal facilities are located at the border communities of San Diego and Calexico, California; Nogales, Arizona; El Paso, Eagle Pass, Laredo, and Brownsville, Texas. Intermodal facilities are also available at large rail transfer points in the border states, such as Long Beach, California, and San Antonio, Texas.

2.3.1 Western Corridor

This corridor is served by the Ferrocarril Pacifico-Norte (FPN), Ferrocarril Chihuahua-Pacifico (FCHP), Burlington Northern Santa Fe Railroad Company (BNSF), Union Pacific Railroad Company (UP), and the South Orient (SO), as follows:

Figure 2.9 - Binational Railroads and Border Crossings

Table 2.2

Historical Southbound Trade Flows by Railroad (In Tons)

	1990	1991	1992	1993	1994
Border Total	7,429,185	7,888,699	9,899,523	10,419323	11,078,164
Calexico,Mexicali	71,129	68,006	10,637	3,593	77,592
Nogales, Nogales	355,424	473,455	598,629	604,972	408,016
El Paso, Cd. Juarez	620,775	721,478	1,143,531	1,438,625	1,500,240
Presidio, Oijinaga	35,124	18,543	26,622	20,611	40,461
Eagle Pass, Piedras Negras	1,066,356	808,174	909,676	883,353	1,012,359
Laredo, Nuevo Laredo	4,675,320	5,205,593	6,411,092	6,6069,643	6,716,762
Brownsville, Matamoros	605,047	593,450	799,336	858,526	1,322,734

Source: E-6 1990-1994 FNM

Table 2.3

Historical Northbound Trade Flows by Railroad (In Tons)

	1990	1991	1992	1993	1994
Border Total	2,373,831	1,914,082	1,884,514	2,686,903	2,428,423
Calexico, Mexicali	136,090	0	38,057	30,433	24,831
Nogales, Nogales	479,212	485,628	574,007	612,689	548,745
El Paso, Cd. Juarez	521,406	279,849	198,974	286,464	256,203
Presidio, Oijinaga	309	0	0	0	0
Eagle Pass, Piedras Negras	378,555	394,985	342,508	547,394	537,626
Laredo, Nuevo Laredo	716,694	667,400	603,091	1,082,879	891,151
Brownsville, Matamoros	141,565	86,220	127,877	127,044	169,867

Source: E-6 1990-1994 FNM

The FPN northern line which travels to northern Mexico—Irapuato, Guadalajara, Mazatlan, Hermosillo, Benjamin Hill, and Nogales—has a branch called Benjamin Hill-Mexicali where it crosses the border to Calexico and continues north to connect with the UP. The same FPN line crosses the border at Nogales, connecting with UP, which travels north. It also has a branch which goes to Irapuato and from there to Aguascalientes, Torreon, Chihuahua and the border crossing at Ciudad Juarez- El Paso, where it connects to the BNSF and UP to the north.

The FPN Tampico line travels north to Ciudad Victoria, Monterrey, Paredon and the border crossing at Piedras Negras-Eagle Pass, where it connects with UP, continuing north. This line is therefore integrated to other origin and destination points in the U.S.

In this corridor, the FCHP operates from the Port of Topolobampo, Sinaloa, continuing through to Chihuahua and crossing the border at Presidio-Ojinaga, where it connects with the South-Orient railroad.

As a special case, it should be noted that the Tijuana-San Ysidro crossing has access through the Tijuana-Tecate line that is concessioned to the San Diego and Arizona Eastern Railway and operated by the San Diego and Imperial Valley Railroad Company.

2.3.2 Midwest Corridor

This corridor joins the north-central region of the U.S. with the northeast and central regions of Mexico. From the north, it starts in Chicago, continues to St. Louis, Oklahoma, and Dallas. From Dallas, the border crossing at El Paso-Ciudad Juarez can be reached by traveling west, where the BNSF and UP connect with FPN that travels south. UP also operates between Chicago and Texas, however, their rail lines travel closer to the northeast corridor through Arkansas and Memphis, Tennessee.

2.3.3 Northeast Corridor

This corridor is served by the Ferrocarril del Noreste (FNE) that starts in Mexico City, traveling north through San Luis Potosi, Saltillo and Monterrey, and then to Nuevo Laredo-Laredo where it crosses the border connecting with the TexMex and UP. UP connects with the most important lines on the East Coast, including Con Rail, CSX Transportation and the Norfolk Southern Corporation that distribute freight to Chicago, Detroit and Canada.

2.3.4 Southeast Corridor

The FNE Monterrey-Matamoros line crosses the border at Matamoros-Brownsville, where it connects with UP and BNSF to continue northeast, interconnecting with the CSX Transportation and the Norfolk Southern Corporation, to reach the southeast region of the U.S., with an itinerary of Houston, New Orleans, and Charlotte.

It is important to note again that these rail corridors conform to topographic constraints, centers of population, manufacturing and raw materials production.

2.3.5 Additional Information

The binational railroad network is included in the Geographical Information System (GIS) developed by FHWA and SCT and is available to the Binational Study. The principal attributes are: railroad name, owner, rolling stock, speed, slope, maximum curvature, number of trains, potential capacity, etc. This information is shown in more detail for each country in the U.S. and Mexican Task 2 reports.

2.4 Ports

This section presents a brief summary of the maritime ports located in Mexico and the U.S. border states. The ports included in the inventory were considered to influence the flow of trade between the two countries particularly where there is a potential impact on the land transportation system in the border region. Figure 2.10 indicates the geographic location of the 14 largest ports, and the 2 ports located at the border, selected for consideration by the Binational Study. Table 2.4 provides a summary of the tonnage carried, by port.

Table 2.4
U.S./Mexican Ports with Potential Impact on the Border Transportation Network

Mexican Ports	Freight[a] (Millions of Tons)	U.S. Ports	Freight[b] (Millions of Tons)
Baja California		California	
Ensenada	0.8	Long Beach	83.3
Sonora		Los Angeles	65.0
Guaymas	2.6	Oakland	26.4
Colima		Richmond	25.9
Manzaillo	4.5	San Diego	0.9
Michoacan			
Lazaro Cardenas	10.7		
Tamaulipas		Texas	
Altamira	2.6	Houston	143.7
Tampico	4.1	Corpus Christi	78.1
Veracruz		Texas City	44.3
Veracruz	6.5	Brownsville	3.4

[a]1995 Freight Movement at Major Mexican Ports, Director General of Ports, SCT, 1995.
[B]1994 data in metric tons, from U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*, Part 5, Belvoir, Va., 1994

The need to include maritime ports in a planning and programming study for a land border region is due to “land bridges” that can form between ports located in one country and activity centers located in the other country. The most commonly referred to land bridge is between the Port of Long Beach and destinations in Mexico. This type of land bridge impacts the quantity of goods crossing the land border between the U.S. and Mexico.

The information presented below is a description of the 14 largest ports, plus the 2 ports located at the border, included in the Task 2 inventory. Additional information and detail is included in the U.S. and Mexican Task 2 reports.

2.4.1 Pacific Coast

California Maritime Ports: California has eight major deepwater ports. The four largest California ports are: Los Angeles, Long Beach, Oakland and Richmond. The Long Beach and Los Angeles ports are contiguous and together form the largest port in the U.S. Their proximity to the border makes them attractive to shippers moving materials and products to Mexico. The Port of San Diego is the only California port within the border lands region (100 kilometers), but it cannot offer as high quality of a facility as Long Beach and Los Angeles.

Figure 2.10- Major Ports Related to Binational Trade

Long Beach, California: The modern facilities and equipment at this port offer the versatility required to move any type of cargo. This port is the leader in container movements. During the fiscal year 1993-1994, a total of 5,272 vessels were accommodated with cargo valued at more than $55 billion. Long Beach is the port that moves the most cargo on the U.S. West Coast, with 83.3 million metric tons being accommodated in 1994.

Los Angeles, California: The Port of Los Angeles is the second most important port on the U.S. West Coast. In 1994 it handled 65 million metric tons of cargo and 2.38 million truck equivalent units (TEU). During 1993 the port handled cargo valued at $65.5 billion, and during the fiscal year 1993-1994, a total of 2,879 vessels were served at the port.

San Diego, California: The main commodities moving through this port include automobiles, canned fish, cement, chemical products, containers, dry bulk, general cargo, grains, wood, petroleum products and refrigerated products. This port also serves as a tourist port.

Port of Ensenada, Baja California: Since Baja California is a peninsula separated from the majority of Mexico by the Sea of Cortez (Gulf of California), ports located in Baja California do not have easy access to markets located in central Mexico. Therefore, the ports in Baja California tend to primarily serve tourism. The Port of Ensenada is considered both a commercial and tourist port, with tourism being its primary purpose. Ensenada is the most important for tourism on the Mexican Pacific coast.

Port of Guaymas, Sonora: The Port of Guaymas is the most important port located in the border state of Sonora. This commercial port has special terminals for moving grains, cement, fluid and oil. Seventy-five percent of the cargo handled in the port was trade with the U.S. Recent negotiations with the State of Arizona has opened new opportunities for the Port of Guaymas to aid in the movement of goods to and from Arizona.

Port of Manzanillo, Colima: This is a commercial port that has specialized terminals to move containers, oil, cement and fluids. International trade with the U.S. represented 43 percent of the total managed by the port, not taking into account oil and oil derivatives.

Port of Lazaro Cardenas, Michoacan: This is a commercial and industrial port. It houses a container terminal, mineral terminal, and grain terminal. International trade with the U.S. represented 14 percent of imports through the port and 12 percent of the exports.

2.4.2 Gulf Coast

Texas Maritime Ports: Texas has 9 major deepwater ports. The three largest Texas ports are Houston, Corpus Christi, and Texas City. The port of Brownsville is the only Texas port within the border region.

Port of Houston: The Port of Houston is a deepwater port that involves both public and private entities. The port is located approximately 50 miles inland and is accessed using a deepwater channel. It is the largest port in Texas in terms of volume (tonnage) and value of cargo. This port has the largest facilities of any port on the Gulf of Mexico. It includes facilities to handle oil, mineral ore, chemicals, grains, containers and general cargo.

Port of Corpus Christi: This is the second largest port on the Texas Gulf coast in terms of cargo handled. The port has facilities to handle oil, mineral ore, chemicals, grains, containers and general cargo.

Port of Brownsville: This port is a deepwater port located on the southern most tip of Texas, east of the city of Brownsville at the end of a 17-mile channel from the Gulf of Mexico. Activities at this port include: construction of off-shore drilling rigs, ship repairing

and dismantling, steel fabrication and bulk terminaling for miscellaneous liquids, grain handling and storage, etc.

Port of Texas City: This is a private port located in the Galveston Bay. The main commodities handled in the port are oil and chemical products.

Port of Altamira, Tamaulipas: This port is located 30 kilometers north of the Port of Tampico. This facility serves as both a commercial and industrial port. In terms of tonnage, international trade with the U.S. represented 50 percent of imports through the port and 7 percent of the exports.

Port of Tampico, Tamaulipas: The Port of Tampico serves both commercial and oil activities. In terms of tonnage, international trade with the U.S. represented 52 percent of imports through the port and 11 percent of the exports.

Port of Veracruz, Veracruz: This port is the most important Mexican port in the Gulf of Mexico. This port has specialized terminals to handle containers, grains, mineral ores, fluids, oil, rail-barges, and has a shipyard. International trade with the U.S. represented 30 percent of imports through the port and 20 percent of the exports, in terms of tonnage.

2.4.3 Additional Information

The U.S. and Mexican Task 2 reports provide additional information on the most significant marine ports related to binational trade between Mexico and the U.S. The GIS data collected as a part of this study include a description of the ports along with the following attribute data: name, location on waterway, street address, major commodities moved, services available, number of berths, operational depth and other related information.

2.5 Airports

There are approximately 55 airports located either within the border region (within 100 kilometers of the international border) or within the border states that provide binational passenger or freight service. The inventory identified 17 airports in Mexico and 38 in the U.S. Figure 2.11 shows the geographic distribution of the major border airports. Table 2.5 presents a brief summary of the number of passengers served and cargo handled by these airports.

2.5.1 Airports Serving Binational Trade in the Border Region

Baja California: In Baja California, there are three airports that serve international trade and commerce located within the border region. These facilities are located in Tijuana, Mexicali and Ensenada. The Tijuana and Mexicali airports are operated by the Aeropuertos y Servicios Auxiliares (ASA) and belong to the Mexican Federal Airport Network. The Ensenada airport is operated by the military; however, general aviation operations also use this facility.

California: In California there are seven airports were identified as having significant operations in the border lands region. Six of these airports are within 100 kilometers of the border. Los Angeles International Airport is not within the border region, but is a significant airport in terms of both international passenger service and air freight. Within the border region, the six public airports that provide passenger and air freight service are: Brown Field Municipal Airport, Calexico International Airport, Gillespie Field, Imperial County Airport, Montgomery Field, and San Diego International Airport (Lindberg Field).

Sonora: In Sonora there are six airports that serve international trade and commerce located within the border region: Nogales, Puerto Peñasco, Agua Prieta, Cananea, Sonoita, and San Luis Rio Colorado. Of these airports, only Nogales is owned by the Mexican Federal Airport Network. The other five airports are operated by the local municipalities and serve light aircraft.

Arizona: In Arizona there are eight airports, seven within the border region and Phoenix Sky-Harbor: Bisbee-Douglas International Airport, Cochise College Airport, Douglas Municipal Airport, Libby AAF (Sierra Vista Municipal Airport), Nogales International Airport, Phoenix Sky-Harbor International Airport, Tucson International Airport, and Yuma MCAS (Yuma International Airport).

New Mexico: There are only two international airports located in the border region of New Mexico: Las Cruces International and Dona Ana County Airport at Santa Teresa.

Chihuahua: There are two international airports located in the border region of Chihuahua. These airports are located in Ciudad Juarez and Ojinaga. The Juarez airport is owned by the Mexican Federal Airport Network and is operated by ASA. The Ojinaga airport is operated by the municipal authorities. The airport in Ciudad Juarez is an international airport serving both passengers and air cargo. The airport at Ojinaga is a general aviation facility.

Coahuila: There are two major airports located in Coahuila: Ciudad Acuña and Piedras Negras, that are operated by State Airport System.

Texas: There are 21 airports in Texas that lie within the border region or which serve the border area. They are: Brownsville-South Padre Island International, Cameron County Airport, Corpus Christi International, Crystal City Municipal Airport, Dallas-Fort Worth International, Del Rio International, Dimmit County Airport, Eagle Pass Municipal, Edinburg (Rio Grande Valley Regional Freight Terminal), El Paso International, Houston Intercontinental, Laredo International, Maverick County Airport, Mid Valley Airport (Weslaco), McAllen-Miller

Figure 2.11- Airports Serving the Border Region

International, Presidio-Lely International, Rio Grande Valley International (Harlingen), San Antonio International, Starr County Airport, Terrell County Airport, and Zapata County Airport.

Nuevo Leon: The only airport in Nuevo Leon involved in binational trade is located in Monterrey and is owned by the Mexican Federal Airport Network.

Tamaulipas: In Tamaulipas there are three airports that handle international passengers and air freight: Nuevo Laredo, Reynosa and Matamoros. All three are owned by the Mexican Federal Airport Network.

2.5.2 Additional Information

The U.S. and Mexican Task 2 reports provide additional information on the most significant airports related to binational trade between Mexico and the U.S. The GIS data collected as a part of this study include a description of the airports along with the following attribute data: airport name, altitude, number of runways, length, width, pavement type, capacity in terms of operations and statistical information such as annual number of operations, passengers and cargo moved.

Table 2.5
International Passenger and Cargo Airports Serving the Border Region

Airport[a]	Passengers[b]	Cargo[c] (Tons)	Airport	Enplaned Passengers[d]	Enplaned Freight Revenue[d](Tons)
Baja California			**California**		
Tijuana	2,768,034		Los Angeles	19,885,450	409,374
Mexicali	240,671	2,600	San Diego	6,168,430	23,312
Sonora			**Arizona**		
Nogales			Phoenix	12,451,569	59,231
			Tucson	1,555,362	5,623
Chihuahua			Yuma	1,378	356
Cd. Juarez	396,666	2,555			
			New Mexico		
Nuevo Leon			Albuquerque	2,938,786	11,967
Monterrey	2,125,923	7,354	Las Cruces	345	—
Coahuila			**Texas**		
P. Negras			Houston	9,680,708	85,083
			San Antonio	2,944,867	13,504
Tamaulipas			El Paso	1,870,163	16,606
N. Laredo	71,559	857	Harlingen	464,455	3,765
Reynosa	55,140	194	Corpus Christi	459,388	367
Matamoros	65,641	239	McAllen-Miller	315,370	654
			Brownsville	64,259	4,679
			Laredo	28,835	2,891

[a] 1994 Airport System Statistics, ASA, 1994.
[b] Total Commercial Passengers.
[c] Total cargo domestic, international and chartered freight.
[d] U.S. Department of Transportation, Airport Activity Statistics of Certificated Route Air Carriers, 12 Months Ending December 31, 1994, ISBN-0-16-047653-X

2.6 Border Demographic and Socioeconomic Data

Demographic and socioeconomic data are collected and maintained at the national level by both Mexico and the United States. In Mexico, the Instituto Nacional de Estadistica, Geografia e Informatica (INEGI) is the responsible agency for the collection and dissemination of demographic and socioeconomic data. In the U.S., the Department of Commerce's Census Bureau is responsible for collecting and maintaining demographic and economic data collected for the decennial census. The Department of Commerce is also responsible for the preparation of projections of both demographic and economic statistics. Often state, regional, or municipal agencies may make area specific projections that account for specialized local conditions, however, these projections are commonly extrapolations of the Census data.

Along the 2,000-mile border between Mexico and the U.S., there are 10 border states, 6 in Mexico and 4 in the U.S. The six Mexican states are: Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas. The four U.S. states are California, Arizona, New Mexico, and Texas.

Within the Mexican border states there are 39 municipalities which are located adjacent to the border with the U.S. In the U.S. border states there are 23 counties that are adjacent to, and form the, border with Mexico. California has the fewest border counties with only two, while Texas has the most with a total of 14. Arizona and New Mexico have four and three border counties, respectively.

2.6.1 Demographic Growth - National versus Border Region

According to the preliminary results of the 1995 Instituto Nacional de Estadistica, Geografia e Informatica (INEGI) census (Conteo de Poblacion y Vivienda), the overall Mexican population is estimated at 91.1 million. The current average annual growth rate (AGR) is approximately 1.8 percent. This represents a decrease in the national AGR from those observed in the 1970s, when the rate was 3.2 percent and the 1980s, when the AGR was close to 2 percent.

With the exception of Coahuila, all of the Mexican border states' populations have been growing at a higher rate than the national average. Table 2.6 lists population and the average annual growth rates for the six Mexican border states for 1980, 1990, and 1995. Baja California has a growth rate which is well above the average growth rate for the other Mexican border states.

U.S. Census data indicate that the U.S. population has been growing at an average annual rate of approximately one percent since 1970. This growth rate has been constant and has not shown any significant variation during the most recent 25-year period.

All of the U.S. border states have been growing at a rate higher than the national average. During the 1970s and 1980s this rate was approximately double the national average. Table 2.7 shows the population and average annual growth rates for the U.S. border states for 1980, 1990, and 1995. Arizona has consistently had the highest growth rate of the U.S. border states over the past 15 years.

Table 2.6
Population and Average Annual Growth Rate for the Mexican Border States

State	1980	1990	1995	Growth Rate 80-90	Growth Rate 90-95
Baja California	1,117,866	1,660,855	2,108,118	3.58%	4.29%
Sonora	1,513,731	1,823,606	2,083,630	1.92%	2.38%
Chihuahua	2,005,477	2,241,873	2,792,989	2.03%	2.40%
Coahuila	1,557,265	1,972,340	2,172,136	2.45%	1.72%
Nuevo Leon	2,513,045	3,098,736	3,549,273	2.17%	2.42%
Tamaulipas	1,924,484	2,249,581	2,526,387	1.61%	2.07%
Total	10,691,888	13,246,991	15,232,533	2.20%	2.80%

Source: Instituto Nacional de Estadistica, Geografia e Informatica (INEGI)

Table 2.7
Population and Average Annual Growth Rate for the U.S. Border States

State	1980	1990	1995	Growth Rate 80-90	Growth Rate 90-95
Arizona	2,718,215	3,665,228	4,217,940	3.03%	2.85%
California	23,667,902	29,760,021	31,589,153	2.32%	1.20%
New Mexico	1,302,894	1,515,069	1,685,401	1.52%	2.15%
Texas	14,229,191	16,986,510	18,723,991	1.79%	1.99%
Total	41,920,182	51,928,818	56,218,480	2.16%	1.60%

Source: U.S. Department of Commerce Census Bureau

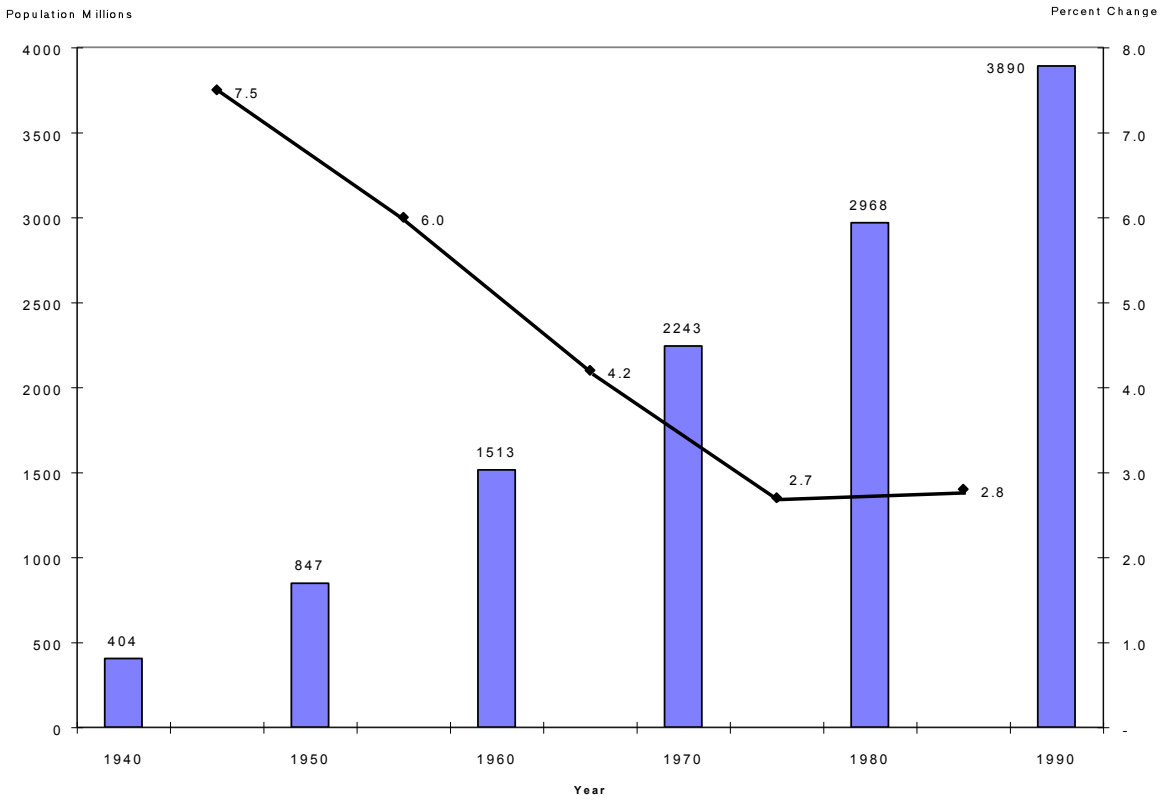
2.6.2 Mexican Border States

The 1990 Census estimated a total of 3.9 million people living in the northern border area of Mexico. This represents 4.8 percent of Mexico's total population which was reported as 81.25 million in 1990. Figure 2.12 shows the border regional population for a 50-year period from 1940 to 1990. This figure also shows the average annual growth rates for each of the 10-year periods. Over the last 20 years, the average annual growth rate has remained relatively stable at around 2.75 percent per year. During the period 1940 to 1980, the average annual growth rate in the border states declined from a rate of 7.5 percent in the 1940s to 2.75 in the 1980s.

Geographic Distribution

Figure 2.13 shows the distribution of population in the northern border municipalities for the 1990 Census data. The City of Juarez is the largest population center which is home to approximately 21 percent of the all border residents. Tijuana is the second largest population center with 19.2 percent of border residents followed by Mexicali with 15.5 percent. Matamoros, Reynosa and Nuevo Laredo are all close in size at 7.8, 7.3 and 5.6 percent, respectively. The smallest border population centers are Hidalgo, Coahuila and Santa Cruz, Sonora each with fewer than 2,000 residents.

Figure 2.12
Distribution of Mexican Population in the Border Region



Source: The Northern Border, Overview of Population and Household Results; Eleventh National Population and Household Census 1990; 1993.

Migration

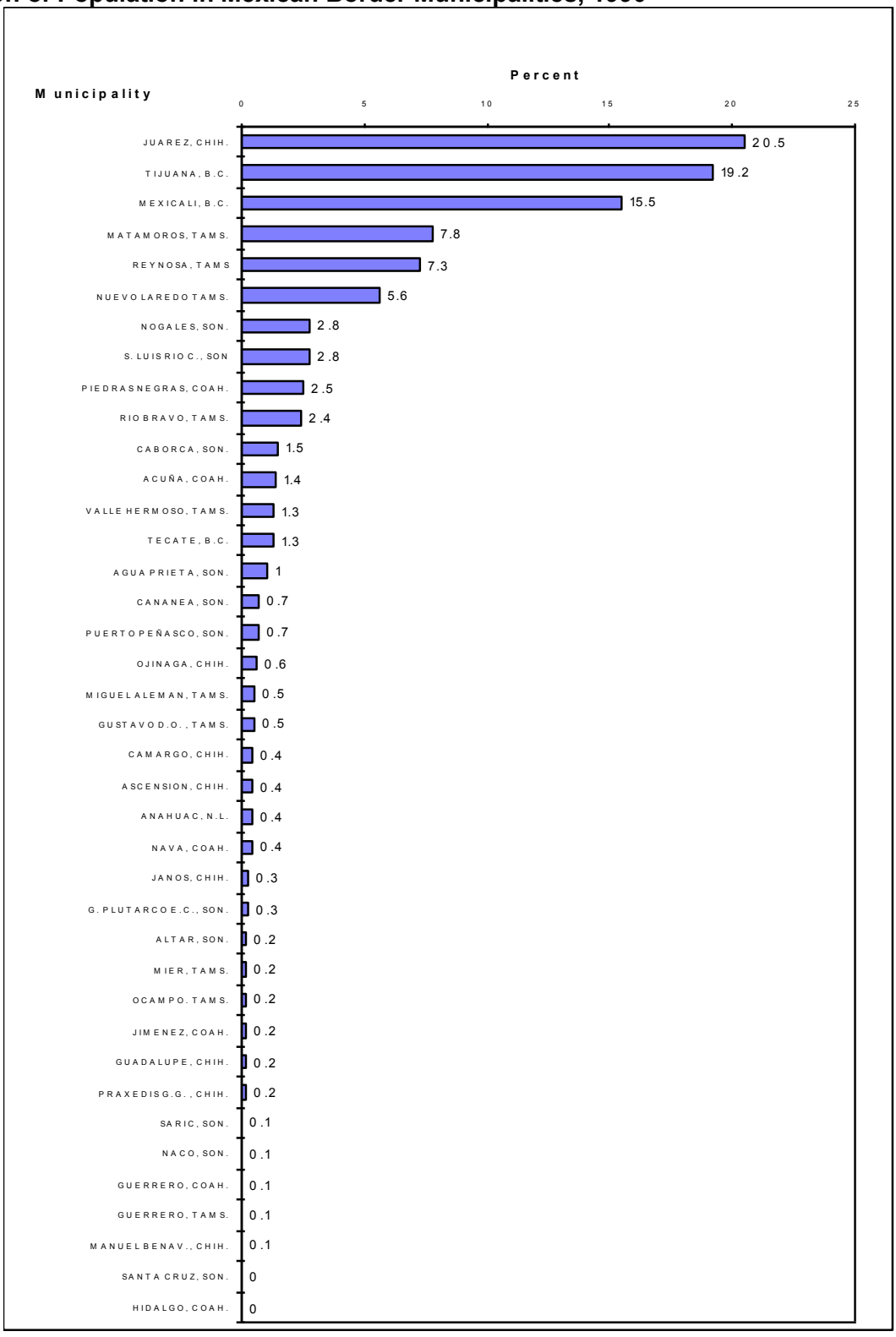
In 1990, 28 percent (1.1 million) of the total population in the northern border municipalities were non-natives to this region. It should be noted that more than half of the non-native population was located in cities of Baja California.

The principal states of origin for the non-native population are, in order of magnitude: Jalisco, Durango, Sinaloa, Guanajuato and Distrito Federal. These five states account for 51.6 percent of the immigrants to the northern border zone. On the other hand, immigrants from foreign countries represent 7.5 percent (82,000) of the border population.

Employment

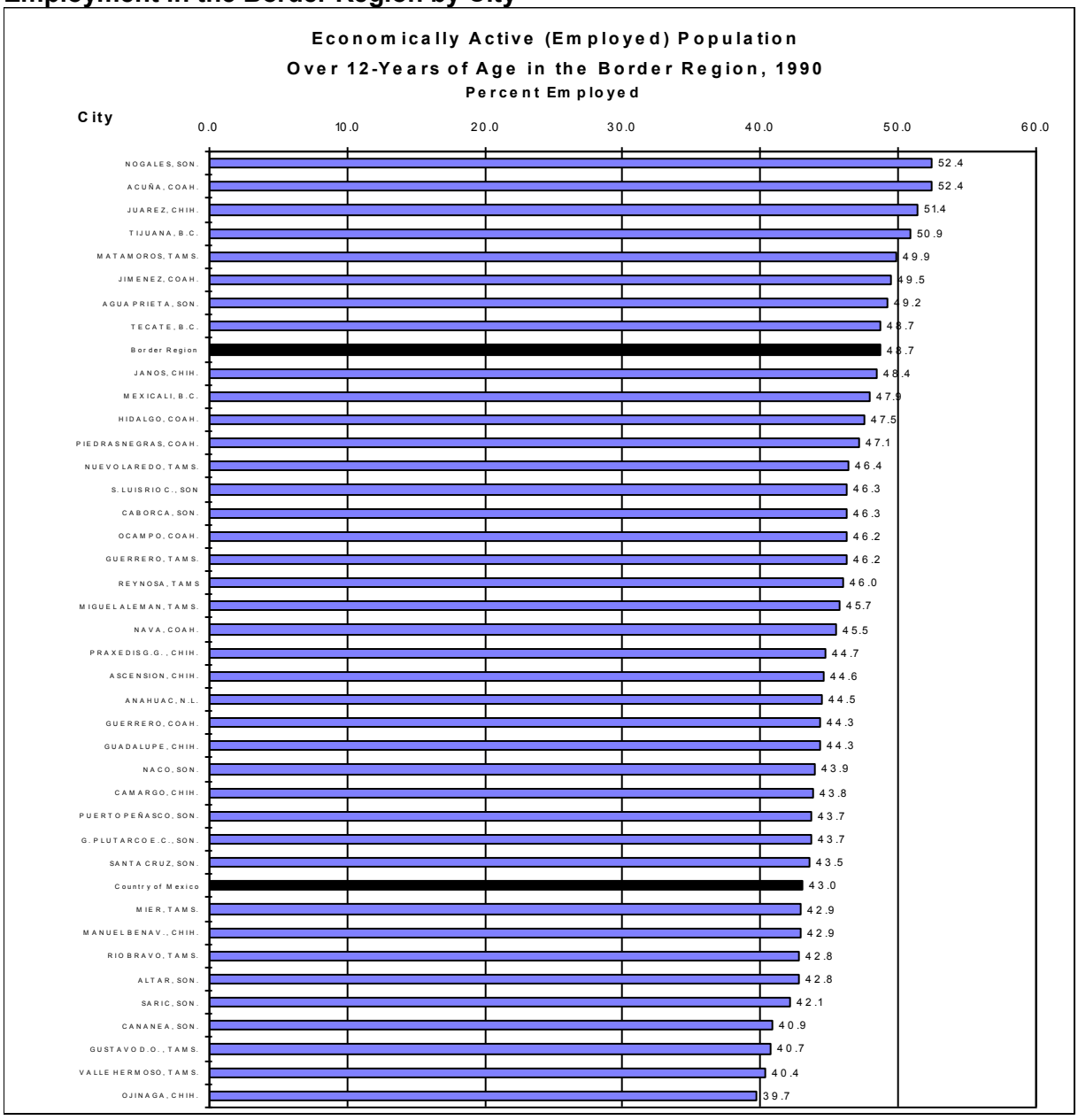
According to the 1990 Census, 49 percent of the northern border population 12 years of age or older were employed. This rate was seven percent higher than the employment rate of 42 percent reported for the region in 1970. Nationally, the average employment rate is 43 percent. The border cities with the highest employment rates are: Nogales, Sonora; Acuña, Coahuila; Ciudad Juarez, Chihuahua; Tijuana, Baja California; and Matamoros, Tamaulipas. Figure 2.14 shows the employment rates for all the northern border municipalities including national and border region averages for comparison.

Figure 2.13
Distribution of Population in Mexican Border Municipalities, 1990



Total population for Border Municipalities=3.9 million
Source: 1990 Mexican Census.

Figure 2.14
Employment in the Border Region by City



Source: 1990 Mexican Census.

Employment in Mexico is generally divided into three economic sectors which are referred to as primary, secondary and tertiary sectors. These sectors can be described as follows:

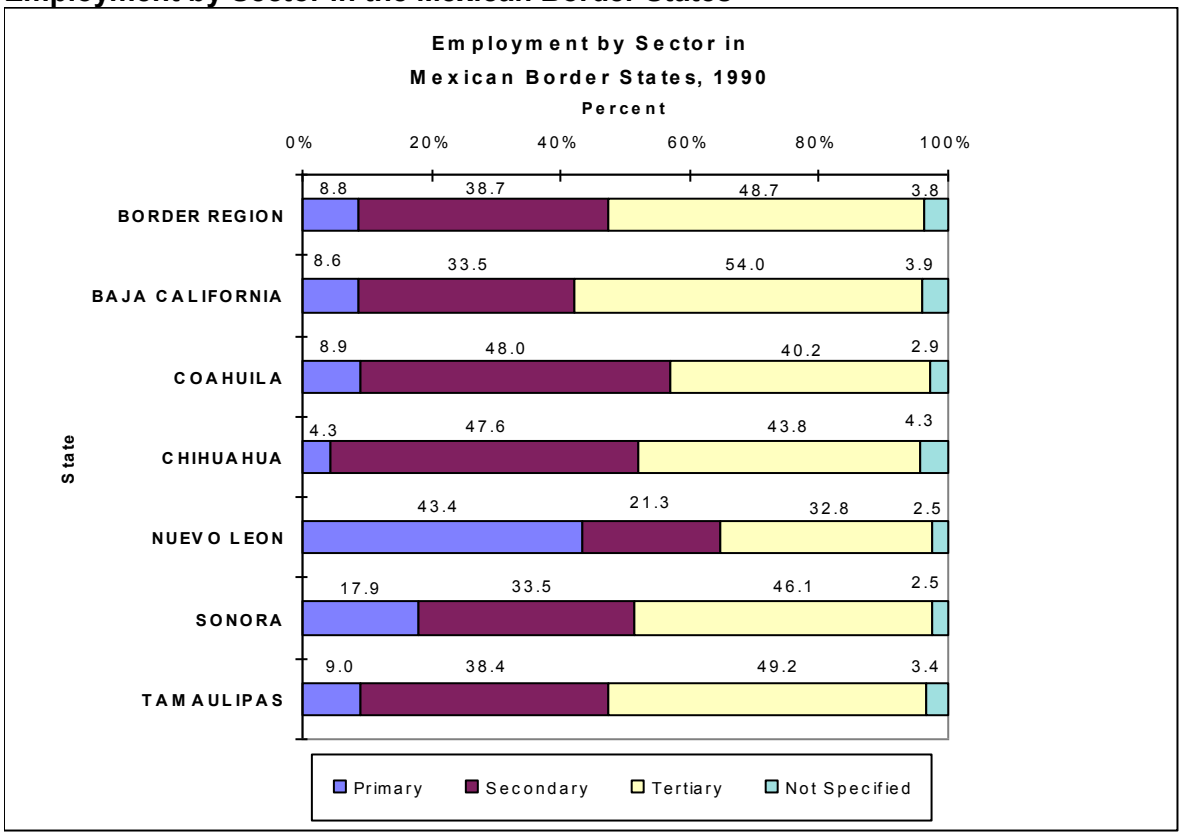
- Primary: Agriculture, cattle, forestry, hunting and fishing.
- Secondary: Mining, oil and gas extraction, manufacturing industry, electricity generation, and construction.
- Tertiary: Trade and Services.

In the 20-years between the 1970 and 1990, there have been significant changes in the employment within the three sectors. The primary-sector-related jobs have experienced the greatest decrease from 25 percent to 9 percent. The secondary-sector have experienced a significant increase from 25 percent to 39 percent. The tertiary sector has experienced a moderate level of increase from 43 percent to 49 percent.

It is important to note that the border region has a significantly higher percentage of workers in the secondary sector. In 1990, the border region employment was 11 percent above the national average for this sector. Conversely, the border region employment in the primary sector was 14 percent below the national average. For the tertiary sector, the border region was only 3 percent above the national average.

Figure 2.15 shows the distribution of jobs within the three employment sectors for the individual border states as well as the border as a whole. These numbers appear to reflect the pattern of maquiladora activity within the border states. Note that agricultural employment is significantly higher in Nuevo Leon than in the other states.

Figure 2.15
Employment by Sector in the Mexican Border States



Source: 1990 Mexican Census.

Additional Information

Based on the results of Task 3 of the Study, six urbanized areas along the border were selected for additional study. These areas are identified by the following cities: Tijuana/San Diego, Nogales/Nogales, Ciudad Juarez /El Paso, Piedras Negras/Eagle Pass, Nuevo Laredo/Laredo, and Matamoros/Brownsville. The U.S. and Mexican Task 2 reports provide additional detail for each of these border cities including data on population, education and employment. The demographic and socioeconomic data presented in the U.S. and Mexican Task 2 reports were taken from the most recent publications of INEGI: *Cuadernos Estadisticos Municipales*.

2.6.3 U.S. Border States

Table 2.7 shows the population for the four U.S. border states (Arizona, California, New Mexico, and Texas) from 1970 through 1995. These data were obtained on a State by State basis from the U.S. Department of Commerce. California had the largest population in 1995 with 31.6 million, followed by Texas with 18.7 million, Arizona with 4.2 million, and New Mexico with 1.7 million. Together, these states represent almost 22 percent of the country's total population. Arizona has historically been the fastest growing border state in terms of population since 1970. The most significant increase in this state occurred between the years 1970 and 1975, when there was an average annual growth rate (AGR) of 5.17 percent. During the period from 1970 to 1985, the four U.S. border states had an AGR of approximately two percent, which is about twice the national average. In the 10 years between 1985 and 1995, the growth rate of the border states slowed somewhat to just under two percent per year.

Table 2.7
Population U.S. Border States with Mexico

State	1970	1975	1980	1985	1990	1995
Arizona	1,775,399	2,284,847	2,718,215	3,183,538	3,665,228	4,217,940
California	19,971,069	21,537,849	23,667,902	26,441,109	29,760,021	31,589,153
New Mexico	1,017,055	1,159,944	1,302,894	1,438,361	1,515,069	1,685,401
Texas	11,198,655	12,568,843	14,229,191	16,272,734	16,986,510	18,723,991
Total	33,962,178	37,551,483	41,918,202	47,335,742	51,926,828	56,216,485

Source: U.S. Department of Commerce Census Bureau

Border County Population

Population and projections from 1973 through 2040 acres shown in Table 2.8 for the U.S. border counties of Arizona, California, New Mexico and Texas. These data are obtained from county level statistics from the U.S. Department of Commerce. As with overall state population, the two California border counties have historically had the largest combined population (as compared with totals for other border counties within the border states) with a projected total of 2.8 million in 1995. This represents approximately 50 percent of the total U.S. border county population.

In Texas, the total border county population projection for 1995 was 1.6 million. This represents approximately 32 percent of the total U.S. border population. In 1995, the three counties with the largest populations were El Paso County, Hidalgo County (major city McAllen), and Cameron County (Brownsville/Harlingen), with populations of 617,300, 407,700, and 271,300, respectively.

Table 2.8

Historical and Projected Population U.S. Counties Bordering Mexico

	Population in 000's	1973	1979	1983	1988	1990	1995	2000	2005	2010	2020	2040
	State Totals	*20867.7*	*23255.1*	*25307.9*	*28314.1*	*29760.0*	*32000.2*	*33792.9*	*35332.9*	*36672.2*	*38480.1*	*39848.6*
California	Border Counties											
	San Diego	1499.6	1827.6	2021.8	2370.4	2498.0	2734.1	2927.5	3098.3	3249.4	3459.6	3625.1
	Imperial	79.6	90.1	100.8	112.8	109.3	115.2	119.6	123.3	126.4	130.6	133.4
California	Border Total	**1579.2**	**1917.7**	**2122.6**	**2483.2**	**2607.3**	**2849.3**	**3047.1**	**3221.6**	**3375.8**	**3590.2**	**3758.5**
	State Totals	*2125.3*	*2638.6*	*2951.8*	*3487.4*	*3665.2*	*4016.5*	*4295.4*	*4537.4*	*4748.5*	*5098.3*	*5437.0*
Arizona	Border Counties											
	Yuma	68.7	83.5	82.2	93.0	106.9	116.6	124.4	131.2	137.4	148.0	158.3
	Pima	428.6	523.3	569.4	636.0	666.9	722.6	766.3	803.8	836.2	891.5	946.2
	Santa Cruz	16.5	19.7	21.4	24.4	29.7	32.2	34.2	36.0	37.6	40.2	42.8
	Cochise	74.6	86.3	91.0	100.4	97.6	103.6	108.3	112.5	116.4	123.7	130.6
Arizona	Border Total	**588.4**	**712.8**	**764.0**	**853.8**	**901.1**	**975.0**	**1033.2**	**1083.5**	**1127.6**	**1203.4**	**1277.9**
	State Totals	*1104.2*	*1280.5*	*1402.5*	*1507.0*	*1515.1*	*1605.4*	*1674.9*	*1732.8*	*1782.6*	*1859.4*	*1908.3*
New Mexico	Border Counties											
	Hidalgo	5.1	6.1	6.4	5.9	6.0	6.2	6.3	6.4	6.5	6.6	6.7
	Luna	13.5	15.5	16.7	18.1	18.1	19.0	19.7	20.2	20.6	21.2	21.6
	Dona Ana	76.9	93.7	109.0	132.0	135.5	146.4	155.1	162.6	169.1	178.5	184.8
New Mexico	Border Total	**95.5**	**115.3**	**132.1**	**156.0**	**159.6**	**171.6**	**181.1**	**189.2**	**196.2**	**206.3**	**213.1**
	State Totals	*12019.0*	*13887.3*	*15813.8*	*16837.2*	*16986.5*	*17598.3*	*18039.1*	*18400.8*	*18725.2*	*19317.4*	*19540.0*
Texas	Border Counties											
	El Paso	398.2	472.3	528.4	585.9	591.6	617.3	636.5	652.8	667.9	694.3	706.6
	Hudspeth	2.5	2.6	2.8	2.5	2.9	2.9	2.9	2.9	2.8	2.9	2.8
	Jeff Davis	1.5	1.6	1.7	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9
	Presidio	7.9	7.5	8.1	7.8	8.7	8.7	8.7	8.7	8.7	8.8	8.8
	Brewster	7.9	7.5	8.1	7.8	8.7	8.7	8.7	8.7	8.7	8.8	8.8
	Terrell	1.9	1.6	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Val Verde	30.5	35.3	39.8	40.2	38.7	39.7	40.3	40.8	41.3	42.6	43.3
	Kinney	2.0	2.2	2.3	2.6	3.1	3.2	3.3	3.4	3.4	3.5	3.5
	Maverick	21.4	29.8	36.1	39.6	36.4	38.2	39.6	40.8	41.9	43.7	44.6
	Webb	83.1	96.8	115.9	128.9	133.2	140.0	145.0	148.9	152.4	158.1	160.4
	Zapata	4.7	6.4	7.9	8.8	9.3	9.7	10.2	10.5	10.9	11.4	11.6
	Starr	20.6	26.0	32.4	39.2	40.5	42.7	44.4	45.8	47.1	49.1	49.8
	Hidalgo	217.0	275.5	335.2	387.9	383.5	407.7	425.6	440.2	453.0	473.3	482.5
	Cameron	166.9	205.5	242.3	264.0	260.1	271.3	279.1	285.3	290.5	299.9	303.8
Texas	Border Total	**966.1**	**1170.6**	**1362.6**	**1518.5**	**1520.0**	**1593.4**	**1647.6**	**1692.1**	**1731.9**	**1799.7**	**1829.8**
U.S. Border		**1973**	**1979**	**1983**	**1988**	**1990**	**1995**	**2000**	**2005**	**2010**	**2020**	**2040**
Counties Total		**3229.2**	**3916.4**	**4381.3**	**5011.5**	**5188.0**	**5589.3**	**5909.0**	**6186.4**	**6431.5**	**6799.6**	**7079.3**

Data Source: County Projections to 2040 (1992); U.S. Department of Commerce

Arizona's border county population is 975,000 or 17.0 percent of the total U.S. border population. The most populated border county in Arizona has historically been Pima County. In the 1995 population projection, Pima's population comprised 74 percent of the total of Arizona's four border counties. Santa Cruz County has the least population of Arizona's border counties, with a projected 1995 population of 32,200. The combined population of the four border counties within this state have shown a steady increase since 1973, with an AGR of 2.2 percent.

New Mexico's total border county population is 1.7 million persons or three percent of the total U.S. border county population. New Mexico's most populated border county is Dona Ana, which in the 1995 projection, comprises 85 percent of the state's total border population.

It should be noted that in both Arizona and New Mexico, due to the physical size of the counties, a significant portion of the border county population is not located immediately adjacent to the border. For example in Pima County, Arizona, the largest population center is Tucson, which is located 100 kilometers (60 miles) north of the border and accounts for more than 60 percent of the county's total population. In contrast for states of California and Texas, the majority of the border county population is located immediately at the U.S.-Mexico border.

Employment

According to the U.S. Department of Commerce, San Diego County in California has historically had the highest total employment of any border county in the four U.S. border states and is projected to remain

the leader into the year 2040. In terms of 1995 projections, San Diego County was estimated to have 1.5 million jobs which represents 54 percent of total employment for all U.S. border counties.

Pima County (Tucson) has the second largest total employment estimated at 358,000 or approximately 13 percent of the total U.S. border employment. As noted earlier, the concentration of population, and therefore employment, in Pima county is within the City of Tucson. (Pima County is within the 100-kilometer zone of the study and is therefore included as a border county).

El Paso County is the third largest employment center within the border region with an estimated 266,000 jobs. This is approximately 10 percent of the total U.S. border employment. Employment along the Texas border is concentrated in four counties: El Paso, Hidalgo, Cameron, and Webb.

The highest employment in New Mexico is located in Dona Ana County and represents slightly over two percent of the total U.S. border employment. Again, the major population centers in the border counties of California and Texas tend to be situated adjacent to the border, while the population centers in Arizona and New Mexico are farther away from the border. Therefore, the largest employment centers on the border tend to be in California and Texas.

Per Capita Income

Table 2.9 provides historical and projected per capita income data for the four U.S. border states. The four counties with the largest population and the highest total employment do not necessarily coincide with ranking in terms of per capita income. In the case of income, San Diego County is still the leader in California, as is Pima County in Arizona; but in Texas, the lead shifts to Terrell County, and in New Mexico, the highest per capita income historically occurs in Hidalgo County. Terrell County, Texas is sparsely populated and has no port of entry into Mexico.

Table 2.9
Historical and Projected Per Capita Income U.S. Counties Bordering Mexico

Earnings in U.S. $'s		1973	1979	1983	1988	1990	1995	2000	2005	2010	2020	2040
	State Totals	*11766*	*13460*	*13378*	*15070*	*n/a*	*15923*	*16795*	*17516*	*18150*	*19298*	*22514*
California	**Border Counties**											
	San Diego	11030	12207	12493	14117	n/a	15031	15867	16560	17169	18268	21328
	Imperial	10552	13235	9840	9817	n/a	10911	11433	11874	12276	12994	14955
	State Totals	*9780*	*10636*	*10658*	*12035*	*n/a*	*12912*	*13734*	*14418*	*15014*	*15960*	*18626*
Arizona	**Border Counties**											
	Yuma	8276	9644	8592	9889	n/a	9561	10053	10454	10797	11359	13090
	Pima	9556	10044	10414	11536	n/a	12310	13086	13733	14297	15194	17716
	Santa Cruz	8973	8862	8262	9520	n/a	8814	9371	9841	10255	10906	12714
	Cochise	8587	7956	8187	8752	n/a	9794	10331	10784	11185	11839	13745
	State Totals	*8220*	*9540*	*9449*	*10034*	*n/a*	*11273*	*12062*	*12724*	*13314*	*14313*	*16939*
New Mexico	**Border Counties**											
	Hidalgo	8168	9850	8446	9416	n/a	10429	11126	11716	12253	13163	15552
	Luna	7224	7249	7080	7496	n/a	8316	8870	9338	9759	10474	12339
	Dona Ana	7326	7893	7988	7864	n/a	8522	9018	9429	9797	10441	12259
	State Totals	*9381*	*11296*	*11474*	*11719*	*n/a*	*12976*	*13877*	*14634*	*15300*	*16283*	*19035*
Texas	**Border Counties**											
	El Paso	7541	7897	7772	8038	n/a	8795	9325	9764	10142	10712	12455
	Hudspeth	6307	8622	7387	10589	n/a	9633	10148	10572	10955	11513	13122
	Jeff Davis	9675	14572	10677	9634	n/a	9707	10339	10854	11300	11982	13963
	Presidio	6904	10107	8460	9177	n/a	8992	9608	10128	10598	11292	13140
	Brewster	6904	10107	8460	9177	n/a	8992	9608	10128	10598	11292	13140
	Terrell	8761	10503	12691	13379	n/a	14903	15784	16516	17168	18097	20788
	Val Verde	6715	6973	6745	7129	n/a	8121	8645	9088	9478	10074	11764
	Kinney	6863	8621	8321	9374	n/a	8689	9340	9890	10376	11079	12905
	Maverick	4421	4844	4640	4472	n/a	5339	5657	5923	6156	6496	7500
	Webb	5380	6143	5610	5986	n/a	6538	6996	7379	7712	8204	9576
	Zapata	5764	6130	5865	5920	n/a	6353	6769	7117	7424	7883	9202
	Starr	4049	3609	3971	3464	n/a	3713	3925	4100	4252	4479	5187
	Hidalgo	5212	6063	5881	5865	n/a	6690	7140	7514	7836	8312	9699
	Cameron	5769	6699	6306	6319	n/a	7303	7870	8351	8771	9383	11011

Data Source: County Projections to 2040 (1992); U.S. Department of Commerce

Generally, the per capita income of the border counties is below the state average. In 1995, the estimated average per capita income in California was $15,923. San Diego County was slightly below that average at $15,031 while Imperial County was well below the average at $10,911. In Texas, the difference between the state average income and the border counties was more dramatic. With the exception of Terrell County, which was above the state average, the remaining 13 counties have a per capita income of $7,605 compared to the state average of $12,976.

The greatest range between individual border counties occurs in the case of Starr County, Texas, versus San Diego County, California, which had projected 1995 per capita income values of $3,713 and $15,031, respectively. Starr County is located in the agricultural region of south Texas. On the other hand, San Diego County is a large metropolitan area located on the Pacific coast with diverse economic activities.

2.7 Pipelines

Seven pipelines currently cross the U.S.-Mexico border: one is located between the states of Arizona-Sonora, and the other six cross between Texas and the states of Chihuahua, Coahuila, and Tamaulipas. No existing lines were identified between the states of California-Baja California and the states of New Mexico-Chihuahua. However, two additional lines have been granted permits but are not yet constructed.

2.7.1 Existing Flows

Table 2.10 shows the historic trend in natural gas shipments from the U.S. to Mexico (north to south) During this period the average daily volume has varied from a low of 96.6 million cubic feet in 1993 to a high of 250 million cubic feet in 1992. In 1995, approximately 173 million cubic feet of natural gas was exported to Mexico by the U.S. Since the decline that occurred in 1993, there has been a consistent increase in the amount of natural gas flowing into Mexico from the U.S. over the past three years. The value of the natural gas exported in 1995 was approximately $100 million ($U.S.).

Table 2.10
Volume of Natural Gas Flowing North to South 1992-1995

	1992		1993		1994		1995	
Crossing	**Vol.**	**Value**	**Vol.**	**Value**	**Vol.**	**Value**	**Vol.**	**Value**
Reynosa-Hidalgo	___	___	66.49	52.16	85.71	53.94	122.95	71.05
Cd. Juarez-El Paso	___	___	22.92	18.18	33.78	23.20	39.13	22.11
Naco-Naco	___	___	5.23	4.59	3.95	3.40	8.72	4.39
P. Negras-Eagle Pass	___	___	1.98	1.89	2.07	1.61	2.13	1.59
Total	250.31	179.46	96.61	77.53	125.07	82.19	172.92	99.13

Source: PEMEX
1 average daily flow in millions of cubic feet.
2 annual value of natural gas.

2.7.2 Existing Pipelines

Arizona-Sonora: El Paso Natural Gas has one natural gas pipeline that crosses the Arizona-Mexico border. This 8-inch outer diameter line crosses the border between Naco and Douglas, running to a copper mine.

Six pipelines cross the US-Mexico border within Texas: one owned by Western Gas Interstate Company, two owned by Texas Eastern Transmission Corporation and three owned by Valero Transportation Company, L.P. Each pipeline conveys well head natural gas. There are no known pipelines which convey crude petroleum or refined petroleum products.

Texas-Chihuahua: Western Gas Interstate Company, a wholly owned subsidiary of Southern Union Co., owns one 12-inch natural gas line in El Paso that crosses the Rio Grande into Ciudad Juarez, Chihuahua. One additional line has a federal permit and several lines are inactive. According to the U.S. Federal Energy Regulatory Commission (FERC), as an interstate carrier this line is not subject to regulation by the Railroad Commission of Texas (RRC).

Texas-Tamaulipas: The two Texas Eastern Transmission Corporation pipelines are both 20-inch diameter lines and provide a tie-in between the Texas Eastern 30-inch diameter McAllen-Vidor

Line at Hidalgo, Texas, with the Petroleos Mexicanos plant across the Rio Grande in Reynosa, Tamaulipas. The two lines are configured as a loop, with one line (eastern or downstream) as the primary and the other (western or upstream) as an auxiliary line. Both lines are regulated under Permit No. 04143 by the Texas RRC.

One of the Valero Transmission Company L.P. pipelines that crossed the international boundary is also located near the Penitas community in Hidalgo County. This 24-inch diameter line runs from the Penitas Dehydrating Station southward into the State of Tamaulipas.

Texas-Coahuila: The other two Valero pipelines that cross the Rio Grande are located in Maverick County downstream from Eagle Pass. This pair of eight-inch diameter lines crosses into Mexico at the same location and is linked by a single line (variously 10 inches and 6 inches) to the Chittim Compressing Station some 20 miles to the northeast. All three Valero trans-border lines are regulated by the Texas RRC under Permit No. 03883.

2.7.3 Proposed Pipelines and Service Improvements

California: San Diego Gas and Electric Co. has received a Presidential Permit to construct a proposed natural gas pipeline into Mexico.

New Mexico: Gas Company of New Mexico has received a Presidential Permit for a proposed natural gas pipeline which would cross into Mexico west of El Paso. Currently, the company is acquiring BLM right of way and permits for an eight-inch gas line that would branch off of El Paso Natural Gas' California line near Chamberino and run 18 miles south to the Santa Teresa Industrial Park. An additional eight-inch line is proposed that would cross into Chihuahua between the Port of Entry and the cattle crossing five miles from the Industrial Park.

Texas: Several pipelines are proposed, or under review, in the state of Texas. Short descriptions of these projects follow.

There are plans to add a new compression station at Reynosa to boost transmission capacity. The proposed plans should add approximately 500 million cubic feet of daily capacity to the cross border flow.

MAPCO, Navajo Refining Company, and AMOCO have a jointly owned pipeline that is nearly complete and will deliver propane and butane to a terminal south of Juarez from originating liquefied petroleum gas (LPG) plants in West Texas and New Mexico. It crosses the border about 15 miles east of El Paso and, in Mexico, is owned by PEMEX.

Chevron Pipeline Company has received a Presidential Permit and IBWC has issued a license allowing the construction of and 8-inch diameter pipeline to cross under the Rio Grande approximately 3.5 kilometers downstream of the Bridge of the Americas in the El Paso, Texas/Ciudad Juarez area. The pipeline will transport gasoline, diesel, and kerosene between the Chevron Refinery in El Paso to the PEMEX storage and distribution plant located in the city of Ciudad Juarez , along the highway to Nuevo Casas Grandes, Chihuahua.

Rio Grande Pipeline Company has received a Presidential Permit and IBWC has issued a license allowing the construction of an 8-inch diameter LPG pipeline to cross under the Rio Grande near the community of Clint Texas/San Isidro, Chihuahua. The pipeline will transport LPG from Hudspeth and El Paso Counties, Texas to the PEMEX, Mendez Terminal in Ciudad Juarez , Chihuahua, Mexico.

El Paso Energy Company has applied for license to construct a 24-inch natural gas pipeline to cross under the Rio Grande near the community of Clint, Texas/San Isidro, Chihuahua. The pipeline will transport natural gas from the pumping station in the U.S. to

the Commission Federal de Electricidad's Samalayuca power generation plant.