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16. Abstract

This report documents the study findings on truck traffic generated from the maquila industries along the Texas/Mexico border. The report also explains the benefits of the maquilas, to both the United States and Mexico. The transportation needs of Texas are defined, promoting the vital economic health of the Texas-Mexico border region.

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by

Dock Burke, Tim Lomax
David Shrank, Ricardo Duarte, and Marvin Hodgson

Research Report 2034-2F
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Sponsored by

Texas Department of Transportation

TEXAS TRANSPORTATION INSTITUTE
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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	2.54	centimeters	cm
ft	feet	0.3048	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
	AREA			
in^2	square inches	6.452	centimeters squared	cm^2
ft^2	square feet	0.0929	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
mi^2	square miles	2.59	kilometers squared	km^2
ac	acres	0.395	hectares	ha
	MASS (weight)			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
	VOLUME			
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.0328	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3

Note: Volumes greater than 1000 L shall be shown in m^3.

	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

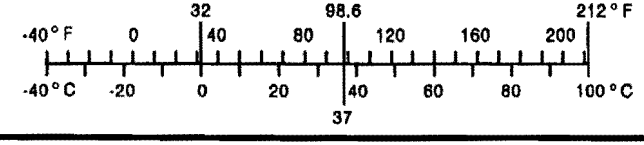
APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
yd	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
yd^2	kilometers squared	0.39	square miles	mi^2
ha	hectares (10,000 m^2)	2.53	acres	ac
	MASS (weight)			
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1000 kg)	1.103	short tons	T
	VOLUME			
mL	millimeters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3

	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

These factors conform to the requirement of FHWA Order 5190.1A

*SI is the symbol for the International System of Measurements



DISCLAIMER

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

IMPLEMENTATION

The information developed, analyzed, and presented herein can be use din TxDOT planning efforts involving border transportation plans and projects. Data/information on truck movements, maquiladora shipments, and origin-destination information for the identified crossings can also be used to estimate similar information for other crossing on the Texas/Mexico border. The resulting planning and project development efforts will be more comprehensive and accurate due to the availability of the information presented in this report.

ACKNOWLEDGMENT

The authors of this report would like to express their appreciation to the members of the Texas Department of Transportation's Planning Division, especially Mr. Joe Impey, who helped formulate this study and advised throughout at critical junctures. Special thanks go to the district personnel along the Texas/Mexico border and members of the U.S. Customs Bureau without whose help the data collection phases of the study would not have been possible. Dr. James Giermanski of Laredo State University was particularly generous in providing his insights to the transportation aspects of the North American Free Trade Agreement.

EXECUTIVE SUMMARY

Substantial increases in trade volumes have occurred in the maquiladora operations and other industries between the United States and Mexico. This increased trade volume has stimulated primarily truck traffic along the U.S.-Mexico border which has grown rapidly over the past five years. This growth has been so great as to cause concern over the adequacy of the transportation infrastructure that currently exists on the border.

In support of this economic expansion, detailed information is needed pertaining to the type, the volume, and the destination of goods for long range planning of transportation systems. This report presents some of the pertinent aspects of the maquiladora program, its operations, and salient aspects of the maquiladora industry's transportation -- principally land-based -- issues. Primary data were collected at the international bridges to document traffic and commodity movements; a separate survey was initiated among the border-sited maquilas to obtain specific information about the movements of the shipments generated by maquila operations. Finally, a preliminary assessment of some potential impacts of the proposed North American Free Trade Agreement (NAFTA) upon border transportation is presented.

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INTRODUCTION

Background

This report is part of a study to develop information which can be used by the Texas Department of Transportation (TxDOT) to assess impacts of growth in truck traffic in the Texas-Mexico border area roadway network. Dramatic increases in the maquiladora and other international trade between Texas and Mexico have generated substantial concern over the adequacy of the infrastructure systems that serve the ports of entry. These industries rely heavily on truck traffic to carry goods within the border area and between the border area and the other regions of the U.S. and Mexico.

Recent changes in Mexico's foreign trade and foreign investment policies are encouraging U.S. exports to Mexico. These changes are making the prospect of transferring or subcontracting production operations to plants in Mexico more attractive for U.S. manufacturers. In 1992, the U.S., Canada, and Mexico completed "fast track" negotiations on the North American Free Trade Agreement (NAFTA). If NAFTA is signed, traffic between the U.S. and Mexico would likely increase more substantially. Even without a NAFTA , the border communities have reported major increases in truck volume. Some border communities have reported, that truck traffic across the border bridges has doubled over past years and may double again over the next five years (*Briefing* of the Highway Commission, 1990).

Study Objective

A large percentage (up to 85%) of goods is shipped into and out of the border area on trucks. Thus, a steady functioning roadway network is vital to the economic health of the Texas-Mexico border region. The objectives of this study are:

- to identify current motor truck traffic patterns within the Texas border zone;
- to determine the current level of export, import, and "inbound" (maquiladora) traffic;

- to forecast traffic growth in these three components; and
- to identify current and future impacts (constraints) on international bridges and roadway networks within the Texas border zone.

Study Approach and Report Organization

The approach adopted for this study entailed literature review, data collection and analysis, and assessment. The materials are presented in four sections: elements of maquiladora program, some history and current operations, some transportation aspects of the maquila industry, and a brief assessment of the future of the maquiladora program (Section 1.0-1.4). The second section (2.0) presents the documentation of border cross truck movements, the survey description, survey results, forecasts of future growth, and infrastructure impacts. The third section (3.0) presents the documentation of the survey of maquiladora plant operators, a description of the resulting database, its limitations, and some selected results of commodity shipments, cross border movements, and shipments to warehouses. The last section was added to provide some preliminary assessments of the proposed language in the NAFTA as it pertains to trucking operations particularly on the Texas/Mexico border. Maps of the border area, tarriff and customs information and references are presented in the Appendix.

1.0 ELEMENTS OF THE MAQUILADORA PROGRAM

Definition

Maquiladoras, also known as "Maquilas," "Twin Plants" or "In-Bond Companies," are Mexican assembly or manufacturing operations, producing primarily for export. These plants may be 100% foreign-owned and managed, but must function as a Mexican corporation for all legal, fiscal, and labor purposes. Maquilas can be located anywhere in Mexico except Mexico City. However, most choose to locate along the U.S.-Mexican border to reduce transportation costs.

Tariff Provisions

Maquiladoras take advantage of Mexican and U.S. tariff provisions. U.S. tariff provisions allow the importation of articles assembled abroad, from U.S. made components, with duties levied only on the value added to those components (labor, electricity, components, etc.). The Mexican tariff provision states that maquilas can bring into Mexico all the material needed for export production, but the material has to leave the country within six months, or longer with special permission. The main point being that the raw material is not to be sold in Mexico or enter the Mexican economy in any way without proper authorization. The same is true for production equipment. The maquila may bring in any equipment needed for production if it is used to manufacture export goods. The equipment is in Mexico temporarily, and it will leave the country when export production is terminated. Appendix A contains a description of the Mexican and the U.S. tariff provisions benefitting maquila operations.

The Maquiladora Program has changed since its inception more than twenty years ago. Now it is easier, for companies to establish and to operate maquilas in Mexico, than it was when the program started. Today, under certain conditions, maquiladoras can sell up to 50% of the annual export value of their production in the Mexican market. A two year permit can be obtained from the Mexican Secretariat of Commerce and Finance (SECOFI). The bond

requirements for material and equipment have also been relaxed. A letter of intention from the maquiladora is sufficient in most cases.

Most maquilas utilize labor intensive production processes. This takes advantage of Mexico's low wages, among the lowest of the semi-industrialized countries. Maquilas also operate as cost centers. Meaning, the maquila will not make any profits on its operations because it will sell at cost. However, many maquiladoras report a small profit margin, usually less than three percent, for profit sharing purposes.

History of the Program

The first maquila plants began as simple assembly operations, primarily sewing shops, in the early 1960's. At that time the U.S. government was ending the Bracero Program. In the Bracero Program, Mexican farm workers were brought to the U.S. to harvest agricultural products. The Mexican government feared a large unemployed work force on the border. It began what was then called the Border Industrialization Program and today has become known as the Maquiladora Program. Its purpose was to attract U.S. industry to the border in an effort to provide employment for migrant workers. The electronics industry came to Mexico soon after the program was introduced. Many large electronic firms had operations in Taiwan, Korea, or Singapore, but transportation costs were high and Mexico offered a viable, less costly alternative. The latter half of the 1960's was a period of evaluation for U.S. companies as no one knew how long the Maquiladora Program would last.

During the first half of the 1970's, there was some growth in the industry, but it was not rapid. One reason, Mexican wages exceeded Korean and Taiwanese wages. At this same time, the U.S. was experiencing a recession that was particularly hard on the electronics industry. Some new maquila plants closed, and those that did not reduced their work force and struggled through those years.

Near the end of 1976, the first peso devaluation hit Mexico. The cost per hour in terms of dollars fell by almost 40%. During this period, the automobile industry was beginning to move into Mexico. Large assembly plants were constructed, and most were using the latest and most advanced manufacturing technology. These plants were more automated and had more manufacturing operations than the assembly-only operations of the electronics industry.

During the late 1970's, the price of oil was rising rapidly, and Mexico had discovered huge oil reserves. The increase in income due to the sale of oil created high inflation and pushed up the minimum wage. The expansion of the maquila industry came almost to a halt except for the auto industry. The labor cost per hour in terms of dollars was more than $1.50 in 1982. Parent corporations of the maquilas started to look for alternatives. Near the end of 1982, with the large devaluation and the nationalization of the banks, it seemed the Mexican economy and the Maquiladora Program were about to collapse. After the devaluation, labor cost dropped to $0.76 per hour, among the lowest of the semi-industrialized countries, and the rush of new maquila plants began (*Twin Plant News*, Jan. 1991).

Development of the Maquila Plants

During the latter part of the 1980's, the maquiladora industry experienced phenomenal growth. In 1984, there were over 670 maquilas plants employing almost 200,000 workers (Mirowski, May-June 1989). By the end of 1990, there were 1,880 maquila plants employing over 430,000 workers (*Twin Plant News*, Jan. 1991).

Today, we see more maquilas in the interior of the country. These Maquilas are taking advantage of a more abundant, stable, less costly, and better educated work force. Also, an increasing number of smaller companies are establishing maquiladora operations.

The NAFTA has been proposed for implementation in 1993. If this agreement is approved, trade between the U.S. and Mexico will likely increase enormously. The maquila industry has already helped prepare the ground for such a significant event.

Growth in Trade Between the U.S. and Mexico

The maquila industry has experienced extraordinary growth since its beginning in the late sixties. It began as a few small assembly plants employing a few hundred workers and has grown to almost 2,000 plants. Many of them operate with the most advanced manufacturing technology available and employ 449,000 Mexican workers. During the early years, the work force consisted predominantly of young females entering the Mexican labor market for the first time. Today, the percentage of females has dropped to less than 60% of the maquila work force (Fatemi, 1990).

Official statistics from the **Instituto Nacional de Estadistica e Informacion** and the *Twin Plant News* place growth at an annual rate of increase of 14.7% as the number of maquilas in Mexico grew from 120 in 1970, to 1,987 in 1992. During this same period, total employment increased at an even higher annual rate of 16.7%, from 20,000 in 1970 to 459,000 in 1992. By 1992, Ciudad Juarez had 300 maquilas, followed by Matamoros (76), Reynosa (61), Nuevo Laredo (58), Ciudad Acuña (43), and Piedras Negras (40). In terms of employment in the maquilas along the Texas-Mexico border, Ciudad Juarez leads with over 130,000 people working in its maquilas, followed by Matamoros (38,268), Reynosa (30,000), Ciudad Acuña (15,000), Nuevo Laredo (10,000),and Piedras Negras (7,436).

Between 1986 and 1990 trade with Mexico grew enormously. In part because Mexico entered into the General Agreement on Trade and Tariffs (GATT). In 1986 U.S. imports were $17.6 billion and exports $12.4 billion. By 1990, U.S. imports increased to $30.5 billion, a 73% increase, and exports increased to $29.5 billion, a 137% increase. Texas' exports to Mexico have more than doubled in the past four years, from $5.6 billion in 1987 to over $12 billion in 1990. The Texas Department of Commerce estimates almost 15% of all maquiladora supplies are purchased in Texas. This means that Texas supplied $1.5 billion in materials to maquiladoras in 1990, or over 12% of all Texas' exports to Mexico (*Briefing* of the Highway Commission, 1990).

1.1 MAQUILA OPERATIONS IN MEXICO

Advantages for Private Corporations

Under the Maquiladora program, companies that manufacture in Mexico and distribute in the U.S. achieve competitive advantages in labor costs, logistics, transportation, and management. Thus, they have become more competitive at home and abroad.

Relative to other semi-industrialized countries, the low wages are the fundamental reason for locating labor intensive operations in Mexico. Due primarily to the collapse of the international price of oil and the subsequent devaluations of the Mexican Peso in 1981-1982, Mexican wages became and continue to be a bargain on the world labor market. During the second half of the 1980's, Mexican wages stayed constant, but in Korea, Taiwan, and Singapore, wages rose in terms of dollars. Mexican workers' productivity has been found to be similar or even superior to that of American workers.

The Mexican economy has been showing signs of healthy growth, but the Peso is not expected to appreciate relative to the dollar any time soon. In the near future, Mexican wages should increase in real terms as the Mexican economy grows and more companies establish maquila operations. Even then, we can expect Mexican wages to stay substantially lower than U.S. wages for years to come.

As more companies establish maquila operations, the competition for skilled labor will intensify, especially in areas where a high concentration of maquilas already exist. This situation has already been observed in some border communities, where shortages of skilled labor have put constraints on the continued growth of those communities.

Most maquila operations are near the U.S.-Mexican border. Companies can easily link their maquila operations with existing U.S. operations via highway, rail, or air. Transportation

costs from the U.S. to Mexico may be only one tenth the cost of transportation from the U.S. to the Far East. Shipping time is also greatly reduced. Usually items can be shipped from anywhere in the U.S. to the Mexican border within three days. Generally, the shipping time to or from the Far East is between two and three weeks. As transportation time is reduced, storage costs are reduced and inventory is held at lower levels, freeing up valuable capital for the company. The close proximity to Mexico has enabled maquilas to establish just-in-time (JIT) inventory systems. This lower inventory level enables the company to respond more quickly to changes in demand or to consumer preferences.

Many companies establish maquilas to perform assembly-only operations. The assembly material comes as a kit of items that will be assembled in the maquila plant. This kit is usually prepared in the U.S. using U.S. made components. This procedure allows for excellent cost control, product flow, and flexibility. Another advantage of maquilas is that its managers have the choice of living on either side of the border, and many take advantage of the educational, cultural, and economic benefits of both countries. Non-Mexican managers, engineers, and technicians critical to the success of the maquila plant can obtain a two year work permit from Mexican authorities.

Maquiladora plants located close to the U.S. are able to quickly obtain critical supplies, components and equipment, an advantage of a border location. It prevents lengthy production delays which may be commonplace in production sharing operations located in more remote areas of the world.

The Mexican government allows raw materials and equipment to be brought into the country duty free. Equipment needing repair can be evacuated from the plant in Mexico, repaired in the U.S. or elsewhere, and returned to the plant without paying duties. This is particularly beneficial to a production facility which must periodically refurbish its manufacturing equipment. Raw materials are also free of duty, if they are also used for export production. Maquiladoras can operate as cost centers and not as profit centers. Therefore, they don't pay Mexican taxes. They do, however, have to pay all of the obligations associated with their

employees; such as social security, medical insurance, profit sharing, etc.

During the last decade, Mexico initiated a debt-equity swap program, to reduce its huge foreign debt. The program has been momentarily suspended, as it is inflationary if the money is not used to generate further growth in the economy. Companies initiating new operations are seen favorably by this program. In the debt-for-equity conversion program, a foreign bank holding Mexican public debt negotiates a sale of that debt to an investor for a discount on the face value. The investor then sells those dollars at face value to the Mexican government and buys Pesos at a discount, which can be invested in a new or existing company, upon approval of the Mexican government.

Companies with maquila operations are in a better position to understand the Mexican market and to establish operations serving the local market. International experience is also gained through maquila operations, which can be helpful when establishing operations in other parts of the world. A maquila operation allows a firm to gain experience in Mexican manufacturing operations and in Mexican distribution which may lead to the development of the vast Mexican market. Under present Mexican law, a maquiladora may sell up to 50% of its production in Mexico, upon government approval.

Benefits for the U.S.

The maquiladora program has helped the U.S. economy as a whole. Maquila products have a higher content of U.S. components than similar goods produced overseas. This means that maquiladoras create business for U.S. companies, creating more jobs in the U.S. Many companies have stated if they were not producing in Mexico, they would be producing overseas. Plants overseas tend to use fewer U.S. made components, resulting in an immediate cost of several hundred thousand American jobs. But not everyone agrees with this concept; the labor unions argue that the maquilas take jobs away from American workers. They cite as an example the growth in the number of car manufacturing plants in Mexico, while in U.S. car plants are closing and laying off record numbers of employees.

Most maquiladoras acquire their supplies from U.S. sources and less than 2% of their supplies come from Mexico. It is estimated that imports from U.S. owned maquiladoras contain about ten times more U.S. made components than similar products imported from U.S. subsidiaries overseas. This same situation is observed with foreign owned maquiladoras (Fatemi, 1990).

During 1985, maquila production had the highest U.S. content of any production sharing country. U.S. content of maquiladora produced goods was approximately 53%, versus 30% for goods produced in Canada, 2% for those produced in West Germany, and 19% for Taiwan's produced goods. This data clearly indicates the positive effect of the Maquiladora Program on U.S. business and employment. The significance of the higher U.S. content is that maquiladoras are much more integrated with U.S. operations than the U.S. plants located overseas (Maquiladora Impact Survey, 1987).

The value of U.S. components used by maquiladoras has increased from $1.1 billion in 1979 to $10 billion in 1990, and is expected to continue increasing with or without a U.S.-Mexico Free Trade Agreement. It is estimated that over 30,000 U.S. companies are supplying materials, components, machinery and services to maquiladora plants. The maquiladora industry may well provide support to over 3,600 major businesses by employing over 2.4 million American workers (Maquiladora Impact Survey, 1987).

Various studies have found, about 10 percent of the wages that Mexicans working in the border cities receive are spent on the U.S. side. This situation stimulates the economy and creates jobs in the U.S. border towns. It is estimated that for every 10% increase in maquiladora employment, a 2-to-4% increase in employment is observed in U.S. border communities (Fatemi, 1990).

Benefits for Mexico

The U.S.-Mexico border is unique. Nowhere in the world do two neighboring countries have such disparity in their respective per capita income level. In 1986, per capita income in U.S. border communities was less than $8,000, while in Mexico it was $1,500. In an effort to raise the standard of living of the Mexicans living close to the border, the Mexican government created the Border Industrialization Program, better known as the Maquila Program, during the late 1960's.

From the viewpoint of the Mexican government, the maquila industry has been beneficial in easing the problem of unemployment in the northern region, and it has become the second largest source of foreign exchange earnings. At this point, the Maquiladora Program has failed to achieve any of the Mexican government's original aspirations. The integration of the maquilas into the overall Mexican industrial complex, the effective transfer of technology, the solving of structural unemployment problems, and the relief of the country's massive poverty problems have not occurred.

The Maquiladora Program is responsible for creating almost half a million direct jobs in northern Mexico. This number represents less than 2% of the Mexican labor force. It is, nonetheless, a contribution toward alleviating Mexico's economic and unemployment problems in the border communities.

A large number of companies are making long-term permanent investments in Mexico by building state of the art manufacturing facilities. The days of the assembly-only operations are slowly disappearing. The new technology requires a high level of training in the work force. In addition, the skilled labor market has become tighter in those communities with a high concentration of maquiladoras, and high turnover levels can increase the maquiladora labor costs. Most large companies have established extensive training courses for their workers, many times training them in their U.S. installations.

The Maquila Program has not contributed to the integration of Mexican and maquila industries or to an effective transfer of technology. Even though maquiladoras have mentioned on numerous opportunities their desire to buy materials from border suppliers when possible, less than 2% of all maquila components are of Mexican origin. Several factors may explain why Mexican suppliers have not become more fully integrated with the maquiladora industry. The factors include a) government policies which isolate the maquiladoras from domestic industry; b) the government emphasis on short term benefits such as capital formation and jobs; c) the shortage of social infrastructure including transportation, telecommunications, etc.; d) the maquiladoras' perception that Mexican suppliers are noncompetitive and non-certifiable; and e) the geographical separation between Mexico's best industries, located in the interior and the maquiladoras, located in the frontier.

The suppliers and the maquiladoras are widely separated geographically. Mexico's most qualified suppliers are located in Mexico City, Guadalajara and Monterrey. The maquiladoras are predominately located in Mexico's frontier with the U.S. The geographical distance represents a significant barrier to trade given Mexico's limited distribution and communication systems. If Mexican suppliers are to successfully penetrate the maquiladora market, they must establish production or distribution center facilities in major maquiladora communities.

1.2 FUTURE OF THE MAQUILADORA INDUSTRY

Factors Affecting the Maquiladora Industry

Maquila plants located along the border region have suffered a high turnover in their work force. There are two reasons for this. The assembly-only operation of the maquiladora industry produces high turnover rates due to the manual, repetitive nature of the work. As a result of the abundant supply of workers, Maquilas could afford to pay the minimum salary and still obtain the workers they needed. This is beginning to change. During the past few years maquilas along the border have experienced shortages of skilled labor for their new

manufacturing plants leading companies to offer higher salaries and pay more attention to their turnover problem.

The Maquilas along the border have a high turnover because most of the labor force in the border area has immigrated from other parts of Mexico. Many times, the border town is a stop before entering the U.S. A high number of maquilas are now establishing operations in Mexico's interior. The interior provides a stable, and better educated work force.

The rapid increase in the number and the size of maquila plants has put great strains on the border communities. The aggregation has led to shortages in housing, water, communications and even workers. Also, roads are deteriorating, sewer problems threaten the population's health, and the Rio Grande has become the most polluted river in the U.S. These problems have been aggravated by the Mexican government's diversion of funds from these border regions to other regions in Mexico's interior. Border towns have become more vocal in the last few years. The requests are for the taxes collected from the border region to be re-invested in those communities.

Infrastructure problems on the U.S. side include inadequate physical facilities to handle the large volume of motor vehicle traffic. There is a need for improved border crossing procedures and customs inspections. Seemingly endless delays can occur at the border, especially when inspectors are looking for suspected drug shipments. During peak hours, weekends, and holidays, it is not uncommon for trucks to wait up to three hours before entering the U.S.

On the Mexican side, infrastructure problems are even worse. In some border locations, the increase in the number of maquilas has overwhelmed the community's ability to provide adequate water, sewage disposal, roads, electricity, housing for workers, and in some cases even workers themselves. In response to these problems, some cities have stopped trying to lure companies into setting up operations in their communities.

The Mexican side of the border also lacks adequate physical facilities to handle the large volume of truck traffic entering Mexico daily. Inadequate telecommunication systems have been another serious impediment of economic growth. The new administration in Mexico has promised to privatize the communication industry, which should be an opportunity for investors and a gain for business.

Issues Affecting the Future of the Maquiladora Industry

The North American Free Trade Agreement is being negotiated by both administrations in accordance with the "fast track" approach, which in effect minimizes the ability of the U.S. Congress to modify the language in the agreement. Just released in September 1992, the language is based on the Canada-U.S. Free Trade Agreement signed during the Reagan administration.

Given the presence of a NAFTA, labor costs in Mexico should rise, in real terms, as a direct result of greater labor demands, stimulated by greater commerce, as well as the probable influx of third-country firms to the Mexican economy. If Mexican labor costs increase substantially, the present competitive advantage of U.S. maquilas will begin to erode.

Many followers of the Free Trade Agreement question what will happen to the maquiladora industry in a free-trade arena. According to the Border Trade Alliance, the maquiladora industry will undergo changes to adapt to its new status. In a sense, the industry has already operated in a free-trade environment, and the industry will not disappear under a free trade agreement. In a free trade environment, U.S. owned maquilas will probably convert into regular foreign investments, becoming more integrated with the Mexican economy. Most importantly, a free trade agreement will also create more opportunities to sell products assembled or manufactured in maquiladoras in Mexico.

If an infrastructure able to handle the increase in traffic and commercial activity is not adequate when the NAFTA is implemented, the success of this accord could be jeopardized. In recent years, the Mexican government has taken steps to advance the development of an efficient transportation industry serving Mexico. Transportation has begun to become deregulated, in some cities more than in others. Recently, the Mexican government announced that U.S. truck companies could operate in Mexico within 26 miles of the U.S. border. It is expected that Mexico will allow U.S. companies to operate, on a larger scale, in Mexico. Even when U.S. drivers are permitted to operate in Mexico, it is unlikely that there will be a rush into Mexico by U.S. drivers. U.S. truckers would face a unique and challenging road, highway, and cultural environment as comfortable motel accommodations are scarce and very expensive. Repair service and spare parts can be difficult to find at times. The quality of the fuel can cause motor damage on U.S. engines designed to operate with a higher quality fuel (*U.S. Trucking in Mexico*, 1990).

Just recently, a U.S. trucking company became the first to establish a fully owned subsidiary in Mexico. This demonstrates that the Mexican government will allow greater involvement by foreign companies in Mexico. Both the U.S. and Mexico have stated that they are working on a possible international license that would permit drivers from both countries to operate in either country. Also, both countries have been working on a common trucking legislation. The legislation would enable tractors and trailers from both countries to operate in either nation. On this issue, it is expected that the Mexican government will accept the stricter U.S. legislation, if they are to operate in the U.S.

Companies from other countries are beginning to set up operations in Mexico. Locating companies in Mexico enables these countries to take advantage of the Maquiladora Program with its proximity to the U.S. market, and to take advantage of Mexico's GSP condition, the generalized system of preferences. In the very near future, we will begin to see a large number of companies from Korea, Taiwan and Hong Kong establishing maquila operations, as these countries lose their GSP status.

Japanese firms are cautious about moving too fast into the U.S.-Mexico border region in search of short-term gains, even though they recognize that the Maquiladora Program and U.S. tariff policies present an opportunity for Japanese corporations to regain international competitiveness that has been eroded by their appreciated Yen, and to bypass U.S. import quotas.

If the U.S. sees a big increase in the number of foreign owned maquiladoras, it might feel that the competitive advantage that it was obtaining from this Maquila Program is being reduced or lost. This situation could encourage U.S. companies to oppose the program and lobby the U.S. government to drop the favorable import tariffs. Despite the controversy being generated, most maquilas still purchase the majority of their components from the U.S. In that sense, the benefits the U.S. derives from foreign owned maquilas are similar to the benefits derived from U.S. owned maquilas.

The Maquiladora Industry in the 1990's

In the past few years we have seen a shift in the maquiladoras configuration, from assembly-only to fully integrated manufacturing. The average factory work force rose from 148 in 1975 to 230 in 1992. The composition of the maquila labor force has been changing over the years. During the early years of the Maquila Program, women made up over 90% of the work force in 1970. This was probably because the repetitive nature of the job was very unappealing to the male worker. With the introduction of manufacturing operations, heavy industry and the shortage of labor along the border, the proportion of male workers has been steadily increasing. In 1986 only 35% of the maquila labor force consisted of males. In 1990 this number increased to about 45%. This trend is expected to continue as companies establish more state of the art manufacturing facilities and abandon the assembly-only operations. (Fatemi, 1990).

The rapid increase in the number and size of maquila plants has led some maquiladoras to seek less-expensive land, a more reliable infrastructure and a stable labor force in the interior of the country. Improvements being made to the Mexican highway system are facilitating this

trend.

Raw materials and components parts are sent from the U.S. parent, assembled or manufactured in Mexico, and then returned to the parent as a finished product of subassembly. Today, however, a new variation has emerged: the supplier maquila. As more large scale manufacturing enters Mexico with its demand for just-in-time delivery of supplies, manufacturers are pressuring their suppliers to open maquilas nearby. The result has been recent approval for inter-maquila transfers, or non-taxable sales between maquiladoras. This represents the best opportunity for Mexican companies to start serving the maquiladoras. Also, as companies begin to establish operations in the interior of the country, where the most efficient Mexican manufacturing companies operate, the likelihood of interaction between the maquilas and these Mexican companies is greatly increased. This situation is already occurring. Maquilas in Mexico's interior buy a higher percentage of their components from Mexican companies than maquila's operating along the border with the U.S.

1.3 SOME TRANSPORTATION ASPECTS

Land Transportation

In 1989, the maquiladoras in Mexico shipped more than $12 billion in components and products into the U.S. This represented about 17% of U.S. imports. Neither finished products nor raw materials go anywhere without efficient transportation. Transportation availability, cost, and efficiency are three important factors to all maquiladoras (Old, December 1990).

As the number of maquiladoras increased, the transportation industry serving the Maquilas grew, and became more advanced. Trucking companies on the border went out of business as new companies moved in to provide service that the older, smaller firms could not offer. It is estimated that 85% of all freight between the United States and Mexico moves on the ground, the vast majority by truck. A general problem of truck transportation out of Mexico

is inefficiency: insufficient border crossing bridges and the slowness of bridge crossings and U.S. Customs clearances, due largely to the number of regulations and the manner in which U.S. Customs manages the process. In part, this is caused by the need for tedious inspections as part of the "war on drugs." Maquila loads have to be checked because they have been used by drug smugglers. Not much improvement in U.S. clearing times should be expected until the need for time consuming drug checks diminishes and more Customs personnel are available for clearing maquila shipments.

The maquiladora program has encouraged foreign companies to enter Mexico and manufacture there. Until now, the Mexican government has failed to make the accommodations necessary for efficient and economical truck transportation of maquiladora raw materials, machinery and finished products in and out of Mexico. This situation has begun to change as the Mexican government has turned to the private sector for backing. A number of toll-road highways are under construction in the northern part of Mexico. This improved highway system will probably lead to a rapid increase in the number of maquilas establishing operations in Mexico's interior.

Mexico shares a border with four U.S. states: Texas, New Mexico, Arizona, and California. The Texas border has the highest volume of border crossings in terms of number of pedestrians, trucks, automobiles, and trains. As of December 1991, there were twenty-two border crossing points along the Texas-Mexico border. The locations are shown in the series of maps (located after the appendix) representing the Texas-Mexico border. Map 1 shows the entire border; Maps 2-a and 2-B show the Lower Rio Grande Valley crossings; Map 3 shows the area around Laredo; and Map 4 shows the area surrounding El Paso. *(International Border Crossings*, December 1991).

Implications for Border Cities' Transportation Infrastructure

If the NAFTA becomes a reality, the already large volume of goods going both ways could increase enormously, and transportation would become even more important than it is now. The rapid increase in traffic between the U.S. and Mexico has outpaced border infrastructure improvements and has overloaded some existing border facilities.

The border communities have realized that they must upgrade their facilities to handle the increasing number of vehicles coming from Mexico or crossing their cities on their way to Mexico. They understand that without the infrastructure in place to handle the growing number of trucks, they will be left outside the economic growth that this increase in trade will bring. They realize that infrastructure and administrative policies represent serious barriers to trade. New international bridges, ports of entry, and facilities may be needed to facilitate trade. Knowing this, the border region has active and vocal associations that support increased trade with Mexico. They participate actively in projects leading to better international crossing bridges and an improved overall transportation infrastructure.

El Paso is one of the largest ports of entry on the southern border with Mexico. El Paso facilities handle more total vehicles and merchandise releases than any other southern port. The Bridge of the Americas is undergoing renovation, including a paved expansion of the import lot, construction of six release booths, and truck scales. Other improvements include the construction of two primary lanes, 3 secondary spaces, a 55 truck dock facility, primary lane pollution abatement and the renovation of the administrative building.

The Brownsville port of entry must be accessed through the downtown streets of Matamoros and Brownsville. The U.S. Customs import lot at Laredo is a narrow parking lot located behind and beneath a motel. The El Paso U.S. Customs lot is too small to handle the 700 commercial vehicles daily. These and similar situations have caused business to undertake various improvement projects.

The city of McAllen is requesting the construction of a cold storage facility. The facility needs to be large enough to accommodate semi-trailer loads of produce. Such a facility would allow for the inspection for loads in a temperature controlled environment, reducing the risk of loss due to spoilage. A new highway between Monterrey and Reynosa/McAllen is under construction. This highway, and the one connecting Laredo and Monterrey, will establish Monterrey as one of the best cities in which to establish operations.

For a long time, Laredo has been one of the main ports of entry for Mexican products. In 1988, Laredo handled 40% of all truck shipments from Texas to Mexico and 68% of all rail shipments. The strategic importance of Laredo has been enhanced by Monterrey, Mexico's largest industrial city located 150 miles to the south . It is responsible for most of Mexico's imports and exports. Between 1986 and 1990, annual cross-border truck shipments through Laredo's two crowded bridges increased by over 120%, from 208,000 to over 460,000. Without a Free Trade Agreement, it is estimated that in 1995 over 750,000 cross-border crossings will occur. With a Free Trade Agreement, close to one million crossings are expected (Briefing on the highway commission, December 1990). It is obvious that the existing procedures and facilities are not in a position to efficiently handle this enormous increase in traffic. The new Dolores-Colombia bridge is supposed to handle a large percentage of the traffic crossing the border through Laredo.

Currently there are two bridges connecting Laredo and Nuevo Laredo. Bridge 1 (Convent Street) has four lanes and bridge 2 (Juarez-Lincoln) has seven lanes (2, 2, and 3 reversible). The problem with bridge 2 is that on the Mexican side there are not any customs facilities, therefore underutilizing this bridge for southbound vehicles. Empty trucks use this bridge when going into Mexico. Because of this situation, the construction of another bridge within Laredo is being discouraged by both governments. On the U.S. side, minor constructions could be undertaken to improve Convent Street and to facilitate the traffic leading to bridge 1. Bridge 2 does not present any serious problem, probably because it connects to I-35 and there is little traffic going southbound. Due to this existing situation, there has been talk of making both bridges one way bridges. Although this might solve some problems, such as the

underutilization of bridge 2, it may create unacceptable problems to businesses located along the streets leading to the bridges. Also, in order to go from one bridge to the other, vehicles would have to travel a considerable distance before being able to turn around (Report on International Bridge Traffic Congestion, 1987).

Recently, Mexico and the U.S. have considered actions to divert some commercial traffic from the Convent Street Bridge to the Juarez-Lincoln bridge. This would necessitate improvements to the import lot of the Juarez-Lincoln bridge. Since Mexico is constructing a new truck access road within Nuevo Laredo, the U.S. has proposed to appropriate $20.5 million to build a new eighty-six truck dock and import lot east of the Laredo facilities.

A new bridge uniting Dolores and Colombia (20 miles west of Laredo) connects, on the Mexican side, with a new toll-road running to Monterrey. The Colombia bridge will be annexed to the Port of Laredo in order to minimize documentation problems shippers might encounter if the bridge is considered part of another city, not the Port of Laredo.

In addition to improvements in border crossing points, improvements in the highway system are being undertaken. An investment group in Corpus Christi has shown interest in constructing a four lane toll-road (Camino Falcon) between Laredo and Corpus Christi. Alternatively, several groups have argued that Texas Highway 44 and U.S. Highway 59 already connect both cities, and upgrading this route would be much easier and economical than building a new highway. The State of Texas is currently evaluating improvements needed on Texas Highway 44 and U.S. Highway 59.

In Brownsville, a $10.7 million renovation and expansion project is being undertaken on the Gateway bridge. Phase one of the renovation includes the addition of two primary lanes, replacement of the secondary inspection area, and construction of four truck booths. Phase two of the renovation includes the construction of a twenty truck dock facility and a fourteen dog kennel. Also in Brownsville, a $5.6 million renovation and expansion project is being undertaken on the B&M bridge. The renovation includes the construction of a replacement

station which will consist of four primary lanes, 12 secondary or access lanes and one pedestrian lane. These lanes are expandable to double their number at a future date. The import lot will have two booths and a fifteen truck dock facility. The City of Brownsville and the county of Cameron have suggested a number of possible sites for the construction of an additional bridge linking Brownsville and Matamoros. The Mexican government has shown no interest in constructing another bridge between these two cities.

In Eagle Pass, construction of five primary lanes, expansion of secondary or access lanes, and constructing of a 24 truck dock is being undertaken. Completion is expected around July 1991. Also, a presidential permit has been filed for a new bridge which would connect with Piedras Negras. A site has already been agreed upon. In Del Rio, a 40 truck dock, two additional primary lanes, 4 additional secondary spaces, 2 pedestrian checkpoints, and security facilities have all been completed within the past year.

Trucking Operations

Most of these bridges are toll bridges. Bridges in Mexico are administered by the Mexican government, while in the U.S. they are typically administered by the local communities. The result, is a uniform charge for all traffic northbound, while tolls for southbound traffic vary, depending on where the crossing occurs. U.S. cities often use different tolls as a way of controlling traffic across the different bridges. Mexico's uniform toll can be an obstacle to this traffic management practice. U.S. cities have expressed concern about Mexico raising the tolls at will, without prior consultation of the U.S. This has led the border communities to express interest in including these bridge crossing charges in NAFTA negotiations.

Even without a NAFTA, trade is expected to increase substantially during the upcoming years. The growth in traffic is expected to increase substantially as well. The existing facilities, and even the border cities, are not in a position to handle this increased traffic. The border communities must begin planning improvements to their infrastructure. If measures are taken

now to administer the increase in traffic, the border communities will have taken steps towards bringing economic progress to their citizens.

Rail Transportation

It is estimated that no more than 25% of the maquila products shipped back to the U.S. from Mexico go by rail. A free exchange of rail equipment between Mexico and the U.S. exists. With a uniform track gauge, merchandise can be moved from the U.S. to Mexico, and vice versa, without the need to transfer it from one car to another (Old, December 1990). The major inconveniences associated with rail transportation are the lack of flexibility and the transit time. This is why railroads are used when the distances are long and the unit cost of the goods is low. Otherwise, inventory holding costs during transit could mount considerably.

Ferrocarriles Nacionales de Mexico (the principal Mexican line) receives the loaded railroad cars from Texas at any of its border crossing points. All these units must be returned to the U.S. through the same points, and about 75 percent of them return empty. This situation represents a great opportunity, for maquiladoras exporting back to the U.S., to use the railroad system to their advantage.

Mexico has rail links with Texas from all the following important maquiladora cities: Brownsville-Reynosa, Laredo-Nuevo Laredo, Eagle Pass-Piedras Negras, Presidio-Ojinaga, El Paso-Ciudad Juarez. The following railroad companies serve Texas: Union Pacific (UP), Southern Pacific (SP), and Atchison, Topeka and Santa Fe (AT&SF). The railroad industry is beginning to appreciate the importance of serving the growing number of maquiladoras. It is making the necessary investments to efficiently serve this expanding industry.

The increase in U.S.-Mexico trade has impelled Union Pacific to open a new $12.5 million intermodal facility 12 miles north of downtown Laredo, as the downtown Laredo facility had been operating at full capacity. Union Pacific crosses about 600 cars a day to and from Mexico at Laredo. This number represents slightly less than 70 percent of Union Pacific's

Mexican traffic. Between 30 to 40 percent of the business with Mexico is related to maquilas. Union Pacific also serves Brownsville and has service to El Paso using Southern Pacific tracks.

Southern Pacific serves six ports of entry into Mexico. About 30 percent of Southern Pacific's Mexican business is related to maquilas. In an effort to compete against the trucking industry, Southern Pacific recently introduced a 36 hour service from El Paso to Chicago. This is very competitive as compared to the service provided by trucking companies. Both Union Pacific and Southern Pacific provide direct rail connections to the following cities in Texas: Dallas-Ft. Worth, Houston, Austin and San Antonio. Atchison, Topeka and Santa Fe Railway Company link the Texas-Mexico border area with the Southwest.

The railroad industry has struggled in the past, and this situation is not expected to change anytime soon. During the last decade, the major railroad companies have reduced the number of miles they operate. Often, sections are sold to smaller regional railroad companies. Although this has been a nationwide trend, Texas has been affected less than other states. This same trend is being observed with the size of their fleet. Nationwide, the revenues, in current dollars, per ton-mile have stayed somewhat constant during the last year. In constant dollars, this figure shows a constant decline in real revenue per ton-mile. These outcomes reflect the difficulty the railroad industry has in competing effectively against the trucking industry, except when the railroad is transporting traditional bulk rail commodities, such as coal, steel, grain, etc. (*Railroad Facts*, 1988).

Today, transportation companies must offer competitive prices, reliability, speed, and flexibility. Railroad companies, who have been trying to upgrade their services to better compete against the trucking company, are now in a position to offer competitive prices. However, their services are often slow, unreliable, and do not offer the flexibility of the trucking companies. Recently, various railroad companies have begun to offer double-stack trains into Mexico. This business, piggyback trains, is the one which has experienced the most growth in the last five years. It promises to be one of the growth areas in the railroad industry's future.

The railroad companies serving the maquiladora industry are upgrading their facilities. If NAFTA is implemented, the need for enlarged storage facilities in the cities neighboring the border would likely be greatly reduced. On the other side, Mexico has taken on the task of improving its railway network and the operation of their railroad companies. Improvements are already being observed, as many maquiladoras have switched to rail transport for low price, high volume goods.

Air Transportation

As air transportation becomes more economical, it is expected to boom in Mexico in the next few years. European and Canadian companies will probably use air transportation. It will be feasible to ship high priced goods by air over long distances. Increased competition, combined with the increased popularity of just-in-time delivery to reduce inventory costs. It has meant not only more efficient and faster service but also a growing reliance on overnight air freight serving the maquiladora industry.

Maquiladoras that are closer to large U.S. cities have access to better air transportation facilities. Currently, no maquiladora border sites have serious air transportation problems. Texas ranks second to California in aircraft departures and enplaned passengers by commercial air carriers. More than 93% of the population residing in Texas lives within 50 miles of an airport with scheduled air passenger service (*Texas Almanac* 1988-1989).

For years a closed market to U.S. cargo carriers, Mexico opened its doors in 1988 when it signed a diplomatic accord allowing three U.S. cargo carriers in. The slots were filled by Federal Express Corp., United Parcel Service, and Amerijet International. Now that the Mexican government has shown its willingness to tolerate foreign companies operating on Mexican soil, a number of U.S. cargo carriers are expected to expand service into northern Mexico. Currently, most of the "overnight" delivery service to the maquiladoras is being provided by regularly scheduled passenger flights and special charters. Maquiladoras that are installing plants in Mexico's interior, but away from major Mexican cities, will find that these

cities often do not have a regional airport to serve their air transportation needs.

The maquila industry is expanding into Mexico's interior. With this expansion, operations will be established near major Mexican cities. Maquilas will find that they have access to regional airports thus making transportation of products by air service feasible. Also, these airports are more likely to be served by any one of the major air cargo companies. A higher volume of business from these airports will make it more profitable for overnight air freight companies. This could lead to reduced and competitive prices. Even without a Free Trade Agreement, trade with Mexico is expected to increase considerably in the future. The Mexican government is realizing that it must provide an adequate infrastructure to accommodate the rising trade. New airports will have to be constructed and existing ones will have to be upgraded. These will serve the growing number of companies from North America, Europe and the Far East coming to Mexico to establish operations. All of these factors will make air transportation more accessible and more advantageous to the maquiladoras.

Water Transportation

There is a growing interest in ocean transport for maquiladora products, especially in Europe and the Far East. Products traveling to and from Europe will probably use a Texas port. While products traveling to and from the Far East will probably use a California or Mexican port. The port of Brownsville is the closest port to Mexico. Thus, it is the most important port to the maquila industry. This port has a 17-mile man-made channel, 36 feet deep inland from the Gulf of South Padre Island. Its main turning basin has dock facilities for eight general cargo ships, tanker vessels, one bulk commodity ship and berthing space for 12 barges. A bulk-materials warehouse can store up to 30,000 tons and can receive and deliver at a rate of 30 tons an hour. The port plans to deepen the channel to 42 feet and construct a new multi-purpose terminal to handle containers, dry bulk and heavy lift cargos.

The Port of Corpus Christi is on the west side of Corpus Christi Bay. It is adjacent to the Gulf of Mexico, 156 miles directly north of Brownsville. Port facilities at Corpus Christi are along a 9-mile stretch of dredged channels and basins. It begins about 21 miles inland from the Arkansas Pass entrance to the Gulf of Mexico. The Port of Corpus Christi has four divisions along a 36.5 mile deepwater channel. All of the divisions have been dredged to 45 feet except for the last six miles of inner harbor. With the deepest channel of all the Texas ports, Corpus Christi has been primarily a bulk commodity port. Its primary commerce with Mexico has been the importation of crude petroleum brought from Pemex for refining in its oil refineries. There are 26 public docks at the main harbor for handling dry cargo, bulk materials, bulk oil and grain. There are 31 private docks to serve the major petroleum refineries. The port's railroad tracks are operated and served by Southern Pacific, Texas-Mexico Railway Company and the Union Pacific system.

There are important Texas ports at Freeport, Galveston, Houston and Beaumont. All of these are within easy distance of the Mexican Gulf ports of Tampico, Veracruz and Progreso. The use of Texas ports by the maquiladora industry is expected to increase considerably in the future. Especially if large numbers of European companies establish maquila operations in Mexico. There is already talk of constructing a new toll-road between Laredo and Corpus Christi. The State of Texas has stated that it will improve the existing highway between these two cities once it sees a marked increase in the traffic using this highway. The Port of Brownsville is already planning expansion. Other Texas ports are also planning to increase their capacity, although not necessarily due to the prospect of an increase in the number of maquiladoras. Port capacity should not be a problem in managing the added tonnage demanded by the maquiladora industry.

Summary

The maquiladora industry has experienced phenomenal growth since its inception, in the late 1960's. It has grown from a modest beginning to almost 2,000 plants dotted along the U.S.-Mexico border and throughout the interior of Mexico. As the number of maquilas has

increased, the associated transportation needs have also increased. The escalation in traffic volume has put great strains on the transportation infrastructure all along the Mexico-Texas border. The rapid increase in traffic volume between Mexico and Texas has outpaced border infrastructure improvements and has overloaded some existing border facilities. Some existing facilities are too small, congested, and antiquated. Steps must be taken now to prepare for the expected increase in trade and traffic between these two countries.

2.0 BORDER CROSSING TRUCK MOVEMENTS

Survey Description

The maquiladora survey was distributed to truck drivers in seven Texas border cities: Brownsville, Del Rio, Eagle Pass, El Paso, Hidalgo, Laredo, and Progreso. The trucks crossing the bridges spanning the Rio Grande were presented with a survey which asked the questions listed in Figure 2-1.

Figure 2-1. Maquiladora Truck Survey

1. Is this load being transferred between maquiladora plants?
   Yes ___ No ___ Not Sure ___
2. Type of facility from which you picked up your load?
   ___ Manufacturing plant
   ___ Warehouse
   ___ Railroad yard
   ___ Other
3. Type of facility where you deliver your load?
   ___ Manufacturing plant
   ___ Warehouse
   ___ Railroad yard
   ___ Other
4. What type of cargo you are carrying?
   ___ Unassembled items
   ___ Raw materials
   ___ Manufactured goods
   ___ Farm products
   ___ Other
5. Where were you coming from when you received this survey card?
   Street Address or Business Name
   City
   Zip or Postal Code
6. Where were you going when you received this survey card?
   Street Address or Business Name
   City
   Zip or Postal Code
7. How many times per week do you make this trip?
   1___ 2___ 3___ 4___ 5___ more than 5 (specify) _____

Table 2-1 contains a list of the bridges surveyed in each of the cities. An attempt was made to survey every truck which crossed each bridge. The average import truck volume for each day of the survey and the dates of the survey are also shown.

The survey was distributed to each truck driver using each bridge. A driver making multiple trips across the bridge was not asked to fill out a different survey for each trip, but only to note the number of times per week the trip was typically made. The percentage of drivers making multiple trips varied by location.

In general, the drivers were handed a survey at the exit from the U.S. Customs import lot for northbound traffic and at the weigh station or toll booth for export traffic. Export traffic was not surveyed at Bridge of the Americas due to the lack of such facilities; trucks and automobiles normally travel at high speeds through the export gate, and implementation of traffic control may have caused significant safety problems.

Table 2-1. Survey Sites and Bridges

City	Bridge Name	Average Daily Import Truck Volume[1]	Dates Surveyed
Brownsville	Gateway	710	July 29, 30, 1991
Del Rio	Del Rio-Ciudad Acuna	120	July 31, Aug 1, 1991
Eagle Pass	Eagle Pass-Piedras Negras	120	Aug 1, 2, 1991
El Paso	Bridge of the Americas	1,490	Oct 21, 22, 1991
	Zaragosa	430	Oct 21, 22, 1991
Hidalgo	Hidalgo-Reynosa	320	July 29, 30, 1991
Laredo	Convent St.	1,260	June 18, 19, 1991
Progreso	B & P	140	July 29, 30, 1991

[1] Source: United States Customs Service from each city listed in table.

Table 2-2 contains a list of these bridges with their average daily volumes of import and export traffic. The table shows data from 1988 and 1991 to illustrate the growth which has occurred. The table also shows the relationship between autos and trucks at the bridges. The total volume of vehicles primarily consists of autos, with trucks accounting for a small percentage of the vehicles crossing the bridge.

The B & M (12th Street) Bridge in Brownsville and three bridges in El Paso (Fabens-Caseta, Good Neighbor and Paso Del Norte), were not surveyed due to the low number of large commercial trucks using each bridge. The Lincoln-Juarez Bridge (Bridge #2) in Laredo was not surveyed because loaded trucks enter and exit Laredo through the Convent Street Bridge (#1). Other Texas-Mexico crossings were not surveyed due to relatively low volumes of all vehicles.

Table 2-2. Percentage of Trucks on Survey Bridges

City and Vehicle Type	Total Daily Volume[1] 1988	Total Daily Volume[1] 1991	Percent Change
Brownsville (Gateway)			
Auto	13,710	15,020	9.5
Truck	540	210	-61.7
Total	14,260	15,230	6.8
% Truck	3.8	1.4	
Del Rio			
Auto	5,070	6,310	24.6
Truck	290	310	7.0
Total	5,350	6,620	23.7
% Truck	5.3	4.6	
Eagle Pass			
Auto	16,000	13,560	-15.3
Truck	440	400	-8.8
Total	16,440	13,960	-15.1
% Truck	2.7	2.9	
El Paso (Bridge of Americas)			
Auto	36,200	39,420	8.9
Truck	1,720	2,560	49.0
Total	37,920	41,980	10.7
% Truck	4.5	6.1	
El Paso (Zaragosa)			
Auto	10,170	8,850	-13.0
Truck	340	190	-43.8
Total	10,500	9,040	-14.0
% Truck	3.2	2.1	
Hidalgo			
Auto	16,580	22,680	34.6
Truck	640	860	34.2
Total	17,500	23,550	34.6
% Truck	3.7	3.7	
Laredo (Convent St.)			
Auto	13,290	12,780	-3.8
Truck	1,830	1,860	2.1
Total	15,110	14,650	-3.1
% Truck	12.1	12.7	
Progreso			
Auto	4,970	4,100	-17.5
Truck	90	250	188.6
Total	5,050	4,350	-14.9
% Truck	1.7	5.8	

[1] Import and export traffic

Source: Reference 1

Study Results: Qualitative Summary

In conducting this study, 7,373 surveys were distributed in the seven border areas. Of these surveys, 903 were returned yielding a return rate of 12 percent (Table 2-3). The number

of surveys collected from all locations other than Progreso was sufficient to allow discussion of the results for each location.

Table 2-3. Distribution and Collection Rates at Survey Areas

City	Number Distributed	Number Returned	Return Rate
Brownsville	967	82	9%
Del Rio	131	46	35%
Eagle Pass	101	20	20%
El Paso	3,570	324	9%
Hidalgo	617	97	16%
Laredo	1,707	320	19%
Progreso	280	6	2%

The results of the survey were tabulated to show how truck drivers in the survey areas responded to each question and combinations of the questions. The number of responses varied between each question on the survey because some surveys were not answered completely. When this occurred, as much of the survey was used as possible. For example, the percentage of trucks with maquiladora involvement could be obtained. This question could also be compared with the destinations of the truck trips. This would give the percentage of trucks which ended their trips at the various locations. If a survey was marked as maquiladora but failed to give a trip destination, it could not be used in this comparison.

The question on the survey concerning the number of trips made per week was used to calculate the number of overall trips which could be represented by the survey. These values were compared against the actual daily and weekly volumes of trucks shown to have crossed the bridges on the days and in the week they were surveyed. This resulted in an estimate of the percentage of truck traffic represented by the returned surveys. Dates were chosen to survey the bridge in each city when bridge volumes were near the highest daily volumes. This allowed the maximum amount of trucks to be surveyed. Responses which accounted for more than 10 percent of the weekly truck volumes on each bridge were obtained at five of the seven cities (Table 2-4).

Table 2-4. Daily and Weekly Import Trips Represented by Survey

City	Actual Daily Import Truck Volume[1]	Weekly Trips[2]	Number of Trips Surveyed	Weekly Percent
Brownsville	1,420	3,550	237	6.7
Del Rio	250	625	158	25.3
Eagle Pass	240	600	75	12.5
El Paso	3,830	9,575	1,447	15.1
Hidalgo	650	1,625	260	16.0
Laredo	2,520	6,300	1,211	19.2
Progreso	280	700	19	2.7

[1] Represents the 2 days on which surveys were distributed at the bridge
[2] Estimated as actual daily import trips x 2.5

Source: U.S. Customs Service (volume counts) and TTI estimates (surveyed trips)

Maquiladora Results

The results of the survey showed that 58 percent of the trips from the respondents were represented by maquiladora traffic, while 36 percent claimed no maquiladora involvement (Table 2-5). The remaining 6 percent were uncertain of whether the trip was related to maquiladora operation. The truck traffic in Brownsville, Del Rio, Eagle Pass, Hidalgo, and El Paso exhibit a high proportion of maquiladora traffic, with greater than 60 percent of truck traffic being involved in maquiladora operations. Truck traffic in Laredo exhibited moderate levels of maquiladora involvement.

Table 2-5. Portion of Bridge Traffic Reporting Maquiladora Trip

City	Yes		No		Not Sure	
	No.	%	No.	%	No.	%
Brownsville	269	60	162	37	12	3
Del Rio	217	81	51	19	-	-
Eagle Pass	77	73	29	27	-	-
El Paso	1,474	79	373	20	13	1
Hidalgo	297	77	80	21	7	2
Laredo	1,075	38	1,453	51	308	11
TOTAL	3,409	58	2,148	36	340	6

Comparison of Trip Origins and Destinations

The questions concerning the location of the pickup and delivery of the cargo were analyzed separately, and also cross-tabulated in order to identify combinations of trip origins and destinations. The data showed a large amount of movement from manufacturing plants and warehouses to these same types of facilities across the border, which would be expected since 58 percent of all of the surveyed truck trips were maquiladora trips.

Table 2-6 shows the trip origins identified by the trucks from the various cities. The majority of the origins for truck trips were at manufacturing plants and warehouses. Either one or both of these locations were identified as a trip origin by at least 15 percent of the truck drivers in each city. Brownsville truck drivers also identified "other" locations as a significant origin point for truck traffic. Rail yards were only a very small percentage of beginning points for truck traffic in all cities.

Truck trips in the survey cities primarily ended at warehouses and manufacturing plants (Table 2-7). Truck trips ended at warehouses more often in five of the six cities with manufacturing plants making the second largest group. Unlike the origins for the truck trips, the destinations included more traffic to rail yards and "other" locations; however, neither of these locations were very significant. In Brownsville, Eagle Pass, and Laredo the trucks cited "other" locations as destinations a significant percentage (more than 20 percent) of the time. In Brownsville, the "other" locations may have included the Port of Brownsville as an ending point for truck traffic.

Table 2-6. Trip Origins

City	Manuf. Plant		Rail Yard		Warehouse		Other		TOTAL
	No.	%	No.	%	No.	%	No.	%	
Brownsville	175	36	1	0	208	43	105	21	489
Del Rio	130	43	5	2	148	48	21	7	304
Eagle Pass	86	78	-	-	17	15	8	7	111
El Paso	1,141	55	24	1	811	39	111	5	2,087
Hidalgo	169	42	-	-	229	58	-	-	398
Laredo	204	16	44	3	888	70	140	11	1,276
TOTAL	1,915	41	74	2	2,301	49	385	8	4,665

Table 2-7. Trip Destinations

City	Manuf Plant		Rail Yard		Warehouse		Other		TOTAL
	No.	%	No.	%	No.	%	No.	%	
Brownsville	207	42	10	2	165	34	107	22	489
Del Rio	91	30	-	-	179	59	34	11	304
Eagle Pass	8	6	15	14	55	50	33	30	111
El Paso	613	29	66	3	1,301	62	107	6	2,087
Hidalgo	175	44	9	2	214	54	-	-	398
Laredo	153	12	126	10	736	58	261	20	1,276
TOTAL	1,247	27	226	5	2,650	56	542	12	4,665

Table 2-8 displays a cross-tabulation of trip origins and destinations. Manufacturing plants and warehouses account for the majority of the origins and destinations of truck traffic. Trucks in Brownsville, Hidalgo, and El Paso reported origins and destinations at manufacturing plants and warehouses. Del Rio trucks showed origins at manufacturing plants and destinations at warehouses. Trucks in Eagle Pass had origins at manufacturing plants and destinations at warehouses and "other" locations. Surveys from Laredo showed trucks had both origins and destinations at warehouses and that rail yard traffic was more significant than in the other cities. Trucks in Del Rio reported no trips to rail yards, and trucks in Hidalgo reported no trips to "other" locations. Hidalgo and Eagle Pass reported no truck trips from rail yards.

Table 2-8. Origin and Destination of Cargo

City and Origin	Destination									
	Manuf. Plant	%	Rail Yard	%	Ware-house	%	Other	%	Total	%
Brownsville										
Manuf.	48	10	-		106	22	21	4	175	36
Rail Yard	-		-		1	0	-		1	0
Warehouse	156	32	10	2	32	7	10	2	208	43
Other	3	1	-		26	5	76	15	105	21
Del Rio										
Manuf.	10	3	-		109	36	11	3	130	42
Rail Yard	-		-		5	2	-		5	2
Warehouse	81	27	-		60	20	7	2	148	49
Other	-		-		5	2	16	5	21	7
Eagle Pass										
Manuf.	6	5	15	14	42	38	23	21	86	77
Rail Yard	-		-		-		-		-	
Warehouse	2	1	-		10	9	5	5	17	15
Other	-		-		3	2	5	5	8	7
El Paso										
Manuf.	255	12	40	2	826	40	20	1	1,141	55
Rail Yard	3	0	9	0	12	0	-		24	1
Warehouse	349	17	17	1	413	20	32	2	811	39
Other	6	0	-		50	2	55	3	111	5
Hidalgo										
Manuf.	57	14	3	1	109	27	-		169	42
Rail Yard	-		-		-		-		-	
Warehouse	118	30	6	2	105	26	-		229	58
Other	-		-		-		-		-	
Laredo										
Manuf.	36	3	40	3	126	10	2	0	204	16
Rail Yard	-		-		24	2	20	1	44	3
Warehouse	109	9	66	5	536	42	177	14	888	70
Other	8	0	20	2	50	4	62	5	140	11

[1] Values are percentages of total city destination movements

Comparison of Cargo Type and Trip Destination

The types of cargo carried by the trucks are shown in Table 2-9. Raw materials were the most frequently cited cargo in three cities and second highest in two other cities. Unassembled items accounted for more than 25 percent of the cargo carried in five of the six cities. Manufactured goods were more than 25 percent of the cargo in three cities. "Other" items were a significant response in Eagle Pass and El Paso. Farm products accounted for 4 percent, and "other" items accounted for 15 percent of the truck loads from the combination of all the study cities.

Table 2-9. Types of Cargo

City	Unassembled Items		Raw Materials		Manufactured Goods		Farm Products		Other		TOTAL
	No.	%	No.	%	No.	%	No.	%	No.	%	
Brownsville	158	27	283	49	90	16	14	2	34	6	579
Del Rio	116	35	89	26	90	26	-	-	45	13	340
Eagle Pass	7	7	19	18	34	32	-	-	46	43	106
El Paso	494	23	805	37	336	16	41	2	481	22	2,157
Hidalgo	174	32	186	34	74	14	54	10	54	10	542
Laredo	521	28	531	28	560	29	137	7	158	8	1,907
TOTAL	1,470	26	1,913	34	1,184	21	246	4	818	15	5,631

The percentage of cargo types was affected by the number of maquiladora trips which were surveyed. Since 58 percent of the total trips from the survey respondents were maquiladora trips, it is understandable that the primary cargoes transported would be unassembled items, raw materials, and manufactured goods.

The types of cargo and their destinations are cross-tabulated in Table 2-10. The results show a large number of truck trips carrying unassembled items, raw materials, and manufactured goods which were transported to manufacturing plants and warehouses. "Other" locations are cited in most of the cities but are not a significant percentage of the destinations reported.

Manufacturing plants were the major destination of truck traffic in Brownsville and Hidalgo. Warehouses were more dominant in Del Rio, Eagle Pass, and Laredo. Truck drivers in El Paso listed manufacturing plants and warehouses as major destinations.

Table 2-10. Types of Cargo and Destinations

City and Cargo	Destination									
	Manuf. Plant	%	Rail Yard	%	Ware-house	%	Other	%	Total	%
Brownsville										
Unassembled Items	100	17	10	2	28	5	20	3	158	27
Raw Material	208	36	-		56	10	20	3	284	49
Manufactured Goods	20	3	-		70	12	-		90	16
Farm Products	-		-		-		14	2	14	2
Other	8	2	-		16	3	10	2	34	6
Del Rio										
Unassembled Items	63	18	-		54	16	-		117	34
Raw Material	28	8	-		61	18	-		89	26
Manufactured Goods	10	3	-		77	23	3	1	90	27
Farm Products	-		-		-		-		-	
Other	-		-		14	4	31	9	45	13
Eagle Pass										
Unassembled Items	-		-		7	7	-		7	7
Raw Material	4	4	-		10	9	5	5	19	18
Manufactured Goods	-		2	2	19	18	13	12	34	32
Farm Products	-		-		-		-		-	
Other	2	2	15	14	19	18	10	9	46	43
El Paso										
Unassembled Items	210	10	14	1	265	12	5	0	494	23
Raw Material	380	18	23	1	381	18	21	1	805	37
Manufactured Goods	42	2	19	1	275	13	-		336	16
Farm Products	3	0	3	0	27	1	8	0	41	2
Other	57	3	42	2	310	14	68	3	481	22
Hidalgo										
Unassembled Items	101	21	-		73	15	-		174	36
Raw Material	101	21	-		85	17	-		186	38
Manufactured Goods	27	6	-		47	10	-		74	15
Farm Products	-		9	1	45	9	-		54	11
Other	-		-		-		-		-	
Laredo										
Unassembled Items	71	4	64	3	270	14	107	6	512	27
Raw Material	85	4	83	4	318	17	45	2	531	28
Manufactured Goods	74	4	74	4	333	18	79	4	560	30
Farm Products	22	1	36	2	70	4	9	0	137	7
Other	15	1	29	2	70	4	44	2	158	8

[1] Values are percentages of total city origin/destination movements

The types of cargo and trip destinations were divided into two categories: maquiladora trips and non-maquiladora trips. Within this division, the maquiladora traffic accounted for 72 percent of the truck trips. This is higher than the overall percentage of maquiladora trips which was earlier reported as 58 percent. The reason for the higher percentage is that this percentage does not include surveys where the maquiladora involvement of trips were marked as "Not Sure," and many surveys failed to report a destination for the trip; however, they did report maquiladora involvement. These surveys were included in the overall percentage, but were not included in the analysis of trip destination.

It appears that the primary destinations are more likely to be manufacturing plants and warehouses when the trip is maquiladora related (Table 2-11). Rail and "other" locations seem to be more frequent destinations when the trip is non-maquiladora. It also appears that "other" items are more likely to be the cargo of non-maquiladora trips.

Truck traffic in Del Rio, Eagle Pass, El Paso, and Laredo involved with maquiladora operations reported destinations at warehouses. Trucks with maquiladora loads in Brownsville and Hidalgo cited manufacturing plants as their destinations. Del Rio, El Paso, and Laredo trucks involved in non-maquiladora operations cited destinations at warehouses just like their counterparts with maquiladora loads. Brownsville, Eagle Pass, and Hidalgo non-maquiladora trucks cited different destinations than the maquiladora trucks from these cities. The truck drivers from Brownsville involved in non-maquiladora operations cited "other" locations as the primary destination. Non-maquiladora trucks in Hidalgo cited rail yards as the destination. Hidalgo trucks listed warehouses as the destination in non-maquiladora operations.

Trucks in Del Rio, Eagle Pass, and Hidalgo which were involved in maquiladora operations did not report any trips to rail yards. Trucks involved in non-maquiladora operations reported no trips to manufacturing plants in Eagle Pass and Hidalgo and reported no trips to rail yards in Del Rio and El Paso.

Table 2-11. Destination of Types of Maquiladora Cargo

City	Maquiladora Destinations (Percent)[1]					Non-Maquiladora Destinations (Percent)[1]				
	Manuf. Plant	Rail Yard	Ware-house	Other	Total	Manuf. Plant	Rail Yard	Ware-house	Other	Total
Brownsville										
Unassembled Items	14	-	4	-	18	0	2	0	3	5
Raw Material	23	-	5	3	31	0	-	3	0	3
Manufactured Goods	7	-	10	1	18	0	-	0	0	0
Farm Products	-	-	-	-	-	-	-	4	4	8
Other	3	4	3	0	10	0	-	3	4	7
Del Rio										
Unassembled Items	16	-	14	-	30	3	-	3	-	6
Raw Material	6	-	11	-	17	3	-	7	-	10
Manufactured Goods	3	-	20	1	24	-	-	3	-	3
Farm Products	-	-	-	-	-	-	-	-	-	-
Other	-	-	3	2	5	-	-	2	3	5
Eagle Pass										
Unassembled Items	-	-	7	-	7	-	-	-	-	-
Raw Material	4	-	-	5	9	-	-	5	-	5
Manufactured Goods	-	-	20	10	30	-	2	-	3	5
Farm Products	-	-	-	-	-	-	-	-	-	-
Other	2	-	9	13	24	-	16	4	-	20
El Paso										
Unassembled Items	10	0	12	-	22	0	-	1	0	1
Raw Material	15	1	16	1	33	3	-	2	0	5
Manufactured Goods	2	1	12	-	15	-	-	1	-	1
Farm Products	0	0	0	-	0	-	-	1	0	1
Other	2	2	9	0	13	0	-	7	2	9
Hidalgo										
Unassembled Items	21	-	15	-	36	-	-	-	-	-
Raw Material	21	-	16	-	37	-	-	2	-	2
Manufactured Goods	6	-	7	0	13	-	-	2	-	2
Farm Products	-	-	2	-	2	-	2	6	-	8
Other	-	-	-	-	-	-	-	-	-	-
Laredo										
Unassembled Items	3	1	13	3	20	0	2	3	3	8
Raw Material	3	1	8	2	14	0	3	11	1	15
Manufactured Goods	2	1	8	1	12	0	2	9	3	14
Farm Products	1	-	4	0	5	0	2	3	0	5
Other	-	-	1	-	1	-	1	4	1	6

[1] Values are percentages of city maquiladora and non-maquiladora traffic

The primary cargoes listed in Table 2-11 show unassembled items, raw materials, and manufactured goods to be the primary cargoes in maquiladora operations. In non-maquiladora operations "other" items were cited in Brownsville and Eagle Pass and farm products were listed in Hidalgo. Farm products were not reported as cargoes for trucks in Del Rio, Eagle Pass, or Hidalgo and were not cited by maquiladora trucks in Brownsville.

Comparison of Cargo Type and Trip Origin

The questions concerning cargo type and pickup location were cross-tabulated to determine where the products originated (Table 2-12). The typical responses included unassembled items, raw materials and manufactured goods being picked up at manufacturing plants and warehouses. Trucks in Brownsville, Hidalgo, and Laredo listed warehouses as their major trip origin. The major origins in Del Rio and El Paso were manufacturing plants and warehouses. The responses from Eagle Pass showed manufacturing plants to be the primary origin location.

Table 2-12. Types of Cargo and Origins

City and Cargo	Origins									
	Manuf. Plant	%[1]	Rail Yard	%[1]	Ware-house	%[1]	Other	%[1]	Total	%[1]
Brownsville										
Unassembled Items	45	7	-		93	15	20	3	158	25
Raw Material	57	9	-		153	24	7	2	217	35
Manufactured Goods	73	12	-		35	6	6	1	114	18
Farm Products	-		-		-		45	7	45	7
Other	27	4	1	0	26	4	37	6	91	15
Del Rio										
Unassembled Items	49	14	-		63	18	5	1	117	34
Raw Material	43	13	-		46	13	-		89	26
Manufactured Goods	57	17	5	2	28	8	-		90	26
Farm Products	-		-		-		-		-	
Other	13	4	-		16	5	16	5	45	14
Eagle Pass										
Unassembled Items	7	6	-		-		-		7	6
Raw Material	10	9	-		6	5	8	8	24	22
Manufactured Goods	32	29	-		2	2	-		34	31
Farm Products	-		-		-		-		-	
Other	37	33	-		9	8	-		46	41
El Paso										
Unassembled Items	325	15	9	0	188	9	7	0	524	24
Raw Material	368	17	9	0	429	20	6	0	812	37
Manufactured Goods	252	12	9	0	82	4	-		343	16
Farm Products	3	0	3	0	30	2	5	0	41	2
Other	245	11	3	0	121	6	90	4	459	21
Hidalgo										
Unassembled Items	77	15	-		117	23	-		194	39
Raw Material	82	16	-		100	20	-		182	37
Manufactured Goods	41	8	-		43	9	-		84	17
Farm Products	14	4	-		24	5	-		38	7
Other	-		-		-		-		-	
Laredo										
Unassembled Items	44	2	11	0	648	28	35	2	738	32
Raw Material	8	0	20	0	513	22	35	2	576	25
Manufactured Goods	118	5	39	2	641	27	28	1	826	35
Farm Products	-		-		70	3	-		70	3
Other	6	0	-		82	4	39	2	127	5

[1] Values are percentages of total city origin movements

The types of cargo and trips origins were divided into those which were maquiladora trips and those which were not (Table 2-13). The maquiladora traffic accounted for 71 percent of the trips which had a response for both trip origin and type of cargo in the surveys.

The majority of the cargo consists of unassembled items, raw materials, and manufactured goods which were picked up at manufacturing plants and warehouses. Rail yards did not account for many of the origins of truck trips except in Laredo where rail was a beginning point for a significant portion of manufactured goods related to maquiladora operations. Rail yards did not appear in the responses for maquiladora trip origins in Brownsville, Del Rio, Eagle Pass, or Hidalgo or for non-maquiladora trip origins in Eagle Pass or Hidalgo. Trucks in Eagle Pass reported no non-maquiladora trip origins at "other" locations, while Hidalgo reported no maquiladora or non-maquiladora trip origins at "other" locations. Farm products did not appear as a cargo in the responses from trucks in Brownsville, Del Rio, or Eagle Pass.

Trucks with maquiladora involvement in Brownsville, Hidalgo, and Laredo listed warehouses as their primary origination points. Eagle Pass trucks involved in maquiladora operations began their trips at manufacturing plants. Responses from Del Rio and El Paso showed maquiladora trucks started at both manufacturing plants and warehouses. Truck traffic in Del Rio, Hidalgo, Laredo, and El Paso which were not involved in maquiladora operations responded with warehouses as their beginning point. Eagle Pass trucks listed manufacturing plants as starting points in non-maquiladora operations just as they did in maquiladora operations. Responses from Brownsville showed "other" locations were a major origination point for truck trips.

Table 2-13. Origins of Types of Maquiladora Cargo

City	Maquiladora Origins (Percent)[1]					Non-Maquiladora Origins (Percent)[1]				
	Manuf. Plant	Rail Yard	Ware-house	Other	Total	Manuf. Plant	Rail Yard	Ware-house	Other	Total
Brownsville										
Unassembled Items	6	-	11	3	20	0	-	2	4	6
Raw Material	8	-	17	6	31	0	-	4	0	4
Manufactured Goods	12	-	2	4	18	0	-	0	0	0
Farm Products	-	-	-	-	-	-	-	-	8	8
Other	3	-	0	2	5	2	0	2	4	8
Del Rio										
Unassembled Items	12	-	16	1	29	3	-	3	-	6
Raw Material	10	-	6	-	16	3	-	7	-	10
Manufactured Goods	16	-	8	-	24	1	2	-	-	3
Farm Products	-	-	-	-	-	-	-	-	-	-
Other	4	-	3	-	7	-	-	1	4	5
Eagle Pass										
Unassembled Items	6	-	-	-	6	-	-	-	-	-
Raw Material	5	-	5	7	17	5	-	-	-	5
Manufactured Goods	26	-	-	-	26	3	-	2	-	5
Farm Products	-	-	-	-	-	-	-	-	-	-
Other	19	-	5	-	24	14	-	3	-	17
El Paso										
Unassembled Items	15	0	8	0	23	0	-	1	0	1
Raw Material	17	0	17	-	34	1	-	4	1	6
Manufactured Goods	12	0	3	-	15	0	-	1	-	1
Farm Products	0	0	0	-	0	-	-	1	0	1
Other	9	-	0	1	10	3	0	3	3	9
Hidalgo										
Unassembled Items	16	-	25	-	41	-	-	1	-	1
Raw Material	14	-	17	-	31	-	-	1	-	1
Manufactured Goods	19	-	7	-	16	-	-	3	-	3
Farm Products	1	-	-	-	1	0	-	5	-	5
Other	-	-	-	-	-	1	-	-	-	1
Laredo										
Unassembled Items	2	2	18	1	23	0	-	10	0	10
Raw Material	0	0	10	-	10	0	0	12	2	14
Manufactured Goods	3	3	11	1	18	2	0	15	0	17
Farm Products	-	-	2	-	2	-	-	1	-	1
Other	-	0	0	-	0	0	-	2	2	4

[1]

Origin and Destination Cities

Each of the Texas survey cities had a Mexican counterpart directly across the border. The normal path of trucking was between these two cities (Table 2-14). One exception was trucks in the Hidalgo area which spread the destinations between many smaller cities located nearby. Most of the other survey cities showed at least 80 percent of truck traffic was moving between the sister cities.

Table 2-14. Origin and Destination Cities

Primary Origin City	Percent		Primary Destination City	Percent	
	Maquiladora	Non-maquiladora		Maquiladora	Non-maquiladora
Import			**Import**		
Matamoros	90	74	Brownsville	80	57
Ciudad Acuna	85	86	Del Rio	91	85
Piedras Negras	93	79	Eagle Pass	100	100
Ciudad Juarez	92	96	El Paso	99	96
Reynosa	77	76	Hidalgo	87	50
Nuevo Laredo	97	98	Laredo	100	100
Export			**Export**		
Brownsville	96	88	Matamoros	96	100
Del Rio	100	--[1]	Ciudad Acuna	100	--[1]
Eagle Pass	71	100	Piedras Negras	64	--[1]
El Paso	97	82	Ciudad Juarez	100	100
Hidalgo	89	86	Reynosa	94	71
Laredo	100	100	Nuevo Laredo	98	99

[1] -- signifies no survey data collected

Maquiladora trips begin at a sister city an average of 91 percent of the time while ending at sister cities 93 percent of the time. Non-maquiladora trips begin at sister cities 88 percent of the time and end at sister cities 87 percent of the time. It appears from this information that maquiladora traffic does not spread as far from the border area as the non-maquiladora truck traffic.

Truck traffic in Laredo and Nuevo Laredo appears to consistently have the highest percentage of sister city trips whether maquiladora or non-maquiladora related. It appears, among responding truck trips, that the maquiladora designation does not have a great deal of effect on the trips in these cities. Trucks travelling between Hidalgo and Reynosa appear to have the lowest percentage of sister city travel. The maquiladora truck traffic does have a higher percentage than the non-maquiladora traffic in the Hidalgo area. This low rate may be explained by the geographical arrangement around Hidalgo. There are many small cities around the Hidalgo area which could absorb some of the truck traffic. Much of the maquiladora traffic may travel between Hidalgo and Reynosa, however, the non-maquiladora traffic may be travelling to these other cities around the Hidalgo area lowering the overall percentage of truck traffic to Hidalgo itself.

Existing Traffic Volume and Projections of Future Growth

Import Bridge Volumes

The import truck traffic on the bridges in the survey cities has increased a great deal in the last several years. Two of the cities have shown increases in truck volume of over 100 percent in the past 6 years. Table 2-15 shows the average monthly import, or northbound, truck volumes at each of the cities for the past few years. The percent changes were the greatest in the smaller cities of Del Rio, Hidalgo, Progreso, and Eagle Pass. The export, or southbound, truck volumes have not been collected by the United States Customs Service and were unavailable.

Figures 2-2 through 2-8 illustrate the monthly variation in truck traffic on the surveyed bridges. Crop growing seasons, the condition of the economy and other factors impact the volume of truck traffic. Some of the variations are very significant and have an effect on the traffic congestion experienced on the bridges. The truck volumes in these figures are provided by the United States Customs Service in each of the respective cities.

The average monthly import bridge volumes do not always reflect the annual trends at each of the individual bridges. For example, the volumes on the Gateway Bridge in Brownsville are much higher in the late summer and fall months than in the remainder of the year. This is due to the vegetable harvest, particularly the okra harvest, in Mexico. The harvest of these okra add approximately 100 trucks (15 percent increase) a day for each day over a 5 month period. This increases the average volume for the year even though the majority of this traffic occurs in this 5 month period. Hidalgo has a 4 month period at the beginning of each year which shows higher volumes than the remainder of the year due to the citrus and vegetable harvest in the area. This additional truck traffic adds approximately 20% more traffic each day. This raises the average volume for the entire year because of these 4 high-volume months.

As Table 2-15 shows, the period of time analyzed for each city varies. The analysis lacks consistency in this area, but the data could not be attained for the same time period for all of the cities.

Figure 2-2. Brownsville Bridge Volumes

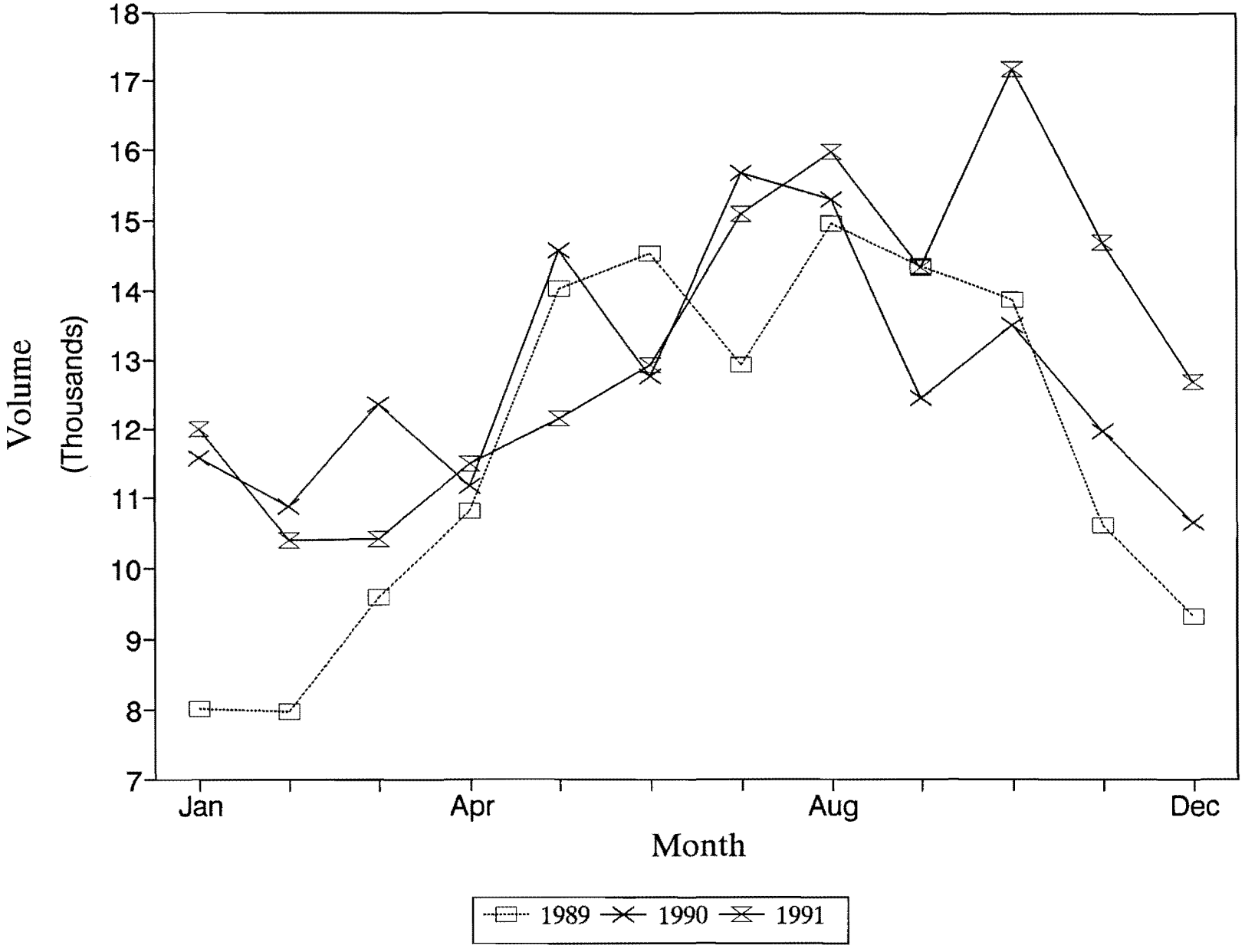


Figure 2-3. Del Rio Bridge Volumes

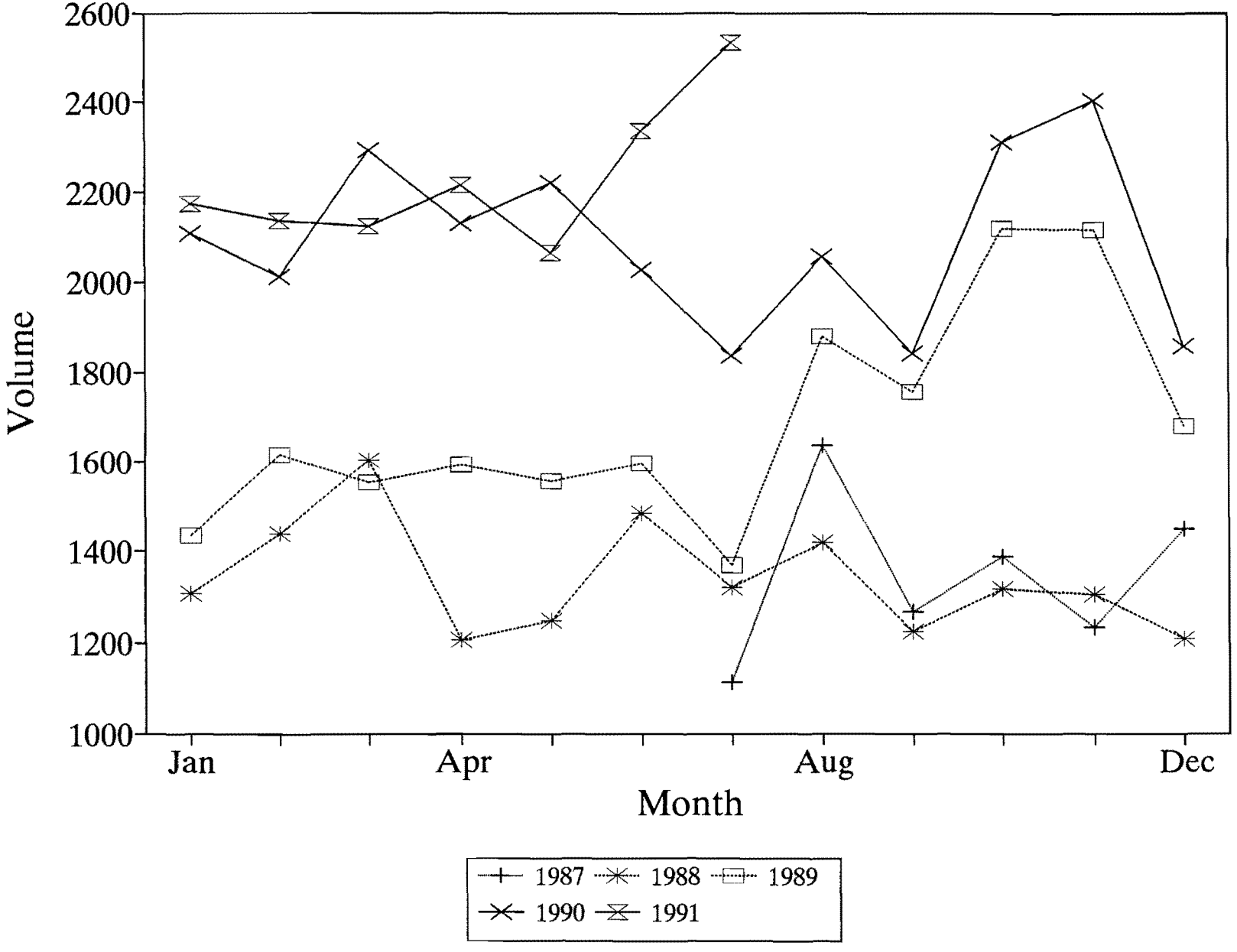


Figure 2-4. Eagle Pass Bridge Volumes

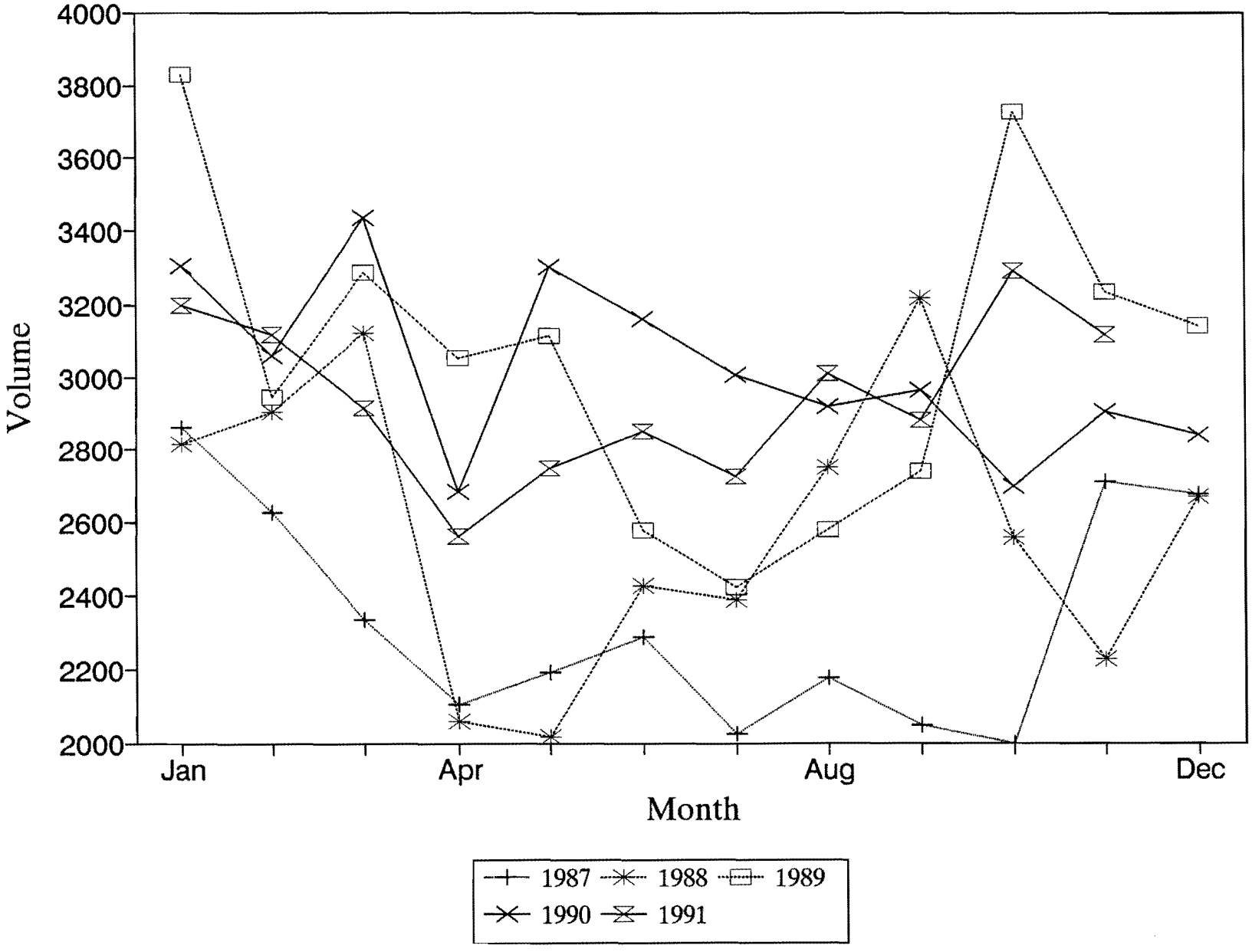


Figure 2-5. El Paso Bridge Volumes

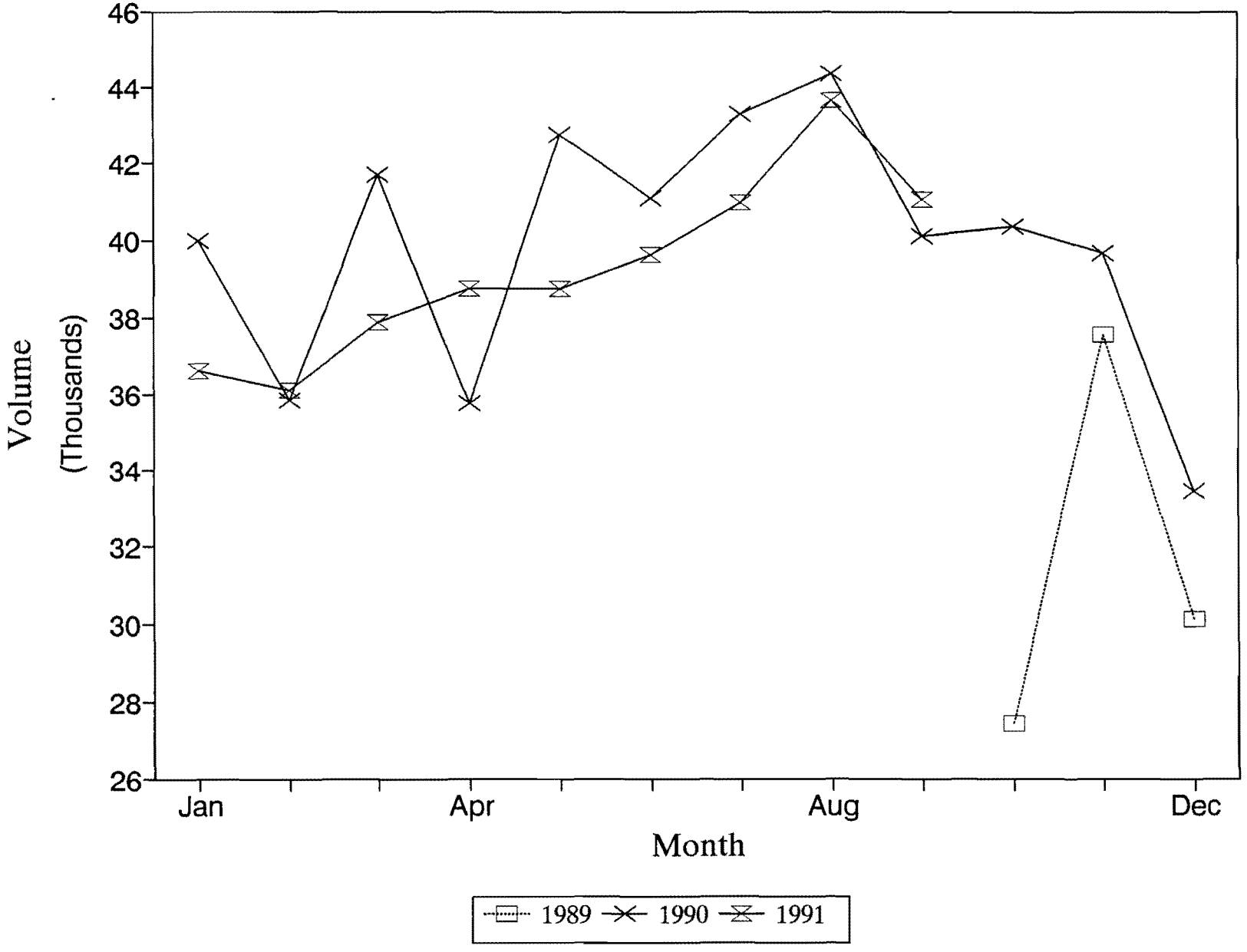


Figure 2-6. Hidalgo Bridge Volumes

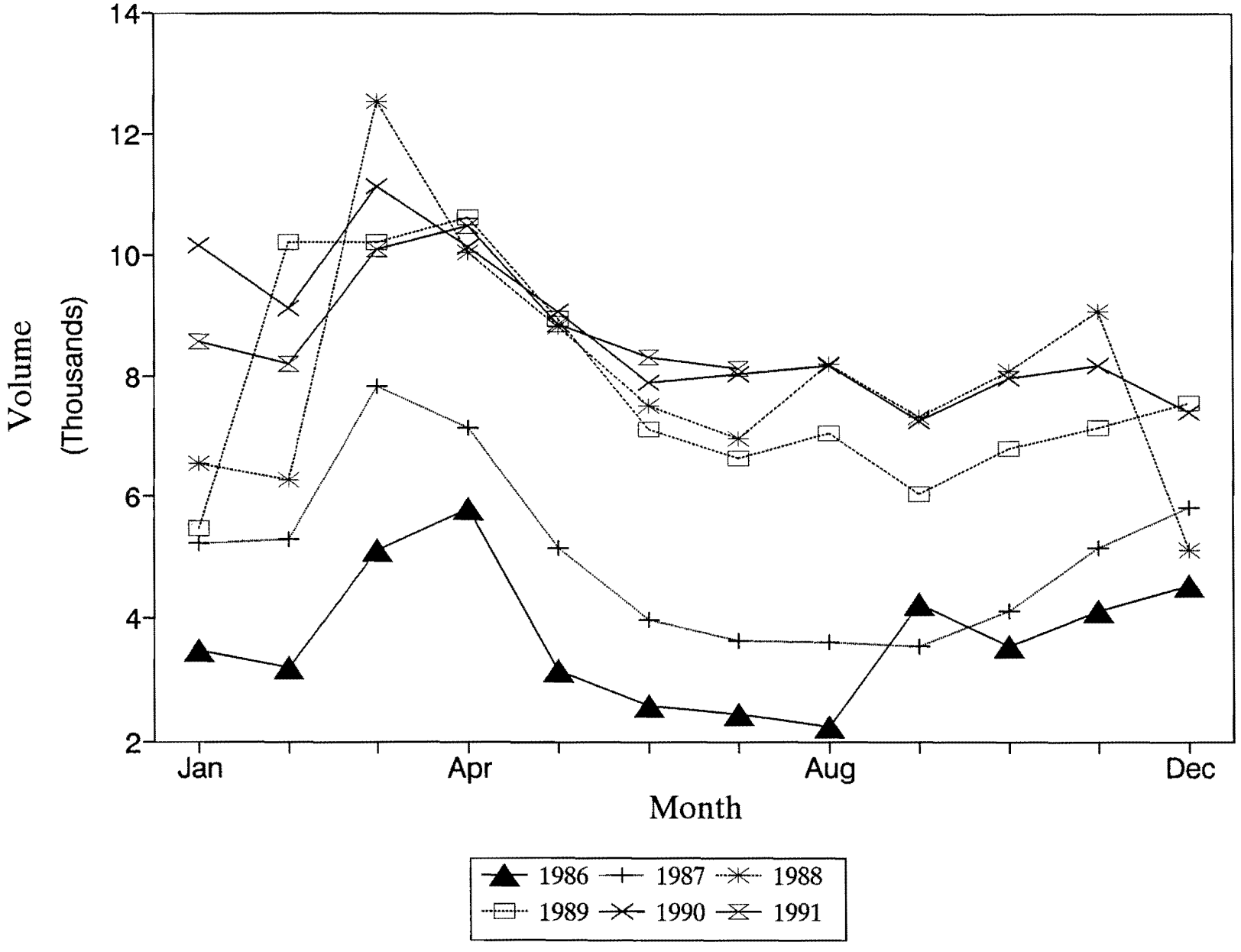


Figure 2-7. Laredo Bridge Volumes

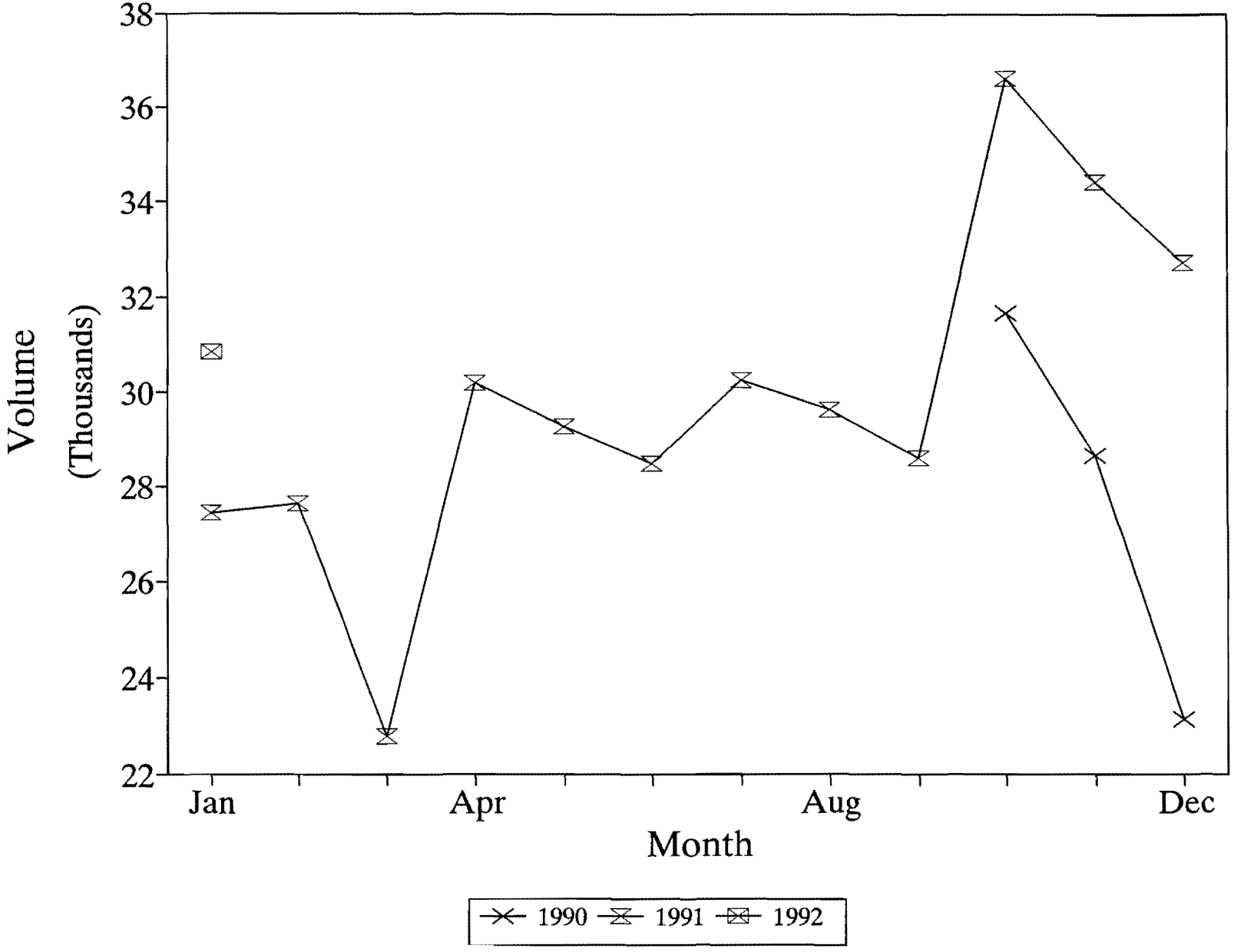


Figure 2-8. Progreso Bridge Volumes

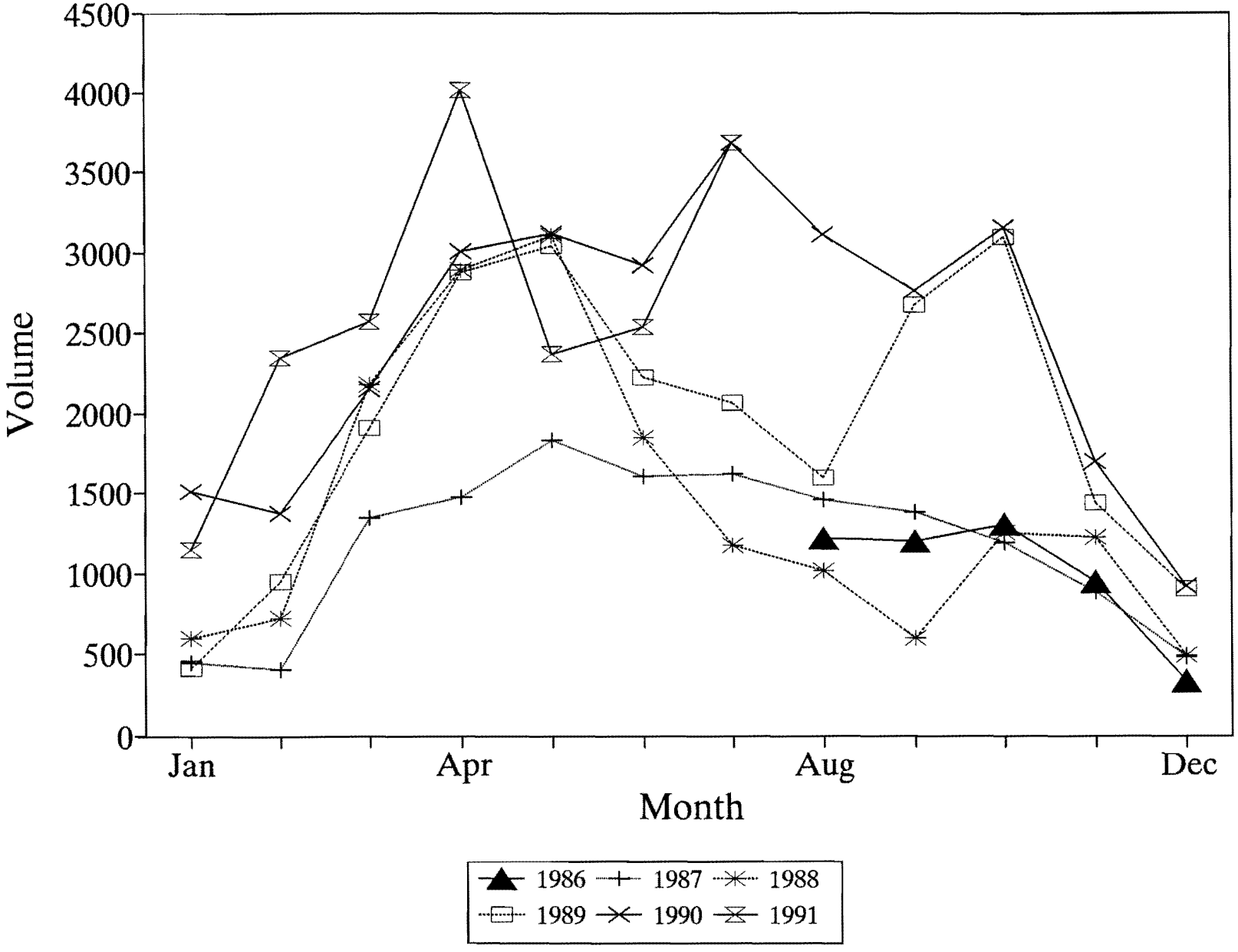


Table 2-15. Change in Average Monthly Bridge Volumes

City	Average Monthly Import Volumes 1986	1987	1988	1989	1990	1991	% Change in time span	Avg Annual Growth Rate
Brownsville				11,760	12,750	13,290	13.0%	6.3%
Del Rio		1,350	1,340	1,690	2,090	2,230	65.2%	13.4%
Eagle Pass		2,340	2,600	3,050	3,020	2,950	26.1%	6.0%
El Paso					39,890	39,280	-1.5%	-1.5%
Hidalgo	3,710	5,050	8,050	7,830	8,720	8,950	141.2%	19.3%
Laredo					27,830	29,850	7.3%	7.3%
Progreso	1,000	1,180	1,420	1,930	2,450	2,670	167.0%	21.7%

Source: United States Customs Service

All cities except El Paso showed an increase in import truck volumes across the time frame analyzed. El Paso showed a small decrease, although a longer time frame would be necessary to show an accurate picture of the traffic on the bridge. The largest increase was in Progreso with a 167 percent increase in import truck traffic between 1986 and 1991. Hidalgo also had a large increase of 142 percent over the same period.

Roadway Average Daily Traffic (ADT) Counts

The average daily traffic values for many of the main traffic arteries near the survey bridges were analyzed to determine the relationship of the growth in roadway traffic to the increase in traffic volumes at the border bridges in their area (Table 2-16). The growth in traffic on these roadways would not be directly proportional to that of the bridges; however, an increase at a bridge serving a city would impact the roadway system to some extent. Most of the truck traffic, as pointed out with the survey, did not appear to be leaving the cities along the Rio Grande River. Thus, this traffic would be dispersed throughout the roadways of each border city.

Table 2-16. Roadway Count Locations Near Survey Cities

City	Roadway	Location
Brownsville	US 77	0.5 mi NW of Brownsville
	SH 48	0.2 mi NE of FM 511
	US 83	0.6 mi N of SH 100
Del Rio	Spur 239	1.0 mi SW of US 90
	US 90	0.5 mi NW of US 377
Eagle Pass	US 57	0.2 mi W of Eagle Pass
	Spur 240	0.2 mi W of Eagle Pass
El Paso	Loop 478	0.2 mi S of US 62
	FM 258	5.4 mi SW of SH 20
	US 54	0.3 mi N of IH 10
	IH 10	1.2 mi S of Loop 375
Hidalgo	Spur 241	1.0 mi SW of Loop 115
	US 83	2.8 mi W of FM 492
	US 83	0.4 mi W of FM 1426
	US 281	7.5 mi S of US 283
Laredo	US 81	0.1 mi W of Laredo
	SH 359	4.9 mi E of US 83
	FM 1472	0.2 mi NW of IH 35
Progreso	FM 1015	2.0 mi S of US 281

Figures 2-9 through 2-15 display the historical volumes at the ADT traffic count stations listed in Table 2-17. The amount of data available for each of the stations varied, but generally the data was available beginning in 1975. The recent trend in traffic volume was chosen from each ADT count station to calculate an annual growth rate for each station. The period of years used and the ADT growth rate are displayed in Table 2-17 along with the growth rate of the bridge volumes in each city.

Table 2-17. Traffic Counts and Bridge Volumes

City	Roadway	Description	Annual Traffic Growth Rate (%)	Period	Annual Growth Rate of Import Truck Traffic on Bridge(%)[1]
Brownsville	US 77	0.5 mi NW of Brownsville	6.1	1984-1990	6.3
	SH 48	0.2 mi NE of FM 511	-0.8	1984-1988	
	US 83	0.6 mi N of SH 100	5.8	1985-1988	
Del Rio	Spur 239	1.0 mi SW of US 90	1.5	1984-1990	13.4
	US 90	0.5 mi NW of US 377	1.8	1984-1988	
Eagle Pass	US 57	0.2 mi W of Eagle Pass	-5.7	1984-1990	6.0
	Spur 240	0.2 mi W of Eagle Pass	4.6	1984-1990	
El Paso	Loop 478	0.2 mi S of US 62	2.9	1986-1990	-1.5
	FM 258	5.4 mi SW of SH 20	11.3	1984-1988	
	US 54	0.3 mi N of IH 10	2.1	1985-1988	
	IH 10	1.2 mi S of Loop 375	4.7	1984-1988	
Hidalgo	Spur 241	1.0 mi SW of Loop 115	-1.0	1984-1990	19.3
	US 83	2.8 mi W of FM 492	7.2	1984-1988	
	US 83	0.4 mi W of FM 1426	5.4	1984-1988	
	US 281	7.5 mi S of US 283	5.3	1984-1988	
Laredo	US 81	0.1 mi W of Laredo	4.4	1984-1990	7.3
	SH 359	4.9 mi E of US 83	6.5	1984-1988	
	FM 1472	0.2 mi NW of IH 35	10.6	1984-1990	
Progreso	FM 1015	2.0 mi S of US 281	4.4	1984-1989	21.7

[1] From Table 2-15.

Figure 2-9.Brownsville Traffic Volumes

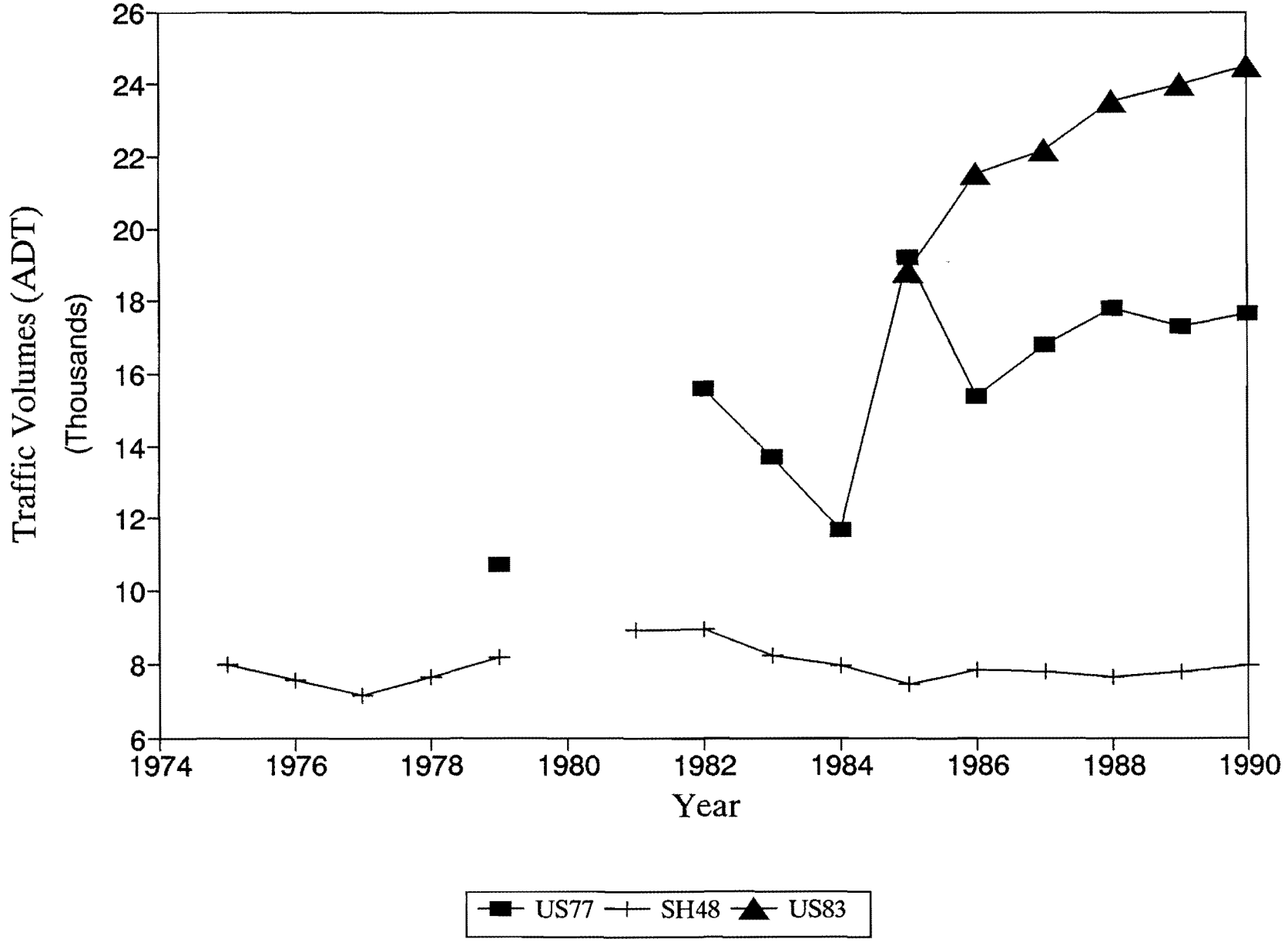


Figure 2-10. Del Rio Traffic Volumes

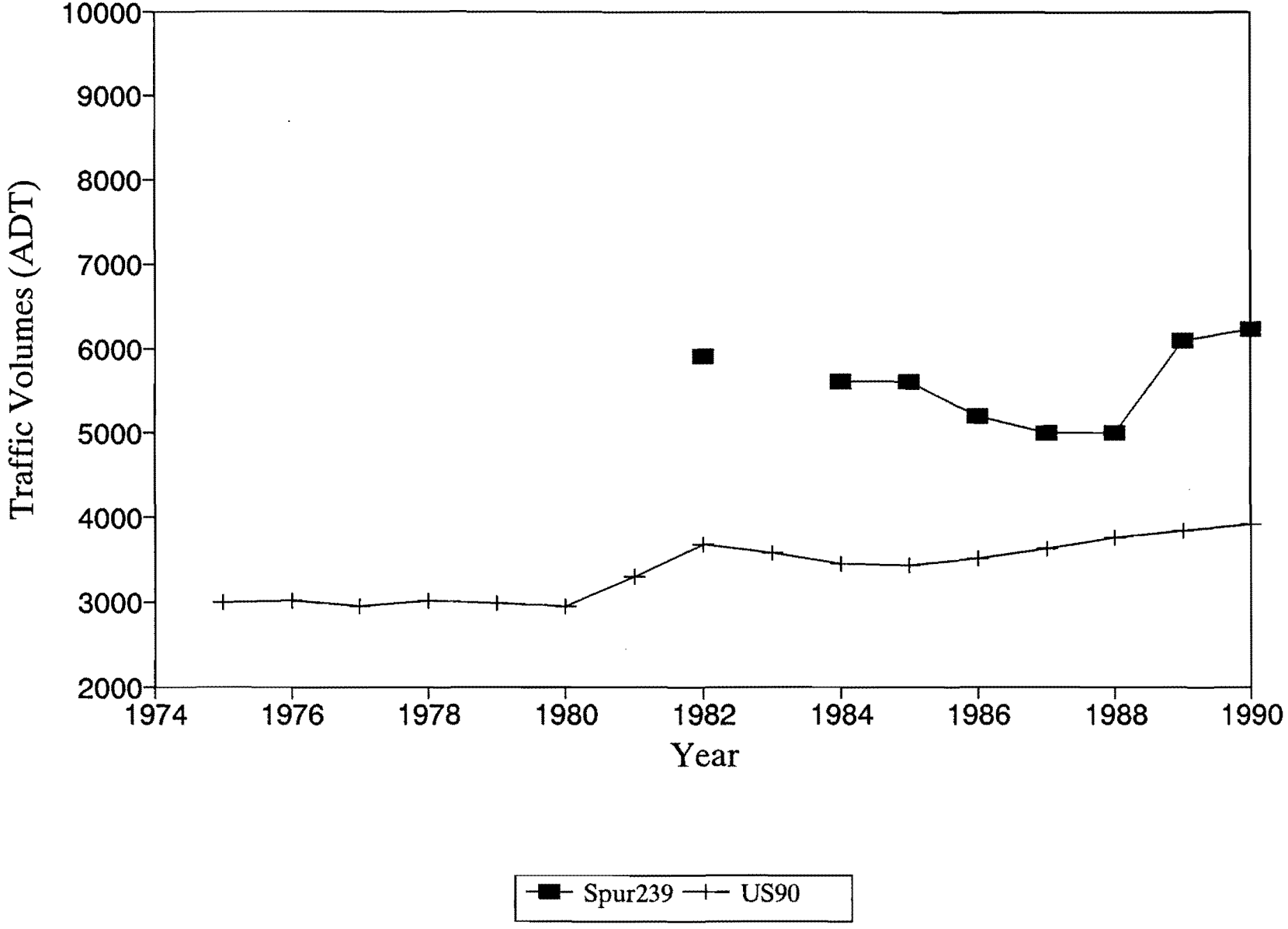


Figure 2-11. Eagle Pass Traffic Volumes

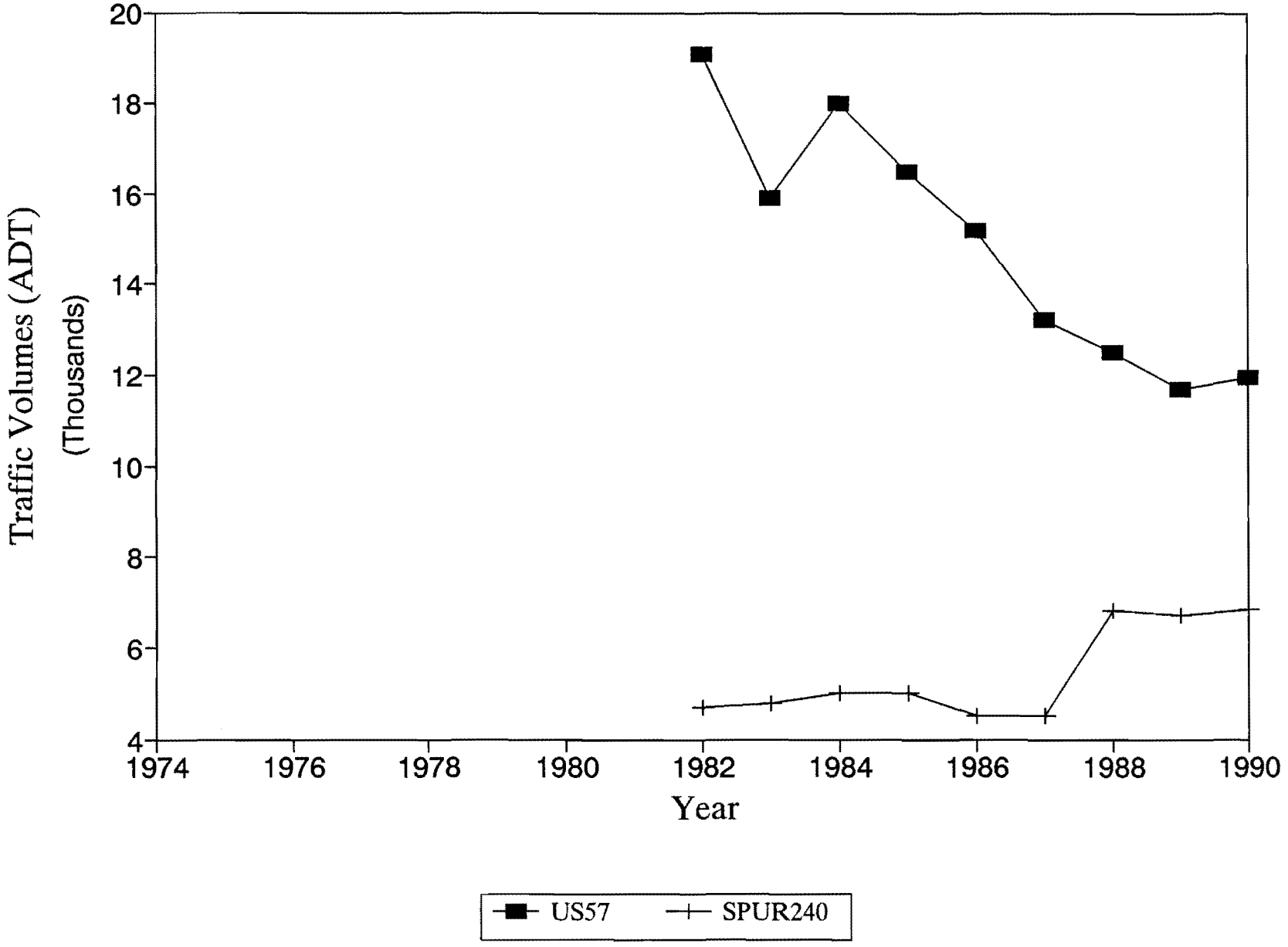


Figure 2-12.El Paso Traffic Volumes

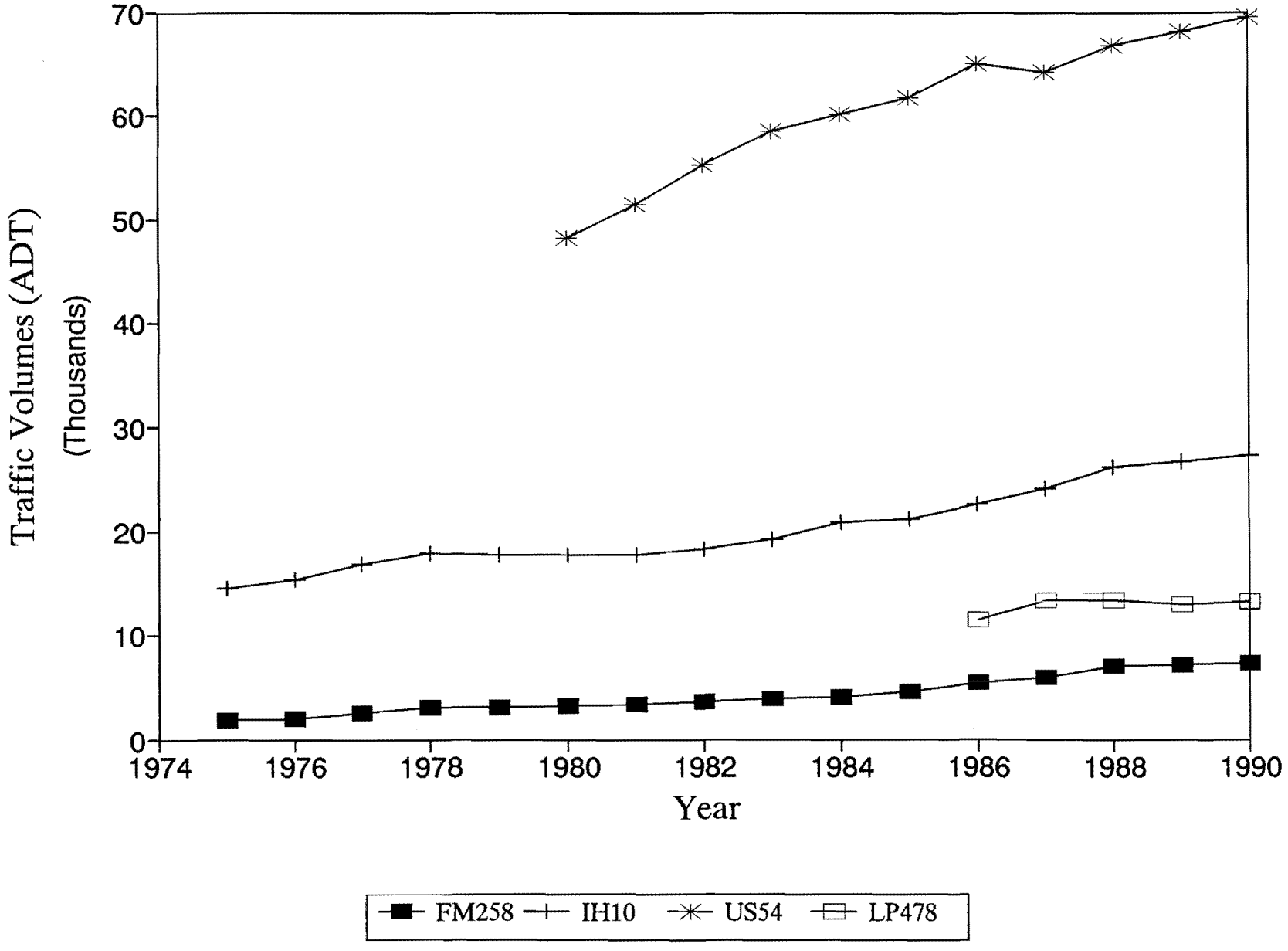


Figure 2-13. Hidalgo Traffic Volumes

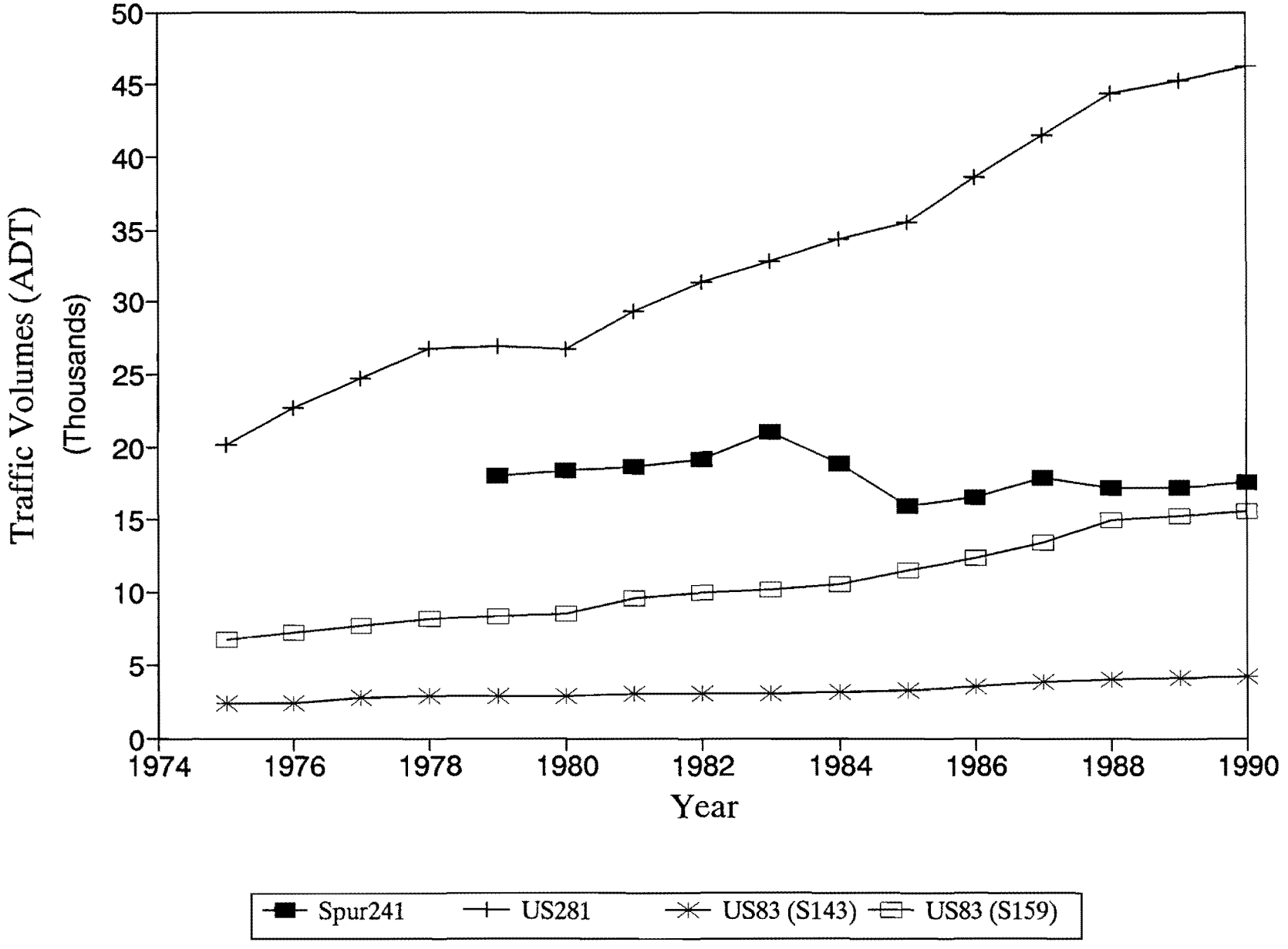


Figure 2-14. Laredo Traffic Volumes

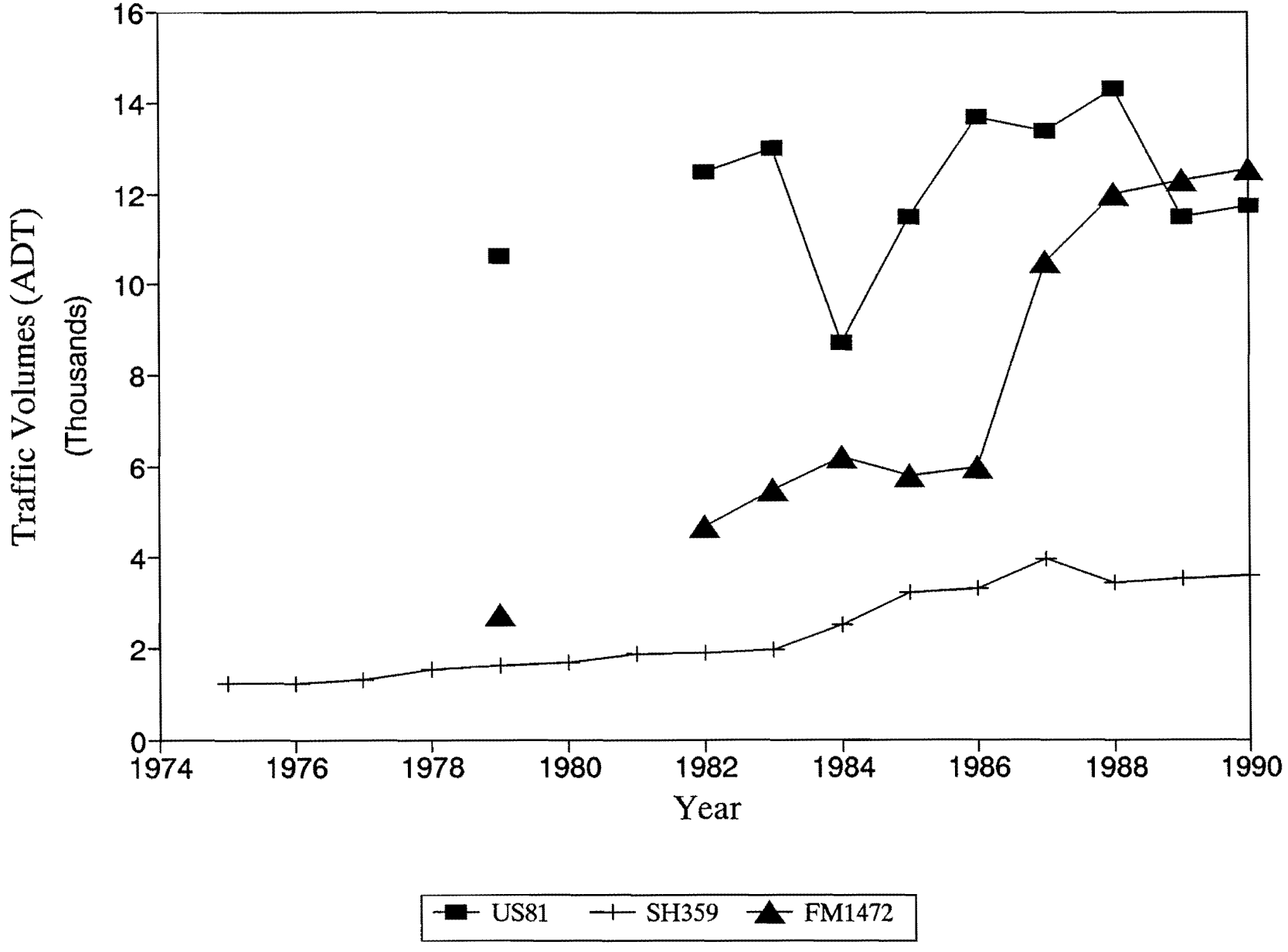
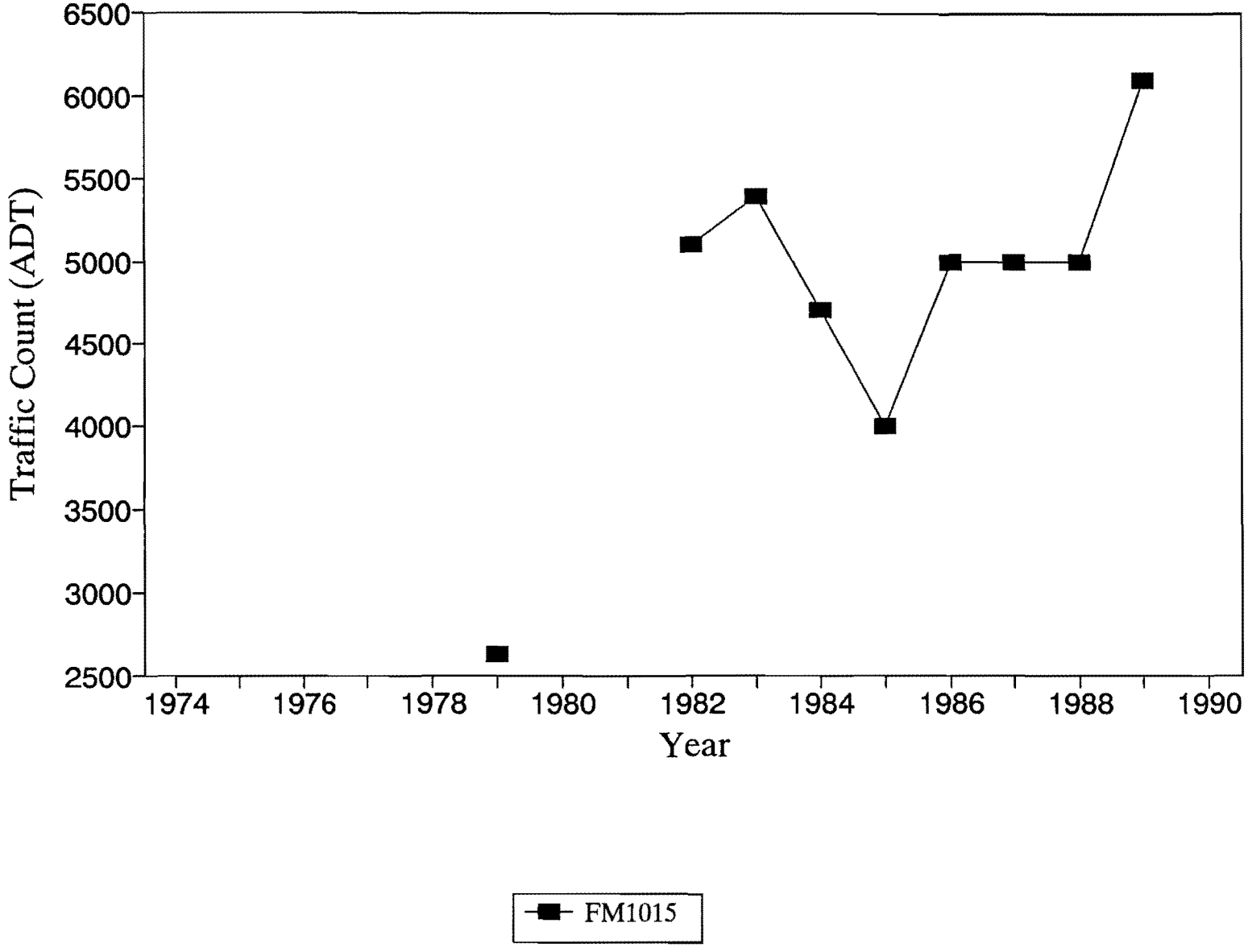


Figure 2-15. Progreso Traffic Volumes



Growth in both the bridge volumes and the daily traffic volumes at the ADT count stations has been fairly consistent. Almost all roadways have shown slight increases in the past few years, while the bridge volumes have been increasing dramatically. The bridge volume increases have been at a higher percentage rate than the roadway increases, although a much higher number of vehicles are recorded on the roadways than at the bridges.

Brownsville

Import truck traffic on the Gateway Bridge in Brownsville has shown a 13 percent increase between 1989 and 1991 (Table 2-15 and Figure 2-2). The local ADT counts in Brownsville have also shown an increase over the past few years (Figure 2-9) (TxDOT District Traffic Maps). US 77 and US 83 in the Brownsville area have had annual growth rates of approximately 6 percent (Table 2-17) in the last several years. The third roadway, SH 48, has remained virtually unchanged with an annual growth rate of -0.8 percent in the same period of time.

Del Rio

Figure 2-3 displays the import truck volumes on the bridge in Del Rio. These truck volumes have had a 65 percent increase between 1987 and 1991 (Table 2-15) resulting in an annual growth rate of 13.4 percent (Table 2-17). The traffic counts in the Del Rio area are displayed in Figure 2-10 (TxDOT District Traffic Maps). Both roadways have shown steady increases (between 1.5 and 2.0 percent) in volume over the period between 1984 and 1989.

Eagle Pass

The ADT count stations in Eagle Pass (Figure 2-11) show a decline in the traffic on US 57 since the early-1980s and a rise for Spur 240 for the same period (TxDOT District Traffic Maps). The average volume decrease on US 57 between 1984 and 1990 was -5.7 percent (Table 2-17). The annual growth rate of Spur 240 over the same period was 4.6 percent. The import bridge volumes in Table 2-15 and Figure 2-4 from Eagle Pass were 26 percent higher in 1991

than they were in 1987, an annual growth rate of 6.0 percent (Table 2-17). An increase in bridge volumes, therefore, does not necessarily mean an increase for all of the roadways in the area.

El Paso

The monthly variation in the volume of import trucks in El Paso is displayed in Figure 2-5. Table 2-15 shows a 2 percent drop in the import truck volumes between 1990 and 1991. This is not a very reliable period of time to look at trends; however, four ADT counts stations in the local roadways show annual growth rates between 1986 and 1989 ranging from 2.1 to 11.3 percent (Table 2-17 and Figure 2-12) (TxDOT District Traffic Maps).

Hidalgo

The four ADT count stations in Hidalgo (Figure 2-13) have generally shown a steady rise since the mid-1980s (TxDOT District Traffic Maps). The bridge volumes in Hidalgo (Figure 2-6) have increased by approximately 140 percent since 1986 (Table 2-15). The increase in import truck traffic on the bridge parallels the increase in traffic on the roadways. Traffic on US 281 has shown an annual growth rate of 5.3 percent between 1984 and 1988 (Table 2-17). Both ADT count stations on US 83 show annual increases between 5 and 7.5 percent between 1984 and 1988. The traffic count station on Spur 241 has shown a slight decrease with an annual growth rate of -1.0 percent between 1984 and 1990.

Laredo

Import truck volumes on the Convent Street Bridge in Laredo is displayed in Figure 2-7. The figure shows that the volumes in the last quarter of 1991 are significantly greater than the volumes which occurred in the same period at the end of 1990. The volume of trucks in January of 1992 was also much greater than the volume which occurred in January of 1991. While this is not a significant amount of data, it does show a notable amount of growth. Table 2-15 lists a 7 percent growth between 1990 and 1991 for the bridge volumes. The traffic counts stations

shown in Figure 2-14 display steady increases since 1984 (TxDOT District Traffic Maps). Traffic on FM 1472 has risen dramatically in the past eight years with an annual growth rate of 10.6 percent between 1984 and 1990 (Table 2-17). Traffic volumes on US 81 have risen with an annual growth rate of 4.4 percent over the same period. Volumes on SH 359 have shown an increase in traffic volume at an annual rate of 6.5 percent between 1984 and 1988.

Progreso

The import truck volumes on the Progreso bridge (Figure 2-8) increased 167 percent between 1986 and 1991 (Table 2-15), an annual growth rate of 21.7 percent. The traffic count station near Progreso showed a slower, but significant annual growth rate between 1984 and 1989 of 4.4 percent (Table 2-17 and Figure 2-15) (TxDOT District Traffic Maps).

Projections of Future Growth

Future bridge volume estimates were obtained from historical growth rates, with some adjustments. The annual growth rates in Del Rio, Hidalgo, and Progreso were extremely high. It was considered unlikely that this trend would continue in the future, so a slightly lower rate (based on the increase in number of vehicles) was determined for them. El Paso showed a negative growth rate, but this only spanned a one-year period. A small positive growth rate was assigned to El Paso because of the unlikely possibility that the negative rate would continue into the future. Brownsville, Eagle Pass, and Laredo were assigned growth rates which were close to the historical growth rates (Table 2-18).

The development of future annual growth rate values for the traffic count stations near the survey cities was a two-part process:

- A single value was estimated from the existing annual growth rates of each of the survey cities.
- This value was reviewed to determine the final future annual growth rate value.

Each of the traffic count stations were reviewed to determine their proximity to the bridge in the survey city. The stations which were closest to the bridge were given more weight in determining the overall growth value for the traffic counts. This process resulted in the historical growth value in Table 2-18 for the traffic on the roadways in each of the survey cities.

Table 2-18. Historic and Estimated Growth Rates for Bridge and Roadway Volumes

City	Historic Growth Values		Estimated Future Growth Values	
	Bridge (%)[1]	Roadway (%)[1]	Bridge (%)	Roadway (%)
Brownsville	6.3	3.8	6.0	3.0
Del Rio	13.4	1.6	7.0	2.0
Eagle Pass	6.0	-2.3	4.0	1.0
El Paso	-1.5	2.2	2.0	2.0
Hidalgo	19.3	3.3	10.0	3.0
Laredo	7.3	4.9	7.0	4.0
Progreso	21.7	4.4	10.0	5.0

[1] From Table 2-17.

The future roadway and bridge traffic growth rates were estimated using the historical data in each of the cities. Most of the estimated future growth rates in Table 2-18 are close to the historical rates. The historical annual growth rate in Eagle Pass, however, was negative. A small positive value of 1 percent was assigned to this city because negative growth was unlikely in the future. The other cities were assigned future annual growth rates very close to their historical growth rates (Table 2-18).

The future annual growth rates were used with the average monthly import bridge volumes to establish the import bridge volumes for the year 2000 shown in Table 2-19 illustrated in Figures 2-16 through 2-22. The estimated volumes from the year 2000 include three separate values. The middle estimate is based on the historical growth. The low and high estimates provide a range in which the estimated volumes in the year 2000 are expected to fall.

The estimated volumes show Laredo having the largest volume of import trucks, surpassing El Paso, due to the much higher growth rate in Laredo. Import truck volumes in Hidalgo and Progreso would more than double between 1991 and 2000. Only the Eagle Pass and El Paso import truck volumes were not estimated to double between 1991 and 2000; however, these two cities had lower growth rates than the other cities.

Figure 2-16. Brownsville Bridge Truck Volumes

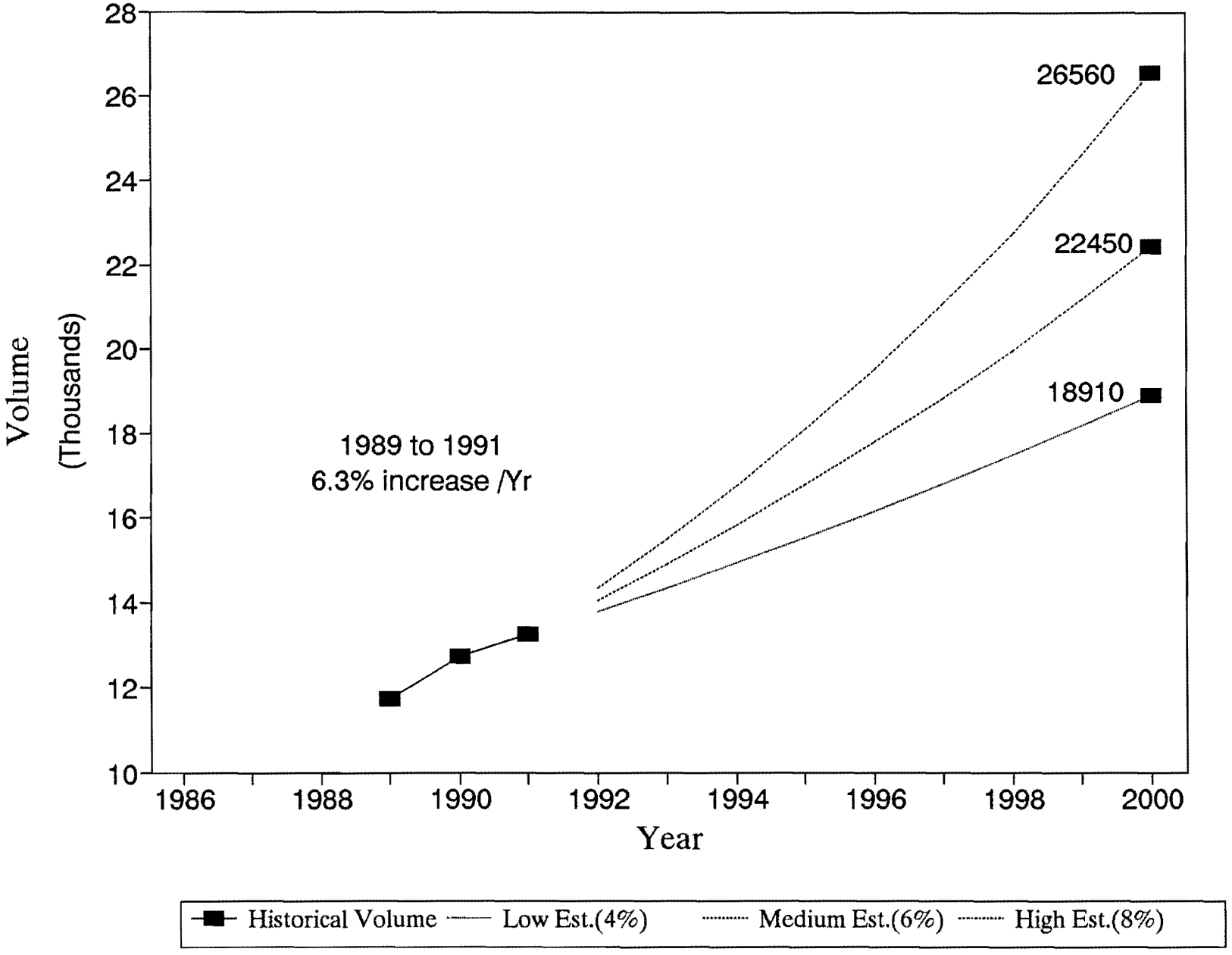


Figure 2-17. Del Rio Bridge Truck Volumes

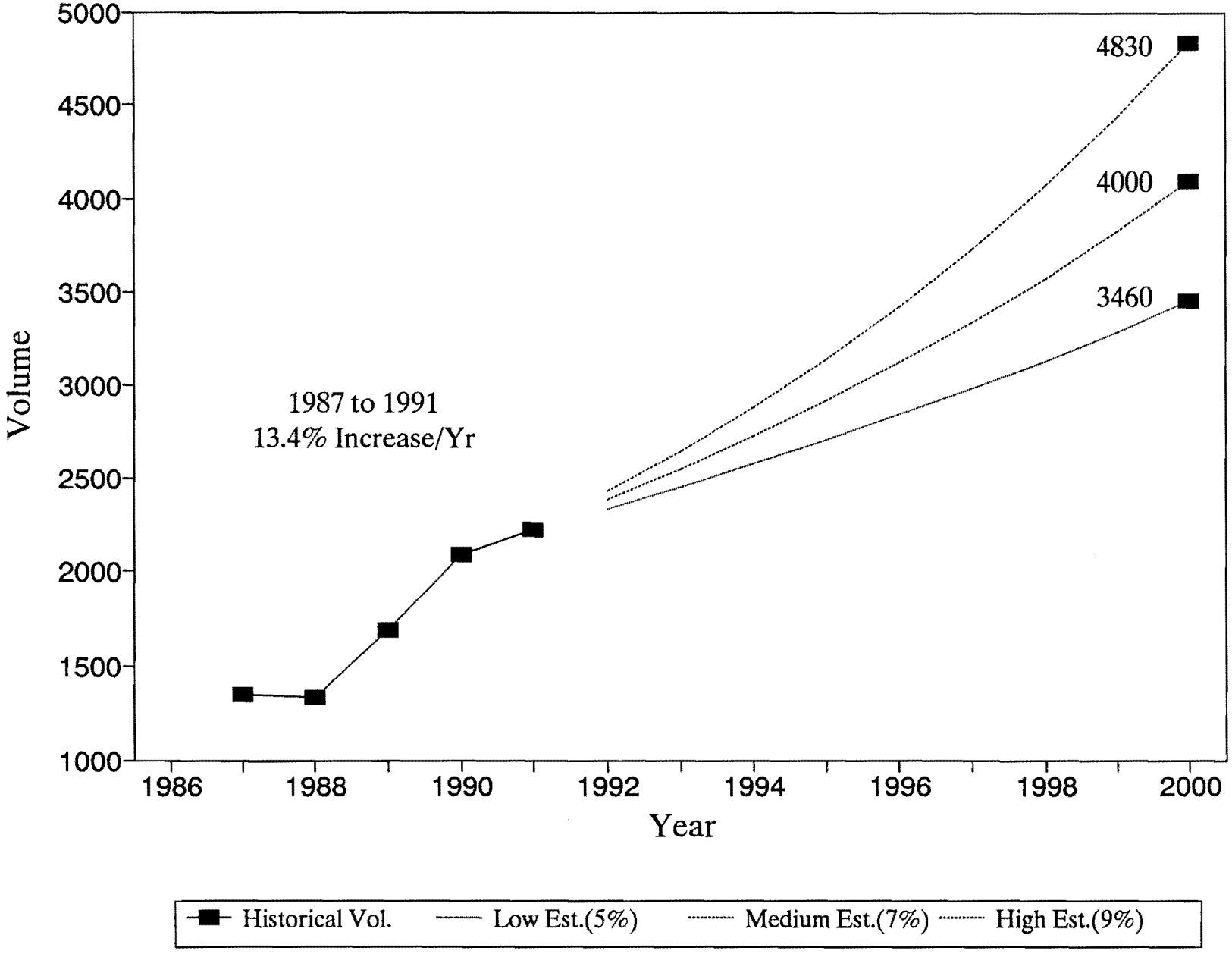


Figure 2-18. Eagle Pass Bridge Truck Volumes

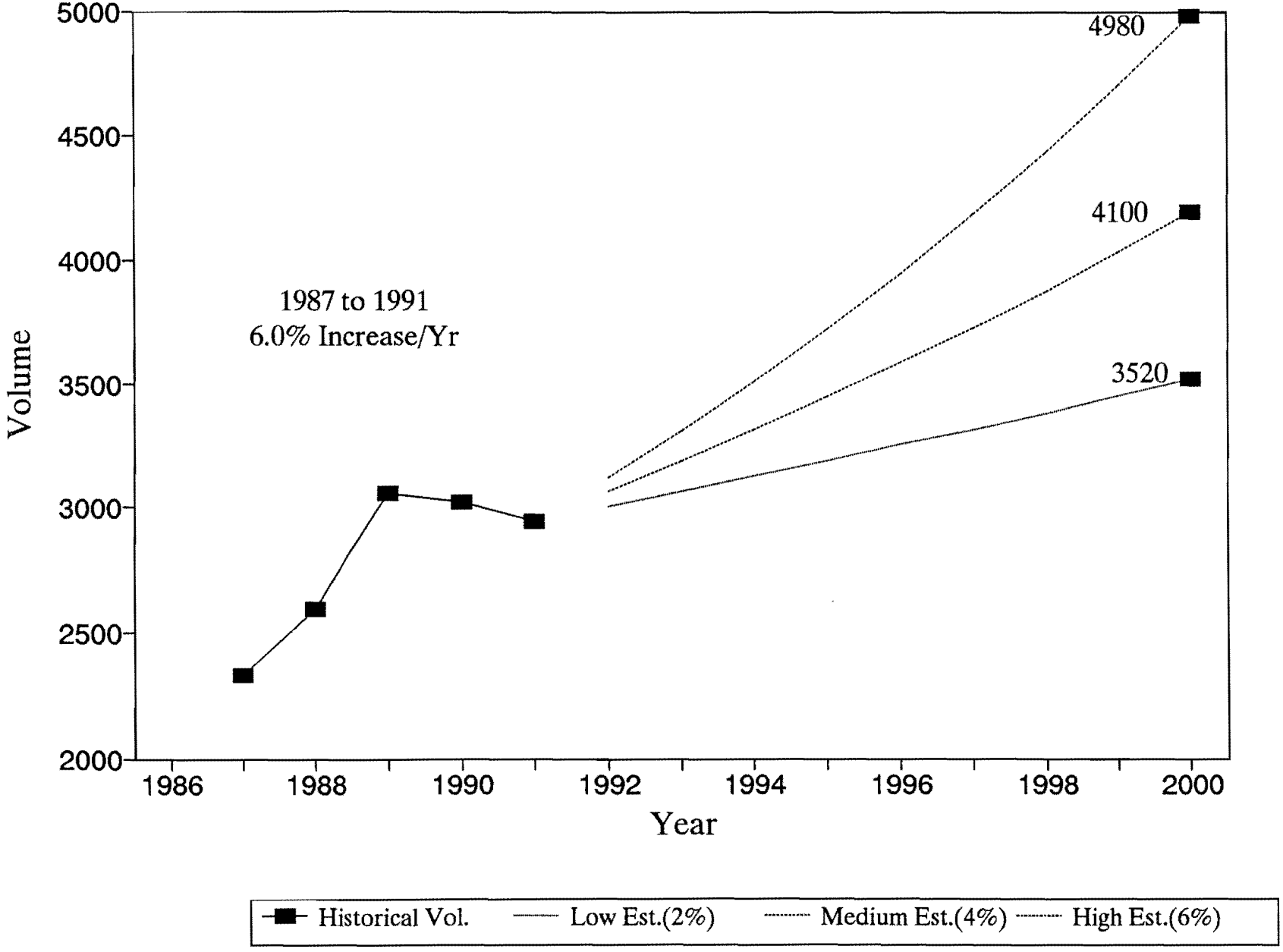


Figure 2-19. El Paso Bridge Truck Volumes

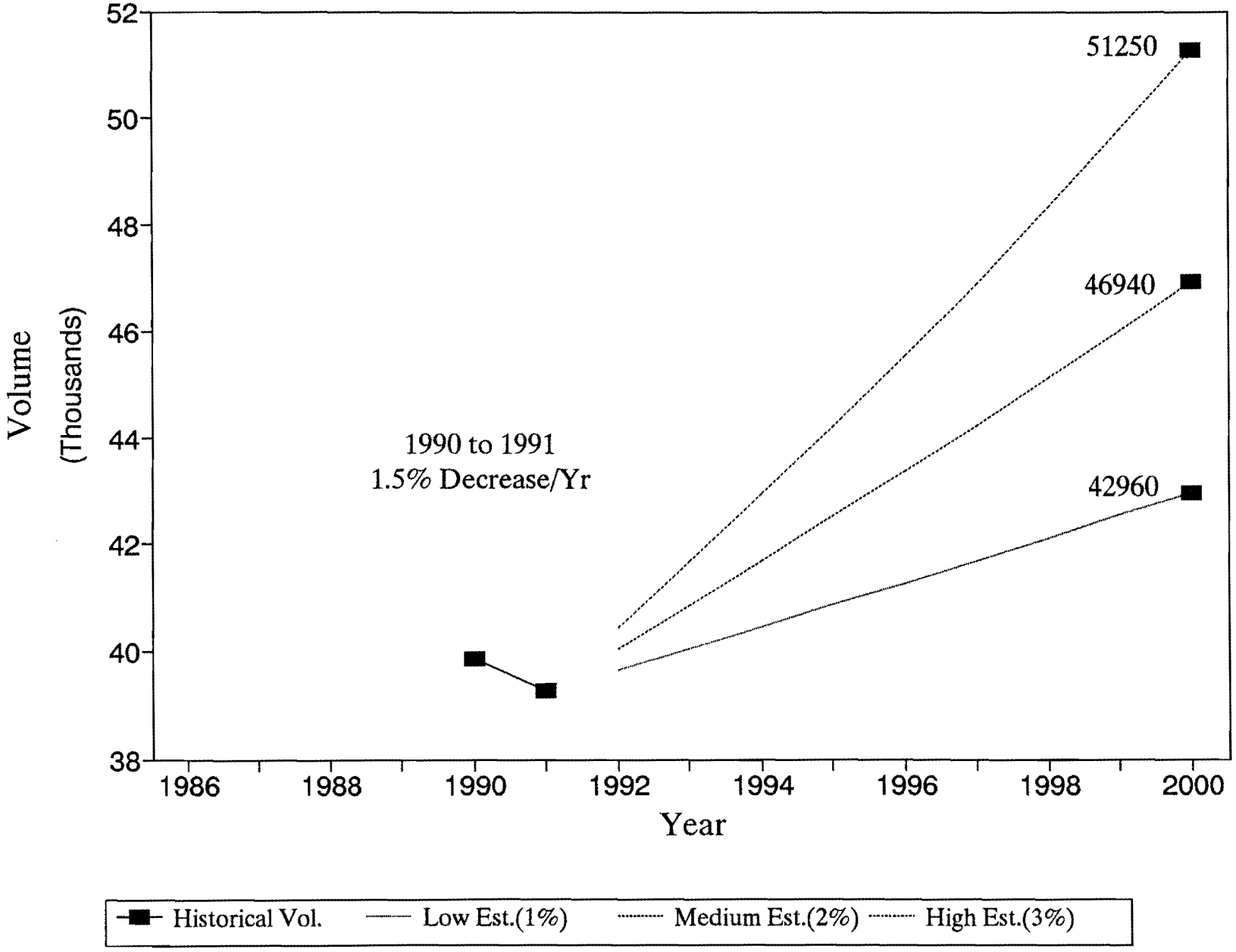


Figure 2-20. Hidalgo Bridge Truck Volumes

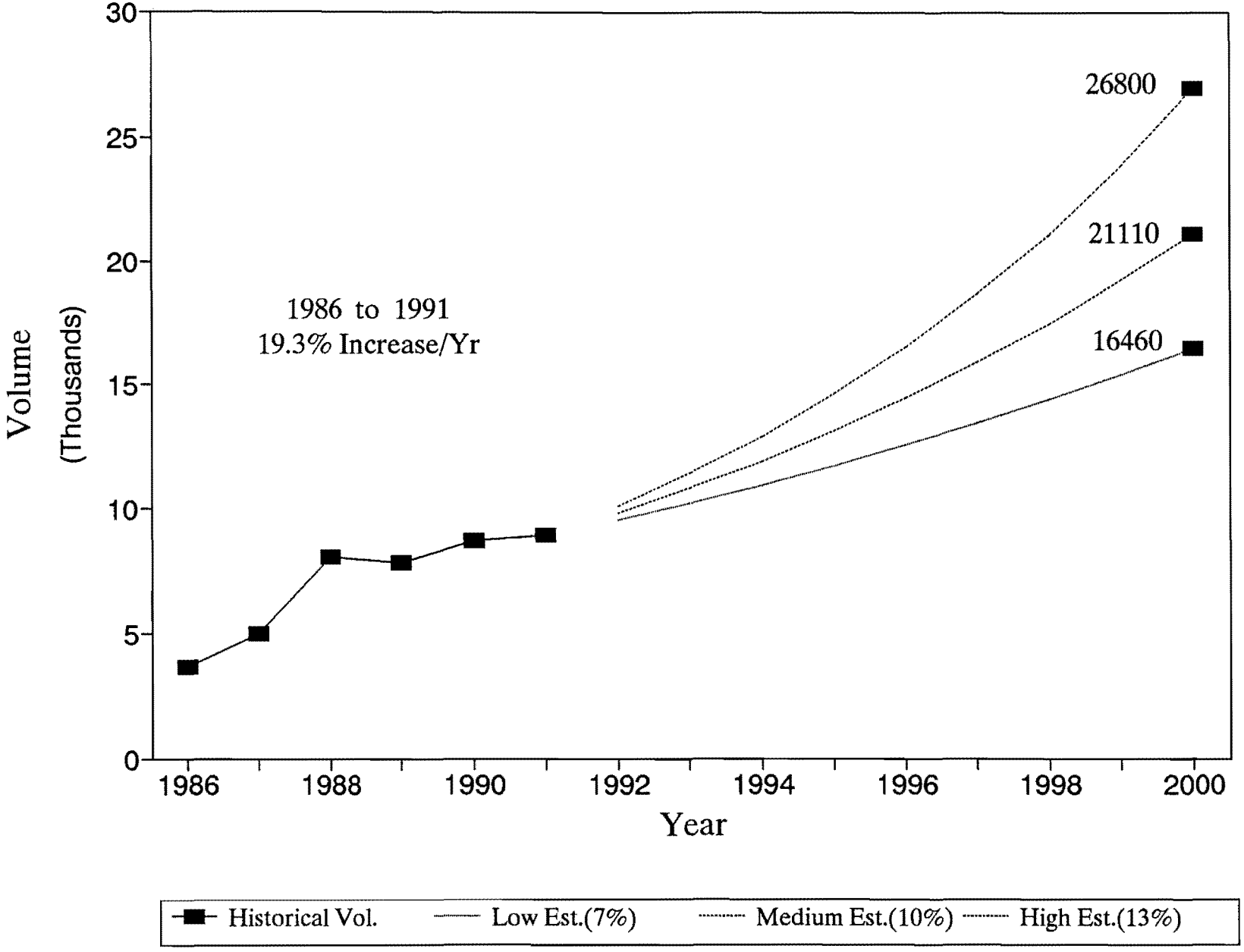


Figure 2-21. Laredo Bridge Truck Volumes

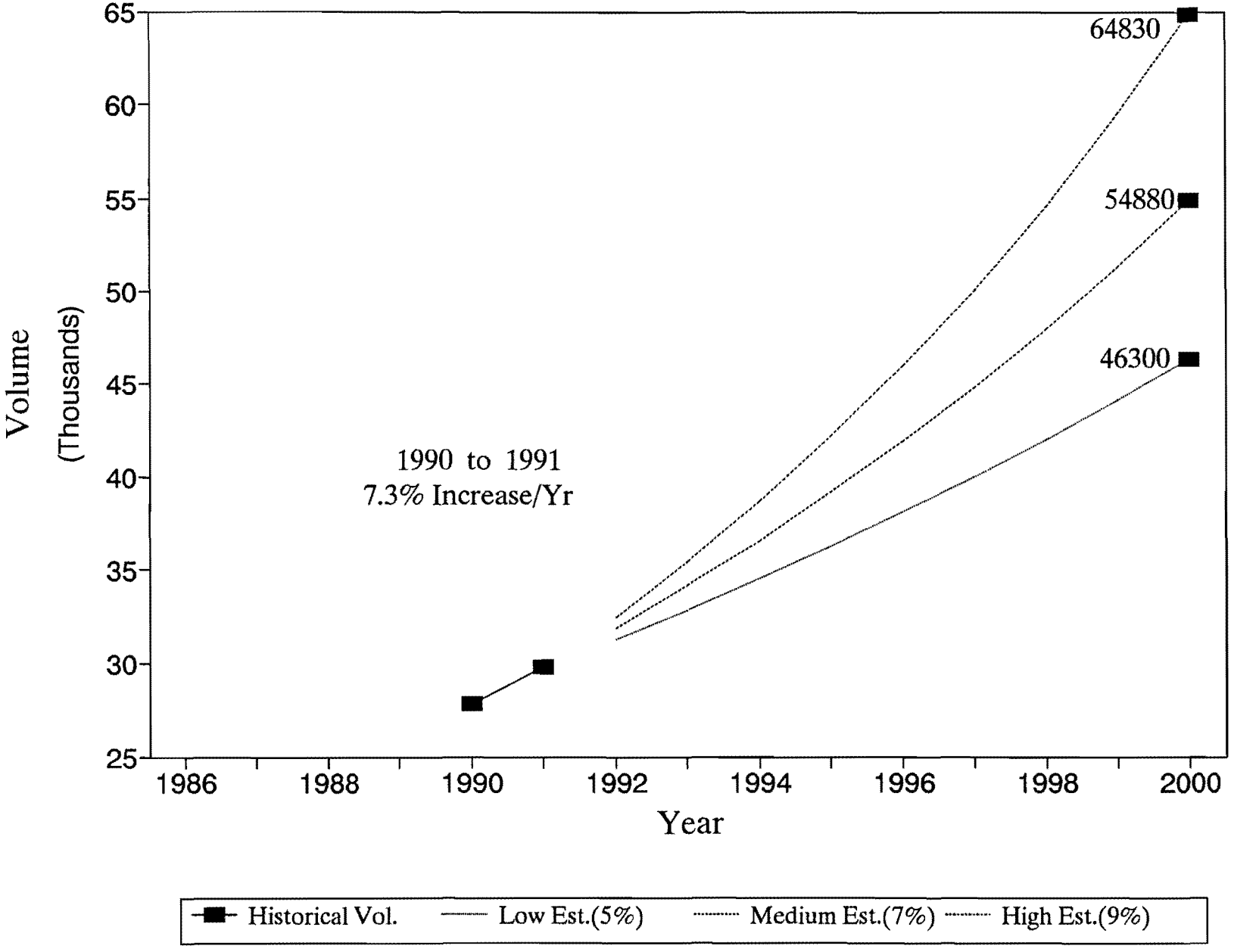


Figure 2-22. Progreso Bridge Truck Volumes

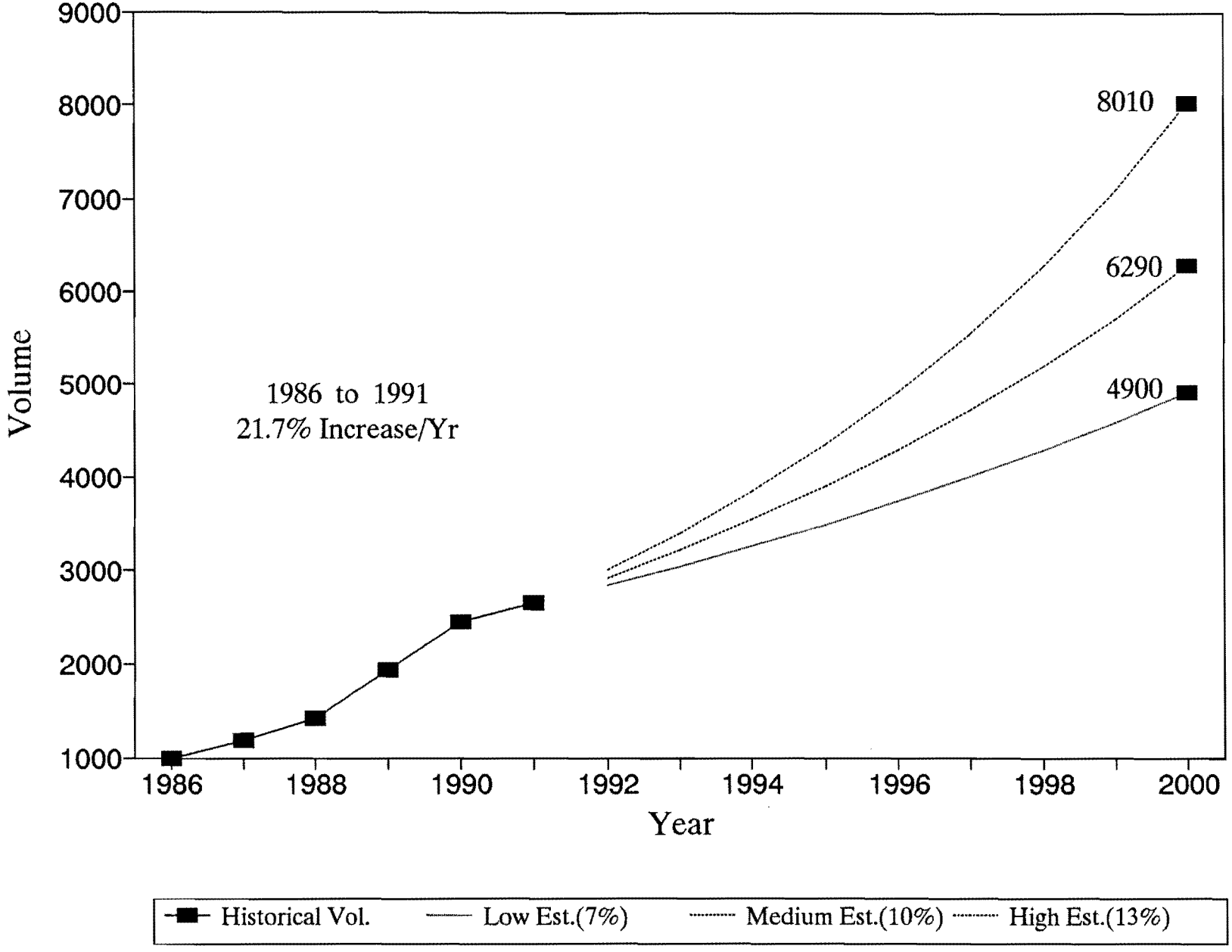


Table 2-19. Estimated Bridge Volumes for 2000

City	Estimated Future Growth for Bridge(%)[1]	Average Monthly Import Truck Volume 1991[2]	2000		
			Low	Historical	High
Brownsville	6.0	13,275	18,910	22,450	26,560
Del Rio	7.0	2,230	3,460	4,100	4,830
Eagle Pass	4.0	2,950	3,520	4,200	4,980
El Paso	2.0	39,280	42,960	46,940	51,250
Hidalgo	10.0	8,950	16,460	21,110	26,900
Laredo	7.0	29,850	46,300	54,880	64,830
Progreso	10.0	2,670	4,900	6,290	8,010

[1] From Table 2-18.
[2] From Table 2-15.

The future annual growth estimates were used with the most recent ADT count from each station to determine the traffic volumes in the year 2000 (Table 2-20). These new volumes ranged from a 10 percent increase in Eagle Pass to a 70 percent increase in Progreso. The range of years over which the growth occurred varied between 10 and 12. This was related to the availability of data at each station.

Table 2-20. Estimated Roadway Volumes for 2000

City	Roadway	Description	ADT Volume and Year		Estimated Daily Traffic in the year 2000 [1]
			Year	Volume	
Brownsville	US 77	0.5 mi NW of Brownsville	1990	17,650	23,720
	SH 48	0.2 mi NE of FM 511	1988	7,660	10,920
	US 83	0.6 mi N of SH 100	1988	23,550	33,570
Del Rio	SPUR 239	1.0 mi SW of US 90	1990	6,220	7,590
	US 90	0.5 mi NW of US 377	1988	3,770	4,780
Eagle Pass	US 57	0.2 mi W of Eagle Pass	1990	11,930	13,180
	SPUR 240	0.2 mi W of Eagle Pass	1990	6,830	7,550
El Paso	LP 478	0.2 mi S of US 62	1990	13,160	16,040
	FM 258	5.4 mi SW of SH 20	1988	6,920	8,770
	US 54	0.3 mi N of IH 10	1988	66,810	84,730
	IH 10	1.2 mi S of LP 375	1988	26,190	33,210
Hidalgo	SPUR 241	1.0 mi SW of LP 115	1990	17,650	23,720
	US 83	2.8 mi W of FM 492	1988	15,000	21,390
	US 83	0.4 mi W of FM 1426	1988	4,040	5,770
	US 281	7.5 mi S of US 283	1988	44,470	63,400
Laredo	US 81	0.1 mi W of Laredo	1990	11,730	17,360
	SH 359	4.9 mi E of US 83	1988	3,460	5,540
	FM 1472	0.2 mi NW of IH 35	1990	12,550	18,570
Progreso	FM 1015	2.0 mi S of US 281	1989	6,100	10,430

[1] Annual growth rate from Table 2-19.

Impacts of Traffic Growth

The implementation of the North American Free Trade Agreement (NAFTA) between the United States and Mexico will have an effect on the cities in this survey. With the easing of trade restrictions between the two countries, there are several areas within the maquiladora industry which could be affected. First, the number of truck trips could increase because of the ease of crossing the border. Second, additional plants might be constructed across the border to utilize the lower production and finishing costs. This, in turn, would increase truck traffic between border cities to carry the additional goods.

The NAFTA could place a real burden on existing roadway and bridge facilities in the border cities. The recent traffic growth that has occurred along the border has identified some of the potential infrastructure problems which might result from new truck policies.

Roadway Improvements

This section discusses the effects of the estimated truck volume growth and possible impacts of the North American Free Trade Agreement (NAFTA) on the existing and future roadway system in the border cities and Texas. Each border city in this study is examined to determine possible problems which may exist if traffic volumes continue to increase as they have in the recent past or if substantial changes might occur due to the revised policies of NAFTA.

The future of traffic, particularly truck traffic, along the border is in question if NAFTA is approved. Many of the bridges in the border cities currently support a tremendous amount of truck volume. Even though trucks make only a small percentage of the total vehicles in the roadway system, further growth in truck traffic may overburden the existing infrastructure in these areas. There exists many possible solutions to this problem; some of these solutions are discussed in this section.

Background

Each truck which intends to cross into Texas must enter into a U.S. Customs Service holding lot to have its paperwork processed and, possibly, its cargo inspected. This process accounts for the majority of the time involved for trucks to enter Texas. NAFTA is expected to loosen some of these restrictions on truck inspections at the border crossing. If these restraints are not eased, truck travel delay at the bridges may not decrease unless a process that streamlines the inspection process (e.g., the electronic transfer of paperwork and preclearance of trucks) is implemented.

The mobility problems facing trucks in the border areas are not, however, limited to the bridges. The roadway system leading to and from the bridges can also create problems. If truck traffic is expected to move freely across the bridges, the approach and connecting roads need to be able to move traffic away from the bridge quickly to keep congestion low and to maximize the benefits from NAFTA. The connecting roads may be currently configured to move high volumes and flow rates of passenger vehicles, rather than trucks, away from the bridges. This is because of the small number of trucks leaving the Customs Service inspection lot at any time. If the manner of inspecting vehicles changes under NAFTA, these approach roads will need to handle a larger percentage of the truck traffic during the peak; customs would no longer "meter" the flow of trucks. This may require adding capacity to the approach and connecting roads or reconfiguring the traffic control devices or associated hardware to change such things as lights, signs, and traffic signals.

Another potential problem area is with connections to the Texas Highway Trunk System (major roadways in the area including State, U.S., and Interstate Highways). The roads connecting the bridges to the Trunk System must be able to move the truck traffic in a quick and efficient manner. The Trunk System should allow the flow of high numbers of trucks and passenger vehicles to destinations in Texas and the United States. The challenge here is to connect with minimal delay and the most direct route feasible.

At the same time, much of the truck traffic from the bridges stays within the city. If truck volumes continue to grow, this will place an additional burden on the streets within the city. This additional volume may require upgrading the existing system as well as creating the need for additional maintenance due to the extra volume.

Possible Improvements

There are many things which can be done to alleviate problems in each part of the system. These may include additional construction, operational improvements, and different operating policies.

The solutions to problems on the bridges seem to depend primarily on the outcome of the NAFTA. If an inspection of each truck and/or its paperwork is not required by NAFTA, the trucks might be allowed to move unimpeded over the bridges. This will reduce the effect on traffic flow by the Customs Service at the bridges, and may also allow the partial transformation of the Customs facilities area into spaces where trucks can be routed around the general traffic lanes and given priority entry to the general roadway system.

Another possible solution exists where a city has more than one bridge. This situation may allow for a separate import and export bridge for trucks. Each bridge would handle only trucks moving in one direction. This would allow each of the bridges to adapt their facilities and efforts into making the border crossing quick and easy for the trucks. Another action which could be taken would be to create a dedicated lane or lanes for trucks on the bridges. This would allow the trucks prompt access to the ramps for them to exit the bridge. A major problem facing trucks is their inability to maneuver in tight locations and any dedicated lane would have to be designed to reduce interference from passenger vehicles and provide connection to the roadway system.

The cities in this study are separated into four groups: Valley Area (Brownsville, Progreso, Hidalgo), Laredo, Eagle Pass and Del Rio, and El Paso. A discussion of the current status at and around the bridges in each of the cities is included in each section.

Valley Area

Brownsville

The bridges in Brownsville, the Gateway and B&M, are located only a few thousand feet apart. The Gateway Bridge has two lanes inbound and two lanes outbound on separate structures. The B&M Bridge has one lane inbound and one lane outbound with train tracks on the same bridge. The bridge closes to auto and truck traffic when a train is crossing. The B&M Bridge is also very narrow and not conducive to trucking. The majority of trucking in Brownsville currently utilizes the Gateway Bridge. This bridge connects with SH 4 and ties into the Trunk System about one mile north at US 77/83 (Figure 2-23). Some of the truck traffic using SH 4 continues on this roadway in route to the port of Brownsville to deliver their cargo. Some of the other truck traffic crossing the Gateway Bridge leaves SH 4 and uses SH 415 to travel to warehouses and railyards on the western side of Brownsville. At the current rate of growth, inbound truck volumes are estimated to be 22,450 trucks per month on the Gateway Bridge in the year 2000, up from 13,275 trucks in 1991. This is approximately a 70% growth in the number of inbound trucks crossing the bridge per month in a nine year period.

There are, however, plans to extend US 77/83 and create a new bridge, Los Tomates, across the Rio Grande River. This new bridge would create additional bridge capacity, provide a closer bridge to the Port of Brownsville, and possibly divert traffic from Gateway. It would also provide a more direct route to the Trunk System; however, it could create operational problems if it connects into the current roadway system at the US 77/83 interchange with SH 4. Traffic from both Los Tomates and Gateway would use this interchange. The problems, such as a possible bottleneck, might create a need for some upgrading of the interchange at that location (Projects, June, 1991).

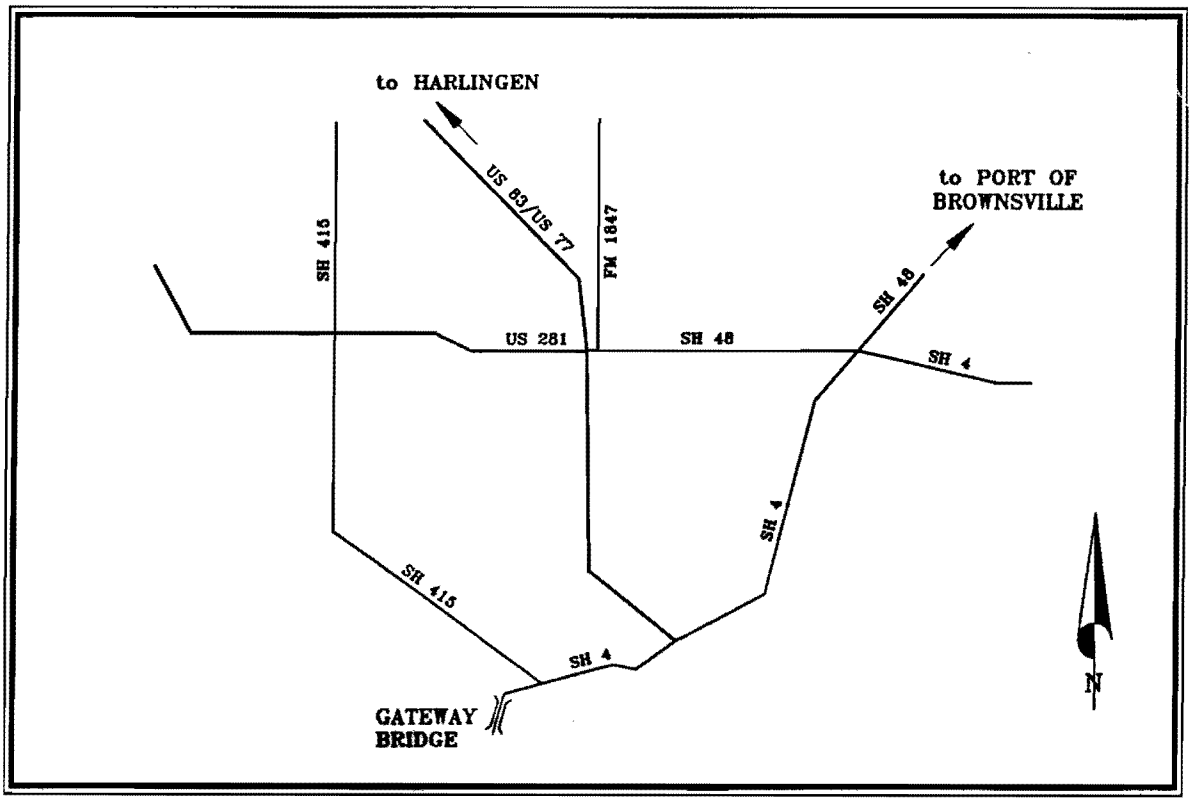


Figure 2-23. Brownsville - Gateway Bridge and Connecting Roadways

Progreso

The B&P Bridge in Progreso has one lane inbound and one lane outbound. The bridge connects with FM 1015 and ties into the Trunk System at US 281 (Figure 2-24). FM 1015 also connects with US 83 north of US 281. It is estimated that 6,290 trucks will cross inbound per month in the year 2000 at Progreso if current trends continue as opposed to the 2,670 which crossed inbound per month in 1991 (a 135% growth in nine years). Although this is a large amount of growth, the total volume of trucks is not very high. Additions or modifications of the area near the bridge and connections to the roadways can be made easier than at some other locations. The bridge is not located within a major city, which would allow for expansions to be accomplished more easily.

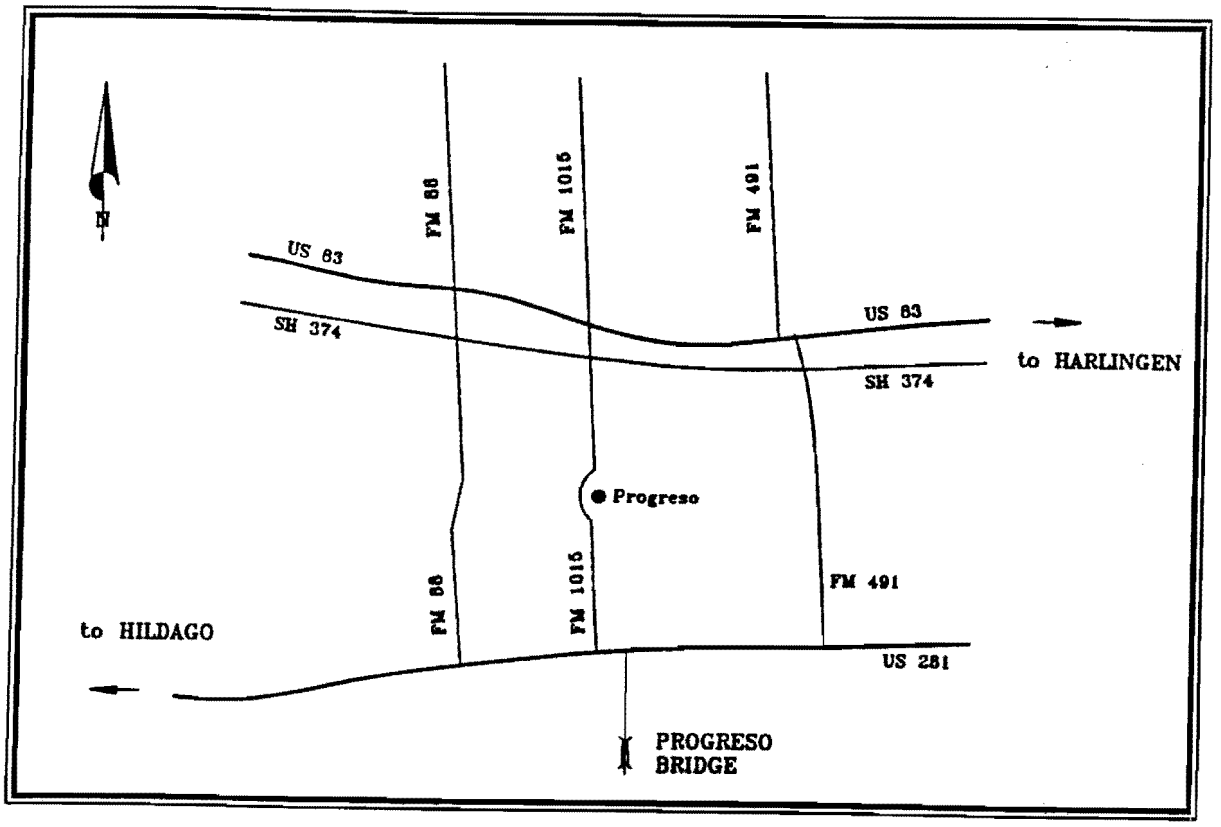


Figure 2-24. Progreso Bridge and Connecting Roadways

There are plans to widen FM 1015 from a 2-lane facility to a 4-lane facility. This includes creating a bypass around Progreso. This bypass will keep future growth in traffic volumes from becoming bottlenecked inside the town of Progreso (Projects, June 1991).

Hidalgo

The Hidalgo-Reynosa Bridge in Hidalgo has four lanes inbound and four lanes outbound on separate structures. The bridge connects with Spur 241, which connects with Spur 115, SH 336, and US 281. All three of these roadways provide access to US 83 (Figure 2-25). At the current rate of growth, inbound truck volumes are estimated to be 21,110 per month in the year 2000 which is up from 8,950 per month in 1991. This is about a 135% growth in the number of inbound trucks crossing the bridge per month in a nine-year period. That volume of trucks in the year 2000 would be almost equal to the number of trucks estimated for 2000 for the Brownsville Gateway Bridge. This would be a significant increase in market share for the Hidalgo Bridge, since its current volume is less than 70 percent of that at the Gateway Bridge.

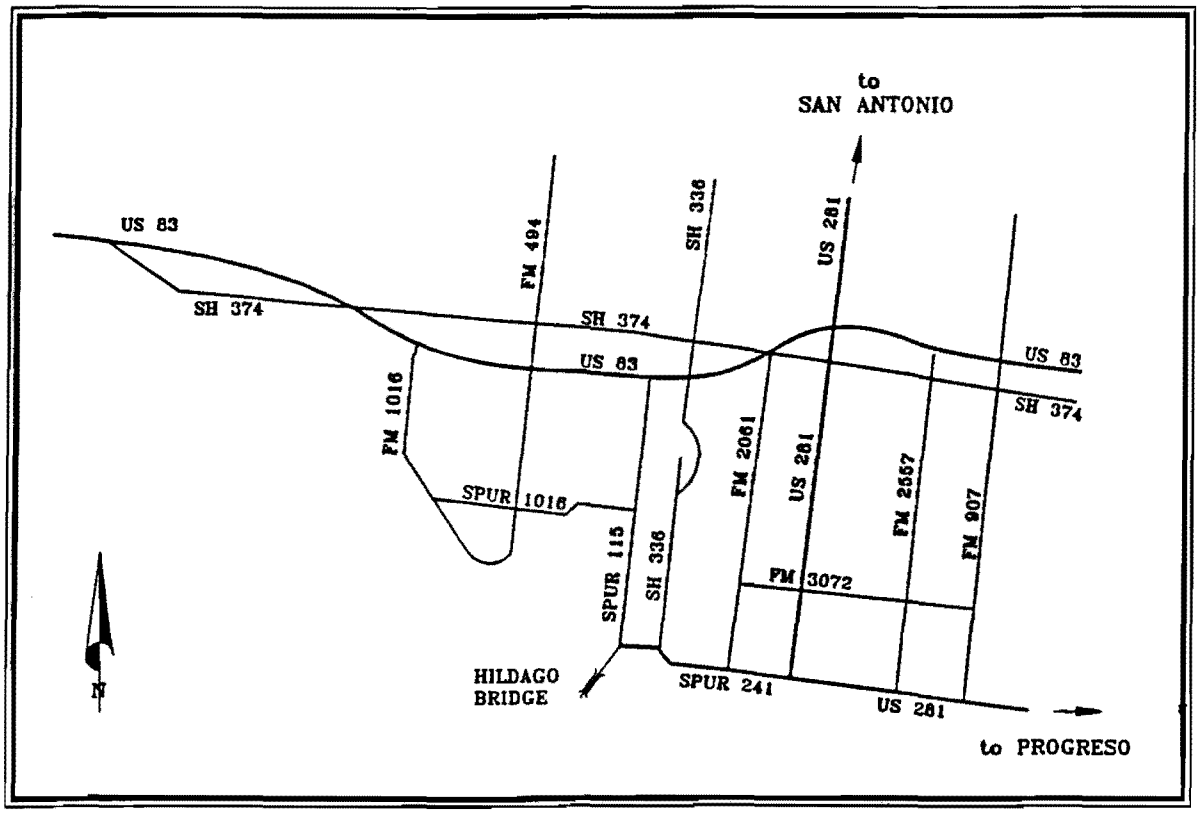


Figure 2-25. Hidalgo Bridge and Connecting Roadways

The bridge at Hidalgo, with its four inbound lanes, should be able to handle this volume of truck traffic. If the truck and passenger vehicle volumes increase substantially, however, the connection to US 83 may require a new roadway that would not load the streets of McAllen with significant truck traffic.

There are plans to construct an interchange at Spur 241 and Spur 115. SH 336 is scheduled to be widened from a 2-lane facility to a 4-lane facility. The interchange at Spur 115 seems to be an important improvement because Spur 241 carries a high number of trucks, and the interchange at Spur 115 is the first major road exiting from Spur 241. It is important that a bottleneck does not occur at this location (Projects, June, 1991).

Laredo

There are three bridges in or near Laredo. The Convent Street Bridge and Lincoln-Juarez Bridge are located in Laredo. The Columbia Bridge is approximately fifteen miles west of Laredo.

The Convent Street Bridge has two lanes in either direction which connects to narrow streets in a business district. The Lincoln-Juarez Bridge is a seven-lane facility with access to IH 35 via wide arterial streets. Only empty trucks currently use this bridge due to problems in accessing the Laredo import lot from the bridge. It is estimated that 54,875 trucks will cross inbound per month in the year 2000. This is up from 29,850 per month crossing inbound in 1991. This represents an 84% increase in inbound truck volumes in the nine year period.

The current arrangement of all loaded trucks using the Convent Street Bridge may not function with the expected truck growth in the area. Utilizing the Lincoln-Juarez Bridge to handle loaded trucks may become more important in the future. Import trucks using the Convent Street Bridge must drive through the import lot and exit onto a road near the Rio Grande River. This road feeds into the roadway system west of the downtown area where many warehouses and railyards exist in the city. Trucks wanting to access IH 35 must use a circuitous route through the city to reach this roadway. This route adds a great deal of travel time to a trip. The Lincoln-Juarez Bridge could allow trucks direct access to IH 35 and would allow a much quicker and easier route on streets designed to handle truck traffic (Figure 2-26).

The Columbia Bridge west of Laredo has four lanes inbound and four lanes outbound. It is located in a rural area and connects to northern Laredo by FM 1472. This roadway is a 2-lane facility which will need upgrading to handle a significant amount of truck traffic. Although this bridge is a modern facility well-suited for truck traffic, it may not replace the older inner-city bridges as the largest carrier of truck traffic in the Laredo area due to the additional travel distance.

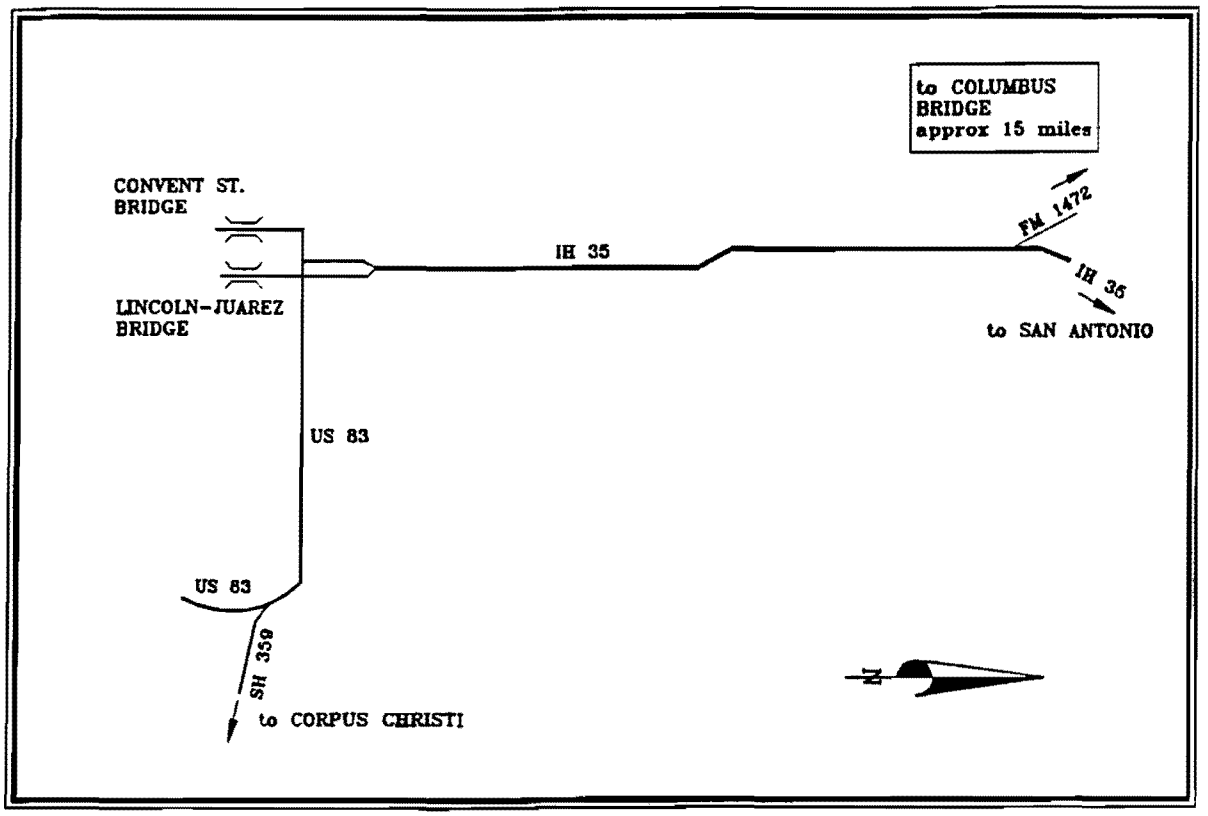


Figure 2-26. Laredo Bridges and Connecting Roadways

There are plans to widen FM 1472 from the present 2-lane facility to a divided 4-lane facility. This improvement will reduce the current disincentive to use the Columbia Bridge because the existing roadway is not favorable to truck traffic. The Columbia Bridge, however, is not near Laredo and Nuevo Laredo, and its appeal should be to long distance trips (e.g., Monterrey to Dallas) rather than local trips (Projects, June, 1991).

Del Rio and Eagle Pass

Eagle Pass

The Eagle Pass-Piedras Negras Bridge is a two-lane facility. The bridge connects to US 57 in Eagle Pass. US 57 connects with US 277 in Eagle Pass (Figure 2-27). The estimated monthly inbound truck volume for the year 2000 is 4,200 trucks. In 1991, the average monthly inbound truck volume was 2,950 (a 42 percent growth over the nine-year period).

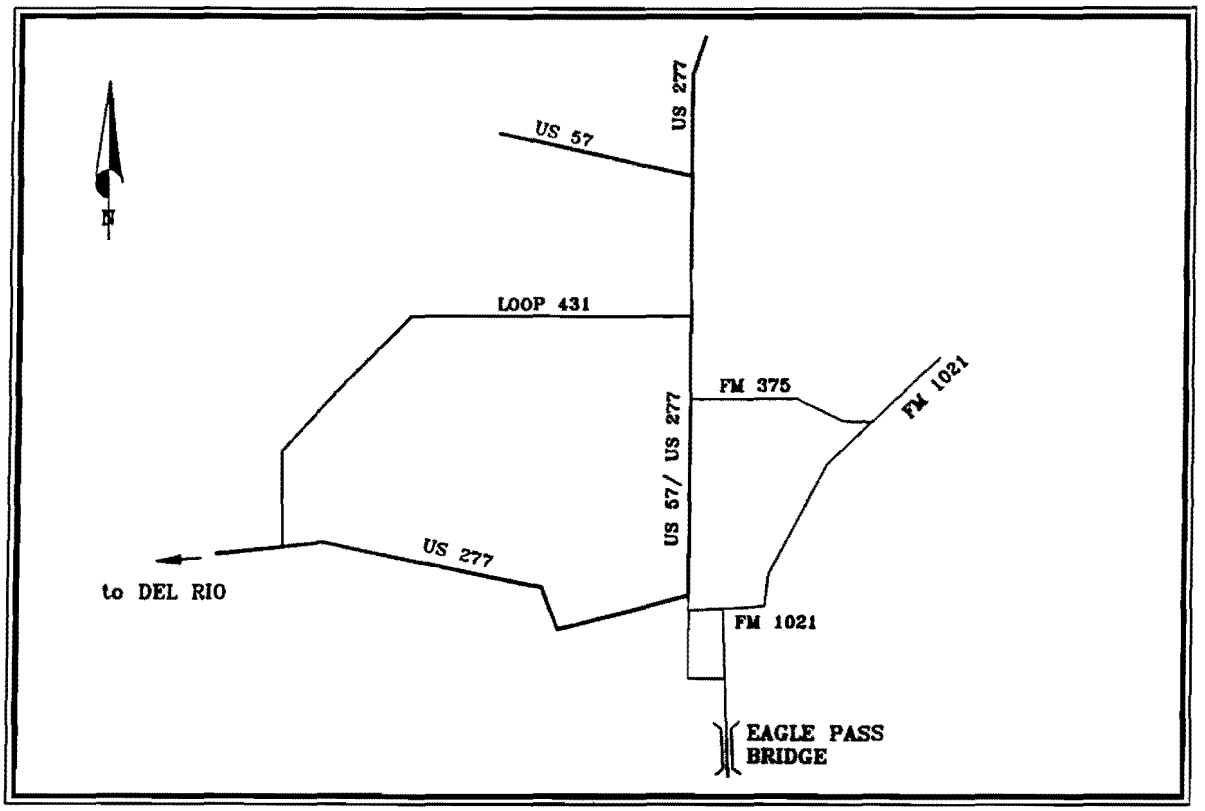


Figure 2-27. Eagle Pass Bridge and Connecting Roadways

Del Rio

The Del Rio Bridge has two lanes inbound and two lanes outbound. The bridge connects with Spur 239 south of Del Rio. Spur 239 connects with US 90 and US 277 in Del Rio (Figure 2-28). The estimated average monthly inbound truck volume in the year 2000 is 4,100 trucks. The average monthly inbound truck volume for 1991 was 2,230 trucks (an 84 percent growth in the nine year period).

Currently there are plans to widen Spur 239 from a 2-lane facility to a divided 4-lane facility. This will add capacity to the major roadway which connects the Del Rio Bridge to the Trunk System (Projects, June, 1991).

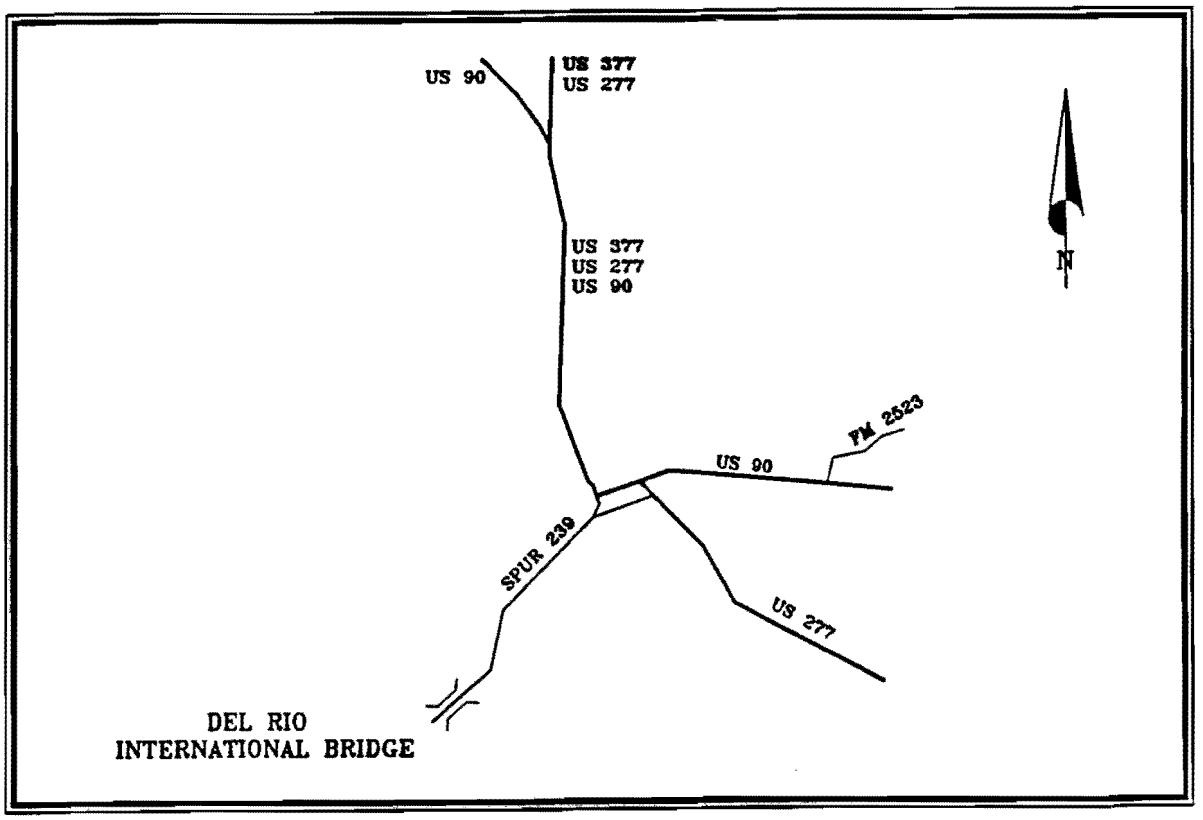


Figure 2-28. Del Rio Bridge and Connecting Roadways

El Paso

The El Paso area has many bridges crossing the Rio Grande River; however, only two of these carry a significant number of trucks. These two bridges are the Bridge of the Americas (BOTA) also known as the Cordova Bridge and the Zaragosa Bridge. The Cordova and Zaragosa Bridges both have four lanes inbound and four lanes outbound, however, Cordova is a toll-free facility and Zaragosa Bridge charges a toll. The Cordova Bridge connects with IH-110 which ties into the IH-10 and US 54 freeways (Figure 2-29). Zaragosa Bridge connects with Zaragosa Road. This road becomes Loop 375 which is currently an arterial street with some grade separations and connects to I-10 (Figure 2-30). The Cordova Bridge had an average monthly inbound truck volume in 1991 of about 30,000 while Zaragosa had an average monthly inbound truck volume of about 9,000. These 39,000 trucks in 1991 (at current growth rates) would grow to approximately 47,000 trucks in the year 2000. This is a 21 percent growth in nine years.

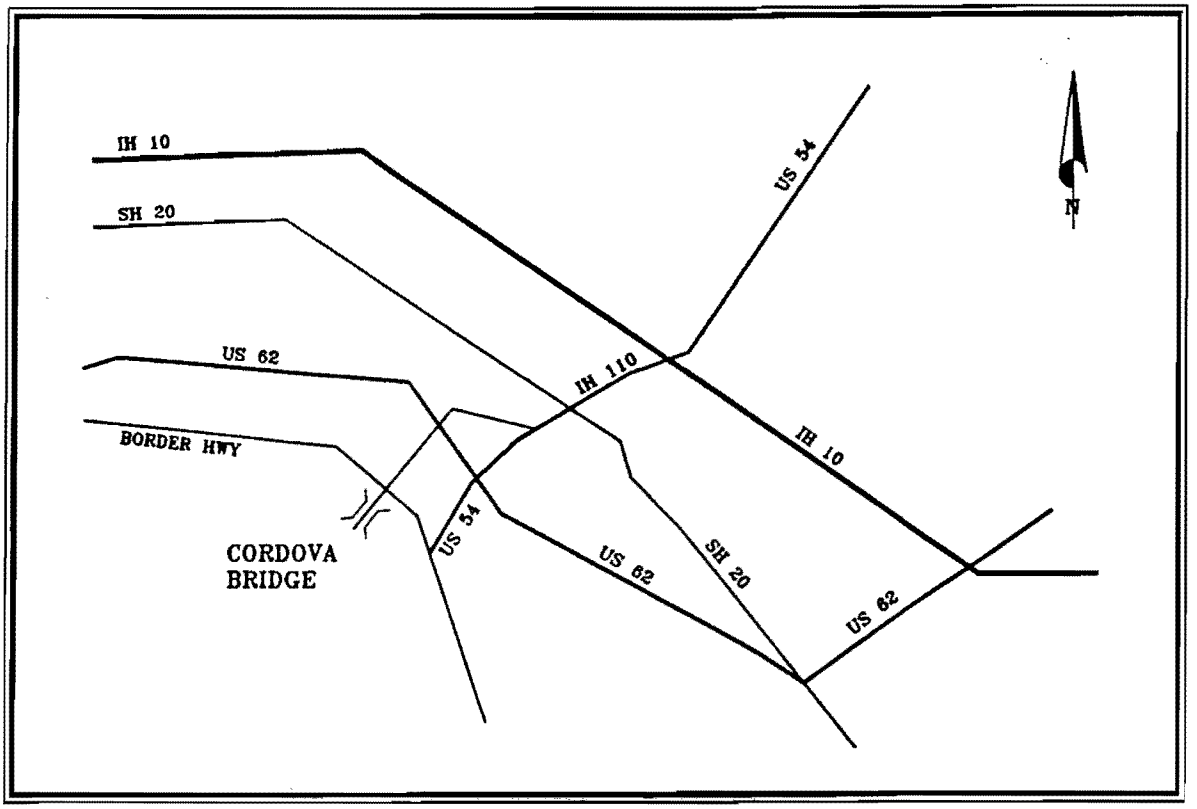


Figure 2-29. El Paso - Cordova Bridge and Connecting Roadways

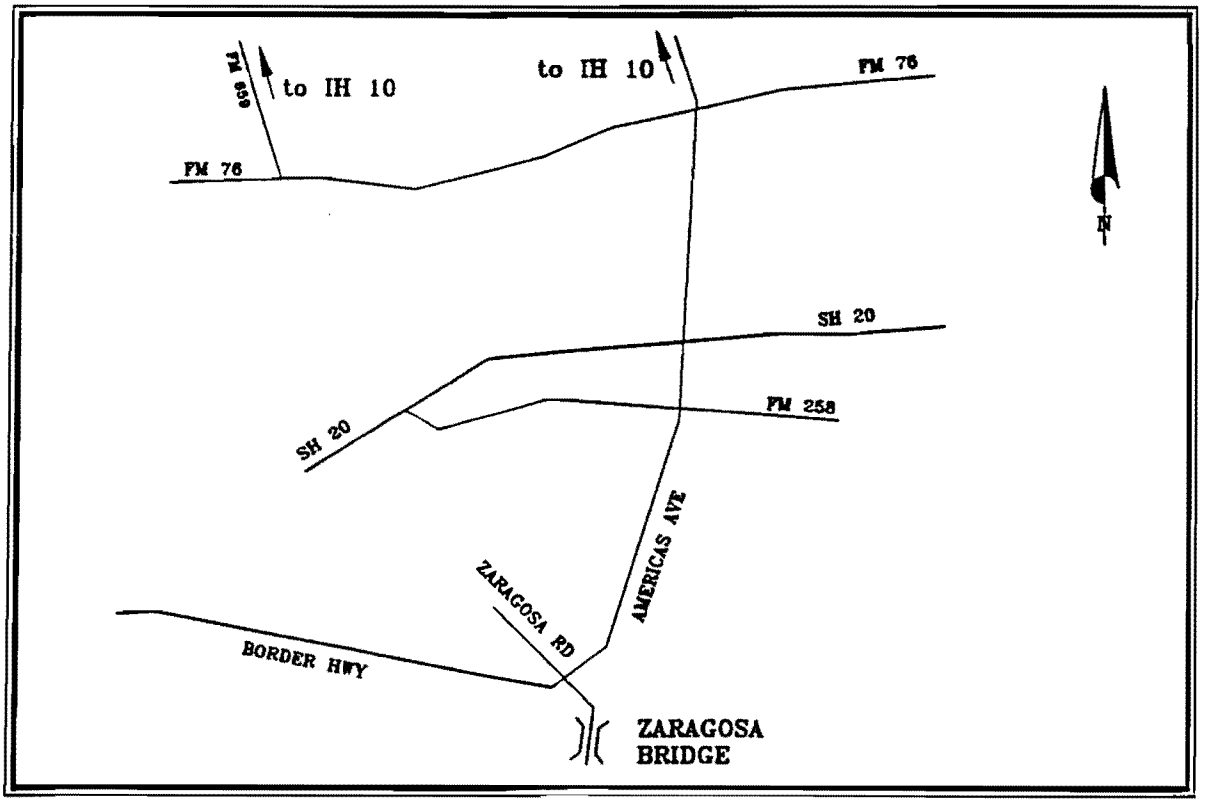


Figure 2-30. El Paso - Zaragosa Bridge and Connecting Roadways

There are some problems with the bridge structure at Cordova. In September of 1991, authorities with the International Boundary and Water Commission made the decision to limit trucks using Cordova to a maximum weight of 40,000 pounds. This decision caused many of the heavier trucks to travel to Zaragosa Bridge and pay the toll required at that facility. If the structural problems continue at the Cordova Bridge, the relative truck and passenger vehicle volumes at the two bridges are subject to change in the future. If the problems are corrected at Cordova, it will continue to be a major link across the Rio Grande River. If the problems cannot be corrected, the importance of the Zaragosa Bridge will continue to grow.

Inbound truck volumes recorded at the Cordova and Zaragosa Bridges give some idea of what effect the weight restriction at Cordova is having on the truck traffic in El Paso. Table 2-21 contains the truck volumes for several months in the last two years. The percentages displayed in the table represent the percent change between volumes in the same months during the two years. For example, a percent change is calculated based on the difference between truck volumes in September of 1990 and September of 1991.

Table 2-21. Inbound Truck Volumes at the Cordova and Zaragosa Bridges

	BOTA Bridge				Zaragosa Bridge[1]		Total			
Month	Empty	Pct[2]	Loaded	Pct[2]	Empty	Loaded	Empty	Pct[2]	Loaded	Pct[2]
August 1990	20,900		23,500				20,900		23,500	
September 1990	17,500		22,600				17,500		22,600	
October 1990	20,400		20,000				20,400		20,000	
November 1990	18,400		21,300				18,400		21,300	
August 1991	16,000	-23	21,600	-8	1,600	4,500	17,600	-16	26,100	11
September 1991	12,500	-29	19,700	-13	6,700	2,100	19,200	10	21,800	-4
October 1991	17,800	-13	28,000	40	8,600	600	26,400	-30	28,600	43
November 1991	15,000	-19	23,400	10	9,200	700	24,200	-32	24,100	13

[1] Bridge under construction until August 1991
[2] Represents the percent change between inbound truck volumes in corresponding months in 1990 and 1991

When the weight restriction was applied to the Cordova Bridge in September of 1991, the volumes of trucks increased at Zaragosa Bridge. The number of loaded trucks increased at Cordova Bridge and decreased at Zaragosa Bridge. The increase in truck volumes at the Zaragosa facility was primarily due to the number of empty trucks using that site. Some of the empty trucks from Cordova Bridge probably began using Zaragosa Bridge for their return trips. However, the overall volume of loaded trucks has increased in this period of time. This may have been caused by the shifting of cargo among trucks. The cargo which would have created

an overweight truck at Cordova may have been split into more than one load or some of the load might have been dispersed onto other trucks. This allows these trucks to continue to use the Cordova Bridge without having to move to the Zaragosa Bridge because of a weight problem.

It appears by the observing the truck volumes, that a change occurred in shipping patterns after the weight restriction was placed on trucks at Cordova Bridge. It appears that at the time that Zaragosa Bridge opened, many of the heavy trucks may have been routed to that facility. However, once this was done for a month or two, the trucks began splitting cargoes and making more frequent trips using the Cordova Bridge. It does appear that many of the return trips with empty trucks are using the Zaragosa Bridge. This explains the increase in total inbound truck volumes and the proportional changes in the number of empty and loaded trucks at each of the facilities.

Currently there are plans to upgrade Loop 375 from near the Zaragosa Bridge to IH-10 to a 4-lane freeway including an improved interchange at IH-10. Also included in future plans is a new 6-lane freeway between Zaragosa Road and FM 76 (Figure 2-29). Near Cordova Bridge, the section of US 54 from Yandell Dr. to Von Buren Ave. is currently being considered for expansion (Projects, June 1991).

3.0 MAQUILADORDA PLANT STUDY

Introduction to Database

During the completion of the survey phase of the 2034 project, a database was utilized to organize and manage the returned questionnaire data in an efficient manner. This section provides a descriptive review of the database information and reports the findings related to the mailout survey. The intent is to discuss the scope of the data, address the variable groups available from the databases, present graphical and tabular reviews of the available information, and provide information relating to the strengths and weaknesses of the data. To facilitate these goals, this section is divided into two parts:

Part I - Database Variables

1) Database Organization,
2) Survey Response Rate
3) Survey Variable Descriptions and Findings,
    a) Commodity Related Information,
        - Shipments
        - Tons Hauled
    b) Transportation Mode,
    c) Bridge Usage,
    d) Origin/Destination, and
    e) Warehouse Activity.

Part II - Data Integrity

1) Database Limitation , and
2) Data Variable Relationships.

Part I - Database Variables

Database Organization - The database utilized for the survey phase of this study was designed as a relational database. The survey was designed in two parts, one section for inbound shipment information and one section for outbound shipment information. This type of survey organization allows the database system to be separated into two sections, incorporating a separate database file for inbound shipments and one for outbound shipments. This database structure provides a logical and easy to manage database system which allows for external validity checks to made, verifying the data after it has been entered. Each survey (questionnaire set) has two sections, IN and OUT, and when any information was reported, it was represented by and entered into the respective database.[1] However,

Table 3-1 - Survey Response Rates

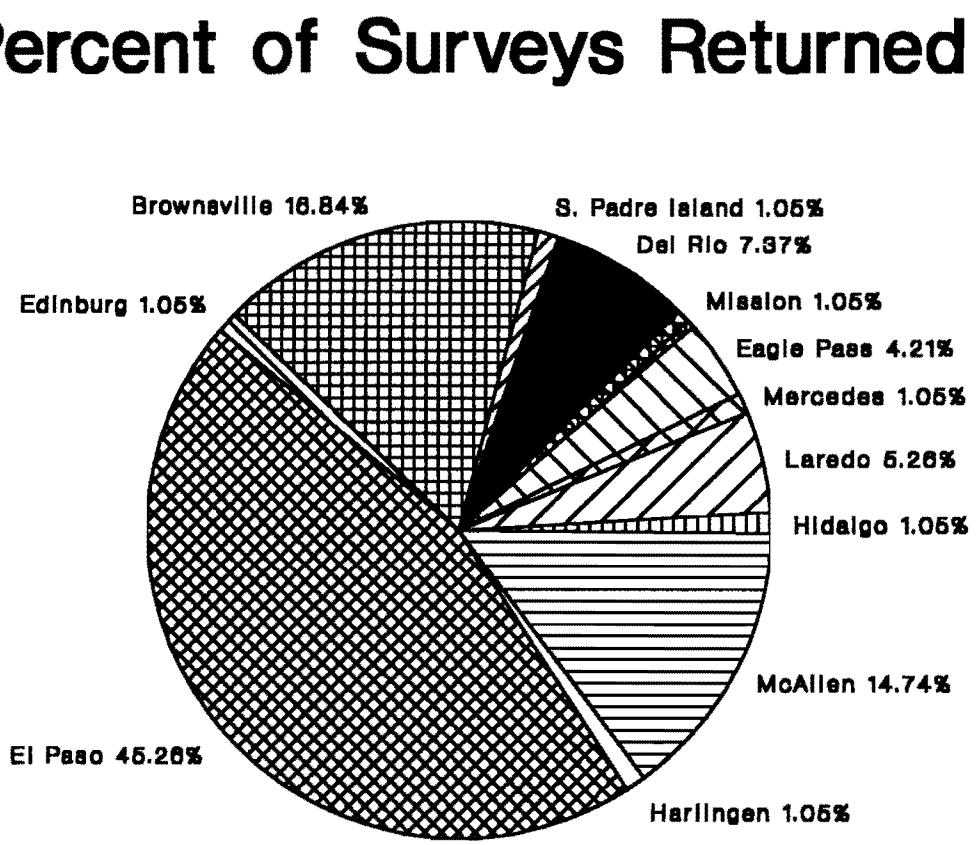
CITY	TOTAL # SENT	RPO	% OF TOTAL	RETURNED	% OF TOTAL
Brownsville	152	16	10.53%	16	10.53%
Del Rio	48	7	14.58%	7	14.58%
Eagle Pass	53	3	5.66%	4	7.55%
Edinburg	2	0	0.00%	1	50.00%
El Paso	213	28	13.14%	43	20.19%
Harlingen	2	0	0.00%	1	50.00%
Hidalgo	8	2	25.00%	1	12.50%
Laredo	56	7	12.50%	5	8.93%
McAllen	60	11	18.33%	14	23.33%
Mercedes	4	1	25.00%	1	25.00%
Mission	2	1	50.00%	1	50.00%
Olmito	1	0	0.00%	0	0.00%
Pharr	3	1	33.33%	0	0.00%
S. Padre Island	2	0	0.00%	1	50.00%

[1] The word "IN" or "OUT" associated with descriptions in this section refer to "inbound" or "outbound" shipments, respectively. Both database files are identical in design and structure except for the information reported. The reader should recognize that discussion relating to the inbound database has the same meaning for the outbound database and vice versa. No future distinction will be made regrading this similarity.

this is not to say that the IN database has a corresponding entry for each one in the OUT database. A survey was included in the respective section only if information pertaining to that section was reported.

Survey Response Rate - Table 3-1 on the previous page provides a breakdown of the fourteen cities included in the survey. The table shows the number of plants sent surveys, the number and corresponding percent of total surveys returned by the post office, and the number and corresponding percent of total survey responses. All cities with the exception of Olmito and Pharr had response rates adequate for statistical analysis. Figure 3-1 represents the percent of total of returned surveys broken down by plant location.

Figure 3-1 - Percent of Total Returned Surveys



Source: 2034 Survey

Survey Variable Descriptions - Each survey is identified by a plant name, a survey city name, and a survey code. The plant name identifies the business which received the survey. The survey city name is an identifier placed on the top of each section of the survey to identify the region where the plant is located. The survey code is a two digit alphanumeric code identifying the survey region and facilitating filing and sorting.

Because the survey cities had a limited number of plants in their area, it was necessary to combine local plant response information into regions. When examination of the survey responses was complete, four regions had evolved which adequately represent the survey response data. The main influence in creating these regions was the concentration of crossing locations within the regions. Specifically, the four regions are:

1) the lower Rio Grande Valley (LRGV),
2) Del Rio/Eagle Pass (DREP),
3) Laredo (LA) and
4) El Paso region (ELPA).

Table 3-3 on the following page shows how the regions are represented as far as bridge crossings are concerned.

Commodity Shipments

Commodity Related Information - The commodity related information reported on the questionnaires was organized to cover four related parts. The database includes four categories labeled as:

- Commodity,
- Item Form,
- Shipments, and
- Weight.

Table 3-2 - Commodity Codes

Commodity Code	Commodity Name
0	Empty
1	Agricultural
2	Textiles
3	Automotive
4	Chemicals
5	Electrical
6	Food Related
7	Fabricated Metal
8	Furniture
9	Leather
10	Medical
11	Paper Products
12	Photographic
13	Sports Related
14	Toys
15	Other

The variable **Commodity** is a two digit code used to identify the fifteen commodity types represented on the surveys. Table 3-2 lists the commodity codes used to report survey information.

Table 3-3 - Regional/Bridge Information

Database Bridge Name	Full Bridge Name	Region	Region File Code	Survey Bridge Name	Bridge Number
Gateway Bridge	Gateway Bridge, Brownsville-Matamoros	Lower Rio Grande Valley	LRGV	Gateway Intl Bridge	1
B & M Bridge	B & M Bridge, Brownsville-Matamoros	Lower Rio Grande Valley	LRGV	B & M Intl Bridge	2
Hidalgo Bridge	Hidalgo-Reynosa Bridge	Lower Rio Grande Valley	LRGV	US 281 Bridge	4
Del Rio Bridge	Del Rio-Cuidad Acuna Bridge	Del Rio / Eagle Pass Area	DREP	US 277 Bridge	13
Eagle Pass Bridge	Eagle Pass-Piedras Negras Bridge	Del Rio / Eagle Pass Area	DREP	US 57 Bridge	12
Bridge of the Americas	Bridge of the Americas, El Paso-Cuidad Juarez	El Paso Area	ELPA	Bridge of the Americas	20
Zaragosa Bridge	Zaragosa Road Bridge, Ysleta-Zaragosa	El Paso Area	ELPA	Zaragosa Bridge	19
Convent Street Bridge	Convent Street Bridge	Laredo Area	LA	Convent Street Bridge	10
No Traffic - Not Used	Paso del Norte Bridge, (Santa Fe St.), El Paso-Cuidad Juarez	N/A	N/A	Pao del Norte Bridge	22
No Traffic - Not Used	Good Neighbor Bridge, (Stanton St.), El Paso-Cuidad Juarez	N/A	N/A	Friendship Bridge	21
No Traffic - Not Used	B & P Bridge	N/A	N/A	B & P Bridge	3
Moved to Other Bridges	N/A	N/A	N/A	US 83 Bridge	N/A
Moved to Other Bridges	Juarez-Lincoln Bridge	N/A	N/A	Juarez-Lincoln Bridge	9
Other Bridges	All Other Reported Bridges	N/A	N/A	Other Bridges	N/A

The regional breakdowns by commodity code are further broken down by commodity and directional movement. The graphics presented in this region illustrate the three directional flow breakdowns: inbound, outbound, and combined (inbound & outbound).

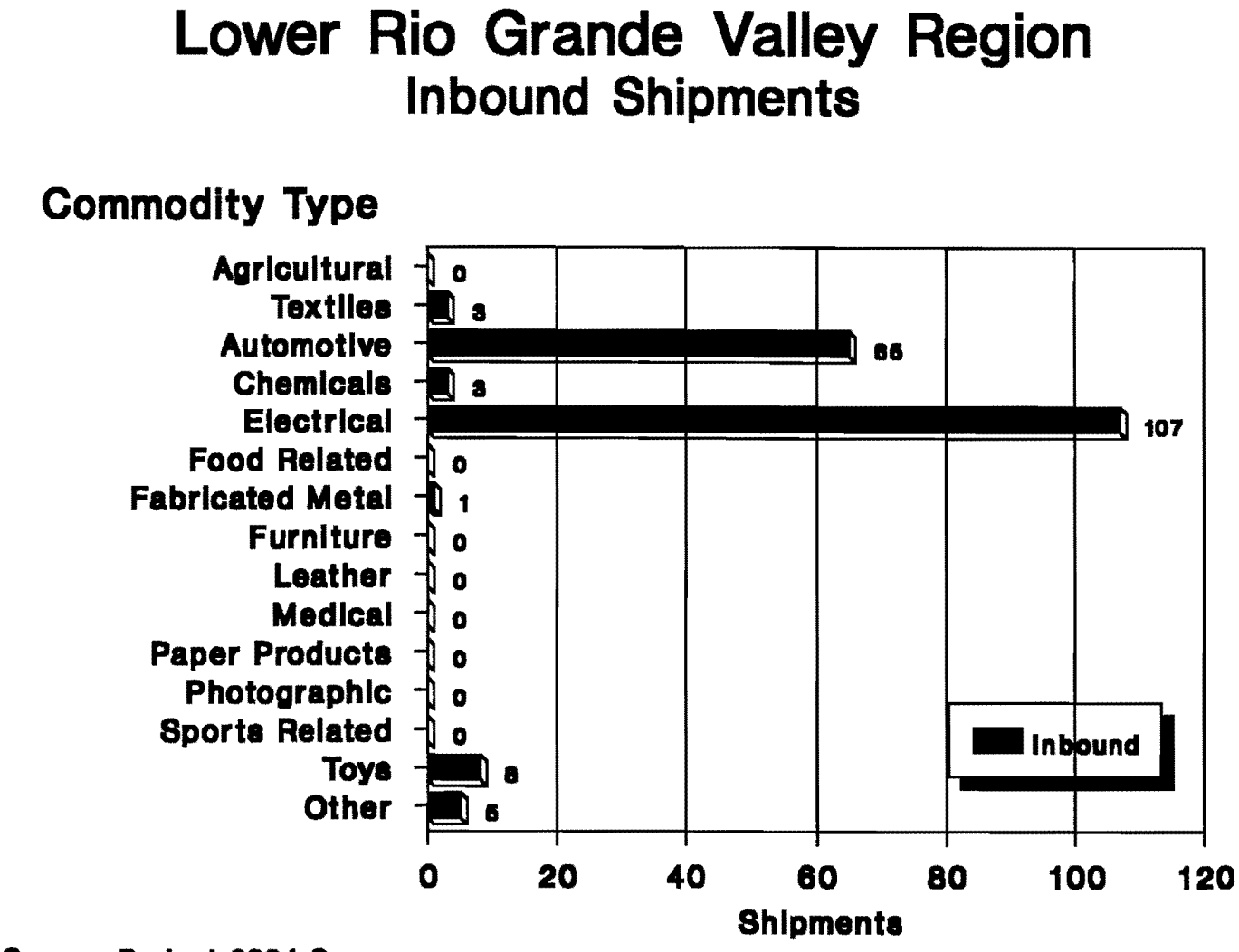
Figures 3-2, 3-3, and 3-4 represent the inbound, outbound, and combined shipment related commodity breakdowns for the Lower Rio Grande Valley (LRGV) region. The LRGV region shows high levels of automotive and electrical commodities being shipped in and out of the plants with the latter comprising the majority of the shipments. The data suggests that slightly higher numbers of shipments moved into plants during the survey period. Figures 3-5, 3-6, and 3-7 present the same data as a percent of all commodities shipped in the LRGV region.

Figures 3-8, 3-9, and 3-10 show inbound, outbound, and combined commodity shipment information for the Del Rio/Eagle Pass (DREP) region. The largest quantity of commodities hauled into the DREP region was inbound fabricated metal products. This commodity represented over ten times the next highest commodities moved in this region. Outbound shipments for the DREP region comprised mainly unreported commodity types. However, low response rates for this region may be skewing the commodity representation. Figures 3-11, 3-12, and 3-13 show the same information as a percent of all commodities shipped in the DREP region.

Figures 3-14, 3-15, and 3-16 illustrate the survey commodity movement for the Laredo (LA) region. The LA region had a good mix of inbound commodity types, mostly electrical products, but like the DREP region lacks a good response rate for validity. The only reported products shipped outbound the LA region were electrical products, but the 54 shipments outbound is almost four time the total of all inbound shipments. Figures 3-17, 3-18 and 3-19 show the same information as a percent of all commodities shipped in the LA region.

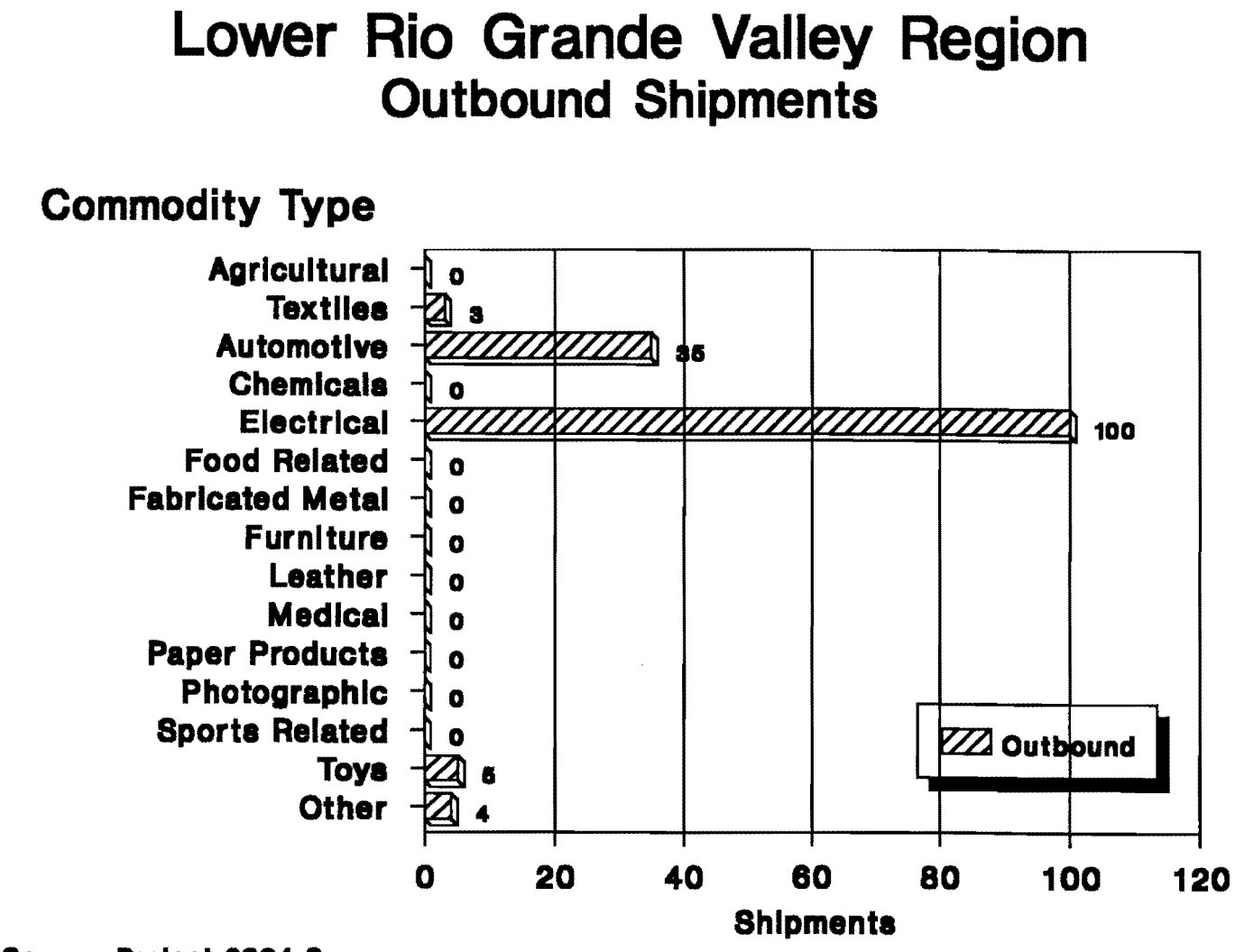
Figures 3-20, 3-21, and 3-22 show the commodity related shipments for the El Paso (ELPA) region. This region boosts the largest response rate of all the regions and as such has a very good representation of commodities shipped. Like the LRGV region, the ELPA region exhibits a very high percentage of automotive and electrical products shipped into and out of the region. These two commodities comprise the majority of all commodities shipped into and out of all regions. Figures 3-23, 3-24, and 3-25 show the same data as a percent of all commodities shipped in the ELPA.

Figure 3-2 - Inbound Shipments by Commodity LRGV Region



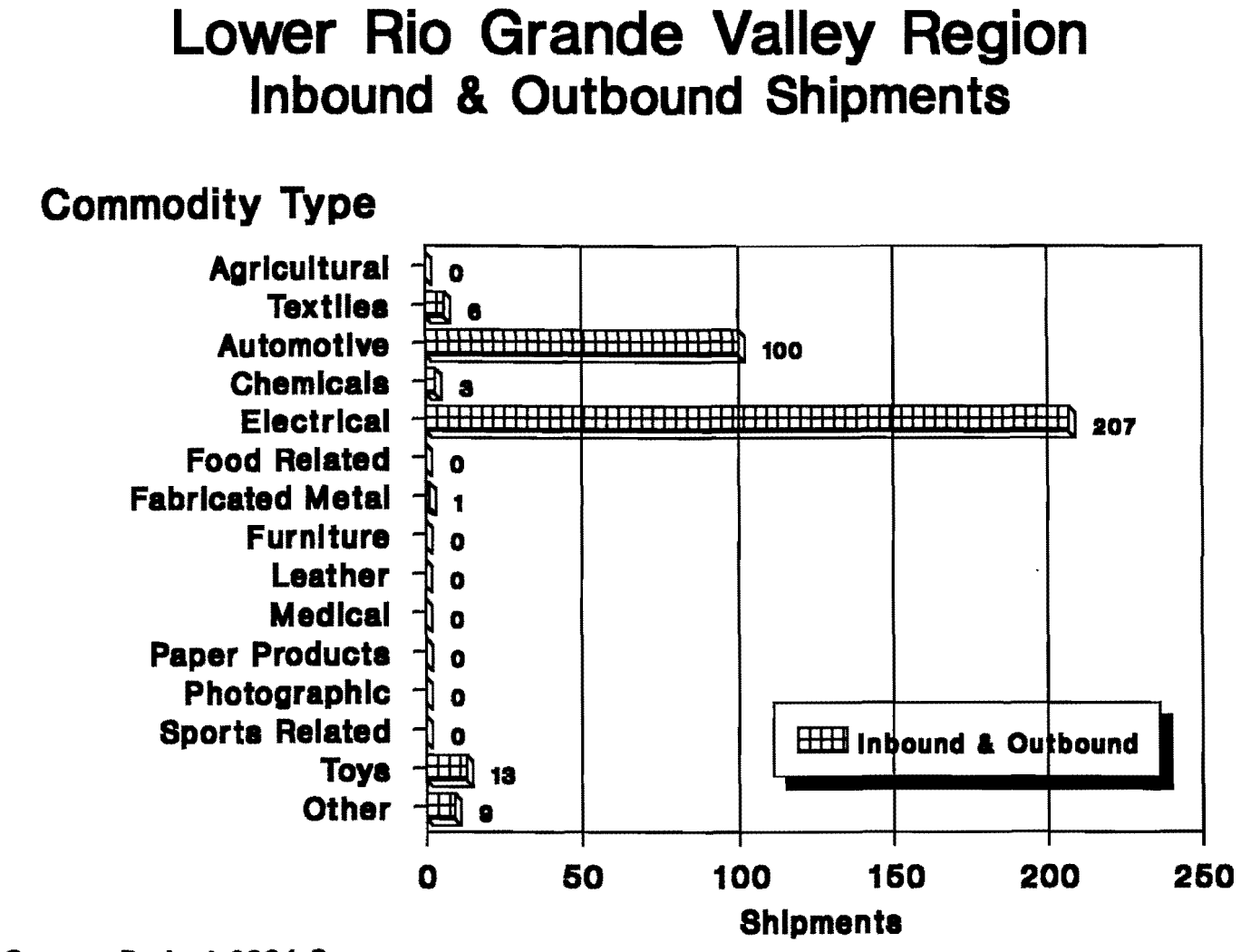
Source: Project 2034 Survey

Figure 3-3 - Outbound Shipments by Commodity LRGV Region



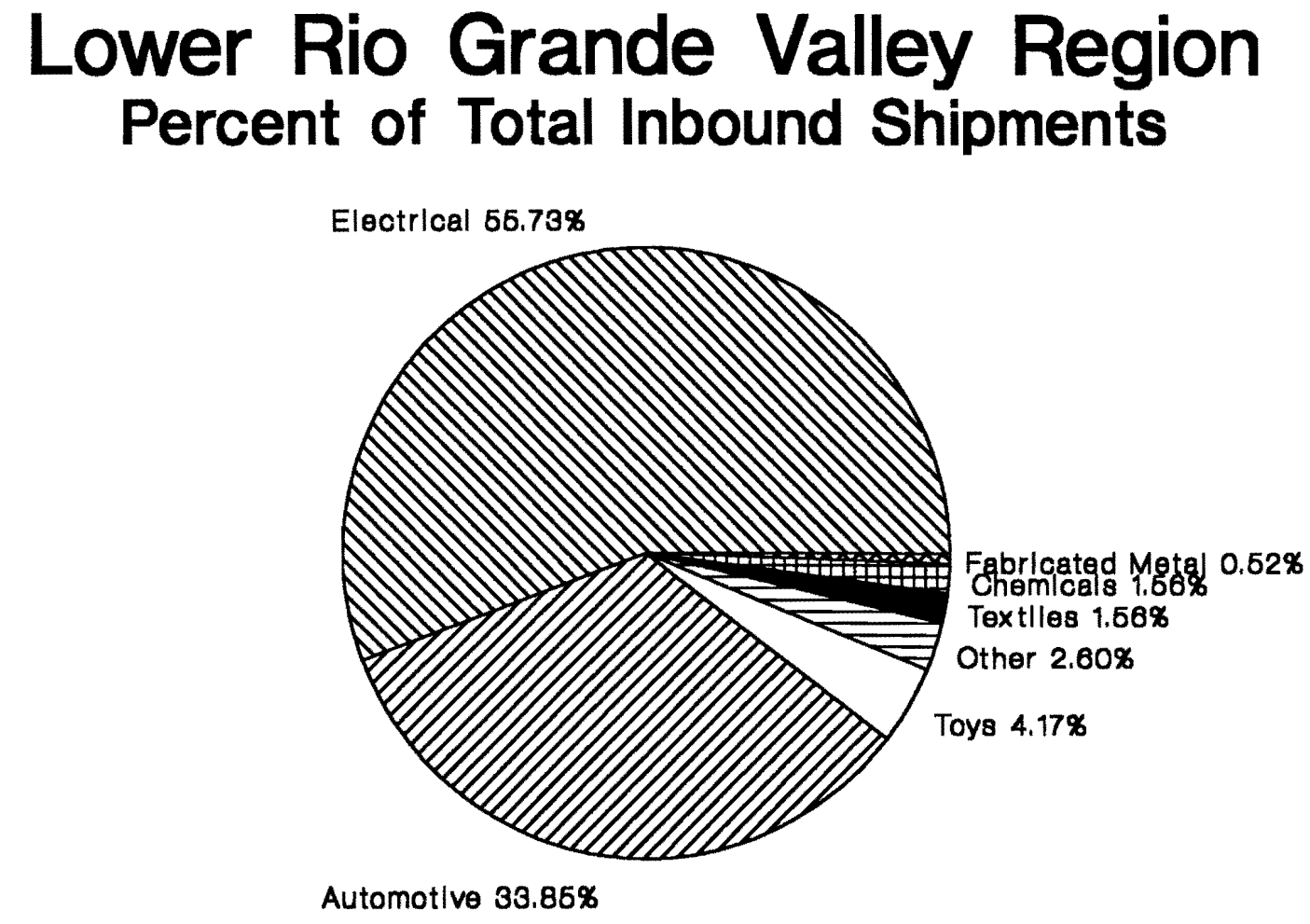
Source: Project 2034 Survey

Figure 3-4 - Inbound & Outbound Shipments by Commodity LRGV Region



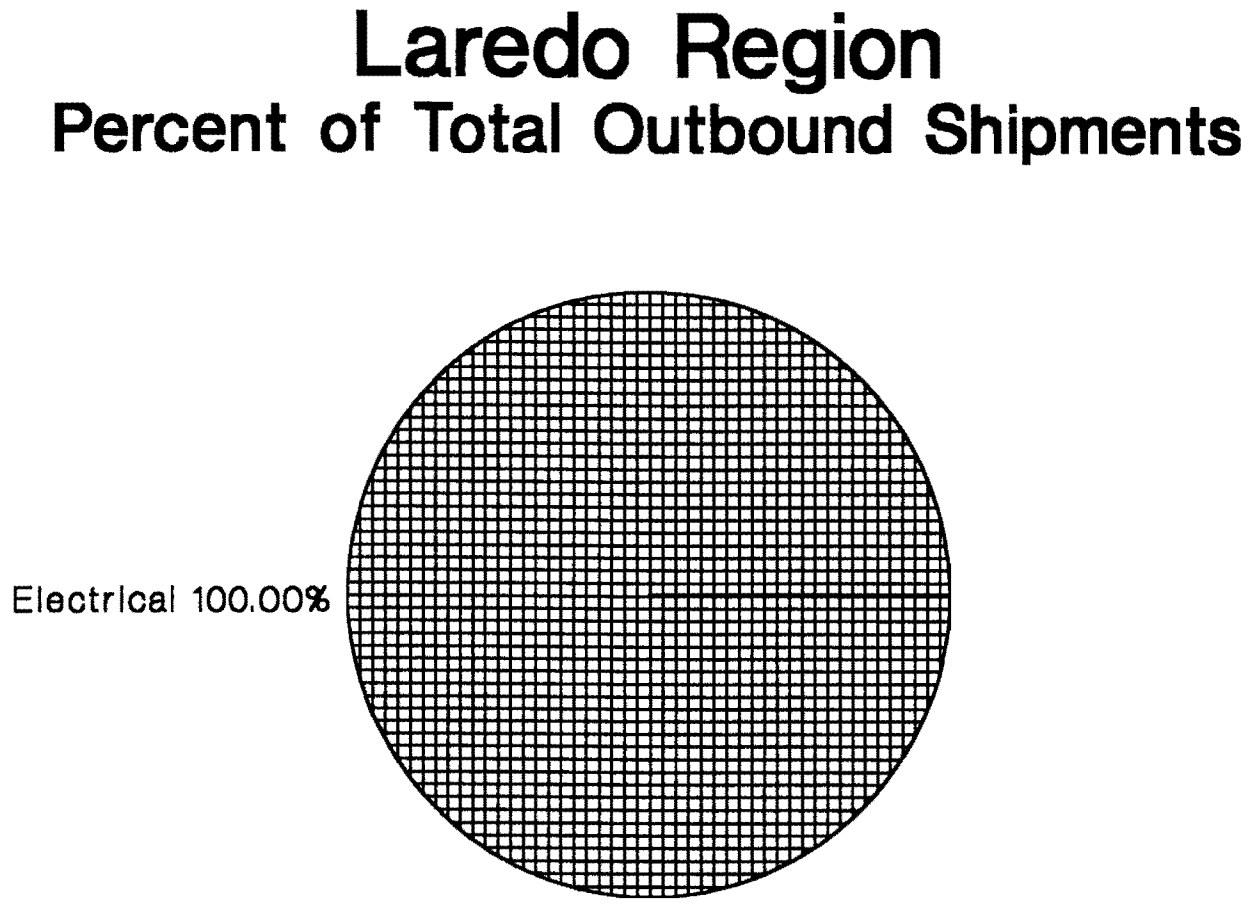
Source: Project 2034 Survey

Figure 3-5 - Percent of Total LRGV Region Inbound Shipments by Commodity



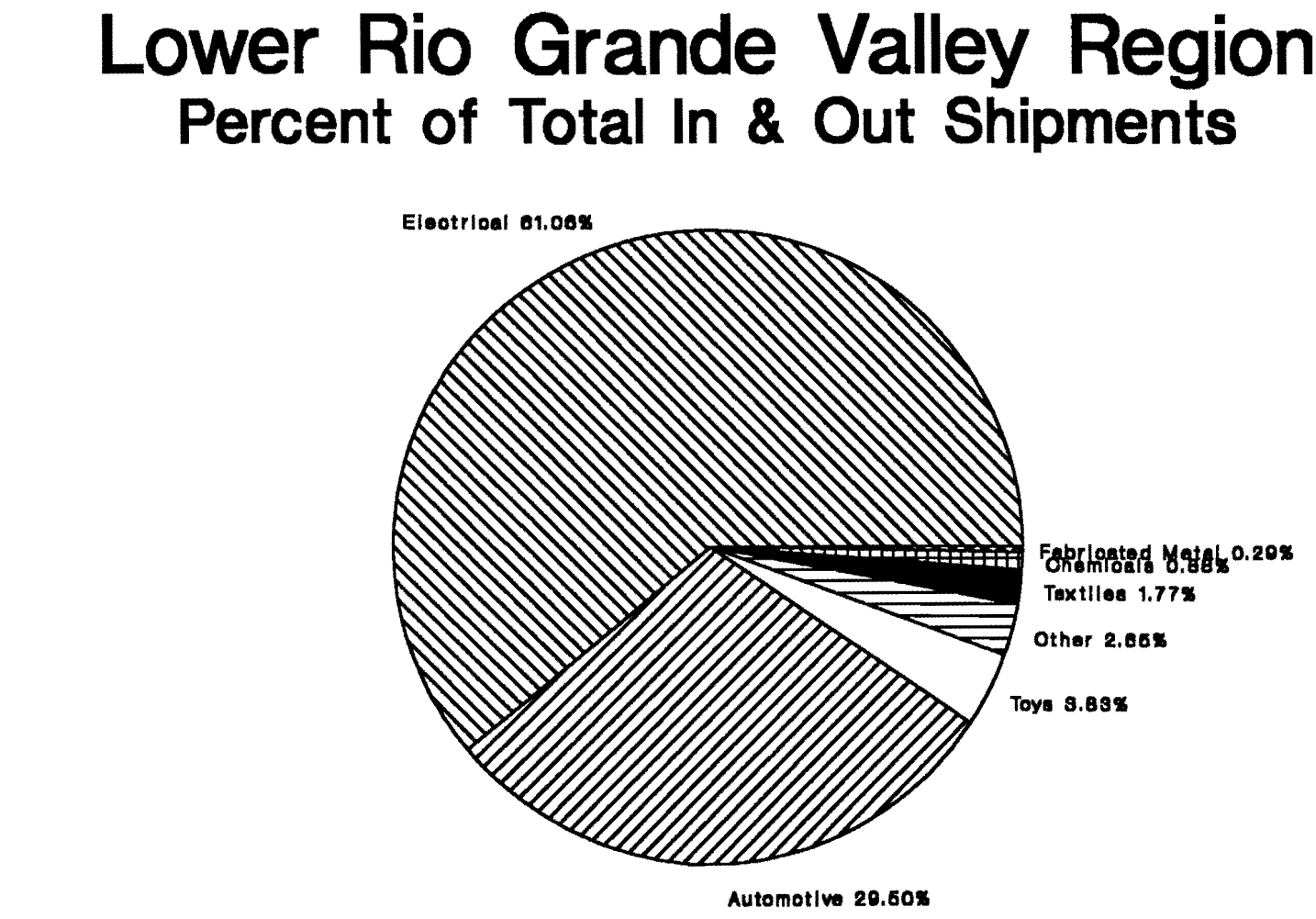
Source: Project 2034 Survey

Figure 3-6 - Percent of Total LRGV Region Outbound Shipments by Commodity



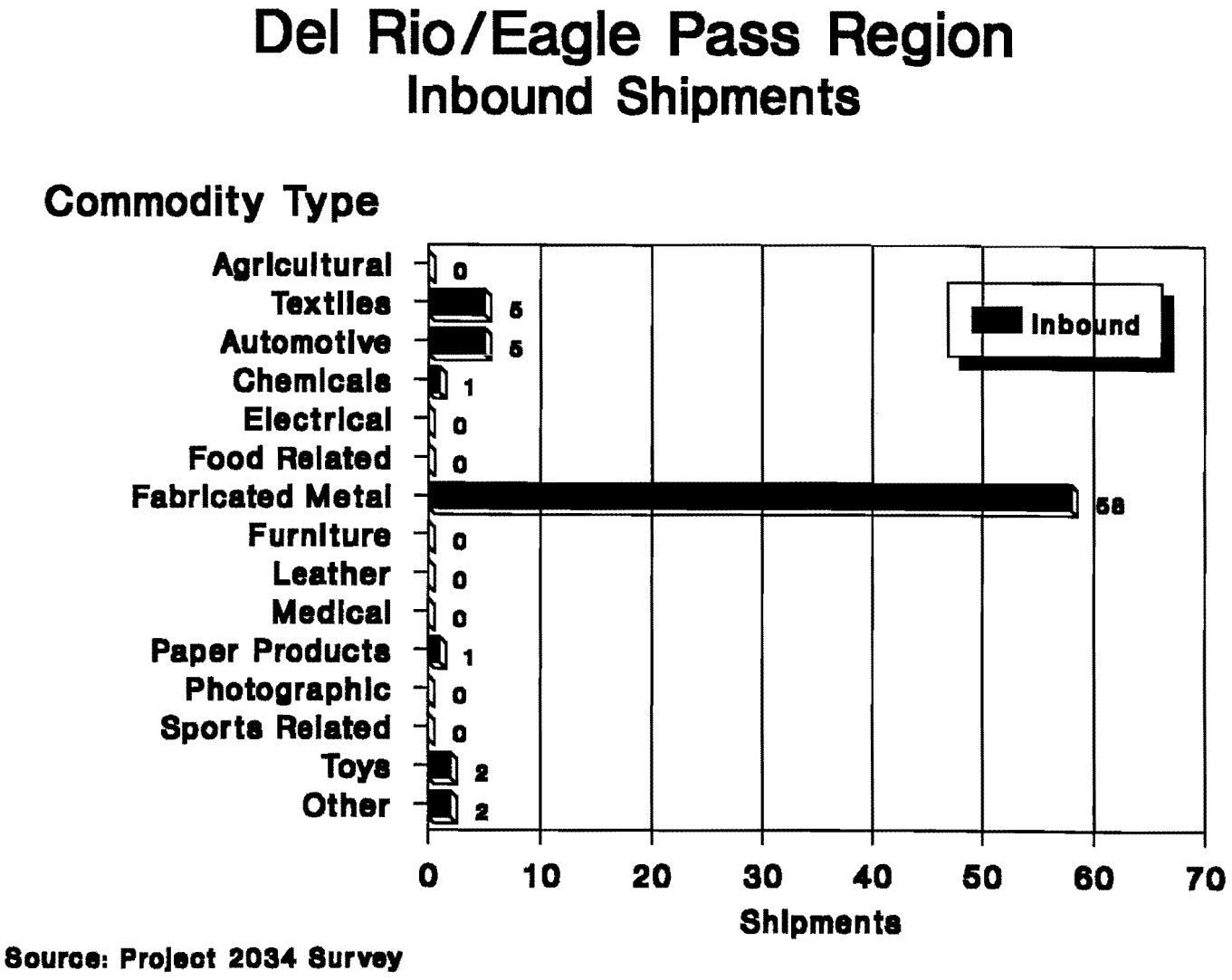
Source: Project 2034 Survey

Figure 3-7 - Percent of Total LRGV Region Inbound and Outbound Shipments by Commodity



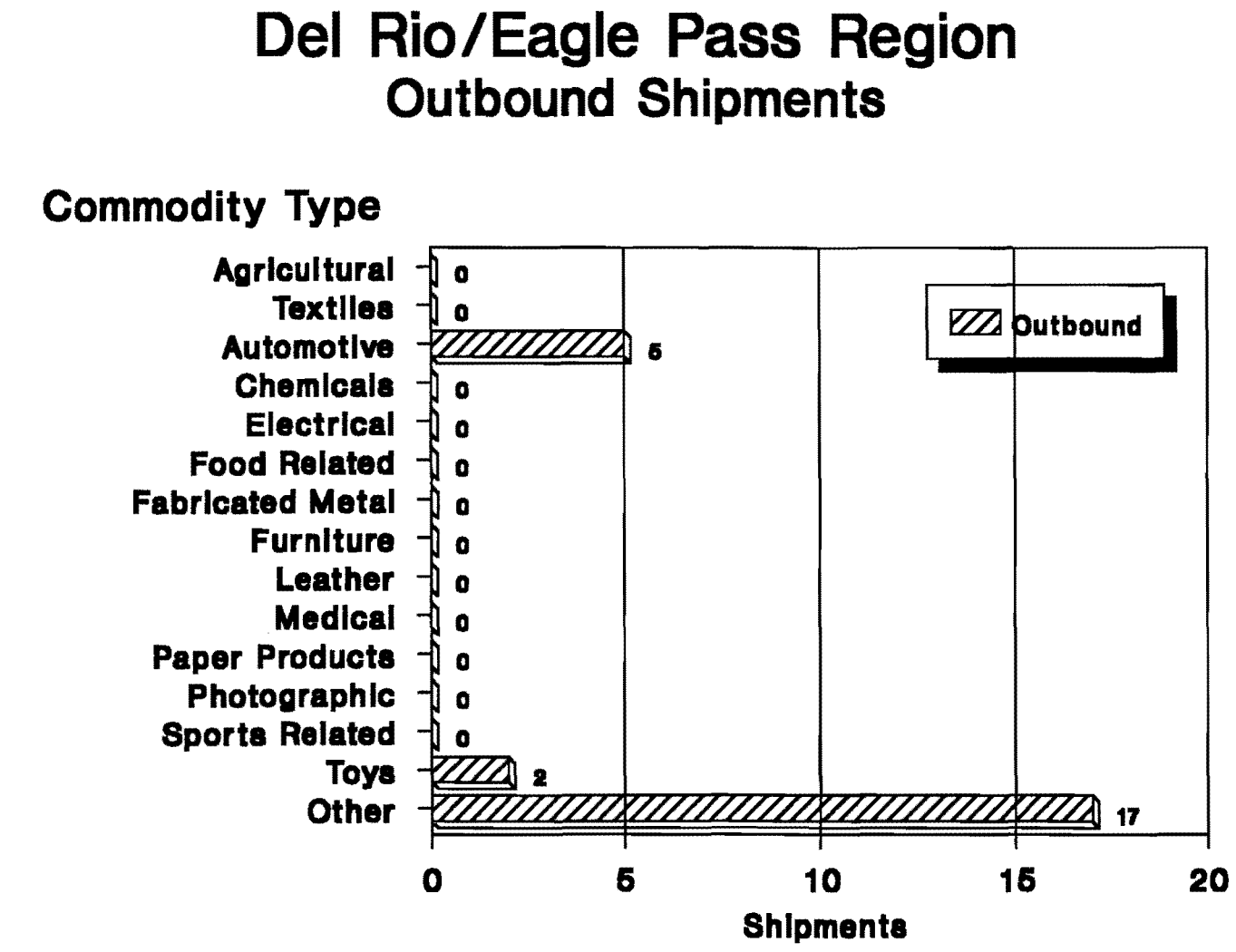
Source: Project 2034 Survey

Figure 3-8 - Inbound Shipments by Commodity DREP Region



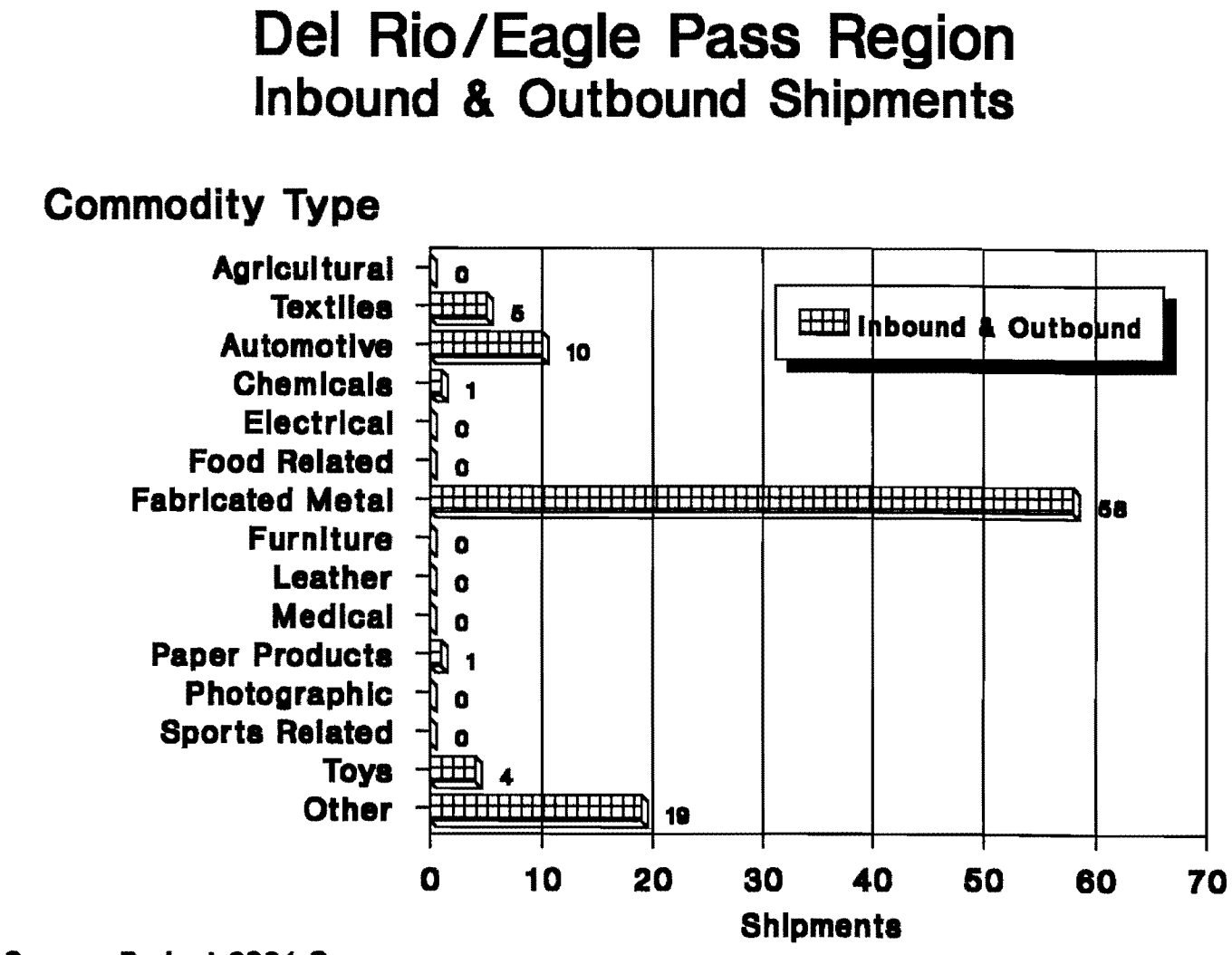
Source: Project 2034 Survey

Figure 3-9 - Outbound Shipments by Commodity DREP Region



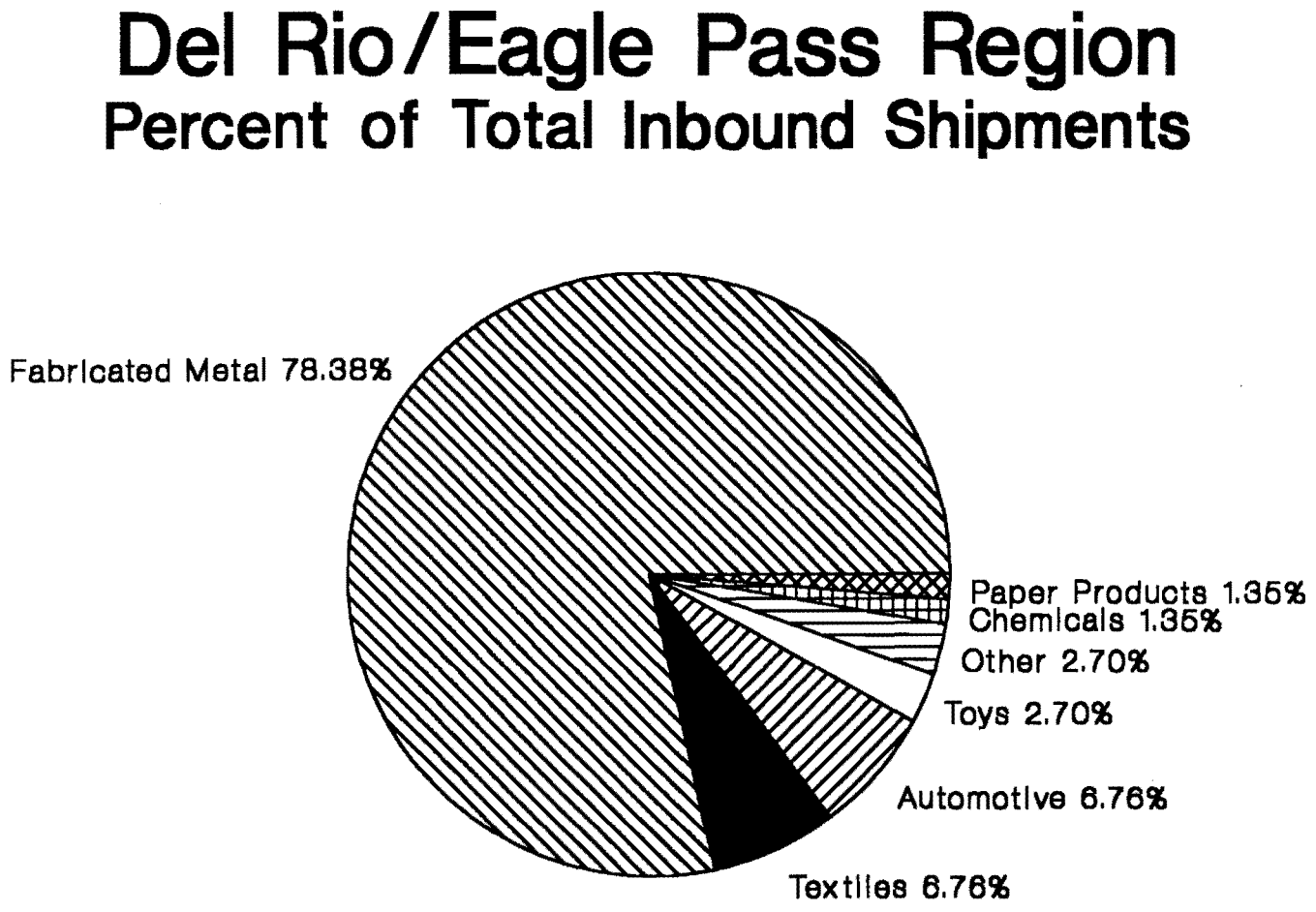
Source: Project 2034 Survey

Figure 3-10 - Inbound and Outbound Shipments by Commodity DREP Region



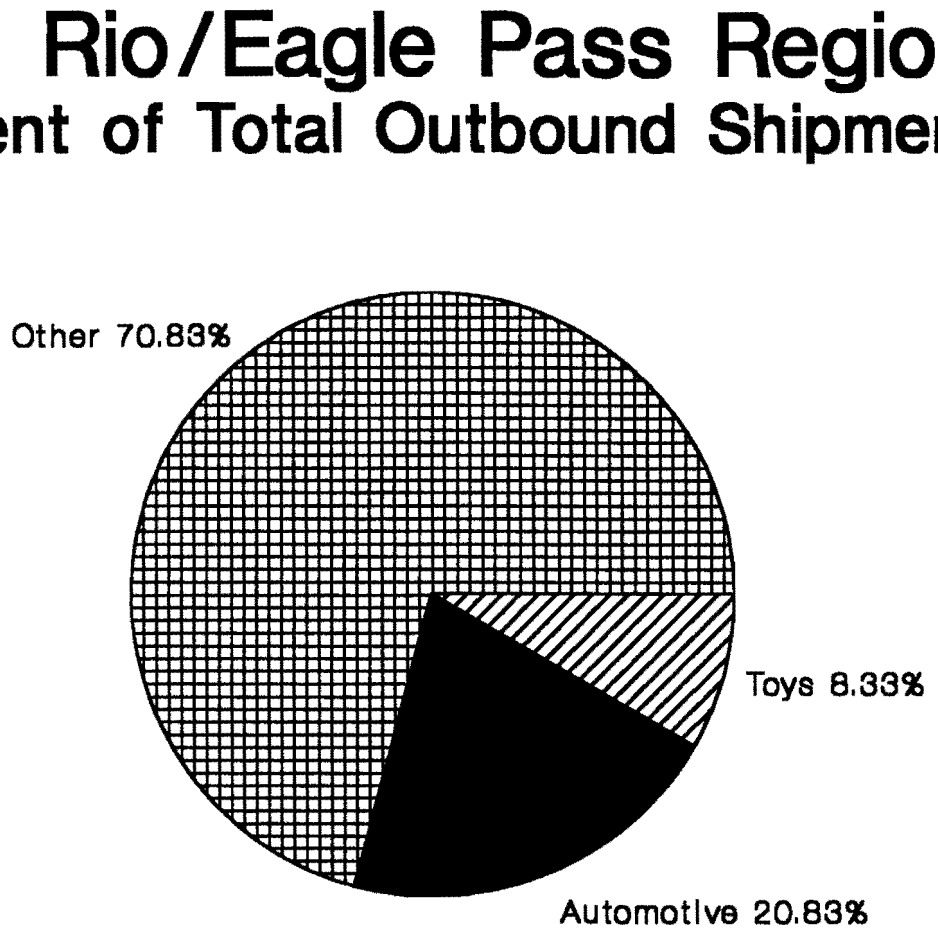
Source: Project 2034 Survey

Figure 3-11 - Percent of Total DREP Region Inbound Shipments by Commodity Code



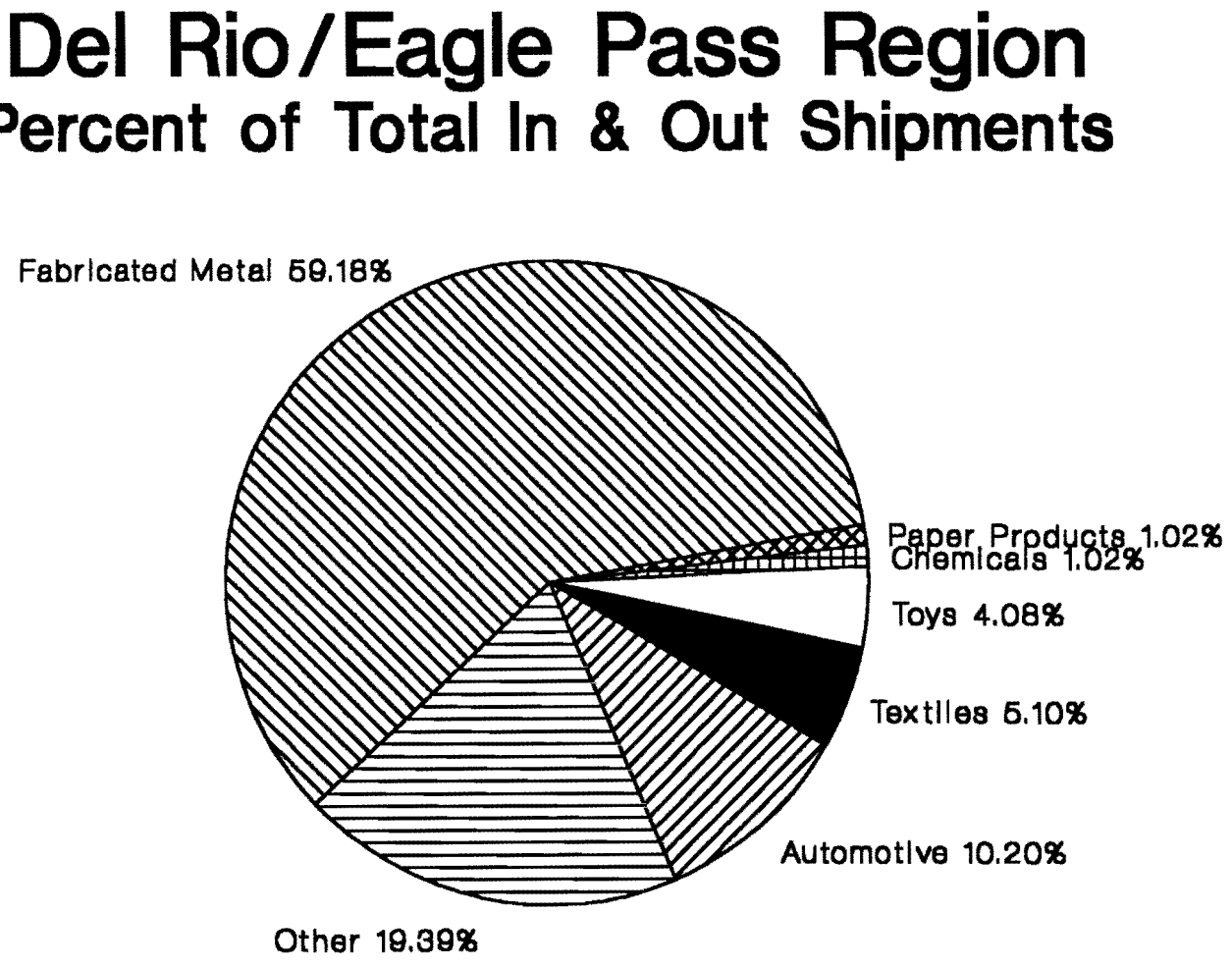
Source: Project 2034 Survey

Figure 3-12 - Percentage of Total DREP Region Outbound Shipments by Commodity



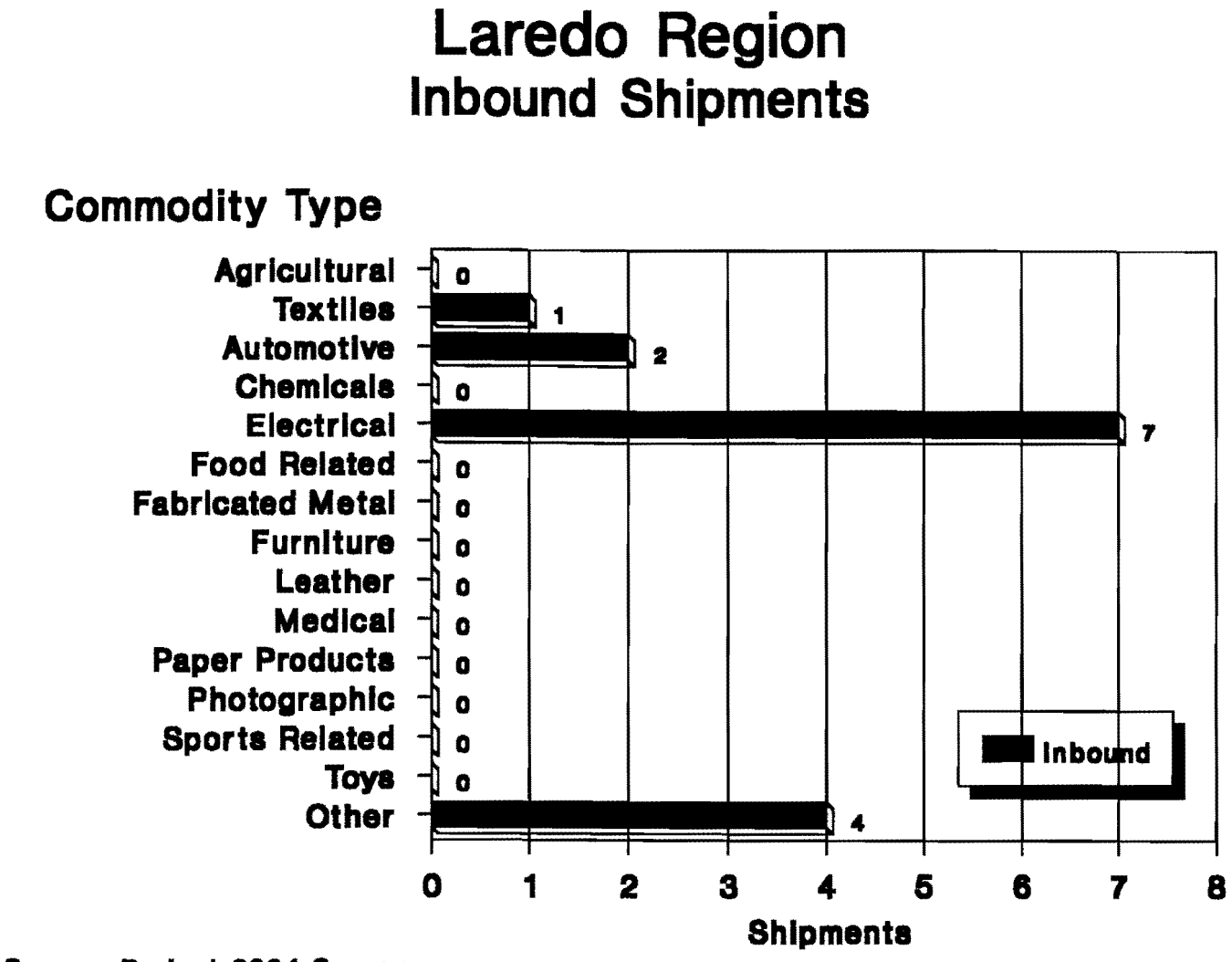
Source: Project 2034 Survey

Figure 3-13 - Percent of Total DREP Region Inbound and Outbound Shipments by Commodity



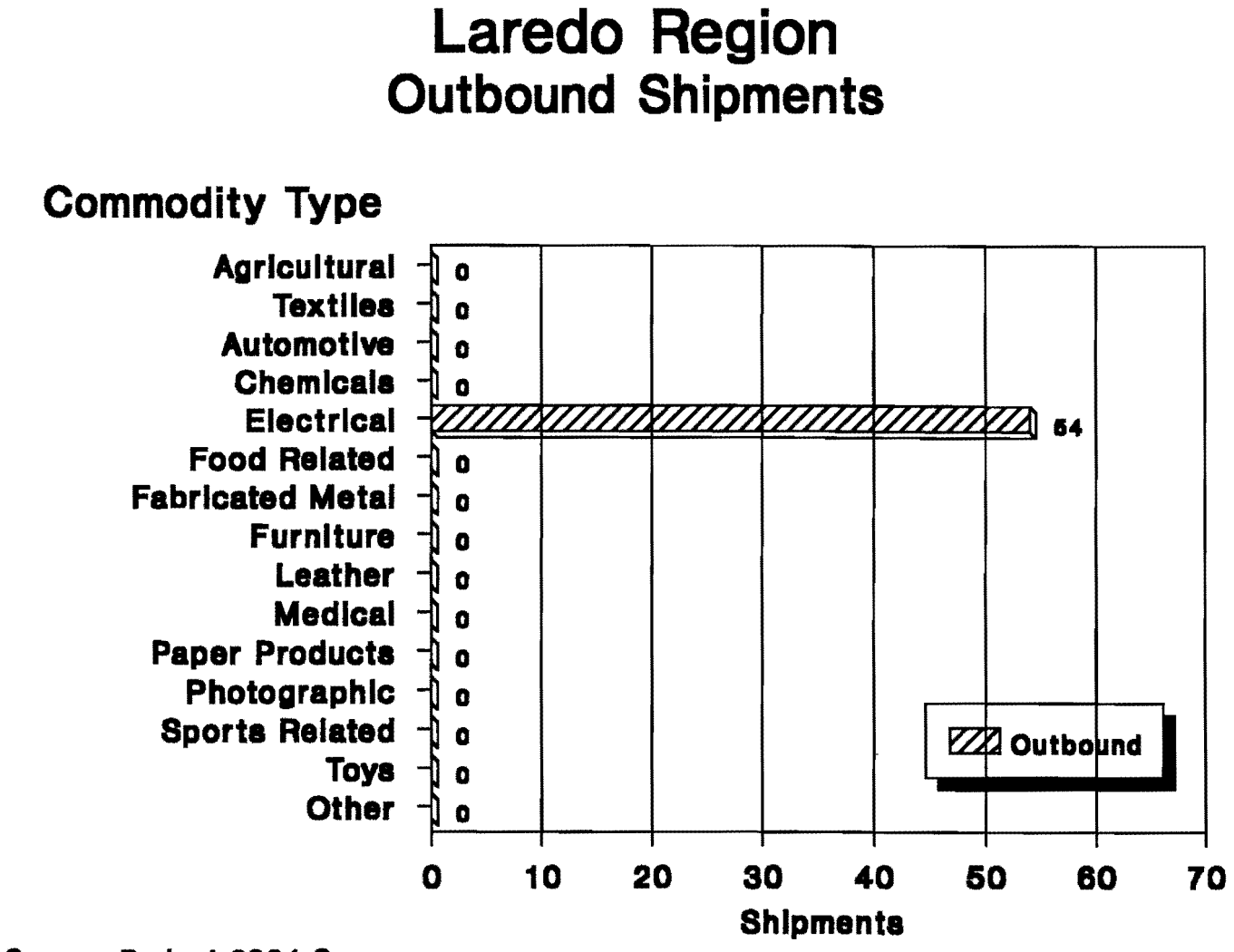
Source: Project 2034 Survey

Figure 3-14 - Inbound Shipments by Commodity LA Region



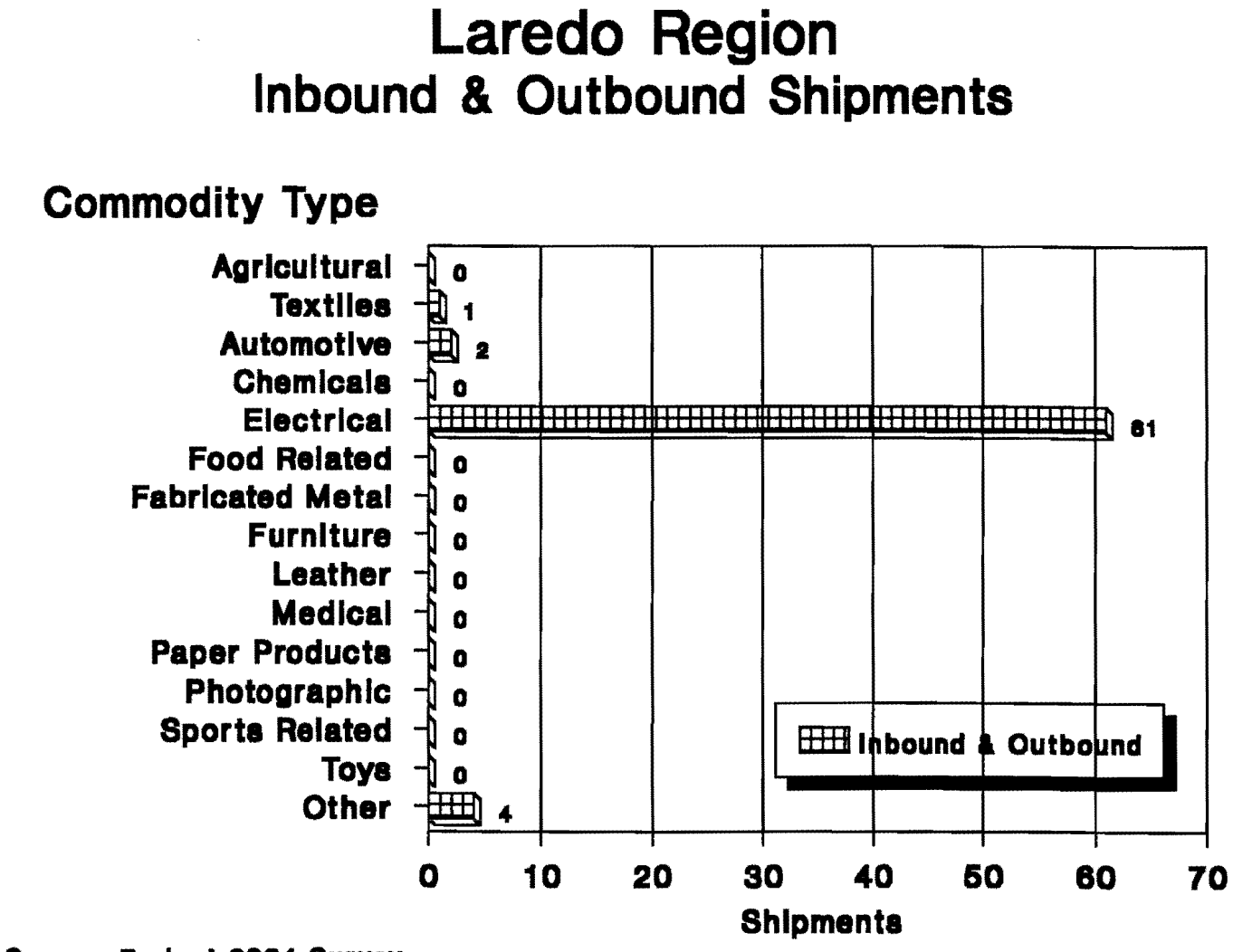
Source: Project 2034 Survey

Figure 3-15 - Outbound Shipments by Commodity LA Region



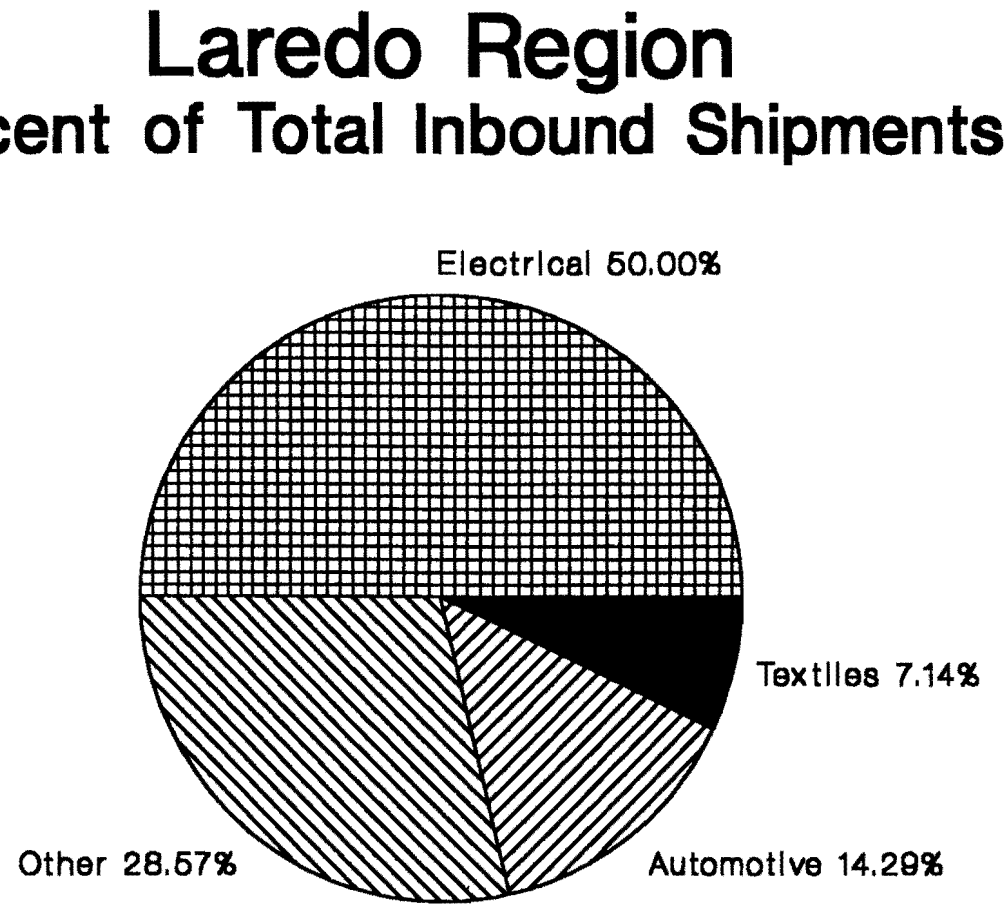
Source: Project 2034 Survey

Figure 3-16 - Inbound and Outbound Shipments by Commodity LA Region



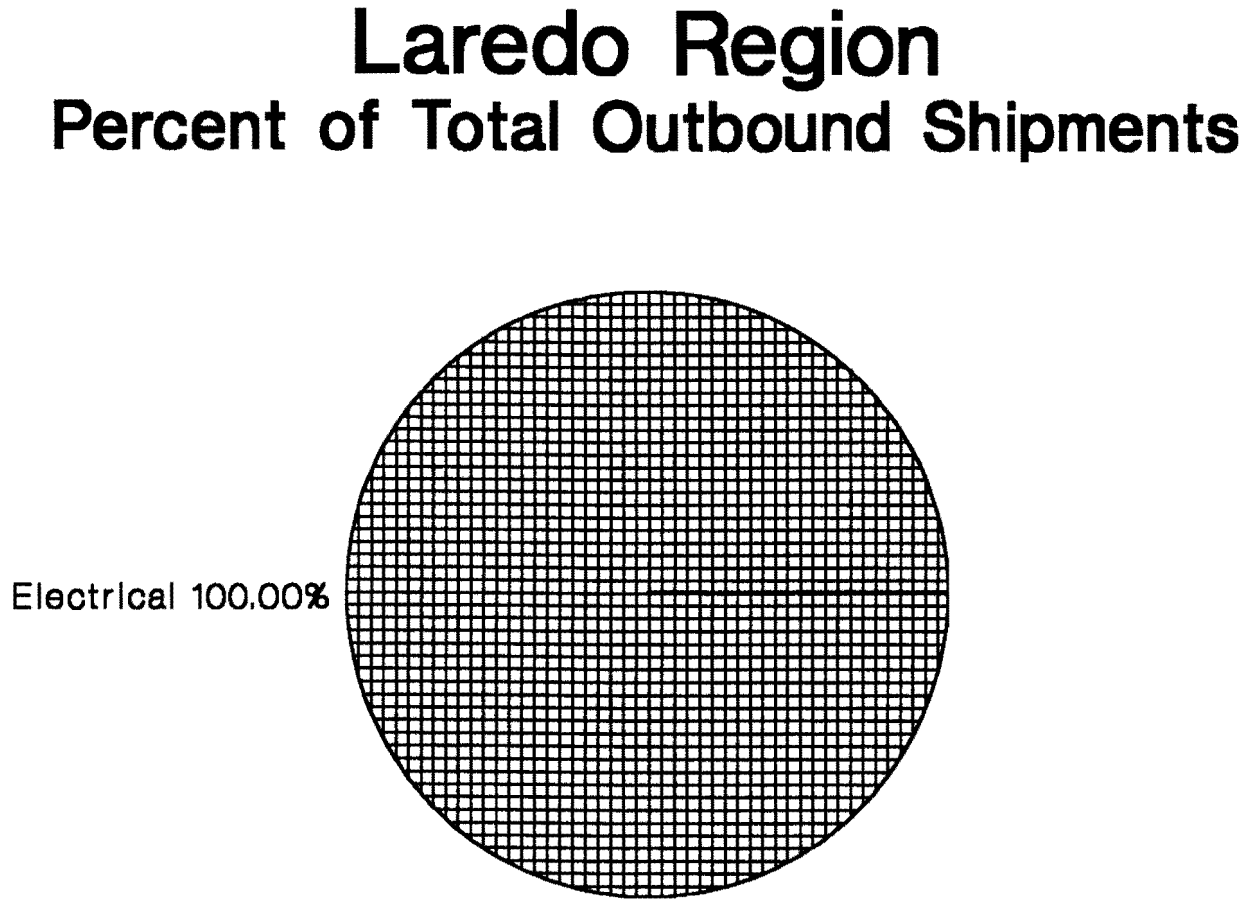
Source: Project 2034 Survey

Figure 3-17 - Percent of Total LA Region Inbound Shipments by Commodity



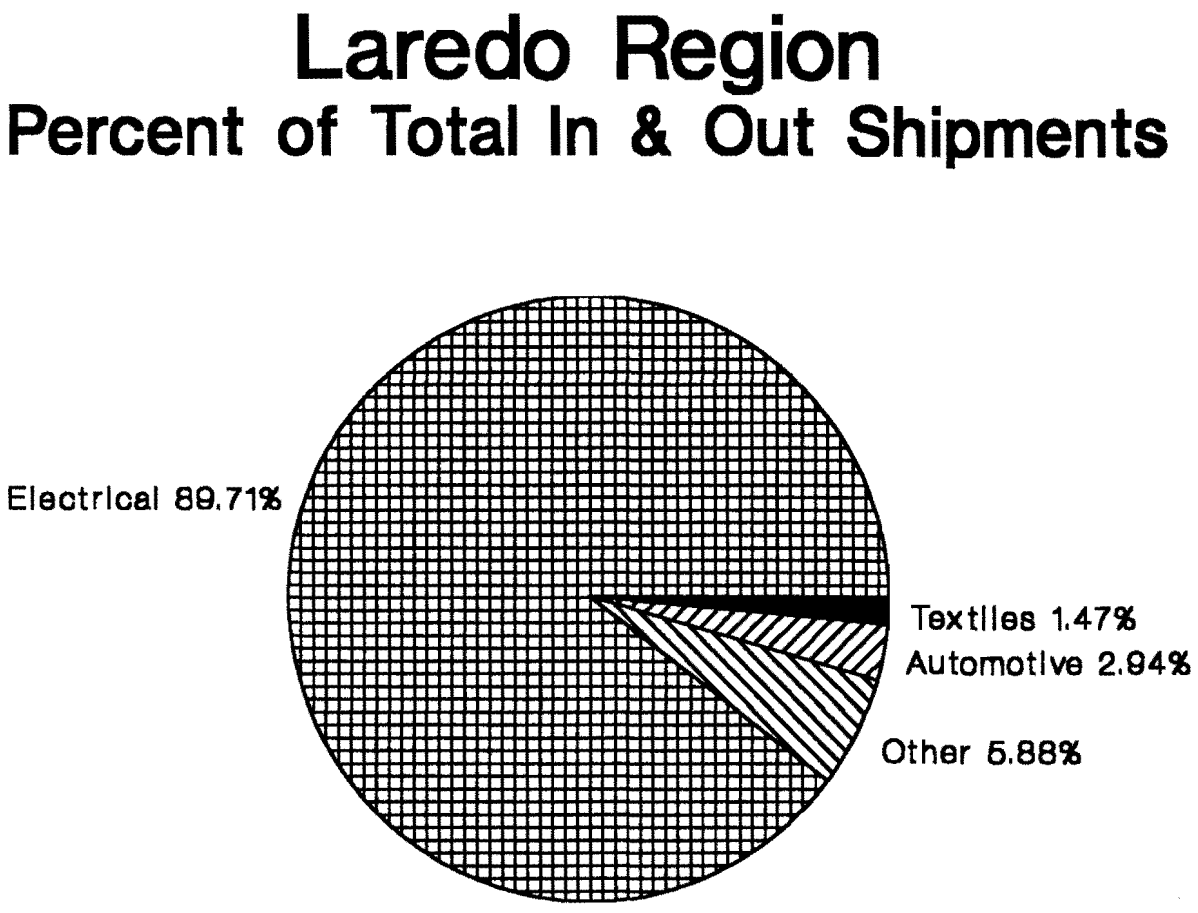
Source: Project 2034 Survey

Figure 3-18 - Percent of Total LA Region Outbound Shipments by Commodity



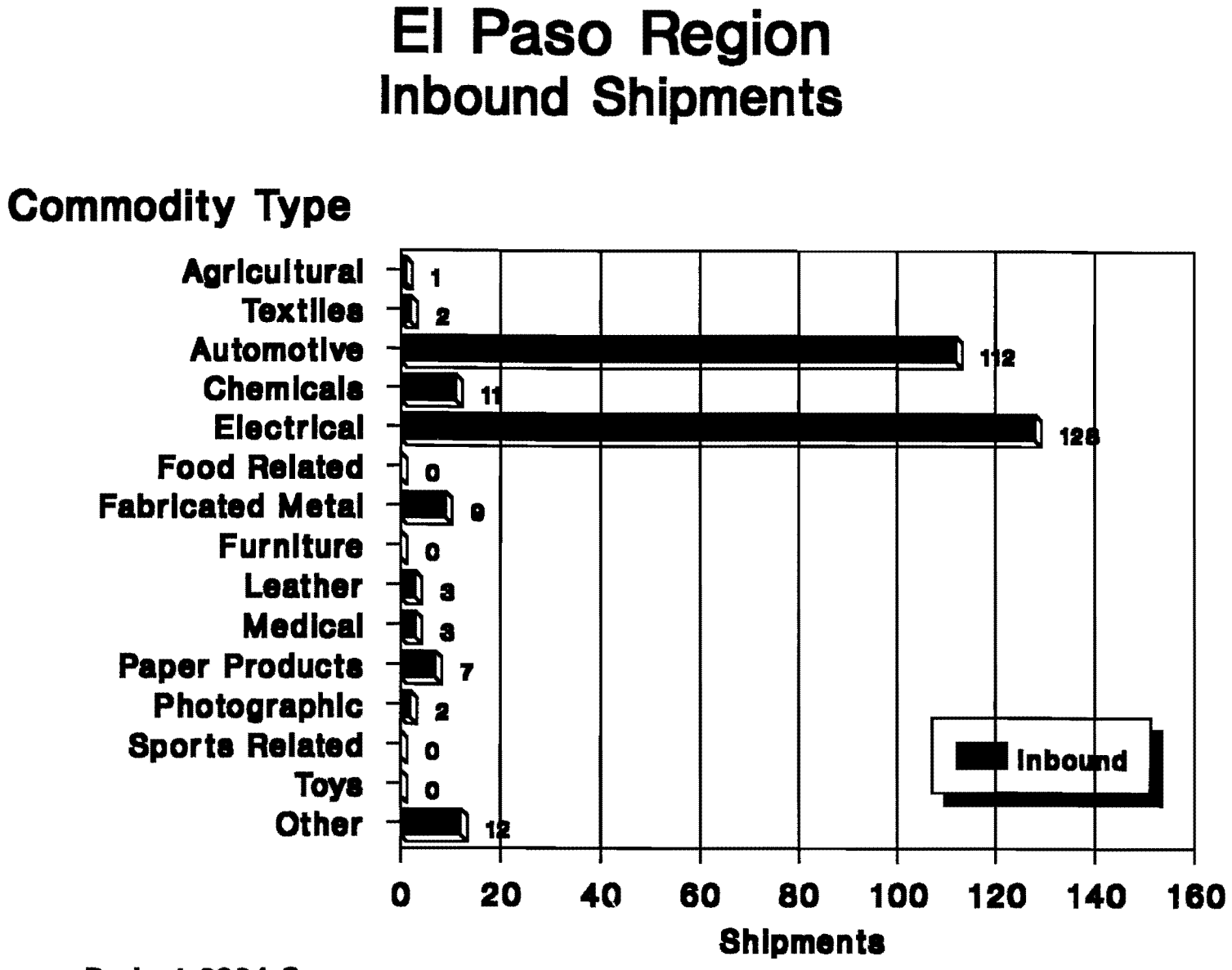
Source: Project 2034 Survey

Figure 3-19 - Percent of Total LA Region Inbound and Outbound Shipments by Commodity



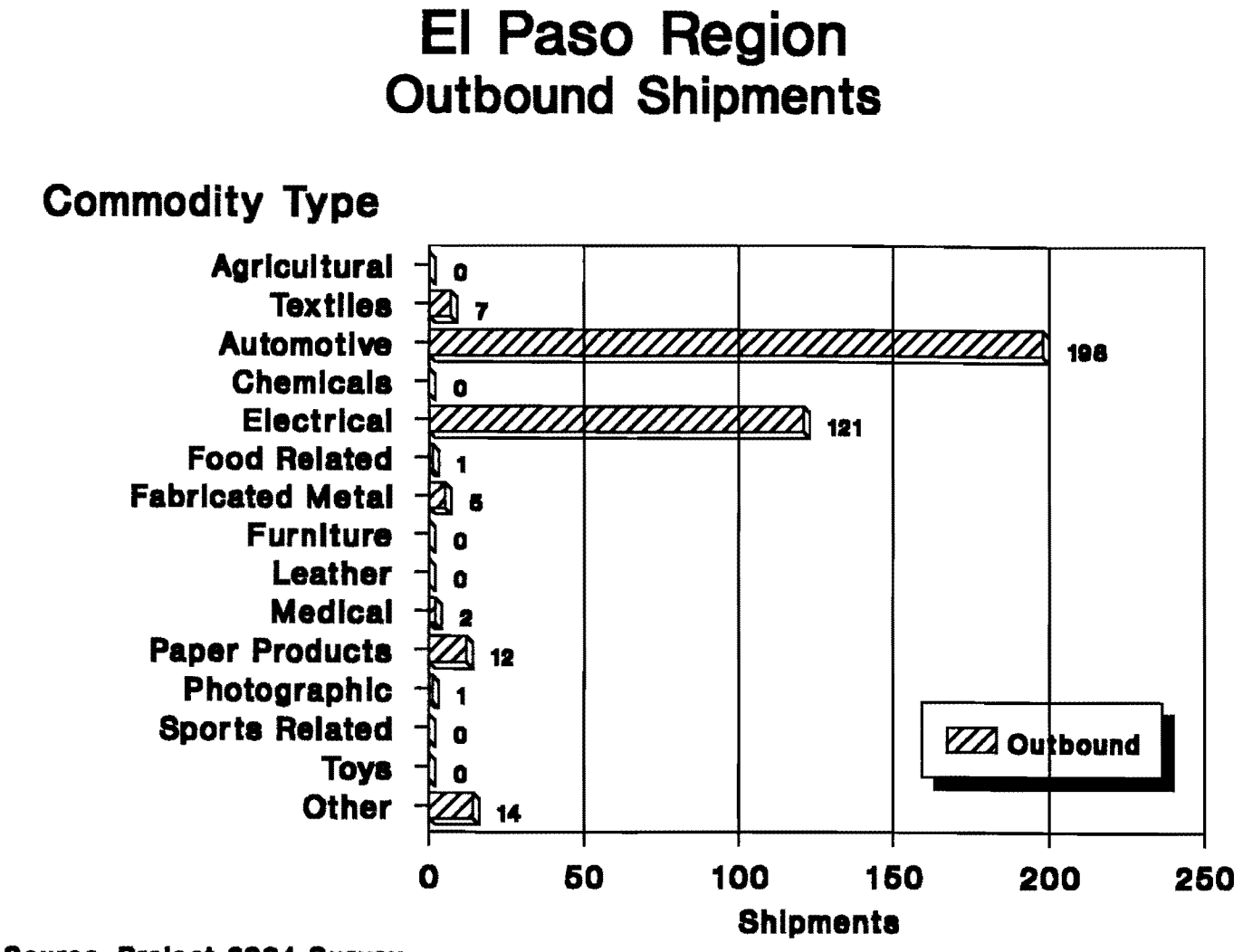
Source: Project 2034 Survey

Figure 3-20 - Inbound Shipments by Commodity ELPA Region



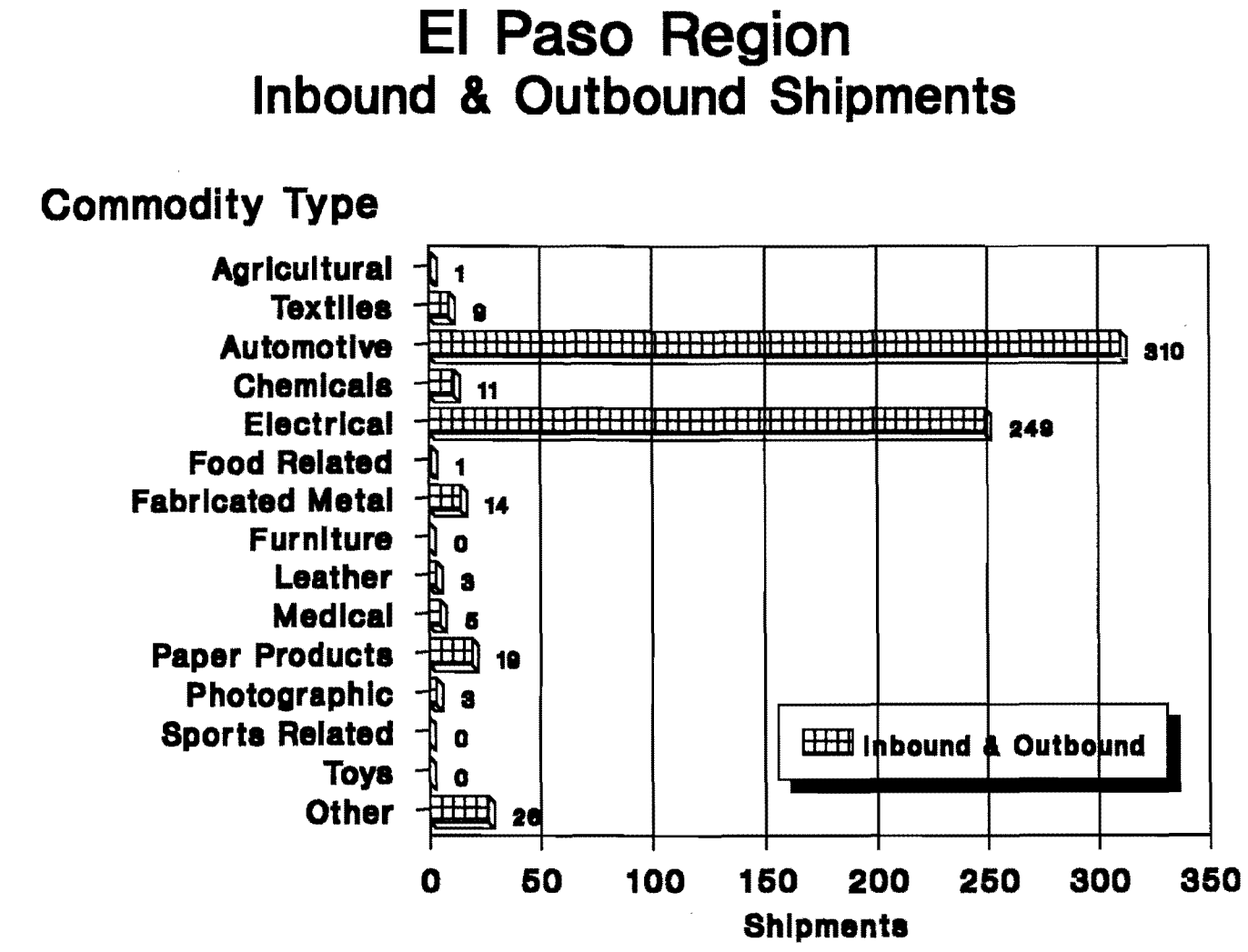
Source: Project 2034 Survey

Figure 3-21 - Outbound Shipments by Commodity ELPA Region



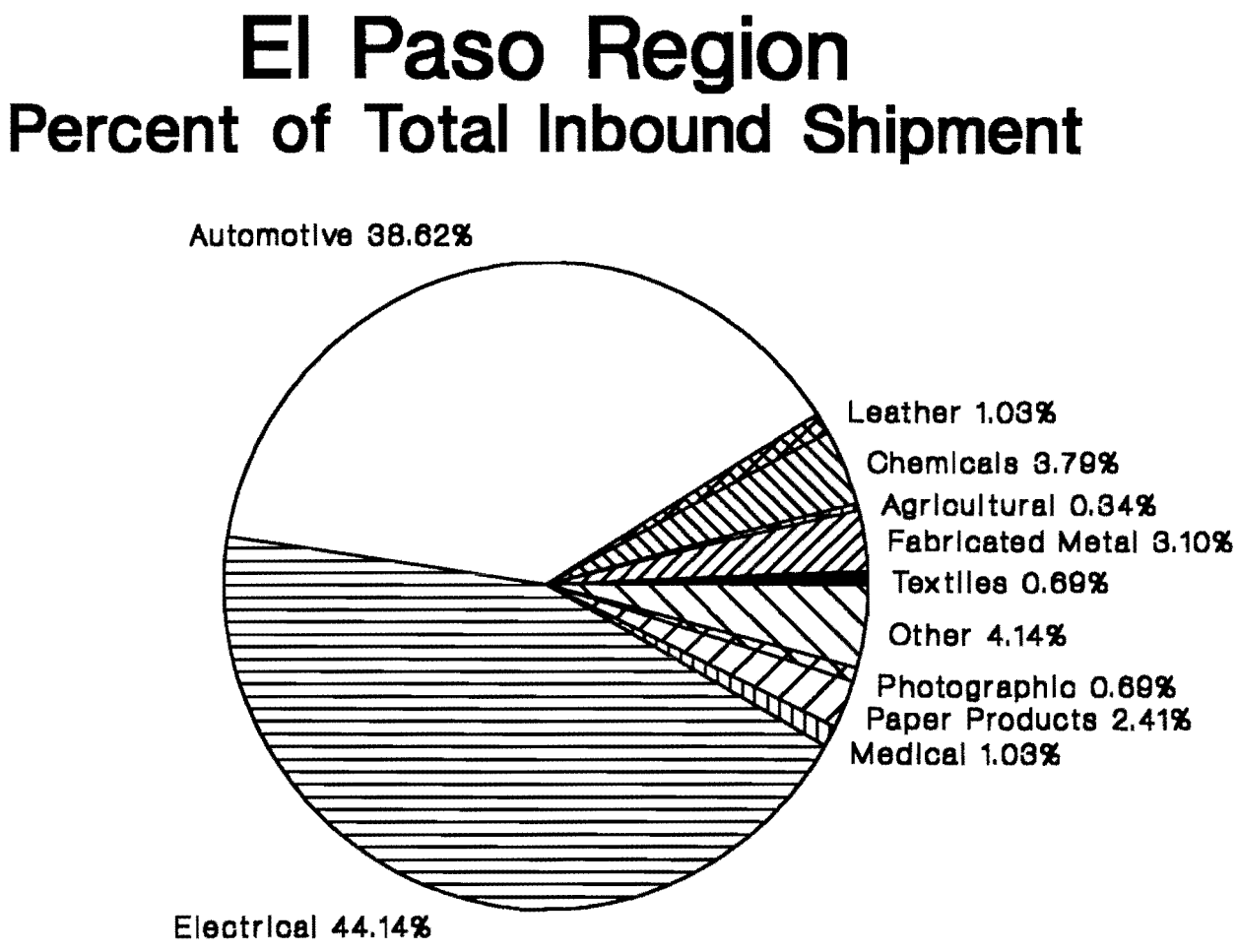
Source: Project 2034 Survey

Figure 3-22 - Inbound and Outbound Shipments by Commodity ELPA Region



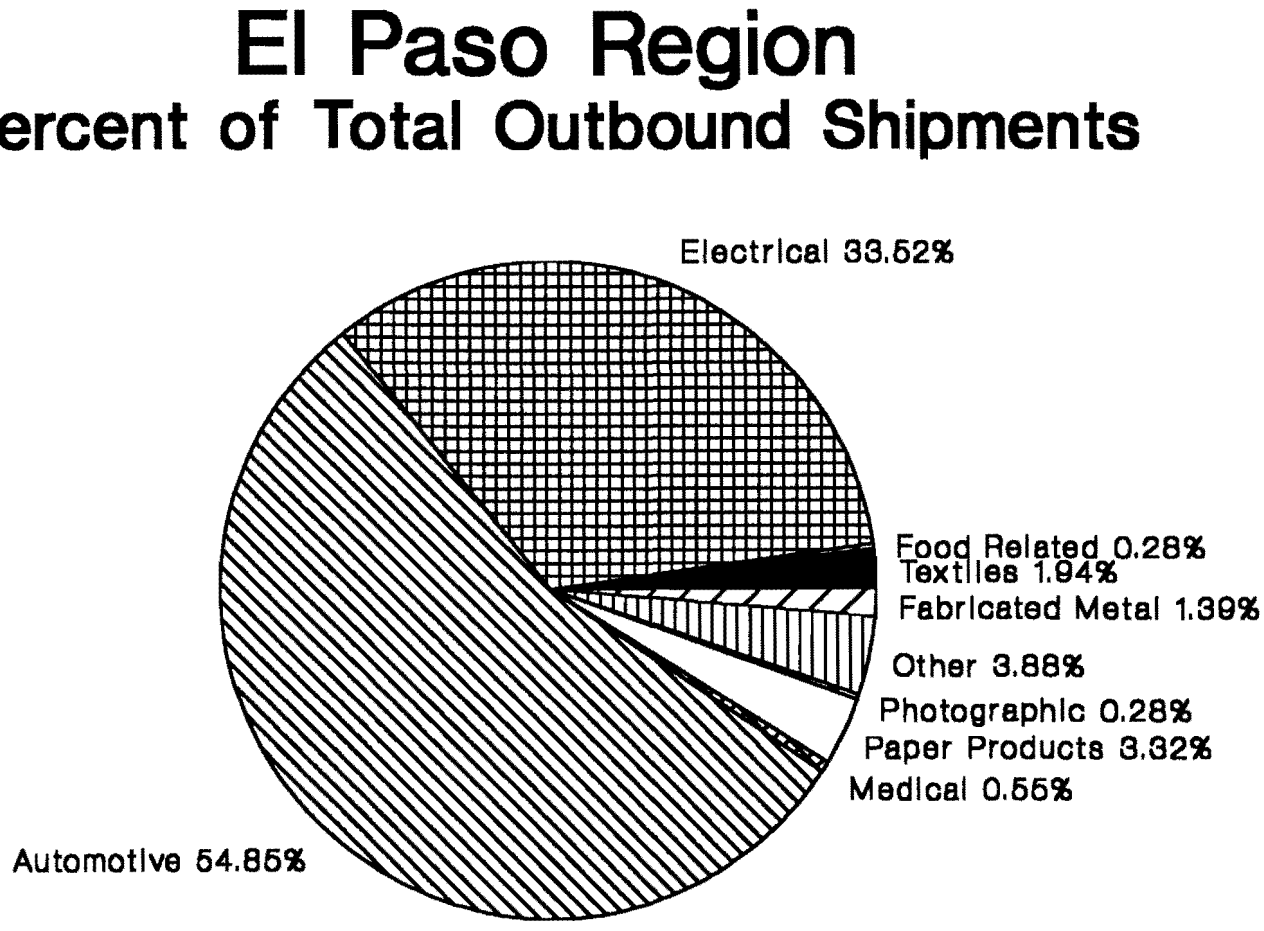
Source: Project 2034 Survey

Figure 3-23 - Percent of Total ELPA Region Inbound Shipments by Commodity



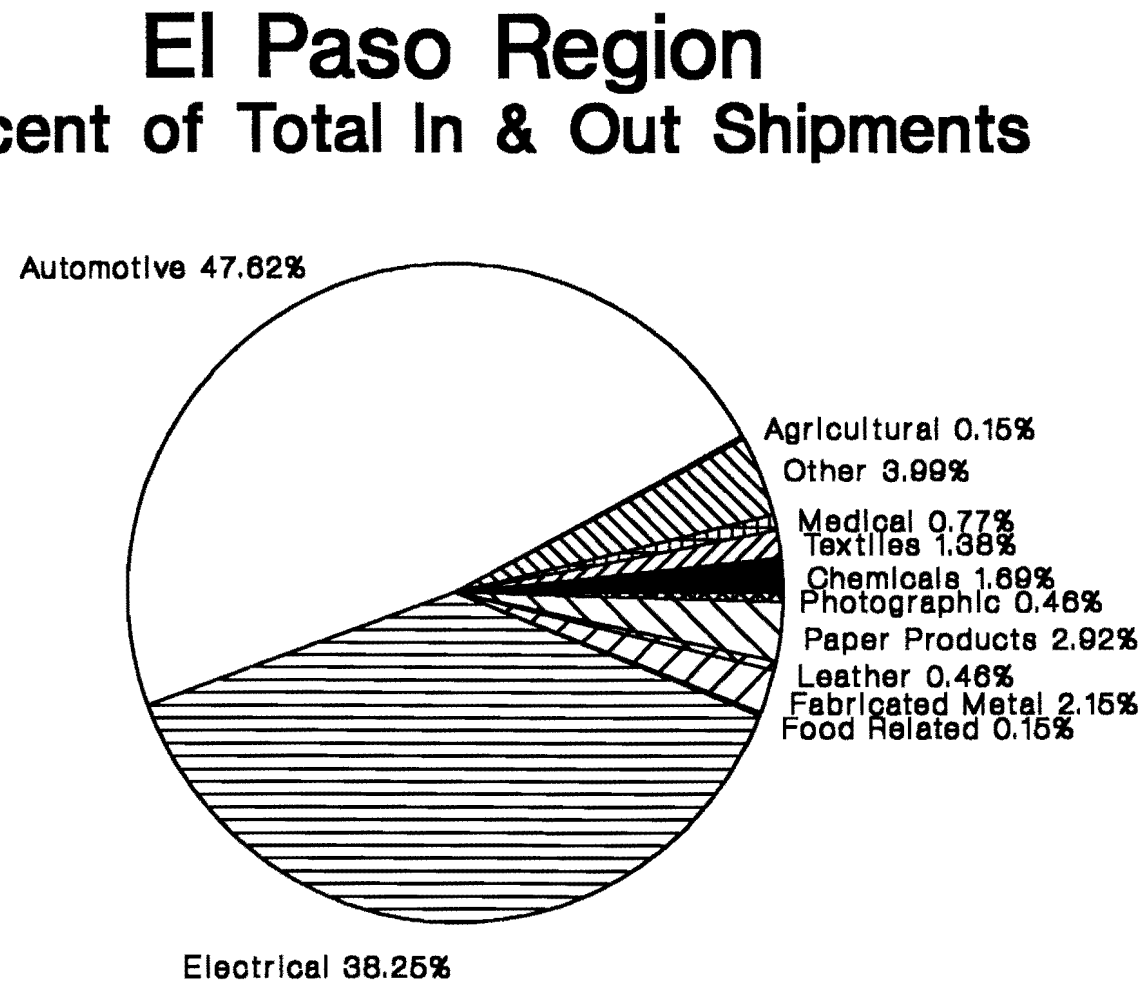
Source: Project 2034 Survey

Figure 3-24 - Percent of Total ELPA Region Outbound Shipments by Commodity



Source: Project 2034 Survey

Figure 3-25 - Percent of Total ELPA Region Inbound and Outbound Shipments by Commodity



Source: Project 2084 Survey

The variable **Item Form** is a numeric code between one and four which represents the product completion stage of the materials being shipped. The item form codes used in the survey are listed in Table 4. Very little information was gained concerning item form, and the information that was gained did not appear to be beneficial; therefore, no breakdowns by item form have been completed.

Table 3-4 - Item Form Codes

Item Form	Item Form Code
1	Raw Materials
2	Assembled
3	End Product
4	Not Reported

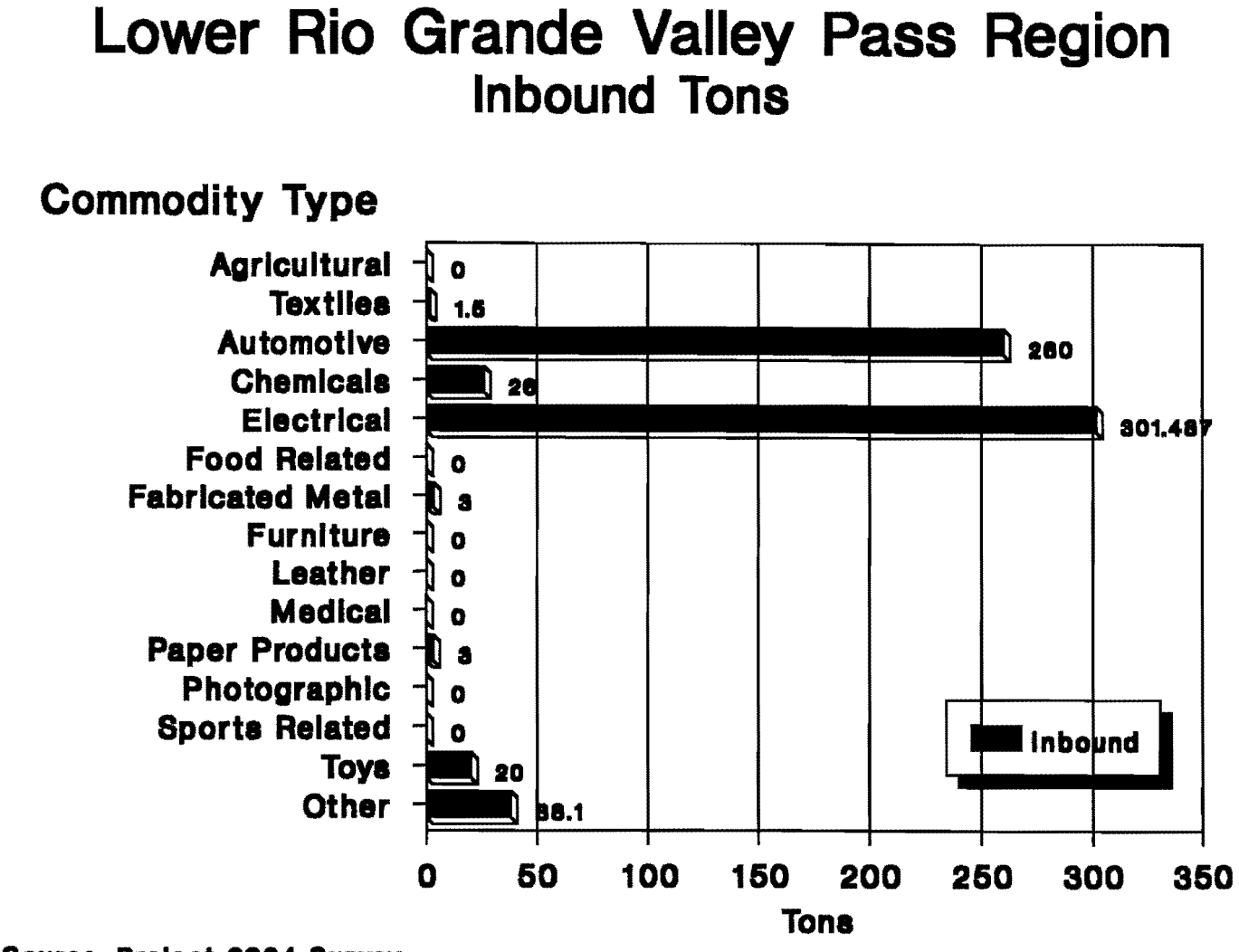
The variables **Shipments** and **Weight** represent the number of truck, rail, or air shipments and tons of material which left plant locations or were received into a plant, respectively. These two variables are related to the commodity and item forms previously mentioned. Pertinent information concerning shipments hauled into and out of plants has been covered in Figures 3-2 through Figure 3-25.

The database field weight represents the tons of product or materials hauled into or out of the various plant locations. The information reported from the surveys is in the same format as the shipment data previously presented. As well, the two variables are directly related. Therefore, the presentation of the weight data will use the same breakdowns and graphical format.

Figures 3-26, 3-27, and 3-28 show the tons of commodities which traveled into and out of the plants located in the LRGV region. There is a direct correlation between the inbound tons hauled and the inbound shipments, but the outbound tons and shipments do not share this relation. The data suggests that there is a significant increase in the weight per shipment of the commodities hauled out of the region. Figures 3-29, 3-30, and 3-31 illustrate the same relationship, but present the information as a percent of total tons hauled in and out of the region.

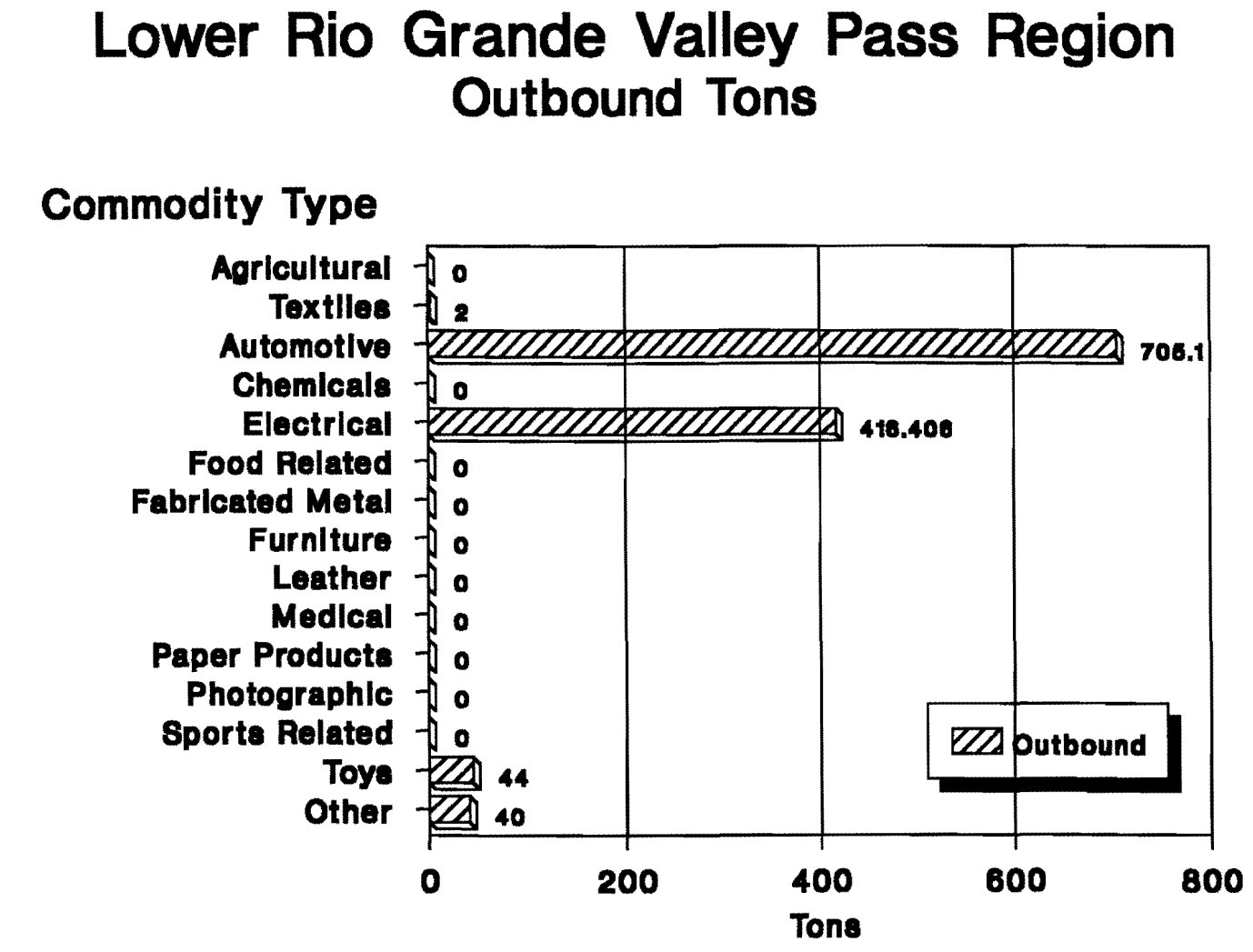
Figures 3-32, 3-33, and 3-34 show the tons of commodities which traveled into and out of the plants located in the DREP region. In this region the commodity fabricated metal product had large quantities of materials shipped into the region with automotive products following a distant second. On the outbound side, automotive products represented the largest commodity group; however, the tons of this commodity hauled were small by comparison. Figures 3-35, 3-36, and 3-37 show the same data presented as a percent of total tons hauled in and out of the region.

Figure 3-26 - Inbound Tons Hauled LRGV Region



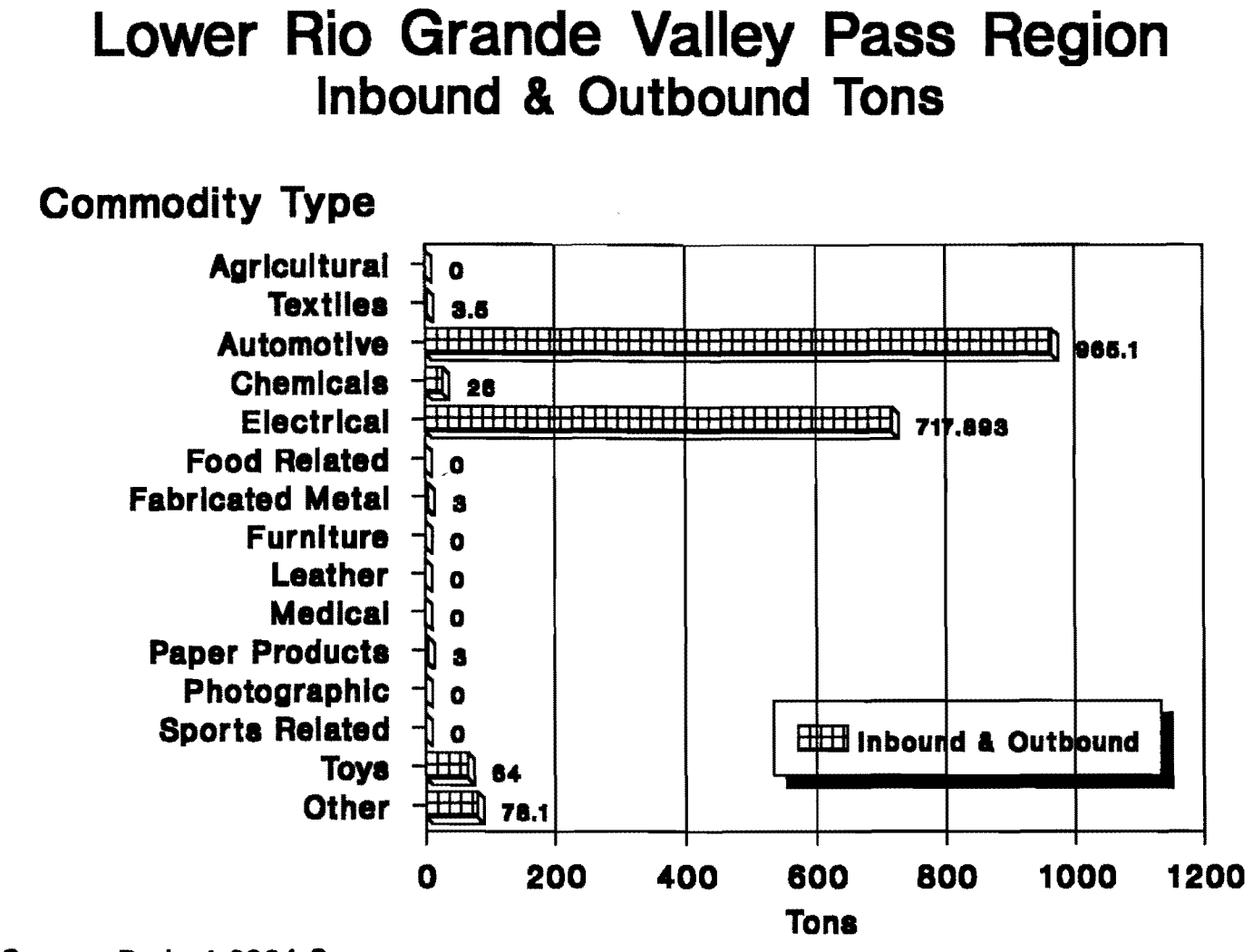
Source: Project 2034 Survey

Figure 3-27 - Outbound Tons Hauled LRGV Region



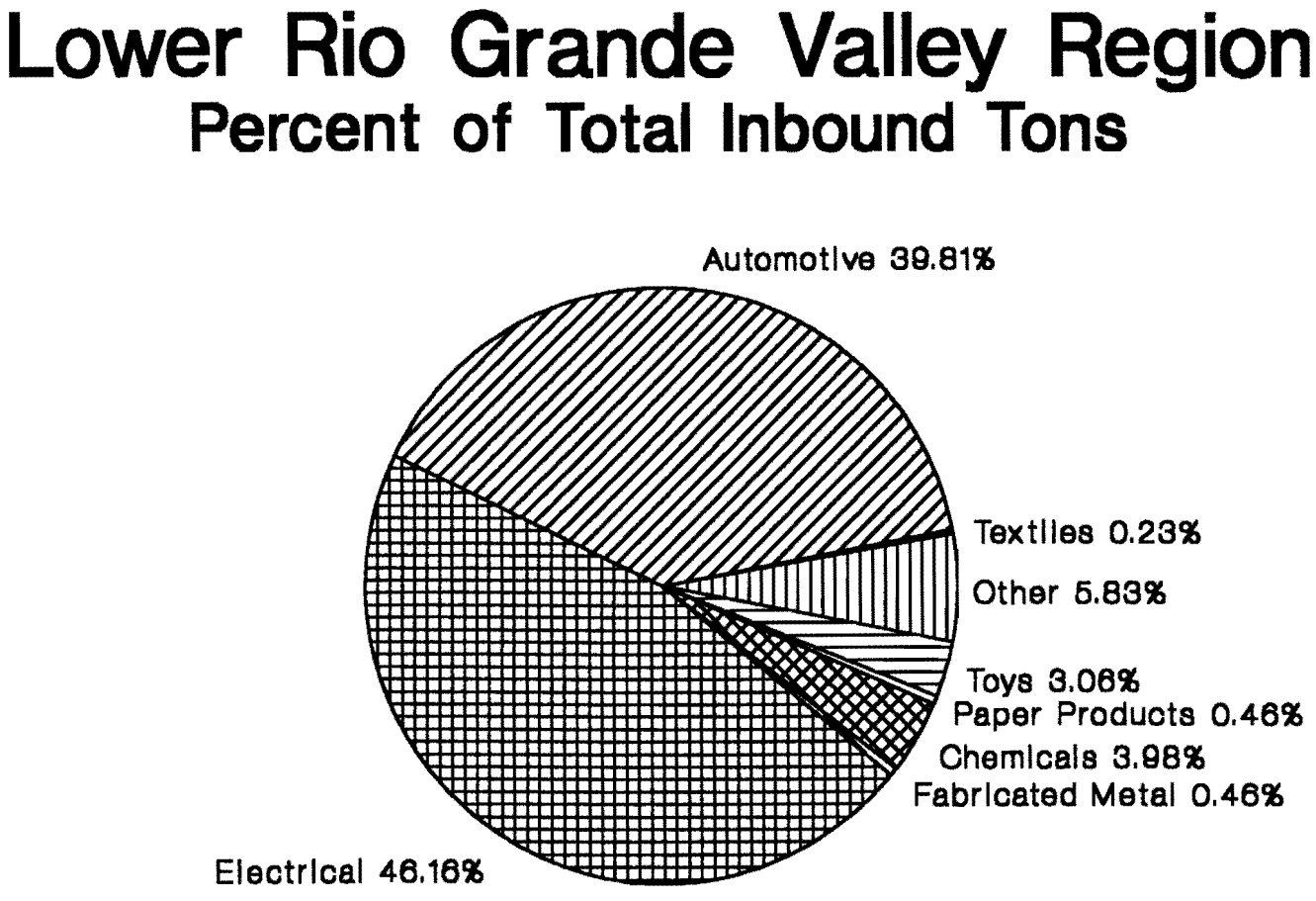
Source: Project 2034 Survey

Figure 3-28 - Inbound and Outbound Tons Hauled LRGV Region



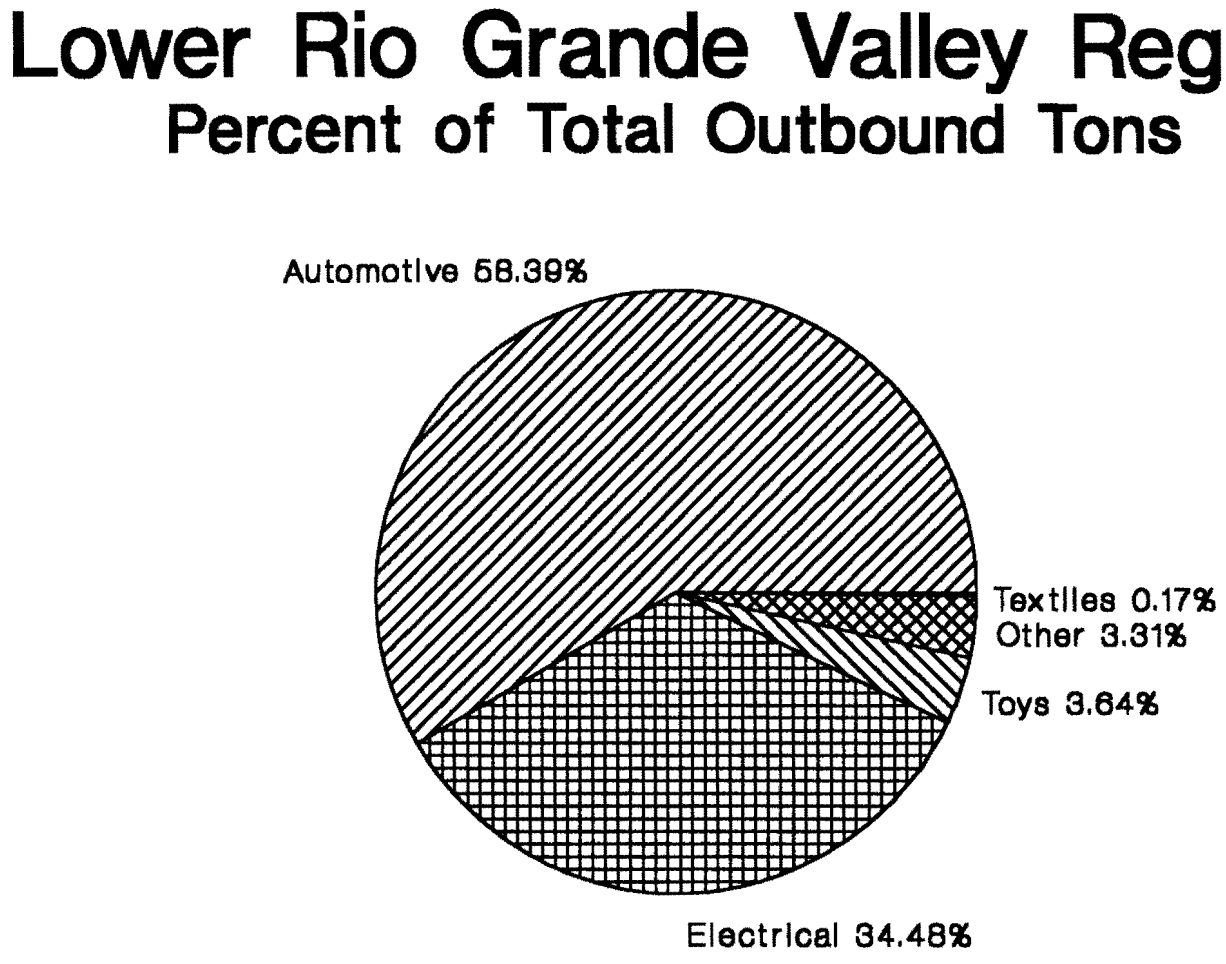
Source: Project 2034 Survey

Figure 3-29 - Percent of Total LRGV Region Inbound Tons Hauled



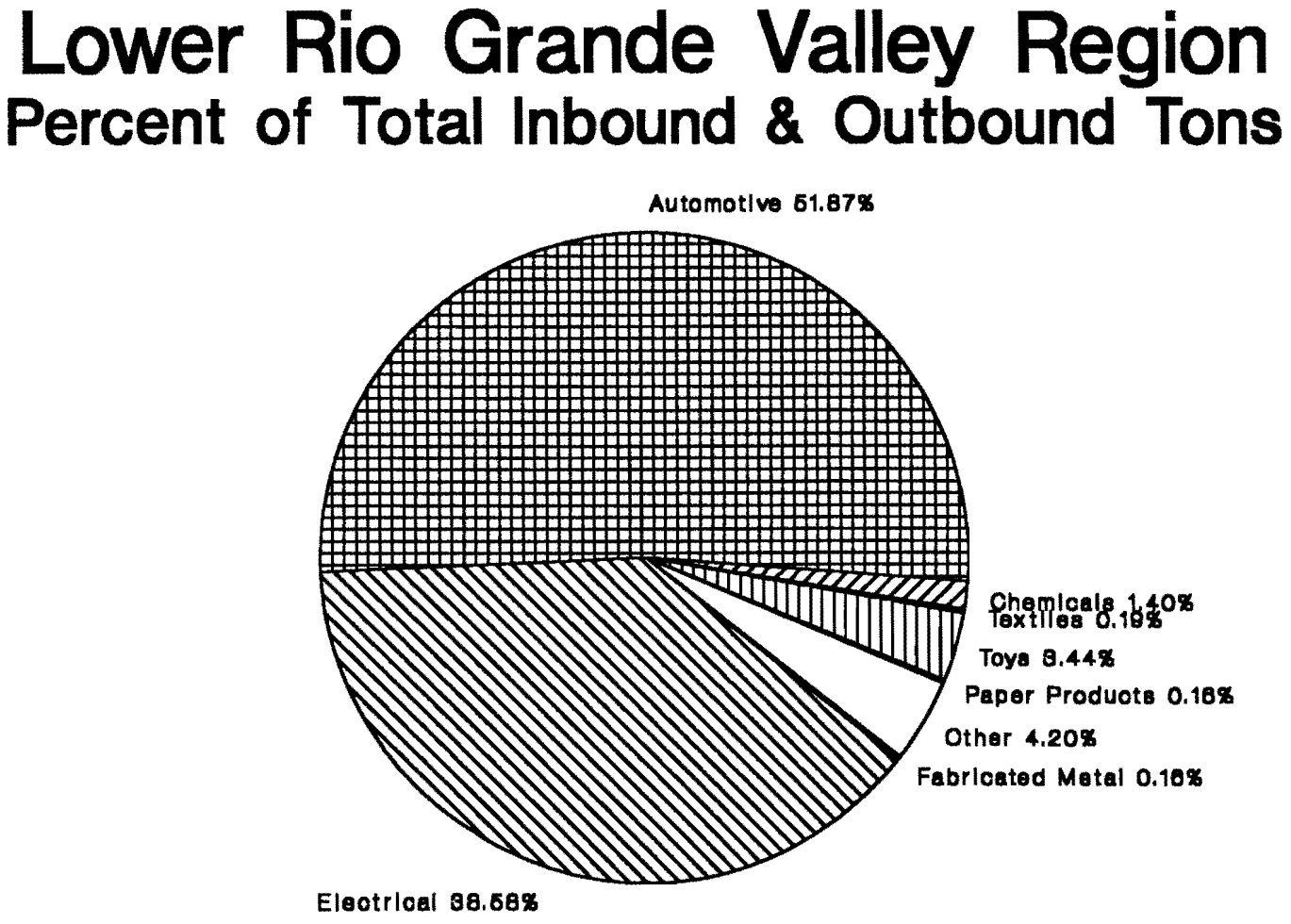
Source: Project 2034 Survey

Figure 3-30 - Percent of Total LRGV Region Outbound Tons Hauled



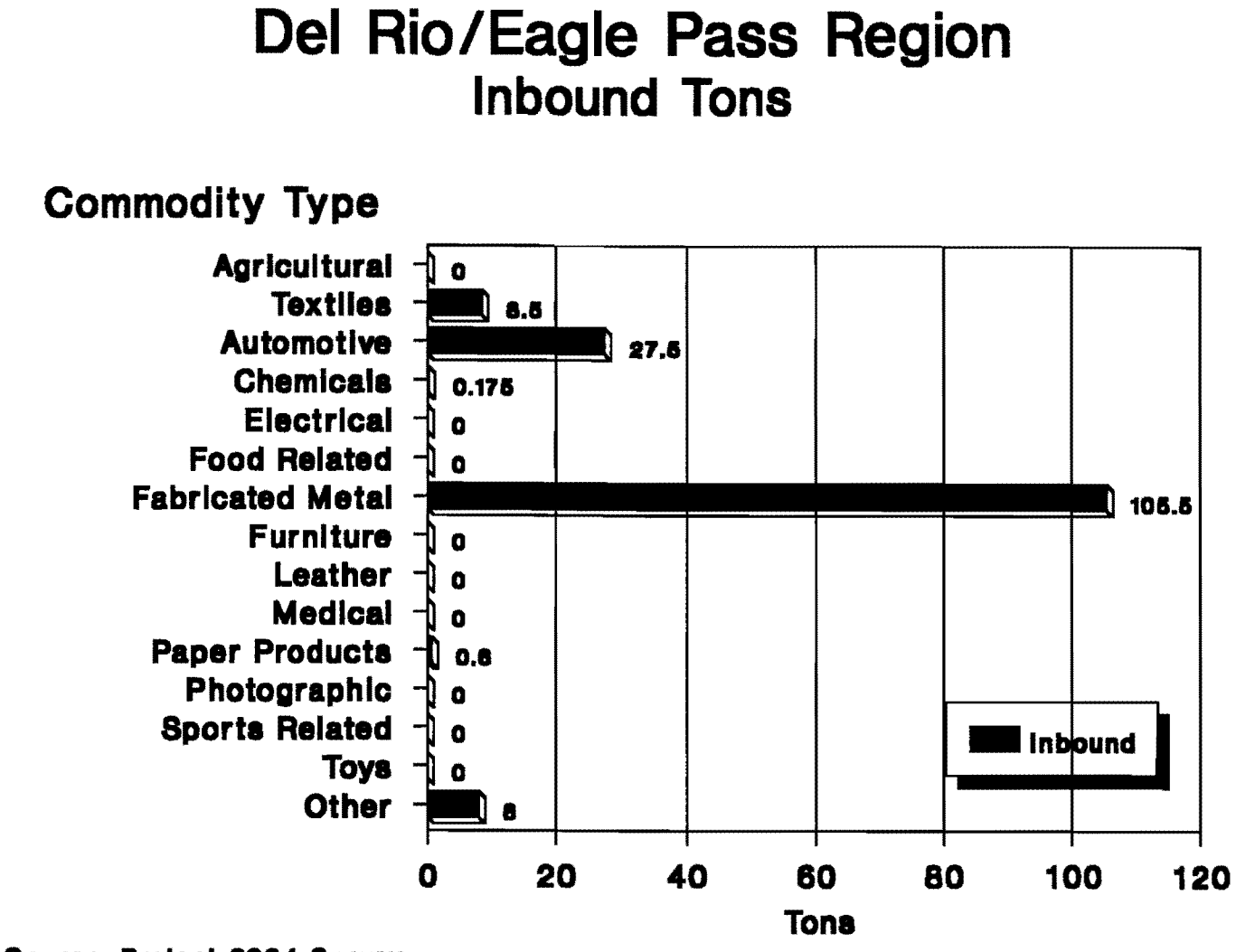
Source: Project 2034 Data

Figure 3-31 - Percent of Total LRGV Region Inbound and Outbound Tons Hauled



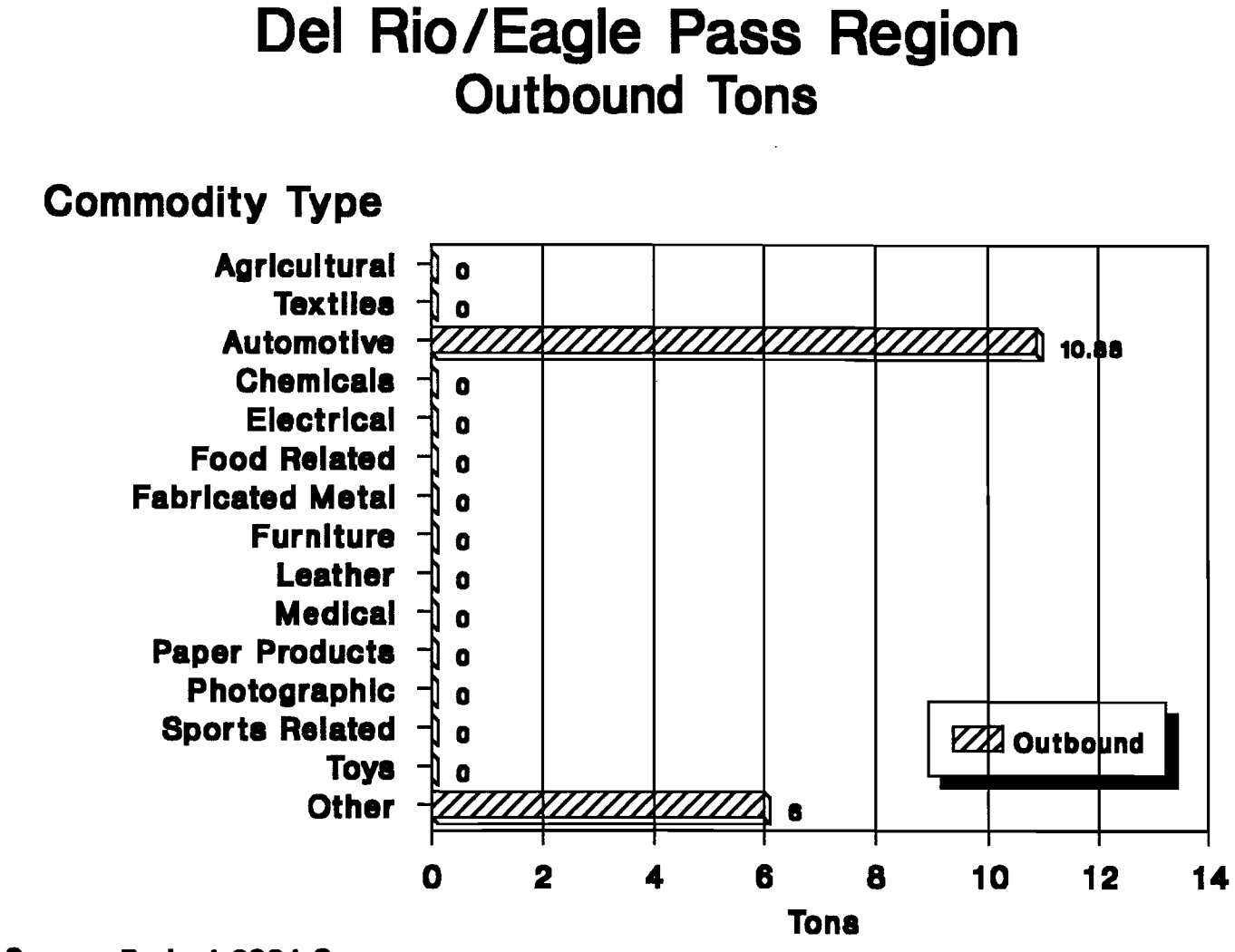
Source: Project 2034 Survey

Figure 3-32 - Inbound Tons Hauled DREP Region



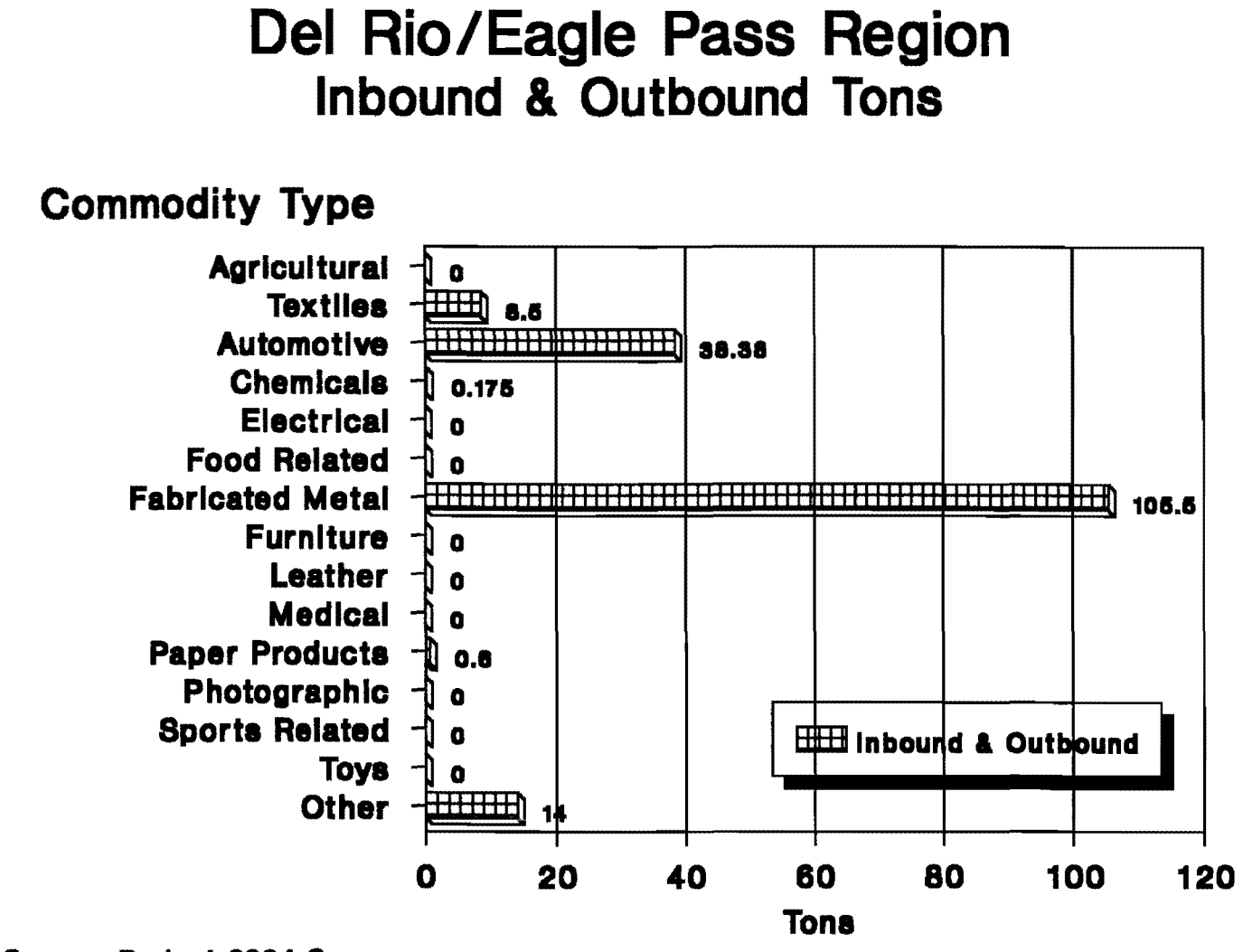
Source: Project 2034 Survey

Figure 3-33 - Outbound Tons Hauled DREP Region



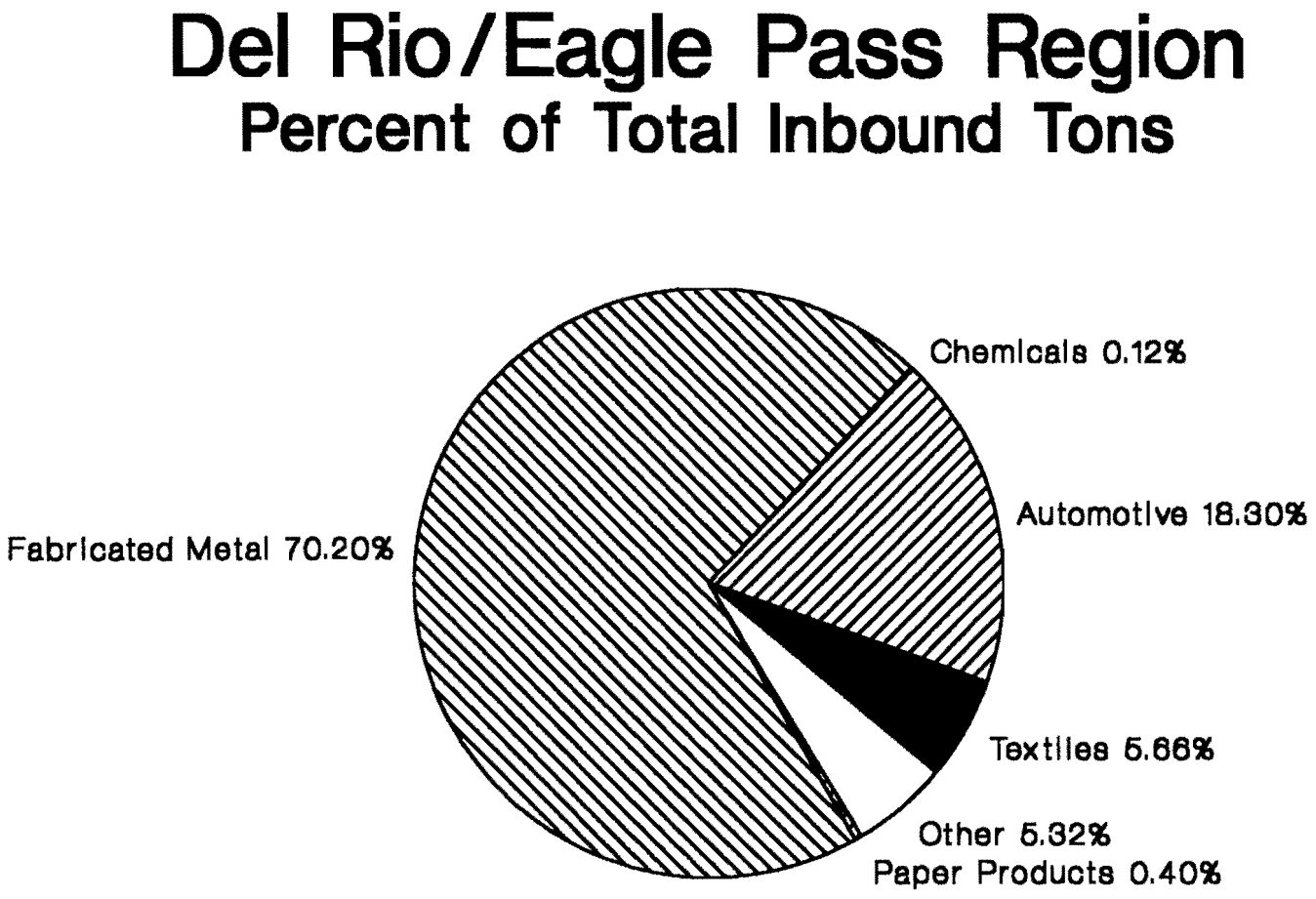
Source: Project 2034 Survey

Figure 3-34 - Inbound and Outbound Tons Hauled DREP Region



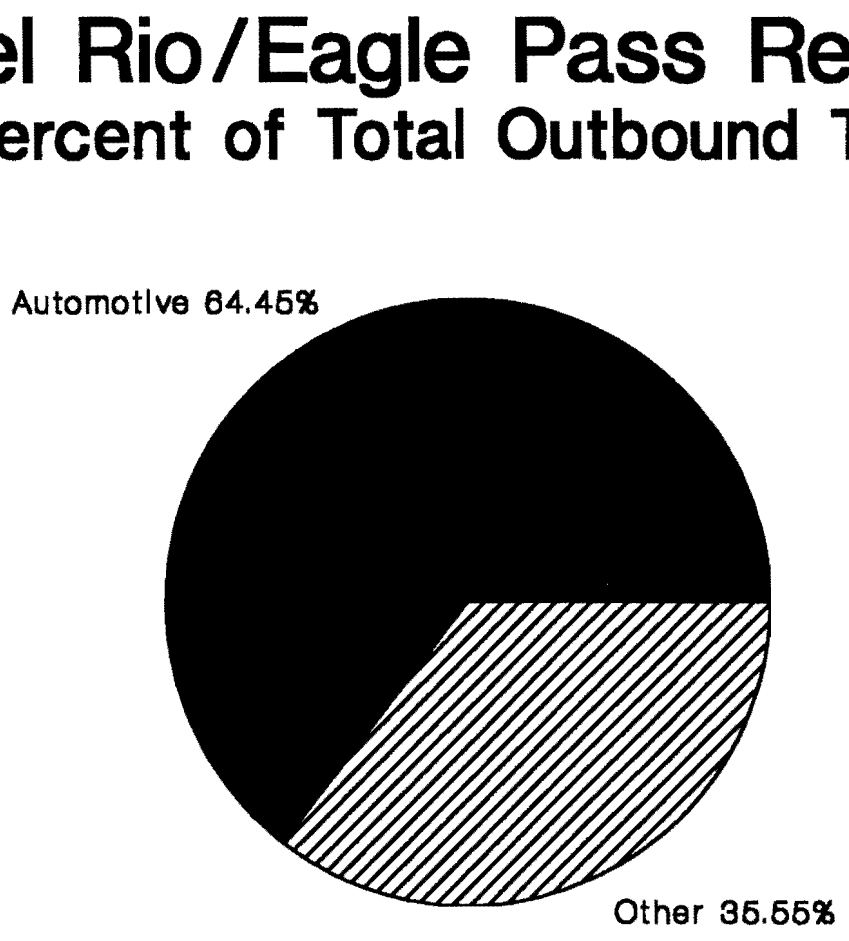
Source: Project 2034 Survey

Figure 3-35 - Percent of Total DREP Region Inbound Tons Hauled



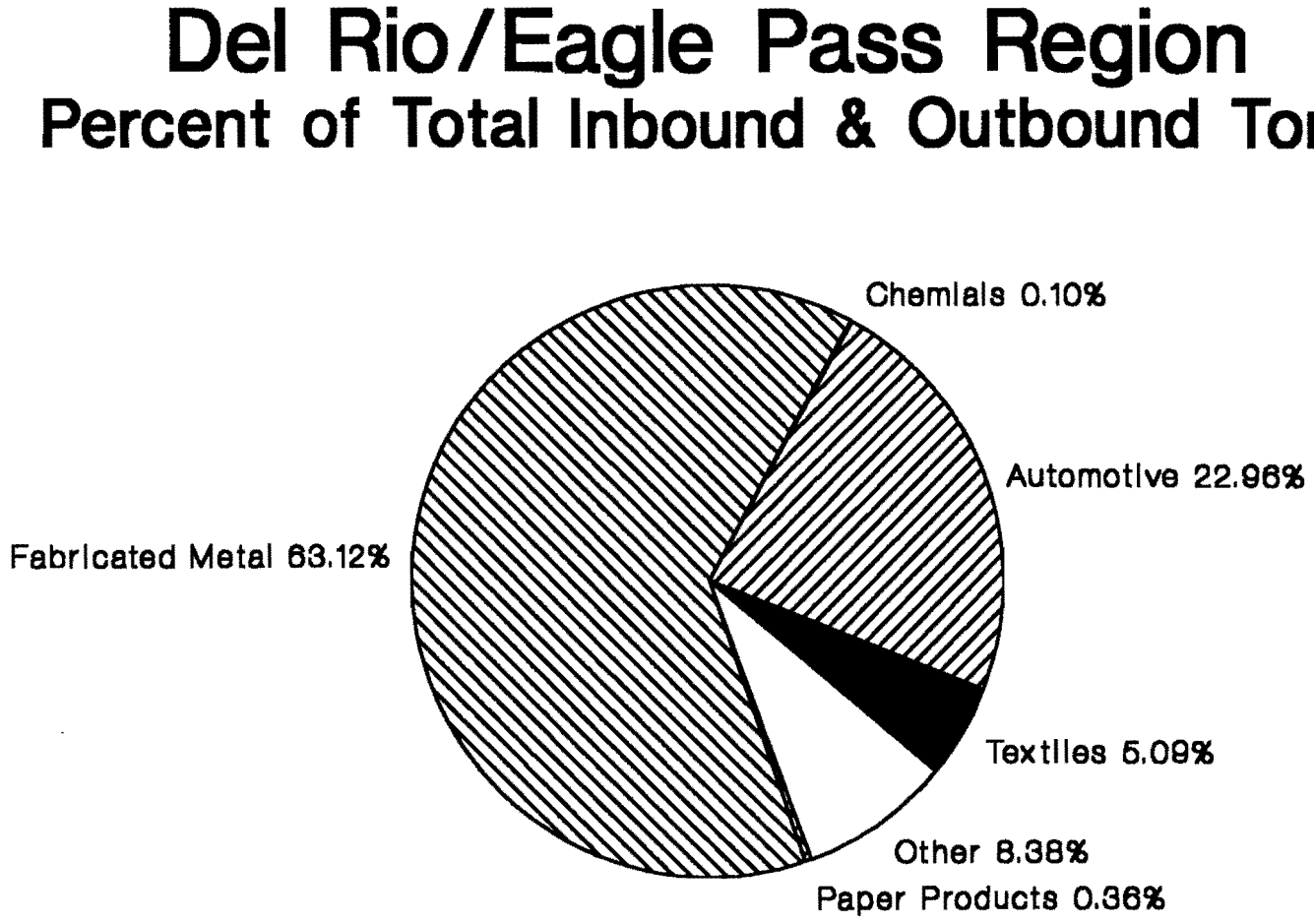
Source: Project 2034 Survey

Figure 3-36 - Percent of Total DREP Region Outbound Tons Hauled



Source: Project 2034 Survey

Figure 3-37 - Percent of Total DREP Region Inbound and Outbound Tons Hauled



Source: Project 2034 Survey

Figures 3-38, 3-39, and 3-40 show the distribution of inbound, outbound, and combined tons reported by the LA region. The highest concentration of tonnage move into the LA region included mainly textiles and automotive products. Figures 3-41, 3-42, and 3-43 show the same information as a percent of total tons hauled for the region.

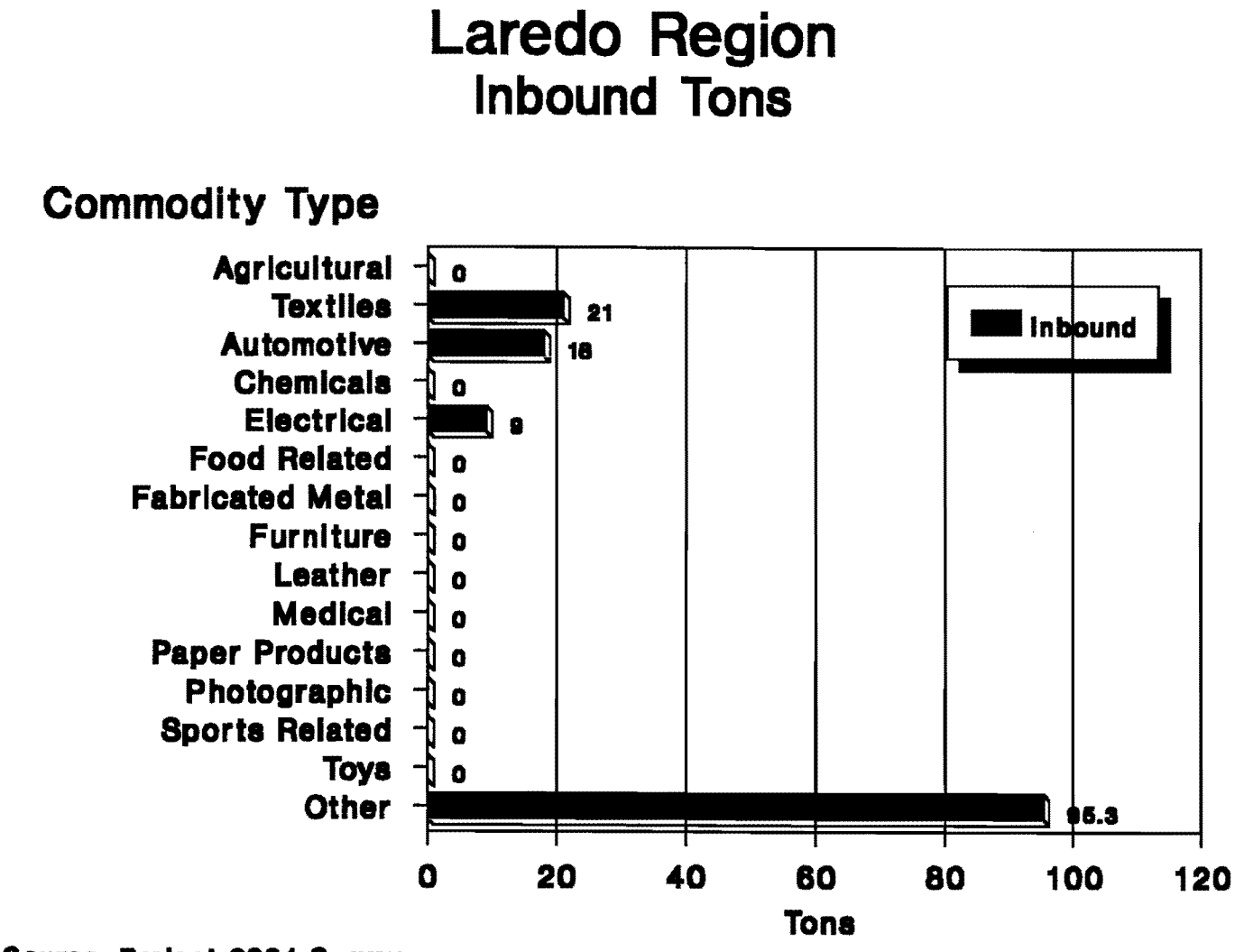
Figures 3-44, 3-45, and 3-46 show the distribution of inbound, outbound, and combined tons reported by the ELPA region. Like most of the other regions, the majority of tonnage hauled comprised automotive and electrical products. However, unlike most regions, the ELPA region exhibited heavier tonnages moving outbound. Some commodities did have higher quantities moving inbound, but as a whole more tons move out of plant location in this region. Figures 3-47, 3-48, and 3-49 show the same information as a percent of total tons hauled for the region.

Transportation Mode - Transportation mode reports the survey respondents information by transportation system. Specifically, the respondents were asked to identify whether they used truck shipments, rail shipments, or air shipments. The data listed in these three variable categories represent the number of shipments which were transported into and out of the plant locations by each of the transportation modes.

Figures 3-50, 3-51, and 3-52 show the distribution of reported inbound, outbound, and combined modal frequencies, respectively. The data show truck shipments to be the highest favored form of transportation for shipments into and out of the four regions. Air and rail shipments were seldom the preferred choices for materials shipments based on the survey results, comprising less than twenty percent of the overall transportation mode. The breakdown of the survey result by percentages for the regions can be seen in Figures 3-53, 3-54, 3-55, and 3-56.

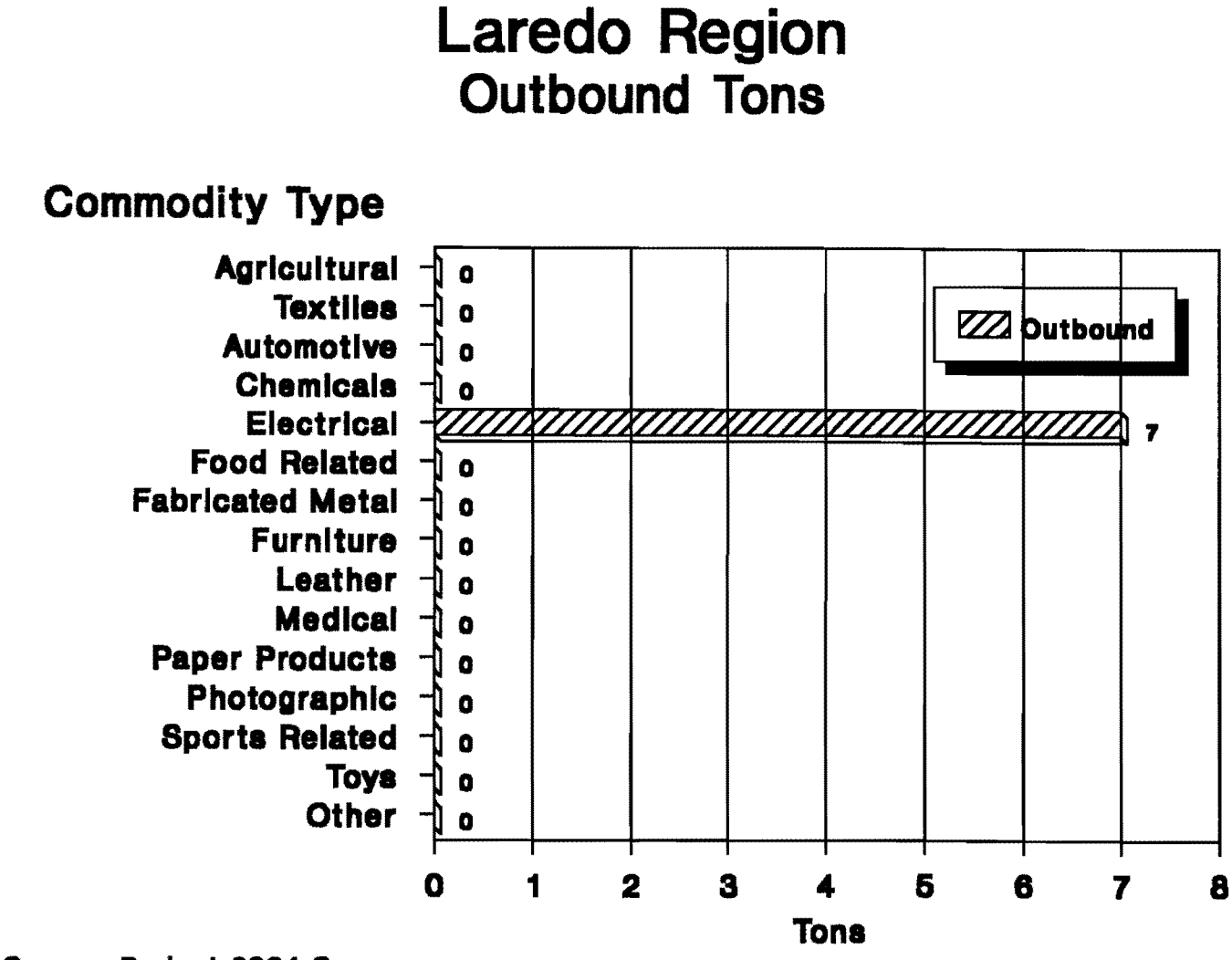
Bridge Usage - As well as the multi-modal nature of commodity shipments in this study, several different bridges were used for the transportation of commodities from plant origins to their various destinations and to plant destination from various origins. All bridges reported by the survey respondents were initially classified as separate variables. The bridges listed on the various surveys are listed in Table 3-3 in the column "Survey Bridge"

Figure 3-38 - Inbound Tons Hauled LA Region



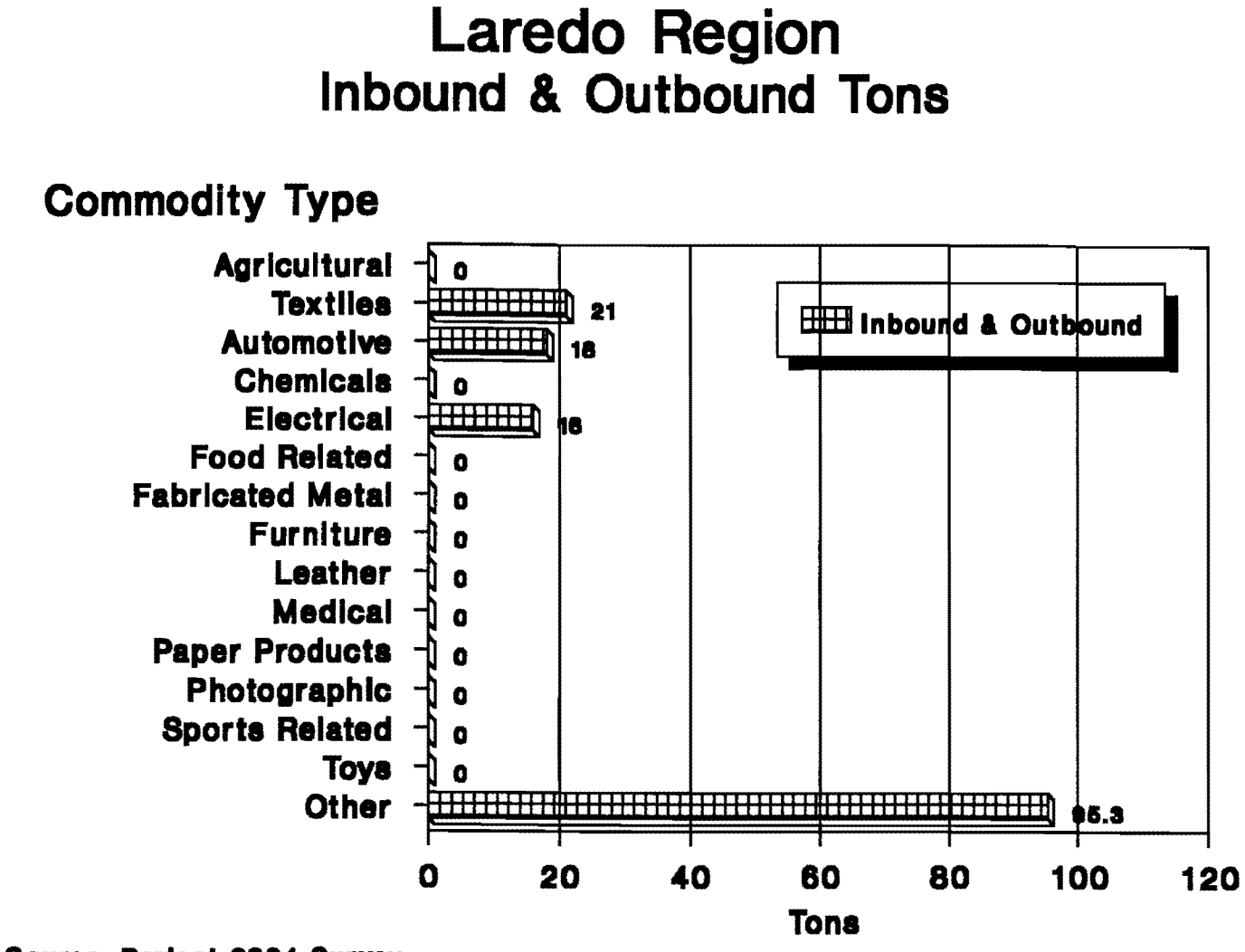
Source: Project 2034 Survey

Figure 3-39 - Outbound Tons Hauled LA Region



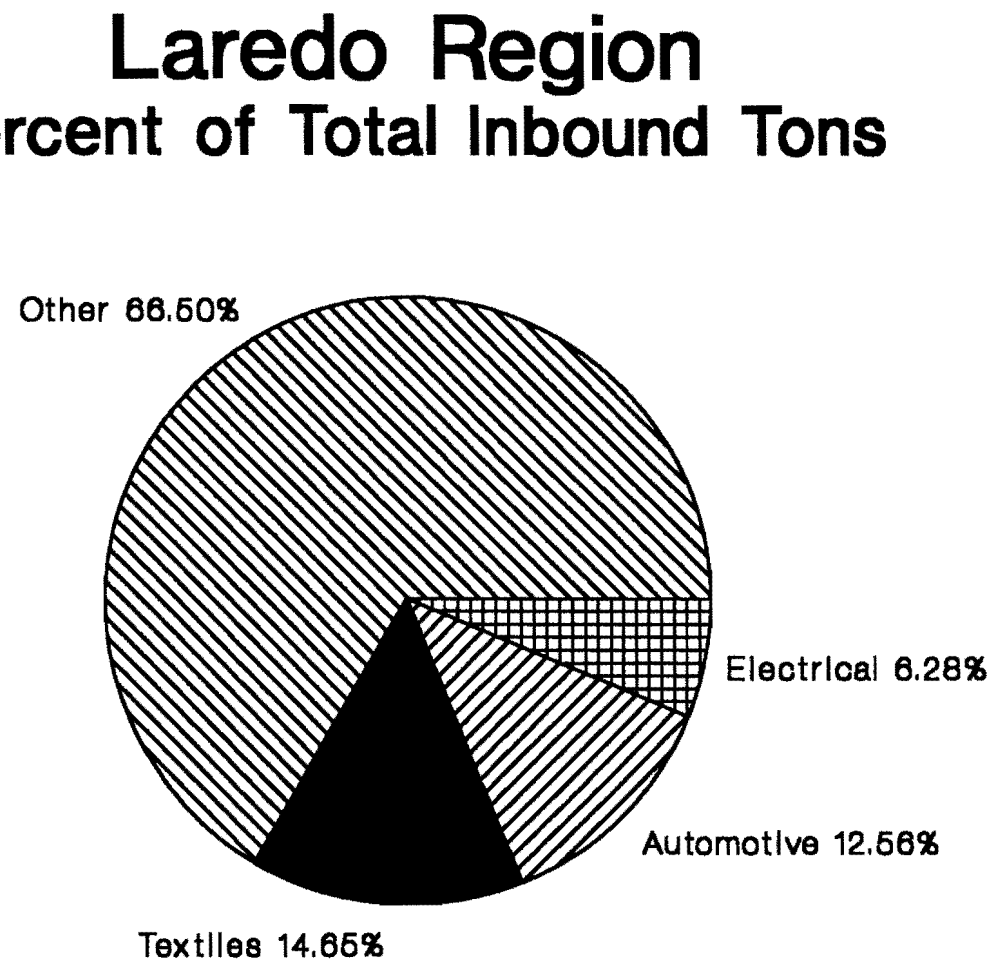
Source: Project 2034 Survey

Figure 3-40 - Inbound and Outbound Tons Hauled LA Region



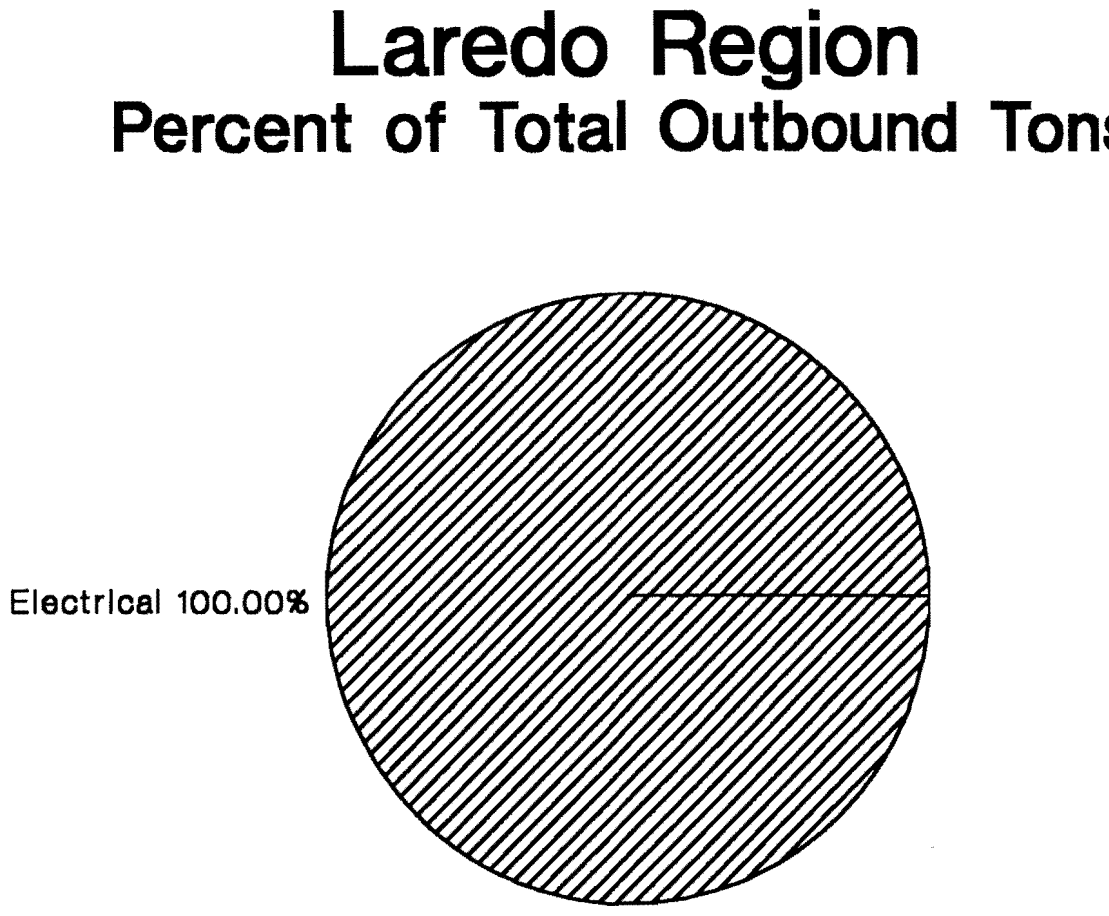
Source: Project 2034 Survey

Figure 3-41 - Percent of Total LA Region Inbound Tons Hauled



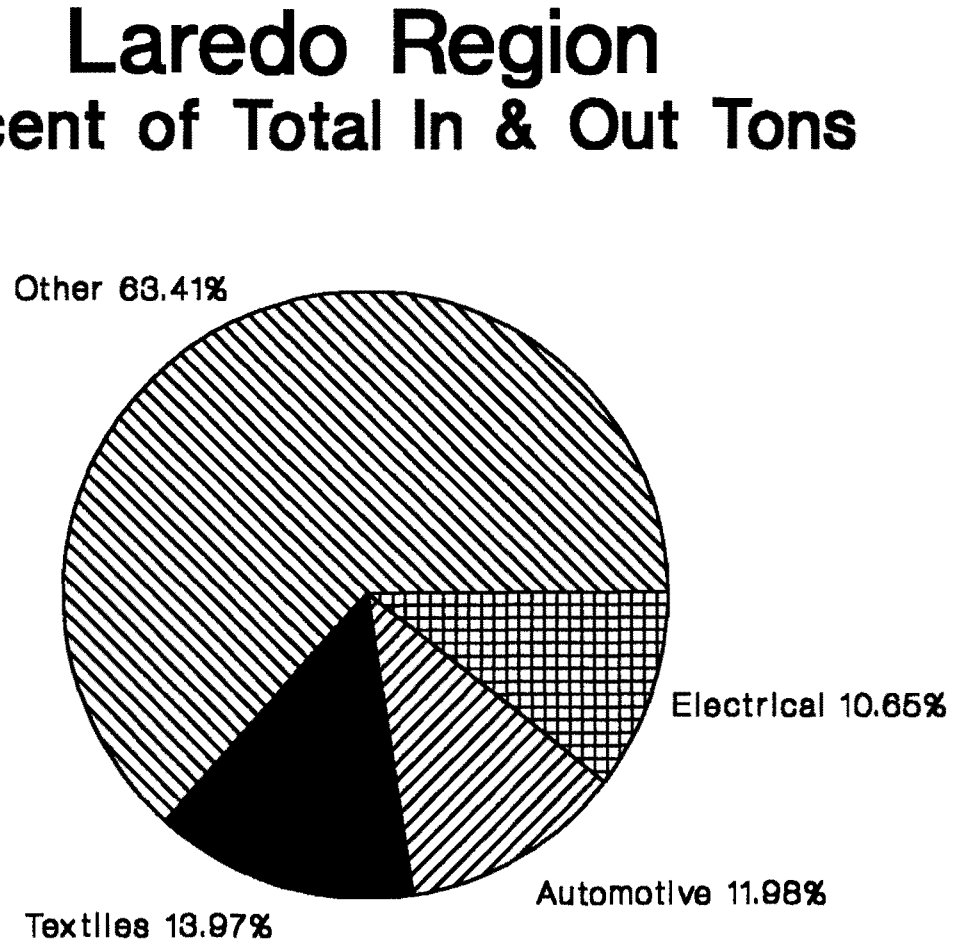
Source: Project 2034 Survey

Figure 3-42 - Percent of Total LA Region Outbound Tons Hauled



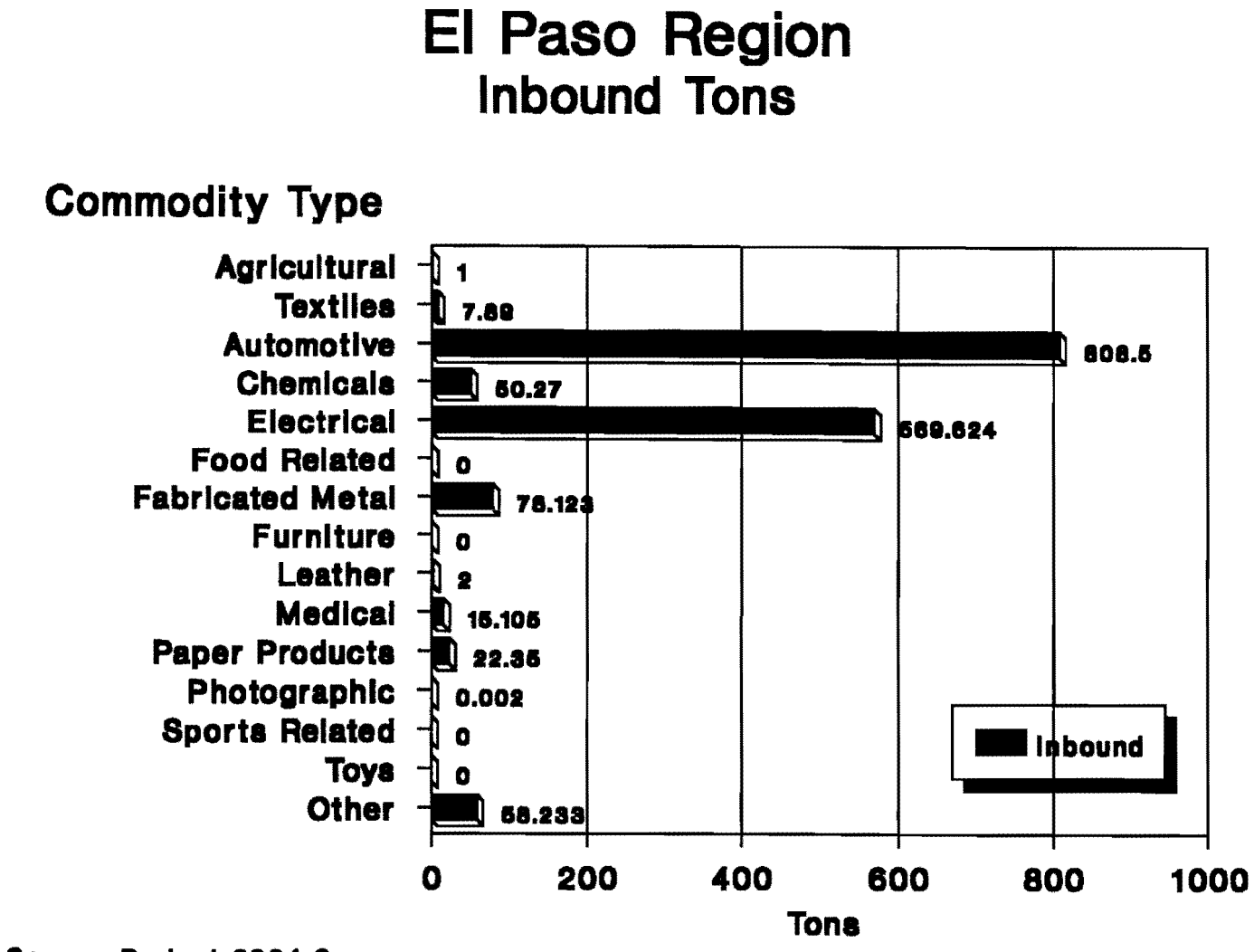
Source: Project 2034 Survey

Figure 3-43 - Percent of Total LA Region Inbound and Outbound Tons Hauled



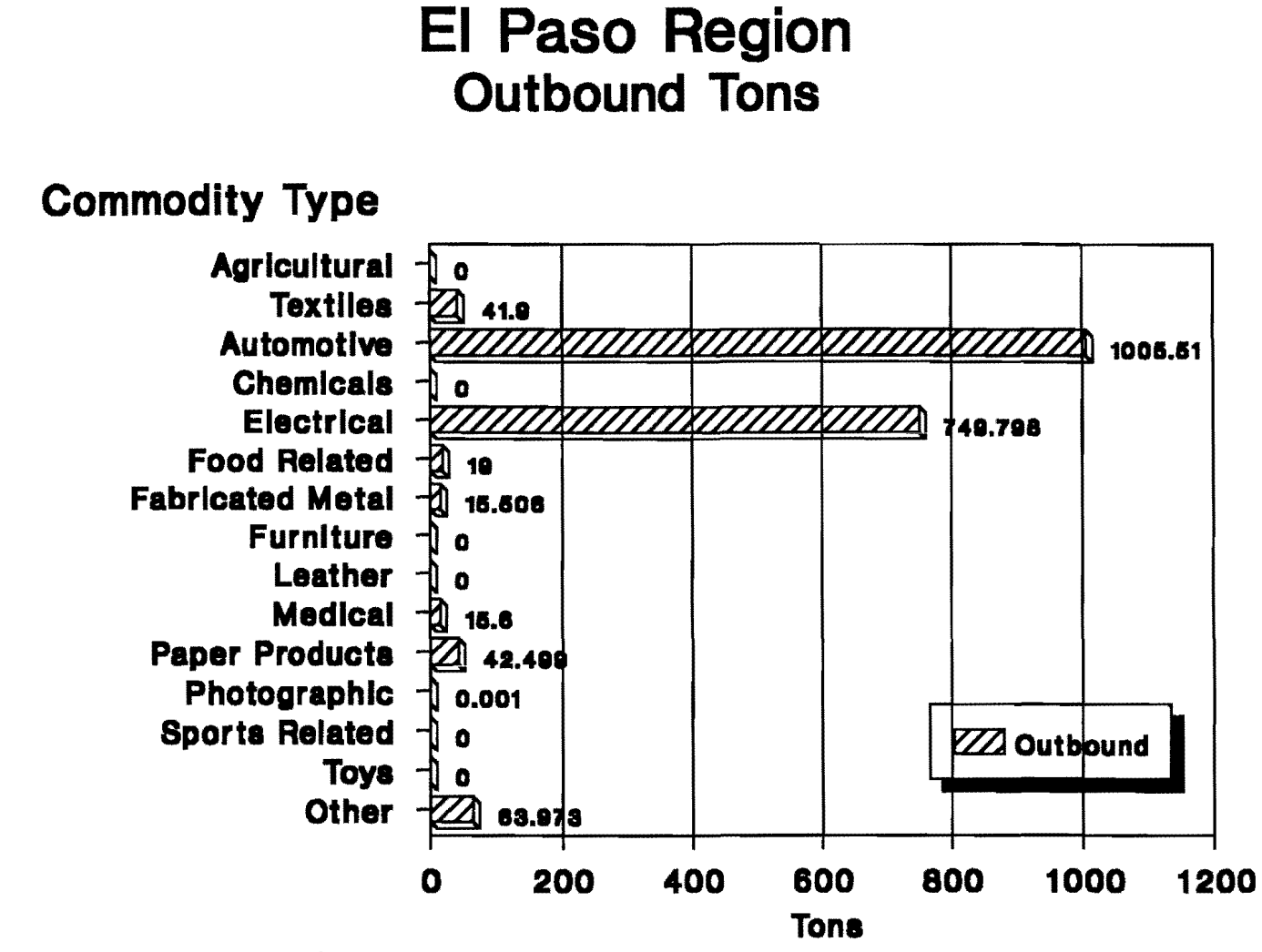
Source: Project 2034 Survey

Figure 3-44 - Inbound Tons Hauled ELPA Region



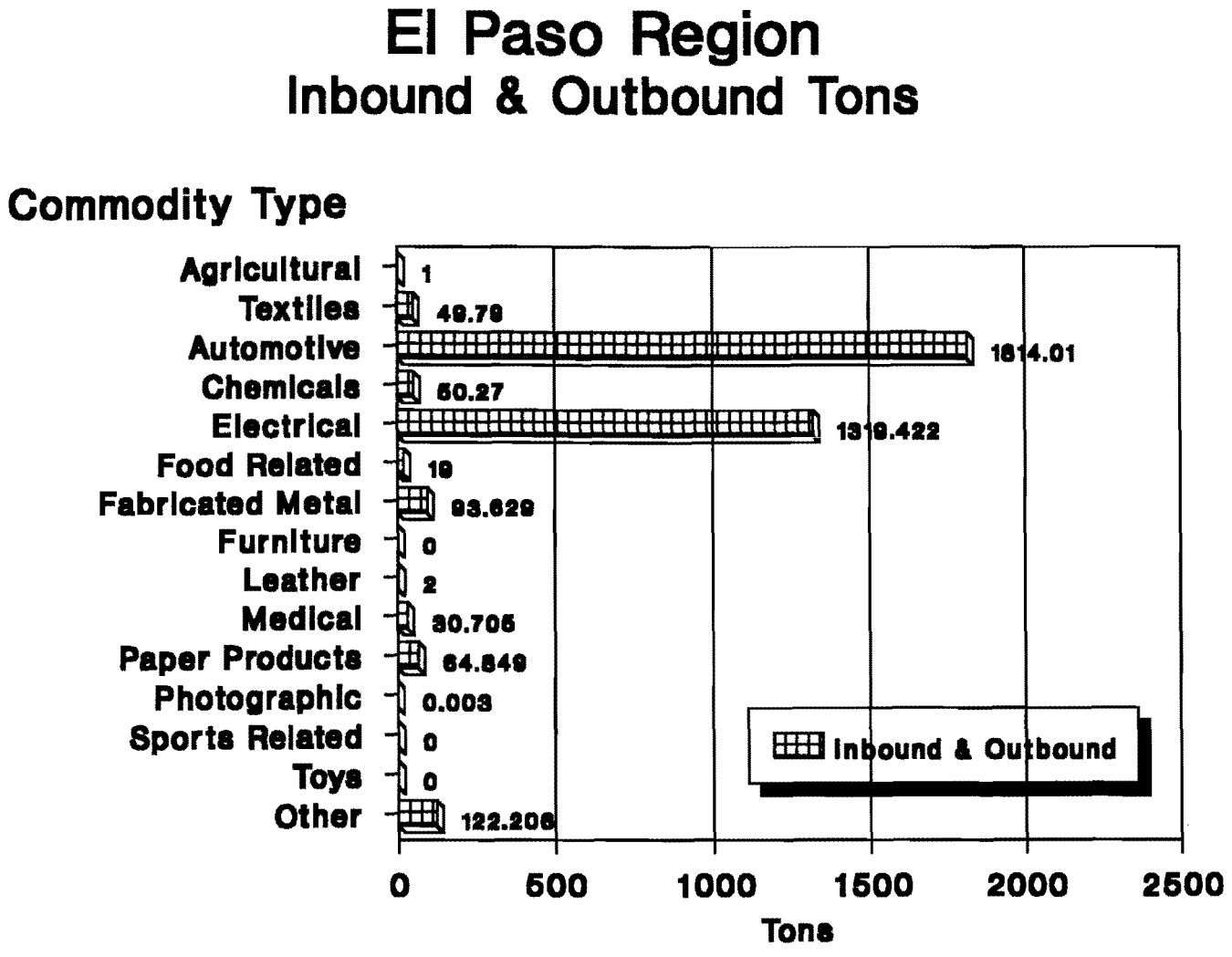
Source: Project 2034 Survey

Figure 3-45 - Outbound Tons Hauled ELPA Region



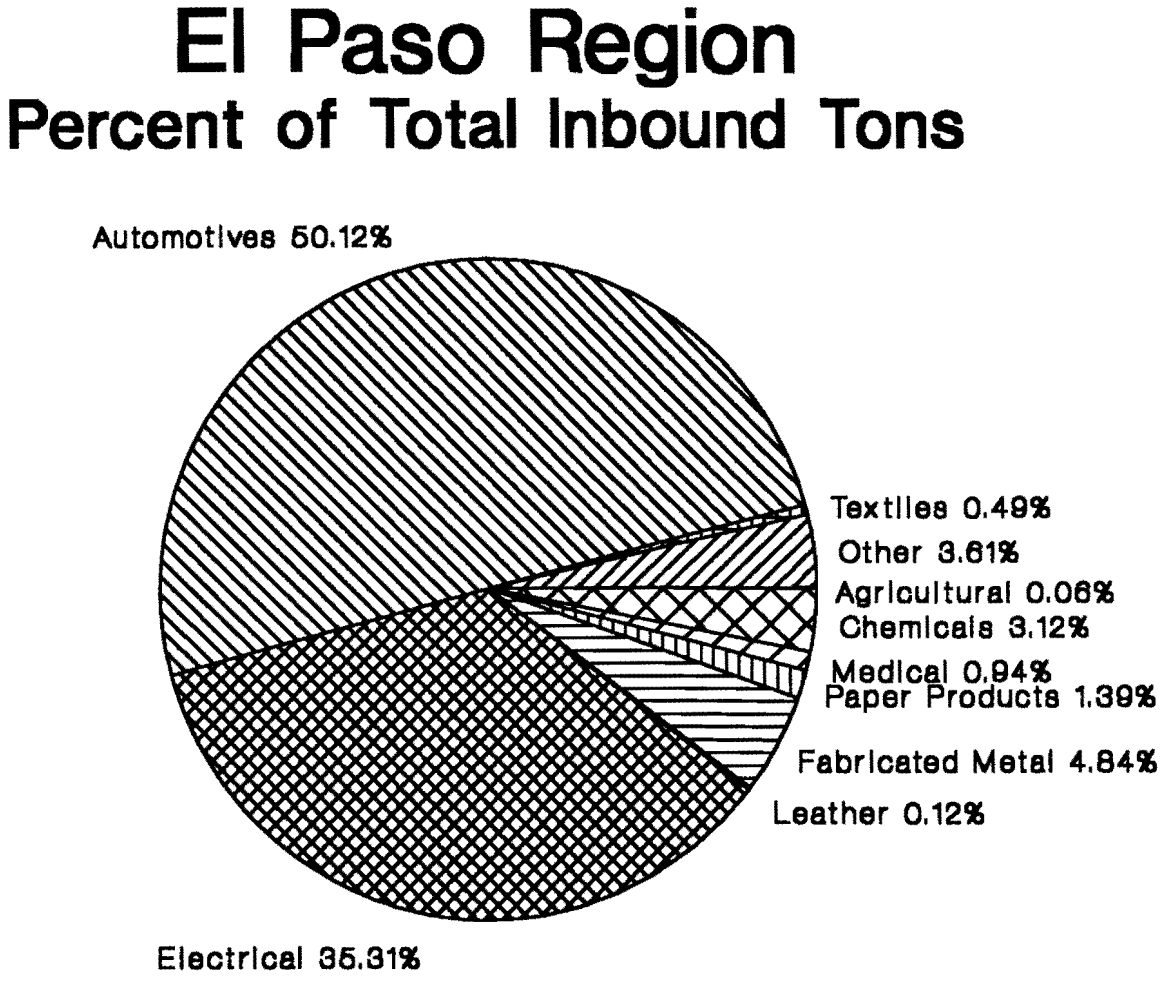
Source: Project 2034 Survey

Figure 3-46 - Inbound and Outbound Tons Hauled ELPA Region



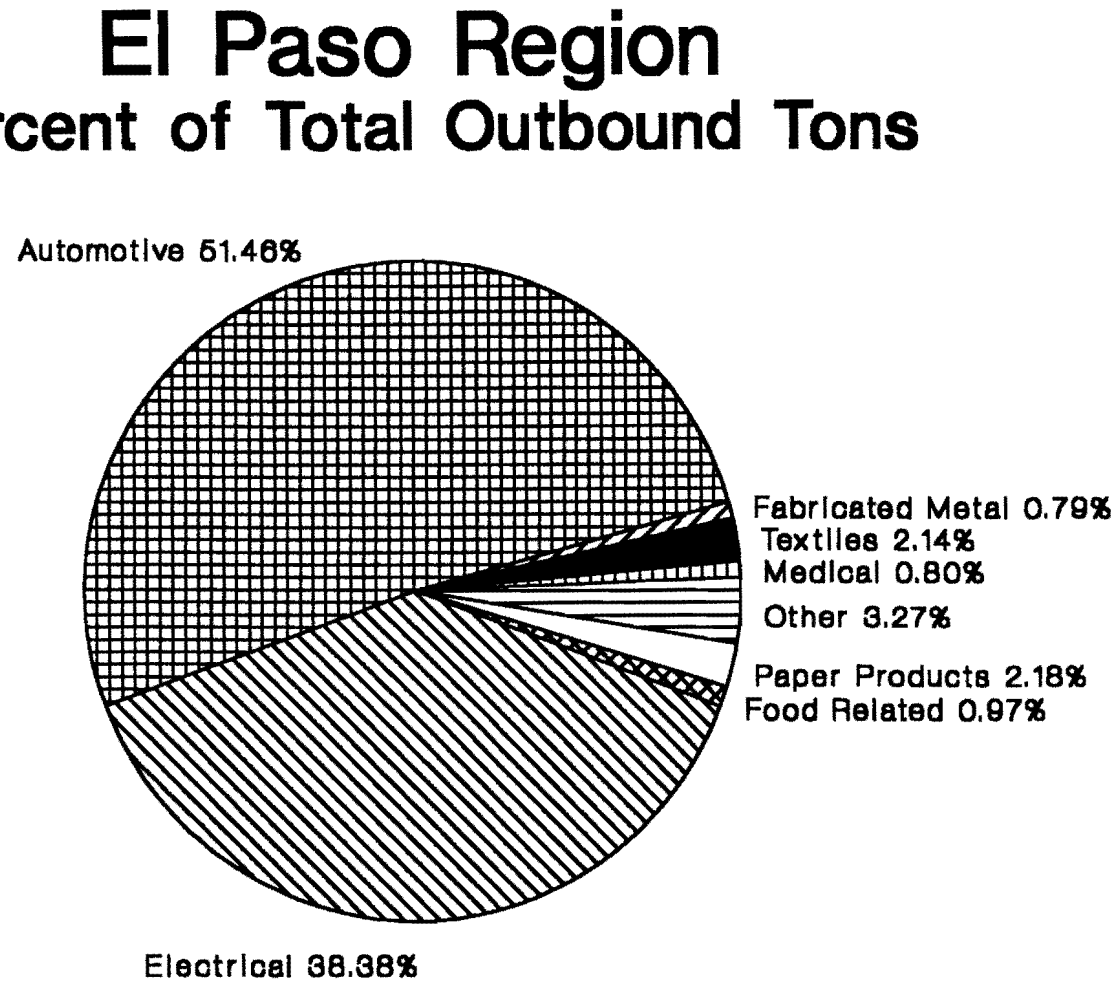
Source: Project 2034 Survey

Figure 3-47 - Percent of Total ELPA Region Inbound Tons Hauled



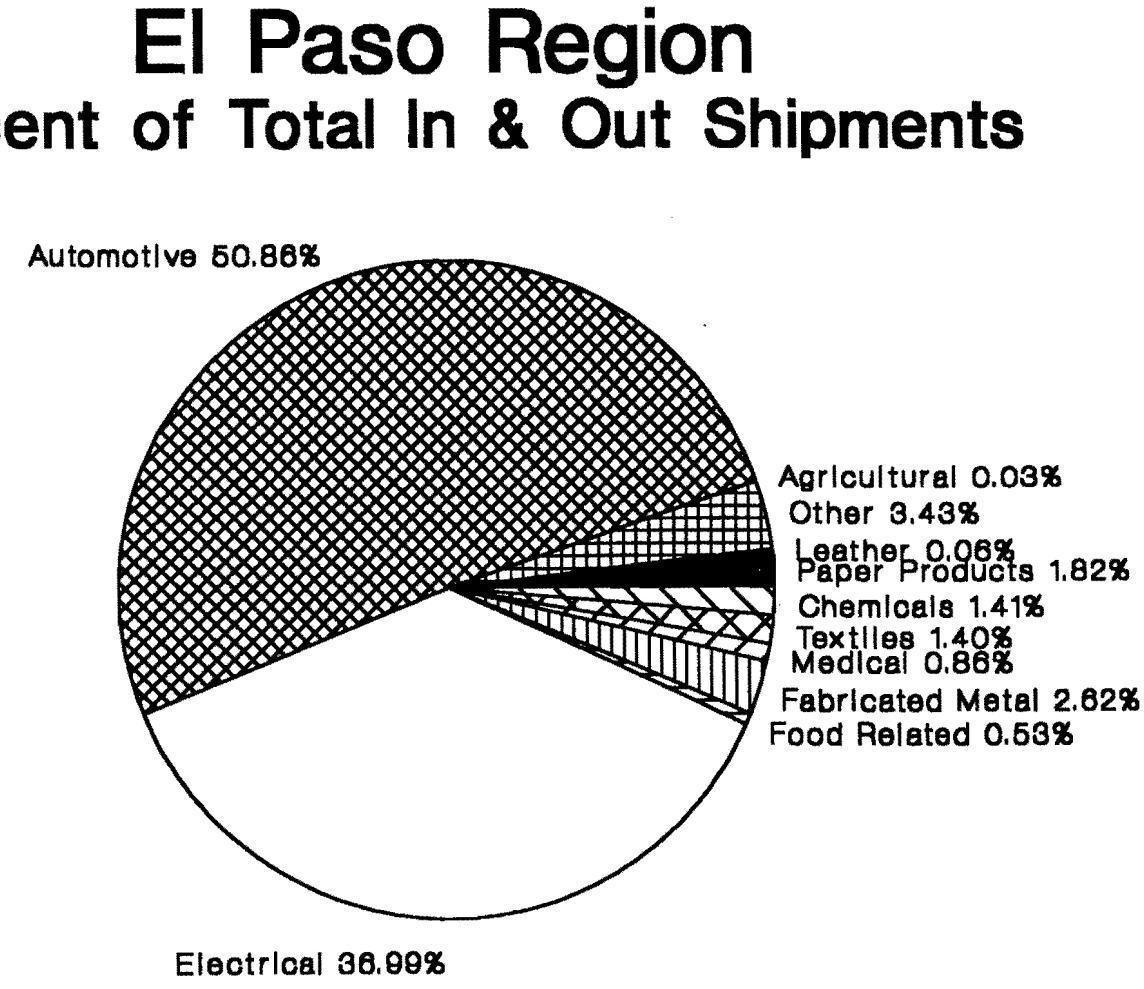
Source: Project 2034 Survey

Figure 3-48 - Percent of Total ELPA Region Outbound Tons Hauled



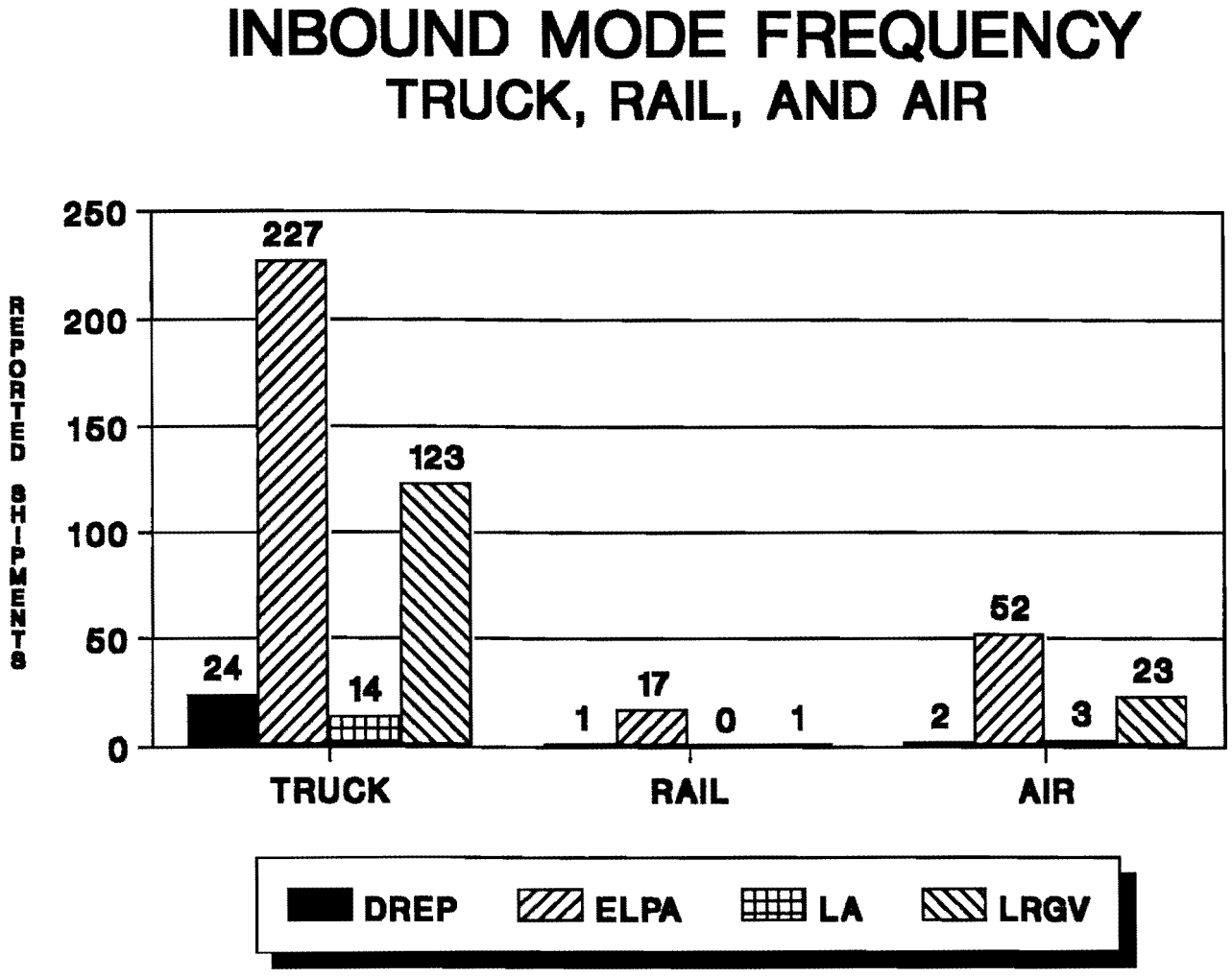
Source: Project 2034 Survey

Figure 3-49 - Percent of Total ELPA Region Inbound and Outbound Tons Hauled



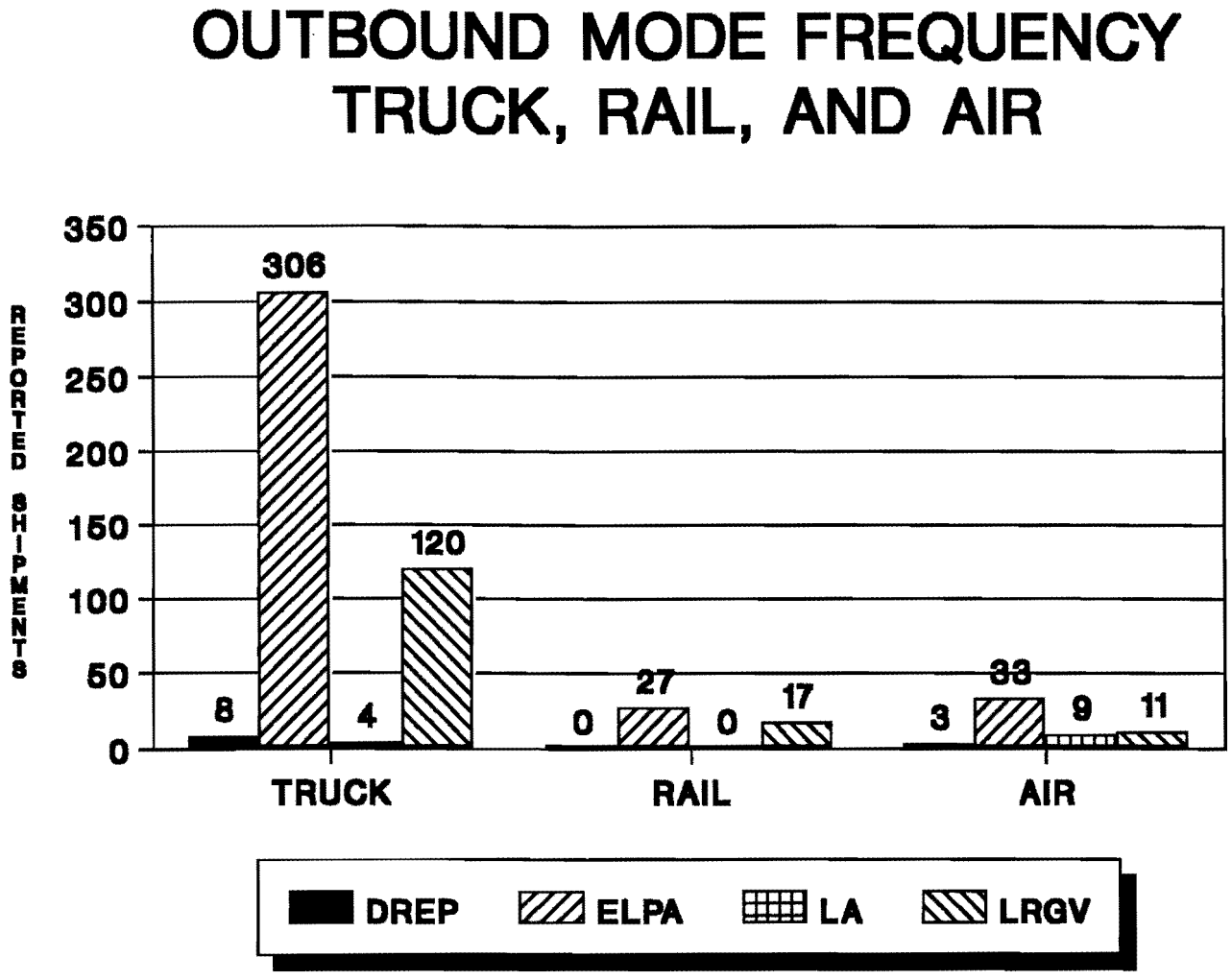
Source: Project 2034 Survey

Figure 3-50 - Inbound Modal Frequency



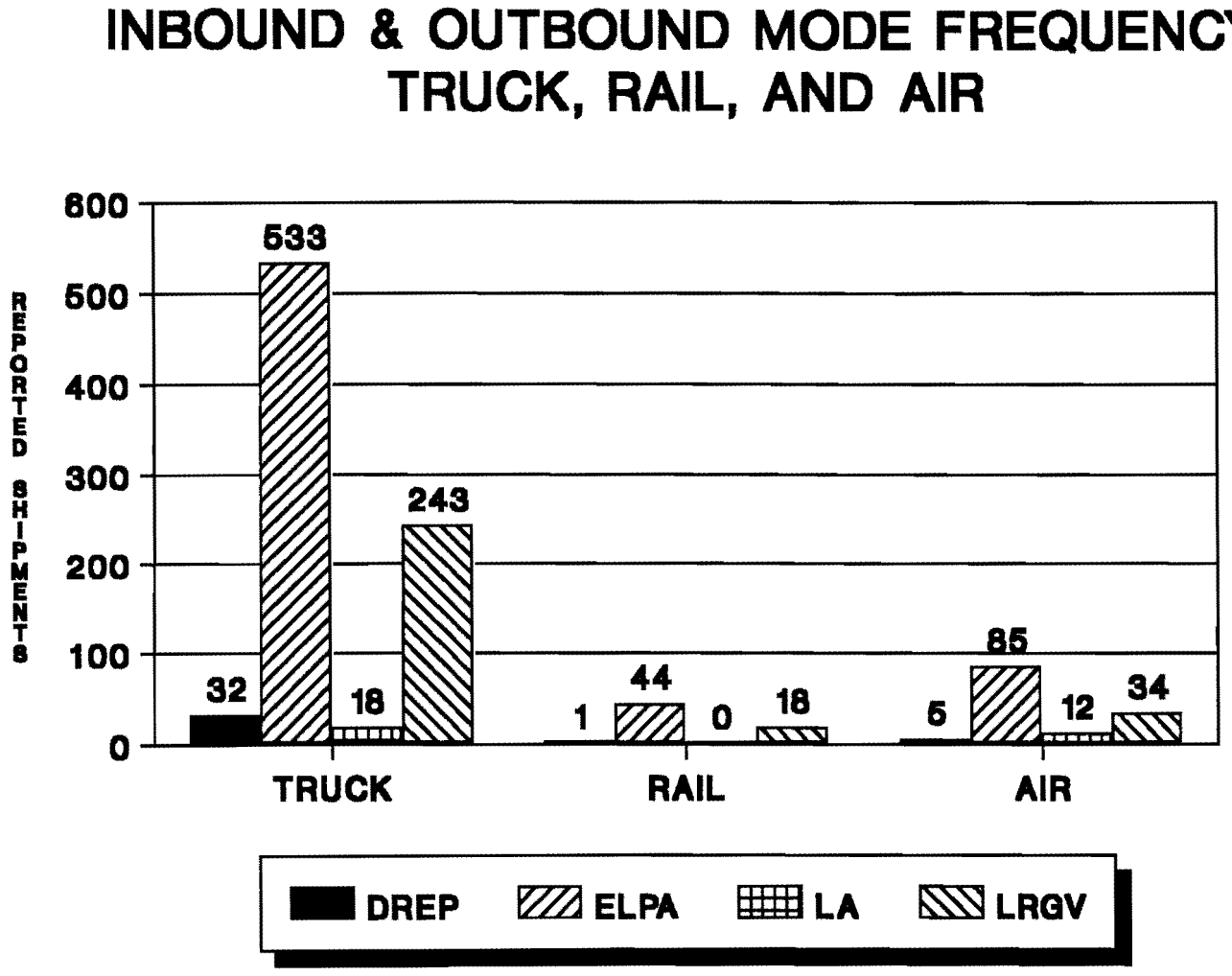
Source: Project 2034 Survey

Figure 3-51 - Outbound Modal Frequency



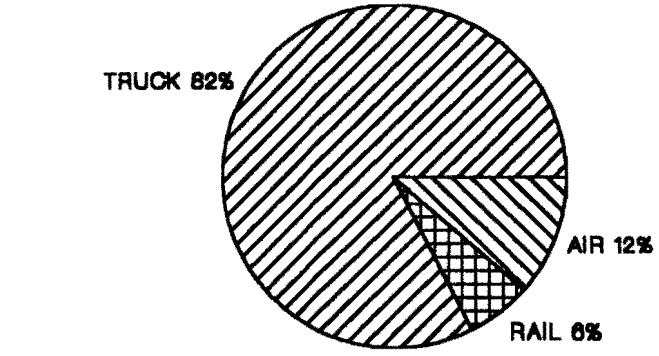
Source: 2034 Survey Data

Figure 3-52 - Inbound and Outbound Modal Frequency

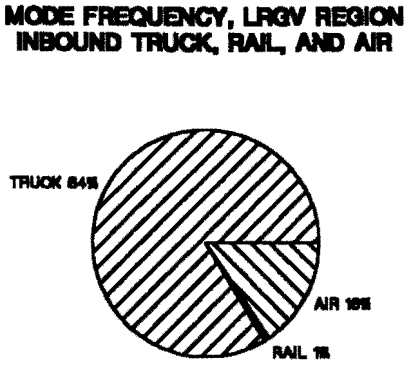


Source: 2034 Survey Data

Figure 3-53 - Modal Frequency LRGV Region



Source: 2034 Survey Data



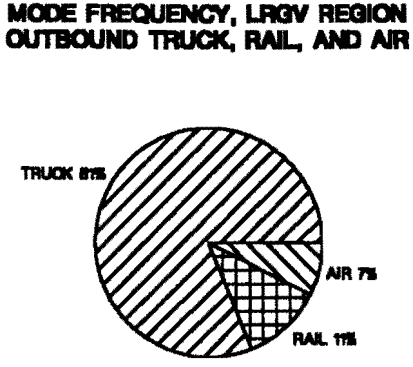
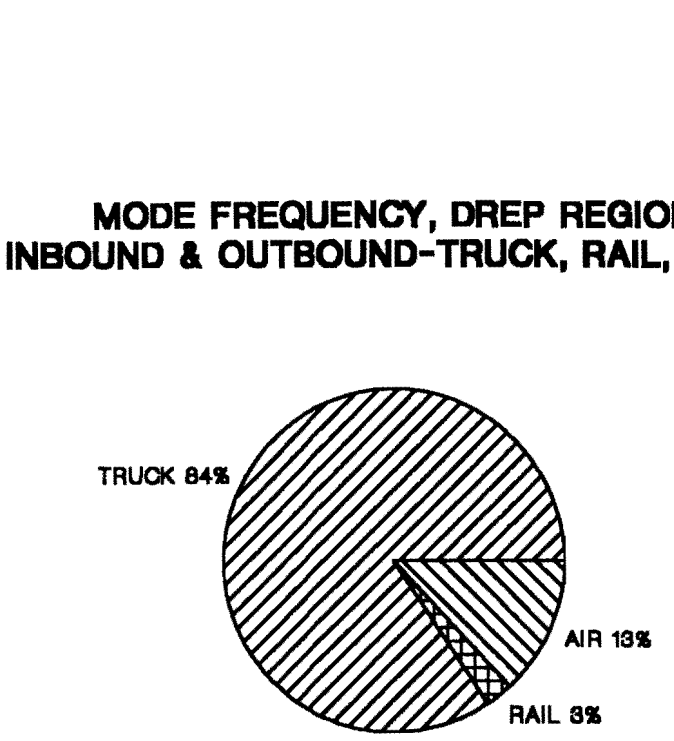
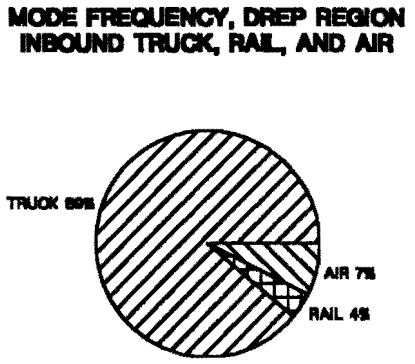


Figure 3-54 - Modal Frequency DREP Region



Source: 2034 Survey Data



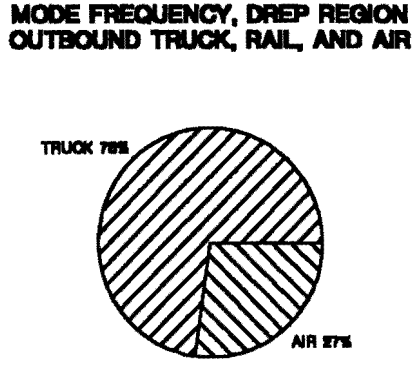
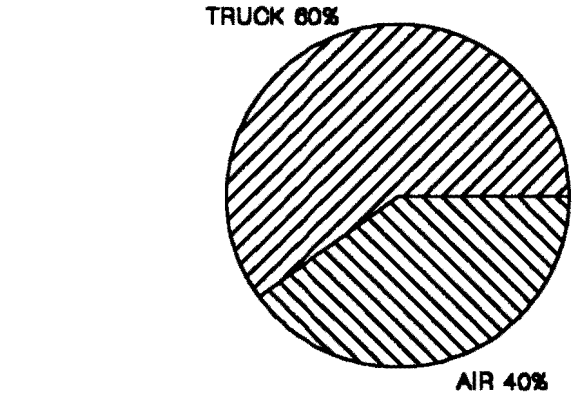
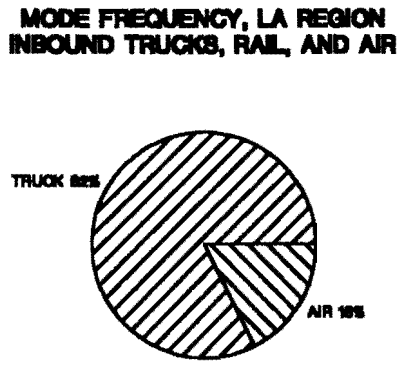


Figure 3-55 - Modal Frequency LA Region



Source: 2034 Survey Data



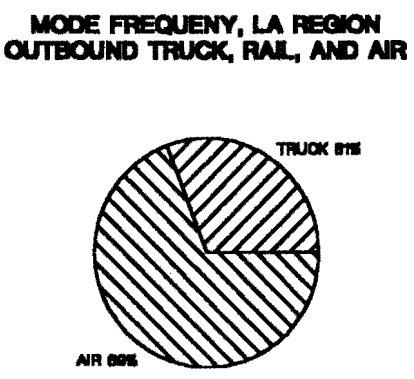
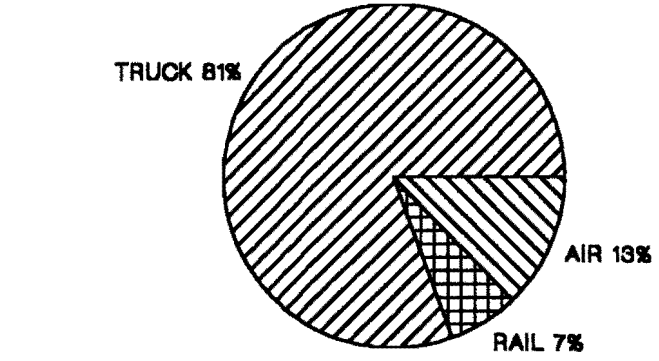
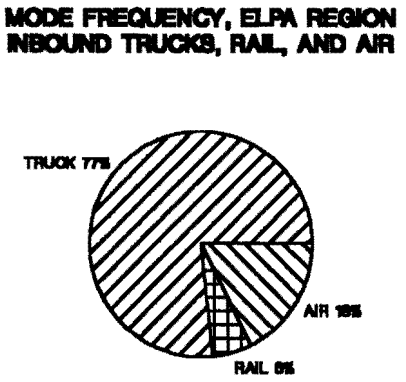
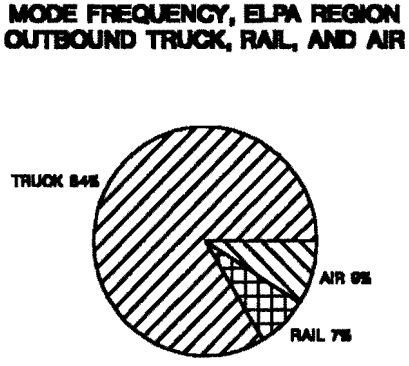


Figure 3-56 - Modal Frequency ELPA Region



Source: 2034 Survey Data





When acceptable levels of shipments crossed each bridge, the reported bridge was included as a separate database variable. However, low response rates on several bridges required the aggregation of infrequently reported bridges into the classification of "other bridges." Aggregation by region was made to show bridge usage independently and as a region. The regional aggregation of the reported information follows the same general pattern as that outlined in *Texas-Mexico International Border Crossings*, (TxDOT 1991). The bridge numbers listed in this table and the full bridge name are also drawn from this publication. The shipment related crossing frequencies and the corresponding percentage breakdowns can be reviewed in Figures 3-57, 3-58, 3-59, and 3-60.

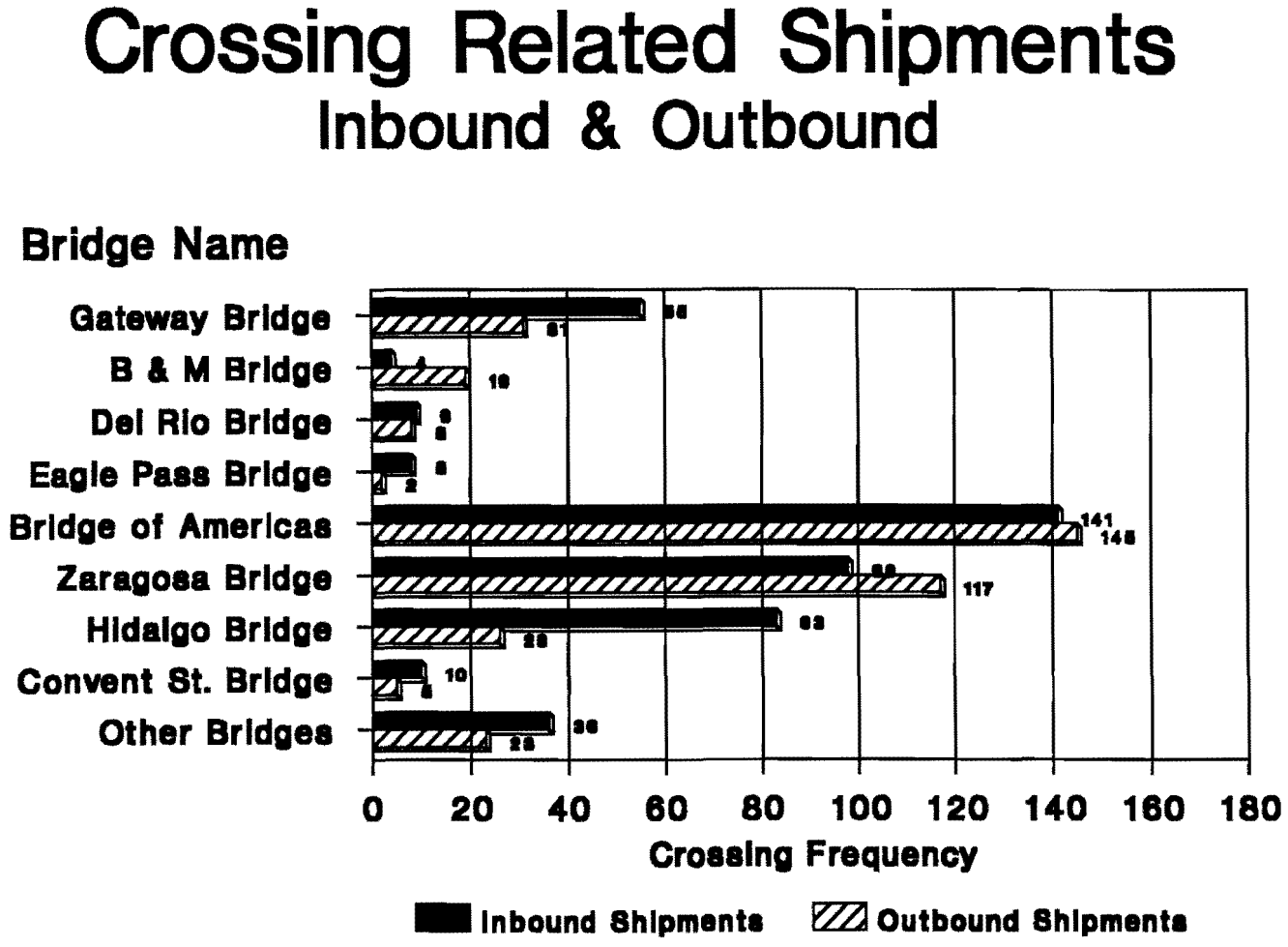
Origin/Destination - The variable Origin/Destination contains information relating the shipment's beginning location and the shipment's final delivery location. The survey asked the respondents to record one of the three origins or destinations as the movement of the commodities dictated. The three origins/destinations are:

- the United States,
- Mexico, and
- Other Locations.

The breakdown of reported origins and destinations by region can be seen in Figure 3-61 with the associated percentage breakdowns in Figures 3-62, 3-63, 3-64, and 3-65. In all regions the United States was the highest reported origin and destination.

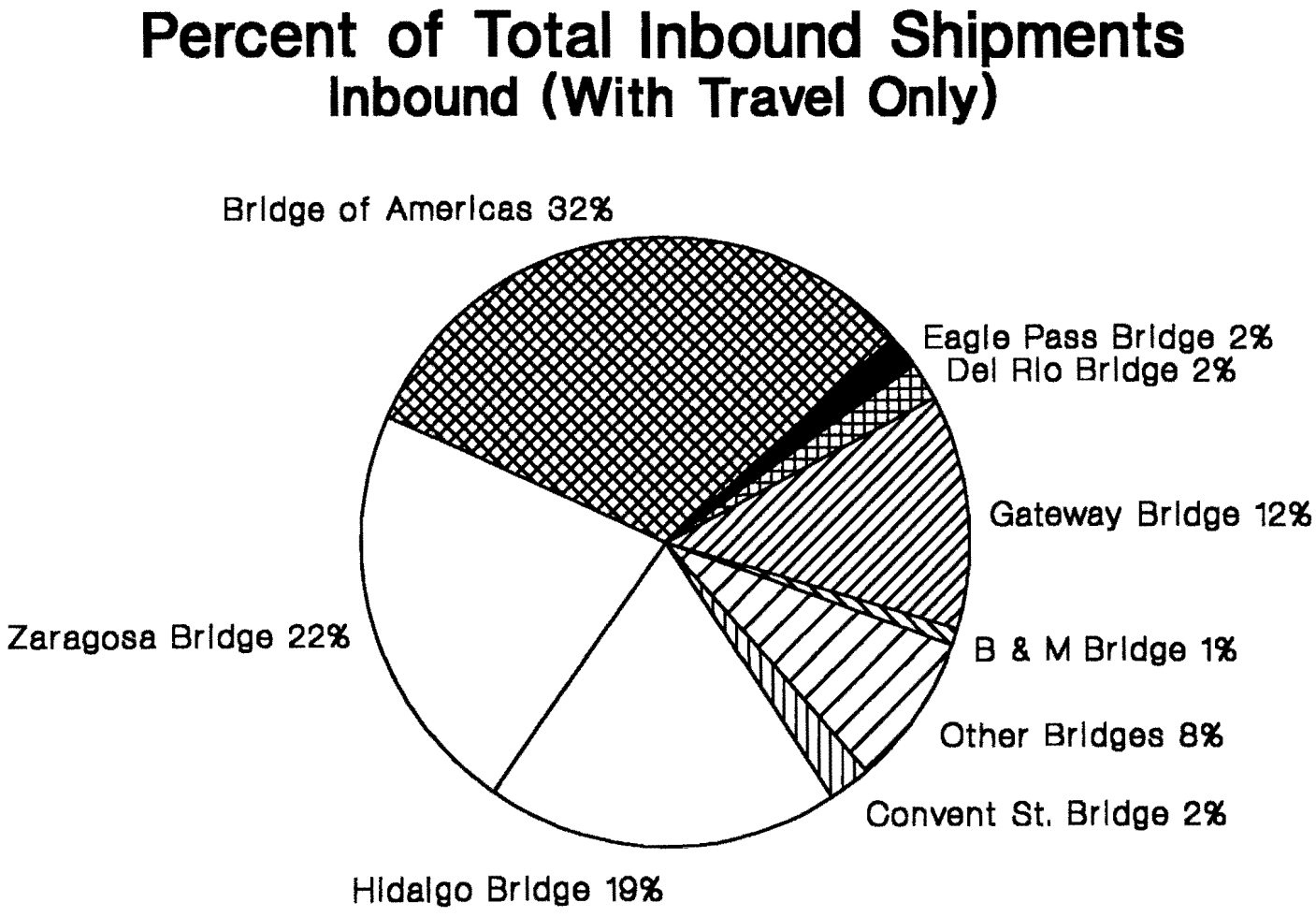
Warehouse Activity - Warehouse activity is a variable which further describes the survey respondent's information concerning the origin or destination of the shipments. The respondents were asked to report the number of shipments which went to a warehouse location as either an origin or a destination. Figures 3-66, 3-67, and 3-68 show the warehouse activity for the LRGV region. Figures 3-69, 3-70, and 3-71 represents warehouse activity for the DREP region. Figures 3-72, 3-73, and 3-74 present the warehouse activity data for the LA region. And Figures 3-75, 3-76, and 3-77 show the warehouse activity for the ELPA. Based on our survey, between 30 and 50 percent of the commodity movements resulted in warehouse activity. The survey data for all regions has been further broken down to show the origin/destination information associated with the reported warehouse activity. A direct correlation between the origin/destination reported in the previous variable group and this group is apparent and base on our survey the distribution for other location can be expected to show this same relationship.

Figure 3-57 - Bridge Crossing Frequency



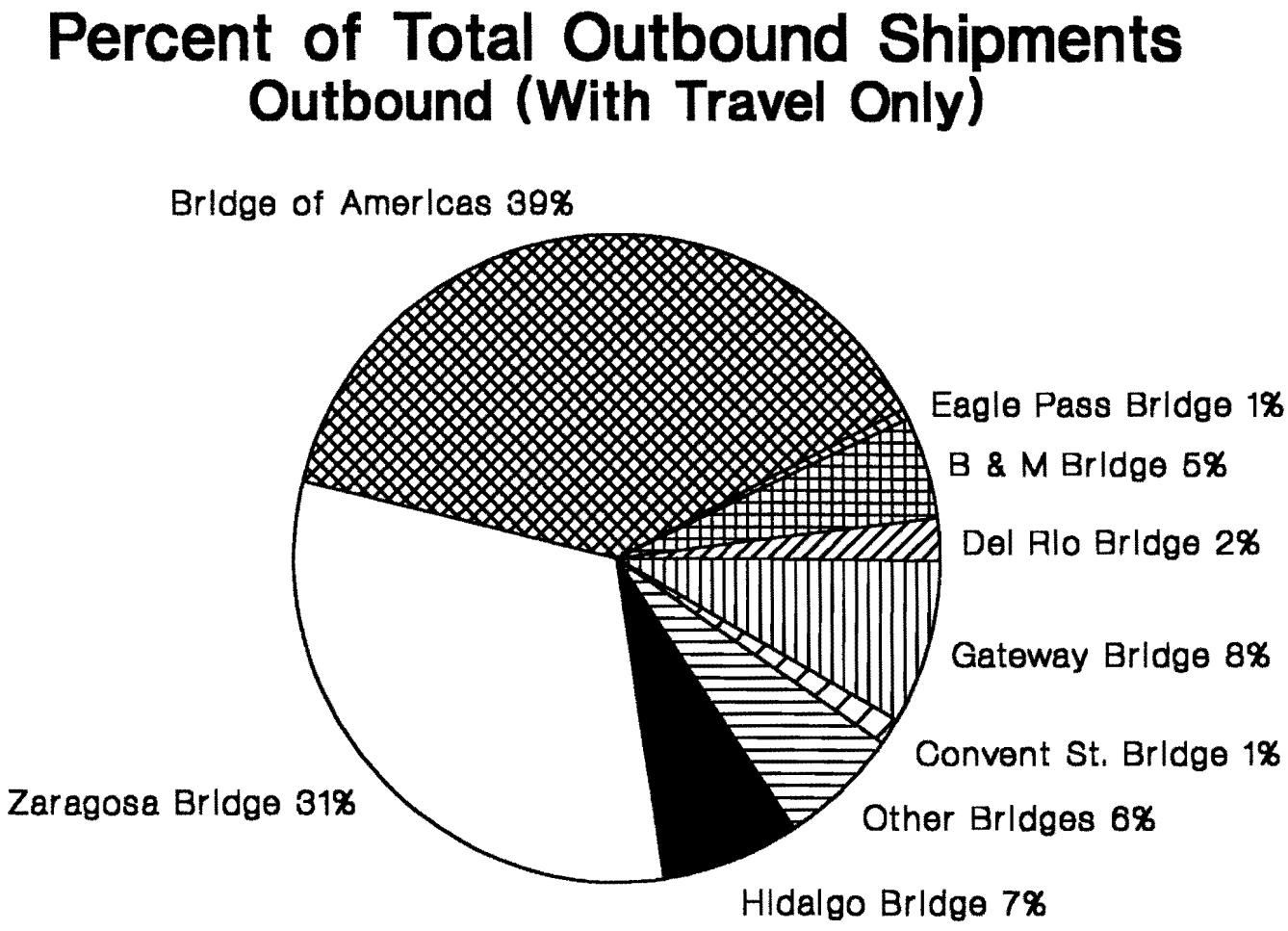
Source: Survey 2034

Figure 3-58 - Percent of Total Inbound Shipments by Crossing Location



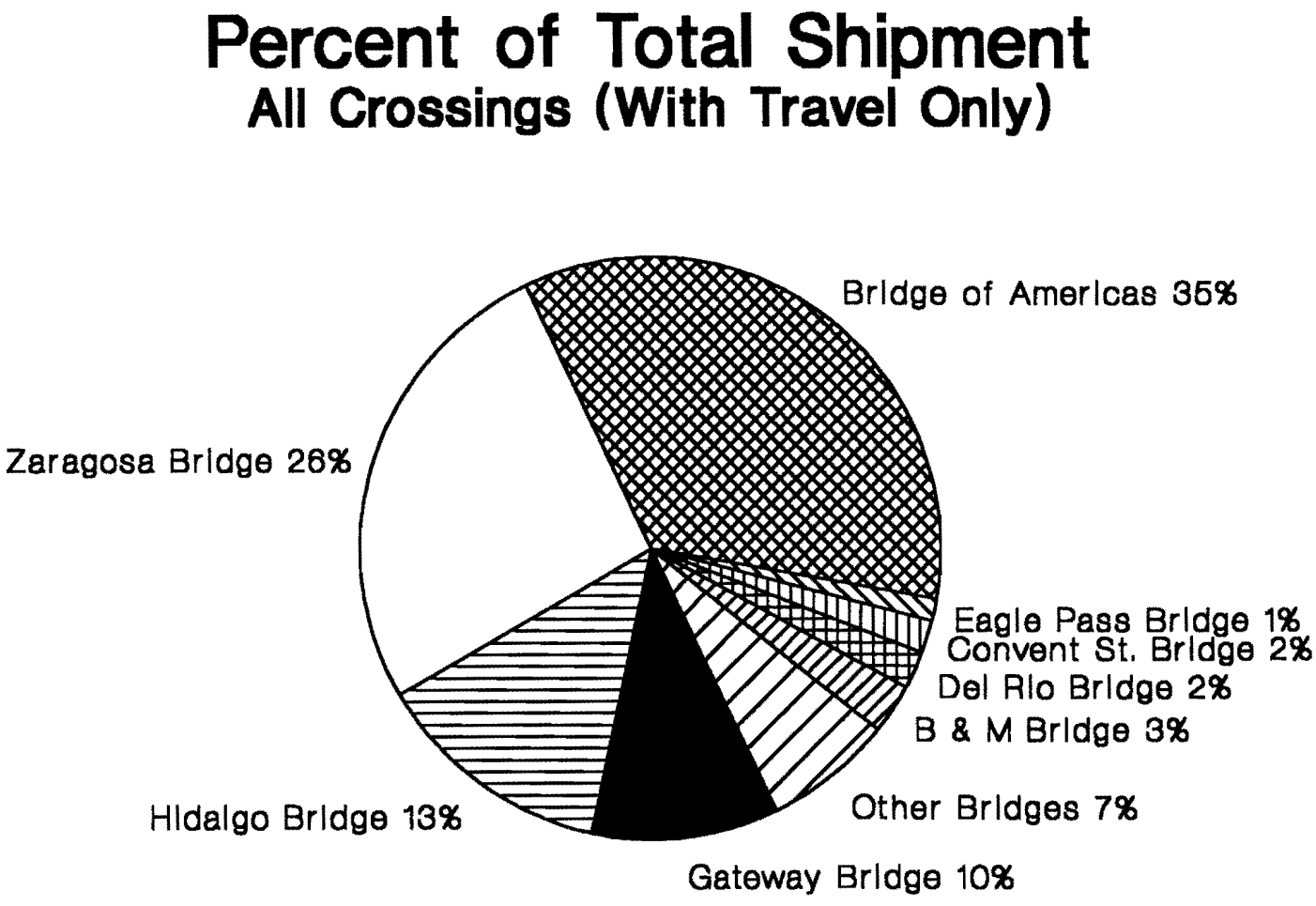
Source: Survey 2034

Figure 3-59 - Percent of Total Outbound Shipments by Crossing Location



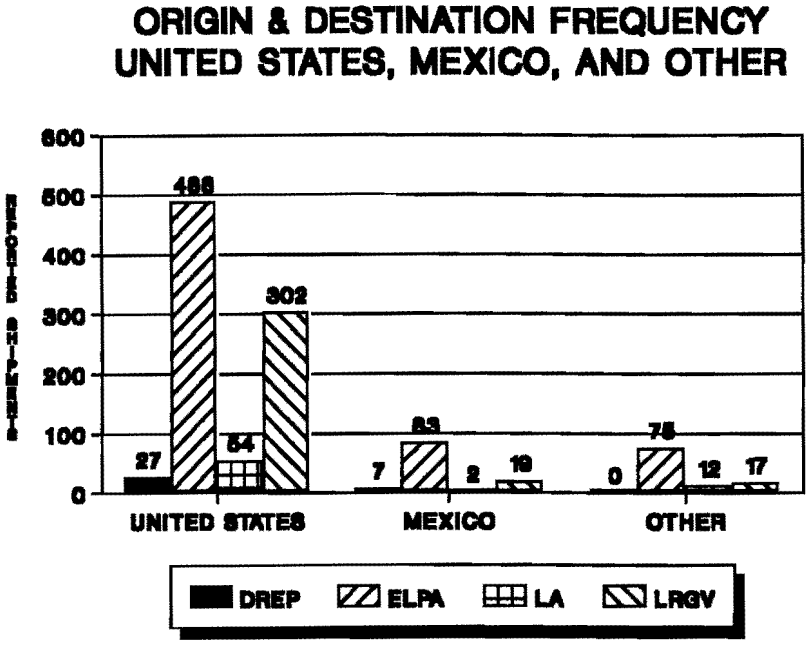
Source: Survey 2034

Figure 3-60 - Percent of Total Inbound and Outbound Shipments by Crossing Location

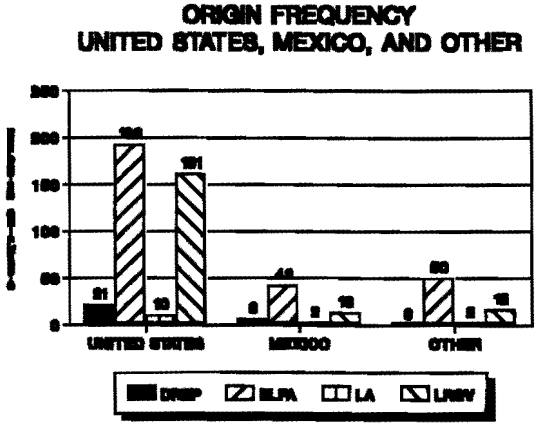


Source: Survey 2034

Figure 3-61 - Origin/Destination All Regions



Source: 2034 Survey Data



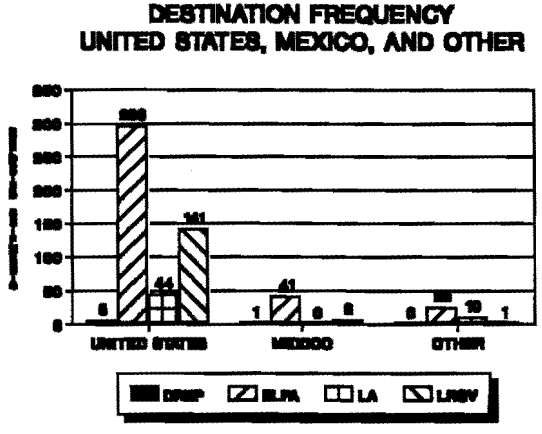
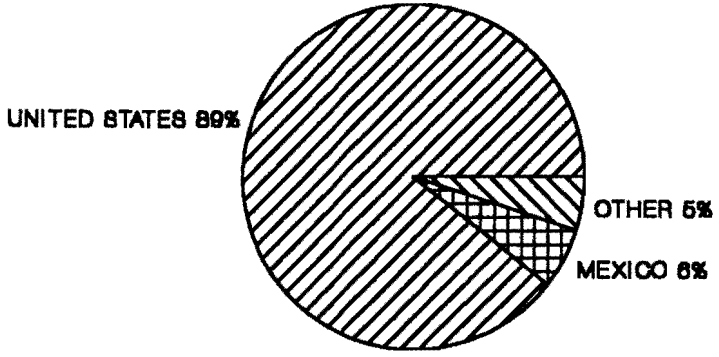
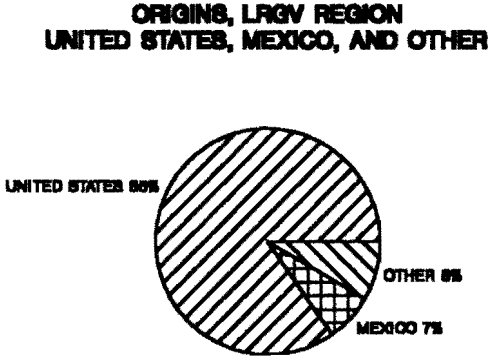


Figure 3-62 - Origin/Destination LRGV Region



Source: 2034 Survey Data



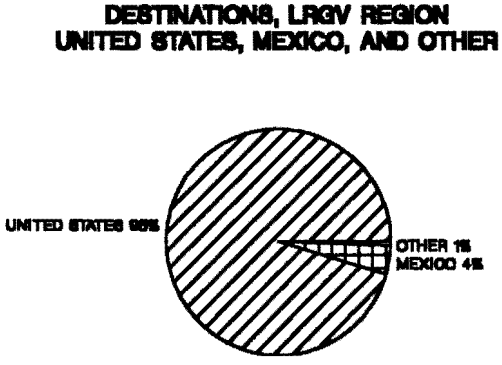
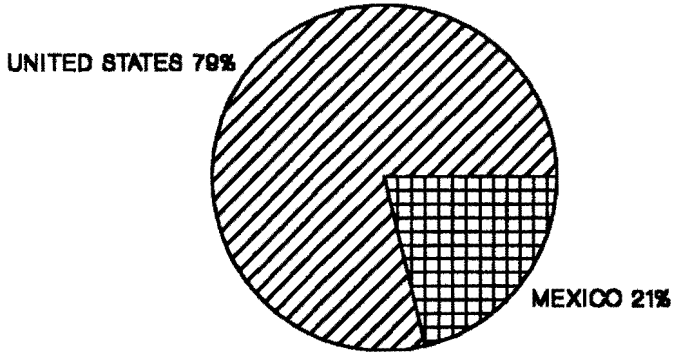
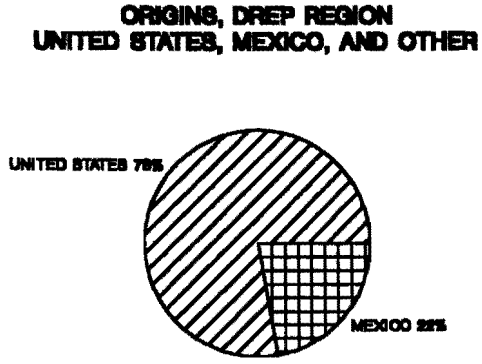


Figure 3-63 - Origin/Destination DREP Region



Source: 2034 Survey Data



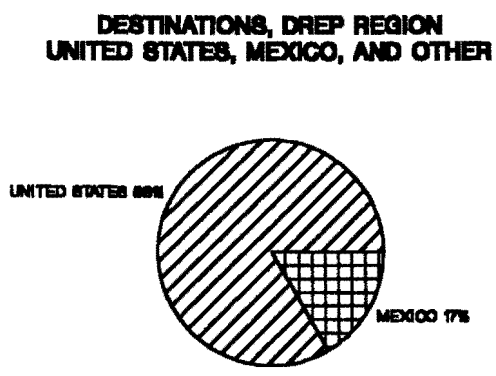
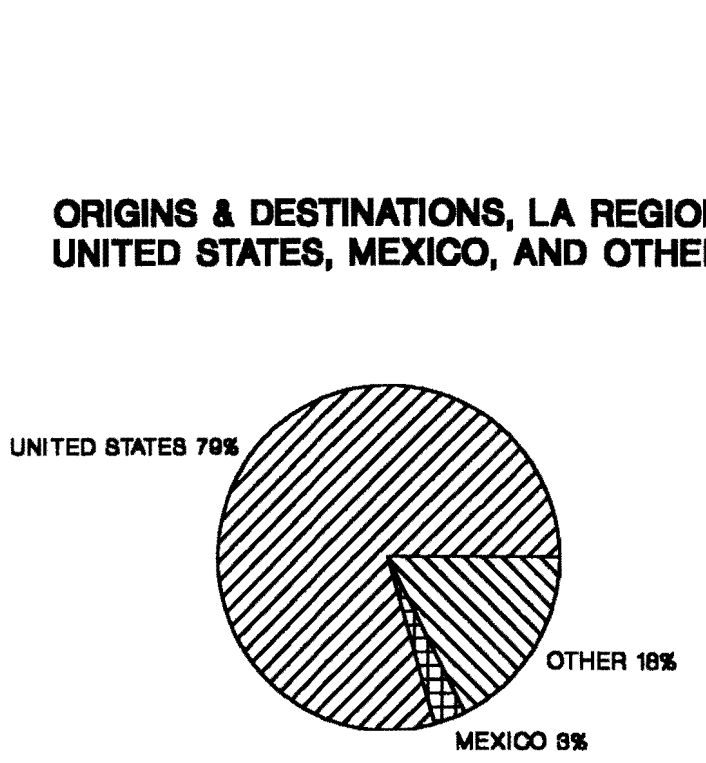
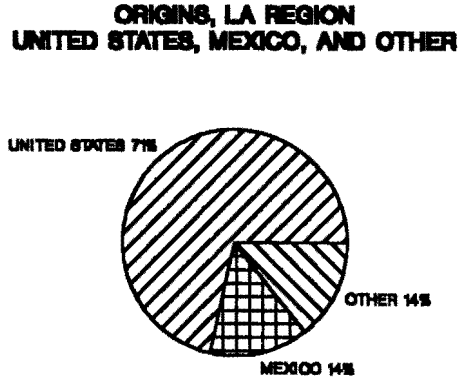


Figure 3-64 - Origin/Destination LA Region



Source: 2034 Survey Data



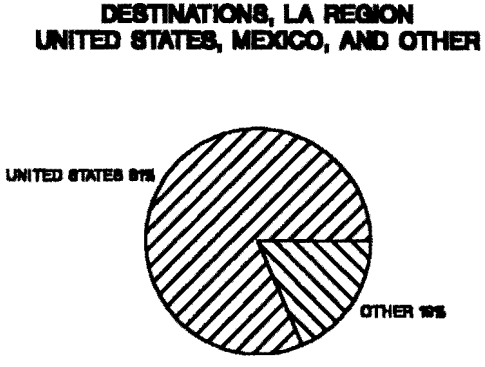
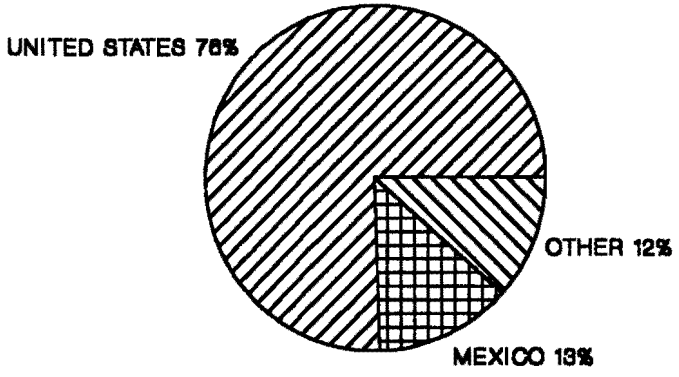
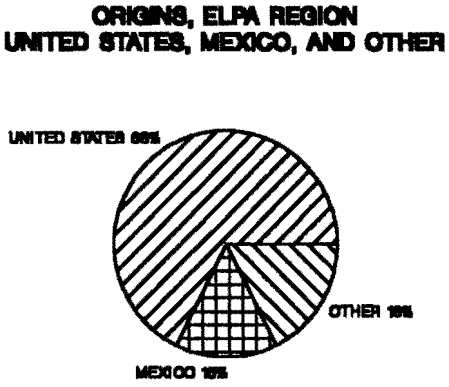


Figure 3-65 - Origin/Destination ELPA Region



Source: 2034 Survey Data



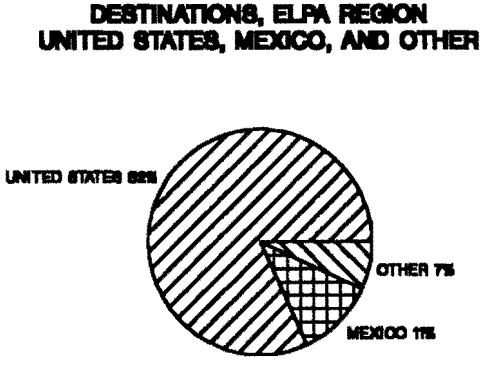
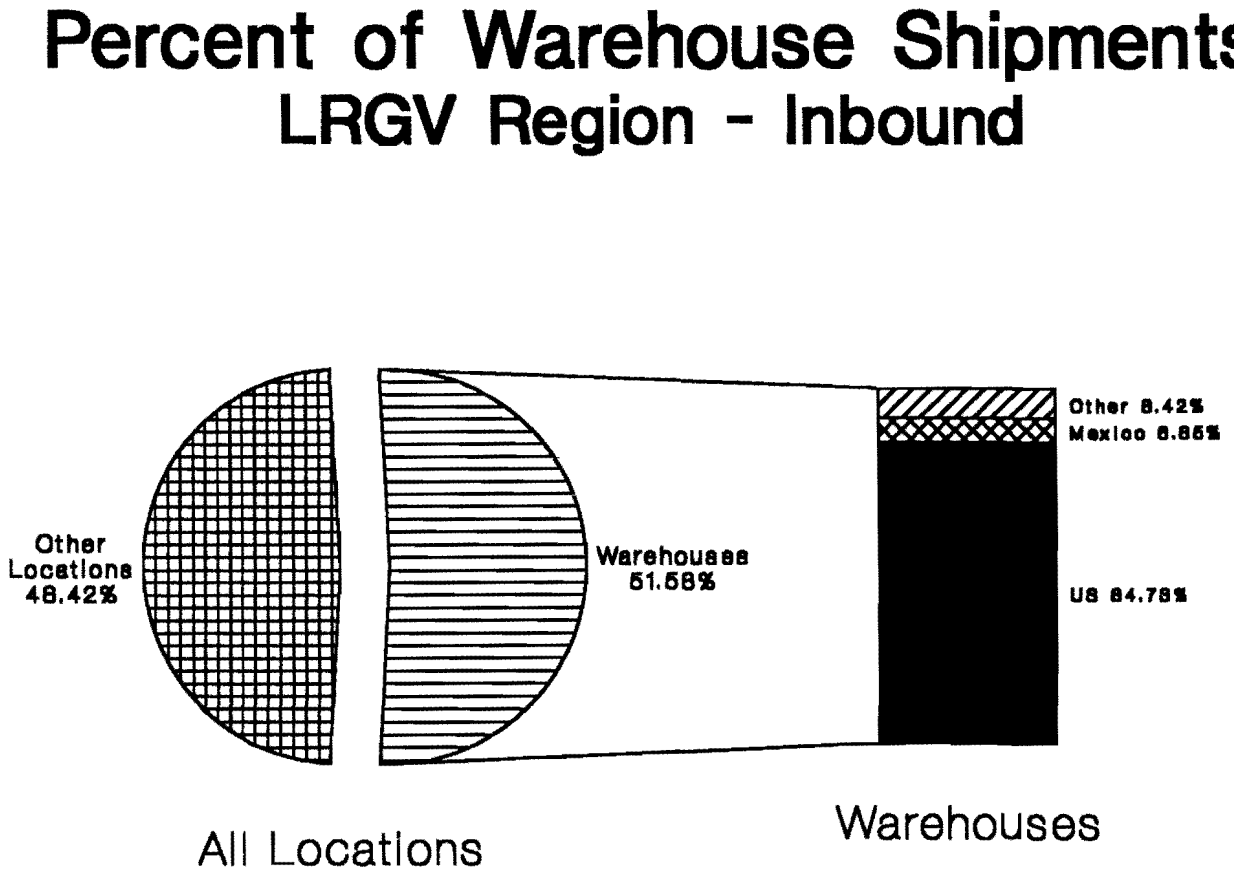
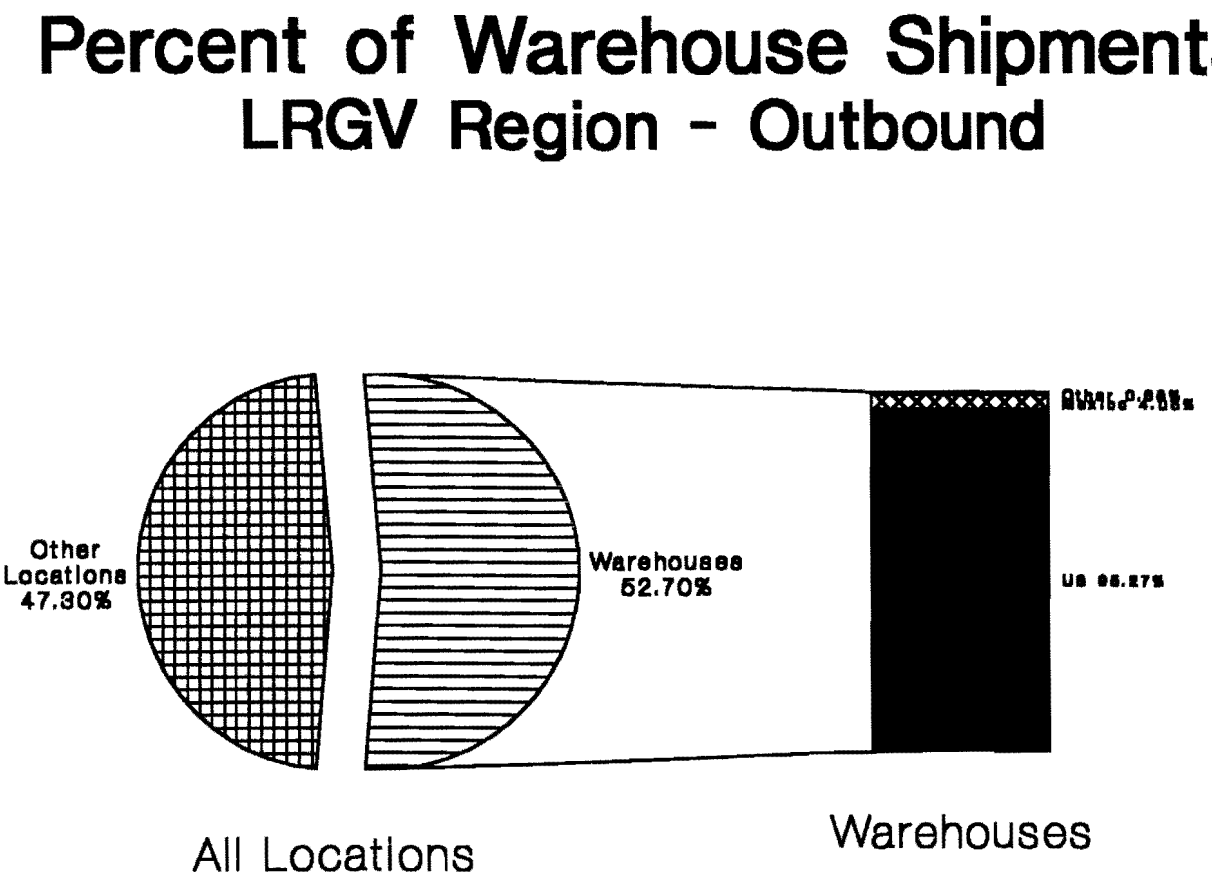


Figure 3-66 - Inbound Warehouse Activity LRGV Region



Source: 2034 Survey

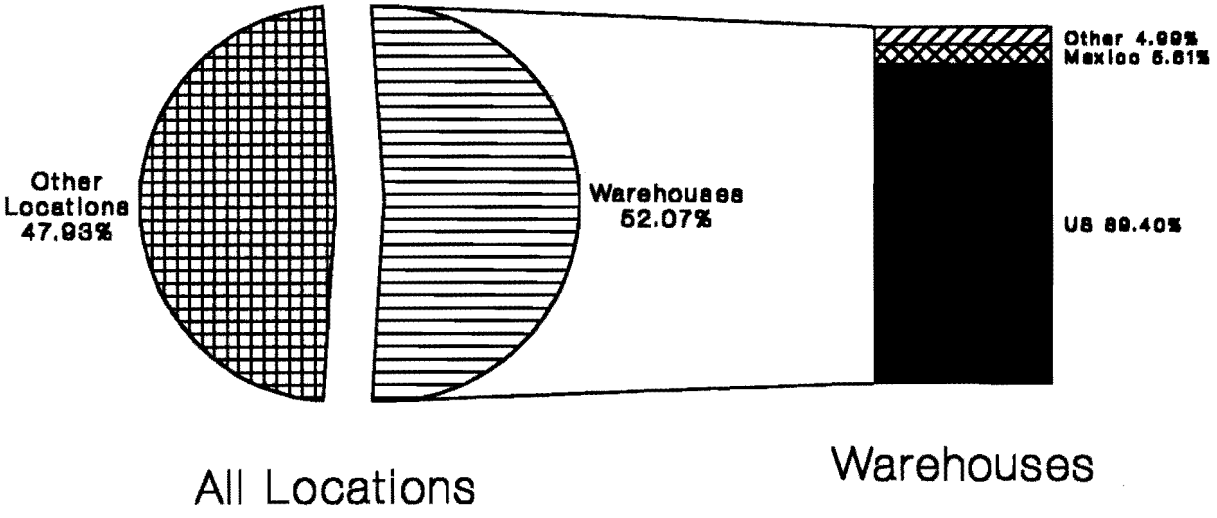
Figure 3-67 - Outbound Warehouse Activity LRGV Region



Source: 2034 Survey

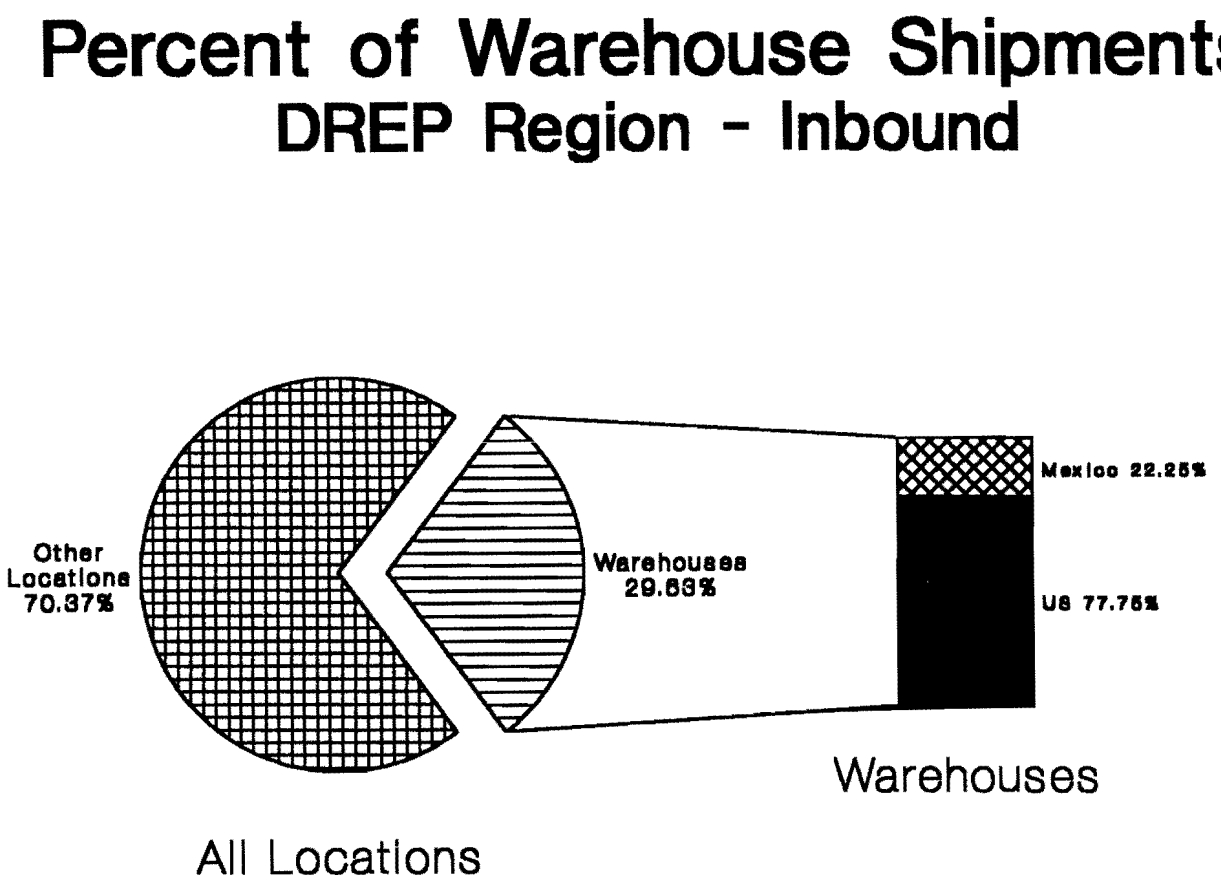
Figure 3-68 - Inbound and Outbound Warehouse Activity LRGV Region

Percent of Warehouse Shipments
LRGV Region - Inbound and Outbound



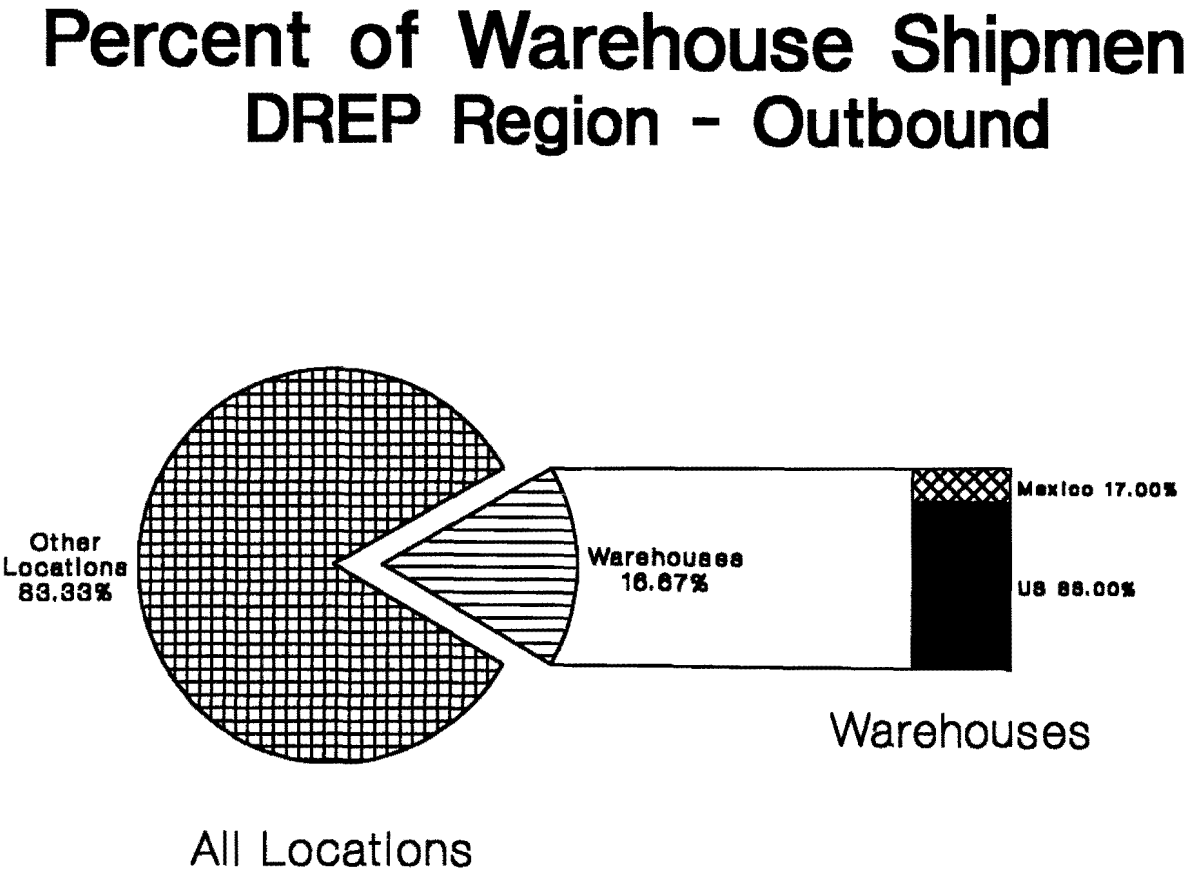
Source: 2034 Survey

Figure 3-69 - Inbound Warehouse Activity DREP Region



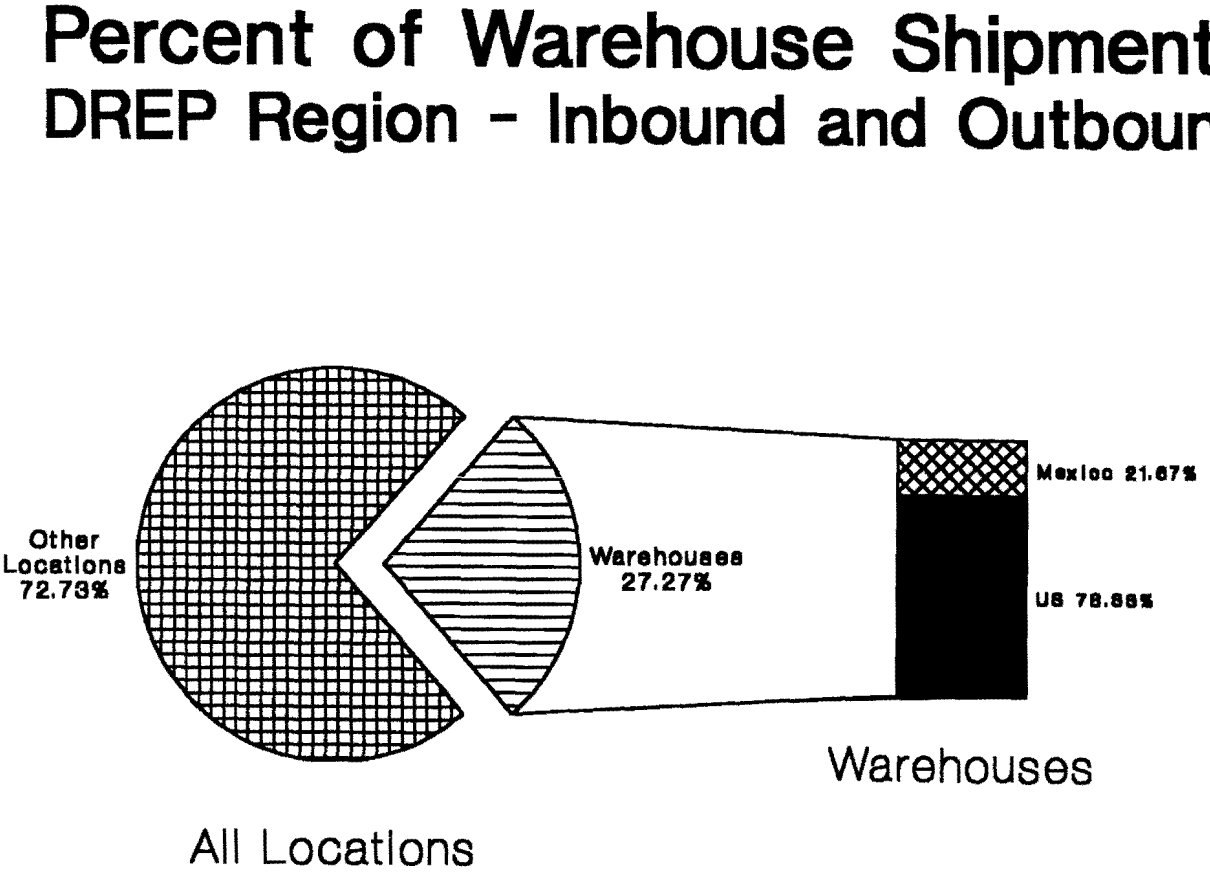
Source: 2034 Survey Data

Figure 3-70 - Outbound Warehouse Activity DREP Region



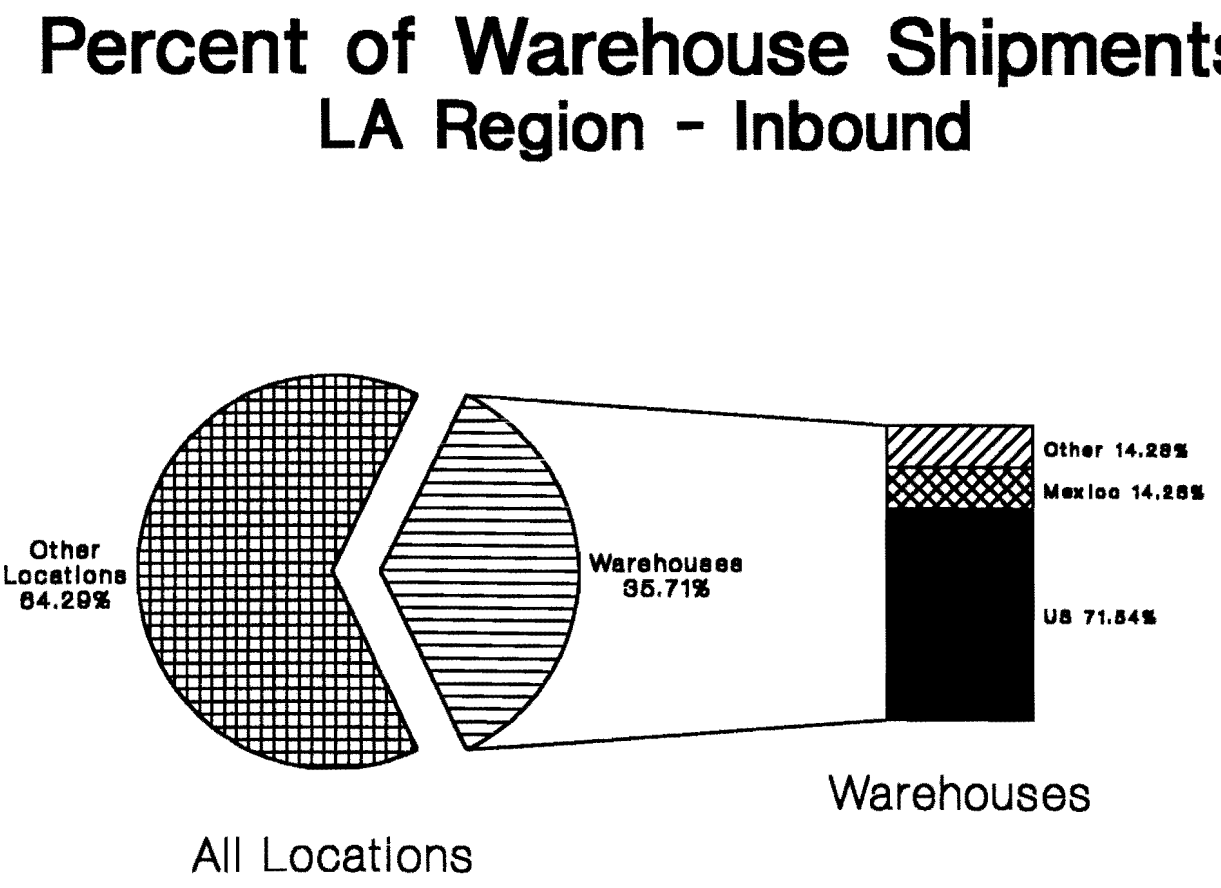
Source: 2034 Survey

Figure 3-71 - Inbound and Outbound Warehouse Activity DREP Region



Source: 2034 Survey

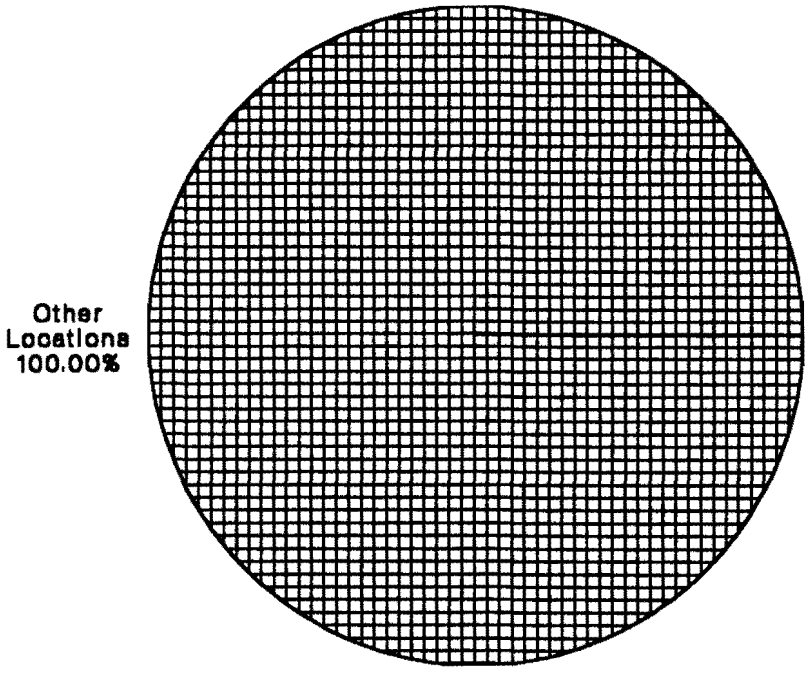
Figure 3-72 - Inbound Warehouse Activity LA Region



Source: 2034 Survey

Figure 3-73 - Outbound Warehouse Activity LA Region

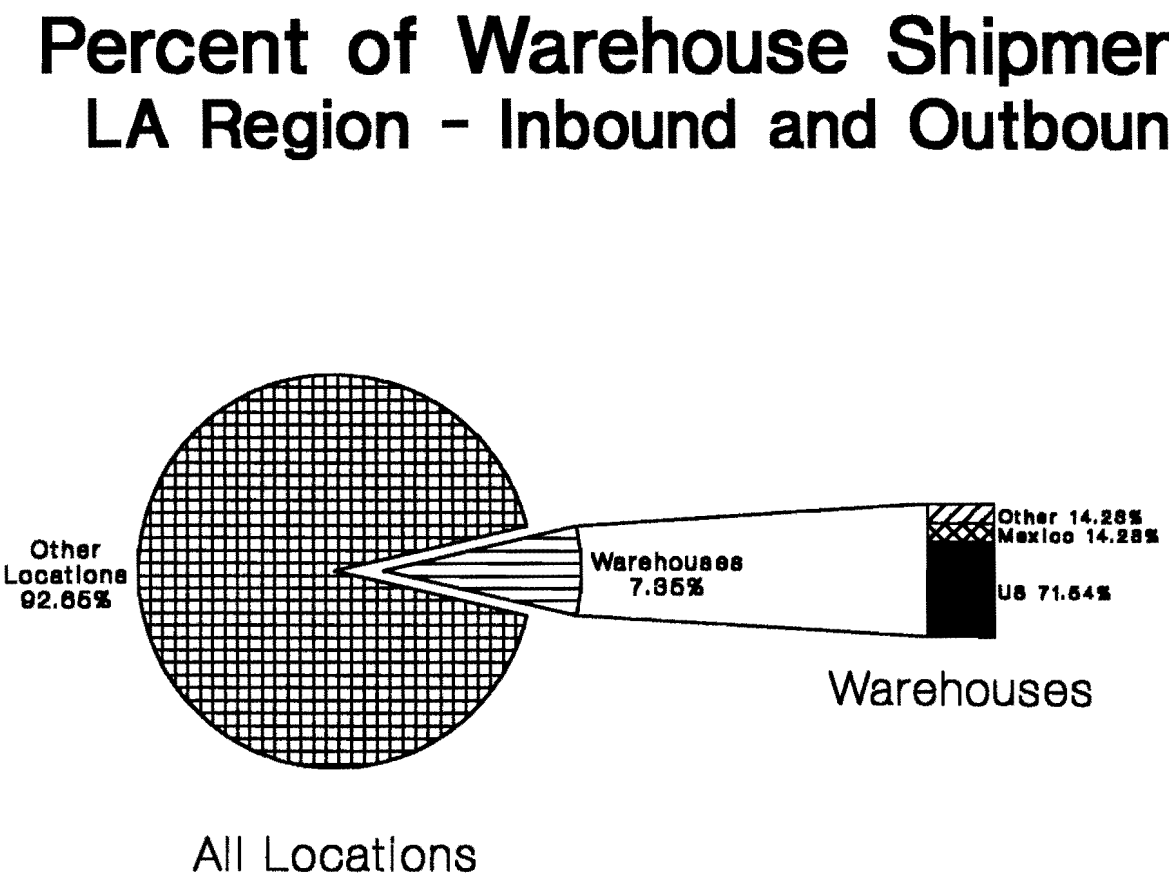
Percent of Warehouse Shipments
LA Region - Outbound



All Locations

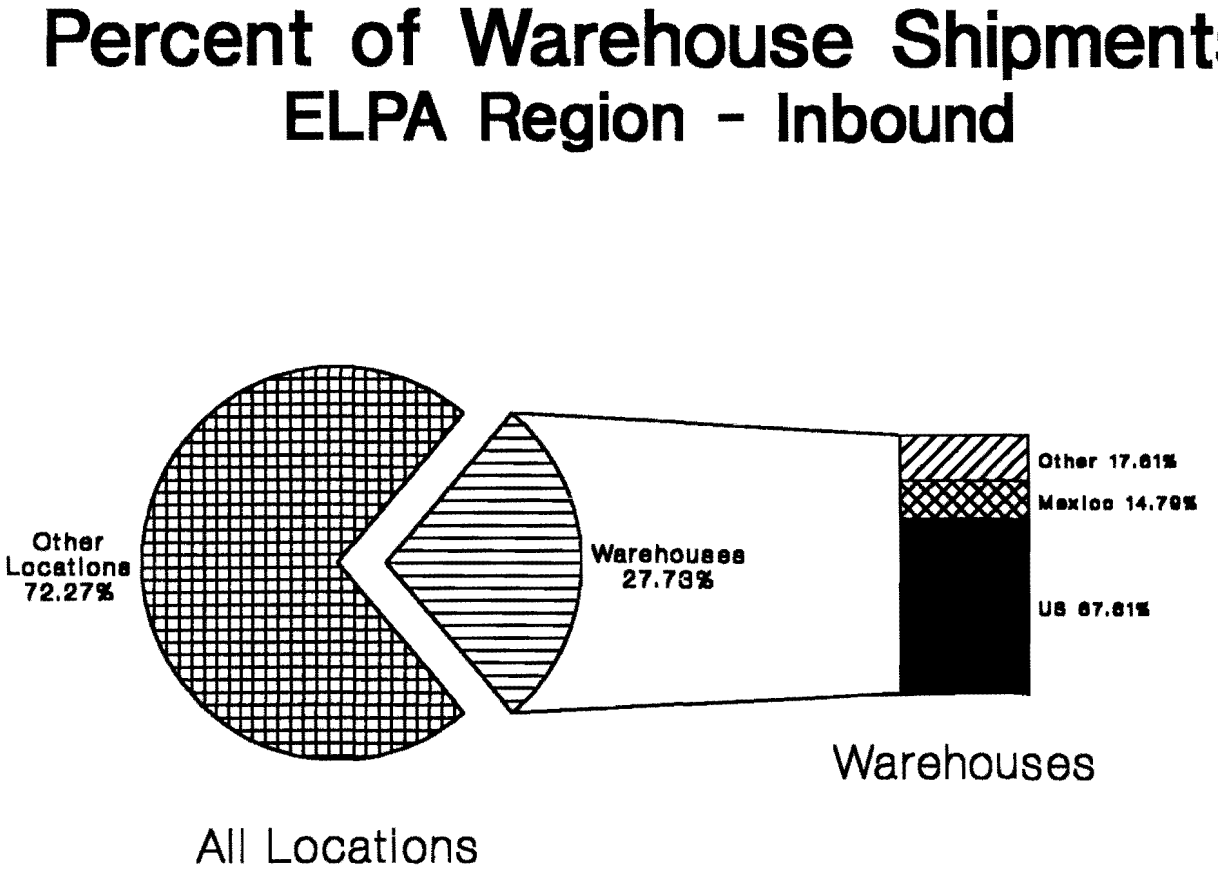
Source: 2034 Survey

Figure 3-74 - Inbound and Outbound Warehouse Activity LA Region



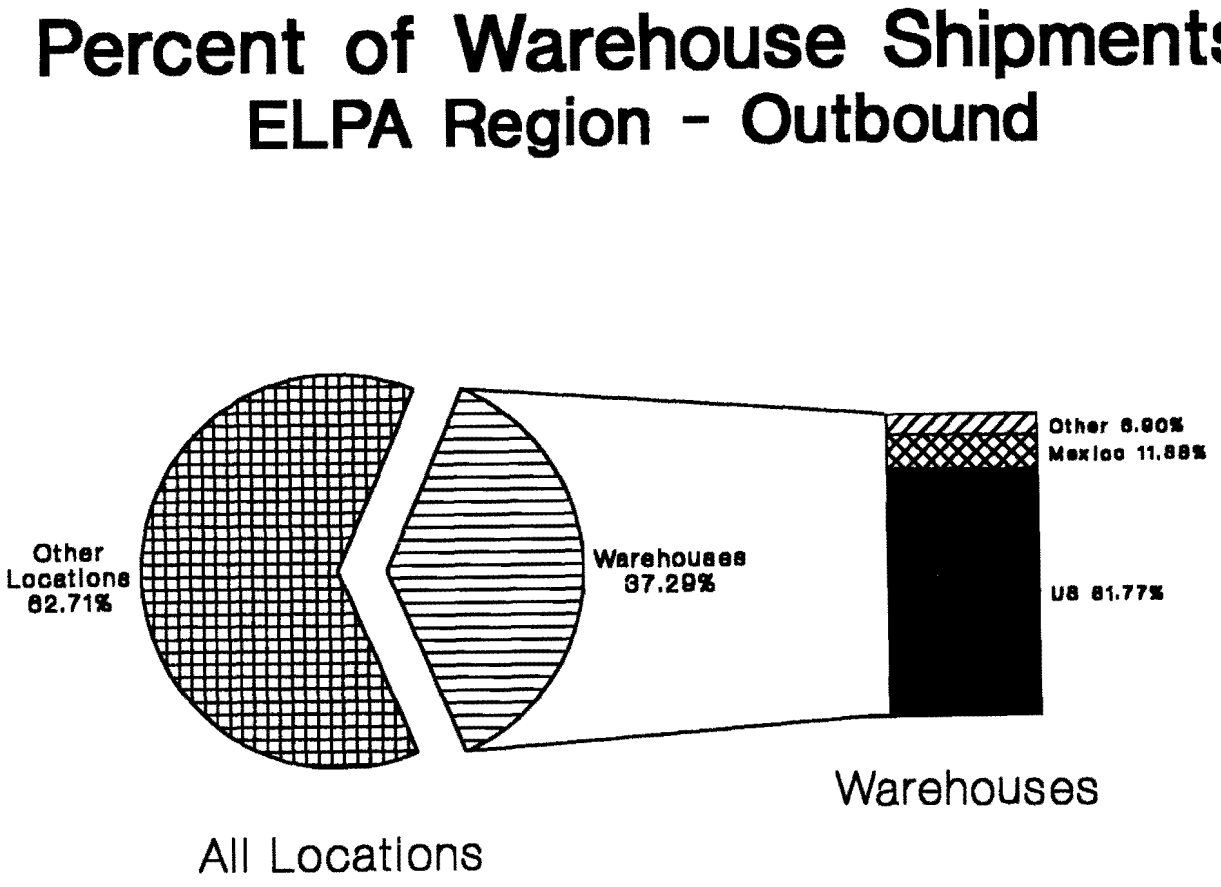
Source: 2034 Survey

Figure 3-75 - Inbound Warehouse Activity ELPA Region



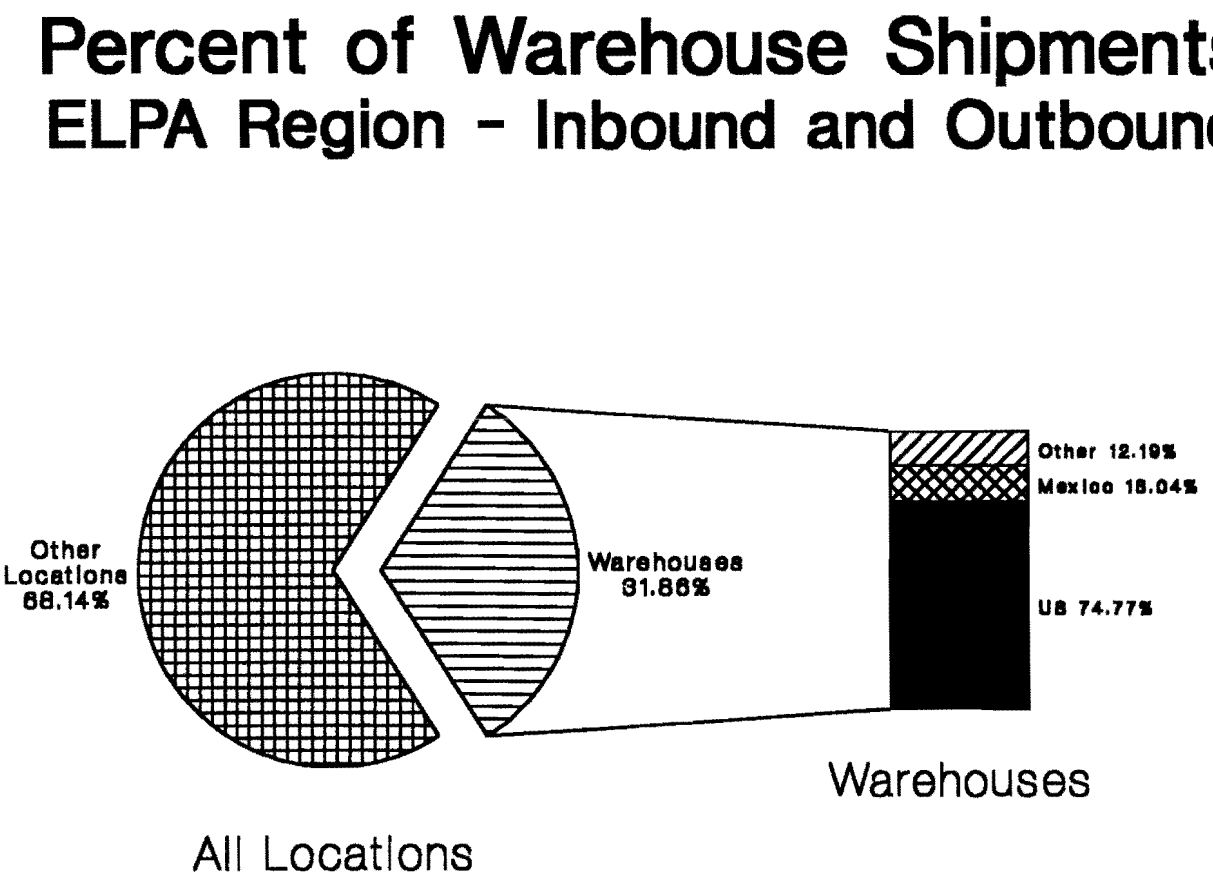
Source: 2034 Survey

Figure 3-76 - Outbound Warehouse Activity ELPA Region



Source: 2034 Survey

Figure 3-77 - Inbound and Outbound Warehouse Activity ELPA Region



Source: 2034 Survey

Part II - Data Integrity

Database Limitations - The survey design and the language barrier where by far the two biggest limitations to the integrity of the data. The information reported on several of the surveys suggested that the respondents were somewhat confused by questionnaire design. When responding to the survey, reasonable shipment quantities were not maintained by many of the respondents. This limitation undermines many of the efforts put forth by this study. However, assuming a normal distribution throughout the database variables, inferences can be made which allow the data between certain sections to be related for analysis purposes.

Another concern relating to the integrity of the data is the number of responses within a few of the regions. Once information is broken down by the many groups, and considering the fact that not all questions are completed on each surveys, the sample of information extracted can be so small that it is no longer statistically valid. Additional sampling and/or further aggregation of regions can allow statistically valid results. The two regions of the biggest concern which could be aggregated are the Laredo region and the Del Rio/Eagle Pass region. This aggregation would be reasonable based on the geographical locations and the similarity of the regions.

Database Variable Relationships - Variable relationships can be viewed in groups. These groups are the same as those discussed earlier under the Survey Variable Descriptions. Specifically, these groups are commodity related information, transportation mode, bridge usage, origin/destination, and warehouse activity. All of the commodity related information such as the commodity type, item form, number of shipments, and weight, can be related to one another for analysis purposes without inferences. This valuable information comprises much of the relevant information needed for this study. One limitation throughout the shipments category for all variable groups was the actual shipments reported by the respondents. In many cases, it could be argued that the respondent was reporting the number of palettes, orders, shipping containers, etc., instead of the number of truck, rail, or air shipments. However, when this appeared to be the case in any given survey, it was obvious that the respondent continued this method of reporting throughout the survey. Therefore, it is still possible to interrelate the information between the survey variables groups.

The transportation mode, bridge usage, origin/destination, and warehouse activity were all listed as separate questions on the survey. It is believed that several survey respondents may have misunderstood the relationship of the shipments reported between these categories to the commodity related information. Discrepancies of information between these groups were obvious and caused limitations to the relationship between these categories. However, if one makes the same assumption that the standard distributions between these categories are normal and that the data between the groups is related, valuable information can still be extracted.

Conclusion

The limitations of responses from the reporting regions required the aggregation of data in some cases. Receiving completed surveys was also a limitation to the availability of data within each of the databases. Some inferences can be made from this data set based on the assumption that the reported data from each questionnaire is related throughout the survey. This assumption allows information to be extracted from any combination of the five data groups. However, because of the regional sampling and the design of the questionnaire, inferences should not be made between the regions.

4.0 SOME ASPECTS OF BORDER TRANSPORTATION UNDER NAFTA

The negotiated language of the North American Free Trade Agreement (NAFTA) came into the public domain in September 1992. While a full analysis of the transportation aspects of NAFTA is beyond the scope of the current study, a preliminary assessment of some of the key transportation (particularly trucking) provisions provides some insights into the impending effects along the international border. The discussion that follows draws heavily upon October 1992 testimony presented to the Texas House of Representatives by Dr. James R. Giermanski and subsequent conversations with Dr. Giermanski.

The NAFTA language highlights agreements reached among the three countries with respect to trucking movements and access, ownership, standards, licensing requirements, and customs procedures. Summaries of these sections (excerpted from Giermanski's testimony) are presented below, followed by some generalized insights into the broader aspects of trucking operations on the border, movements of overweight Mexican vehicles onto the Texas highway system, heavy vehicle use tax, and infrastructure needs.

Access by Truck

Three years after NAFTA is signed, United States and Mexico motor carriers will have *reciprocal access to any part of any border state of the two nations and will be allowed to ingress and egress through different ports of entry.* Under this provision, it is possible that a Mexican carrier could enter the United States through Laredo, Texas and return to Mexico through Brownsville, Texas or through Anrade, California, both ports of entry. U.S. and Mexican carriers, then, could traverse the states of Texas, New Mexico, Arizona, California, Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas. No longer will these carriers be restricted to the United States Interstate Commerce Commission (ICC) Commercial Zones or the Mexican Frontier Zone.

Six years after entry into the force of NAFTA, U.S. and Mexican motor carriers achieve full reciprocal access to the entire territories of each nation. Thus, if NAFTA is ratified by all three nations at its earliest possible opportunity (sometime in 1993), it is possible that Mexican carriers can take advantage of this provision by 1999 and transport international cargo to any location in the United States.

Importantly, to receive access to the U.S. under these terms of NAFTA, Mexican carriers must meet U.S. federal motor carrier standards for equipment and operations. Also, from the U.S. truckers' perspective, access to Mexico is practically unobtainable now and will remain so in the near future (even with the provisions of NAFTA) for the following practical reasons:

1. few and poor quality roads
2. unsafe curve radii
3. lack of spare parts for U.S. commercial vehicles
4. poor diesel fuel
5. limited accommodations for U.S. truckers.

Investment in Trucking Enterprises

While mutual access between Mexico and the United States is reciprocal and seems fair, Mexican investment restrictions in the trucking industry are still present though less restrictive than before the Agreement. The U.S. really has no investment restriction for Mexican nationals or their enterprises with respect to establishing a motor carrier transportation company in the United States. Within three years from the signing of NAFTA, Mexican motor carriers will be allowed to own U.S. firms and distribute international cargo within the United States.

United States motor carriers are not as unrestricted, however. After the three-year period, a U.S. person is only allowed a 49% equity participation in a firm in Mexico

providing truck services in the distribution of international cargo in the territory of Mexico. After seven years, a U.S. person may own just 51%, and only after 10 years may a U.S. person own 100% of a trucking firm in Mexico dedicated to the distribution of international cargo within the territory of Mexico. Importantly, motor carriers of both nations are not allowed ownership in truck service companies in their opposite nations for the purpose of distributing cargo other than international.

For Texas, the investment provisions with respect to truck transportation suggests that the State will see foreign investment and greater competition in the industry by Mexican motor carriers. This should, of course, mean greater numbers of Mexican equipment and drivers and increased traffic. Compliance to federal and state motor carrier regulations will mean more additional enforcement duties by DPS. Additionally, adherence to state law regarding the establishment and operation of these firms may be a matter for other State agencies.

Land Transportation Standards

Under NAFTA rules, a Land Transportation Standards Subcommittee was established to harmonize specific relevant standards involving motor carrier equipment and operations of each nation. The schedule below represents the standards to be made compatible among the party nations from the date of the Agreement's entry of force:

1. no later than one and one-half years for non-medical standards-related measures regarding drivers, including minimum age and language;
2. no later than two and one-half years for medical standards-related measures regarding drivers,
3. no later than three years for measures related to vehicles, including weights and dimensions, tires, brakes, parts and accessories, securement of cargo, maintenance and repair, inspections, and emissions and environmental pollution levels;
4. no later than three years for measures respecting each nation's supervision of motor

carriers' safety compliance; and

5. no later than three years for measures harmonizing road signs.

In terms of enforcement and compliance, how will Texas respond to the expected increase in Mexican and U.S. motor carriers on Texas highways? For example, at the present time there are 250 Department of Public Safety personnel assigned to License and Weight Service statewide. Of this number, only 13 are assigned to the Texas/Mexico border. Already, the affected Texas border cities, the Texas Railroad Commission, and the Department of Public Safety (DPS) have begun to scrutinize the Agreement for its potential increased demands on the State and local resources.

Commercial Truck Drivers

No specific mention of truck drivers is made in the NAFTA's Land Transportation-related annexes. However, drivers are singled out specifically in the Chapter 16 *Temporary Entry For Business Persons*. This chapter authorizes the temporary entry of Mexican truck drivers into the United States to transport international cargo to and from Mexico. Thus, Mexican drivers may displace some U.S. drivers now providing this service. However, given wage differentials, U.S. drivers will not cross into Mexico to provide similar services there.

The issue of commercial drivers as stated in NAFTA is really not new, but the potential impact of job loss or wage reduction may be critical for border cities. Even without the Agreement, recent rulings by the U.S. Interstate Commerce Commission, Immigration and Naturalization Service, and U.S. Customs Service (with respect to equipment) have already authorized the legal hiring of Mexican nationals as truck drivers and the using of certain Mexican motor carrier equipment in the United States. Thus, if this trend continues under the relaxed provisions of NAFTA, that segment of U.S. commercial truck drivers specializing in international drayage operations may lose their jobs to Mexican drivers or be forced to take a pay cut to compete with their Mexican counterpart.

Customs Procedures

In the NAFTA language, customs brokers are specifically mentioned. In general, relationships with respect to Customs procedures between Canada and the United States are reciprocal. They allow customs brokers from each nation to forward freight into their own respective countries. However, with respect to Mexico under the terms of NAFTA, the United States customs brokers cannot enter Mexico to forward freight back into the U.S. While not a major macreconomic disturbance, this practice prevents U.S. citizens from engaging in this area of the economy within the territory of the United States without having to use the services of a Mexican broker, thereby preventing competition -- clearly a trade distorting feature.

Related Concerns

In addition to the specific transportation items mentioned in the NAFTA draft and outlined in items 1-5 above, expanded trade under NAFTA will have some other significant implications for transportation services and facilities in Texas, including some border specific concerns. Dr. Giermanski's testimony highlighted the following, which have been excerpted and summarized:

- transportation services
- overweight vehicles in international shipments
- heavy vehicle use tax

Transportation Services

At the present time congestion and delay plague some Texas road-crossing points. Large and small shippers alike find these delays inefficient and costly. Two factors, in particular, exacerbate these problems: (1) the Mexican customs procedures; and (2) crossing practices which do not permit full trailer-load traffic by the returning carrier. These problems are well known along the border and have unique aspects within each border city jurisdiction. However, since there is no apparent legal basis for either Mexican or U.S. carriers to return empty after

dropping their cargo, improvements in this aspects of the problem are likely to be more achievable than significant, rapid improvements in the processes of Mexican customs. Importantly, expanded investment in improved infrastructure (roads and bridges) will not achieve maximum improvements in efficiencies unless significant changes are made in the current system of operations along the Texas/Mexico border.

Overweight Vehicles in International Shipping

The *Texas Consortium Report on Free Trade,* released in October of 1991 noted that Mexican motor carriers routinely carry up to twice the lawful U.S. vehicle weight. It also revealed that data are available that such overloading degrades vehicle performance such as handling, braking, and causes mechanical and tire failures. Additionally, pavement research disclosed that small increases in axle load can produce large increases in pavement wear. Traffic at the present rate already speeds the deterioration of pavement. Coupled with decreased handling and risk of mechanical and brake failures, drivers in the community are at risk. However, until now these problems have been only the border's. With NAFTA, more of Texas will experience these negative effects of overloaded vehicles and expanded commercial traffic. In September 1992, research projects at the Texas Transportation Institute of the Texas A & M University System and the Center For Transportation Research of the University of Texas at Austin were initiated to analyze this and other transportation impacts of NAFTA.

Heavy Truck Use Tax

The same *Texas Consortium Report On Free Trade* found that although the United States' heavy vehicle use tax is a major source of revenue for the construction of public highways within the national highway system, and that it is applicable to Mexican carriers, the United States Internal Revenue Service has no mechanism in place for collecting this tax from Mexican carriers. Also, Mexican trucks operating in the border zone are effectively exempt by a provision which exempts trucks which travel fewer than 5000 miles in the taxable period. Even then, the law assesses only a 75% rate of tax for Canadian and Mexican trucks. Given the increased access

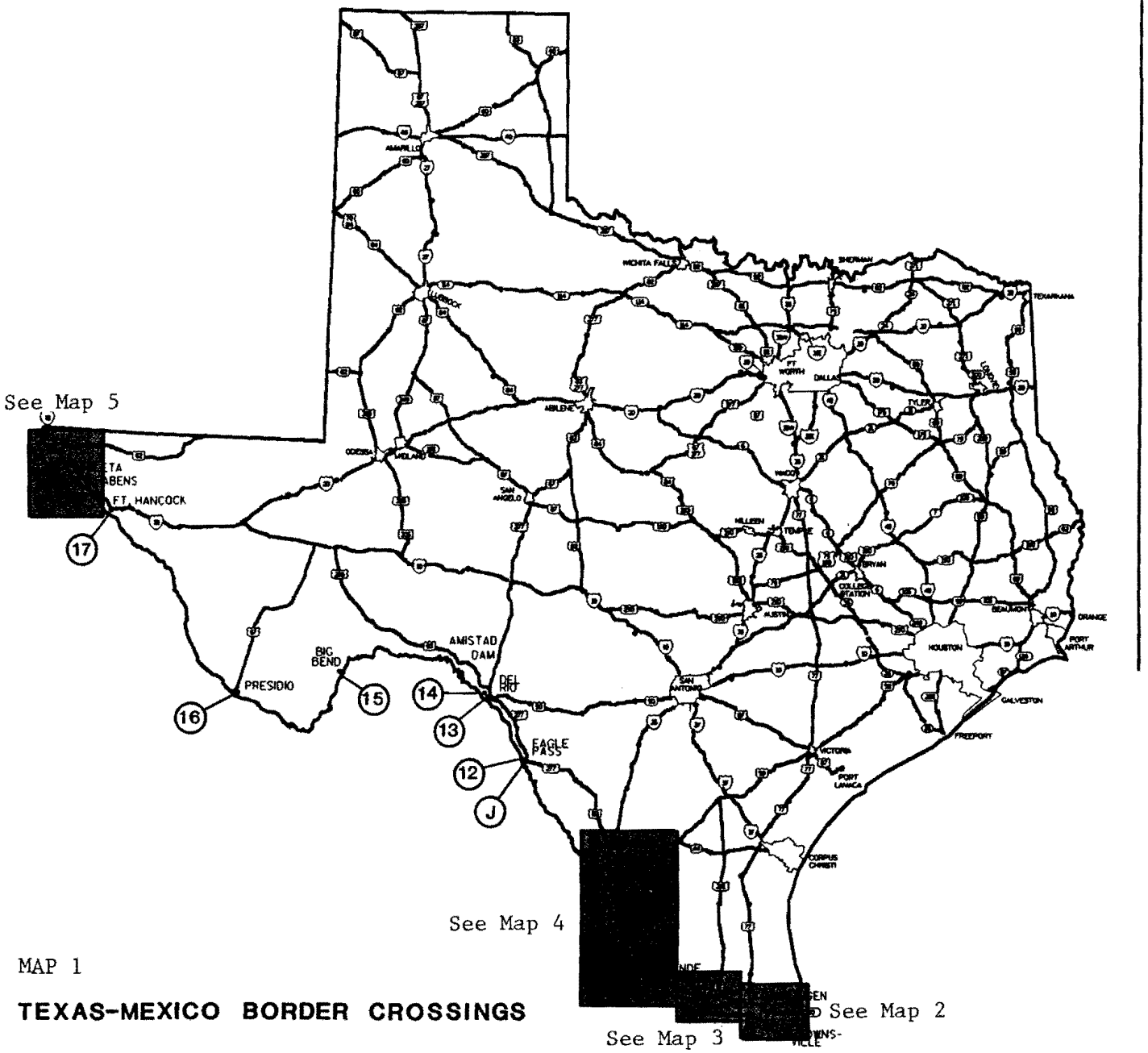
to the United States provided to Mexican carriers by NAFTA, it is essential that appropriate taxation be levied on Mexican carriers.

Summary

The advantages of increased trade are widely known. More trade creates expanded markets, strengthens bonds of friendship and cooperation, fosters competition, promotes development, and provides better products for the consumer at reduced prices. A free-trade agreement does even more by reducing trade distortions thereby facilitating expanded trade opportunities. Increased trade, in general, and the North American Free Trade Agreement (NAFTA) in particular, however, provide not only benefits, but also threats. The Agreement will bring about changes in the way certain sectors of the economy in Texas currently function. Cross-border motor carrier transportation is one of those sectors. Therefore, Texas must recognize potential problems and prepare to prevent them from occurring or, at least, to begin to develop solutions for them. This testimony will focus on some potential threats related to motor carrier transportation and their probable spinoff on Texas border cities.

Transportation is only one significant aspect of the North American Free-Trade Agreement. Properly implemented, increased trade promotes the best interests of the country. As NAFTA promotes expanded trade, the differential effects (both positive and negative) upon the Texas economy and infrastructure must be closely monitored and analyzed to properly assess the expected effects of NAFTA.

APPENDIX



MAP 1

TEXAS-MEXICO BORDER CROSSINGS

EXISTING BORDER CROSSINGS

(12) EAGLE PASS-PIEDRAS NEGRAS

(13) DEL RIO-CIUDAD ACUNA

(14) LAKE AMISTAD DAM

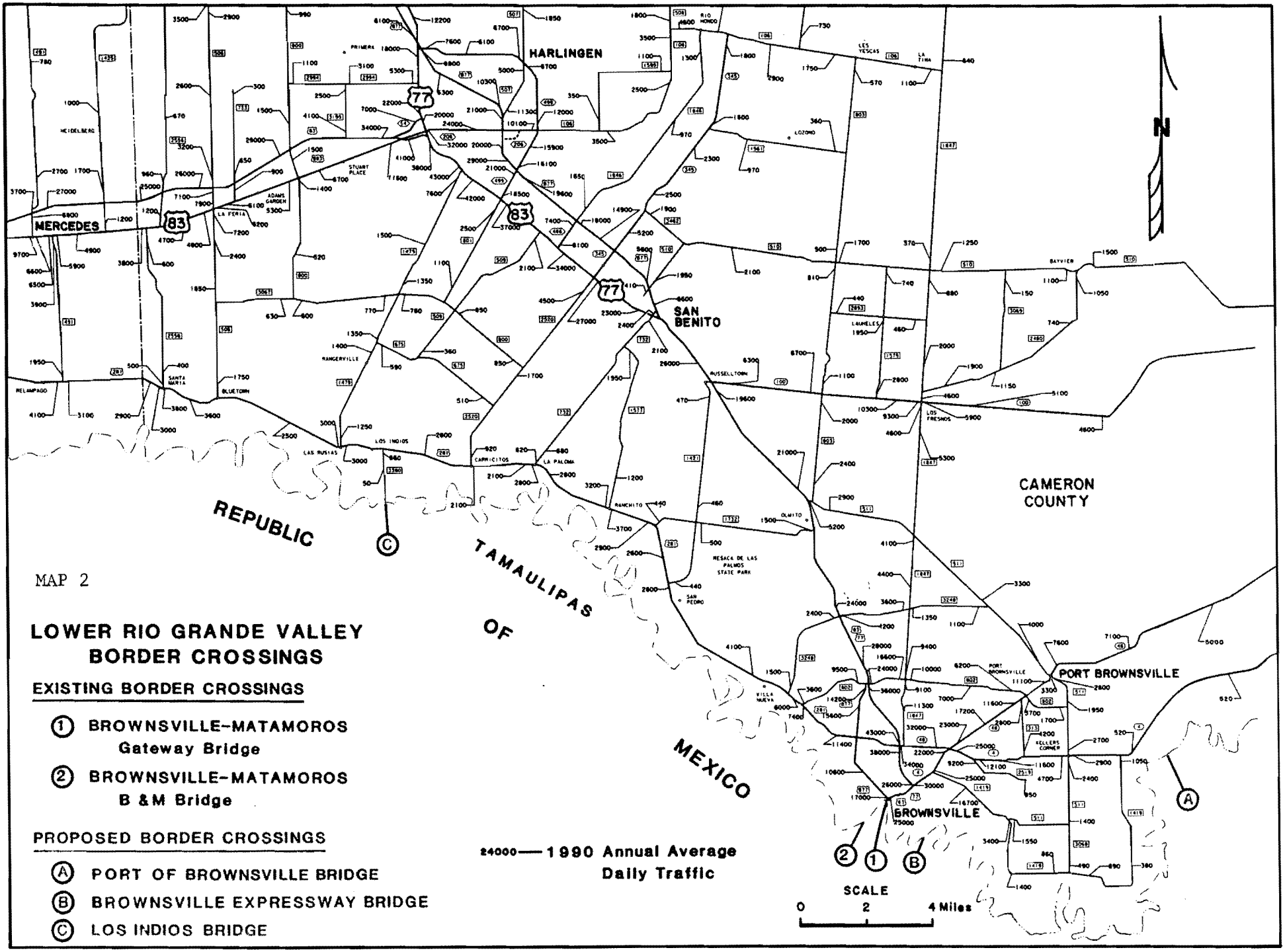
(15) LA LINDA
Big Bend

(16) PRESIDO-OJINAGA

(17) FORT HANDCOCK-EL PORVENIR

PROPOSED BORDER CROSSING

(J) EAGLE PASS BRIDGE #2



MAP 2

LOWER RIO GRANDE VALLEY BORDER CROSSINGS

EXISTING BORDER CROSSINGS

(1) BROWNSVILLE-MATAMOROS Gateway Bridge

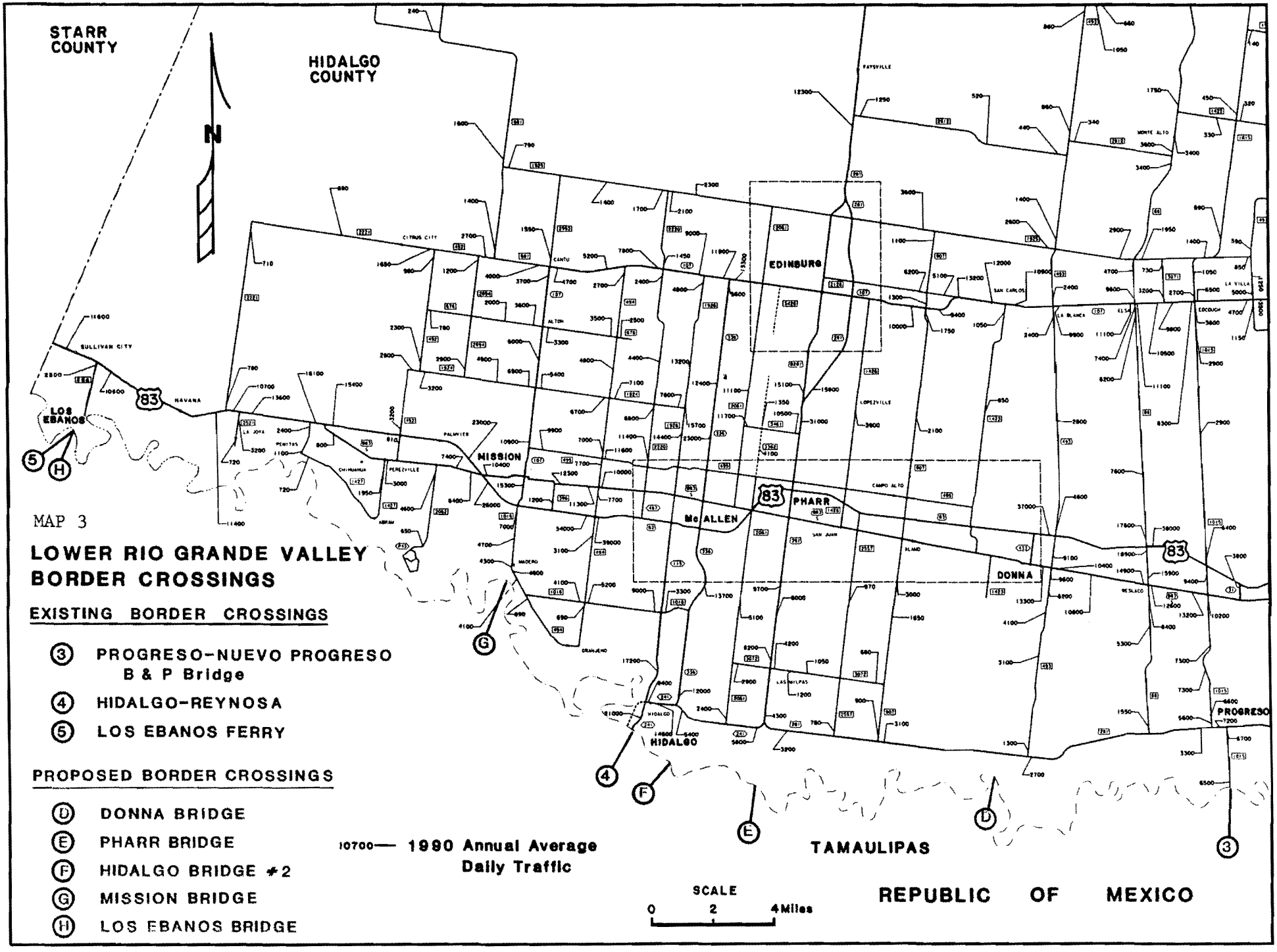
(2) BROWNSVILLE-MATAMOROS B &M Bridge

PROPOSED BORDER CROSSINGS

(A) PORT OF BROWNSVILLE BRIDGE

(B) BROWNSVILLE EXPRESSWAY BRIDGE

(C) LOS INDIOS BRIDGE



MAP 3

LOWER RIO GRANDE VALLEY BORDER CROSSINGS

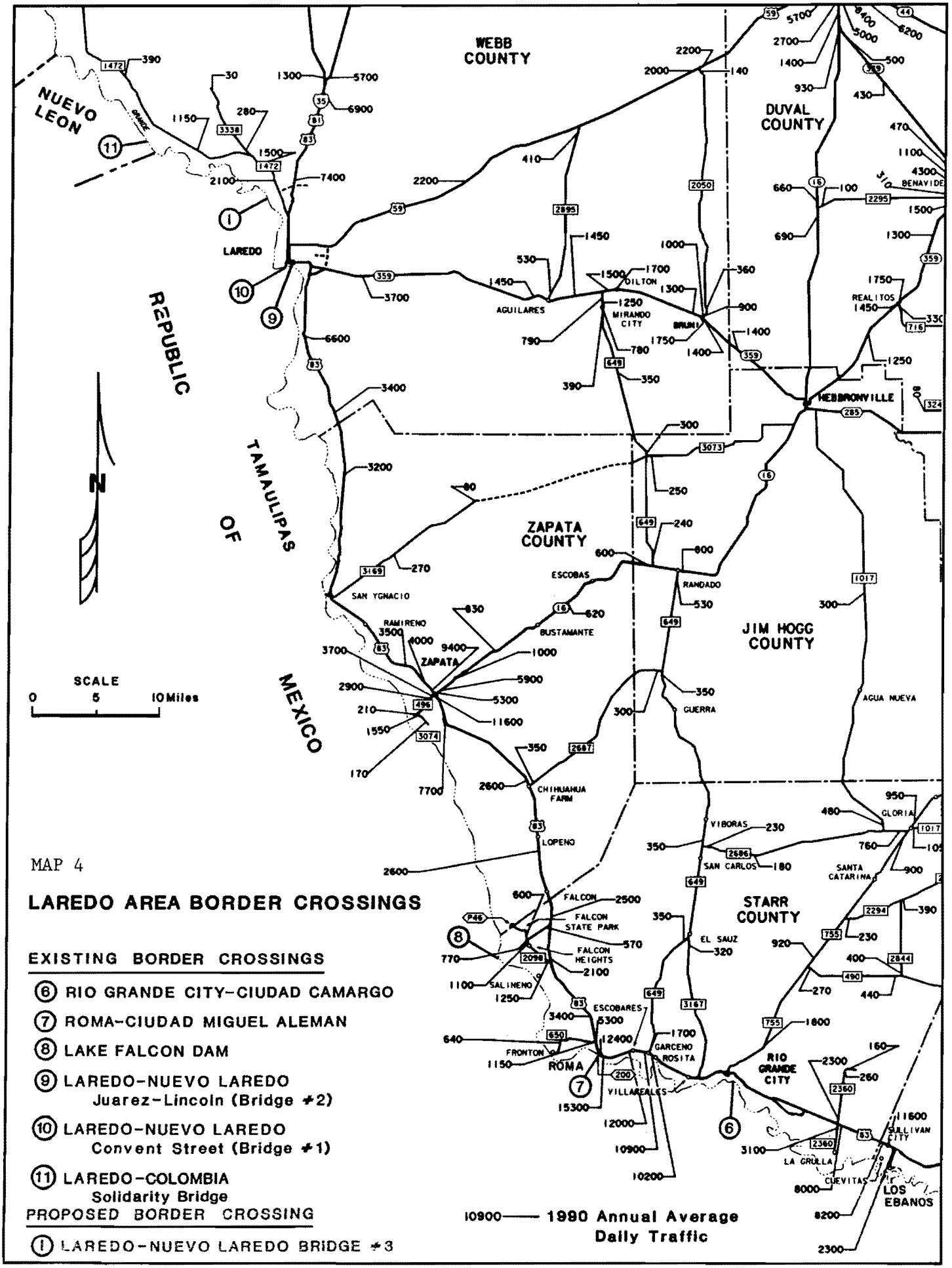
EXISTING BORDER CROSSINGS

- (3) PROGRESO–NUEVO PROGRESO B & P Bridge
- (4) HIDALGO–REYNOSA
- (5) LOS EBANOS FERRY

PROPOSED BORDER CROSSINGS

- (D) DONNA BRIDGE
- (E) PHARR BRIDGE
- (F) HIDALGO BRIDGE #2
- (G) MISSION BRIDGE
- (H) LOS EBANOS BRIDGE

10700— 1990 Annual Average Daily Traffic



MAP 4

LAREDO AREA BORDER CROSSINGS

EXISTING BORDER CROSSINGS

⑥ RIO GRANDE CITY–CIUDAD CAMARGO

⑦ ROMA–CIUDAD MIGUEL ALEMAN

⑧ LAKE FALCON DAM

⑨ LAREDO–NUEVO LAREDO
Juarez–Lincoln (Bridge #2)

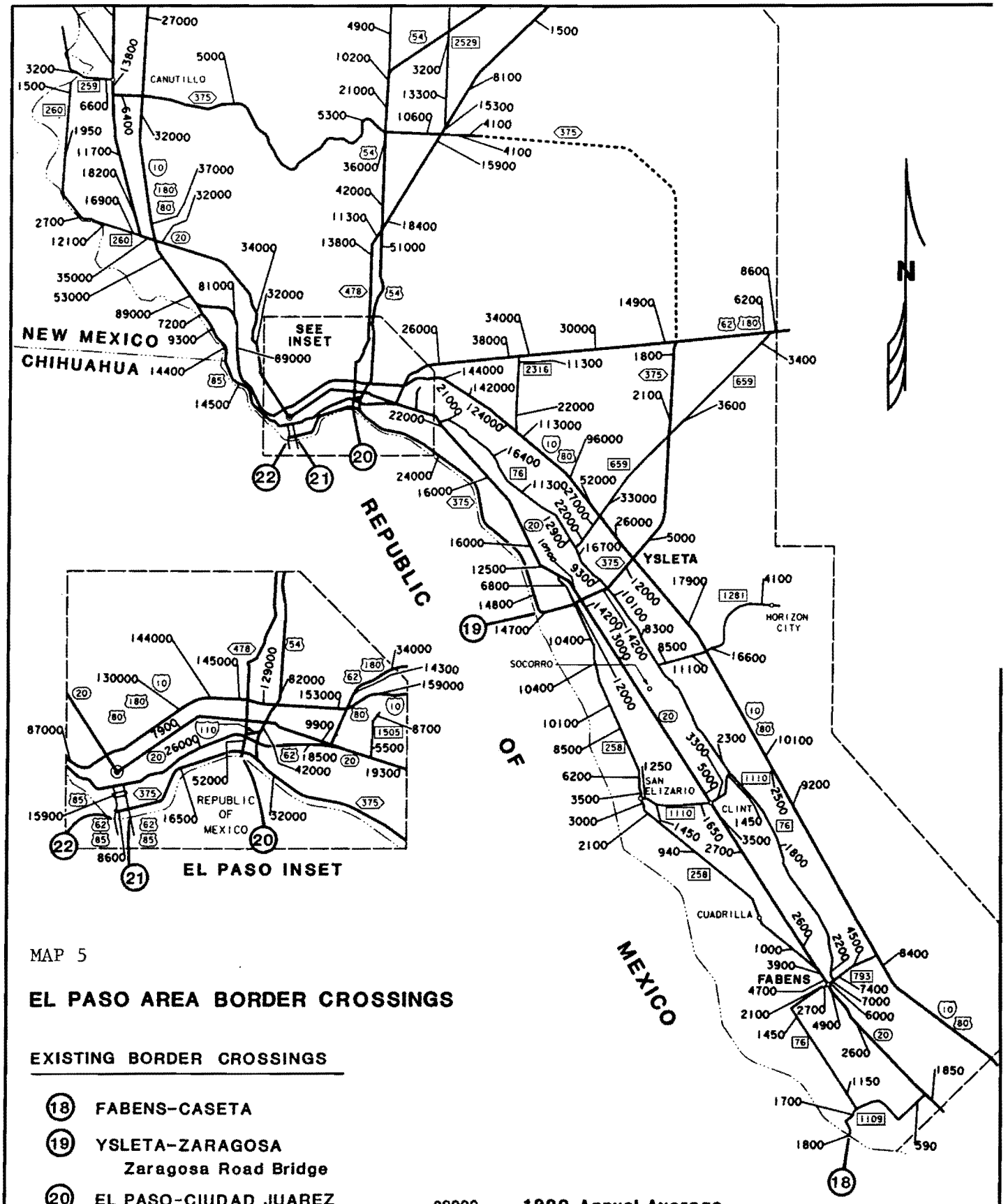
⑩ LAREDO–NUEVO LAREDO
Convent Street (Bridge #1)

⑪ LAREDO–COLOMBIA
Solidarity Bridge

PROPOSED BORDER CROSSING

① LAREDO–NUEVO LAREDO BRIDGE #3

10900—— 1990 Annual Average Daily Traffic



MAP 5

EL PASO AREA BORDER CROSSINGS

EXISTING BORDER CROSSINGS

(18) FABENS-CASETA

(19) YSLETA-ZARAGOSA
Zaragosa Road Bridge

(20) EL PASO-CIUDAD JUAREZ
Bridge Of The Americas

(21) EL PASO-CIUDAD JUAREZ
Good Neighbor Bridge

(22) EL PASO-CIUDAD JUAREZ
Paso Del Norte Bridge

89000—— 1990 Annual Average Daily Traffic

A. Mexican tariff provisions

Allowable raw materials, capital equipment, and component parts temporarily imported into Mexico are exempt from Mexican import duties *as long as these products are used for export production.* In lieu of duties, maquiladora operators must post a bond with Mexican Customs to guarantee that these inputs will enter the Mexican market. The bond is based on the value of the inputs and capital machinery/equipment and will be returned to the maquiladora operator in full once it ceases operations.

During the past year the Mexican government has relaxed the bond requirements. A simple letter stating that raw materials, capital equipment and components will be used for export production and that they will leave the country once the maquila operation ceases to operate for exports. With permission from the Mexican government, up to 50% of the maquiladora production can be sold within the Mexican market.

B. U.S. Customs Regulations

a. Item 9802.00.60

Allows the import of metal products processed abroad with duties assessed only on the value-added to those goods by foreign processing. For example, in the case of the maquiladora, the total value of Mexican inputs, including labor, electricity, parts, etc. is counted as value added; the value of U.S. components is not. Under this tariff provision, the products must have been processed in the U.S. before being sent abroad and then must be further processed in the U.S. upon their return.

b. Item 9802.00.80

Allows the import of articles assembled abroad from U.S. made components with duties levied only on the value added to those components as described above. These goods may or may

not involve metal components and do not require further processing upon their return to the U.S.

c. Generalized System of Preferences Regulations:

If the goods assembled/manufactured in Mexico have at least 35% of their value in Mexican content upon import to the U.S., they may be eligible for treatment under the U.S. Generalized System of Preferences (GSP). This would enable them to enter the U.S. market with no duties levied.

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