Urban Travel in the San Patricio and Nueces County Area

An Overview of Travel Surveys

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INTRODUCTION

In 1996, the Texas Department of Transportation (TxDOT), in cooperation with the Corpus Christi Metropolitan Planning Organization, conducted a travel survey for the Corpus Christi Transportation Study area. The purpose of the survey was to obtain information on the amount and type of travel occurring in the Corpus Christi region for use in updating the models used to project travel within the area.

The study area included San Patricio and Nueces counties, with an estimated 1996 population of nearly 376,570 persons and 137,878 households. The five travel surveys conducted as part of this effort included a household survey, a commercial vehicle survey, a special generator survey, an on-board transit survey, and an external station survey. This report presents an overview of the travel surveys conducted and a summary of the resulting travel information.

SURVEYS

Following is a brief description of the five surveys conducted as part of the study.

Household Survey
Households were selected at random throughout the Corpus Christi region, and those that agreed to participate were asked to record in a diary the travel made by each person over the age of five years during a 24-hour period. For each trip, participants were asked to record the time, place the trip began and ended, mode of travel, number of passengers, purpose of the trip, and other descriptive information. In addition to the data on travel, characteristics of the household such as number and age of persons in the household, number of household members employed, household income, and number of vehicles available were obtained for each participating household.

The survey consisted of 1,712 households in the two-county study area. Of these, 1,684 surveys, representing nearly 4,800 persons and involving over 18,200 trips, were included in the analyses and used to develop trip rates for the Corpus Christi region.

External Station Survey
External stations are points where trips enter and leave the study area. Therefore, external stations are located where a transportation facility crosses the study area boundary. There are 22 external

stations in the Corpus Christi area and 18 were surveyed. At each location, vehicles headed in the outbound direction were randomly selected and the drivers interviewed to determine information on the trip purpose, the trip origin and destination, and the vehicle occupancy. At the external stations with average daily traffic volumes of less than 1,000 vehicles, an attempt was made to survey all outbound vehicles. This information is used to estimate the number of trips originating outside the study area and traveling to a point inside the area, and the number of trips beginning and ending at a point outside the study area (through trips). This information is used to estimate the trips originating inside the study area and ending at a point outside the study area. More than 6,800 interviews were conducted at the Corpus Christi area external stations.

On-Board Public Transit Survey

An on-board survey of bus passengers was performed for the Regional Transportation Authority (RTA - The "B"). The survey was designed to collect information on current bus rider characteristics and to provide data to develop a representative origin-destination trip table for use in the travel demand models. Data collected included trip origins and destinations, mode of travel to/from the bus stop, trip purpose, bus routes taken for trip, ridership frequency, fare paid and method of payment, vehicle availability, and household size and income.

The "B" operates 23 fixed routes and 8 contracted fixed routes. These routes serve an average of more than 11,000 weekday passenger trips. Demand-response service is also available, but was not included in the survey. The survey was conducted on Tuesdays through Thursdays during April and May of 1996. A total of 1,780 completed bus surveys were returned.

Commercial Vehicle Travel Survey

In addition to the survey of commercial trucks performed as part of the external station surveys, a separate commercial truck survey was completed. This data is used to develop a more comprehensive database of travel patterns, vehicle weights, and fuel types for commercial trucks operating in the Corpus Christi two-county region. Information collected from this survey was used to develop truck trip rates for travel demand models and provide local data for estimating emissions used in air quality analysis.

Firms participating in the survey provided data for each trip taken during one day of travel during April through June of 1996. Information collected included trip purpose, departure and arrival

times, an address for each trip origin and destination, and the type of land use activity at the destination end of each trip. Other information collected included the beginning and ending odometer reading for the day, type of truck used, type of cargo hauled, and truck routes traveled. More than 1,300 surveys were mailed to 970 businesses that agreed to participate. More than 500 completed surveys representing 118 firms and documenting more than 2,700 truck trips were returned.

Special Generator Survey

Special generators are land use activities considered unique and are handled individually in the modeling process. Special generators typically include colleges and universities, military bases, hospitals, amusement parks, major regional airports, and major regional shopping malls. Special generator surveys collect information on travel patterns for employees and visitors at sites that exhibit special trip generating characteristics. The data obtained in the surveys is used to develop trip attraction rates by trip purpose for each site.

A full survey was conducted at Driscoll Children's Hospital and partial surveys were conducted at the Naval Air Station, Texas A&M University-Corpus Christi, and the Naval Station in Ingleside. The full survey at Driscoll Children's Hospital provided data on employee trip data, non-employee trip data, characteristic information on the site, and information about all vehicles and persons arriving and departing from the site. A total of 215 employee, 182 visitor, and 31 commercial vehicle surveys were obtained from Driscoll Children's Hospital in May 1996.

Information gathered in the partial surveys performed at the Naval Air Station, Texas A&M University, and the Naval Station included characteristic information specific to the sites and a count of vehicles and persons arriving and departing the sites. No surveys or interviews were conducted for employees or visitors in the partial surveys. The vehicle and person counts, along with the characteristic information on number of employees, employees in attendance, hours of operation, number of shifts, number of military and civilian personnel housed on base, and number of students were collected during the fall of 1997.

TERMINOLOGY

There are several terms and phrases used in travel surveys and travel demand modeling that have the potential to confuse or mislead the reader. To avoid this in the subsequent sections of this report, these terms are defined below.

Trip Purpose
Trip purpose is the purpose of a trip. In the analyses of surveys, four trip purposes were used; home based work (HBW), home based non-work (HBNW), non-home based (NHB), and truck/taxi. Home based work trips are trips that begin at home and end at work or begin at work and end at home. Home based non-work trips are those trips that begin or end at home and the purpose of the trip is to travel to a place other than work such as school, shopping center, or doctor's office. Non-home based trips are those trips that do not begin or end at home. Truck and taxi trips are trips made by a commercial vehicle or a commercial passenger carrier, vehicles or carriers that are not public transportation providers.

Person Trips
Person trips are those trips made by persons five years of age or older by any mode of transportation. These are usually summed for all members of a household, reported as person trips per household, and referred to as the person trip rate. Person trips are also summed by household and divided by the number of persons in the household to compute the person trips per person.

Vehicle Trips
Vehicle trips are those trips made by individuals in a household driving a vehicle. These are generally reported as vehicle trips per household and/or vehicle trips per person. Vehicle trips per person are computed by summing all of the vehicle trips and dividing by the number of persons within a household. Vehicle trips per household is also referred to as the vehicle trip rate.

Mode of Travel
Mode of travel is the physical means of transportation used for a trip. The modes available include auto/truck/van driver, auto/truck/van passenger, public transit, bicycle, school bus, walking, taxi, commercial vehicle, and other. For this report, trips were aggregated for similar modes such as private vehicle driver, private vehicle passenger, public transit, school bus, bicycle, walk, taxi, commercial vehicle and other.

Vehicle Availability
Vehicle availability is the number of vehicles available to members of a household for travel purposes.

Vehicle Occupancy
Vehicle occupancy is the number of occupants in a vehicle during a vehicle trip including the driver.

Trip Length
Trip length is the length of a trip measured in distance or in time.

Productions
Productions are the trips that are produced by members of a household. They are computed by trip purpose as well as mode of travel. Production rates refer to the total trips produced divided by the number of households.

Attractions
Attractions are the trips to and from a work place made by employees and non-employees. They are computed by trip purpose as well as by mode of travel. Attraction rates refer to the total attractions for a work place divided by the number of employees at the work place. Attraction rates are also developed for households.

Transit-Boarding Trip
A transit-boarding trip is a trip on one transit vehicle that starts when the passenger boards and ends when the passenger exits the vehicle.

Linked Transit Trip
A linked transit trip is a trip that is taken via the transit mode regardless of the number of transit vehicles boarded. Thus, several transit-boarding trips may be linked together into one linked transit trip.

CORPUS CHRISTI REGIONAL TRAVEL BEHAVIOR

This section presents various statistics and comparisons of travel behavior data as developed from the 1996 Corpus Christi travel surveys. It presents information on area characteristics that influence travel and the travel behavior information developed from the various surveys. In some instances a comparison of data developed from the 1961 Corpus Christi travel surveys is provided to provide insight on changes in travel behavior that occurred over time.

Household Survey

The number of households surveyed in the Corpus Christi area was 1,712. Of those surveyed, responses from 28 households were excluded from further data analysis due to a failure to report household income or questionable responses.

Household Profile

In 1996, there were approximately 376,570 people and 137,878 households in the Corpus Christi area. The change in population and households for San Patricio and Nueces counties between 1970 and 1996 is shown in Figure 1. The area experienced a population increase of more than 32% during this period while the number of households grew by almost 72%. The higher growth in the number of households is consistent with the trend toward decreasing household size. Figure 2 shows the change in average household size for the Corpus Christi area between 1970 and 1996.

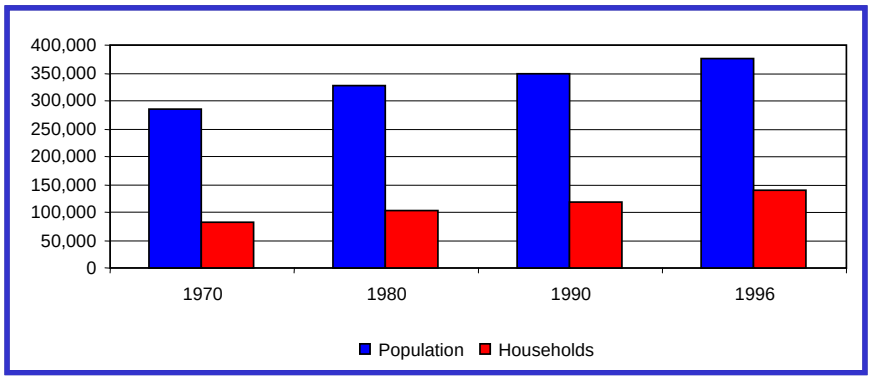

FIGURE 1. Population and Household Trends in the Corpus Christi Area

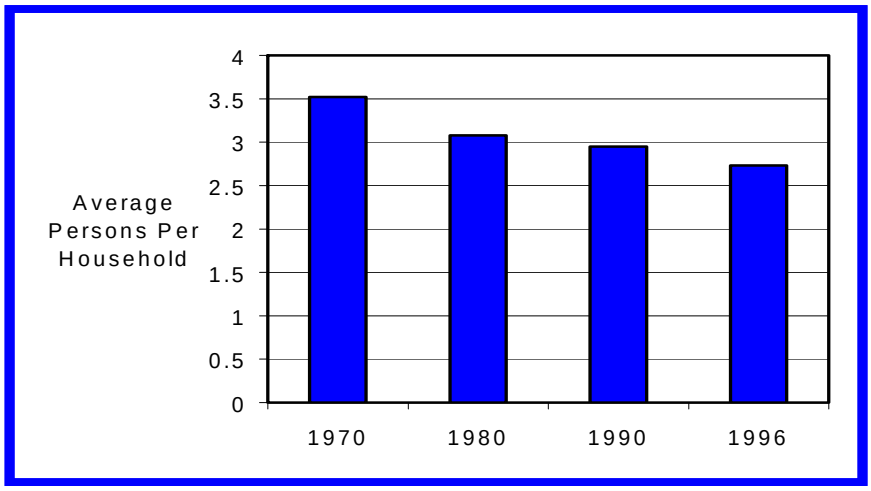

FIGURE 2. Trends in Average Household Size for the Corpus Christi Area

A comparison of the distribution of households by household size as reported in the 1970, 1980, and 1990 census and the 1996 estimate for the Corpus Christi area is shown in Figure 3. The increase in the percentage of one- and two-person households is consistent with the trend in decreasing household size.

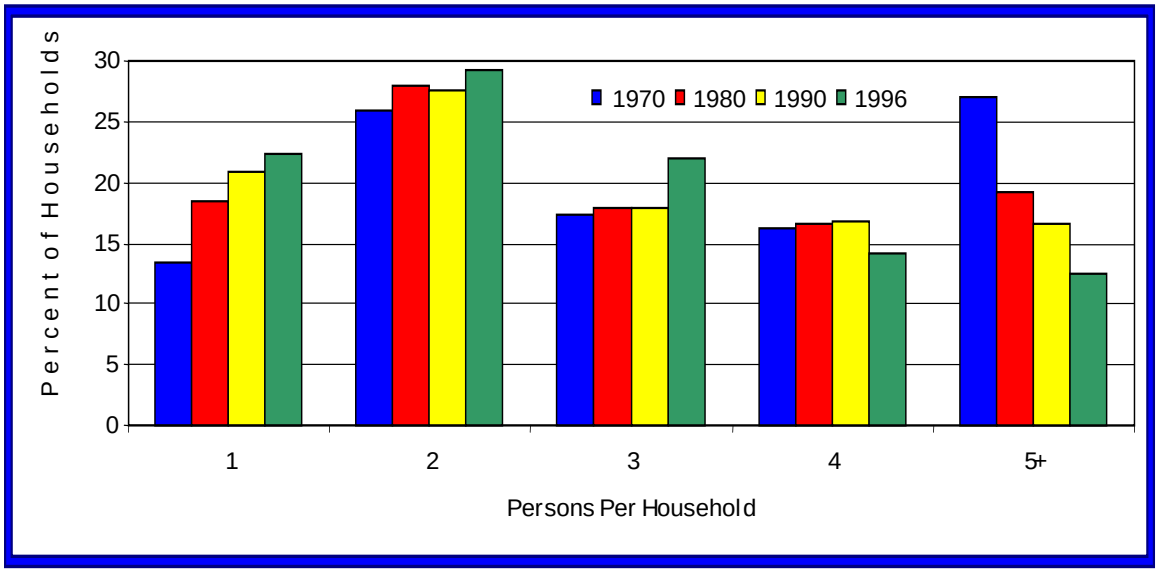

FIGURE 3. Trends in Distribution of Households by Household Size

The average number of employed persons per household has also declined since 1970. As illustrated in Figure 4, the 1970 estimate of employed persons per household was 1.19 for the Corpus Christi area, and in 1996, this average was 0.95. Although the number of two worker households has increased during this time, the decline is largely the result of decreasing household size.

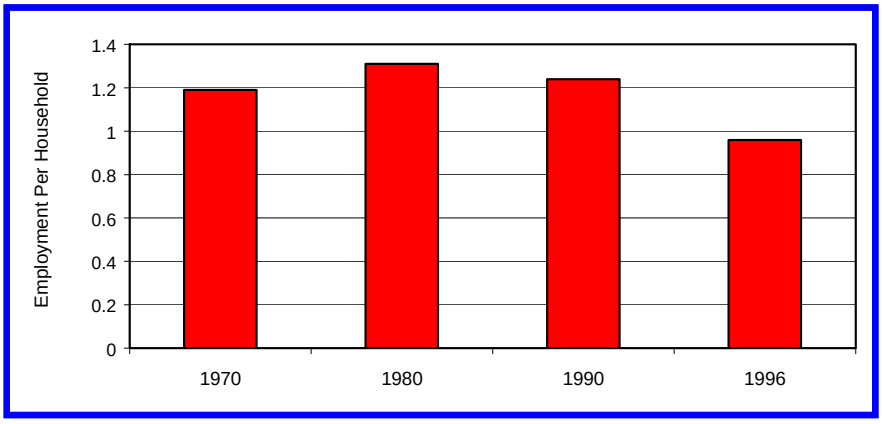

FIGURE 4. Trend in Employment Per Household

Vehicle availability, in terms of the average number of vehicles per household, increased steadily between 1970 and 1980, and declined slightly between 1980 and 1990 as shown in Figure 5. Since smaller households typically own fewer vehicles, the decline in the average number of vehicles available may be a result of decreasing household size. It is expected that the average number of vehicles available per household will remain relatively stable.

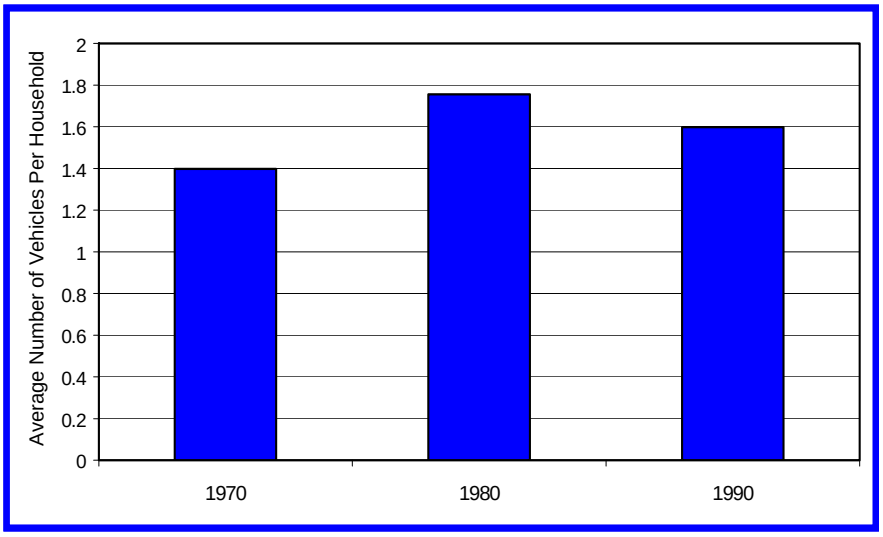

FIGURE 5. Trend in Household Vehicle Availability

The trend in median household income in constant 1996 dollars for the Corpus Christi area is shown in Figure 6. Between 1969 and 1989, the median household income increased approximately 7%. However, the median household income decreased by more than 7% between 1989 and 1996. This decline is consistent with state and national trends.

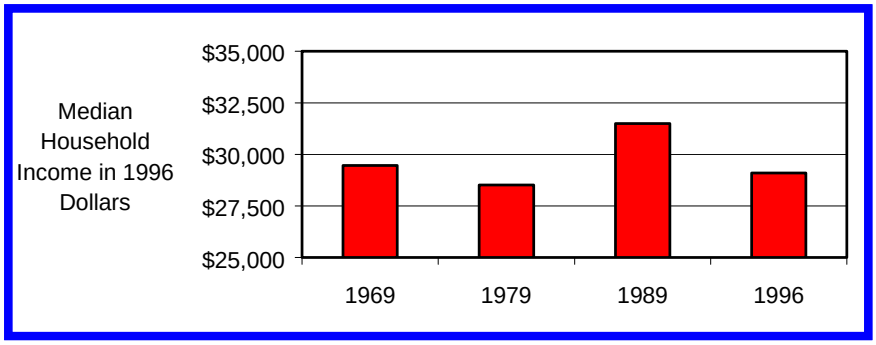

FIGURE 6. Trend in Median Household Income for the Corpus Christi Area

Household Travel Characteristics

Based on the data gathered in the 1996 travel survey, more than 1.4 million trips beginning and ending in the Corpus Christi area are made every weekday. Figure 7 presents the breakdown of these trips by mode of travel. As expected, most trips (92%) are made by private vehicle either as an auto driver (67%) or auto passenger (25%). Travel by school bus accounts for 2% of the trips, walking 4%, and public transit 1% of the trips made in the area. A comparison of the mode of travel in 1961 with that in 1996 is

presented in Figure 8. Since 1961 the number of auto driver trips has increased while those made by auto passengers has decreased. This would indicate a decline in average vehicle occupancy.

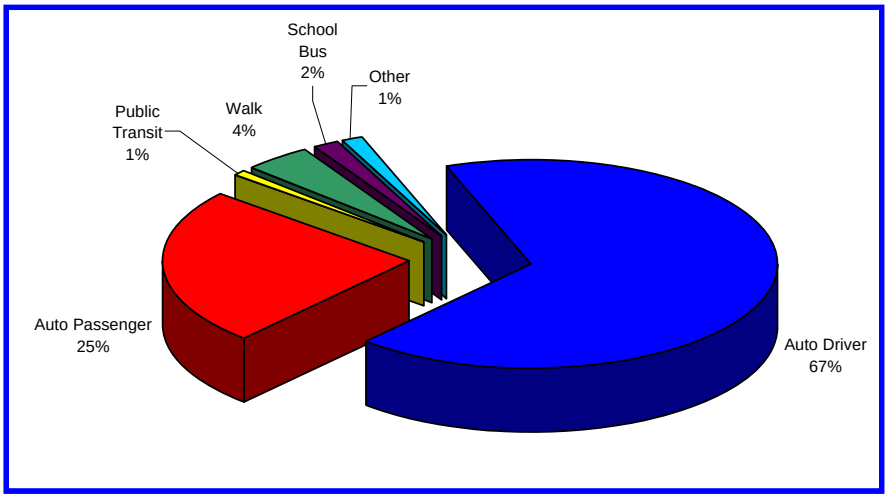

FIGURE 7. Percent Distribution of Household Trips by Mode

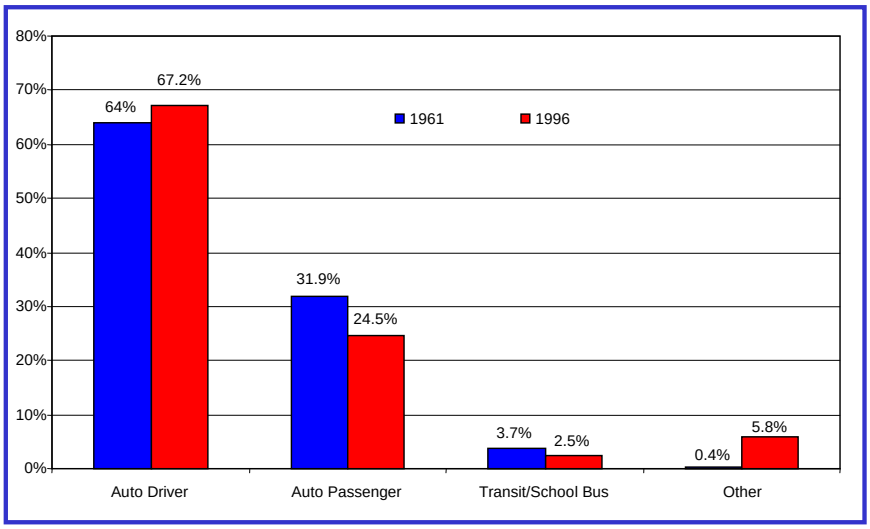

FIGURE 8. Historic Distribution of Household Trips by Mode of Travel

The home travel survey collected information on the activity associated with each trip. The different activities reported in the survey were aggregated into three trip purposes: home based work trips, home based non-work trips, and non-home based trips. Figure 9 presents a comparison of the percentage of trips observed in 1961 with those observed in 1996 by trip purpose. The comparison shows little change in the percentage of home-based work trips. Home based non-work trips declined by 10% while non-home based trips increased by 35%.

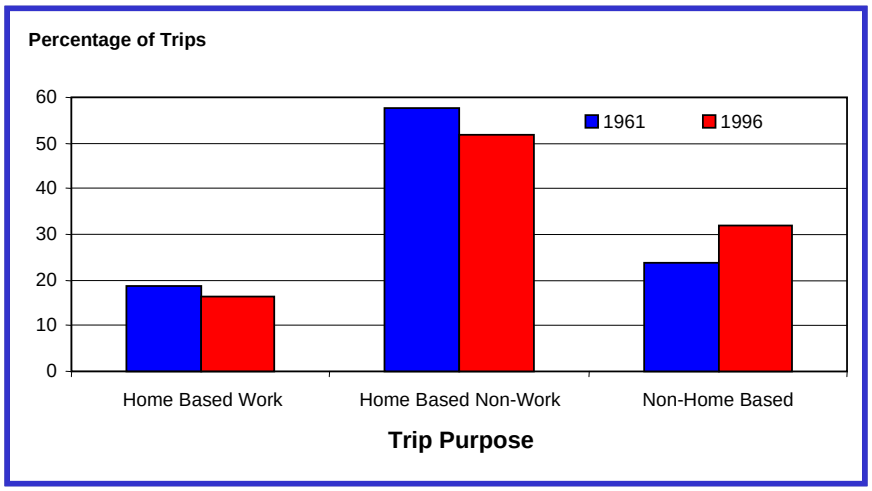

FIGURE 9. Distribution of Household Trips by Trip Purpose

Figure 10 presents the average number of person trips per household by household size. On average, a 1-person household makes 3.8 person trips each day while households with 5 or more persons make an average of 20.8 trips each day. Region wide, each household makes an average of almost 11 person trips each day. The influence that household size has on travel is illustrated by comparing the percentage of households in each size category to the percentage of total daily person trips made by households in each category. As shown in Figure 11, 1-person households account for almost 22% of the total number of households but make less than 8% of the total daily person trips. Households with 5 or more persons account for just over 12% of the total number of households but make more than 20% of the trips each day.

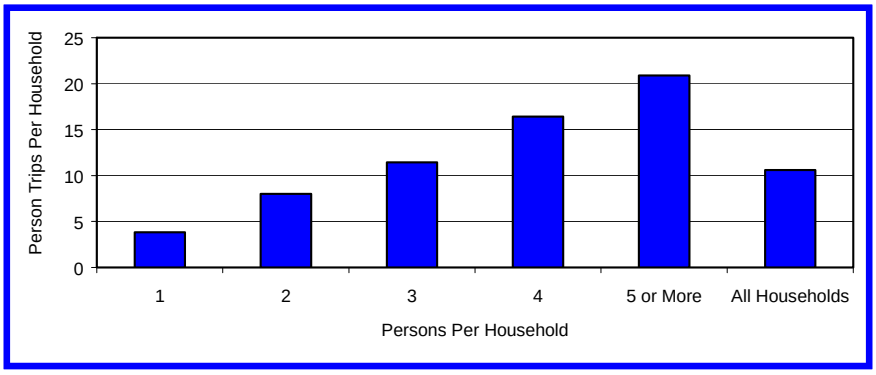

FIGURE 10. Average Daily Person Trips Per Household by Household Size

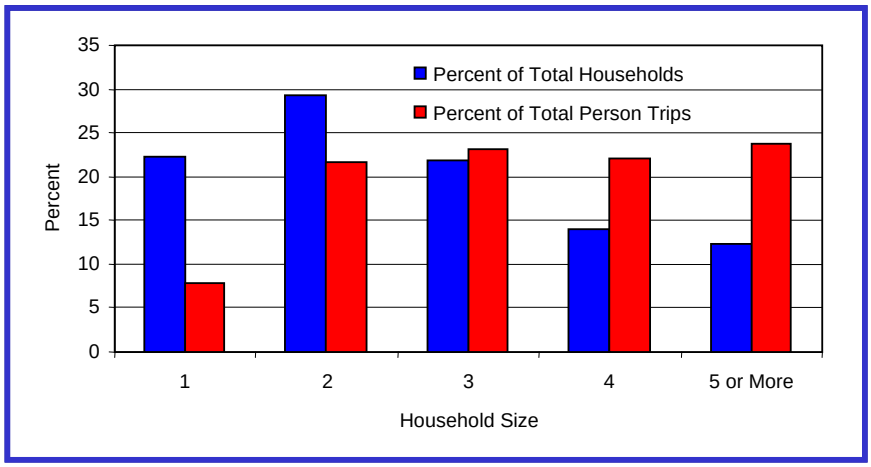

FIGURE 11. Comparison of the Percentage of Households by Household Size and the Percentage of Daily Person Trips

Figure 12 shows the average number of person trips per household by median household income. Households with incomes of less than $10,000 make approximately 6 person trips each day, while households with incomes of $50,000 or more make more than 13 person trips each day. The influence of household income on personal travel is shown in Figure 13. Households with incomes of less than $10,000 represent almost 16% of all households but account for only 8.6% of the trips. Households in the highest income range represent 29% of the region's households and account for more than 36% of the trips.

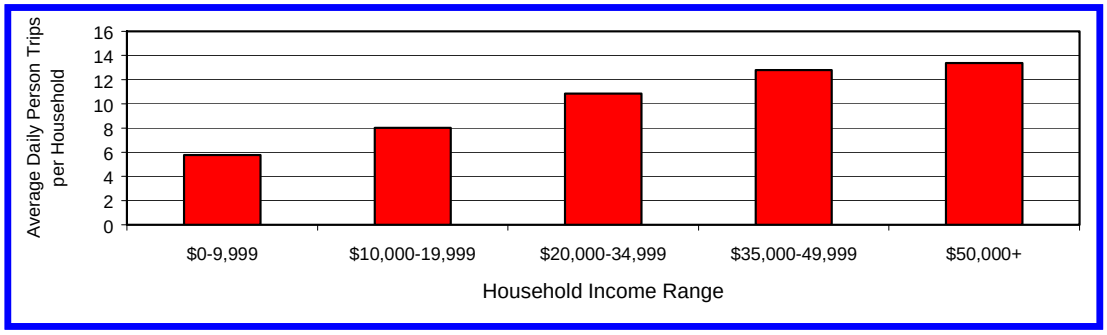

FIGURE 12. Average Person Trips Per Household by Household Income

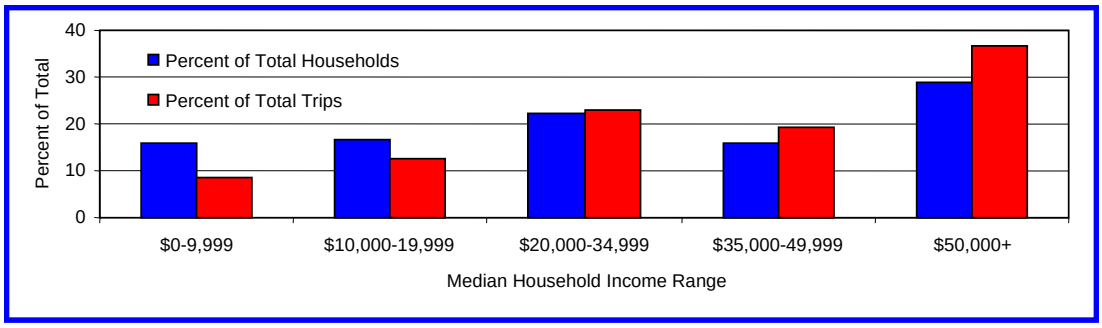

FIGURE 13. Comparison of the Percentage of Households and Percentage of Daily Person Trips by Household Income

Figure 14 presents the average trip length in miles and in minutes by trip purpose for the 1996 travel survey. The average trip length for all trip purposes was 5.5 miles and slightly more than 13 minutes. The longest trips, in both distance and time, were work trips. Home based work trips averaged just over 8 miles and almost 12 minutes of travel time. Home based non-work trips averaged approximately 5 miles in length and more than 7½ minutes of travel time. Non-home based trips averaged just over 5 miles in length and slightly more than 8 minutes in travel time. Figure 15 provides a comparison of the average trip length from recent surveys conducted in other Texas urban areas. The average trip length in the Corpus Christi area for all three trip purposes was less than that in urban areas of similar or greater population, and greater than that in areas of less population.

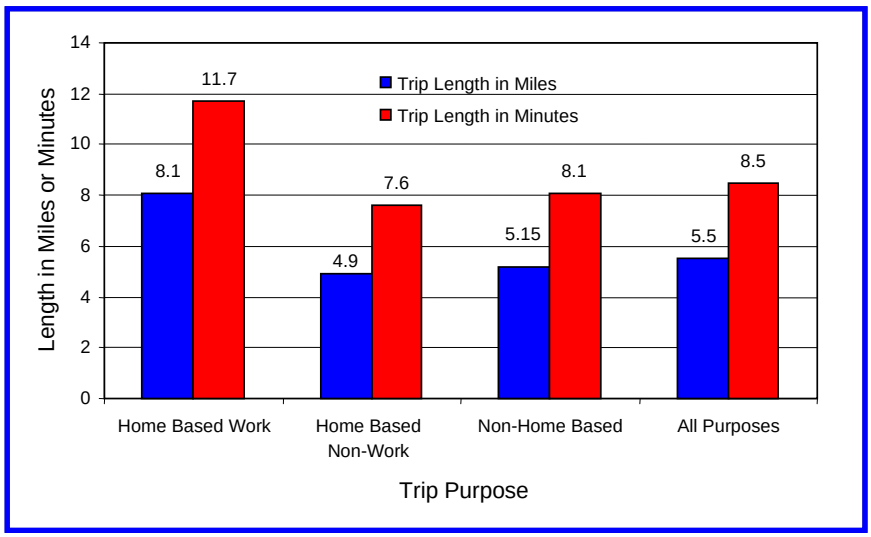

FIGURE 14. Average Trip Length in Miles and Minutes by Trip Purpose from 1996 Household Survey

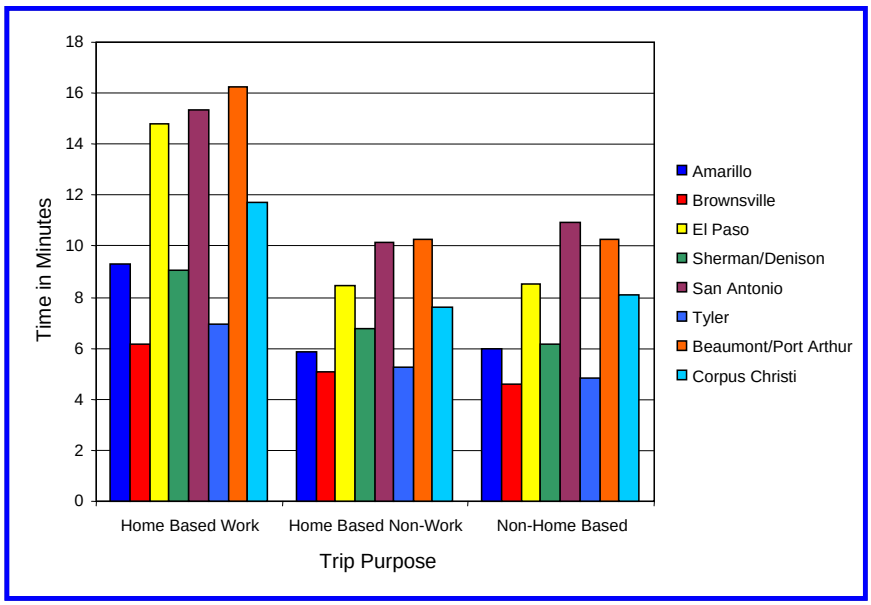

FIGURE 15. Comparison of Average Trip Length by Trip Purpose

In summary, more than 1.4 million person trips totaling more than 8 million vehicle miles of travel were made each day by households in the Corpus Christi region. An average household in the region made more than 10 trips each day. The average trip was 5.5 miles in length and required just over 13 minutes to complete. From this data, it was determined that the average household travels more than 58 miles and spends almost 2 hours and 20

minutes traveling each day. Of the more than 1.4 million trips made each day in the region, 1.3 million trips are made by private vehicle.

External Travel Characteristics

External travel consists of those trips that begin or end outside of the Corpus Christi study area. When a trip begins outside and ends inside the area, that trip is called an external-local trip. Conversely, a trip that begins inside and ends outside the area is called a local-external trip, and trips that begin and end outside the study area are called external-external, or through trips. External-local and local-external trips are grouped together for analysis and referred to as external-local trips.

The external travel survey included 18 locations where vehicles entered and exited the study area. At the remaining four external station locations, 24-hour traffic counts were obtained to provide an estimate of the number of vehicles entering and exiting the Corpus Christi area on a daily basis. A total of 6,327 external surveys were completed. Of these, occupants of non-commercial vehicles completed 92% of the surveys.

On an average weekday, more than 67,000 external trips are made in the Corpus Christi area by non-commercial vehicles. Together with the estimated 13,000 external commercial trips, more than 80,000 external trips traveling more than 1.8 million vehicle miles are made each weekday in the Corpus Christi area. The average trip length in travel time and miles for non-commercial and commercial external local trips is shown in Figure 16. The average non-commercial vehicle trip is 23 miles in length and takes 26½ minutes to complete. Commercial vehicle trips are typically longer in distance and travel time, averaging more than 28 miles and requiring almost 31 minutes to complete.

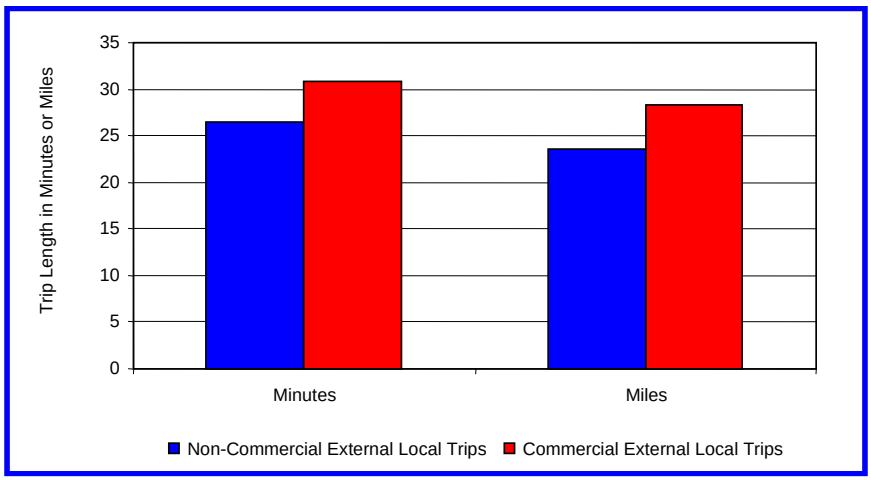

FIGURE 16. Average External Trip Length in Miles and Minutes

The distribution of internal and external vehicle trips from the 1961 and 1996 surveys is provided in Figure 17. The percentage of internal versus external trips has not changed significantly since 1961, although there has been a slight decline in the percentage of external local trips and a slight increase in the percentage of external through trips. Total external trips accounted for 6.5% of total trips in 1996, the same as in 1961. Of all external trips in 1996, more than 84% are external local trips.

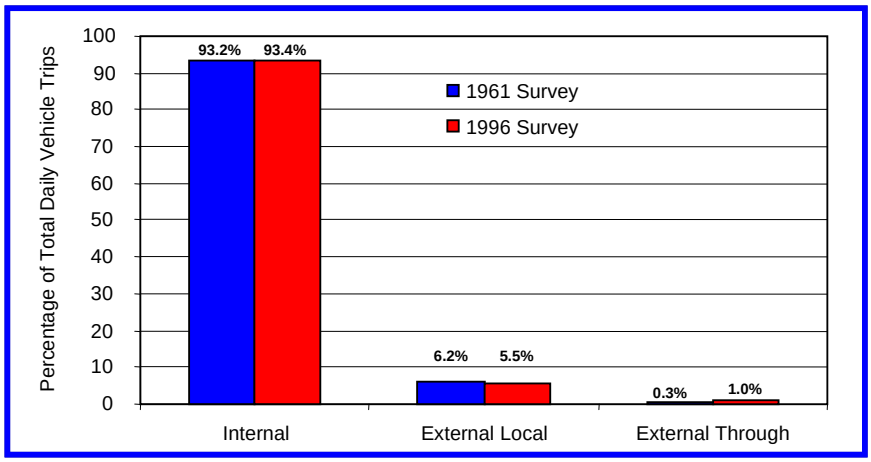

FIGURE 17. Distribution of 1961 and 1996 Vehicle Trips for the Corpus Christi Area

On-Board Transit Survey

The on-board transit survey of the regional bus system, The "B", provided data on transit rider and transit trip characteristics. The "B" averages 16,600 transit passenger boardings each weekday. A transit boarding is different from a transit trip in that passengers

may ride more than one bus to reach their destination. From the survey data, it is estimated that approximately 11,150 transit trips are made each weekday on public transit in the Corpus Christi area.

The distribution of transit trips by trip purpose is presented in Figure 18. The majority of transit trips in the Corpus Christi area, 56%, are home based non-work trips such as shopping, school, or medical trips. About 26% are home based work trips and 17% are non-home based trips. The percentage of home based work and non-home based transit trips differ significantly from the trip purpose for all person trips in the Corpus Christi area. As shown in Figure 19, the percentage of transit home based work trips is about 60% greater than for all person trips, while the percentage of non-home based trips is about one-half that of all person trips in the area. The percentage of home based non-work transit trips is only slightly greater than for all trips.

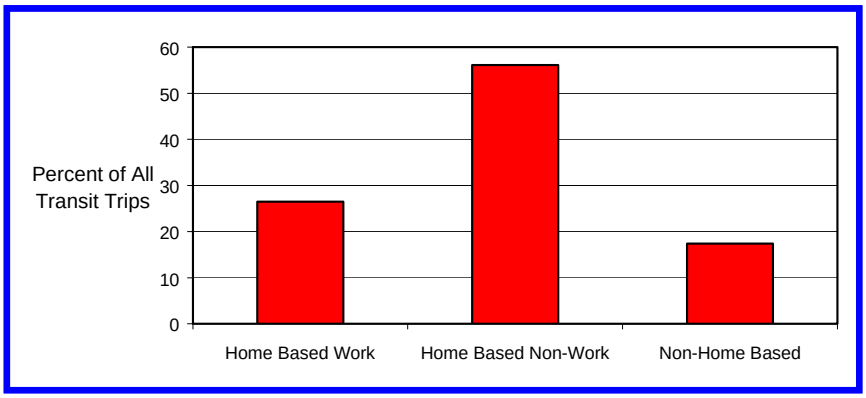

FIGURE 18. Percentage of Transit Trips by Trip Purpose

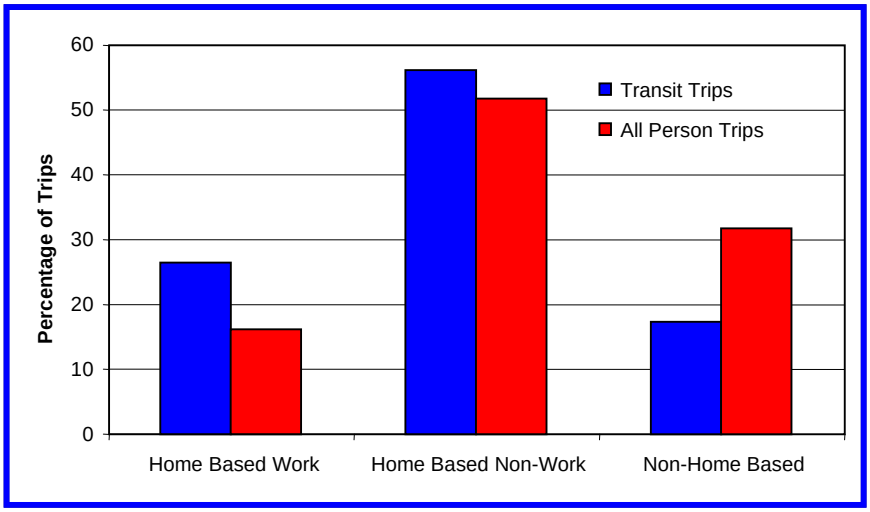

FIGURE 19. Comparison of Trip Purpose for Transit Trips and All Trips

A greater percentage of transit trips are made by persons in 1-person households than all trips made in the area as shown in Figure 20. The percentage of transit trips made by persons from households with 2 or more persons is similar to that for all trips made within the area. The percentage of transit trips made by persons living in households with 5 or more persons is not significantly less than that for all trips made in the area. Transit riders also tend to be from households with lower incomes. More than 70% of the transit riders have annual household incomes under $20,000, while only 43% of all households in the Corpus Christi area have incomes under $20,000. The distribution of transit trips by passenger household income is presented in Figure 21. More than 52% of The “B” riders were from households that do not have vehicles and another 29% of riders were from households that have one vehicle available. The average number of vehicles available to households of transit riders was 0.72, just slightly more than one-half the 1.6 vehicles per household available region wide.

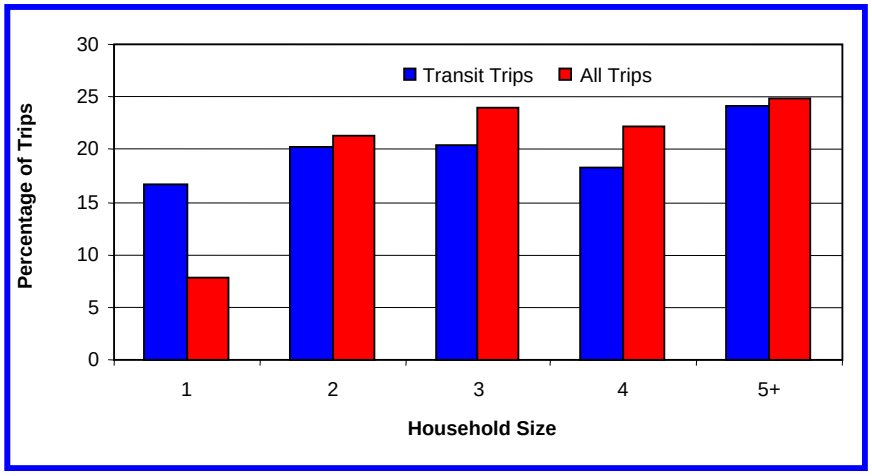

FIGURE 20. Comparison of Transit Trips to All Trips by Household Size

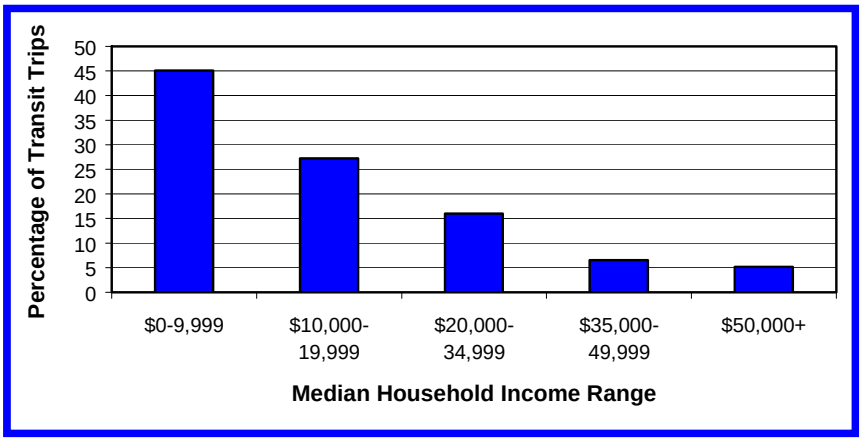

FIGURE 21. Distribution of Transit Trips by Household Income

Figure 22 provides the mode transit riders used to access transit in the Corpus Christi area. An overwhelming majority of transit riders, 77%, access transit by walking. Approximately 18% of the passengers indicated they accessed their bus from another transit vehicle, while only 4% either drove themselves or someone else drove them to the transit access point.

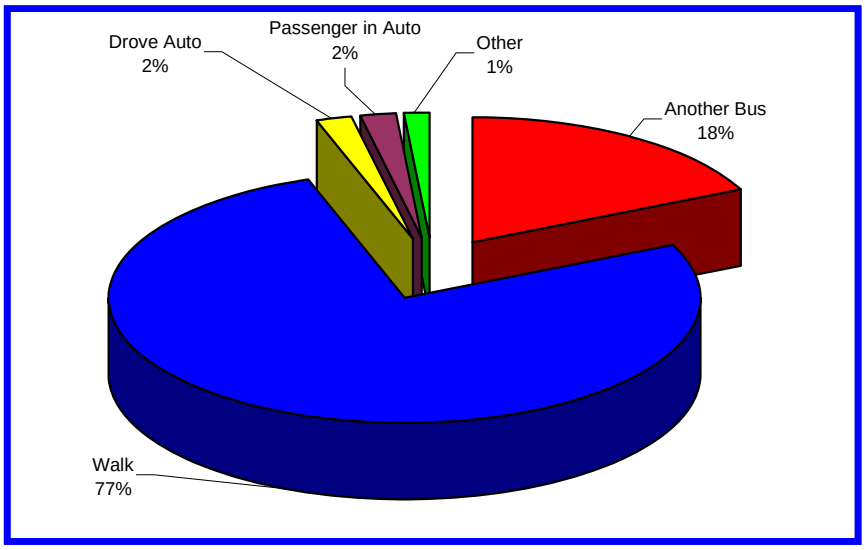

FIGURE 22. Mode of Access to Transit Service

Commercial Vehicle Survey

The commercial truck survey provided estimates of the number of trucks operating in the Corpus Christi area as well as information on the weight, fuel type, and trip characteristics of the commercial vehicles. A total of 509 surveys were completed.

From data collected in the survey, it was estimated that more than 8,100 commercial vehicles operate in the Corpus Christi area on an average weekday. Most of the commercial trucks operating in the area, almost 68%, were diesel powered as shown in Figure 23. The average commercial truck makes just over 6 trips each day, with each trip averaging 7½ miles and requiring more than 10 minutes to complete. Commercial vehicles travel almost 364,000 miles in the Corpus Christi area each weekday.

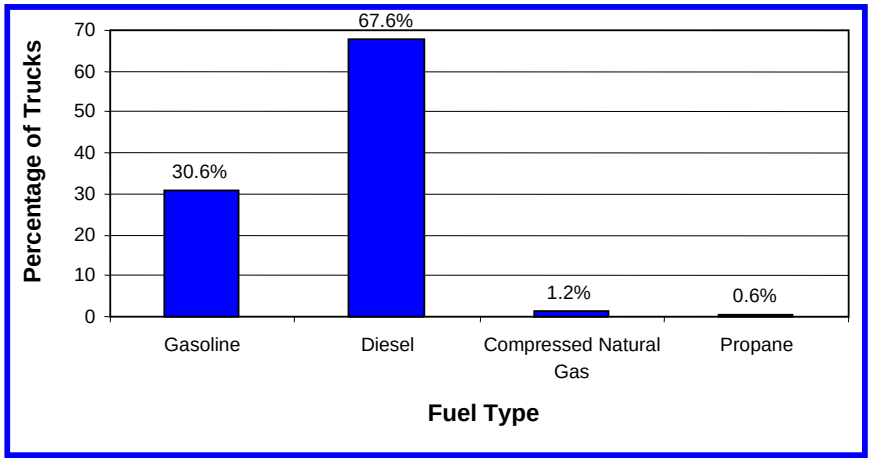

FIGURE 23. Distribution of Trucks Operating in the Corpus Christi Area by Fuel Type

Special Generator Survey

From data collected in the survey, trip attraction rates were developed for each special generator by trip purpose. As shown in Figure 24, the percentage of trip attractions by trip purpose varies between the special generators and differs from the trip attractions areawide. For example, Texas A&M has a much greater percentage of home based non-work trips than the other special generators and the area as a whole due to the number of student trips beginning at home. Conversely, the Naval Air Station and Ingleside Naval Station have a much higher home based work trip attraction rate than usual due to the more restricted nature of their business.

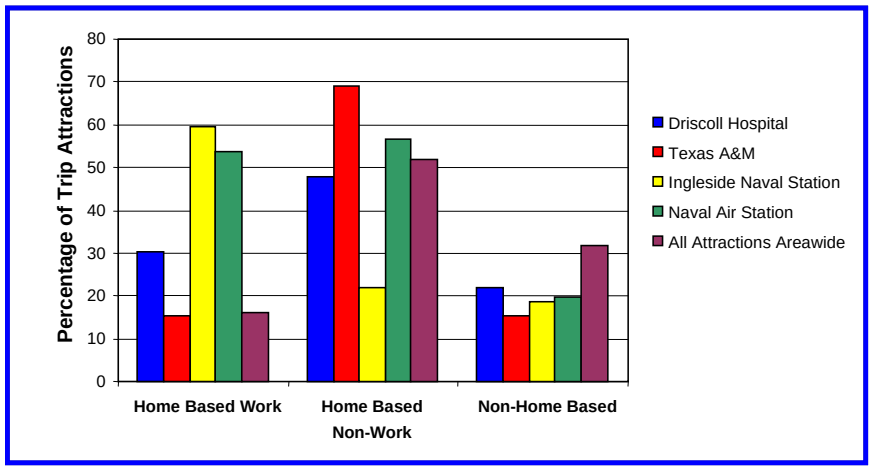

FIGURE 24. Comparison of Special Generator Attractions to All Attractions by Trip Purpose

SUMMARY

Overall, travel within the Corpus Christi area has increased during the past 35 years. The number of average daily person trips has increased by 258% between 1961 and 1996, although the population has increased by only 105%. Additionally, the vehicle miles of travel per capita have increased by over 340% during this period. This increase in travel is largely attributed to an increase in the average number of trips per household, from 7.3 trips in 1961 to 10.6 trips in 1996, in combination with the increase in the number of households. The average daily vehicle miles of travel in the region increased by more than 700% between1963 and 1996.

Automobile trips continue to account for the majority of trips in the region, with a slightly greater percentage of trips, 67%, in 1996 being made as an automobile driver compared to 64% in 1961. The majority of the trips, 51%, produced and attracted within the region in 1996 were for home based non-work trips that include travel for school, shopping, personal business, and medical trips.

External travel in the Corpus Christi area has also increased from 42,560 trips per day in 1961 to over 80,000 trips per day in 1996, more than an 88% increase. The distribution of external trips between external local and external through trips has remained relatively stable, with only a slight increase in the percentage of through trips.

In summary, approximately 1.6 million trips totaling 10 million vehicle miles of travel were made each day in the Corpus Christi region. Of the 1.6 million trips, 1.4 million, or 92%, are internal trips. External travel accounts for 5% and commercial vehicles account for 3% of all trips.