Investment Grade Traffic and Revenue Analysis for SH365 and IBTC

- FINAL REPORT -

Presented to

HCRMA
HIDALGO COUNTY REGIONAL MOBILITY AUTHORITY

DANNENBAUM
ENGINEERING CORPORATION

Submitted By:

C&M
C&M Associates, Inc.
10 years of reliable advice

September 2014

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Prepared For:

Hidalgo County Regional Mobility Authority
through
Dannenbaum Engineering Corporation

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Prepared by: Axel Herrmann, M.S., Dipl.-Ing.

Roshna Ashraf, M.E., E.I.T.

Reviewed by:

Date	Details	Name/Position	Signature/ Initials
September 8, 2014	Draft Report V1	Shahram Bohluli, PE Vice President	SB
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The results of this study constitute the opinion of C&M. This opinion is based on normal professional effort with respect to future traffic and revenue for the tolled facility, and subject to the time and budget constraints of the study's scope of work, and based on the information available to C&M at the time of execution of this study. C&M cannot guarantee or assure future events in connection to this traffic and revenue forecast.

Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

Acronym/Abbreviation	Description
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AP	Attraction-to-Production
ATR	Automatic Traffic Recorder
BLS	Bureau of Labor Statistics
BPR	Bureau of Public Roads
C&M	C&M Associates, Inc.
CAGR	Compound Annual Growth Rate
CANACAR	Cámara Nacional de Autotransporte de Carga
CBEST	Center for Border Economic Studies
CBP	U.S. Customs and Border Protection
CMHCTDM	C&M Hidalgo County Travel Demand Model
CPI	Consumer Price Index
C-TPAT	Customs-Trade Partnership Against Terrorism
CV	Commercial Vehicle
DOT	Department of Transportation
EB	Eastbound
EDC	Economic Development Corporation
ETC	Electronic Toll Collection
FAST	Free and Secure Trade
FM	Farm-to-Market Road
FHWA	Federal Highway Administration
GDP	Gross Domestic Product
IH	Interstate Highway
HBH	Home-Based Home
HBO	Home-Based Other
HBW	Home-Based Work
HCMPO	Hidalgo County Metropolitan Planning Organization
HCRM	Hidalgo County Road Builders
HCRMA	Hidalgo County Regional Mobility Authority
HNW	Home-Based Non-Work
HOT	High Occupancy Toll
IBTC	International Bridge Trade Corridor
IDENT	Automated Biometric Fingerprint Identification System
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act
ITE	Institution of Transportation Engineers

LOS	Level of Service
MCFTZ	McAllen Foreign Trade Zone
MD	Midday
Moody's	Moody's Analytics
MSA	Metropolitan Statistical Area
MTP	Metropolitan Transportation Plan
NAFTA	North American Free Trade Agreement
NHB	Non-Home-Based
NHTS	National Household Travel Survey
NPV	Net Present Value
NT	Nighttime
OBH	Other-Based Home
OBO	Other-Based Other
OBW	Other-Based Work
OD	Origin and Destination
PA	Production-to-Attraction
POE	Port of Entry
R^2	Coefficient of determination
RFID	Radio Frequency Identification
RFP	Request for Proposal
SENTRI	Secure Electronic Network for Travelers' Rapid Inspection
SH	State Highway
SIAVE	Sistema de Aforo Vehicular
SP	Stated Preference
T&R	Traffic and Revenue
TAZ	Traffic Analysis Zone
TDM	Travel Demand Model
TIP	Transportation Improvement Program
TOD	Time-of-Day
TSDC	Texas State Data Center
TTI	Texas Transportation Institute
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
US	U. S. Route
USA PATRIOT	United and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism
UTPA	University of Texas-Pan American
VMT	Vehicle Miles Traveled
VOT	Value of Time
W&P	Woods & Poole Economics

WBH	Work-Based Home
WBO	Work-Based Other
WBW	Work-Based Work
WHTI	The Western Hemisphere Travel Initiative
WiSE	Wireless Signal Extraction

Executive Summary

This Investment Grade Traffic and Revenue (T&R) Analysis summarizes C&M Associates', Inc. (C&M) efforts to carry out a T&R forecast for the proposed State Highway 365 (SH 365) and International Bridge Trade Corridor (IBTC) projects (The Projects) in Hidalgo County, Texas. This analysis was conducted to support possible financing of the Projects by the Hidalgo County Regional Mobility Authority (HCRMA).

ES.1. Study Background

The study area comprises the Rio Grande Valley region, specifically the area covering both sides of the U.S./Mexican border along the southern part of Hidalgo County. The location of Hidalgo County, in combination with the economic opportunities offered by the North American Free Trade Agreement (NAFTA), make this one of the most dynamically growing areas in the United States. Compared to other counties along the border, the state of Texas, and the United States as a whole, demographic growth in Hidalgo County has been among the highest. Employment in the county exhibited an average annual growth rate of 2.8 percent between 2001 and 2012, while population grew by 2.9 percent annually.

Hidalgo County and northern Mexico represent a highly integrated economic unit. Residents from both countries cross the border each day in search of consumer goods, personal services, and educational and employment opportunities. Businesses ship raw materials and unfinished goods to manufacturing facilities throughout the region for additional processing, final assembly, and distribution. Therefore, it is important to consider socioeconomic trends within the border area of Mexico, given the connection to activity in Hidalgo County.

Reynosa, the largest Mexican municipality near Hidalgo County, has shown a very fast rate of population growth in recent decades. From 1990 to 2000, the Reynosa municipality exhibited the second highest population growth rate in all of Mexico, with a CAGR of 4.48 percent. From 2000 to 2010, the Reynosa municipality became the fastest growing municipality in Mexico, with a reported CAGR of 3.6 percent.

The Projects are proposed to be open to traffic on July 1, 2018 and can be briefly described as follows:

- SH 365: 14.8 miles from Farm-to-Market Road 1016 (FM 1016/Conway Avenue) to U.S. Route 281 (US 281/Military Highway).
- IBTC: 12.3 miles from the intersection of SH 365 and FM 3072 (Dicker Road) to Interstate Highway 2 (IH2/US 83) and FM 493 to IH2 (US 83).

The Projects are being planned as a new toll road facility. C&M has delivered several T&R studies related to the Projects since 2008, when they were originally envisioned as a single project (i.e., the Hidalgo Loop). C&M performed an intermediate level T&R study for the Hidalgo Loop project in 2008. Then, in the second half of 2009, C&M studied traffic and revenue on two southern sections of the Loop—an east section and a west section—and presented HCRMA with an update of its earlier intermediate

T&R study. In 2010, C&M presented the first Investment Grade Study for the project. This study was then updated in 2013.

ES.2. Study Components

The current study effort involves the following key components:

- *Existing Data Collection*: C&M updated its databases of existing traffic data, which were collected in the previous studies, to analyze traffic pattern changes within the study area. The existing traffic data considered for this study include the historical data of nearby roadway networks and International Bridges, historical trends, and the current traffic pattern. Since the traffic pattern of the study area is strongly affected by the cross-border traffic, C&M took into consideration border trends and policies.

  According to the Texas Department of Transportation (TxDOT), the Annual Average Daily Traffic (AADT) on the two major freeways IH2 (US 83) and IH69C (US 281) has been growing by more than 3.0 percent per year during the 2000–2012 period.

- *Field Data Collection and Analysis*: Since 2008, C&M has been collecting field data in the study area specifically for the Projects. Based on these data, C&M has not only developed a user profile, but also gained a better understanding of traffic characteristics and travel patterns within the study area. The field work performed by C&M for the present investment grade analysis included: Economic Development Corporation's (EDC) survey in Hidalgo County, Automatic Traffic Recorder (ATR) counts, Travel time monitoring, cell phone metadata based Origin-Destination (OD) surveys and a Commercial vehicle survey on the US/Mexican Border.

- *Independent Socioeconomic Forecast*: The University of Texas-Pan American (UTPA) in Hidalgo County prepared the socioeconomic forecast for the study area. UTPA estimated the annual growth rate in population and employment for the year 2012–2035 to be 1.7 and 1.8 percent, respectively.

- *Model Development*: C&M developed the C&M Hidalgo County Travel Demand Model (CMHCTDM), updated the base year network for the year 2012, and created three future build networks for model years 2018, 2025, and 2035. A series of sensitivity tests were performed based on toll rates, value of time (VOT), and socioeconomic forecast scenarios.

- *Traffic and Revenue Forecast*: C&M modeled and prepared T&R forecasts for two different scenarios: a scenario for the proposed Projects (i.e., SH 365 and the IBTC), and an SH 365-Only scenario that includes only some highway segments of SH 365.

ES.3. Traffic and Revenue Assumptions

C&M's T&R forecast is based on the following set of post-processing assumptions, some of which may differ depending upon whether the traveler remains exclusively within the United States or crosses the U.S./Mexican border. C&M determined that of the Projects' potential users, approximately 20 percent of those will have their origins or destinations in Mexico.

The following T&R assumptions were used in this study:

- The Projects are expected to open to traffic by July 1, 2018.
- Traffic and revenue were forecasted for a 40-year period beginning in 2018.
- Trucks were assumed to have an average of 3.9 axles for internal trucks and 4.9 for external trucks.
- All revenues are expressed in nominal dollars. C&M used the average CPI from the Dallas Forth Worth and Houston Metropolitan Area forecasted by Moody's to inflate the revenue forecast.
- While a number of new toll roads are scheduled to open within the next five years in the Rio Grande Valley of South Texas, the fact remains that the region currently has no toll roads, and the only existing tolled facilities are the international bridges. Therefore, during its analysis, C&M was aware that many drivers in the area may be unfamiliar with the notion of road pricing and, consequently, reluctant to use the new toll roads. This may result in an extended ramp-up period (i.e., the time it takes for traffic volumes to reach their full potential after the opening of a new toll facility). For the analysis, trucks are expected to utilize the facilities at a slightly higher rate than cars throughout the ramp-up period. In addition, C&M also expected passenger car motorists on the U.S. side of the border to become familiar with the toll roads more quickly than those Mexican drivers crossing the border on a regular basis. Ramp-ups for cars and trucks start at a modest 50 and 60 percent, respectively, during the Projects' opening year.
- Tolls will be collected by means of ETC or video recognition. The video toll rates are assumed to be 150% of the ETC rates to compensate the offset of additional costs associated with the video tolling recognition and billing method.
- In the Projects' opening year, ETC penetration—referring to the percentage of all toll transactions collected electronically—was assumed to be 50–60 percent for U.S. customers (passenger vehicles and trucks) and 30–50 percent for border-crossing customers. These percentages were assumed to reach an eventual maximum of 80 percent for U.S. customers and 60–70 percent for border-crossing customers. In fact, C&M's SP survey in earlier projects found that more than 70 percent of automobile travelers said they would be likely to utilize the ETC system. ETC penetration for trucks was assumed to be higher than that for autos due to the operational characteristics of truck traffic.

- For this study, the ETC leakage rate was assumed to be 1 percent, enough to account for any uncollected revenue from ETC customers as a result of system deficiencies.
- A video violation rate was applied in order to make up for revenue lost as a result of deficiencies in the video transaction system and potential toll evaders. An effective video toll factor of 32 percent was assumed for all customers in the opening year.
- In order to obtain annual T&R figures, C&M estimated equivalent revenue days of 350 for cars (365 for border-crossing cars) and 280 for trucks (275 for border-crossing trucks), a result of its analysis of weekday and weekend traffic counts.
- Only the roadway improvements from the Hidalgo County MTP 2010–2035 and TIP have been implemented within the model.
- It was assumed that the use of alternative modes of transportation in the area of influence would remain unchanged during the forecast period.
- Gasoline availability and prices were assumed to remain at levels that would not significantly affect traffic.
- Federal and state fuel taxes would not change to a degree that would affect travel behavior.
- The proposed toll road would be efficiently maintained for the length of the forecast period.

ES.4. Traffic and Revenue Results

Table ES-1 and Table ES-2 present the predicted annual transactions for the Projects (Scenario 1) and the SH 365-Only scenario (Scenario 2), respectively. For Scenario 1, transactions are shown for SH 365, the IBTC, and both facilities combined. Table ES-3 and Table ES-4 present the predicted annual revenue for the Projects and the SH 365-Only scenario, respectively. All results are based on the most likely (i.e., Base) socioeconomic forecast and have the same toll rates per mile.

Table ES-1. SH365 and IBTC Annual Transactions– Base Scenario

Year	SH365 Annual Transactions (in Thousands)			IBTC Annual Transactions (in Thousands)			Total Annual Transactions (in Thousands)		
	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total
2018	1,895	420	2,315	565	150	715	2,460	570	3,030
2030	12,630	2,700	15,330	3,740	1,060	4,800	16,370	3,760	20,130
2035	14,560	3,170	17,730	4,580	1,300	5,880	19,140	4,470	23,610
2040	16,500	3,660	20,160	5,550	1,590	7,140	22,050	5,250	27,300
2050	20,430	4,710	25,140	7,470	2,190	9,660	27,900	6,900	34,800
2057	22,970	5,430	28,400	8,120	2,390	10,510	31,090	7,820	38,910

Table ES-2. SH365 only Annual Transactions- Scenario 2

Year	SH365 Annual Transactions (in Thousands)		
	Auto	Truck	Total
2018	1,315	205	1,520
2030	8,210	1,250	9,460
2035	9,190	1,420	10,610
2040	10,140	1,600	11,740
2050	12,120	2,000	14,120
2057	13,360	2,270	15,630

Table ES-3 SH365 and IBTC Annual Revenue– Base Scenario

Year	SH365 Annual Revenue (in Thousand Nominal Dollars)			IBTC Annual Revenue (in Thousand Nominal Dollars)			Total Annual Revenue (in Thousand Nominal Dollars)		
	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total
2018	$845	$630	$1,475	$390	$380	$770	$1,235	$1,010	$2,245
2030	$10,300	$6,340	$16,640	$4,400	$3,820	$8,220	$14,700	$10,160	$24,860
2035	$13,510	$8,310	$21,820	$5,910	$5,120	$11,030	$19,420	$13,430	$32,850
2040	$17,040	$10,670	$27,710	$7,960	$7,050	$15,010	$25,000	$17,720	$42,720
2050	$26,360	$17,190	$43,550	$13,290	$12,240	$25,530	$39,650	$29,430	$69,080
2057	$34,550	$23,130	$57,680	$16,880	$15,650	$32,530	$51,430	$38,780	$90,210

Table ES-4 SH365 only Annual Revenue- Scenario 2

Year	SH365 Annual Revenue (in Thousand Nominal Dollars)		
	Auto	Truck	Total
2018	$630	$305	$935
2030	$6,990	$3,020	$10,010
2035	$9,360	$3,900	$13,260
2040	$11,510	$4,900	$16,410
2050	$17,280	$7,670	$24,950
2057	$22,290	$10,190	$32,480

1.Introduction

This report documents the Investment Grade Traffic and Revenue (T&R) Analysis conducted by C&M Associates, Inc. (C&M)—acting as an independent T&R consultant—for the proposed State Highway 365 (SH 365) and International Bridge Trade Corridor (IBTC) projects (the Projects) in Hidalgo County, Texas. This analysis will support the Hidalgo County Regional Mobility Authority (HCRMA) in their effort to finance the Projects by providing an Investment Grade T&R forecast for the Projects over a 40-year period.

1.1. Study Background

Figure 1-1 shows the study area and the Projects' locations. Hidalgo County's proximity to major industrial and retail centers on both sides of the U.S./Mexican border promotes constant economic growth in this region. Alongside economic growth, population and employment in Hidalgo County have grown faster than those in other border counties in Texas. From 2001 to 2012, population and employment grew by 2.9 and 2.8 percent, respectively. The Milken Institute ranked this metro area as one of the top ten best performing U.S. cities from 2005 to 2011.[1] According to the University of Texas-Pan American (UTPA) forecast, the population in Hidalgo County is expected to grow, with an annual average growth rate of about 1.7 percent from 2012 to 2035. In the same period, employment is expected to grow at a Compound Annual Growth Rate (CAGR) of approximately 1.8 percent.[2]

As a result of economic and population growth, the transportation needs in this region have been increasing. According to the Texas Department of Transportation (TxDOT), the Annual Average Daily Traffic (AADT) on the two major roadways in the urban area—U.S. Route 83 (US 83) and US 281—has grown by more than 3.5 percent during the 2000–2012 period. As part of its study on emission trends in different Texas counties, the Texas Transportation Institute (TTI) estimated that Vehicle Miles Traveled (VMT) has grown by an average annual growth rate of more than 4 percent between 1990 and 2012.[3] The study forecasts that VMT in Hidalgo County will grow by approximately 46 percent by 2030.

Hidalgo County and northern Mexico represent a highly integrated economic unit. Residents from both countries cross the border each day in search of consumer goods, personal services, and educational and employment opportunities. Businesses ship raw materials and unfinished goods to manufacturing facilities throughout the region for additional processing, final assembly, and distribution. Therefore, it is important to consider socioeconomic trends within the border area of Mexico, given the connection to activity in Hidalgo County.

Reynosa, the largest Mexican municipality near Hidalgo County, has shown a very fast rate of population growth in recent decades. From 1990 to 2000, the Reynosa municipality exhibited the second highest population growth rate in all of Mexico, with a CAGR of 4.48 percent.[4] From 2000 to 2010, the Reynosa municipality became the fastest growing municipality in Mexico, with a reported CAGR of 3.6 percent.[5]

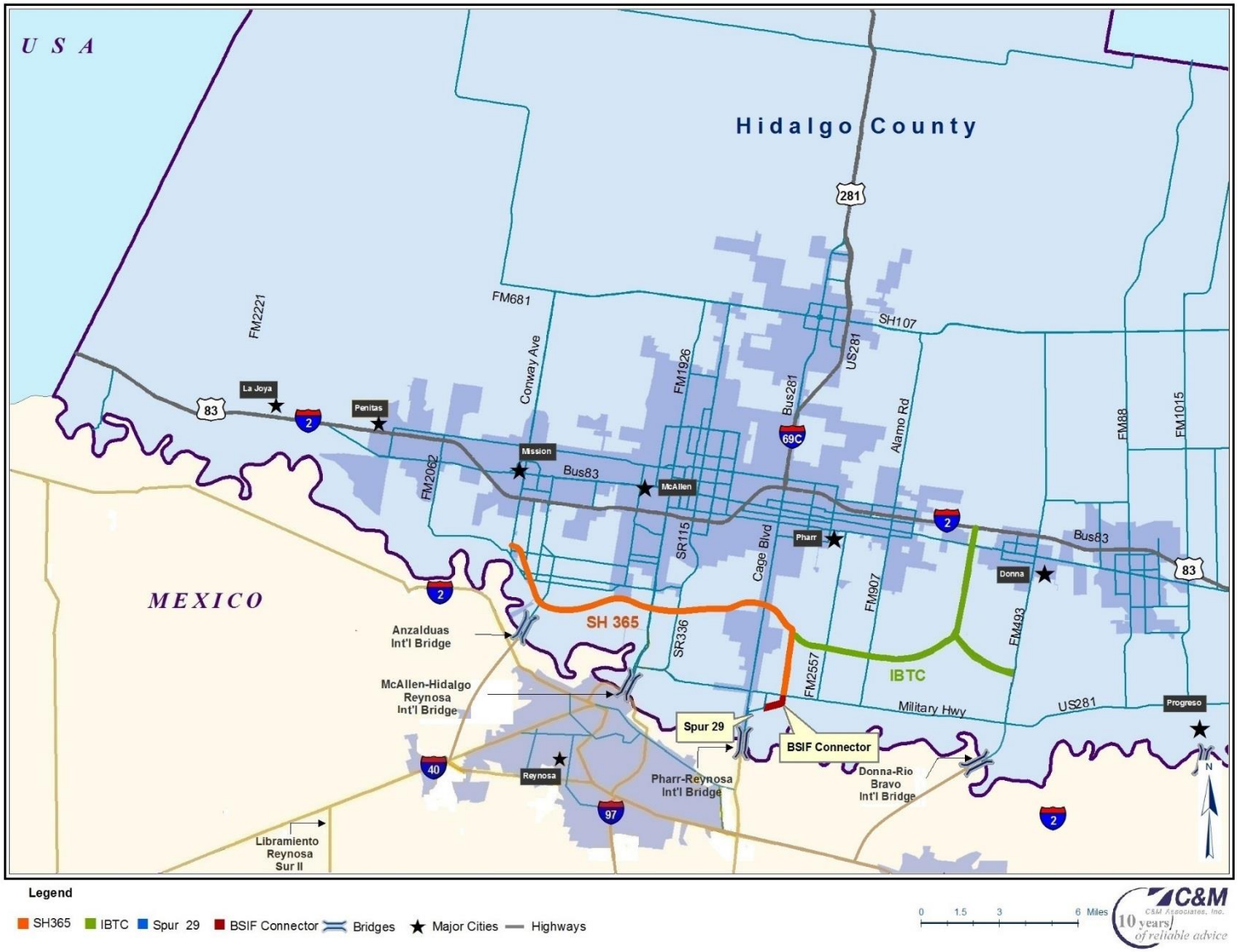

Figure 1-1. Project Location and Study Area

In addition to the truck traffic associated with the *maquiladora* industry, many other vehicles travel the roadways of the study area on a daily basis. These vehicles might include cross-border commuters destined for universities and other education centers, or commuters driving to their places of employment. Others might be crossing the border on their way to the many retail attractions located within the study area, or for other non-work related trips. Whatever the case, the combination of various traffic generators is unique to this region and has resulted in, and continues to contribute to, significant traffic growth in Hidalgo County. These conditions are expected to contribute to increasing congestion and pollution over time due to a lack of state funds with which to expand the existing, and already congested, traffic network.

To deal with future transportation needs, the Hidalgo Loop was proposed. Originally envisioned as a single project and now split into the proposed Projects, the Hidalgo Loop will eventually result in the formation of a loop around the metropolitan area of the cities of McAllen, Mission, Pharr, and Edinburg. In 2008, on behalf of Hidalgo County Road Builders (HCRB), C&M performed an intermediate level T&R study for the Loop project.[6] Then, in the second half of 2009, C&M studied traffic and revenue on two southern sections of the Loop—an east section and a west section—and presented HCRMA and First Southwest Company with an update of its earlier intermediate T&R study.[7] In 2010, C&M presented the first Investment Grade Study for the project.[8] This study was then updated in 2013.[9]

Based on the results of these studies, HCRMA decided to finance and build the following two projects:

- SH 365: 14.8 miles from Farm-to-Market Road 1016 (FM 1016/Conway Avenue) to US 281 (Military Highway).
- International Bridge Trade Corridor (IBTC): 12.3 miles from the intersection of SH 365 and FM 3072 (Dicker Road) to Interstate Highway 2 (IH2/US 83) and FM 493 to IH2 (US 83).

For the present T&R Investment Grade Analysis, C&M can build upon the previous knowledge and efforts related to the Projects, including the following traffic surveys:

- Commercial truck Origin and Destination (OD) and Stated Preference (SP) survey on the U.S./Mexican border crossings.
- Commercial company OD and SP survey.
- Regional intercept and off-side OD and SP survey using mail back, internet, and person-to-person interview methods.
- Person-to-person interviews with the Projects' stakeholders.
- A video license plate recording survey for vehicle OD on the major corridors.
- Several traffic count data collection efforts with automatic and manual counts, including turning movements and vehicle axle counts.

1.2. Objective and Scope of the Study

The aim of this Investment Grade T&R Analysis is to create traffic and revenue forecasts for the Projects. Results are expressed in annual toll transactions and toll revenue over a 40-year period beginning in 2018.

C&M T&R forecast methods and practices meet common standards and are accepted within the T&R business. Part of the scope for this study is an independent socioeconomic review of the study area conducted by a local economist from UTPA. Another improvement over previous studies is the possibility of a cellphone-based regional OD survey of the entire model area. The regional OD, as well as an extensive field data collection program, are the keys to calibrating the C&M Hidalgo County Travel Demand Model (CMHCTDM) to base year conditions. The field work scope includes traffic counts and a commercial truck OD survey on the U.S./Mexican Border. The CMCHTDM and socioeconomic forecast create the traffic demand for the Projects, which will ultimately lead to the final traffic and revenue figures.

1.3. Study Area

The focus of this study is on the southern part of Hidalgo County and includes both sides of the U.S./Mexican border. Figure 1-1 shows the study area and the location and alignment of the Projects. Major U.S. cities located within the study area include McAllen, Pharr, Mission, Alamo, and Donna in Texas; and Reynosa in Mexico. The study area features significant transportation generators such as industrial zones and shopping malls.

The area is served by two major roads: IH2 (US 83) and IH69C (US 281). IH2 is a major east-west travel corridor connecting the urban areas of Hidalgo County with those of neighboring Cameron County to the east and Starr County to the west. Many residential and commercial developments are located along the IH2 corridor.

IH69C is a north-south travel corridor which intersects US 83 just north of the City of Pharr, linking that city to the Pharr-Reynosa International Bridge located further south at the U.S./Mexican border. North of IH2, IH69C becomes a high speed roadway that connects Hidalgo County to northern destinations throughout the State of Texas and to the broader United States.

1.4. Project Description

The Projects will provide more efficient traffic movement and congestion relief for locals within the study area and for the traffic movements between the international bridges and IH2. The toll road will only have electronic and video toll systems installed, meaning that vehicles are not required to stop at any time when using this toll facility.

In the opening year, the Projects will be built with two mainlanes in each direction. They will be upgraded to three lanes per direction in 2035, providing a high-speed connection between the Pharr-Reynosa International Bridge, the Anzalduas International Bridge, the Alliance International Bridge, and IH2.

SH 365 is expected to be constructed as an extension from Military Road, west of FM 1016 towards the eastern section of S I Road crossing Cage Boulevard (US 281). It then runs north-south, meeting Military Highway (US 281) to the east of the Pharr International Bridge. SH 365 will have access to the Pharr International Bridge through Spur 29 at Cage Boulevard and the Border Safety Inspection Facility (BSIF) Connector at Military Highway, which is a toll-free road.

It is also expected that SH 365 will have an interchange with the IBTC, north of the Pharr Bridge, that will run west to east along FM 3072 (Dicker Road), allowing partial access to nearby intersecting roads, and that it will run from south to north before merging with US 83 between the cities of Alamo and Donna. Near Valley View Road, the IBTC will spur eastward and proceed to FM 493, which is the access road leading to the Alliance International Bridge. The existing FM 3072 has been developed as a frontage road for the IBTC.

1.5. Organization of the Report

This report is organized into six chapters, with the remaining chapters consisting of the following:

- Chapter 2 provides a review of existing traffic information, historical traffic trends and characteristics of existing traffic within the study area, including those typical of traffic crossing the U.S./Mexican border. Background information regarding the Mexican traffic network near the border, as well as a description of special programs that facilitate easier cross-border travel, are also provided in this chapter.
- Chapter 3 describes C&M's data collection efforts and the results of its traffic data analysis.
- Chapter 4 reviews and evaluates the study area's existing and projected socioeconomic data.
- Chapter 5 explains the travel demand modeling procedure undertaken by C&M in its effort to obtain traffic and revenue figures based on socioeconomic inputs and traffic characteristics within the study area.
- Chapter 6 summarizes the toll transactions and revenue projected by C&M for the proposed SH 365 and IBTC Projects, as well as an outline of results from various sensitivity analyses performed by C&M during the development of its T&R projections.

1.6. C&M Qualifications

C&M Associates, Inc. is a corporation founded by U.S. investors and by Cal y Mayor y Asociados, S.C., a premier Mexican engineering firm with offices and operations throughout Latin America. The combined experience of C&M Associates, Inc. and Cal y Mayor y Asociados, S.C., jointly referred to as C&M, comprises more than 25 years of U.S. and international T&R analysis. C&M's staff has vast experience in providing reliable and detailed traffic and revenue forecasts, as well as risk analysis, to turnpike authorities, trusts, bond underwriters, rating agencies, credit enhancers, bank lenders, and investors,

in both the United States and Latin America.

C&M's experience in P3 projects includes toll roads, toll tunnels, and toll bridges as well as HOT lanes, managed lanes, and projects with fixed, dynamic, and variable pricing, with a focus on congestion management and/or revenue maximization.

1.6.1. Traffic and Revenue Expertise

From 2005 to 2012, C&M has served as a prime traffic and revenue consultant, performing 142 traffic and revenue studies to date: 32 in the United States and the remainder in Mexico, Colombia, and Puerto Rico. This experience ranges from sketch to investment grade studies for the support of toll revenue bonds and bank debt on behalf of a variety of clients almost evenly distributed between public entities and private concessionaires. Of the 142 studies, 52 have been investment grade studies. More than $11 billion in bonds and debt, plus equity investments, have been supported by C&M's investment grade studies.

1.6.2. Recent Experience

Route 460 Investment Grade T&R Study, Virginia (2012) – Produced an investment grade T&R study to support the ultimate issuance of approximately $300 million in toll revenue bonds. The project consisted of constructing a 55-mile Greenfield toll road connecting the Richmond and Hampton Roads metropolitan areas.

PR-22 PR-5 and Dynamic Tolled Lanes Investment Grade T&R Study, Puerto Rico (2011) – As part of the investment grade traffic and revenue study performed on behalf of Citi Infrastructure Investors and CCR for the PR-22 and PR-5 in Puerto Rico privatization, C&M conducted an analysis of the proposed dynamic tolled lanes to be built in the western end of the San Juan metropolitan area. The work included a review of the operational implications of the added lanes and a T&R forecast.

North Tarrant Express Managed Lanes Investment Grade T&R Study, Texas (2008) – Provided forecasts to support the concession bid of Itinere North America. C&M's work included forecasting revenues for the concession period, an operational analysis—through micro-simulation—of the interaction between the managed lanes and the surrounding network and key interchanges, and presenting the results to financial advisors and lenders.

I-64 HOT Lanes Sketch Level T&R (2008) and Intermediate T&R (2012-2013) – Produced a preliminary T&R study of the possible development of I-64 High Occupancy Toll (HOT) Lanes by the Virginia Department of Transportation (DOT). The HOT lane analysis was performed in urban areas within a larger I-64 toll project in Virginia, from I-95 (east of Richmond) to the beginning of the Hampton Roads Bridge-Tunnel in Hampton Roads.

IH20 East Managed Lanes T&R (2008) – Produced sketch and subsequent intermediate T&R forecasts for the Public Private Initiative Program of the Georgia DOT. The analysis included the following: assessing the feasibility of a base case project and an extension alternative; forecasting traffic demand, project revenues, and the resulting toll rates of a free-flow throughput maximization strategy; interacting with the environmental review team to select geometric alternatives and ramp configurations; and conducting a micro-

simulation traffic operation analysis to identify potential issues in the interaction of the managed lanes with the general purpose lanes and surrounding network.

I-70 Mountain Corridor RFP Development and Proposal Review, Colorado (2012) – Provided the High Performance Transportation Enterprise division of the Colorado DOT with Request for Proposal (RFP) Language Development Assistance and RFP Response Evaluation Assistance regarding the scope and adequacy of traffic and revenue, and regarding conclusions presented by the proposers to develop managed lanes along the corridor as a co-development agreement.

Midtown Tunnel / Downtown Tunnel / MLK Freeway Extension T&R Study and Review (2009–2011) – Intermediate level T&R study, in which C&M advised the Virginia DOT in the procurement of the Downtown Tunnel / Midtown Tunnel / MLK Freeway Extension project in Norfolk and Portsmouth, Virginia. The project comprised a new two-lane tunnel parallel to the existing Midtown Tunnel, maintenance and safety improvements to the existing Midtown and Downtown Tunnels, and extension of the MLK Freeway to Interstate 264. C&M reviewed the project sponsor's T&R forecast and provided the Virginia DOT with advice during contract negotiations.

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[1] Milken Institute (2010). Best-performing cities: Large cities 2010. Retrieved from http://www.best-cities.org/bestcities.taf?rankyear=2010&type=Large-Cities-Rankings

[2] Center for Border Economic Studies (2014). *Hidalgo county tract level socioeconomic forecast*. Edinburg, TX: University of Texas-Pan American.

[3] Texas Transportation Institute (2008). County Population, VMT, CO, CO, VOC, NOx, SO, NH, and PM Trends for 1990 – 2040. Retrieved from ftp://amdaftp.tceq.texas.gov/pub/Mobile_EI/Trends/m62/Trends_Charts_Report .pdf

[4] Instituto Nacional de Estadistica y Geografía (INEGI) (2000). Tamaulipas: Perfil sociodemográfico. *XII Censo General de Población y Vivienda 2000*. Retrieved from http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/censos/poblacion/2000/perfiles/perfil_tams_1.pdf

[5] INEGI (2011). Principales resultados del Censo de Población y Vivienda 2010: Tamaulipas. *Censo de Población v Vivienda.* Retrieved from http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/censos/poblacion/2010/princi_result/tamps/28_principales_resultados_cpv2010.pdf

[6] C&M Associates, Inc. (2009). *Hidalgo County Loop Intermediate Traffic and Revenue Study*. Dallas, TX: Author.

[7] C&M Associates, Inc. (2009). *Hidalgo County Loop Intermediate T&R Forecast Update* [Memorandum]. Dallas, TX: Author.

[8] C&M Associates, Inc. (2010). *Hidalgo County International Bridge Trade Corridor Investment Grade Traffic and Revenue Study*. Dallas, TX: Author.

[9] C&M Associates, Inc. (2013). *Hidalgo County Loop (SH 365 and IBTC) Intermediate Traffic and Revenue Study***.** Dallas, TX: Author.

2. Existing Traffic Information

This chapter presents an overview of existing traffic-related data corresponding to the study area, including the historical data of nearby roadway networks and International Bridges, historical trends, and the current traffic pattern that has been used for the study's traffic forecast. The traffic pattern of the study area is strongly affected by the cross-border traffic; therefore, the last section of this chapter discusses border trends and policies.

C&M updated the existing traffic data, which were collected in the previous studies, to analyze traffic pattern changes within the study area. The following two sections discuss the existing roadway networks and related historical traffic data in Hidalgo County and in Mexico near the border (i.e., in and around the city of Reynosa), respectively.

2.1. Existing Roadway Network: Hidalgo County

Hidalgo County has two major traffic corridors: IH2 (US 83) traveling east-west and IH69C (US 281) traveling north-south. Additionally, a minor but nevertheless important east-west corridor is Military Highway (US 281), which serves as the major connection between Hidalgo County and Cameron County after IH2. Finally, given the high proportion of truck traffic in the study area, it is necessary to consider specific truck road corridors in Hidalgo County. The following sections describe the characteristics and functions of these corridors, as well as provide corresponding historical traffic data.

2.1.1. IH2 (US 83)

IH2 (US 83) is the major east-west limited-access regional highway in Hidalgo County, running parallel to the border with Mexico for approximately 48 miles. Within the study area of Hidalgo County, IH2 (US 83) extends from Sullivan City at the Starr County line on the west to the city of Mercedes at the Cameron County line on the east. Beyond the study area, the road continues out of Hidalgo County into the City of Harlingen in Cameron County to the east and to the City of Laredo in Webb County to the west.

IH2 (US 83) connects most of the major cities in Hidalgo County with outlying counties to the west and with Brownsville and South Padre Island to the east, making it a crucial industrial, retail, and recreational link within the region. Its traffic pattern is influenced not only by trucks coming from and going to the industrial zones within the study area, but also by retail shoppers driving to malls along the expressway, vacationers traveling to South Padre Island resorts, and daily commuters.

The only major interchange along IH2 (US 83) within the study area is located at the junction of IH69C (US 281), a leading roadway that provides access to northern destinations in Hidalgo County and the rest of Texas, as well as to southern destinations in Mexico. This interchange is currently working near capacity, with low speeds during peak times.

Within the study area, US 83 runs from approximately 1.5 miles east of Peñitas at its westernmost point, to the Cameron County line at its easternmost point, and functions as an expressway with overpasses, frontage roads, and entrance and exit ramps at major

crossroads. Figure 2-1 below presents historical Annual Average Daily Traffic (AADT) volumes at both ends of IH2 (US 83) within Hidalgo County and near its interchange with US 281. As expected, the traffic increases with proximity to the interchange. Overall, traffic has exhibited an average annual growth of about 3.0 percent since 2000 near the more densely populated areas west of US 281 and Mercedes. Near La Joya, the CAGR has remained at 0.0 percent since 2000.[1]

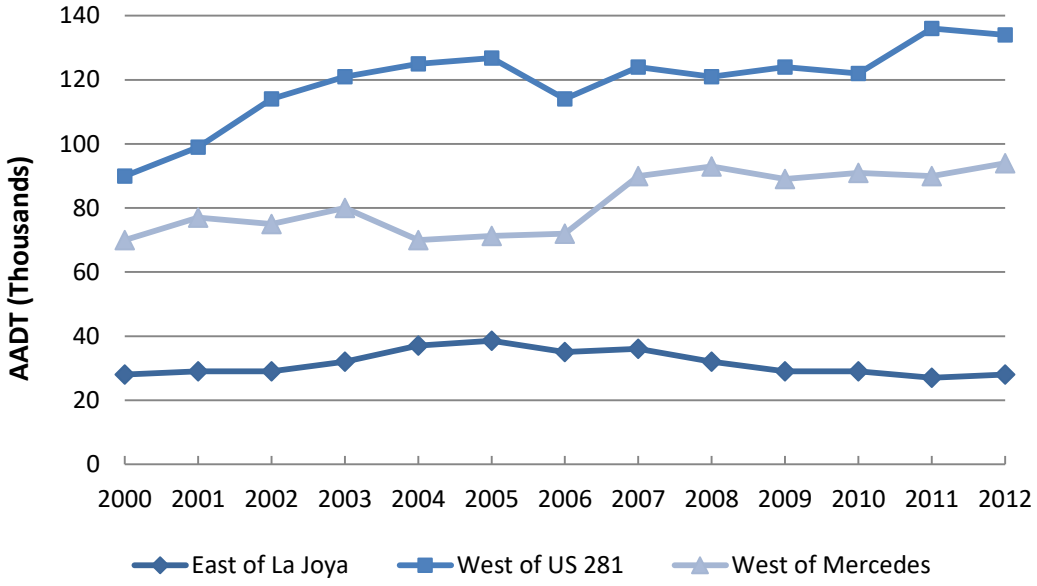


Figure 2-1. IH2 (US 83) AADT at Selected Locations

2.1.2. IH69C (US 281)

This section focuses on the north-south direction of IH69C (US 281) from the Pharr International Bridge to the north county line, approximately 50 miles to the northern end of Hidalgo County. The portion of US 281 known as Military Highway—the east-west direction between the Pharr International Bridge and the east county line—is described in the next section.

Just south of its interchange with IH2 (US 83), US 281 serves as a signalized main street through the City of Pharr. In addition to the numerous retail properties located near this corridor, there are also low density residential areas scattered along the southbound path of US 281, as well as agricultural and industrial zones where it approaches the international bridge at the US/Mexico border. North of IH2 (US 83), this facility becomes a limited-access highway—indeed, Hidalgo County's most crucial north-south route—connecting Hidalgo County not only to San Antonio and other northern Texas cities, but to the rest of the country.

IH69C plays a critical role within Hidalgo County: This single roadway is the county's link to the Pharr International Bridge, important industrial parks, major retail centers, IH2, and, by way of San Antonio, to the rest of Texas and the interstate highway system. Because IH69C (US 281) is the only major roadway within the study area by which long haul trucks can reach their nationwide destinations, the traffic pattern of this road is greatly influenced

by international trucks going to and coming from the study area's industrial zones. Traffic on IH69C (US 281) is also significantly affected by the large number of retail shoppers who use this roadway to access area malls, as well as by daily commuters.

The only interchange along IH69C (US 281) is where it meets IH2 (US 83). This interchange currently is working near or above capacity. The IH2 (US 83) and IH69C (US 281) interchange is by far the most congested within the study area during peak periods. According to INRIX's 2013 national traffic scorecard, the McAllen-Edinburg-Mission Metropolitan Area was ranked 78th in national congestion based on the congestion at the US 83/US 281 interchange.[2] Traffic congestion is mostly a result of the high volume of traffic that merges from IH2 (US 83) into IH69C (US 281). Figure 2-2 presents historical AADT volumes at selected locations along IH2 and US 281: south of Military Highway near the Pharr International Bridge, near the northern Hidalgo County line just south of FM 490, and north of IH2 (US 83). Similar to IH2 (US 83), IH69C (US 281) has exhibited a CAGR of 2.6 percent since 2000.[3]

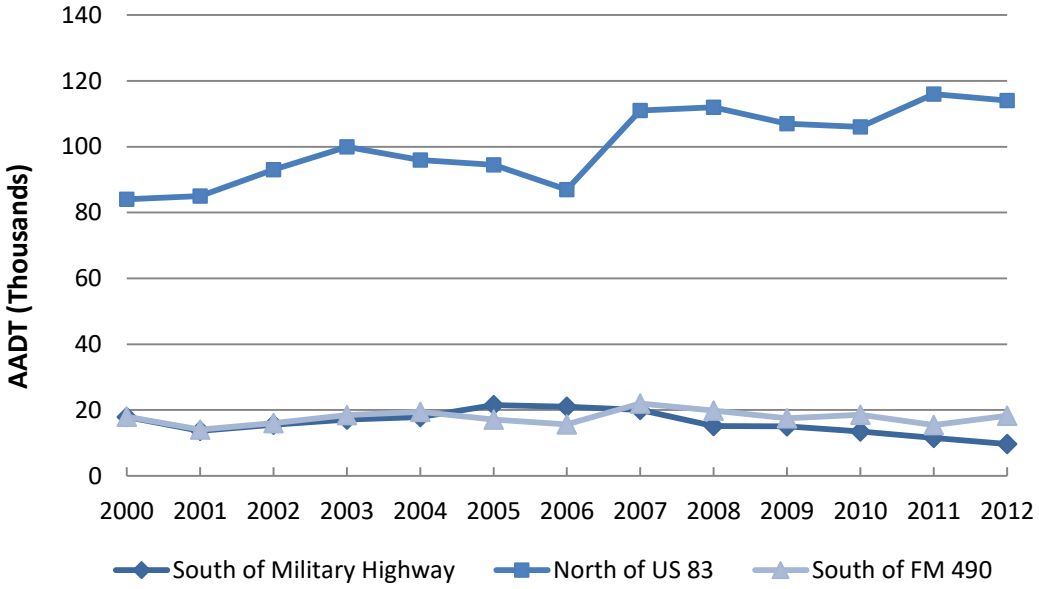


Figure 2-2. IH69C (US 281) AADT at Selected Locations

2.1.3. Military Highway (US 281)

In the past, Military Highway (US 281) was a major east-west truck corridor, but recently its traffic pattern has become more closely aligned with that of commuters, tourists, and retail shoppers. This has resulted in a reduced Level of Service (LOS) for truckers, forcing many of them to opt for alternate routes. Recent improvements on Military Highway east of US 281 Cage Blvd, in the form of bypass lanes, have improved the LOS for a few segments. Trucks now encounter large numbers of passenger cars traveling to and from the many residential and retail developments between the Pharr International Bridge and the Hidalgo International Bridge. West of the Pharr International Bridge, Military Highway is a four-lane local access road with traffic signals and turning bays at all major intersections. This section of the road is located near major shopping outlets, business

centers, and industrial parks. East of the Pharr International Bridge, Military Highway is a two-lane farm-to-market road primarily serving the agricultural needs of local farmers. Figure 2-3 presents historical AADT volumes at selected locations along Military Highway (US 281). As with the previous two corridors, traffic has exhibited high growth near the more densely populated or industrial areas, but the overall CAGR has been less than 1.0 percent since 2000.[3]

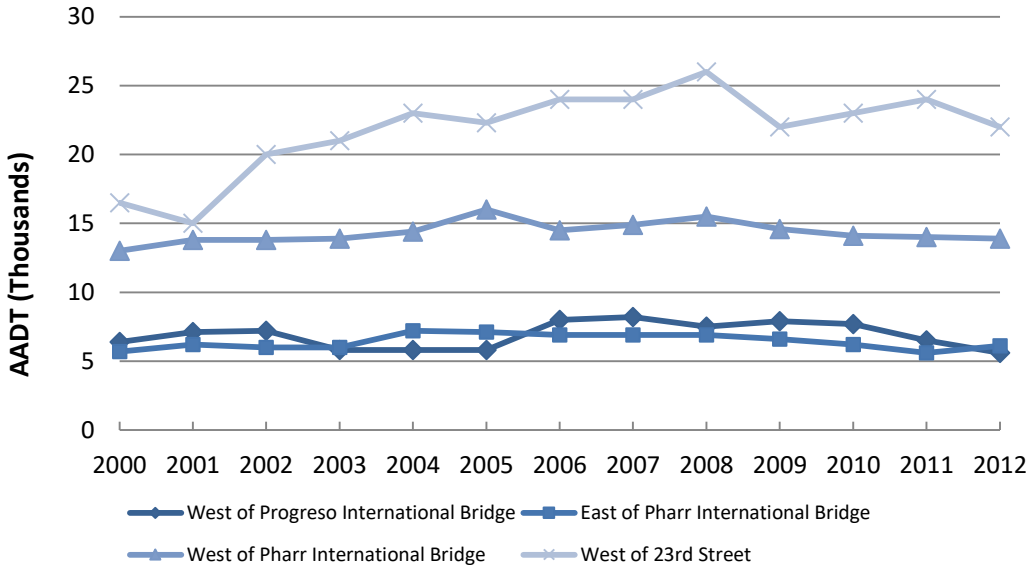


Figure 2-3. Military Highway (US 281) AADT at Selected Locations

2.1.4. Dicker Road/Jackson Road Corridor

Dicker Road and Jackson Road provide an alternative route to the congested Military Highway (US 281) for heavy trucks traveling north from the Pharr-Reynosa International Bridge. Typically, after crossing the Pharr-Reynosa International Bridge, most truckers will proceed north onto Jackson Road and then west on Dicker Road until they reach 10th Street and the McAllen Foreign Trade Zone (MCFTZ).

Both facilities are two-lane local access roads with traffic signals at major intersections. Although they have succeeded in helping reduce the high volume of truck traffic on Military Highway (US 281), the spillover of that traffic has caused these roadways to suffer the effects of increased heavy truck traffic, including reduced LOS and conflicts with passenger vehicles. Figure 2-4 depicts historical AADT volumes at selected locations along the Dicker/Jackson Road truck corridor. As with the other corridors, a high CAGR overall is observed here, with the section west of the Pharr International Bridge exhibiting a CAGR as high as 7.0 percent.[3]

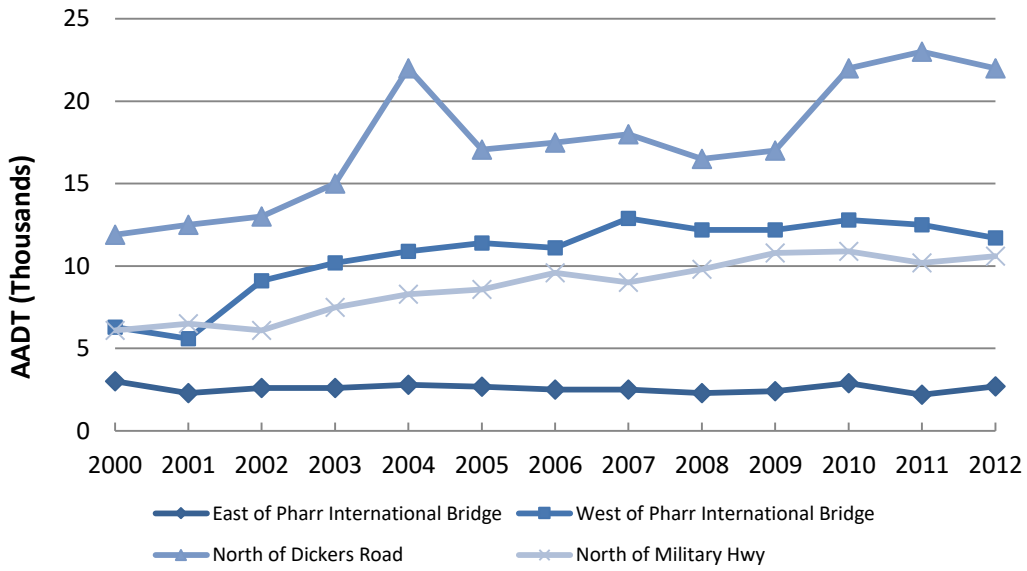
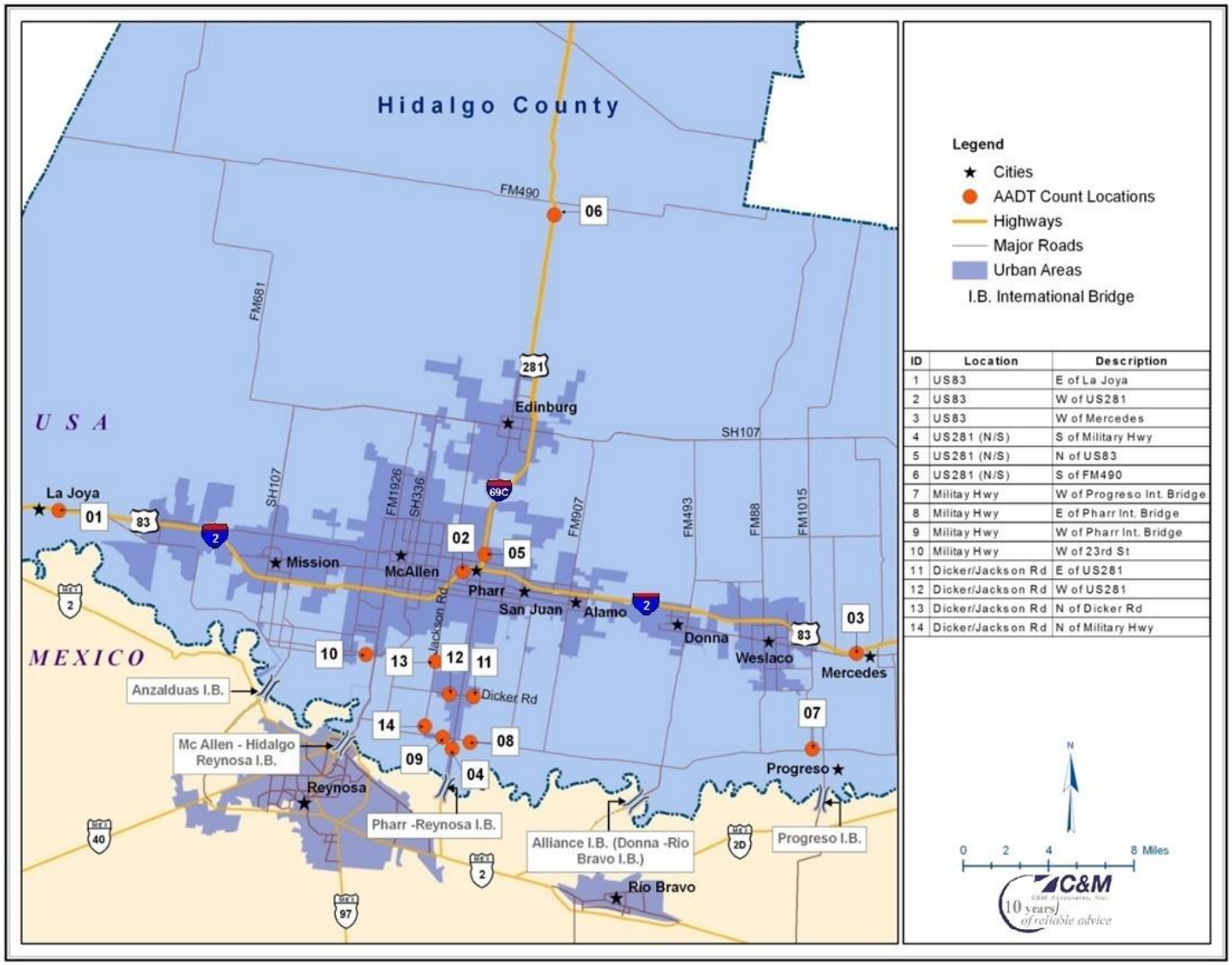


Figure 2-4. Dicker/Jackson Rd AADT at Selected Locations

Figure 2-5 below presents a map of the AADT count locations corresponding to the Hidalgo County roadway network facilities described above.



ID	Location	Description
1	US83	E of La Joya
2	US83	W of US281
3	US83	W of Mercedes
4	US281 (N/S)	S of Military Hwy
5	US281 (N/S)	N of US83
6	US281 (N/S)	S of FM490
7	Military Hwy	W of Progreso Int. Bridge
8	Military Hwy	E of Pharr Int. Bridge
9	Military Hwy	W of Pharr Int. Bridge
10	Military Hwy	W of 23rd St
11	Dicker/Jackson Rd	E of US281
12	Dicker/Jackson Rd	W of US281
13	Dicker/Jackson Rd	N of Dicker Rd
14	Dicker/Jackson Rd	N of Military Hwy

Figure 2-5. Representative AADT Locations

2.2. Existing Roadway Network: Reynosa, Mexico

The traffic network in and around the Mexican city of Reynosa comprises three major federal roads and two important toll roads. The following paragraphs discuss the major roads that impact the study area; Figure 2-6 presents a map of these roads.

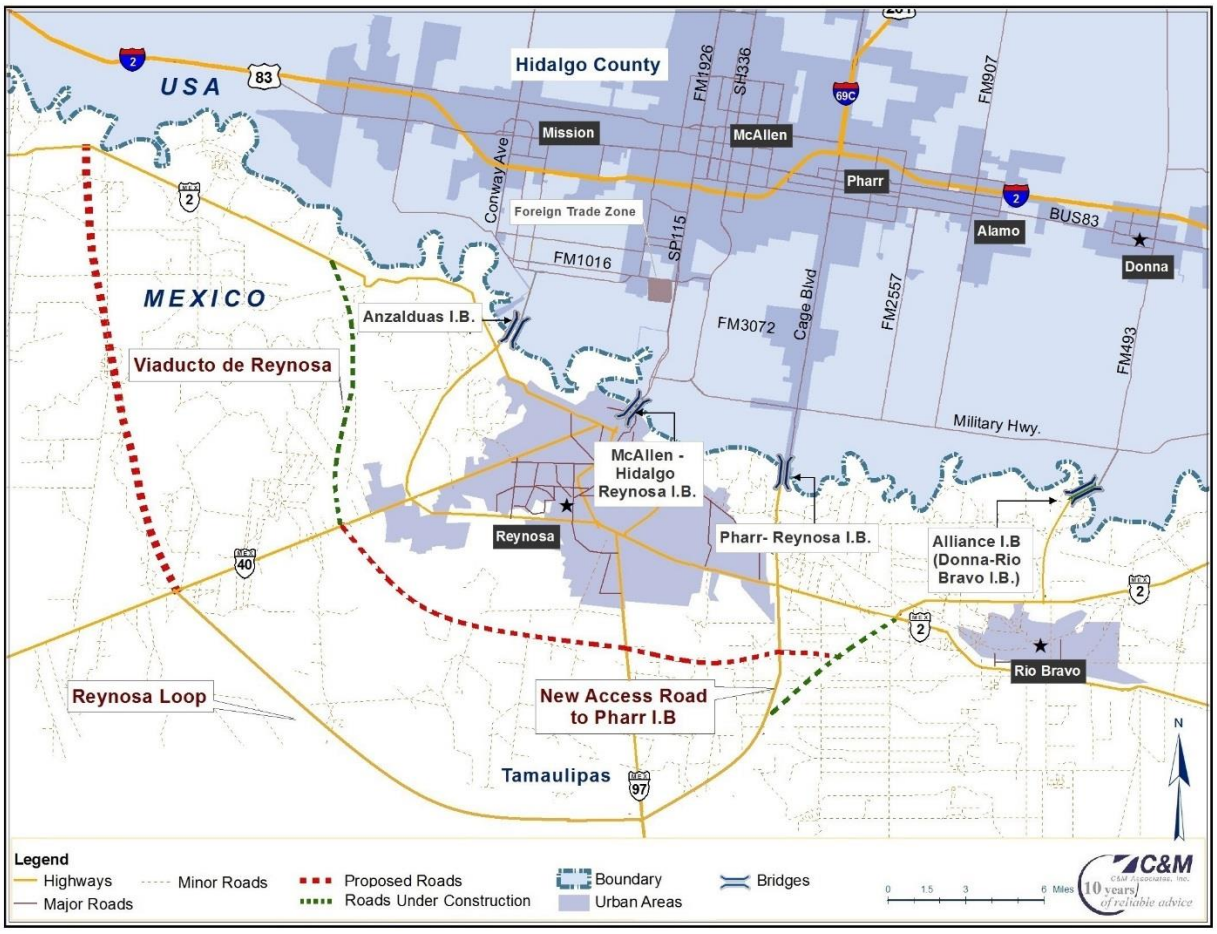


Figure 2-6. Mexican Road Network

2.2.1. Highway 40/40D: Cadereyta - Reynosa (MEX40/40D)

Highway 40/40D connects the City of Reynosa to the City of Monterrey, Mexico's leading industrial center located in the State of Nuevo Leon. Highway 40 is a four-lane facility with turning bays and traffic signals in the vicinity of Reynosa. On the state line between Tamaulipas and Nevo Lean, this Highway becomes a toll road (Highway 40D). This road meets Highway 2 (discussed below), thereby allowing access to the McAllen-Hidalgo-Reynosa International Bridge and the Pharr-Reynosa International Bridge. AADT on the free highway section near the state limit is approximately 12,000.[4]

2.2.2. Highway 2/2D: Reynosa Matamoros (MEX2/Med2D)

Highway 2/2D connects Reynosa to Nuevo Laredo, in the Mexican state of Tamaulipas, on the west and to Matamoros, also in Tamaulipas, on the east. Highway 2 is a four-lane facility with turning bays and traffic signals in the vicinity of Reynosa. A portion of Highway 2 runs through downtown Reynosa, connecting it to the McAllen-Hidalgo-Reynosa International Bridge by way of local streets. There is a major interchange east of Reynosa which connects Highway 2 to the Pharr-Reynosa International Bridge, and further east, minor access roads provide access to the Progresso International Bridge. Highway 2 divides east of Reynosa into the toll-free Highway 2 and the toll road Highway 2D; these two roads join again west of the city of Matamoros. AADT on Highway 2 west of Reynosa is approximately 8,000.[4] Toll Road 2D links Highway 2 with the Progreso International Bridge and the *maquiladora* area of Rio Bravo, in the Mexican state of Tamaulipas. Toll Road 2D is a four-lane limited-access highway with overpasses at major crossroads in the area. AADT on this road is approximately 3,000.[4]

2.2.3. Highway 97 (MEX97)

Highway 97 not only connects the City of Reynosa with Ciudad Victoria, the capital city of the State of Tamaulipas, but also provides access to Mexican ports along the Gulf of Mexico and to the rest of the state. Highway 97 is a four-lane facility with turning bays and traffic signals in the vicinity of Reynosa. This road connects to Highway 2, thereby allowing access to the McAllen-Hidalgo-Reynosa International Bridge and the Pharr-Reynosa International Bridge. AADT on this road is approximately 4,500.[4]

2.2.4. Reynosa Loop (Libramiento Reynosa Sur II)

Traffic using the McAllen-Hidalgo-Reynosa International Bridge previously had to use the congested local streets of Reynosa City. With the opening of the Anzalduas International Bridge, the Alliance International Bridge, and the Ryenosa Loop (Libramiento Sur II), travelers from outside Reynosa are able to avoid the local streets of Reynosa on their way to the United States. Trucks also have a direct connection between the Pharr International Bridge and the Reynosa Loop, which has especially improved the connection for trucks coming or going to Monterrey. The average travel speed is estimated to be approximately 56 mph. Due to the wide shoulder, this operates as a super two-lane highway, which gives slower vehicles the possibility to move to the far right of the extra-large shoulder to let faster vehicles pass.

2.2.1. Historical AADTs and Seasonality

Figure 2-7 shows the AADT growth on Highway 40D and 2D from 2006 to 2012, and Figure 2-8 presents the seasonal variation at selected locations.

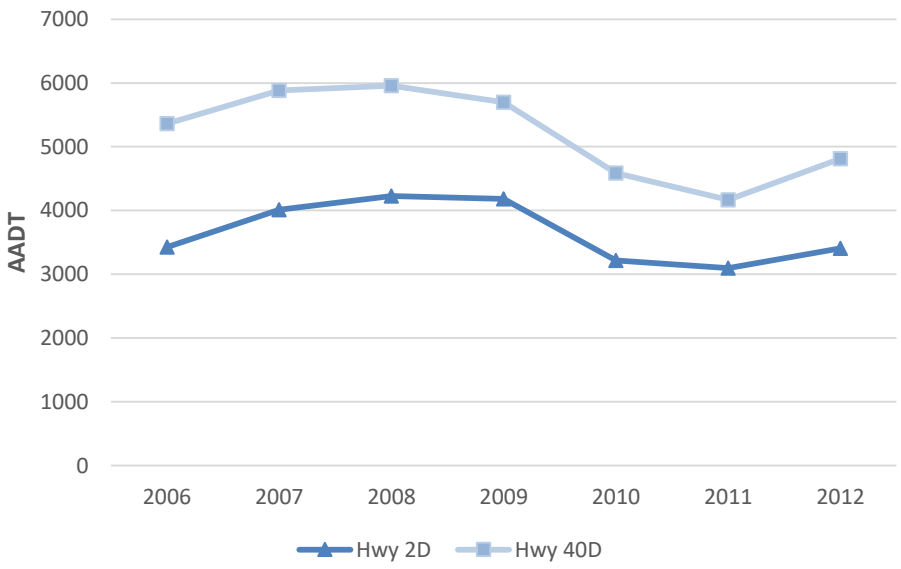


Figure 2-7. AADT at Highway 2D and 40D

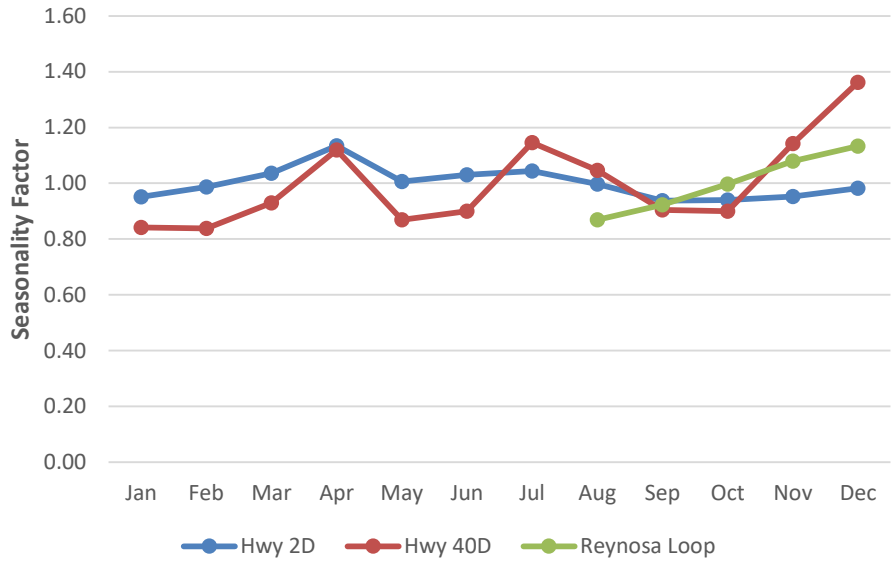


Figure 2-8. Seasonal Variation of Highway 2D, 40D, and Reynosa Loop

On the above presented graphs it can be seen that the national traffic volumes towards Reynosa were also affected by *Operation Michoacán*, the escalation of drug violence, further discussed in this chapter. In terms of seasonality, it can be observed that the highest traffic volume is in the months typically associated with vacations such as Easter, summer, and Christmas.

2.3. International Bridges

2.3.1. Hidalgo County Bridges

There are five international bridges connecting Hidalgo County to the Mexican city of Reynosa, thus providing access to retail, industrial, and educational centers on both sides of the border. A map showing the location of these bridges along Hidalgo County's southern border with Mexico can be found in Chapter 1: Introduction (Figure 1-1). Information about each of these bridges, based on visits and interviews with stakeholders, can be summarized as follows:

- Anzalduas International Bridge: This bridge is operated by the City of McAllen and connects the McAllen Foreign Trade Zone-MCFTZ and surrounding industrial areas (via a new access road at Bryan Road and US 83) to Reynosa's western *maquiladora* parks and Mexican highway 40. The bridge has one four-lane span, as well as immigration, customs, and TxDOT facilities. This bridge has a Secure Electronic Network for Travelers' Rapid Inspection (SENTRI) lane in the U.S. portion. The Bridge only serves passenger cars, since trucks will not be allowed to use it until 2015.
- McAllen-Hidalgo-Reynosa International Bridge: This bridge is operated by the City of McAllen and connects Hidalgo County to downtown Reynosa. This bridge has two spans, with four lanes in the southbound direction and four lanes in the northbound direction. It also includes a SENTRI lane that became operational in August 2006 and a READY lane, which is a special lane that uses Radio Frequency Identification (RFID) technology to speed up the border crossing process. The bridge also has immigration and customs facilities as well as the highest passenger car volumes in Hidalgo County. Trucks have not been allowed to use the northbound direction of this bridge since 1996.
- Pharr-Reynosa International Bridge: This bridge is operated by the City of Pharr and connects Reynosa's eastern *maquiladora* parks and Mexican Highway 2 to the Pharr Industrial Park, the MCFTZ, and local retail and tourist centers. It is currently the biggest truck traffic crossing within the study area. It has one four-lane span as well as immigration, customs, and TxDOT facilities. The Free and Secure Trade (FAST) lane program began to operate in late 2004. This bridge has a SENTRI lane and a recently opened READY lane.
- Alliance International Bridge: This bridge was completed in December 2010. It is operated by the City of Donna and links that city to the *maquiladora* industrial area in the Mexican city of Rio Bravo, as well as to toll road 2D in Mexico. The bridge has four lanes in each direction and permits access to only passenger cars. Trucks will also be allowed access by the time the Projects are built. This bridge includes a READY lane and also has immigration, customs, and TxDOT facilities.
- Progreso International Bridge: This privately-owned bridge is operated by the B&P Bridge Company and connects the U.S. border city of Progreso with the Mexican border city of Nuevo Progreso, linking the retail, medical, and tourist centers of both sides. Within the study area, this bridge is the primary means by which trucks

transport bulk materials back and forth across the border. This bridge has two spans: one with four lanes for passenger vehicles (two lanes in each direction) and one with two lanes for trucks. Both spans have immigration and customs facilities.

Table 2-1 presents annual data regarding northbound passenger vehicles and trucks crossing Hidalgo County bridges.[5] The data show a steady decline in passenger car crossings after the events of September 11, 2001, when excessive delays at the border became commonplace, forcing many travelers to consolidate their trips. The current state of the economy has also played a role in reducing the number of passenger cars crossing bridges at the border. In contrast, truck crossings have experienced steady growth rates since 1994, when the North American Free Trade Agreement (NAFTA) went into effect.

Table 2-1. Yearly Traffic for Hidalgo County International Bridges since 1995: Northbound

Hidalgo County Bridges		
Year	Passenger Cars (Thousands)	Trucks (Thousands)
1995	6,553	198
1996	7,122	229
1997	7,599	254
1998	8,192	282
1999	9,471	342
2000	9,866	386
2001	8,685	388
2002	9,350	414
2003	8,321	426
2004	8,305	477
2005	7,974	515
2006	7,491	489
2007	7,819	528
2008	7,859	520
2009	6,969	465
2010	6,172	503
2011	5,706	496
2012	5,849	526
2013	5,848	553

Source: RITA

Table 2-2 shows the percentage share of Hidalgo County bridges. The Pharr-Reynosa International Bridge opened in 1995, attracting trips from the other two area bridges. It specifically removed trucks from the northbound direction of the McAllen-Hidalgo-Reynosa International Bridge, which no longer accepts trucks. The Pharr-Reynosa International Bridge is now the main point of entry for international trucks in the area, averaging an annual growth rate of 2.4 percent between 2000 and 2013.

Table 2-2. Hidalgo County Bridge Percentages Shares

Year	Passenger Cars					Trucks	
	Hidalgo	Pharr	Anzalduas	Donna	Progreso	Pharr	Progreso
2000						97%	3%
2001						95%	5%
2002						94%	6%
2003						95%	5%
2004	63%	24%			13%	95%	5%
2005	67%	21%			13%	95%	5%
2006	64%	23%			13%	94%	6%
2007	64%	23%			13%	92%	8%
2008	63%	26%			11%	91%	9%
2009	65%	23%	1%		11%	90%	10%
2010	51%	24%	16%	1%	9%	91%	9%
2011	40%	22%	17%	7%	15%	91%	9%
2012	35%	22%	18%	8%	16%	92%	8%
2013	33%	22%	17%	10%	18%	92%	8%

Truck traffic has suffered under the pressure of the economic downturn, when it experienced a CAGR of -12.0 percent at the end of 2009, signaling a considerable reversal of the positive trend it had enjoyed since 1995, when truck traffic grew at a CAGR of 8.0 percent. While this downward trend was cause for concern, it has begun to show signs of easing since 2010.

2.3.2. Cameron County Bridges

There are four international bridges connecting Cameron County to the Mexican city of Matamoros, thus providing access to retail, industrial, and educational centers on both sides of the border. A map showing the location of these bridges along Cameron County's southern border with Mexico can be found in Chapter 1: Introduction (Figure 1-1). Information about each of these bridges, according to TxDOT,[6] can be summarized as follows:

- Brownsville & Matamoros International Bridge: This privately-owned bridge is operated by the B&M Bridge Company and connects the U.S. border city of Brownsville with the Mexican border city of Matamoros. There are two bridges at this crossing. The old bridge consists of a single railroad track and two commercial lanes, one in each direction. The new bridge expansion consists of four lanes, two in each direction. It is used exclusively for noncommercial vehicles. The southbound pedestrian sidewalk is located on the old bridge, while the northbound pedestrian sidewalk is located on the new bridge expansion. Trucks have not been allowed to use this bridge since 1999. All commercial vehicles began using the Veterans International Bridge at Los Tomates.
- Gateway International Bridge: This is operated by the City of Brownsville and consists of two bridges, with a total of four lanes. One bridge has two lanes for southbound traffic, while the other has two lanes for northbound traffic.

Commercial vehicles are no longer allowed on either bridge. This crossing stopped processing northbound commercial vehicles on April 30, 1999. Southbound commercial vehicles were stopped on February 28, 2001. At that time, all commercial vehicles in the area began using only the Veterans International Bridge. Oversize/overweight commercial vehicles with permits can travel on SH 48/SH 4 between this bridge and the Port of Brownsville. This bridge includes a READY lane.

- Veterans International Bridge: This four-lane bridge, operated by the City of Brownsville, carries commercial vehicles, passenger vehicles, and pedestrians. A FAST lane opened in 2004 and a SENTRI lane became operational in August 2006.
- Los Indios International Bridge: This four-lane bridge is owned jointly by Cameron County and the Cities of Harlingen and San Benito. It connects the U.S. border city of Los Indios with the Mexican border city of Matamoros.[7]

Table 2-3 presents annual data regarding northbound passenger vehicles and trucks crossing Cameron County bridges.[8] As with Hidalgo County, the data show a steady decline in passenger car crossings after the events of September 11, 2001. Table 2-4 shows the percentage share of Cameron County bridges.

Table 2-3. Yearly Traffic for Cameron County International bridges since 1995: Northbound

Cameron County Bridges		
Year	Passenger Cars (Thousands)	Trucks (Thousands)
1995	5,768	224
1996	6,074	226
1997	6,161	248
1998	6,513	277
1999	7,579	304
2000	7,877	299
2001	7,548	252
2002	7,897	249
2003	7,220	229
2004	7,211	226
2005	7,104	235
2006	6,968	243
2007	6,477	239
2008	6,567	222
2009	5,513	190
2010	4,640	207
2011	4,123	208
2012	4,262	218
2013	4,277	208

Source: RITA

Table 2-4. Cameron County Bridge Percentages

Year	Passenger Cars				Trucks	
	B&M	Gateway	Veterans	Free Trade	Veterans	Free Trade
2000	34%	30%	27%	8%	79%	21%
2001	30%	30%	31%	9%	89%	11%
2002	26%	31%	33%	10%	90%	10%
2003	24%	31%	34%	10%	90%	10%
2004	24%	32%	34%	11%	90%	10%
2005	23%	31%	35%	11%	89%	11%
2006	24%	31%	35%	11%	89%	11%
2007	26%	31%	32%	11%	84%	16%
2008	36%	27%	26%	12%	84%	16%
2009	43%	24%	24%	9%	88%	12%
2010	29%	27%	32%	12%	86%	14%
2011	29%	29%	31%	10%	85%	15%
2012	31%	29%	30%	10%	87%	13%
2013	35%	30%	26%	9%	89%	11%

2.3.3. Shipment Types by Bridge

C&M noted in previous studies that for a future truck forecast, it is crucial to not only look at the overall growth pattern, but to observe the growth trends of the goods that are shipped on every single bridge. Along the entire Mexican/U.S. border, the International Port of Entries have specialists for certain types of goods. This specialization for certain goods affects the historical growth rates as well as the future forecast of the truck crossings. Figure 2-9 through Figure 2-11 illustrate historical trends regarding the amount of goods imported, by category.

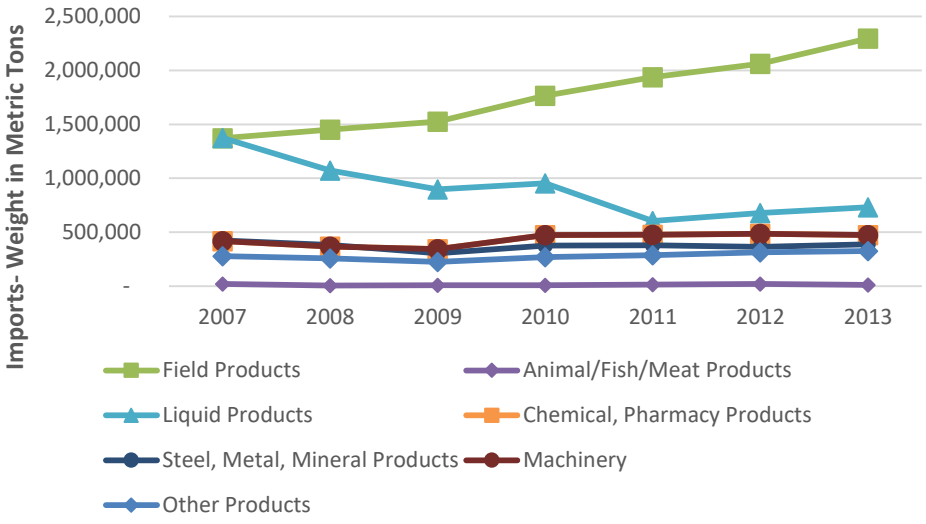


Figure 2-9 Hidalgo Bridge – Import Weights in Metric Tons

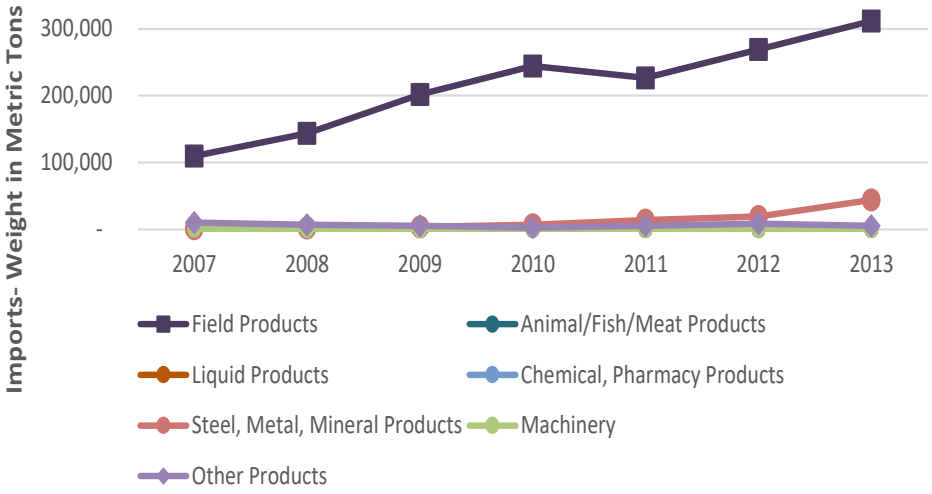


Figure 2-10 Progreso Bridge – Imports Weights in Metric Tons

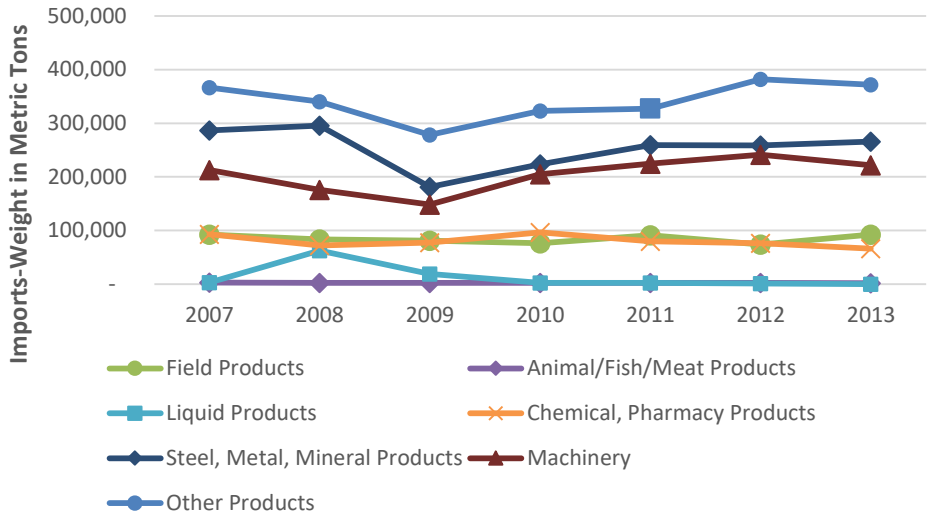


Figure 2-11 Brownsville Bridge – Imports Weights in Metric Tons

As can be seen from Figure 2-9, Hidalgo Bridge imports a majority of field products, followed by liquid products and machinery, and Figure 2-10 shows that more than 85 percent of imports on Progreso Bridge consist of field products. For Brownsville Bridge, the primary import is miscellaneous products followed by steel/metal/mineral products and machinery, as shown in Figure 2-11. It is also important to note that the weight magnitude of imports is much higher through the Hidalgo Bridge compared to the other two bridges.

2.4. Seasonality

Seasonal variation is an important factor to consider when making annual projections, as it can have a significant impact on traffic patterns. The following information outlines the effects of seasonal changes on traffic patterns within the study area.

2.4.1. International Bridge Crossing Seasonality

Figure 2-12 and Figure 2-13 depict monthly passenger vehicle factors for Hidalgo and Cameron county bridges, respectively, from 2010-2013, while Figure 2-14 and Figure 2-15 presents similar data for trucks.[9]

For both counties, passenger vehicle patterns indicate an increase in traffic during the Christmas and Easter months, seasons of the year when Mexican citizens typically go on holiday. From 2011 to 2013, the seasonal traffic is highest in December for passenger vehicles in both counties. Average monthly factors for passenger vehicles range from 0.91 to 1.13 for Hidalgo County and 0.91 to 1.09 for Cameron County, which show a distinct seasonality. For corresponding truck data, monthly factors show a greater variation of 0.9 to 1.14 for Hidalgo County and 0.87 to 1.1 for Cameron County, which indicate strong seasonality. Truck volumes are at their lowest during the summer months and during the December holiday season; the highest volumes are observed primarily in March or April.

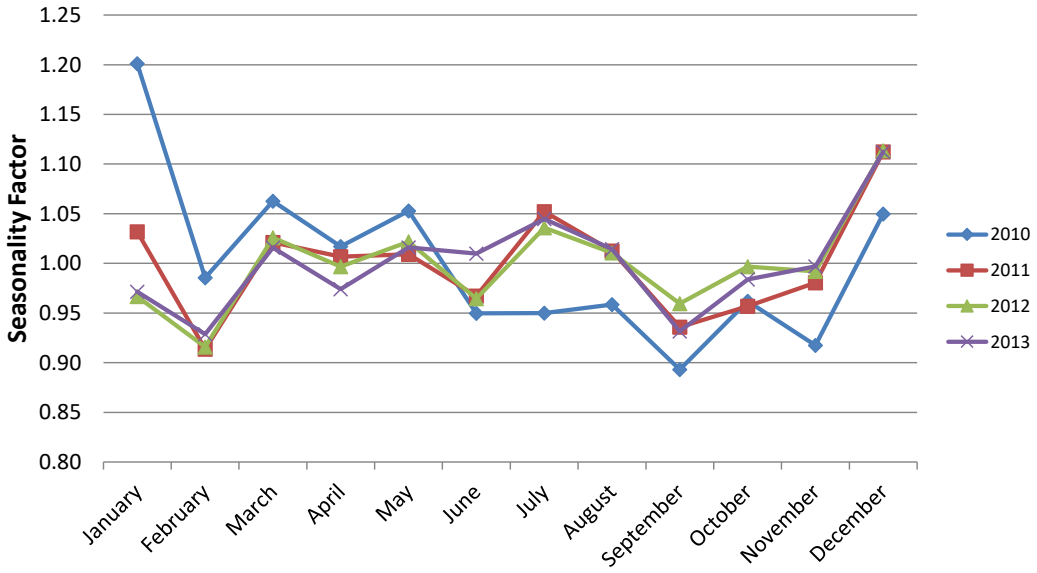


Figure 2-12. Passenger Vehicle Seasonality Factors at Hidalgo County Bridges

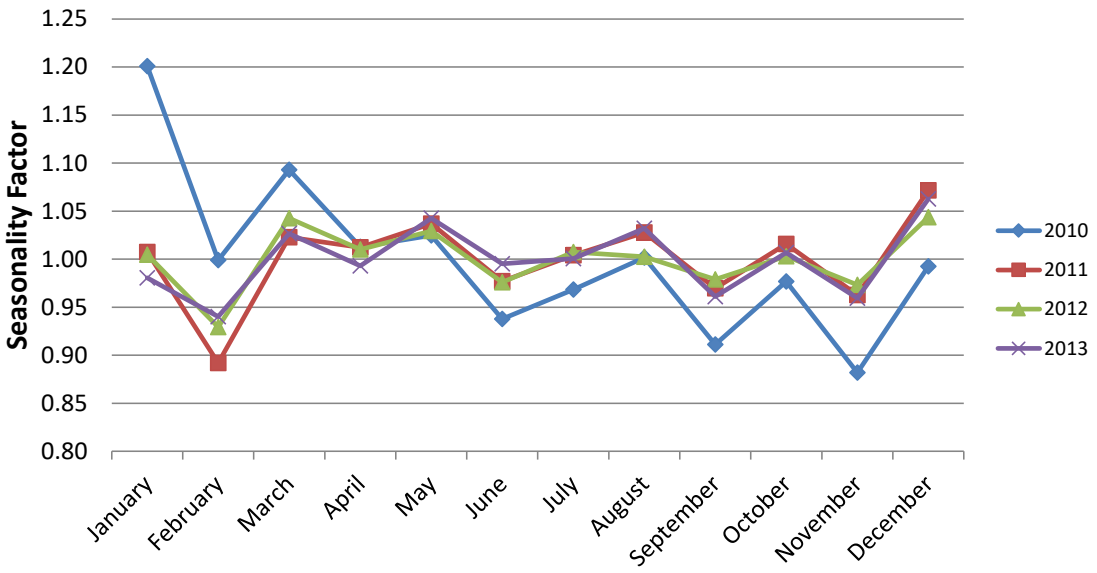


Figure 2-13. Passenger Vehicle Seasonality Factors at Cameron County Bridges

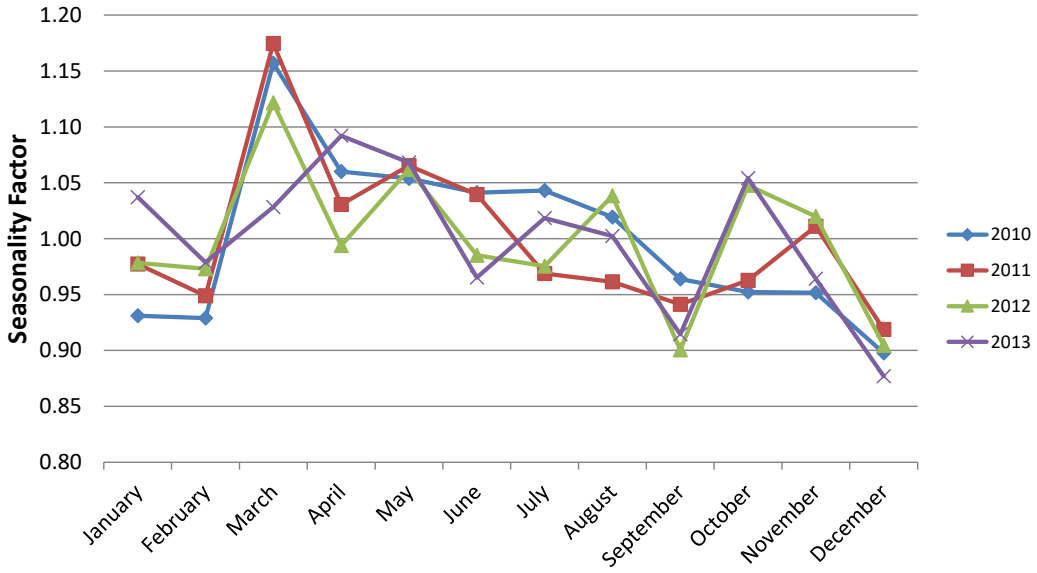


Figure 2-14. Truck Seasonality Factors at Hidalgo County Bridges

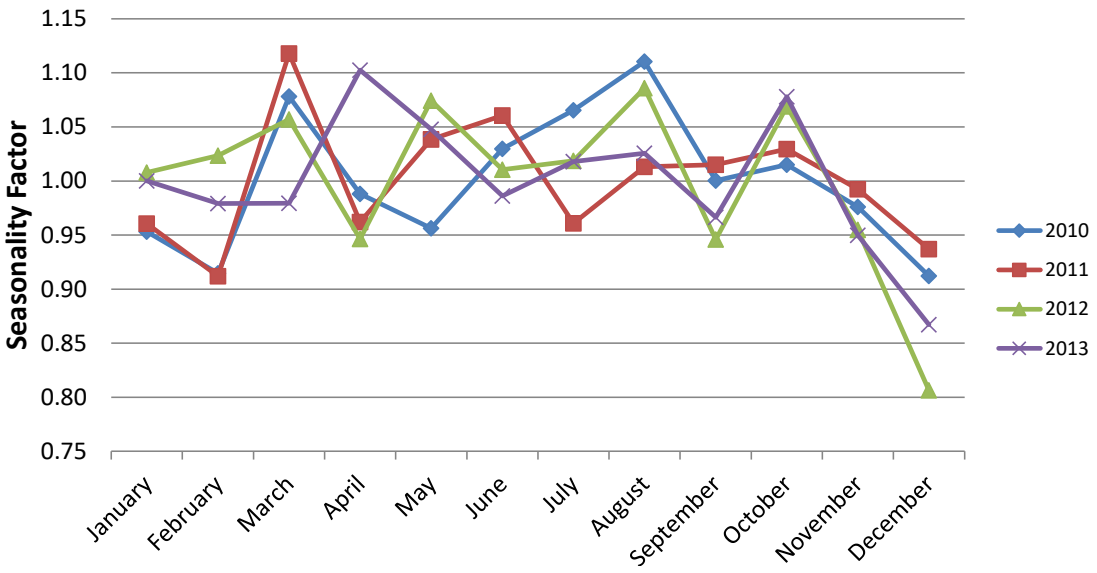


Figure 2-15. Truck Seasonality Factors at Cameron County Bridges

2.4.2. Seasonal Data in Other Locations in the Study Area

TxDOT maintains 10 permanent counting stations in the Pharr District (see Figure 2-16). Selected stations relevant to this study are listed below.

- US 83: 0.2 miles west of FM1426 in Pharr, Texas: Station S143
- US 83: 0.2 miles west of SP374 in Mission, Texas: Station S159
- US 281: 7.4 miles south of U.S.83 in Pharr, Texas: Station S173
- BU83S: 1.3 miles east of U.S.281 in Pharr, Texas: Station A327
- US 281: 7.4 miles south of U.S.83 in Pharr, Texas: Station S2102
- US 281: 9.3 miles north of SH186 in N of Edinburg, Texas: Station S235
- FM 396: 0.6 miles south of FM 1016 in Hidalgo, Texas: Station S300
- SH 336: 3.5 miles south of SH107 in McAllen, Texas: Station S69
- US 281: 0.1 miles east of FM1015 in Progreso, Texas: Station S2103

Numbers from these locations are reported as seasonal variation in Average Daily Traffic (ADT) by month, so their patterns are characteristic of both commuter and commercial traffic, as described in previous sections.

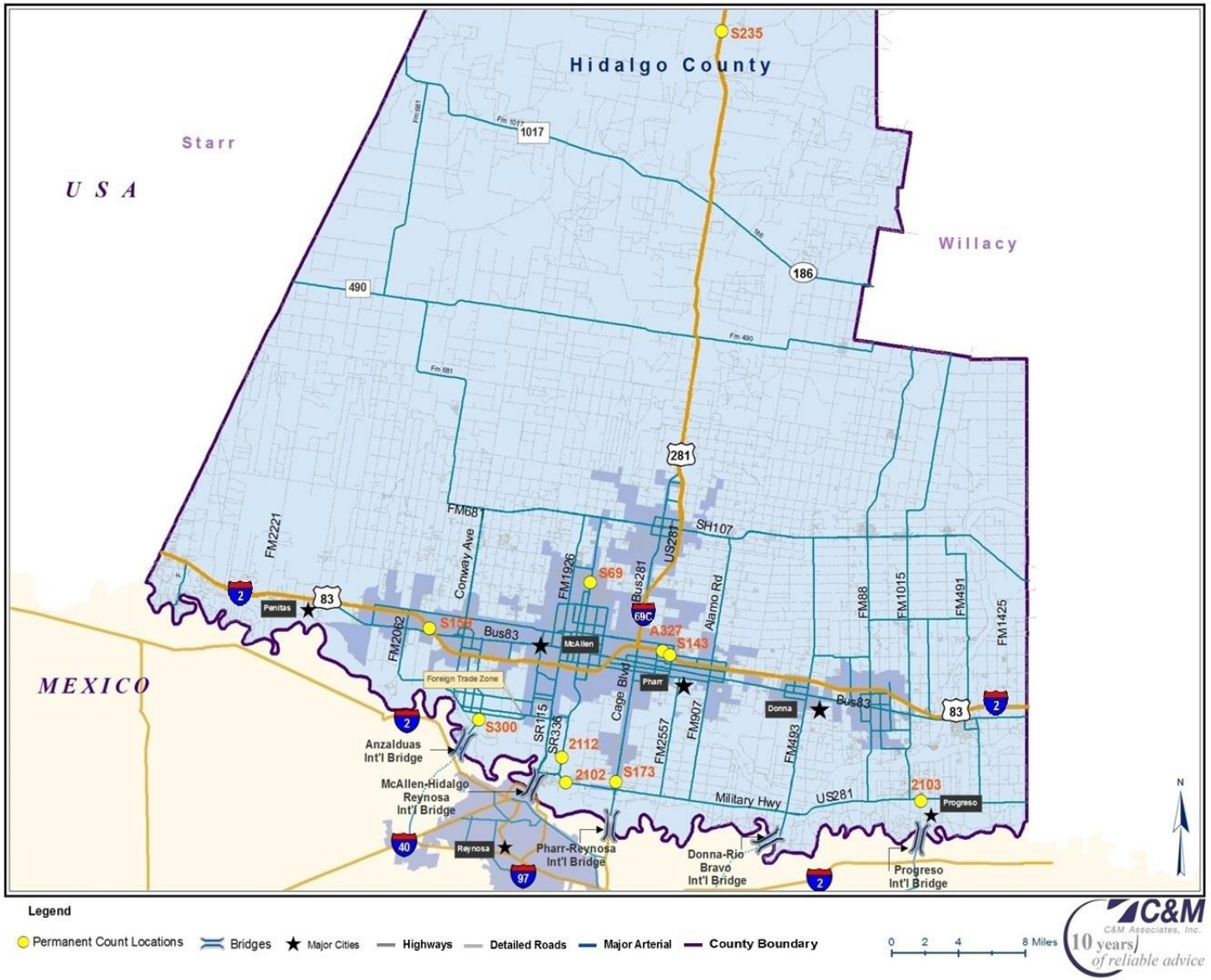


Figure 2-16. Permanent Count Locations

Figure 2-17 and Figure 2-18 show seasonal variations at mentioned stations within and outside the Projects area. Average monthly factor ranges from 0.93 to 1.09 for these stations, which indicates strong seasonality, with the Easter season standing out as a high traffic period and the summer months reflecting the lowest numbers.[10]

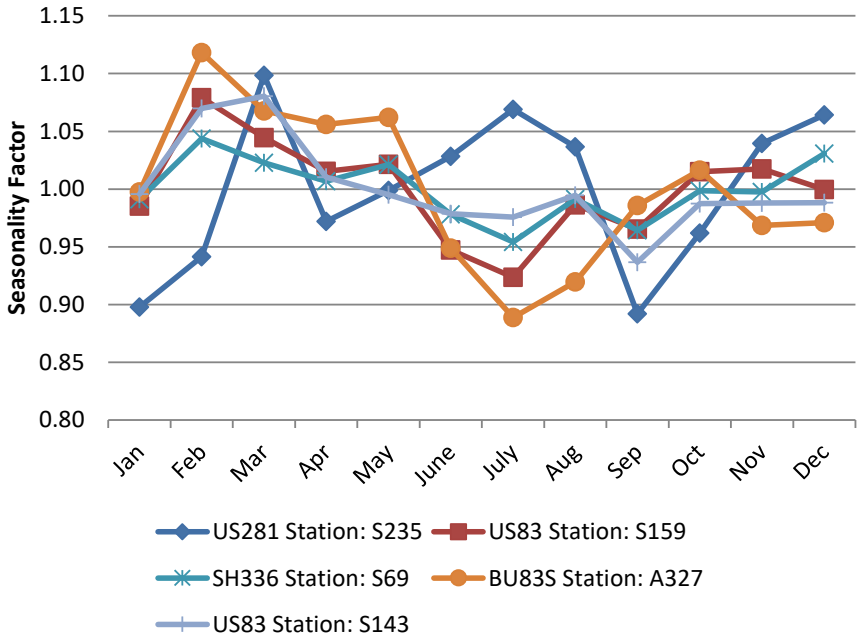


Figure 2-17 Seasonal Variations at Selected Permanent Count Stations

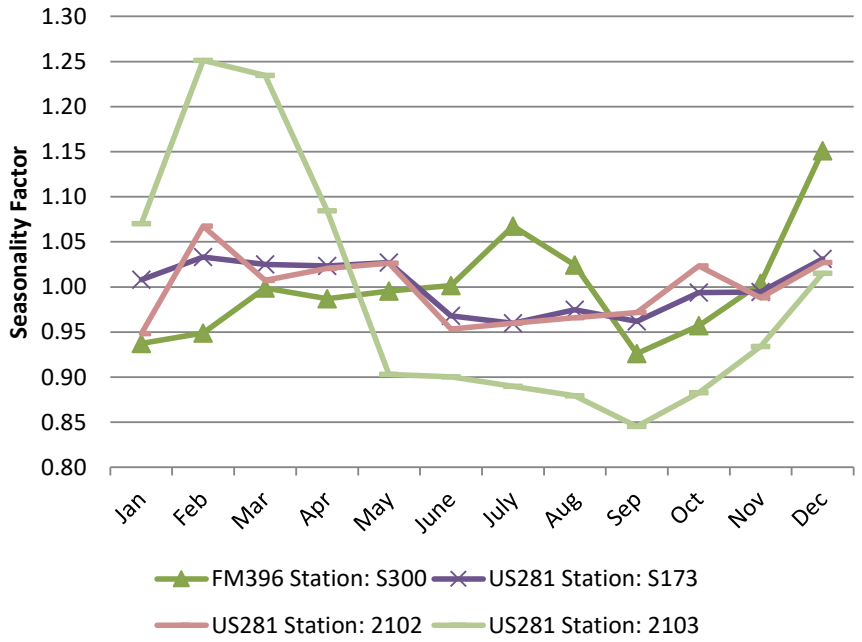


Figure 2-18 Seasonal Variations at Other Selected Permanent Count Stations

Figure 2-19 presents weekly traffic profiles for a subset of the mentioned stations. As can be seen, weekdays exhibit more traffic than weekends. Traffic trends and magnitudes are similar in both directions except for US 281 Station S235, which is far north of US 83.

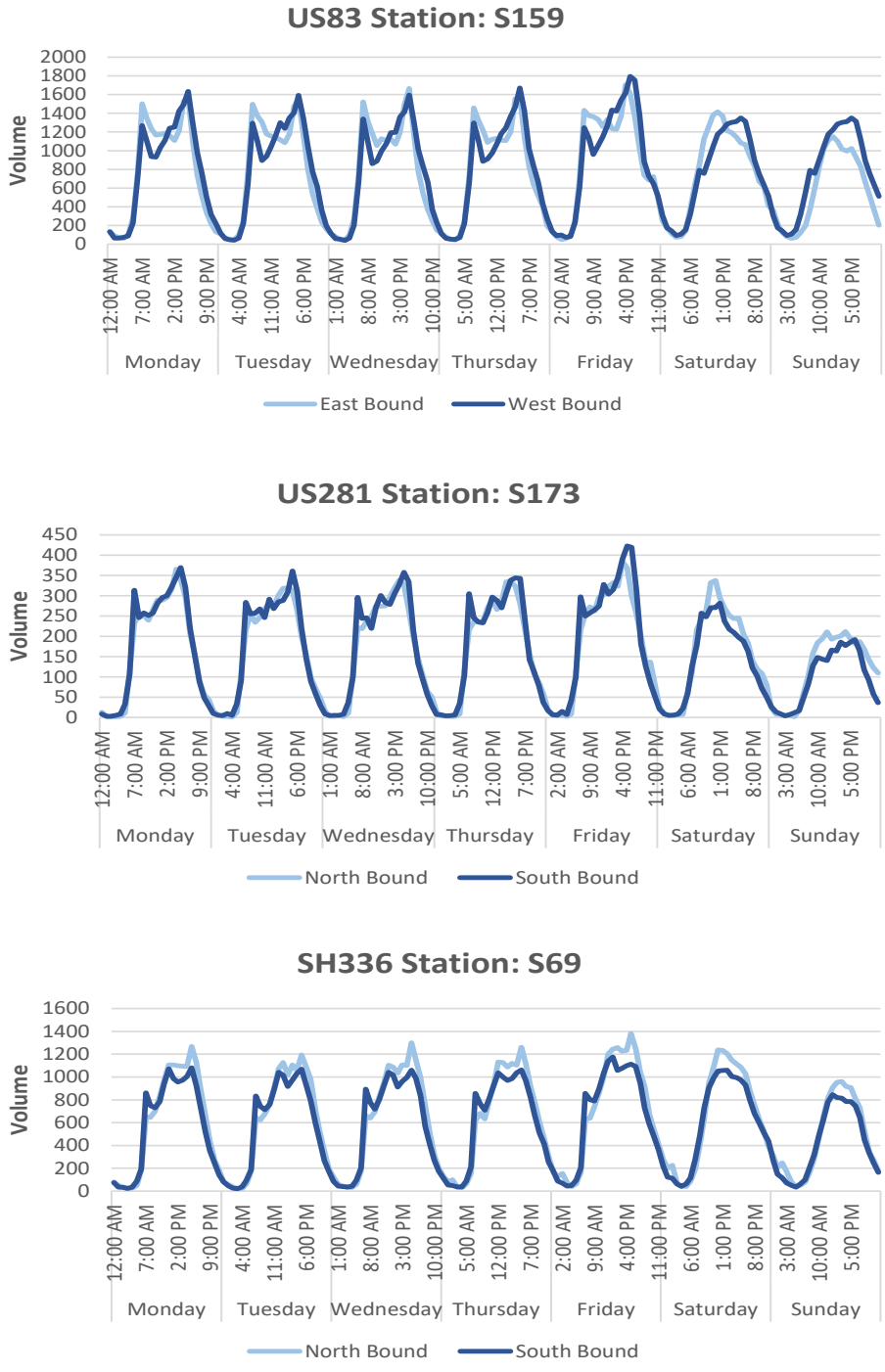


Figure 2-19. Weekly Traffic Profile at Selected Stations

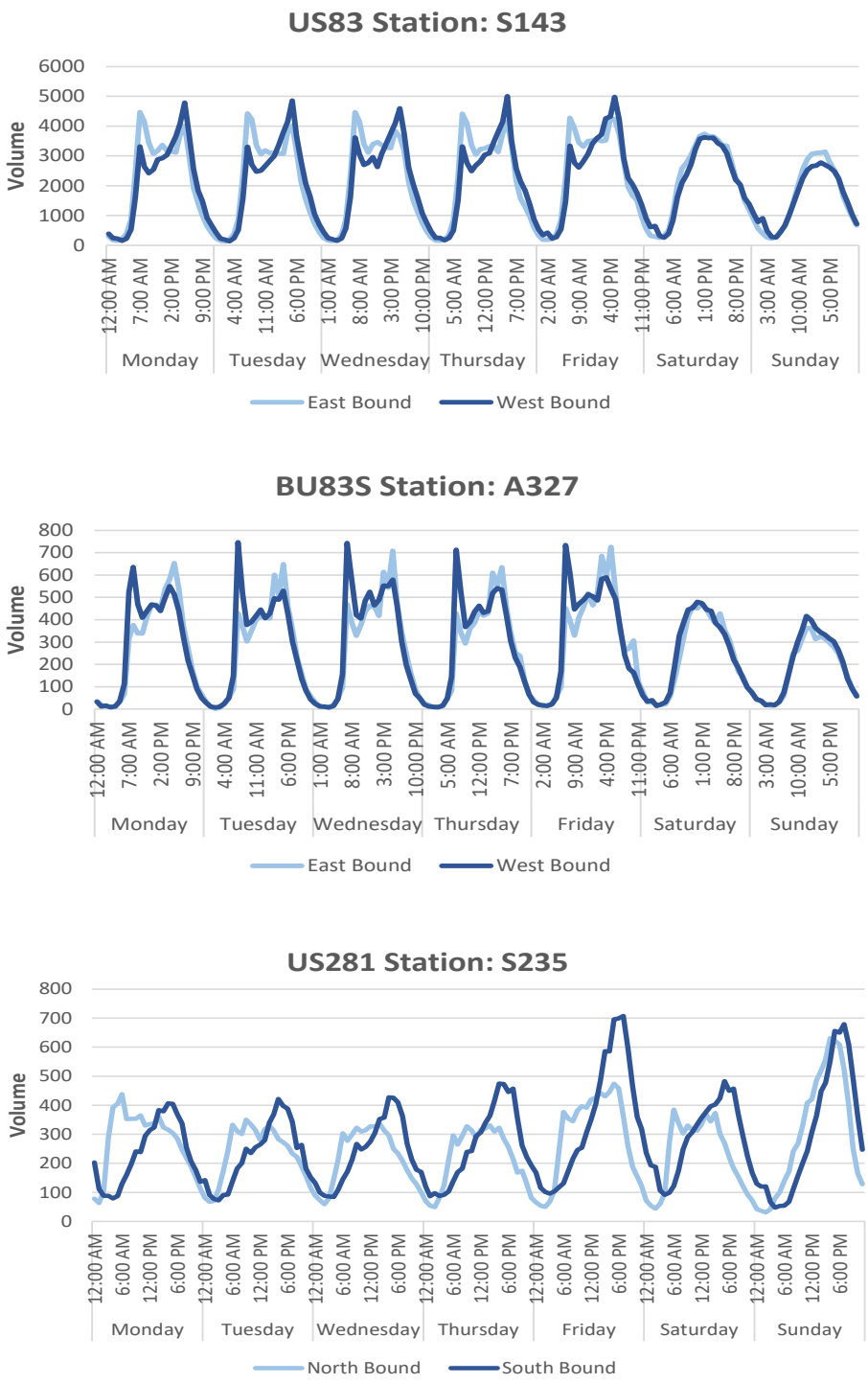


Figure 2-19 Weekly Traffic Profile at Selected Stations (Cont'd.)

2.5. Border Traffic Trends

Given that the traffic characteristics of the study area are influenced by Mexican/U.S. border traffic, the following sections discuss border traffic trends and policies.

2.5.1. Passenger Cars

The Hidalgo County metropolitan statistical area (MSA) has a unique traffic composition of local commuters and national and international visitors. Local vehicles exhibit typical commuter patterns of home-to-work trips in the morning and afternoon. Major origins and destinations are the urban areas along US 83. Visitor traffic on its way to the shopping and recreational destinations in the study area make up an important part of the economy in Hidalgo County, and of particular interest are passenger cars from Mexico. The MSA of Hidalgo County has been ranked by the Texas Comptroller as 3rd in Texas for Sales Tax collections per household and 4th in per capita sales tax, which demonstrates the high amount of non-local visitors to the area.

Passenger car crossings on the international bridges tend to be higher during the weekends, due mostly to Mexican visitors on their way to retail malls in the study area, with a smaller fraction on their way to touristic areas such as South Padre Island.

Passenger cars from the United States and Mexico also use these bridges in typical commuter patterns, such as workers traveling to industrial parks on both sides of the border in the morning and returning home in the afternoon. In addition, some Mexican drivers travel north to American schools and universities, creating familiar school trip patterns across the bridges. These traffic patterns also impact other roadways such as US 83 and US 281 within the traffic network, though not significantly.

2.5.2. Truck Traffic

Regarding the composition of international trade and truck travel patterns, each region along the U.S./Mexican border has its own specific characteristics and markets. In the case of the Reynosa/Hidalgo County region, international trade is driven by two different market segments: the local *maquiladora* trade and fruit imports from Mexico to the United States. Figure 2-20 presents the industrial parks in the United States and the *maquiladora* parks in Mexico.[11,12] Many Texas produce shippers have already invested in farming operations in Mexico, and produce already crosses the border into the lower Rio Grande Valley for distribution throughout the United States and Canada.[13] Cameron and Hidalgo counties are seeing a greater amount of imported produce shares, with estimates as high of 40 percent in the past five years.[14] The produce shippers are using the already-existing logistic infrastructure that allows Texas, as one of the important U.S. agricultural producers, to distribute produce imported from Mexico throughout the entire United States.

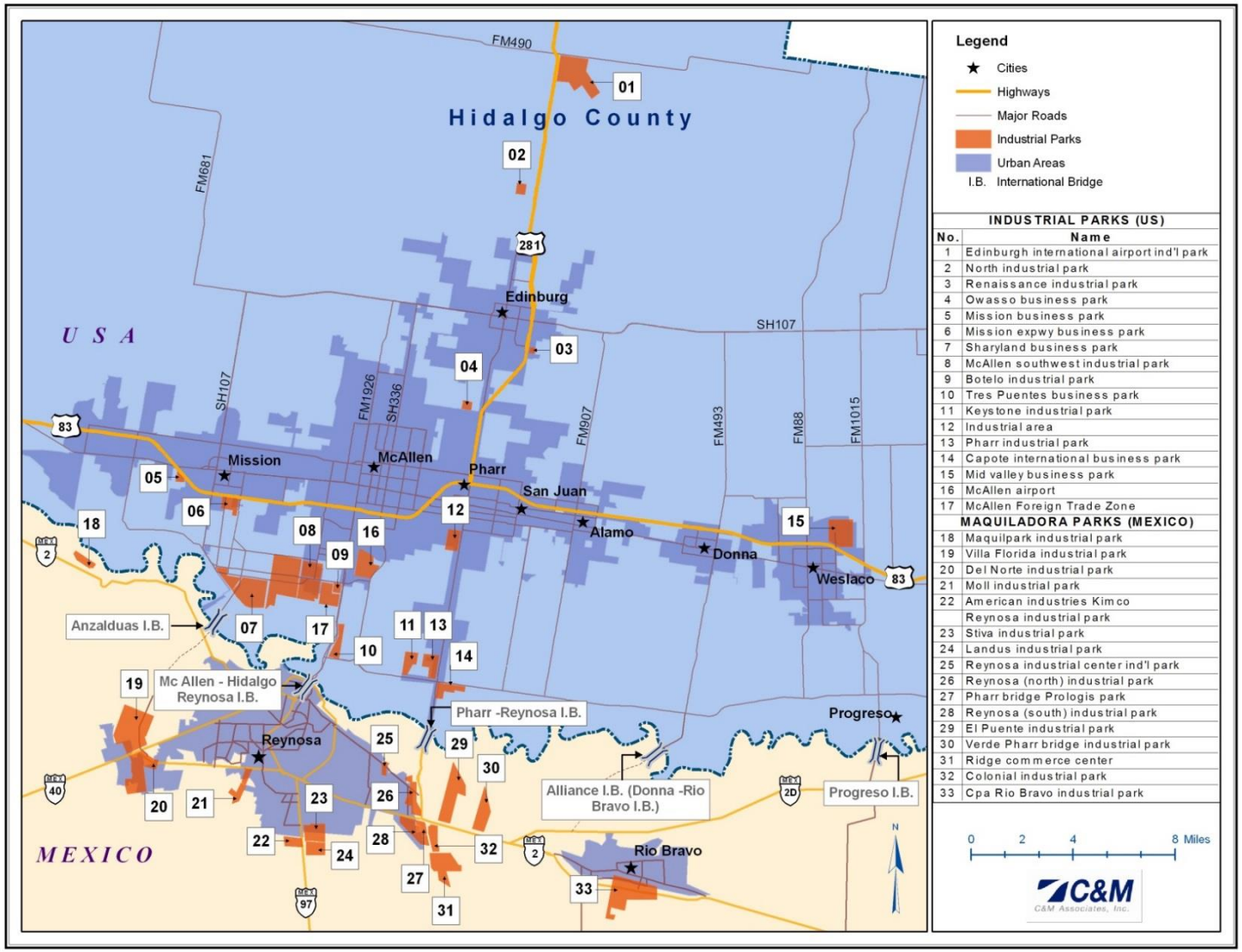


Figure 2-20. Industrial and Maquiladora Parks in the Study Area

Truck travel patterns between the Mexican city of Reynosa and Hidalgo County in the United States are generally short haul in nature, known within the industry as “cartage” or “transfer” hauling. The less frequent long haul truck movements typically originate further south in Monterrey, Mexico’s leading industrial city and capital of the northern state of Nuevo Leon.

The *maquiladora* trade activity is accomplished by means of short haul truck movements. Typically, these trucks pick up products from their origins at *maquiladora* plants in the Mexican city of Reynosa and haul them across the border to interim distribution centers in Hidalgo County and surrounding areas. Conversely, trucks on the U.S. side of the border pick up components from warehouses in Hidalgo County and surrounding areas and deliver them to *maquiladora* plants in Reynosa to the south.

Short haul truck movements are also attractive for the produce industry because in Mexico, trucks are allowed to carry 125,000 pounds, whereas in the United States, trucks heavier than 80,000 pounds are required to have an overweight permit. When these overweight Mexican produce arrive at the border, they typically re-distribute their cargo to other trucks in order to cross the border. Table 2-5 presents the current truck standards in the United States and Mexico.

Table 2-5. U.S. and Mexican Truck Regulations

Standard	Height	Width	Weight
U.S.	14 ft	8.5 ft	80,000 lbs
Mexico	15 ft, 6 in	12 ft	125,000 lbs

Source: U.S. Department of Transportation

In January 2014, Hidalgo County established an overweight permit, which covers travel over selected Hidalgo County roads for vehicles weighing no more than the Mexican legal weight limit. This overweight permit makes it theoretically unnecessary for trucks coming from Mexico to re-distribute their loads.

2.5.3. Government Policies

This section discusses a number of government policies that can aid in understanding factors other than the economy that have an impact on border crossings. These policies and their impacts on border crossings are listed in Table 2-6.

Table 2-6. Border Policies and their Effect on Border Crossings

Item	Year	Effect
North American Free Trade Agreement (NAFTA)	1994	Positive
The Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA)	1998	Negative
Secure Electronic Network for Travelers Rapid Inspection (SENTRI)	2010	Positive
Free and Secure Trade (FAST)	2004	Positive
Laser Visas (Mexican Border Crossing Cards)	2001	Negative
The Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act (USA PATRIOT)	2001	Negative
The Enhanced Border Security and Visa Entry Reform Act	2002	Negative
The Western Hemisphere Travel Initiative (WHTI)	2008	Negative
Ready Lane	2010	Positive
México's Policies Against Organized Crime	2006	Negative
Sistema de Aforo Vehicular (SIAVE)	2011	Negative
U.S. Truck Restrictions	2010	Negative

These policies are explained in detail below.

- **North American Free Trade Agreement (NAFTA)**

U.S./Mexican economic integration boomed in the 1980s and 1990s, beginning with Mexico pursuing a unilateral liberalization of its economy—after decades of protectionism—and then a regional strategy which, in 1994, resulted in the implementation of NAFTA. This signature piece of legislation not only enhanced U.S./Mexican economic integration, but also resulted in an annual bilateral trade growth rate of 17.4 percent, the value of which doubled before the end of the decade. However, since 2000, a number of regional and global factors have slowed the pace of integration, reducing the average annual increase in trade by 9.5 percent. Still, NAFTA has served as a model of production sharing and cross-border investment among the three North American countries, making their economies an example of profound interdependence. This is especially evident in Hidalgo County, where production sharing through maquiladoras is an important part of the economy and where truck traffic across the U.S./Mexican border increased from approximately 5.0 billion in 1994 (pre-NAFTA) to approximately 19.9 billion in 2006 and 23.5 billion in 2011.

- **The Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA)**

In 1996, Congress began addressing the need for greater border security by passing the IIRIRA, under which border security provisions were concentrated along the U.S./Mexican border with the intent of increasing border enforcement. At the same time, to facilitate legitimate travel to the United States, IIRIRA sought to address the persistent problem of long delays at each port of entry (POE) by authorizing the hiring of enough inspectors in 1997 and 1998 to ensure full staffing during peak crossing hours. The act also authorized

the U.S. Attorney General to formulate six inspection projects—such as the construction of dedicated commuter lanes—aimed at speeding up the border-crossing process for frequent crossers paying a fee.

In an effort to stem illegal immigration, IIRIRA not only authorized the expansion of border barriers, but also gave the Attorney General the authority to acquire and use all available federal equipment in the government's attempt to reduce the flow of illegal immigrants into the United States. This legislation also authorized appropriations for the nationwide expansion of the Automated Biometric Fingerprint Identification System (IDENT) in order to include the fingerprints of all illegal or criminal aliens apprehended at the border. IIRIRA also contained a first-time provision requiring biometrics as one form of identity on certain travel documents. Specifically, the act required that the Secretary of State issue border-crossing cards bearing a biometric identifier that is machine readable and, furthermore, that the biometric identifier must match the biometric characteristic of the card holder in order for that person to enter the United States.

- **Secure Electronic Network for Travelers Rapid Inspection (SENTRI)**

The SENTRI program from U.S. Customs and Border Protection (CBP) is a program for pre-approved, low-risk travelers that have access to specific, dedicated primary lanes into the United States. Participants in the program wait for shorter periods of time than those in regular lanes when entering the United States through a land POE, even at the busiest time of day. Critical information required in the inspection process is provided to the officer in advance of the passenger's arrival to the inspection booth, thus reducing the inspection time from an average of 30–40 seconds to an average of 10 seconds.[15] CBP's goal is that the waiting time for users in these dedicated lanes will not exceed 30 minutes.

Applicants have to voluntarily go through a biographical background check against criminal, law enforcement, customs, immigration, and terrorist databases, with an additional 10-fingerprint law enforcement check and a personal interview with a CBP officer. An approved SENTRI applicant will be issued an RFID that will identify its record and status in the CBP database upon arrival at the U.S. POEs. Additional to the personal identification document, a transponder is also issued to the applicant's vehicle or motorcycle. Anecdotal evidence suggests that some border crossers are reluctant to go through the detailed screening process for privacy or residency concerns. This, in combination with the high price, serves as a barrier to higher utilization rates for this program.

SENTRI was first implemented at the Otay Mesa POE on November 1, 1995. SENTRI lanes are available to passenger cars at the Pharr-Reynosa International Bridge (since 2010), the McAllen-Hidalgo-Reynosa International Bridge, the Veteran international bridge (since 2006), and the Anzalduas International Bridge (since 2009). The Alliance International Bridge, opened in December 2010, has applied to the SENTRI program and expects approval soon.[16]

- **Free and Secure Trade (FAST)**

The FAST program is a commercial clearance program for known low-risk shipments entering the United States from Canada and Mexico. Initiated after the events of September 11, 2001, this trusted traveler/trusted shipper program allows expedited processing for commercial carriers who have completed background checks and fulfill certain eligibility requirements. More than 78,000 commercial drivers are currently enrolled in the FAST program nationwide.[17] The FAST program is open to enrollment by U.S., Canadian, and Mexican commercial vehicle (CV) drivers.

The FAST program was first implemented in December, 2002 in U.S./Canadian land POEs. The first dedicated FAST lanes on the U.S./Mexican border are located in El Paso, Texas. CBP officers began the initial processing of CVs through FAST lanes on October 27, 2003. The Pharr International Bridge and Veteran International Bridge have mixed FAST lanes from 2004, and the Anzalduas International Bridge is expected to have FAST lanes only once it opens to trucks in 2015.

Participation in FAST requires that every link in the supply chain—from manufacturer to carrier to driver to importer—is certified under the Customs-Trade Partnership Against Terrorism (C-TPAT) program. C-TPAT is a voluntary government-private sector partnership in which companies involved in commerce destined for the United States demonstrate that they have implemented enhanced security measures within their facilities and day-to-day operations to prevent terrorists and weapons of mass effect from infiltrating the supply chain. At about 25 percent, the percentage of CVs meeting all requirements of the FAST program is low when compared to the number of CV shipments that meet at least one of the C-TPAT program requirements (35 percent).

The benefits of FAST members are dedicated access lanes for faster crossing time and efficiency in the processing of transporter shipments, a reduced number of inspections resulting in reduced delays at the border, and priority (front of the line) processing for CBP inspections.

- **Laser Visas (Mexican Border Crossing Cards)**

Since 1953, the United States has made special accommodations for Mexican nationals who visit the country frequently and conduct business in border communities. Mexican nationals applying for admission to the United States as visitors are required to obtain a visa or possess a Mexican border crossing card, now referred to as a laser visa. The laser visa is valid for 10 years and can be used multiple times by citizens of Mexico desiring short-term entry (up to six months) for business or tourism in the United States. Mexican citizens can obtain a laser visa from the Department of State Bureau of Consular Affairs if they are otherwise admissible as B-1 (business) or B-2 (tourism) nonimmigrants. As of October 1, 2001, first-time laser visa applicants are required to present a valid Mexican passport as primary evidence of their citizenship and identity.

Most Mexican entrants with laser visas are not required to obtain an I-94 arrival/departure form if CBP officers determine that they do not intend to travel more than 25 miles into the country or stay more than 30 days. If it is determined by a CBP officer that a Mexican citizen intends to exceed either limit, the entrant is then referred to a secondary inspection point at the POE, where he or she will be subject to U.S.-VISIT requirements and issued

an I-94 form, if no grounds are found on which to deny the application. Figure 2-21 depicts the limits of the 25-mile zone in the San Diego region.

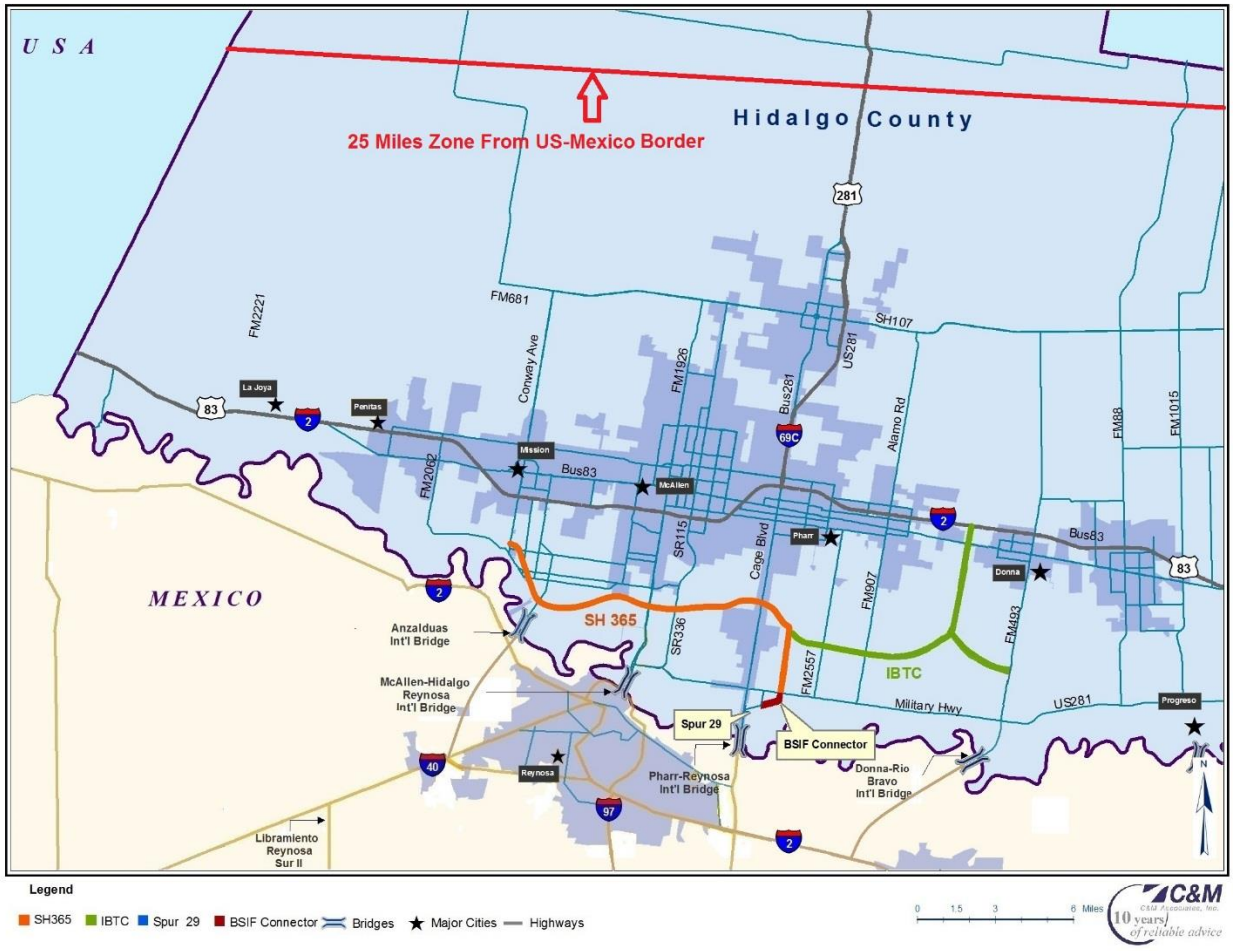


Figure 2-21. Twenty-Five Mile Zone From the U.S./Mexican Border

The I-94 form is valid for six months and allows travel throughout the country. In recognition that a large number of Mexican citizens may need to go beyond the 25-mile zone during the holiday season, travelers can obtain an I-94 form up to 30 days before travel for a $6 fee. This process is intended to avoid congestion at the POE secondary inspection facilities during holidays and is not meant as an everyday crossing mechanism.

- **The Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act (USA PATRIOT)**

The 2001 USA PATRIOT Act called for the immediate implementation of an integrated entry and exit data system and required that the system be interoperable with other law enforcement data systems. Moreover, the act required the Attorney General and the Secretary of State to develop and certify a technology standard that could be used to verify the identity of people seeking a visa to enter the United States. The mandate to implement an integrated entry and exit data system and the requirement that travel documents contain a biometric identifier have had direct implications on most foreign nationals seeking entry into the United States at the U.S./Mexican border.

- **The Enhanced Border Security and Visa Entry Reform Act**

The 2002 Enhanced Border Security and Visa Entry Reform Act called on the Attorney General (now the Secretary of Homeland Security) to take additional measures in the government's effort to secure U.S. borders. Specifically, this act mandated the installation of biometric data readers and scanners at all POEs and extended a previously set deadline requiring border crossing identification cards (laser visas) to contain a biometric identifier matching a biometric characteristic of the card holder.

- **The Western Hemisphere Travel Initiative (WHTI)**

In April 2005, the U.S. Departments of State and Homeland Security unveiled their Western Hemisphere Travel Initiative (WHTI), pursuant to section 7209 of the Intelligence Reform and Terrorism Prevention Act of 2004 (the "9/11 Intelligence Bill"). As a result of this initiative, all travelers to and from the Americas—including Canada, Mexico, Central America, and South America—and to the Caribbean and Bermuda were required to possess a valid passport, or other accepted document or combination of documents, in order to enter or re-enter the United States. Phase one of WHTI, which instituted passport requirements for air travel, went into effect in 2007, followed by Phase two on June 1, 2009, which instituted passport requirements for land and sea travel into the United States. In addition, under the terms of WHTI, as of January 31, 2008, CBP officers ended their practice of accepting verbal declarations of citizenship from U.S. travelers at land POEs and instead began requiring each traveler to produce a secure document in order to enter or depart the country. It is suspected that these measures have had a negative impact on the number of trips taken by U.S. citizens into Mexico. Indeed, according to the WHTI Final Programmatic Environmental Assessment, while 43 percent of all U.S./Mexican border crossings in 2004 were made by U.S. citizens, 68 percent of those travelers were estimated to not possess passports.[18] Cost and convenience factors may have played a role in these findings, as currently it can take two–six weeks for passport applications to be processed, at a cost of $135 each.

- **Ready Lane**

The Ready program, or "Ready Lane," is a dedicated primary vehicle lane for travelers entering the United States at land POEs. Travelers who obtain and travel with a WHTI-compliant RFID-enabled travel document may receive the benefits of utilizing a Ready Lane. The Ready Lane border crossing stations are able to scan the card from 10–30 feet away. Travelers simply need to hold the RFID card up to the windshield while driving

through the station. The CBP officer is then able to read all related information to the scanned user in a monitor, which makes the passport control process faster. CBP launched the Ready Lane program in 2010 at the Ambassador Bridge port of entry in Detroit, Michigan. The Pharr-Reynosa international bridge, McAllen-Hidalgo-Reynosa Bridge, Donna International Bridge, and Gateway international bridge have Ready Lanes. CBP expects that, as travel documents undergo a renewal cycle, in the near future 100 percent of all border crossers will have RFID, which will decrease waiting times at POEs.

Ready Lane users experience, on average, 15–20 seconds less processing time than travelers with no RFID.

- **Mexico's Policies Against Organized Crime**

In 2006, Mexican President Felipe Calderon ordered 6,500 federal troops into the State of Michoacán in an effort to end the rampant drug violence there. Known as *Operation Michoacán*, this step was regarded as the first major initiative against organized crime in México and, as such, was generally viewed as the starting point in the combat by the Mexican government against drug cartels. This combat continues today and has resulted in large scale violence that affects the border region and its citizens on a daily basis, particularly as drug cartels engage not only the Mexican government, but also each other, in their attempt to control drug trafficking routes into the United States. As with many U.S./Mexican border towns, violence along the border in Tamaulipas and Nuevo Leon has had a detrimental effect on the entertainment and tourism industries of Mexico, as many U.S. citizens have chosen to stay away from Reynosa to avoid unnecessary risk. According to surveys conducted in 2010 by C&M in Mexico's northeast border region, the perception of insecurity has translated into lower traffic volumes.[19] Likewise, travelers living in the interior sections of the United States or Mexico are more often choosing to fly into or out of airports away from the Mexican border region rather than cross the border by land. Recent trends have shown a decline in drug cartel related crime in Reynosa and Matamoros,[20] which could be one of the reasons that the passenger car crossings are not declining like they have in previous years.

- **Sistema de Aforo Vehicular (SIAVE)**

The growing drug-related violence in Mexico has led to increased southbound inspections at many ports of entry, as part of the U.S. and Mexican governments' attempts to slow the shipment of firearms and money linked to illicit activities in Mexico. In addition, the Mexican government has instituted Sistema de Aforo Vehicular (SIAVE), a program by which the actual weight of a vehicle is compared against a database; when a vehicle is discovered during inspection to be outside a prescribed weight range, it becomes subject to further scrutiny.[21] In addition, on the U.S. side of the border, CBP conducts random inspections of vehicles before they cross into Mexico in an effort to intercept firearms and dirty money made from the sale of illegal drugs. These individual efforts—SIAVE and random inspections conducted by CBP—not only have added stress to a system that was not meant to handle southbound inspections, but they have resulted in increased wait times at the border.

- **U.S. Truck Restrictions**

For many years, the system by which goods are shipped back and forth across the U.S./Mexican border generally has involved three types of trucks. Typically, a Mexican long-haul truck is the first vehicle involved, delivering a container of goods to a location near the U.S. border. There, a so-called drayage service is employed to carry the goods across the border in a short-haul truck where, finally, a U.S.-based long-haul truck picks up the goods and delivers them to their final destination. In the case of maquiladoras operating in Reynosa, the process involves only the last two steps. The U.S. Department of Transportation estimates the cost of drayage at between $100 and $200 per trip, which—when multiplied by the 4.7 million CVs that crossed the U.S. border in 2010—puts the approximate cost of the drayage system at between $0.5 and $1 billion dollars a year.[22]

Under the terms of NAFTA, the United States agreed to allow Mexican CVs to transport goods into the United States, starting in 1995 with the border-states and extending throughout the country by 2000. Likewise, Mexico offered the same access to U.S. trucks. However, in 1995, President Clinton delayed implementation of those trucking provisions out of what his administration considered to be a legitimate concern for safety. Clinton's action was followed in 2001 by a NAFTA arbitration panel ruling in which the United States was declared out of compliance with its NAFTA obligations. In a renewed effort to implement cross-border trucking, President Bush took steps in 2002 to address the Clinton administration's safety concerns; however, Bush's attempts were thwarted by a series of legal challenges, which delayed the implementation of cross-border trucking until 2007. That year, a small pilot program was launched, thereby allowing a select few Mexican trucking companies to move beyond the designated 25-mile border zone they had been accessing since before NAFTA. In 2009, Congress put an end to the pilot program, and in March 2011, President Obama announced a breakthrough on the issue, which resulted in a plan granting U.S. access to Mexican CVs capable of meeting stringent safety standards. In October 2011, Transportes Olympic, based in Apodaca in the Mexican state of Nuevo León, became the first Mexican trucking company to be granted permission to make deliveries throughout the United States. Since then, only two other firms have received similar permission: Distribuidora Marina El Pescador and Grupo Behr de Baja California, both based in Tijuana.

While it is too early to tell how the lifting of restrictions on Mexican commercial vehicles will affect freight operations within the Hidalgo County-Reynosa region, an interview with a local delegate of the national Mexican Association of Commercial Vehicles— Cámara Nacional de Autotransporte de Carga (CANACAR)—suggests there will be little impact in the short term.[23] This prediction was due not only to uncertainties surrounding the new program, but also to questions about its chances of becoming permanent. Indeed, with an investment of about $10,000 per truck needed to obtain permission to deliver beyond the current geographical limits within the United States, most of the industry is adopting a wait-and-see attitude. Nevertheless, in the long term, analysts believe transportation costs will go down and bilateral trade between the United States and Mexico will be stimulated.[24]

Officials within the U.S. and Mexican governments are pushing ahead with their "21st Century Border" project. This project builds on the Bush administration's "Smart Border Initiative," which seeks to give a broader definition to the meaning of "border," moving it beyond the notion of a simple line to a concept of secure flows.[25]

The programs, initiatives, and legislation outlined in the preceding section detail the lengths to which the U.S. and Mexican governments have gone in order to ensure border security in an age of international terrorism and drug trafficking. How these measures affect life and business along the U.S./Mexican border is difficult to quantify; however, acknowledging their role is vital to the task of being able to accurately analyze border crossing trends and make predictions about the future of this region.

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[1] Texas Department of Transportation, Transportation Planning and Programming Division (2009). *TxDot. 1997 - 2007 District Traffic Maps* (Electronic ed.). Austin, TX: Author.

[2] INRIX (n.d.). *Traffic Scorecard*. Retrieved September 5, 2014 from http://scorecard.inrix.com/scorecard/

[3] Texas Department of Transportation, Transportation Planning and Programming Division (2009). *TxDot. 1997 - 2007 District Traffic Maps* (Electronic ed.). College Station, TX: Author.

[4] Institutos Nacional de Estadística y Geografía, Mexico (n.d.). *Base de datos estadística*. Retrieved July 30, 2010 from http://www.capufe.gob.mx/portal/site/WebCapufe

[5] Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (2013, December). *Border crossing/Entry data*. Retrieved from http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html

[6] Texas Department of Transportation (n.d.). *Texas-Mexico Border Crossings Study: Crossings.* Retrieved May 28, 2014 from https://www.txdot.gov/inside-txdot/projects/studies/statewide/border-crossing/crossings.html

[7] Texas Department of Transportation (2011). *Texas-Mexico International Bridges and Border Crossings: Existing and Proposed*. Retrieved from http://ftp.dot.state.tx.us/pub/txdot-info/iro/2011_international_bridges.pdf

[8] RITA, Bureau of Transportation Statistics (2013, December). *Border crossing/Entry data*. Retrieved from http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html

[9] Ibid.

[10] Transportation Planning and Programming Division, Texas Department of Transportation (2014). Pharr District: 2013 Permanent counts hourly and monthly report. Austin, TX: Author.

[11] McAllen Economic Development Corporation (n.d.). *Mexico and Reynosa Industrial maps*. Retrieved July 10, 2010 from http://www.mexicoindustrialmaps.com/reynosa/publicacion/

[12] Hidalgo County Metropolitan Planning Organization (HCMPO) (n.d.). *Geographic information system: Land use map*. Retrieved July 15, 2010 from http://www.hcmpo.org/gis.html

[13] HaulProduce.com (2012, October 1). *Texas produce shipments to loom larger in future*. Retrieved from http://haulproduce.com/2012/texas-produce-shipments-to-loom-larger-in-future/

[14] Parra, L. F. (2011). The Sierra Madre bypass: A challenge to the Nogales Produce Distribution Industry. *Eco Border: Business*. Retrieved from http://bordereco.com/internationalbusiness/2011/12/21 /the-sierra-madre-bypass-a-challenge-to-the-nogales-produce-distribution-industry/

[15] U.S. Customs and Border Protection (CBP), Department of Homeland Security (n.d.). About SENTRI: Secure Electronic Network for Travelers Rapid Inspection." Retrieved November 16, 2010 from http://www.cbp.gov/travel/trusted-traveler-programs/sentri

[16] Sánchez, L. (2011). Low price for SENTRI to be temporary. *San Diego Red*. Retrieved from http://www.sandiegored.com/noticias/3520/Low-price-for-SENTRI-to-be-temporary/

[17] CBP, Department of Homeland Security (2013). *Fact Sheet: Free and Secure Trade Program (FAST)*. Retrieved from http://www.cbp.gov/sites/default/files/documents/ofo_fast_final_file_3.pdf

[18] CBP, Department of Homeland Security (2007). *Western Hemisphere Travel Initiative in Land and Sea Environments: Final programmatic environmental assessment.* College Park, MD: Office of the Federal Register, National Archives and Records Administration.

[19] Cal y Mayor y Asociados, S.C. (2010). *Encuesta de Opinión Región Noreste: Nuevo León y Tamaulipas*. Commissioned by SCT to assess impact of violence in vehicle traffic levels in México's northeast region.

[20] Heinle, K., Ferreira, O. R., & Shirk, D. A. (2014, April). *Drug violence in Mexico: Data and analysis through 2013*. University of San Diego: Department of Political Science & International Relations. Retrieved from http://justiceinmexico.files.wordpress.com/2014/04/140415-dvm-2014-releasered1.pdf

[21] Servicio de Administración Tributaria (2009). *Sistema de Supervisión y Control Vehicular (Siave)*. Retrieved from http://www.aduanas.gob.mx/aduana_mexico/2008/sala_prensa/158_14391.html

[22] Ojah, M. I., et al. (2002). Truck transportation through border points of entry: Analysis of coordination systems. College Station, TX: Texas Transportation Institute, The Texas A&M University System. Retrieved from http://www.borderplanning.fhwa.dot.gov/tocTTI.asp

[23] Cervantes, S. (2011, October 27). Interview with Alfonso Esquer Millán. *El Economista*.

[24] Wilson, C. E. (2011). *Working together: Economic ties between the United States and México*. Washington, DC: México Institute, Woodrow Wilson International Center for Scholars.

[25] Ibid.

3. Data Collection and Analysis

Since 2008, C&M has been collecting field data in the study area specifically for the Projects. Based on this data, C&M has not only developed a user profile, but also gained a better understanding of traffic characteristics and travel patterns within the study area, all of which provided critical support for the travel demand model described in Chapter 5. The field work performed by C&M for the present Investment Grade study included:

- Field reconnaissance
- Economic Development Corporation's (EDC) survey in Hidalgo County
- Automatic Traffic Recorder (ATR) counts
- Travel time monitoring
- Origin-Destination (OD) surveys
- Commercial vehicle survey

3.1. Field Reconnaissance and Monitoring

Using publicly available satellite imagery and aerial photography, as well as data gathered through field observation and reconnaissance, C&M determined the general geometric inventory of the traffic network on both sides of the border—including information such as number of lanes and ramp locations. This information was used to create the base year road network.

Field reconnaissance was focused primarily on IH2 (US 83), US 281, the industrial zones, international bridges, and on the major roads and *maquiladora* parks of Mexico.

C&M staff members made several trips during the AM, PM and off-peak hours to the major roadways discussed in the previous chapter. Field observations revealed that traffic across the study area is greatly influenced by large numbers of trucks originating in and destined for Hidalgo County. Interaction between trucks and passenger vehicles, combined with competition for space on the roadways, has a significant negative impact on level of service (LOS).

Field reconnaissance on the region's international bridges and within the related industrial zones found that truck traffic reaches its peak during the midday hours every Monday through Friday, thus confirming its relationship to the *maquiladora* industry in Mexico and to the long wait times experienced by travelers at the U.S./Mexican border.

3.2. EDC Survey

C&M, in cooperation with the University of Texas-Pan American (UTPA), conducted an EDC survey to estimate future developments in Hidalgo County. The focus of the survey was to detect future developments in Hidalgo County that might not have been included within the socioeconomic data forecast. UTPA visited the most important EDCs within Hidalgo County, listed below.

- City of Edinburg
- City of McAllen
- City of San Juan
- City of Weslaco
- City of Mission
- City of Pharr
- City of Mercedes

The survey consisted of questions relating to new businesses that are coming to the cities in the coming years. The survey did not request the names of specific businesses, but rather an approximated number of companies, types, and sizes.

The outcome of this survey has been growth indicators for each City area, which are a direct input for the socioeconomic forecast models.

3.3. Automatic Vehicle Classification Counts

Automatic vehicle classification counts were collected by C&M at more than 120 locations on both sides of the border from 2008 to 2012. For the present Investment Grade study, C&M collected traffic data from 35 count locations, as shown in Figure 3-1. All counts were performed over a seven-day period.

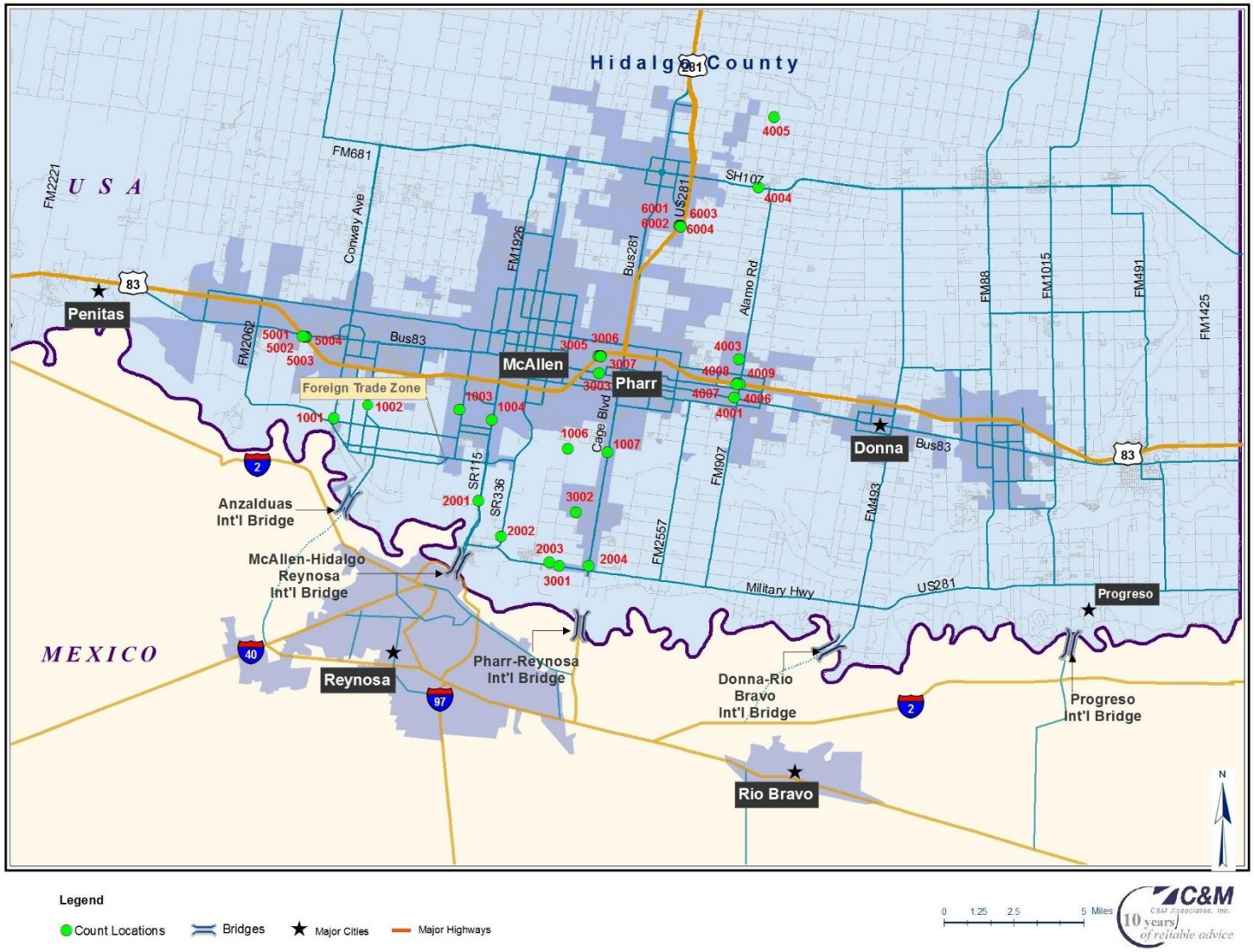


Figure 3-1. Field Data Collected in the Study Area

The observed traffic patterns are similar to C&M's observations in previous years. The study area locations have the same traffic profile over weekdays and weekends. Table 3-1 shows the ADTs and truck percentages over these selected locations. As can be seen, the majority of locations have high truck percentages.

Table 3-1. ADT and Truck Percentages at Selected Locations

ID	Description	ADT	Truck Percentage
1001	FM 1016 (S Convey Ave) North of Los Indios Rd	6,275	13.1%
1002	FM 396 (Bryan Rd) South of Trinity Rd	5,665	6.1%
1003	FM 2220 (S Ware Rd) North of Rio Grande Road	13,680	10.2%
1004	FM 115 (S 23rd St) North of Elmira Ave	19,500	11.1%
1005	FM 336 (S 10th St) North of W Military Hwy	10,650	11.0%
1006	FM 2061 (S Jackson Rd) North of Main Floodway	21,174	13.5%
1007	US 281 (S Cage Blvd) South of W El Rancho Blanco Rd	17,255	4.6%
2001	SPUR115 - (23rd St/International Blvd) South of Dicker Rd	16,585	6.6%
2002	SR336 (10th Street) North of US 281/ Military Hwy	10,733	17.5%
2003	SR2061 (Jackson Rd) North of Military Hwy	8,887	11.9%
2004	US 281 (Cage Blvd) North of Military Hwy	7,276	19.5%
3001	US 281/Military Hwy East of Jackson Rd	9,884	25.8%
3002	SR 3072/ Dicker Dr West of S Plata Ln	8,154	12.0%
3003	Center Ave (SR 374/US Business US83) East of Sugar Rd	9,851	7.2%
3004-3007	US 83 (I-2) - Frontage Road West of N Sugar Rd	9,987	13.8%
3005-3006	US 83 (I-2) - Mainlanes West of N Sugar Rd	126,656	10.6%
4001	Bus 83 West of FM 907	4,216	5.1%
4002	US281 West of FM 907 (S Alamo Rd)	4,454	23.3%
4003	FM 495 West of FM 907 (S Alamo Rd)	4,230	13.4%
4004	SR 107 (University Drive SR 107 West of SR 907	15,167	7.1%
4005	FM 1925 (E Monte Cristo Rd) West of FM 907 (N Alamo Rd)	8,002	13.2%
4006-4009	US 83 (I-2) - Frontage Road West of FM 907 (N Alamo Rd)	15,413	5.2%
4007-4008	US 83 (I-2) - Mainlanes West of FM 907 (N Alamo Rd)	106,411	8.6%
5001-5004	US 83 (I-2) - Frontage Road South of Bus 83	20,985	12.8%
5002-5003	US 83 (I-2) - Mainlanes South of Bus 83	43,242	17.4%
6001-6004	US 281 - Frontage Road South of E Canton Rd	12,258	4.3%
6002-6003	US 281 - Mainlanes South of E Canton Rd	71,610	11.4%

Figure 3-2 shows the weekly traffic profile in selected locations along IH2 (US 83), IH69C (US 281), and within the study area. US 83 has more traffic in the eastbound direction, whereas US 281 shows a similar trend in both directions and traffic dampens during the weekends. These weekly profiles aid in verifying the revenue days used for the present study. The observed weekend to weekday ratio for these selected road ways is presented in Table 3-2.

Table 3-2. Weekend-Weekday Ratio Selected Locations

Station	Description	ADT		Weekend-Weekday Ratio
		Weekday	Weekend	
3005-3006	US 83 (I-2) - Mainlanes West of N Sugar Rd	131,697	114,054	87%
6002-6003	US 281 - Mainlanes South of E Canton Rd	78,238	57,605	74%
4007-4008	US 83 (I-2) - Mainlanes West of FM 907 (N Alamo Rd	110,638	95,844	87%
1004	FM 115 (S 23rd St) North of Elmira Ave	20,171	17,823	88%
1007	US 281 (S Cage Blvd) South of W El Rancho Blanco R	17,840	15,794	89%

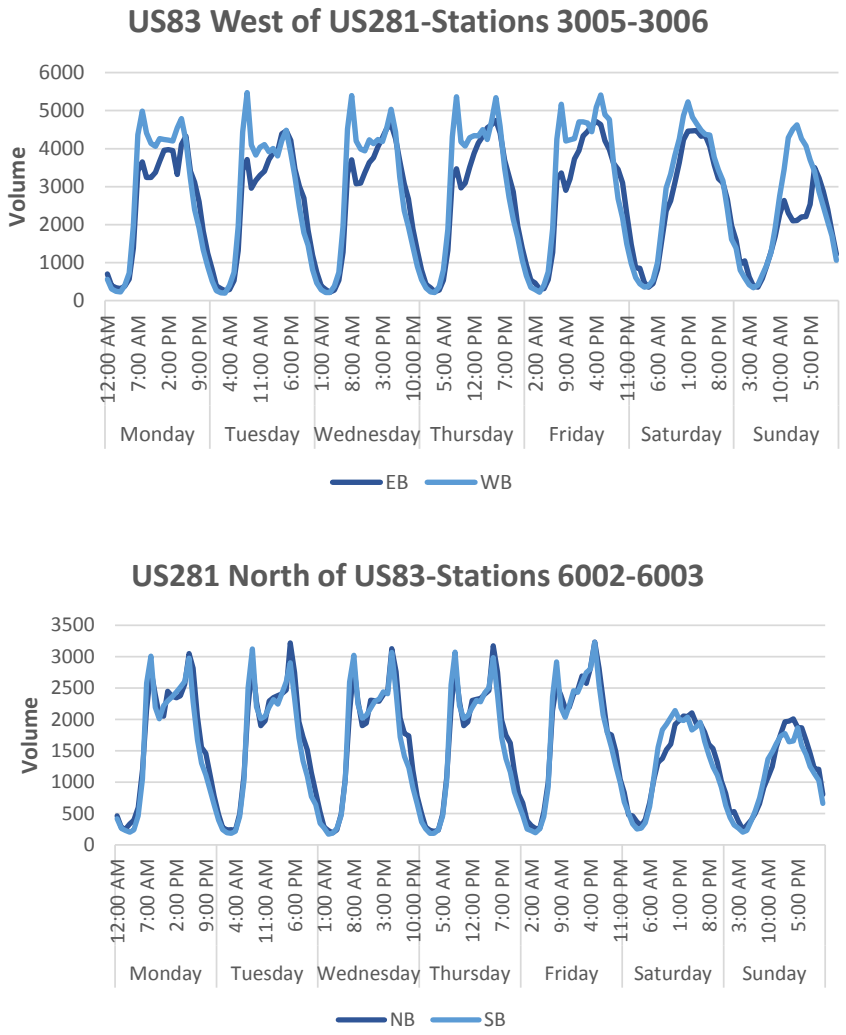
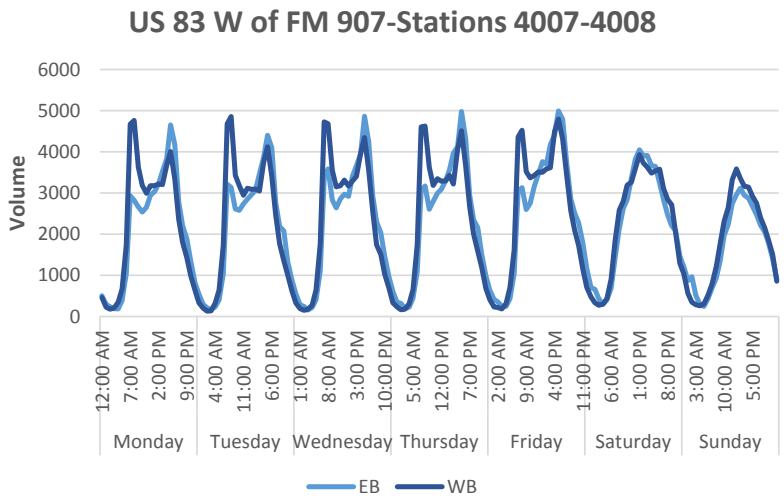
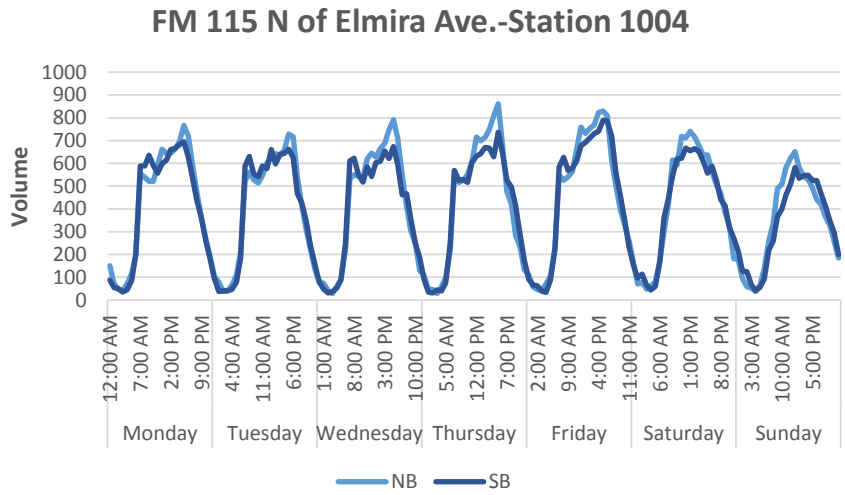


Figure 3-2. Weekly Traffic Profile at Selected Locations





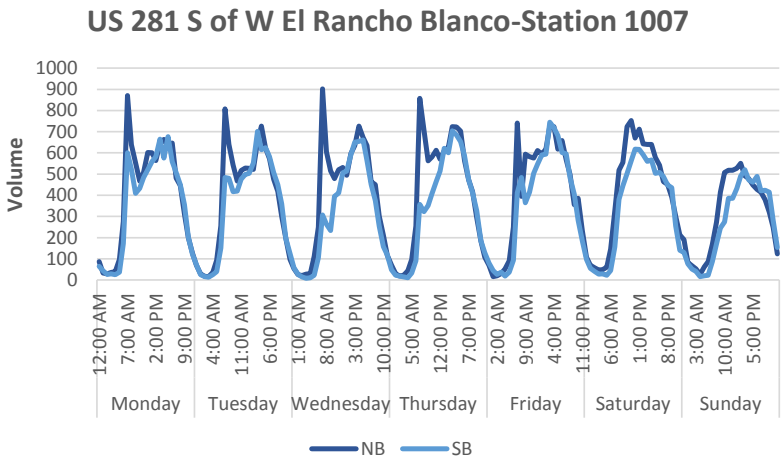


Figure 3-2. Weekly Traffic Profile at Selected Locations (Cont'd.)

3.4. Speed Monitoring

The purpose of a travel time study is to evaluate the quality of traffic movement along a route and determine the locations, types, and extent of traffic delays. C&M's data streaming program gathers the travel time of predefined road segments every five minutes from Google Maps. This travel time streaming process can be used to compare operational conditions before and after roadway or intersection improvements have been made. It can also be used as a tool to assist in prioritizing projects by analyzing the magnitude of operational deficiencies (such as delays and stops) for the project under consideration.

An analysis of traffic congestion was performed over a full day period by collecting travel times for selected segments of IH69C (US 281), IH2 (US 83), and several available local roads. For each segment, the average speed was calculated during a selected five-minute interval for each time period throughout the day. The present study used the full data output of this streaming program conducted over several months.

Figure 3-3 and Figure 3-4 represent exemplary speed heat maps for AM and PM peak periods in eastbound (EB) direction. Each heat map shows a color-coded representation of the average vehicle speed during the time period from May to August 2014; green represents speeds greater than 55 mph, yellow represents speeds from 35 to 55 mph, and red represents speeds lower than 35 mph.

During the AM and PM peak period, heavy congestion is observed on IH2 (US 83) in the EB directions just before IH69C (US 281). C&M used the raw data from the monitoring program and, after reviewing and validating it, incorporated the acquired speeds into the CMHCTDM validation.

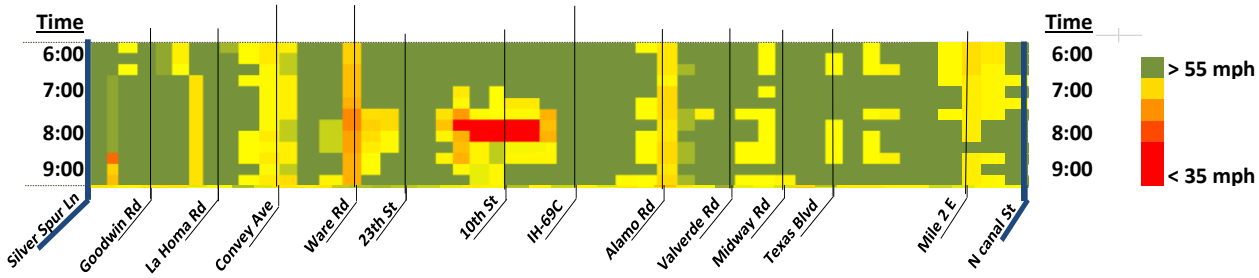


Figure 3-3. AM Speed Heat Map for IH2 East Bound

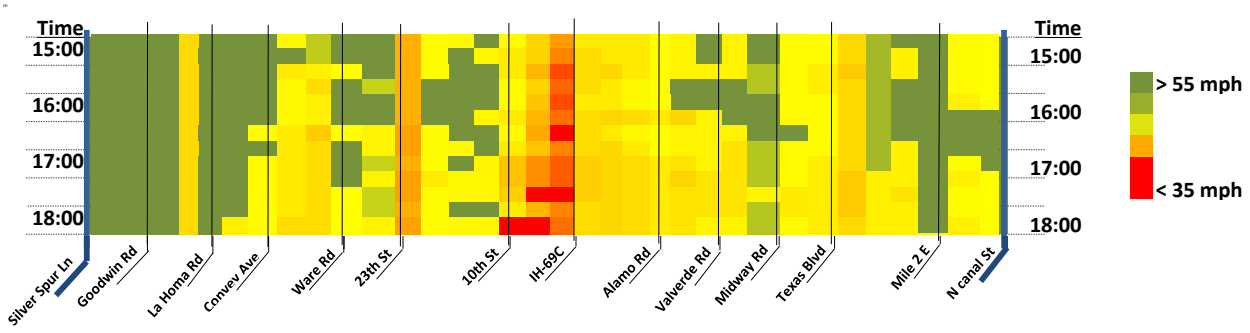


Figure 3-4. PM Speed Heat Map for IH2 East Bound

3.5. Origin-Destination Surveys

C&M designed a regional OD survey for Hidalgo and Cameron County and a commercial truck survey for truck crossings into Hidalgo County. The regional OD Survey was performed by AirSage, Inc. (AirSage) based on mobile device data. Since such data can only track the movement of people (e.g., cell phone owners), C&M added a commercial truck survey to acquire ODs specifically from trucks entering Hidalgo County. The following sections describe the two surveys in more detail.

3.5.1. Airsage OD Survey

The regional OD survey was performed by AirSage using Wireless Signaling Extraction (WiSE) technology that compiles data from select wireless carrier networks as generated by mobile devices. This technology anonymizes the data and performs multiple stages of analysis to monitor the location and movement of mobile devices.

AirSage uses a modular, multi-step methodology to derive useful information and analytics from wireless signaling data provided by its wireless carrier partners. The core components of the data collection, processing, and delivery process include the following:

- *Device Location Processing:* Time-stamped locations (latitude/longitude) are generated for each mobile device (e.g., a cellphone), utilizing the network signaling data generated each time a mobile device interacts with the mobile network. This interaction occurs not only when devices are in use, but also when they are in idle mode.
- *Activity Pattern Analysis:* The data are run through a series of pattern recognition and statistical clustering algorithms to determine repeated and irregular trip patterns and primary activity locations for a device. This information can then be used to classify trip purpose.
- *Activity Point Generation*: Each device location is combined with other recent sightings and known activity locations to further refine the location, determine if the device is moving or stationary, and calculate additional attributes to create individual "Activity Points." These are then combined to create "Trip Legs," which eventually allow the creation of a network of travel behaviors.

- *Population Synthesis:* A full population is synthesized from the original set of data collected by considering device quality and the penetration rates, which is the ratio of number of residents observed by AirSage in a given geographical area to the 2010 census population.
- *Trip Analysis*: Each trip is analyzed and classified into various categories such as resident class of subscriber, trip purpose, time of day, and day of week.
- *Data Aggregation and Packaging:* A unique study area is further subdivided into analysis zones, and the trip ends (Activity Points) are assigned to these zones. All of the trip ends within these zones are also assigned a purpose and time of day during which they took place. All of these data are then packaged in the form of an OD Matrix.

The OD data was processed for 145 aggregated traffic analysis zones (TAZs) for Hidalgo and Cameron County from mid-October to mid-November, representing an average month of the study area in terms of traffic volumes. The population covered approximately 1,300,000 people. The OD survey was created for weekdays (Tuesday through Thursday) and for weekend trips separately. The coefficient of determination (R^2) between the obtained OD trip volume of the aggregated TAZs within the two counties and the volume from the calibrated TDM was 0.95, indicating a good model fit. Figure 3-5 to Figure 3-8 shows origin and destination trip density comparison of the AirSage versus the CMHCTDM.

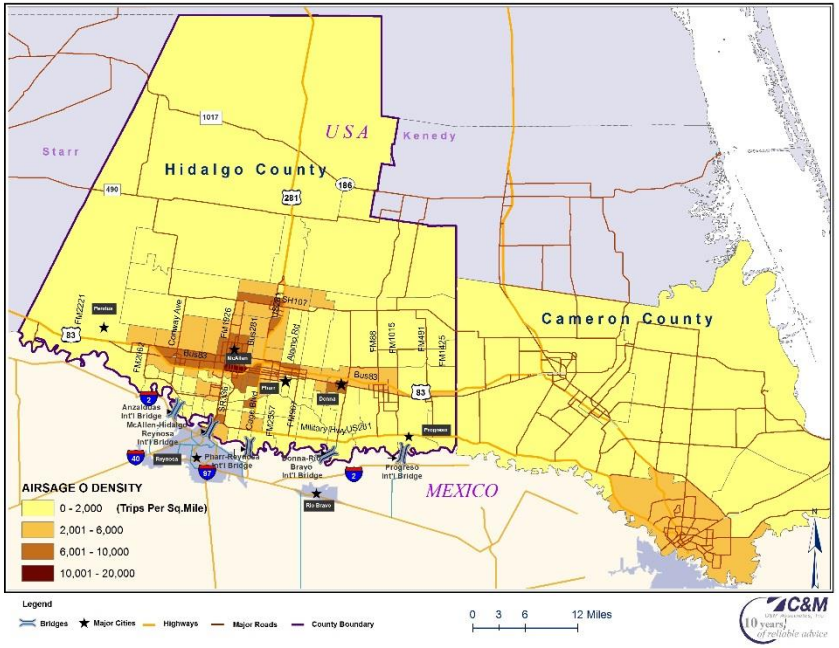


Figure 3-5. Airsage Trip Density Origin

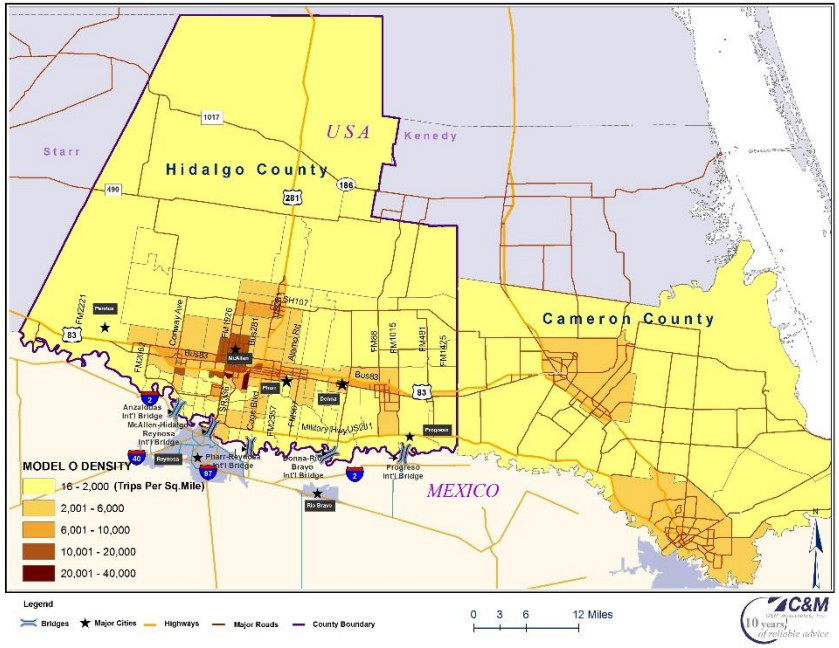


Figure 3-6. CMHCTDM Trip Density Origin

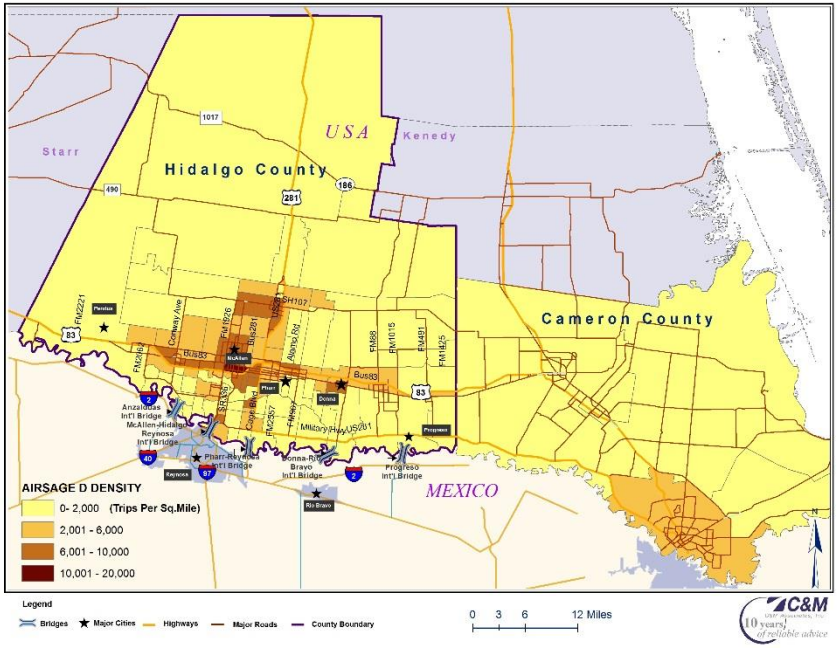


Figure 3-7. Airsage Trip Density Destination

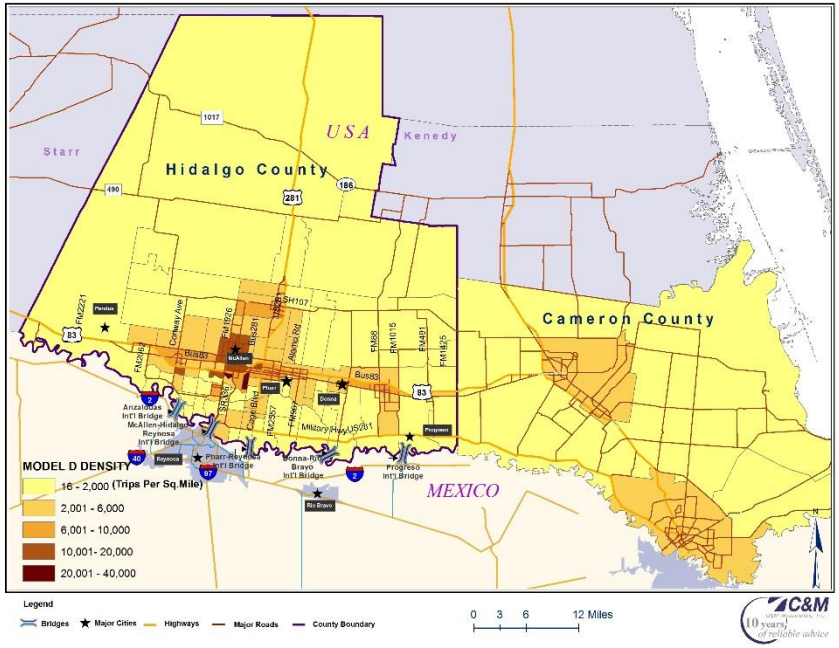


Figure 3-8. CMHCTDM Trip Density Destination

Besides the pure OD data from this survey, C&M obtained additional information that has also been used in model development and validation. Based on the location, length of stay, and the time of day, the mobile device OD survey determined the OD matrix also by trip purposes. The following trip purposes were included in this survey: Home-Based Work (HBW), Home-Based Other (HBO), Work-Based Other (WBO), Worked-Based Home (WBH), Worked-Based Work (WBW), Home-Based Home (HBH), Other-Based Home (OBH), Other-Based Work (OBW), and Other-Based Other (OBO).

C&M used the aggregated version of trip purpose information to validate the Trip Tables from the CMHCTDM by time period, as shown in Table 3-3. It can be observed that the distribution over the daily time periods for the aggregated trip purposes HBW, Home-Based Non-Work (HNW), and Other are similar.

Table 3-3. Comparing Model vs Survey Trip Purpose Distribution by Time Period

Item	Type	AM	PM	MD	NT
Model Shares	HBW	31%	26%	22%	21%
	HNW	12%	23%	45%	20%
	Other	13%	24%	44%	19%
Survey Shares	HBW	29%	21%	30%	20%
	HNW	15%	21%	35%	29%
	Other	15%	22%	42%	21%

Note: AM = Morning Period, PM = Afternoon Period, MD = Mid Day Period, NT = Night Time Period

The obtained trip length distribution from the OD survey is compared to the model distribution in Chapter 5. Other data that have been very useful for model development include the separation of the OD matrix into 16 income groups. Based on these data, C&M could identify for every OD pair the percent of trip volume by these income groups, which provides a significant improvement to the toll diversion model of the CMHCTDM. Comparing the total trip volume from AirSage by income group to the Census household income group distribution of Cameron and Hidalgo County shows a similar pattern, as can be seen in Figure 3-9.

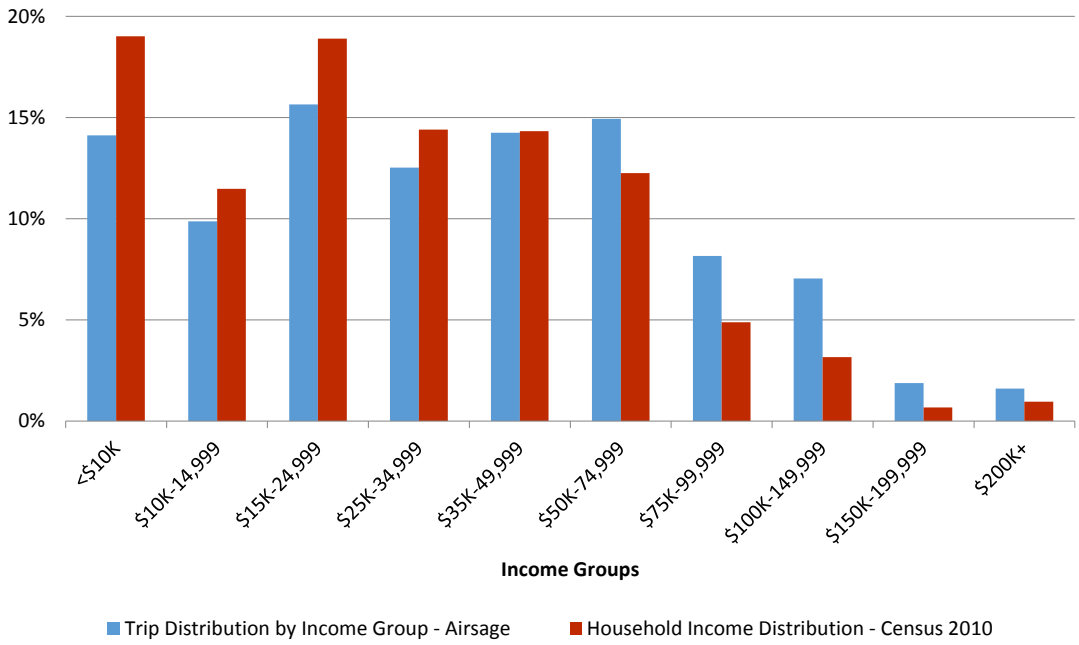


Figure 3-9. Income Group Distribution Comparison

3.5.2. Commercial Truck survey

C&M performed a commercial truck survey on the two truck-carrying international bridges in Hidalgo County: Pharr and Progresso International Bridge. C&M surveyed the trucks crossing from Mexico into the United States. The survey was conducted for one week in May 2014. Existing data regarding truck crossings on Hidalgo County international bridges indicate that May is a representative month in terms of traffic volumes. Due to the project schedule, there was no possibility to survey trucks based on specific load types, because the types of goods imported to the United States vary throughout the year. C&M obtained permission to survey truck drivers south of the Mexican/U.S. border while they were in the queue waiting to cross into the United States. The survey materials included a paper-and-pencil questionnaire and a Projects location map. Figure 3-10 shows example images of the surveying process.

Figure 3-10. Truck Survey Images

The survey sample size was 615 truck drivers on the Pharr International Bridge and 140 truck drivers on the Progresso International Bridge, which makes around 33 and 80 percent of the daily truck trips. The achieved sample size is a statistically significant proportion of the truck populations for these bridges.

The survey included not only questions about origin and destination, but also trip frequency, trip duration, cargo type, and general information of the truckers' company and logistics. Selected statistics from the survey are summarized below.

Who pays the Tolls?

For the question regarding who pays the fee to use a toll road, the majority of respondents answered that each route is pre-determined by the driver's company, and if there are tolls involved, each driver is expected to pay the tolls and receive company reimbursement later.

Average Duration of the Trip

Figure 3-11 and Figure 3-12 present the average hourly duration of a trip for truck drivers using Pharr and Progreso International Bridge, respectively. As can be seen, the respondents on both bridges gave similar answers regarding trip duration.

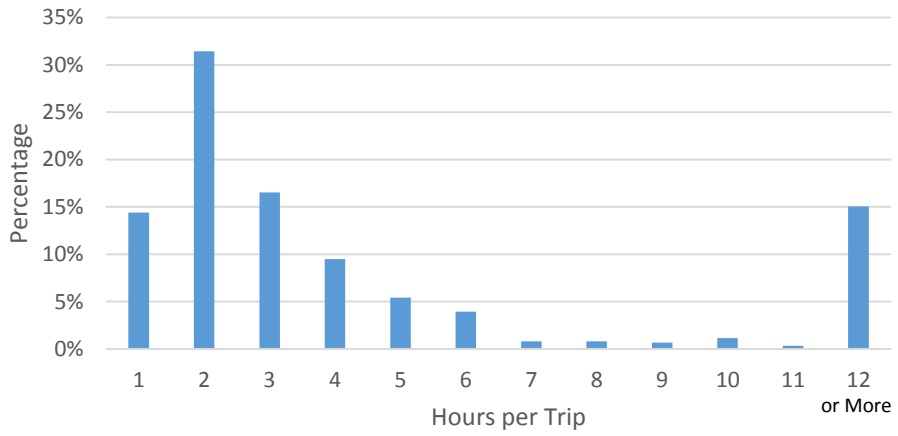


Figure 3-11. Trip Duration – Pharr Bridge

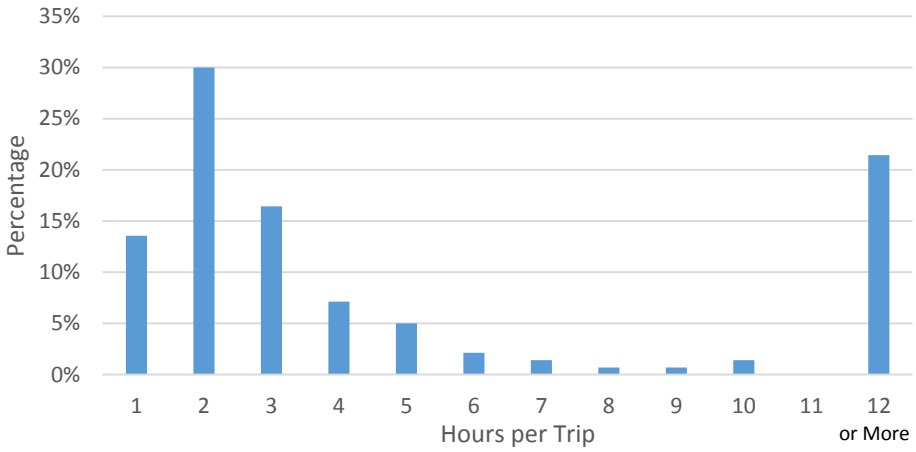


Figure 3-12. Trip Duration – Progreso Bridge

Average Number of Truck Axles

Figure 3-13 and Figure 3-14 show the number of truck axles crossing Pharr and Progreso International Bridge, respectively. Results indicated that the majority of trucks on both bridges have five axles, and the Progreso International Bridge has not been used by trucks with less than five axles.

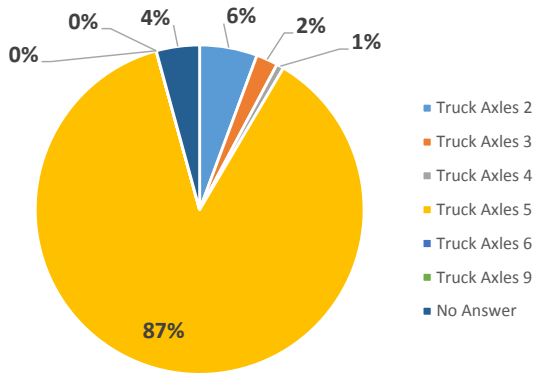


Figure 3-13. Number of Axles – Pharr

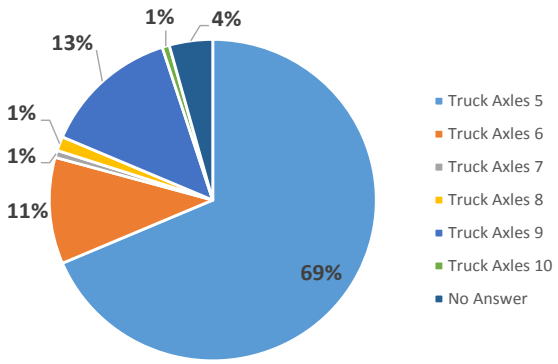


Figure 3-14. Number of Axles – Progreso

Load Type

Figure 3-15 and Figure 3-16 show the types freight the trucks carry on Pharr and Progreso International Bridge, respectively. Fruits and Vegetables were the major imported products on both bridges, and a greater variety of freight is carried over the Pharr International Bridge. However, as noted earlier, these types of freight imported are subject to change throughout the year.

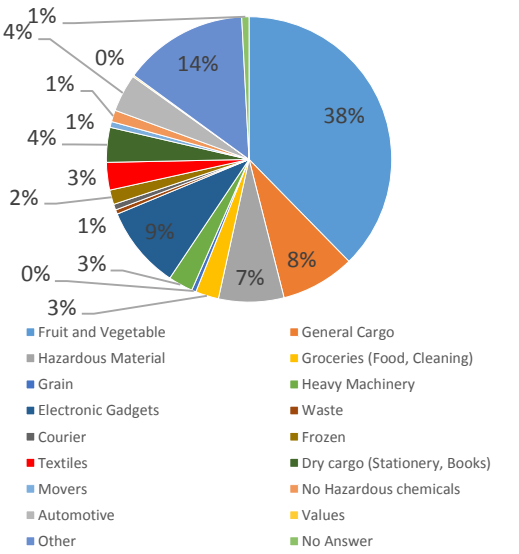


Figure 3-15. Load Type – Pharr

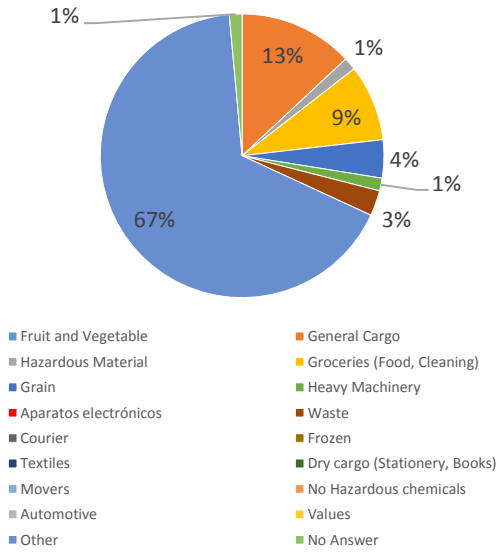


Figure 3-16. Load Type – Progreso

Other Relevant Statistics

- 49% of drivers at Progreso Bridge and 34% of drivers at Pharr Bridge perform this trip on a weekly basis.
- 94% of drivers at Progreso Bridge and Pharr Bridge have the cost of crossing the bridges paid for by their companies.
- 89% of drivers at Progreso Bridge and 52% of drivers at Pharr Bridge were not coming from a Maquiladora or an industrial park.
- 53% of trucks at Progreso Bridge and 74% of trucks at Pharr Bridge are owned by a Company or an Association.
- 55% of trucks at Progreso Bridge and 48% of trucks at Pharr Bridge do not belong to a fast driving program.
- 64% of drivers at Progreso Bridge and 44% of drivers at Pharr Bridge do not face any traffic congestion once they cross the U.S. border.
- 36% of trucks crossing the Pharr International Bridge from the United States to Mexico are three-axle trucks.

4. Socioeconomic Evaluation and Projection

This chapter provides an evaluation of current and future socioeconomic data within Hidalgo County and surrounding areas relevant to the Projects. Special emphasis was placed on factors that impact transportation activities and drive traffic demand within the area of the Projects, particularly population, employment, number of households, median household income, and gross domestic product (GDP).

C&M based its socioeconomic evaluation on a study carried out by the Center for Border Economic Studies (CBEST) at the University of Texas-Pan American (UTPA). CBEST is a public policy research unit of the College of Business Administration at UTPA; it is dedicated to the study of problems and issues unique to the U.S./Mexican border economy. CBEST conducts interdisciplinary research that supports economic development, trade, entrepreneurship, innovation, social mobility, and access.

C&M's evaluation process not only included a study of historical growth within Hidalgo County, but within the region as a whole. In addition, C&M considered other data and projections in the evaluation process, and a number of private economic research and forecast groups were consulted, among them Moody's Analytics and Woods & Poole Economics. Information from the previous CMHCTDM – 2012 Update was also used.

As part of its socioeconomic evaluation of the study area, C&M personnel took the following steps:

- Reviewed historical and forecasted socioeconomic data.
- Determined countywide population and employment growth rates between 2012 and 2035.
- Determined population and employment growth at the census tract level.
- Prepared Traffic Analysis Zone (TAZ)-level socioeconomics for all future model years using socioeconomic data provided by UTPA.

The following sections summarize the results of C&M's socioeconomic evaluation, beginning with a description of population data.

4.1. Population

The baseline assessment of population was derived from county and city data, including datasets on population and land use, all of which were collected and analyzed. Additional data were gathered from the following local, state, and federal agencies:

- Texas State Data Center (TSDC)
- U.S. Census Bureau (Census)
- HCMPO/C&M Model
- Reports and studies produced for cities within Hidalgo County
- Moody's Analytics (Moody's)

- Woods & Poole Economics (W&P)
- Texas Water Development Board (TWDB)

4.1.1. Historical Population Trends

The population of Hidalgo County has expanded rapidly in the last four decades, particularly in the 1990s following the implementation of NAFTA. As seen in Table 4-1, Hidalgo County has added 237,537 residents since 2000, with a Compound Annual Growth Rate (CAGR) of about 3 percent. In comparison, the state's overall CAGR is 1.9 percent for the same time period. With a 2012 population of 807,000 Hidalgo County is fast becoming the state's most populous border region.

Table 4-1. Hidalgo County Historical Population Trend

Item	1970	1980	1990	2000	2009	2010	2012
Hidalgo Population	181,535	283,229	383,545	569,463	741,200	774,769	807,000
CAGR		4.5%	3.1%	4.0%	3.0%	4.5%	2.1%

Source: US Census

Population growth in Hidalgo County has been influenced by two key demographic variables: high birth-rate and domestic in-migration. The high birth rate within the area is most likely due to the county's relatively young population. Indeed, its median age of 28.7 years is notably less than that of 33.6 registered for Texas and 36.9 for the United States. In addition, unlike its neighboring counties, Hidalgo County has a positive domestic in-migration, meaning that more people move into the county than move out. This ability to attract residents is a result not only of Hidalgo County's successful economic development programs and quality of life, but also of its booming economy, a by-product of its close relationship with the Mexican city of Reynosa on its southern border.

4.1.2. Population Projections by Outside Sources

In its analysis, C&M studied population projections and compared CAGR forecasts from a variety of outside sources, including W&P, Moody's, the TSDC, and the TWDB. It was found that W&P predicts the fastest rate of growth for the area, whereas the TSDC predicts the slowest growth, as seen in Table 4-2. UTPA population estimates are smaller than those presented by W&P and Moody's. UTPA argues that one key factor behind their lower estimates is lower population growth rates reported by the Census for 2011 and 2012. While the average yearly population growth rate between 2000 and 2010 has been 3.1 percent, for 2011 and 2012 this growth rate dropped to 1.9 and 1.6 percent, respectively.

Table 4-2. Hidalgo County Population Projections from Different Sources

Source	CAGR			Population
	2012-2018	2018-2025	2025-2035	2035
Moody's	2.1%	2.0%	1.8%	1,251,850
W&P	2.0%	2.0%	1.9%	1,270,862
C&M Model	1.7%	1.7%	1.5%	1,176,810
UTPA	1.9%	1.7%	1.5%	1,174,081
TSDC	1.5%	1.4%	1.3%	1,091,697
TWDB*	2.4%	2.3%	2.0%	1,353,520

Note: *Populations for 2012, 2018, and 2035 from the TWDB are calculated via linear interpolation from available data for 2010, 2020, 2030, and 2040.

4.1.3. Population Projections by UTPA

The research conducted by UTPA utilized panel statistical techniques to create "Optimistic," "Conservative," and "Most Likely" population estimates in Hidalgo County for the years 2012 through 2050. Table 4-3 presents UTPA's forecasts and C&M's adopted forecast.

Table 4-3. UTPA Population Forecasts for Hidalgo County

Population Forecast	2012	2018	2025	2035
Conservative	797,947	880,852	956,631	1,025,793
Most Likely	797,468	893,825	1,009,047	1,174,081
Optimistic	796,989	906,798	1,061,464	1,324,631
C&M Model	**809,552**	**895,597**	**1,011,213**	**1,176,810**
CAGR		2010-2018	2018-2025	2025-2035
Conservative		1.7%	1.2%	0.7%
Most Likely		1.9%	1.7%	1.5%
Optimistic		2.2%	2.3%	2.2%
C&M Model		**1.7%**	**1.7%**	**1.5%**

After evaluating UTPA's methodology and findings, C&M adopted the projections of this economic forecasting firm for use in its travel demand model (TDM).

4.1.4. Population at the Census Tracts Level

Using the existing proportions within the census tract as a base, population forecasts were assigned to each census tract. Figure 4-1 presents 2012 population density at the census tract level. Figure 4-2, Figure 4-3, and Figure 4-4 illustrate projected population density for the years 2018, 2025, and 2035, respectively.

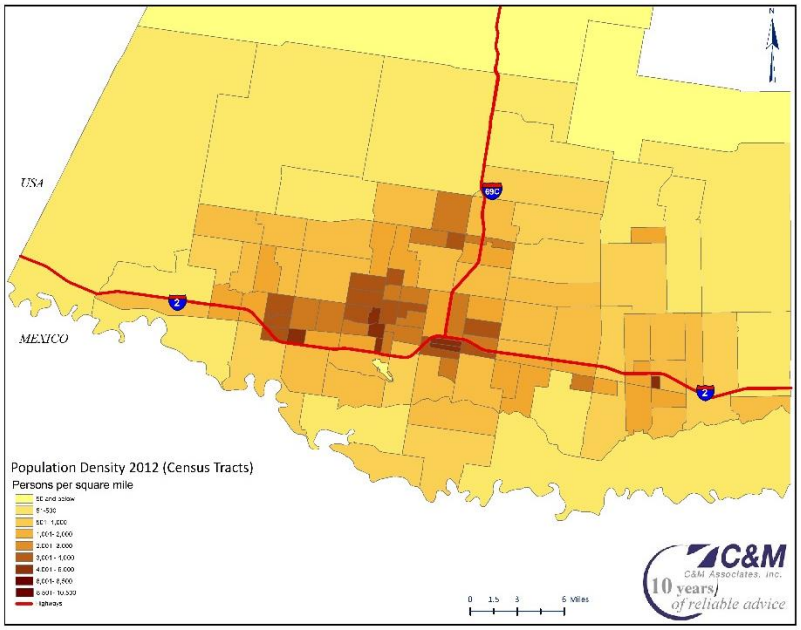


Figure 4-1. Population Density Map – 2012

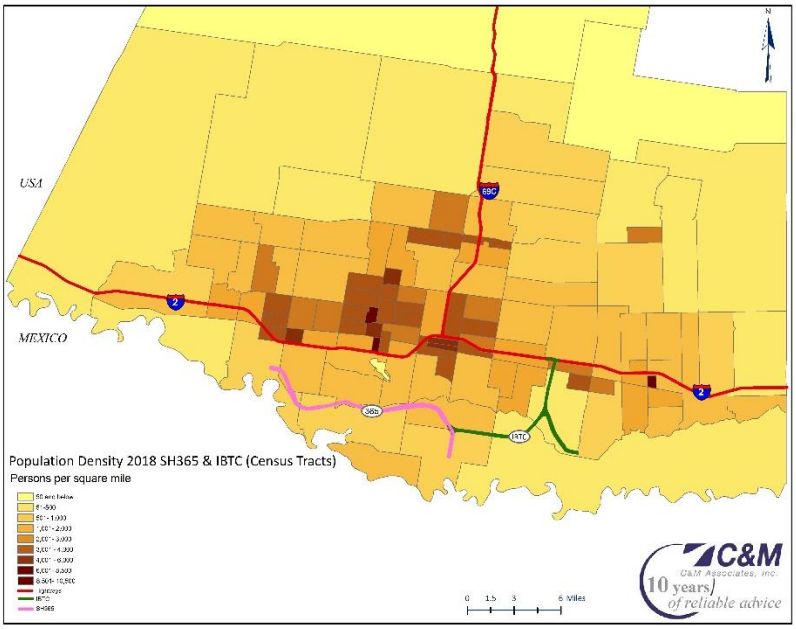


Figure 4-2. Population Density Map – 2018

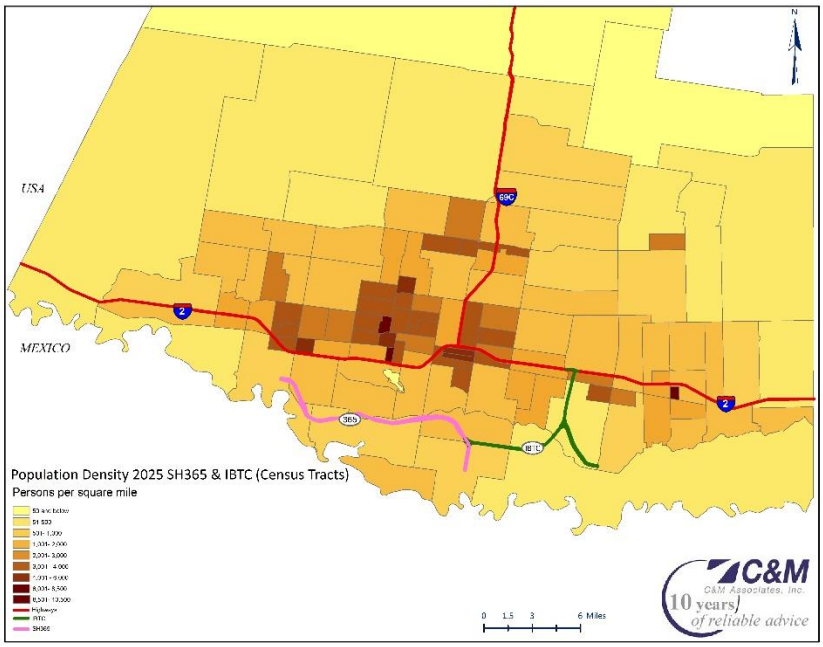


Figure 4-3. Population Density Map – 2025

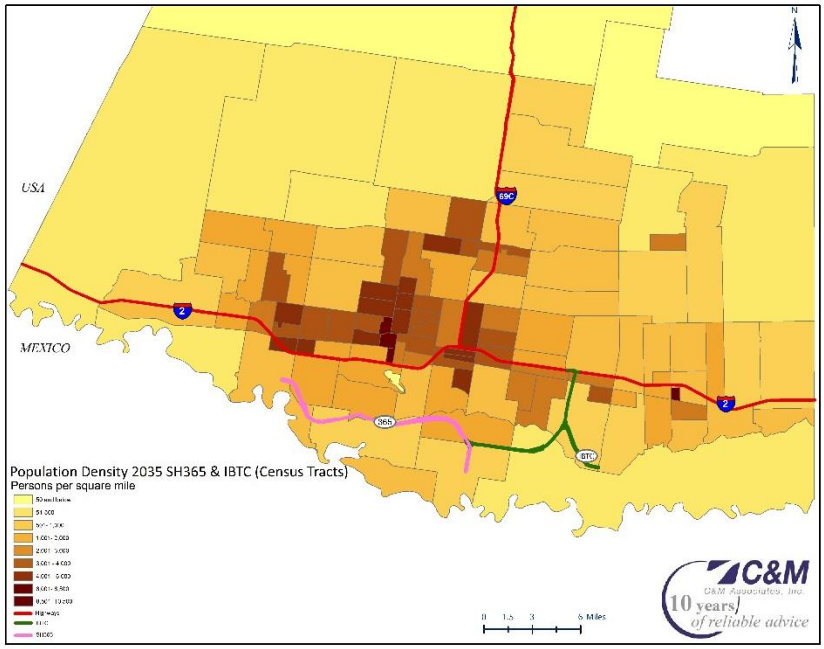


Figure 4-4. Population Density Map – 2035

4.2. Employment

From a transportation planning perspective, workplace-based employment in a region provides a more straightforward picture of trip destinations. In an effort to develop such a picture, C&M studied and evaluated Hidalgo County's current job market, the area's employment history, and available projections for the county. Based on that information, employment forecasts were developed for the greater Hidalgo County area, specifically for those census tracts within the study area. The final employment forecast took into account information obtained through interviews with Hidalgo County stakeholders. These interviews not only provided valuable insights into the current trends within the area, but they also provided an indication of what might lie ahead in the future.

4.2.1. Historical Employment Trends

C&M collected and analyzed county and city data pertaining to employment and labor force size within Hidalgo County. Additional employment information was then gathered from local, state, and federal agencies, as well as from the following private economic research and forecasting groups:

- Bureau of Labor Statistics (BLS)
- Moody's
- W&P

Table 4-4 below depicts Hidalgo County's employment growth pattern since 1990. The findings indicate that, with the exception of 2009, the area has consistently experienced an increase in jobs. In fact, until 2008 employment in Hidalgo County was growing at a faster rate than the population. During recent years, both employment and population have grown at similar rates.

Table 4-4. Hidalgo County Historical Employment Trends

Item	1990	2000	2005	2006	2007	2008	2009	2012
Total Nonfarm Employment	101,408	156,875	194,492	202,158	211,842	219,258	217,475	228,900
CAGR		4.5%	4.4%	3.9%	4.8%	3.5%	-0.8%	1.7%

Source: Bureau of Labor Statistics (BLS)

From 2000–2012, when compared to other counties along the Texas-Mexico border, as well as to the State of Texas and the nation as a whole, Hidalgo County experienced a substantially higher rate of population and employment expansion, as seen in Figure 4-5.

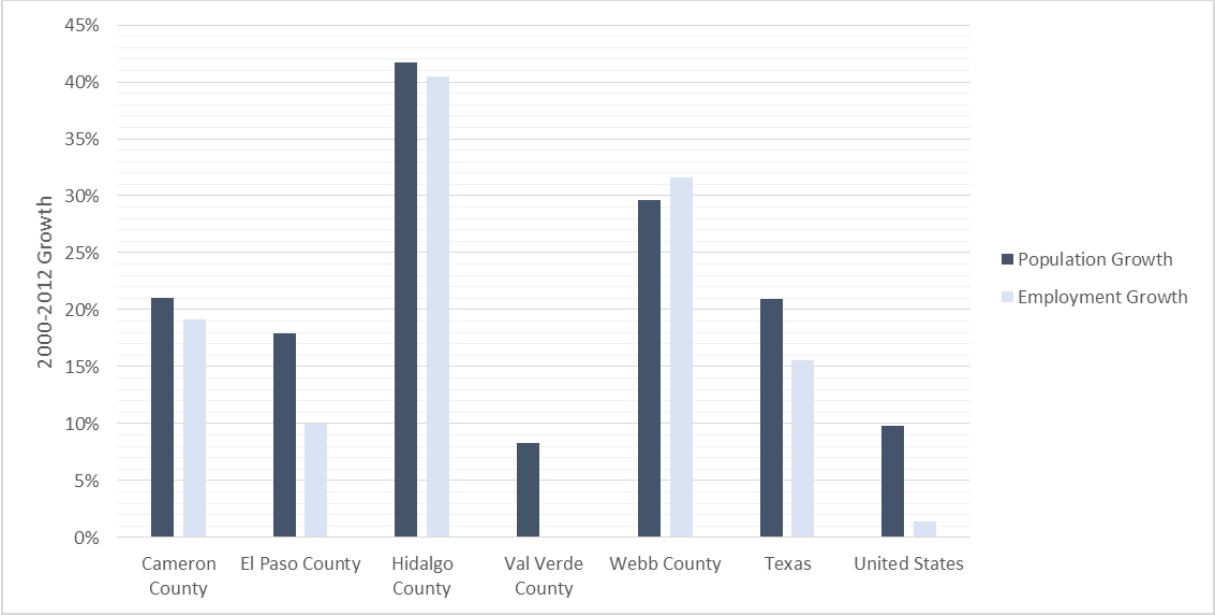


Figure 4-5. Comparison of Hidalgo Demographic Growth with Other Areas

4.2.2. Employment Projections by Outside Sources

C&M reviewed employment projections provided for Hidalgo County by Moody's and W&P, as seen in Table 4-5 below. While the findings reveal a significant difference between the two firms regarding employment growth during the first few years, both sources forecast similar overall growth by the year 2035.

Table 4-5. Hidalgo County Employment Projections from Different Sources

Source	Forecasted CAGR		
	From 2012 to 2018	From 2018 to 2025	From 2025 to 2035
Moody's	3.3%	1.6%	2.2%
W&P	2.2%	2.2%	2.1%

4.2.3. Employment Projections by UTPA

Providing a short-term and long-term economic forecast for employment within the project area required a review of current macroeconomic trends such as the national economic recession, inflation, trade deficits, and others, all of which impact local economic activity. Also factored into this economic equation were existing and planned activities in Hidalgo County and the Mexican city of Reynosa.

The national economy is an important driver for Hidalgo County's short-term economic outlook; indeed, national and international trends are proving to have a major impact on the health status of an increasing number of local firms. The area's close proximity to northern Mexico's many manufacturing and export assembly plants (i.e., *maquiladoras*) has led to a robust trade industry; as a result, the long-term forecast calls for Hidalgo County to remain an attractive location for residents and businesses alike. Therefore,

long-term population and employment projections outlined in this report represent realistic estimates of Hidalgo County's growth potential. Accordingly, employment projections are expected to follow historical growth patterns as illustrated in Table 4-6, which shows the Most Likely, Optimistic, and Conservative forecast levels used by UTPA to gauge Hidalgo County's employment through 2035.

Table 4-6. UTPA Employment Forecasts for Hidalgo County

Employment Forecast	2012	2018	2025	2035
Conservative	230,951	257,833	284,602	313,992
Most Likely	230,951	260,676	296,086	346,922
Optimistic	230,951	263,520	307,570	379,904
C&M Model	**230,951**	**260,676**	**296,086**	**346,922**
CAGR		**2018-2010**	**2025-2018**	**2035-2025**
Conservative		1.9%	1.4%	1.0%
Most Likely		2.0%	1.8%	1.6%
Optimistic		2.2%	2.2%	2.1%
C&M Model		**2.0%**	**1.8%**	**1.6%**

Hidalgo County's employment growth has closely mirrored its growth in population. In fact, over the past 20 years, employment in the area has expanded at a CAGR of about 3.8 percent. By the year 2035, UTPA's Most Likely scenario projects 346,922 jobs within the Hidalgo County area.

4.2.4. Employment at Census Tract Level

Forecasted county-wide employment totals served as the control for assigning employment figures at the census tract level. Total employment figures were estimated by job category to match the input fields for C&M's TDM. Basic, retail, and service employment categories contribute to about 14, 14, and 72 percent of the total employment, respectively. Education sector employment was included in the service sector.

Figure 4-6 presents employment density in 2012 at the census tract level. Figure 4-7, Figure 4-8, and Figure 4-9 illustrate employment density for the years 2018, 2025, and 2035 based on the build scenarios for the IBTC and SH 365.

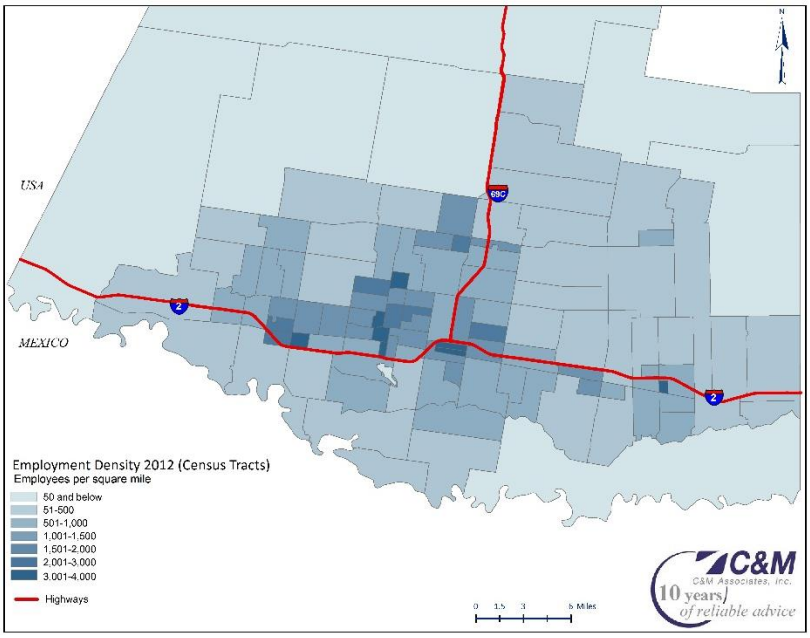


Figure 4-6. Employment Density Map – 2012

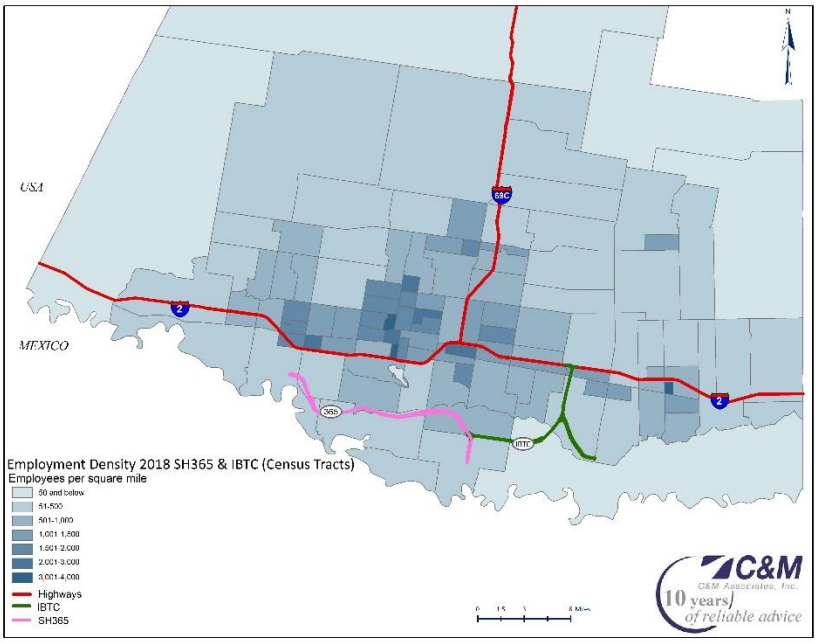


Figure 4-7. Build Scenario Employment Density Map – 2018

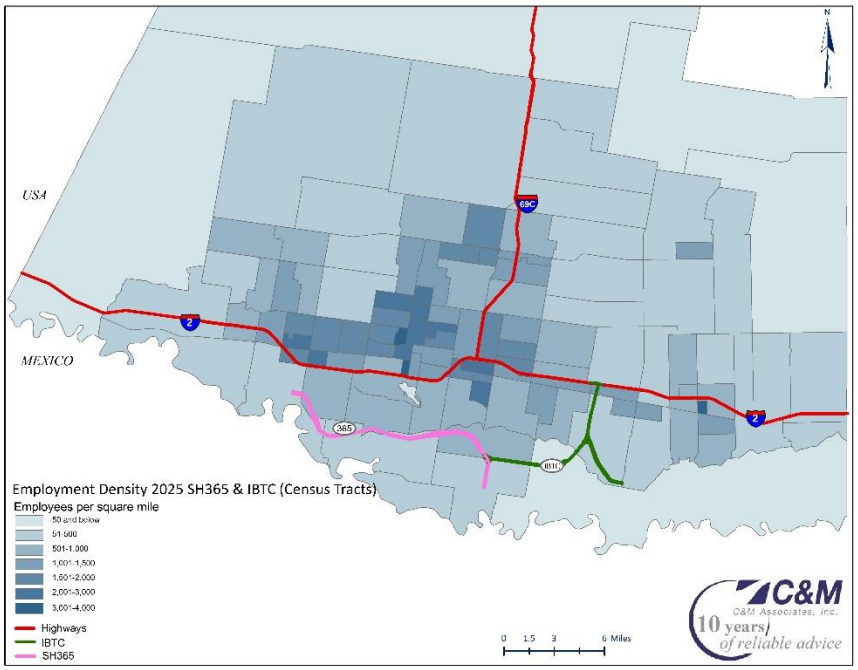


Figure 4-8. Build Scenario Employment Density Map – 2025

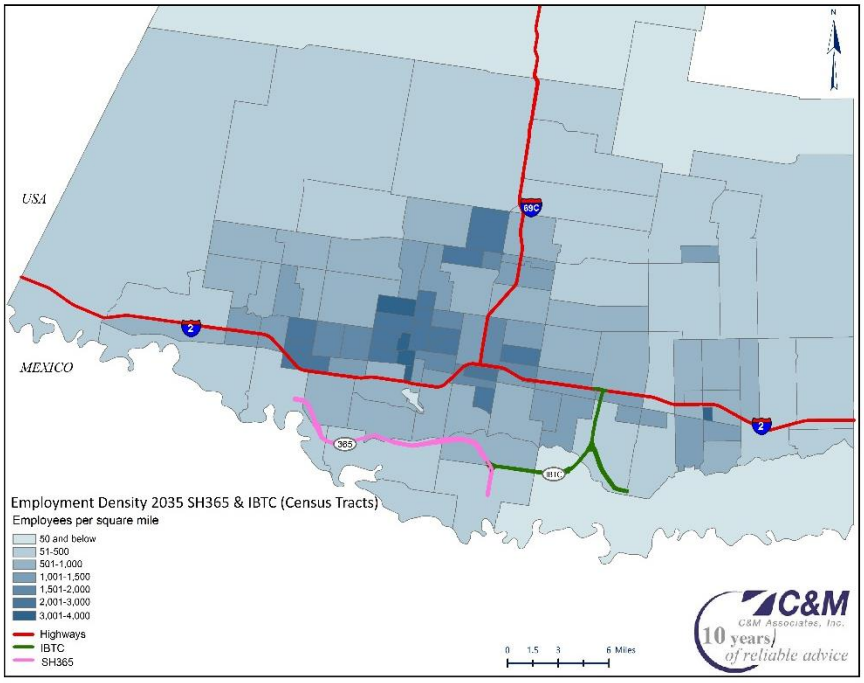


Figure 4-9. Build Scenario Employment Density Map – 2035

4.3. Cross Border Economic Activity

Hidalgo County and northern Mexico represent a highly-integrated economic unit. Each day, residents from both countries travel across the border in search of consumer goods, personal services, and educational and employment opportunities. Businesses ship raw materials and unfinished products to manufacturing facilities throughout the region, where they await additional processing, final assembly, and eventual distribution. Therefore, socioeconomic trends in Mexico and the border region have a profound impact on activity within Hidalgo County, stimulated in large part by the fast-growing Mexican city of Reynosa, located just across the border. From 2000–2010, Reynosa's population experienced a CAGR of 3.8 percent.[1] Figure 4-10 compares Reynosa's recent population boom with the populations of other major urban areas in Mexico, as well as with the State of Tamaulipas and the nation as a whole.[2]

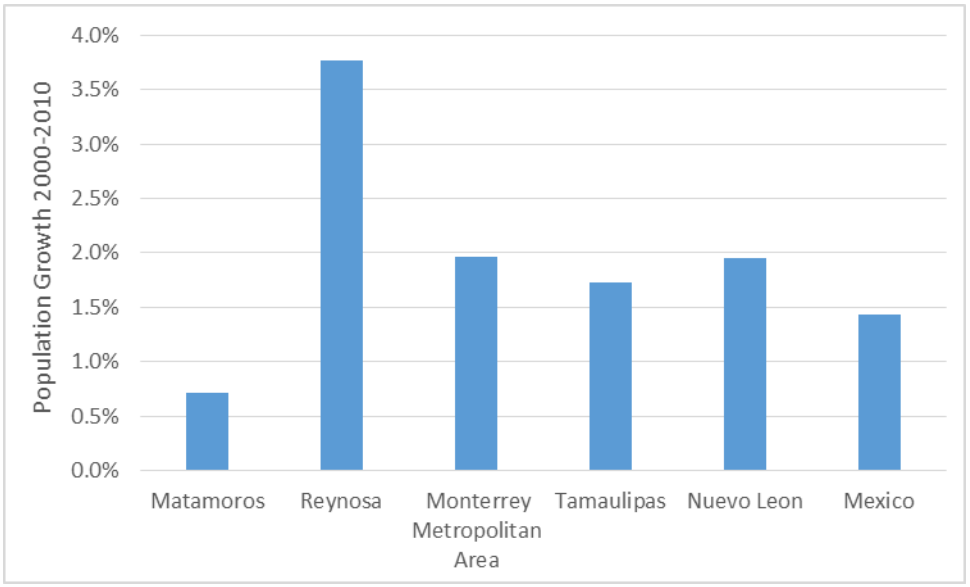


Figure 4-10. 2000 to 2010 Population Growth in Representative Mexican Regions

4.3.1. Median Household Income Trends and Projections

Median household income is another socioeconomic variable used as an input in travel demand modeling. Data pertaining to Hidalgo County's median household income were obtained from a variety of sources. Historical trends, current figures, and future projections were compared in order to ensure consistency. Historical and forecasted median household income for Hidalgo County is presented in Figure 4-11 below.

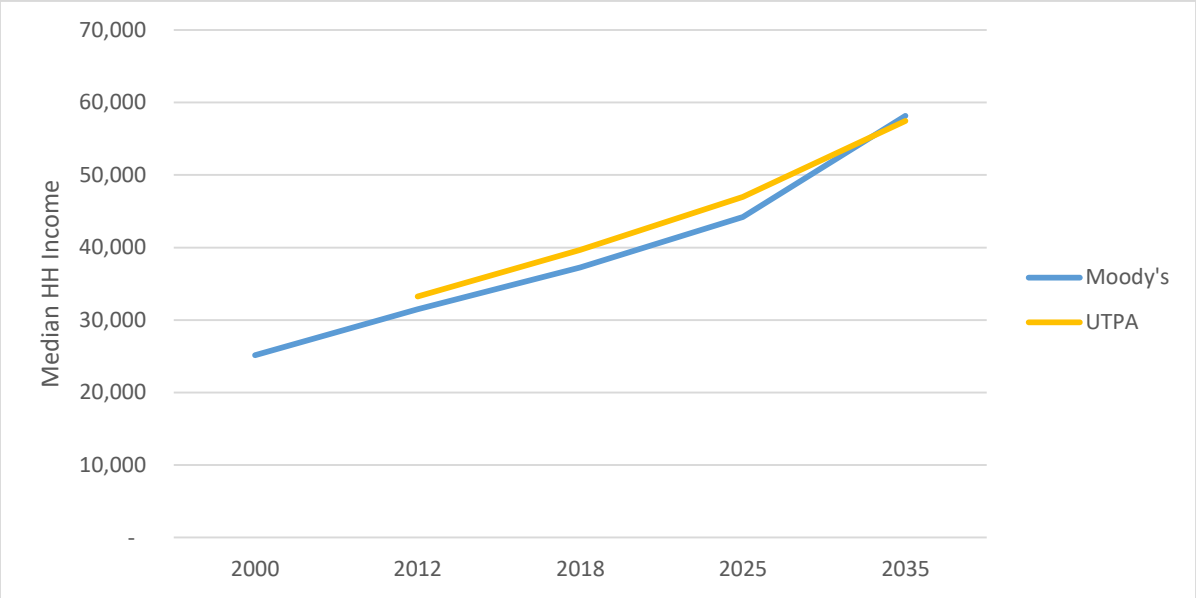


Figure 4-11. Historical and Projected Median Household Income by Source

4.4. Gross Domestic Product

Gross Domestic Product (GDP) is widely seen as the most comprehensive measure of economic activity. An industry's GDP, or its value added, is calculated as the sum of incomes earned by labor and capital and the costs incurred in the production of goods and services.

Consistent with a growing economy, Hidalgo County's GDP has reached the levels experienced prior to the Great Recession: over $13.8 billion. As with other socioeconomic information, C&M adopted UTPA's projections for future GDP trends. Figure 4-12 presents historical and future GDP per-capita trends for Hidalgo County according to UTPA.

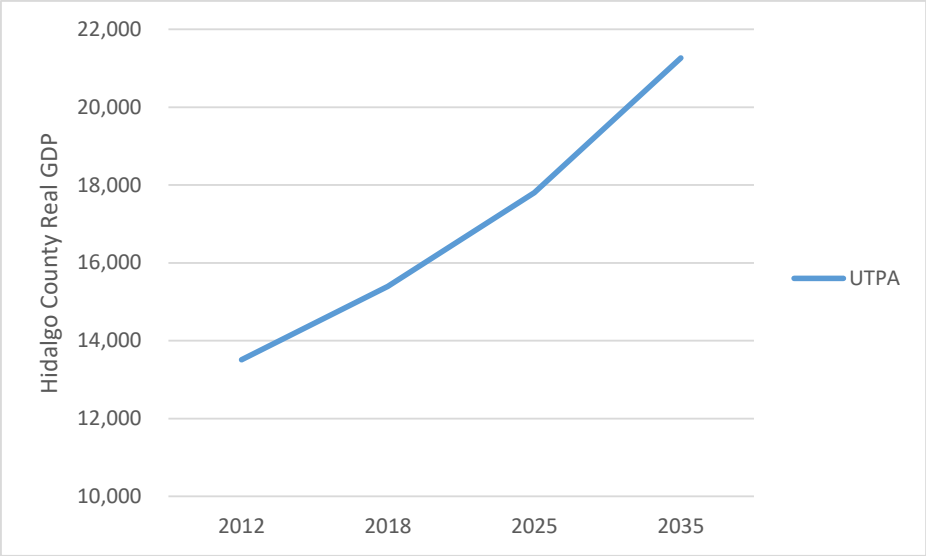


Figure 4-12. UTPA's Hidalgo County Real GDP Projections

Moody's provided Texas GDP based on historical growth and other economic factors. Figure 4-13 presents historical and future GDP forecasts from Moody's.

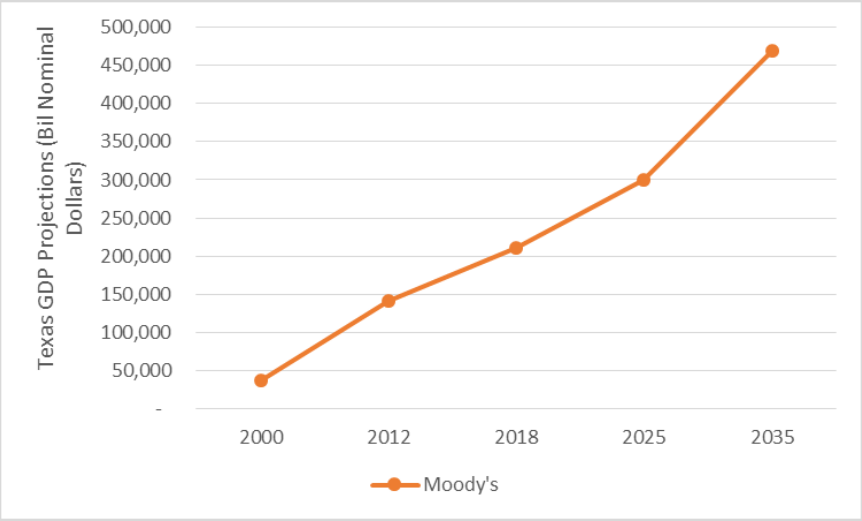


Figure 4-13. Moody's Texas GDP Projections

4.5. Consumer Price Index

The Consumer Price Index (CPI) measures the average price of consumer goods and services purchased by households, as well as price change for a constant market quantity of goods and services from one period to the next within the same region. The annualized percent change in CPI is a means of estimating inflation. Usually, economic indicators such as GDP are forecasted in nominal terms by different economists. CPI is used to deflate this forecast to dollars of one base year so that the real growth in such indicators

can be understood. C&M used percent changes in CPI projections provided by Moody's to obtain the real growth in per capita GDP and, in turn, real growth in toll rates for the Projects throughout the concession period.

Figure 4-14 illustrates historical CPI for the State of Texas as well as future projections adjusted to the year 2012.

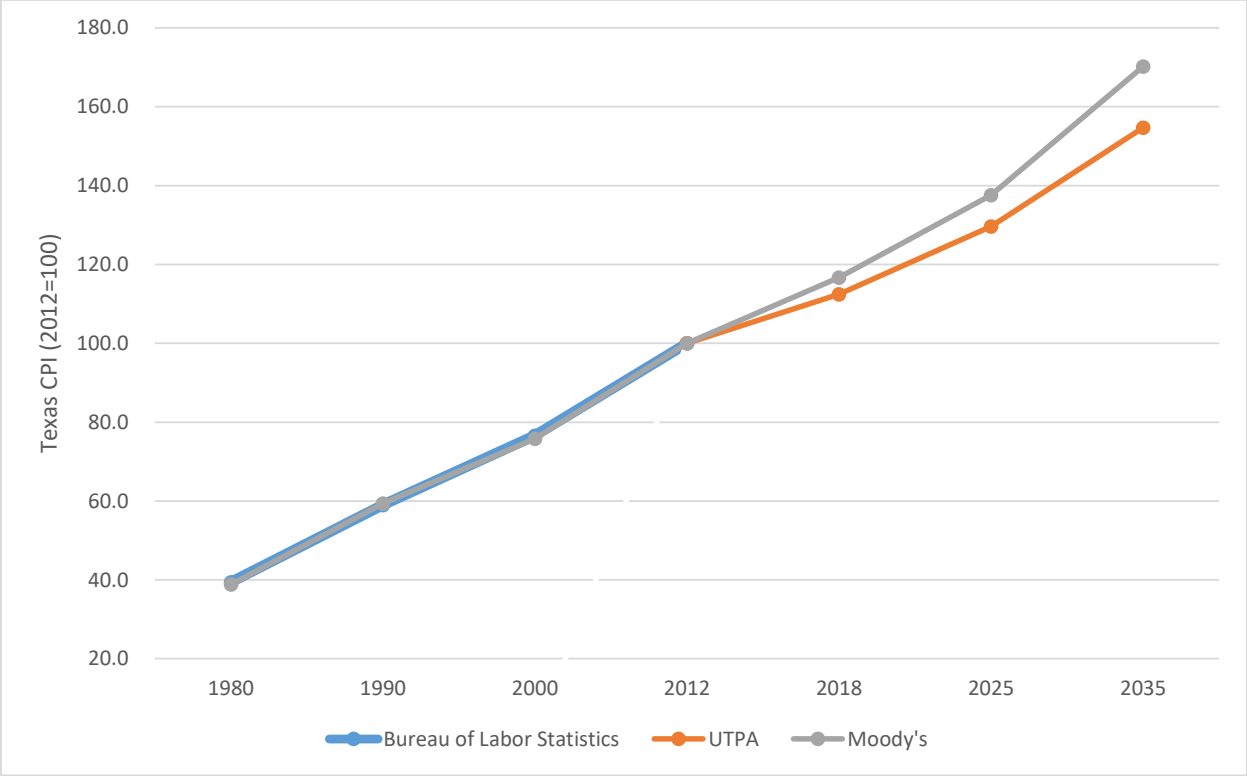


Figure 4-14. Historical and Projected CPI by Source

[1]Instituto Nacional de Estadística y Geografía, Mexico (n.d.). Datos de la Población Mexicana. Retrieved August 4, 2014 from http://www.inegi.org.mx/inegi/default.aspx

[2] City Population (n.d.). Mexico: Metropolitan areas. Retrieved August 5 2014 from http://www.citypopulation.de/Mexico-Agglo.html

5. Modeling Approach

This chapter outlines the steps undertaken by C&M in its effort to model travel demand for the proposed Projects. For this study, C&M updated the existing C&M four-step travel demand model (TDM) on the TransCAD 6.0 build 6025 platform. C&M evaluated and updated all four steps of the TDM based on current transportation data, future road network improvements, travel demand, and traffic patterns available within the project area.

The model was calibrated to existing traffic conditions within the area and subsequently used in the development of future year networks for 2018, 2025, and 2035. For those years falling in between the modeled years, and for those after 2035, T&R figures were calculated by interpolating and extrapolating the results of the models and applying them to projected years. The model area is divided into 926 Traffic Analysis Zones (TAZs): 900 internal zones and 26 external zones. The external zones comprise 16 major highways and 10 international bridges, as presented in Figure 5-1.

The following sections describe the development of the C&M Hidalgo County TDM (CMHCTDM) as well as the time of day methodology, model calibration, and toll diversion.

5.1. Travel Demand Model Development

The CMHCTDM development included updating the model transportation networks as well as updating and validating the four-step model methodology. The following section outlines the process undertaken by C&M to update the 2012 base year model network and the future roadway networks within the project area.

5.1.1. Network Coding

Base Year Network

C&M reviewed the CMHCTDM 2012 base year network with existing information. The major source for the network update has been the Hidalgo County Metropolitan Planning Organization (HCMPO) Thoroughfare Plan from February 20, 2014,[1] supplemented by other publicly available satellite images, with a specific focus on the study area around the Projects.

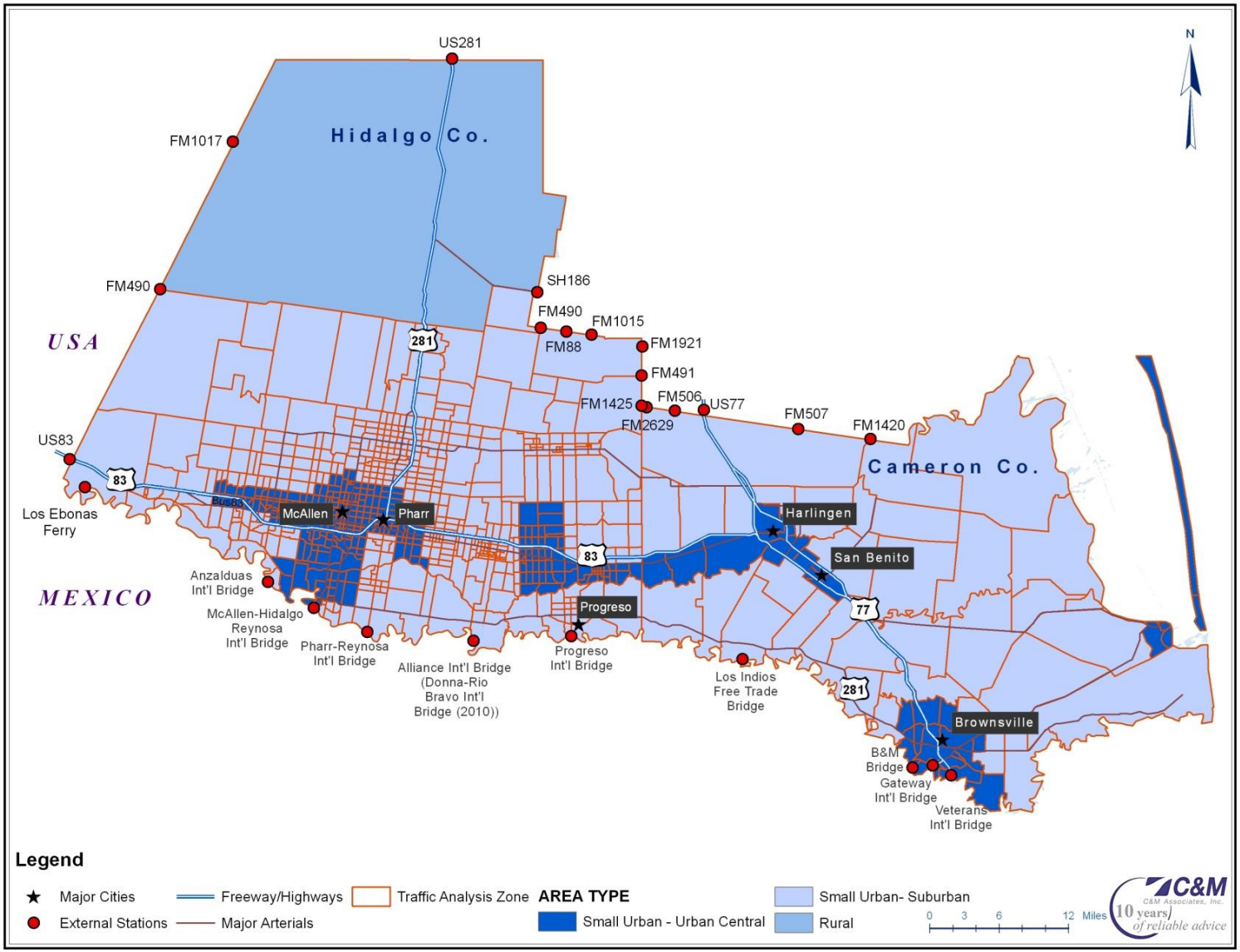


Figure 5-1. CMHCTDM Traffic Analysis Zones

The CMHCTDM roadway links have seven classes based on their individual functions within the transportation network. Every road class has its own free flow speed and hourly capacity per lane, depending on the kind of area in which the roadway link is located. Table 5-1 presents the speed and daily capacity per lane for every road class. Figure 5-2 depicts the functional classes of the CMHCTDM base year roadway network.

Table 5-1. Hourly Capacity and Speed Table

Road Class	Area Type					
	Small Urban - Suburban		Small Urban - Urban Central		Rural	
	Capacity	Speed	Capacity	Speed	Capacity	Speed
Highways	1,600	65	1,400	65	1,400	70
Major Arterials	800	45	600	50	600	55
Minor Arterials	800	35	700	40	600	45
Collectors/Local St.	600	30	600	35	400	40
Frontage Road	1,000	35	800	35	800	35
Ramps	1,500	35	1,500	35	1,500	35
Centriod Connectors	9,000	35	9,000	35	9,000	55

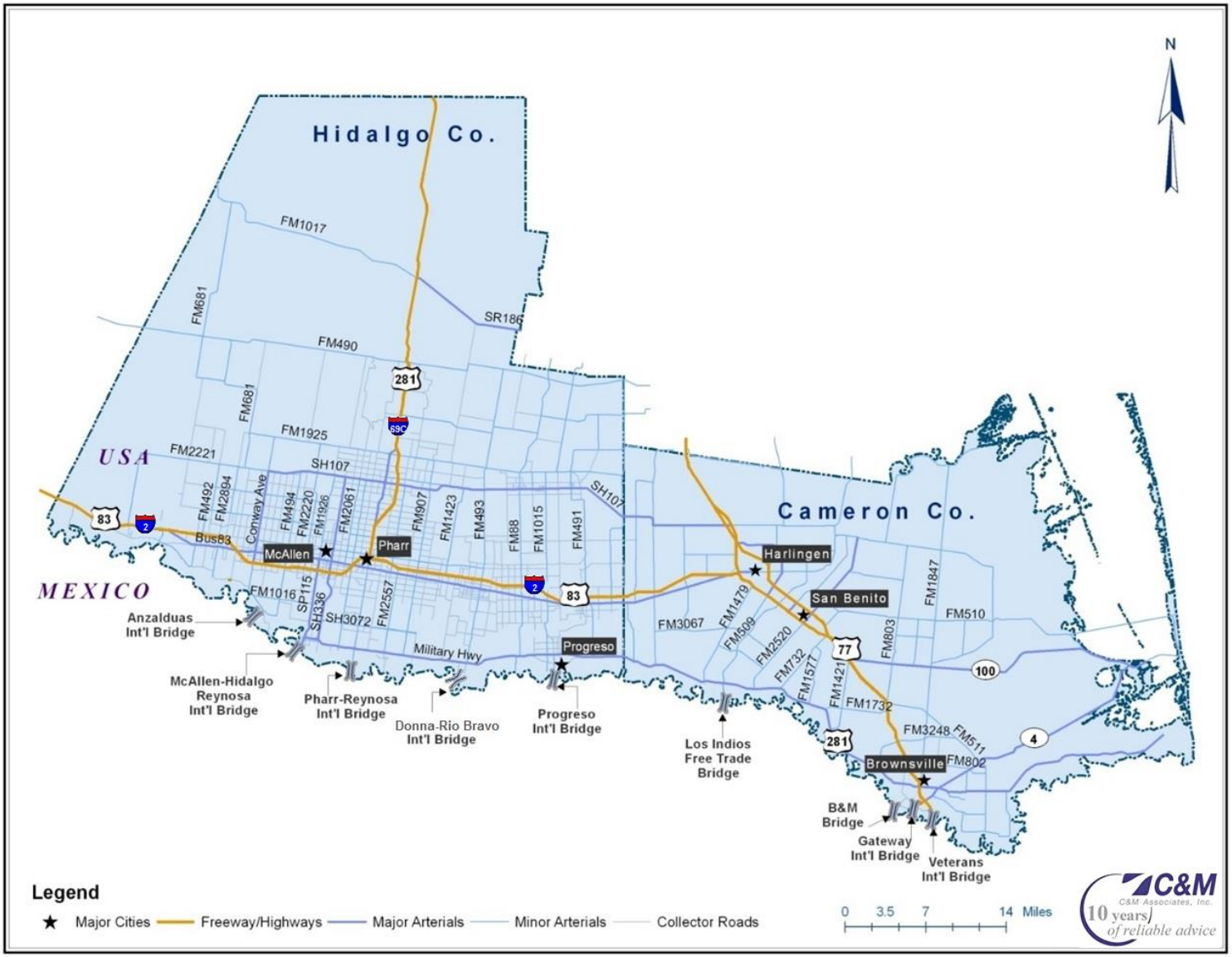


Figure 5-2. CMHCTDM Base Year Roadway Network

Future Year Networks

C&M developed model roadway networks for 2018 (Opening year), 2025, and 2035, taking into consideration the HCMPO Long Range Metropolitan Transportation Plan (MTP) 2035[2] and the Transportation Improvement Program (TIP) outlined in the MTP for fiscal year 2013–2016[3] (Amendment #5). All network improvements inside the study area that were assumed in developing future year network improvements are illustrated in Table 5-2 and Figure 5-3.

Build Networks

The Projects are expected to open in 2018. C&M coded the Projects' alignments inside the 2018, 2025, and 2035 model roadway networks based on the design drawings provided by Dannenbaum Engineering, Inc. Roadway characteristics corresponding to the Highway road class were assigned to the Projects.

As per design drawings, the Projects will have two lanes in each direction during the opening year and will be improved to three lanes in each direction by 2035. C&M assigned a free flow speed of 75 mph. Figure 5-3 shows the Projects' alignments and includes the future network improvements.

Table 5-2. Network Improvements in the Study Area from 2010–2035

HCMPO Project ID	Roadway	From	To	Number of Lanes and Year				
				2012	2018	2025	2030	2035
HC-10	FM 1925	Kenyon	FM 907 (Alamo Rd)	2	4	4	4	4
HC-106	Dove (Owassa)	Jackson	US 281	2	4	4	4	4
HC-113	FM 3461 (Nolana)	FM 2061 (McColl Rd)	US 281	4	4	6	6	6
HC-117A	FM 676 (Mile 5 N)	FM 492 (Doffing)	SH 364 (La Homa Rd)	2	2	2	2	4
HC-117B	FM 676 (Mile 5 N)	SH 364 (La Homa Rd)	SH 107 (Conway)	2	2	2	4	4
HC-117C	FM 676 (Mile 5 N)	SH 107 (Conway)	Taylor Rd	2	2	4	4	4
HC-119	FM 907 (Alamo Rd)	Nolana	US 83	2	2	4	4	4
HC-125	Hutto Rd	US 83	Bus 83	2	2	2	4	4
HC-12A	FM 1925	FM 907 (Alamo Rd)	3rd St	2	2	4	4	4
HC-12B	FM 1925	3rd St	FM 493 (La Blanca)	2	2	2	4	4
HC-13	FM 1925	FM 493 (La Blanca)	FM 88	2	2	2	2	4
HC-130	Jackson Ave	S Bicentennial Ave	S 2nd St	2	2	2	4	4
HC-14	FM 1925	FM 88	FM 491 (Mile 1 W)	2	2	2	2	4
HC-144	Mile 5 N	Taylor Rd	Ware Rd	2	2	4	4	4
HC-148B	Mile 6 W Rd	Mile 11 N	SH 107	2	2	2	2	4
HC-152a	Nolana Loop	FM1426 (Raul Longoria)	East of FM 907	2	2	4	4	4
HC-152b	Nolana Loop	East of FM 907	East of FM 1423	2	2	4	4	4
HC-152C	Nolana Loop	East of FM 1423	East of FM 493	2	2	2	4	4
HC-152D	Nolana Loop	East of FM 493	FM 88	2	2	2	4	4
HC-155A	Nolana Loop	FM 2220 (Ware Rd)	SH 336 (10th St)	4	4	4	6	6
HC-166	Schunior Ave	Sugar Rd	4th St	2	2	2	2	4
HC-167	Sioux Rd	I Rd	FM 1426 (Raul Longoria)	2	2	2	4	4
HC-170	Sprague Ave	Sugar Rd	SH 336 (N 10th St)	2	2	2	4	4
HC-171	Sugar Rd	SH 107	Schunior Ave	2	2	2	4	4
HC-177A	Trenton Rd	US 281	FM 1426 (Raul Longoria)	2	2	2	4	4
HC-178B	US 83	0.5 Mi E of Bus 83	FM 1427 (Abram)	4	4	6	6	6
HC-18	FM 2062 (Bentsen Palm)	US 83S	Bus 83	2	2	2	4	4
HC-182AB	SH 364 (La Homa)	FM 1924 (Mile 3 N)	FM 2221	2	2	2	2	4
HC-19B	FM 2220 (Ware Rd)	FM 1924 (Mile 3 N)	Mile 5 N (Auburn Ave)	4	6	6	6	6
HC-19A	FM 2220 (Ware Rd)	Mile 5 N (Auburn Ave)	SH 107	4	4	4	6	6
HC-224	SH 107 (Conway)	FM 495	FM 1924 (Mile 3 N)	4	4	4	6	6
HC-225	SH 107 (Conway)	FM 1924 (Mile 3 N)	FM 676 (Mile 5 N)	4	4	4	6	6
HC-244	Mile 4 1/2 W Rd	US 83	Mile 9 N Rd	2	2	4	4	4
HC-248	E Yuma Ave	Jackson Rd	McColl Rd	2	2	2	4	4
HC-249B	SH 336 (10th st)	Trenton Rd	SH 107	4	4	6	6	6
HC-253	Trenton Rd	FM 1926 (23rd st)	SH 336 (10th St)	4	4	6	6	6
HC-254	Wisconsin Rd	7th street	2nd st			4	4	4
HC-256	Taylor Rd	US 83	Bus 83	2	2	2	4	4
HC-257	Taylor Rd	Bus 83	Mile 2N	2	2	2	2	4
HC-258	Taylor Rd	Mile 2 N	Lark Ave (Mile 4 N)	2	2	2	2	4
HC-264	Mile 10 North	Westate (Mile 6)	FM 1015	2	2	2	2	4
HC-282	Inspiration Rd	US 83	FM 1924 (Mile 3 N)	2	4	4	4	4
HC-284A	Liberty Blvd (Phase I)	US 83	Mile 3 Rd	2	2	4	4	4
HC-286A	Mile 3 N (Phase I)	East Goodwin Rd	Tom Gill Rd	2	2	4	4	4
HC-286B	Mile 3 N (Phase II)	Tom Gill Rd	FM 2221					2
HC-286B	Liberty Blvd (Phase II)	Mile 3 Rd	FM 2221	2	2	2	2	4
HC-290	FM 1925	10th St	McColl Rd	2	2	4	4	4
HC-291	Dicker Road	Spur 115 (23rd St)	FM 2061 (Jackson Rd)	2	2	4	4	4
HC-292A	FM 494 (Shary Rd)	Mile 5 N (FM 676)	Mile 7	2	2	4	4	4
HC-292B	FM 494 (Shary Rd)	Mile 3 N (FM 1924)	Mile 5 N (FM 676)	2	2	2	2	4
HC-295C	SH 68	US 83	FM 1925		4	4	4	4
HC-34A	FM 493 (La Blanca)	Mile 10 N Rd	Mile 14 N Rd	2	2	4	4	4
HC-34B	FM 493 (La Blanca)	Mile 14 N Rd	SH 107	2	2	2	4	4
HC-39CB	FM 88	SH 107	FM 1925	2	2	2	4	4
HC-40	FM 907 (Alamo Rd)	SH 107	Nolana	2	2	2	2	4
HC-48B	SH 364 (La Homa)	FM 495	FM 1924 (Mile 3 N)	2	4	4	4	4
HC-51A	SP 115 (S 23rd St)	US 83	FM 1016 (Military Hwy)	4	4	4	6	6
HC-60C	US 83 La Joya Relief	FM 886 (El Faro Rd)	Showers Rd		4	4	4	4
HC-62A	FM 495	2nd St (McAllen)	US 281	4	6	6	6	6
HC-79	10th St	SH 107	FM 1925 (Monte Cristo)	2	4	4	4	4
HC-80BA	2 Mile Line N Rd	SH 364	Moorefield Rd.	2	4	4	4	4
HC-80BB	2 Mile Line N Rd	Moorefield Rd	Inspiration Road	2	4	4	4	4
HC-80A	2 Mile Line N Rd	Inspiration Rd	SH 107 (Conway)	2	4	4	4	4
HC-83	6th St (Weslaco)	Westgate Drive	Bus83	2	2	2	4	4
HC-85	Airport Drive (Weslaco)	Bus 83	US 83	2	2	2	4	4
HC-87	Alberta Rd	McColl Rd	US281	2	2	2	2	4
HC-92	Border Ave	S 18th St (Mile 6 N)	Bus 83	2	2	2	4	4
HC-93	Bridge Ave	10th St	Pike Blvd	2	2	2	4	4
RMA-1AB	US 281 Military Highway	Spur 600	FM 2557 (Stewart Rd)	2	4	4	4	4

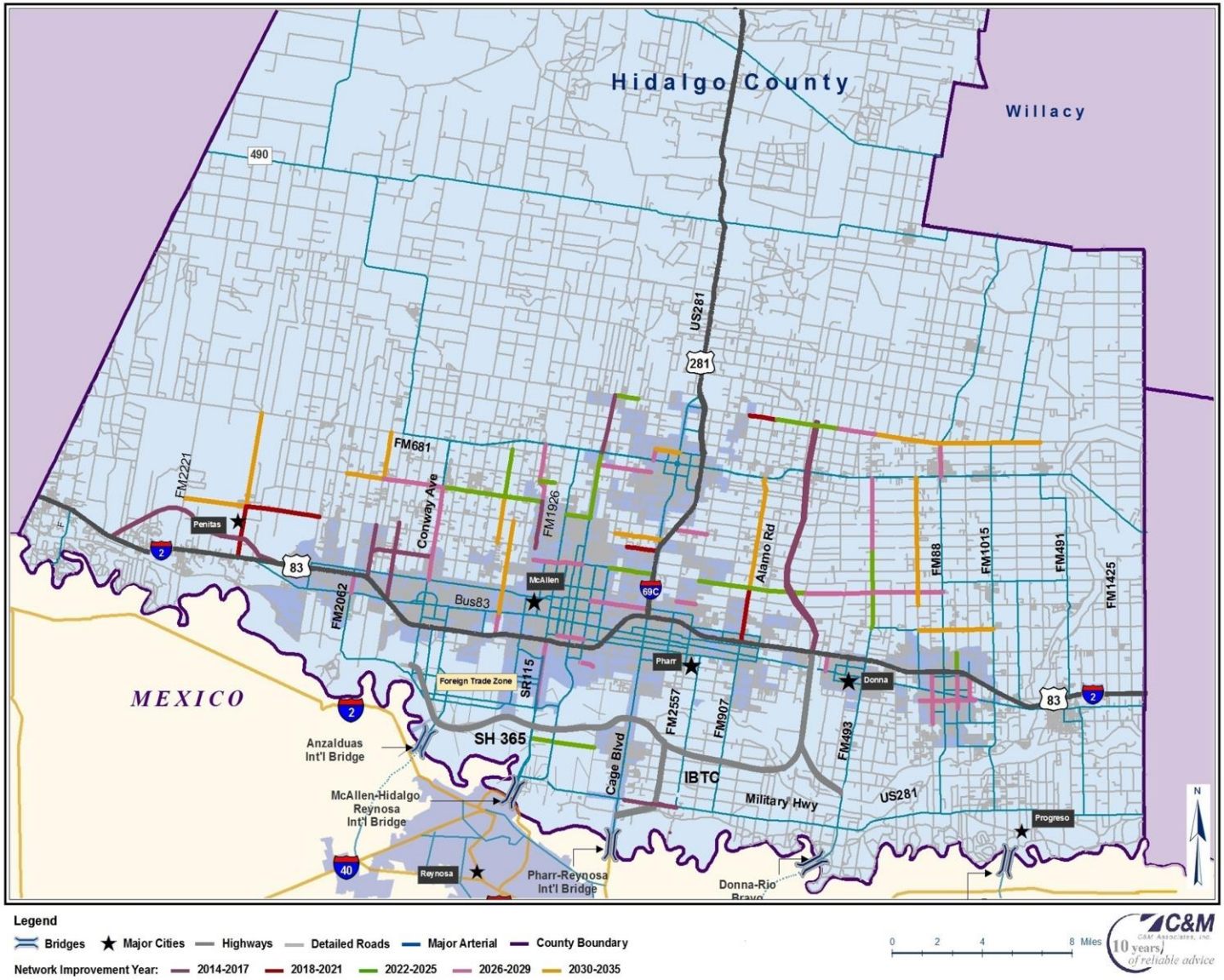


Figure 5-3. Network Improvements in the Study Area from 2010–2035

5.1.2. Four-Step Travel Demand Modeling

This section outlines the updating process of the CMHCTDM. Each of the four modeling steps is briefly discussed below.

Trip Generation

The trip generation process estimates the productions and attractions for each trip purpose. Trip production represents the number of trips originating in each TAZ and trip attraction represents the number of trips ending in each TAZ.

C&M estimated trip production and attraction using the cross-classification method model. The cross-classification method separates an urban area population into relatively homogenous groups based on certain socioeconomic characteristics. Average trip production rates per household are then empirically estimated for each classification. C&M employed the default NCHRP365 trip rates. A list of independent variables used in the model is provided below.

Trip Production:

- Population
- Number of households
- Median household income

Trip Attraction:

- Number of households
- Basic, retail, and service employment
- Area type
- Special generators

C&M prepared trip productions and attractions for the following trip purposes: Home-Based Work Auto (HBW Auto), Home-Based Non-Work Auto (HNW Auto), Non-Home-Based Auto (NHB Auto), and Internal Trucks (Trucks).

The 2012 model trip productions and attractions have been evaluated at the census tract level and by trip purpose, with the production rates provided by the 2009 National Household Travel Survey (NHTS). Figure 5-4 presents the coefficient of determination (R^2) between the resulting average model trip rates and NHTS trip rates of the TDM area by census tract. The resulting R-squared (R^2) of 0.92 indicates a good model fit.

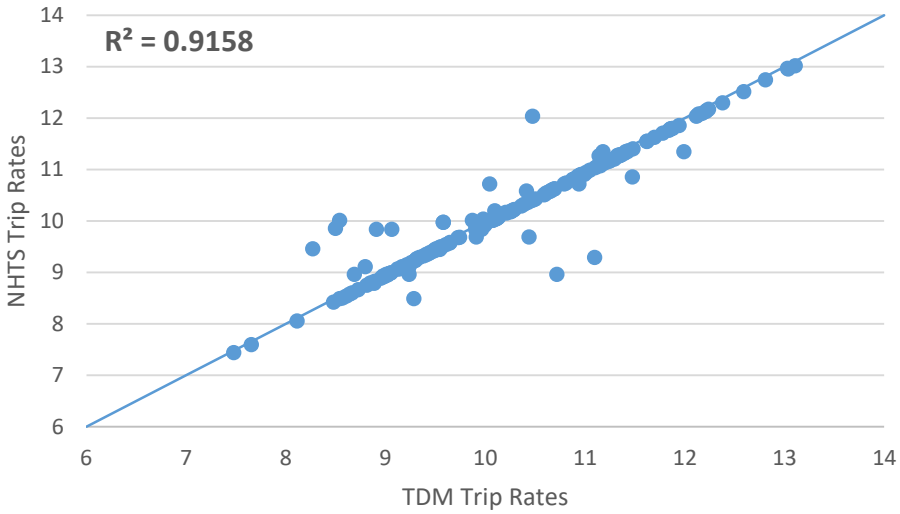


Figure 5-4. Comparison of Trip Rates by Census Tract between the TDM and NHTS

The model's distribution of person trips by trip purpose was within the range of trip shares from various publicly available travel surveys, as presented in Table 5-3, and also within the range of AirSage's OD Survey, as presented in Chapter 3.

Table 5-3. Trip Share by Purpose from CMHCTDM versus from Various Sources

Purpose	CMHCTDM	Rio Grande Valley	Cameron - Hidalgo[1]	Houston[2]	Dallas/ Ft.Worth[2]	Denver[2]	Atlanta[2]
	2012 Model	2004 Model	2004-2005 Survey	1985 Model	1984 Travel Survey	1985 Travel Survey	1980 Travel Survey
HBW	16%	26%	14%	18%	27%	26%	18%
HBNW	57%	47%	52%	51%	48%	47%	54%
NHB	28%	27%	34%	31%	25%	27%	28%

Sources: 1. Texas Transportation Institute,[4] 2. TMIP Manual[5]

Within the trip generation modeling step, C&M incorporated the special generators from the Hidalgo County MPO. The generated trips are based on the Institute of Transportation Engineers (ITE) trip rate calculator. In addition to the HCMPO special generators, C&M utilized 2013 land use maps in order to extend the special generators to special commercial vehicle destinations and origins, such as warehouses and industrial areas. Special generators from existing models of the region, such as the Texas State Analytical Model and the Rio Grande Valley Regional TDM, have been reviewed and added to the special generators in the case that they have not been considered within the previous process. Figure 5-5 shows the locations of commercial vehicle special generators extracted from the HCRMA land use maps.

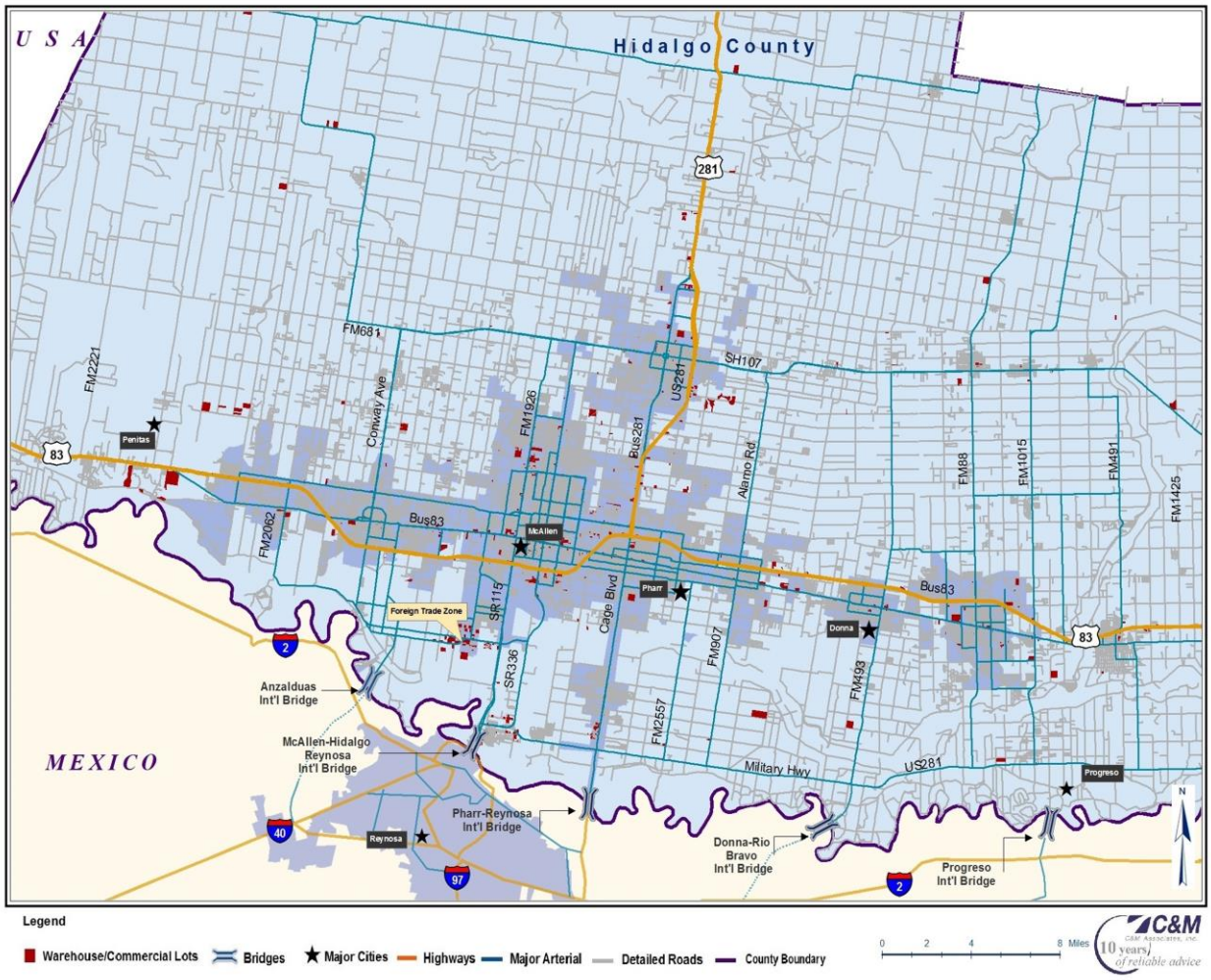


Figure 5-5. Special Generators for Trucks Based on HCRMA Land Use Maps

Internal Truck Trip Generation

The Internal truck trips are generated with guidance from the Quick Response Freight Manual,[6] along with the additional trips generated by the implemented special generators. Within the calibration process, the final CMHCTDM trip rates were adjusted to reproduce the overall truck volume observed from real-world traffic counts.

External Auto and Truck Trips

The CMHCTDM has 26 external stations. The external trip volume for autos and trucks is based on a variety of current and historical data sources:

- TxDOT AADT maps
- TxDOT truck AADT flow-band maps
- Federal Highway Administration (FHWA) border crossing data
- TTI classification counts
- C&M classification counts

The future growth rates of every external station were determined by applying several different time series forecast methodologies, including the use of the following parameters:

- Historical traffic growth rate at each external station;
- Historical and projected growth rates from socioeconomic parameters such as population, employment, and maquiladora industry production growth rates from Texas, Hidalgo County, Cameron County, and Reynosa;
- Historical and projected growth of manufactured goods shipments; and
- Historical and projected GDP growth

The international border crossings of Hidalgo County have to be mentioned separately from the other external stations of the model. In the last year, C&M has submitted two studies focusing solely on the border crossings of Hidalgo County: one study for the HCRMA and one for the City of Donna. Based on the experience gathered from these two projects, C&M developed the future forecast of the Hidalgo County international bridges, as shown in Table 5-4 .

Table 5-4 Border Crossing Forecast – Northbound and Southbound

Bridge	Year	Autos	Trucks	Total	Auto (Average Weekday)	Truck (Average Weekday)
Pharr	2012	2,537,000	963,000	3,500,000	7,249	3,439
	2018	2,639,000	639,000	3,278,000	7,540	2,282
	2035	3,159,000	860,000	4,019,000	9,026	3,071
Progresso	2012	1,908,000	89,000	1,997,000	5,227	318
	2018	2,010,000	60,000	2,070,000	5,507	214
	2035	2,409,000	69,000	2,478,000	6,600	246
Hidalgo	2012	4,130,000	0	4,130,000	11,315	0
	2018	4,429,000	0	4,429,000	12,134	0
	2035	5,318,000	0	5,318,000	14,570	0
Donna	2012	975,000	0	975,000	2,671	0
	2018	1,043,000	94,000	1,137,000	2,858	336
	2035	1,224,000	136,000	1,360,000	3,353	486
Anzalduas	2012	2,147,000	0	2,147,000	6,134	0
	2018	2,444,000	565,000	3,009,000	6,983	2,018
	2035	2,950,000	836,000	3,786,000	8,429	2,986
Total 2012 All		**11,697,000**	**1,052,000**	**12,749,000**	**32,597**	**3,757**
Total 2018 All		**12,565,000**	**1,358,000**	**13,923,000**	**35,021**	**4,850**
Total 2035 All		**15,060,000**	**1,901,000**	**16,961,000**	**41,978**	**6,789**
2012-2035 CAGR (%)		1.1%	2.6%	1.2%	1.1%	2.6%

The trip destination at each external station was extracted from the AirSage mobile device OD survey and applied to each external station. Regarding the commercial trips of the Pharr and the Progreso International Bridge, C&M obtained truck trip destinations from C&M's commercial vehicle border survey.

Trip Distribution and Mode Choice

Trip distribution is the second component of a four-step TDM. After estimating the total number of trip productions and attractions, the trip distribution step is performed in order to determine the number of trips between each pair of TAZs. C&M used gravity models specific to each trip purpose to determine trip distribution. The trips between each pair of TAZs are a function of trip production in the TAZ of origin, trip attraction in the destination TAZ, and the travel impedance between these two TAZs. The CMHCTDM employed an exponential function as a travel impedance function to estimate trip exchange by trip purpose between two given TAZs. C&M used generalized travel costs as measures of impedance. The parameters in this function were different for each trip purpose. The initial parameters were taken from the CMHCTDM, and C&M adjusted them within the model calibration process in order to bring the model volumes more in line with observed traffic counts.

Figure 5-6 presents the trip length distribution from the CMHCTDM versus the observed trip length from the AirSage cell phone OD survey.

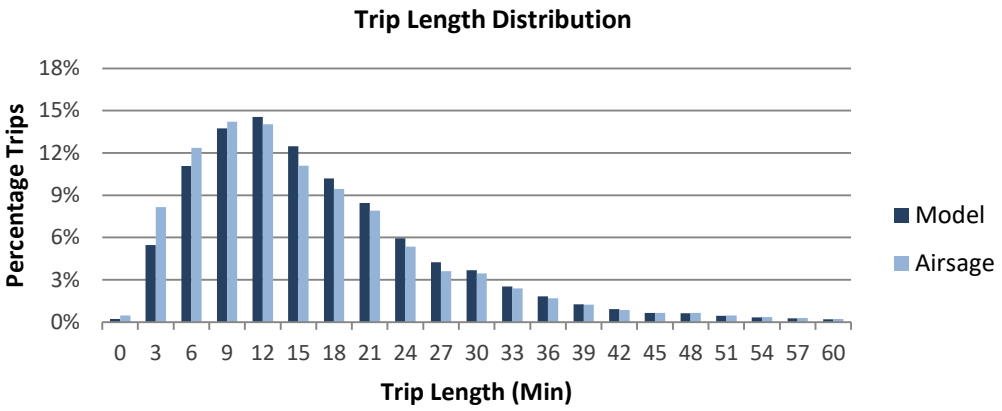


Figure 5-6. Observed vs CMHCTDM Trip Length Distribution

It can be observed that the trip distribution of the CMHCTDM accurately represents the surveyed trip distribution of the model area.

Mode choice is typically the third component of a four-step TDM. However, due to the lag of mass transportation infrastructure and the low share of public transport in the model area, C&M has not considered a specific mode choice model within the CMHCTDM.

Traffic Assignment

Traffic assignment is the final component of the four-step travel demand modeling process. For the purpose of travel forecasting, the traffic assignment step seeks to project which routes will be used by travelers within a variety of transportation networks. The model was first calibrated to the traffic conditions during different time periods of the day.

Link volumes were determined within the traffic assignment iterative process using

volume-delay functions developed by the Bureau of Public Roads (BPR). Coefficients of the BPR functions were calibrated such that the model reasonably replicated existing traffic conditions.

Finally, a number of iterations were performed in which the network-loaded travel times from traffic assignment were fed back into trip distribution; the change in model volumes was checked between iterations for the purpose of ensuring a reasonable overall convergence within the final assigned volumes.

5.2. Time of Day Travel Demand Model Preparation

C&M developed a Time-of-Day (TOD) model in order to evaluate the effects of peak and off-peak traffic conditions on the Projects and to gain a better understanding of what impact congestion has on a traveler's decision to choose a toll route over a free route.

To implement such a model, an average weekday was divided into four time periods, each representing different traffic conditions in terms of congestion and trip patterns. Then, using recent traffic counts, C&M defined each time period, traffic distribution, and the trip factors involved. The four time periods analyzed in this study are listed below.

- AM Peak period: 7:00 a.m. – 9:00 a.m.
- MD (Midday) period: 9:00 a.m. – 4:00 p.m.
- PM Peak period: 4:00 p.m. – 7:00 p.m.
- NT (Nighttime) period: 7:00 p.m. – 7:00 a.m.

The TOD trip tables were created from the daily trip tables using the TOD factors from National Cooperative Highway Research Program (NCHRP) Report 365[7] as a base. C&M adjusted these factors based on the traffic profile in the study area obtained from field traffic counts and directionality at individual count locations. Figure 5-7 depicts the TOD distribution of Production-to-Attraction (PA) and Attraction-to-Production (AP) trips for Home-Based Work (HBW), Home-Based Non-Work (HNW), and Non-Home-Based (NHB) trip purposes. Table 5-5 and Table 5-6 give the numbers in tabular format. For internal trucks, a profile matching the NHB trips was used. The daily external trip tables were also split into TOD trip tables using factors from the hourly profiles at the external stations.

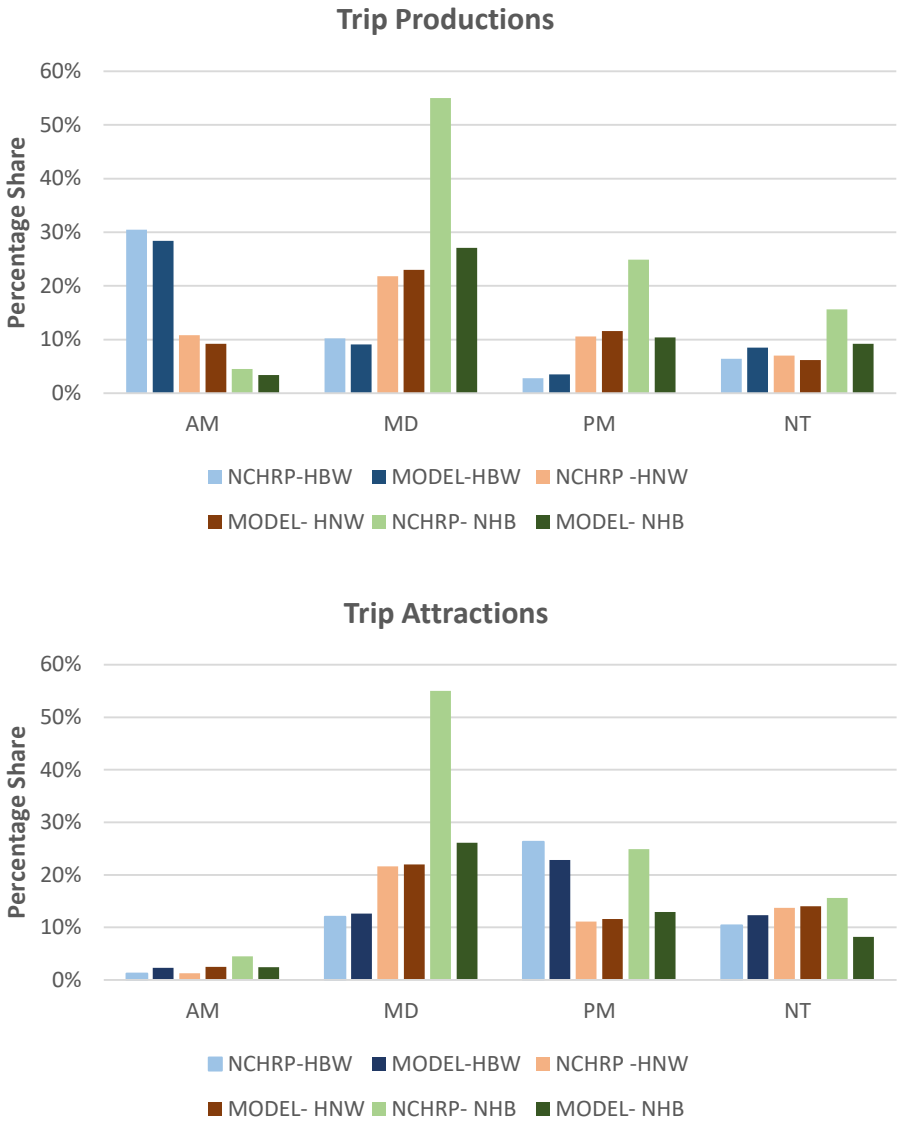


Figure 5-7. Time of Day Profiles Used for TOD Model

Table 5-5. NCHRP Percentage Share of Trip Purposes

NCHRP		AM	MD	PM	NT
Trip Productions	HBW	30.5%	10.2%	2.8%	6.4%
	HNW	10.8%	21.8%	10.6%	7.0%
	NHB	4.5%	55.0%	24.9%	15.6%
Trip Attractions	HBW	1.2%	12.0%	26.3%	10.4%
	HNW	1.3%	21.6%	11.1%	13.7%
	NHB	4.5%	55.0%	24.9%	15.6%

Table 5-6 Model Percentage Share of Trip Purposes

MODEL		AM	MD	PM	NT
Trip Productions	HBW	28.4%	9.1%	3.5%	8.5%
	HNW	9.2%	23.0%	11.6%	6.2%
	NHB	3.4%	27.1%	10.4%	9.2%
Trip Attractions	HBW	2.3%	12.6%	22.8%	12.3%
	HNW	2.5%	22.0%	11.6%	14.0%
	NHB	2.4%	26.1%	12.9%	8.2%

5.3. Model Calibration and Validation

Calibration of the base year model was performed with the aim of matching modeled traffic conditions with observed traffic counts. This was accomplished through the use of "screenline" analysis within the project corridor—validation checkpoints along imaginary lines which count the total number of vehicles that cross particular locations within the roadway system of a given project area. Moreover, additional traffic counts at individual locations spread throughout the study area were also factored into the calibration (for detailed information about traffic count locations, see Chapter 3).

As mentioned earlier, C&M calibrated and validated the model using the 2012 socioeconomic data, roadway network data, and traffic data. C&M's 2014 traffic counts, as well as TxDOT's 2012 AADTs, were also used for calibration purposes (for a description of C&M's traffic data collection effort, see Chapter 3). Truck counts from C&M vehicle classification counts and from TxDOT's truck flow-band maps were used for validation. The model projection results were later validated with the latest 2014 traffic counts.

In order to replicate base year traffic conditions and to match the modeled volumes with those observed at count locations, some of the link characteristics (e.g., speed and capacity parameters) were adjusted within the corresponding network links. Based on the findings of C&M's initial analysis, eight major traffic screenlines were chosen for the study area: four capturing east-west travel and four capturing north-south travel. These screenlines are illustrated in Figure 5-9.

Following the TOD traffic assignment, link volumes on each screenline were determined and then used to validate the results of the traffic assignment step and the calibration process.

The daily differences between the screenline count and model volumes fall within the acceptable range recommended by the FHWA8 and the Model Validation and Reasonableness Checking Manual.[9]

Table 5-7 and Table 5-8 compare the model volumes with observed traffic counts along each screenline daily and by time period, respectively. Figure 5-8 shows the National Cooperative Highway Research Program (NCHRP) criteria for screenline calibration, all screenlines are under the NCHRP deviation criteria.

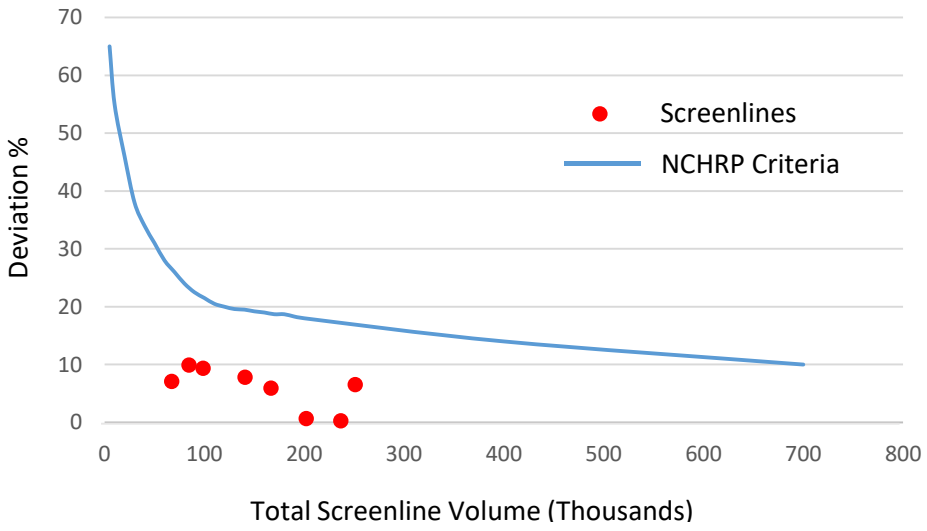


Figure 5-8. Comparison of Screenline Counts with Maximum Desirable Deviation

Table 5-7. Comparison of Daily Screenline counts and Model Volume

Screenline	Screenline Counts	Model Volume	Difference (Percentage)
Screenline NS1	70,708	65,386	-7.5%
Screenline NS2	102,370	112,439	9.8%
Screenline NS3	254,820	237,237	-6.9%
Screenline NS4	144,384	132,552	-8.2%
Screenline EW1	88,061	78,903	-10.4%
Screenline EW2	205,488	207,351	0.9%
Screenline EW3	240,366	241,496	0.5%
Screenline EW4	170,463	159,656	-6.3%

Table 5-8. Comparison of the Modeled and Observed Traffic Volume by Time Period

	AM			MD			PM			NT		
Screenline	Counts	Model Volume	Difference	Counts	Model Volume	Difference	Counts	Model Volume	Difference	Counts	Model Volume	Difference
NS1	9,899	8,857	-10.5%	31,227	28,200	-9.7%	15,056	15,400	2.3%	14,525	12,929	-11.0%
NS2	14,802	15,573	5.2%	43,424	49,198	13.3%	22,603	27,336	20.9%	21,540	20,332	-5.6%
NS3	38,387	33,345	-13.1%	105,109	100,203	-4.7%	56,944	55,131	-3.2%	54,380	48,558	-10.7%
NS4	21,765	18,854	-13.4%	61,843	56,403	-8.8%	33,143	30,767	-7.2%	27,633	26,528	-4.0%
EW1	11,829	10,998	-7.0%	36,897	33,506	-9.2%	19,130	18,734	-2.1%	20,205	15,665	-22.5%
EW2	27,422	28,746	4.8%	86,841	87,047	0.2%	45,272	47,048	3.9%	45,953	44,510	-3.1%
EW3	31,784	34,037	7.1%	103,686	101,060	-2.5%	50,239	54,492	8.5%	54,657	51,907	-5.0%
EW4	24,989	23,792	-4.8%	72,632	64,873	-10.7%	37,470	34,015	-9.2%	35,371	36,976	4.5%

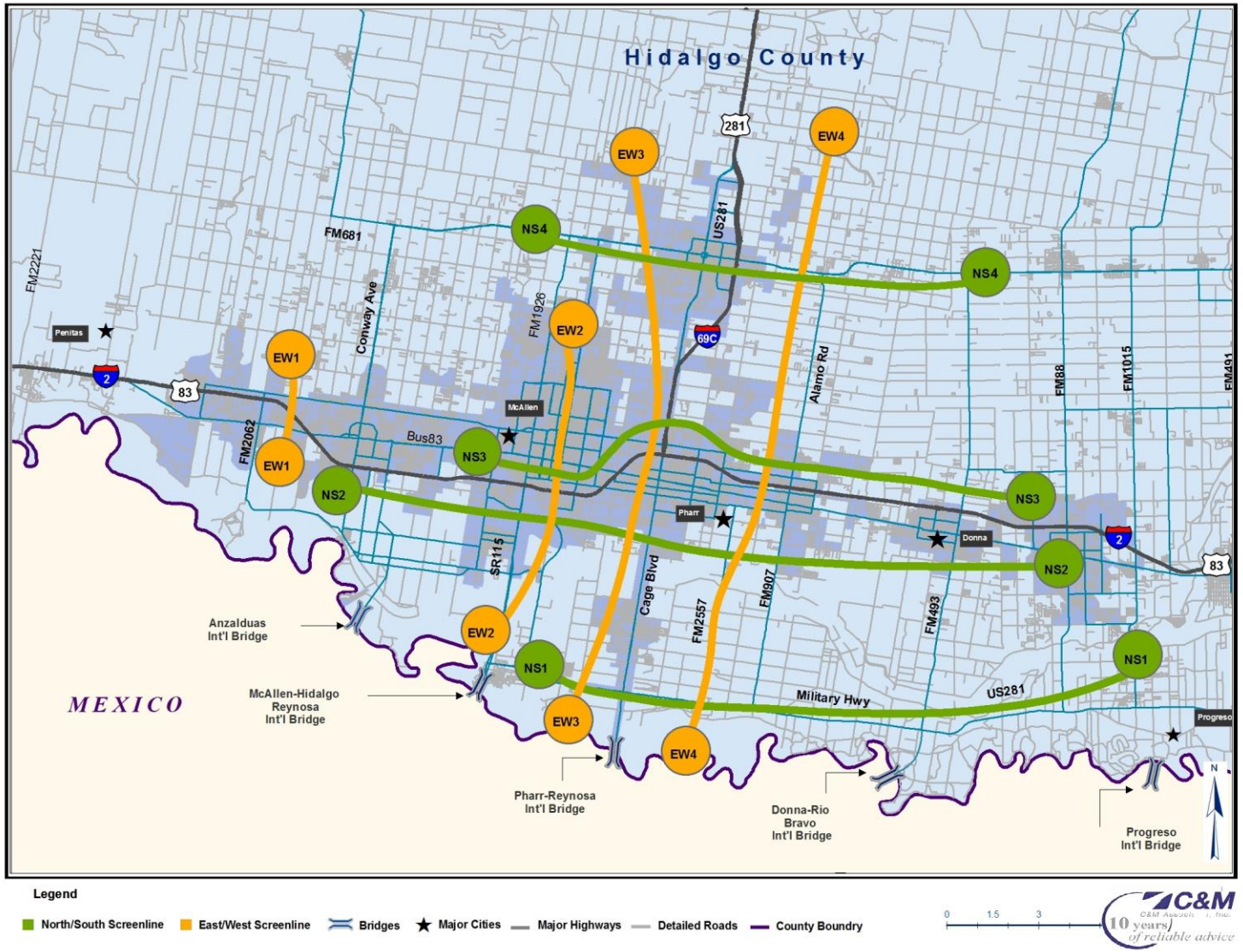


Figure 5-9. Map of Screenlines

5.4. Toll Diversion Model

As discussed in earlier sections, C&M modeled the Projects as a toll road in the model years 2018, 2025, and 2035. In the development of its model, C&M took into account the likelihood of induced travel demand within the study area following the Projects' opening. The section below provides a summary of the toll diversion methodology used by C&M in the design and implementation of its model.

5.4.1. Implementation of C&M's Toll Diversion Model

Toll diversion models are used to estimate traffic demand for facilities such as toll roads, toll bridges and managed lanes. C&M's toll diversion models are structured as logit functions, dividing toll and non-toll trips on the basis of travel time savings and toll costs with respect to the socioeconomic characteristics of the individual traveler. The final product of the logit models is a probability that reflects the share of toll and non-toll trips between any given OD pair that may utilize the toll facility.

C&M created a new toll diversion model while making the cost coefficient dependent on income of the origin. C&M uses a general binary logit model as follows:

$$PT = 1 / (1+ eU)$$

Where:

PT = Probability of selecting a tolled facility

e = Base of Natural Logarithm

$$U = (CT * \Delta T + CC * Cost + C)$$

Where:

CT = Coefficient of time savings

CC = Coefficient of cost

TT = Travel time on toll route in minutes

TF = Travel time on free route in minutes

$\Delta T = TT - TF$

Cost= Toll in Dollar

C = Constant

As described in Chapter 3, the AirSage OD survey provided OD matrices between the TAZs by 16 income groups. These 16 income groups, combined with trip purposes, have been used to create 53 different trip tables for the toll diversion model. This creates a higher sensitivity towards the probability function within the C&M toll diversion methodology, thereby creating a higher sensitivity regarding which users are allowed to use the toll road.

To create the probability function based on the income groups, C&M analyzed the raw data from the Stated Preference (SP) survey conducted for the 2010 investment grade study in Hidalgo County. The values of time (VOTs) by trip purpose have been in a fairly close range to the VOTs considered in the previous study.

The auto and truck toll diversion models discussed above were incorporated into the traffic assignment procedure with the help of TransCAD macro language (GISDK). This macro performs a number of iterations each time, distributing total trips into toll trips and non-toll trips and then assigning them to corresponding network configurations accordingly.

The results from the toll diversion model can be observed on the screenlines EW2, EW3 and EW4 which are the screenlines that cross the Projects. Table 5-9 presents the daily screenline share for the toll and toll-free scenario as well as the volume retention from the Projects.

Table 5-9. CMHCTDM -Daily Screenline Share and Toll Retention 2012, 2018 and 2035

Screenlines	Road	2012	2018		2035	
		Free	Free	Toll	Free	Toll
EW2	**SH365**	**0%**	**13%**	**3%**	**20%**	**7%**
	IH2	47%	45%	48%	41%	46%
	BS83	9%	8%	9%	7%	8%
	Other	44%	34%	40%	32%	40%
	Retention			**22%**		**32%**
EW3	**SH365**	**0%**	**12%**	**3%**	**13%**	**3%**
	IH2	46%	39%	43%	34%	37%
	BS83	4%	6%	7%	6%	6%
	Other	50%	43%	48%	47%	53%
	Retention			**20%**		**23%**
EW4	**IBTC**	**0%**	**10%**	**3%**	**12%**	**4%**
	IH2	57%	48%	51%	39%	43%
	BS83	6%	6%	6%	6%	6%
	Other	37%	37%	40%	43%	47%
	Retention			**29%**		**33%**

5.4.2. Travel Time Benefits from the Projects

When the Projects open to traffic, they are expected to provide travel time savings as well as reliability and safety benefits for toll road users. Major competitors for the Projects will be IH2 (US 83) and Military Highway in the eastbound and westbound directions, and US 281 and FM 493 in the northbound and southbound directions. Travel time benefits may increase in future years when the Projects will feature three lanes in each direction and, as a result, higher free flow speeds. At the same time, growing congestion on competing roadways is expected to result in additional time savings for toll road users. Table 5-10 illustrates the expected the maximum travel time savings of trips using SH 365 or the IBTC in the AM and PM peak between two selected OD pairs in the opening year as well as in 2035. In 2018, travelers using SH 365 and the IBTC are predicted to achieve time savings of 11.39 and 8.13 minutes, respectively. In 2035, the predicted time savings for SH 365 and the IBTC increase to 13.42 and 11.15 minutes, respectively. For each case, the tolled path and an alternative toll-free path are shown in Figure 5-10 and Figure 5-11.

Table 5-10. Travel Time Savings During AM/PM Peak for Selected Origin-Destination Pairs

Trip	Origin	Destination	Toll Path	Free path	Length (miles)		Time (minutes)		Time Savings (minutes)
					Toll Path	Free Path	Toll Path	Free Path	
Year 2018									
A	Pharr International Bridge	S Inspiration Rd. and S Mile Road	SH365	FM1016 and S Inspiration Road	20.54	17.50	23.56	34.95	11.39
B	Pharr International Bridge	FM493 and BU83	IBTC	Military Highway and FM493	17.39	16.97	19.55	27.68	8.13
Year 2035									
A	Pharr International Bridge	S Inspiration Rd. and S Mile Road	SH365	FM1016 and S Inspiration Road	20.54	17.50	23.85	37.27	13.42
B	Pharr International Bridge	FM493 and BU83	IBTC	Military Highway and FM493	17.39	16.97	19.84	30.99	11.15

The toll for Trip A's tolled path is $2.95, whereas Trip B is $2.24. This means, for example, that all users who have a VOT equal to or higher than $12.00 per hour in the year 2035 would choose the toll option over the toll-free option.

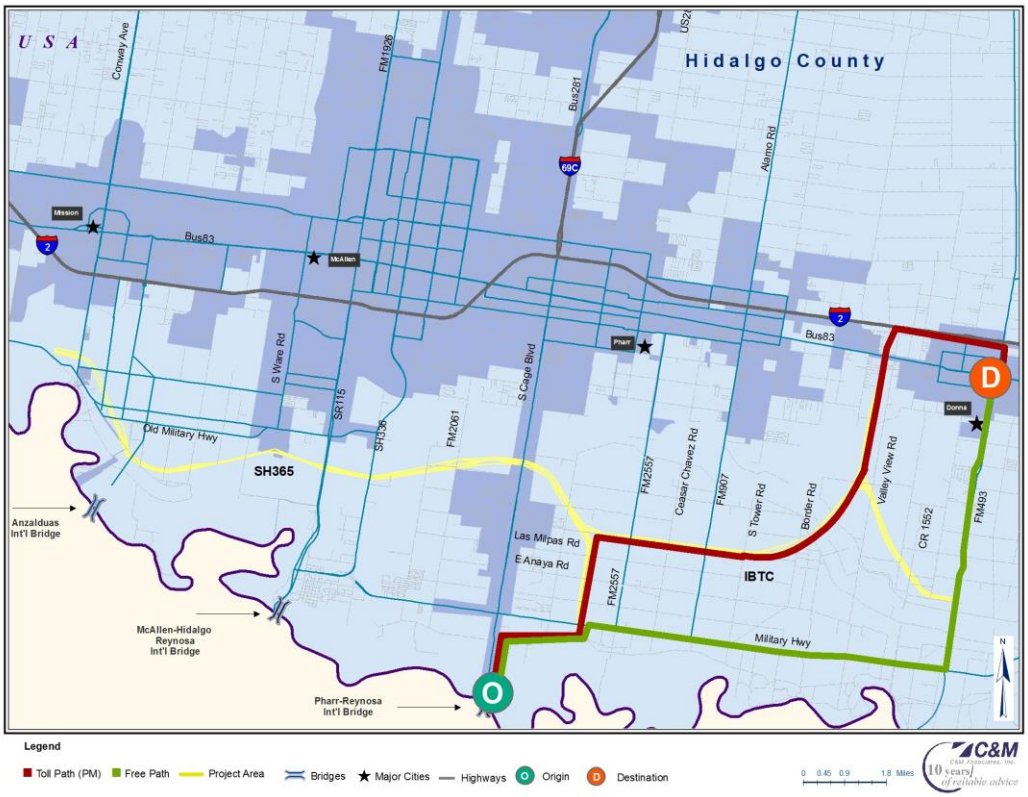


Figure 5-10. Toll and Toll-Free Path for Trip A

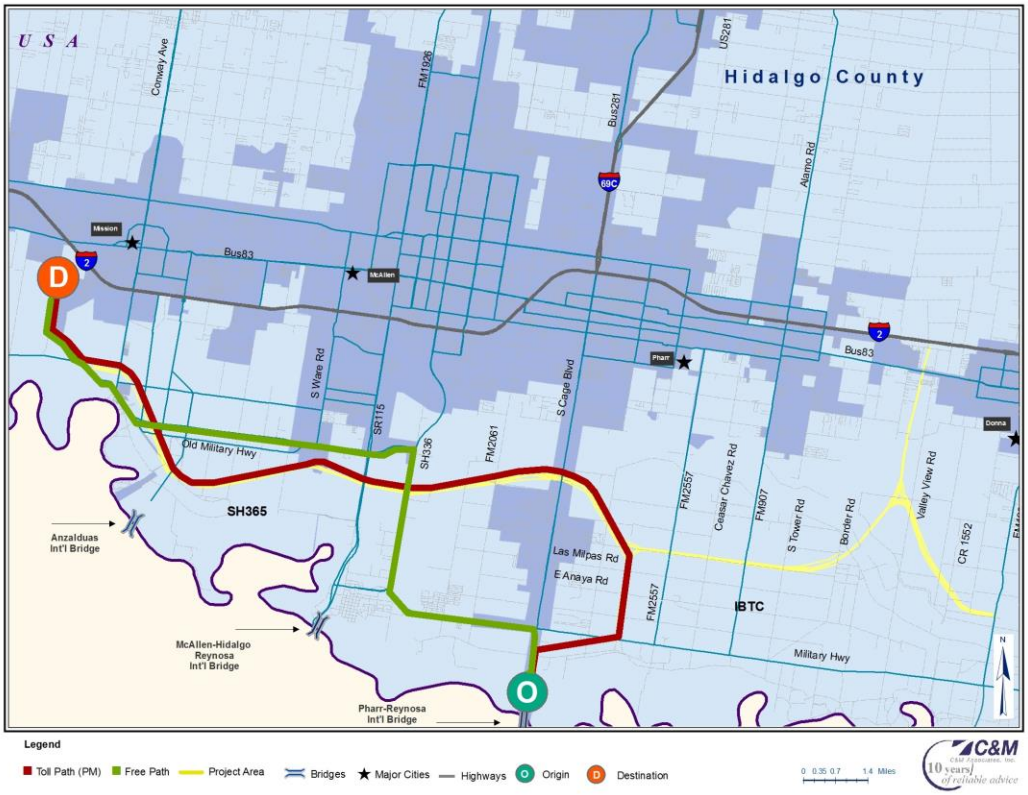


Figure 5-11. Toll and Toll-Free Path for Trip B

[1] Hidalgo County Metropolitan Planning Organization (2014, August 25). *Hidalgo County Thoroughfare Plan*. Retrieved from http://www.hcmpo.org/home/files/2114/0898/2104/Thoroughfare_Plan_new_2014.pdf

[2] Hidalgo County Metropolitan Planning Organization (2010). *2010 – 2035 Metropolitan Transportation Plan*. Retrieved from http://www.hcmpo.org/home/mtp/

[3] Hidalgo County Metropolitan Planning Organization (2013). *Statewide Transportation Improvement Program: Hidalgo County MPO FY 2013-2016 TIP – Pharr district projects, FY 2013*. Retrieved from http://www.hcmpo.org/home/files/4013/7476/1885/FY2013-16_Mobility_TIP_Amend_5_-_7-18-13.pdf

[4] Texas Transportation Institute (2010). *2004-2005-2006 Rio Grande Valley Regional Study Area Travel Surveys* . College Station: Texas Department of Transportation.

[5] Cambridge Systematics, Inc. (2010). *Travel model validation and reasonableness checking manual* (2nd ed.). Retrieved from https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/validation_and_reasonableness_2010/fhwahep10042.pdf

[6] Alliance Transportation Group, Inc., and Cambridge Systematics, Inc. (2011). *Statewide analysis model (second version): Freights model*. Austin, TX: Texas Department of Transportation.

[7] Transportation Research Board, National Research Council (1998). *National Cooperative Highway Research Program (NCHRP) Report 365: Travel estimation techniques for urban planning.* Springfield, VA: U.S. Department of Commerce, National Technical Information Service. Retrieved from http://ntl.bts.gov/lib/21000/21500/21563/PB99126724.pdf

[8] Federal Highway Administration, U.S. Department of Transportation (1990). *Calibration and adjustment of system planning models*. Washington, DC: National Transportation Library. Retrieved from http://ntl.bts.gov/DOCS/377CAS.html

[9] Cambridge Systematics, Inc. (2010). *Travel model validation and reasonableness checking manual* (2nd ed.). Retrieved from https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/validation_and_reasonableness_2010/fhwahep10042.pdf

6. Traffic and Revenue Forecast

The following chapter presents the traffic and revenue (T&R) estimates for the Projects in Hidalgo County for a forecast period of 40 years. C&M employed the CMHCTDM to model the traffic and revenue for a typical working day, as well as perform future scenario runs to project traffic for the years 2018, 2025, and 3035. The details of this modeling effort are discussed in Chapter 5.

After the travel forecast for a typical working day was created, C&M incorporated this information into its post-processing model designed to project traffic and revenue on an annual basis. The traffic was interpolated between the three model years and extrapolated after the 2035 model year to cover the entire forecast period. C&M also incorporated the results of its traffic data analysis and, based on experience with existing toll road facilities, utilized a series of assumptions regarding toll system implementation and enforcement.

C&M modeled various sensitivity T&R scenarios based on roadway network configurations and socioeconomic projections. Two scenarios were modeled for different project alignments: the proposed scenario in which the Projects are open in 2018, and an SH 365-Only scenario added by C&M. This additional scenario is further explained in this chapter.

In addition, C&M's T&R analysis was conducted with the assumption that exit ramps for the Projects will be designed with proper geometric configuration and traffic control to ensure that traffic is not negatively affected. Other assumptions used in the development of the post-processing model, as well as assumptions pertaining to the toll collection system, are discussed in this chapter.

6.1. Toll Collection System and Schedule

The Projects are scheduled to open to traffic on July 1, 2018. Initial toll rates have been determined by using a toll maximization methodology, and rates are based on each vehicle's number of axles. In addition, the analysis assumed that tolls would be collected by means of electronic toll collection (ETC) and video recognition systems only. This system relies on transponders mounted inside vehicles using the toll road, which—when detected by overhead gantries—electronically identify each vehicle, thus registering the appropriate toll and making it possible for travelers to proceed without having to stop. In addition to their ETC function, these gantries are also expected to have video capability, allowing them to photograph the license plates of vehicles not equipped with transponders. Once these license plate images are processed, toll bills can then be sent by mail to vehicle owners informing them of the charges they owe. Toll gantry locations were chosen with the intent of capturing all travelers using the Projects.

6.2. Toll Treatment

After analyzing several different toll systems, C&M configured the toll system presented in Figure 6-1. Under this configuration, the entire length of the toll road comprised eight toll segments, with one mainline gantry located on each segment. Additional gantries

were placed at selected entry and exit ramps in order to ensure that all possible vehicle movements were tolled.

In 2018, tolls will be charged at a total of seven mainlane gantry locations in both travel directions and 11 ramp gantries. In 2035, there will be a total of eight mainlane gantry locations and no additional ramp locations. Table 6-1 lists the toll segments along with the length of each segment and the opening year.

Table 6-1. Description of Toll Segments

Segment ID	Project	From	To	Length	Opening Year
1	SH365	Military Road (FM1016)	Anzalduas GSA Connector	2.7	2018
2		Anzalduas GSA Connector	Spur 115 (23rd Road)	4.3	2018
3		Spur 115 (23rd Road)	US 281 (S. Carge Blvd)	4.0	2018
4		US 281 (S. Carge Blvd)	IBTC	2.0	2018
5		IBTC	US 281 (Miltary Hwy)	1.8	2018
6	IBTC	SH365	CR1821	6.0	2018
7		CR1821	IH2 (US83)	3.3	2018
8		CR1821	US 281 (Miltary Hwy)	2.9	2035

C&M used a revenue maximization method to define the toll rate per mile for the Projects. According to this analysis, the initial toll rate (i.e., the toll rate at the opening of the Projects), would be 20 cents per mile in 2012 dollars, a rate which is assumed to increase every year based on CPI.

Trucks (i.e., vehicles with more than four tires), are charged at a higher rate than passenger cars, with each truck paying the passenger car rate multiplied by $N-1$, where N is the number of axles. For the purposes of C&M's analysis, the minimum toll charged at any gantry was $0.20 (in 2012 dollars), and tolls were rounded to the nearest one cent.

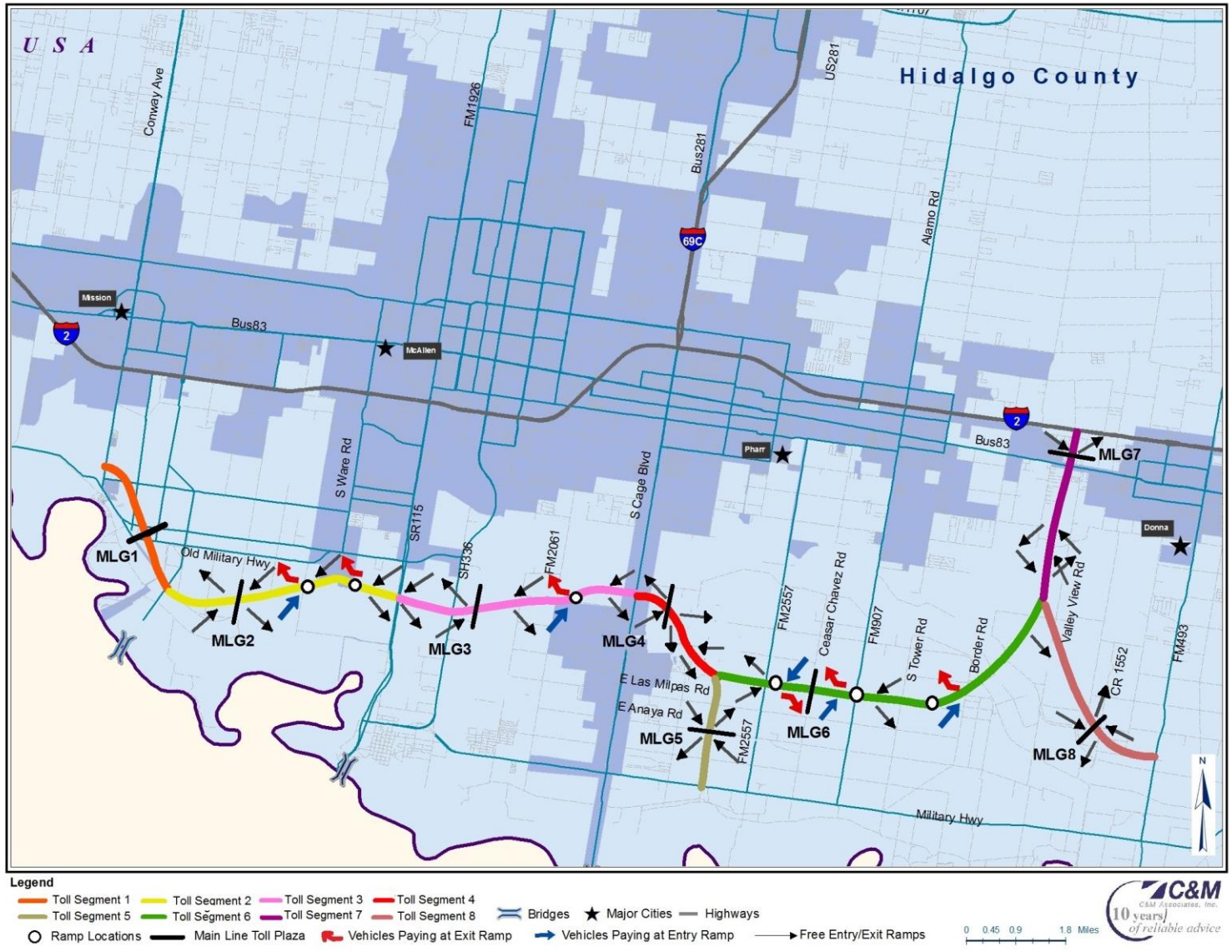


Figure 6-1. Final Toll Treatment

Figure 6-2 and Figure 6-3 list the toll rates of all gantries for the opening year and 2035, respectively. Please refer Figure 6-1 for the labels of mainlane and ramp gantries.

Based on 2014 prices, Figure 6-4 compares the initial toll rate used in this analysis to the ETC toll rates of various other toll roads across the United States. While these findings indicate that the Projects' proposed toll rate falls within the range of other toll roads, it is important to note that this comparison was intended only as a benchmark since it did not include all U.S. toll roads. It is also worth noting that the toll roads listed in Figure 6-4 differ significantly from one another based on their function (urban vs. interurban), length, land use, and the socioeconomics of their individual geographic regions.

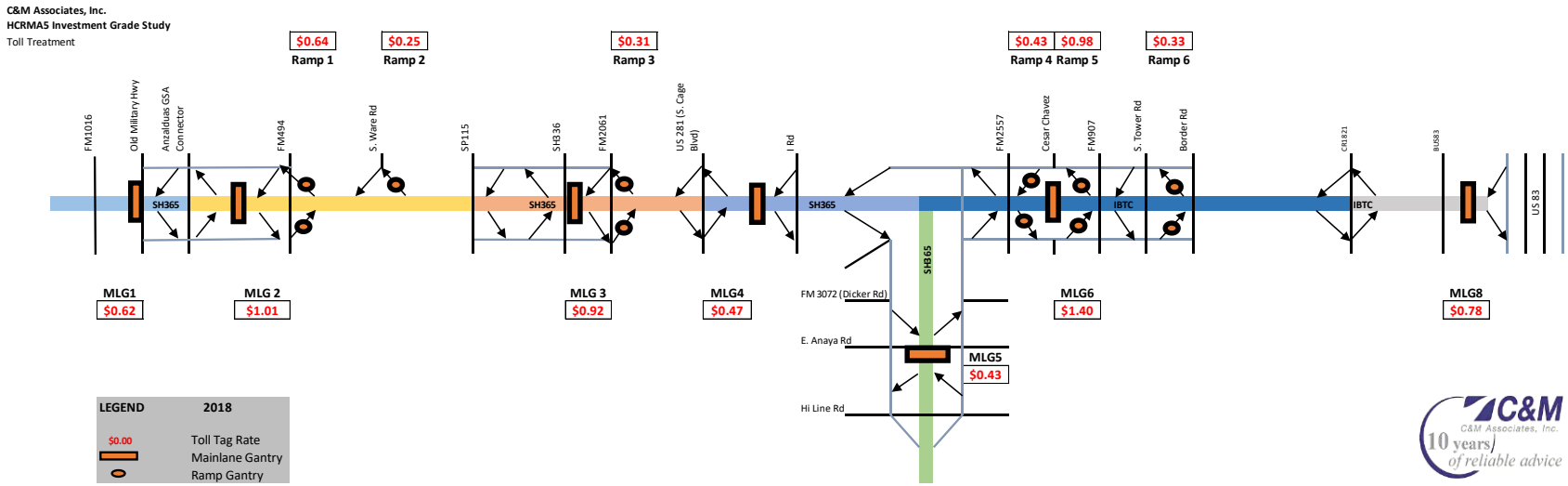


Figure 6-2. Toll Rates by Gantry 2018

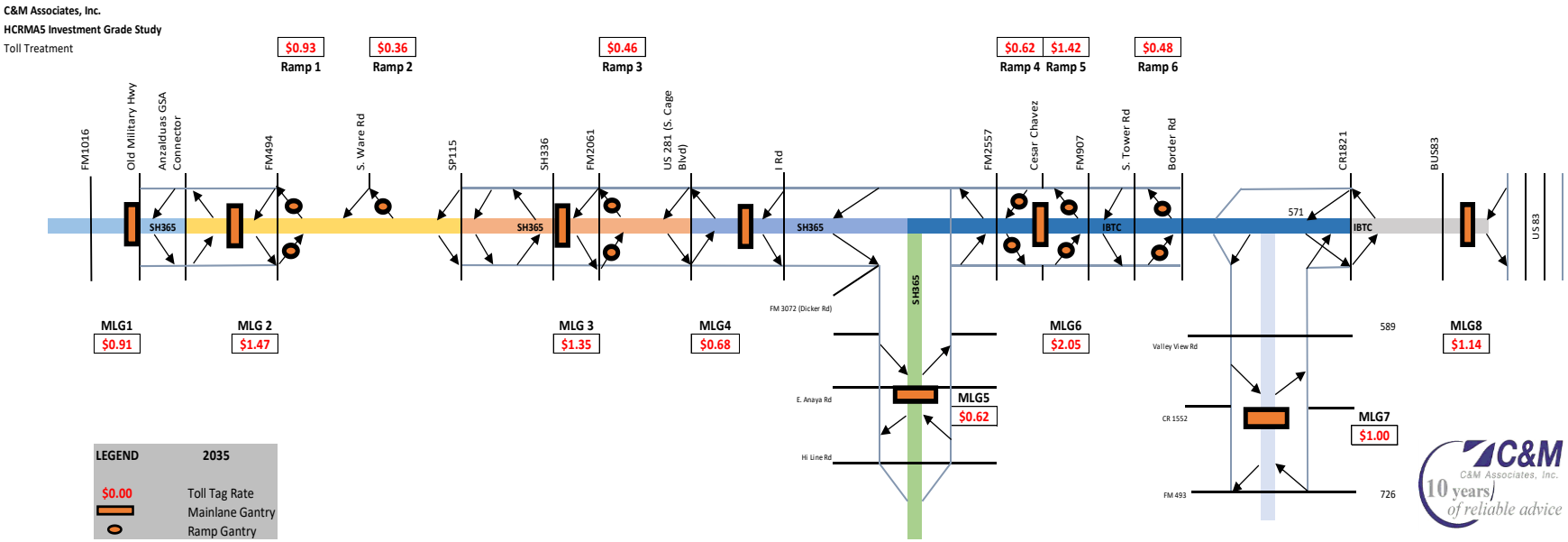


Figure 6-3. Toll Rates by Gantry 2035

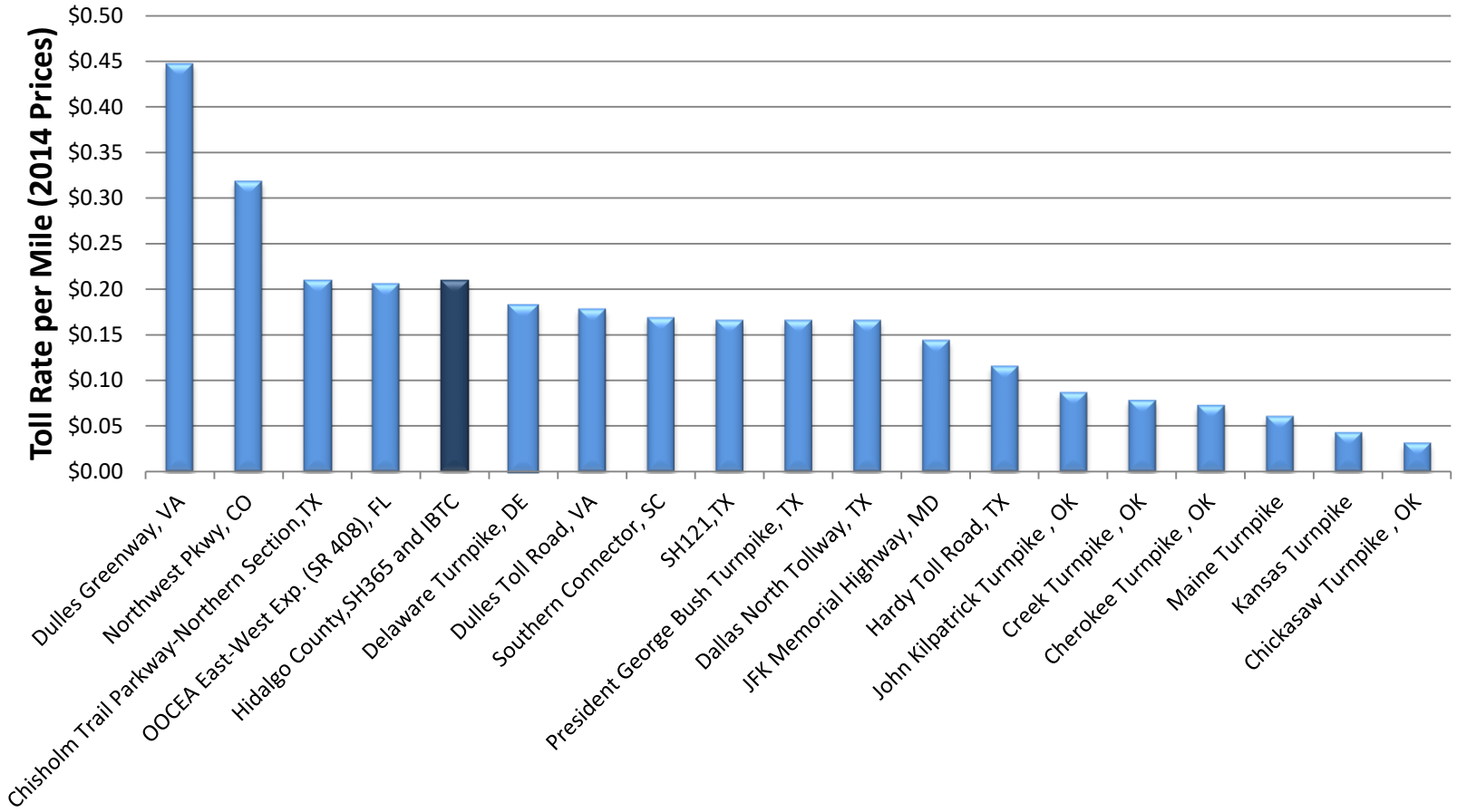


Figure 6-4. Comparison of ETC Toll Rates among Various U.S. Toll Roads

6.3. Sensitivity Analysis

C&M performed sensitivity analyses regarding toll rate, value of time (VOT),and different demographic future scenarios for the Projects.

The toll sensitivity analysis, which is accomplished by altering the toll rate, was not only used to show sensitivity to revenue, but also to determine the maximum toll rate and, ultimately, the optimum toll rate for the Projects. The VOT sensitivity analysis assumes an increase and decrease of the model VOT by fifteen percent. As presented in Chapter 4, C&M created three different demographic forecasts: Low (Conservative), Base (Most Likely), and High (Optimistic) case scenarios. While the Most Likely case scenario is used to create the T&R, the other demographic scenarios are used within the sensitivity analysis.

The following section outlines the variables for these sensitivity analyses and presents the results.

6.3.1. Toll Rate

C&M conducted a series of model runs in order to find the optimum toll rate per mile, increasing the toll rate per mile for all gantries simultaneously. This analysis was performed for model years 2018 and 2035. Figure 6-5 illustrates the sensitivity of transactions vs revenue by different toll rates per mile. Toll rates and daily revenue are shown in 2012 dollars. A variety of models featuring different times of the day was used in this analysis, enabling C&M to gather total daily revenue and transaction data and graph it against the toll rate. This analysis was performed using the Base scenario forecast for demographic variables. The daily revenue was maximized at approximately $0.30 per mile in both 2018 and 2035.

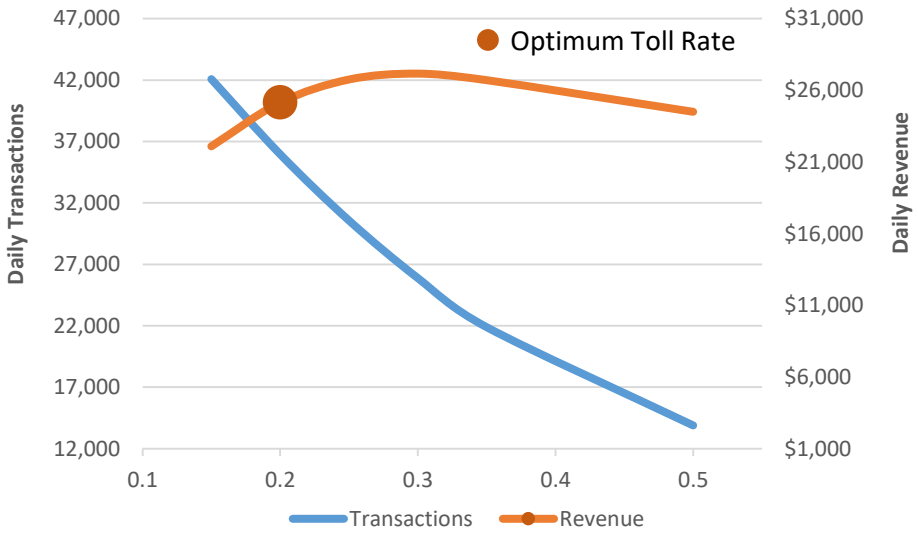


Figure 6-5. 2018 Toll Revenue Sensitivity to Toll Rate

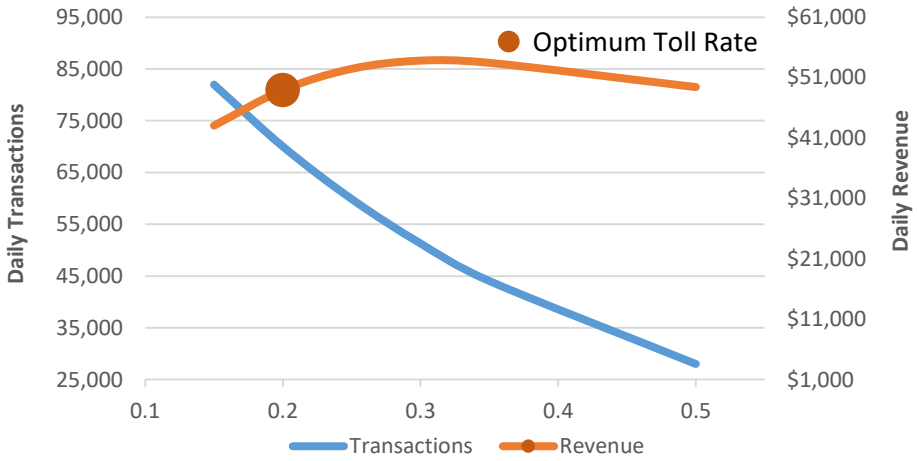


Figure 6-6. 2035 Toll Revenue Sensitivity to Toll Rate

In the final analysis, C&M chose to use a toll rate of $0.20 per mile (in 2012 dollars) for the opening year 2018. Escalating this toll rate in the future based on CPI CAGR results in a nominal toll rate of $0.23 in 2018 and $0.34 in 2035.

6.3.2. Value of Time

Chapter 3 and Chapter 5 of this report discuss passenger car and truck values of time savings. These values were based on route choice models derived from C&M's SP survey from previous studies. They were then validated against the average hourly wage rate within the region.

Over the years, VOT is expected to grow in direct correlation with the CPI growth rate. Therefore, C&M assumed an annual VOT CAGR of about 2.34 percent between 2012 and 2035. C&M performed a sensitivity analysis based on VOT by selecting one scenario with 85 percent of the Base VOT (Low) and another scenario with 115 percent of the Base VOT (High). The Net Present Value (NPV) of the Projects will decrease by 8.2 percent in the Low scenario and increase by 8.4 percent in the High scenario. This means that in 2035, the revenue of the Projects will be $2,620,000 less in the Low scenario and $2,580,000 more in the High scenario.

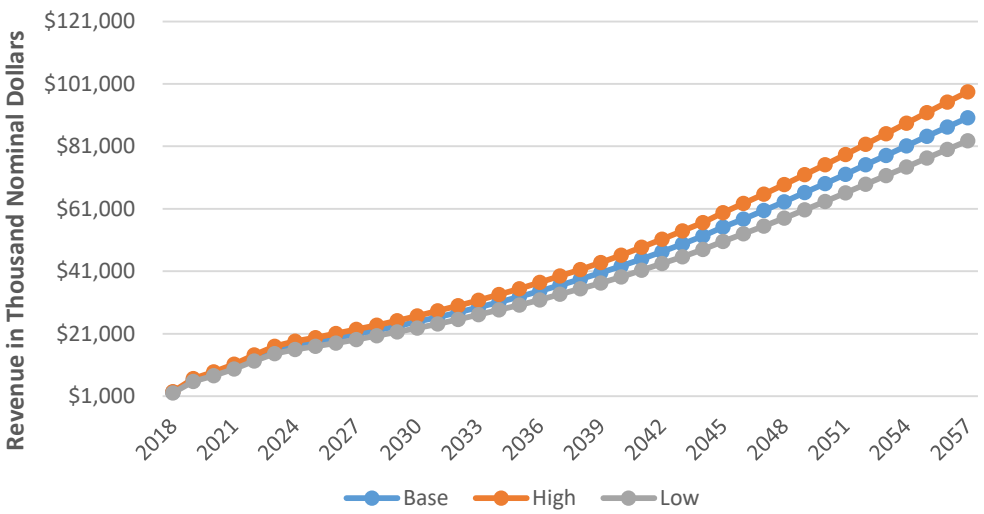


Figure 6-7. Revenue Sensitivity to VOT

6.3.3. Demographics

As mentioned earlier and presented in Chapter 4, three different demographic forecasts were developed. The Most Likely, or Base, scenario has been used as the model input for the final T&R. Figure 6-8 shows the comparison of revenues for the Low, Most Likely, and High scenarios.

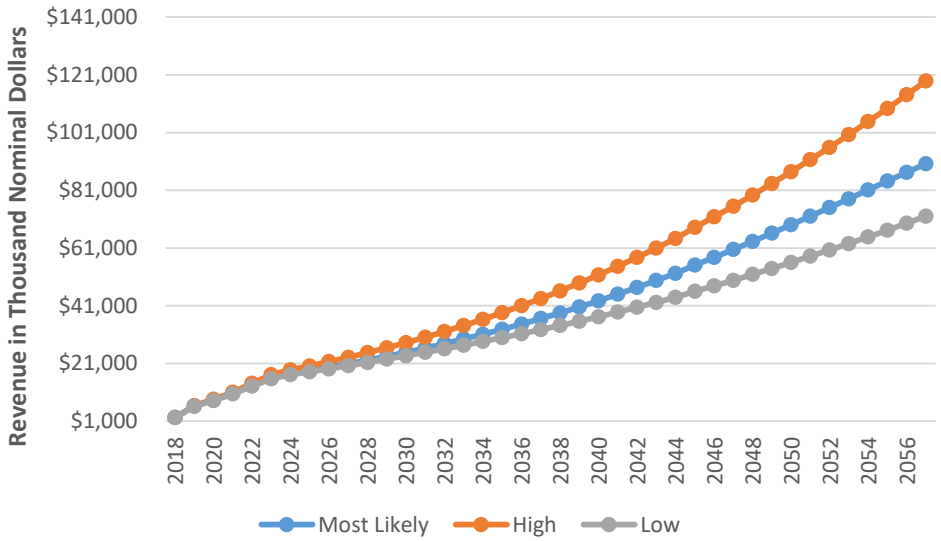


Figure 6-8. Revenue Sensitivity to Demographics

The NPV of the Projects will decrease by 15 percent for the Low scenario and increase by 23 percent for the High scenario. This means that in 2035, the revenue of the Projects will be $2,940,000 less in the Low scenario and $5,720,000 more in the High scenario.

6.4. Traffic and Revenue Assumptions

C&M's T&R forecast is based on the following set of post-processing assumptions, some of which may differ depending upon whether the traveler remains exclusively within the United States or crosses the U.S./Mexican border. C&M determined that of the Projects' potential users, approximately 4.6 percent of those driving automobiles and 0.9 percent of those driving trucks will have origins or destinations in Mexico.

The following T&R assumptions were used in this study:

- The Projects are expected to open to traffic by July 1, 2018.
- Traffic and revenue were forecasted for a 40-year period beginning in 2018.
- In general, trucks were assumed to have an average of 3.9 axles.
- All revenues are expressed in nominal dollars. C&M used the average CPI from the Dallas Forth Worth and Houston Metropolitan Area forecasted by Moody's to inflate the revenue forecast.
- While a number of new toll roads are scheduled to open within the next five years in the Rio Grande Valley of South Texas, the fact remains that the region currently has no toll roads, and the only existing tolled facilities are the international bridges. Therefore, during its analysis, C&M was aware that many drivers in the area may be unfamiliar with the notion of road pricing and, consequently, reluctant to use the new toll roads. This may result in an extended ramp-up period (i.e., the time it takes for traffic volumes to reach their full potential after the opening of a new toll facility). For the analysis, the same initial ramp-up was assumed for both automobile and truck drivers. In addition, C&M also expected passenger car motorists on the U.S. side of the border to become familiar with the toll roads more quickly than those Mexican drivers crossing the border on a regular basis. As shown in Table 6-2, ramp-up for autos starts at a modest 50 percent and truck start at 60 percent during the Projects' opening year.
- Tolls will be collected by means of ETC or video recognition. The video toll rates are assumed to be 150% of the ETC rates to compensate the offset of additional costs associated with the video tolling recognition and billing method.
- In the Projects' opening year, ETC penetration—referring to the percentage of all toll transactions collected electronically—was assumed to be 50–60 percent for U.S. customers (passenger vehicles and trucks) and 30–50 percent for border-crossing customers with Mexican license plates. These percentages were assumed to reach an eventual maximum of 80 percent for U.S. customers and 60–70 percent for border-crossing customers with Mexican license plates. In fact, C&M's SP survey in earlier projects found that more than 70 percent of automobile travelers said they would be likely to utilize the ETC system. ETC penetration for trucks was assumed to be higher than that for autos due to the operational characteristics of truck traffic. Table 6-2 presents a detailed look at assumptions for ETC penetration.

- For this study, the ETC leakage rate was assumed to be 1 percent, enough to account for any uncollected revenue from ETC customers as a result of system deficiencies.
- A video violation rate was applied in order to make up for revenue lost as a result of deficiencies in the video transaction system and potential toll evaders. An effective video toll factor of 32 percent was assumed for all customers in the opening year.
- In order to obtain annual T&R figures, C&M estimated equivalent revenue days of 350 for autos and 280 for trucks, a result of its analysis of weekday and weekend traffic counts. Border crossing cars resulting in 365 revenue days and trucks in 275.
- Only the roadway improvements from the Hidalgo County MTP 2010–2035 and TIP have been implemented within the model.
- It was assumed that the use of alternative modes of transportation in the area of influence would remain unchanged during the forecast period.
- Gasoline availability and prices were assumed to remain at levels that would not significantly affect traffic.
- Federal and state fuel taxes would not change to a degree that would affect travel behavior.
- The proposed toll road would be efficiently maintained for the length of the forecast period.

Table 6-2 summarizes the traffic and revenue assumptions discussed above.

Table 6-2. Traffic and Revenue Assumptions

Item	Assumptions
Opening Year	July 1,2018
Last Forecast Year	2057
Type of Toll Collection	All Electronic Toll amd Video Tolling
Posted Speed	75 mph

Number of Mainalne Lanes

Year	2018	2025	2035	After 2035
# of Lanes	2	2	3	3

Traffic Ramp-Up

Year	US		Border Crossings	
	Auto	Truck	Auto	Truck
2018	50%	60%	50%	60%
2019	60%	70%	60%	70%
2020	70%	80%	70%	80%
2021	80%	90%	80%	90%
2022	90%	100%	90%	100%
2023	100%	100%	100%	100%
After 2023	100%	100%	100%	100%

ETC Penetration

Year	US		Border Crossings	
	Auto	Truck	Auto	Truck
2018	50%	60%	30%	50%
2019	55%	65%	35%	55%
2020	60%	70%	40%	60%
2021	65%	75%	45%	63%
2022	70%	80%	50%	66%
2023	75%	80%	45%	68%
After 2023	80%	80%	60%	70%

ETC Leakage 1%

Video Revenue Reduction Factors

Item	2018	2019	2020	2021	2022
Total Video Revenue in Process (Invoiced)	60%	63%	66%	68%	70%
Invoiced Video Revenue Recovered	35%	36%	37%	38%	40%
Video Revenue Toll Factor	1.5	1.5	1.5	1.5	1.5
Effective Video Toll Factor	0.32	0.34	0.37	0.39	0.42

Revenue Days

Item	Revenue Days
Internal - Auto	350
Internal - Truck	280
Border Crossing - Auto	365
Border Crossing - Truck	275

Commercial Vehicle Toll Factor (Toll Factor=N-1, N being the number of truck axles)

Item	Toll Factor
Internal - Truck	2.9
External - Truck	3.9

6.5. Traffic and Revenue Results

This section presents the results of C&M's T&R analysis in terms of annual toll transactions and revenue. The model forecast years from the TDM were interpolated and extrapolated to obtain annual transactions and revenue figures by employing a post-processing model.

C&M has provided the Projects' T&R forecast along with an additional SH 365-Only scenario. Both scenarios and their respective T&Rs are presented in the following sections.

6.5.1. Scenario 1: The Projects

The Projects' annual T&R forecasts for the years 2018–2057 are presented in Figure 6-9. T&R is shown for each project separately and for the Projects combined. Table 6-3 shows the annual T&R by cars, trucks and total.

For the opening year 2018, C&M forecasted that the Base scenario would generate more than $2 million in toll revenue as a result of some 3 million toll transactions. By 2035, the number of transactions was projected to increase to approximately 23 million, and to more than 38 million by the final forecast year 2057. Annual revenue was projected to reach about $33 million by 2035 and $90 million by 2057. The Projects' NPV is $1,677,875,000.

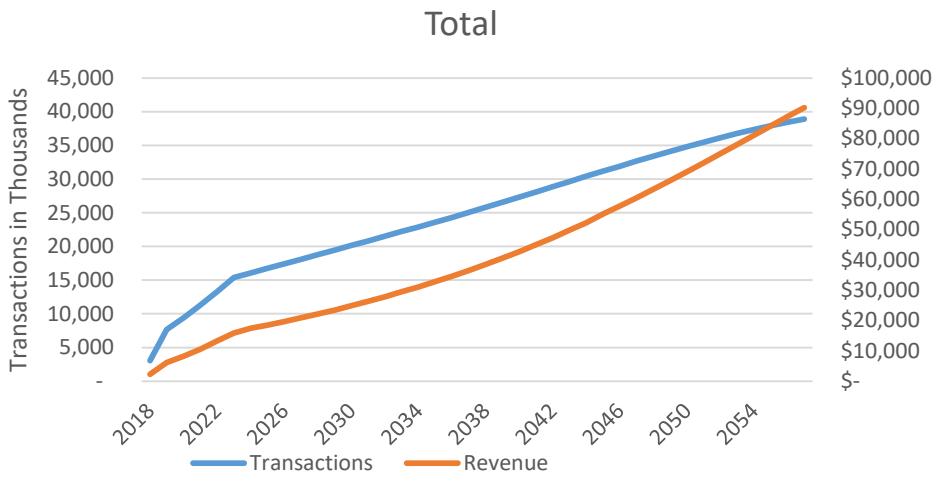
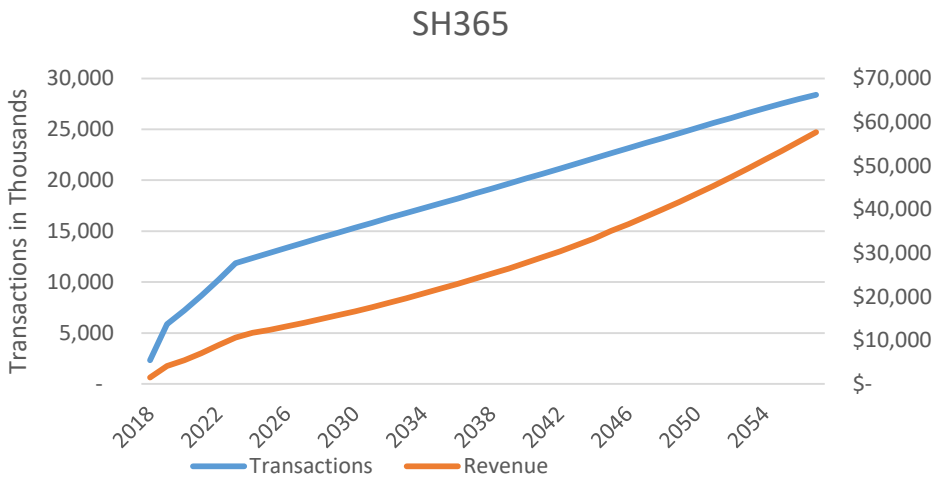


Figure 6-9. The Projects' T&R



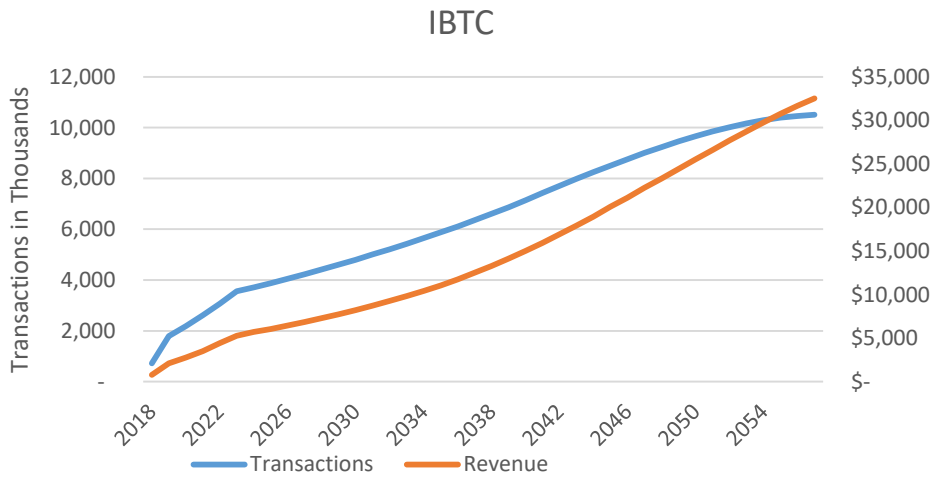


Figure 6-9. The Projects' T&R (Cont'd.)

Table 6-3. The Projects' T&R Annual Forecast - Total

Year	Transactions (in Thousands)			Revenue (Nominal Dollar - in Thousands)		
	Auto	Truck	Total	Auto	Truck	Total
2018	2,460	570	3,030	$ 1,235	$ 1,010	$ 2,245
2019	6,230	1,440	7,670	$ 3,450	$ 2,730	$ 6,190
2020	7,650	1,760	9,410	$ 4,600	$ 3,600	$ 8,200
2021	9,170	2,100	11,270	$ 5,960	$ 4,570	$ 10,530
2022	10,800	2,480	13,280	$ 7,580	$ 5,710	$ 13,290
2023	12,540	2,870	15,410	$ 9,170	$ 6,740	$ 15,910
2024	13,080	2,990	16,070	$ 10,260	$ 7,150	$ 17,410
2025	13,630	3,110	16,740	$ 10,900	$ 7,550	$ 18,450
2026	14,170	3,240	17,410	$ 11,600	$ 8,020	$ 19,620
2027	14,720	3,370	18,090	$ 12,320	$ 8,530	$ 20,860
2028	15,270	3,510	18,780	$ 13,090	$ 9,050	$ 22,140
2029	15,820	3,630	19,450	$ 13,870	$ 9,580	$ 23,460
2030	16,370	3,760	20,130	$ 14,700	$ 10,160	$ 24,860
2031	16,920	3,910	20,830	$ 15,560	$ 10,760	$ 26,320
2032	17,470	4,040	21,510	$ 16,480	$ 11,370	$ 27,860
2033	18,030	4,180	22,210	$ 17,410	$ 12,040	$ 29,450
2034	18,580	4,320	22,900	$ 18,400	$ 12,710	$ 31,110
2035	19,140	4,470	23,610	$ 19,420	$ 13,430	$ 32,850
2036	19,700	4,610	24,310	$ 20,440	$ 14,210	$ 34,650
2037	20,280	4,770	25,050	$ 21,520	$ 15,030	$ 36,550
2038	20,860	4,930	25,790	$ 22,610	$ 15,870	$ 38,490
2039	21,450	5,090	26,540	$ 23,790	$ 16,770	$ 40,560
2040	22,050	5,250	27,300	$ 25,000	$ 17,720	$ 42,720
2041	22,660	5,420	28,080	$ 26,260	$ 18,720	$ 44,970
2042	23,280	5,580	28,860	$ 27,550	$ 19,750	$ 47,320
2043	23,880	5,760	29,640	$ 28,930	$ 20,810	$ 49,750
2044	24,480	5,920	30,400	$ 30,320	$ 21,930	$ 52,250
2045	25,070	6,090	31,160	$ 31,940	$ 23,180	$ 55,120
2046	25,650	6,250	31,900	$ 33,380	$ 24,360	$ 57,760
2047	26,240	6,420	32,660	$ 34,930	$ 25,580	$ 60,510
2048	26,800	6,580	33,380	$ 36,460	$ 26,820	$ 63,280
2049	27,360	6,740	34,100	$ 38,070	$ 28,110	$ 66,170
2050	27,900	6,900	34,800	$ 39,650	$ 29,430	$ 69,080
2051	28,420	7,050	35,470	$ 41,290	$ 30,760	$ 72,040
2052	28,930	7,200	36,130	$ 42,960	$ 32,110	$ 75,070
2053	29,420	7,350	36,770	$ 44,610	$ 33,450	$ 78,060
2054	29,880	7,480	37,360	$ 46,280	$ 34,850	$ 81,130
2055	30,310	7,610	37,920	$ 47,980	$ 36,210	$ 84,190
2056	30,700	7,730	38,430	$ 49,650	$ 37,590	$ 87,240
2057	31,090	7,820	38,910	$ 51,430	$ 38,780	$ 90,210

Table 6-4. The Projects' T&R Annual Forecast – SH365

Year	Transactions (in Thousands)			Revenue (Nominal Dollar - in Thousands)		
	Auto	Truck	Total	Auto	Truck	Total
2018	1,895	420	2,315	$ 845	$ 630	$ 1,475
2019	4,820	1,060	5,880	$ 2,370	$ 1,710	$ 4,090
2020	5,930	1,290	7,220	$ 3,190	$ 2,260	$ 5,450
2021	7,120	1,540	8,660	$ 4,150	$ 2,870	$ 7,020
2022	8,400	1,810	10,210	$ 5,290	$ 3,590	$ 8,880
2023	9,760	2,090	11,850	$ 6,400	$ 4,240	$ 10,640
2024	10,180	2,180	12,360	$ 7,190	$ 4,500	$ 11,690
2025	10,600	2,260	12,860	$ 7,640	$ 4,760	$ 12,400
2026	11,010	2,350	13,360	$ 8,140	$ 5,040	$ 13,180
2027	11,420	2,440	13,860	$ 8,650	$ 5,350	$ 14,000
2028	11,830	2,530	14,360	$ 9,180	$ 5,670	$ 14,850
2029	12,230	2,610	14,840	$ 9,730	$ 5,990	$ 15,730
2030	12,630	2,700	15,330	$ 10,300	$ 6,340	$ 16,640
2031	13,020	2,800	15,820	$ 10,900	$ 6,710	$ 17,600
2032	13,410	2,890	16,300	$ 11,520	$ 7,070	$ 18,600
2033	13,800	2,980	16,780	$ 12,150	$ 7,480	$ 19,630
2034	14,180	3,070	17,250	$ 12,820	$ 7,870	$ 20,690
2035	14,560	3,170	17,730	$ 13,510	$ 8,310	$ 21,820
2036	14,940	3,260	18,200	$ 14,160	$ 8,750	$ 22,910
2037	15,330	3,360	18,690	$ 14,850	$ 9,200	$ 24,050
2038	15,720	3,460	19,180	$ 15,540	$ 9,670	$ 25,220
2039	16,110	3,560	19,670	$ 16,280	$ 10,160	$ 26,440
2040	16,500	3,660	20,160	$ 17,040	$ 10,670	$ 27,710
2041	16,890	3,760	20,650	$ 17,810	$ 11,220	$ 29,030
2042	17,290	3,860	21,150	$ 18,620	$ 11,770	$ 30,400
2043	17,680	3,970	21,650	$ 19,470	$ 12,340	$ 31,820
2044	18,080	4,070	22,150	$ 20,350	$ 12,960	$ 33,310
2045	18,470	4,180	22,650	$ 21,370	$ 13,660	$ 35,030
2046	18,860	4,280	23,140	$ 22,290	$ 14,320	$ 36,620
2047	19,260	4,390	23,650	$ 23,270	$ 14,990	$ 38,260
2048	19,650	4,490	24,140	$ 24,260	$ 15,690	$ 39,960
2049	20,040	4,600	24,640	$ 25,310	$ 16,430	$ 41,730
2050	20,430	4,710	25,140	$ 26,360	$ 17,190	$ 43,550
2051	20,810	4,810	25,620	$ 27,450	$ 17,970	$ 45,420
2052	21,190	4,920	26,110	$ 28,580	$ 18,780	$ 47,360
2053	21,570	5,030	26,600	$ 29,720	$ 19,590	$ 49,310
2054	21,940	5,130	27,070	$ 30,900	$ 20,460	$ 51,360
2055	22,300	5,230	27,530	$ 32,110	$ 21,330	$ 53,440
2056	22,640	5,330	27,970	$ 33,340	$ 22,230	$ 55,570
2057	22,970	5,430	28,400	$ 34,550	$ 23,130	$ 57,680

Table 6-5. The Projects' T&R Annual Forecast – IBTC

Year	Transactions (in Thousands)			Revenue (Nominal Dollar - in Thousands)		
	Auto	Truck	Total	Auto	Truck	Total
2018	565	150	715	$ 390	$ 380	$ 770
2019	1,410	380	1,790	$ 1,080	$ 1,020	$ 2,100
2020	1,720	470	2,190	$ 1,410	$ 1,340	$ 2,750
2021	2,050	560	2,610	$ 1,810	$ 1,700	$ 3,510
2022	2,400	670	3,070	$ 2,290	$ 2,120	$ 4,410
2023	2,780	780	3,560	$ 2,770	$ 2,500	$ 5,270
2024	2,900	810	3,710	$ 3,070	$ 2,650	$ 5,720
2025	3,030	850	3,880	$ 3,260	$ 2,790	$ 6,050
2026	3,160	890	4,050	$ 3,460	$ 2,980	$ 6,440
2027	3,300	930	4,230	$ 3,670	$ 3,180	$ 6,860
2028	3,440	980	4,420	$ 3,910	$ 3,380	$ 7,290
2029	3,590	1,020	4,610	$ 4,140	$ 3,590	$ 7,730
2030	3,740	1,060	4,800	$ 4,400	$ 3,820	$ 8,220
2031	3,900	1,110	5,010	$ 4,660	$ 4,050	$ 8,720
2032	4,060	1,150	5,210	$ 4,960	$ 4,300	$ 9,260
2033	4,230	1,200	5,430	$ 5,260	$ 4,560	$ 9,820
2034	4,400	1,250	5,650	$ 5,580	$ 4,840	$ 10,420
2035	4,580	1,300	5,880	$ 5,910	$ 5,120	$ 11,030
2036	4,760	1,350	6,110	$ 6,280	$ 5,460	$ 11,740
2037	4,950	1,410	6,360	$ 6,670	$ 5,830	$ 12,500
2038	5,140	1,470	6,610	$ 7,070	$ 6,200	$ 13,270
2039	5,340	1,530	6,870	$ 7,510	$ 6,610	$ 14,120
2040	5,550	1,590	7,140	$ 7,960	$ 7,050	$ 15,010
2041	5,770	1,660	7,430	$ 8,450	$ 7,500	$ 15,940
2042	5,990	1,720	7,710	$ 8,930	$ 7,980	$ 16,920
2043	6,200	1,790	7,990	$ 9,460	$ 8,470	$ 17,930
2044	6,400	1,850	8,250	$ 9,970	$ 8,970	$ 18,940
2045	6,600	1,910	8,510	$ 10,570	$ 9,520	$ 20,090
2046	6,790	1,970	8,760	$ 11,090	$ 10,040	$ 21,140
2047	6,980	2,030	9,010	$ 11,660	$ 10,590	$ 22,250
2048	7,150	2,090	9,240	$ 12,200	$ 11,130	$ 23,320
2049	7,320	2,140	9,460	$ 12,760	$ 11,680	$ 24,440
2050	7,470	2,190	9,660	$ 13,290	$ 12,240	$ 25,530
2051	7,610	2,240	9,850	$ 13,840	$ 12,790	$ 26,620
2052	7,740	2,280	10,020	$ 14,380	$ 13,330	$ 27,710
2053	7,850	2,320	10,170	$ 14,890	$ 13,860	$ 28,750
2054	7,940	2,350	10,290	$ 15,380	$ 14,390	$ 29,770
2055	8,010	2,380	10,390	$ 15,870	$ 14,880	$ 30,750
2056	8,060	2,400	10,460	$ 16,310	$ 15,360	$ 31,670
2057	8,120	2,390	10,510	$ 16,880	$ 15,650	$ 32,530

6.5.2. Scenario 2: SH 365-Only

C&M provided a second T&R scenario in which only the highway segments 1–3 of SH 365 where considered to be built. Figure 6-10 shows the three considered highway segments and the alignment of the SH 365-Only scenario. The alignment of SH 365-Only scenario begins in the west, from the Anzalduas GSA Connector, and connects to the Pharr International Bridge over Spur 29. The tolled segments on the SH 365-Only scenario correspond to the Projects' toll segments 2–5 and will utilize the same toll treatment as the Projects.

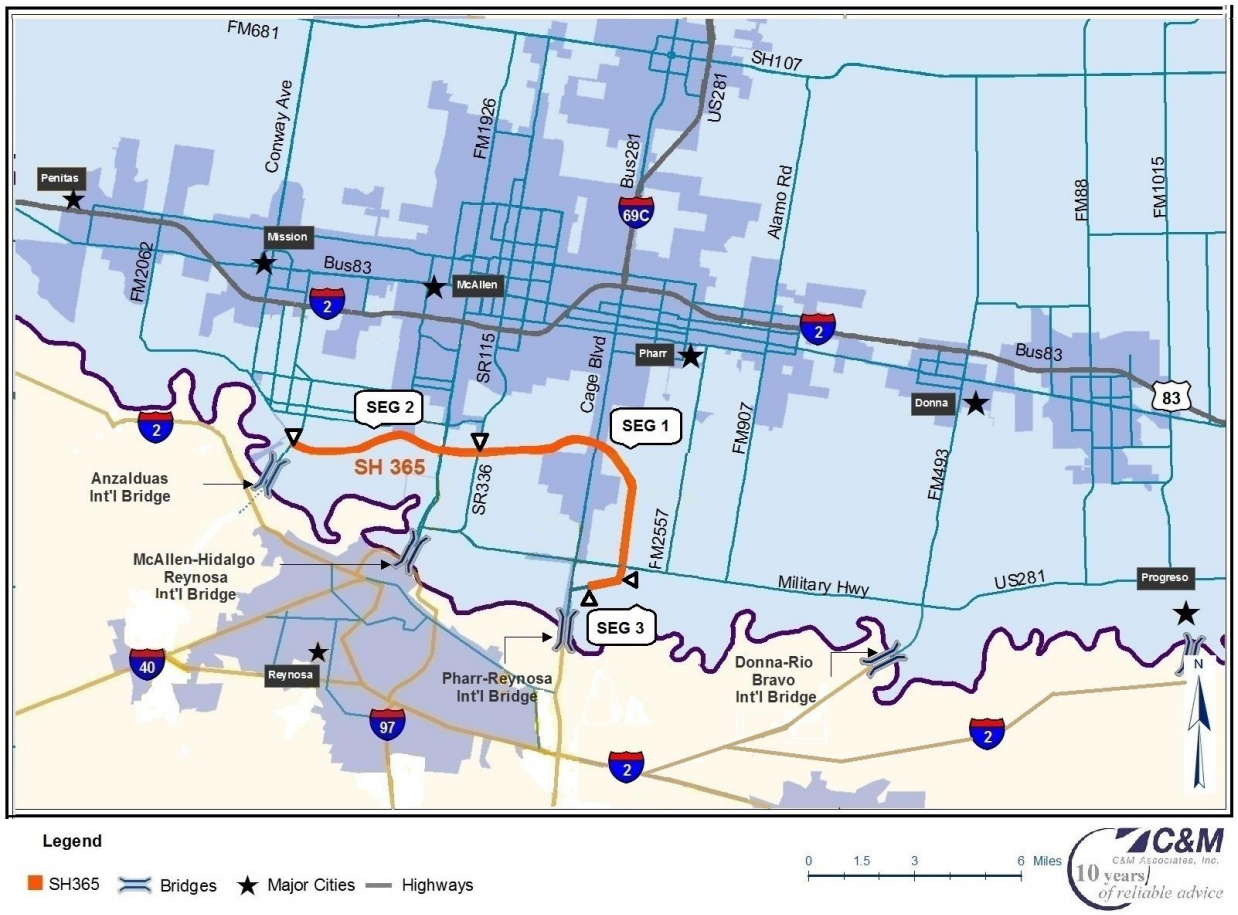


Figure 6-10. Alignment of SH 365-Only Scenario

Figure 6-11 presents the annual T&R of the SH 365-Only scenario. For the opening year 2018, C&M forecasted that the SH 365-Only scenario would generate approximately $0.9 million in toll revenue. By 2035, approximately 10 million transactions were projected under this scenario, a number expected to increase to 15.6 million by the final forecast year 2057. The SH 365-Only scenario projected annual revenue to be approximately $13 million by 2035 and $32 million by 2057. Table 6-6 provides a detailed look at T&R figures based on this scenario. The NPV of the SH 365-Only scenario constitutes 38 percent of the Projects' NPV.

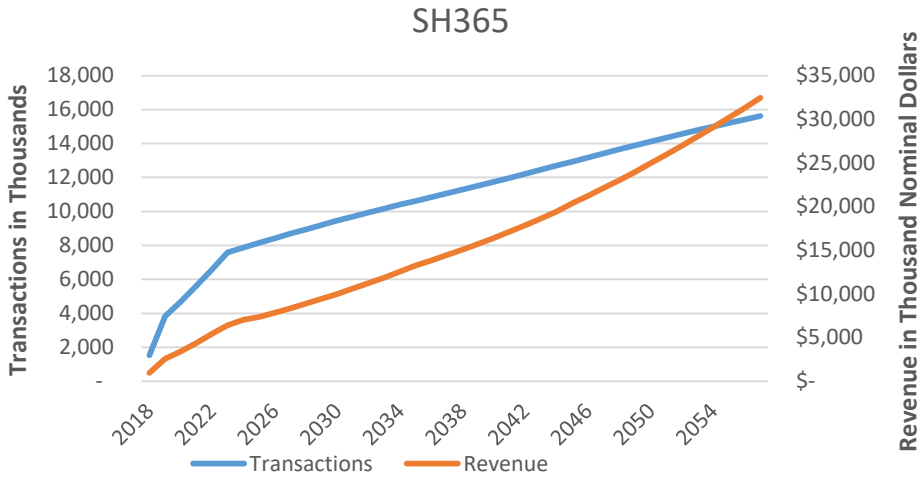


Figure 6-11. SH 365-Only T&R

Table 6-6. SH 365-Only T&R Annual Forecast

Year	Transactions (in Thousands)			Revenue (Nominal Dollar - in Thousands)		
	Auto	Truck	Total	Auto	Truck	Total
2018	1,315	205	1,520	$ 630	$ 305	$ 935
2019	3,320	510	3,830	$ 1,740	$ 830	$ 2,570
2020	4,070	620	4,690	$ 2,310	$ 1,090	$ 3,400
2021	4,860	740	5,600	$ 2,940	$ 1,400	$ 4,340
2022	5,700	860	6,560	$ 3,680	$ 1,740	$ 5,420
2023	6,590	1,000	7,590	$ 4,360	$ 2,050	$ 6,410
2024	6,840	1,030	7,870	$ 4,830	$ 2,180	$ 7,020
2025	7,080	1,070	8,150	$ 5,040	$ 2,310	$ 7,350
2026	7,320	1,100	8,420	$ 5,410	$ 2,440	$ 7,850
2027	7,550	1,140	8,690	$ 5,780	$ 2,580	$ 8,360
2028	7,780	1,170	8,950	$ 6,170	$ 2,720	$ 8,890
2029	8,000	1,210	9,210	$ 6,560	$ 2,870	$ 9,430
2030	8,210	1,250	9,460	$ 6,990	$ 3,020	$ 10,010
2031	8,420	1,280	9,700	$ 7,420	$ 3,180	$ 10,600
2032	8,620	1,320	9,940	$ 7,890	$ 3,350	$ 11,230
2033	8,820	1,350	10,170	$ 8,360	$ 3,520	$ 11,870
2034	9,010	1,390	10,400	$ 8,840	$ 3,700	$ 12,540
2035	9,190	1,420	10,610	$ 9,360	$ 3,900	$ 13,260
2036	9,380	1,460	10,840	$ 9,760	$ 4,070	$ 13,830
2037	9,570	1,490	11,060	$ 10,170	$ 4,270	$ 14,440
2038	9,760	1,530	11,290	$ 10,600	$ 4,470	$ 15,070
2039	9,950	1,570	11,520	$ 11,060	$ 4,680	$ 15,740
2040	10,140	1,600	11,740	$ 11,510	$ 4,900	$ 16,410
2041	10,340	1,640	11,980	$ 12,000	$ 5,130	$ 17,130
2042	10,540	1,680	12,220	$ 12,510	$ 5,360	$ 17,870
2043	10,740	1,720	12,460	$ 13,010	$ 5,600	$ 18,620
2044	10,940	1,760	12,700	$ 13,560	$ 5,860	$ 19,420
2045	11,140	1,800	12,940	$ 14,200	$ 6,170	$ 20,370
2046	11,340	1,840	13,180	$ 14,780	$ 6,440	$ 21,220
2047	11,540	1,880	13,420	$ 15,390	$ 6,750	$ 22,130
2048	11,740	1,920	13,660	$ 15,990	$ 7,040	$ 23,030
2049	11,930	1,960	13,890	$ 16,640	$ 7,340	$ 23,970
2050	12,120	2,000	14,120	$ 17,280	$ 7,670	$ 24,950
2051	12,310	2,040	14,350	$ 17,940	$ 7,990	$ 25,940
2052	12,490	2,080	14,570	$ 18,630	$ 8,330	$ 26,960
2053	12,670	2,120	14,790	$ 19,340	$ 8,700	$ 28,030
2054	12,850	2,150	15,000	$ 20,040	$ 9,050	$ 29,090
2055	13,020	2,190	15,210	$ 20,770	$ 9,420	$ 30,190
2056	13,190	2,230	15,420	$ 21,510	$ 9,800	$ 31,310
2057	13,360	2,270	15,630	$ 22,290	$ 10,190	$ 32,480