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SAFETY AND ECONOMIC IMPACTS OF TEXAS TRAVEL INFORMATION CENTERS

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16. Abstract

The overall goal of this research was to develop a methodology and gather sufficient data to quantify the impact of Texas Travel Information Center staff and services on the safety of travelers on Texas roadways. Researchers used data and analytical tools that quantify the value of person-to-person contact with visitors by providing information on travel route, road condition, destination, weather, and disaster evacuation. Several tasks were performed under this study to provide a response to this legislative request. The economic impact of Texas Travel Information Centers was established through two years of data collection via surveys collected on-site at the center locations, combining analysis of annual visitation and that of average daily per-person spending figures and other data. The research identified several safety benefits of Travel Information Centers such as reduction of driver fatigue and other wellness issues, transmission of critical information on safety and hazardous road and weather conditions, reduction of driver discomfort and distraction, reduction of highway shoulder stops, and reduction of excess travel to get services. Crash data analysis developed by this research also showed a significant positive effect on safety associated with Travel Information Centers. It was also found that Travel Information Centers have a significant economic benefit to Texas. Numerous safety benefits of the Texas Travel Information Centers were not addressed in this study. Many of these benefits were unquantifiable. Among the benefits that can be quantified in future studies are the comfort and convenience benefits, the relationship between the crash reduction rate and distance from a center, and the safety benefits of reduction of excess travel.

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view of the Federal Highway Administration (FHWA) or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation. The researcher in charge was Hatim O. Sharif (P.E. #97703) with the Department of Civil and Environmental Engineering at The University of Texas at San Antonio, San Antonio, Texas.

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EXECUTIVE SUMMARY

BACKGROUND

The Texas Department of Transportation (TxDOT) operates and maintains 12 Travel Information Centers (TICs), which serve visitors traveling into and through Texas. These visitors include vacation travelers, commercial truckers, commuters, motorcoach tours, motorcyclists, and others.

The mission of TxDOT's Travel Information Division is to promote travel to and within Texas. The Travel Information Centers, established in 1936, work to fulfill this mission by offering professional travel counseling services and providing routing and highway condition information. The centers are open 360 days a year, closing only on New Year's Day, Easter Sunday, Thanksgiving Day, Christmas Eve, and Christmas Day. These services are provided free of charge to the public.

Conveniently situated along major routes, most Travel Information Center locations provide 24-hour facilities such as restrooms and safety rest areas. All are staffed with trained professional travel counselors during business hours. Travelers primarily stop to obtain travel and tourism information or take a rest break from the road. Visitors also stop for the vending machines, relief for children or pets, vehicle checks, picnicking, changing drivers, or even sleeping.

Texas Travel Information Centers promote tourism in close partnership with the Texas travel industry. The centers distribute industry literature and provide expert recommendations to visitors on what to do and see in Texas. Because of this, industry partners underwrite familiarization tours so that travel counselors will have the most current firsthand information available and will be able to speak to visitors with authority and enthusiasm about travel destinations within Texas. Tourism industry partners also work closely with Travel Information Center staff to hold public events promoting travel and tourism, taking advantage of the opportunity to bring their information to the high volume of travelers stopping at the centers.

Texas Travel Information Centers also perform three distinct safety functions for the benefit of the traveling public:

1. Travel Information Centers are an integral component of TxDOT's DriveTexas™ Highway Conditions service. Current information on highway closures, construction, accidents, and weather-related travel conditions is displayed on an interactive map at www.DriveTexas.org and provided via TxDOT's toll-free Travel Information Line at 1-800-452-9292. This line provides automated highway condition information as well

as an option to speak with a travel counselor at one of the centers to receive personal, professional assistance during business hours.

2. During emergency events, this toll-free information line is TxDOT's primary public interface. In case of evacuations, hurricanes, winter storms, or other emergency conditions, Travel Information Center staff are activated as a state emergency resource and dispense information on a variety of subjects including emergency shelter information, fuel availability, food and water availability, emergency medical resources, and more. Travel Information Centers may go into extended hours or 24-hour operations, depending on the nature of the emergency. In the event that an emergency evacuation route includes a Travel Information Center, the center may serve as an emergency staging location and provide personal assistance to evacuees.
3. Throughout the year, Travel Information Centers partner with TxDOT district safety officers, the Texas Department of Public Safety, local law enforcement, and other organizations to host safety awareness events for the public. These events tie in with such public safety campaigns as Click It or Ticket, impaired and distracted driving awareness campaigns, child car seat safety campaigns, and work zone driving safety campaigns. These events feature educational games and activities, promotional materials, presentations, demonstrations, and entertainment and are well attended by local community members as well as passing travelers.

This study examined two key quantifiable benefits of Travel Information Center operations: safety benefits and economic benefits.

SAFETY BENEFITS

A four-tiered approach was established to provide evidentiary data supporting the safety impact of Texas Travel Information Centers, by means of the following methodologies:

1. Sourcing existing literature and research studies that demonstrate safety benefits of Travel Information Centers, particularly for risks of fatigued driving, impacts of commercial trucks, and influences on traveler behavior.
2. Collection and analysis of visitor surveys at Travel Information Centers, weighted and indexed for safety factors.
3. Analysis of peaks in DriveTexas™—Travel Information Line call volume answered by Texas Travel Information Center staff during emergency or extreme weather events affecting travel.
4. Analysis of crash data for stretches of roadway served by Travel Information Centers, demonstrating a reduction in crash rates immediately downstream of Travel Information Center facilities.

Full safety impact results are listed in Chapters 2–5 of this report.

ECONOMIC BENEFITS

Economic impact data for Texas Travel Information Centers were established through two years of data collection through visitor surveys, combining analysis of annual TIC visitation and that of average daily per-person spending figures from D.K. Shifflet & Associates Ltd., in conjunction with the travel research office of the Office of the Governor—Economic Development and Tourism (EDT). Full results of the Travel Information Center economic impact study are included in Chapter 6 of this report.

STUDY FINDINGS SUMMARY

There is no doubt that the existence of Travel Information Centers results in reduction of crashes caused by driver fatigue, shoulder parking, driver distraction, hazardous road and weather conditions, and vehicle malfunction. In addition, since the TIC user survey clearly showed that TIC users make use of the information provided at the TIC, the safety information provided at TICs must have positive impacts on travelers' safety. For the three rural TICs that were part of the study scope where the impact on crash statistics is not affected by cofactors (such as adjacency to urban centers), crash analysis revealed a statistically significant reduction in crash rates for two and a reduction in the number of crashes for all three TICs. Crash rate reductions were from 30 to 45 percent for the directions of travel that benefit from the enticement to stop and rest provided by the TICs. This is certainly a significant benefit that needs to be taken into account in any cost-benefit evaluation of TICs.

TICs also contribute to travelers' safety through direct communication. For example, analysis of telephone inquiries received by TICs showed that the numbers of calls increased by multiple orders of magnitude during inclement weather, and that the vast majority of the calls were about road conditions and shelter availability. TICs provide general safety information to travelers and collaborate with local authorities on safety promotion. A safety index was proposed to estimate how TIC users perceive the impact of the usage on the safety of their travel experience. This safety index was based on the results from the field questionnaires. Results suggested that TICs have significant impact on the safety of the travelers as remarked by the computed value of the proposed safety index.

The economic benefits of TICs include comfort and convenience, promotion of in-state tourism, enhancement of public safety, reduction of excess travel to obtain services, savings on vehicle operation and maintenance, benefits to specific business enterprises, and reduction of traffic diversion into communities.

Taking into account the tourism benefits evaluated in this study alone, TICs are economically viable. For fiscal year (FY) 2014, economic benefits of TICs included $109,858,014 in increased visitor spending, 1,099 jobs supported by TICs, and $6,152,590 in state tax

revenue generated by TICs. Other economic benefits of TICs, such as comfort and convenience benefits and reduction of excess travel to access similar services if TICs did not exist, were not assessed in this study; however, several published studies that quantified these benefits concluded that they exceed tourism benefits. Therefore, TICs have a significant economic benefit to the State of Texas.

Finally, TICs contain several aspects of attractiveness over comparable facilities, such as gas stations and food chains, as shown in Figure E-1.

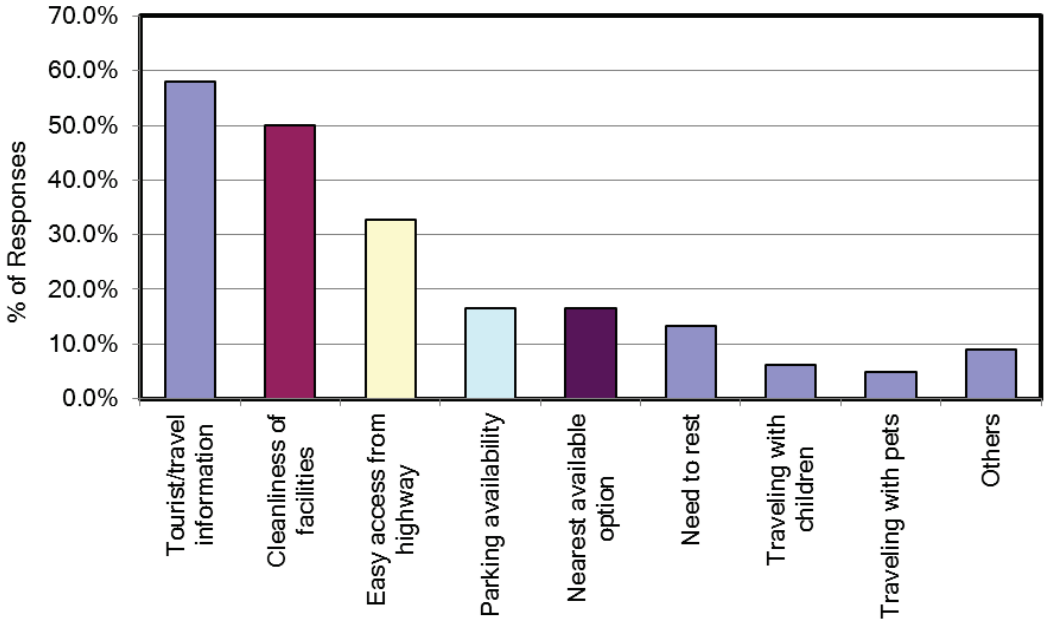


Figure E-1. TICs' Attractiveness versus Comparable Facilities.

CLOSING REMARKS

Texas Travel Information Centers are economically viable facilities and have significant safety benefits for travelers on Texas roadways.

CHAPTER 1: INTRODUCTION

STATEMENT OF PROBLEM

Travel Information Centers, typically located at entry points along state borders, have long been recognized to serve a myriad of purposes including providing an efficient way for travelers to rest and obtain various types of travel-related information, including official state travel maps and guides and promotional literature featuring state attractions, recreation activities, and accommodations. Travel Information Centers also have the objective of reducing driver fatigue and other adverse physiological effects; reducing in-vehicle driver distraction; reducing roadside and shoulder stops; providing a safe refuge under hazardous weather, visibility, and roadway conditions; reducing roadside stops for vehicle maintenance and inspection; and providing safety-related information to drivers (King 1989). Most relevant, previously completed safety-related research was focused on rest areas in general; however, a Travel Information Center is an enhanced rest area due to the staff and the additional services provided. Little research has been conducted on the impact of Travel Information Centers on safety, e.g., impacts of information provided at Travel Information Centers on travelers' behavior, characteristics of users, and motivation to stop at a center.

Rider 37 of TxDOT's appropriation under Senate Bill 1, 83rd Legislature, Regular Session, 2013, requires TxDOT to "develop a methodology to determine the economic and safety impact of travel information centers." An ongoing economic impact study has already been performed, and its results are published in Chapter 6. To comply with the safety impact portion of this legislative requirement, TxDOT needs to quantify the Travel Information Center impact to driver and traveler safety and identify the tangibles in order to measure impacts on safety. Data and analytical tools are needed that quantify the value in terms of visitor safety enhanced by travel route, road condition, destination, weather, and disaster evacuation information. In addition, safety impacts in the form of crash reductions need to be evaluated.

STUDY GOAL AND OBJECTIVES

The economic impact study performed at the Travel Information Centers sought to quantify the influence of travel counselor recommendations and center-distributed literature on visitor behavior. Surveys collected from Travel Information Center visitors over the past two years were used to estimate this economic impact based on widely used and recognized standard calculation formulas. The purpose of the safety research was to quantify Texas Travel Information Center impacts on driver and traveler safety, beyond serving as rest areas, and present a methodology to measure those impacts. The methodology included data collection from the 12 Texas Travel Information Centers located across the state and the development of survey tools to assess their safety impacts on drivers. The information collected included Travel Information Center operations, services provided, visitor

information, and incident data. In-person traveler surveys were also conducted at all Texas Travel Information Centers. Follow-up mail or phone surveys were later conducted to obtain feedback on the impact of the visit on the travelers' trip experience. Extensive statistical analysis of the survey results was performed. The outcome of the research was a detailed assessment of the safety impacts of Texas Travel Information Centers and statistical quantification of the measurable safety benefits of the project to TxDOT. In addition, detailed crash analysis on road segments potentially affected by three of the Travel Information Centers was implemented.

SUMMARY OF TASKS

The following tasks were performed in order to accomplish the aforementioned study objectives:

- Perform a review of the operations of Travel Information Centers in Texas.
- Perform a comprehensive literature review of the safety benefits of Travel Information Centers.
- Survey users of Travel Information Centers to identify the economic and safety benefits of the centers.
- Collect and analyze crash data to estimate potential safety impacts of Travel Information Centers.
- Perform an analysis of the economic benefits of Travel Information Centers.
- Develop conclusions pertaining to the economic and safety value of Texas Travel Information Centers.

CHAPTER 2: LITERATURE REVIEW

INTRODUCTION

Travel Information Centers, and to a lesser extent most rest areas, offer a critical venue at which highway authorities and other public agencies can reach out to highway travelers. A driver who receives accurate and useful weather, road, and traffic information will most likely use it to find a safer, more convenient route or time for his/her trip. This type of benefit can only be proved if reported by a Travel Information Center user, and its real value depends on the user's perception. Therefore, it is impossible to quantify this type of benefit without the implementation of user surveys.

Although one of the main purposes of rest areas and Travel Information Centers is travelers' safety, little research has quantified the impact of these facilities on the number of road crashes, even though the link between drivers' fatigue and crash risk is strong, primarily because of the difficulty in quantifying the traveler performance before and after the stop and how that directly impacts his/her driving performance and behavior on the road, which are major factors in crash potential. The Travel Information Centers and rest areas can only be effective when used—like safety belts, for example. To that effect, an Australian study noted that facilities such as Travel Information Centers and rest areas can only be effective if supported by non-engineering interventions, e.g., encouraging travelers to make proper uses of them (Austroads 2008). A rest area forum organized by the Federal Highway Administration (FHWA) (1999) emphasized that education is critical for addressing driver fatigue. For example, the study noted that drivers are not adequately notified or informed of available parking at rest areas and that intelligent transportation system technology might be needed to help direct travelers to available parking space in rest areas and Travel Information Centers.

Travel Information Centers nationwide have long been recognized to serve a myriad of purposes such as disseminating travel information, enhancing tourism, and offering a rest stop. In Texas, the Travel Information Centers also play an emergency response role. Tourism researchers continue to conduct studies on the benefit of Travel Information Centers. Most of the research on Travel Information Centers has focused on studying two broad areas. The first is the Travel Information Center users. For example, Mason (1975), Muha (1977), and Fesenmaier (1994) studied the demographic characteristics of Travel Information Center users in different states. Howard and Gitelson (1989) and Stewart et al. (1993) examined the differences between these users and other travelers who do not stop at the Travel Information Centers. Other studies investigated the factors that led travelers to stop at Travel Information Centers (e.g., Fesenmaier 1994; Howard and Gitelson 1989; Gitelson and Perdue 1987). The second area of research was the impact of stopping and the information provided at Travel Information Centers on travel behavior. For example, Gitelson and Perdue (1987) investigated how the travel information at the Travel

Information Centers helped influence travelers' current and future visits. Other studies investigated the impact of information obtained at Travel Information Centers on travelers' behavior, such as increasing spending and extending duration of stay in the Travel Information Center's state (e.g., Fesenmaier 1994; Fesenmaier and Vogt 1993; Roehl, Fesenmaier, and Fesenmaier 1993; Tierney 1993; Fesenmaier et al. 1993).

DRIVER FATIGUE AND DROWSINESS

A National Sleep Foundation poll found that 60 percent of adult drivers said they had driven a vehicle while feeling drowsy or fatigued (Drobnich 2005). A more alarming statistic from the poll is that more than one-third of those polled had actually fallen asleep while driving. This agrees with an earlier survey study by McCartt et al. (2000), who reported that 47.1 percent of truck drivers in New York had fallen asleep while driving. Vanlaar et al. (2008) reported that 59 percent of a sample of Canadian drivers admitted to driving while fatigued, and 15 percent admitted that they had fallen asleep while driving. Ohayon et al. (2010) reported that working outside regular daytime hours was associated with shorter sleep duration, sleepiness, and driving collision risk. They found that night driving disrupted sleep habits the most, resulting in excessive sleepiness and sleep attacks during driving.

Various predisposing and situational factors can cause drivers' drowsiness and fatigue. Brown (1994) and Brill et al. (2003) listed the length of continuous work spells and daily duty periods; time available for rest and continuous sleep; and arrangement of duty, rest, and sleep periods within each 24-hour cycle as major factors. Williamson et al. (2001) noted that drivers experienced high fatigue mostly in the early morning and to a lesser extent in the early afternoon. Long driving hours and problems with loading and unloading were among the main fatigue-causing factors. Stutts et al. (2003) found that drivers in sleep-related crashes were more likely to work multiple jobs, night shifts, or other unusual work schedules. They averaged fewer hours of sleep per night, reported poorer quality sleep, were less likely to feel they got enough sleep, were sleepier during the day, drove more often late at night, and had more prior instances of drowsy driving. Compared with drivers in non-sleep-related crashes, they had been driving for longer periods of time, had been awake more hours, and had slept fewer hours the night before. Otmani et al. (2005) reported similar observations but also remarked that driver age was another contributing factor. They also noted that young drivers were significantly less alert than middle-age drivers at low traffic flow or when driving between 11 p.m. and 6 a.m.

Drivers' behaviors and lifestyles were also found to be major factors in creating situations of driving while fatigued or drowsy. For example, one can eliminate these situations by obtaining a good night's sleep before driving, planning ahead, and avoiding medications that can cause drowsiness (Austroads 2012). Medical conditions can also aggravate a driver's condition. Gurubhagavatula et al. (2008) reported that drivers with sleep apnea were more

likely to be involved in fall-asleep crashes. The National Highway Traffic Safety Administration (NHTSA 2011) lists a number of chronic predisposing factors and acute situational factors that increase the risk of drowsy driving and related crashes:

- Driving patterns, including driving between midnight and 6 a.m.; driving a substantial number of miles each year and/or a substantial number of hours each day; driving in the mid-afternoon hours (especially for older persons); and driving for long times without taking a break.
- Use of sedating medications, especially prescribed anxiolytics, hypnotics, tricyclic antidepressants, and some antihistamines.
- Untreated or unrecognized sleep disorders, especially sleep apnea syndrome and narcolepsy.
- Consumption of alcohol, which interacts with and adds to drowsiness.

Williamson et al. (2001) reported that contract and working conditions might prompt drivers to drive while drowsy or fatigued. For example, drivers who were paid by trip (flat load) reported fatigue more often than drivers who were paid hourly rates. Rodriguez et al. (2003) found that drivers' pay, job tenure, and percentage of miles driven during winter months increased the likelihood of crashes more than demographic factors, with low-paid drivers being involved in more crashes.

FATIGUE-RELATED ACCIDENTS

Fatigue is one of the major causes of traffic accidents that, according to NHTSA estimates, result in 1500 fatalities and 71,000 injuries in the U.S. every year (Knipling and Wang 1994). However, an NHTSA (2011) report estimated fatalities to be slightly above 1000 per year for the 2005–2009 period, noting that this number might be an underestimate. The majority of evidence concerning the effect of fatigue on accident risk has come from studies of driving performance. The majority of such studies have inferred a relationship between travel driving and risk, from the study of driving performance and fatigue. It is widely believed that fatigue-related crashes are generally underreported (Carson et al. 2011) because "driver asleep" or "driver fatigued" observations are self-reported by the involved driver or inferred by the investigating officer. Many researchers suggested that fatigue-caused crashes result in higher injury and death rates than actually reported (e.g., Bunn et al. 2005; Connor et al. 2002; Garbarino et al. 2001). The reason that driver fatigue is mostly self-reported is the absence of a universally accepted definition of fatigue (Dobbie 2002). Even among traffic and highway authorities, the exact definition of a fatigue-related crash can be subjective and varies among different jurisdictions. According to NHTSA (Banerjee et al. 2009), an archetypical collision related to sleepiness has the following characteristics:

- The incident occurs during late night/early morning or mid-afternoon.
- The crash is likely to be serious.
- A single vehicle leaves the roadway.
- The crash occurs on a high-speed road.
- The driver does not attempt to avoid a crash.
- The driver is alone in the vehicle.

Based on an Australian operational definition, transportation researchers in Canada suggested a more realistic definition of fatigue that included the following criteria (Highway Safety Roundtable 2008):

- Police or coroner identified fatigue as a contributing factor.
- Vehicle condition had no apparent defect.
- Driver did not exceed the speed limit and did not travel at speeds too fast for the conditions at the time of the crash.
- Driver was not impaired by alcohol or drugs.
- Driver had no medical or physical disability.
- Crash occurred on a dry pavement.
- Initial impact type was related to fatigue (head-on collisions where neither vehicle was overtaking at the time of collision, rear-end collision and single-vehicle collisions).
- Crashes that involved unlicensed drivers were excluded.
- Crashes that involved pedestrians or animals (wild or domestic) were excluded.
- Driver initiated the crash.

Using a model based on this operational definition, it was found that on Ontario roads in 2004, 18 percent of all fatal crashes and 26 percent of crashes causing injury were fatigue related. Based on an operational definition of fatigue, the Australian Transport Council (ATC 2003) estimated that fatigue was a factor in 20–30 percent of fatal crashes. A National Transportation Safety Board study in 1990 estimated that 31 percent of crashes where truck drivers were killed were fatigue related (Smith et al. 2005). This is in contrast to the NHTSA (2009) statistics showing just 3 percent of all fatal crashes reported annually as fatigue related.

Rajaratnam and Jones (2004) asserted that sleepiness is now regarded as the largest identifiable and preventable cause of accidents in all modes of transportation. Other researchers suggested similar characteristics. Horne (1995) observed that most single-vehicle crashes occurred without prior braking, and that their highest incidence occurred during the periods between 2:00 a.m. and 6:00 a.m. and between 2:00 p.m. and 4:00 p.m. Furthermore, Sagberg (1999) found that the odds of fatigue or sleep being the cause increased by a factor of six when crashes occurred between midnight and 6:00 a.m.

Dobbie (2002) reported that the critical times for fatigue-related crashes were midnight to 6:00 a.m. and 2:00 p.m. to 4:00 p.m.

Fatigue can be most effectively managed when drivers take breaks that coincide with periods of fatigue (Feyer and Williamson, 1995). Stave (1977), for example, suggested that taking just a four-minute break from a three-hour trip at the point that major driving decision errors began to occur led to an almost complete elimination of errors following the break. A study by Clark (1979) recommended taking 10-minute stops every hour. However, Lisper and Eriksson (1980) found that breaks that included food intake were more effective in enhancing driving performance than rest breaks that involved doing nothing. Drory (1985) reported that adverse fatigue-related effects could be reduced by periodic rest, exercise, and moderate use of mild stimulants, such as caffeine. For example, taking a break that includes a short nap and/or drinking coffee is more effective in reducing drowsiness than taking a rest break alone that includes doing nothing (Reyner and Horne, 1997; Horne and Reyner, 1996). Dalziel and Job (1997) found a significant negative correlation between length of total rest time and number of accidents in a study involving taxi drivers.

An FHWA (1996) study noted that about 30,000 more parking spaces were needed at Travel Information Centers and public rest areas across the country. The shortage was more urgent for truck parking for long-term or overnight parking. The study also noted that public and private parking facilities are not necessarily direct substitutes for each other, but are complementary. The FHWA study warned that failing to "solve the truck parking shortage could pose significant risks to the traveling public by forcing tired drivers to continue driving, or park in inherently dangerous locations such as ramps and shoulders." A subsequent study by the American Trucking Association (ATA 1996) also warned that "increasingly, truck drivers seeking rest are parking illegally along highway shoulders and entrance and exit ramps, rather than at either public rest areas or private truck stops." These observations are consistent with the findings of Hartley et al. (1996), who reported that drivers suggested that improving roadside rest facilities would help reduce fatigue. In 2002, the *California Department of Transportation Journal* released the *Master Plan for Safety Roadside Rest Areas*, which recommended constructing 80 new rest areas in addition to creating more space in existing ones (Berthelsen 2002). A study by the Main Roads Western Australia (2007) stressed the need for enhancing the road network infrastructure including increasing the numbers of TIC-like facilities that encourage fatigued drivers to rest. They predicted that improvements in the safety of roads and roadside rest areas could reduce fatal crash rates in Western Australia by as much as 43 percent. A subsequent Austroads report (Austroads 2009) documented similar recommendations and noted that the availability of more TIC-like facilities could help reduce the frequency of fatigue-related crashes. A variety of prevention programs and campaigns over the past 10–15 years resulted from the strong links made between fatigue and road crashes. Initiatives included hours-of-service regulations,

advertising and education campaigns, and dedicated works across research and public policy (Smolensky et al. 2011).

COMMERCIAL TRUCKING AND CRASH RISK

Truck drivers use Travel Information Centers and rest areas for sleeping purposes, including nighttime stays of several hours, as they must comply with federal hours-of-service regulations (CFR 2014). Most importantly, a certain amount of off-duty time is required after driving for either 10 or 11 hours. A survey by Fleger et al. (2002) indicated that commercial truck stops and travel centers were preferred for long duration stops, while rest areas were preferred for quick naps.

The Federal Motor Carrier Safety Administration (FMCSA 2013) reported that of the 3341 fatal crashes involving commercial trucks in 2011, more than 10 percent were attributed to driver fatigue. The estimated total costs of these fatal crashes was $87 billion. Driver fatigue has been identified as a major factor (FMCSA 2006) because driver performance can easily deteriorate due to long hours of driving or irregular working schedules. Several studies have shown that lack of sleep can seriously affect truck drivers' safety performance (Dinges et al. 1997). Chen and Xie's (2014) study on the effect of driver fatigue in truck crashes noted the following:

- Statistical analyses suggest that increasing the total duration of rest breaks does have an increasingly positive safety impact.
- During a 10-hour trip, taking one or two rest breaks can significantly reduce commercial truck drivers' crash risk. Compared to trips without any rest breaks, having one and two rest breaks can reduce the probability that a truck driver will be involved in a crash by 30 percent and 11 percent, respectively.
- The durations of the rest breaks can also have a significant impact on crash risk. The results suggest that 30 minutes is generally considered an adequate and cost-effective rest break for truck drivers.

Studies have revealed that driving performance worsens with the duration of driving time (Campagne et al. 2004; Feyer et al. 1997). Long-distance truck drivers exhibit worse driving performance than ordinary drivers, with driving time the main factor affecting their driving ability (Otmani et al. 2005; Philip et al. 2003). The duration of the driving time, monotonous environment, and circadian effects have been shown to negatively influence driving performance (Rossi et al. 2011; Wang and Pei 2014). Haitao (2009) suggested that a rest break of 20 minutes every two hours prevented fatigue compared to a trip with no rest. Wang and Pei (2014) remarked that driving time and rest time have significant effects on driving performance and driver recovery. When driving continuously for two to four hours, all aspects of driving performance are influenced significantly. However, a 15–30 minute rest

break will restore the perception and reaction performance and the attention and operating performance.

A study examining the most frequently reported symptoms of sleepiness in driving, revealed by a questionnaire of 154 truck and bus drivers, was conducted by Berg and Landström (2006). The study revealed the following:

- About 14 percent of the drivers reported regular sleepiness while driving, 33 percent had occasionally fought sleepiness while driving, and 8 percent had experienced nodding of the head while driving.
- The majority of the drivers had once been so tired that they had to stop driving.
- Sleepiness normally occurred at the end of longer trips.
- Poor sleep and poor working hours were considered the most important causes of sleepiness.
- Eye tiredness, yawning, difficulties concentrating on the road, and difficulties keeping one's thoughts together were the most frequently reported symptoms of sleepiness.

Mackie and Miller (1978) remarked that driving performance has been found to begin to deteriorate after eight to nine hours of driving in the case of truck and bus drivers, while the frequency of accidents during the last half of the journey has been shown to be twice that during the first half. Bin et al. (2007) confirmed that reaction and attention abilities have been shown to decrease significantly after eight to 12 hours of driving, while perceptions and operating abilities are not significantly affected for commercial drivers. MacLean et al. (2003) reported that changes in driving characteristics have been found to include increased variability of speed and lateral lane position. The speed coordination of drivers following another car has been shown to deteriorate after 2.5 hours of driving (Brookhuis et al. 1994).

REASONS FOR STOPPING AT TRAVEL INFORMATION CENTERS

Several researchers studied the reason and motivation for stopping at a Travel Information Center by conducting surveys of random samples of Travel Information Center users. Tierney and Hass (1988) reported that the use of restrooms is the most popular reason for stopping. Gitelson and Perdue (1987) reported that a substantial proportion of North Carolina Travel Information Center visitors stopped for restroom use and to pick up information. Those visitors remarked that they would use the information for decisions on both current and future trips. Fesenmaier and Vogt (1993) found that the majority of Travel Information Center visitors in Indiana stopped to use restrooms (62 percent), while approximately 25 percent of the respondents indicated they stopped to stretch/exercise/nap or to obtain sightseeing information. About 10 percent of those surveyed indicated that they stopped specifically to obtain travel information. Results of many travel and tourism studies (e.g., Fesenmaier et al. 1993; Tierney and Hass 1988; Gitelson and Purdue 1987; Muha 1977)

contended that obtaining travel information was one of the major reasons for stopping at Travel Information Centers.

CHARACTERISTICS OF TRAVEL INFORMATION CENTER USERS

Results from studies on the characteristics of Travel Information Center users are not conclusive and largely inconsistent. Muha (1977), who analyzed data from 243 Travel Information Centers in 43 states, reported significant differences not only between users and non-users of Travel Information Centers but also between first-time and frequent users. He found that compared to all travelers, Travel Information Center users were younger, were traveling in larger parties, had above-average incomes, were on pleasure trips, and were on non-weekend, vacation trips. He also found that first-time users tended to be younger, travel in larger travel parties, have lower incomes, stay in tents or travel trailers, and stop to get travel information primarily about campgrounds. Tierney and Hass (1988) reported that Travel Information Center users and non-users in Colorado differed significantly in terms of their socio-demographic and trip characteristics. The most significant differences between users and non-users were found to be in their expenditures during their trips. When compared to non-users of Travel Information Centers in Texas, Stewart et al. (1993) found that users were more likely to reside in a nonadjacent state, were older, drove more miles within Texas, were associated with a longer trip-planning horizon, had higher expenditures per party, and were more likely to be on a vacation/leisure trip. In contrast, Howard and Gitelson (1989) examined whether vacation travelers who use Travel Information Centers in the state of Oregon are different from those who do not and concluded that no differences existed between the socio-demographic characteristics of users and non-users. Based on this finding, they suggested that Travel Information Center users may be representative of all highway travelers in the state. A study by Fesenmaier et al. (1993) also did not find significant differences in the socio-demographic characteristics between users and non-users of Travel Information Centers in Indiana, except that the income-level users had slightly higher income levels.

TRAVEL INFORMATION CENTERS AND EXCESS TRAVEL

Studies have shown that some drivers would leave the highway (for various reasons) if there were no Travel Information Centers or rest areas available. Excess travel can be estimated as the arithmetic difference between the net distance (or time) traveled to access the next closest alternate commercial service facility (fast food restaurant, gas station, or truck stop) and the net distance (or time) traveled to access the particular rest area (Gates et al. 2012). King (1989) estimated the excess travel resulting from the above to be in excess of 2.5 billion miles per year. Gates et al. (2012) reported that 62 percent of the travelers they surveyed would have diverted to a nearby commercial service facility if a Travel Information Center or rest area were not available. Excess travel unquestionably results in more crashes.

However, it is almost impossible to estimate the number of crashes that result from excess travel.

TRAVEL INFORMATION CENTERS AS REFUGE

A TIC-like facility can serve as a safe refuge in several situations when driving becomes hazardous. For example, when a vehicle malfunctions, the driver needs to stop for a check or apply necessary service or maintenance. Common problems such as low tire pressure need attention within a short distance after detection. Repairs should be performed at a safe place and not on the roadside shoulder. The vehicle can be parked at TIC-like facilities while waiting for professional assistance to address serious problems such as braking, steering, and lighting malfunctions. Equally important is the opportunity for proactive drivers to check the performance of their vehicle periodically at TIC-like facilities. Occurrence of natural hazards on the road, such as severe weather, icy roads, or low visibility, present situations where Travel Information Centers can prevent the risks of continuing driving or stopping on the road side. During these situations and major road closures, travelers can stop at Travel Information Centers and receive guidance on when and how to resume travel. A contributing factor to crashes is driver distraction, which can be due to in-vehicle disturbance caused by a distressed passenger, an agitated child, or an unruly pet. Such distractions are likely to be reduced by appropriately spaced safety rest areas. Also, drivers can make necessary phone calls or text messages at Travel Information Centers, reducing the risk of doing so while driving. All of the above-mentioned benefits of Travel Information Centers are challenging to quantify.

TRAVEL INFORMATION CENTERS AND SHOULDER PARKING

A study conducted by FHWA (1997) reported that 3 percent of all crashes involved vehicles on the shoulder. Howell et al. (1985) reported 42 fatal crashes resulting from shoulder stops in California with approximately half involving a truck parked on the shoulder. King (1986) reported that excess travel (caused partially by lack of TIC-like facilities) increased the number of accidents on roads and provided some estimates of this increase. King (1989) reported that lack of TIC-like facilities resulted in heavy-vehicle drivers parking on road shoulders and increased the number of roadside accidents, and asserted that these crashes are underreported. He estimated that the absence of such facilities would have increased the number of accidents involving vehicles parked on a road shoulder by 50 percent. King (1989) concluded that these accidents are most likely to be underreported, as they do not include sideswipe or rear-end crashes involving vehicles entering or leaving the shoulder or crashes involving dismounted motorists likely as a result of a shoulder stop. Smith et al. (2005) reported that on routes where supply of rest areas and Travel Information Centers is limited, heavy-vehicle drivers tended to park on highway shoulders and ramps, creating a significant safety hazard. A recent study found that during nighttime

hours, there was a significant increase in single-vehicle crashes related to shoulder parking beyond rest areas and Travel Information Centers (SRF Consulting Group 2007).

SPACING OF TRAVEL INFORMATION CENTERS AND REST AREAS

Several researchers indicated that spacing of Travel Information Centers and rest areas is one of the main factors when considering reducing fatigue of truck drivers. However, the optimal distance between these facilities has been a subject of great debate. For example, the Montana Rest Area Plan states that in 1985, Montana identified 70 miles as the target spacing on roadways with more than 750 vehicles per day or 100 miles on roadways with more than 1000 vehicles a day, but Montana currently recommends a spacing of 54 miles, or the length of one hour of travel time (Banerjee et al. 2009). The Minnesota Department of Transportation recommends that a spacing of 50 miles is "desirable." Gardner (2002) determined that the ideal distance between rest areas (or Travel Information Centers) is 55 miles for truck drivers. Similarly, the American Association of Highway and Transportation Officials suggests a distance of 60 miles between rest areas (Perrault 2008). However, a University of Maine study claimed the distance covered in one hour is too long and recommended a 30-mile spacing between stops (Gardner 2002). Gates et al. (2009), after reviewing several studies, noted that the vast majority of recommend distances shorter than the current FHWA recommendations of 50 miles or one-hour drive time on major highways. Austroads (2012) developed a method for determining optimal locations for heavy-vehicle rest areas on designated freight routes using data on directional volume and vehicle mix, crash rates, roadway functional classification, and roadway geometry.

Taylor et al. (1999) investigated the relationship between the average distance between rest areas on highways and the percentage of overall crashes involving single heavy-vehicle crashes and found a significant increase in single heavy-vehicle crashes when the distance between rest areas exceeded 30 miles. More recently, O'Brien and Morris (2006) also found that commercial vehicle crash rates in Minnesota were higher where the distance between rest areas (or Travel Information Centers) exceeded 30 miles. A Minnesota study showed similar results, reporting that frequencies of truck crashes increased at distances greater than 30 miles beyond a rest area during all times of the day (SRF Consulting Group 2007). Banerjee et al. (2009) performed an analysis of both fatigue and non-fatigue collisions and found that the number of collisions due to fatigue significantly increased for distances beyond 30 miles from rest areas and Travel Information Centers. In an evaluation of the effectiveness of TIC-like facilities in reducing accidents in the United Kingdom, Reyner et al. (2010) compared accident frequency in the 10 miles upstream and downstream of these facilities after the service areas with crashes in the 10 miles prior to the service areas and found a 14 percent reduction in casualty crashes and a 22 percent reduction (statistically significant) in fatigue-related crashes. Gates et al. (2012) performed an analysis of fatigue-related crashes in the vicinity of rest areas and welcome centers (Travel Information

Centers) in Michigan along the main route served by the facility and found that such crashes increased with the distance from the rest area or Travel Information Center. Crash reduction modeling indicated that the greatest safety impacts were associated with facilities on roadways with the highest mainline traffic volumes and turn-in rates. The authors estimated that Michigan rest areas and Travel Information Centers reduced fatigue-related crashes system wide by 273 crashes within 20 miles upstream and downstream of the facilities, i.e., 3.37 crashes per facility per year on average.

IMPACT OF TRAVEL INFORMATION CENTER USE ON TRAVELERS' BEHAVIOR

The issue of the impact of Travel Information Center visits on the travelers' behavior was also studied. Numerous studies have been conducted to evaluate the level of information use, types of information obtained, and effect of information on travel behavior. Travel and tourism researchers found that most travelers did use information obtained at Travel Information Centers (e.g., Fesenmaier et al. 1993; Gitelson and Perdue 1987). Gitelson and Perdue (1987) indicated that substantial percentages of the individuals stopping at Travel Information Centers cited receiving various types of trip-related information as reasons for stopping. An even larger percentage was likely to pick up information once stopped even if that was not the primary reason for the stop. Most importantly, the respondents also indicated that they were likely to use the information they received at the Travel Information Centers for current and/or future trip decisions. Tierney and Haas (1988) reported that the impacts of information obtained at state Travel Information Centers included a 25 percent increase in visitors' average daily expenditures. The results also showed that Travel Information Centers had a significant impact on travel decision making. Fesenmaier et al. (1993) found that the information provided at Travel Information Centers actually did influence the travel behavior of many of the users. A large proportion of those surveyed indicated that they were more likely to use the information obtained at Travel Information Centers to plan future trips, suggesting that information was often collected and then stored for future use. Fesenmaier and Vogt (1993) reported that one-third of respondents spent additional money, 21 percent stayed longer than initially planned, and 29 percent visited places not originally planned as a result of the information obtained at Travel Information Centers. Data collected by The University of Texas at San Antonio and TxDOT during the course of this study reconfirmed the significance of travel literature, personalized one-on-one information, and highway condition information as primary motivations encouraging a stop at a Travel Information Center, as well as the impact on length of stay and visitor spending.

SUMMARY

In summary, the literature review revealed the following:

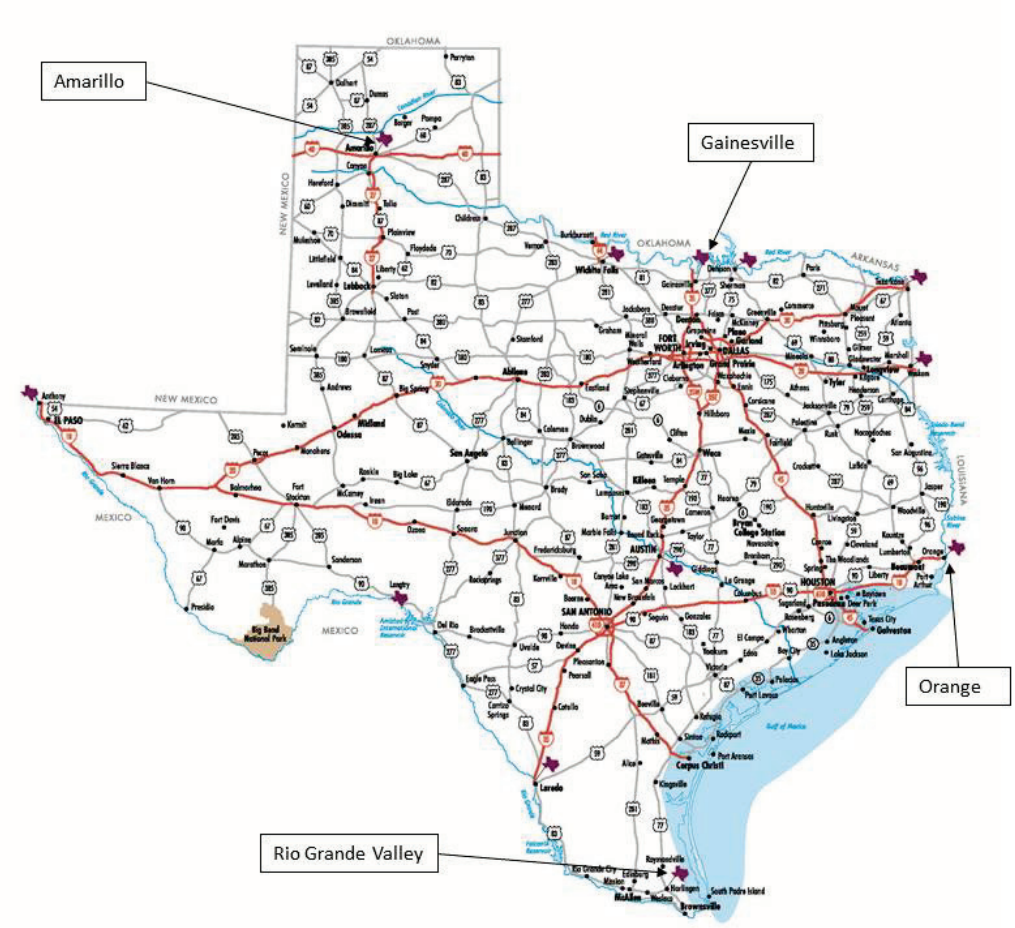
- Travel Information Centers have many safety benefits, such as reducing driver fatigue and other adverse physiological effects; reducing roadside and shoulder stops; providing important personalized safety information; reducing excess travel to get services such as toilets and water; reducing in-vehicle driver distraction; providing a safe refuge during hazardous weather, visibility, and roadway conditions; reducing roadside stops for vehicle maintenance and inspection; and providing safety-related information to drivers.
- Direct quantification of safety benefits is challenging; however, researchers have suggested that the benefits are most likely underestimated.
- Research has shown that the information provided at Travel Information Centers has a significant positive impact on travelers' behavior and spending.

CHAPTER 3: SITE VISITS TO TEXAS TRAVEL INFORMATION CENTERS

Texas has 12 Travel Information Centers that serve travelers entering the state, as shown in Figure 3-1. The centers are staffed by professional travel counselors working for TxDOT's Travel Information Division who welcome visitors to Texas, help with driving directions, and provide information on nearby facilities, attractions, events, and weather and road conditions. The centers also provide a place for travelers to rest and relax and, in many cases, serve as a refuge during inclement weather and road conditions. The information provided includes the Texas Official Travel Map, Texas State Travel Guide, Texas Public Campgrounds and Texas Events Calendar, and other travel literature, including maps, pamphlets, booklets, and brochures from local and statewide destinations, points of interest, special events, lodging, and restaurants. Most of the Travel Information Centers provide free wireless Internet service, a video theater for Texas attractions and destinations, and access to the Weather Channel inside the main building. At most centers, amenities outside the main building include restrooms, covered picnic areas, and vending machines. Except for the Texas Travel Information Center located inside the Capitol Visitor Center in Austin, the Travel Information Centers operate and are staffed between 8:00 a.m. and 5:00 p.m. daily, and until 6:00 p.m. from Memorial Day weekend through Labor Day. Travel Information Centers are closed only on Easter, Thanksgiving, Christmas Eve, Christmas Day, and New Year's Day. Eight of the 12 have 24-hour access to restroom facilities.

The research team arranged visits to four Travel Information Centers to obtain adequate and comprehensive information about the operation of Texas centers and prepare for the site surveys involving the center users to be performed later in the project (Task 3). The following Travel Information Centers were selected for initial visits: (a) Rio Grande Valley, (b) Orange, (c) Amarillo, and (d) Gainesville (Figure 3-1). During these visits, members of the research team examined the information provided at the centers; interviewed supervisors and staff on the operation of the centers, the services provided, the amenities in the center, the frequency of visitors, and the most frequently requested information by visitors; and gathered information about the visitors.

These four Travel Information Centers also distributed a survey to random samples of their visitors. The center staff provided input on how to set up the survey administration in terms of when, how, and where to approach travelers during their visits. The research team gathered information from the Travel Information Center staff on center operations, amenities, services offered, and the nature of help provided for visitors.



Note: The four centers whose visitors were surveyed are identified by name.

Figure 3-1. Texas Travel Information Centers.

VISIT TO RIO GRANDE VALLEY TRAVEL INFORMATION CENTER

A research team member visited the Rio Grande Valley Travel Information Center on March 1, 2014. Figures 3-2 through 3-4 provide photos of the center. This center is the most frequently used Travel Information Center by Winter Texans. Although Winter Texans stop at other centers, this particular center offers the opportunity to meet a large number of these travelers during a short period. A summary of the discussion points with center staff is provided below. The statistics provided below (e.g., regarding the visitor characteristics) are approximate and not official and were only used to help in preparing the site surveys.

- There are three parking lots attached to the center: off the US77 service road, off Harrison Avenue, and off Tyler Avenue.
- The busiest entrance to the center is through the service road.
- WiFi service is available inside the building only.

- All restrooms are inside the building and are available only during the hours the center is open.
- Friday and Saturday are the busiest days of the week.
- The busiest time of the day is between 10 a.m. and 1 p.m.
- Some travelers stop after 5 p.m. and before 8 a.m.
- Some travelers stay overnight inside their vehicles.
- Trucks also stop at the center.
- About 5–10 percent of the center users speak Spanish only.
- The center personnel answer questions about road closures by phone.
- Many travelers ask about how safe it is to go to Mexico. Although employees do not make recommendations, they direct travelers to where to find security information.
- Many travelers know the travel and tourism information offered at the Travel Information Centers is the most unbiased and accurate.
- Because a large portion of this center's users are Winter Texans, its peak visitation takes place between October and April rather than during the summer travel season.
- Families, including children, use the center more frequently in the summer time. The most sought information at the center includes directions and tourist attractions and activities.
- There is a viewing room for weather information and tourism videos.
- The center safety awareness and tourism events are held throughout the year.
- The center is open daily from 8 a.m. to 5 p.m., and from 8 a.m. to 6 p.m. between Memorial Day weekend and Labor Day.
- The center extends hours as needed during emergencies (such as hurricane evacuations or winter storms) that generate a high call volume to TxDOT's toll-free Travel Information Line.

Figure 3-2. Aerial View of the Rio Grande Valley Travel Information Center.

Figure 3-3. Main Entrance to the Rio Grande Valley Travel Information Center Viewed from Tyler Avenue.

Figure 3-4. Inside the Rio Grande Valley Travel Information Center.

VISIT TO ORANGE TRAVEL INFORMATION CENTER

A research team member visited the Orange Travel Information Center on March 8, 2014. Figures 3-5 through 3-7 show photos of the center. This center is the busiest in Texas and is located in an area affected by tropical storms and hurricanes. A summary of the discussion points with the center staff is provided below. These statistics (e.g., regarding the visitor characteristics) are approximate and not official and were used only to help in preparing the site surveys.

- The access to the Orange Travel Information Center is similar to a standard safety rest area.
- The center operates like an unstaffed safety rest area after business hours.
- WiFi service is available inside the building only.
- Restrooms are available inside the building and available when the center is open. There are also restrooms outside of the main center building that are available after hours.
- Friday and Saturday are the busiest days of the week.
- The busiest time of the day is between 10 a.m. and 1 p.m.
- Some travelers stop after 5 p.m. and before 8 a.m.
- Some travelers stay overnight inside their vehicles.

- Trucks also stop at the center.
- The center personnel answer questions about road closures by phone.
- There is an auditorium in the main building where a television is tuned to weather information.
- The center was opened around the clock during catastrophic events such as Hurricane Katrina to provide support to the stranded motoring public.
- Families including children use the center and are attracted by the boardwalk attached to the main building that extends over the adjoining bayou and allows for viewing of wildlife such as alligators, raccoons, and snakes.
- The most frequently asked questions at the center involve directions and tourist attractions and activities.
- The center hosts special events in conjunction with other organizations such as local law enforcement, the Department of Public Safety, and TxDOT Traffic Safety specialists.
- The appeal of the center to passing drivers could be increased by providing playground equipment for children.
- There is a viewing room for weather information and tourism videos.
- The center safety awareness and tourism events are held throughout the year.
- The center is open daily from 8 a.m. to 5 p.m., and from 8 a.m. to 6 p.m. between Memorial Day weekend and Labor Day.
- The center extends hours as needed during emergencies (such as hurricane evacuations or winter storms) that generate a high call volume to TxDOT's toll-free Travel Information Line.

Figure 3-5. Aerial View of the Orange Travel Information Center.

Figure 3-6. Main Entrance to the Orange Travel Information Center.

Figure 3-7. Inside the Orange Travel Information Center and Behind the Information Counter.

VISIT TO AMARILLO TRAVEL INFORMATION CENTER

A research team member visited the Amarillo Travel Information Center on March 19, 2014. Figures 3-8 through 3-10 show photos of the center. This center is not located at the Texas border but is used by travelers who come to Texas from several other states, as it serves a number of highways. A summary of the discussion points with the center staff is provided below. The statistics provided below (e.g., regarding the visitor characteristics) are approximate and not official and were used only to help in preparing the site surveys.

- The center was built in 2003.
- There are two parking areas: one for cars/RVs and the other for trucks.
- The vending machines are open 24 hours and outside restrooms are open between 5 p.m. (6 p.m. in the summer) and 8 a.m. the next morning.
- Restrooms inside the main building are open from 8 a.m. to 5 p.m.
- WiFi service is available inside the building only.
- The busiest period is between late May and mid-August.
- Friday and Saturday are the busiest days of the week, followed by Thursday.
- The busiest time of the day is between 10 a.m. and 1 p.m. and between 4 p.m. and 6 p.m.
- Some travelers stay overnight inside their vehicles.
- Many trucks and RVs stop at the center.
- About 50–60 percent of the center users talk to attendants.
- Many foreign travelers (especially from Europe) use the center.
- The center serves 300–350 travelers per day during the summer months.
- The center personnel answer questions about road closures via phone.
- Many travelers ask about attractions in the area, directions, hotels, and information related to the Amarillo Medical Center.
- Many travelers know the travel and tourism info offered at Travel Information Centers is the most unbiased and accurate.
- Families including children use the center more frequently in the summer time.
- The center is used by travelers for sheltering in place during storms.
- The center serves as a refuge during major road closures (due to winter conditions).
- The center has safety literature focused on driving during inclement weather and U.S. driving info and laws for foreigners.
- The center collaborates with the local National Weather Service office on some education and outreach events.
- The center serves as a staging center for emergency services.
- The center was once used as a triage unit during a major car pile-up caused by icy road conditions and a staging area for the Red Cross for displaced families during the wildfires.
- There is a viewing room for weather information and tourism videos.

- The center's safety awareness and tourism events are held throughout the year.
- The center is open daily from 8 a.m. to 5 p.m., and from 8 a.m. to 6 p.m. between Memorial Day weekend and Labor Day.
- The center extends hours as needed during emergencies (such as hurricane evacuations or winter storms) that generate a high call volume to TxDOT's toll-free Travel Information Line.

Figure 3-8. Aerial View of the Amarillo Travel Information Center.

Figure 3-9. Main Entrance to the Amarillo Travel Information Center.

Figure 3-10. Inside the Amarillo Travel Information Center.

VISIT TO GAINESVILLE TRAVEL INFORMATION CENTER

A research team member visited the Gainesville Travel Information Center on March 22, 2014. Figures 3-11 through 3-13 show photos of the center. This Travel Information Center is among the busiest in Texas and serves travelers coming from or returning through Oklahoma. A summary of the discussion points with the center staff is provided below. The statistics provided below (e.g., regarding the visitor characteristics) are approximate and not official and were used only to help in preparing the site surveys.

- There are two parking areas: one for cars/RVs and the other for trucks.
- The vending machines and outside restrooms are open after hours.
- The restrooms inside the main building are open from 8 a.m. to 5 p.m.
- About 95 percent of the visitors are southbound.
- The center has several picnic areas.
- Visitors represent all age groups, but there are more older people than younger ones.
- WiFi service is available inside the building.
- The busiest period is between June and August.
- Friday and Saturday are the busiest days of the week, followed by Thursday.
- The busiest time of the day is between 10 a.m. and 1 p.m.
- Some travelers stay overnight inside their vehicles.
- Many trucks and RVs stop at the center.
- About 50 percent of the center users talk to attendants.
- The center serves 500–600 travelers per day during the summer months.
- The center personnel answer emergency questions about weather and road closures by phone.
- Many travelers ask about maps, directions, attractions in the area, and hotels.
- Families including children use the center more frequently in the summer time.
- The most sought information at the center includes maps, directions, tourist attractions, and hotels.
- The center is used by travelers for sheltering in place during storms.
- The center organizes two safety events annually: Safety Awareness Week and a work zone safety event.
- There is a viewing room for weather information and tourism videos.
- The center safety awareness and tourism events are held throughout the year.
- The center is open daily from 8 a.m. to 5 p.m., and from 8 a.m. to 6 p.m. between Memorial Day weekend and Labor Day.
- The center extends hours as needed during emergencies (such as hurricane evacuations or winter storms) that generate a high call volume to TxDOT's toll-free Travel Information Line.

Figure 3-11. Aerial View of the Gainesville Travel Information Center.


Figure 3-12. Main Entrance to the Gainesville Travel Information Center.

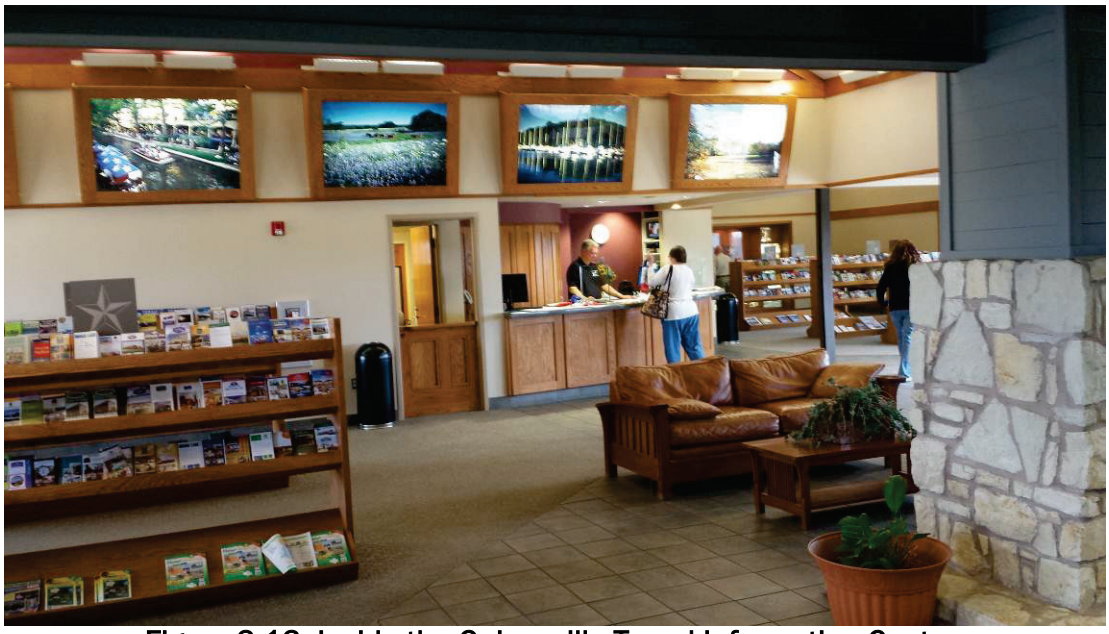


Figure 3-13. Inside the Gainesville Travel Information Center.

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CHAPTER 4: SURVEYS OF TRAVEL INFORMATION CENTER USERS

INTRODUCTION

This chapter describes the safety survey that was conducted at the 12 Travel Information Centers. The objective of the surveys was to collect information from the visitors on their travel plans and the purpose for their stop at the Travel Information Center. These responses were also used to study the centers' impact on the safety of the travelers.

SURVEY STRUCTURE

The survey was structured into two parts. The first covered questions for all visitors on their trip duration before and after the stop, the reasons for stopping at the Travel Information Center, and their preferences for stopping during their trip at TICs, rest areas, and other comparable facilities. The second part covered follow-up questions, for returning visitors only, on the services they obtained from centers that altered or assisted their travel plans. A copy of the survey is included in Appendix A. For each question, multiple possible answers were given to assist the visitors in making a quick reply. Considering the fatigue of the visitors and their inherent pressure to resume their trips, the survey was planned so that it could be completed in no more than two minutes. The surveys were handed out to the visitors during their stops at the Travel Information Center facilities through the staffed extended summer operating hours from 8 a.m. until 6 p.m.

Four Travel Information Centers were initially surveyed by the researchers during the spring of 2014. Those centers were Harlingen, Orange, Gainesville, and Amarillo. The schedule of the visits is shown in Table 4-1. Figure 4-1 shows the surveying table as it was set up for the Amarillo and Harlingen centers. The visit to each center lasted two to three days in order to complete a target of 300 surveys. In the case where the target was not met within that time period, the survey forms were left with travel counselors to administer to visitors until the target number of surveys was met.

Table 4-1. Scheduled Survey at the Four Travel Information Centers.

Travel Information Center	Date
Harlingen (Rio Grande Valley)	March 14–16, 2014
Orange	April 18–19, 2014
Gainesville	May 28–29, 2014
Amarillo	May 30–31, 2014

Figure 4-1. Surveying Table at Amarillo (left) and Harlingen (right) Travel Information Centers.

After the completion of the initial visits, another surveying cycle was conducted during the summer of 2014. In this cycle, the 12 Travel Information Centers were requested to perform the survey from the period of July 9 to August 31, 2014, in an attempt to collect more responses to use in the study. This cycle was handled by the center employees, and the completed forms were mailed back to the researchers for tabulation and analysis.

SURVEY RESPONSES AND DATA ANALYSIS

The total number of surveys available for this study was 2098. Visitors were asked about their trip duration prior to and after their stop at the Travel Information Centers. Multiple choices were assigned to these questions including the following: < 1 hour, 1–2 hours, 2–3 hours, and > 4 hours. Visitors were asked to respond to one choice only. Figures 4-2 and 4-3 suggest that the majority of the visitors were long-distance travelers. Results suggested that 32 percent of the visitors spent more than four hours driving prior to their stop at the Travel Information Center, and 38 percent expected to resume traveling for the same period of time. The vast majority of the visitors crossing the Texas borders expressed their interest to visit the major metropolitan areas (Houston-Galveston, San Antonio, and Dallas-Fort Worth [DFW]) during their stay. Traveling to these metropolitan areas required driving more than two hours from the closest border line. The prior trip duration time was counted from the original origin at the home state. Visitors with less than one-hour trip duration were mostly local residents residing in close proximity and taking advantage of the Travel Information Centers' amenities (maps, restroom, etc.).

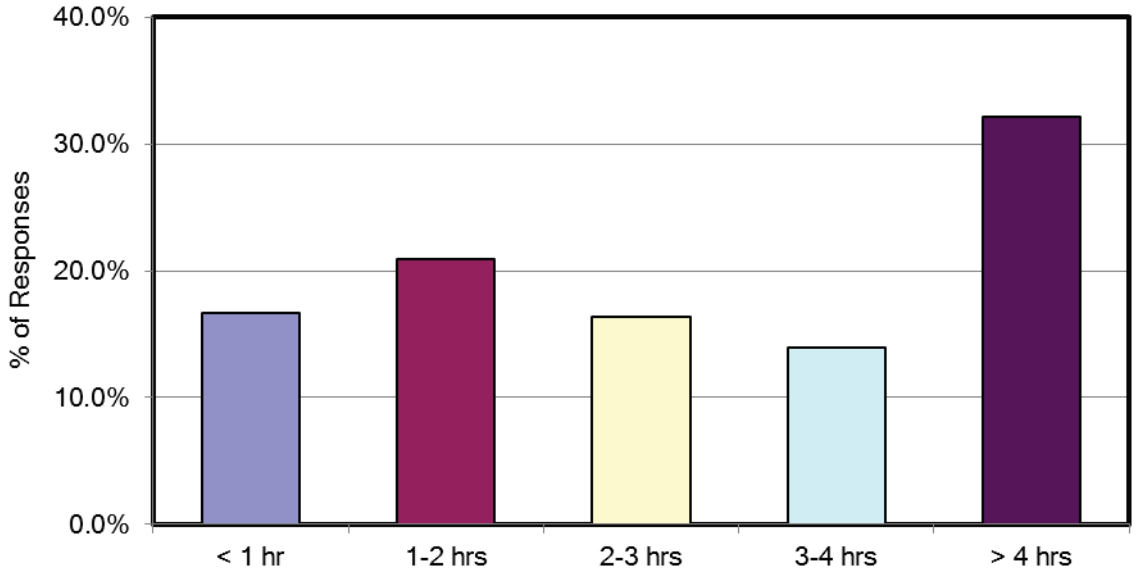

Figure 4-2. Visitor Trip Duration Prior to the Stop at the Travel Information Center.

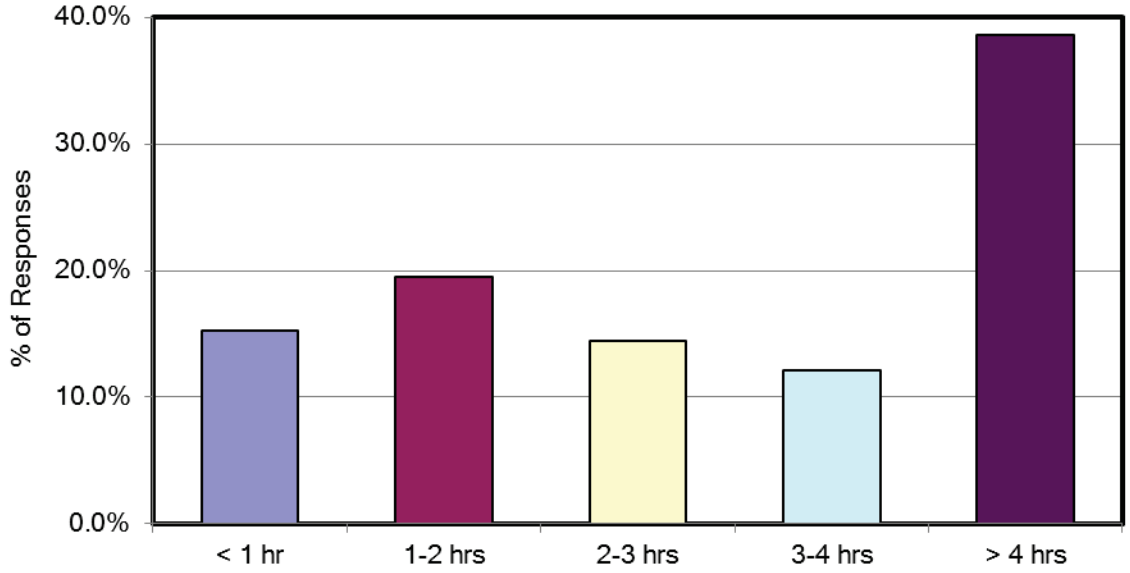

Figure 4-3. Visitors' Expected Trip Duration after the Stop at the Travel Information Center.

The visitors were asked about the reasons for their stop at the Travel Information Centers. Multiple choices were assigned, including restroom, travel info, children and pet relief, vehicle check, etc. The visitors were given the choice to select more than one option in this question, as shown in Figure 4-4. The responses suggested that the most selected causes for stop at the Travel Information Centers were associated with using restrooms, obtaining travel information, and taking a short break, with percent response of 69, 61, and 43 percent, respectively. The other options were considered insignificant for the visitors, with a response rate of 6 percent or less.

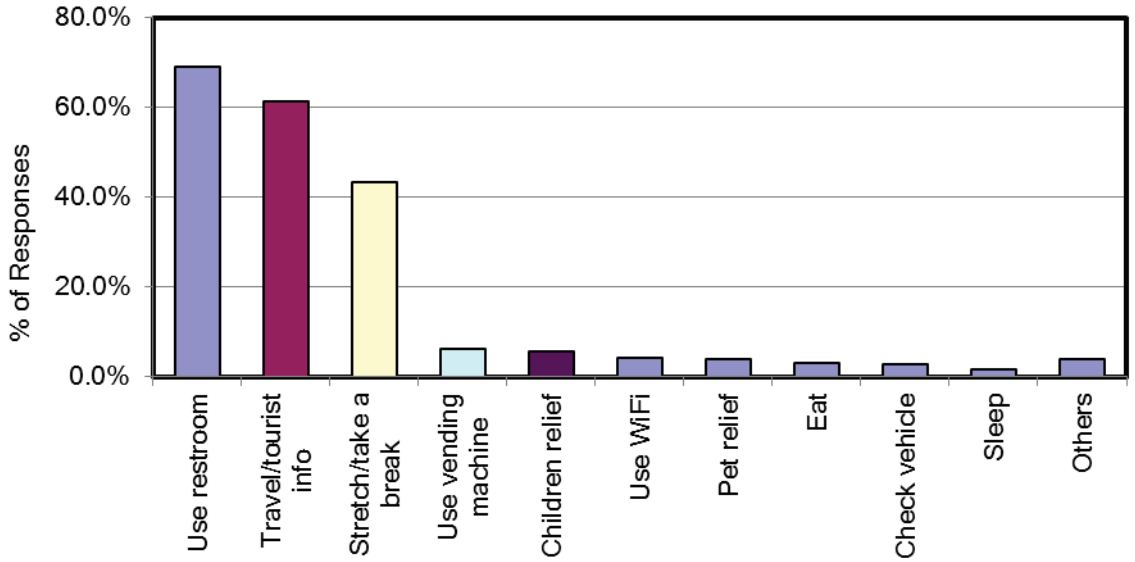

Figure 4-4. Reasons for Stopping at the Travel Information Center.

The researchers attempted to determine the advantages of the Travel Information Centers to attract visitors for stopping as opposed to other comparable facilities such as gas stations, food chains, etc. The related survey question was assigned multiple choices and an option to select multiple relevant choices if any. More than 58 percent of the responses suggested that the main advantage of the Travel Information Center was the availability of personalized travel information, as shown in Figure 4-5. Other significant factors were the cleanliness of the facilities and the easy access from highway travel main lanes, with response rate of 50 and 33 percent, respectively. Traveling with children and pets was found to be an irrelevant factor affecting the Travel Information Center visitor decision stop, with a response rate of less than 6 percent.

Visitors were also able to share their input in the "others" section by introducing other reasons for stopping. With a response rate of 9 percent (189 response), visitors reported statements such as "feel safe," "taking pictures," "exploring the place," "like the offered services," and "it is a tradition to stop at Texas entrance."

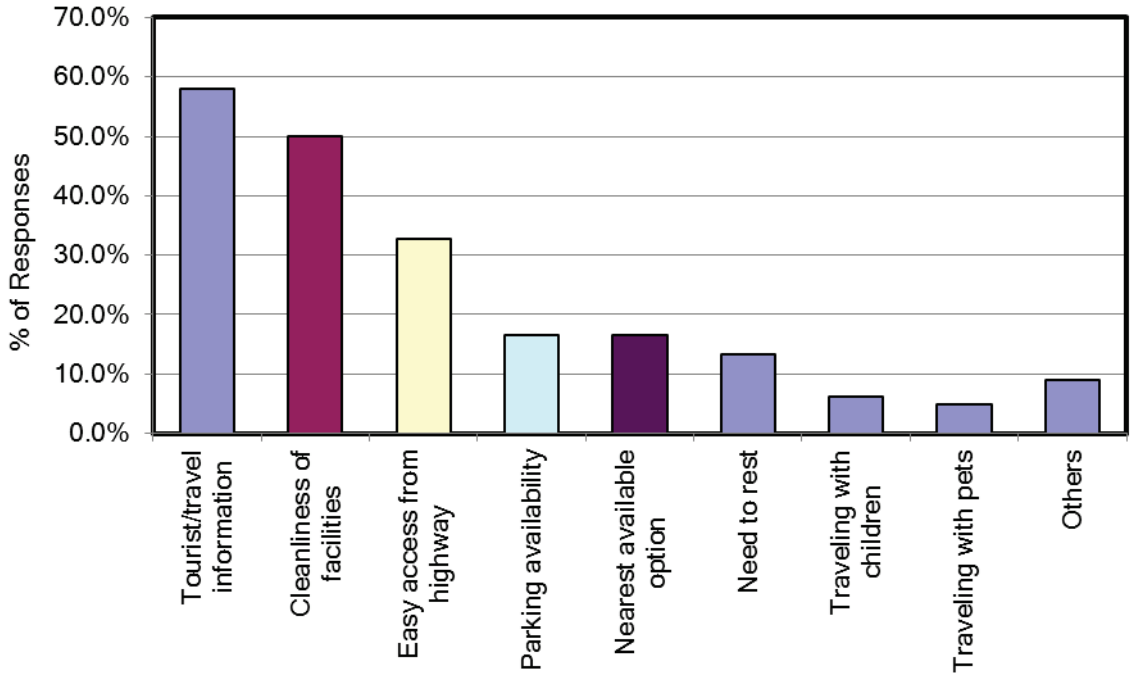

Figure 4-5. The Preference of Travel Information Centers over Comparable Facilities.

To determine the visitors' preferences when stopping due to common interruption activities associated with their trip, a question was dedicated to the facility type they prefer to stop at. The survey requested that the visitors choose their preferred facility to stop for a particular trip interruption activity. The interruption activities included the following: use restroom, take short break or long rest, eat a meal, check vehicle, and provide children/pet relief. The facility options included Travel Information Center, safety rest area, private facility (e.g., restaurant, hotel, or gas station), and no preference. Visitors suggested that Travel Information Centers were their preferred stop for restroom and short breaks, at 69 and 53 percent, respectively, significantly more than the other facilities. The Travel Information Centers, however, were less likely to meet the travelers' needs for other trip interruption activities, with a response rate of less than 20 percent. For instance, private facilities such as restaurants and hotels were major facilities to fulfill eating and long rest needs, with a response rate of 33 and 23 percent, respectively. Travel Information Centers were the preferred facility for restroom breaks and short travel breaks.

The second part of the survey was planned to collect responses from visitors who had previously stopped and used the Travel Information Center amenities. Visitors were asked not to complete the second part if the stop was their first at any Travel Information Center in Texas. However, they were handed a survey including only the second part if they were completing their trip and returning to their origin. The response rate for the first question in Part II was 72 percent of the total surveys. The first question requested selecting the services that visitors had used in the previous stops that assisted their travel plans, as shown in Figure 4-6. Choices offered included obtaining travel plans, road closure

information, weather information, attraction information, or a Texas map, or talking to the Travel Information Center counselors. Visitors were given the choice to select more than one option for this question. More than 68 percent of the visitors claimed that they had picked up a Texas map, and more than 38 percent had talked to counselors and obtained attraction information. Obtaining weather and road closure information was the least among all the responses, at a rate of 15 percent or less. In the "other" section, which accounted for 12 percent of the total responses in this follow-up question, more than 50 percent (95 visitors) remarked that they either used restrooms or took a break, while 35 percent (66 visitors) claimed that none of the offered services were used.

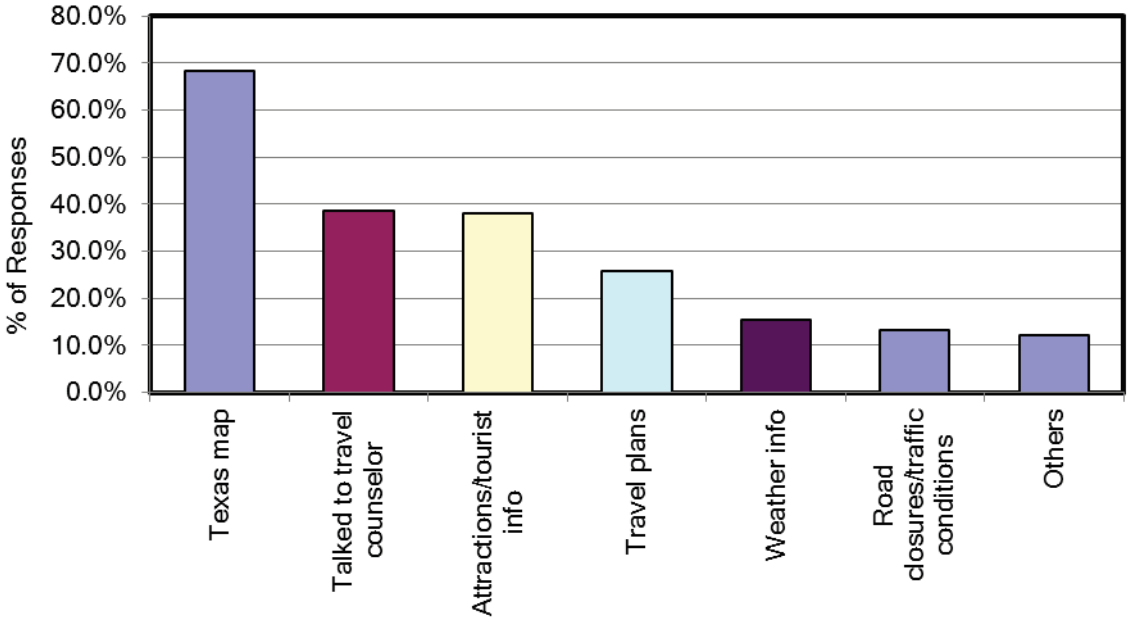

Figure 4-6. Response Rate on the Travel Information Center Services That Visitors Had Previously Used during Their Stop.

The last follow-up question asked the visitors if they had taken advantage of services/info offered at the Travel Information Centers that helped plan their travel. The response rate for this question was 75 percent (1570 visitors). More than 80 percent of the visitors responded positively on the impact of the Travel Information Center services on their travel, as shown in Figure 4-7.

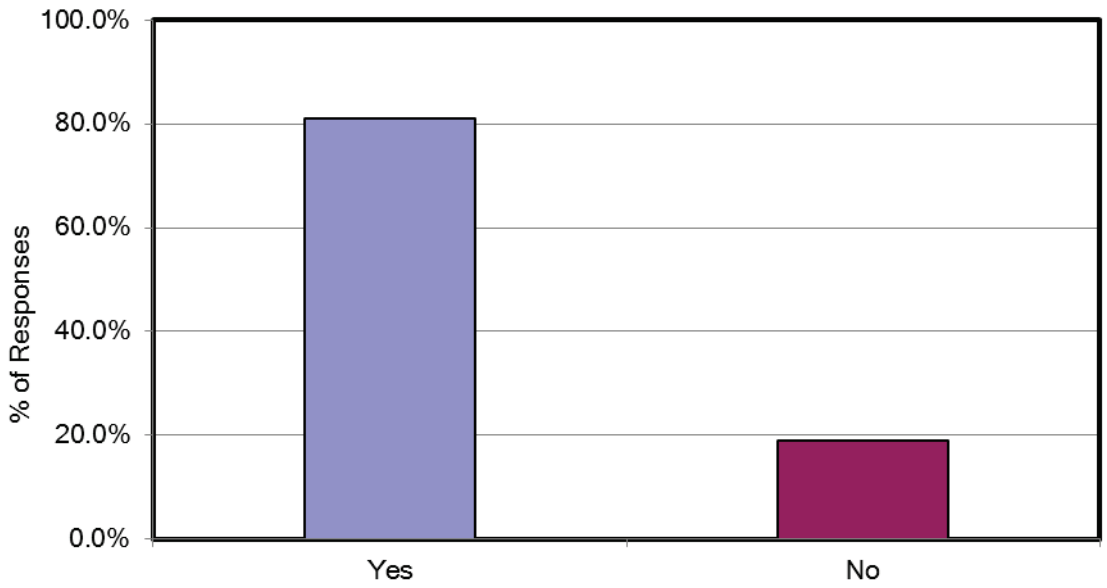

Figure 4-7. Response Rate on the Influence of Travel Information Center Services on Visitors' Travel Plans.

SUMMARY

An on-site survey was conducted to collect visitors'/travelers' feedback on using the amenities offered at 12 Travel Information Center locations across the state of Texas. Surveys were conducted during the spring and summer of 2014 to ensure that a representative sample of travelers visiting Texas was included in the study. Survey responses suggest the following conclusions:

- About 50 percent of the visitors had spent three hours continuously driving, and 40 percent expected to travel another four hours or more following their stop. This suggests that the visitors were in urgent need of a break and that the Travel Information Center served as an incentive to stop and rest.
- The main reasons the visitors elected to stop at the Travel Information Centers were to use clean restrooms, obtain travel information from a travel counselor, and take a short rest/break.
- The top three identified advantages of the Travel Information Centers in attracting visitors to stop there as opposed to comparable facilities were availability of personalized travel information, cleanliness of facility, and ease of access from highways.
- The Travel Information Centers were identified as the preferred stop site for travelers to use restrooms and take a break, as compared to alternatives such as rest areas or private facilities.

- The most used services by visitors at the Travel Information Centers involved obtaining Texas maps and travel and tourist information from the center's travel counselors.
- More than 80 percent of the visitors surveyed at the Travel Information Centers claimed that the services offered by the Travel Information Centers helped their travel plans.

CHAPTER 5: SAFETY BENEFITS PROVIDED BY TRAVEL INFORMATION CENTERS

ROLE OF TRAVEL INFORMATION CENTERS DURING STATEWIDE EMERGENCIES

During hurricane season and winter storms, travelers can call the 1-800 Interactive Voice Response (IVR) line for updated information on road conditions, climate, suggested hurricane routes, road closures, etc. If the caller opts to speak with a representative, these calls are routed to the 12 Travel Information Centers for immediate response by center staff, regardless of whether the center is in close proximity to the affected area. All Travel Information Centers are equipped with full access to current weather and road conditions and make them readily available to disseminate to the public.

As part of this study, call records from the 2008 hurricane season were classified into multiple inquiries as reported by the IVR. These inquiries included the following: Referred to 911, Referred to 211, Referred to Red Cross, Referred to EOC, Road Conditions, Shelter, Medical, Fuel, Comfort Stations, Food, and Other. Excluding the referred calls, the inquiries were answered by the Travel Information Centers' staff. Three hurricane records in 2008—Dolly (July 24–27), Gustav (August 29–September 1), and Ike (September 10–18)—were used to study the number of calls and types of inquiries. The total number of calls answered by Travel Information Center staff were 1288, 652, and 13,973, respectively. Figure 5-1 presents the distribution of the call inquiries at the Travel Information Centers during the hurricane season. The figures suggest that road condition inquiries accounted for more than 88 percent of the total call volume during the period of the hurricane. Responding to these calls is crucial for the safety of road users, particularly in hazardous climate conditions.

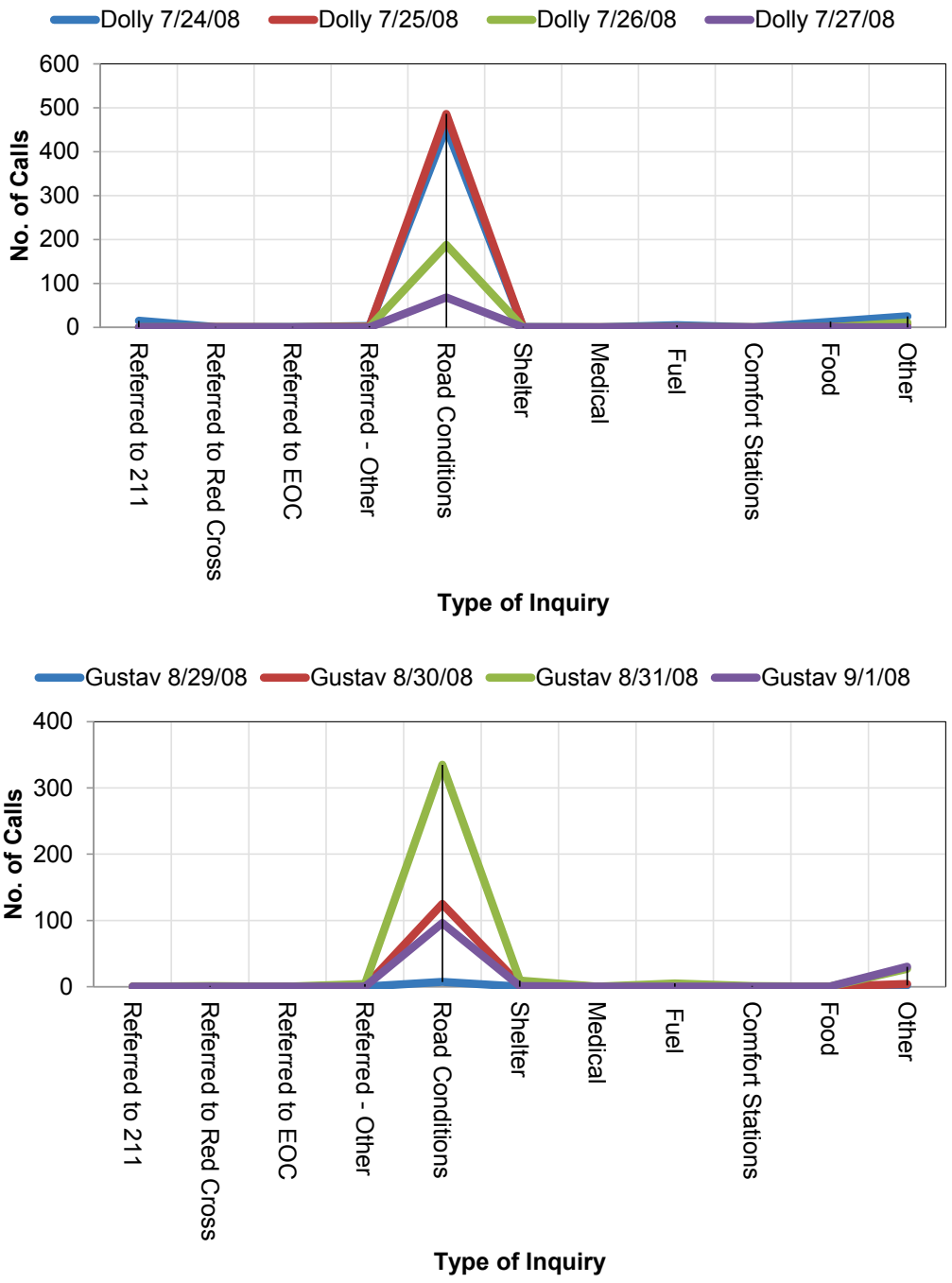

Figure 5-1. Call Inquiries during Three Hurricanes in 2008: Dolly, Gustav, and Ike.

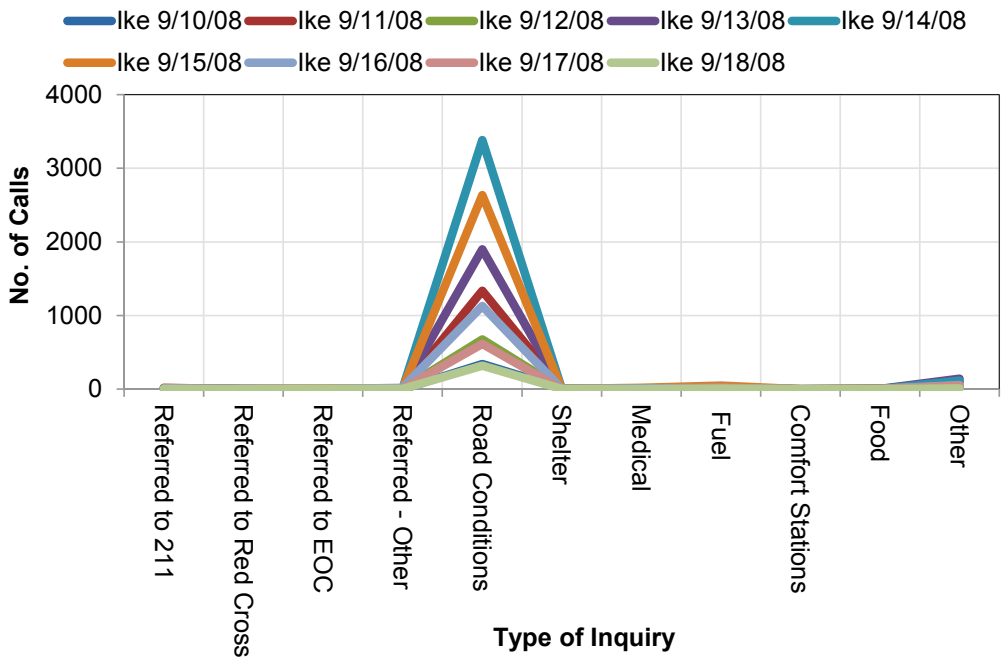

Figure 5-1. Call Inquiries during Three Hurricanes in 2008: Dolly, Gustav, and Ike (Continued).

ROLE OF TRAVEL INFORMATION CENTERS DURING WINTER STORMS

Records of total calls reported by the IVR from September 2011 to May 2014 are shown in Figure 5-2. During this period, numerous winter storms affected Texas and surrounding states. These storms were the Groundhog Day Blizzard (February 2011 North American winter storm), Southwest winter storm (December 19–21, 2011), North America storm (November 22–25, 2013), Cleon (December 5–11, 2013), Kronos (January 24–25, 2014), Leon (January 27–29, 2014), Slovenia (February 2–4, 2014), Pennsylvania (February 6, 2014), and Titan (March 2–5, 2014). Figure 5.2 suggests that during these storms, spikes in the IVR calls were evident, as many users sought help or information from the 1-800 line. Some of these calls were routed to the Travel Information Centers for further help and assistance. The average call volume was 53,762 and 9892 during winter storms and 7807 and 2582 during non-winter storms for the IVR and Travel Information Centers, respectively. This suggests that Travel Information Centers play a vital role in providing crucial information during hazardous road conditions.

It is worth mentioning that the percent of calls answered by Travel Information Centers dropped during the winter storm seasons as compared to other non-hazardous conditions in the year, as shown in Figure 5-3. The average percent of calls answered by Travel Information Centers with respect to the total IVR calls was 22 and 34 percent during winter and non-hazardous conditions, respectively. This could be attributed to the overflow of calls received by the centers that increased the waiting time for staff members to answer. It could

also be attributed to the sufficient road and climate information provided by the IVR particularly during winter storms. It is also worth mentioning that the percent of calls transferred to the Travel Information Centers is on the rise based on the winter storm call volumes in 2013–2014, as shown in Figure 5-4. This suggests that Travel Information Centers' role in providing guidance and assistance in hazardous conditions has increased among callers.

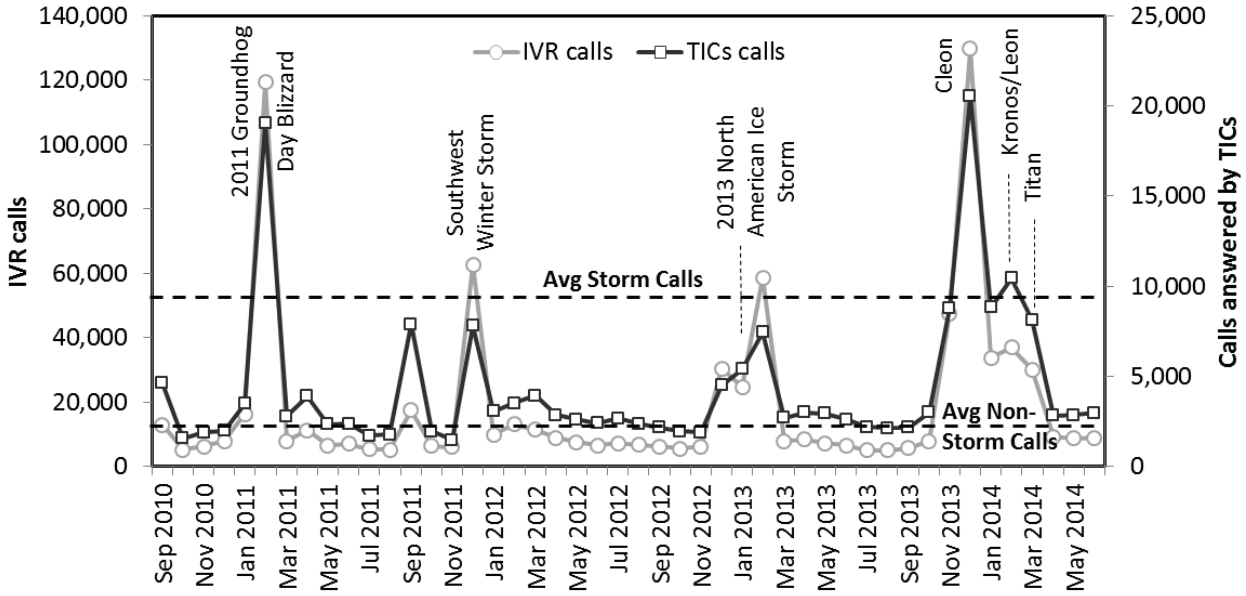

Figure 5-2. Number of Calls Handled by the Automated IVR System vs. Calls Answered by Travel Information Center Staff during Hurricane Seasons from 2010–2014.

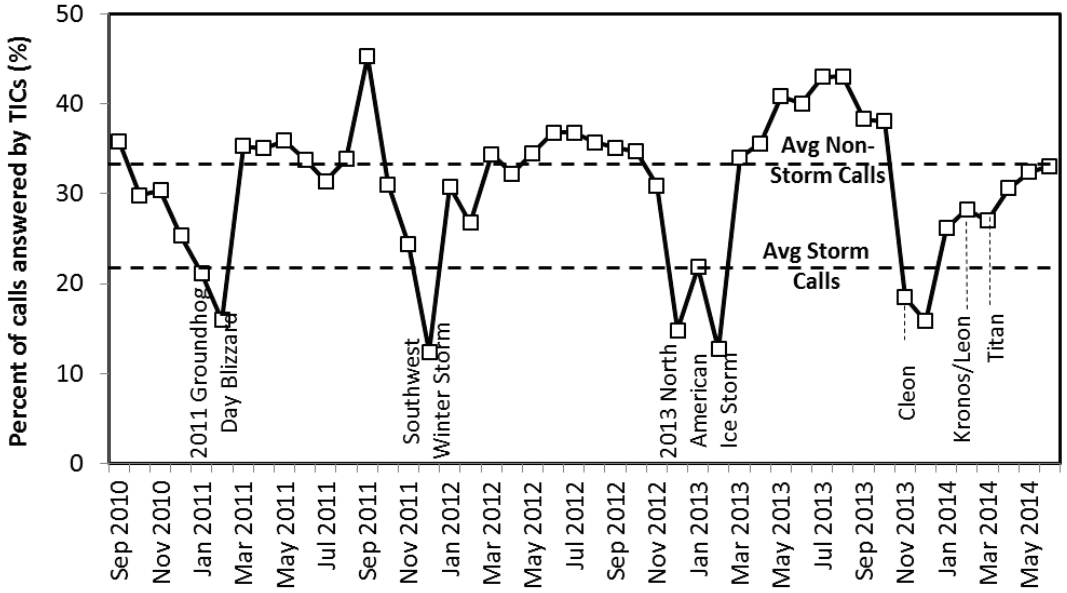

Figure 5-3. Percent of Calls Answered by Travel Information Centers during Hurricane Seasons from 2010–2014.

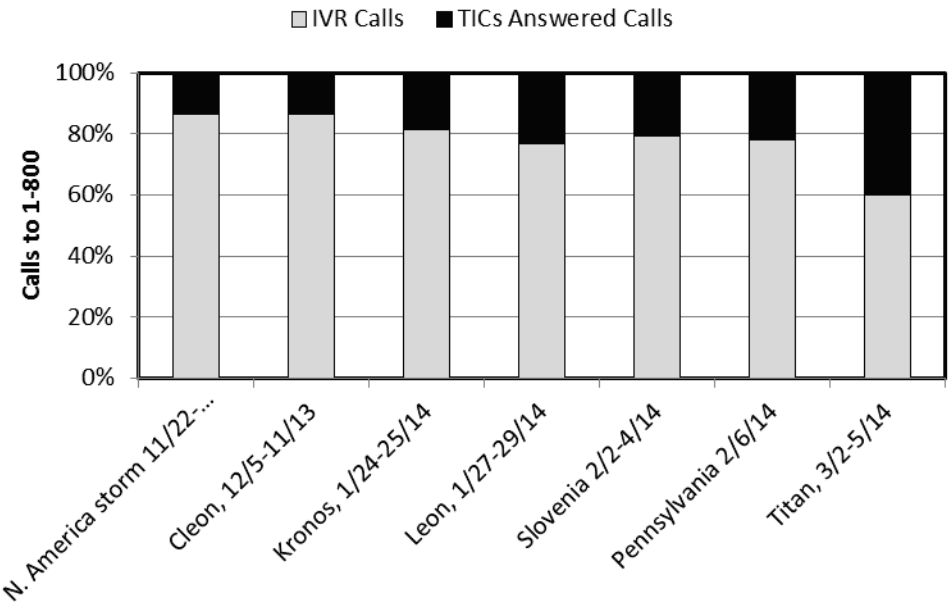

Figure 5-4. Call Distribution between IVR and Calls Referred to Travel Information Centers during 2013–2014.

SAFETY INDEX

The survey responses reported previously were used to determine the significance of the Travel Information Centers in increasing travelers' safety. This was accomplished by identifying a weight factor for each answer for the safety-related survey questions. The safety-related questions were Questions 1–5, as shown in the survey instrument in Appendix A.

The procedure for identifying the weight factor was mainly associated with the role of the question responses on the safety of the Travel Information Center visitor. For example, in Question 1, the responses highlighted the time the visitors spent and expected to spend on the road before and after the stop at the Travel Information Center. The safety impact on the visitors who spent four hours or more driving prior to the stop was more significant than for those who spent fewer hours driving. Therefore, the safety weight factor was higher for a longer driving time as compared to a shorter one. Examples of the weight factors for each question are shown in Table 5-1 through Table 5-5. The same weighing concept applied for the rest of the questions. In Question 2, the "use of restroom" and "taking a break" were the top factors that had a great influence on safety, as compared to "using WiFi" or "vending machine." The weight factors were determined on a scale of 1 to 5, where 1 represented insignificant and 5 represented very significant impact on safety.

The weight factors were chosen based on the researchers' rationale, traveler feedback, and literature review on previous safety studies. The weight factors along with the survey

responses were used to establish the safety index for each question according to Equation 5.1.

$$Safety\ Index = \frac{\sum_1^n No.of\ Responses\ X\ Weight\ Factor}{Total\ No.of\ Responses} \quad (5.1)$$

where *n* refers to the number of responses in the question. This equation applied to questions with single (e.g., Question 1) or multiple answers (e.g., Question 2–5). The overall safety index was determined by applying the equation to all questions. All questions scored an index greater than 3.0, as shown in Table 5-6. Results suggested that the Travel Information Centers had a significant impact on the safety of the travelers, as supported by an overall safety index of 3.66.

Table 5-1. Identification of the Weight Factors for Survey Responses, Question 1.

Que. 1	Weight Factor
> 4 hr	5
3–4 hr	4
2–3 hr	3
1–2 hr	2
< 1 hr	1

Table 5-2. Identification of the Weight Factors for Survey Responses, Question 2.

Que. 2	Weight Factor
Use restroom	5
Stretch/break	5
Travel/tourist info	4
Check vehicle	4
Sleep	3
Children relief	2
Pet relief	2
Vending machine	1
WiFi	1
Eat	1
Other	1

Table 5-3. Identification of the Weight Factors for Survey Responses, Question 3.

Que. 3	Weight Factor
Need to rest	5
Nearest available option	4
Access from highway	4
Tourist/travel info	4
Parking availability	3
Traveling with children	2
Traveling with pets	2
Cleanliness of facilities	1
Other	1

Table 5-4. Identification of the Weight Factors for Survey Responses, Question 4.

Que. 4	Weight Factor
Restroom	5
Short break	5
Check vehicle	4
Long rest	3
Children relief	2
Pet relief	2
Eat a meal	1

Table 5-5. Identification of the Weight Factors for Survey Responses, Question 5.

Que. 5	Weight Factor
Weather info	5
Road closures/traffic	5
Talked to counselor	4
Travel plans	4
Tourist info	4
Texas map	3
Other	2

Table 5-6. Safety Index for Survey Questions.

Que.	1	2	3	4	5	Overall
Safety Index	3.31	4.19	3.02	3.92	3.70	3.66

CRASH DATA ANALYSIS

This section discusses the crash data analysis performed as part of the research project. The crash data analysis relied on crash records provided by the Crash Records Information System (CRIS). The CRIS is a statewide crash reporting system maintained by TxDOT and updated by standardized crash reports generated by peace officers in the field. TxDOT is responsible for the collection and analysis of crash data submitted by law enforcement on form CR-3, Texas Peace Officer's Crash Report. A statistical analysis was performed on roadway segments within the area of influence of several Travel Information Centers that were also evaluated through field surveys and user questionnaires (the results of which are summarized in other sections of this research report).

CRIS data were obtained via download from a TxDOT-maintained web-based system. These data come in the format of a single zip file that contains eight individual comma-separated value (CSV) files. Data are summarized on a yearly basis and contain all reportable crashes for a period of one year. From the eight individual files that encompass an end-of-year summary, of particular interest to this analysis were the crash file and the unit file, for reasons summarized next.

The crash file acts as a master file for all the other supporting files and contains summary information about a crash event including several key variables such as geo-referenced information, latitude and longitude of the crash event, and a unique identifier for the crash in the form of a CRASHID variable, which allows for connections with the remaining data tables in the crash file. Several other variables can also be retrieved from the crash file table, such as time of the crash and road surface conditions, e.g., wet or dry. A key variable in the analysis was the latitude-longitude coordinates of the crash, which provided a way of spatially linking the crash event to the roadway alignment and the establishment of crash data sets that were within the area of influence of a specific Travel Information Center. However, the latitude and longitude information for a given crash event has only become available within the last three years of CRIS data—2011 through 2013—after global positioning system (GPS) locator availability became more widespread on peace officers' cruisers. Table 5.7 offers a summary of the crash file dimensions for the years 2011 through 2013. The total number of recorded crashes in the CRIS for the three years was more than 1.4 million, with an average per year of about 487,000 crashes.

Also of relevance for the crash analysis reported herein was the unit file. Basically, the unit file summarizes the vehicle and driver information for each crash event, allowing for the analysis of issues like the direction of travel for each vehicle involved in a crash event, a summary of the number of vehicles involved, and driver license information such as state of origin and vehicle state of origin.

Of particular relevance for the analysis reported in this chapter was the direction of travel of each vehicle. As expected, since there could be multiple vehicles involved in a specific crash event, the unit file was much larger in record count when compared to the crash file. As discussed before, the unit file may be linked to the crash file through the unique variable CRASHID. Table 5.8 summarizes the statistics for the 2011 through 2013 unit files.

An analysis of Tables 5.7 and 5.8 shows that the total number of vehicles involved in crashes for the three years was over 2.8 million, with an average of about two vehicles per crash event.

Table 5-7. Crash File Yearly Statistics.

Year	Crashes
2011	456,018
2012	495,519
2013	510,584
Total	**1,462,121**

Table 5-8. Unit File Yearly Statistics.

Year	Crashes
2011	891,045
2012	975,212
2013	1,006,296
Total	**2,872,553**

Roadway Highway Inventory Network (RHiNo) data provide geo-referenced information about the TxDOT-maintained road network and include information such as segment length and traffic volumes, which were used to calculate crash rates.

Crash rate calculations consisted of a straightforward process that involved the implementation of the following equation (Equation 5.2) for each of the RHiNo road segments under analysis. The crash rate R in Equation 5.2 is represented in terms of crashes per million vehicle miles traveled (VMT).

$$R = (\mathrm{N} * 1{,}000{,}000)/(\mathrm{L} * \mathrm{V} * 365) \qquad (5.2)$$

where N = number of crashes along the study roadway segment per year, L = length of roadway segment in miles, and V = average daily traffic volume along the roadway.

Statistical Methodology for Crash Analysis

T-tests and analysis of variance (ANOVA) are widely used statistical methods to compare group means. In this study's particular application of evaluating the crash reduction potential of Travel Information Centers, the crash statistics from the CRIS were arranged so that it was possible to test the statistical significance of the differences in mean crash rates in two opposing directions of a highway using a paired t-test. With this paired t-test procedure, researchers were able to compare the significance of the differences in average crash rates for segments that benefitted from the potential stopping of a driver to rest and relax at the Travel Information Center with the average crash rates of drivers in the opposite direction who may have been driving for an extended period of time to determine the associated effects on crash probability caused by drivers' fatigue. In statistical jargon, this was the research hypothesis. The significance of the test was measured by the null hypothesis, which stated that there would be no difference between the crash rates in the two opposing directions and there would be a probability of alpha of accepting the null hypothesis. Usually, alpha is set at 5 percent for these types of studies.

Examples of these paired scenarios were observed at several Travel Information Centers placed at the borders of Texas with adjoining states.

The paired comparisons assumed that for crash rate comparisons of roadway segments on opposite directions, factors such as roadway geometry, traffic volumes, and heavy-vehicle

percentages would be similar for the opposing direction's roadway segments and that these effects would then cancel out in the analysis.

Using the Gainesville Travel Information Center as an example, it was possible to identify a stretch of IH35 that went from the center several miles south, where drivers who had an opportunity to stop at the center while driving south would get much needed rest and stretching to improve driving safety conditions when they resumed their trip south toward the DFW area. On the opposite direction of IH35, northbound, the opportunities for resting on an organized safety rest area are many miles away at a Hill Country stop that was opened in the fall of 2013 midway between Dallas-Ft. Worth and Waco.

The statistical methodology employed to determine the crash reduction impacts of Travel Information Centers consisted of the following steps and was applied for crash data spanning the calendar years 2011 to 2013:

1. Identify roadway segment for analysis.
2. Retrieve crash data from the CRIS crash table.
3. Execute a spatial proximity algorithm using a geographic information system (GIS) tool in order to associate the crash information with the road segments established by RHiNo.
4. Combine crash table data with unit table data to determine direction of travel for the crash events associated with road segments in Step 2.
5. Calculate crash rates by road segment for opposing directions using RHiNo traffic information and geometry of the segments such as length.
6. Implement paired t-tests on the resulting paired data set of crashes per segment and analyze statistical significance.

Gainesville Travel Information Center Crash Analysis

The Gainesville analysis is detailed using the six steps documented previously and serves as a summary explanation of the analysis procedure that was applied for the remaining Travel Information Centers.

Step 1: Identify Roadway Segment for Analysis

The Gainesville Travel Information Center is located at the border of Texas with Oklahoma on IH35 and serves the traffic entering Texas and heading south on IH35. The segment for crash analysis was selected so that it did not encompass the DFW metroplex area. The segment for analysis was defined as including segments and crashes with latitude greater or equal to 33.299, which is the latitude of the IH35–FM3163 intersection. This analysis segment is about 30 miles long. Figure 5.5 depicts the GIS map of the segment with the RHiNo data block for a specific segment 1.243 miles long that needed to be spatially related

to the crash data from the CRIS. There were 50 road segments that comprised the Gainesville study route.

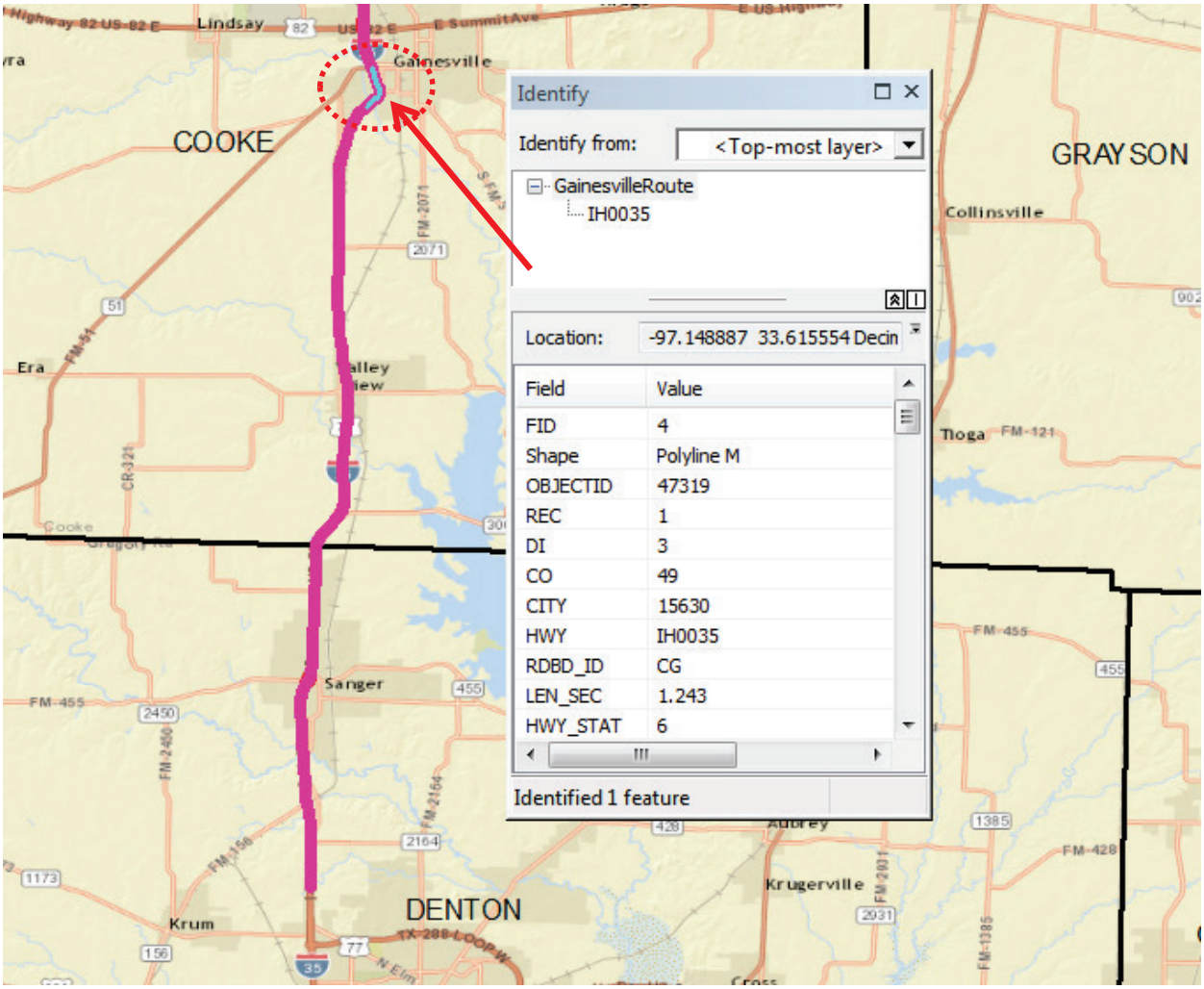

Figure 5-5. Gainesville Segment Identified for Crash Analysis.

Step 2: Retrieve Crash Data from the CRIS Crash Table

Using the latitude parameter identified in the previous step, researchers imported the crashes that met the criteria into a GIS environment (ArcMap) for further analysis. The processing of the CRIS crash table for the analysis years was performed by custom-written computerized routines using the SAS® programming language. Results of this analysis are depicted in Figure 5.6, which shows the crash points for the year 2012 together with the data block for one of the crashes. The specific data block depicted in Figure 5.6 belongs to a crash that happened at latitude 33.40 and longitude −97.176 on June 12, 2012, at 3 p.m. on IH35. The unique CRASHID variable for this specific crash as recorded in the CRIS tables

was 12750720. There were a total of 214 recorded crashes in the study segment for the year 2012 for the north and south directions combined.

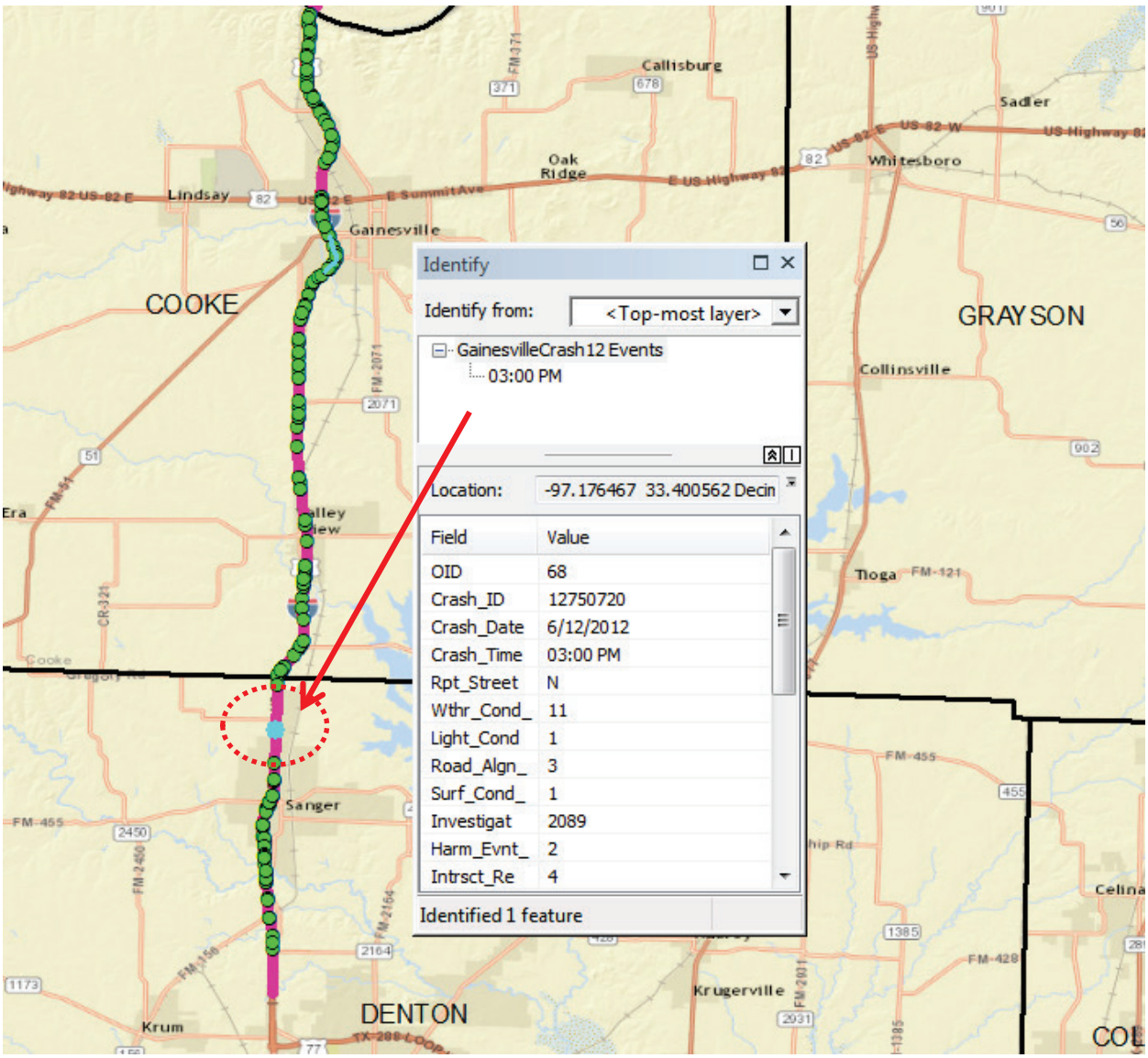

Figure 5-6. Gainesville 2012 Crash Events.

Step 3: Execute a Proximity Algorithm

Once the data layer containing the crash events for a given year was available in the GIS ArcMap, it was possible to use a geo-processing routine called a proximity algorithm to spatially match the CRIS crash data depicted in Figure 5.6 with the roadway segments defined by RHiNo (depicted in Figure 5.7). The result of this process was a set of RHiNo road segments that contained the crash events depicted in Figure 5.6. However, these results needed to be exported to the SAS system to allow for data clean up involving deletion of

duplicate crash events and matching with the unit data of the CRIS to allow for the split of the crash data between the north and south directions. Figure 5.7 depicts the results of the proximity algorithm for a specific segment in the route together with the data block for one point on the GIS map that actually represented two crashes that happened in the segment with an OBJECTID of 47318, which was actually a 1.59-mile segment. The two crashes happened on different dates during the year 2012. The tabular data resulting from this proximity algorithm were then exported into SAS for further processing.

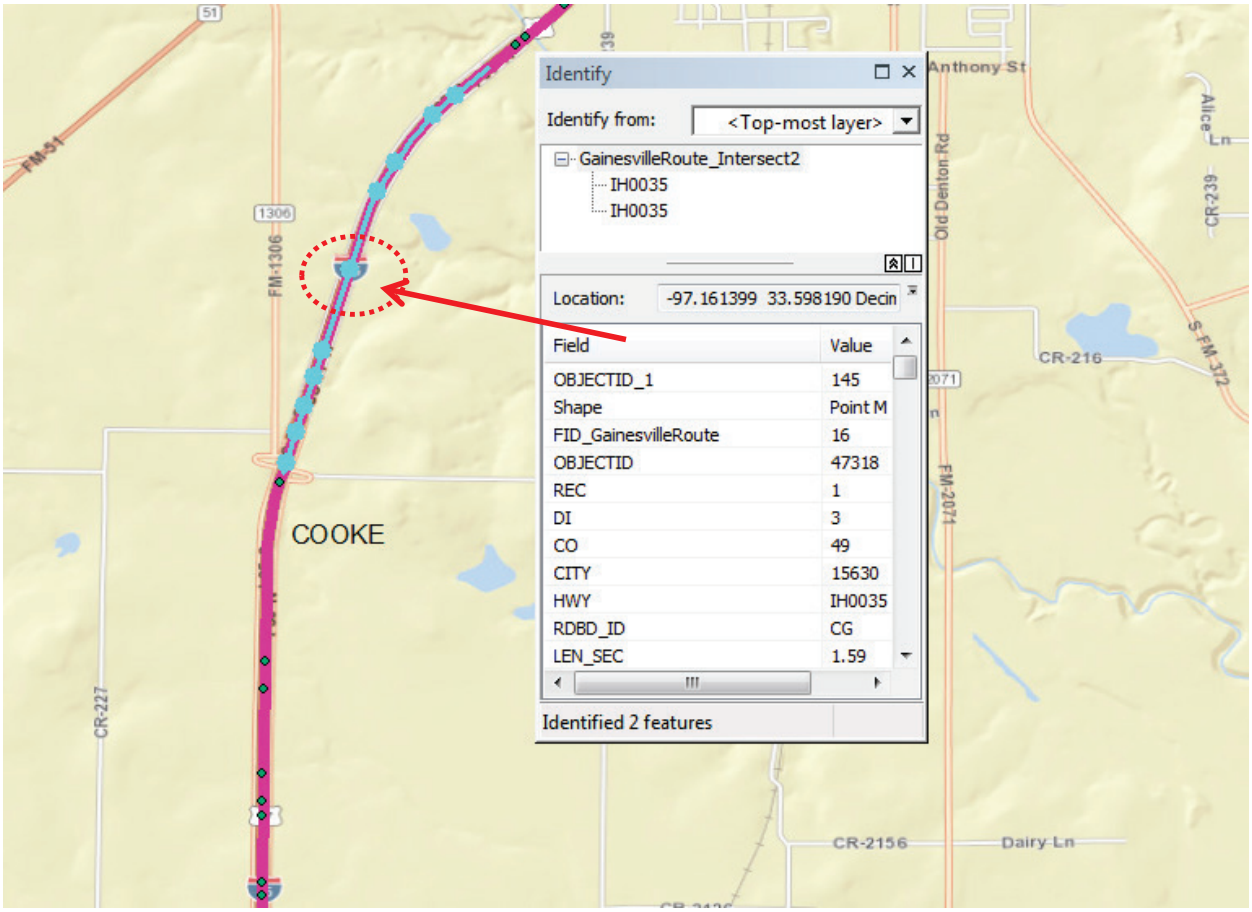

Figure 5-7. Gainesville 2012 Proximity Algorithm Results.

Step 4: Determine Direction of Travel

Using custom-written computerized routines written in SAS, researchers processed the results of the proximity algorithm to generate a crash distribution by segment. For this purpose, the direction of travel for the first vehicle involved in a specific crash needed to be retrieved from the CRIS data table containing the unit file. Results for the segment (with OBJECTID 47318 highlighted in Figure 5.7 for the year 2012) are summarized to illustrate the results of the process implemented using SAS for all segments in the Gainesville crash

study route. For a total of 13 crashes in the roadway segment with an OBJECTID of 47318, eight crashes happened in the north direction and five in the south direction.

Step 5: Calculate Crash Rates

Crash rates were calculated using Equation 5.2 and the information on crash frequencies by segment generated in Step 4 combined with the RHiNo traffic volume statistics corrected for the specific crash year data. The roadway segment with OBJECTID 47318, as depicted in Figure 5.7, was used again to illustrate the calculation process for the 2012 crashes. Results are summarized in Table 5.9, and crash rate calculations were 0.83 and 0.52 per million VMT for the north and south directions, respectively. The process was repeated for all 50 segments in the Gainesville study route for the years 2011 through 2013. Table 5.9 summarizes the statistics for the average crash rates northbound and southbound.

Table 5-9. Crash Rate Calculations for a Given Segment.

Segment ID	Direction	Length (Miles)	Crashes 2012	ADT	VMT	Crash Rate
47318	North	1.59	8	16,637	26,45	0.83
47318	South	1.59	5	16,637	26,45	0.52

Step 6: Analyze Statistical Significance of Paired T-Tests

The final dataset of crashes to be analyzed by the paired t-test described at the beginning of this chapter encompassed 100 pairs of segments for the crash data spanning the years 2011 through 2013. Table 5.10 summarizes the number of crashes included in the analysis, for a total of 372 crashes northbound and 292 crashes southbound.

Table 5-10. Crashes in the Gainesville Study Segment from 2011 to 2013.

Year	No. of Crashes North	No. of Crashes South
2011	120	89
2012	121	93
2013	131	110
Total	**372**	**292**

Table 5.11 summarizes the statistical results for the means of the crash rates in the study road segment for the Gainesville Travel Information Center. Table 5.11 shows that the mean crash rates for the northbound and southbound directions were different, with the northbound crash rate mean being higher than the southbound crash rate mean. The number of pairs reported in Table 5.10 did not match the total number of segments in the

study route, which added up to 150 segments for each of the three years, because some segments in the study route during the 2011 to 2013 period did not incur any crashes.

Next, the statistical significance of the difference in the mean crash rates for northbound and southbound was evaluated using a paired t-test comparison. The paired t-test results are summarized in Table 5.12, which shows that the calculated t value was 1.95. The calculated value indicated a probability of 5.38 percent supporting the statement that indeed the crash rate averages for the Gainesville study route were different and that there was a crash rate reduction possibly associated with the presence of the Gainesville Travel Information Center fostering rest stops for drivers driving southbound into Texas.

However, it should also be noted that crash analysis is far from a precise science because crash rates may be affected by other factors, such as weather and work zones, that the paired comparison may be unable to filter out of the analysis. Thus, researchers lumped crashes temporally so that aggregation would filter out some of these factors.

Table 5-11. Mean Crash Rates for the Gainesville Study Segment from 2011 to 2013.

Variable	No. of Pairs	Mean	Standard Deviation	Minimum	Maximum
Crash Rate South	100	0.57	0.65	0	4.28
Crash Rate North	100	0.75	0.60	0	3.00

Table 5-12. Paired Comparison for the Gainesville Study Segment from 2011 to 2013.

Difference	Degrees of Freedom	t Value	Probability
Crash Rate North-Crash Rate South	99	1.95	0.0538

Orange Travel Information Center Crash Analysis

The same detailed process used for the Gainesville Travel Information Center crash analysis was used for the Orange Travel Information Center crash analysis. The analysis segment for the Orange Travel Information Center encompassed IH10 from the center to the Chambers County Rest Area, which has a longitude of −94.6107. This longitude together with the IH10 alignment was used to filter the crash data for the years 2011 to 2013. Figure 5.8 depicts the study road segment together with the crash events for the year 2011. The data block depicted in Figure 5.8 is for a crash that happened November 22, 2011, at 10:43 a.m. The total number of crashes for the east and west directions recorded in this segment for the year 2011 was 874. The length of the study segment was about 67 miles. Table 5.13 summarizes the number of crashes split by the east and west directions for the years 2011 through 2013.

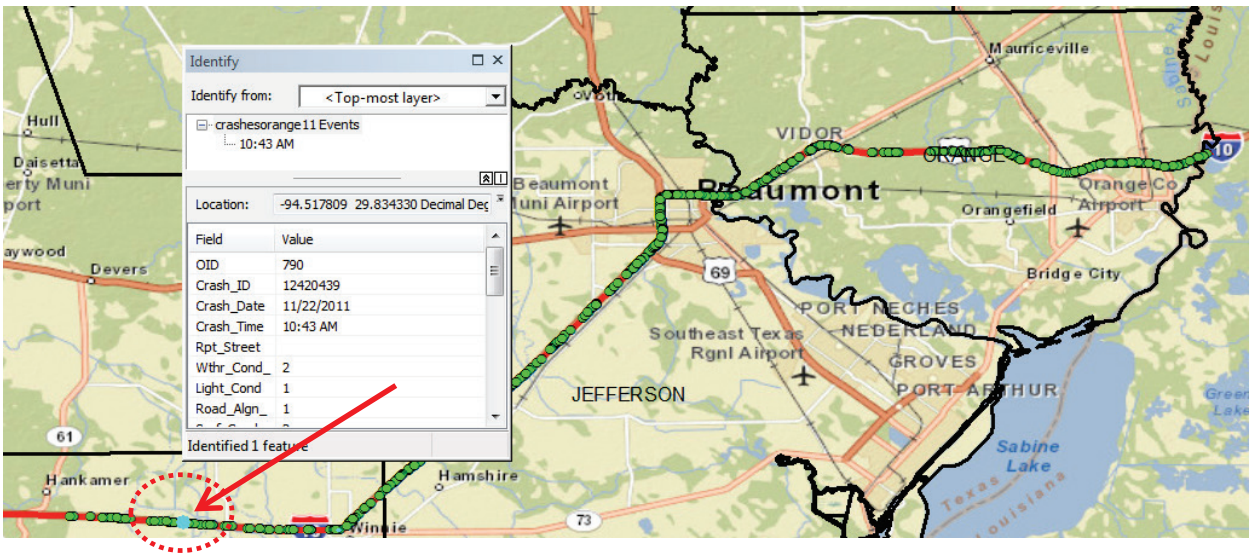

Figure 5-8. Crashes in the Orange Travel Information Center Study Segment for 2011.

Table 5-13. Crashes in the Orange Study Segment from 2011 to 2013.

Year	No. of Crashes East	No. of Crashes West
2011	455	419
2012	574	509
2013	545	448
Total	**1,574**	**1,376**

The statistical analysis and levels of significance of the paired t-tests are reported in Tables 5.14 and 5.15, respectively. The paired t-test results are summarized in Table 5.15, which shows that the calculated t value was 2.11. This value indicated a probability of 3.59 percent supporting the statement that indeed the crash rate averages for the Orange study route were different and that there was a crash rate reduction possibly associated with the presence of the Gainesville Travel Information Center fostering rest stops for drivers driving westbound into Texas.

Table 5-14. Mean Crash Rates for the Orange Study Segment from 2011 to 2013.

Variable	No. of Pairs	Mean	Standard Deviation	Minimum	Maximum
Crash Rate East	221	1.416	2.745	0	22.07
Crash Rate West	221	1.155	1.661	0	12.00

Table 5-15. Paired Comparison for the Orange Study Segment from 2011 to 2013.

Difference	Degrees of Freedom	t Value	Probability
Crash Rate East-Crash Rate West	220	2.11	0.0359

Amarillo Travel Information Center Crash Analysis

The same detailed process used for the Gainesville Travel Information Center crash analysis was used for the Amarillo center crash analysis. The analysis segment for the Amarillo Travel Information Center encompassed IH40 from the center to the Donley County Rest Area, which has a longitude of −100.8353. This longitude together with the IH40 alignment was used to filter the crash data for the years 2011 to 2013. Figure 5.9 depicts the study road segment together with the crash events for the year 2013. The data block depicted in Figure 5.9 is for a crash that happened August 31, 2013, at 3:01 p.m. The total number of crashes for the east and west directions recorded in this segment for the year 2013 was 86. The length of the study segment was about 52 miles. Table 5.16 summarizes the number of crashes split by the east and west directions for the years 2011 through 2013.

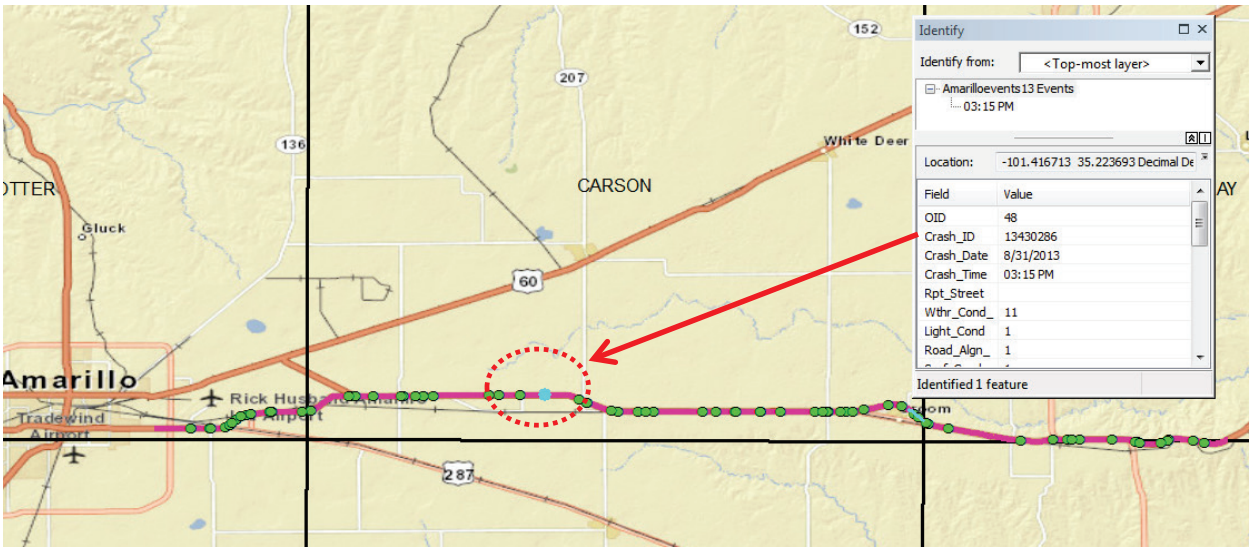

Figure 5-9. Crashes in the Amarillo Travel Information Center Study Segment for 2013.

Table 5-16. Crashes in the Amarillo Study Segment from 2011 to 2013.

Year	No. of Crashes East	No. of Crashes West
2011	35	37
2012	27	40
2013	32	54
Total	**94**	**131**

The statistical analysis and levels of significance of the paired t-tests are reported in Tables 5.17 and 5.18, respectively. The paired t-test results are summarized in Table 5.18, which shows that the calculated t value was 1.01. This value indicated a probability of 31.42 percent not supporting the statement that indeed the crash rate averages for the Amarillo study route were different in the east and west directions.

However, a closer examination of Table 5.16 shows a reduction in the number of crashes for the east direction compared to the west direction, possibly showing the effect of the Amarillo Travel Information Center on the number of crashes for drivers heading in the east direction.

Table 5-17. Mean Crash Rates for the Amarillo Study Segment from 2011 to 2013.

Variable	No. of Pairs	Mean	Standard Deviation	Minimum	Maximum
Crash Rate East	100	0.705	1.413	0	8.50
Crash Rate West	100	0.556	0.800	0	6.08

Table 5-18. Paired Comparison for the Amarillo Study Segment from 2011 to 2013.

Difference	Degrees of Freedom	t Value	Probability
Crash Rate East-Crash Rate West	99	1.01	0.314

SUMMARY AND CONCLUSIONS

There is no doubt that the existence of Travel Information Centers results in reduction of crashes caused by driver fatigue, shoulder parking, driver distraction, hazardous road and weather conditions, and vehicle malfunction. In addition, since the Travel Information Center user survey clearly shows that Travel Information Center users make use of the information provided at the centers, the safety information provided at the centers must have a positive impacts on travelers' safety. Different methods can be used to quantify safety impacts of Travel Information Centers, such as before-after comparisons, case-control analyses, and descriptive statistics. Complete geo-referenced crash data in Texas have become available only in recent years. The research team identified two Travel Information Centers where the impact on crash statistics was not affected by obvious cofactors (such as adjacency to urban centers). Crash analysis revealed a statistically significant reduction in crash rates of 23 percent and 18 percent, which may have been caused by the Orange and Gainesville Travel Information Centers, respectively. Analysis of crash data for the area around the Amarillo Travel Information Center did not reveal a statistically significant effect on crashes or a significant reduction in the number of crashes. The Amarillo Travel Information Center was relocated in 2003, and the Anthony Travel Information Center was reopened in 2000 following a major renovation. Recent research conducted by the Texas A&M Transportation Institute (Carson et al. 2011) determined that the Amarillo and Anthony Travel Information

Centers reduced crashes by 6.9 and 14.8 percent, respectively, based on before-after analyses. A safety index was proposed to estimate how the Travel Information Center users perceived the impact of the usage on the safety of their travel experience. This safety index was based on the results from the field questionnaires. Results suggested that Travel Information Centers have a significant impact on the safety of travelers, as evidenced by the computed value of the proposed safety index.

CHAPTER 6: ECONOMIC BENEFITS OF TRAVEL INFORMATION CENTERS

TxDOT's Travel Information Division began exploring ways to calculate the economic impact of the 12 Travel Information Centers in 2010. For internal reference, TxDOT applied visitor behavior results from an Iowa Welcome Center survey to Texas Travel Information Center visitor numbers and average daily per-person spending figures from D.K. Shifflet & Associates Ltd., for the travel research office of the Office of the Governor—EDT.

Preliminary results from these studies were not officially reported, but recognizing the valuable information that could be derived from primary research, TxDOT and EDT began working together to develop a survey tool for the collection and analysis of Texas visitor behavior, to be administered directly at the Travel Information Centers. The methodology listed below was formulated jointly by these two agencies, with final approval of the completed survey tool and methodology given by EDT. TxDOT began reporting the results of this study at the beginning of FY 2013. The year-end results for FY 2013 and FY 2014 are given in Table 6-1.

Table 6.1. Year-End Results for FY 2013 and 2014.

Travel Information Center Economic Benefits	FY 2013	FY 2014
Direct Visitor Spending Generated by Centers	$82,858,014	$109,858,014
Jobs Supported by Centers	829	1,099
State Tax Revenue Generated by Centers	$4,557,191	$6,152,590

METHODOLOGY

Study methodology was as follows:

- Surveys were collected from each center in proportion to its visitation.
    - Three per day:
        - Denison.
        - Gainesville.
        - Orange.
        - Texarkana.
        - Rio Grande Valley (Harlingen).
        - Waskom.
        - Wichita Falls.
    - One per day:
        - Amarillo.
        - Anthony (El Paso).
        - Capitol Visitor Center (Austin).
        - Judge Roy Bean Visitor Center (Langtry).
        - Laredo.

    - Surveys were collected during set time windows. If no visitors came in during the set window, no survey was collected until the next time window.
    - The travel party size used to calculate total spending was set according to travel party size results from this survey.
- The daily per-person spending figure from the most recently released D.K. Shifflet report available through EDT at the beginning of the fiscal year was used throughout the fiscal year.
- Reports were generated quarterly. At the end of the fiscal year, the quarterly totals were added to arrive at the yearly total.
- Economic impact was calculated based on two types of responses:
    - Visitors who responded that they would extend their trip longer than originally planned:
        - Two hours and one-half day—calculated at one-half daily spending.
        - One day—calculated at 1x daily spending.
        - Two days—calculated at 2x daily spending.
        - Three or more days—calculated at 3x daily spending.
    - Visitors who responded that they would visit more attractions/points of interest in Texas on their trip than originally planned (without spending additional time):
        - Calculated at one-half daily spending.
    - Visitor response of "no changes to this trip, but will use the information for future trips" had an uncalculated/unreported economic impact.
    - Visitor response of "none of the above" estimated to have no economic impact.
- Counselors handed out paper survey forms to visitors. Completed surveys were entered into an online database tool whose contents were maintained by TxDOT Travel Information Division administration.

The survey tool collected additional data for internal use and analysis by TxDOT, including visitor origin and destination, purpose of travel, and customer satisfaction. Demographic information was not collected to avoid redundancy with the research done by EDT.

The survey form appears in Figure 6-1.

Texas Travel Information Center Survey – Center Name

Today's Date: _____

A trip is traveling 50 miles or more from home.

1a. In what country do you presently reside? _____

1b. If "United States," what state and ZIP code? _____

2a. What state or country is (or was) your destination on this trip?
(If you are on your way home, please tell us where you went.)

_____

2b. If "Texas" is (or was) your destination, what city or region?

_____

3. How many trips will you take in Texas this year? _____

4. How many are in your traveling party (including you)?

1☐ 2☐ 3☐ 4☐ 5☐ More than 5☐

5a. Which of the following are you most likely to do because of information provided at the Travel Information Center? *(Please check only one.)*

☐ Extend this trip longer than originally planned

☐ Visit more attractions/points of interest in Texas on this trip than originally planned (without spending additional time)

☐ No changes to this trip, but will use the information for future trips

☐ None of the above

5b. If extending this trip, about how much longer?

☐ 2 hours ☐ 2 days

☐ ½ day ☐ 3 or more days

☐ One day

6. What is the main purpose of this trip?

☐ Vacation/Leisure ☐ Business/Work ☐ Other _____

7. Please rate your satisfaction with the following:

	Poor		*Neutral*		*Excellent*
a. Center facility	1	2	3	4	5
b. Center staff	1	2	3	4	5
c. Printed information	1	2	3	4	5
d. Overall / general	1	2	3	4	5

Comments:_____

_____

Thank you for your visit!

Office Use Only
Survey Administered by: _____

Figure 6.1. Survey Form.

Collection

In FY 2013, 6323 visitor surveys were collected at the Travel Information Centers. In FY 2014, there were 6919 visitor surveys collected.

Calculation Variables

The variables listed in Table 6.2 were used to calculate the Travel Information Center economic impact for FY 2013 and FY 2014. Unless otherwise specified, figures given were drawn from the Travel Information Center Visitor Survey results.

Table 6.2. Calculation Variables.

	FY 2013	FY 2014
Daily per-person spending	$102*	$115**
Number of travel parties who received a travel counseling session at a Travel Information Center	638,472	687,607
Average travel party size	2.4	2.41
Percent of survey respondents extending their trip longer than originally planned	13.9%	15.5%
Percent of survey respondents visiting more attractions/points of interest in Texas on their trip than originally planned (without spending additional time)	59.9%	60.9%

*D.K. Shifflet & Associates Ltd., *2012 Texas Visitor Profile.*

**D.K. Shifflet & Associates Ltd., *2013 Texas Visitor Profile.*

Jobs Supported and State Tax Revenue Generated

In addition to the calculations of direct visitor spending based on the methodology above, EDT calculates that every $100,000 in direct visitor spending supports one job. Spending also yields state tax revenue, calculated at 5.5 percent for FY 2013 and 5.6 percent for FY 2014.

Customer Satisfaction

The Travel Information Centers' customer satisfaction rating results are consistently high. In both FY 2013 and FY 2014, the Travel Information Centers received a rating of 4.96 out of 5 for overall customer satisfaction with the facility, staff, and travel literature available.

Additionally, a TxDOT-wide customer service survey conducted by the Texas Legislative Council in FY 2014 yielded a customer satisfaction rating of 99 percent for the Travel Information Centers, making them the most highly rated area in the agency.

FACILITY COSTS

In FY 2013, operating costs for the Travel Information Centers were $3,418,122, with maintenance costs of $2,972,345. In FY 2014, operating and maintenance costs were $3,303,805 and $2,357,095, respectively.

TRAVEL INFORMATION CENTER BENEFITS

Tourism Benefits

The mission of TxDOT's Travel Information Division is to promote travel to and within Texas. The Travel Information Centers work to fulfill this mission by offering professional travel counseling services and providing routing and highway condition information. The centers are open 360 days a year, closing only on New Year's Day, Easter Sunday, Thanksgiving Day, Christmas Eve, and Christmas Day. These services are provided free of charge to the public.

In conjunction, the centers provide free services to Texas tourism organizations and attractions via a partnership model. Travel counselors are extensively trained to be knowledgeable about current tourism opportunities within the state and participate in a state and national professional certification program. Regional, city, and private-sector tourism partners underwrite educational familiarization tours and training for these counselors throughout the calendar year, thus providing extensive staff training at minimal expense to TxDOT. Through a partnership with the Texas Travel Industry Association (TTIA), iPad kiosks are available at most centers where visitors can purchase discount attraction tickets directly from participating TTIA member organizations; a percentage of revenue from these sales goes toward funding center operations. The centers also provide free literature display and distribution to promote cities, regions, and attractions throughout the state.

Comfort and Convenience Benefits

Texas Travel Information Centers are conveniently located at all major points of entry to the state, as well as in the Capitol Visitors Center in Austin and the historic Judge Roy Bean Visitor Center in Langtry. Continuing the tradition that began when the first centers were founded in 1936 to assist travelers coming to Texas for its Centennial celebrations, each center's design uniquely reflects the geography and history of its region. The centers are designed to be aesthetically pleasing and convenient, and they feature such amenities as clean restrooms, landscaped grounds, shaded picnic arbors, free wireless Internet access, "Welcome to Texas" photo ops, and viewing rooms featuring videos on Texas tourism

destinations. The attractive facilities and extensive park-like grounds promote safety by enticing travelers to stop and take a break from the road. These benefits have an additional, unquantified economic impact.

Safety Benefits

Texas Travel Information Centers perform three important safety functions for the benefit of the traveling public:

1. Travel Information Centers are an integral component of TxDOT's DriveTexas™ highway conditions service. Current information on highway closures, construction, accidents, and weather-related travel conditions is displayed on an interactive map at www.DriveTexas.org and provided via TxDOT's toll-free Travel Information Line at 1-800-452-9292. This line provides automated highway condition information as well as an option to speak with a travel counselor at one of the centers to receive personal, professional assistance.
2. During emergency events, this toll-free information line serves as an emergency information conduit for the traveling public. In case of evacuations, hurricanes, winter storms, or other emergency conditions, Travel Information Center staff are activated as a state emergency resource and dispense information on a variety of subjects including emergency shelter information, fuel availability, food and water availability, emergency medical resources, and more. Travel Information Centers may go into extended hours or 24-hour operations, depending on the nature of the emergency. In the event that an emergency evacuation route includes a Travel Information Center, the center may serve as an emergency staging location and provide personal assistance to evacuees.
3. Throughout the year, Travel Information Centers partner with TxDOT district safety officers, the Texas Department of Public Safety, local law enforcement, and other organizations to host safety awareness events for the public. These events tie in with such public safety campaigns as Click It or Ticket, impaired and distracted driving awareness campaigns, child car seat safety campaigns, and work zone driving safety campaigns. These events feature educational games and activities, promotional materials, presentations, demonstrations, and entertainment and are well attended by local community members as well as passing travelers.

By reducing crashes, property damage, injuries, and lost time, these safety benefits have an additional unquantified economic benefit to the State of Texas.

Reduction in Excess Travel

Finally, Travel Information Centers provide the additional, unquantified economic benefit of reducing excess travel time by providing expert directional information, taking into account both the most efficient route and any delays or detours resulting from highway conditions along that route.

RESULTS

In FY 2013 and FY 2014, the Travel Information Centers demonstrated significant economic value, as shown in Table 6-3. In addition, customer satisfaction ratings continued to be very high, with the centers rated 4.96 out of 5 both years.

Table 6.3. Economic Value for FY 2013 and 2014.

Travel Information Center Economic Benefits	FY 2013	FY 2014
Direct Visitor Spending Generated by Centers	$82,858,014	$109,858,014
Jobs Supported by Centers	829	1,099
State Tax Revenue Generated by Centers	$4,557,191	$6,152,590
Travel Information Center Costs	**FY 2013**	**FY 2014**
Center Operating Costs (Staffing and Consumables)	$3,418,122	$3,303,805*
Center Maintenance Costs (Facilities)	$2,972,345	$2,357,095*
Total	$6,390,467	$5,660,900*

* The FY 2014 budget will not be closed out until December 2014. Operating and maintenance costs listed are correct as of September 2014. The final figures may be slightly different.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

Travel Information Centers in Texas serve a broad range of travelers, including vacation/recreational travelers, commercial truckers, commuters, bus travelers, motorcyclists, and others. Travel Information Centers provide the distinct advantage of quick and convenient access, with many facilities that are open 24 hours per day. A majority of travelers stopping at Travel Information Centers obtain travel and tourism information, use the restroom, or simply take a break to rest and stretch. Other patrons utilize the Travel Information Center visit for other purposes such as using the vending machines, providing relief for children or pets, performing vehicle checks and maintenance, picnicking, changing drivers, or even sleeping. Conditions of a recent legislative appropriation prompted TxDOT to reassess the functional value of Travel Information Centers and develop a methodology to determine their economic and safety impact. The overall goal of this research was to develop methodologies and gather sufficient data to quantify the impact of Texas Travel Information Centers' staff and services on the safety of travelers on TxDOT roadways, as well as on the behavior and spending of visitors. Data and analytical tools that quantified the value of person-to-person contact with visitors and provision of travel route, road condition, destination, weather, and disaster evacuation information were used. Several tasks were performed as part of this research to help achieve the research objectives.

CONCLUSIONS

Travel Information Center Operations

Travel Information Centers are an integral component of TxDOT's DriveTexas™ highway conditions service. The centers are conveniently located at all major points of entry to the state, as well as in the Capitol Visitors Center in Austin and the historic Judge Roy Bean Visitor Center in Langtry. The centers are designed to be aesthetically pleasing and convenient, and they feature such amenities as clean restrooms, landscaped grounds, shaded picnic arbors, free wireless Internet access, "Welcome to Texas" photo ops, and viewing rooms featuring videos on Texas tourism destinations. The attractive facilities and extensive park-like grounds are designed to entice travelers to stop and take a break from the road, promoting safety.

Travel Information Centers promote in-state tourism by offering professional travel counseling services, featuring an extensive selection of current statewide travel literature and maps, and providing routing and highway condition information. In addition, the centers provide information on highway closures, construction, accidents, and weather-related travel conditions. In case of evacuations, hurricanes, winter storms, or other emergency conditions, Travel Information Center staff are activated as a state emergency resource and dispense information on a variety of subjects including emergency shelter information, fuel availability, food and water availability, emergency medical resources, missing persons

information, and more. The centers may also serve as emergency staging locations and provide personal assistance to evacuees. Throughout the year, Travel Information Centers partner with TxDOT district safety officers, the Texas Department of Public Safety, local law enforcement, and other organizations to host safety awareness events for the public. Their large open spaces, ample parking, and trained staff make them prime public outreach venues for TxDOT.

Safety Benefits

The research team identified several safety benefits of Travel Information Centers, such as reduction of driver fatigue and other wellness issues, transmission of critical information on safety and hazardous road and weather conditions, reduction of driver or passenger discomfort and distraction, reduction of highway shoulder stops, and reduction of excess travel to obtain services. Three highway segments where the effect of a Travel Information Center's existence on crash reduction could be identified were selected for analysis. Analysis of crash data revealed statistically significant reduction in crash rates due to the existence of two Travel Information Centers, Orange and Gainesville, and a significant crash count reduction for the Amarillo Travel Information Center based on analysis of the directions of travel that benefit from the incentive to stop and rest provided by the Travel Information Center. A previous study supported by TxDOT identified significant crash reductions due to the reopening of the Anthony and Amarillo Travel Information Centers. Crash analysis for the Harlingen Travel Information Center, one of the targets for the center user surveys, was not included because of the existence of cofactors such as adjacency to urban centers, which would have made the crash analysis results questionable. Acknowledging that most safety benefits of Travel Information Centers cannot be directly quantified, researchers proposed a safety index to estimate how the center users perceived the impact of usage on the safety of their travel experience. Results suggested that Travel Information Centers have significant impacts on the safety of travelers, as evidenced by the computed values of the proposed safety index.

User Satisfaction and Valuation of Travel Information Centers

The rest area user survey yielded 13,242 responses for the economic study obtained from the 12 Texas Travel Information Centers. The safety survey resulted in 3978 additional responses. The overwhelmingly common reasons for stopping at a rest area were to use the restroom (65 percent) and to stretch/walk/take break (45 percent). The primary reason for selecting the Travel Information Center rather than a nearby commercial facility was the quick access from the highway (78.3 percent) and the availability of clean restrooms (63 percent). The Travel Information Centers' customer satisfaction rating results are consistently high. In both FY 2013 and FY 2014, the Travel Information Centers received a rating of 4.96 out of 5 for overall customer satisfaction with the facility, staff, and travel literature available.

Economic Assessment

The economic benefits of Travel Information Centers include comfort and convenience, promotion of in-state tourism, reduction of excess travel to get services, savings on vehicle operation and maintenance, benefits to specific business enterprises, and reduction of traffic diversion into communities. Only tourism benefits were evaluated in this study. The results of the economic analysis showed that all Travel Information Center facilities may be considered economically viable. The total state tax revenue generated by Travel Information Centers through tourism enhancement alone for 2013 and 2014 was $4,557,191 and $6,152,590, respectively. Texas Travel Information Centers supported 829 and 1099 jobs for each of those two years. The total operation and maintenance costs for those two years were $6,390,467 and $5,660,900, respectively. Other economic benefits of Travel Information Centers, such as reduction of excess travel to access similar services if the centers did not exist and comfort and convenience benefits, were not assessed. Several published studies that quantified these benefits concluded that they far exceed the tourism benefits. Thus, Travel Information Centers have a significant economic benefit to the State of Texas.

RECOMMENDATIONS

All Texas Travel Information Centers are economically viable facilities for TxDOT to operate and have significant safety benefits for travelers on Texas roadways. Comprehensive economic assessment is recommended for making decisions on adding a new facility or upgrading existing facilities.

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APPENDIX A: SAFETY SURVEY

Texas Department of Transportation
University of Texas-San Antonio

Texas Travel Information Center Safety Survey

Center's Name: **Today's Date:** --/--/2014

1. **Since your most recent stop today:**

How long have you been on the road?

Under 1 hr ☐ 1-2 hrs ☐ 2-3 hrs ☐ 3-4 hrs ☐ More than 4 hrs ☐

How longer will you be on the road?

Under 1 hr ☐ 1-2 hrs ☐ 2-3 hrs ☐ 3-4 hrs ☐ More than 4 hrs ☐

2. **Why did you stop at this facility (pick more than one)?**

Use Restroom ☐ Tourist/Travel Info ☐ Take a Break ☐ Eat ☐ Sleep ☐
Use Vending Machine ☐ Children Relief ☐ Pet Relief ☐ Check Vehicle ☐ Use WiFi ☐
Other:_____

3. **Why did you choose to stop at this facility rather than a gas station or fast food restaurant?**

Tourist/Travel Info ☐ Cleanliness of Facility ☐ Need to Rest ☐ Parking Availability ☐
Access from Highway ☐ Traveling with Children ☐ Traveling with Pets ☐ Nearest Available Option ☐
Other: _____

4. **When traveling, choose your stopping preference for the following purposes?**

Restroom:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Eat a Meal:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Short break:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Long Rest:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Check Vehicle:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Children Relief:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐
Pet Relief:	This Travel Facility ☐	Rest Area ☐	Private Facility ☐	No preference ☐

Please complete the section below ONLY if you have been at this facility before

5. **Which services of this facility have you used in previous stops?**

Texas Map ☐ Talked to Travel Counselor ☐ Travel Plans (lodging, food, gas, etc.) ☐
Attractions Info ☐ Weather Info ☐ Road Closures/Traffic Conditions ☐
Other: _____

6. **If you have taken advantage of any of the services/info offered at this facility, did that help plan your travel?**

Yes ☐
No ☐

Thanks for your time

APPENDIX B: SAFETY SURVEY RESPONSE RATES

Since your most recent stop today: How long have you been on the road?		
Answer Options	**Response Percent**	**Response Count**
< 1 hr	16.7%	350
1-2 hr	20.9%	439
2-3 hr	16.3%	343
3-4 hr	13.9%	292
> 4 hr	32.1%	674
answered question		**2098**

How much longer will you be on the road?		
Answer Options	**Response Percent**	**Response Count**
< 1 hr	15.3%	320
1-2 hr	19.5%	410
2-3 hr	14.5%	304
3-4 hr	12.2%	255
> 4 hr	38.6%	809
answered question		**2098**

Why did you stop at this facility?		
Answer Options	**Response Percent**	**Response Count**
Use restroom	69.2%	1452
Travel/tourist info	61.3%	1287
Stretch/take a break	43.4%	911
Use vending machine	6.2%	130
Children relief	5.6%	117
Use WiFi	4.2%	88
Pet relief	4.0%	84
Eat	3.2%	67
Check vehicle	2.9%	60
Sleep	1.6%	33
Others	4.1%	87
answered question		**2098**

Why did you choose to stop at this facility rather than a gas station or fast food restaurant?		
Answer Options	**Response Percent**	**Response Count**
Tourist/travel information	58.0%	1216
Cleanliness of facilities	50.0%	1050

Easy access from highway	32.7%	686
Parking availability	16.6%	349
Nearest available option	16.5%	347
Need to rest	13.3%	278
Traveling with children	6.1%	127
Traveling with pets	4.8%	101
Others	9.0%	189
answered question		**2098**

When traveling, choose your stopping preference for the following purposes?					
Answer Options	**Travel Information Center**	**Rest Area**	**Private Facility**	**No preference**	**Response Count**
Restroom	1453	278	69	298	2098
Short break	1119	416	71	492	2098
Eat a meal	313	138	687	960	2098
Long rest	416	203	481	998	2098
Check vehicle	438	200	289	1171	2098
Children relief	448	143	88	1419	2098
Pet relief	332	180	42	1544	2098
answered question					**1764**

Which services of this facility have you used in previous stops?		
Answer Options	**Response Percent**	**Response Count**
Texas map	68.3%	1031
Talked to travel counselor	38.7%	585
Attractions/tourist info	38.0%	574
Travel plans	25.7%	388
Weather info	15.4%	233
Road closures/traffic conditions	13.3%	201
Others	12.1%	183
answered question		**1510**

If you have taken advantage of any of the services/info offered at this facility, did that help plan your travel?		
Answer Options	**Response Percent**	**Response Count**
Yes	81.1%	1274
No	18.9%	296
answered question		**1570**