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16. Abstract

The four-year research effort that resulted in this assessment and methodology product developed and tested a methodology to estimate the economic impacts of median design. The results of this research effort will provide insight to planners, engineers, and researchers investigating the economic impacts of raised median projects. This product highlights tables, graphics, and conclusions from the project that the research team expects to be especially useful in communicating potential economic impacts to business and property owners prior to construction.

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ASSESSMENT OF ECONOMIC IMPACTS AT SELECTED RAISED MEDIAN INSTALLATION LOCATIONS IN TEXAS AND DEVELOPMENT OF RECOMMENDED METHODOLOGY FOR ECONOMIC IMPACTS ESTIMATION

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The four-year research effort that resulted in this assessment and methodology product developed and tested a methodology to estimate the economic impacts of median design. The results of this research effort will provide insight to planners, engineers, and researchers investigating the economic impacts of raised median projects. This product highlights tables, graphics, and conclusions from the project that the research team expects to be especially useful in communicating potential economic impacts to business and property owners prior to construction.

Product for Project Number 7-3904
Research Project Title: Economic Impact of Median Design

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation (TxDOT).

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1.0 INTRODUCTION

The economic impacts of raised medians on adjacent businesses become more important to many transportation professionals as these treatments are implemented along urban and suburban arterials. Previous research has shown the benefits of raised medians on improved traffic operations and safety by separating opposing traffic flows and removing left-turning vehicles from the through lanes. Through access control, raised medians restrict left turns to mid-block and intersection median openings. Though the improved access control will likely improve the operations and arterial signal coordination, owners of businesses and properties adjacent to the arterial might feel the economic impacts of restricting these left turns. While rather extensive research has been previously performed to quantify the costs and benefits of constructing raised medians with respect to initial costs and benefits to motorists in terms of reduced delay and increased safety, there is relatively limited research in estimating the economic impacts of median treatments.

Many state and local transportation agencies, including the Texas Department of Transportation (TxDOT), have recognized the need to provide answers to the public regarding the pre-, during-, and post-construction impacts of installing raised medians. The use of raised medians is increasing in urban areas. Transportation agencies and the public are interested in learning more about the economic impacts. TxDOT requires a methodology for determining if such concerns are warranted. With such a methodology, TxDOT will be better informed of the overall economic impact that a raised median may have on adjacent businesses and properties. After estimating what, if any, impacts may be expected, TxDOT can provide this information to the public to keep them informed of anticipated changes.

1.1 PROJECT OBJECTIVES

The objective of this project was to develop and test a methodology to estimate the economic impacts of median design. The research team met this objective by:

- identifying prior evaluations and practices in the literature related to the effects of median design, as well as identifying other relevant issues and concerns;
- developing a methodology for evaluating the economic impacts of median design; and
- evaluating economic impacts at several locations throughout Texas.

In the first year of this project, a methodology was developed and tested on one case study location in College Station, Texas. Data were collected before and during construction along this corridor where a raised median was being installed. In the second year of the project, the research team sought additional case study locations to test the methodology for estimating the economic impacts of median design. The second year of the research effort was used to identify and collect data at these additional case study locations. After investigating several potential case study locations, the research team selected 10 sites in the following cities: McKinney, Longview, Wichita Falls, Odessa, Houston, and Port Arthur. In the third year of the project, the research team analyzed the data obtained in the second year. In the fourth and final year of the research effort, post-construction data were collected along Texas Avenue in College Station. Customer surveys were administered along Texas Avenue, and personal interviews were conducted with business owners in Amarillo, Texas, at locations where raised medians were removed in the fourth year of the project (*1*,*2*,*3*,*4*).

Currently, TxDOT does not have a method of estimating the economic impacts of new raised medians on adjacent businesses. Developing such a methodology will allow TxDOT engineers and planners to estimate the potential impacts so that the information can be provided to the public, specifically to business owners. Several TxDOT roadway construction projects currently underway, or in the planning stages, would benefit from such a methodology and estimated impacts. In addition, TxDOT can use the methodology to estimate economic impacts of raised median installation projects in the future.

2.0 METHODOLOGY, CASE STUDIES, AND DATA COLLECTION

2.1 METHODOLOGY

The primary purpose of this research project was the development of a methodology to determine if there are any economic impacts on adjacent businesses when a raised median is installed. The research team developed a methodology and tested it on a case study in the first year of the project. After analyzing the procedures and results of that test, the research team revised the methodology and tested it on 10 case studies in the second year of the project. The current methodology, consisting of eight main steps, provides a logical structure by which the user can identify case studies and collect and analyze data. The steps of the methodology are:

1. identify sites (cities) with potential corridors,
2. identify corridor characteristics,
3. contact sources of information,
4. inventory businesses and establishments along the subject corridor,
5. obtain information about businesses,
6. prioritize businesses to be surveyed,
7. collect data by personal interviews, and
8. analyze and summarize data.

2.1.1 Identify Sites (Cities) with Potential Corridors

The first step in the methodology is the selection of sites at which the research team would evaluate the economic impacts. In this project, the research team investigated all potential case study corridors to determine their applicability to this project. The process of investigating potential case study corridors included several steps. The first step of the site investigation process was to talk to individuals at local agencies (e.g., TxDOT, metropolitan planning organization (MPO), city) to obtain as much preliminary information as possible about each potential corridor. The information included the type of construction project, the construction time periods, the types of abutting development, and the amount of abutting undeveloped land.

The research team used this information to rule out corridors that did not fit the parameters established in the methodology. For example, preferable corridors included those that had been constructed within the last six years or so and were primarily abutted by commercial property. The researchers looked for corridors with more retail development than residential development, office development, or undeveloped land. The vast majority of the corridors the research team investigated involved the installation of raised medians. However, the team also evaluated median removals and developed two case studies of median removals. Table 2–1 shows the characteristics of the study corridors.

2.1.2 Identify Corridor Characteristics

This step included identifying the corridor characteristics of a particular corridor based upon the characteristics desired as explained in section 2.1.1 above. Many corridors were investigated for inclusion in the project.

2.1.3 Contact Sources of Information

Contacting sources of information is also necessary for the successful estimation of the economic impacts. Several agencies and groups provided vital support in the data collection for this project. The team sought and obtained endorsement of the survey instrument and process from chambers of commerce in most of the case study cities. In Houston, chamber of commerce personnel recommended the research team contact neighborhood/business groups for research support and provided contacts. In larger cities such as Houston, neighborhood/business groups provide more support to research activities if business owners are more involved with these associations than a chamber of commerce.

Table 2–1. Characteristics of Case Study Locations.

Street Name	City and Population	Before Constr.	After Constr.	Study Limits	Length (miles)	Construction Years	Survey Type	Land Use	Number of Establishments
Texas Avenue	College Station 64,200	Two-way left turn lane (TWLTL)	Raised Median	University Dr. to Dominik Dr.	1.5	1996 to 1998	Interview	Retail, University	59
South Post Oak Road	Houston 1,844,000	Undivided	Raised Median	I-610 to South Main Street	1.5	1988 to 1990	Interview	Retail, Industrial	155
Clay Road	Houston 1,844,000	Undivided	Raised Median	Hollister Rd. to Gessner Rd.	2.2	1994 to 1996	Mail-out	Retail, Industrial, Undeveloped	63
West Fuqua Road	Houston 1,844,000	Undivided	Raised Median	Hiram Clarke Rd. to Almeda Rd.	1.5	1987 to 1989	Mail-out	Retail, Undeveloped	68
Long Point Road	Houston 1,844,000	Undivided	Raised Median	Campbell Rd. to Hollister Rd.	0.7	Surveyed pre-constr.	Mail-out	Retail	41
Twin Cities Highway	Port Arthur 58,600	Raised Median	TWLTL	53rd Street to Griffing Park	2.0	1983 to 1985	Mail-out	Retail, Office	90
9th Avenue	Port Arthur 58,600	Undivided	Raised Median	Texas 365 to Lake Arthur Drive	1.5	1979 to 1980	Mail-out	Retail, Residential, Undeveloped	66
University Drive	McKinney 35,000	Undivided	Raised Median	U.S. 75 to Texas Highway 5	1.4	1991 to 1992	Interview	Retail, Residential	132
Loop 281	Longview 76,000	Flush Median	Raised Median	Spur 63 to Spur 502	0.6	1996	Interview	Retail	65
Call Field Road	Wichita Falls 98,200	Undivided	Raised Median	Kemp Blvd to Lawrence Street	0.3	Surveyed pre-constr.	Interview	Retail	55
Grant Avenue	Odessa 95,400	Undivided	Raised Median	2nd Street to 8th Street	0.6	1992	Interview	Retail, Office	42
Various	Amarillo 168,000	Raised Median	Undivided or TWLTL	Varies	Varies	Varies (1989–1995)	Interview	Retail	118

Generally, a researcher would contact the chamber of commerce and determine the appropriate person to write a letter (or sign a letter prepared by the research team explaining the research) addressed to business owners/managers or undeveloped landowners along the corridor. The research team viewed this step as crucial since it was hypothesized that the businesses would be more willing to participate in a survey if the chambers of commerce endorsed it. In all cases, the chambers of commerce were cooperative and all but one of them were able to provide the desired letters. None of the chambers of commerce refused to provide assistance.

Appraisal districts in some of the cities significantly supported data collection efforts. They allowed the researchers to use public computer terminals to obtain property value information. The amount and specific types of data available varied among districts. Some of the appraisal districts have more historical data available on their computers than others. In some cases, depending on the age of the project and the amount of historical data available, researchers were able to collect all of the desired data from computers in the appraisal district offices. To ease the collection of the property values from the appraisal districts for some of the case study locations, the research team obtained compact discs from a private company that made this information available. Data were available in this form for larger metropolitan areas (e.g., Harris County). Appraisal districts were often able to provide anecdotal information regarding land development trends or contact information for business owners.

2.1.4 Inventory Businesses and Establishments along the Subject Corridor

To get the most detailed information possible during site visits of potential corridors, the researchers performed windshield surveys of the corridors. In doing so, they recorded the names, addresses, and telephone numbers (when available) from store fronts. The researchers recorded this information by sketching maps of the corridors and noting specific details such as parcel location, site circulation, driveway locations, and median opening locations. This information was very useful for the development of stratifying variables for the analysis presented in Chapter 3.0. The research team used these variables to provide separate analyses for factors such as whether a business is a stand-alone business or located in a shopping center, whether a business is located on a corner lot with direct access, or whether a business is located

mid-block or at a street intersection. The business inventory process also included photographing the corridors. Researchers took slides of the roadway cross-sections, as well as examples of adjacent businesses. The researchers used the slides as a record of specific attributes of the corridors.

2.1.5 Obtain Information about Businesses

During this step of the methodology, data were collected from the appraisal districts regarding trends in property values. Analyses to quantify metrics such as percent change in employees, gross sales, and property values were also performed in this step. Data were collected for each city, county, and statewide for comparison to each particular corridor to identify differences in local and regional economic activity. Employee data were collected from the Texas Workforce Commission (TWC). Researchers also collected gross sales data from the Texas Comptroller of Public Accounts, and property values were collected from the appraisal districts.

2.1.6 Prioritize Businesses to Be Surveyed

This step of the methodology identifies all businesses that one desires to survey. One can also decide in this stage of the methodology whether to use a mail-out survey or in-person interview. Not all of the businesses identified in the site visits and windshield surveys were surveyed in the project. Some business types such as churches or other non-commercial offices were not included. In-person interviews were the primary means of data collection in this project, but researchers also used some mail-out surveys.

2.1.7 Collect Data by Personal Interviews

This step of the methodology includes the actual interviews and data collection from each particular business. Collecting data by personal interviews is quite labor intensive, but it provides a much greater participation rate than mail-out surveys, as well as higher quality data. For this project, in-person interviews were formally scheduled with business owners/managers

for each business. However, some mail-out surveys were performed at selected corridors in an effort to provide additional sample size without a significant added cost.

2.1.8 Analyze and Summarize Data

This step of the methodology includes summarizing and analyzing the information that researchers collect for the project. This step includes investigating the key performance measures of interest (e.g., number of employees, property values, gross sales) for different business types and stratifying variables of interest. Chapter 3.0 includes the results of the analysis.

3.0 ANALYSES RESULTS

3.1 ANALYSES INTRODUCTION AND SAMPLE SIZES

This chapter contains tables of the analyses results that the research team expects to be of most value for communicating potential impacts of raised medians to the public. Figure 3–1 shows how the business groups are defined for the analyses that follow. Further detailed information can be obtained from the research report from the fourth year of this project (*1*). Tables 3–1 through 3–3 show the overall sample size by site, business type, and business group. Table 3–4 shows sample size information for the customer surveys performed along five corridors in College Station.

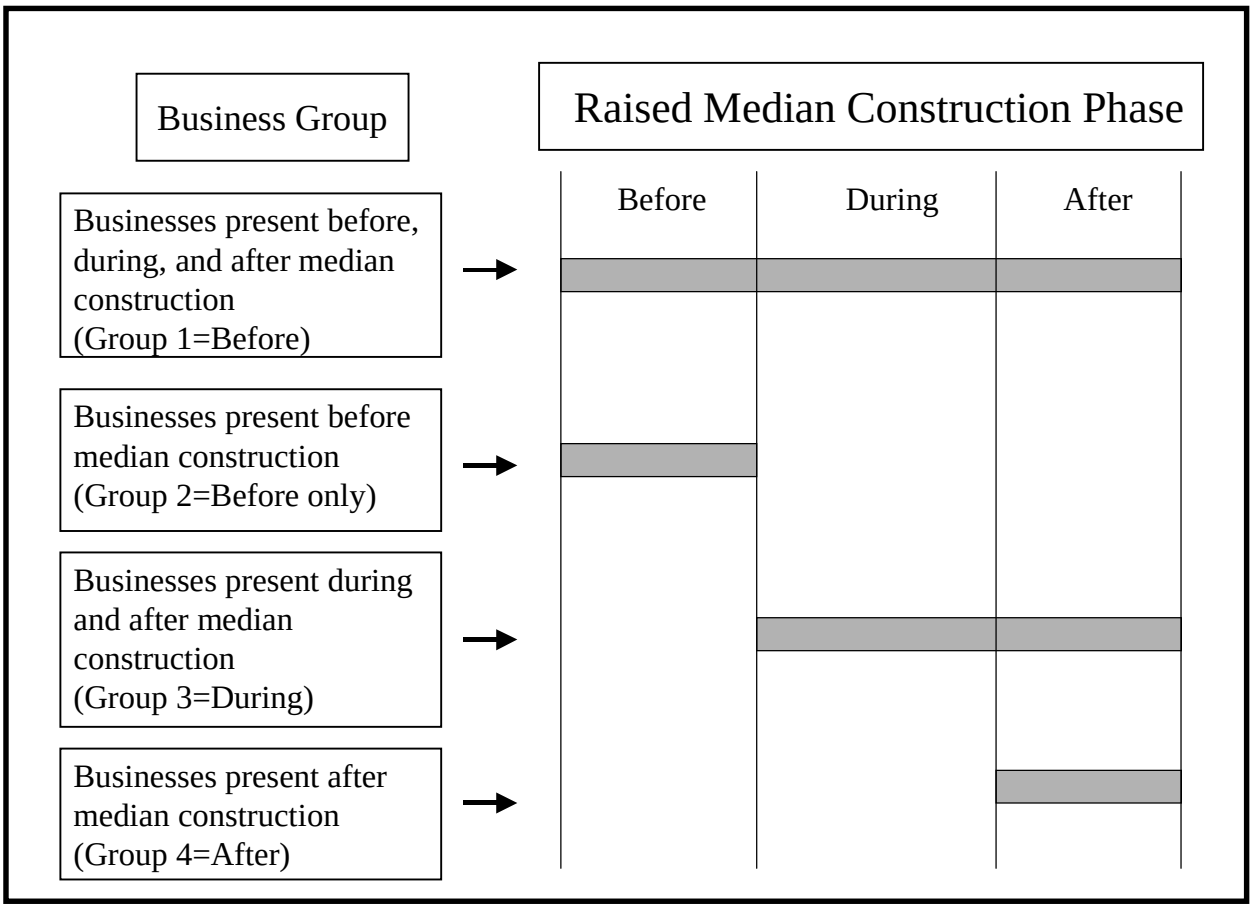

Figure 3–1. Business Groups as Defined by Raised Median Construction Phase.

Table 3–1. Business Group Sample Sizes by Site.

Business Group	McKinney	Longview	Wichita Falls	Odessa	South Post Oak Road	Long Point Road	Fuqua Road	Clay Road	9th Ave.	Texas Ave.	Totals
1	10	18	0	8	13	0	1	3	0	23	76
2	0	0	17	0	0	6	0	0	0	0	23
3	3	2	0	1	0	0	0	2	1	8	17
4	12	2	0	5	17	0	1	3	4	3	47
Totals	25	22	17	14	30	6	2	8	5	34	163

Note: Business Group 1 = businesses present before, during, and after median installation; Business Group 2 = businesses present before the median construction and construction is yet to begin; Business Group 3 = businesses present during and after median installation; and Business Group 4 = businesses present only after the median had been installed.

Table 3–2. Sample Sizes for Business Type by Business Group.

Business Group	Durables Retail	Specialty Retail	Grocery	Gas Stations	Fast–Food Restaurant	Sit–Down Restaurant	Medical	Auto Repair	Hair Salon	Other Services	Other	Total
1	2	23	1	5	11	10	2	7	0	12	3	76
2	1	8	2	1	1	1	3	1	3	2	0	23
3	1	7	0	1	1	2	1	0	1	3	0	17
4	4	14	2	1	2	7	1	0	2	13	1	47
Totals	8	52	5	8	15	20	7	8	6	30	4	163

Note: Business Group 1 = businesses present before, during, and after median installation; Business Group 2 = businesses present before the median construction and construction is yet to begin; Business Group 3 = businesses present during and after median installation; and Business Group 4 = businesses present only after the median had been installed.

Table 3–3. Sample Sizes for Business Type by Site.

Site	Durables Retail	Specialty Retail	Grocery	Gas Stations	Fast–Food Restaurant	Sit–Down Restaurant	Medical	Auto Repair	Hair Salon	Other Services	Other	Totals
McKinney	1	4	2	2	7	6	0	0	1	2	0	25
Longview	2	14	0	0	2	4	0	0	0	0	0	22
Wichita Falls	1	8	1	1	1	0	1	0	2	2	0	17
Odessa	2	6	0	0	0	1	1	1	2	1	0	14
South Post Oak Rd.	1	8	0	1	0	1	2	3	0	10	4	30
Long Point Road	0	0	1	0	0	1	2	1	1	0	0	6
Fuqua Road	1	0	0	0	1	0	0	0	0	0	0	2
Clay Road	0	1	0	1	1	0	1	2	0	2	0	8
9th Avenue	0	0	1	0	0	0	0	0	0	4	0	5
Texas Avenue	0	11	0	3	3	7	0	1	0	9	0	34
Totals	8	52	5	8	15	20	7	8	6	30	4	163

Table 3–4. Customer Survey Overall Sample Size Information.

Business Type	Completed Surveys	Percentage of Total
Sit-Down Restaurant	168	37.2
Sit-Down Restaurant	65	14.4
Gas Station	56	12.4
Gas Station	56	12.4
Fast-Food Restaurant (inside)	65	14.4
Fast-Food Restaurant (drive thru)	42	4.3

3.2 STATISTICAL SIGNIFICANCE OF ANALYSES AND RESPONSE BIAS

The target population for the business surveys for all the corridors included all the businesses and establishments adjacent to the corridors in the project. Random sampling of such a small population would require mathematically involved statistics. For this project, it was possible to contact the entire population along the corridor. In spite of this, complete information for the whole population was not obtained because some business managers chose not to answer some or all of the questions. Whether the information obtained from those who chose to respond is representative of the whole population is open to speculation. Respondents themselves selected whether or not to respond to the survey and thus were not chosen at random. Therefore, statistical tests based on random sampling do not answer the question of whether the number of respondents was appropriate for inferences about the whole population. Furthermore, there is an inherent response bias in the collected data since not all businesses completed a survey. Even though the information may not fully represent the whole population, the research team used the most complete information available.

Customer surveys were performed over a two-week period. For one day, students handed out the surveys (over two- to four-hour periods at each site at five locations in College Station). As above, respondents themselves selected whether or not to respond to the survey and thus were not chosen at random. It is again open to speculation as to whether the information obtained from these surveys is representative of the whole population of customers at a given institution or a like business. However, the customer surveys provided an interesting comparison to the business owner survey results.

3. 3 AGGREGATE SUMMARY STATISTICS

3.3.1 Impacts on Importance of Access to Customers

One question in the survey asked business owners to rank accessibility to store with other factors including distance to travel, hours of operation, customer service, product quality, and product price in order of importance to customers. In all cases, the accessibility to the store ranked third or lower. Accessibility to store was ranked fourth or lower for all business types aggregated together. Generally, accessibility was ranked lower than customer service, product quality, and product price—all elements that business owners/management themselves can directly influence. A similar question was asked on the customer survey. In all cases, the customers ranked accessibility to store with lower or equal value to the business owners. Customers ranked accessibility as number two at one of the gas station locations after product price.

3.3.2 Impacts on Regular Customers

Another question of particular interest on the survey was business owners' perceptions of the impacts on regular customers due to the raised median installation. The results of the responses to this question are shown in Table 3-5 for each business group. The business owners that were along the corridor before, during, and after the construction of the raised median (group one) indicated a smaller percentage of their regular customers would be less likely to visit their business as a result of the raised median compared to those business owners that were interviewed prior to the raised median installation (14.3 percent compared to 19.1 percent).

Table 3-5. Percent and Frequency of Raised Median Installation Impacts on Regular Customers by Business Group.

Business Group	Less Likely	More Likely	Stay About the Same
1	14.3% 10	15.7% 11	70.0% 49
2	19.1% 4	14.3% 3	66.7% 14
3	12.5% 2	18.8% 3	68.8% 11
4	18.2% 6	24.2% 8	57.6% 19

Note: Business Group 1 = businesses present before, during, and after median installation; Business Group 2 = businesses present before the median construction and construction is yet to begin; Business Group 3 = businesses present during and after median installation; and Business Group 4 = businesses present only after the median had been installed.

Customers at the five study locations in College Station were also asked a similar question to relate to the responses of those particular business owners. Table 3-6 shows the results. The majority of the customer survey responses match the business owner's/manager's selection at all five sites. The gas station business owners/managers interviewed seemed to be the most affected by the raised median installation. Questions seven and eight of the customer survey refer to reasons for selecting less likely or more likely. The results of these questions are shown in Table 3-7. The primary reason for indicating less likely is due to access being more difficult. Interestingly, the primary reason for indicating more likely is that access is safer. In addition, customers were asked about their likeliness to visit the establishment during the construction phase of the median installation. At the gas stations, 71 percent indicated they were less likely to visit. About 50 percent of the sit-down restaurant and fast-food restaurant indoor patrons also indicated that they were less likely to visit. Finally, 70 percent of the drive-thru fast-food restaurant customers indicated that they were less likely to visit. The results indicated the potential impacts that the construction phase can have on these business types.

Table 3-6. Frequency of Responses from Customers and Business Owners Regarding Customers' Endorsement of Business.

Business Type	Survey Type	Less Likely to Visit	More Likely to Visit	Stay About the Same
Sit-Down Restaurant	Customers	19.7% 15	4.0% 3	76.3% 58
	Business Owner			✓
	Customers	8.0% 2	0.0% 0	92.0% 23
	Business Owner			✓
Gas Station	Customers	41.2% 7	5.9% 1	52.9% 9
	Business Owner			✓
	Customers	58.8% 10	0.0% 0	41.2% 7
	Business Owner	✓		
Fast-Food Restaurant (inside)	Customers	29.0% 11	2.6% 1	68.4% 26
	Business Owner			✓
Fast-Food Restaurant (drive-thru)	Customers	34.8% 8	0.0% 0	65.2% 15
	Business Owner			✓

Table 3-7. Reasons for Selecting "Less Likely" and "More Likely" in the Customer Surveys.

Visit Business Prior to Median?	Less Likely			More Likely		
	Access More Difficult	Takes Longer to Get Here	Other Stores More Convenient	Access More Convenient	Less Time to Get Here	Access More Safe
Yes	77.9% 35	0.0% 0	22.2% 10	0.0% 0	33.3% 4	58.3% 7
No	79.0% 15	5.3% 1	10.5% 2	0.0% 0	14.3% 1	42.9% 3

Note: Percentages may not add up to 100 as some respondents selected "other" for this question.

3.3.3 Impacts on Number of Employees, Property Values, Accidents, and Traffic Volume

Impacts upon the number of employees, property values, accidents, and traffic volumes were also of interest. Results of these factors by business group are shown in Table 3-8. The "during" column in Table 3-8 indicates the impacts during construction relative to prior to the construction, and the "after" column indicates the impacts after construction relative to prior to the construction. For all the business groups, the number of full-time employees increases on average. Business group two—those interviewed prior to the raised median installation—indicated that they felt the number of full-time employees would decrease slightly during construction while it actually increased 8.6 percent for the group one business owners. The number of part-time employees decreased slightly after construction of the median. The perception of business owners was that property values increased 6.7 percent after the median installation (group one), but those business owners interviewed prior to the median installation (group two) expected a 2.3 percent decrease. The group one business owners also indicated a perceived decrease of 10.2 percent in accidents along with a 31.5 percent increase in traffic volumes.

Table 3-9 presents the impacts on customers per day and gross sales for the four business groups. "Gross sales where the median installed" refers to a question on the survey in which business owners were asked what they believe was/is the impact of the raised median for all businesses along the corridor where the median was installed. "Gross sales in the area" refers to a similar question that asked about gross sales for all other businesses in the area (not necessarily just the corridor) due to the raised median installation. The construction phase did seem to impact customers per day and gross sales as evidenced by the values in the "during" columns. The perceptions of group two business owners seem to indicate a larger expected loss in gross sales during construction (18.6 percent) compared to the 11.6 percent reduction expected by those businesses that were present before, during, and after the median installation. The decrease in gross sales after the median installation is relatively small.

Table 3–8. Percent Change, Standard Deviation, and Sample Sizes of Full- and Part-Time Employees, Property Values, Accidents, and Traffic Volumes by Business Group.

Business Group	Full-Time Employees		Part-Time Employees		Property Values		Accidents		Traffic Volume	
	During	After	During	After	During	After	During	After	During	After
1	8.6% 28.3 55	3.2% 20.0 57	–3.3% 19.7 53	–0.3% 12.2 55	1.5% 10.3 31	6.7% 15.8 38	5.5% 23.7 40	–10.2% 27.1 40	–12.5 21.1 38	31.5% 50.7 44
2	–0.3% 1.1 19	0.3% 7.8 18	–0.2% 0.9 18	–1.0% 4.9 17	–8.2% 22.5 14	–2.3% 11.8 13	–3.3% 23.0 18	–13.2% 33.5 14	–11.1% 25.0 19	7.9% 20.5 17
3	–6.3% 17.7 8	9.4% 26.5 8	–6.3% 17.7 8	0.0% 0.0 9	–5.8% 14.3 6	4.7% 7.7 7	–7.1% 18.9 7	–10.7% 28.3 7	–8.8% 27.5 8	28.8% 20.5 8
4	0.0% 0 3	7.1% 18.9 7	0.0% 0.0 3	6.3% 17.7 8	–15.6% 22.4 9	7.7% 12.9 11	0.0% 0.0 6	6.7% 18.6 12	–21.9% 23.9 8	37.7% 89.3 11

Note: Business Group 1 = businesses present before, during, and after median installation; Business Group 2 = businesses present before the median construction and construction is yet to begin; Business Group 3 = businesses present during and after median installation; and Business Group 4 = businesses present only after the median had been installed.
Note: The “during” column indicates impacts during construction relative to prior to construction, and the “after” column indicates impacts after construction relative to prior to construction.

Table 3-9. Percent Change, Standard Deviation, and Sample Sizes of Customers per Day, Gross Sales, Gross Sales along the Portion Where the Median Was (Will Be) Located, and Gross Sales in the Area.

Business Group	Customers per Day		Gross Sales		Gross Sales Where Median Installed		Gross Sales in the Area	
	During	After	During	After	During	After	During	After
1	–14.9% 30.6 54	17.7% 101.0 55	–11.6% 24.7 53	–0.03% 1.5 61	–16.4% 18.5 37	8.5% 20.5 35	7.6% 17.5 25	1.2% 7.1 22
2	–9.5% 31.8 18	–5.9% 10.0 16	–18.6% 24.8 19	–0.8% 1.6 16	–14.2% 17.2 13	5.4% 22.9 14	11.8% 14.5 14	2.7% 6.0 13
3	–15.6% 22.9 8	–3.9% 22.6 9	–17.9% 23.8 7	0.0% 1.2 9	–12.95% 18.7 7	13.6% 20.6 7	0.7% 15.9 7	0.7% 18.8 7
4	0.0% 0.0 2	50.0% 105.6 8	0.0% – 1	0.3% 1.5 7	–20.4% 17.8 12	12.9% 18.1 12	9.5% 13.7 11	5.9% 13.8 11

Note: Business Group 1 = businesses present before, during, and after median installation; Business Group 2 = businesses present before the median construction and construction is yet to begin; Business Group 3 = businesses present during and after median installation; and Business Group 4 = businesses present only after the median had been installed.

Note: The “during” column indicates impacts during construction relative to prior to construction, and the “after” column indicates impacts after construction relative to prior to construction.

3.3.4 Impacts on Customers per Day, Gross Sales, and Property Values by Business Types

Table 3-10 provides results of analyses for different types of group one businesses for customers per day, gross sales, property values, full-time employees, and part-time employees. The construction phase of the project appears to have a negative effect on many of the metrics of interest for many of the different business types. After construction of the raised median, gasoline stations, auto repair, and other services indicated a small negative effect on gross sales. These values are slightly lower for customers per day. Property values after construction are indicated as either rising or the same after the construction of the median, and there are only small changes in full- and part-time employees.

Figure 3-2 and Figure 3-3 present the percentage of each of these potential impacts indicating better, the same, or worse for each business group, respectively. Distinctions can be made between Figure 3-2, showing the impacts on businesses present before, during, and after the median installation (group one), and Figure 3-3, showing the indications of group two business owners. The group one businesses in Figure 3-2 generally indicated worse at lower percentages than those group two businesses in Figure 3-3. In particular, property access is indicated as worse for group one businesses at 39.4 percent while higher at 55.6 percent for group two businesses. Similar results are also noticeable for business opportunities, customer satisfaction, and delivery convenience. The reverse is true for traffic congestion, though the percent difference between the two groups is not large (15.3 percent for group one and 14.3 percent for group two). Traffic safety is indicated as worse for 8.5 percent of group one businesses while zero percent felt it would be worse prior to construction of the median.

Table 3-10. Summary of Average Percent Change, Standard Deviation, and Sample Size for Responses from Businesses Present Before, During, and After Raised Median Installation (Group One Businesses).

Business Type	Total Sample Size	Percent Change in Responses of Interest									
		Customers per Day		Gross Sales		Property Values		Full-Time Employees		Part-Time Employees	
		During	After	During	After	During	After	During	After	During	After
Durables Retail	2	15.0% – 1	5.0% – 2	15.0% – 1	1.0% – 2	1.0% – 1	17.5% 3.5% 2	– – 0	0.0% – 1	0.0% – 1	0.0% – 1
Specialty Retail	23	–6.6% 14.0% 19	8.1% 12.8% 18	–5.6% 15.6% 19	0.4% 1.2% 21	–1.0% 3.2% 10	3.7% 17.9% 13	22.0% 41.0% 20	1.0% 11.4% 20	0.9% 14.1% 19	–5.3% 16.8% 19
Gas Station	5	–20.4% 68.1% 5	–17.6% 23.3% 5	–40.4% 24.8% 5	–2.4% 1.3% 5	16.7% 28.9% 5	20.0% 26.5% 5	2.6% 19.1% 5	–5.0% 11.2% 5	–20.0% 44.7% 5	0.0% 0.0% 5
Fast-Food Restaurant	11	–19.9% 37.0% 8	108.9% 237.6% 9	–8.6% 36.1% 7	0.4% 1.5% 7	–17.0% 12.6% 3	16.7% 8.8% 6	–3.7% 26.6% 6	30.8% 46.3% 6	–15.3% 30.0% 7	3.0% 13.3% 7
Sit-Down Restaurant	10	–6.1% 8.8% 7	2.6% 3.6% 7	–3.6% 10.6% 7	0.8% 0.4% 10	0.0% 0.0% 4	0.0% 0.0% 4	1.8% 5.0% 9	3.5% 8.2% 10	1.8% 5.0% 9	5.0% 10.5% 10
Auto Repair	7	–24.0% 25.1% 5	–5.0% 11.2% 5	–20.0% 24.5% 6	–0.5% 1.2% 6	3.3% 5.8% 3	3.3% 5.8% 3	0.0% 0.0% 5	0.0% 0.0% 5	0.0% 0.0% 4	0.0% 0.0% 4
Other Services	12	–32.5% 35.7% 8	–8.4% 9.3% 8	–17.5% 36.6% 6	–1.0% 1.7% 8	2.0% 4.5% 5	7.6% 10.8% 5	3.1% 5.9% 8	–4.4% 18.8% 8	0.0% 0.0% 7	1.4% 3.8% 7

Note: Each cell contains the average percent change (top), standard deviation (middle), and number of observations (bottom).

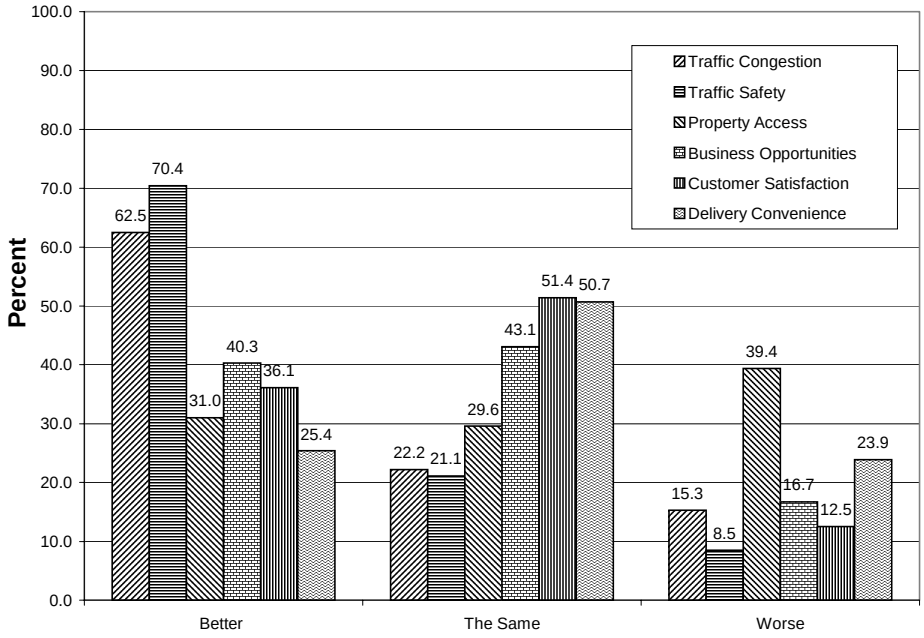

Figure 3–2. Raised Median Impacts of Interest for Group One Businesses.

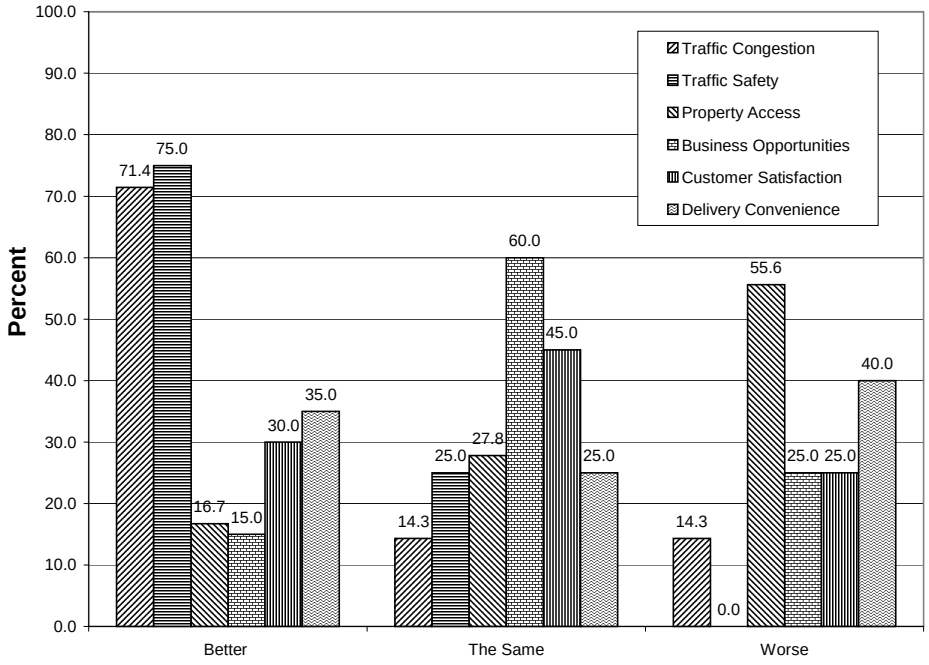

Figure 3–3. Raised Median Impacts of Interest for Group Two Businesses.

4.0 DISCUSSION AND CONCLUSIONS

Although the sample sizes upon which analyses were performed were often rather small, many observations and interesting points may be drawn from this research effort. These observations are invaluable in laying the foundation for this type of research due to limited previous work. This product will provide valuable insight for TxDOT in communicating potential economic impacts of raised median projects. Some of the key points are listed as follows.

- When asked to rank order the factors that affect customers endorsing their businesses, business owners generally ranked accessibility to store fourth or lower below some combination of customer service, product quality, and product price. According to business owners, the most important elements used by customers to determine what businesses they will endorse are factors that may be controlled by the business owners themselves to some extent. In surveys of customers at five selected businesses along the Texas Avenue corridor in College Station, the research team found that customers ranked accessibility to store with lower or equal value to the business owners.
- When combining all business types, researchers discovered that 85.7 percent of business owners whose businesses were present before, during, and after the median installation felt that their regular customers would be more likely (15.7 percent) or stay about the same in likeliness (70.0 percent) to endorse their business. In contrast, those businesses that were interviewed prior to the installation of the raised median indicated this percentage slightly lower (i.e., indicated more regular customers less likely) at 80.9 percent. Therefore, for the case studies investigated in this project, the perceptions appear slightly more negative than what actually occurred along corridors where business owners were present before, during, and after the median installation. A similar question was posed to customers in College Station at the five selected businesses, and a majority of the customer survey responses matched the business owner's / manager's opinion. Generally, customers did indicate they were less likely to visit the business during the construction of the raised median.

- A majority of customers indicated that while the raised median made access more difficult, their level of customer satisfaction was better or remained about the same for the five businesses where customer surveys were performed.
- There was almost always an increase in the number of total employees along several of the corridors. Those corridors that did experience a decrease in the number of employees experienced a decrease for only one year and not over consecutive years. This decrease often did not coincide with the construction years along the corridor. Researchers found that business owners were generally quite loyal to employees even during the construction phase.
- Property values were indicated as increasing 6.7 percent after the raised median installation by those business owners present before, during, and after the raised median installation (group one), while the perception of the group two businesses was that there would be a decrease of 2.3 percent.
- Business owners in Amarillo, Texas, that were present before, during, and after the median removal generally indicated an average increase in sales of 3.9 percent after the removal. The owners noted 3.7 percent increase in passer-by traffic (12 business owner surveys) and accessibility to store was ranked fourth in importance by business owners behind customer service, product quality, and product price. This raised median was different than those at other locations. This median treatment was approximately 2 feet wide, and 50 to 200 feet of it was being removed at signalized intersections to provide access to select businesses that were interviewed.
- The construction phase seemed to impact customers per day and gross sales. For all types of businesses, perceptions again indicated a larger expected loss in the group two businesses that were interviewed prior to the construction of the raised median. These business owners indicated they expected an 18.6 percent reduction in gross sales, while those that were present before, during, and after the median installation (group one) indicated an 11.6 percent reduction as shown in Table 3-9. After the construction phase, a 17.7 percent increase in customers per day was indicated along with a decrease in gross sales of 0.03 percent for all businesses present before, during, and after the median installation. Business types such as durables retail, specialty retail, fast-food restaurants, and sit-down restaurants indicated increasing customers

per day, gross sales, and property values as shown in Table 3-10. Gas stations, auto repair, and other service businesses indicated decreasing customers per day and gross sales after the raised median was installed.

- The construction phase appears to have the most detrimental impacts on businesses. Suggestions to alleviate these impacts include: 1) ensuring adequate and highly visible access to businesses during construction, 2) reducing construction time, and 3) performing the construction in smaller roadway segments (phases) when possible.
- Overall, public involvement was indicated as low for 61.5 percent of the business surveys.
- The in-person business surveys provided more reliable data than the mail-out surveys. In-person respondents also appreciated the face-to-face opportunity to have their opinions heard. The average response rate for the in-person surveys was much higher (55.0 percent) than the response rate for the mail-out surveys (9.0 percent).

One of the greatest challenges to TxDOT staff has been providing information to business and property owners regarding potential economic impacts of raised medians on businesses and properties. TxDOT staff will be able to use the results of this research to explain experiences on these corridors. It will be important for the staff to note that the results of this research will not guarantee any specific economic impacts on particular business or property types but may be used to anticipate general impacts. At a minimum, this information will allow TxDOT staff to discuss these issues with the public using appropriate research data, instead of having to say that they are unsure of what to expect. These results are also anticipated to be of help to other planners, engineers, and researchers investigating these issues or involved in similar median projects.

5.0 REFERENCES

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