

Restudy of Changes in Land Value, Land Use, and Business Activity Along A Section of Interstate Highway 35 in Temple, Texas

by

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Foreword

In November of 1957, the U. S. Bureau of Public Roads and the Texas Highway Department authorized the Texas Transportation Institute to conduct an economic impact study along sections of the Interstate Highway System in Texas. This authorization called for joint financial support by the Bureau of Public Roads and the Texas Highway Department.

The study was to include an analysis of the economic impact on local areas of the Interstate Highway System. The specific objectives were to measure the changes in land value, land use, business activity, travel habits, and general community development that could be associated with this new highway facility.

At the time the study was authorized, very little of the Interstate System had been constructed within the State. There were, however, several sections of expressway-type roadway which had already been constructed and which, with minimum alterations, would meet the Interstate construction standards. It was decided to select three sections of expressway-type roadway which had been completed for a minimum of two years as the starting point for this study. This would allow a "before and after" study to be conducted within these areas while basic data were being accumulated from other sites.

With the advice of the Project Advisory Committee, three such sites were selected: One each in or near the cities of Austin and Temple, and one in Rockwall County. Field work was initiated immediately in order to establish base period land value, land use, and business activity information as soon as possible.

At the time the study was authorized, it was requested that a preliminary report of findings be submitted to the Bureau of Public Roads by July 1, 1958. These findings were to be used by the Department of Commerce in its report to Congress on nonvehicular benefits as required under Section 210 of the Highway Revenue Act of 1956. Such a report was submitted to the Bureau of Public Roads at that time. In September, 1960, a complete report of findings for the Temple area was made to sponsors in the form of a bulletin entitled "Changes in Land Value, Land Use, and Business Activity along a Section of the Interstate Highway System in Temple, Texas," by C. V. Wootan and H. G. Meuth.

At a later date, the Project Advisory Committee requested that a restudy be made of the Temple area. This report presents the results of the restudy which embodies much of the data contained in the previous reports.

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Summary of Findings

The effects measured and analyzed in the report are presented in terms of changes in land values, land uses, and business activities along the old route (U. S. 81) and the new route (IH 35) which bypassed Temple in 1955.

These findings supplement those of the original report and are as follows:

1. Land values in the study area, encompassing the IH 35 bypass, increased rapidly in the "after construction period" as compared to the control area. Unimproved acreage land prices (expressed in constant dollars) increased \$2,368 per acre or 2602 percent in the study area versus \$38 per acre or 39 percent in the control area between the "before" and "after" periods. The probable highway influence was \$2,331 per acre or 2562 percent.

2. The probable highway influence on abutting land prices was \$907 per acre or 997 percent greater than on nonabutting land prices.

3. Land in the study area was only in agricultural, rural residential, and institutional uses before the new highway bypass was constructed. After construction of the facility, much of the agricultural land changed into 18 tracts of land held for future use, three rural residential tracts, four urban residential tracts, seven commercial tracts, five industrial tracts, and one institutional tract. Most of these tracts abutted the new bypass. Of the land changing from agricultural use in the after period, land held for future use was the greatest in land area. Two additional commercial tracts and five industrial tracts were established from the land that had previously changed to land held for future use.

4. An analysis of the relationship between changes in land use and land values revealed that the tracts of land succeeding from lower to higher uses advanced materially in value during the period studied.

5. The total dollar volume of all old route (U. S. 81) and new route (IH 35) retail businesses located in the study area increased 7.7 percent between 1954 and 1957, 25.1 percent between 1957 and 1961, and 34.8 percent between 1954 and 1961. The new bypass apparently depressed gains in gross dollar volume during the first period, but in the aggregate these effects failed to continue through the second period.

6. Traffic serving businesses (service stations, motels, and food service establishments) on the old route showed a 15.3 percent decline in gross volume between 1954 and 1957. But between 1954 and 1961, these businesses experienced less than a one percent decrease in sales volume. The new highway depressed the sales of motels more than the other two groups.

7. The nontraffic serving retail businesses showed an increase in gross sales of 8.2 percent between 1954 and 1957 and 36.1 percent between 1954 and 1961. Most of the operators of these businesses indicated that taking the heavy through traffic off their street (old route) helped their local business.

8. Other statistics presented in this report indicate that the future looks bright for the study areas and the whole city of Temple from the standpoint of the bypass effects measured and analyzed here.

Introduction

Temple is located about 35 miles southwest of Waco in the Black Prairies of Central Texas. Its 1960 population was 30,419 and the 1961 population is estimated to be up slightly from this figure. Like Austin, Temple's economy is diversified in nature. It depends heavily upon agriculture, hospitals, light manufacturing, wholesale distributing, and a U. S. Government facility (Fort Hood). Since 1941 a fairly large contingent of military service personnel and dependents have lived and shopped in Temple. The city is also a major medical center. It has a large industrial output for a city of its size, producing rock wool insulation, shoes, furniture, school equipment, clay products, cottonseed oil, food, and feedstuffs. Also, it has a Junior College. Bell County, in which Temple is situated, is one of the State's leading dryland farming counties. In the last decade, Temple has experienced a 20 percent growth in population, which is slightly under the 24.2 percent for the State. Bell County's population increased about 27.5 percent during the same period.

Temple is served by two U. S. highways and two State highways. U. S. 190 carries east-west traffic through the city, while Interstate 35 serves the north-south traffic. In addition, State Highway 36 carries northwest-southeast traffic through the city, and State Highway 53 connects Temple with U. S. 77, the major north-south highway between Fort Worth and Corpus Christi.

Of the above highways, Interstate 35 is Temple's most important traffic artery. It is one of Texas' major north-south highways, being designated a part of the Interstate Highway System in 1956. Temple is one of three cities on Interstate 35 involved in the study, "Economic Impact of the Interstate Highway System on Local Areas." The other cities are Austin and Waxahachie. The former is a "parallel route" study where the new highway does not bypass the city, but the latter is a true "bypass" study similar to the Temple Study.

Until the new bypass was opened in early 1955, U. S. 81 (now IH 35) went through the main business district of Temple. The old route made use of three different streets and traffic congestion became heavy in the downtown area. Therefore, city and county officials, in cooperation with the Texas Highway Department, decided to relocate the highway to the west of town. Acquisition of the rights of way for a three-mile section began in 1948 and purchases were completed in 1952. The rights of way were acquired at an estimated cost of \$195,000. The Texas Highway Department completed construction of the bypass at a cost of \$1,142,191. It was opened to traffic in April, 1955.

Although the new bypass was constructed before passage of the 1956 Federal Highway Act which created the Interstate Highway System, the facility meets all the Interstate System's construction standards, except for one grade crossing near the most northerly interchange. It has full frontage roads over all but one short stretch near the north end. The standards of the older section of IH 35 south of the study area affected those of the newer section. This section also has grade crossings.

Study Areas

The study area, as defined for the measurement of land value and land use changes, consists of almost the entire Interstate 35 bypass area around the main business district of Temple. It is a rectangular section of land about three miles long and a mile and three quarters wide extending to each side of Interstate 35 (see Figure 1). The area is bounded on the east of the new highway by the Temple city limits, which were in effect during the base and construction periods. The western boundary is a county road about a mile west of the facility. State Highway 36 is the southern boundary, and the northern boundary is just north of the intersection of Interstate 35 and old U. S. 81 (North 3rd Street). In all, the study area consists of 2,380 acres of land.

The business activity study area consists of that portion of Interstate Highway 35 included in the above area and abutting properties to old U. S. 81 passing through the city. The exact bounds of the latter route are covered later in this report.

Control Areas

Control areas for the study were selected to aid in determining the net effects of the new facility on land values, land uses, and business activity. These areas were chosen because of their similarity to the study areas during the base period before the Interstate Highway was built.

To control the land value changes in the study area, several complete surveys were selected. All were near Temple to the north, east, and west of the study area (see Figure 1). To assure a sufficient number of sales of comparable property, it was necessary to select 10 small surveys. The names of the surveys were: Henry Mallard, William Gilmore, P. M. Mercer, C. S. Masters, Cris Adams, Jr., Alex Smith, Sarah Christopher, Garnett S. Hardcastle, I. and G. N. Railroad Co., and Walter W. Davis. This is a total of approximately 11,000 acres of land area. All the above surveys are outside the Temple city limits, as was the study area during the before period. Most of the control land is farther removed from the city than desired; however, the selection was dictated by the fact that most of the land closer in to the city was in one large survey which includes the city itself. While control land closer in to the city would have been preferred, land sales in these control surveys are considered to reflect fairly accurately the general trends in land values in the vicinity of Temple.

Control areas were not considered necessary to the analysis of land use changes. Changes in land uses can be vividly seen when they occur. This permits a tracing of the ripening process or the speed of development without attempts to relate these changes to conditions in an unaffected area.

To control the changes in business activity in the study area, certain secondary economic data for the whole city of Temple were collected from the U. S. Department of Commerce's Bureau of Census.

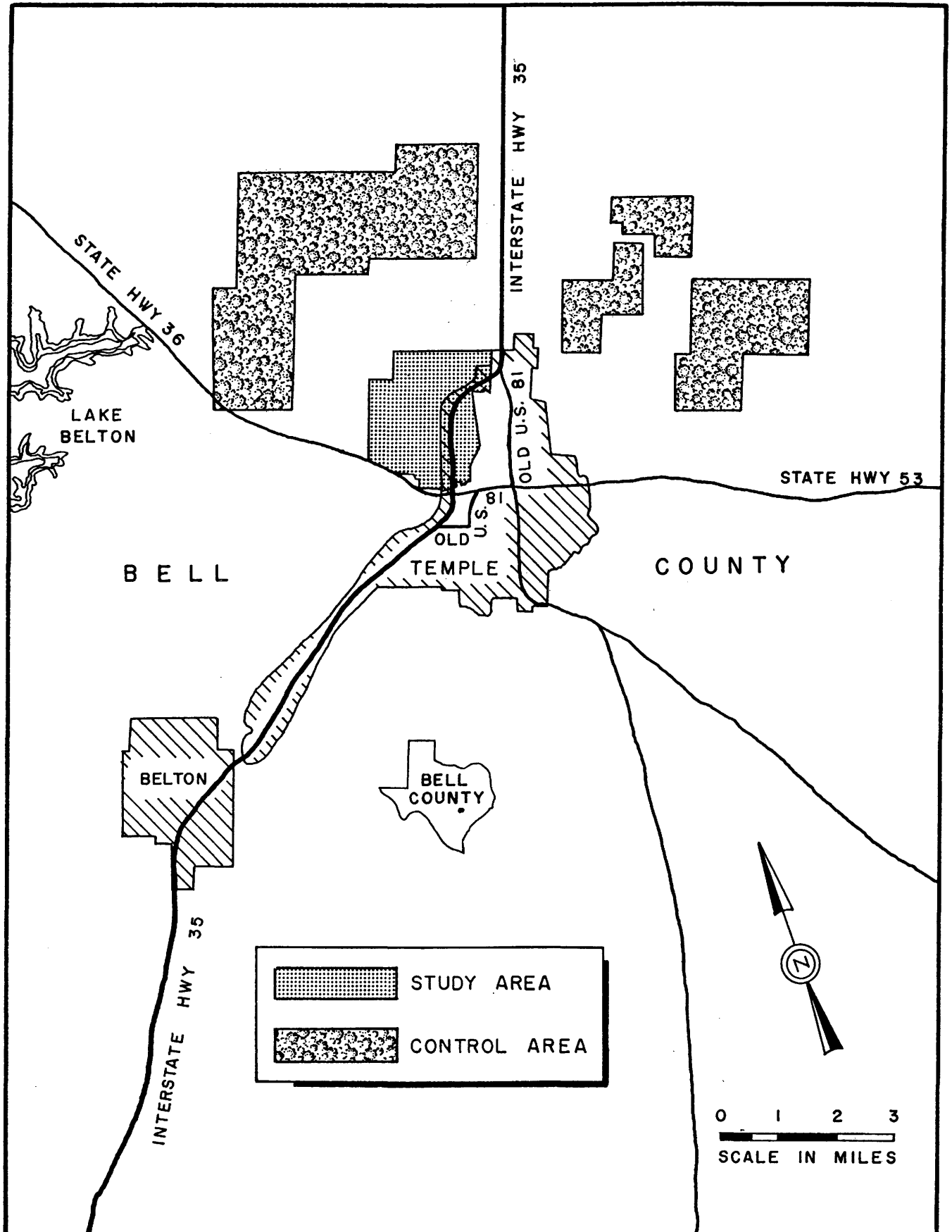


Figure 1. Temple land value study and control areas.

Methods Used

The methods and procedures used in both the collection of field data and the analysis are set forth in detail in the Appendix of this report. They are basically the same as used in the other areas under this study series.

In brief, land sales data were collected from the county deed records and recorded on data cards. All study area sales were located on a map and the names of the buyer and seller, the date of sale, the acreage, and the selling price were recorded. Land uses were determined before and after completion of the new facility, and these changes were recorded on the data cards and land use maps. The land use data were collected by field inspections and by interviews with buyers, sellers, and long-time residents of the area.

All businesses located both on the old U. S. Highway 81 business route through Temple and on the new highway were personally interviewed to collect pertinent economic data. Detailed information concerning changes in gross sales, hours of operation, numbers of employees, management, physical plant, products handled, etc. was obtained from each cooperating business. The business analysis was focused primarily on the retail sales group. Other economic data were collected from city and county officials, *Texas Almanac*, U. S. Department of Commerce's Bureau of Census, and other secondary sources.

The organization of data for purposes of analysis involved transcribing useable land value and land use data on to electronic data cards. The Texas A&M University Data Processing Center was used to make all necessary calculations for the tables that appear in this

report. Appropriate tests of significance were made on these data to augment the basic analysis (see Appendix for formulas used).

Definitions

So far as this report is concerned, the terms below will carry the following definitions:

1. Before and after — a comparative technique used to measure changes in land values, land uses, and gross dollar sales between different periods of time. One time period is designated as the before period and another the after period. In this land analysis, the after period has been further divided into two periods.

2. Area weighted price — a mean price derived by summing all purchase prices for a particular number of land sales and dividing by the sum of all acres represented by those sales.

3. Price not area weighted — a mean price derived by summing the price per acre paid for each of a particular number of land sales and dividing by the total number of transactions represented by those sales.

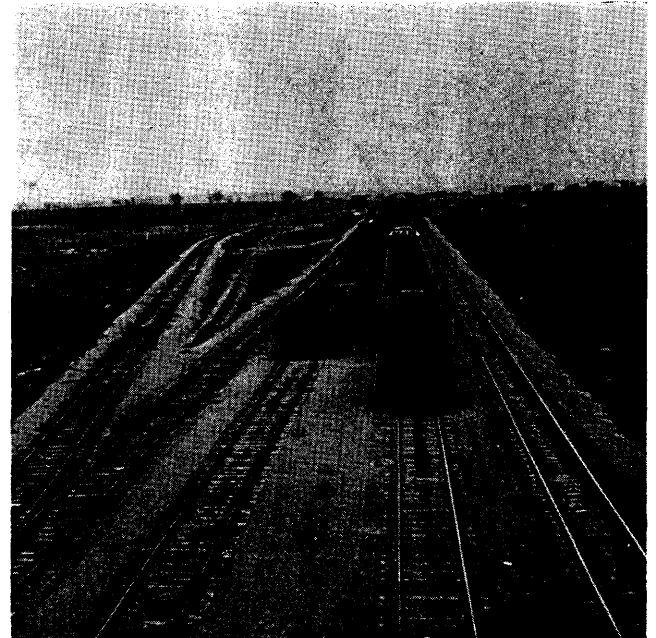
4. Adjusted land prices — prices which are deflated to a constant dollar base by using the Bureau of Labor Statistics' Consumer Price Index. (See explanation and schedule in the Appendix.)

5. Abutting and nonabutting land — refers only to land in the study area. Abutting land is that with frontage on the new IH 35, and nonabutting land is all other land within the study area boundaries.

6. Average daily traffic volume—the mean average traffic volume of 24-hour counts made at a certain location in a given year.



Interstate Highway 35



Railroad

Interstate Highway 35 and a railroad are the two major transportation facilities passing through the study area.

Changes In Land Values

Changes in land values in the study and control areas were measured by changes in the sales prices of property transactions occurring in each area during the 19-year period under study. This is considered the most accurate measure of land value changes. The hypothesis is that if land prices increase more in the study than in the control area during a specified period, the new highway by-pass caused the difference. This assumption depends on the original hypothesis that both areas were comparable before the bypass was constructed.

To aid in the land value analysis, the before and after technique was used. Therefore, the 19-year period was divided into shorter time periods of specific before and after periods. Control area property sales were divided by the same time periods as those of the study area.

Four time periods were used, the first three being the same as that used in the original report. The additional period covers the time lapsed since the cut-off date of that report. A six-year base period (1943-48, inclusive) was used to establish land values before construction of the new facility. The second period, also six years in length, (1949-54, inclusive) is the period during which the rights of way for the facility were acquired and the actual construction of the facility was performed. The third period, three years in length (1955-57, inclusive) is the first after period. The fourth period, four years in length (1958-61, inclusive) is the second after period. Both of the after periods constitute the time lapsed since the bypass was first opened to through traffic movement. These two periods are also combined in the tables for specific before and after comparisons.

All land sales in the study area were placed in two classifications: abutting properties and properties that did not touch the new bypass route. This was done in order to measure the new facility's lateral influence on land values. Since proximity is considered a significant factor, it was assumed that properties abutting the facility would show a greater increase in land value than those not abutting.

Another classification that has been used in the analysis of land value changes in other areas was not considered applicable to this area. This is the division of the study area into sections to measure the influence on land value changes caused by distance to the central business district. Since the entire section is only about three miles long and curves around the main business district, distance from the downtown area was not considered to be a major influencing factor on land value changes.

There were no subdivisions in the study area; therefore, no such property sales are included in the land value analysis. Since there were very few property sales which had improvements of any consequence, these were also excluded from the land value analysis. However, these sales are included in the land value-land use comparisons.

The land sales prices for both the study and control area were analyzed two ways: (1) by area weighted

price per acre comparisons, and (2) by comparison of simple average prices per acre derived from an array of individual sales. This comparison is called not area weighted. Tables with both of these types of data are included in the report.

In order to remove the effect of the general price inflation on the data during the 19-year period, the actual sales prices of property were adjusted to a common dollar base by using the Consumer Price Index (1947-49=100). A full schedule of this index appears in the Appendix. Although actual and adjusted price per acre data are presented in tabular form, most of the remarks will allude to the latter data only.

Volume of Land Sales in the Study and Control Areas

Of all land sales transactions occurring in the study and control areas during the 19-year period, there were 79 study area and 110 control area acreage sales in which the sales prices could be determined. These all proved to be legitimate market sales. (See Table 1.) The volume of sales not used was assumed to be of the same proportion to useable sales in both areas. Of the 79 study area sales, 69 were unimproved and 10 were improved. Of the 110 control area sales, only four were improved. This small number of improved sales prevented the inclusion of this type transaction in the land value analysis.

Figure 2 presents the changes in volume of land sales in each of the areas. The three-year moving average plotted on semilogarithmic paper shows that sales volume increased about 80 percent in the study area and decreased about 55 percent in the control area through the period. The number of sales in this study area is particularly significant in view of the fact that the study area is much smaller in total land area than the control

Table 1
THE NUMBER OF LAND SALES TRANSACTIONS USED IN THE ANALYSIS OF LAND VALUES IN THE TEMPLE STUDY AND CONTROL AREAS, 1943-61

Item	Number of Sales Transactions		Grand Total
	Acreage		
	Unimproved	Improved	
Study Area			
Before Period (1943-48)	16		16
Construction Period (1949-54)	20	2	22
First After Period (1955-57)	10	3	13
Second After Period (1958-61)	23	5	28
Total Study Area Sales	69	10	79
Control Area			
Before Period (1943-48)	55		55
Construction Period (1949-54)	28		28
First After Period (1955-57)	12		12
Second After Period (1958-61)	11	4	11
Total Control Area Sales	106	4	110
Total Sales Analyzed	175	14	189

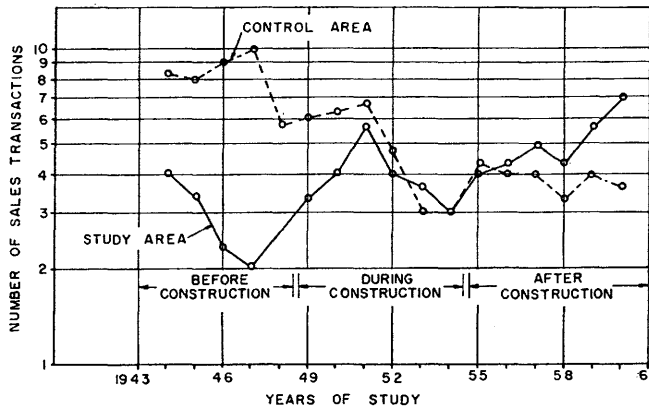


Figure 2. A three-year moving average of annual volume of land sales transactions in the study and control areas, 1943-48.

area. After a post World War II rise and decline, the volume of land sales in the study area increased about 140 percent from 1954-61. For the same period there was only a 20 percent increase in the control area. The new bypass was completed in the study area in early 1955, and is considered to be largely responsible for the increase between 1954-61.

Changes in Land Values in the Study and Control Areas

For an over-all look at the land sales data used in the study and control area land value analysis, Table 2 presents a summary of some of the more pertinent facts. The 79 study area sales represent a total area sold of 2,409 acres. On the other hand, the 110 control area sales add up to a total of 8,814 acres. This is an average size of 31 versus 80 acres per sale for the study and control areas, respectively. The average size control area sale was 2.6 times that of the study area.

Of the total price paid for all transactions in each area, the study area total was 65 percent of the control area total, even though the former had 30 fewer transactions. This put the average price per sale of the study area very close to that of the control area. But the aver-

Table 2
SUMMARY DATA OF LAND SALES TRANSACTIONS OCCURRING IN THE STUDY AND CONTROL AREAS FOR THE 1943-61 PERIOD

Item	AMOUNTS	
	Study Area	Control Area
	Number	Number
Number of Sales Recorded	79	110
Total Area Sold in Acres	2,409	8,814
Number of Acres Per Sale	31	80
Number of Repeat Sales Transactions ¹	15	28
	Dollars	Dollars
Total Price Paid, All Transactions ²	\$609,118	\$866,116
Average Price Paid Per Sale	7,710	7,874
Average Price Per Acre	253	98

¹This does not include those repeat transactions of the same property where improvements were added or removed between the two sales.

²This is the actual total price paid for all transactions.

age price paid per acre for study area land was 2.4 times that of the control area.

The number of repeat sales; that is, two or more sales of the identical tract of land, was greater in the control area than in the study area. Repeat sales as a percent of all sales were also higher in the control area than the study area.

Figure 3 shows the annual average adjusted price per acre paid for land in the study and control areas. A three-year moving average plotted on semilogarithmic paper was used to smooth out the trend line. During the first seven years (1943-49), land prices in both areas were highly comparable, but they diverged greatly during the last 12 years. During the last period, study area prices increased by 2104 percent, while the control area prices decreased by 3.4. The opening of the new facility in early 1955 coincides directly with the spiraling increase in land prices that occurred in the study area. This strongly supports the conclusion that the new highway bypass greatly influenced changes in land values in the area.

Changes in Land Values in the Study and Control Areas by Time Periods

Using the same periods mentioned earlier, changes in land values in the study and control area were measured between each period, especially the before and whole after periods.

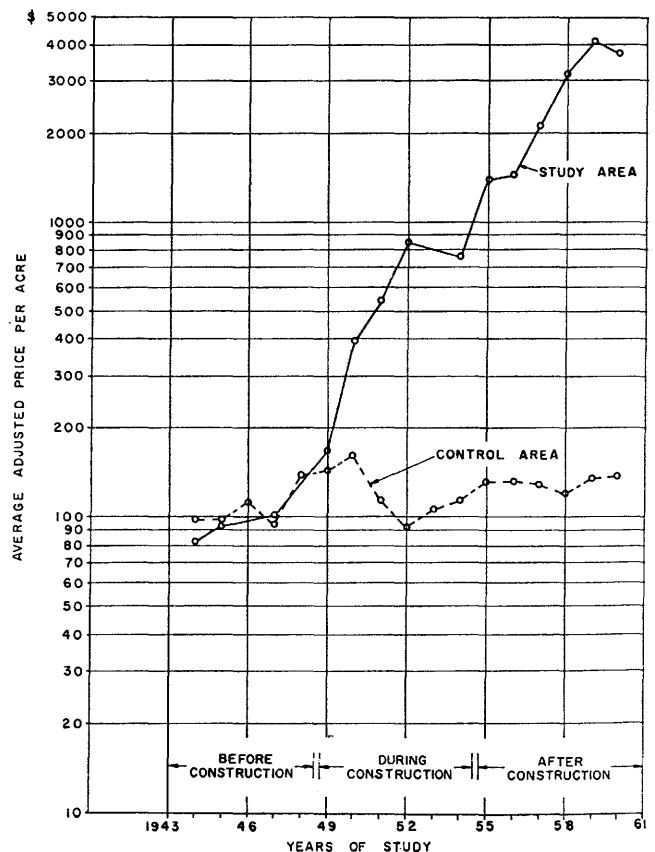


Figure 3. A three-year moving average of the adjusted annual average price per acre of study and control area land transactions.

Tables 3 and 4 show time period analyses based on actual and adjusted data not area weighted. The average price per acre paid for the before period land in the study and control areas was considered fairly comparable, although the statistical tests indicate that the mean prices are significantly different. Ideally, there should be no difference between prices paid during the base period for the study and control area properties. Then the percentage changes between the base period and other periods for each area would be exactly comparable. As it is, the mean price of the control area is seven dollars higher than that of the study area. (See Table 4.) Thus, the same dollar increase in each area between the before and after periods would yield different percentage increases, with that of the study area being slightly higher than that of the control area. On the other hand, equal percentage increases between the before and after periods would yield different dollar increases, with the control area being slightly higher than the study area. A similar explanation is shown in footnotes 4 and 5 under Table 3.

Since the study and control area before period prices are not the same, a combination of the above two measures (based on percentage and dollar changes) is considered a more accurate measure of true change than either one separately. This comparison is shown in the tables by averaging the changes resulting from dollar variance and percentage changes between periods to yield the probable highway influence as a single percentage figure. The dollar influence is then derived by multiplying this percentage answer by the study area be-

fore period price. Again, the procedure is explained in the footnotes 6 and 7 of Table 3.

Table 4 shows that the probable highway bypass influence in the Temple area was 2562 percent or \$2331. This represents a tremendous increase in land value in the study area as opposed to the control area. These figures are based on changes occurring between the before and whole after periods. The magnitude of these changes is dramatically illustrated in Figure 3. On the basis of this comparison there is little doubt that the new highway played a great part in magnifying the difference between land values in the study area before and after construction of the facility.

The table also indicates that during the second after period land prices in the study area almost doubled those of the first after period. This is contrasted to only a slight increase in control area prices between these periods. This means that the new facility's impact on land values has continued to be highly significant during the last after period.

Table 5 presents the changes in land values on an area weighted basis. The adjusted land price changes reflected on this basis are not as spectacular as shown in Tables 3 and 4, although they are still extremely large. By this measure land prices in the study area increased 1202 percent versus only 27 percent in the control. The primary reason for the area weighted comparisons showing a more conservative increase than data not area weighted was the sale of two large tracts during the second after period. Both these sales were made at

Table 3
CHANGES IN THE ACTUAL LAND PRICES OF UNIMPROVED ACREAGE TRACTS IN THE STUDY AND CONTROL AREAS OF TEMPLE, TEXAS

Item	Price per Acre ¹		Difference Between Areas	Percent of Study Area Before Period Price
	Study Area	Control Area		
Before Period (1943-48)	\$ 73 (16)	\$ 82 (55)	\$ 9 ²	
Construction Period (1949-54)	633 (20)	148 (28)	485	
First After Period (1955-57)	1921 (10)	153 (12)	1768	
Second After Period (1958-61)	3548 (23)	182 (11)	3366	
Whole After Period (1955-61)	3055 (33)	167 (23)	2888 ³	
Increase Between Periods Before & Construction				
Dollars	\$ 560	\$ 66	\$ 494	677% ⁴
Percent	767%	80%	687% ⁵	
Construction & Whole After				
Dollars	\$2422	\$ 19	\$2403	
Percent	383%	13%	370% ⁵	
Before & Whole After				
Dollars	\$2982	\$ 85	\$2897	3968% ⁴
Percent	4085%	104%	3981% ⁵	
Probable Highway Influence				
Percent ⁶	3974%			
Dollars ⁷	\$2901			

¹The number of transactions is shown in parentheses.

²The standard error (S.E.) is \$2. This is significant at a confidence level of 99 percent, t is equal to 4.17.

³The S.E. is \$97. This is significant at a confidence level of 99 percent; $t = 29.77$.

⁴This is one way of measuring the amount of highway influence. It is assumed that the study and control areas would have increased in value by the same dollar value in the absence of the new road improvement. That is, both would have increased in value by \$66 or \$85, depending on the periods compared. Following this assumption, if the control area had had a new highway, its gain would have been less percentagewise by this type of measurement than that of the study area.

⁵This is another way of measuring the amount of highway influence. It assumes that such percentage increases would have been the same in the absence of a new highway. That is, both would have increased in value by 80 or 104 percent, depending on the periods compared. Dollar-wise, this would have resulted in a larger increase for the control area than for the study area.

⁶This is the average of the above percentages, 3968 percent (based on dollar increases) and 3981 percent (based on dollar increases or decreases).

⁷This is the average percentage increase due to the new highway times the before period study area price per acre.

Table 4
**CHANGES IN ADJUSTED LAND PRICES OF UNIMPROVED ACREAGE TRACTS IN THE STUDY AND CONTROL AREAS OF TEMPLE, TEXAS
 IN CONSTANT DOLLARS (1947-49=100)**

Item	Price per Acre ¹		Difference Between Areas	Percent of Study Area Before Period Price
	Study Area	Control Area		
Before Period (1943-48)	\$ 91 (16)	\$ 98 (55)	\$ 7 ²	
Construction Period (1949-54)	568 (20)	136 (28)	432	
First After Period (1955-57)	1636 (10)	130 (12)	1506	
Second After Period (1958-61)	2817 (23)	143 (11)	2674	
Whole After Period (1955-61)	2459 (33)	136 (23)	2333 ³	
Increase Between Periods Before & Construction				
Dollars	\$ 478	\$ 38	\$ 448	492% ⁴
Percent	531%	39%	492% ⁵	
Construction & Whole After				
Dollars	\$1891	0	\$1891	
Percent	333%	0	333% ⁵	
Before & Whole After				
Dollars	\$2368	\$ 38	\$2330	2560% ⁴
Percent	2602%	39%	2563% ⁵	
Probable Highway Influence				
Percent ⁶	2562%			
Dollars ⁷	\$2331			

¹The number of transactions is shown in parentheses.

²The S.E. is \$3. This is significant at a confidence level of 99 percent; $t = 2.68$.

³The S.E. is \$84. This is significant at a confidence level of 99 percent; $t = 27.77$.

⁴See footnote 4 of Table 3 for an explanation of this type of measurement.

⁵See footnote 5 of Table 3 for an explanation of this type of measurement.

⁶See footnote 6 of Table 3 for an explanation of this type of measurement.

⁷See footnote 7 of Table 3 for an explanation of this type of measurement.

a price per acre that was considerably smaller than the others selling in that period. The large size of these two sales exerted extreme influence on the over-all average price since all the other sales were under 20 acres in size. Consequently, it is thought that land value changes as shown in Tables 3 and 4 are more representative of actual values in the area than those shown in Table 5.

However, both methods of analysis of land sales offer conclusive evidence that the new highway did greatly influence land value in the study area. Other factors were undoubtedly corollary contributions but to a lesser extent than the new highway. Regardless of the new bypass, Temple probably would have gradually increased in size during the period. This natural growth would have caused some increase in land value in the

Table 5
**CHANGES IN ADJUSTED LAND PRICES OF UNIMPROVED ACREAGE TRACTS IN THE STUDY AND CONTROL AREAS OF TEMPLE, TEXAS, WEIGHTED BY AREA SOLD
 IN CONSTANT DOLLARS (1947-49=100)**

Study Period	Number of Sales	Number of Acres	Adjusted Price/Acre	Price Changes Between Periods	
				Per Acre	Per Acre
STUDY AREA					
Before Period (1943-48)	16	1,508	\$ 61		
Construction Period (1949-54)	20	443	154	\$ 93	152%
First After Period (1955-57)	10	61	923	769	499
Second After Period (1958-61)	23	338	771	-152	-16
Whole After Period (1955-61)	33	400	794	733 ¹	1202 ¹
CONTROL AREA					
Before Period (1943-48)	55	4,864	\$ 84		
Construction Period (1949-54)	28	2,108	113	\$ 29	35%
First After Period (1955-57)	12	1,085	108	-5	-4
Second After Period (1958-61)	11	750	105	-3	-3
Whole After Period (1955-61)	23	1,835	107	23 ¹	27 ¹

¹Changes between the Before Period (1943-48) and the Whole After Period (1955-61) of the Study and Control Areas.

Table 6

CHANGES IN ACTUAL LAND PRICES OF ABUTTING AND NONABUTTING UNIMPROVED ACREAGE TRACTS IN THE STUDY AREA AS COMPARED TO THE CONTROL AREA OF TEMPLE, TEXAS

Item	Price per Acre ¹			Difference Between Areas			Percent of Respective Parts of Study Area's Construction Period Price	
	Study Area Abutting	Study Area Nonabutting	Control Area	Abutting vs. Nonabutting	Abutting vs. Control	Nonabutting vs. Control	Abutting	Nonabutting
Before Period (1943-48) ²	\$ 73 (16)	\$ 73 (16)	\$ 82 (55)	\$	\$	\$ 9		
Construction Period (1949-54)	1,045 (1)	611 (19)	148 (28)	434	897	463		
First After Period (1955-57)	2,096 (9)	350 (1)	153 (12)	1,746	1,943	197		
Second After Period (1958-61)	4,790 (10)	2,591 (13)	182 (11)	2,199	4,608	2,409		
Whole After Period (1955-61) ³	3,514 (19)	2,431 (14)	167 (23)	1,083	3,347	2,264		
Increase Between Periods Before & Whole After								
Dollars	\$3,441	\$2,358	\$ 85	\$1,083	\$3,356	\$2,273	4597% ⁴	3114% ⁴
Percent	4713%	3230%	104%	1483%	4609% ⁵	3126% ⁵		
Probable Highway Influence								
Percent ⁶	4603%	3120%						
Dollars ⁷	\$3,360	\$2,278						

¹Number of transactions is shown in parentheses.

²There were no study area acreage abutting sales in the Before Period (1943-48); however, in this period, abutting land and nonabutting land prices will be considered perfectly correlated for the purposes of this table. That is, the same data gathered for the study area nonabutting acreage will be used for the abutting land category in the Before Period.

³The S.E. of the difference between the means of the study area (abutting) and the study area (nonabutting) is \$231. This is significant at a confidence level of 99 percent—t is equal to 4.68. The S.E. of the difference between the means of the study area (abutting) and the control area is \$128. This is significant at a confidence level of 99 percent; t is equal to 26.14. The S.E. of the difference between the means of the study area (nonabutting) and the control area is \$147. This is significant at a confidence level of 99 percent; t is equal to 15.40.

⁴See footnote 4 of Table 3 for an explanation of this type of measurement.

⁵See footnote 5 of Table 3 for an explanation of this type of measurement.

⁶See footnote 6 of Table 3 for an explanation of this type of measurement.

⁷See footnote 7 of Table 3 for an explanation of this type of measurement.

Table 7

CHANGES IN ADJUSTED LAND PRICES OF ABUTTING AND NONABUTTING UNIMPROVED ACREAGE TRACTS IN THE STUDY AREA AS COMPARED TO THE CONTROL AREA OF TEMPLE, TEXAS
IN CONSTANT DOLLARS (1947-49=100)

Item	Price per Acre ¹			Difference Between Areas			Percent of Respective Parts of Study Area's Construction Period Price	
	Study Area Abutting	Study Area Nonabutting	Control Area	Abutting vs. Nonabutting	Abutting vs. Control	Nonabutting vs. Control	Abutting	Nonabutting
Before Period (1943-48) ²	\$ 91 (16)	\$ 91 (16)	\$ 98 (55)	\$ 0	\$ 7	\$ 7		
Construction Period (1949-54)	921 (1)	549 (19)	136 (28)	372	785	413		
First After Period (1955-57)	1,784 (9)	306 (1)	130 (12)	1,478	1,654	176		
Second After Period (1958-61)	3,779 (10)	2,062 (13)	143 (11)	1,717	3,636	1,919		
Whole After Period (1955-61) ³	2,845 (19)	1,937 (14)	136 (23)	908	2,709	1,801		
Increase Between Periods Before & Whole After								
Dollars	\$2,754	\$1,846	\$ 38	\$ 908	\$ 276	\$1,808	2985% ⁴	1987% ⁴
Percent	3026%	2029%	39%	997%	2987% ⁵	1993% ⁵		
Probable Highway Influence								
Percent ⁶	2986%	1989%						
Dollars ⁷	\$2,717	\$1,810						

¹Number of transactions is shown in parentheses.

²There were no study area acreage abutting sales in the Before Period (1943-43); however, in this period, abutting and nonabutting land prices will be considered perfectly correlated for the purposes of this table. That is, the same data gathered for the study area nonabutting acreage will be used for the abutting land category in the Before Period.

³The S.E. of the difference between the means of the study area (abutting) and the study area (nonabutting) is \$183. This is significant at a confidence level of 99 percent; t is equal to 4.96. The S.E. of the difference between the means of the study area (abutting) and the control area is \$102. This is significant at a confidence level of 99 percent; t is equal to 4.96. The S.E. of the difference between the means of the study area (nonabutting) is \$117. This is significant at a confidence level of 99 percent; t is equal to 15.38.

⁴See footnote 4 of Table 3 for an explanation of this type of measurement.

⁵See footnote 5 of Table 3 for an explanation of this type of measurement.

⁶See footnote 6 of Table 3 for an explanation of this type of measurement.

⁷See footnote 7 of Table 3 for an explanation of this type of measurement.

study area as reflected by control area prices. However, the new highway appears to have speeded up the overall growth of the city and has particularly stimulated growth in that direction, causing large increases in land values. Therefore, adding another four years of data to the after period has not changed the conclusions reached in the original report; rather, it has tended to magnify them.

Changes in Land Values of Abutting and Nonabutting Property

An analysis of the changes in values of abutting land versus nonabutting land was made using all before period sales as a base for both types. Comparisons were made between the before and whole after periods.

Tables 6 and 7 present the actual and adjusted land value changes. Between the before and the whole after period, abutting and nonabutting land values increased

greatly. The former increased more than the latter. In the case of abutting property, significant increases occurred in all periods. But in the case of nonabutting property, most of the increase did not occur until the second after period. This appears to be a logical sequential occurrence. Abutting land should be first to experience the impact of a new highway on land values; then the highway influence spreads to the nonabutting land nearest to the facility.

When comparing the changes of abutting and non-abutting land values in the study area with those of the control area, Table 7 shows that abutting land received a higher probable highway influence than nonabutting land. The area weighted data reported in Table 8 also show that abutting land values increased considerably more than nonabutting land values. Thus, it is apparent that the new facility not only influenced abutting land values more than nonabutting land values but caused both types of land to increase significantly.

Table 8
CHANGES IN THE ADJUSTED LAND PRICES OF ABUTTING AND NONABUTTING UNIMPROVED ACREAGE IN THE STUDY AREA, WEIGHTED BY AREA SOLD IN CONSTANT DOLLARS (1947-49=100)

Study Period	Number of Sales	Number of Acres	Adjusted Price/Acre	Price Changes Between Periods	
				Per Acre	Per Acre
ABUTTING					
Before Period ¹ (1943-48)	16	1,508	\$ 61		
Construction Period (1949-54)	1	2	921	\$ 860	1410%
First After Period (1955-57)	9	60	933	12	1
Second After Period (1958-61)	10	49	2,965	2,032	218
Whole After Period (1955-61)	19	110	1,833	1,772 ²	2905 ²
NONABUTTING					
Before Period (1943-48)	16	1,508	61		
Construction Period (1949-54)	19	441	149	88	146
First After Period (1955-57)	1	1	306	156	104
Second After Period (1958-61)	13	289	398	92	30
Whole After Period (1955-61)	14	290	397	248 ²	166 ²

¹There were no study area acreage abutting sales in the Before Period (1943-48); however, in this period, abutting and nonabutting land prices will be considered perfectly correlated for the purposes of this table. That is, the same data gathered for the study area nonabutting acreage will be used for the abutting land category in the Before Period.

²Changes between the Before Period (1949-54) and the Whole After Period (1955-61).

Land Use Changes

Land use changes reflect to a considerable extent the influence that a new highway has on an area. In order to show the changes in land use in the vicinity of the Temple bypass, the before and after approach was used. The last year before the purchase of rights of way began was 1948, which became the base year. The original report showed the changes that occurred during the 1949-57 period. This study briefly reviews these changes and covers the additional changes occurring during the 1958-61 period.

The determination of the 1948 land use was made through interviewing long time residents in the area, some of which were realtors, who were familiar with the study area in that year. For a determination of the 1957 and 1961 land use changes, visual inspection and interviews with the property owners within the area furnished the necessary information.

A base map (Figure 4C) records the land use as of 1948. The first overlay to the base map (Figure 4B) shows only the changes in land use that have occurred during the 1949-57 period. The second overlay to the basemap (Figure 4A) shows the changes in land use that have occurred during the 1958-61 period.

Eight different land uses were observed in the study area during the whole period studied. They were as follows: (1) agricultural land; (2) land held for future use; (3) rural residential; (4) urban residential; (5) commercial traffic serving; (6) commercial nontraffic serving; (7) industrial; and (8) municipal. A definition of each of these uses is found in the appendix.

Land Use as of 1948

Figure 4C shows that the major portion of the study area land was being used for agricultural purposes in 1948. The soil in the area is rich and fertile. Thus, in the absence of imperative demand for more intensive uses, its highest and best immediate use was in agricultural production.

By 1948 the western boundaries of the city's residential development had reached to the railroad tracks near the eastern limit of the study area. However, the railroad, acting as a physical barrier, prevented development moving to State Highway 36. With the exception of farm houses, only three rural residential tracts were located in the study area in 1948. The absence of rural residences is surprising since several county roads provided adequate (though low level) access throughout the area. Apparently, there were other sites in Temple more desirable for such development prior to 1948.

Also, the majority of the improvement on the farms within this area were below average in both appearance and quality of construction. To some extent, this may have hindered rural and urban residential development in the area. Most people prefer not to live in an area which has unsightly homes, etc.

There was only one additional land use noted in the area in 1948. The American Legion and National Guard each own a tract of land shown on the map as institutional-municipal land. This land has buildings

that are used for the county fairs and other local activities.

The Gulf Coast and Santa Fe Railroad is located at the east boundary line of the study area and has several spurs and switching tracts running into the area. This gave the eastern side of the study area the potential for industrial use, but no firms had located in that area by 1948. A large tract on the east of IH 35 engulfing the spurs and side tracts is owned by the above railroad.

Land Use Changes During the 1949-57 Period

Figure 4B shows only the changes in land use which occurred during the 1949-57 period. A look at this overlay to the basemap indicates that agricultural activities remained the most prevalent land use in the study area. Practically none of the properties that were not abutting the recently constructed bypass route had changed from agricultural use.

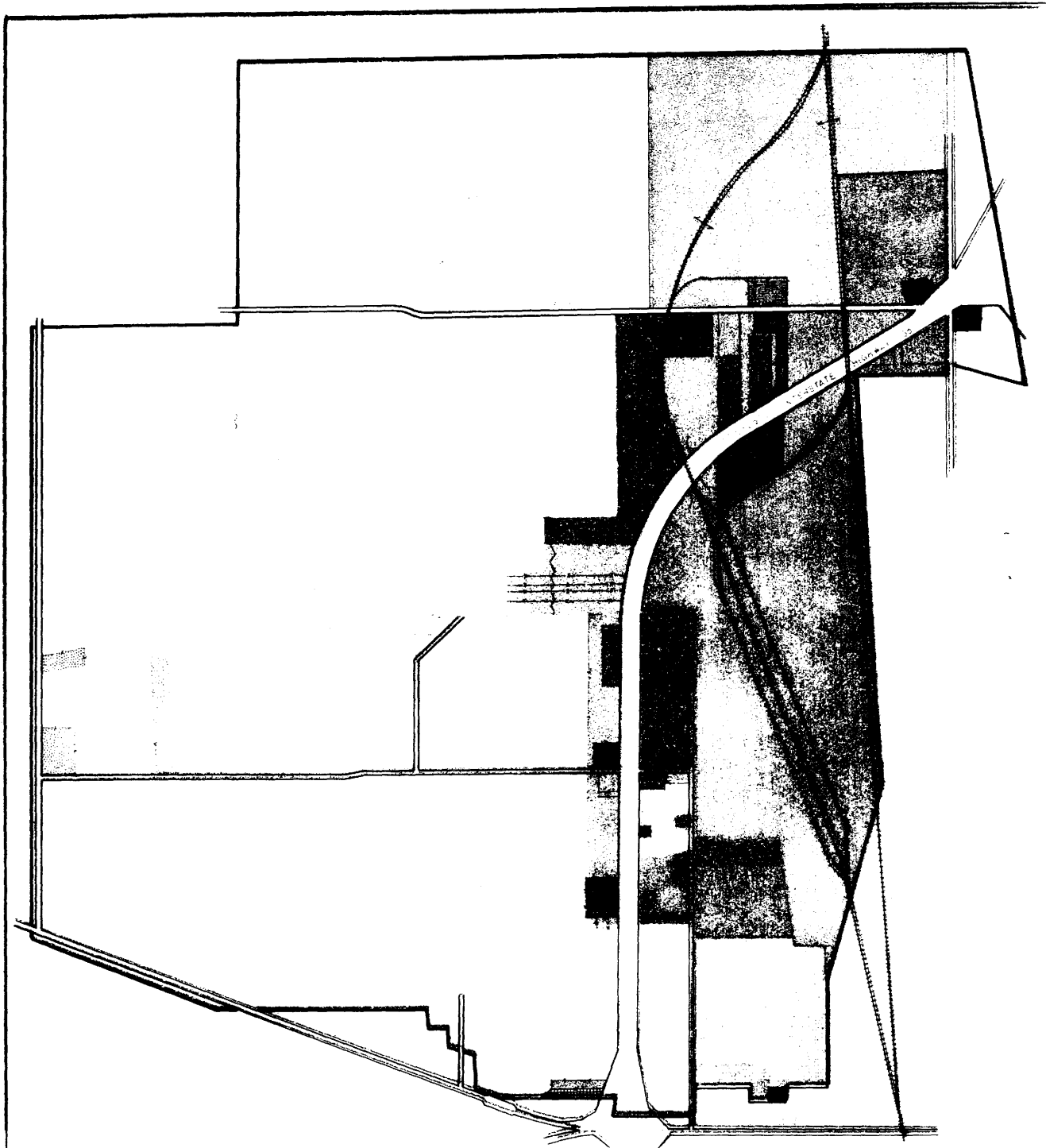
Of the abutting properties which had changed from agricultural use, most were being held for future use. This land was lying idle, with the new owners waiting for further ripening before either developing the properties or selling to other developers. There were several of these tracts lying adjacent to both the new route and the railroad track.

Five tracts, originally in agricultural use, were already in commercial use. Three tracts, all agricultural in 1948, were in industrial use by 1957. They supported four businesses, two light manufacturing firms, and two warehouses. One of these tracts is very large and has frontage on the new highway and a railroad track, making it an ideal location for the firm in operation there.

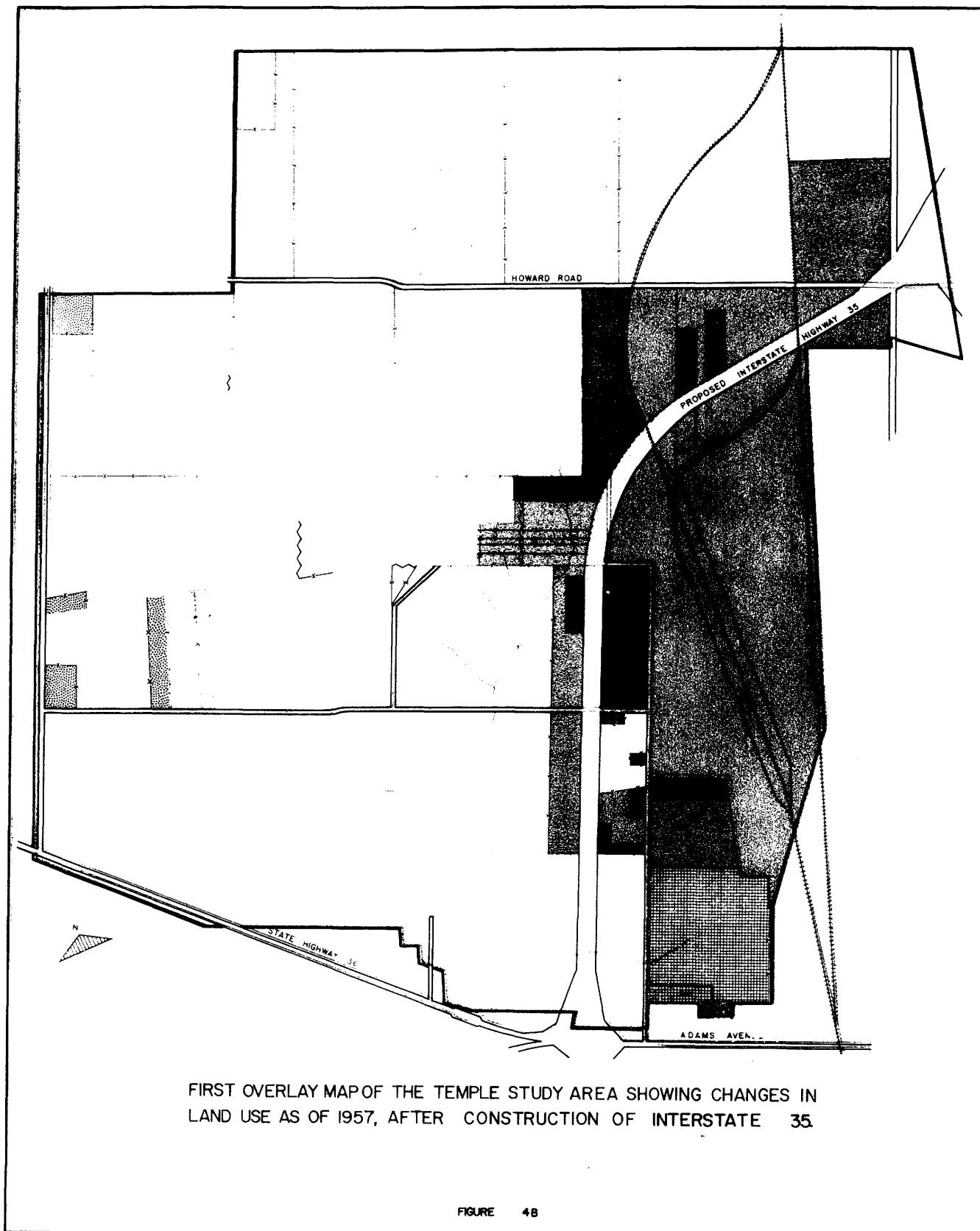
Three new rural residential tracts were located on the nonabutting agricultural land at the extreme western side of the study area. They were located near the other residences that were already in the area in 1948. Four urban residential tracts were also located in the area during this period. One of them abuts the new route. The others abut a side road east of the new facility. This land was agricultural in 1948.

Quite a few property divisions occurred in the area during this period. Most of them were made by the owners of agricultural land selling tracts for other uses. But some were property break-ups from tracts held for future use. There were also a few cases of property consolidation involving agricultural land, wherein one owner would purchase an adjacent tract, thus reducing the total number of properties.

Since the study area encompassed only one interchange (actually a grade crossing) this might explain why there was a relatively small amount of commercial development along the new facility during this early period. Only three retail businesses and one nonretail business were in operation. However, less than three years had elapsed since the new facility was opened for traffic. Another possible explanation for the lack of development in the area is that commercial development had already occurred just south of the study area along a four-lane



SECOND OVERLAY MAP OF THE TEMPLE STUDY AREA SHOWING CHANGES
IN LAND USE AS OF 1961, AFTER CONSTRUCTION OF INTERSTATE 35





THE BASE MAP OF THE TEMPLE STUDY AREA SHOWING LAND USE AS OF 1948, BEFORE CONSTRUCTION OF INTERSTATE 35.

AGRICULTURAL	MUNICIPAL INSTITUTIONAL	URBAN RESIDENTIAL (subdivisions)	COMMERCIAL SERVING TRAFFIC
RURAL RESIDENTIAL	LAND HELD FOR FUTURE USE	INDUSTRIAL MANUFACTURING	COMMERCIAL SERVING NON-TRAFFIC

FIGURE 4C

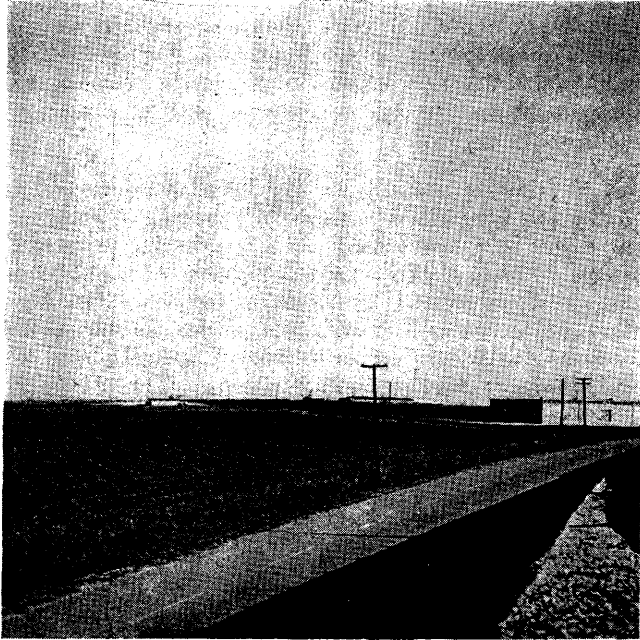
facility which is a part of Interstate Highway 35. That section of old U. S. 81 was improved prior to the construction of the bypass route. Service stations, restaurants, etc., were operating extensively in this area.

Land Use Changes During the 1958-61 Period

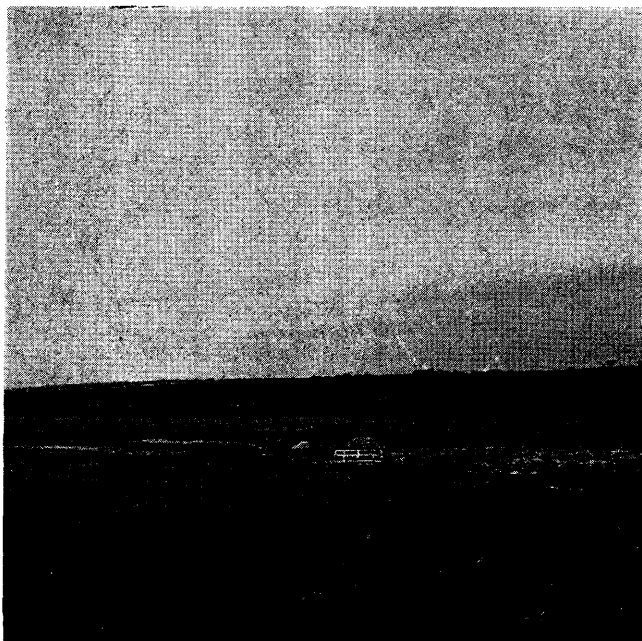
During the next four years considerably more of the study area land increased to higher uses. (See Figure 4A.) There were very few abutting agricultural tracts left. However, there were only a few changes in land use on nonabutting property. Most of these were in the form of additions made to present abutting tracts by purchases of land to the rear.

During this period, tracts in higher uses changed from agricultural and land held for future use. Those changing from the former were as follows: three being held for future use, two for commercial use, two for industrial use, and one for institutional use. Those changing from land held for future use were as follows: three for commercial use and five for industrial use. Six small tracts were sold off a large tract being held for future use. All of these are abutting the new highway. Also, part of a nonabutting residential tract changed to land held for future uses in this period.

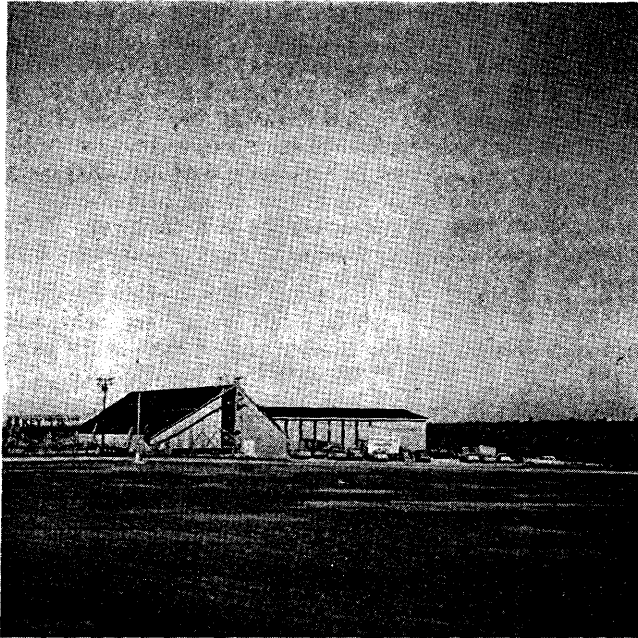
Considering the whole study area, less land area changed uses during the 1958-61 period than in the prior



Several tracts abutting IH 35 and near industrial firms are still undeveloped.



Large and small tracts abutting IH 35 are apparently being held for future use.



A church building is being constructed on previously agricultural land.

1949-57 period. But most of the changes which did take place occurred on property abutting the new highway and moved to higher uses. Consequently, there were



Some manufacturing firms near IH 35 on a crossroad have been constructed on land formerly held for future use.

twice as many firms operating in the area by 1961 as there were in 1957. Of the 16 businesses in operation in 1961, five were commercial traffic serving. This was the case even though only two located at an interchange and competition already existed to a large degree south of the study area.

There are still large tracts abutting the bypass that are available for development. Much of the underdeveloped area in the vicinity of the facility and railroad is highly suitable for industrial development. A look at the land use maps indicates the value which owners of the existing industrial firms placed on the availability of transportation within this area. They wanted direct access to both the highway and railroad. These two facilities are apparently the key to future commercial and industrial development in the study area. Since several industrial firms have already located in the area, there is little doubt that further development will take place in the near future.

Continuing commercial and industrial development of abutting land will encourage the changing of nonabutting land into urban and rural residential properties. Homes located in this area will be close to major shopping facilities located just south on Interstate 35. Also, their occupants will have ready access to the central business district of Temple by way of State Highway 21, which crosses the new facility.



Relationship Between Changes in Land Use and Land Values

A concerted effort was made to determine the relationship existing between changes in land use and land value in the Temple area for the period studied. Theoretically, if some external factor causes land use to change in an area there should be a corresponding change in land value. When land use changes from a less intensive use to more intensive use, the land in question should increase in land value. Since this is a developing area, changes in use moved up from a low use to a higher use. There was not, however, an orderly progression through all succeeding uses. Rather, the use changes were generally made directly from one of the lower use types to a higher one.

In order to relate land value changes to land use changes, 79 property sales transactions were studied. They included both undeveloped and improved properties. In each case, a determination was made as to the land use of the tract before and after it sold. The land use changes, as reflected by these properties that sold at least once during the period, complement the section on changes in land use that dealt with a shorter time period.

Land Use Before and After Sale

The analysis shows three different relationships between land use and land value (prices) by time periods. These periods are the same as those used in the land value analysis. First, the sales were grouped according to their use before they sold to show the differences in prices between periods for the various original uses. Secondly, the sales were grouped according to their use after they sold to show the differences in prices between time periods for the various uses. And finally, the sales were grouped according to specific uses to show the differences in prices when the properties change from a specific use to another specific use.

Table 10
TRENDS IN THE AVERAGE ADJUSTED PRICE PER ACRE OF PROPERTIES SELLING IN THE STUDY AREA RELATED TO GENERAL LAND USE CHANGES, BY TIME PERIOD
IN CONSTANT DOLLARS (1947-49=100)

Land Use Changes ¹	Average Adjusted Price Per Acre			
	Period 1 (1943-48)	Period 2 (1949-54)	Period 3 (1955-57)	Period 4 (1958-61)
Agricultural				
From All Uses	\$ 70	\$ 111	\$	\$ 97
To All Uses	73	437	1,611	3,288
Land Held for Future Use				
From All Uses		706	1,494	3,041
To All Uses	172	765	1,647	2,402
Rural Residential				
From All Uses	103	903	1,552	800
To All Uses		1,286	1,876	761
Commercial Traffic & Nontraffic				
Serving and Industrial			2,016	2,986
From All Uses				
To All Uses				
Institutional or Municipal				
From All Uses	172			3,491
To All Uses				

¹Change in land use before or after sale of property, which ever is appropriate.

Tables 9 and 10 show the land value and land use relationships as outlined above. Although more sales were needed in some of the groupings to complete the picture, there were enough sales to give a general indication of the land value and land use relationship. These sales tended to confirm the above assumptions.

Table 9
TRENDS IN THE AVERAGE ADJUSTED PRICE PER ACRE OF PROPERTIES SELLING IN THE STUDY AREA RELATED TO SPECIFIC LAND USE CHANGES, BY TIME PERIOD
IN CONSTANT DOLLARS (1947-49=100)

Land Use Changes ¹	Average Adjusted Price Per Acre			
	Period 1 (1943-48)	Period 2 (1949-54)	Period 3 (1955-57)	Period 4 (1958-61)
Agricultural				
To Agricultural	\$ 70	\$ 111	\$	\$ 97
To Land Held for Future Use		470	2,990	2,333
To Rural Residential	103	749		
To Commercial Traffic Serving				7,050
To Commercial Nontraffic Serving			1,537	8,240
To Municipal or Institutional				3,491
Land Held for Future Use				
To Land Held for Future Use		765	995	4,457
To Rural Residential				997
To Commercial Traffic Serving			2,153	
To Commercial Nontraffic Serving			1,664	5,951
To Industrial			3,062	1,052
To Municipal or Institutional	172			
Rural Residential				
To Rural Residential		1,286	1,967	761
Institutional or Municipal				
To Commercial Nontraffic Serving				2,648

¹Land use before and after sale of property.

In conclusion, perhaps the most significant observation that can be drawn from the above analysis is that the prices of land succeeding to higher uses advanced materially within and between the time periods studied. The new highway was a significant influence in this advance, since it provided the potential for development of commercial and industrial businesses in the study area. It was the essential ingredient placed in the area to entice agricultural land to change to such uses. The addition of an extra four years of data to this study area

shows that land in the area is succeeding to higher uses at an accelerated rate and price. Some of this land has moved directly from agricultural to commercial use, although a large part passed through the hands of speculators or developers en route. There is still much agricultural land available for higher uses in the study area; however, most of it is not as ideally located in relation to the new facility as the land which already has changed to higher uses.

Changes in Business Activity

As new Interstate Highways bypass towns and cities, they cause considerable economic impact upon business activity within a local area. A routing change of the facility, causing the removal of the transit traffic from the old route through the town may benefit certain old route retail businesses while disbenefiting others. At the same time, the new route usually provides additional high quality sites for commercial businesses and industry. Total benefit then must be evaluated in terms of the net change that is brought about along both routes.

The new facility in Temple has now been open to traffic for seven years. This restudy, covering the four additional years 1958-61, permits a better analysis of the longer-term effects of the bypass on business activity in the area than could be determined in the original study. The firms along the old route have had more time to make adjustments in their operations in order to meet the particular demands of the area. Changes in types of businesses have had time to occur. For instance, a restaurant may have changed to a grocery store, or a number of small businesses could have been replaced by a new shopping center. Some may even have moved to other locations in town or along the new route.

In analyzing the effects of the bypass on retail businesses, consideration should be given to the attitudes and reactions of owners and managers of the businesses involved. Businesses, even within the same class, will be affected differently, and some operators will react differently in an attempt to adjust to the changing conditions. This usually results in a mixture of benefits and disbenefits which must be carefully analyzed before conclusions can be drawn. The shift of transit traffic from the old route could cause a shift in gross sales from other areas of the town to businesses located along the old route. A shift of this type is more likely to occur within the group of nontraffic serving businesses than in the traffic serving group. Other studies indicate that local residents of an area have more freedom to travel along the less congested old route after being bypassed. This definitely has an influence on residents' in-town travel and shopping habits. Since the nontraffic serving businesses depend primarily on sales to local residents, the ease of access to their establishments may be a definite benefit to their operations. In contrast, traffic serving businesses are more likely to experience a considerable reduction in gross sales, since they are partially dependent on transients for trade.

The scope of this study includes all retail businesses located along both the old and new routes. These businesses have been broadly segregated into traffic serving and nontraffic serving groups. Additional classifications were made within each of the two broad groups. These more detailed groupings include separate treatment of service stations, motels, and restaurants that make up the broad traffic serving group. In the case of non-traffic serving businesses, only grocery stores were grouped separately because of so few businesses of each type.

Since there are only a few retail businesses located along the new route, their gross dollar sales are grouped

with like businesses on the old route in the major part of this analysis. In evaluating the business activity on each route, a comparison was made of the total gross dollar sales of all businesses.

The analysis of individual businesses (outside the groups) was largely confined to determining the reasons for changes in business activity. This was done primarily in order to distinguish between changes, if any, occurring during the study period which were due to the influence of the new facility and those which were due to management or other internal conditions. The data collected to substantiate these determinations are not presented on all firms in detail in this report for obvious reasons. See the Appendix for more details regarding the procedures used in the business analysis.

The two areas of study are shown in Figure 5. For the new route, the study area begins at the intersection of State Highway 36 and continues to the intersection with North Third Street (old U. S. 81) on the north side of the city. All businesses abutting this route which are located within the bounds of the study area were considered new route businesses. As for the old route, only those businesses abutting that route were considered to be in the study area. Beginning on the south side of the city, the old route proceeds east along Avenue H from its

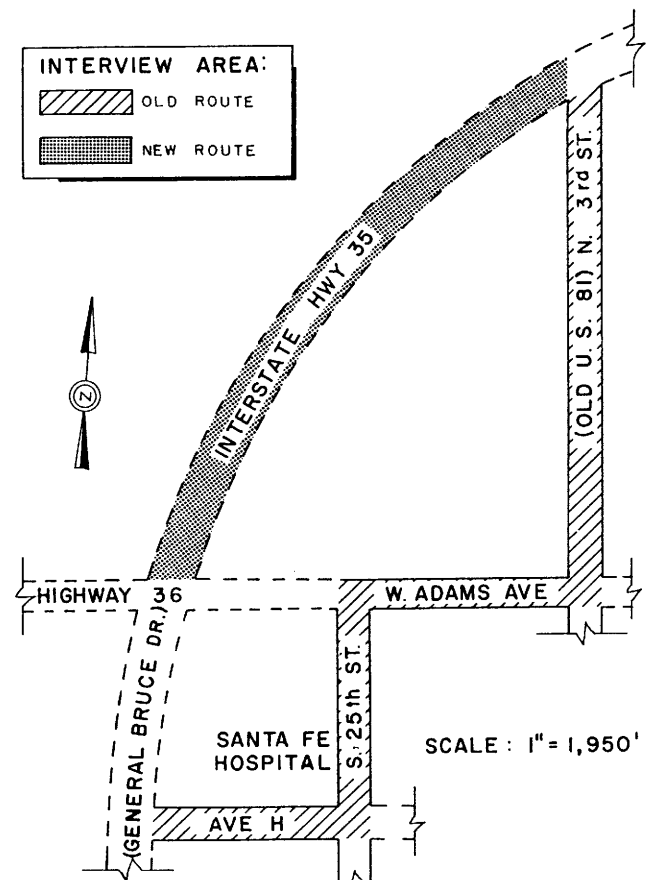


Figure 5. Old and new route business study areas.

intersection with General Bruce Drive to South 25th Street, thence north along South 25th Street to its intersection with West Adams Avenue, thence east along West Adams Avenue to its intersection with North Third Street, and thence north along North Third Street to General Bruce Drive on the north side of town.

The section of the new route between General Bruce Drive and State Highway 21 was not studied because it was constructed at an earlier date and is not up to interstate standards.

Using the before and after method of analysis, 1954 represented the last full year in which businesses operated with all through traffic traveling on the old route. Thus, it was selected as the base period year. Then 1957 was selected as the after period year for the study which was covered in the original report. This restudy uses 1961 for the final after period year.

The data for 1954 and 1957 were gathered from the businesses through personal interviews in 1958. The data for 1961 were again gathered by personal interviews in 1962.

To obtain information concerning the general economy of the city, other interviews were conducted with city officials and secondary data were obtained from several additional sources.

One economic indicator that was used in the first report and again here is the changes in number of military and civilian personnel employed at Fort Hood, a U. S. Army facility located about 20 miles west of Temple. It was thought that the changes in activity at this military base would have an influence on retail sales, since Temple is a larger city with more complete shopping facilities than the closer but smaller towns of Killeen and Belton. Over the eight-year period, manpower at the post has fluctuated as shown below:

Year	Military	Civilian	Total	Percent Change from 1954
1954	21,820	1,759	23,579	
1957	17,385	1,882	19,267	-18
1962*	40,000	2,217	42,217	+79

*Reported manpower at the beginning of 1962.

At the time of the first Temple report, the base had experienced a drop of 18 percent in manpower from 1954. This decline was considered an important factor in the decrease in sales of some of Temple's retail businesses over the same period. Between 1954 and 1962, however, the base has shown an increase of 79 percent in manpower. This has undoubtedly stimulated the recovery in sales throughout the Fort Hood trade area.

Since some businesses on the old route received a considerable amount of business from transient customers, it was also considered advisable to obtain daily traffic volume data along both the new and old routes in an effort to compare the effect of the new route on traffic volume along the old route between 1954-61. Thus, average daily traffic volumes were obtained for specific locations on both routes from the Highway Planning Survey Division of the Texas Highway Department.

Traffic counts along each route and the combined totals are shown below:

Year	Old Route* ADT	New Route** ADT	Total ADT
1954	6,550	Under Construction	6,550
1955	3,190	3,570	6,760
1956	3,650	4,000	7,650
1957	3,200	4,360	7,560
1958	3,410	4,410	7,820
1959	3,910	4,750	8,660
1960	Not Available	Not Available	
1961	4,590	5,850	10,440

*Traffic count made on North Third Street near its intersection with new Interstate route to the north of Temple.

**Traffic count made on loop around Temple.

After the bypass was opened, the traffic on the old route was cut approximately in half. Since that time, traffic on the old route has been gradually building back until its 1961 ADT was less than 2,000 short of the 1954 traffic level. At the same time, traffic on the bypass has increased at an even faster rate, until its 1961 ADT was only 700 less than the old route traffic in 1954. In fact, the combined travel on both routes in 1961 almost doubled that of 1954.

During 1961, the Texas Highway Department made traffic counts at other points in Temple, and those ADT traffic volumes are shown in Figure 6. A significant point brought out in the 1961 traffic count is the 12,540 average daily traffic on West Adams Street. There

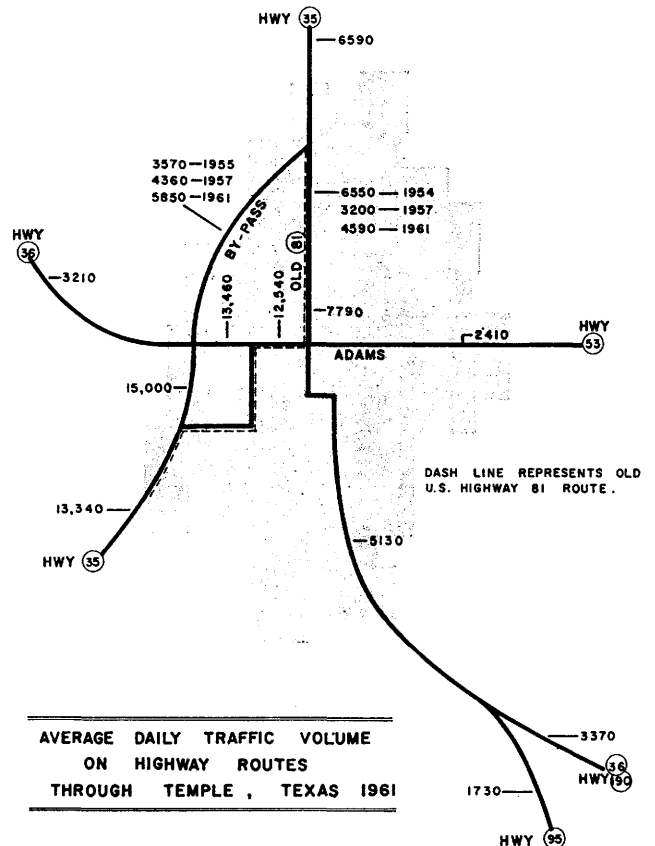


Figure 6. Average daily traffic volume on highway routes through Temple, Texas, 1961.

were no traffic data available on this section prior to 1961 so no comparison can be made. This section of the old route carries traffic for Highway 36 going east and west through Temple and is the main route for traffic entering the city from the southwest off the Interstate Highway. Along this section of the old route, business activity has shown a substantial increase since 1957.

Business Inventory

In 1958 an attempt was made to compile an accurate inventory of all business establishments which were located along both the old and new routes at the end of 1954

and 1957. With businesses changing locations, managers, and types of activity, and some business failures, it was impossible to obtain a completely accurate inventory for 1954. However, an acceptable estimate was developed, and specific inventories were made for 1957 and 1961.

From the above inventories, it was found that at the end of 1954 there were 95 businesses of all types in operation along the old route. There were 97 at the end of 1957 and 107 at the end of 1961. (See Table 11.) The new route had six businesses in operation at the end of 1957 and the number had increased to 14 by



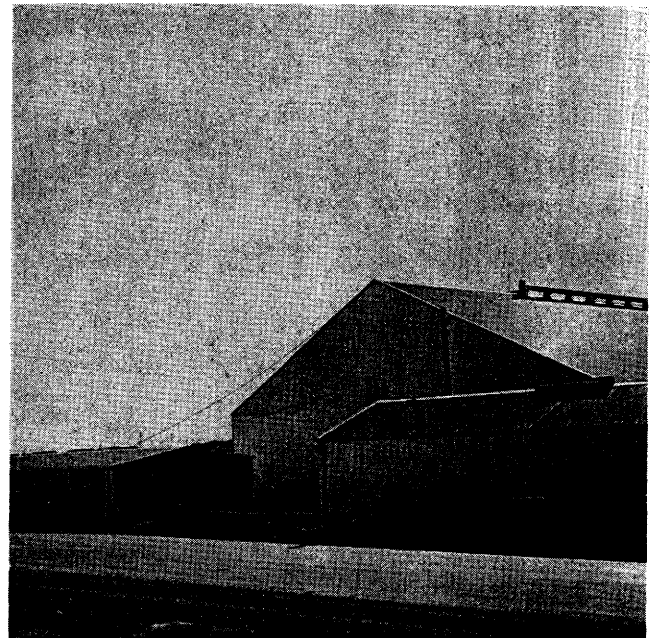
Storage and Transfer Firm



Manufacturing Firm



Grain Storage Firm



Processing Firm

Typical nonretail businesses abutting IH 35 in the study area.

the end of 1961. These totals include only those firms that were in operation at the end of each of the respective years. Therefore, it does not reflect fluctuations in numbers within the year, nor does it assure that the inventoried firms had been in operation for a full year. A firm may have been in operation for only one month or it may have been open for the first 11 months of the year and then have been closed at the time the inventory was made. The inventory does indicate the amount of general business activity along both the old and new routes during the years studied, and provides an insight into changes in number of business establishments for each of the routes between those years.

The inventory also reveals that between 1954 and 1957 there were 14 new firms located along both of the routes while seven businesses were closed. Then, between 1957 and the end of 1961, 37 new businesses were opened while 19 firms went out of business. Some of the new businesses actually moved into an old building that had been vacated by another type of firm. A firm was classified as a new business if its operation was different from the previous business as defined by the Standard Industrial Classification system.

One of the most significant points that the inventory revealed is the increase in the number of nonretail establishments that had been located along both study routes by 1961. Along the new route, this group includes such firms as warehouses, wholesale distributors, manufacturing concerns, grain storage facilities, a poultry hatchery,

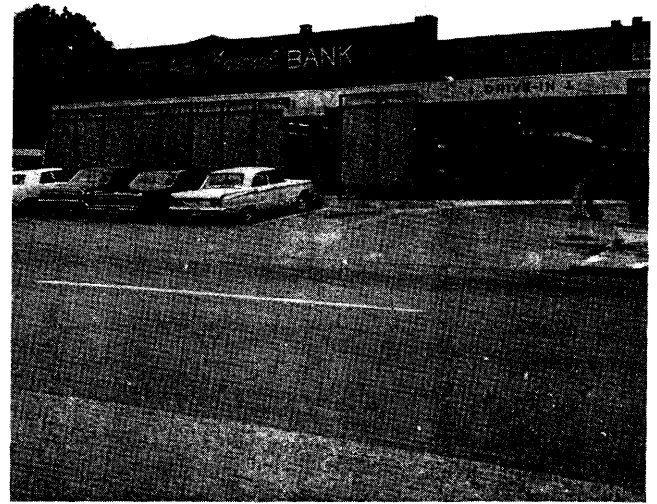
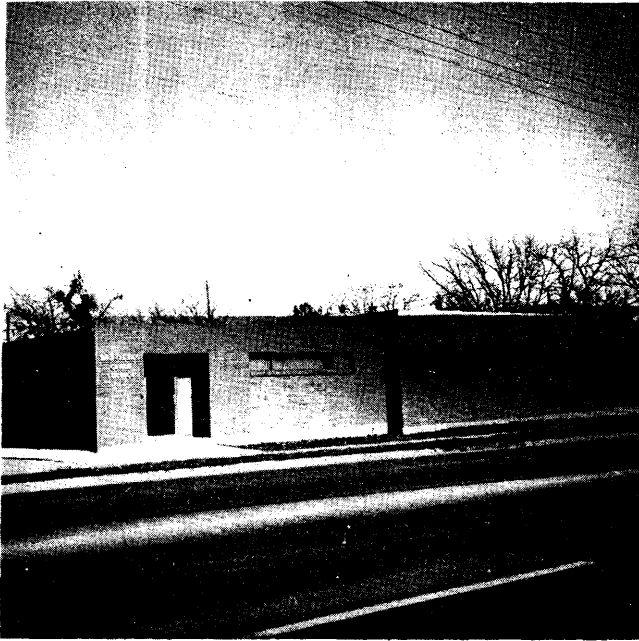
and a livestock auction. Along the old route, the new firms consisted primarily of insurance companies, small wholesalers, law offices, and a bank. The old route had nine nonretail businesses in 1954, 10 in 1957, and 16 in 1961. The new route had one nonretail firm in 1954, four in 1957, and eight in 1961. Between 1954 and 1961, then, the increase in the number of nonretail businesses along the bypass route was the same as that along the old route, but the establishments were of an industrial nature and much larger than those on the old route. Therefore, the eight firms in operation along the new route with a larger combined payroll than the 16 firms located along the old route probably exerted a stronger impact on the economy of the area. The presence of the new highway influenced most of these firms in their location. Even a greater number of firms probably would have located along IH 35 in the study area, if it had not been for the prior large scale commercial development along the older section of the new route to the south. Also, the presence of these firms on the new route indicates the importance of such a facility to the development of local industry.

Table 11 shows the number of retail businesses in operation along each route at the end of the years studied. It further shows the breakdown of retail businesses into traffic and nontraffic serving groups.

The section of the old route along West Adams Street has undergone a major face lifting since 1957. It has shown a greater change than any other segment of

Table 11
THE NUMBER OF BUSINESSES IN OPERATION WITHIN THE TEMPLE STUDY AREA AT THE END OF 1954, 1957, AND 1961

Type of Business	Number of Businesses						
	Open at End of 1954	New Before End of 1957	Closed Before End of 1957	Open at End of 1957	New After 1957	Closed Before End of 1961	Open at End of 1961
Old Route							
Motels	5	0	0	5	0	0	5
Service Stations	18	5	4	19	2	4	17
Food Service Establishments	13		1	12	3	1	14
Total Traffic Serving Retail	36	5	5	36	5	5	36
Grocery Stores	12	1		13	2	3	12
Other Retail	38	2	2	38	14	9	43
Total Nontraffic Serving Retail	50	3	2	51	16	12	55
Total Traffic and Nontraffic Serving Retail	86	8	7	87	21	17	91
Total Nonretail	9	1		10	6		16
Total Old Route	95	9	7	97	27	17	107
New Route							
Total Traffic Serving Retail	0	1		1	4	0	5
Total Nontraffic Serving Retail	0	1		1	1	1	1
Total Traffic and Nontraffic Serving Retail	0	2	0	2	5	1	6
Total Nonretail	1	3		4	5	1	8
Total New Route	1	5	0	6	10	2	14
Both Routes							
Total Traffic Serving Retail	36	6	5	37	9	5	41
Total Nontraffic Serving Retail	50	4	2	52	17	13	56
Total Traffic and Nontraffic Serving Retail	86	10	7	89	26	18	97
Total Nonretail	10	4	0	14	11	1	24
Total Both Routes	96	14	7	103	37	19	121



New buildings housing nonretail firms have been constructed on the old route during the after period.

the old route. A number of small buildings have been removed and larger structures built. In some cases, traffic serving businesses were replaced by firms of the nontraffic serving nature while at other locations, principally at corners, nontraffic serving businesses were replaced by firms in the traffic serving group. For example, three new shopping centers have located along this section of the old route since 1957. One is rather small, consisting of only two firms.

Firms along North Third Street appeared to have stabilized by 1961, but some did go through an adjustment period after being bypassed. Also, some new businesses were opened for operation, one being a discount house. On the other hand, firms along South 25th Street have not recovered and a number of traffic serving

businesses (mainly service stations) have been closed for two or three years.

Business Interviewed

All business establishments located along the old route of U. S. 81 through Temple and those located along the new route were interviewed in the summer of 1962. All retail firms were interviewed, even though they refused to cooperate in 1958.

In the first interview (1958) there were 89 retail businesses along the old route of U. S. 81, and complete data were gathered from 45 firms of 1954, and 54 firms for 1957. In 18 cases, however, interviews proved unsuccessful due to the uncooperativeness of the owner or the lack of sufficient data. Another eight firms co-

Table 12
CHANGES IN BUSINESS VOLUMES OF 13 SERVICE STATIONS LOCATED IN THE TEMPLE STUDY AREA BETWEEN THE SELECTED YEARS

Group 1 Stations Firm No.	DOLLAR SALES			CHANGES BETWEEN YEARS		
	1954	1957	1961	1954- 1957	1957- 1961	1954- 1961
1	\$140,900	\$ 72,300	\$ 65,678	- 48.7%	- 9.2%	- 53.4%
2	81,000	40,800	78,600	- 49.6	+ 92.6	- 3.0
3	97,500	81,000	81,000	- 16.9		- 16.9
5	45,000	36,000	35,000	- 20.0	- 2.8	- 22.2
6	108,000	54,000	57,000	- 50.0	+ 3.6	- 47.2
7	25,000	76,000	77,000	+204.0	+ 1.3	+208.0
8	35,000	37,000	49,470	+ 5.7	+ 33.7	+ 41.3
9	45,000	43,000	35,000	+ 4.4	- 18.6	- 22.2
11	25,000	16,600	15,000 ¹	- 33.6	- 9.6	- 40.0
12	72,000	89,000	92,000	+ 23.6	+ 3.4	+ 27.8
13	103,000	73,000	85,000	- 29.1	+ 16.4	- 17.5
16	41,735*	26,655*	22,500	- 36.1	- 15.6	- 46.1
19	52,875*	6,590*	24,700	- 87.5	+274.8	- 53.3
Sub-total	\$872,010	\$651,945	\$717,948	- 25.2%	+ 10.1%	- 17.7%

¹Ten months' sales.

*Estimate of sales based on volumes of gasoline sold, using the average dollar return per gallon of gasoline for each year of stations reporting both gallons and sales.

operated in the interview but only furnished general information such as history of the business, condition of the building, etc. No gross sales data were gathered from these businesses.

By 1962, the total number of retail firms along the old route had increased to 97. Of these, 57 firms furnished complete data on their 1961 operations. The others either refused to cooperate or the present or former operators could not be contacted. In a few cases, firms that had refused to furnish information for the first study did so in 1962. Others that furnished information in 1958 refused to do so in 1962. However, enough businesses cooperated in this restudy to produce accurate conclusions concerning the impact of the new route on the study area businesses.

Traffic Serving Retail Businesses

Traffic serving retail businesses, as defined in both reports, are service stations, motels, and food service establishments. These businesses were analyzed separately from the other retail businesses because they usually receive a significant amount of business from available through traffic.

The tables for each of the above types of businesses show gross dollar sales for the year studied and the percent changes between these years. The reason for the difference in number of businesses of each type between each year studied is due to the opening and/or closing of businesses.

OLD AND NEW ROUTE SERVICE STATIONS

In 1954, there were 18 old route service stations in operation. By 1957 23 were in operation, but this number had been reduced to 18 by 1961. In addition, however, one new route station was placed in operation after the new highway opened. These stations were divided into three groups for analysis. Group 1 includes those stations which were in operation for at least some period

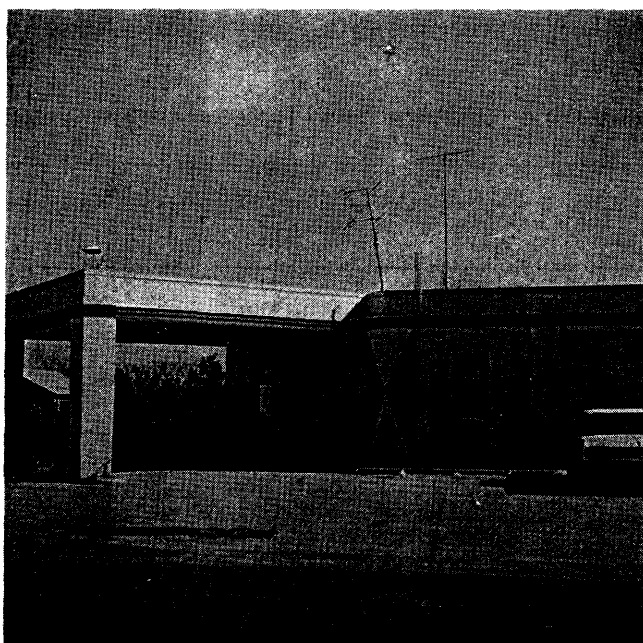


Table 13
CHANGES IN BUSINESS VOLUMES OF SEVEN SERVICE STATIONS LOCATED IN THE TEMPLE STUDY AREA THAT WERE OUT OF BUSINESS IN 1961

Group 2 Stations	DOLLAR SALES		Changes Between 1954 and 1957
	1954	1957	
Firm No.			
4	\$ 27,000	\$14,000	-48.1%
10	72,000	12,000	-83.3
14	31,050*	25,770	-17.0
22	2,445	525* ¹	-78.5
23	31,980*	3,483 ¹	-89.1
20	Not open	13,420* ²	NA
21	Not open	7,163* ³	NA
TOTAL	\$164,475	\$76,361	-53.6%

¹Four months' sales.

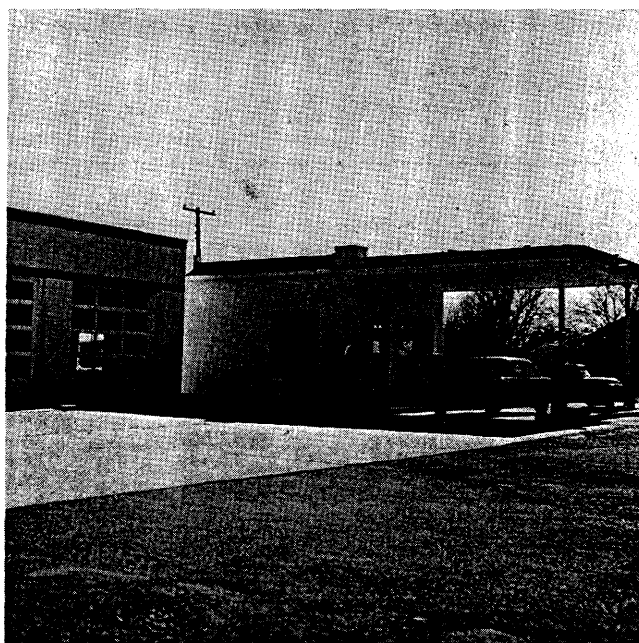
²Seven months' sales.

³Five months' sales.

*Estimate of sales based on volumes of gasoline sold, using the average dollar return per gallon of gasoline for each year of stations reporting both gallons and sales.

during each of the years studied. Group 2 includes those in operation only during one or both 1954 and 1957 with all closed in 1961, and Group 3 includes those in operation only during one or both 1957 and 1961, with all not open in 1954.

There were 13 stations that operated throughout the entire study period. Between 1954 and 1957, these 13 stations in Group 1 (Table 12) experienced a 25.2 percent decline in gross dollar sales. But during the last period, 1957-61, sales increased 10.1 percent. This shows that the sales of these stations were affected significantly by the opening of the new highway which diverted some the north- and south-bound through traffic. As was noted earlier, the average daily traffic volume was reduced by 50.8 percent.



Two of the old route service stations which closed in the after period.

The increase in the last period (1957-61) dollar volume reduced the net losses between the 1954-61 period to 17.7 percent of the 1954 base. This is still a significant over-all loss in sales, since it represents a decline in the average dollar volume per station from \$67,078 in 1954 to \$55,227 in 1961. However, it is significant that the average age of all these businesses was 22.6 years. This indicates that some of the loss may have been attributable to deterioration of plant, particularly since new competing stations were being built within the vicinity. The fact that there were no changes in management of nine of these businesses during the last six years of the study period indicates that this group of businesses had fairly stable managements in spite of the new highway and the age of the business. Consequently, it is not believed that managerial instability was a factor in the loss of sales.

Table 13 presents the gross sales of Group 2 stations which operated only during 1954 and 1957. Actual gross sales were obtained from five of these stations for one or both years of operation. Three were closed part of 1957. The 1954 or 1957 dollar volumes for some of the stations were estimated, based on the volume of gasoline sold during that year. The average dollar return per gallon of gasoline sold each year for the stations reporting both dollar and gallonage sales was multiplied by the gallonage of the nonreporting stations. The gallonages were obtained from the respective oil companies' records. Table 13 shows that these seven stations experienced a 53.6 percent decline in gross sales between 1954 and 1957. It was expected that this group would experience a greater decline than the Group 1 stations, since most of them were marginal operations and were operating in antiquated buildings. The average size of their sales volumes indicates that they were marginal stations and most would probably have had to close regardless of the bypass route. The loss of through traffic trade probably caused them to close sooner.

Table 14 presents the Group 3 stations, none of which were in operation during 1954. Two of these

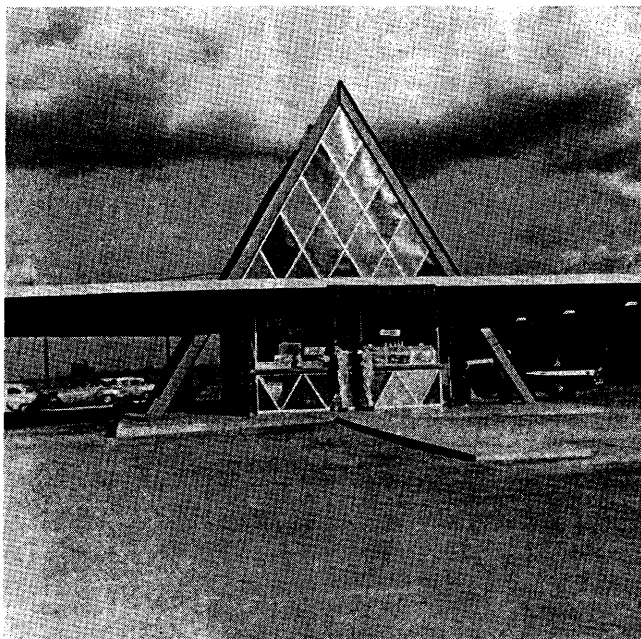


Table 14
CHANGES IN BUSINESS VOLUMES OF SIX SERVICE STATIONS THAT BEGAN OPERATIONS IN THE TEMPLE AREA AFTER 1954

Group 3 Stations Firm No.	DOLLAR SALES		Changes Between 1957 and 1961
	1957	1961	
15	\$ 86,000	\$ 48,345	-43.8%
17	41,750*	39,526	- 5.3
18	71,000	67,800	- 4.5
26	17,625	24,475	+38.9
24	Not open	151,665	NA
25	Not open	22,636	NA
TOTAL	\$216,375	\$354,447	+63.8%

*Estimate of sales based on volumes of gasoline sold, using the average dollar return per gallon of gasoline for each year of stations reporting both gallons and sales.

stations were in business only during 1961. All but one of these stations reported actual gross sales, with the other one giving data for one year. The sales of the other years were estimated. This group of stations, some in new buildings, show a 63.8 percent increase in sales between 1957 and 1961. One is a new route station. The two stations opening in the last period are really responsible for the over-all increase in sales since the percentages of the individual stations reveal that three had a decline in sales between 1957 and 1961. However, the entry of the two new stations may have reduced the volumes of the other stations already in operation.

It is significant that for every old route station which went out of business between 1954 and 1961 a new one took its place, except for two businesses which opened and closed during 1957. There were three genuine service station entries on the old route before 1957 and two after 1957 which replaced the five which closed after being in operation several years. Three of these old businesses which closed were 22, 28, and 30



New traffic serving businesses located on the old route in the after period.

years of age. There is strong evidence to support the contention that these old stations could not compete with the new ones, since the 1957 dollar volume of the three new entries was over three and one half times that of the three old stations that remained open all of 1957.

Therefore, the performance of all three groups of service stations through the whole study period is not nearly so bad as that depicted by Groups 1 and 2 above. Even without the volume of the one new route station in Group 3, the total 1961 dollar volume of 18 stations is greater than that of 18 in 1954. Table 15 shows the changes in business volumes of all service stations in the area, both old and new route. Between 1954 and 1957, the volume declined 8.8 percent but increased 13.5 percent between 1957 and 1961. Thus the volume gained in the last period more than offset the loss of the first period to leave a net gain of 3.5 percent between 1954 and 1961.

Actual gasoline gallonage information on all the stations showed a decline of 8.6 percent in gasoline sales between 1954 and 1957, an increase of 11.6 percent between 1957 and 1961, and an increase of two percent between 1954 and 1961. These indicate that dollar gallonage volumes changed about the same, percentagewise, between the respective periods.

The figures presented above indicate that something caused a decline in service station sales. The most important factor seems to be the removal of through traffic from the old route. Another factor which may have had a depressing influence on this group of businesses was the 18 percent reduction in the number of military employees based at Fort Hood between 1954 and 1957.

The improvement in the service station business volumes between 1957 and 1961 was probably due to several factors. The primary factor is considered to be the continued economic growth of the city as reflected by increases in population, employment, etc. New industries located along the new highway helped to increase the over-all employment in the city. An additional 22,000 military and civilian employees located at Fort Hood in 1961 over 1957 should have had quite a stimulating effect on the service station business volumes in Temple. Many of these employees live in Temple. Others living elsewhere shop in Temple.

It is interesting to note which section of the old route was most adversely affected by the removal of through traffic from the standpoint of service station business. Service stations on South 25th Street, the most southern segment of the old route (shown in Figure 5) suffered a greater loss in sales than the other two sections. The amount of through traffic available to

these stations after the new bypass was opened approached zero. The other two sections, West Adams and North Third Streets, continued to have some through traffic generated from other highways entering Temple from the east and southeast. The section of old U. S. 81 on West Adams benefitted the most from continued through traffic. In fact, three of the new stations were located there after the new highway was opened. Gross dollar sales of these stations more than doubled between 1954 and 1957, and the gallonage volume increased by 89 percent. Only one station closed in that section, whereas three closed on each of South 25th and North 3rd Streets.

Between 1954 and 1957 the service stations on the old route reduced their hours of operation by an average of four hours per day. This was probably a reaction to the loss in trade during that period. As volume increased between 1957 and 1961 the stations again increased their hours of operation by one-half hour per day over the 1957 average. Thus, the net decrease in the number of hours of operation between 1954 and 1961 was 3.5 hours per day. Therefore, the individual operator reduced his labor costs providing increases which prevented his net income from dropping as much as would be indicated by the reduction in gross sales. This statement assumes that increases in labor rates were not enough to offset the reduced labor costs resulting from a decline in the total number of hours of operation. In fact, the extra three or four hours of operation in 1954 may not have been very profitable anyway. The largest hourly cut backs were made by stations that had originally remained open 24 hours per day.

OLD AND NEW ROUTE MOTELS

By the end of 1961 there were seven motels located on both routes, five on the old route and two on the new route. Complete information was collected on six of these. Four of the old route motels could be classified as "average" and two as "below average." Both of the new route motels could be classified as the luxury type. Considering the calibre of the old route motels, it could be said that these lodging facilities are somewhat lower in quality than the traveling public has come to expect. No remodeling of these facilities occurred between 1957 and 1961, and only minimum maintenance has been performed.

It was not until 1958 that a new motel was built on the new facility. A year following, another one was constructed. Both are located just south of the north interchange which carries traffic into Temple. One is on one side of the new facility and one on the other. Since 1961, another large motel was constructed along the bypass section.

Table 15
CHANGES IN BUSINESS VOLUMES OF ALL SERVICE STATIONS LOCATED IN THE TEMPLE STUDY AREA
BETWEEN SELECTED YEARS

Group	1954		1957		1961		CHANGES BETWEEN YEARS		
	Firms	Sales	Firms	Sales	Firms	Sales	1954-57	1957-61	1954-61
1	13	\$ 872,010	13	\$651,945	13	\$ 717,948	- 25.2%	+ 10.1%	- 17.7%
2	5	164,475	7	76,361	0	Out of Business	- 53.6	NA	NA
3	0	NA	4	216,375	6	354,447	NA	+ 63.8	NA
TOTAL	18	\$1,036,485	24	\$944,681	19	\$1,072,395	- 8.8%	+ 13.5%	+ 3.5%



Two luxury motels with restaurants which have located on IH 35 in the business study area.

Motels are more dependent on transient customers than service stations. Thus a diversion of traffic from the old route could be expected to cause a severe loss of motel business. This is just what happened. Table 16 shows that the four reporting motels experienced a 54.4 percent decrease in dollar sales between 1954 and 1957 with some recovery by 1961. The nonreporting motel owner said his firm had experienced a large decrease in sales between 1954 and 1957, and about a \$1,500 increase between 1957 and 1961.

With the opening of the new motels during the 1957-61 period, it seems that the old route motel volume would have declined at an even greater rate than that experienced during the first period. The fact that it did not indicates that the type of service offered by the old firms allowed them to compete for a different type of customer. Two of the old route motels reported a slight increase in local trade to partly offset the loss of tourist trade in the first period. These were principally construction workers. Such increases in local tenants were not nearly enough to prevent a continued decline in gross sales, so

in order to stabilize sales somewhat the owners started converting some of their units into apartments. Also, by 1961 two motels had rented out three units that were occupied by other businesses.

It should also be noted that several motels were constructed on the IH 35 route just south of the study area before 1957. Undoubtedly these attracted a good portion of the overnight transient traffic which might otherwise have done business with the motels along the old route. This accounts for some of the decline in the old motels' gross sales from the 1954 level.

The occupancy rate for the five old route motels averaged 92 percent in 1954, 49 percent in 1957, and 43 percent in 1961. These figures correspond with percent changes in gross sales between 1954 and 1961. The rate of occupancy in 1961 was down to 25 percent of total capacity for two of the old motels. The occupancy rate of the two new motels averaged 84 percent in 1961. Thus the average for all seven motels was 54.7 percent of capacity.

Table 16
CHANGES IN BUSINESS VOLUMES OF SIX MOTELS LOCATED IN THE TEMPLE STUDY AREA BETWEEN SELECTED YEARS

Firm No.	DOLLAR SALES			CHANGES BETWEEN YEARS		
	1954	1957	1961	1954-1957	1957-1961	1954-1961
52	\$17,400	\$ 9,700	\$ 7,400	-44.3%	- 23.7%	- 57.5%
53	14,500	4,000	2,000	-72.4	- 50.0	- 86.2
54	16,800	7,200	2,400	-57.1	- 66.7	- 85.7
55	5,200	3,700	2,450	-28.8	- 33.8	- 52.9
Sub-total	\$53,900	\$24,600	\$ 14,250	-54.4%	- 42.1%	- 73.6%
50	NOT OPEN			NOT APPLICABLE		
51	*			*		
Sub-total			\$101,325			
GRAND TOTAL	\$53,900	\$24,600	\$115,575	-54.4%	+369.8%	+114.4%

*To protect the identity of the firms, individual sales were not shown.

The five old motels have had very stable management. As of 1961 the time under present management averaged 13.6 years. This corresponds with a 20-year average age of the five businesses although the average age of the buildings is slightly more. Two of the motels were still being operated by the same people who constructed the building. Several were operated by elderly persons to supplement social security income.

The two new motels have had a considerable turnover in management, three each since opening. One of the owners at the time of interview said there were too many motels in operation in the Temple area. Those already located along the older section of the new route probably had an adverse effect on these two motels.

With the above observations, it can be concluded that the motel business along the old route was definitely depressed by the removal of the tourist or transient traffic. In fact, it was more depressed than the service station or food service businesses. Both service stations and food service establishments have more flexibility in attracting new customers locally. The trend has already been established that these motels are trying to attract local customers by converting some of their units into apartments. In 1962, another motel was converting seven units into apartments, partly due to the increase in number of Fort Hood personnel. They are also converting units abutting the street to other commercial uses, in order to provide a minimum guaranteed income. One owner said he was planning to sell his business or wreck the motel building and construct a new building for another type of business. It can be seen, then, that adjustments are still taking place eight years after opening the bypass route.

OLD AND NEW ROUTE FOOD SERVICE ESTABLISHMENT

There were 13 food service establishments in operation along the old route in 1954, 12 in 1957, and 14 in 1961. Between 1957 and 1961, two new route restaurants were in operation, making a 1961 total of 16 for both routes. Three new businesses opened on the old route between 1957 and 1961. On the other hand, one old route business closed before 1957 and another one before 1961.

Of all the food service establishments in operation along the old route during 1954, 1957, and 1961, six supplied all requested information. Three were primarily drive-ins; two were restaurants, and one was a tavern. The average age of these businesses was 13 years. The average length of time they had been under present (1961) management was almost eight years. There were two businesses which had management changes between 1954 and 1957 and two others between 1957 and 1961.

Table 17 shows the changes in dollar volumes experienced by the six businesses. The 1961 dollar volume of one business was estimated by the manager. Between 1954 and 1957 the combined dollar volumes declined by 14.6 percent. All businesses in the group showed decreases, ranging from 1.5 to 55.6 percent. However, between 1957 and 1961, the group as a whole experienced an increase in sales, with individual changes ranging from minus 11.7 percent to plus 48.1 percent. Thus the over-all 1961 dollar volume was 10.5 percent below that of 1954, with all but one business showing a decline in volume during the period.

It is obvious from the above table that these rather stable old route businesses lost sales in the 1954-57 period due to the removal of through traffic from the old route. It is assumed that the other seven businesses experienced the same. Three of these businesses indicated at least a 15 to 20 percent loss in sales. All of the operators contacted attributed most of their loss in sales to the new highway.

With a 43 percent increase in average daily traffic between 1957 and 1961, the six old route businesses were able to gain back four percent of the sales loss in the 1954-57 period. Of course, gaining new local customers also helped replace the transient customer losses.

Considering the dollar volumes of the two new route restaurants and that of the two new reporting old route businesses, the total reported 1961 volume of 10 food service firms is 35.5 percent more than the 1954 volume of the six old route firms. Therefore, after being bypassed seven years, the total dollar volume of the old route food service businesses is again near the 1954 level, with the volume of the new route businesses extra.

Table 17
CHANGES IN BUSINESS VOLUMES OF 10 FOOD SERVICE ESTABLISHMENTS LOCATED IN THE TEMPLE STUDY AREA BETWEEN SELECTED YEARS

Firm No.	DOLLAR SALES			CHANGES BETWEEN YEARS		
	1954	1957	1961	1954-1957	1957-1961	1954-1961
1	\$ 57,000	\$ 55,800	\$ 49,250	- 2.1%	-11.7%	-13.6%
2	105,500	87,700	98,000	-16.9	+11.7	- 7.1
3	55,000	54,000	54,500	- 1.8	+ .9	- .9
4	54,000	24,000	22,000	-55.6	- 8.3	-59.2
5	30,000	27,000	40,000	-10.0	+48.1	+33.3
6	68,000	67,000	67,000	- 1.5		- 1.5
Sub-total	\$369,500	\$315,500	\$330,750	-14.6%	+ 4.8%	-10.5%
7		N E W	5,900 ¹	NA	NA	NA
8			53,950	NA	NA	NA
9			61,000	NA	NA	NA
10		RESTAURANTS	50,100	NA	NA	NA
Sub-total			\$170,050	NA	NA	NA
GRAND TOTAL	\$369,500	\$315,500	\$500,800	-14.6%	+58.7%	+35.5%

¹Six months' sales.

Estimates of changes in the type of clientele served by the food service firms gives an indication of how they fared gross sale-wise. It was assumed that a reduction in transient customers in relation to local customers meant a corresponding decrease in gross sales for the firms involved. This relationship did exist. The operators of the six reporting old route businesses estimated the percentage of their customers that were local and transient in 1954, 1957, and 1961. In 1954, 77 percent were local and 23 percent were transient. In 1957, the percentage estimated was almost 96 percent local and less than five percent transient. The gross sales of these firms declined 14.6 percent between 1954 and 1957. Then, as gross sales increased 4.8 percent between 1957 and 1961, the operators estimated that about 88 percent of their customers were local and 12 percent transient. Notice the percentage of transient customers in 1961 was 12 percent compared to five percent in 1957.

The operators of the two new firms located on the old route reported that about 30 percent of their customers were transient. Also, as expected, 75 percent of the new route motel restaurant's customers were considered transient. Thus, changes in the proportion of transient customers have an impact on the food service industry.

Nontraffic Serving Retail Business

Nontraffic serving retail businesses were interviewed along both routes in an effort to determine the new highway's influence on that type of business. Also, to some extent, the performance of this type of business during the study period serves as an indication of the changes in the retail business volume of the whole city, thus serving as a control for the traffic serving businesses on the old and new routes. It was assumed that the removal of the traffic from the old route would stimulate certain nontraffic businesses from the standpoint of both numbers and business volumes.

There were 50 nontraffic serving retail businesses operating along the old route in 1954. This number had

increased to 51 by 1957 and to 55 by 1961. Between 1954 and 1957, three new businesses were established and 2 closed. Between 1957 and 1961, 16 new businesses were established and 12 closed. By 1957, the new route had one nontraffic serving retail firm. Between 1957 and 1961, another new route firm opened, but it closed before 1961. Thus the new route still had only one nontraffic serving retail firm.

Complete information was collected on 17 old route businesses in 1954, 19 in 1957, and 21 in 1961. The others were noncooperative, could not supply such information, or could not be contacted. The new route business furnished complete information.

There were too few businesses of each type to permit analysis by specific grouping except for the grocery industry. The old route had 12 grocery stores in operation during 1954, 13 in 1957, and 12 in 1961. One opened between 1954 and 1957, and two opened between 1957 and 1961. During the last period two major supermarkets opened for business. Nine of these stores operated continuously through the whole period. According to Table 18, the gross sales of the nine stores increased 7.7 percent between 1954 and 1957 and nine percent between 1957 and 1961. The total increase between 1954 and 1961 was 17.4 percent. This is considered a respectable increase when compared to the increase for the city as a whole.

Considering the other four grocery firms which gave actual gross sales (Table 18), the total sales from all 13 stores increased 5.5 percent between 1954 and 1957, but declined 7.4 percent between 1957 and 1961. It is interesting to note that the three stores which went out of business before 1961 had lower gross volumes in 1957 than in 1954. These operators indicated that the new highway affected their business very little, causing less than five percent of their loss in sales. In fact, all three owners said that the bypass reduced heavy traffic congestion and eased their customers' parking problems. They felt that none of these went out of business because of the highway. Two of the buildings which had been

Table 18
CHANGES IN BUSINESS VOLUMES OF 13 GROCERY STORES LOCATED IN THE TEMPLE STUDY AREA BETWEEN SELECTED YEARS

Firm No.	DOLLAR SALES			CHANGES BETWEEN YEARS		
	1954	1957	1961	1954-57	1957-1961	1954-1961
1	\$ 400,000	\$ 500,000	\$ 409,154	+ 25.0%	-18.2%	+ 2.3%
2	203,000	186,000	165,000	- 8.4	-11.3	-18.7
3	142,000	94,156	110,118	-33.7	+16.9	-22.5
4	130,000	90,000	76,115	-30.8	-15.4	-41.4
5	150,000	165,000	185,000	+10.0	+12.1	+23.3
7	550,000	675,000	1,000,000	+22.7	+48.1	+81.8
8	142,000	143,000	120,000	+ 0.7	-16.1	-15.5
9	140,000	167,000	147,330	+19.3	-11.8	+ 5.2
10	111,080	98,812	97,326	-11.0	- 1.5	-12.4
Sub-total	\$1,968,080	\$2,118,968	\$2,310,043	+ 7.7%	+ 9.0%	+17.4%
6		153,000	137,723	NA	-10.0	NA
11	300,000	250,000		-16.7	NA	NA
12	150,000	65,000		-56.7	NA	NA
13	87,400	55,800		-36.2	NA	NA
Sub-total	\$537,400	\$ 523,800	\$ 137,723	- 2.5%	-73.7%	-74.4%
GRAND TOTAL	\$2,505,480	\$2,642,768	\$2,447,766	+ 5.5%	- 7.4%	- 2.3%

¹Opened in 1955.

²Closed in 1960.

³Changed to another type business.



Two of the new shopping centers have replaced old businesses on the old route in the after period.



New nontraffic serving businesses which have located on the old route in the after period.

rented by the former occupants now house other types of businesses.

Most of the grocery stores on the old routes were small independent businesses. The nine businesses which operated continuously averaged 18 years of age. They were under the same management an average of 11 years. Only one had a change in management between 1954 and 1961. But regardless of the stable management of these stores, they have suffered from competition by the major supermarkets, as has been the case throughout the country.

Table 19 shows the actual gross sales volumes of 12 miscellaneous businesses, 11 of which were located on

the old route. Five of these businesses reported sales for all three years. Their sales showed impressive gains during both periods, with an over-all gain of 94.5 percent between 1954 and 1961. The new route business actually showed a decline in sales between 1957 and 1961.

Using the average sales volume of the above 12 old and new businesses as a basis for calculating the gross volumes of the old and new nonreporting firms, Table 20 shows the results of such expansion. The footnotes list the types of businesses involved and the method of calculating the sales. Enough old and new firms reported actual sales to make the calculated figures realistic estimates of the volumes of the nonreporting firms.

Table 19
CHANGES IN BUSINESS VOLUME OF 12 MISCELLANEOUS RETAIL FIRMS LOCATED IN THE TEMPLE STUDY AREA BETWEEN SELECTED YEARS

Firm No.	DOLLAR SALES			CHANGES BETWEEN YEARS		
	1954	1957	1961	1954-1957	1957-1961	1954-1961
1	\$ 10,000	\$ 10,300	\$ 12,000	+ 3.0%	+ 16.5%	+ 20.0%
2	5,890	5,920	6,000	+ 0.5	+ 1.4	+ 1.9
3	100,000	150,000	325,000 ¹	+50.0	+116.7	+225.0
4	80,200	80,220	98,429 ²	0.0	+ 22.7	+ 22.7
5	92,000	89,000	120,000	- 3.3	+ 34.8	+ 30.4
Sub-total	\$288,090	\$335,440	\$ 561,429	+16.4%	+ 67.4%	+ 94.9%
6		\$175,000	\$ 140,030	NA	- 20.0%	NA
7	NEW	20,000	17,000	NA	- 15.0	NA
8			8,400	NA	NA	NA
9			700,000	NA	NA	NA
10	BUSINESSES		12,000	NA	NA	NA
11			120,000 ³	NA	NA	NA
12			78,375	NA	NA	NA
Sub-total		\$195,000	\$1,075,775	NA	- 19.5%	NA
GRAND TOTAL	\$288,090	\$530,440	\$1,637,204	+84.1%	+208.7%	+468.3%

¹Under new management.

²New location in 1961.

³Four months' sales.

Thus, the actual and calculated sales combined represent the gross volumes of the whole miscellaneous group, and show an over-all increase in sales of 56.7 percent between 1954 and 1961. This includes the new route firm. During the first period, when the bypass was opened, these businesses showed a 19.2 percent increase in sales. Only one of the operators of the old route miscellaneous businesses indicated that the new highway depressed his sales. Some were inclined to feel that the removal of through traffic made their business location more favorable to local trade than before. There were five more new businesses which opened on the old route than closed between 1954 and 1957. This suggests that the old route is more attractive now for location of nontraffic serving businesses than before the new route opened. Some of these new businesses are located in the three new shopping centers constructed on the West Adams Street section of the old route. However, most of them were

located along North Third Street. In 1962, North Third Street was widened and completely rebuilt which will make it even more attractive to nontraffic serving businesses in the future.

Traffic and Nontraffic Serving Retail Business

Table 21 shows the combined changes in gross sales of traffic and nontraffic serving businesses located along the old and new routes. All firms are represented with actual or estimated sales for the respective years they were in operation. The combined sales of the service stations, food service establishments, and motels on the old route show a decrease of 15.3 percent between 1954 and 1957 and a 17.4 percent increase between 1957 and 1961. For the whole period between 1954 and 1961, these businesses experienced less than a one percent

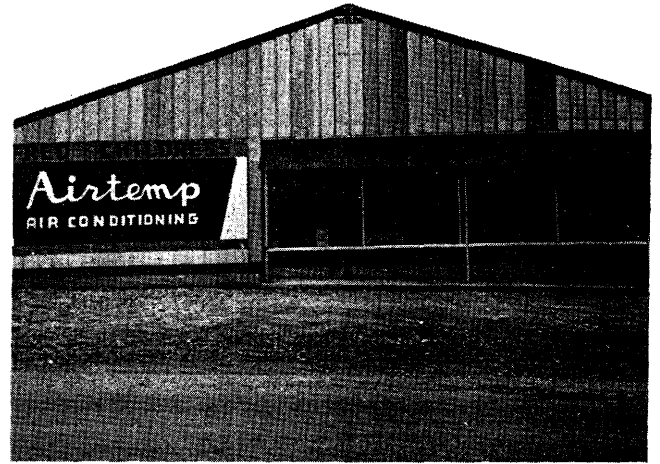
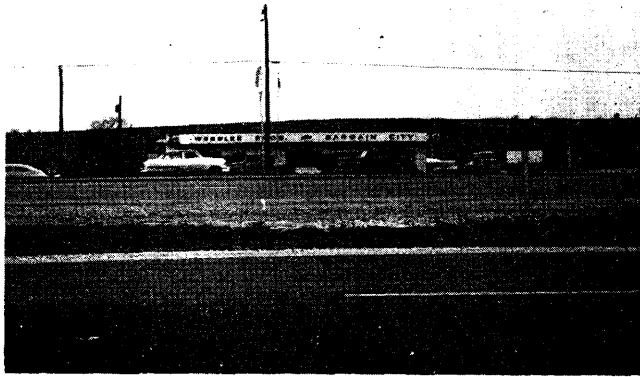
Table 20
CHANGES IN DOLLAR VOLUME OF ALL MISCELLANEOUS RETAIL BUSINESSES LOCATED IN THE TEMPLE STUDY AREA BETWEEN SELECTED YEARS¹

Status of Business	1954		1957		1961		CHANGES BETWEEN YEARS		
	Firms	Sales	Firms	Sales	Firms	Sales	1954-57	1957-61	1954-61
Old Businesses (Actual Data)	5	\$ 288,090	5	\$ 335,440	5	\$ 561,429	20.8%	67.4%	94.9%
Old Businesses (Calculated) ²	33	1,901,000	31	2,079,728	22	1,300,350	9.4	-37.5	-31.6
New Since 1954 (Actual Data)		NA	2	195,000	2	157,000	NA	-19.5	NA
New Since 1957 (Actual Data)		NA		NA	5	918,775	NA	NA	NA
New Since 1957 (Calculated) ³		NA		NA	9	492,246	NA	NA	NA
Totals	38	\$2,189,090	38	\$2,610,168	43	\$3,429,800	19.2%	31.4%	56.7%

¹Includes the following type businesses: Drugs, dress shops, variety stores, appliances, laundries and dry cleaning shops.

²The sales volumes for these years were calculated by using the average sales of similar reporting firms for each year and expanding it to represent the nonreporting firms.

³Sales volumes for the nine new firms were calculated by using the average sales volume of similar businesses reporting in 1961 and expanding it to represent the new nonreporting firms.



Two nontraffic serving retail businesses located on IH 35.

decrease in sales volume. The new highway depressed the sales of motels more than the other two groups.

The nontraffic serving businesses on the old route showed an increase in gross sales of 8.2 percent between 1954 and 1957, 21.6 percent between 1957 and 1961, and 36.1 percent between 1954 and 1961. The gains for the first period were modest, but the gains for the second period was significantly greater.

All old route businesses showed an increase in sales of 4.7 percent in the first period, 20.7 in the second period and 26.4 in both periods combined. For the new

route businesses, only one of which was nontraffic serving, most of the 97.7 percent increase in gross sales can be attributed to the gain by four new firms between 1957 and 1961. The route is better suited for traffic serving businesses than nontraffic serving commercial retail businesses.

Combining all old and new route firms, the total dollar volume increased 7.7 percent between 1954 and 1957, 25.1 percent between 1957 and 1961, and 34.8 percent between 1954 and 1961. On a per year basis, these businesses gained 1.9 percent in the first period,

Table 21

CHANGES IN TOTAL DOLLAR VOLUME OF ALL RETAIL BUSINESSES LOCATED ON THE OLD AND NEW ROUTE IN THE TEMPLE STUDY AREA, BY INDUSTRY AND BETWEEN SELECTED YEARS

Type of Business	1954		1957		1961		Changes Between Years		
	Firms	Sales	Firms	Sales	Firms	Sales	1954-57	1957-61	1954-61
FIRMS LOCATED ON OLD ROUTE									
Traffic Serving Service Stations	18	\$1,036,485	23	\$ 927,056	18	\$1,047,920	+10.6%	+13.0%	+ 1.1%
Food Service ¹	13	585,044	12	473,252	14	611,062	-19.1	+29.1	+44.3
Motels ²	5	67,375	5	30,750	5	20,400	-54.4	-33.7	-69.7
Sub-Total	36	1,688,904	40	1,431,058	37	1,679,382	-15.3	+17.4	- 0.6
Nontraffic Serving									
Grocery ³	12	2,505,480	13	2,642,768	12	2,959,512	+ 5.5	+12.0	+18.1
Miscellaneous ⁴	38	2,189,090	38	2,610,168	43	3,429,800	+19.2	+31.4	+56.7
Sub-Total	50	4,694,570	51	5,252,936	55	6,389,312	+ 8.2	+21.6	+36.1
TOTAL OLD ROUTE	86	\$6,383,474	91	\$6,683,994	92	\$8,068,691	+ 4.7%	+20.7%	+26.4%
FIRMS LOCATED ON NEW ROUTE									
All Firms			2	\$ 192,625	6	\$ 380,750	NA	+97.7%	NA
GRAND TOTAL	86	6,383,474	93	6,876,619	98	\$8,602,797	+ 7.7%	+25.1%	+34.8%

¹Sales were expanded each year to include the nonreporting firms. Sales for the firms were based on the average of the reporting firms and expanded to represent the number of firms not reporting.

²Sales were expanded to include one nonreporting firm. Method of expansion same as footnote 1.

³Sales were expanded to include two new firms, one operated only the last six months of 1961 which was calculated at one-half the operational level of other firms.

⁴Expanded each year to include all nonreporting firms. Of the 43 firms in 1961, nine were new businesses and their sales were based on similar type businesses operating in 1961.

6.3 percent in the second period, and 4.4 in the combined periods. The highway depressed the gains in the first period, but the second period gains improved significantly. This indicates that the depressing effect of the bypass on the old route businesses did not continue through the second period to any great extent.

A comparison was made of gross sale performance of the study area businesses with that of the whole city of Temple. The Bureau of Census' "Census of Business" gives annual estimates of changes in gross sales of total retail businesses in the city. Table 22 shows the comparison between the gross volumes of study area businesses and the city of Temple as reported by the "Census of Business".

Considering all businesses, the sales of study area businesses showed a slightly smaller percentage increase than that experienced by all of the Temple businesses between 1954 and 1957. Between 1957 and 1961 the study area firm sales increased about five percent more than that of the city firms. For the whole period between 1954 and 1961, the rate of increase in gross sales

of the study area firms was about four percent greater than that of city of Temple firms.

Therefore, the conclusion is that the combined volumes of all businesses along the study area routes, which were principally old route firms, experienced a greater percentage increase in volume between 1954 and 1961 than that estimated for all the city's retail firms. This being the case, the new highway bypass did not have a depressing effect on study area businesses in general. As for general groups, it did have a depressing effect on the traffic serving group. More specifically, the motel industry experienced the greatest decline in sales volume. Next hardest hit were the food service establishments. The service station industry was the least affected of the traffic serving businesses. The food service businesses showed the greatest improvement of the three groups in the last period of study. The nontraffic serving businesses suffered little or no ill effect from the bypass. In fact, the study indicated that most firms benefitted from it and that sites along the old route were becoming increasingly popular for use by this type of business.

Table 22
A COMPARISON OF CHANGES IN RETAIL SALES AS REFLECTED BY STUDY AREA BUSINESSES VERSUS THAT REPORTED BY THE BUREAU OF CENSUS' "CENSUS OF BUSINESS" FOR THE CITY OF TEMPLE AND THE STATE OF TEXAS BETWEEN SELECTED YEARS

Item	Dollar Volume			Percent Change Between		
	1954	1957	1961	1954-57	1957-61	1954-61
	(\$1,000)	(\$1,000)	(\$1,000)			
Study Area Businesses						
Traffic Serving	\$ 1,689	1,431	1,679	-15.3%	17.4%	- 0.6%
Nontraffic Serving	4,694	\$ 5,253	\$ 6,389	8.2	21.6	36.1
Total All Businesses	\$ 6,383	\$ 6,684	\$ 8,069	4.7%	20.7%	26.4%
"Census of Business"						
Bell County	\$ 75,379	\$ 84,900	\$ 107,403	12.6%	26.5%	42.5%
Temple	42,900	45,358	52,528	5.7	15.8	22.4
State of Texas	\$9,032,371	\$10,792,559	\$12,715,376	19.5%	17.8%	40.8%

¹The "Census of Business", a publication by the Bureau of Census, contains retail sales information on a state, county and city basis. The Bureau of Census bases its statistics on income tax data. Retail sales for the years 1954, 1958 and 1963 are presented, respectively.

Other Economic Changes Affecting the Temple Area

This section of the report reviews some of the other economic changes affecting the Temple area and the whole City of Temple before and after the new highway was constructed. These statistics represent the City of Temple and give some reflection of its economic status during the study period.

Table 23 presents the percentage changes in population, number of dwelling units, number of employees, wholesale receipts, value added by manufacture, and city government finance between selected years as given by the United States Department of Commerce's Bureau of Census. Each of the above will be discussed below.

Population Changes

Temple has experienced a 19.4 percent increase in population between 1950 and 1960. This is a respectable increase when compared with 24.2 percent increase for the whole state. But its population growth has not kept pace with the population of urban places in the state which experienced a 48.5 percent increase.

The new highway bypassing the central business district probably helped the population growth of Temple. This is evidenced by the fact that several out of town commercial and manufacturing establishments were influenced to locate along the bypass, bringing in personnel from other places. New commercial and residential development has engulfed Interstate Highway 35 south of the study area as well as within the study area.

The net increase in the number of military and civilian employees at Fort Hood has helped the population growth of Temple during this decade. The 79 percent increase in these employees between 1954 and 1962 no doubt has brought many dependents to Temple and

the surrounding area. In 1962 there were over 25,000 army dependents living on post or in the area.

The increased number of wholesale and manufacturing plants locating in the city between 1954 and 1961 has helped support the population growth of Temple.

Dwelling Unit Changes

The 30.1 percent increase in the number of dwelling units in Temple between 1950 and 1960 exceeded the percent change in population. But actually there was a 24.1 percent increase in the number of dwelling units occupied. To correspond with this increase, there was an 11 percent increase in the number of families living in Temple between 1950 and 1960. Many of the new dwelling units have been constructed on the northwest side of town between the old and new route, and some are to the east of the old route near the new route. But, by far, the greatest buildup of dwelling units occurred southwest of town on the east side of IH 35 just south of the study area. These improvements represent a substantial increase in property evaluations during the study period.

Changes in Employment

Between 1950 and 1960, the total number of persons employed and living in Temple increased by 18.2 percent. Since military personnel reside in Temple, it is appropriate to indicate that the number of civilian employees increased by 20.2 percent. Employment by the City Government increased almost 30 percent.

Employment in wholesale and retail trade increased over nine percent between 1950 and 1960. Employment in the above two trades apparently increased in the study area too.

The manufacturing firms increased the numbers they employed by four percent during the same period. Since several of these firms located along the new route in the study area, the study area made some contribution to the increase in employment in this important segment of Temple's economy. By 1962, some 11 truly manufacturing firms had located in Temple along the Interstate Highway 35, three of which were in the study area. According to the "Directory of Texas Manufacturers," published by the University of Texas' Bureau of Business Research, these firms employed between 450 and 850 persons in 1962. The two study area firms employed at least 150 of these persons. Thus the importance of the new highway is manifested in these employment figures.

Changes in Wholesale Receipts

Wholesale receipts increased over 100 percent between 1954 and 1963. Several new wholesale warehouses located along the new bypass. So a significant part of the above increase was due to these firms.

Changes in Value Added by Manufacture

The dollar change in the value added by manufacture is the best measure available for determining the increasing or decreasing importance of manufacturing to a city's economy. The value added is derived by subtracting the cost of materials, supplies, containers, fuel,

Table 23

CHANGES IN SEVERAL ECONOMIC INDICATORS FOR THE CITY OF TEMPLE BETWEEN SELECTED YEARS

Indicator	Percent Change Between	
	1950 and 1960	
Total Population	19.4%	
Total Dwelling Units	30.1	
Number Employed		
Total	18.2	
Civilian Labor Force	20.2	
City Government	29.1	
Manufacturing	4.0	
Wholesale and Retail Trade	9.6	
	1954 and 1963	
Wholesale Receipts	111.2%	
	1954 and 1958	
Value Added by Manufacture	49.1%	
	1955 and 1960	
City Government		
Total Revenues	31.5%	
Total Expenditures	43.4	

Source: "Census of Business" and "Census of Population", Bureau of Census, United States Department of Commerce.

purchased electric energy, and contract work from the value of shipments of manufacturing establishments. Between 1954 and 1957 the value added by manufacture increased 49.1 percent.

Temple is really growing in the area of wholesaling and manufacturing. The study area is sharing in this growth and appears to offer even more potential for future growth than other areas around the city.

Changes in City Government Finance

The city of Temple gained 31.5 percent more revenue in 1960 than in 1955, the year the new route opened.

Partly due to the increase in property valuation along the new route, the city's total property tax revenues increased 31.4 percent. There is every indication that the gains in tax revenues continued through 1961, with the study area properties furnishing their proportionate share of the total increase in tax revenues.

The total expenditures of the city increased 43.4 percent between 1955 and 1960, indicating that it is going to a great deal of expense to improve the city's public facilities. In general, the future looks bright for the study area and the whole city of Temple.

Appendix

Objectives and Procedures

OBJECTIVES

One of the principal objectives of this study was to measure any changes in land values that occurred during a specific period of time within given areas near the Interstate Highway System. A second part of this objective was to determine the extent to which these changes might be attributed to or associated with the construction and operation of the facility. Another principal objective was to determine the changes in land use that may have occurred within these same areas, and to attempt to explain these changes in terms of influence by the facility. Still another objective was to determine the relationship of land use to land values, as land in the area of the highway facilities progresses through sequential uses. A final objective was to determine the effect of the highway facility upon over-all business activity in the areas which were served by it.

PROCEDURES

A uniform set of procedures was developed for use in each of the study areas. Except where local conditions made deviations necessary, the same procedures were followed in each area.

A. The procedures followed in developing and analyzing the land value information were as follows:

1. Area Selection:

A general area was first selected for study. The Interstate Highway facilities in this area had, in the opinion of the Project Advisory Committee, been constructed long enough for changes in land use and land values to become apparent and for variations in over-all area business activity to be discernible. This area is located in and around Temple. It extended along the new route from its intersection with State Highway 36 north to near the point where it rejoined old U. S. 81.

2. Boundary Selection:

- a. Exterior boundaries of the area were carefully selected to permit the inclusion of the major expected influence zone and still keep the area to a manageable size.
- b. Interior boundaries were drawn so that properties were divided into two classes for analytical purposes — abutting and nonabutting.
- c. Such additional interior divisions as seemed feasible were made in each area.

3. Time Periods:

To measure changes in land value, three time periods were chosen for the study. The length of each period was determined by

the construction schedule for the area. The periods were selected as follows:

- a. Study Period — The original study period was the length of time from the completion of construction through 1957 (1955-1957). The restudy has lengthened the study period to include 1958 through 1961.
- b. Construction Period — The construction period was the time from the announcement of location through completion of construction (1949-1954).
- c. Base Period — The base period was a six-year period preceding the announcement of construction of the facility (1943-1948). The length of the base period was partially determined by the availability of sales information.

4. Property Identification:

Through use of city records, county maps, A.S.C. aerial photos and State right of way strip maps, each piece of property within each study area was identified and the name of the owner recorded.

5. Land Sales:

Through the use of ownership maps, each property transaction was traced through the deed records in the County Clerk's office. Sales prices were recorded from each legitimate sale. In cases where the actual consideration was not revealed, the median of the range as revealed by Federal Revenue Stamps was used. (These stamps are affixed in multiples of \$.55 per \$500.) Since most of the study area properties were located outside the city limits, city tax records, showing evaluations for land and improvements separately, were not available for use. This meant that it was not possible to deduct improvement valuations from total sales prices in most instances. For this reason only unimproved properties were used in the land value analysis. Fortunately most of the sales had been made without improvements.

6. Control Areas:

Specific control areas were selected for the Temple study area. These control areas were selected to represent properties similar to those prevalent in the study area prior to construction of the Interstate System. Entire land surveys were used as control areas, and all land sales within each survey were recorded. The restudy contained the same areas.

7. Statistical Treatment of Sales:

- a. To remove the effect of general inflation over the large number of years studied,

each sale was deflated by the Bureau of Labor Statistics' Consumer Price Index (1947-1949 = 100). See schedule in this appendix. This reduced all sales prices to a common dollar value base.

- b. The sales were next converted to a common price per acre so that comparisons could be made from a common unit base. Area weighted values were used in the original study, but the restudy also used the average price per acre resulting from an array of sales price per acre. A three-year moving average price per acre was shown graphically for each area in the restudy.
 - c. All sales were then grouped according to the various classifications being considered.
 - d. Changes were shown as both actual and percentage changes.
- B. The procedures followed in the analysis of land use changes were as follows:
1. Land use for the last year in the base period was investigated and recorded for each piece of property within the study areas. This use was then compared to the 1957 and 1961 land use as shown on land use maps.
 - a. Agricultural Land
 - (1) Used primarily for agricultural purposes.
 - (2) Minimum size 10 acres. (Exception: Truck or other intensive type farm minimum size 2 acres.)
 - b. Land Held for Future Use
 - (1) Generally considered to be held for future use rather than its present utility.
 - (2) May be farmed or grazed or used for other agricultural purposes during interim period.
 - (3) May be either inside or outside city limits.
 - c. Rural Residence
 - (1) Used primarily as a dwelling place. Must have occupiable house but need not necessarily be occupied.
 - (2) Outside city limits.
 - (3) Maximum size 10 acres: Larger size becomes either a or b above, depending on whether farming activity is carried on. (Exception: Truck or other intensive type farm maximum size 2 acres.)
 - d. Urban Residence
 - (1) Dwelling unit inside city limits.
 - (2) Subdivisions outside city limits.
 - (3) Maximum size 5 acres (larger plots will be classed as b above).
 2. Changes in land use are shown graphically by means of before and after land use maps. The restudy shows the changes in use by use of overlays to base map.
- C. The procedures followed in relating changes in land value to changes in land use were as follows:
1. Land use at time of sale was determined according to the classifications in B above for each piece of property that sold. Post sale use was also determined for each property.
 2. Each sales card was classified in accordance with the changes in land use attendant to the sale.
 3. Analyses were run on each land use classification change. All sales were grouped by use changes and the analysis was made on the basis of relative changes in price. Data not area weighted were used in the restudy.
 4. The relationship between the changes in land use and land value are shown both graphically and in tabular form.
- D. The procedures followed in determining the effects of the new facilities on retail business activity were as follows:
1. It was decided to use the gross sales figures of retail businesses as the most practical measure of business activity.
 2. A complete inventory of businesses along both the old and new routes were made, to reflect the number of businesses in 1954, 1957, and 1961.
 3. All retail businesses located on the old route within the study area were personally interviewed by members of the research staff. A concerted effort was made to obtain gross sales figures for 1954, 1957, and 1961. The first year served as the base year, since it
 - e. Commercial - Traffic Serving
 - (1) Any commercial firm deriving more than 50 percent of its income from traffic.
 - (2) Primarily nonmanufacturing
 - f. Commercial - Nontraffic Serving
 - (1) Any commercial firm deriving less than 50 percent of its income from traffic.
 - (2) Primarily nonmanufacturing
 - g. Industrial
 - (1) Manufacturing firm.
 - h. Institutional-Municipal
 - (1) Any publicly owned property (city, county, state, or Federally owned property).
 - (2) Any group owned or operated property (churches, schools, cemeteries, etc.).

was the last year before the new facility was completed. Then 1957 was the first after year studied and 1961 the second after year studied.

4. All retail businesses located on the new route were interviewed and a record of 1957 and 1961 sales was obtained. Since the new route was located on a new location, few businesses had been established until after the new highway had been opened for business.
5. All businesses were classified into homogeneous groups such as service stations, motels, etc. These groups were then classed as traffic serving or nontraffic serving businesses in accordance with their dependence on traffic for their revenue.
6. In analyzing the effect of the new facility on business activity, as many as six combinations of businesses were used for comparison of each group of businesses. The number of comparisons used depended upon the availability of data in each case. These comparisons are:
 - a. Business Comparisons
 - (1) Cooperating old businesses — old route.
 - (2) Total old businesses — old route (derived by adding in the calculated volumes for noncooperating businesses).
 - (3) New businesses — old route (those established after the new facility had opened).
 - (4) All businesses — old route.
 - (5) New businesses — new route.
 - (6) All businesses — both routes.
 - (7) All businesses — study area versus city of Temple.
 - b. Business Groupings

The purpose in grouping the businesses in this manner was to allow an inspection of the effects on businesses from several viewpoints. We are interested in the influences of the new facility from the following standpoints:

- (1) As it influences particular groups of old firms located on the old route.
- (2) As it influences traffic serving as opposed to nontraffic serving old businesses on the old route.
- (3) As it influences activity of the old route as a whole (old plus new firms).
- (4) As it influences the development within the entire area under study (both old and new routes).
- (5) As it influences the development within the entire area under study

(both old and new routes) compared to the whole city.

- E. The procedures followed in determining other economic changes affecting study area.
 1. Personal interviews were conducted or letters written to obtain data which would affect the general economic changes of the study area.
 - a. Number of military and civilian employees at Fort Hood in 1954, 1957, and 1961.
 - b. Average daily traffic volumes on the old and new routes for the years 1954, 1957, and 1961.
 2. Secondary data were collected from the U. S. Department of Commerce's Bureau of Census to show the general economic changes occurring in Temple between selected years in the study period.
 - a. Population.
 - b. Number of dwelling units.
 - c. Total number employed.
 - d. Total number of civilians employed.
 - e. Total employed in retail, selected service, wholesale and manufacture trades.
 - f. Total retail sales, selected service receipts and value added by manufacture.
 - g. City government revenues and expenses.

Formulas Used in Making Statistical Tests on Land Value Data

In the footnotes of the land value tables, certain statistical data are presented to aid the reader in further evaluating the land value information given in the tables. By using the appropriate small sample formulas, the standard errors of the difference between various pairs of means (Study versus Control areas, Section 1 versus Section 2, etc.) were computed and shown in the footnotes under each table. These standard errors were used as inputs in formulas deriving Student's t value. These values are also shown. Finally, the approximate confidence level in which these t values are significant is shown.

An explanation of the formulas used in determining the standard error of difference between two means and the t values is presented below:

For a pair of samples, one of which or each of which is made up of less than 30 observations, the standard error of the difference between the means of these two samples is given by

$$S_d = \sqrt{\frac{\sigma_1^2 + \sigma_2^2}{N_1 + N_2 - 2}}$$

where σ_1 and σ_2 are the standard deviations of the populations from which samples 1 and 2 come, respectively. With the two σ 's not known, the corresponding sample standard deviations were used. N_1 and N_2 are the number of observations that make up samples 1 and 2,

respectively. In determining whether the difference between the means of samples 1 and 2 deviates significantly at a certain confidence level, a t value is computed by using Student's t and is given by

$$t = \frac{D}{S_d \sqrt{\frac{N_1 N_2}{N_1 + N_2}}}$$

where D is the difference between the means of samples 1 and 2, and S_d is the standard error given above. It is assumed that samples 1 and 2 come from normal populations.

Consumer Price Index

As a means of measuring price changes, constant dollars were calculated and presented in the analysis of this report. The actual dollars were multiplied by the reciprocal of the consumer price index for the United States, as published by the U. S. Department of Commerce, Bureau of Labor Statistics, to arrive at the constant dollar value.

Below is a listing of the consumer price index and its reciprocal for each year involved. The base was 1947-49=100.

<i>Year</i>	<i>Index</i>	<i>Reciprocal</i>
1944	75.2	1.330
1945	76.9	1.300
1946	83.4	1.200
1947	95.5	1.047
1948	102.8	0.973
1949	101.8	0.982
1950	102.8	0.973
1951	111.0	0.901
1952	113.5	0.881
1953	114.4	0.874
1954	114.8	0.871
1955	114.5	0.873
1956	116.2	0.861
1957	120.2	0.832
1958	123.5	0.810
1959	124.6	0.803
1960	126.5	0.791
1961	127.9	0.782