SOME ECONOMIC EFFECTS OF THE SUBURBAN PORTION OF NORTH CENTRAL EXPRESSWAY, DALLAS, TEXAS

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A Special Report to the Bureau of Public Roads,
United States Department of Commerce
June, 1961

BULLETIN NO. 15

E 47-61

TEXAS TRANSPORTATION INSTITUTE
(A part of the A. & M. College of Texas)
College Station, Texas

ACKNOWLEDGMENTS

A study of this nature requires the cooperation of a large number of persons, who aside from regular duties give their good counsel and help to locate important data and materials.

The authors wish to thank specifically Mr. Orin Coats of Dallas County's Plat Book Section, Dr. Tom McMillan of the Texas Power and Light Company, and Mr. R. B. Sherrill of the City of Richardson for their time and interest. Also appreciated is the cooperation of the other city officials of Richardson and the city officials of Carrollton, Lancaster, Mesquite, and Seagoville.

Personnel of Dallas' City Planning and Tax departments were courteous and helpful. These and other persons who cooperated in the study, although not individually named here, will understand that previous expressions of gratitude were most genuine.

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SUMMARY AND CONCLUSIONS

This report presents the findings of a study of the impact of a suburban radial freeway upon the value and use of adjacent land and upon the size and character of a small town whose accessibility to the Central Business District (CBD) of Dallas it greatly improved.

The road facility studied is an 8.1-mile section of North Central Expressway (U. S. 75) which is of freeway design with frontage roads throughout the study area. This section begins about 5.4 miles north of downtown Dallas and runs northward to the Dallas County line. The study period for land values is 1946 through 1960, the "before" Expressway period being 1946-51 and the "after" period being 1952-60. The study area was comprised of a band averaging about one-half mile in width on either side of the freeway. Another area some distance removed from North Central Expressway was used for control or comparative purposes.

The land use analysis employed 1949 and 1959 data for "before" and "after" comparisons. The study and control areas were the same as those used in the study of land values.

Four control towns were selected for comparison with Richardson, which is a relatively small town near the north boundary of the study area and located about 15 miles from Dallas' CBD. The data used in this analysis were for 1940, 1950, 1955, and 1960.

The major findings of the study are as follows:

1. The Expressway had a very marked influence upon the value of unimproved abutting land. In terms of constant dollars, the benefit of road improvement to such land was $2,752 per acre or 269 percent.
2. Nonabutting unimproved land near the expressway was benefitted but to a much smaller degree. The Expressway influence for this property was $158 per acre or 17 percent, again expressed on the basis of constant dollars.
3. The values of unimproved land in the Dallas and Richardson portions of the study area were equalized. In the after-Expressway period, undeveloped land sold for $3,116 per acre in Dallas and $2,902 per acre in Richardson. In the before-Expressway period, land values were more than twice as high in Dallas as in Richardson.
4. The Expressway traversed an area of open land. Land development near the facility almost all occurred in the "after" period but proceeded at a slow rate; in the control area almost no land development and improvement had occurred by 1961.
5. Industrial uses occupied about seven percent of the study area land in 1959. Residential subdivisions accounted for 13 percent of the study area, but 74 percent of the land remained in agricultural use or was idle. About one percent of the land was in commercial use, and five percent was in public use.
6. The town of Richardson had its time of travel to downtown Dallas reduced significantly, and it experienced an upsurge of population growth coincident with the completion of the Expressway. It grew from 2,890 persons in 1955 to 16,810 in 1960. Only one of the four control towns had a similar population increase, this being Mesquite.
7. Only Richardson among the towns studied had attracted a substantial amount of industry. It had 2,296 industrial employees in 1961, more than six times the number of such employees in any other town. Other comparisons with control towns indicate that Richardson received important benefits from its location on North Central Expressway.

SOME ECONOMIC EFFECTS OF THE SUBURBAN PORTION OF NORTH CENTRAL EXPRESSWAY, DALLAS, TEXAS

Part 1 - Introduction

Much attention has been given during recent years to the economic impact of limited-access roads. Studies of this nature have contributed to the knowledge of non-vehicular road benefits and have proved useful in right-of-way acquisition as well as in considerations of road location and design.

The Texas Transportation Institute has conducted a series of economic impact studies covering a variety of road types and land development situations. The current study has as its subject the influence of a freeway-type radial facility upon a suburban area of open land and upon a small rural town for which travel time to the Dallas Central Business District was cut from something over 30 minutes to about 17 minutes.

This is the third economic impact study in the Dallas area. The first such study (reported in *Effects of the Dallas Central Expressway on Land Values and Land Use*, Texas Transportation Institute Bulletin 6) dealt with the 5.4-mile portion of North Central Expressway from near the Central Business District to Loop 12. The study periods were 1941-45, which was before construction of the facility, and 1951-55, which represented the "after" period. (See Figure 1.) Most of the area traversed by this road improvement was already developed in a variety of urban uses although some open land still existed in the vicinity of Loop 12. The findings revealed a very striking influence on abutting properties all along the route. The value of abutting land in the built-up areas was increased by about 450 percent, attributable to the road improvement. Other land in the adjacent areas experienced a minor influence on value of about 25 percent. Abutting land in the open area near Loop 12 received a net influence of over 800 percent, while nonabutting land in the same area was increased by about 400 percent.

The second economic impact study in the Dallas area was concerned with the Stemmons Freeway, a 7.3-mile portion of Interstate Highway 35E. This highway was built through an area of about 5,000 acres of reclaimed overflow land which was being developed or held for development as industrial subdivisions. The study was conducted shortly after the facility was opened to traffic in December, 1959. Evidence was found that abutting land was raised considerably in value, but very little influence on nonabutting land was demonstrated. (The findings of this study were released in Texas Transportation Institute Report E 59-60.)

The present study may be considered as a continuation of the first study of North Central Expressway. Beginning at Loop 12, where the initial study terminated, the area studied in this latest effort is along an 8.1-mile segment of the expressway stretching northward past the city of Richardson and almost to the Dallas County line. A major purpose of the study was to determine the economic impact of the greatly improved accessibility of Richardson, a town having a population of only 1,289 in 1950. A second objective was to investigate not only the influence of land use and land values of the new road but also whether the measurable impact upon areas of open land was generally restricted to a narrow band on either side of the facility, as had been found to be the case in built-up areas.

Description of the Expressway

North Central Expressway is a section of U.S. 75, which has Galveston as its southern terminal and stretches to Winnipeg, Manitoba, Canada. Tulsa, Oklahoma, and Topeka, Kansas, are among the cities it serves. The portion between Galveston and downtown Dallas has been redesignated as Interstate Highway 45 and is currently being constructed to interstate highway standards. U.S. 75 north of Dallas is not included in the Interstate System.

"Expressway" is a misnomer for North Central since it is actually of freeway design, having no grade crossings and no stop signals on its four free lanes. The highway has continuous frontage roads through the study area.

Although the location of North Central Expressway was generally decided in 1945 and right-of-way acquisition was begun in 1946, construction of the study sections of the freeway did not begin until 1952.

Construction was done by sections over a three-year period. The work proceeded as follows: (a) from Loop 12 to Pinson Road, 1.5 miles, contract let February, 1952, and completed July, 1953; (b) from Pinson Road to near Forest Lane Road, 1.3 miles, contract let June, 1952, and completed June, 1953; (c) from near Forest Lane Road to Spring Valley Road, 2.2 miles, contract let October, 1952, and completed April, 1954; and (d) from Spring Valley Road to Campbell Road, 3.1 miles, contract let June, 1953, and completed April, 1955.

For about one-third the distance, the right of way followed Coit Road, a paved two-lane county road; for the balance of the distance the road was built on new location.

According to the Texas Highway Department, by 1961 the average daily traffic immediately north of Loop 12 was 40,620 vehicles; this was the heaviest traffic volume in the study area. At the southern city limits of Richardson the average daily traffic was 23,380.

Description of the Surrounding Area

At the time the new highway was planned, during the late summer of 1945, the development of Dallas in that direction was contained well within its city limits, not yet having grown beyond Loop 12. The area

through which the new road passed was almost entirely open land being used for agricultural purposes or lying idle. Although a part of the area is flat, generally it is characterized by low rolling hills. The several creeks in the area flood the surrounding lowlands or valleys. Much of the abutting land was considerably below the grade of the new road and was poorly suited for many types of development.

Richardson, located on U.S. 75 about 15 miles from downtown Dallas, was a small community of 1,206 people in 1940 and had grown to only 1,289 in 1950. Primarily it served agriculture and had little, if any, dependence on Dallas. Beginning in 1955, Richardson grew rapidly, both in population and area, as is discussed in more detail later in the report.

During the 1950's Dallas experienced very rapid growth. It annexed the area surrounding the new facility in several steps between 1945 and 1958, at which time the north city limits of Dallas extended to the south city limits of Richardson. (See Figure 1.)

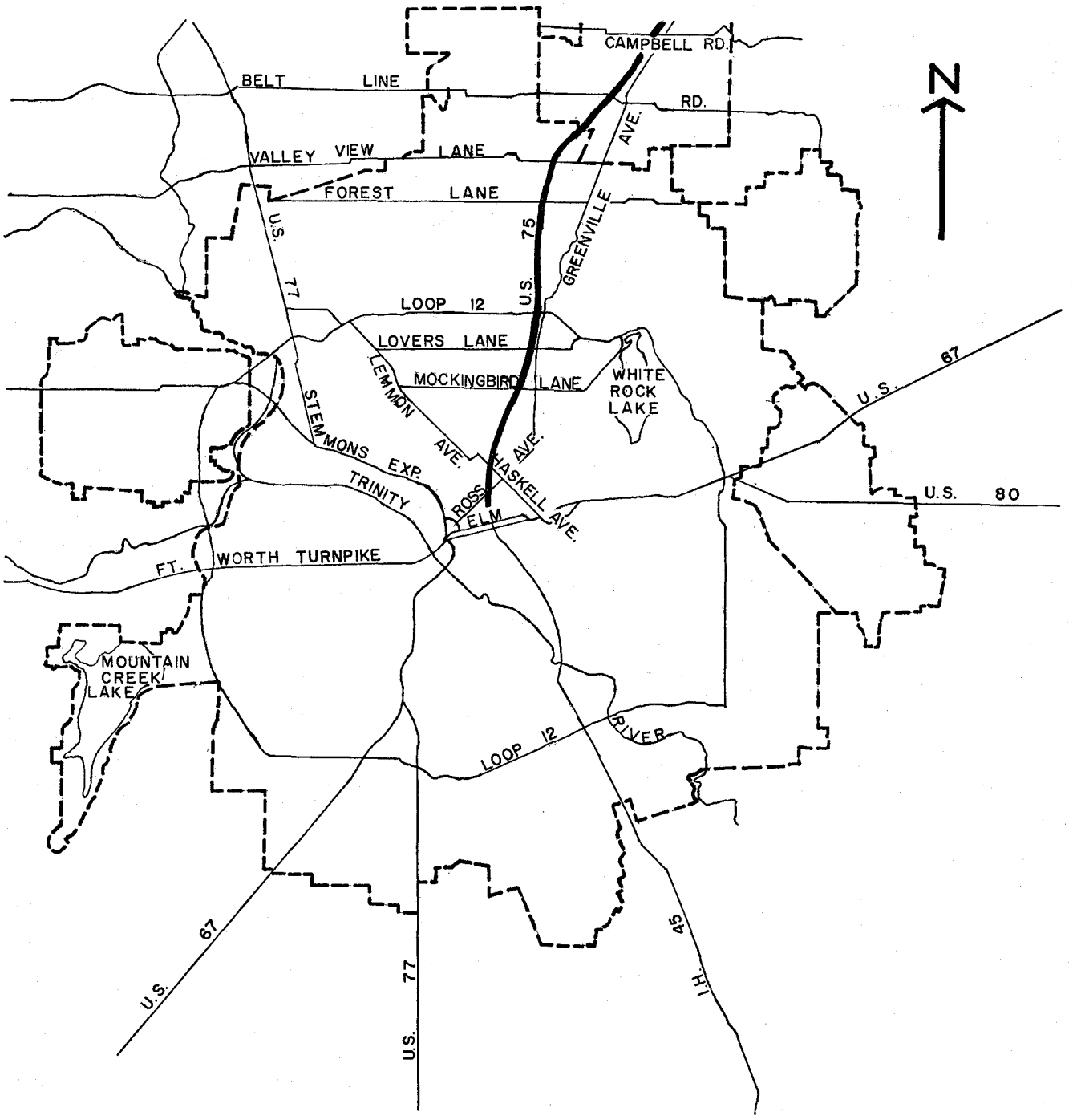


Figure 1. Outline map of Dallas showing North Central Expressway.

Much of the study area was not zoned at the time Central Expressway was built. However, the Planning Commissions of Dallas and Richardson established zoning classifications as additional areas were annexed, thus directing an orderly and planned development of lands near the expressway.

As is shown in Figure 4, most of the study area within Dallas has been zoned for residential use, with retail and commercial development permitted along part of the facility. Manufacturing areas are few and are limited to firms classified as "light manufacturing" operations. The portion of the study area in the southern part of Richardson has zoning provisions for commercial and light manufacturing near the expressway while beyond the zoning is for residential development.

The Study Method

The objectives of the study were (a) to determine changes in the use and value of land attributable to the expressway's influence, and (b) to analyze the influence of improved access on the development of the small town of Richardson, located about 15 miles from downtown Dallas.

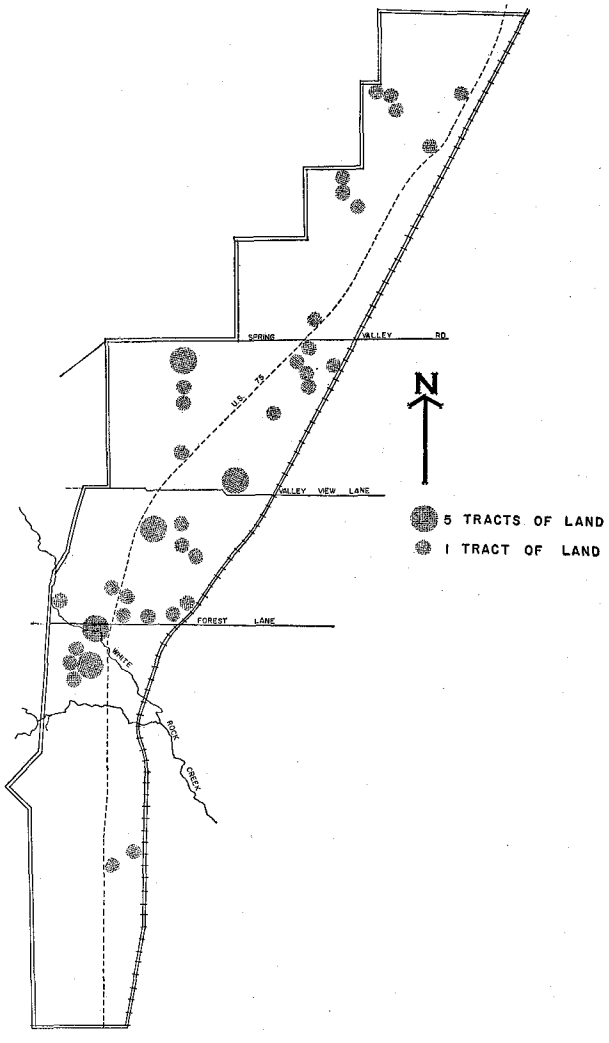


Figure 2. Location of tracts that sold in the study area during the before period.

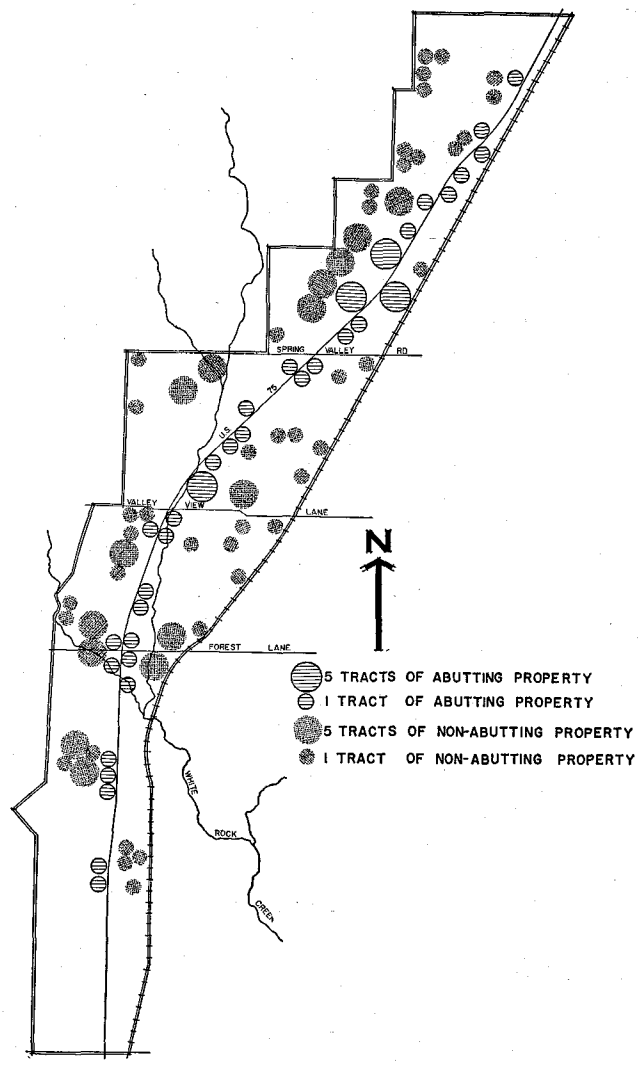


Figure 3. Location of tracts that sold in the study area during the after period.

The general approach to these objectives was what has come to be known as the "before and after" approach. Comparisons were made of areas near Central Expressway and more remote areas. Richardson was compared with other towns in the vicinity of Dallas. It was required that the study areas (near the expressway) and the control areas (remote from the facility) should have been similar in the before-expressway period. Assuming no other major influences acting on the study and control areas differentially, differences in changes are inferred as expressway effects.

Time Periods Selected: The 8.1-mile portion of the expressway from Loop 12 north to Campbell Road had been opened to traffic for about six years at the time the study was undertaken. Such a time period seemed sufficient to permit the use of the before and after technique as a means of measuring the influence of the expressway on land values.

Although the location of the right of way was established in 1945 and a few bridges were built shortly thereafter, construction of the highway did not start until 1952. Thus, it was decided to consider the six years

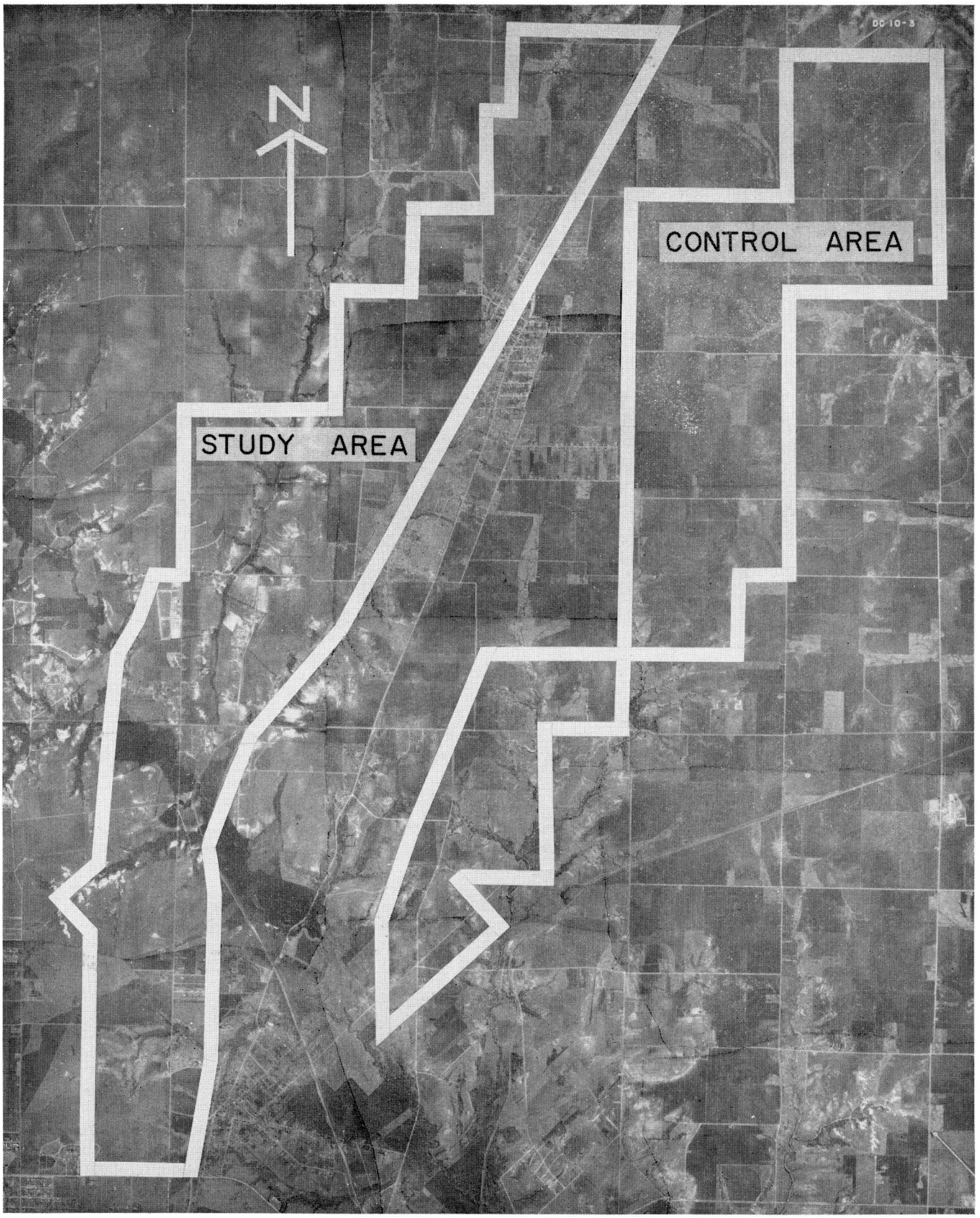


Plate 1. Aerial photograph showing the study area and the control area in 1949.

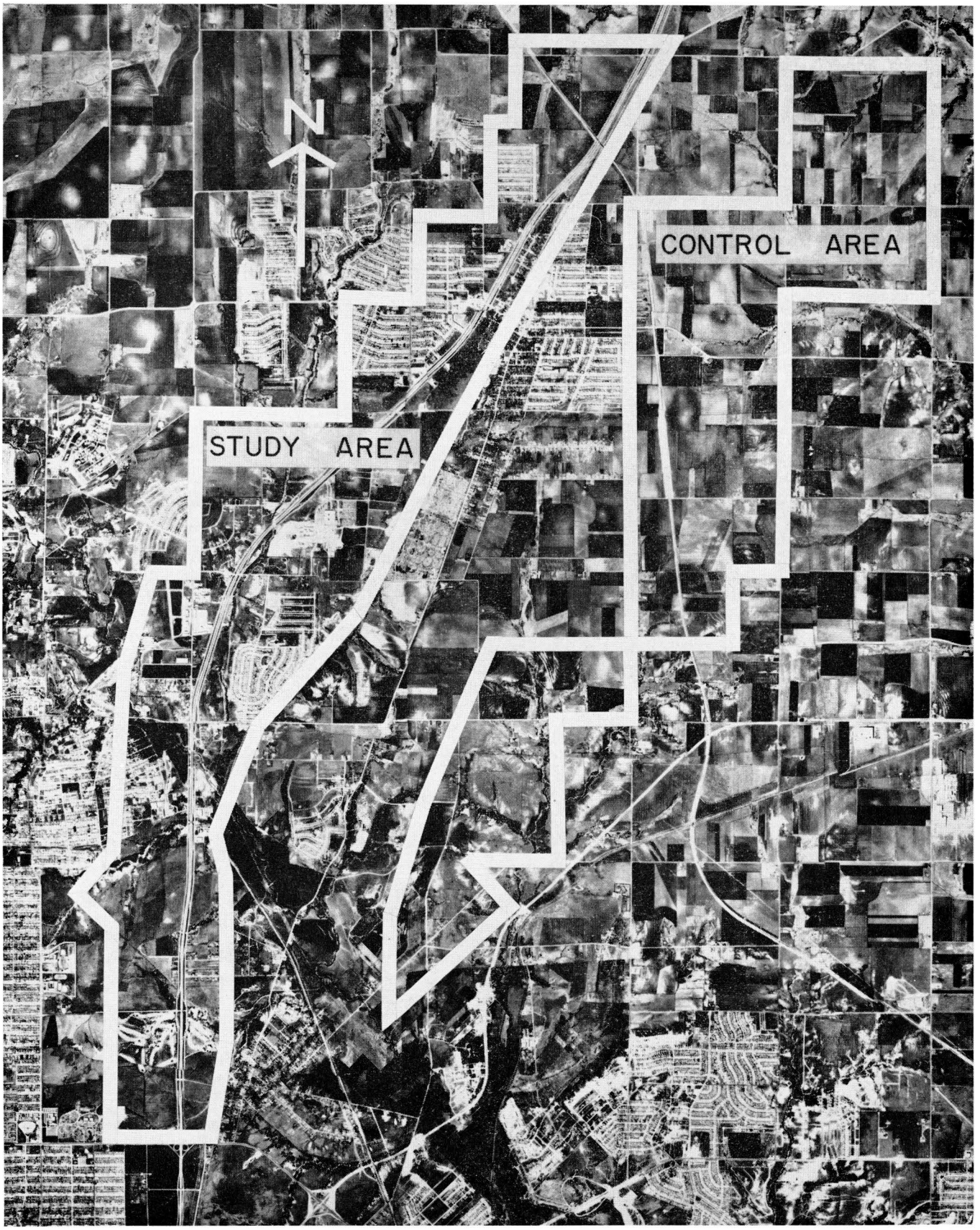


Plate 2. Aerial photograph showing the study area and the control area in 1959.

from January 1, 1946, through December 31, 1951, as the "before period." For analytical purposes the time from January 1, 1952, through April, 1955, would be considered as the "construction period" and the six years of April, 1955, through December 31, 1960, as the "after period." However, since the highway had been planned for so many years and sections were actually opened to traffic as they were completed, it was believed that it would be more accurate to combine the construction period and after period and present data in the report for only two periods. Thus, the years 1946 through 1951 are referred to in this report as the "before period" and the years 1952 through 1960 as the "after period." (The consequence of this combination of periods upon measurements of value is discussed in a footnote to Table 3.)

Study and Control Areas: It was originally planned that an area approximately one-half mile on either side of the expressway would be selected for detailed land sales analysis. An investigation of the area and surveys (abstracts) within the area caused modification of the arbitrarily designed one-half mile boundary. A railroad track roughly parallels the expressway on the east, varying in distance from the highway from less than 100 feet in Richardson to about three-fourths of a mile in another section of the study area. There are few roads or streets that cross the railroad; as a result it was believed that the influence of the expressway would not extend as far as it would in unobstructed, open land. For this reason the railroad was selected as the eastern boundary of the study area. The western boundary followed survey lines but also was modified by ownership patterns and road network.

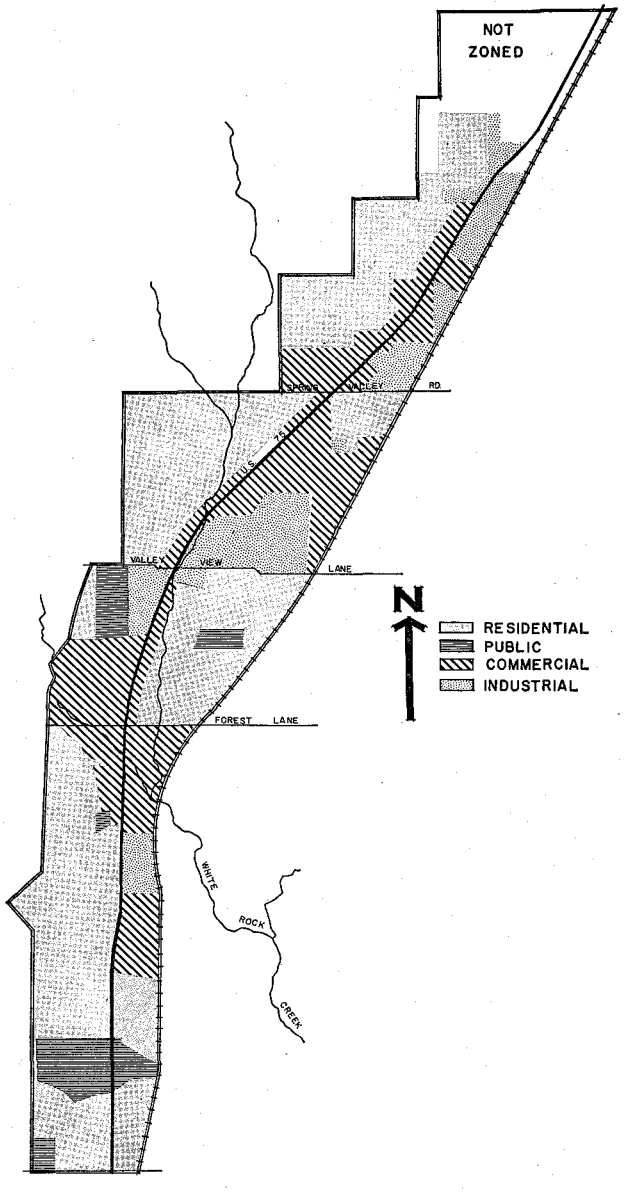


Figure 4. Zoning in the study area in 1961.

The control area lies to the east of the study area. It is not as far removed from Central Expressway as would have been desirable. On the other hand, no better control area was found, since in the before period the two areas to be compared were quite similar. The similarity was evident for such factors as terrain, distance to Dallas, road service, and land use, which was primarily agricultural in both areas. (See Plate 1.) As will be discussed later, land values in the two areas also were comparable in the before-expressway period.

To investigate the influence of the expressway on Richardson, various factors indicative of the growth and economic development of the community were analyzed. Four other communities were selected as "control towns" with which to compare Richardson. These were Mesquite, Seagoville, Lancaster, and Carrollton, each of which was a small town in 1950. Each is located about 15 miles from the Dallas Central Business District. None was served from downtown Dallas by an expressway-type facility. Each town differs in character and individually would not be an ideal control for Richardson. However, it was believed that a comparison of towns both separately and compositely over the period of the study would reveal something of the influence of the expressway.

Sources of Data: The real estate sales used in the study were identified from the records of Dallas County's Map and Plat Section. The data were secured from deed "take-off" file cards, and the property was located and platted on a map. For many of the transactions, the price was determined from revenue stamps affixed to the deed. The deed record for each usable sale was checked for assumed debts (which are not reflected by revenue stamps) and for any indication that the sales prices of the land needed additional verification. Insofar as could be determined only bona fide market sales were retained for study.

Lots in platted subdivisions were not included in the study. Finally a total of 373 property sales were accepted for analysis. Whether or not the land involved was improved was determined by personal inspection, by aerial photographs, and by the inspection of tax records. In the study area, there were 221 sales of unimproved tracts and 74 sales of improved tracts. The control area experienced 69 sales of unimproved tracts and 9 sales of improved tracts.

An analysis of the 373 real estate sales showed these involved 312 individual tracts or parcels of land. It was found that some pieces of property sold as many as six

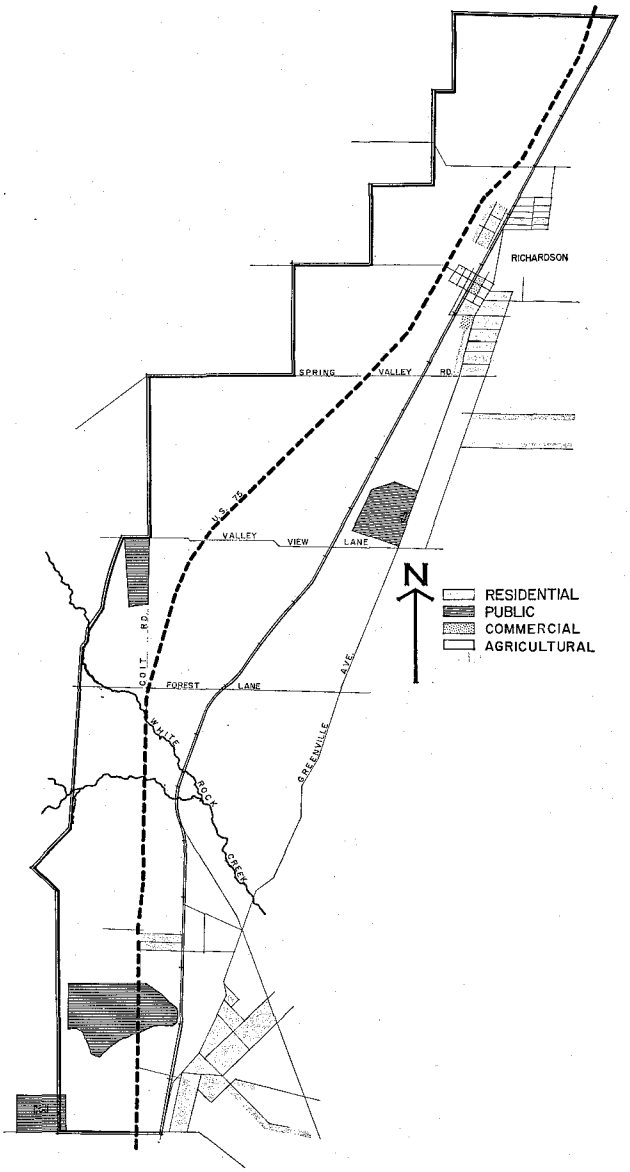


Figure 5. Land use in the study area in 1949.

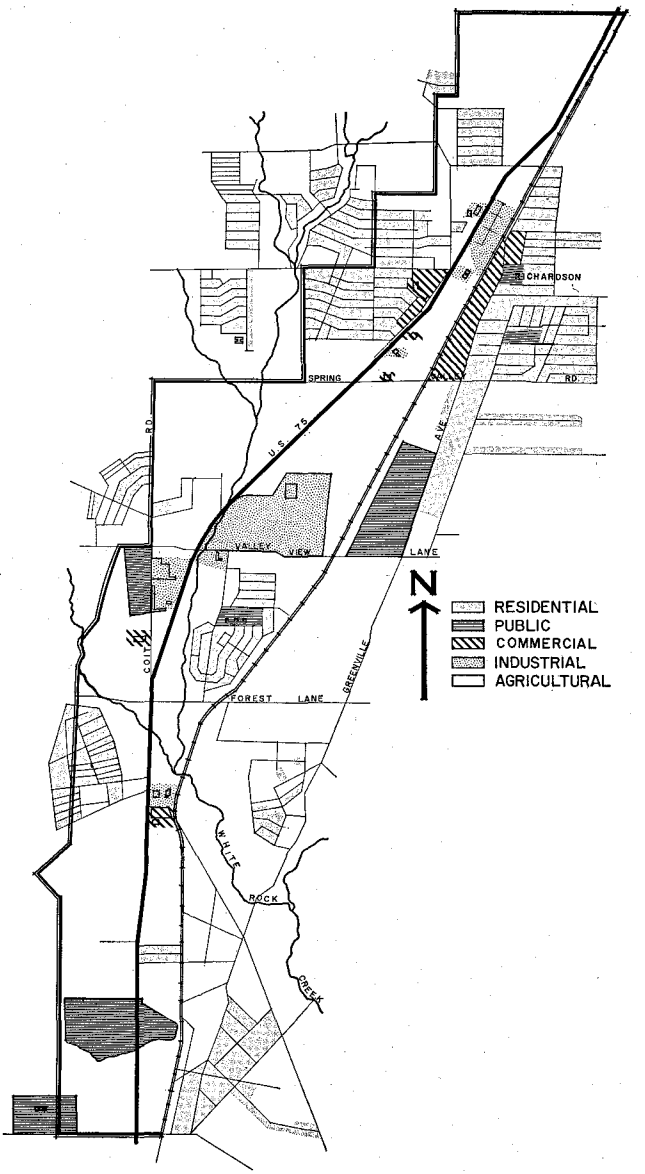


Figure 6. Land use in the study area in 1959.

times during the same period. These transactions had an undue influence when sales prices were averaged, particularly in those calculations in which relatively few sales were involved. It was believed that a truer picture of land values would be obtained by using tracts or parcels of land as the basis for the analysis rather than individual sales. Thus, in those instances where more than one sale of a piece of property occurred during the same time period (all sales of unimproved or all sales of improved land) the several sales were averaged and that figure used in all calculations for the particular tract of land. (See Table 1.)

Changes in land use in the study area were learned from inspection of aerial photographs and by field observations. An aerial photograph of the area taken in 1949 was used to represent the "before" period and one of March, 1959, to represent the "after" period. The percentage of the total land used for each of the several purposes was estimated from these maps and conclusions drawn as to changes in land use between these two time periods.

Data concerning Richardson and the control towns were obtained from the city officials of each town and also from the Texas Power and Light Company.

Part II - Influence of the Expressway on Land Values

Real estate sales were analyzed in the study to obtain a reflection of land values and land value changes. The deed records yielded 373 such sales which involved 312 individual tracts of land. Table 1 shows the number of sales and the number of tracts which sold in the study and control areas. Also shown are the numbers of sales which occurred during each period of the study and whether these involved unimproved or improved land. As may be seen, the preponderance of sales was of unimproved land. This was to be expected as most properties were unimproved in the before period, and relatively few improvements were added subsequent to the construction of the expressway. Furthermore, as was mentioned previously, sales of developed lots were not studied as such properties had had value added to them through street and utility improvements, such value being a factor very difficult to account.

Land was classified in a number of ways in the analysis. The major comparisons used in studying the expressway's influence on land prices were as follows:

1. Unimproved versus improved land.
2. Abutting versus nonabutting land.
3. Land in Richardson versus land in Dallas.

Real estate sales perhaps give the best reflection of land value available to the researcher. A principal concern in using such data is whether or not the property that sells is representative of all property in a particular area or class. This worry is allayed to some extent in the present study because of the large amount of unimproved land which has a lower variability than might be expected among mixed uses. However, some indication of the quality of the various averages calculated seems desirable. For this reason, each of the following tables regarding land values shows the standard errors of the differences between the means being compared. The means used in the study are simple averages; that is, they are not area-weighted.

A very large number of alternative indices of a factor's influence on land values might be used. If the before period prices in study and control areas are equal, such indices would generally yield the same answers. Such a condition seldom prevails, however. Thus a choice among measurement systems which yield different results becomes necessary. In this study two indices were selected and are averaged to obtain an inferred expressway influence. These indices and their accompanying assumptions are discussed in the footnotes of Table 2. The two indices are averaged to obtain a single measure of influence in each case.

Unimproved Land

Table 2 presents a comparison of the actual average prices paid for unimproved land in the study and control areas and during the before and after periods. Unimproved land in the study area advanced in price far more than did such land in the control area. The expressway's influence was shown as 123 percent by Index 1 and 67 percent by Index 2. The average of the two indices is 95 percent, which yields a dollar measure of $961 per acre.

The analysis presented in Table 3 is favored because the price data have been corrected for changes in the value of the dollar. Unimproved land in the study area is shown to have increased 106 percent in value by the road improvement. Dollar-wise this is $1,004 per acre.

Statistically, the inference is strong as the difference between the $947 and $747 means in the before period is not highly significant, which indicates at least fair comparability of the study and control areas before the expressway was constructed. In the after period the average prices per acre in the two areas were quite different statistically. (The measures from which these conclusions are drawn are given in the footnotes of each table.)

Improved Land

There was very little improved land in the two areas during the before-expressway period. The control area remained virtually without improvements through the after period as is reflected by only four sales of such property. Some improvements had been added in the study area both in subdivisions and upon unplatted tracts. The study area experienced sales of 56 improved tracts in the after period. (It should be recalled that sales of developed lots were not obtained.)

The very limited number of sales of improved property restricts the conclusions that may be drawn from Tables 4 and 5. The strongest conclusion is that the study area became relatively more attractive for improvements because the expressway gave it superior access. In other words, development was encouraged. (The later section on land use supports this finding.) In

TABLE 1

Number of Sales and Tracts of Land Used in the Analysis of Land Values

	Sales		Tracts of Land	
In Study Area				
During 1946-1951 (Before)				
Unimproved land	71		52	
Improved tracts	10		8	
During 1952-1960 (After)				
Unimproved land	150		127	
Improved tracts	64		56	
Total		295		243
In Control Area				
During 1946-1951 (Before)				
Unimproved land	12		11	
Improved tracts	3		3	
During 1952-1960 (After)				
Unimproved land	57		51	
Improved tracts	6		4	
Total		78		69
Total Analyzed		373		312

TABLE 2

Changes in the Value of Unimproved Land in the Study and Control Areas

Actual Prices

	Price per Acre[1]	
	Study Area	Control Area
Before period, 1946-51[2]	$1,012 (52)	$ 709 (11)
After period, 1952-60[3]	$3,597 (127)	$2,045 (51)
Dollar increase	$2,585	$1,336
Percent increase	255%	188%
Inferred influence of the expressway[4]		
Index 1	123%	
Index 2	67%	
Mean of Index 1 and Index 2	95%	
Mean dollar influence[5]	$ 961	

[1]The number of land tracts that sold is shown in parentheses.

[2]The standard error (S.E.) of the difference $303 is $237; the difference is not highly significant.

[3]The S. E. of the difference $1,552 is $361; the data indicate that the difference is quite significant.

[4]Index 1 is the difference between dollar increases in study and control areas expressed as a percentage of the before period study area price per acre. It assumes that study and control areas would have increased in value by the same dollar amount in the absence of the road improvement. That is, both would have increased in value by $1,336 per acre. Following this assumption, if the control area had had an expressway, its gain would have been greater percentage-wise by Index 1 measurement than that of the study area.
Index 2 is the difference between the percentage increases in values in study and control areas. It assumes that such percentage increases would have been the same in the absence of an expressway. That is, both would have increased in value by 188 percent. Dollar-wise this would have resulted in a smaller increase for the control area than for the study area.
Note that Index 1 and Index 2 would have yielded identical results if before prices in the study and control areas had been identical.

[5]Mean of the indices times the before period study area price per acre.

addition, the evidence suggests that improvements in the study area had a higher average value than those in control areas.

Abutting versus Nonabutting Land

As mentioned earlier, two previous economic impact studies in Dallas had determined that land abutting freeway-type facilities was enhanced by such location. Beyond the relatively narrow band of such properties, however, it was found that such benefits as occurred were small, or at least quite difficult to determine. Such findings may suggest that the tools of measurement are capable of distinguishing only relatively large influences. This view seems quite reasonable when it is remembered that nonabutting lands in the immediate vicinity of a freeway are in position to receive very marked betterment of general accessibility, although site visibility and other value factors may be less affected.

Another explanation of the restricted lateral influence as measured in the first North Central Expressway study had to do with the types of land use through which the facility passed. The study area as a whole from downtown Dallas to Loop 12 was mostly built-up; most

TABLE 3

Changes in the Value of Unimproved Land in the Study and Control Areas

In Terms of Constant (1947-49) Dollars

	Price per Acre[1]	
	Study Area	Control Area
Before period, 1946-51[2]	$ 947 (52)	$ 747 (11)
After period, 1952-60[3]	$3,033 (127)	$1,692 (51)
Dollar increase	$2,086	$ 945
Percent increase	220%	127%
Inferred influence of the expressway[4]		
Index 1	120%	
Index 2	93%	
Mean of Index 1 and Index 2	106%	
Mean dollar influence	$1,004	

[1]The number of tracts that sold is shown in parentheses. If 1955-60 were used as the after period as mentioned in the introduction, the average prices per acre would be $3,763 for the study area and $1,892 for the control area.

[2]The S.E. of the difference of $200 is $245; the difference is not highly significant.

[3]The S.E. of the difference of $1,341 is $301; the data show the difference in prices in the two areas to be quite significant.

[4]See Footnotes 4 and 5 of Table 2 for an explanation of the selected indexes of measurement.

of the unimproved land abutted the expressway, which occupied an old railroad right of way. It was believed the improvements on nonabutting lands stood in the way of land-use change, and for this reason that expressway benefits to land were dampened or obscured.

The present study of the economic impact of the suburban portion of North Central Expressway gave an opportunity to observe the influence of such a facility on the value of open land and to determine whether or not measurable benefits were found beyond abutting properties. Tables 6 and 7 present the comparisons made in pursuit of this objective. Sales prices of unimproved land were used for the test.

TABLE 4

Changes in the Value of Improved Property in the Study and Control Areas

Actual Prices

	Price per Acre[1]	
	Study Area	Control Area
Before period, 1946-51[2]	$ 4,276 (8)	$ 4,468 (3)
After period, 1952-60[3]	$30,377 (56)	$12,110 (4)
Dollar increase	$26,101	$ 7,642
Percent increase	610%	171%
Inferred influence of the expressway[4]		
Index 1	432%	
Index 2	439%	
Mean of Index 1 and Index 2	436%	
Mean dollar influence	$18,643	

[1]The number of tracts that sold is shown in parentheses.

[2]The S.E. of the difference $192 is $2,300; the difference in means is not significant.

[3]The S.E. of the difference $18,267 is $5,870; the difference is statistically significant.

[4]See Footnotes 4 and 5 of Table 2 for an explanation of the selected indexes of measurement.

TABLE 5

Changes in the Value of Improved Property in the Study and Control Areas

In Terms of Constant (1947-49) Dollars

	Price per Acre[1]	
	Study Area	Control Area
Before period, 1946-51[2]	$ 4,136 (8)	$4,418 (3)
After period, 1952-60[3]	$24,837 (56)	$9,874 (4)
Dollar increase	$20,701	$5,456
Percent increase	501%	123%
Inferred influence of the expressway[4]		
Index 1	369%	
Index 2	378%	
Mean of Index 1 and Index 2	374%	
Mean dollar influence	$15,469	

[1]The number of tracts sold is shown in parentheses.

[2]The S.E. of the $282 difference is $2,140. The means are not significantly different.

[3]The S.E. of the $14,963 difference is $4,730. The means are significantly different.

[4]See Footnotes 4 and 5 of Table 2 for an explanation of the selected indexes of measurement.

Table 6 indicates that in terms of actual prices, abutting land experienced sizable benefits from the expressway. Such land rose in value dollar-wise and percentage-wise more than did unimproved land in the control area. Index 1 shows the expressway influence to be 319 percent for abutting land while the Index 2 estimate was 265 percent. The mean of the indices was 292 percent, which is equal to $3,119 per acre.

In terms of actual prices, nonabutting land in the study area increased more dollar-wise than control area land but less proportionately. It is important to note that the $2,542 average price per acre of nonabutting land in the after period was significantly greater statistically than was the $2,045 value calculated for land in the control area; the before period difference in average prices had little statistical significance. The average of the indices of measurement is a negative six percent. These findings leave some uncertainty as to benefits, but this is reconciled in the Table 7 analysis.

Table 7 compares values of abutting and nonabutting lands in terms of constant dollars. This analysis is preferred, for it has been corrected, at least partially, for the irregular scatter of sales over rather lengthy study periods through an adjustment for the changing purchasing power of the dollar. The results, while similar to those presented in Table 6, are more consistent. Abutting land apparently was enhanced appreciably in value, 269 percent, according to the average of the indices.

Nonabutting land also experienced expressway benefits; but these were a great deal smaller (17 percent), indicating that at least as far as they can be measured, expressway influences on land values diminish very rapidly with distance from the facility.

Improved Abutting and Nonabutting Land

There were only two sales of improved abutting tracts (tracts which later abutted the expressway) and six sales of improved nonabutting tracts in the before period. The control area experienced only three sales of improved tracts during this period. As far as could be determined, all of these sales involved residential improvements. The average price per acre in all three areas was about $4,000 for improved tracts.

In the after period, 20 improved tracts abutting the expressway sold for an average of $31,962 per acre. Thirty-six nonabutting improved tracts sold for $20,879 per acre. Many of the tracts in each area were improved with residences, but abutting tracts which sold were known to include some small commercial buildings. Only four improved tracts sold in the control area, at an average price per acre of $9,874.

Little may be concluded from these comparisons regarding abutting and nonabutting land. It may be

TABLE 6

Changes in the Value of Unimproved Land Abutting and Not Abutting the Expressway

Actual Prices

	Price per Acre[1]		
	Study Area Abutting	Study Area Non-abutting	Control Area
Before period, 1946-51[2]	$1,068 (11)	$ 996 (41)	$ 709 (11)
After period, 1952-60[3]	$5,810 (41)	$2,542 (86)	$2,045 (51)
Dollar increase	$4,742	$1,546	$1,336
Percent increase	453%	155%	188%
Inferred expressway influence[4]			
Index 1	319%	21%	
Index 2	265%	—33%	
Mean of Index 1 and Index 2	292%	— 6%	
Mean dollar influence	$3,119	—$ 60	

[1]The number of tracts that sold is shown in parentheses.

[2]The S.E. of the $72 difference between means of abutting and nonabutting land is $342; the S.E. of the $359 difference between means of abutting and control area land is $370; the S.E. of the $287 difference between means of nonabutting and control area land is $245. The average prices are not significantly different statistically.

[3]The S.E. of the $3,268 difference between the means for abutting and nonabutting land is $901; the S.E. of the $3,765 difference between means for abutting and control area land is $896; the S.E. of the $497 difference between the means for nonabutting and control area land is $215. Each mean is significantly different from the other means.

[4]See Footnotes 4 and 5 of Table 2 for an explanation of the selected indexes of measurement.

TABLE 7

Changes in the Value of Unimproved Land
Abutting and Not Abutting the Expressway
In Terms of Constant (1947-49) Dollars

	Price per Acre[1]		
	Study Area Abutting	Study Area Non-abutting	Control Area
Before period, 1946-51[2]	$1,023 (11)	$ 927 (41)	$ 747 (11)
After period, 1952-60[3]	$4,897 (41)	$2,145 (86)	$1,692 (51)
Dollar increase	$3,874	$1,218	$ 945
Percent increase	379%	131%	127%
Inferred expressway influence[4]			
Index 1	286%	29%	
Index 2	252%	4%	
Mean of Index 1 and Index 2	269%	17%	
Mean dollar influence	$2,752	$ 158	

[1]The number of tracts that sold is shown in parentheses.
[2]The S.E. of the $96 difference between the means for abutting and nonabutting land is $329; the S.E. of the $276 difference between the means of abutting and control land is $370; the S.E. of the $180 difference between nonabutting and control land is $251. The means are not significantly different statistically.
[3]The S.E. of the $2,752 difference between the means for abutting and nonabutting land is $756; the S.E. of the $3,205 difference between the means for abutting and control land is $752; the S.E. for the $453 difference between nonabutting and control land is $177. Each mean is significantly different from the others.
[4]See Footnotes 4 and 5 of Table 2 for an explanation of the selected indexes of measurement.

reasonable to assume that abutting land brought the higher price because of the commercial improvements involved in a number of sales and because of the potential of the land upon which the improvements were located.

Land Values in Dallas and Richardson

A number of additional analyses of land sales were attempted in the study, but very often these failed because of small frequencies of sales. The comparison of values in the Dallas and Richardson portions of the study area resulted in an interesting finding, however. The differential in average prices in the two areas tended to disappear after the expressway was constructed. As is shown in Table 8, the before period price of unimproved land in the area later annexed to Dallas was $1,057 per acre, more than twice the $484 per acre price of land in the Richardson area. In the after period, prices in the two areas were very similar. (Statistically they were not significantly different.)

In effect, this finding suggests that the expressway tended to equalize values in adjacent areas as it reduced the differences in their accessibility to downtown Dallas and other points. However, attempts to explore this probability were thwarted because the number of sales were too small to allow the control of other such important factors as proximity to the expressway, dates of annexation to cities, and terrain and other physical characteristics.

TABLE 8

Changes in the Value of Unimproved
Land in the Dallas and Richardson
Portions of the Study Area
In Terms of Constant (1947-49) Dollars

	Price per Acre[1]	
	Dallas	Richardson
Before period, 1946-51[2]	$1,057 (42)	$ 484 (10)
After period, 1952-60[3]	$3,116 (78)	$2,902 (49)
Dollar increase	$2,059	$2,418
Percent increase	195%	500%

[1]The number of tracts that sold is given in parentheses.
[2]The S.E. of the difference $573 is $156; the difference is highly significant.
[3]The S.E. of the difference $214 is $549; the difference is not significant statistically.

Part III - Changes in Land Use

Prior to the construction of the expressway the area through which the highway passed was almost entirely unimproved land lying idle or used for agricultural purposes. Only a few residences existed outside Richardson, and there were no commercial or industrial establishments in the area. The control area selected for study had a few scattered rural homes.

Although a large part of the area is flat, some of it is characterized by low rolling hills. The several creeks in the area occasionally flood the surrounding lowlands and valleys. The land in the study area is not ideally suited for all types of development. Again, the control area generally is characterized by the same characteristics.

During the before period, several miles of open land separated Dallas and Richardson. Both cities have grown rapidly, and in several steps each annexed adjoining lands until by 1958 their city limits became a common boundary between them. The Planning Commissions of Dallas and Richardson established zoning regulations as the areas were annexed, thus directing an orderly and planned development of the area near the expressway. Figure 4 shows the present zoning in the study area for both the land in Dallas and in Richardson. As is shown in the map, property on both sides of the expressway for a mile or so north of Loop 12 has been zoned for residential use, with the exception of the country club located in the area. All other abutting property has been zoned for commercial (wholesale or retail) and light manufacturing use. The area between the expressway and the railroad to the east is likewise zoned for commercial or industrial use. To the west of the highway, however, the land behind the commercial abutting tracts is reserved for residential use. The control area (not shown in Figure 4) was zoned "residential" and "temporary residential."

Through 1960, development in the study area had remained relatively slow, except in the immediate vicinity of Richardson. However, it should be noted that the control area experienced even less change in land use as only a few residences were added from 1949 to 1959, the dates of the aerial photographs shown in Plates 1 and 2.

Outside of Richardson, in the Dallas portion of the study area, only one manufacturing plant was built. This development is Texas Instruments, which in early 1961 employed several thousand persons. Other smaller businesses included a storage and transport firm, three wholesale businesses, a tourist court, and a number of service stations and retail service shops. Three fairly large residential subdivisions were developed after the expressway was constructed, and most of the lots were improved by 1961.

Table 9 compares the proportions of the study area in various uses in 1949 and in 1959. The data include a narrow band of properties in Richardson; the city as a whole is discussed in the next section. The most obvious change in land use in the study area was the increase of land in residential and industrial uses and the associated decrease in agricultural (and idle) land.

One additional observation regarding land use seems worthwhile at this point. Early in 1961, a sizable acreage of land zoned residential was obtained under a 99-year lease by a firm which announced its intent to build a very large shopping center. However, efforts to obtain the necessary change in zoning had not been successful by mid-1961. The acreage involved is located in the southern part of the study area at the Loop 12-Central Expressway cloverleaf interchange. Although this case may not be generally representative, it is perhaps suggestive that zoning restrictions while abetting orderly growth have at the same time served to slow development.

TABLE 9

Land Use in the Study Area
During the Before and After Periods

	Percent of the Study Area in Specified Land Uses	
	Before	After
Land Used For:		
Agriculture	94%	74%
Residential	1	13
Industrial	—	7
Public	5	5
Commercial	—	1
Total	100%	100%

Source: Aerial photographs dated 1949 and 1959 and reproduced as Plates 1 and 2.

Part IV - Influence of the Expressway on Richardson

The second major objective of this study of the economic impact of North Central Expressway was to learn something of the influence of such a facility upon a small town near a large city.

Richardson was a community of 1,206 population in 1940, and by 1950 its population had increased slightly to 1,289. Central Expressway was completed along its western edge in April, 1955, at which time, according to city officials, Richardson's population was about 2,890. The town had begun to feel the influence of Dallas, but it still retained many of the characteristics of a small rural community. From 1955 to 1960 Richardson's population had increased to 16,810, and its continued growth seemed to be assured. (In fact, as of March 31, 1961, city officials of Richardson estimated the city's population to be 20,315.) Its incorporated area expanded from one square mile in 1950 to about five square miles in 1955 and 22 square miles in 1960.

The upsurge in the growth of Richardson apparently coincided with the completion of the expressway. Other factors favorable to the town's development were present, however, and how much growth may be assignable to the expressway is questionable. In an effort to develop yardsticks or indicators of this influence, it was decided to compare Richardson with several other towns similar in size in 1950 and about the same distance from the burgeoning city of Dallas.

Four such towns were selected for comparison purposes. Although no one of these was strictly comparable to Richardson in 1950, it is believed that individually and collectively they will serve to help demonstrate something of the influence of the expressway. Meaningful comparisons which have been prepared deal with the following factors: (1) population, (2) manufacturing plants and their employees, (3) residential building permits, (4) assessed valuations, and (5) bank deposits. It is recognized that these measures are not fully adequate, for they fail to isolate the importance to growth of such factors as precise geographic characteristics, industrial development potential, and the attitudes of a town's citizens and leaders, all of which are critical to the rate and extent of its progress.

The Control Towns

The four towns selected as controls are Carrollton, Lancaster, Mesquite, and Seagoville. All were of a strictly rural character in 1940, and each had begun to reflect the spread of Dallas by 1950. The towns varied in distance from downtown Dallas from 13 to 16 miles, whereas Richardson was about 15 miles from the center of Dallas. None of the towns was served by a limited-access highway facility in 1955, but such roads were under construction by 1960. IH 35 Freeway was serving Carrollton by early 1961, and IH 20 Freeway crossed the northern edge of Mesquite. Neither of these facilities was complete all the way to downtown Dallas as was Central Expressway. U.S. 175 Freeway through Seagoville was well-advanced in construction by early 1961, but several more years would be required for its completion to downtown Dallas. Lancaster had benefitted from improvements to its main road to Dallas, this being a high-type two-lane highway for most of the distance.

The general locations of the control towns and Richardson are presented in Figure 7. A further brief description of each town follows.

Carrollton—The city is located about 15 miles northwest of downtown Dallas. Since the IH 35 Freeway (Stemmons) was opened to traffic in December, 1959, one can travel from the western edge of Dallas' Central Business District to Carrollton via freeways for about three-fourths of the distance and a state highway the balance of the way.

Carrollton differs from the other three control towns in that the city of Farmers Branch is situated between it and Dallas. Farmers Branch has experienced very rapid growth as a result of the expansion of Dallas. Its population increased from 915 in 1950 to 2,930 in 1955 and to 13,441 in 1960. In 1960, Carrollton's incorporated area was seven square miles.

Carrollton was chosen as a control town instead of Farmers Branch for two reasons: (1) Carrollton is located about the same distance from Dallas as Richardson, Farmers Branch being closer to Dallas; (2) In 1950, Carrollton was actually larger than Farmers Branch.

TABLE 10

Populations of Richardson, the Control Towns, and Dallas County for 1940, 1950, 1955, and 1960

	Population				Percent Increase		
	1940	1950	1955	1960	1940 to 1950	1950 to 1960	1955 to 1960
Richardson	1,206	1,289	2,890	16,810	7%	1204%	482%
Control Towns:							
Carrollton	1,506	2,274	2,930	4,253	51	87	45
Lancaster	1,151	2,632	3,918	7,550	129	187	93
Mesquite	1,045	1,696	5,904	31,250	62	1743	429
Seagoville	1,300	1,927	2,731	4,360	48	126	60
Average for control towns	1,250	2,132	3,871	11,803	71	454	205
Dallas County	398,564	614,799	——	951,527	54	55	——

Sourse: Figures for 1940, 1950, and 1960 are from U. S. Census data. The 1955 population of Richardson was estimated by the town's city officials. Other 1955 figures are estimates of the Texas Power and Light Company's Industrial Development Division. 1955 population data for Dallas County were not obtained.

Lancaster—This town, located about 16 miles from the center of Dallas, began to serve as a "bedroom" town for Dallas in the 1940's. Its growth has been rather steady from 2,632 in 1950 to 3,918 in 1955 and 7,550 in 1960. Its 1960 area was nine square miles.

Little manufacturing and commercial activity has entered the area. The economy is still based to a considerable extent upon agriculture and upon employment in the Dallas area. Lancaster was a larger town than Richardson but may have been somewhat weaker in growth potential. It nevertheless offers a reasonable yardstick for evaluating the influence of the expressway upon Richardson.

Mesquite—The center of Mesquite is about 13 miles from Dallas' Central Business District. A community of only 1,045 persons in 1940 and 1,696 in 1950, and 5,904 in 1955, it had attained a population of 31,250 in 1960. This exceptional growth may be explained primarily in terms of Dallas' natural expansion. Mesquite remained more or less static until Dallas grew eastward to its own city limits. Then there seemed to occur an overflow of population into the vicinity of Mesquite. In an annexa-

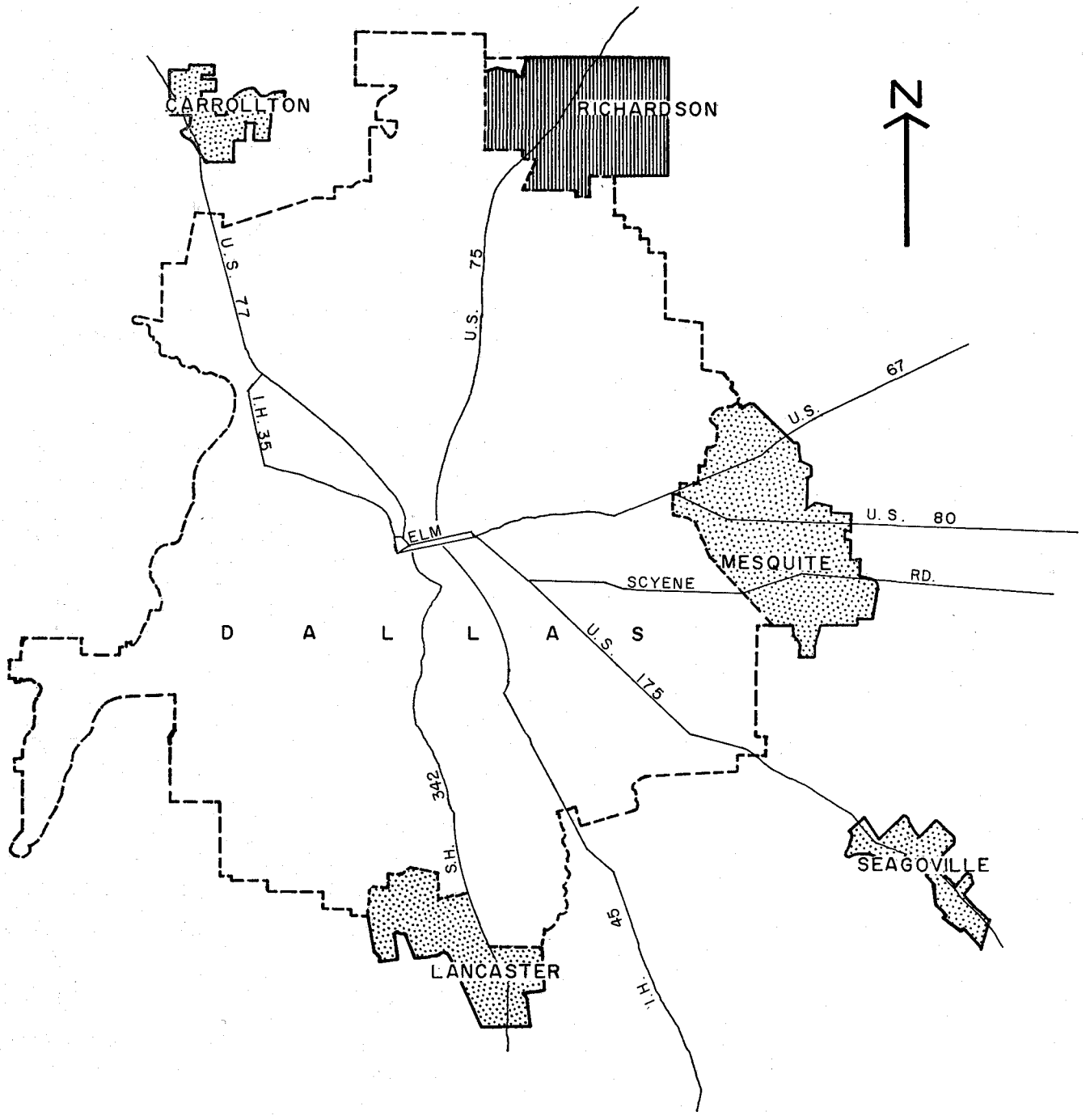


Figure 7. Outline map of the Dallas area showing Richardson and the four control towns.

tion program, Mesquite expanded its area from less than one square mile in 1940 to almost 21 square miles in 1960. This area expansion is very similar to that of Richardson.

A part of the population increase occurred through the annexation of populated areas near Dallas. Other factors were that the Mesquite area had good road service via a major highway and several county roads to industrial and commercial areas of East Dallas.

In early 1961 there were only five manufacturing plants in Mesquite, but the town does have important commercial enterprises. In spite of the growth of the area, the town is still quite dependent upon Dallas for employment.

As a control town, it possibly had greater potential for population growth due to its better location and accessibility in relation to Dallas than did Richardson. By late 1960, the northern section of Mesquite had improved access to Dallas via the IH 20 Freeway for a part of the distance.

Seagoville—Among the towns studied, this community was farthest from (16 miles) and had the poorest access to Dallas, being separated from the metropolitan area by the East Fork of the Trinity River. Its only major road service was U.S. 175. Nevertheless, it grew in population from 1,927 in 1950 to 4,360 in 1960, although its area was only four square miles in 1960.

Like Lancaster, its economy still is based primarily on agriculture, but it naturally has been dependent on Dallas for some employment.

Among control towns, it probably had the poorest growth potential. In early 1961, however, U.S. 175 was being constructed as a freeway, a factor that will greatly improve Seagoville's accessibility.

Comparison of Richardson with Control Towns

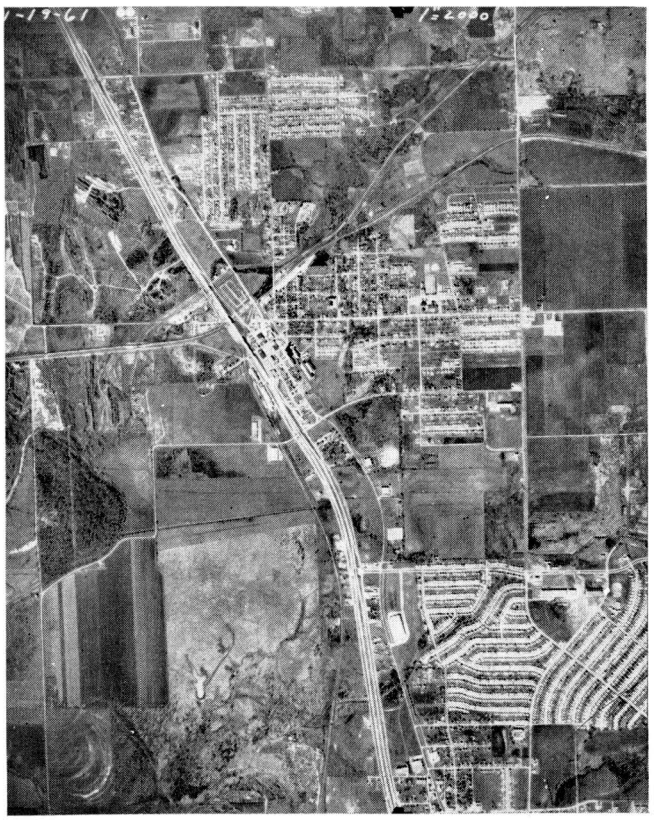
Until Central Expressway was constructed, Richardson was connected with Dallas by U.S. 75, a two-lane highway typical of the times. Travel to downtown Dallas required 30 minutes or more under good conditions. Such accessibility was suitable to a very few persons, and it was not until the promise of access via freeway that developers took an active interest in the area.

The city officials of Richardson and its businessmen generally attribute a substantial part of the city's growth to the presence of Central Expressway. They also give substantial credit for the growth, and especially its nature, to several intangible factors. They cite such influences as the desire of the citizenry to build a "model" town, clean and lasting, and the wisdom of the town's planners in conceiving and pursuing orderly and selective growth.

It is significant that the city annexed areas all around the original townsite and immediately placed relatively high restrictions on its use. Only certain types of manufacturing were to be permitted, these to be of the clean and light type. Enterprises so large that they might dominate the economy were not encouraged.

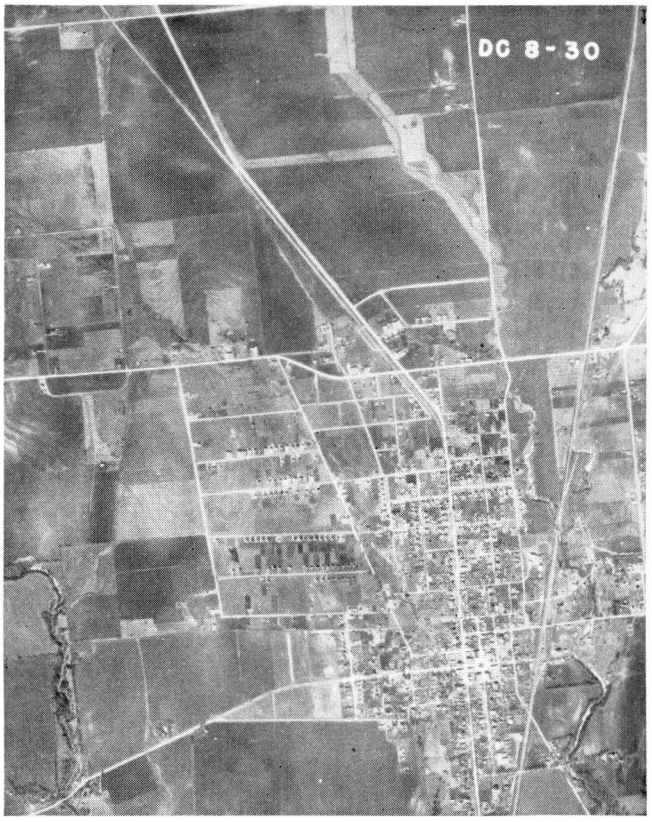
Rigid building codes were adopted for residential development and buildings. As a consequence, all of the 75 miles of streets in the city are curbed and paved. (County and other public roads also are hardsurface.)

1949



1961

Plate 3. Aerial photographs of Carrollton, 1949 and 1961.



1949

1961

Plate 4. Aerial photographs of Lancaster, 1949 and 1961.

Residential lots are of an ample minimum size, and dwellings must be of masonry in addition to meeting other quality standards.

Whereas such controls have undoubtedly affected the character of Richardson, it is only conjecture that they have abetted its growth. Contrarily, perhaps its exclusiveness has actually slowed growth in favor of other goals such as quality and stability. In any event, none of the control towns had been so stringent in regulating development. This is illustrative of the fact that the following comparisons reflect the influence of several factors other than the expressway.

Population Growth—One of the best over-all indicators of an area's progress and growth is its population trend. A strong and sustained upward movement reflects either a permanent shift in a city's economic base and/or an improvement in its acceptability as a place to reside for persons employed elsewhere. A number of factors may contribute to such changes, but none is so universally important as the location or accessibility factor.

Richardson's exploding population has been mentioned previously as has the coincidence of this upsurge with the completion of North Central Expressway. A look at the population changes of the control towns, which only now are beginning to receive significantly improved road facilities, is now in order. Table 10 presents these data.

Only Mesquite exceeded Richardson in population increase from 1950 to 1960. This "bedroom" city for Dallas grew in population by 1743 percent, compared to 1204 percent for Richardson. From 1955 to 1960, however, Richardson had a 482 percent increase in population compared to Mesquite's smaller 429 percent increase. By 1960 both towns had incorporated areas of about 21 to 22 square miles; thus Mesquite had a considerably higher population density. Other control towns also showed population growth, but their increases for both the 1950-60 and 1955-60 periods were much smaller than those of Richardson and Mesquite. Dallas County, as a whole, increased by 55 percent in population from 1950 to 1960.

The inference is strong that North Central Expressway contributed materially to the differentials in population growth. It is doubtful that any other factor, not shared generally by Richardson and the control towns, had so important an impact. It is believed that without

TABLE 11

Manufacturing Plants and Their Employees in Richardson and in Control Towns, 1961

	Number of Plants	Number of Employees
Richardson	14	2,296
Control towns:		
Carrollton	7	371
Lancaster	2	46
Mesquite	5	127
Seagoville	1	45
Average for control towns	3.8	147

Source: Texas Power and Light Company, Industrial Development Division.

service via limited-access road Richardson would have been hard-pressed to exceed Carrollton, Lancaster, and Seagoville in growth; and it would not have approached Mesquite's growth rate.

Manufacturing Activity—In industrial development, Richardson was virtually unchallenged by the control towns. (Table 11.) In 1961, Richardson had 14 manufacturing plants which employed 2,296 persons. All of these plants were established after the expressway became of common knowledge.

Mesquite, which exceeded Richardson in population growth, had but five manufacturing plants in 1961, and these employed only 127 persons. Carrollton, among the control towns, had the largest number of plants with seven, which had 371 employees.

Although other activities such as wholesaling, warehousing, and various services grew in importance in all of the control towns, industry was attracted to Richardson to a unique degree. Again the expressway's influence is strongly indicated. Richardson actively and successfully sought manufacturing, but one of its best qualifications was its newly-acquired locational advantage.

Residential Building Permits — Table 12 presents data on the residential building permits issued by Richardson and the control towns during the 1955-60 period. As in population, Mesquite exceeded Richardson in the number of new dwellings constructed with 7,534 to Richardson's 4,556. However, it is of some interest that the total value of the permits was greater in Richardson. This occurrence is explained by the difference in quality of the dwellings authorized. Permits in Richardson averaged $14,090 in value, those in Mesquite averaged only $8,109.

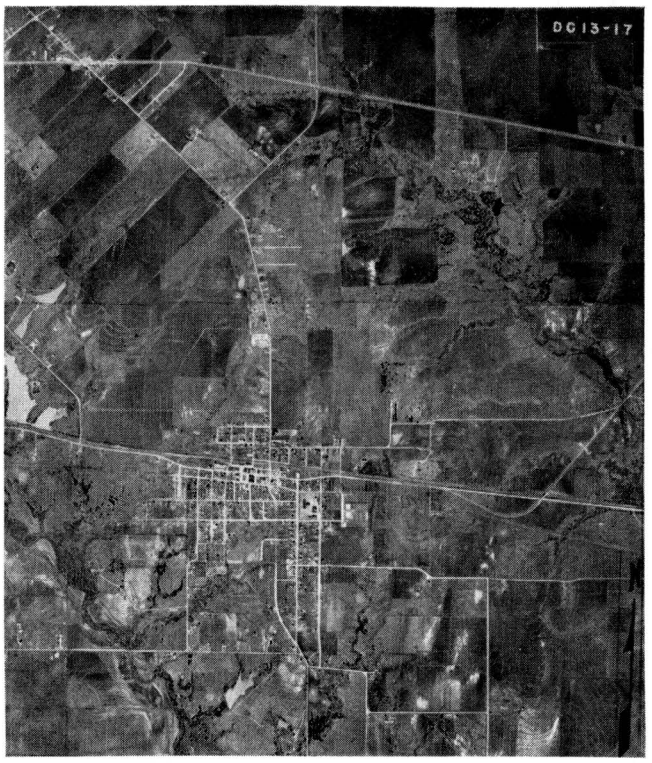
The residential restrictions adopted by Richardson helped account for the high value of permits. As previously discussed, whether these encouraged or inhibited population growth is a matter of conjecture. One conclusion which is indicated, however, is that total investment in the Richardson area, as shown by the number of manufacturing plants and the value of dwellings, approaches that in Mesquite and is far above investment in the other control towns.

TABLE 12

Building Permits for Residential Units Issued by Richardson and the Control Towns, 1955-60

	Building Permits for New Dwellings		
	Number	Total Value	Average Value
Richardson	4,556	$64,195,183	$14,090
Control towns:			
Carrollton	476	4,701,676	9,877
Lancaster	568	*	*
Mesquite	7,534	61,095,131	8,109
Seagoville	304	*	*
Average for control towns	2,220	—	—

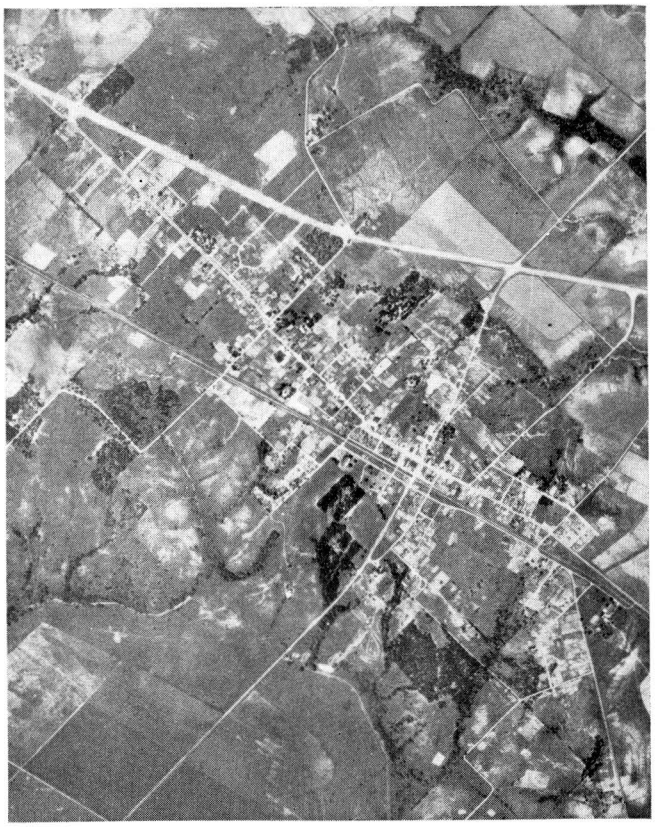
Source: Bureau of Business Research of the University of Texas, and from the various cities.
* Not available.



1949

1961

Plate 5. Aerial photographs of Mesquite, 1949 and 1961.



1949

1961

Plate 6. Aerial photographs of Seagoville, 1949 and 1961.

City Tax Valuations—It is highly unlikely that any two cities will have identical property tax policies. Thus it is not contended that the data presented in Table 13 are completely comparable. The percentage increases in tax valuations have good comparability, however, in view of the fact that Richardson and the control towns reported relatively stable evaluation procedures during the 1955-1960 period.

Richardson led the control towns in this measure of growth with an increase of 584 percent compared to a 346 percent increase for Mesquite. Again it is indicated that investment in Richardson has risen faster than in control towns, supporting conclusions already submitted.

Demand Deposits in Banks—The final comparison selected for presentation deals with the cash resources deposited in banks. Richardson's two banks had deposits of $8,209,989 on December 31, 1960. This amount was significantly greater than bank deposits in control towns. Deposits per capita were $488 in Richardson and only $196 in Mesquite; Carrollton and Lancaster had greater deposits per person. Whereas such

TABLE 13

City Tax Valuations for Richardson and the Control Towns, 1955 and 1960[1]

	Tax Valuations		Percentage
	1955	1960	Increase
Richardson	$6,562,963	$44,858,984	584%
Control towns:			
Carrollton	2,743,943	8,565,741	212
Lancaster[2]	3,437,000	6,300,000	83
Mesquite	6,537,596	29,150,870	346
Seagoville	1,455,780	2,610,185	79
Average for control towns	[3]	[3]	180

Source: City records of each city.

[1]As far as could be determined, none of the cities changed its tax valuation base from 1955 to 1960. Since policies vary among cities, however, the important comparisons are the percentage changes.

[2]The data are approximate.

[3]Data are not additive.

TABLE 14

Demand Deposits in Banks in Richardson and the Control Towns, December 31, 1960

	Number of Banks	Deposits	Deposits per Capita[1]
Richardson	2	$8,209,989	$488
Control towns:			
Carrollton	1	3,079,989	724
Lancaster	1	4,485,957	594
Mesquite	1	6,113,546	196
Seagoville	1	1,989,995	456
Average for control towns	1	3,917,372	332

Source: Texas Power and Light Company, Industrial Development Division.

[1]Calculated by dividing deposits by 1960 populations; the per capita amounts have an upward bias because of the earlier data of the census of population.

Plate 7. An aerial photograph of a part of Richardson, 1961.

measures as total deposits reflect wealth to some extent, they also reflect something of a town's independence.

The data in Table 14 suggest that perhaps Mesquite is more closely associated with Dallas than are Richardson and the control towns; more of Mesquite's residents are employed in Dallas and may tend to bank and shop there.

Bank deposits reflect something of economic activity such as Richardson's industry but also may be related to family incomes; Richardson's family income apparently averaged about $3,000 per year higher than that in control towns.

A number of additional comparisons of characteristics of the various towns have been made. These included school data, recreational and park facilities, city budgets, city indebtedness, tax rates, and various city services. In summary, only Mesquite among control towns generally compared favorably with Richardson in facilities and rate of progress.

APPENDIX

CONSUMER PRICE INDEX USED IN STUDY

As a means of measuring price changes in real estate, constant dollar figures were calculated and studied as well as actual dollar prices paid for land.

Actual dollars paid were multiplied by the reciprocal of the consumer price index for Houston, Texas, as published by the U. S. Department of Commerce, Bureau of Labor Statistics, in order to arrive at the constant dollar value.

The consumer price index and its reciprocal used in these calculations, 1947-1949 base, are as follows:

YEAR	INDEX	RECIPROCAL
1946	80.7	1.239
1947	94.8	1.054
1948	102.8	0.972
1949	102.5	0.975
1950	105.6	0.946
1951	114.0	0.877
1952	115.4	0.866
1953	116.8	0.856
1954	116.7	0.856
1955	115.9	0.862
1956	117.8	0.848
1957	121.5	0.823
1958	123.6	0.809
1959	124.6	0.802
1960	125.6	0.796