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16. Abstract

Previous studies on the effects of highway construction upon land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the effects of such improvements upon land use. This report relates the findings of research done upon an area of College Station, Texas, where Texas Avenue was upgraded from a two-lane to a four-lane facility. The improvement took place in an urban area that was in the developing stage of development where the predominant land use was unimproved. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Data were collected for a period encompassing approximately five years before construction began up to the end of 1977, the last year data collection was possible. Total acres in each type of land use were determined for each year. Comparisons were made of the types and rates of development before and after the upgrading occurred. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the improved highway were also researched and are reported. Highway planners should be able to use this report, and subsequent reports of this study, to make more accurate predictions of land use changes due to specific highway improvements in different areas.

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LAND USE IMPACT OF WIDENING TEXAS AVENUE SOUTH IN A DEVELOPING AREA IN COLLEGE STATION, TEXAS

by

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Research Report 225-4
Research Study Number 2-8-77-225
Economics of Highway Design Alternatives

Sponsored by
State Department of Highways
and Public Transportation
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July, 1978

Texas Transportation Institute
Texas A&M University
College Station, Texas

PREFACE

The authors wish to express appreciation to those who have assisted or facilitated this study. Special acknowledgement is due Mr. James W. Barr and Mr. James R. Farrar, Jr., of the Texas State Department of Highways and Public Transportation.

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The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

ABSTRACT

Previous studies on the effects of highway construction upon land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the effects of such improvements upon land use. This report relates the findings of research done upon an area of College Station, Texas, where Texas Avenue South was upgraded from a two-lane to a four-lane facility. The improvement took place in an urban area that was in the developing stage of development where the predominant land use was unimproved. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Data were collected for a period encompassing almost five years before construction began up to the end of 1977, the last year data collection was possible. Total acres in each type of land use were determined for each year. Comparisons were made of the types and rates of development before and after the upgrading occurred. The data are reported in narrative, graphic and tabular form. Causes of development in the area other than the improved highway were also researched and are reported. Highway planners should be able to use this report, and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements in different areas.

SUMMARY OF FINDINGS

Land use data were collected for the Texas Avenue South Study Area in College Station to determine the uses of the land before, during, and after improvement of a portion of Texas Avenue South from a two-lane to a four-lane facility. The study covers a ten-year period beginning in 1968, almost four years before formal planning for the facility began, and continuing until the end of 1977, the last full year data collection was possible.

The findings are summarized as follows:

1. The Study Area has undergone much change.
    a. The predominant land use has remained unimproved from 1968 through 1977.
    b. The stage of development has remained developing.
    c. The most extensive type of development that has occurred in the whole area within the study period is multiple family development.
    d. Public-governmental development was second in development with the addition of several acres in parks.
2. Properties abutting Texas Avenue South have developed at a slightly slower rate than nonabutting properties.
    a. The predominant land use on abutting property has remained unimproved.
    b. Nontraffic-serving commercial acreage on abutting property increased from 2.25 acres (.91 hectares) to 19.75 acres (7.99 hectares) making it the predominant developed land use in 1977.
    c. Traffic-serving commercial acreage increased from none to 5.87 acres (2.38).

d. Single family residential acreage decreased from 6.50 acres (2.63 hectares) to 5.70 acres (2.31 hectares) due to the conversion of two houses to commercial establishments.

e. Total abutting developed acreage increased by 78 percent from 1968 to 1977.

3. Nonabutting properties have developed considerably during the study period.

   a. The predominant nonabutting land use has remained unimproved.

   b. Multiple family residential acreage has increased most gaining from none to 51.64 acres (20.90 hectares).

   c. Public-governmental acreage was second in increase and total acreage increasing from none to 37.5 acres (15.18 hectares).

   d. Acreage for mobile homes was third in increase and total acreage by 1977. It increased from 10.62 acres (4.30 hectares) to 25.00 acres (10.12 hectares).

   e. Single family residential acreage almost doubled increasing from 11.33 acres (4.59 hectares) to 21.51 (8.70 hectares).

   f. Nontraffic-serving commercial, semi-public-nonprofit, and industrial developments all had significant increases within the study period.

   g. Total nonabutting development increased by 565 percent.

4. The growth in the Texas Avenue South Study Area has paralleled the growth of Texas A&M University.

   a. Development has taken place in the Study Area due to financial opportunities made available by the growth of the University and the two cities.

   b. The Study Area is conveniently located near the University creating a logical place for development to occur.

5. The highway improvement has facilitated the growth and provided a more likely place for continued growth.

   a. Commercial development in the Study Area occurred at a faster rate between 1970 and 1977 than in other areas of Bryan-College Station.

   b. Although nonabutting development occurred at a faster rate than abutting development, the highway improvement is still viewed as having a positive influence on abutting property. There were other factors helping create a situation more conducive to development of nonabutting land.

   c. Because of its location and the dynamic characteristics of Bryan-College Station and Texas A&M University, the Texas Avenue South Study Area is considered an area that will continue to develop. The highway improvement will be an important aspect of further growth.

IMPLEMENTATION STATEMENT

This report relates the findings of a case study on land use changes that have occurred after an existing highway has been improved. The findings can be implemented immediately by highway agencies in predicting what might happen as a result of a similar highway improvement in a comparable area elsewhere.

This case study is one of several being done in different Texas cities. The predictive capabilities will be increased after analysis and comparison of data from other study areas is accomplished. Those findings will be described in future reports.

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INTRODUCTION

Purpose and Objectives of Study

The near completion of the Interstate Highway System, the completion of many urban freeways, and the increasing shortage of funds for future highway construction have caused state highway agencies to concentrate on upgrading and increasing the capacity of existing highways and freeways.

Much research has been conducted in the past to learn the impact of new highway construction. Little research has been done to show what happens when an existing highway is upgraded. In order to optimize public benefits, highway agencies need information of this kind to help predict what will happen in a particular area when an existing facility is improved.

One important impact of any highway construction is the changes that occur in how the land nearby is used. The overall purpose of this study is to determine land use changes in areas where an existing highway or street has been improved. This report relates the findings of investigation of an area in College Station where a portion of Texas Avenue South has been improved. Texas Avenue is the portion of a state highway that runs north and south in the city limits of Bryan and College Station. It was formerly designated as State Highway 6, but in 1972 the name was changed to Loop 507. The new by-pass on the east side of the towns became the new State Highway 6. The roadway will be referred to as Texas Avenue for this report. The study site will be called the Texas Avenue South Study Area. Areas with other types of highway improvements and areas in varying stages of development when the improvement began were also studied and subsequent reports on these areas are forthcoming.

Objectives of this study were as follows:

1. To determine the initial and long-range land use impacts of different highway design changes on existing highways with a minimum of data collection.
2. To determine traffic volume changes resulting from various types of improvements.

Method of Study

The "before" and "after" approach was employed in this study to discover land use changes in the Texas Avenue South Study Area. Since land use could have been affected by anticipation of a better roadway, data were collected for 1968, which is almost four years before formal planning began by the District Office of the State Department of Highways and Public Transportation. The years 1968 through 1970 are the "before" construction and planning years, 1971 through 1974 were designated as the "during" years, and 1975 through 1977 make up the "after" period. Actual changes and rates of change in land use were determined for 1968, the first before year; 1970, the last year before planning began; 1975, the first year after construction was complete; and 1977, the last full year data collection was possible for this study. The commercial square footage, number of apartments, and the number of single family houses were determined for 1968, 1970, 1975, and 1977, in addition to the number of acres in each use.

The land was divided into abutting and nonabutting properties. Abutting properties were those with frontage on Texas Avenue South. In the undeveloped portions, a section extending 300 feet back from the highway right-of-way was designated as abutting. These two categories of properties were studied separately to determine the differences in land uses and rates of development.

To determine some of the reasons behind the land use changes in the area, several knowledgeable people were interviewed. Planning and zoning commission

members were questioned about an overall plan for the area and zoning changes that have taken place. Developers and individuals involved in real estate provided information about sales and developments in the area. They also provided insight into consideration given to highway design in making decisions about developing the land involved. Other factors which might have influenced land use change were also investigated.

Location of Highway Improvement

The improved portion of Texas Avenue South is located in the metropolitan area of Bryan-College Station. This metropolitan area is located approximately in the middle of a triangle formed by the Dallas-Fort Worth, San Antonio, and Houston metropolitan areas. As Table 1 shows, the two adjoining cities had an estimated 1977 population of 88,949. Brazos County, in which the two cities are located, was designated as a Standard Metropolitan Statistical Area after the 1970 U.S. Census count.

Although agriculture, agribusiness, and manufacturing are economically important to the area, the major influence on the area's economy is Texas A&M University. With a fall 1977 enrollment of 28,848 and over 15,000 permanent employees, the university had a total economic impact of over $171 million on Bryan-College Station in 1977.[1] Wages and salaries paid employees; university expenditures for utilities, services, and supplies; student expenditures for food, housing, and related items; and money spent by people attending athletic events and continuing education programs make up most of the benefits realized by the community. According to the Bureau of the Census, Bryan-College Station is one of the fifteen fastest growing metropolitan areas in the nation. This

[1] Statistics provided by the State Department of Highways and Public Transportation.

Table 1. Population Changes in Bryan-College Station, Brazos County, and Texas A&M University, 1950-1977

	1950	Change and % Change 1950-1960	1960	Change and % Change 1960-1970	1970	Change and % Change 1970-1977	1977
Bryan	18,102	9,440	27,542	6,177	33,719	13,385	47,104
		52%		22%		40%	
College Station	7,925	3,471	11,396	6,280	17,676	24,169	41,845
		44%		55%		137%	
Brazos County	38,390	6,505	44,895	13,083	57,978	42,570	100,548
		17%		29%		73%	
Texas A&M (fall enrollments)	6,675	546	7,221	7,095	14,316	14,532	28,848
		8%		98%		102%	

is due in large part to the growth of Texas A&M. As Table 1 shows, the fall 1977 enrollment was 102 percent greater than the fall 1970 enrollment of 14,316. The rate of growth at Texas A&M is expected to decline and stabilize at approximately 32,000 students in 1982.

Another possible source of economic growth is beginning to emerge in Brazos and surrounding counties. In the small community of Kurten, approximately 15 miles northeast of Bryan-College Station, 32 producing oil wells have been drilled during 1977. Drilling is increasing monthly and a 23,000 foot wildcat well is being drilled on Texas A&M University property south of College Station.

In addition to the oilfield discoveries, a November, 1976 report from the U.S. Bureau of Mines, states that some 450 million tons of lignite are commercially recoverable in Brazos and neighboring counties. The discovery and development of these energy sources will undoubtedly attract industry to the area and give the local economy a broader base that is less dependent upon the university.

The growth of the two cities and the university has generated increasing traffic and made greater demands on the street and highway systems. A highway improvement made in anticipation of greater traffic volumes was the widening and resurfacing of a portion of Texas Avenue South.

The Study Area, as shown in Figure 1, is located .57 miles from Texas A&M University, the largest traffic generator in Bryan-College Station, with more than 100,000 vehicles entering or leaving the main campus each day. The main business district of College Station, which is on University Drive and Texas Avenue, reaches the northern part of the Study Area. Downtown Bryan is approximately five miles away.

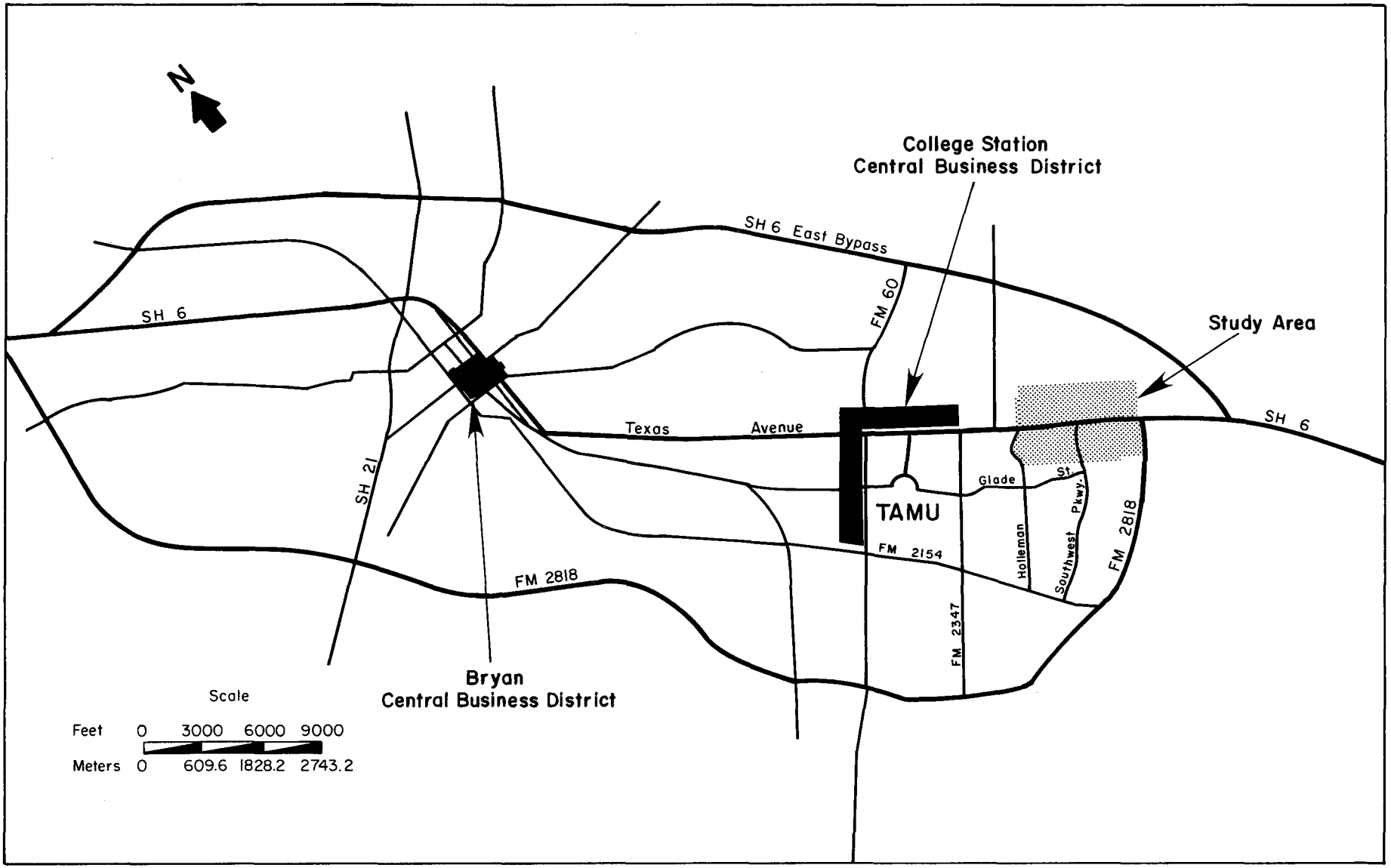

Figure 1. Map of the Bryan-College Station Area Showing the Location of the Texas Avenue South Study Area

Key Characteristics of Highway Improvement

This area was one of several study sites chosen for this project. The stage of development, the type of highway, the predominant land use, and whether the setting was rural or urban were all determined for the period before the improvements began. This provided a basis for selecting differing study sites that will allow comparisons. These comparisons will be made in a future report.

For the Texas Avenue South Study Area, the stage of development before the improvement began was classified as developing. The development was very slow at that time since most of the improvements had been there for several years. The predominant land use was unimproved. The area was considered likely to undergo strip commercial development because of its location, and because that was what had happened just north of the Study Area on Texas Avenue.

Source of Data

Data on the planning and construction of the improvement on Texas Avenue South were collected from files at the District Office of the State Department of Highways and Public Transportation (SDHPT). The SDHPT was also the source of traffic volume data.

Land use data were collected from files and maps at the District Office of the SDHPT; from records of the A&M Consolidated School District Tax Office; from city directories of Bryan-College Station; from personal interviews with realtors, planners, and city officials; and from detailed on-site inspection of the area.

Zoning data were obtained from members of the College Station Planning and Zoning Commission and from records of the City Planner. The 1970 U.S.

Census and population projections made by the SDHPT were sources of population and socio-economic data.

Definitions

Land use categories assigned to the properties are as follows:

(1) Residential Single Family - tract improved with occupiable house for one family

(2) Residential Multiple Family - tract improved with duplexes or apartment complexes

(3) Residential-Mobile Homes - tract improved with a mobile home

(4) Commercial-Traffic-Serving - tract improved with a commercial business deriving much of its income by serving traffic, e.g. motels, service stations, and restaurants

(5) Commercial-Nontraffic-Serving - tract improved with a commercial business other than traffic-serving businesses

(6) Public-Governmental - tract improved with governmental office, park, public owned utility, etc.

(7) Semi-Public-Nonprofit - tract with improvements such as churches, nonprofit clubs, or other such nonprofit organizations.

(8) Industrial - tract improved for industrial use.

CHARACTERISTICS OF AREA ROADS BEFORE AND AFTER IMPROVEMENT OF TEXAS AVENUE SOUTH

Texas Avenue

Texas Avenue runs north to south through the lengths of both Bryan and College Station. It leads to State Highway 6 that goes to Hearne, Texas, and eventually Waco to the north. Navasota, Hempstead, and Houston are the destinations of the through traffic going south.

The District Office of the SDHPT requested authorization to begin investigation, planning, and engineering for the Texas Avenue South project in October, 1971. Approval was granted in November, 1971, and the contract was let in October, 1972. Construction began in December, 1972, and the project was completed in November, 1974. Although 1.798 miles (2.89 kilometers) of Texas Avenue South was improved at that time, only 1.14 miles (2.09 kilometers) from Holleman Drive to Farm to Market Road 2818 will be considered in this study due to the rest of the improvement being of a different type.

Prior to improvement, the portion of Texas Avenue South studied was a two-lane roadway with a center stripe, 10 foot (3.05 meters) surfaced shoulders, and an open ditch on each side. As Figure 2 indicates, the road is now a four-lane with four foot (1.22 meters) surfaced shoulders, a flush median that provides a continuous left-turn lane, and open ditches on the sides.

As Table 2 indicates, Texas Avenue has widely varying traffic counts for different sections of the road. At a point just south of where the Study Area begins, the 1970 traffic count was 5,999. This count had increased to almost three times that number with 17,870 through 1977. A point within the Study Area, north of Southwest Parkway, showed a similar increase within the same time period. A point just north of FM 2818 where the Study Area ends showed slightly higher counts than a point just south of FM 2818.

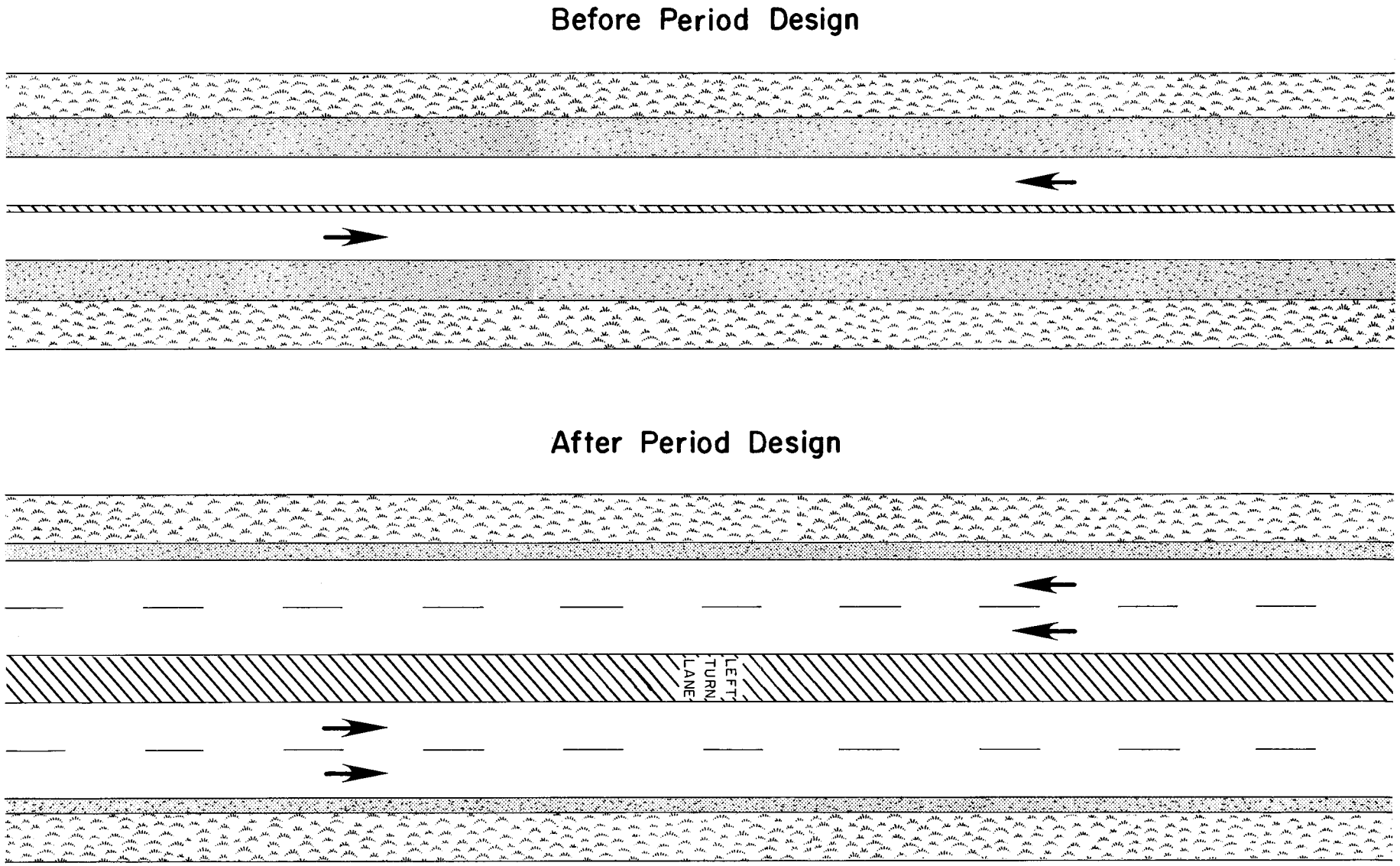

Figure 2. Design of Texas Avenue South Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on Texas Avenue South and Other Parallel and Intersecting Roads

Location of Traffic Counts	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
STUDY ROUTE										
Texas Avenue South										
North of FM 2347			14,760						16,346	28,010
North of State Highway 30										25,050
South of State Highway 30			6,140				9,550	11,980		23,900
South of Holleman Street			5,999							18,100
North of Southwest Parkway		5,470	6,380							17,870
South of Southwest Parkway										13,090
North of FM 2818			5,186		5,820		6,700			
South of FM 2818		4,010	4,390		5,080	5,680	5,480	5,460		7,200
PARALLEL ROADS										
State Highway 6 East By-Pass										
North of Texas Avenue					2,000	2,300	2,740	2,910		3,720
FM 2154										
North of FM 2347			5,526						10,952	
South of FM 2347	2,770	2,630	2,960		4,140	5,190	6,530	7,110		11,540
North of Southwest Parkway									7,050	
North of FM 2818	1,260	1,570	1,840		3,070	3,250	4,450	5,000		5,550
Glade Street										
South of Holleman			2,810							3,950
North of Southwest Parkway								2,807	2,807	2,830
INTERSECTING ROADS										
Holleman Drive										
West of Anderson								3,268		3,100
West of Texas Avenue			1,480							5,280
Southwest Parkway										
East of Bee Creek									4,263	
West of Texas Avenue										4,940
FM 2818										
West of FM 2154	390	360	880		1,050	2,130	2,250	1,510		
East of FM 2154			560							4,870
West of Texas Avenue	390	630	640		1,110	1,880	2,400	2,710		4,460

Parallel Roads

Running parallel to Texas Avenue is the State Highway 6 East By-Pass. This limited access, four-lane, divided highway handles a large part of non-local traffic and some local traffic travelling between the two cities or to points out in the county.

Traffic count data for the East By-Pass were available for the point just north of the intersection with Texas Avenue. As Table 2 shows, the counts have been steadily increasing since 1972.

Although there are no traffic data available for it, another parallel street should be mentioned here. Anderson Street is the center of much of the development, particularly multiple family residential development, that has occurred in the west and southwest sections of the Study Area. It is a wide, curbed and guttered, city street that runs from Texas Avenue to Southwest Parkway. The last section of it, from just south of Holleman Street to Southwest Parkway, was finished in 1977. This provided very good access to the university by diverting traffic away from the more congested single family residential sections to the west and by avoiding the busier Texas Avenue.

Glade Street is also a curbed, guttered, city-maintained street that runs parallel to Texas Avenue on the west side. Although little data were available for comparison, a slight increase in traffic volume was indicated. This wide, two-lane street runs through residential areas.

Farm to Market Road 2154 is also west and parallel of Texas Avenue. It borders the west side of the main campus of Texas A&M. The section next to the campus is four-lane with left-turn lanes at intersections. Another section south of the campus is four-lane without left-turn provisions. The road changes to two-lane before the intersection with Southwest Parkway. At a

point south of FM 2347, which is a short distance north of the Study Area, the traffic count increased from 2,770 to 11,540, or 317 percent, from 1968 to 1977. The counter increased from 1,260 to 5,550, or 340 percent, at a point just north of FM 2818.

Intersecting Roads

Holleman Drive marks the boundary of the Study Area on the northwest side. It is a wide, two-lane city street with curbs and gutters that runs from east of Texas Avenue to FM 2154. The traffic count near Texas Avenue showed a considerable increase between 1970 and 1977. However, a count near Anderson Street showed a slight decrease from 1975 to 1977.

Southwest Parkway is also a curbed and guttered, city street running from Texas Avenue to FM 2154. It is a wide, two-lane street with a continuous left-turn lane. Not enough data were available to make comparisons of traffic counts.

The other major road that intersects the Study Area is FM 2818. It is two-lane and is not curbed and guttered. A point west of FM 2154 had varying traffic counts with increases in most years but decreases in 1969 and 1975. A point just west of Texas Avenue showed increases throughout the study period with a 1,044 percent increase overall.

CHARACTERISTICS OF STUDY AREA BEFORE AND AFTER IMPROVEMENT OF TEXAS AVENUE SOUTH

Size and Boundaries of Study Area

The Study Area, located in south College Station, encompasses approximately 531 acres (214.88 hectares). An area on each side of Texas Avenue South was chosen to provide data on both abutting and nonabutting properties. The eastern side of the Study Area extends back approximately 1950 feet from the right-of-way of Texas Avenue. The western side is approximately 1650 feet wide. The length of the whole Study Area averages approximately one and one-quarter mile. Boundaries were drawn along property lines, streets, and other logical delineations.

Land Use Characteristics

The "before" and "after" period land use of the Study Area were determined. Figure 3, shows the "before" or 1968 land use, and Figure 4 shows the "after" land use at the end of 1977. Table 3 shows the actual acres of land in each use of abutting and nonabutting property as of 1968 and 1977.

In 1968, the year designated as the first "before" year, the Study Area was in the developing stage of land development. There were 28.97 acres (11.72 hectares) of improved abutting land and 22.2 acres (8.98 hectares) of improved nonabutting land for a total of 51.17 improved acres (20.71 hectares) in 1968. There were 27.22 acres (11.02 hectares) of streets and roads in 1968. Development on abutting property in 1968 consisted of 15 single family residences, one nontraffic-serving commercial establishment, one city owned cemetery, and two churches. Improved nonabutting property consisted of 42 single family residences, one nontraffic-serving commercial development, and 55 mobile homes. The remaining land was unimproved, making it the dominant land use in the Study Area in 1968.

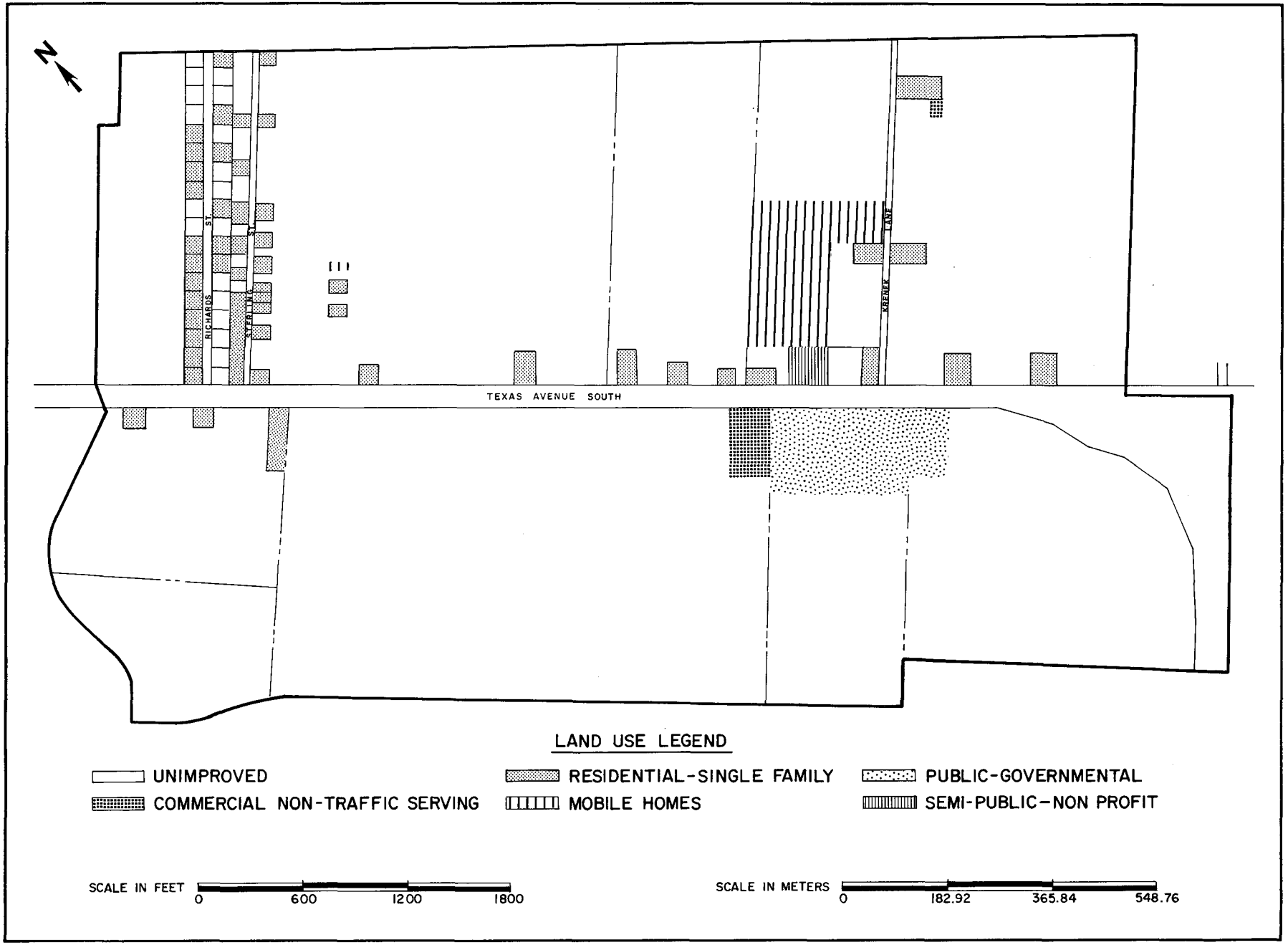

Figure 3. Land Use in the Texas Avenue South Study Area in 1968

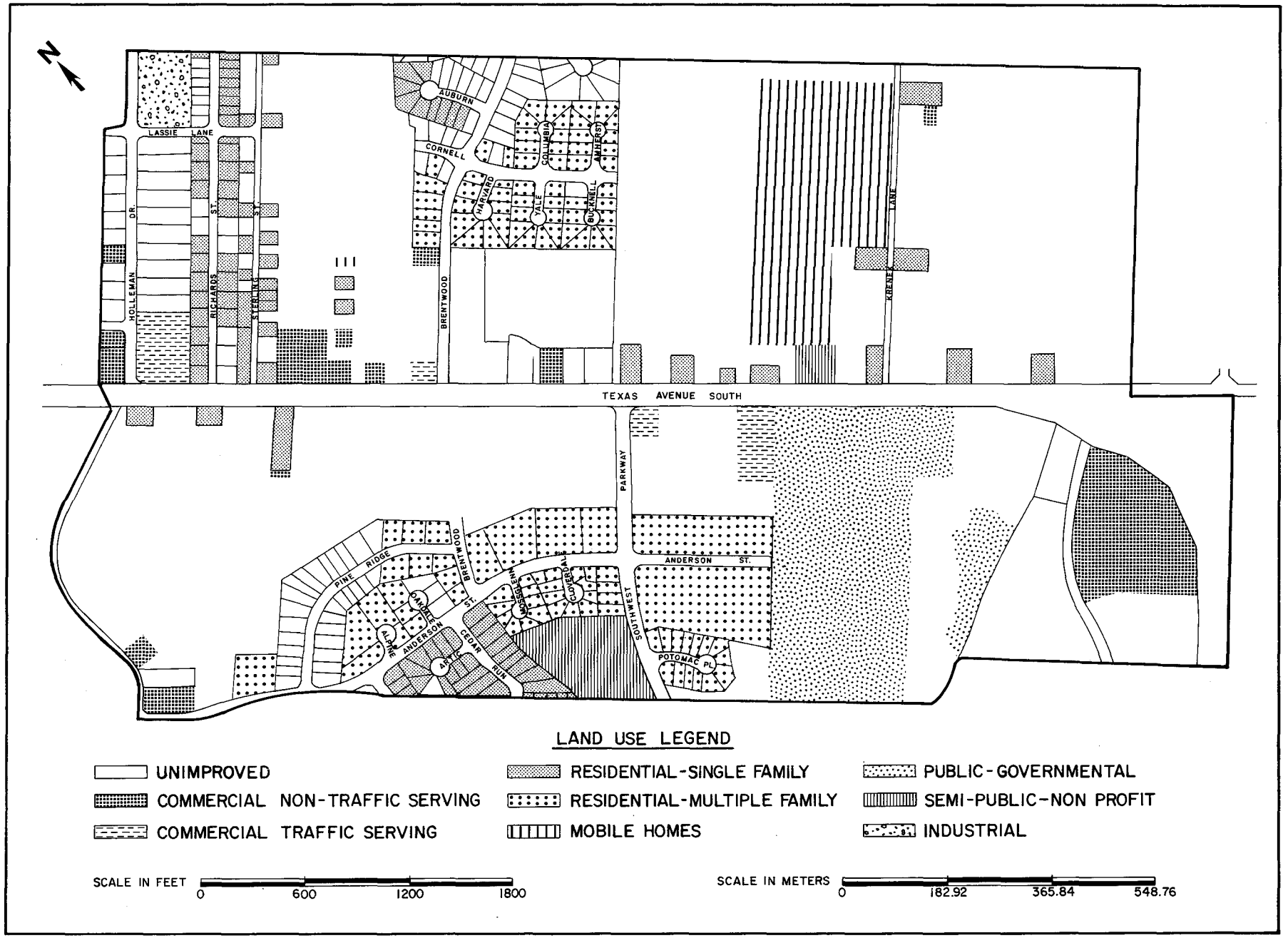

Figure 4. Land Use in the Texas Avenue South Study Area in 1977

Table 3. Total Land Use Changes by Location of Property

Type of Land Use	Abutting				Nonabutting			
	Acres of Land[a]		Changes		Acres of Land[a]		Changes	
	1968	1977	Quantity	Percent	1968	1977	Quantity	Percent
Single Family Residential	6.50	5.70	-0.80	-12%	11.33	21.51	10.18	90%
Multiple Family Residential	0	0	0	0	0	51.64	51.64	-
Mobile Homes	0	0	0	0	10.62	25.00	14.38	135%
Traffic-Serving Commercial	0	5.87	5.87	-	0	0	0	0
Nontraffic-Serving Commercial	2.25	19.75	17.5	778%	0.25	2.92	2.67	1068%
Public-Governmental	16.72	16.72	0	0	0	37.5	37.5	-
Semi-Public-Nonprofit	3.5	3.5	0	0	0	6.21	6.21	-
Industrial	0	0	0	0	0	2.75	2.75	-
Subtotal	28.97	51.54	22.57	78%	22.20	147.53	125.33	565%
Streets and Roads	22.99	30.04	7.05	31%	4.23	35.92	31.69	749%
Unimproved	54.96	25.34	-29.62	-54%	397.83	240.81	-157.02	-39%
TOTAL ACRES	106.92	106.92	-	-	424.26	424.26	-	-

[a]One acre equals .4046856 hectares.

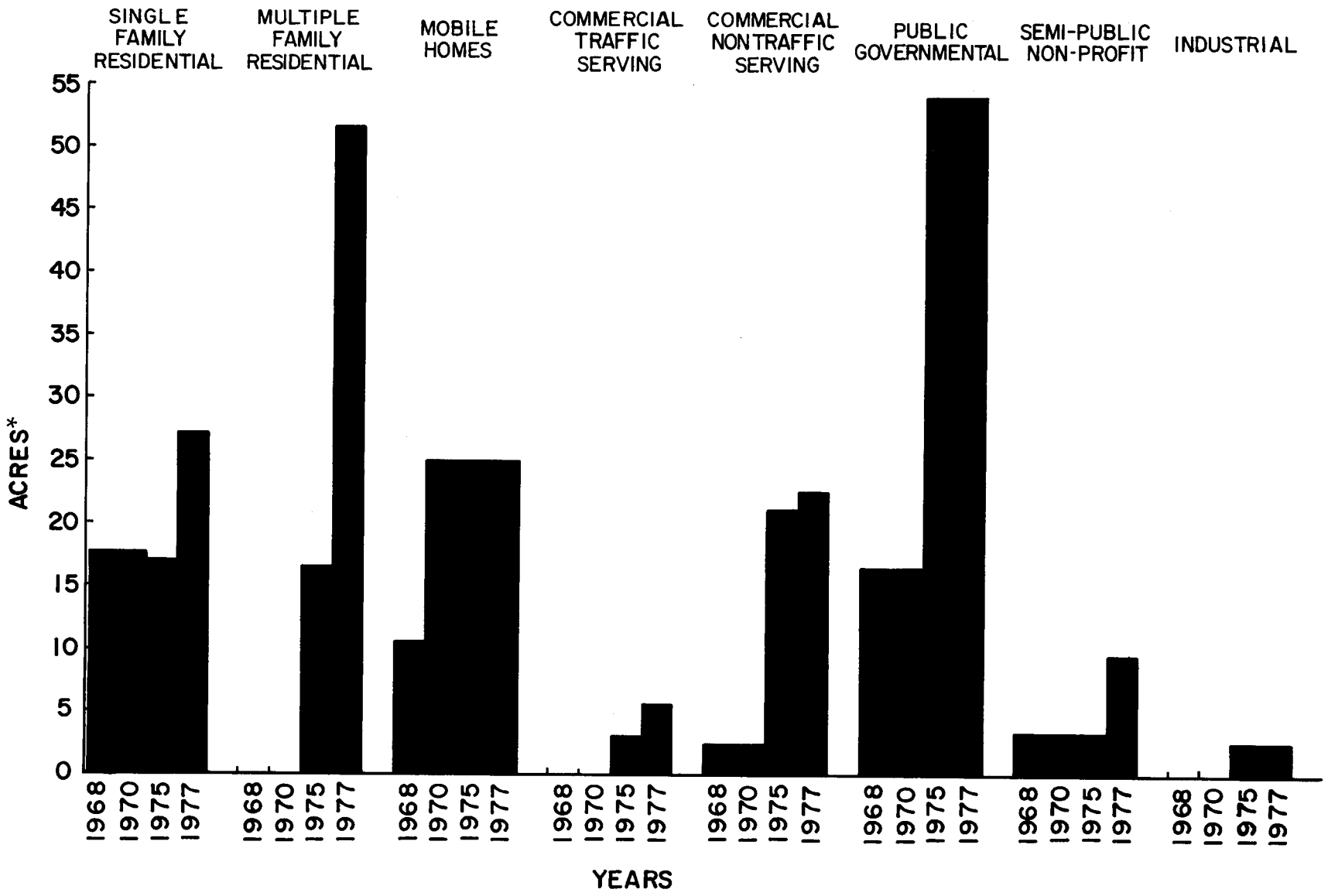

Figure 5. Total Changes in Land Use in the Texas Avenue South Study Area

* One acre equals .4046856 hectares.

Table 4. Changes in Land Use of Abutting Properties by Time Period and Year

Land Use and Type of Change	Total Acres By Time Period and Year[a]			
	Before		After	
	1968	1970	1975	1977
Residential - Single Family				
Total Acres	6.50	6.50	5.70	5.70
Absolute Change	0	-0.80	0	
Percent Change	0	-12%	0	
Commercial-Traffic Serving				
Total Acres	0	0	3.18	5.87
Absolute Change	0	3.18	2.69	
Percent Change	0	-	85%	
Commercial-Nontraffic Serving				
Total Acres	2.25	2.25	19.07	19.75
Absolute Change	0	16.82	0.68	
Percent Change	0	748%	4%	
Public-Governmental				
Total Acres	16.72	16.72	16.72	16.72
Absolute Change	0	0	0	
Percent Change	0	0	0	
Semi-Public-Nonprofit				
Total Acres	3.5	3.5	3.5	3.5
Absolute Change	0	0	0	
Percent Change	0	0	0	
Streets and Roads				
Total Acres	22.99	28.61	29.65	30.04
Absolute Change	5.62	1.04	.39	
Percent Change	24%	4%	1%	
Unimproved				
Total Acres	54.96	49.34	29.10	25.34
Absolute Change	-5.62	-20.24	-3.76	
Percent Change	-10%	-41%	-13%	

[a]One acre equals .4046856 hectares.

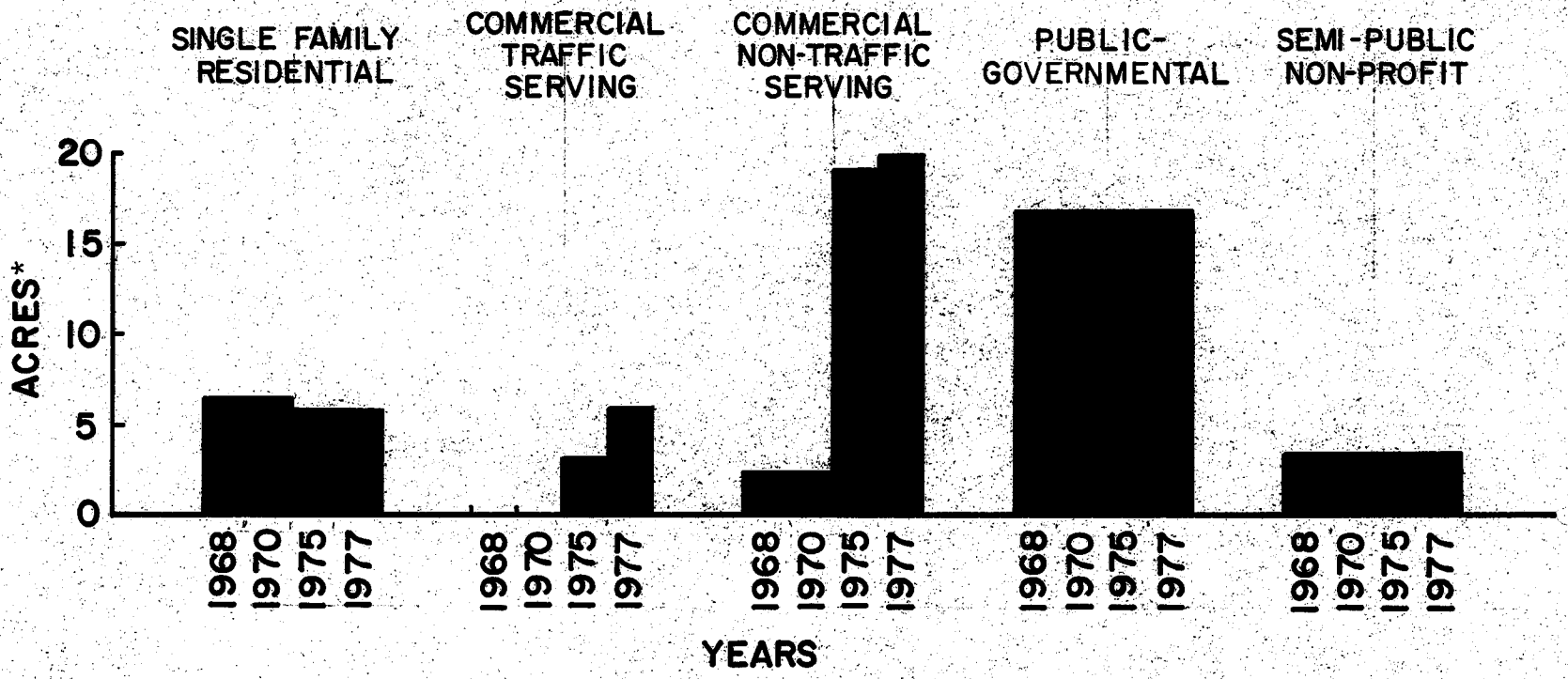

Figure 6. Changes in Abutting Land Uses in the Texas Avenue South Study Area

* One acre equals .4046856 hectares.

Table 5. Changes in Land Use of Nonabutting Properties by Time Period and Year

Land Use and Type of Change	Total Acres by Time Period and Year[a]			
	Before		After	
	1968	1970	1975	1977
Residential-Single Family				
Total Acres	11.33	11.33	11.33	21.51
Absolute Change	0	0	10.18	
Percent Change	0	0	90%	
Residential-Multiple Family				
Total Acres	0	0	16.72	51.64
Absolute Change	0	16.72	34.92	
Percent Change	0	-	209%	
Residential-Mobile Homes				
Total Acres	10.62	25.00	25.00	25.00
Absolute Change	14.38	0	0	
Percent Change	135%	0	0	
Commercial-Nontraffic-Serving				
Total Acres	.25	.25	2.32	2.92
Absolute Change	0	2.07	.60	
Percent Change	0	828%	26%	
Public-Governmental				
Total Acres	0	0	37.5	37.5
Absolute Change	0	37.5	0	
Percent Change	0		0	
Semi-Public-Nonprofit				
Total Acres	0	0	0	6.21
Absolute Change	0	0	6.21	
Percent Change	0	0	-	
Industrial				
Total Acres	0	0	2.75	2.75
Absolute Change	0	2.75	0	
Percent Change	0	-	0	
Streets and Roads				
Total Acres	4.23	11.10	18.37	35.92
Absolute Change	6.87	7.27	17.55	
Percent Change	162%	65%	96%	
Unimproved				
Total Acres	397.83	376.67	310.27	240.81
Absolute Change	-21.16	-66.40	-69.46	
Percent Change	-5%	-18%	-22%	

[a]One acre equals .4046856 hectares.

mobile homes, and one small business. The only change between 1968 and 1970 on nonabutting properties was the addition of 55 mobile homes on 14.38 acres.

As shown in Figure 7, by 1975 several changes had occurred on nonabutting property. The largest increase in development was in public-governmental acres with 37.5 acres going into city parks. Multiple family housing and industrial development appeared for the first time on nonabutting land and nontraffic-serving commercial development increased.

Single family residential acreage had almost doubled by 1977 on nonabutting land. Multiple family residential acreage had increased over twofold. Nontraffic-serving commercial acres had increased slightly and semi-public-nonprofit development had begun.

As indicated previously in Table 3, abutting developed acreage increased by 78 percent while nonabutting development increased by 565 percent. Changes in units other than acres on both abutting and nonabutting property are shown in Table 6.

Land Use Impediments

As stated previously, factors which could have influenced land use were investigated. Zoning, availability of utilities, and the holding of land for future development were studied to determine their effects in the Texas Avenue South Study Area.

Zoning

In 1970, the last "before" year, the Study Area was zoned for single family dwellings, apartment houses, and commercial developments. Although this may have been somewhat restrictive, it does not appear to have lessened or slowed the development that has occurred. Several zoning changes were made to allow developers to build what they proposed. In some cases, owners

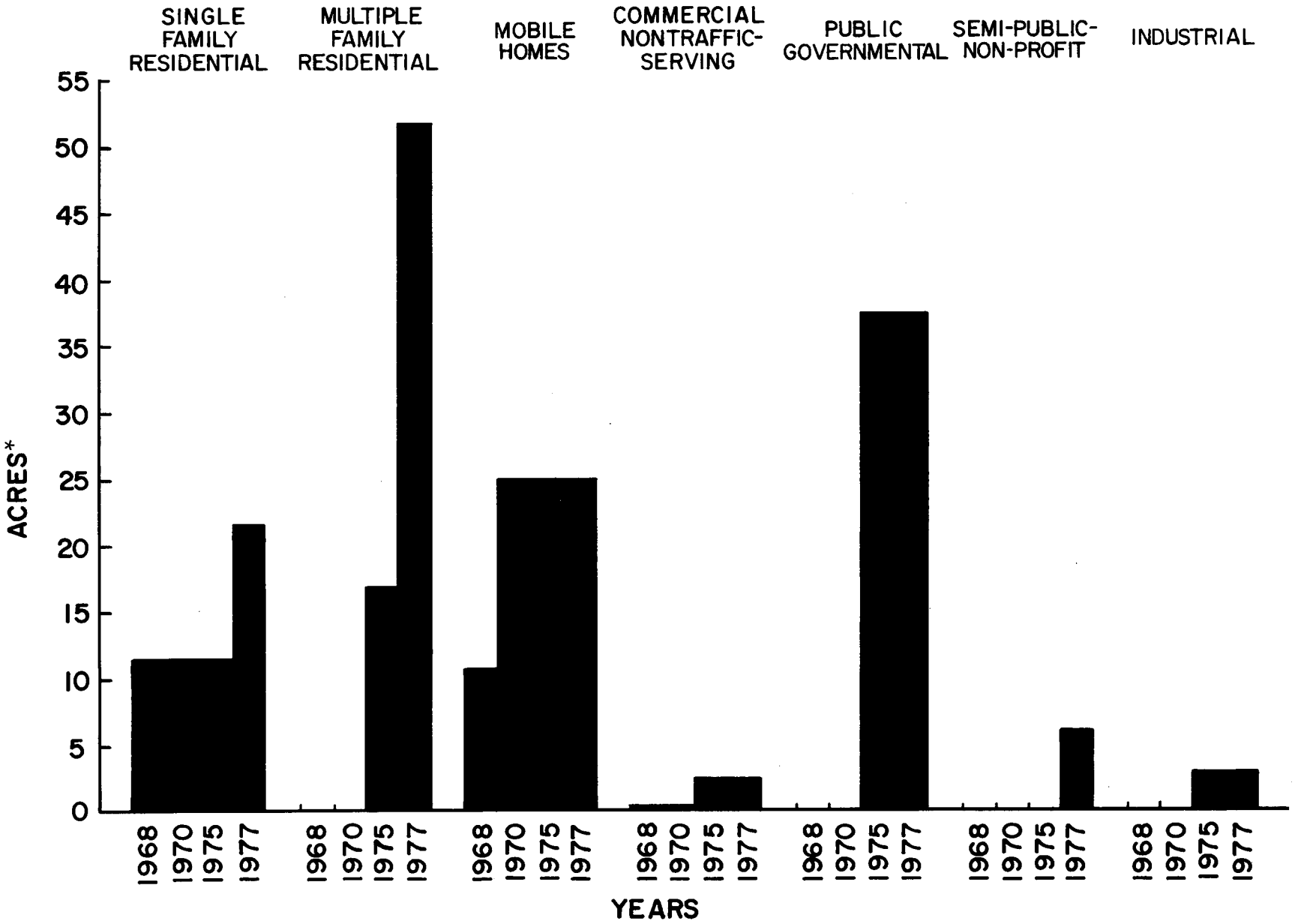

Figure 7. Changes in Nonabutting Land Uses in the Texas Avenue South Study Area

* One acre equals .4046856 hectares.

Table 6. Changes in Units Other Than Acres by Type of Property

Type of Land Use	Type of Units	Abutting				Nonabutting			
		Number of Units		Change in Units		Number of Units		Change in Units	
		1968	1977	Quantity	Percent	1968	1977	Quantity	Percent
Residential-Single Family	Number of Homes	17	15	-2	-12	42	86	44	105
Residential-Multiply Family*	Number of Apartments	0	0	0	-	0	684	684	-
Residential-Mobile Homes	Number of Homes	0	0	0	-	55	167	112	204
Commercial-Traffic-Serving	Square Feet	0	29,756	29,756	-	0	0	0	-
Commercial-Nontraffic-Serving	Square Feet	5,750	104,652	98,902	1720	1000	15,854	14,854	1,485
Industrial	Square Feet	0	0	0	-	0	17,831	17,831	-

* Not included in this mulitple family count is a 15,000 square foot nursing home.

of large tracts requested some commercially zoned acreage and were granted 300 foot deep commercial tracts along Texas Avenue South. No instances of refusal to change zones when requested could be found. Little opposition to the changes occurred.

Other Impediments

There are many reasons why some pieces of property lag behind when other properties nearby are developing. One reason for this found in the Texas Avenue South Study Area was that one family with a large land holding was demanding a higher price than developers were willing to pay. Consequently, development "leap-frogged" past them and occurred further down the road where land could be bought at an acceptable price. Some of this land, which is in the northwestern portion of the Study Area, has begun to develop in recent years, but probably would have developed much sooner if the price had been more in line with other nearby property prices.

Another reason found for the lack of development on some tracts was the manner in which the property was divided up for heirs. In some instances a large tract had been divided into small strips to allow each heir to have some access to Texas Avenue, thereby making the narrow tracts undesirable for most types of development.

One other reason discovered for the lack of development on some tracts was financial difficulties of potential developers. On at least one tract, commercial development was planned that never materialized because the people involved lost a great deal of money in an investment elsewhere in College Station and, therefore, were not able to carry out their plans. That land is still idle.

There are other developments that have been proposed for much of the presently unimproved land. These were not included in the tabulations for

this report unless they had begun construction before January 1, 1978. This approach was taken to facilitate accurate data collection and to avoid including a development that might be cancelled or postponed.

Socio-Economic Characteristics

Characteristics of an area such as educational level, median income, types of employment, etc. can all have significant effects on the use made of an area's land. These characteristics were investigated for the Texas Avenue South Study Area. Data of this nature were available only from the 1970 U.S. Census. The data were analyzed to compare the Study Area to College Station and the Bryan-College Station SMSA.

The study site for Texas Avenue South fell into both Census Tract 12 and Census Tract 16, making it necessary to look at figures from both areas to obtain a representative picture of the socio-economic condition of the study site in 1970. Tract 12 is actually a composite of three distinct geographic locations; however, that area which contains a portion of the Texas Avenue South study site is more densely populated than the remaining two sections of the tract. Thus, the information compiled for the tract as a whole is considered appropriate for the purposes of this study. The section under discussion borders on Texas Avenue on the west and Highway 30 on the north. The other census tract which encompasses a portion of the Study Area -- Census Tract 16 -- is located entirely west of Texas Avenue, running from FM 2347 to a line close to Southwest Parkway. It extends back from Texas Avenue to FM 2154.

According to the decennial Census, the median number of school years completed and the percent of high school graduates in Tract 12 were considerably lower than the figures for both the City of College Station and the Bryan-College Station SMSA as a whole (Table 7). On the other hand, Tract

Table 7. Comparison of 1970 Socio-Economic Characteristics of Census Tracts 12 and 16 to Bryan-College Station

	SMSA (Brazos County)	Bryan	College Station	Tract 12	Tract 16
Population	57,978	33,719	17,676	3,103	4,442
Median School Years Completed	12.2	11.9	15.8	10.5	15.7
Percent High School Graduates	54.5%	49.6%	82.9%	40.0%	82.4%
Median Family Income	$ 7,636	$ 7,775	$ 7,849	$ 5,616	$12,466
Median Income of Families and Unrelated Individuals	4,002	6,341	1,824	$ 4,485	$ 8,993
Median Value Owner Occupied Residences	$13,000	12,200	18,500	$10,500	$19,500
Median Rent Paid by Tenants	$ 74	$ 64	$ 87	$ 89	$ 140
Percent Families Below Poverty Level	16.6%	16.0%	14.1%	24.5%	7.3%
Occupations					
Total Employed, 16 Years and Over	21,909	13,120	6,354	1,178	1,709
Percent Professional, Technical and Kindred Workers	24.8%	20.3%	39.4%	20.54%	43.18%
Percent Managers and Administrators except farm	8.5%	10.0%	6.0%	3.82%	9.48%
Percent Sales Workers	6.6%	7.4%	5.5%	3.31%	8.25%
Percent Clerical and Kindred Workers	17.3%	17.4%	17.9%	15.79%	11.70%
Percent Craftsmen, Foreman, and Kindred Workers	10.1%	12.2%	4.5%	10.36%	4.45%
Percent Operatives, Except Transport	6.8%	7.8%	3.6%	5.52%	2.81%
Percent Transport Equipment Operatives	3.0%	4.0%	1.0%	3.14%	0.65%
Percent Laborers, Except Farm	4.6%	4.7%	4.0%	4.92%	0.88%
Percent Farm Workers	3.6%	1.3%	4.0%	14.34%	4.56%
Percent Service Workers	11.4%	11.4%	12.0%	12.65%	10.77%
Percent Private Household workers	3.3%	3.5%	2.0%	5.60%	3.51%

16 figures were higher than those for all of Brazos County, and virtually identical to the figures for the city.

Similar findings were noted for other indicators of socio-economic status; for example, Census Tract 12 was found to have lower median incomes of both families and the combination of families and unrelated individuals. Also, the median value of owner occupied residences was significantly lower in that tract than the City of College Station or the total SMSA. Median rent paid by tenants was slightly higher in Tract 12 than in College Station and Brazos County, but the difference was only marginal. Finally, over 24 percent of all families in Census Tract 12 were below the poverty level, compared to only 14 percent in College Station and roughly 17 percent in the Brazos County SMSA.

Income figures for Census Tract 16 were much higher than those for College Station and the SMSA, as were the numbers reported for median value of owner occupied residences and median rent paid by tenants. As would be expected, the percent of families falling below the poverty level was much smaller in Tract 16 than in the other areas of comparison.

Without going into unnecessary detail, the occupational breakdown presented in Table 7 indicates that Census Tract 12 contained a much larger percentage of blue-collar workers than did the city or the county overall. Over 56 percent of all workers in Tract 12 fell into blue-collar occupations, compared to only 28 percent in Tract 16, 31 percent in College Station, and 43 percent in Brazos County, respectively. This, of course, was to be expected, based on the education and income figures discussed previously.

The South Texas Avenue Study Area differed appreciably along the various socio-economic variables outlined in Table 7, with the area west of Texas Avenue having a much higher level of socio-economic status than the portion of the study site located to the east of the highway. The

area to the west of Texas Avenue -- that portion falling into Census Tract 16 -- was found to contain more highly educated and affluent individuals than the majority of either the City of College Station or the county. Conversely, that section of the study site located in Tract 12 was found to have very low levels of educational and occupational achievement, with correspondingly low measures of income and residential property values.

Population for the Study Area alone was estimated, based on the number of living units. The Study Area showed a much higher percentage increase from 1970 to 1977 than did College Station or the Bryan-College Station SMSA (Table 8). The average yearly rate of growth was 170% for the Study Area compared to 20% for College Station and 10% for the SMSA.

Table 8. Comparison of Population Estimations for the Texas Avenue South Study Area to Populations of College Station and the Bryan-College Station SMSA.

	1970	1977	Quantity Change	Percentage Change	Yearly Rate
Study Area	175	2255	2080	1189%	170%
College Station	17676	41845	24169	137%	20%
SMSA	57978	100548	42570	73%	10%

IMPACT OF HIGHWAY IMPROVEMENT ON LAND USE IN THE STUDY AREA

An attempt is made to reach some reasonable estimate as to the extent of the impact of the Texas Avenue South improvement on land use in the Study Area. Two types of data are used to indicate the extent of this impact: (1) actual changes in land use in the area by location, and (2) the opinions of knowledgeable people.

Actual Land Use Changes

In the 1968 to 1977 period, 147.9 acres (59.85 hectares) of previously unimproved land was developed in the Texas Avenue South Study Area (Table 3). An additional 38.74 acres (15.68 hectares) of streets and roads were added to the 27.22 acres (11.02 hectares) existing in 1968.

Abutting Vs. Nonabutting Development

There was a 78 percent increase in development on land abutting Texas Avenue South and a 565 percent increase in development on nonabutting land. To make a better comparison of the impact upon abutting and nonabutting properties, changes in unimproved land available for development between 1968 and 1977 were determined. On abutting property, 21.11 percent of available land developed compared to 29.54 percent on nonabutting land (Table 9).

This abutting and nonabutting comparison indicates that development on abutting tracts failed to keep pace with development on nonabutting tracts. Therefore, this finding could mean that the highway improvement produced no positive effect on development. However, it could also mean that improved access or the removal of some other impediment to development was almost simultaneously exerting a greater influence on nonabutting property than on abutting property, thus overshadowing the positive influence of the highway

Table 9. Extent of Change in Unimproved Land in the Texas Avenue South Study Area by Location of Property.

Location of Property	Total Area Acres	Extent of Land Use Change	
		Acres[abc]	Percent[d]
Abutting Property	106.92	22.57 (2.5)	21.11% (2.3)
Nonabutting Property	424.26	125.33 (13.9)	29.54% (3.3)
Total Study Area Property	531.18	147.90 (16.4)	27.84% (3.1)

[a] Number in parentheses represents the average annual rate of change.

[b] One acre is equal to .4046856 hectares.

[c] Change in acres does not include streets and roads.

[d] Percent is calculated by dividing the number of developed acres by the total number of acres in each category.

improvement. Given the fact that a new direct access route to the Texas A&M campus was provided to much of the nonabutting property through the extension of a wide, two-lane, curbed and guttered street (Anderson Street) during and after construction of the Texas Avenue South improvements, the above condition appears logical. Also, an impediment to development was overcome by the agreement made by developers with the landowner who had been holding out for a higher price. This resulted in several multiple family units being built on nonabutting land.

An indication that the highway improvement did exert a positive influence on development is shown by the abutting and nonabutting comparison of average annual percentage reduction in unimproved land for the "before", "during", and "after" planning and construction periods (Figure 8). In the "during" planning and construction period, average annual percentage reduction in unimproved land was greater for abutting land than for nonabutting land. Much of this reduction was attributable to commercial development. This may indicate that development increased partly because of the improved roadway that was being planned and built at that time. It appeared to be a growing area with potential for more traffic, therefore, making it an attractive place for growth, particularly commercial growth.

Another factor which explains part of the differences between abutting and nonabutting development is the construction on nonabutting land that has been built next to existing structures. This has been particularly true of the single family housing in the west and southwest portions of the Study Area. The housing was built to be part of existing neighborhoods rather than set apart closer to Texas Avenue. Some of the commercial establishments have been built near residential areas to attract these customers. All of the multiple family housing in the west and southwest sections has been built in the logical pattern of being near other existing units. In brief, much of

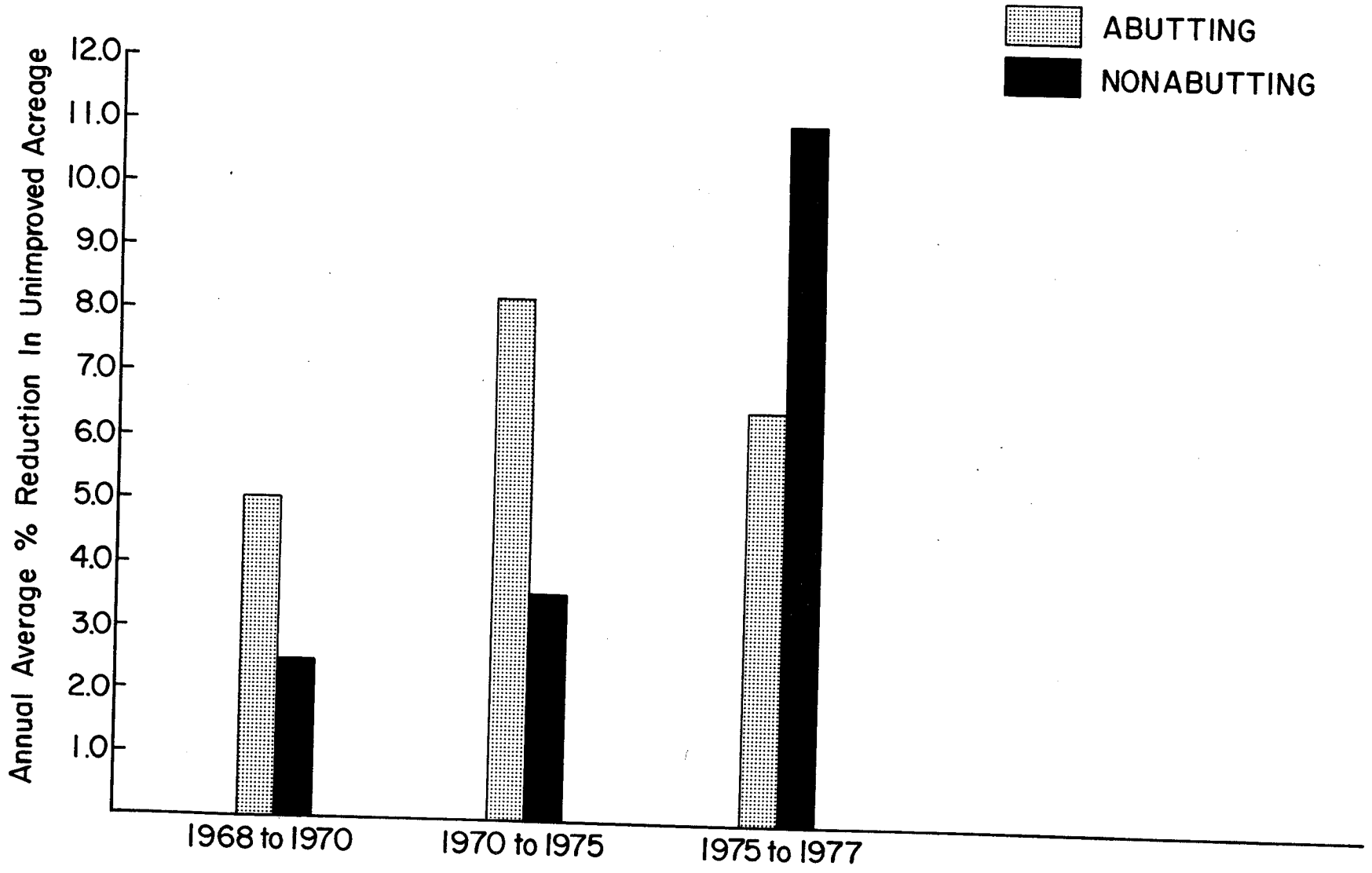

Figure 8. Annual Average Percent Reduction in Unimproved Acreage by Property Type and Period

the nonabutting growth has been enlargements of single family or multiple family neighborhoods that existed just outside of the Study Area. This pattern has not been the same on abutting land because there was so little there in the beginning of the study period.

These and probably other factors caused nonabutting property to develop at a faster rate than abutting. The highway improvement was an asset to all properties in the area, abutting and nonabutting, by providing better, easier access.

Other Factors Influencing Change

Investigation of the changes in land use reveals that many factors influenced the rate of development and the types of development that took place. The dynamic character of Bryan-College Station dictates that development has and will be taking place, especially along this, the main street in the two towns. The growing population capable of supporting more retail businesses provided the opportunity for commercial development. Multiple family housing was needed by the growing student body at Texas A&M. More single family houses were needed for the growing population. The larger population provided more taxes to enable expansion in public-governmental development. All of these and probably other factors help explain why development took place in Bryan-College Station. The more pertinent question is why such development took place in the Texas Avenue South Study Area?

The closeness to Texas A&M University is certainly an important consideration. Although the area is not within a comfortable walking distance from the heart of the main campus, it is a very short drive and convenient for students to live in the area or shop at the businesses there. A shuttle bus runs from the Study Area to Texas A&M and back several times a day. This helps explain why multiple and single family housing was located there. The convenient location was also a factor in the placement of businesses and other developments.

Commercial Development

Because of its location, this study site was considered a likely place for commercial development. To compare the rates of development in this area to other areas in Bryan-College Station, 1970 and 1977, serial zone data from the Bryan-College Station Urban Transportation Study were used (data were not available for 1968 or 1969, the first study years).

To make the units of comparison more similar, data from the five serial zones in which the Study Area falls were used instead of data from just the Study Area. The Study Area encompasses most of the area of those five serial zones and all but a small part of the commercial development.

Serial zones chosen for comparison were picked on the basis of: (1) they had some commercial development in 1970, (2) they had vacant land available for other possible commercial development, and (3) they were in the higher growth areas of Bryan-College Station. None of the serial zones were from downtown Bryan or north of downtown. This was done to have areas more similar to the Study Area.

The control serial zones were further divided on the basis of whether or not the zone's major street or road had been improved since 1970. Comparisons are made with the totals of each of the two groups and with the grand total of the two groups together. This, in effect provides three control groups with which to compare the Study Area's commercial development. The data were not broken down by traffic-serving and nontraffic-serving. The control group with street improvements consisted of five serial zones and the one without street improvements contained four serial zones.

Acreage of commercial development was adjusted to allow for differing sizes of serial zones and control groups. A percentage of the total acres of all areas was determined for each group. That percentage was multiplied

by the number of acres for 1970 and 1977 for each area to derive an adjusted acreage that would reflect the relative size difference in areas.

As indicated in Table 10, the Study Area had a higher percentage change in acres of commercial development than either of the control groups or the total of the two control groups. This does not indicate that more development is occurring there than elsewhere, but it does show that the Study Area is experiencing a higher rate of growth. In 1970, there was a relatively small amount of commercial development in the Study Area. By 1977 it had increased over five times as much as the 1970 figure. The other areas have not kept pace in rate of growth.

It is interesting to note that the control area containing serial zones with street improvements has developed at a higher rate than the control area without street improvements. It is not within the scope of this report to determine whether those improvements or that development came first.

The higher rate of growth in the Study Area points out what a dynamic area the Texas Avenue South Study Area was from 1970 to 1977. The improvement of Texas Avenue South was a factor in that growth. Although a specific amount of influence cannot be determined, it appears that the improved highway helped attract more commercial development to this area rather than other areas in Bryan-College Station.

Table 10. Comparison of Commercial Development in the Texas Avenue South Study Area to Other Areas in Bryan-College Station.

	Commercial Acreage		Adjusted Commercial Acreage[a]		Change In Adjusted Acreage	
	1970	1977	1970	1977	Quantity	Percent
Study Area						
Study Area Serial Zones	5.05	30.56	2.02	12.22	10.20	505%
Control Areas						
Serial Zones With Street Improvements	56.41	89.29	21.43	33.93	12.50	58%
Serial Zones Without Street Improvements	24.95	30.53	5.49	6.72	1.23	22%
Total Control	81.36	119.82	48.82	71.89	23.07	47%

[a]Adjusted for size of serial zone.

Opinions of Knowledgeable People

Interviews with individuals involved in real estate and development in Bryan-College Station indicate that the type of road and condition of Texas Avenue South were important considerations in the placement of the developments there. Ease of access to and from the establishments was considered important. The improvement has decreased travel time by providing a better, less congested roadway.

Although the road improvement was an important consideration, it can't be described as an overriding reason for development in the area. The opinion was expressed by many that development along Texas Avenue would have taken place anyway, although a very congested situation would have eventually occurred. Texas Avenue is the main street linking Bryan and College Station and goes past the main gate of Texas A&M. This physical lay-out makes it a very logical place for development to occur. The improvement of the highway is just one of many factors that entered into development in the Texas Avenue South Study Area.

CONCLUSIONS

The Texas Avenue South Study Area has experienced much change within the 1968 to 1977 period. The stage of development has remained developing. The predominant land use for the whole Study Area has remained unimproved, however, several types of land use have increased considerably during this time. Acres for public-governmental use and multiple family housing have led the way.

The predominant land use for abutting property has remained unimproved. Nontraffic-serving commercial acreage had the largest increase. Single family residential acreage actually decreased slightly due to two former residences being changed into commercial establishments.

The predominant nonabutting land use has remained unimproved also. Multiple family residential has shown the greatest increase in acreage.

Many factors have contributed to the growth that has occurred in the Texas Avenue South Study Area. Probably the most important factor has been the growth of Texas A&M University. The university has brought a large part of the people and the money to Bryan-College Station that supports the development that has taken place in the Study Area. The Study Area is near Texas A&M and provides an excellent place for easily accessed development.

An important aspect of the study of land use in this area has been land that did not develop. Land being held for a higher price, land being divided into narrow tracts undesirable for most development, and financial difficulties of potential developers are all reasons why some of the land has not developed.

In summary, the highway improvement was one of many factors that influenced development in this study site. Because of its location, this Study Area has potential for continued growth, particularly commercial development. The increasing traffic and improved road will be important considerations in that development.