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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 State Highway 30 was upgraded from a two-lane to a four-lane facility. The improvement took place in an urban area that was in the undeveloped 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 four and one-half 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 STATE HIGHWAY 30
IN AN UNDEVELOPED AREA IN COLLEGE STATION, TEXAS

by

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Economics of Highway Design Alternatives

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PREFACE

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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 State Highway 30 was upgraded from a two-lane to a four-lane facility. The improvement took place in an urban area that was in the undeveloped 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 four and one-half 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 State Highway 30 Study Area in College Station to determine the uses of the land before, during, and after improvement of State Highway 30 from a two-lane to a four-lane facility. The study covers a ten-year period before, during, and after construction of the improvement.

These findings are summarized as follows:

1. There has been much change in land use in the Study Area as a whole from 1968 to the end of 1977.
 - a. The predominant land use in 1968, the first year included in the study, was unimproved.
 - b. The stage of development has changed from the undeveloped stage to the developing stage.
 - c. The most extensive type of development that has occurred in the whole area is multiple family housing.
 - d. Single family housing, traffic-serving commercial, nontraffic-serving commercial, and public-governmental developments have also increased significantly.
2. Properties abutting Highway 30 have developed faster than nonabutting properties during the ten-year period.
 - a. The predominant abutting land use has changed from unimproved to multiple family residential. The acreage of multiple family residential development on abutting properties has increased from none to 61.34 acres (24.82 hectares).
 - b. The acreage of nontraffic-serving commercial development on abutting properties has increased from none to 7.25 acres (2.93 hectares).

- c. The acreage of traffic-serving commercial development on abutting properties has increased by 97 percent.
 - d. The acreage of public-governmental development has changed from none to 7.53 acres (3.05 hectares) in the form of city parks.
 - e. Total abutting developed acreage has increased by 8,461 percent.
3. Nonabutting properties have also been developing during the study period.
- a. The predominant nonabutting land use is still unimproved.
 - b. Nontraffic-serving commercial acreage on nonabutting property has increased from none to 24.20 acres (9.79 hectares). Most of this development fronts on Texas Avenue which has had a greater influence on this development than has State Highway 30.
 - c. Nonabutting single family residential acreage increased by 130 percent. None of this type of residential development occurred on abutting properties.
 - d. Nonabutting multiple family acreage increased from none to 17.90 acres (7.24 hectares).
 - e. Nonabutting traffic serving commercial acreage increased from none to 3.31 acres (1.34 hectares).
 - f. Nonabutting public-governmental acreage increased from none to 10.23 acres (4.14 hectares) in the form of city parks and a city owned electrical substation.
4. The growth in the Highway 30 study area has somewhat paralleled the growth of Bryan-College Station and Texas A&M University.
- a. Development has taken place in the Study Area due to financial

opportunities made possible by the growth of the cities and university.

- b. The improvement on Highway 30 has facilitated the growth in the Study Area and provided a more likely place for such growth.
- c. Multiple family residential development has occurred at a much higher rate in the Highway 30 Study Area than in the five other major areas of multiple family housing near the university.
- d. The improvement on Highway 30 has had an effect on land development in the area. Based on an abutting and nonabutting development comparison, it is concluded that 34 percent of the abutting acreage available for development developed as a result of the highway improvement. Excluding the Texas Avenue influence, the State Highway 30 improvement influence would be increased to 38 percent.

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 adjacent land use. 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 State Highway 30 has been improved. 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

A "before" and "after" approach was employed in this study to discover land use changes in the Highway 30 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 by the District Office of the State Department of Highways and Public Transportation began. Since planning did begin in late 1971, 1971 through 1974 were designated "during" construction years and all of the years since make up the "after" period. Actual changes and rates of change in land use were determined for each year. The square footage per commercial establishment; number of units in an apartment complex; and the number of single family houses were determined by year in addition to the number of acres in each use.

The land was divided into abutting and nonabutting properties. Abutting properties are those with frontage on Highway 30. In the undeveloped portions, a section 300 feet back from Highway 30 was designated as abutting property. 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. Planners and zoning commission members were questioned about an overall plan for the area and the 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 changes such as traffic volume, population, and income changes in the area were also investigated.

Location of Highway Improvement

The improved portion of Highway 30 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 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

¹Statistics 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 52%	27,542	6,177 22%	33,719	13,385 40%	47,104
College Station	7,925	3,471 44%	11,396	6,280 55%	17,676	24,169 137%	41,845
Brazos County	38,390	6,505 17%	44,895	13,083 29%	57,978	42,570 73%	100,548
Texas A&M (fall enrollments)	6,675	546 8%	7,221	7,095 98%	14,316	14,532 102%	28,848

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 southwest 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 State Highway 30.

The study area, as shown in Figure 1, is located .1 mile (.16 kilometers) 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 reaches to and includes part of the study area abutting Texas Avenue. Downtown Bryan is approximately five miles away.

Key Characteristics of Highway Improvement

In order to collect data on highway improvements from varying areas, the stage of development of the area before the improvement began was determined. The type of highway, whether it was in a rural or urban area, and the predominant abutting land use were also determined for the period before the improvement began in order to describe the setting in which the highway improvement took place.

For the State Highway 30 Study Area, the stage of development before the improvement began was basically undeveloped. Some building had occurred in

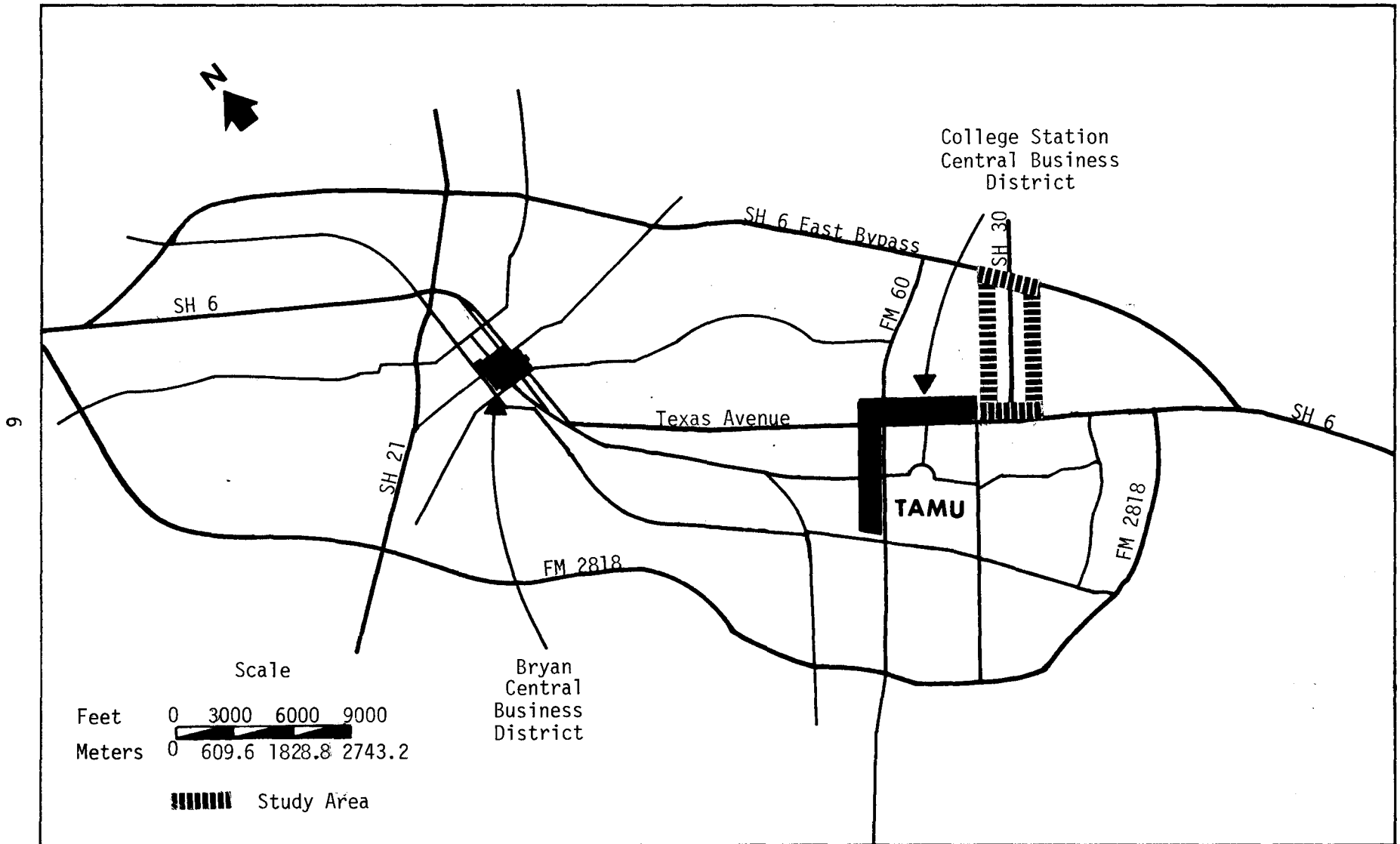


Figure 1. Map of the Bryan-College Station Area Showing the Location of the State Highway 30 Study Area

the area, but the overwhelming majority of the land had never been developed. The improvement was made upon an existing full access highway located in an urban fringe area. The predominant abutting land use was unimproved. The area appeared likely for development due to growth in the community and the area's closeness to the university.

Source of Data

Data on the planning and construction of the improvement on Highway 30 were collected from files at the District Office of the State Department of Highways and Public Transportation (SDHPT). The Department 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 Independent 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 were as follows:

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

Residential Multiple Family - tract improved with duplexes or apartment complexes

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

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

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

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

CHARACTERISTICS OF AREA ROADS BEFORE AND
AFTER IMPROVEMENT OF STATE HIGHWAY 30

State Highway 30

State Highway 30 runs between College Station and Huntsville, Texas, approximately 50 miles. In College Station, it connects Texas Avenue and the State Highway 6 East By-Pass.

The District Office of the SDHPT requested authorization to begin investigation, planning and engineering for the Highway 30 project in September of 1971. Approval was granted that same month and contracts were let in April of 1972. Construction actually began in July of 1972 and the facility was completed in April of 1974. Although 3.8 miles (6.11 kilometers) of Highway 30 were improved at that time, only the 1.4 miles (2.25 kilometers) within the College Station city limits will be considered in this study, because the improvement beyond that point was of a different type.

Prior to improvement, the portion of Highway 30 studied was a two-lane, 20-foot (6.1 meters) wide roadway surfaced with asphalt. It had no surfaced shoulders and was in fair condition. As Figure 2 indicates, the road is now a four-lane, 68-foot (20.7 meters) wide roadway surfaced with asphaltic concrete with a four-foot (1.2 meters) wide flush median and four-foot (1.2 meters) wide surfaced shoulders. The highway has no left turn provisions.

As indicated by Table 2, Highway 30 had a 1977 24-hour traffic count of 12,720 near its intersection with Texas Avenue. This is an increase of 2056% from 590 in 1968, the first year included in the study.

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Table 2. Twenty-Four Hour Traffic Counts on State Highway 30 and Other Parallel and Intersecting Roads in the Area

Location of Traffic Counts	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
STUDY ROUTE										
Highway 30										
East of Texas Avenue	590	610	1510		2050	4180	8400	8780		13,720
West of Munson Street										10,730
East of Munson Street										9,945
West of East By-Pass										3,780
PARALLEL ROADS										
Dominik Street										
East of Munson Street									1663	2005
East of Texas Avenue								5440		5190
Farm to Market Road 60										
East of Texas Avenue					5910					
West of 29th Street				4701						
West of East By-Pass										4720
INTERSECTING ROADS										
Texas Avenue										
South of Jersey Street										30970
South of Highway 30			6140				9550	11980		23900
North of FM 2818					5820		6700			
South of FM 2818					5080	5680	5450	5460		7200
East By-Pass										
North of Texas Avenue					2000	2300	2740	2910		3720
South of Highway 30					2070	2440	2880			
North of Highway 30										7800
Munson Drive										
South of Dominik Street									711	1815
South of Francis Street										290

Parallel Roads

Running parallel to Highway 30 is Dominik Street. This two-lane city street, which was in existence when Highway 30 was improved, is an alternate route to many points on or near Highway 30. Dominik Street, located north of Highway 30, had a 1977 traffic count of 5,190 near its intersection with Texas Avenue, as shown in Table 2. This is a 6.3% decline from a 1975 count of 5,540.

Another alternate route for Highway 30 is FM 60. It also runs parallel to Highway 30 and is located further north than Dominik Street. It is considered an alternate street because it too connects Texas Avenue and the East By-Pass. This roadway is a four-lane facility for approximately .7 miles with noncontinuous left turn provisions at points of heavy traffic. The mile from that point to the East By-Pass is two-lane with surfaced shoulders and a wide flush median.

The 1977 traffic count for FM 60 was 16,320 near its intersection with Texas Avenue and 4,720 near its intersection with the East By-Pass (Table 2). No other traffic counts are available for FM 60.

Intersecting Roads

The portion of Texas Avenue that Highway 30 intersects was previously a two-lane facility. It was changed to a six-lane, curbed and guttered highway with noncontinuous left turn provisions at approximately the same time Highway 30 was improved. Texas Avenue, the most heavily travelled street in Bryan-College Station, runs the length of both towns and is the street along which most of the business activity is located.

At a point on Texas Avenue just south of the intersection with Highway 30, the 24-hour traffic count increased by 289% from 6,140 in 1970 to 23,900 in 1977 (Table 2).

Another intersecting road is the State Highway 6 East By-Pass. The East By-Pass handles a large part of non-local traffic and some of the local traffic travelling between the two cities or to points out in the country. This new facility was under construction but not open in 1970, the last "before" year. The East By-Pass is a limited access, four-lane divided highway.

Data are not available for a before and after comparison of traffic counts on the East By-Pass, but at a point just south of the intersection with Highway 30, the counts for 1972, 1973, and 1974 show a steady increase. A 1977 count for north of the East By-Pass and Highway 30 intersection reported 7,800 vehicles in 24 hours on the East By-Pass (Table 2).

The city street, Munson Drive, also intersects the improved portion of Highway 30. It is a two-lane, curbed and guttered facility. The portion of Munson Drive that extends from Dominik Street to the intersection with Highway 30 was constructed in 1971. Traffic volume data for Munson Drive were limited but showed an increase from 1976 to 1977 (Table 2).

CHARACTERISTICS OF STUDY AREA BEFORE AND
AFTER IMPROVEMENT OF STATE HIGHWAY 30

Size and Boundaries of Study Area

The Study Area, located in southeastern College Station, encompasses approximately 581 acres (235.12 hectares). An area on each side of Highway 30 was chosen to provide data on both abutting and nonabutting properties. The area on the northern side of Highway 30 extends back to Dominik Street. The southern side, which is approximately 1000 feet wide, is somewhat smaller than the northern. It was chosen in order not to include some development with access only from Texas Avenue that is part of another study area in College Station. Texas Avenue on the west and the East By-Pass on the east form the other boundaries of the Highway 30 study area.

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 "undeveloped" stage of land development. This is verified by the fact that there were only 13.91 acres (5.63 hectares) of improved land and 25.77 acres (10.43 hectares) of streets and roads. The remaining land was unimproved, making it the dominant land use for the Study Area. Development in the Study Area in 1968 consisted of one traffic serving commercial establishment, two churches, and 31 single family residences.

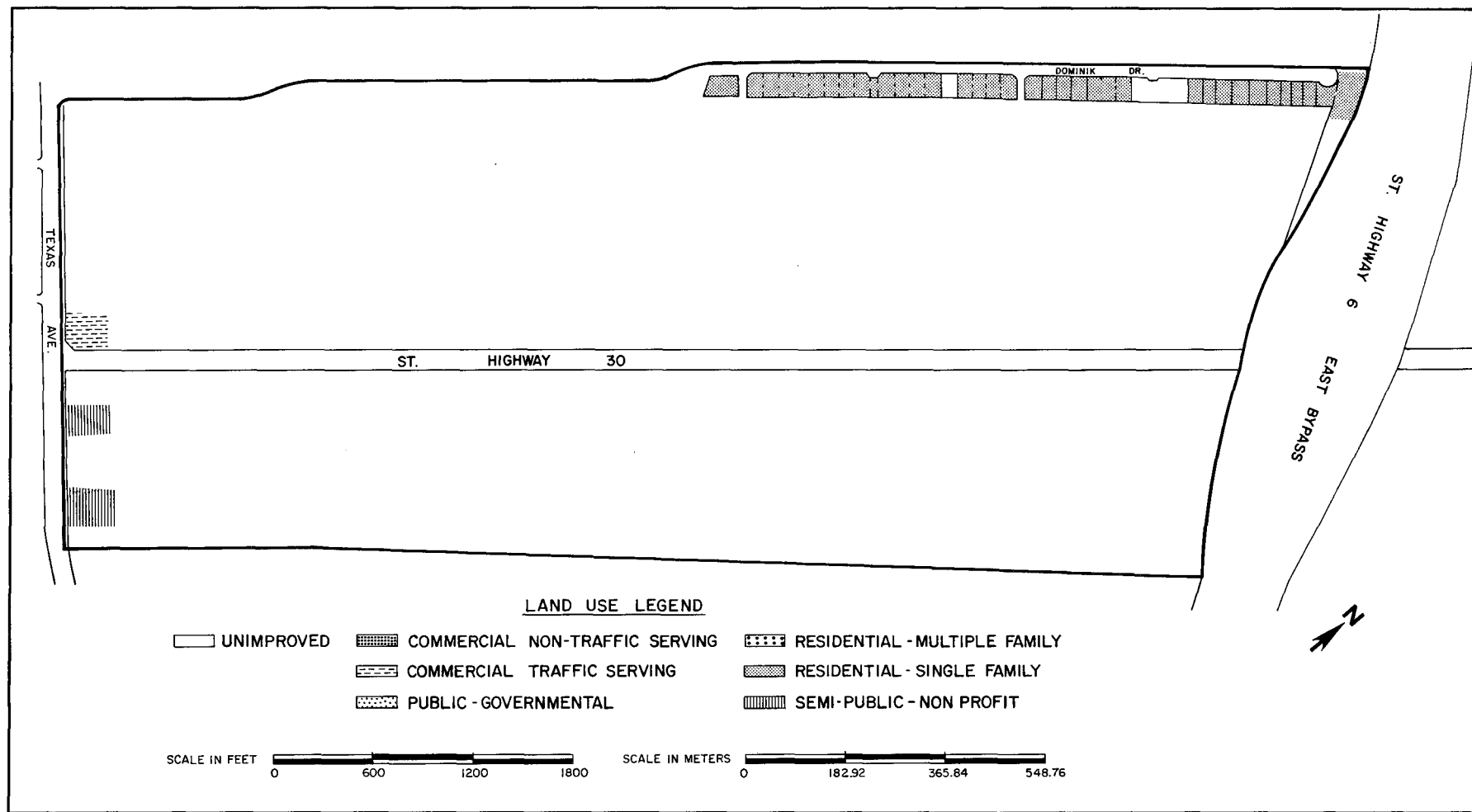


Figure 3. Land Use in the Highway 30 Study Area in 1968

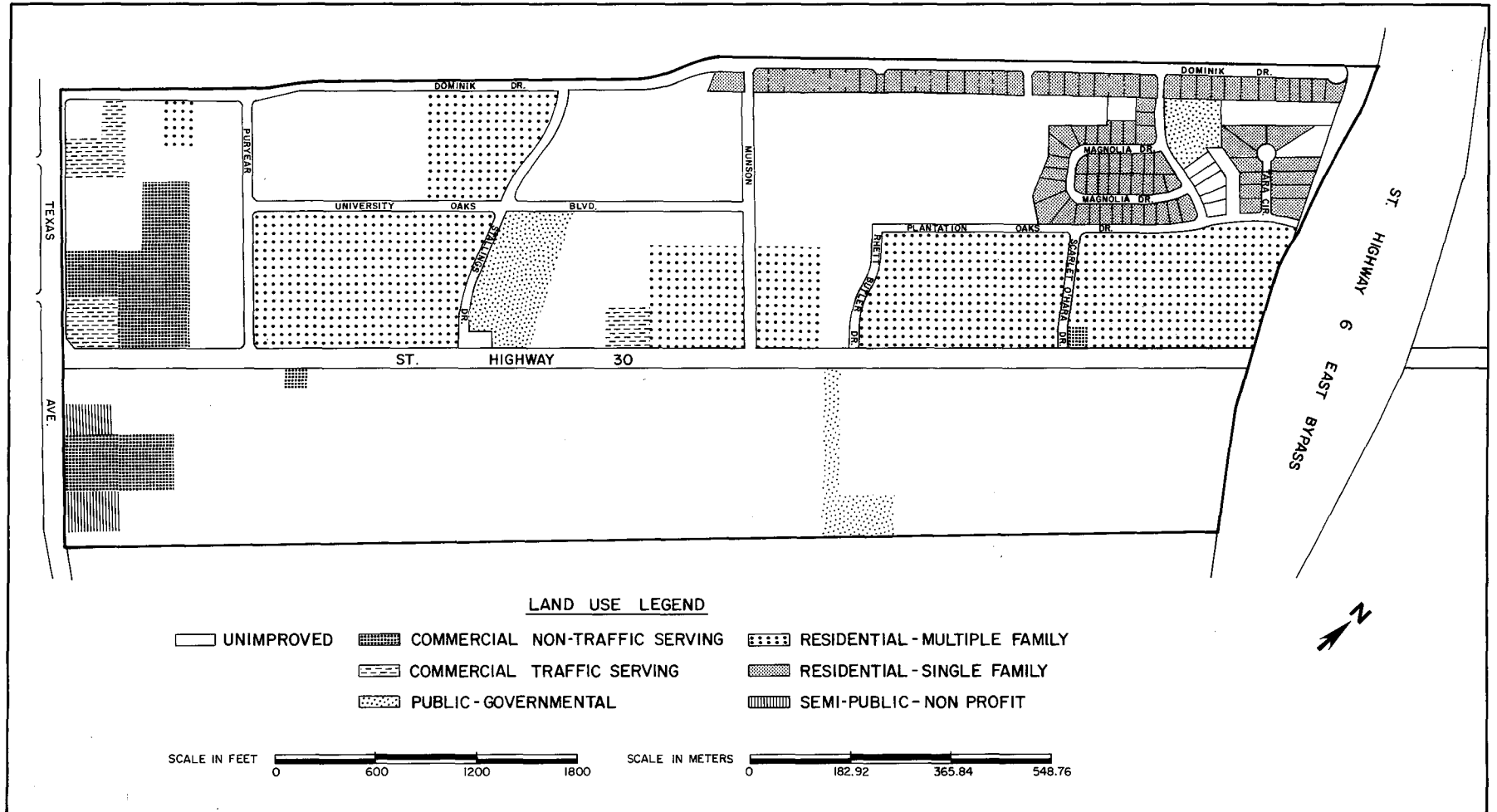


Figure 4. Land Use in the Highway 30 Study Area in 1977

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
Residential - Single Family	0	0	0	-	10.87	25.00	14.13	130
Residential - Multiple Family	0	61.34	61.34	-	0	17.90	17.90	-
Commercial - Traffic-Serving	.91	1.79	.88	97	0	3.31	3.31	-
Commercial - Nontraffic-Serving	0	7.25	7.25	-	0	24.20	24.20	-
Public - Governmental	0	7.53	7.53	-	0	10.23	10.23	-
SemiPublic - Nonprofit	0	0	0	-	2.13	2.13	0	-
Subtotal	.91	77.91	77.00	8461	13.00	82.77	69.77	537
Streets and Roads	19.34	21.21	1.87	10	6.43	22.57	16.14	251
Unimproved	132.07	53.20	-78.87	-60	409.57	323.66	-85.91	-21
TOTAL ACRES	152.32	152.32	0	-	429.00	429.00	0	-

^aOne acre is equal to .4046856 hectares

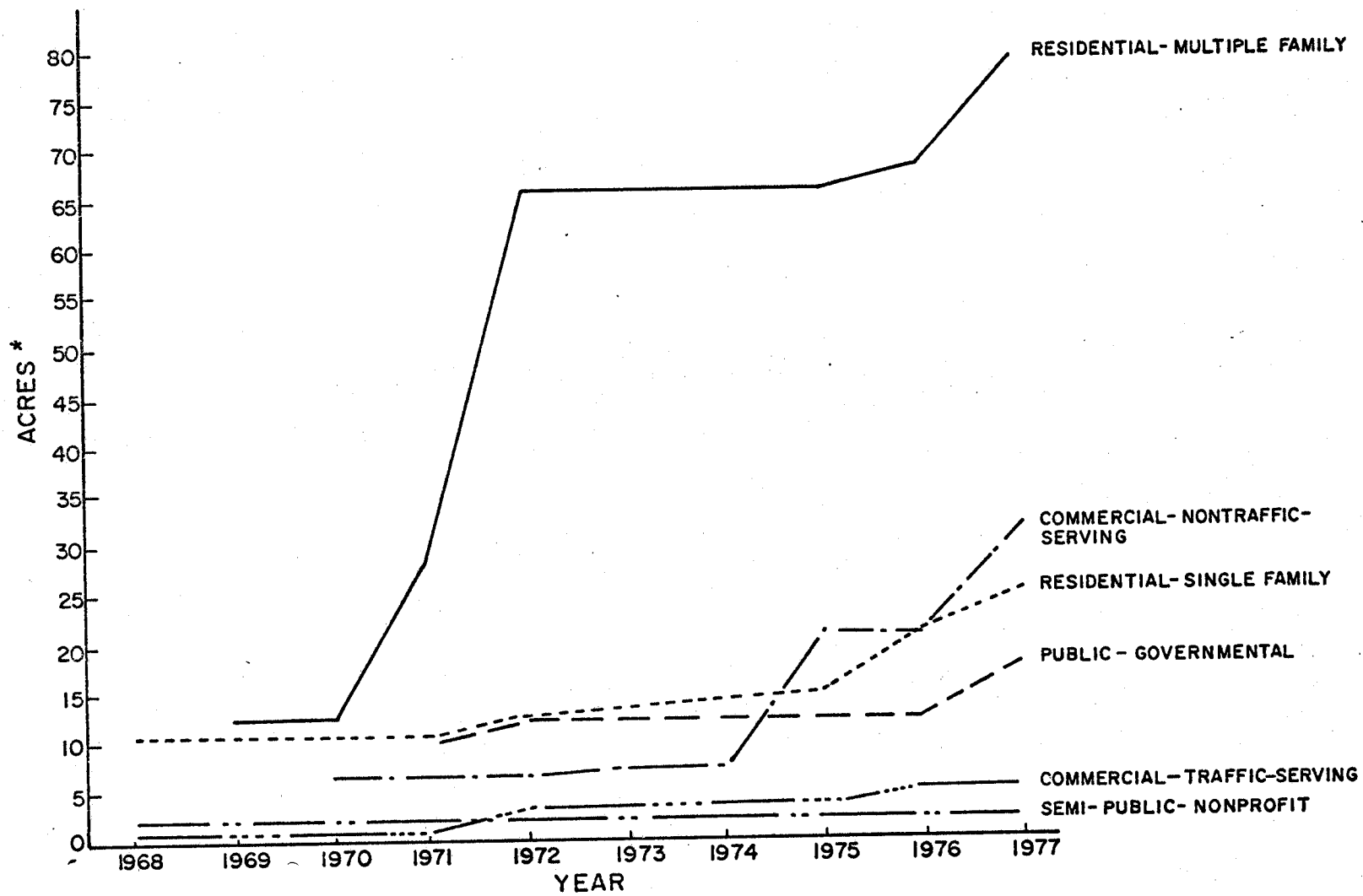


Figure 5. Total Annual Changes in Land Use in the State Highway 30 Study Area

*One acre is equal to .4046856 hectares.

back several hundred feet from the highway, but the complex would all be classified as abutting since it is one development whose main access is from Highway 30. For the undeveloped parts of the area, a section 300 feet (91.44 meters) back from the right-of-way of Highway 30 was considered abutting. Three hundred feet was chosen because that is a typical commercial lot depth in the general area. In some cases, this is the depth zoned as commercial on previously unimproved land nearby. All other land in the study area was considered "nonabutting".

The division of the properties into these two categories was done to facilitate comparison. The nonabutting properties were used as a control area with which to compare the abutting property to help determine the influence of the highway improvement. Although the improved highway could have influenced changes in nonabutting land use, it would be expected that abutting properties would have been most affected. This could be proved or disproved by looking at the two groups separately.

As Table 4 shows, abutting properties had undergone only traffic-serving commercial development in the form of one gasoline station on .91 acres (.34 hectares) in 1968. The remainder of the abutting property was unimproved. In the other "before" years of 1969 and 1970, other development in the forms of multiple family housing and nontraffic-serving commercial began to emerge.

The years 1971 to 1973, which were during the planning and construction of the improvement on Highway 30, brought a 375% increase in developed abutting land in the forms of multiple family housing, parks, and nontraffic-serving businesses. No abutting development occurred in the year construction was completed, 1974. As Figure 6 shows, an abrupt change in multiple family residential development occurred early in the planning and construction period.

Developed abutting acreage increased by 11.08 acres (4.48 hectares) in the period after construction, 1975 to 1977.

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			During Planning and Construction				After				
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977		
Commercial-Traffic Serving												
Total Acres	.91	.91	.91	.91	.91	.91	.91	.91	.91	.91	1.79	1.79
Absolute Change	0	0	0	0	0	0	0	0	0	.88	0	0
Percent Change	0	0	0	0	0	0	0	0	0	97%	0	0
Commercial-Nontraffic Serving												
Total Acres	0	0	1.50	1.50	1.50	2.05	2.05	7.25	7.25	7.25	7.25	7.25
Absolute Change	0	0	1.50	0	0	.55	0	5.20	0	0	0	0
Percent Change	0	0	-	0	0	37%	0	254%	0	0	0	0
Residential-Multiple Family												
Total Acres	0	12.26	12.26	20.48	56.34	56.34	56.34	56.34	56.34	58.34	61.34	61.34
Absolute Change	12.26	0	8.22	35.86	0	0	0	0	2	3	3	3
Percent Change	-	0	67%	175%	0	0	0	0	3.5%	5%	5%	5%
Public-Governmental												
Total Acres	0	0	0	0	7.53	7.53	7.53	7.53	7.53	7.53	7.53	7.53
Absolute Change	0	0	0	0	7.53	0	0	0	0	0	0	0
Percent Change	0	0	0	0	0	0	0	0	0	0	0	0
Streets and Roads												
Total Acres	19.34	20.05	20.05	21.21	21.21	21.21	21.21	21.21	21.21	21.21	21.21	21.21
Absolute Change	.71	0	1.16	0	0	0	0	0	0	0	0	0
Percent Change	4%	0	6%	0	0	0	0	0	0	0	0	0
Unimproved												
Total Acres	132.07	119.10	117.6	108.22	64.83	64.28	64.28	59.08	56.2	53.2	53.2	53.2
Absolute Change	-12.97	-1.94	-9.38	-43.39	-5.55	0	-5.20	-2.88	-3.0	-3.0	-3.0	-3.0
Percent Change	-10%	-2%	-8%	-40%	-0.01%	0	-8%	-5%	-5%	-5%	-5%	-5%

^aOne acre is equal to .4046856 hectares

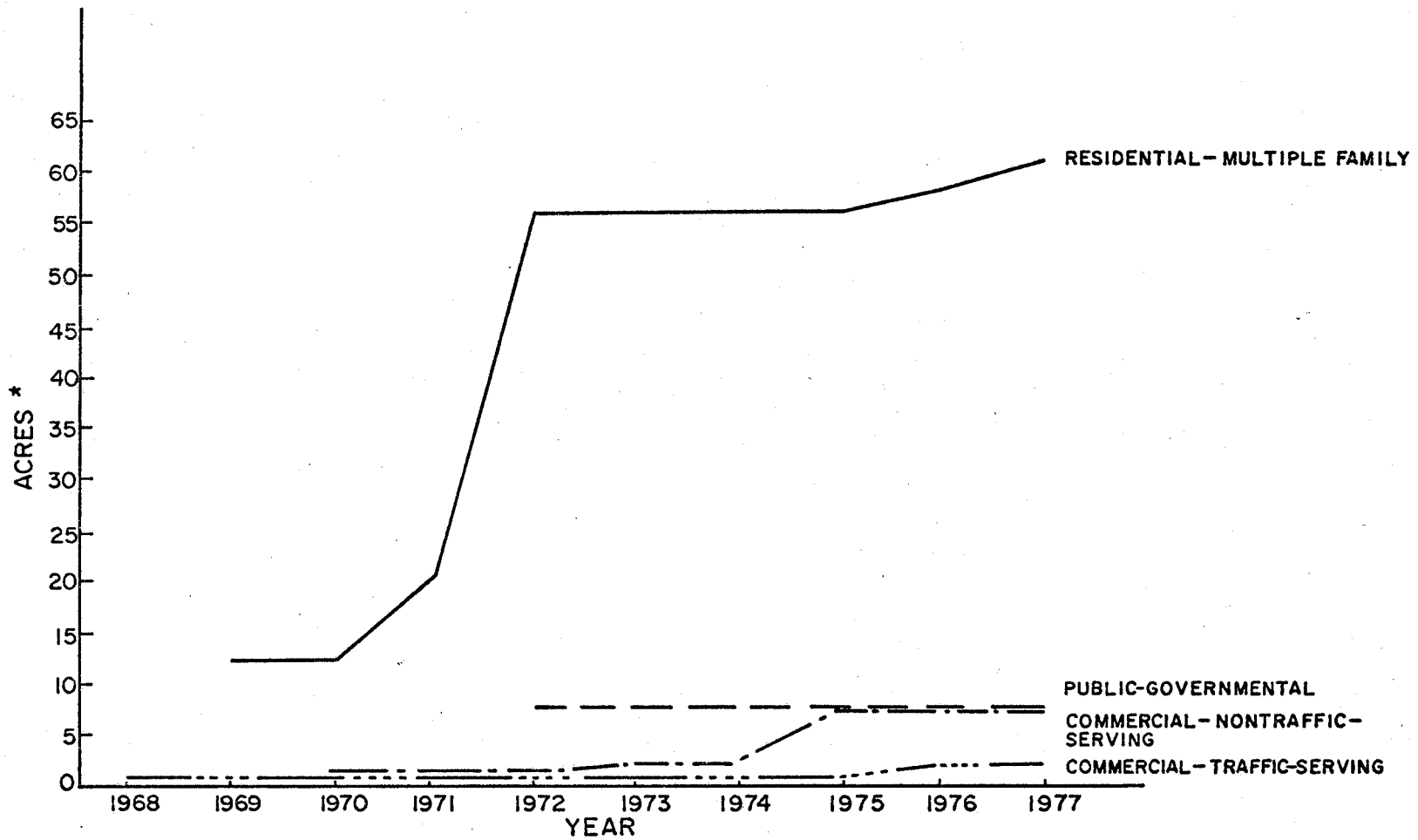


Figure 6. Annual Changes in Abutting Land Uses in the State Highway 30 Study Area

*One acre equals .4046856 hectares.

The predominant developed land use for nonabutting properties in 1968 was single family residences with 31 homes on 10.87 acres (4.40 hectares) (Table 5). There were 2.13 acres (.86 hectares) of semi-public-nonprofit development making a total of 13.00 acres (5.26 hectares) of improved non-abutting land in 1968. Total developed nonabutting acreage in the "before" period increased to 18.05 with the addition of 5.05 acres of nontraffic-serving commercial development in 1970.

During the years 1971 through 1974, when planning and construction were taking place, 19.67 nonabutting acres (7.96 hectares) were developed (Table 5). A 250 unit apartment complex on 9.5 acres (3.84 hectares) fronting Dominik Street accounted for the largest increase. The total developed non-abutting acres amounted to 37.72 (15.26 hectares) at the end of 1974. This was a 109 percent increase from the last "before" year of 1970.

The years after construction was completed, 1975 through 1977, brought 36.02 more acres (14.58 hectares) of development on nonabutting land for a total of 82.77 developed, nonabutting acres (Table 5). Nontraffic-serving commercial development accounted for the largest portion of this development. The development was in the form of several retail shops in a shopping center on the corner of Texas and Highway 30. Figure 7 shows the annual changes in nonabutting land use in the Highway 30 Study Area. It should be noted no abrupt changes in land use occurred during the study period.

Changes in units other than acres on abutting and nonabutting property are shown in Table 6. Nontraffic serving commercial development, which showed the greatest percent increase, was primarily in retail shops in the shopping center on Texas Avenue and Highway 30.

Table 3 shows that abutting development acreage increased by 8461 percent while nonabutting development acreage increased by 537 percent. Multiple

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			During Planning and Construction				After										
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977								
Commercial-Traffic Serving																		
Total Acres	0	0	0	0	0	0	2.16	2.16	0	2.16	2.57	0	2.57	0	3.31	0	3.31	
Absolute Change		0	0	0	0	0	2.16	0	0	.41	0	0	.74	0	0	0	0	
Percent Change		0	0	0	0	0	0	0	0	19	0	0	34%	0	0	0	0	
Commercial-Nontraffic Serving																		
Total Acres	0	0	5.05	5.05	0	5.05	0	5.05	0	5.05	0	5.05	8.39	0	13.44	10.76	24.20	
Absolute Change		0	5.05	0	0	0	0	0	0	0	0	8.39	0	0	0	10.76	0	
Percent Change		0	-	0	0	0	0	0	0	0	0	166%	0	0	0	80%	0	
Residential-Multiple Family																		
Total Acres	0	0	0	0	9.50	9.50	0	9.50	0	9.50	0	9.50	0	0	9.50	8.4	17.90	
Absolute Change		0	0	0	9.50	0	0	0	0	0	0	0	0	0	0	8.4	0	
Percent Change		0	0	0	0	0	0	0	0	0	0	0	0	0	0	88%	0	
Residential-Single Family																		
Total Acres	10.87	10.87	10.87	10.87	10.87	12.63	13.30	13.97	13.97	14.61	20.85	25.00	25.00	25.00	25.00	25.00	25.00	
Absolute Change		0	0	0	0	1.76	.67	.67	.67	.64	6.24	4.15	4.15	4.15	4.15	4.15	4.15	
Percent Change		0	0	0	0	16%	5%	5%	5%	5%	43%	200%	200%	200%	200%	200%	200%	
Public-Governmental																		
Total Acres	0	0	0	0	0	2.50	2.50	4.50	4.50	4.50	4.50	10.23	10.23	10.23	10.23	10.23	10.23	
Absolute Change		0	0	0	0	2.50	2	0	0	0	0	5.73	5.73	5.73	5.73	5.73	5.73	
Percent Change		0	0	0	0	0	80%	0	0	0	0	127%	127%	127%	127%	127%	127%	
Semi-Public - Nonprofit																		
Total Acres	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	
Absolute Change		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Percent Change		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Streets and Roads																		
Total Acres	6.43	13.75	13.75	19.71	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	22.57	
Absolute Change		7.32	0	5.96	2.86	0	0	0	0	0	0	0	0	0	0	0	0	
Percent Change		114%	0	43%	15%	0	0	0	0	0	0	0	0	0	0	0	0	
Unimproved																		
Total Acres	409.57	402.25	397.20	381.74	372.46	369.79	368.71	359.68	352.70	323.66	323.66	323.66	323.66	323.66	323.66	323.66	323.66	
Absolute Change		-7.32	-5.05	-15.46	-9.28	-2.72	-1.08	-6.98	-29.94	-29.94	-29.94	-29.94	-29.94	-29.94	-29.94	-29.94	-29.94	
Percent Change		-2%	-1%	-4%	-2%	-7%	-3%	-2%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	-8%	

^aOne acre is equal to .4046856 hectares

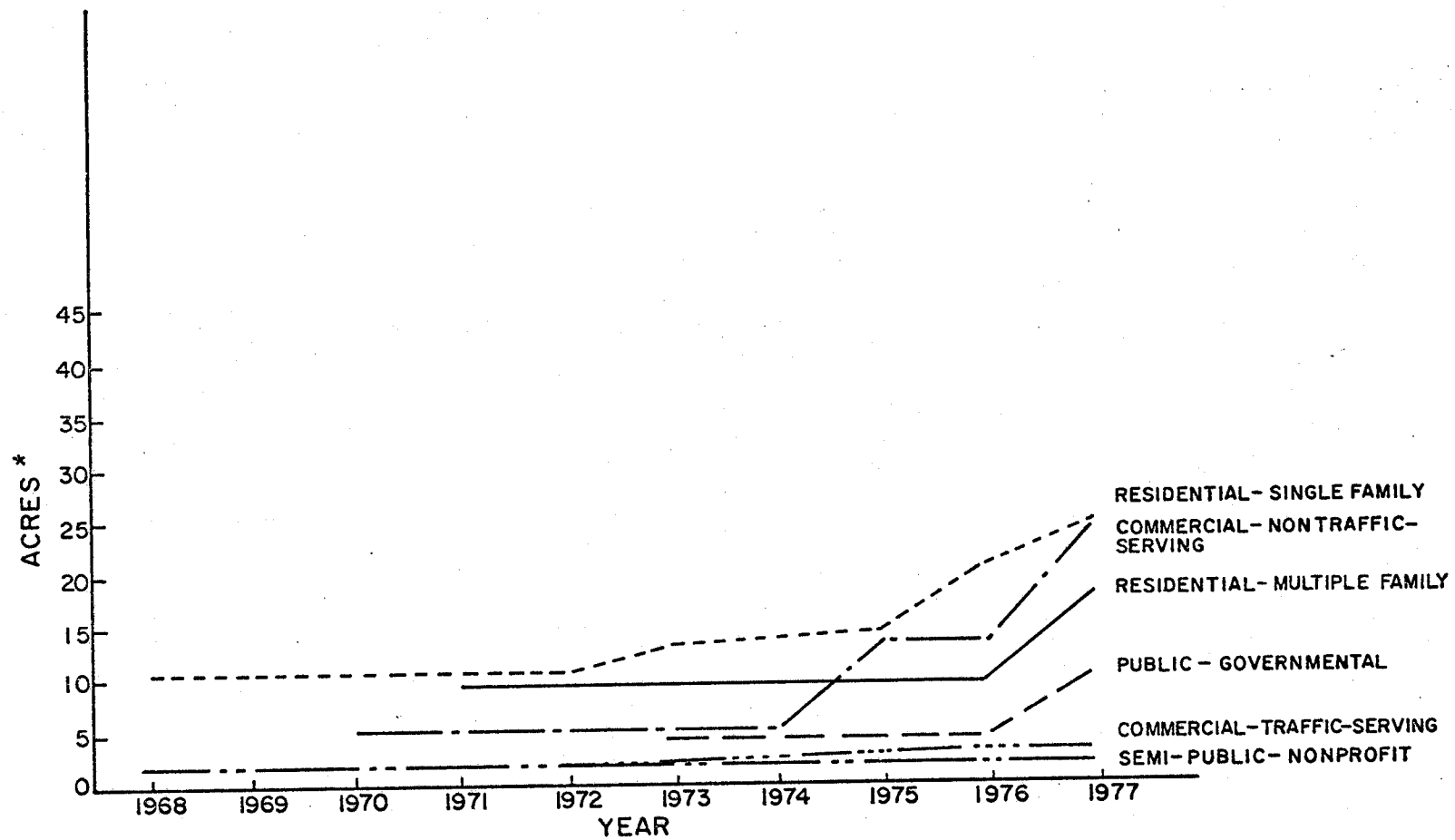


Figure 7. Annual Changes in Nonabutting Land Uses in the State Highway 30 Study Area

*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 1968	Number of Units 1977	Change in Units Quantity	Change in Units Percent	Number of Units 1968	Number of Units 1977	Change in Units Quantity	Change in Units Percent
Residential-Single Family	Number of Homes	0	0	0	-	31	86	55	177
Residential-Multiple Family	Number of Apartments	0	1,909	1,909	-	0	453	453	-
Commercial-Traffic- Serving	Square Feet	1,885	11,765	9,880	524	0	12,517	12,517	-
Commercial-Nontraffic- Serving	Square Feet	0	35,456	35,456	-	0	130,554	130,554	-

family housing accounted for the largest increase on abutting property. Nontraffic serving commercial development accounted for the largest increase in nonabutting development.

Land Use Impediments

As stated previously, factors which could have influenced land use were researched. Zoning was investigated to determine if it had dictated the type of developments that took place. Also, other impediments such as availability of utilities and properties being held off the market were investigated.

Zoning

In 1970, the last "before" year, the area was zoned commercial, apartment house, or single family residential. Although this may appear to be restrictive as to uses that could be made on particular tracts, it does not appear to have been the case in the Highway 30 study area. Several zoning changes were made to allow developers to build what they proposed. No instances of refusal to change zones when requested could be found. Little opposition to the changes occurred. One notable exception was found that involved nonabutting property in the northeast corner of the study area. The single family residential owners successfully fought the high density apartment zoning adjacent to their properties. This property was changed to a band of single family zoning followed by a band of low density apartment zoning and then by a band of high density apartment zoning.

Other Impediments

One restrictive force upon how the land was used is the fact that much of the land on the south side of the area is low. Flooding and drainage problems have impeded development there. A proposed shopping center in that area has been designed to be built upon piers to overcome these problems.

A more important factor in the lack of development on the south side of Highway 30 is the holding of land by individuals not interested in development. Much of that land was held unimproved until the mid-seventies when it began to be sold. Although several developments are planned for those tracts now, the ownership did prevent any earlier possible development.

No other impediments to land use were discovered. Several commercial and multiple family developments 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 prevent 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 the area's land. These characteristics were investigated to determine their significance in the Highway 30 area.

In order to give some indications of the extent to which the State Highway 30 area characteristics differed from those of College Station in the period before highway construction, the 1970 census data were examined. Census Tract 13 of the Bryan-College Station SMSA contains all of the population portion of the Study Area; therefore, the comparison was made on that basis. No census tract data were available for Bryan-College Station before 1970.

According to Table 7, the median school years completed and percent of high school graduates were higher in Census Tract 13 than Brazos County and Bryan and approximately the same as in College Station. Median family income was noticeably higher in the census tract than either of the cities or the county as a whole. The census tract also had a smaller percent of families below the poverty level.

Table 7. Comparison of 1970 Socio-Economic Characteristics of Census Tract 13 to Bryan-College Station

	SMSA (Brazos County)	Bryan	College Station	Census Tract 13
<u>Population</u>	57,978	33,719	17,676	3,588
Median School Years Completed	12.2	11.9	15.8	15.8
Percent High School Graduates	54.5	49.6	82.9	82.4
Median Family Income	\$7636	\$7775	\$7849	\$10,918
Median Income of Families and Unrelated Individuals	\$4002	\$6341	\$1824	\$7204
Median Value Owner Occupied Residences	\$13,000	\$12,200	\$18,500	\$17,700
Median Rent Paid by Tenants	\$74	\$64	\$87	\$149
Percent Families Below Poverty Level	16.6%	16.0%	14.1%	11.4%
<u>Occupations</u>				
Total Employed, 16 Years and Over	21,909	13,120	6,354	1,367
Percent Professional, Technical and Kindred Workers	24.8%	20.3%	39.4%	45.0%
Percent Managers and Administrators except farm	8.5%	10.0%	6.0%	9.4%
Percent Sales Workers	6.6%	7.4%	5.5%	5.5%
Percent Clerical and Kindred Workers	17.3%	17.4%	17.9%	14.9%
Percent Craftsmen, Foreman, and Kindred Workers	10.1%	12.2%	4.5%	3.7%
Percent Operatives, Except Transport	6.8%	7.8%	3.6%	1.8%
Percent Transport Equipment Operatives	3.0%	4.0%	1.0%	1.2%
Percent Laborers, Except Farm	4.6%	4.7%	4.0%	5.0%
Percent Farm Workers	3.6%	1.3%	4.0%	0.7%
Percent Service Workers	11.4%	11.4%	12.0%	8.8%
Percent Private Household Workers	3.3%	3.5%	2.0%	4.0%

These and other characteristics portray Census Tract 13 as containing a more professional, more educated population with higher incomes, than Bryan-College Station as a whole in the before period.

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 State Highway 30 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, 146.77 acres (59.40 hectares) of previously unimproved land was developed in the Highway 30 Study Area (Table 3). An additional 18.01 acres (7.29 hectares) of streets and roads were added to the 25.77 acres (10.43 hectares) existing in 1968.

Abutting Vs. Nonabutting Development

There was an 8461 percent increase in development on land abutting Highway 30 compared to 537 percent increase in development on nonabutting land.

Perhaps it is better to show the extent of the highway improvement's impact in terms of changes in the amount of unimproved land available for development between 1968 and 1977. Table 8 shows the extent of such changes for abutting property, nonabutting property, and total study property. The relative difference between the abutting and nonabutting percentages is 34 percent or an annual rate of almost four percent. When using the nonabutting properties as a control area, the relative difference between the percentages of unimproved land that was developed is attributed to the highway improvement. Therefore, the highway improvement could have been the cause of 34 percent of the reduction in unimproved abutting land.

Table 8. Extent of Change in Unimproved Land in the Highway 30 Study Area by Location of Property

Location of Property	Total Area Acres	Extent of Land Use Change	
		Acres ^{abc}	Percent ^d
Abutting Property	152.32	77.00 (8.6)	50.55% (5.7)
Nonabutting Property	429.00	69.77 (7.8)	16.26% (1.8)
Total Study Area Property	581.32	146.77 (16.3)	25.25% (2.8)

^aNumber in parentheses represents the average annual rate of change.

^bOne acre is equal to .4046856 hectares.

^cChange in acres does not include streets and roads.

^dPercent is calculated by dividing the number of developed acres by the total number of acres in each category

This conclusion is based upon the assumption that the nonabutting land development was not affected by the highway improvement. However, to the extent that nonabutting development was affected, the actual highway impact would have been greater than 34 percent. Although this analysis has limitations because the nonabutting properties are not a perfect control area, it is still believed to be a useful tool in attempting to quantify the highway's impact. It is virtually impossible to find a control area that would be exactly like the study area except for the lack of a highway improvement. The nonabutting properties within the Study Area do offer some advantages. There is little difference in the locations of the two groups of properties relative to the university and other major points in Bryan-College Station. Both the abutting and nonabutting properties were predominantly unimproved

in 1968, the first "before" year. Land ownership was comparable with both abutting and nonabutting tracts having the same owner in several cases. This is important, because some of the development could have occurred on one of the other streets, for instance Dominik, rather than Highway 30, since the same party owned tracts in both locations. Both abutting and nonabutting land in the southern part of the study area was held out of development due to the same owners who did not wish to have their land developed until recently. For these reasons the nonabutting properties provide a satisfactory control area to enable the comparison to be made.

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 and Texas A&M indicates that development has and will be taking place. The need of housing for students showed that multiple family housing would be erected somewhere near the university. The growing population capable of supporting more retail businesses provided the opportunity for commercial development. More single family residences were needed to house that segment of the growing population. The larger population provides 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 Highway 30 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 very convenient for students. This helps explain why multiple family housing was

located there. Commercial establishments located in the area are also close and convenient to the university as well as convenient to residential sections.

Influence of Texas Avenue

Texas Avenue has an important influence upon land use in the Highway 30 Study Area. Because the two highways intersect, part of the property in the study area actually fronts Texas Avenue. Placement of part of the development was because of the location on Texas Avenue rather than the influence of Highway 30. Although it may be impossible to completely disentangle the influence of the two streets, the property fronting Texas Avenue was subtracted from the Study Area to determine if the Texas Avenue properties were making a significant difference. Table 9 indicates the acres available for development and how much development did occur without the Texas Avenue properties. With all properties fronting Texas Avenue and a 300-foot band of undeveloped land bordering Texas Avenue subtracted out of the study area, there was a difference between abutting and nonabutting development of 37 percent. This is three percent higher than the difference between abutting and nonabutting development when the Texas Avenue properties are left in the analysis. Although the influence of Texas Avenue upon development in the Study Area may still be present, subtracting out the most obvious influence of this major street does not weaken the comparison between abutting and nonabutting properties but rather strengthens it.

then two-lane to the East By-Pass. It is this two-lane section that has had little development. This road that was not designed to handle as much traffic as Highway 30 could have been influential in decisions about locations for development, particularly types of development that would generate much traffic such as commercial and multiple family.

Growth Trends

A comparison of the growth trend of housing units in the study area with the growth trend of Highway 30 daily traffic volume indicates that the growth in housing units did not keep pace with the growth in traffic volume (Figure 8). The same is true when comparing the growth in TAMU's fall enrollment. These results suggest that most of the students are housed out of the Study Area and that not all of the traffic volume on Highway 30 is due to Study Area residents. Therefore, TAMU enrollment and Highway 30 traffic volume are not very good predictors of the number of housing units in the study area, or vice versa.

Multiple Family Development

The major type of development on the abutting property in the Highway 30 Study Area has been multiple family residential development. To determine how this development has occurred relative to development in other areas in Bryan-College Station, 1970 and 1977 serial zone data from the Bryan-College Station urban transportation study were analyzed (serial zone data were not available before 1970).

All areas with major concentrations of multiple family housing within an approximate radius of three miles from the center of the main campus of Texas A&M University were chosen as control areas to compare to the Study Area. Three control areas are in College Station, one is in Bryan and one is partly in both cities.

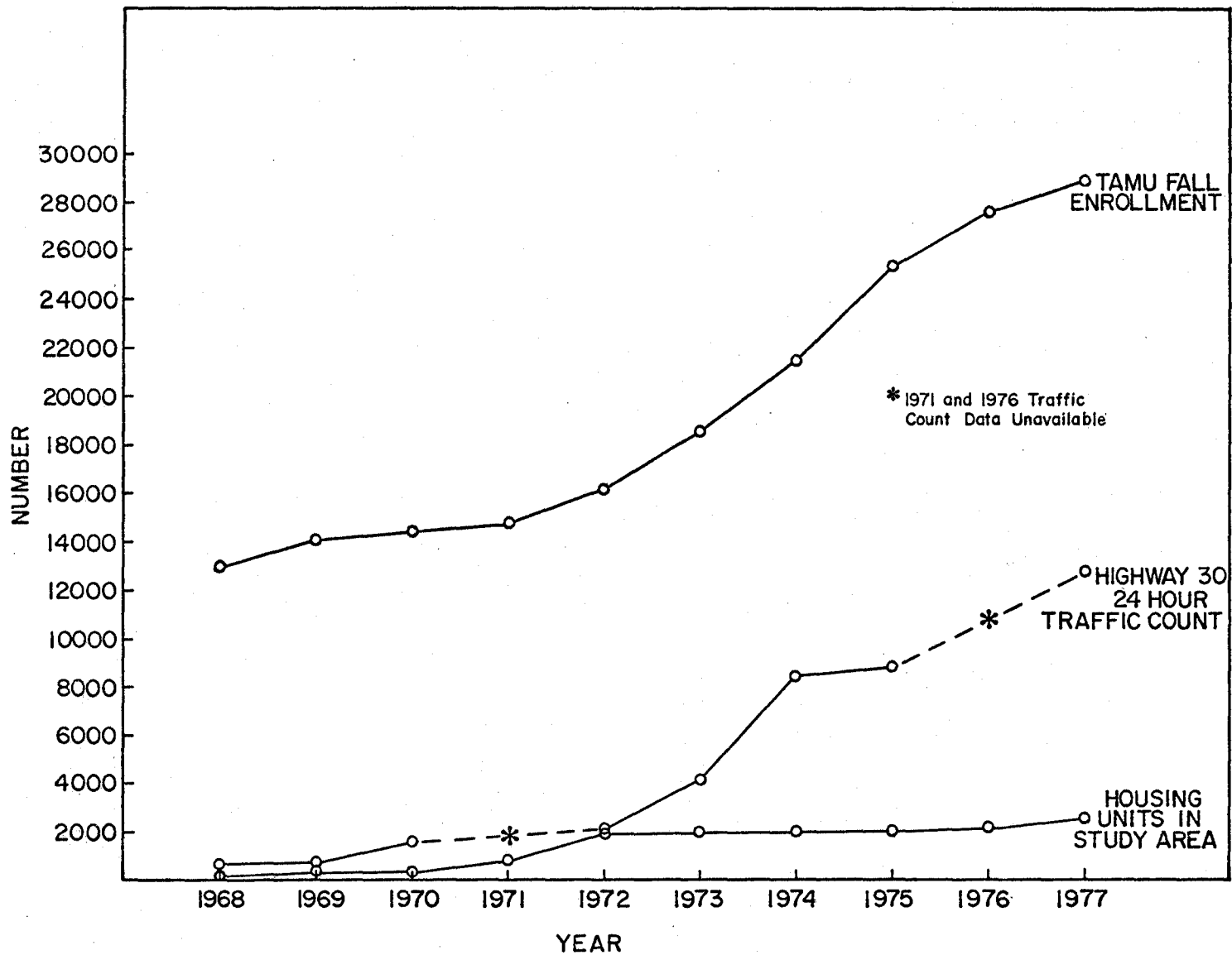


Figure 8. Growth in TAMU Fall Enrollment, Highway 30 24-Hour Traffic Count, and Housing Units in the Study Area Between 1968 and 1977

The Anderson Street Control Area is approximately .8 miles south of the center of Texas A&M. Anderson is a wide, curbed and guttered city street with easy access to the university and shopping districts.

The Southwest Parkway Control Area is approximately 1.7 miles south of the center of the campus. Southwest Parkway is a wide curbed and guttered city street with a continuous left turn lane. It connects Texas Avenue and FM 2154 providing good access to the campus and shopping areas.

The FM 2818 Control Area is also south of the campus, approximately 2.3 miles. This two-lane road with open ditches also connects Texas Avenue and FM 2154 providing good access to the university and business districts.

The College Main Control Area is located approximately .4 miles north of the center of campus in an area called Northgate. College Main is a two-lane street with open ditches. The university and business districts are convenient to this area with many points being within a comfortable walking distance.

The 29th Street Control Area is located in Bryan, approximately 2 miles from the heart of the campus. Twenty-ninth Street is a four-lane, curbed and guttered street with easy access to the university and shopping areas.

In order to compare the control areas to the Highway 30 Study Area, the serial zones most closely coinciding with the areas of multiple family housing were examined. In some cases, two serial zones were combined in order to include all of the multiple family housing in the area.

As shown in Table 10, the serial zones representing the Highway 30 Study Area have had a higher absolute and percentage increase in multiple family housing than any of the control areas. The Highway 30 Study Area had over two-thirds as much development between 1970 and 1977 as all of the control areas combined. The Study Area has also had over twice the percentage increase in development as the average of the control areas.

Table 10. Comparison of Multiple Family Residential Development in the Highway 30 Study Area to Other Areas in Bryan-College Station

Area	Total Acres		Change in Acres		Acres Per Frontage Mile		Change in Acres Per Frontage Mile	
	1970	1977	Absolute	%	1970	1977	Absolute	%
<u>Study Area</u>								
Highway 30	12.26	79.12	66.86	545%	8.76	56.51	47.75	545%
<u>Control Areas^a</u>								
Southwest Parkway	0	29.16	29.16	-	0	26.51	26.51	-
FM 2818	0	13.41	13.41	-	0	22.35	22.35	-
Anderson Street	10.60	32.93	22.33	211%	17.67	54.88	37.21	211%
College Main	10.52	27.33	16.81	160%	11.69	30.37	18.68	160%
29th Street	12.38	29.67	17.29	140%	13.67	32.97	19.21	140%
Total Control	33.50	132.50	99.0	296%	8.17	32.32	24.15	296%
Average of 5	6.7	23.4	16.7	249%	8.38	29.25	20.87	249%

^aBased on serial zone data collected for the Bryan-College Station Urban Transportation Study.

To further analyze the extent of multiple family development and to adjust for size differences between areas, the number of acres per frontage mile along the main thoroughfare in the areas were determined. Although three control areas had a higher number of acres per frontage mile in 1970, none of the control areas had experienced as much change as the Study Area. This indicates that the Highway 30 Area was the center of multiple family development in the vicinity between 1970 and 1977.

The higher amount of multiple family development in the Study Area during the study period indicates that the road design change on State Highway 30 could have had an effect upon multiple family development. More development could have occurred in other areas, but instead was attracted to the Highway 30 Area. It is contended that the improved roadway was a factor in this attraction. Although it is difficult to determine exactly what the effect of the highway change was, the difference between the amount of development in the control areas and the Study Area indicates that the improved access may have been instrumental in attracting development to the Study Area.

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 Highway 30 were important considerations in placement of the developments there. Ease of access to and from the establishments was considered very important. An improved Highway 30 has provided easier access to the properties both abutting and nonabutting in the Study Area. It has decreased travel time by providing a less congested highway than would be the case if it were still two-lane.

Much of the development that took place in the Highway 30 area would have occurred somewhere in College Station anyway due to the financial opportunities

available. Widening and improving Highway 30 made that area a more likely and desirable place for the development to occur. The improved roadway enhanced and facilitated, rather than caused, the growth and it must be considered an important influence. An improved Highway 30 has helped attract development to that area and in this sense has accelerated changes in land use, especially abutting property.

CONCLUSIONS

The State Highway 30 Study Area has experienced much change within the 1968 to 1977 period. The stage of development has changed from undeveloped to developing. Although the predominant land use for the whole Study Area has remained unimproved, the majority of acreage changing in use has become multiple family residential acreage.

The predominant land use for abutting property has changed from unimproved to multiple family residential. This development reflects opportunities made available by Texas A&M University's growing student population. Nonabutting acreage has remained predominantly unimproved with nontraffic-serving commercial development having the highest increase in acreage.

Many factors have contributed to the growth that has occurred in the Highway 30 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 support 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, particularly multiple family housing and commercial establishments. These and other factors, including the improvement of Highway 30, have influenced the development that has occurred.

In an attempt to determine the impact of the highway improvement upon land use, the abutting and nonabutting properties were compared using the nonabutting as a control area. The two groups of properties have been subject to many of the same influences with the exception of the highway improvement. Therefore, the difference between the percent of available land that developed in each category is a rough estimate of the highway's impact. In this case, 51 percent of unimproved abutting land developed within the period studied compared

to 16 percent of unimproved nonabutting land. The difference, 34 percent, is interpreted as the amount of unimproved abutting land developed as a result of the highway improvement.