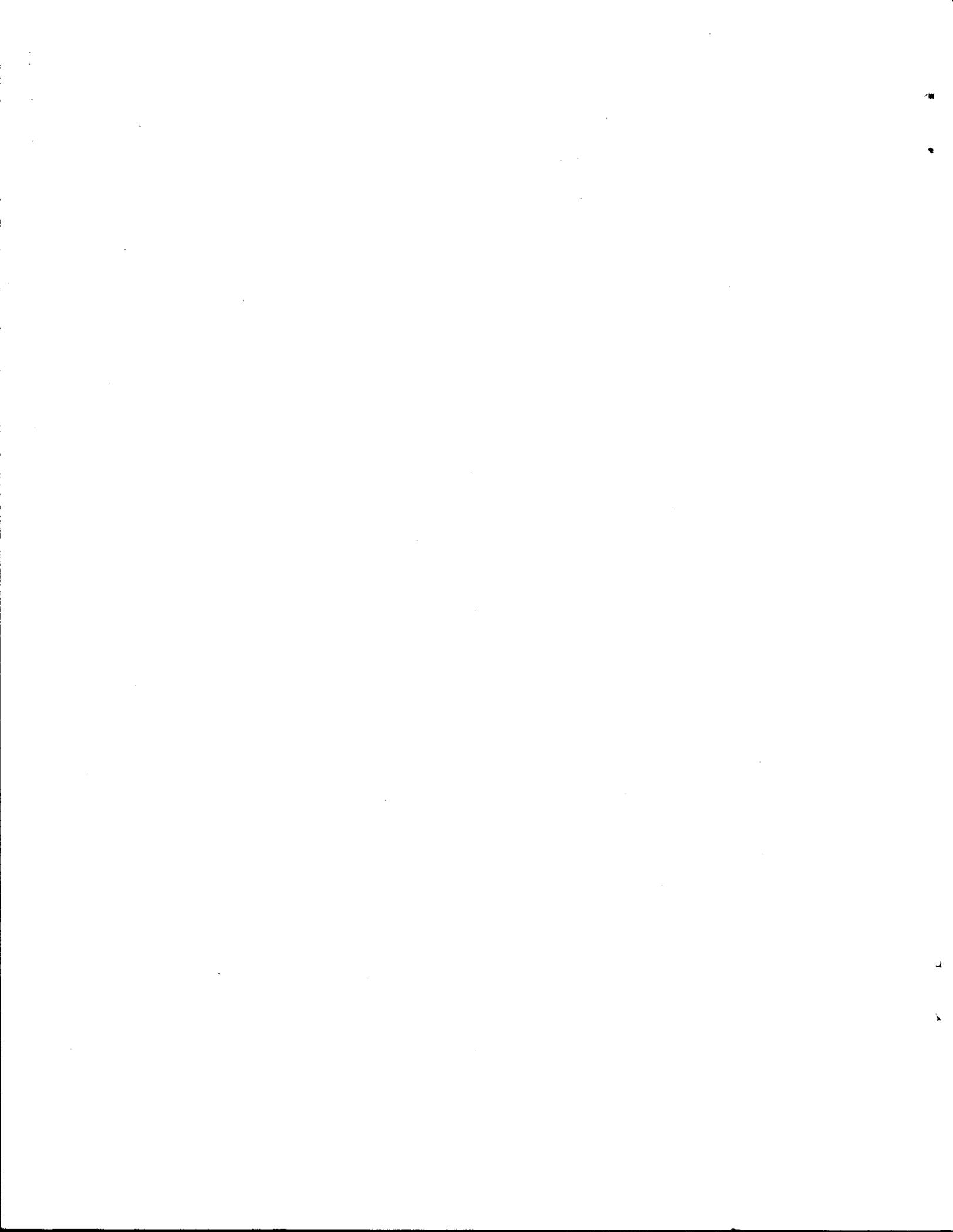


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16. Abstract <p>Previous studies on the effects of highway construction upon land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the effects of such improvements upon land use. This report relates the findings of research done in an area of Arlington, Texas where a section of Farm-to-Market Road 157 was upgraded from a 24 foot two-lane road with a center stripe and open ditch to a 62 foot four-lane road with a continuous left turn lane and curbs and gutters. The improvement took place in an undeveloped area where most of the land 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 including six years before planning for the specific improvement began up to the end of 1978. Total acres in each type of land use were determined for two "before construction" years, 1964 and 1969, and for two "after construction" years, 1976 and 1978. 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 street improvement 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.</p>			
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LAND USE IMPACT OF IMPROVING SECTION ONE
OF FARM TO MARKET ROAD 157 IN AN
UNDEVELOPED AREA OF ARLINGTON TEXAS

by

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Research Report 225-11
Research Study Number 2-8-77-225
Economics of Highway Design Alternatives

Sponsored by
State Department of Highways
and Public Transportation

in Cooperation with the
Federal Highway Administration
U.S. Department of Transportation

July 1979

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

PREFACE

The authors wish to express appreciation to those who have assisted in this study. Special thanks are due Mr. James W. Barr and Mr. James R. Farrar of the Texas State Department of Highways and Public Transportation (SDHPT). Mr. Bill Buglehall and Mr. Don Walden of the Dallas/Fort Worth Regional Planning Office of the SDHPT in Grand Prairie were particularly helpful in supplying data and providing assistance. Mr. Burton Clifton, Mr. R. W. Renfro, and others of District 2 of the SDHPT in Fort Worth were very cooperative in providing traffic count data and information on the construction and design change of the road.

Officials of the City of Arlington provided valuable information and suggestions. Several business people and residents of Arlington also provided data about the study site and the road improvement.

Members of the Texas Transportation Institute have been most supportive and have offered suggestions and encouragement. Ms. Katie Womack's efforts in securing land use and other data are very much appreciated. Her hard work and perseverance greatly aided this study. Special assistance was provided by Ms. Lashelle Plantt in typing the manuscript.

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented within. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, a 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 in an area of Arlington, Texas where a section of Farm-to-Market Road 157 was upgraded from a 24 foot two-lane road with a center stripe and open ditch to a 62 foot four-lane road with a continuous left turn lane and curbs and gutters. The improvement took place in an undeveloped area where most of the land 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 including six years before planning for the specific improvement began up to the end of 1978. Total acres in each type of land use were determined for two "before construction" years, 1964 and 1969, and for two "after construction" years, 1976 and 1978. 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 street improvement 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.

IMPLEMENTATION STATEMENT

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

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

SUMMARY OF FINDINGS

Land use data were collected for the Section One of Farm to Market Road 157 study area in Arlington, Texas, to determine the impact upon land use of the improvement of the road. The road was changed from a two-lane, open ditch design to a four-lane road with a continuous left turn lane and curbs and gutters. Data were collected for 1964, which was six years before formal planning for the road improvement began; 1969, the last year before planning began; 1976, the first year after the improvement was completed; and 1978, the last full year data collection was possible.

The findings are summarized as follows:

1. The total study area has undergone numerous changes from 1964 to 1978.
 - a. The area has remained a developing one.
 - (1) Six percent of the total area was developed in 1964, and 19 percent was developed in 1969.
 - (2) Thirty percent was developed in 1976, and 35 percent was developed in 1978.
 - b. The total area has remained predominantly unimproved, however, multiple family, commercial, and public uses have claimed large portions of the area's land.
2. Properties abutting FM 157 underwent several notable changes.
 - a. Excluding streets, commercial use has been predominant on abutting land for most of the study period.
 - b. Public land use emerged on abutting property when the city purchased a large tract.

- c. Single family residential use declined to zero when a home was converted to commercial use.
3. Nonabutting land also underwent numerous changes between 1964 and 1978.
 - a. Public use became the predominant improved use in terms of number of acres.
 - b. Multiple family use became the second most common land use on nonabutting land when several large complexes were constructed.
 - c. Commercial use almost tripled with the addition of several new businesses.
 - d. Single family residential use declined as houses were removed to enable the land to be used for a different purpose.
4. The period with the greatest rate of change for abutting property was the long-run after period, 1976 through 1978.
 - a. Abutting land changed use at a rate of 4.3 percent per year in the long-run after period as compared to 1.55 percent in the before period and 1.26 percent in the short-run after period.
 - b. Previously unimproved land that became improved for the first time accounted for all but a small amount of change on abutting land.
5. The period of most change for nonabutting land was the before period, 1964 through 1969.
 - a. The rate of nonabutting change was 3.06 percent in the before period, as compared to 1.55 percent in the short-run after period and 1.95 percent in the long-run after period.

- b. Unimproved land that became improved for the first time accounted for all but a very small amount of the land use change. A small amount of land changed from one improved use to another.
6. The improvement of FM 157 had a positive effect on land use change by providing a more attractive place for development.
- a. The opinions of people knowledgeable about the area were that the road improvement had created a more attractive place for development and accelerated the development.
 - b. The rates of land use change support the contention that the road improvement encourages land use change, especially from unimproved to commercial.
 - c. The growth of Arlington and the Dallas/Fort Worth SMSA and the resulting declining supply of undeveloped land were the primary reasons for development that occurred in this study area.

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INTRODUCTION

Purpose and Objective 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 streets and highways. Much research has been conducted in the past to learn the impact of new highway construction, but little has been done to indicate what happens when an existing highway is upgraded. In order to optimize public benefits, highway agencies need information of this kind to help predict the consequences of improvement of an existing facility.

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 presents the findings of investigation in an area of Arlington, Texas, where a section of Farm-to-Market Road 157 (FM 157) was improved. Areas with other types of improvements and areas in varying stages of development with different types of predominant land use when improvement began have been studied or are under study. Reports of findings in those areas are available or are forthcoming.

Objectives of this study are 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 FM 157 study area. Since land use could have been affected by anticipation of a better roadway, data were collected for a time well before the improvement of this facility began (the applicable time periods are defined in the Definitions Section).

Land use data were collected for 1964 and 1969, the two "before years" and for the "after" years, 1976 and 1978. On-site inspections aided in identifying the correct land uses.

The land was divided into abutting and nonabutting properties. Abutting properties were defined as those with frontage on FM 157. On undeveloped tracts, a section extending back 300 feet from FM 157 was designated as abutting. Land use changes and rates of land development were determined for each category to facilitate comparison.

To determine reasons underlying the land use changes in the area, several knowledgeable people were interviewed. Real estate salespeople and developers provided information on land developments. City officials who were familiar with the area also provided information about land changes. Other factors which might have influenced land use changes were also investigated. Among these were: traffic volumes, population, and median family income in the area.

Location of the Road Improvement

The improved portion of FM 157 is located just within the city limits

of Arlington, Texas (Figure 1). Arlington is located in the eastern edge of Tarrant County, one of the eleven counties making up the Dallas/Ft. Worth Standard Metropolitan Statistical Area. Arlington is positioned nearly midway between Dallas and Fort Worth in this largest SMSA in Texas. Due to the interdependence between cities and counties in the SMSA, a brief discussion of the SMSA as a whole is presented first followed by a more specific description of Arlington.

Although the Dallas/Fort Worth SMSA grew at an estimated 8.7 percent between 1970 and 1976, this was somewhat less than the 11.5 percent rate of growth for the state.¹ The cities of Dallas and Fort Worth both recorded increases in total population but lost residents through out migration to the smaller communities in the SMSA.

The economy of the Dallas/Fort Worth SMSA is well balanced in the areas of manufacturing, trade, transportation, finance, services, and real estate. Manufacturing, the largest contributor to personal income, is comprised primarily of light industry such as electronics, aircraft, apparel, oil-field equipment, food processing, automotive transportation, printing and publishing, and nonelectrical equipment.

The second largest contributor to personal income in the Dallas/Ft. Worth area is the wholesale and retail trade sector. Numerous shopping centers, including several regional malls (with greater than 50,000 square feet), are located in the SMSA. Among the many large retail firms in the area is the original Neiman-Marcus department store, one of the world's best known and most unusual. This area is also the heart of an eleven state wholesale market and distribution network. At the center of the Dallas/Fort Worth wholesale

¹Information on the Dallas/Fort Worth SMSA is from: Austin, Joanne P. "Dallas Fort Worth: The Southwest Metroplex", Texas Business Review, September, 1978.

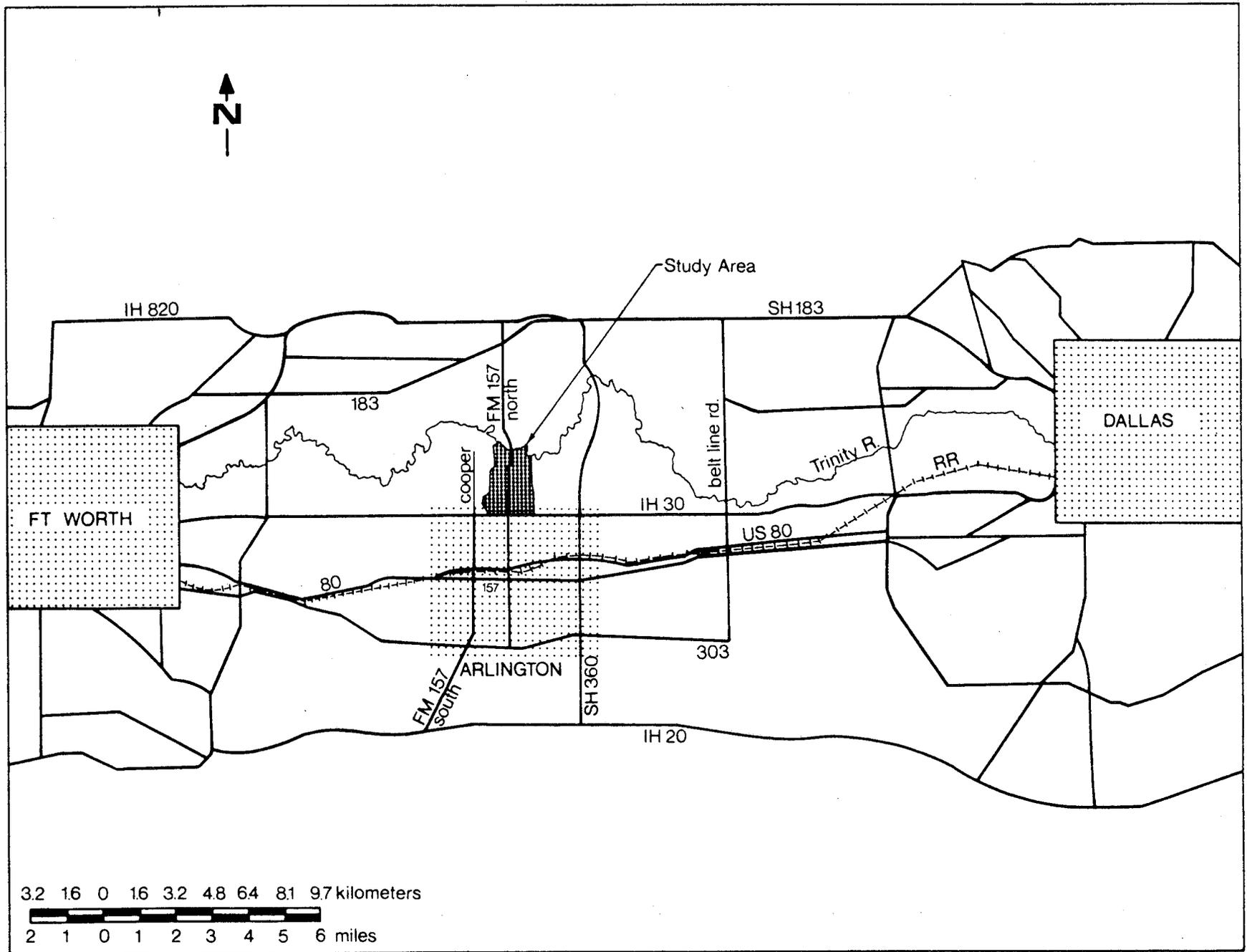


Figure 1. Map of the Dallas/Fort Worth Area Showing the Location of the Section One of Farm to Market Road 157 Study Area.

business is the Dallas Market which is the largest wholesale merchandising complex located at one site in the world. Buyers from all fifty states and approximately 25 foreign countries come to choose from merchandise ranging from wearing apparel to toys and home furnishings.

Despite the fact that Dallas/Fort Worth has no inland waterway, it is a major crossroad for nearly all types of domestic and international shipping and is the major point of intersection of routes from New York, Los Angeles, Chicago, and Mexico City. In addition, to several interstate, state, and federal highways, the area is served by ten railroads, forty-five common motor carriers, and five major bus lines. But perhaps the primary factor in the transportation network of Dallas/Fort Worth is the Dallas/Fort Worth Regional Airport that opened in January 1974. The airport is the largest in the nation and is reported to be the third busiest handler of scheduled air carrier operations in the world.

The services sector of the economy of Dallas/Fort Worth is also very important with conventions and tourism rated as two of the area's most important industries. The most popular tourist attraction is Six Flags Over Texas, which bypassed the Alamo in 1963 as the number one tourist attraction in Texas. Other attractions include professional and intercollegiate sports, the Texas State Fair, museums, fine restaurants, and excellent shopping facilities. Dallas has been rated first nationally in total number of meetings held in the city. Both Dallas and Fort Worth have large convention centers, exhibit space, and hotel rooms that attract the convention business. Service income is also generated by health and educational facilities including seven private four-year colleges, one private junior college, and the Baylor University schools of nursing and dentistry.

The finance, insurance, and real estate sector is also very important in the SMSA. Among the over 200 commercial banks in the area are the two largest banks in Texas. The area has long been recognized as the financial center of the state. The Dallas/Fort Worth area is also the state's leading insurance center with more than 260 insurance companies.

Arlington, located approximately midway between Dallas and Fort Worth has emerged from being a small agricultural service center to being an integral part of the SMSA. The city, benefiting from its central location, has attracted major industrial, retail, and entertainment developments.

The population of Arlington has increased from 7,692 in 1950 to 90,643 in 1970 (a 1,078 percent increase) and to 160,000 in 1978 (a 77 percent increase since 1970), as shown in Table 1. The population is projected to reach 170,000 in 1980 and 208,600 in 1985. Although many Arlington residents work within the city, numerous residents work in Dallas or Fort Worth but prefer Arlington as a place to live.

There are over 350 industrial firms in Arlington making and distributing numerous products. Among the largest is an automobile assembly plant.

Entertainment facilities at Six Flags Over Texas Amusement Park and the Texas Ranger Baseball Park are important contributors to income in Arlington. Six Flags attracts more tourists than any other recreational facility in the state.

City retail sales almost trippled between 1960 and 1970 increasing from \$64,978,000 to \$190,594,000. The increase was even greater between 1970 and 1978, when sales increased over fourfold to \$799,572,000.

Table 1. Population and Percentage Change in Population for Arlington, Dallas, Fort Worth, and the SMSA^a

	1950	Change and % Change 1950-1960	1960	Change and % Change 1960-1970	1970	Change and % Change 1970-1975	1975
Arlington	7,692	37,083 482%	44,775	45,868 102%	89,723	-	b
Dallas	434,462	245,222 56%	679,684	164,717 24%	844,401	-	b
Dallas SMSA	614,799	468,802 76%	1,083,601	472,533 44%	1,556,134	-	c
Fort Worth	278,778	77,490 28%	356,268	37,208 10%	393,476	-	b
Fort Worth SMSA	361,253	211,962 59%	573,215	188,870 33%	762,085	-	c
Dallas-Fort Worth SMSA	c	-	c	-	2,378,353	158,595 7%	2,536,948

^aData from the Bureau of the Census, U.S. Department of Commerce Publications.

^bData unavailable.

^cAfter the 1970 Census, the Dallas and Fort Worth SMSA's were combined to create a new SMSA that encompasses an eleven county area.

Key Characteristics of Street Improvement

The study area is one of eighteen study sites chosen for analysis of land use changes relative to street improvements. The study areas were chosen according to the following characteristics:

- (1) Stage of area development,
- (2) Type of highway or street,
- (3) Predominant land use, and
- (4) Type of setting (urban or suburban).

These factors were determined for the period of time prior to the beginning of the street improvement project. Using these characteristics, different types of study sites have been selected that will permit analyses of various design changes and the resulting impacts on land use.

Since the FM 157 area was only six percent improved in 1964 and 19 percent improved in 1969, the stage of development before the improvement began was developing.² The primary type of improvement was commercial, with the exception of streets and roads. The improvement is located just inside of the north Arlington city limits.

Sources of Data

The source of information on the design change and construction dates of the road improvement was the District 2 Office of the SDHPT in Fort Worth. Data on the planning and justification of the design change were provided by

²The percentage of total land area already improved with buildings, parks, roads, and streets is used to determine which stage of development the study area falls within. The three stages of development defined in this manner are: Undeveloped - 0 to 10% improved, developing - 10% to 80% improved, and developed - 80% to 100% improved.

personnel of the District Office and from planners with the City of Arlington.

The Dallas-Fort Worth Regional Planning Office of the SDHPT in Grand Prarie was the major source of land use information. The city of Arlington Planning Office also provided some land use data and data on zoning. On-site inspection and city directories helped determine the correct land uses. Interviews with real estate developers, SDHPT personnel and city planners and officials, area residents, and property owners also provided background information on land use and plans for the road improvement.

Traffic volume data were obtained from the District 2 Office and the Dallas-Fort Worth Regional Planning Office of the SDHPT. The Arlington Chamber of Commerce and the U.S. Census provided population and other socio-economic data.

Definitions

The following land use categories and time periods were used in this study:

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

Multiple-Family Residential - tract improved with duplex or apartment complexes designed to house two or more families.

Commercial - tract improved with a commercial business.

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

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

Industrial - tract improved for manufacturing, product stroage, etc.

Streets and Roads - land improved with a street or road; includes land dedicated as right-of-way.

Unimproved - land which has not been developed for any particular use; also includes previously developed land that is presently vacant or unused and land used for agricultural purposes.

Time periods used in the analysis are as follows:

Before Period - the period from 1964 to 1969 which ends the year before formal planning and construction began.

Short-Run After Period - the period which includes changes that occurred since the end of 1969 through 1976. This period includes the construction years, 1974 and 1975.

Long-Run After Period - the period which includes changes that occurred since the end of 1976 through 1978.

CHARACTERISTICS OF AREA STREETS AND ROADS
BEFORE AND AFTER IMPROVEMENT OF FM 157

FM 157

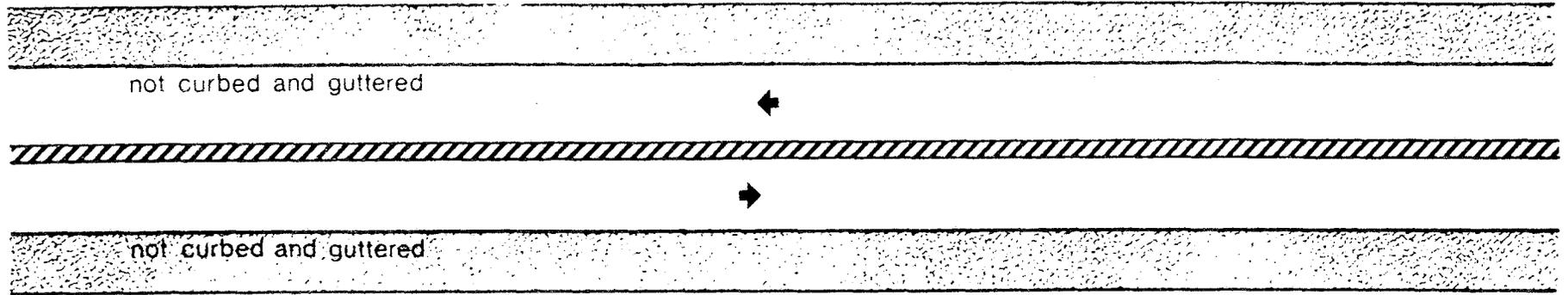
Farm to Market Road 157 (FM 157) is a major north-south arterial in Arlington as shown in Figure 1. The road actually begins north of Arlington in Grapevine, Texas, near the Dallas-Fort Worth Airport and continues south to Euless, Arlington, Mansfield and Maypearl. The section of FM 157 that this report concentrates on begins at the intersection with Interstate 30 (Dallas - Fort Worth Turnpike) and extends north for approximately two miles (3.22 kilometers) to the Trinity River. This section of FM 157 is referred to as Section One in the title since another report will focus upon a different portion of the road.

The improvement changed this section of FM 157 from a 24-foot surface with two lanes, a center stripe, and open ditch to a 62-foot surface with four lanes, a continuous left turn lane, and a curb and gutters (Figure 2). Investigation, planning, and engineering (I.P.E.) for this project began in September 1970. The contract was let in March of 1974, and the project was completed in June 1975. No right-of-way had to be acquired.

Traffic counts at a point on FM 157 south of Lamar Boulevard, which is approximately 700 feet (213.36 meters) north of the exchange roads of Interstate 30, were 15,470 vehicles per day in 1972 and 20,299 in 1973, the year before construction on the road began (Table 2). There was a 29 percent increase from the 1973 count to a count of 26,080 in 1976, the year after construction was completed. The count increased another 10 percent to 28,730 in 1977.

Another count for FM 157 which represents the northern section of the

Before Period Design



12

After Period Design

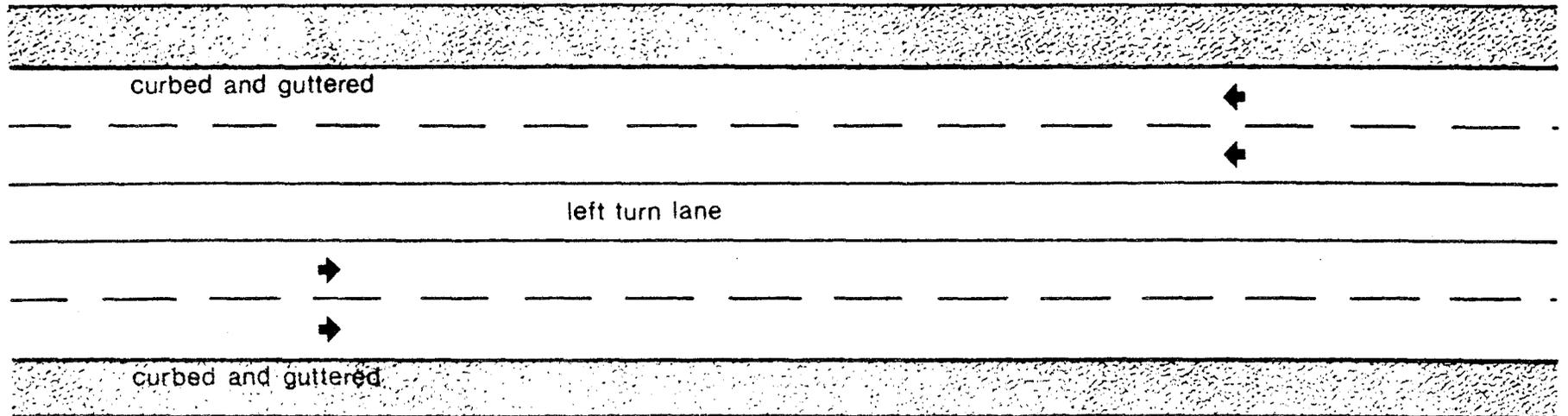


Figure 2. Design of Section One of Farm to Market Road 157
Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on F.M. 157 and Other
Intersecting and Parallel Streets

Location of Traffic Count	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
STUDY ROUTE FM 157 South of Lamar Blvd. North of Brown Blvd.	12,300	12,100	12,300	13,470	13,220	13,890	15,470 14,200	20,290			26,080 22,220	28,730 20,320
INTERSECTING STREETS Interstate 30 West of FM 157 Waldrop Drive At FM 157 Lamar Blvd. West of FM 157 Washington Drive West of FM 157 Brown Blvd. West of FM 157							36,020		1,980	2,150	2,060	3,726
								7,610		10,100		12,288
											880	4,250
PARALLEL ROADS State Highway 360 North of I 30 North Cooper Street North of I 30 Davis Street North of I 30	9,790	10,140	13,260	15,490	18,100	18,450	20,250	22,660	21,380		23,080	32,140
								1,890			3,030	5,547
								3,890		4,390		6,564

study area, shows that the number of vehicles per day fluctuated up and down between 12,300 and 13,220 from 1966 to 1970. The count then increased to 14,200 in 1972 and to 22,220 in 1976. An unexplicable decrease occurred in 1977 when the count dropped to 20,320.

Intersecting Roads

FM 157 intersects Interstate 30 at the southern boundary of the study area. Interstate 30 has been open throughout the years of study, 1964 through 1978. Only one count was available to give an indication of the traffic volume on I30 near the study area. Slightly over 36,000 vehicles traversed a point near FM 157 in 1972.

Other streets that intersect FM 157 are Waldrop Drive where counts near FM 157 increased from 1,980 in 1974 to 3,726 in 1978. Lamar Boulevard showed an increase from 7,610 in 1973 to 12,288 in 1978 at a point near FM 157. Washington Drive had 4,250 vehicles per day in 1978, and Brown Boulevard had a count of 880 in 1975.

Parallel Roads

State Highway 360 is east of and parallel to FM 157. This alternate route has had steadily increasing volumes of traffic since 1966, the first year data was available. The only exception was in 1974 when the count decreased almost 1,300 vehicles from the 1973 count. SH 360 had 32,140 vehicles per day in 1977 as compared to 28,730 for a similar location on FM 157.

Other roads parallel to FM 157 are North Cooper Street and Davis Street. Both experienced increases in traffic volume in recent years but had much lower volumes than FM 157. North Cooper Street had 5,547 vehicles per day in 1977, and Davis Street had 6,564 vehicles per day.

CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF FARM TO MARKET ROAD 157

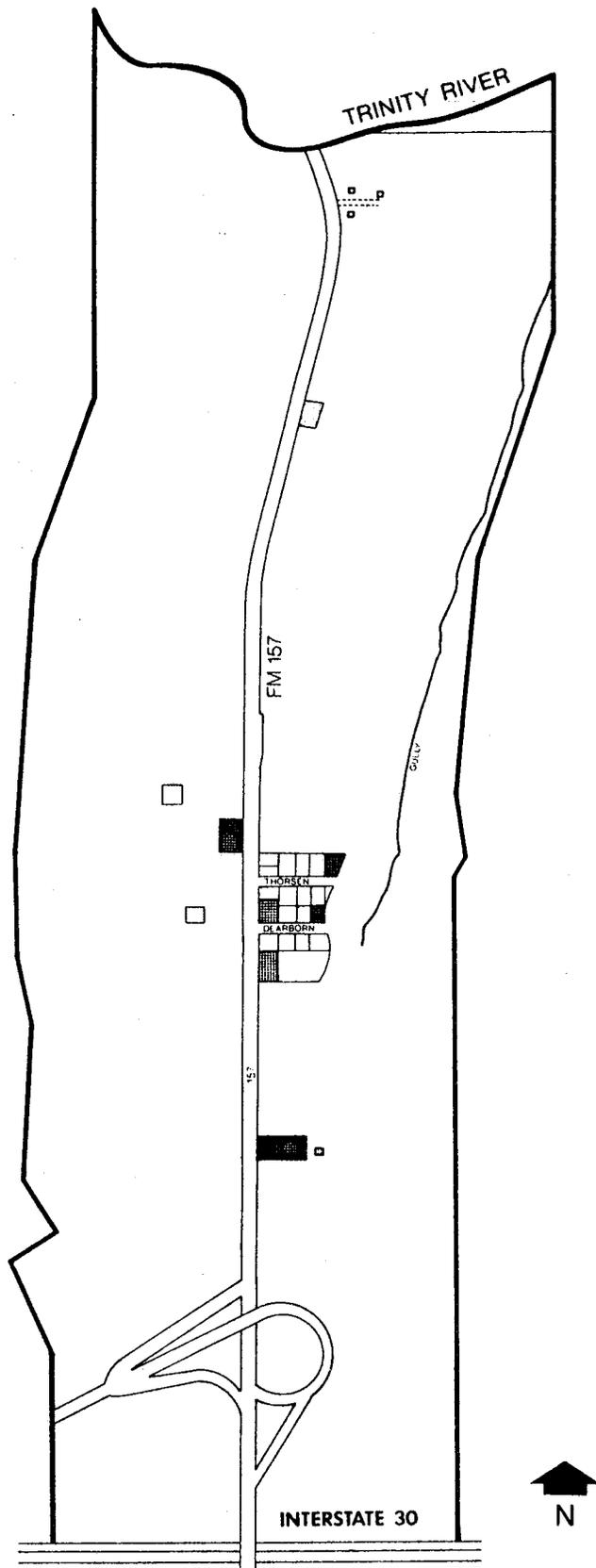
Size and Boundaries of the Study Area

The FM 157 study area encompasses approximately 752.70 acres (304.6 hectares). An area on each side of the road was chosen to include approximately three blocks (or the equivalent distance) of land on each side of FM 157, thus including both abutting and nonabutting land. Interstate Highway 30 marks the southern boundary of the study area, the the Trinity River marks the northern boundary. The eastern and western boundaries were drawn primarily along property lines and streets. The study area extends approximately 1,500 feet (457.20 meters) to the east and west of FM 157.

Land Use Characteristics

As indicated in the land use maps in Figures 3 and 4, the majority of the land in the study area was unimproved in both of the before years, 1964 and 1969. Six percent of the total area was improved in 1964 and 19 percent was improved in 1969. Excluding streets and roads, commercial development encompassed the most improved acreage in 1964, but by 1969 the city had purchased a very large tract in the northwestern section of the study area making public use the predominant improved use. Although the publicly owned tract has not yet been improved, it will be classified as an improved portion because the city's holding of the land excludes any other type of development. A recreational development is planned for that location.

Thirty percent of the area was improved in 1976, and 65 percent was improved in 1978. As Figures 5 and 6 portray, commercial development became predominant along FM 157 on the abutting property and multiple family



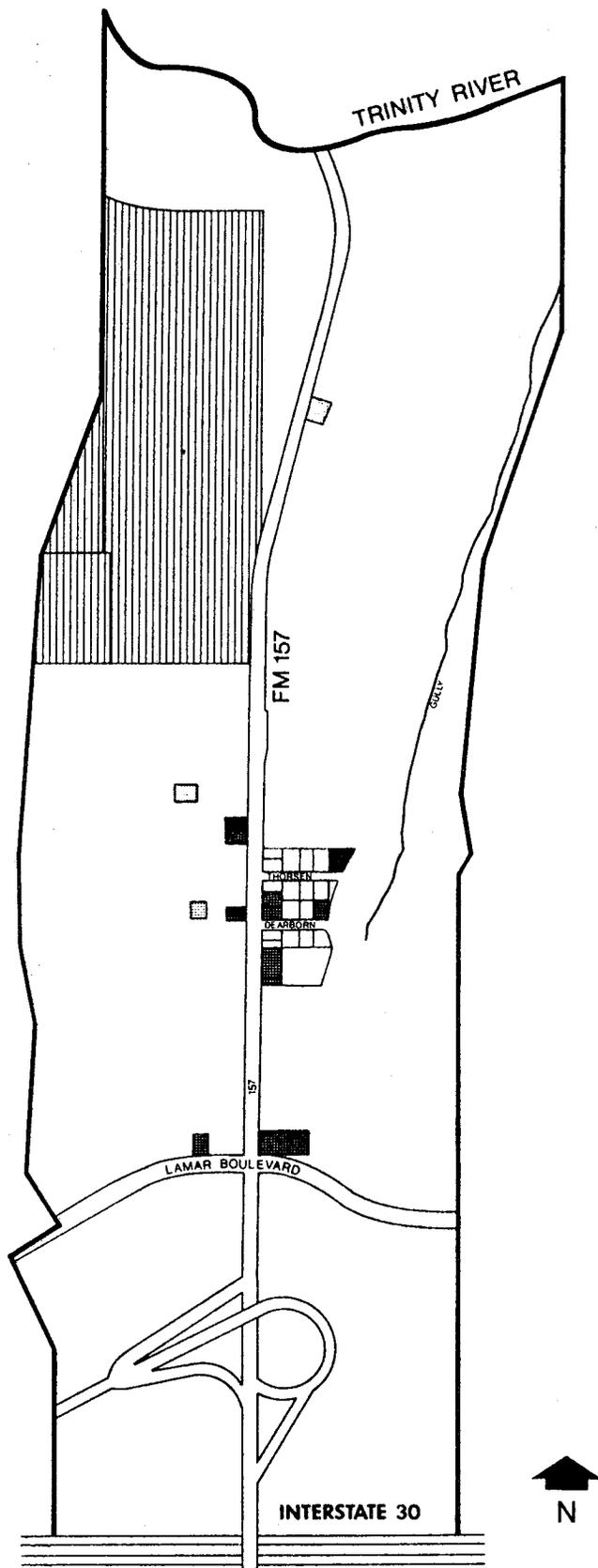
LAND USE LEGEND

- | | |
|--|---|
|  UNIMPROVED |  RESIDENTIAL-SINGLE FAMILY |
|  COMMERCIAL |  PUBLIC-GOVERNMENTAL |

SCALE IN FEET 0 600 1200 1800

SCALE IN METERS 0 182.88 365.76 548.64

Figure 3. Land Use in the Section One of FM 157 Study Area in 1964
16



LAND USE LEGEND

- | | |
|--|---|
|  UNIMPROVED |  RESIDENTIAL-SINGLE FAMILY |
|  COMMERCIAL |  PUBLIC-GOVERNMENTAL |

SCALE IN FEET 0 600 1200 1800

SCALE IN METERS 0 182.88 365.76 548.64

Figure 4. Land Use in the Section One of FM 157 Study Area in 1969

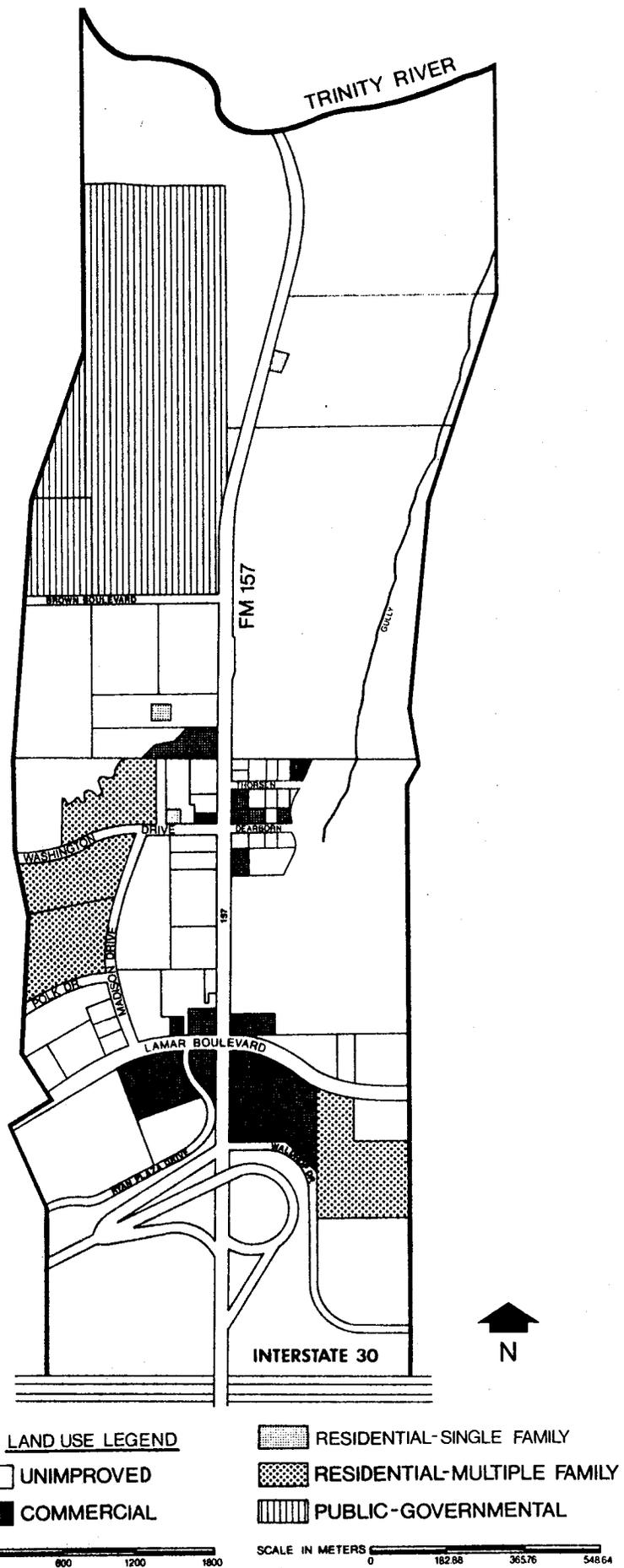


Figure 5. Land Use in the Section One of FM 157 Study Area in 1976

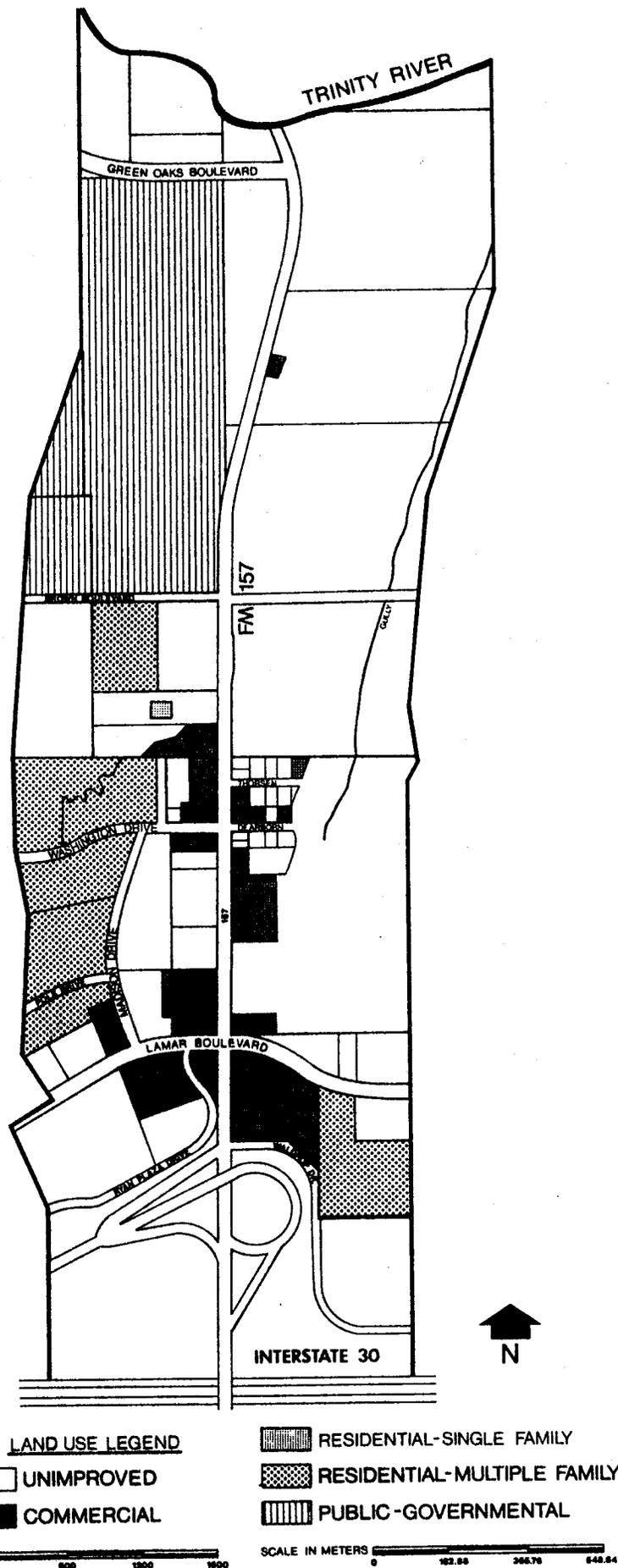


Figure 6. Land Use in the Section One of FM 157 Study Area in 1978

residential development became most prominent on nonabutting land, with the exception of the publicly held tract.

Land Use Changes

The FM 157 study area changed from an almost totally unimproved expanse to one that is experiencing rapid development. This section of Arlington is viewed as a prime location for more near-future growth. The changes that have occurred are discussed first in terms of the total study area and then in terms of proximity to FM 157.

Overall Study Area

In 1964, this total area contained only seven single family residences and six commercial establishments. As Arlington grew, the decreasing supply of available land caused developers to become interested in this location. The first major change in land use occurred between 1964 and 1969 when the City of Arlington purchased a large tract for use as a park. The portion of this tract which lies within the study area consumed almost one-seventh of the land that was previously classified as unimproved. The other major changes in the area have been the increase in commercial development and the construction of numerous multiple family units. The majority of development has occurred since 1969. Several streets have also been constructed or extended in this area. In total, 216.34 acres (87.55 hectares) were improved between 1964 and 1978 (Table 3).

Table 3. Changes in Land Use of All Properties
by Time Period and Year^a

Land Use and Type of Change	b Total Acres by Time Period and Year			
	Before		After	
	1964	1969	1976	1978
Residential-Single Family	1.82	1.07	1.07	0.39
Absolute Change	-0.75	0	-0.68	
Percent Change	-41%	0	-64%	
Residential-Multiple Family	0	0	44.03	58.56
Absolute Change	0	+44.03	+14.53	
Percent Change	0	+100%	+33%	
Commercial	8.06	8.71	22.99	36.32
Absolute Change	+0.65	+14.28	+13.33	
Percent Change	+8%	+164%	+58%	
Public	0	95.63	95.63	95.63
Absolute Change	+95.63	0	0	
Percent Change	+100%	0	0	
Streets	34.15	41.32	61.34	69.47
Absolute Change	+7.17	+20.02	+8.13	
Percent Change	+21%	+48%	+13%	
Unimproved	708.67	605.97	527.64	492.33
Absolute Change	-102.70	-78.33	-35.31	
Percent Change	-14%	-13%	-7%	

^aTotal acreage equals 752.70 acres (304.61 hectares).

^bOne acre equals .4046856 hectares.

Proximity to FM 157

Tracts of land were classified according to their location relative to FM 157. Tracts with frontage on FM 157 were classified as abutting with whole abutting tracts being included to avoid division of a development. A section 300 feet (91.44 meters) from the right-of-way was considered abutting on the undeveloped tracts. All other land was classified as non-abutting.

Although the improved facility could have influenced land use changes on nonabutting properties, it is expected that abutting properties would be most affected. The division of land into the abutting and nonabutting categories permits a comparative analysis to determine which underwent the most change.

Abutting Properties. In 1964 the first before year, over 77 percent of the 156.88 abutting acres (63.49 hectares) were still unimproved. Except for streets and roads, commercial use was the main type of improvement (Table 4). Total abutting improvements consisted of four businesses and one single family residence.

Abutting property experienced little growth in the before period, 1964 to 1969. Only one small commercial tract and some public land changed from the unimproved category. Construction of Lamar Boulevard also claimed a small amount of unimproved abutting land. Seventy percent of abutting land was unimproved in 1969.

The years from 1969 to 1976, which are called the short-run after period, experienced a 327 percent increase in commercial development. The area was becoming a prime location for business activity at that time. More acreage was also committed to streets in this period leaving 61 percent of the land unimproved in 1976.

Table 4. Changes In Land Use on Abutting Properties by Time Period and Year^a

Land Use and Type of Change	Total Acres by Time Period and Year ^b					
	Before			After		
	1964	1969		1976	1978	
Residential-Single Family	0.39	0.39		0.39	0	
Absolute Change			0		-0.39	
Percent Change			0		-100%	
Commercial	3.31	3.57		15.23	26.39	
Absolute Change		+0.26		+11.66	11.16	
Percent Change		+8%		+327%	+73%	
Public	0	10.33		10.33	10.33	
Absolute Change		+10.33		0	0	
Percent Change		+100%		0	0	
Streets	31.86	33.40		35.54	37.09	
Absolute Change		+1.54		+2.14	+1.55	
Percent Change		+5%		+6%	+4%	
Unimproved	121.32	109.19		95.39	83.07	
Absolute Change		-12.13		-13.80	-12.32	
Percent Change		-10%		-13%	-13%	

^aTotal acreage equals 156.88 acres (63.49 hectares).

^bOne acre equals .4046856 hectares.

In the long-run after period, 1976 to 1978, increases in commercial use and streets were again the sources of reductions in unimproved land. The unimproved category made up 53 percent of total abutting land in 1978. The only change from one improved use to another improved use also occurred during this time when a single family residence was converted to commercial use. Changes in abutting acreages by type of land use are charted in Figure 7.

Nonabutting Properties. In 1964, small amounts of single family residential and commercial were the only uses being made of nonabutting land, except for streets (Table 5). Ninety-nine percent of nonabutting land was still unimproved at that time.

The addition of 85.30 acres (34.52 hectares) to the public use category between 1964 and 1969 consumed a large portion of unimproved land, but little other development was occurring at that time. A small amount of commercial use and some new streets were added, but single family residential use was reduced. Eighty-three percent of nonabutting land was unimproved in 1969.

Multiple family developments began in the next period, 1969 to 1976, with 44.03 acres (17.82 hectares) being committed to this use. Commercial acreage also increased and several new streets were constructed. Unimproved land was reduced to 73 percent of total nonabutting land by 1976.

More multiple family and commercial developments occurred between 1976 and 1978. More street construction also took place bringing the total amount of unimproved land to 69 percent of nonabutting land in 1978. Although there were still several large undeveloped tracts, nonabutting property has changed from being almost totally undeveloped in the before period to one which is developing rapidly and with good potential for intense future development. Changes in nonabutting acreages by type of land use are charted in Figure 8.

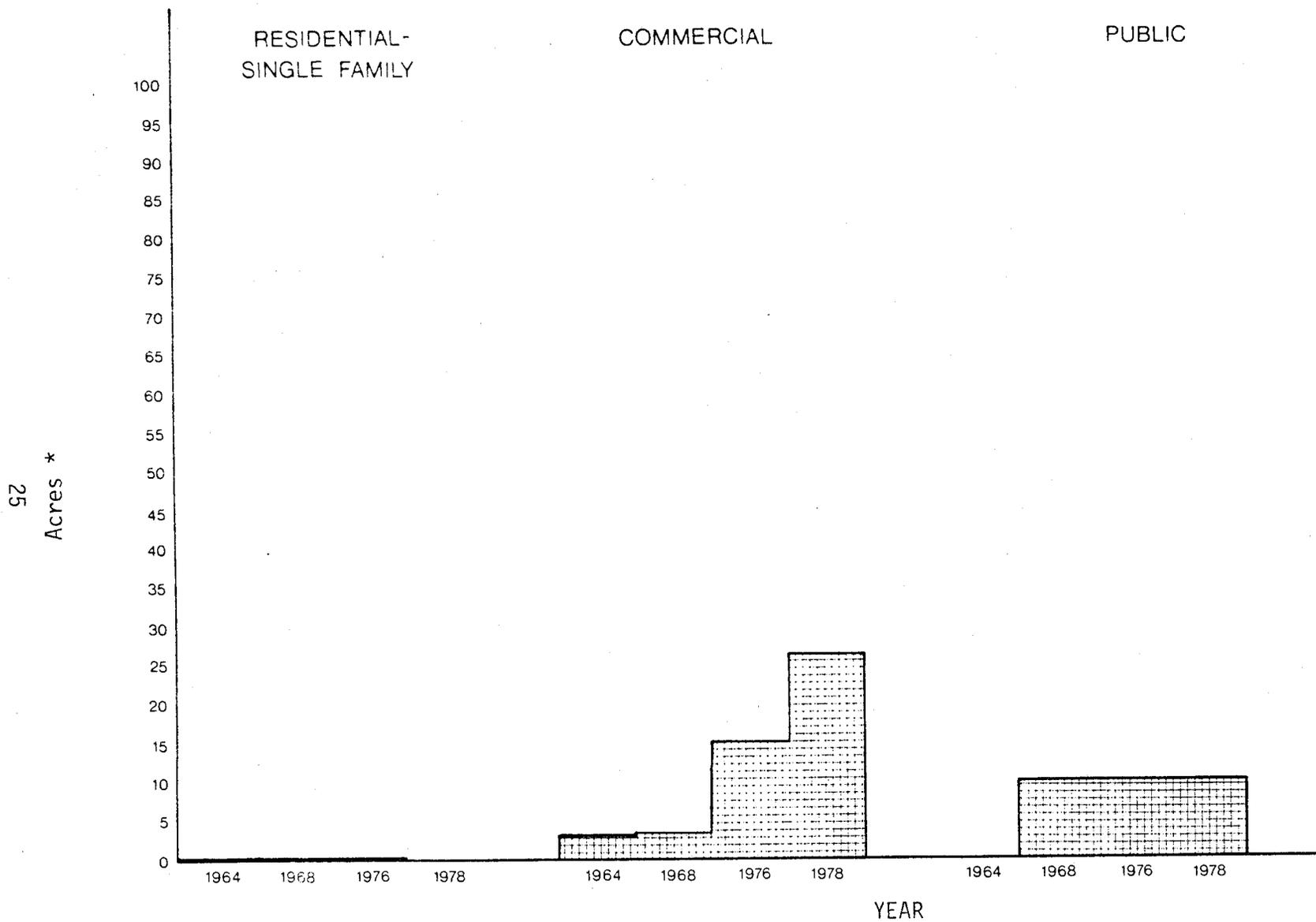


Figure 7. Changes in Abutting Land Uses in the Section One of Farm to Market Road 157 Study Area

* One acre equals .4046856 hectares

Table 5. Changes In Land Use on Nonabutting Properties
by Time Period and Year

Land Use and Type of Change	b Total Acres by Time Period and Year			
	Before		After	
	1964	1969	1976	1978
Residential-Single Family	1.43	0.68	0.68	0.39
Absolute Change	-0.75	0	-0.29	
Percent Change	-52%	0	-43%	
Residential-Multiple Family	0	0	44.03	58.56
Absolute Change	0	+44.03	+14.53	
Percent Change	0	+100%	+33%	
Commercial	4.75	5.14	12.80	14.97
Absolute Change	+0.39	+7.66	+2.17	
Percent Change	+8%	+149%	+17%	
Public	0	85.30	85.30	85.30
Absolute Change	+85.30	0	0	
Percent Change	+100%	0	0	
Streets	7.84	13.47	25.80	32.38
Absolute Change	+5.63	+12.33	+6.58	
Percent Change	+72%	+92%	+26%	
Unimproved	581.80	491.23	427.21	404.22
Absolute Change	-90.57	-64.02	-22.99	
Percent Change	-16%	-13%	-5%	

^aTotal acreage equals 595.82 acres (241.12 hectares).

^bOne acre equals .4046856 hectares.

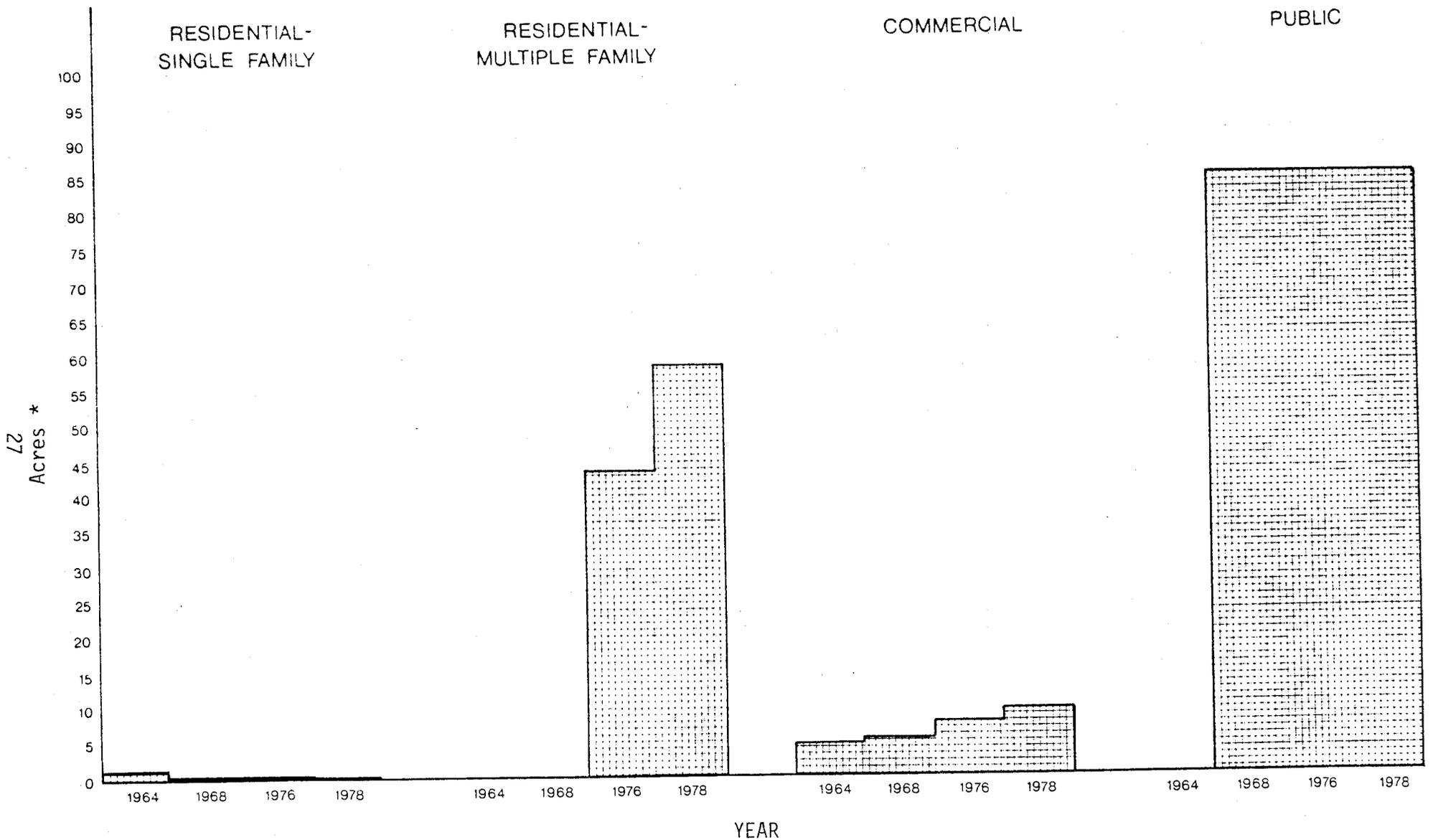


Figure 8. Changes in Nonabutting Land Uses in the Section One of Farm to Market Road 157 Study Area

*One acre equals .4046856 hectares.

Land Use Impediments

Development of this study area has occurred much later than development in other areas of Arlington. This is due in part to the study area being on the outer boundary of the city limits but also due to several impediments to land use that exist in the area. The Trinity River has created rugged terrain with steep slopes and deep gullies in the northern part of the study area. This condition has not been conducive to development since considerable leveling and filling would be mandatory to make parts of the land usable. The land nearest the river is also subject to flooding. Much of this land remains unimproved now.

Another obstacle that potential developers have faced was the way the land just north of Lamar Boulevard on the eastern side of FM 157 was platted and sold. It originally was divided into lots for single family residences in the 1940's and was called Highland Acres Subdivision. The land did not develop as expected, and no single family homes exist in the part of the old subdivision that is in the study area. Developers have had some difficulty in buying enough lots to create a tract large enough for another land use, such as commercial. Some commercial development has occurred in that location and negotiations concerning this land are still underway.

Utilities were not available to parts of the study area until recent years. This also hindered development in some sections.

Other Factors Influencing Change

The growth of the entire Dallas-Fort Worth Metroplex has certainly been a primary factor in the growth of all of Arlington as well as in the FM 157 study area. Being centrally located between the two large cities makes Arlington an ideal place for businesses, industries, and residences to be established.

The development in the study area reflects the general expansionary trend of the Metroplex's economy.

Land Use Controls and Plans

Land use is regulated in Arlington by zoning. Since this area is on the periphery of the Arlington city limits, it began to develop later than most other parts of Arlington. Part of the study area was not even within the city limits in the earliest years of this study. Therefore, most of the study area had not been zoned until recent years. Nearly all of the area was zoned by 1978, with the majority of the land being in commercial or multiple family residential zones.

Zoning has not been a hindrance to development since very few zoning requests have been refused. Those that were refused were requests to change from one type of commercial zone to another type of commercial zone.

Two land use plans for Arlington were available to determine if development in the study area has occurred as projected. A plan entitled the Arlington Plan, published in 1964, predicted that the southeastern quadrant of the study area would become light industrial. The northern half of the land in the entire study area was projected to be part of a proposed Trinity River Navigation Channel which has never materialized. The land use in the southwestern quadrant was projected to become commercial, medium density multiple family housing and single family housing. This southwestern section has developed somewhat like the plan indicated, although the exact location for the various types has not occurred precisely as the plan indicated. For example, there is no multiple family housing on abutting land as was shown in the plan. However, there is presently multiple family housing on nonabutting land on the west side of FM 157. The southeastern section has not developed at all as indicated in the plan since no light industrial use has occurred. The develop-

ments in that section have all been commercial and multiple family. The northern half of the area has also not developed as planned since there is no navigation channel and the area is partially in other improved uses.

In another plan published in 1971 and entitled Arlington, Texas, Urban Development Framework, the projected uses much more closely resemble the way development has actually occurred. The plan indicated that considerable commercial development would occupy the land near Interstate 30 by 1980. The park in the northwest quadrant of the study area was also shown and the remainder of the land was projected to become residential or remain open. Slightly less commercial development has actually occurred next to Interstate 30 and a little more commercial development than was indicated in the plan has occurred further north between Lamar and Brown Boulevards.

These land use plans are predictions based on existing land use, land development trends, age of existing improvements, amount of unimproved land available for development, and amenities offered for various types of developments. The improvement of FM 157 was already in the planning stage when the second plan was published. The road improvement may have been taken into account in the land use predictions.

Socio - Economic Characteristics

Selected socio-economic characteristics were investigated to reveal differences, if any, between the study area, Arlington as a whole, and the Fort Worth SMSA, which contains Arlington. Data from 1960 and 1970 were used to determine changes.

Census tract data were used to estimate the statistics of the FM 157 study area. The study area was within Census Tract T-0031 in 1960, and in Census Tract 131 in 1970. These two census tracts represent approximately the same area.

As shown in Table 6, all three areas of comparison (the census tract, Arlington and the SMSA) had increases in population between 1960 and 1970. The rate of increase for the census tract was not as great as that for Arlington and the SMSA. Arlington's population increased by 105 percent while the SMSA had a 33 percent increase and the census tract a 21 percent increase. This is not unexpected since the census tract is located partly on the border of the city limits and partly outside of any city where growth has been slower to occur than elsewhere in Arlington. The 1980 census data will indicate the growth in population due to the residential development that has occurred in the area since 1970.

The median school years completed and the median income figures for the census tract are lower in 1960 but higher in 1970 than in the city or SMSA. This reflects the beginning of the change from a primarily rural area where education and income have traditionally lagged behind to a more urbanized area that is attracting people with higher socio-economic characteristics. Although data were not available for comparing change between 1960 and 1970, it is interesting to note that the median value of owner occupied residences in 1970 was considerably higher in the census tract than in the city or SMSA, but the median rent paid by tenants was lower in the census tract. This was probably due to the emergence of new single family developments just outside the study area but within the census tract that occurred before the newer multiple family developments that now exist were begun.

The types of occupations engaged in by the census tract residents indicate a change between 1960 and 1970 to a more white-collar population. Percentage increases in the number of professionals and sales workers in the census tract were large compared to the percentage increases in those categories in the city and SMSA. The other two white-collar categories, managerial and clerical workers, also increased in the census tract while all blue-collar and laborers

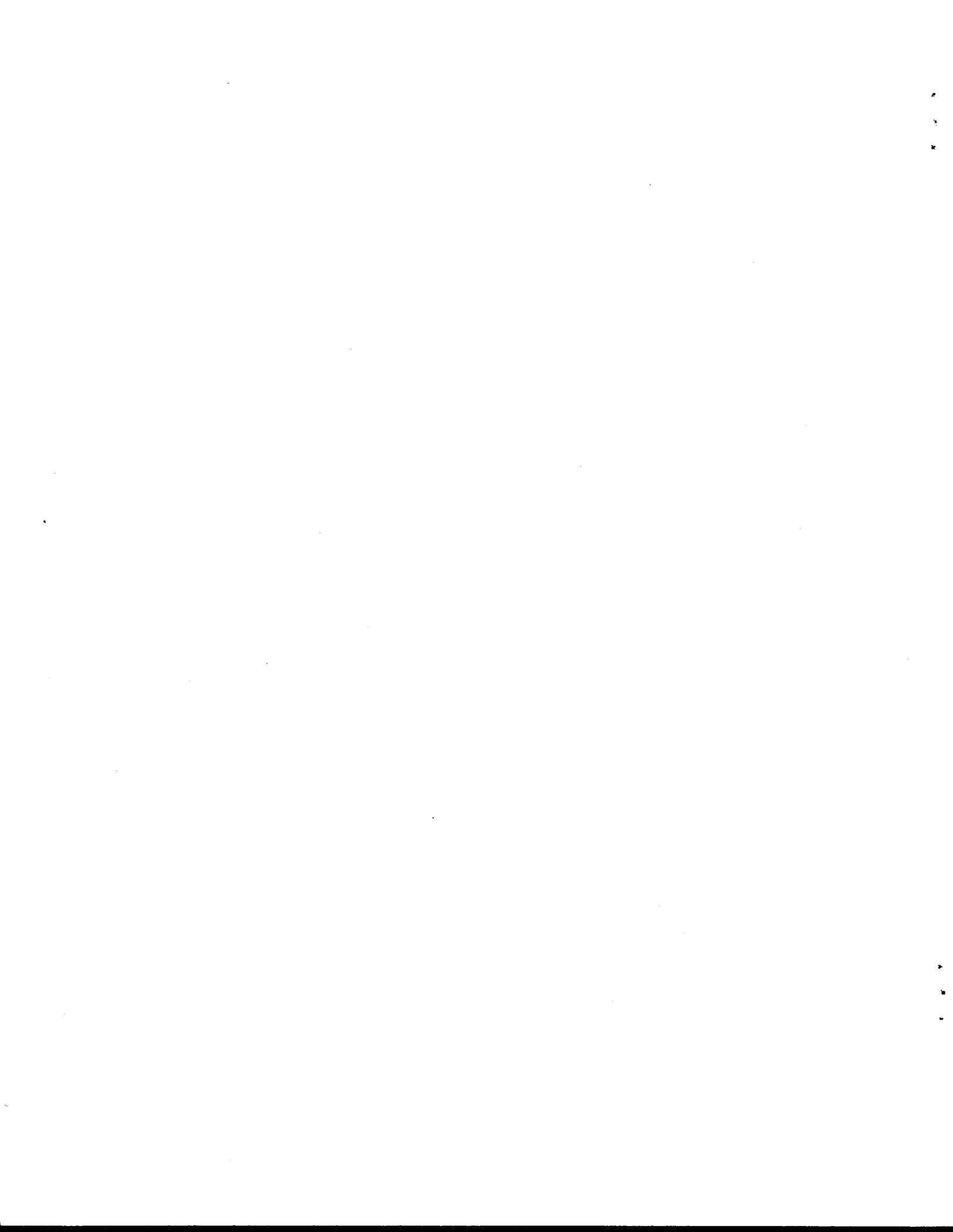
Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of Census Tract 131 to Arlington and the Fort Worth SMSA

Socio-Economic Characteristics	SMSA			Arlington			Census Tract 131		
	1960	% Change	1970	1960	% Change	1970	1960	% Change	1970
Population	573,215	+33%	762,085	44,775	+105%	91,685	1,487	+21%	1,800
Median School Years Completed	11.4	+6%	12.1	12.3	+2%	12.6	8.9	+45%	12.9
Median Family Income	\$5,617	+80%	\$10,101	\$6,574	+55%	\$10,218	\$4,364	+201%	\$13,116
Median Income of Families and Unrelated Individuals	\$4,952	+74%	\$8,607	\$6,024	+44%	\$8,690	\$4,257	+169%	\$11,447
Median Value of Owner Occupied Residences	\$5,000	+162%	\$13,100	\$10,900	+58%	\$17,200	not reported	-	\$29,500
Median Rent Paid by Tenants	\$58	+55%	\$90	\$78	+71%	\$133	not reported	-	\$74
<u>Occupation</u>									
Total Employed	214,782	+45%	310,567	16,005	+151%	40,136	499	+56%	780
Professional, Technical, and Kindred Workers	28,126	+75%	49,284	2,932	+206%	8,977	13	+1,223%	172
Managers and Administrators	20,944	+24%	26,056	1,421	+155%	3,628	58	+81%	105
Sales Workers	35,220	-29%	24,959	2,839	+15%	3,266	3	+3,067%	95
Clerical and Kindred Workers	17,017	+251%	59,658	1,418	+512%	8,678	23	+826%	213
Craftsmen, Foremen, and Kindred Workers	30,833	+53%	47,072	2,757	+102%	5,576	79	-38%	49
Operatives	33,680	+59%	53,682	2,464	+120%	5,412	107	-48%	56
Laborers	5,782	+146%	14,250	166	+711%	1,347	60	-42%	35
Service Workers	18,649	+68%	31,314	1,042	+193%	3,058	69	-20%	55
Private Household Workers	10,345	+59%	4,292	398	-51%	194	35	-100%	0

Source:

categories decreased. With the exception of private household workers category in Arlington, all of the blue-collar and laborers categories had increases in Arlington and in the SMSA.

In summary, the census tract did not gain population as fast as Arlington and the SMSA, however the data shows that the level of socio-economic well being was increasing faster in the census tract than in Arlington and SMSA. In 1970, the median person in the census tract was better educated, had a higher income, lived in a more expensive home, and was more likely to be in a white-collar occupation than the median resident of all of Arlington and the SMSA.



IMPACT OF HIGHWAY IMPROVEMENT ON
LAND USE IN THE STUDY AREA

To examine the impact on land use of the section one of FM 157 improvement, two types of data were used. These types are:

- (1) land use changes in the area, and
- (2) opinions of people knowledgeable about the area.

Effects on Abutting and Nonabutting Land

Improving and changing the design of a road may affect some types of land use more than others. Therefore, the specific shifts in land use should be examined for each time period. Table 7, which shows changes in absolute acres, indicates not only changes from unimproved to an improved use but also changes from an improved use to some other use. These changes can point out important aspects of land use transformation that may be in part a result of the road improvement. Table 8 is expressed in terms of percentage changes for each land use type and time period. The percentages adjust for differences in lengths of time periods and for the larger acreage in the nonabutting category, thereby, permitting a more meaningful comparison. These changes are discussed first for abutting property and then for nonabutting.

Abutting Property. As indicated by Table 7, there was not a large difference in the number of abutting acres that changed use in the before, short-run after, and long-run after time periods. However, when the percentage changes are put on an average annual basis, as in Table 8, the long-run after period stands out as the time of most change. The annual rate of change was 4.30 as compared to 1.55 in the before period and 1.26 in the short-run after period. This means that an average of 4.30 percent of abutting land changed use in each year of the long-run after period. All but a small amount of abutting

Table 7. Absolute Changes In Land Use of Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change^a

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1969		1969-1976		1976-1978		1969-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Unimproved	0	0.75	0	0	0.39	0.29	0.39	0.29
Single Family to Commercial	0	0	0	0	0.39	0	0.39	0
Unimproved to Single Family	0	0	0	0	0	0	0	0
Unimproved to Multiple Family	0	0	0	44.03	0	14.53	0	58.56
Unimproved to Commercial	0.26	0.39	11.66	7.66	11.16	2.17	22.82	9.83
Unimproved to Public	10.33	85.30	0	0	0	0	0	0
Unimproved to Streets	1.54	5.63	2.14	17.88	1.55	6.58	3.69	24.46
Total Land Changing Use	12.13	92.07	13.80	64.53	13.49	23.57	27.29	88.10
Improved Land	0	0.75	0	0	0.78	0.29	0.78	0.29
Unimproved Land	12.13	91.32	13.80	64.53	12.71	23.28	26.51	87.81

^aOne acre equals .4046856 hectares.

Table 8. Average Annual Percentage Changes in Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change^a

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1969		1969-1976		1976-1978		1969-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Unimproved	0	0.03	0	0	0.12	0.02	0.03	0.01
Single Family to Commercial	0	0	0	0	0.12	0	0.03	0
Unimproved to Multiple Family	0	0	0	1.06	0	1.22	0	1.08
Unimproved to Commercial	0.03	0.01	1.07	0.18	3.57	0.18	1.61	0.18
Unimproved to Public	1.32	2.86	0	0	0	0	0	0
Unimproved to Streets	0.20	0.19	0.19	0.43	0.49	0.55	0.26	0.46
Total Land Changing Use	1.55	3.09	1.26	1.55	4.30	1.97	1.93	1.64
Improved Land	0	0.03	0	0	0.25	0.02	0.06	0.01
Unimproved Land	1.55	3.06	1.26	1.55	4.05	1.95	1.87	1.63

^aDerived from the absolute acreages in Table 7 by dividing the acreages changing use by the total acreage in the abutting or nonabutting category for each period and then dividing that number by the number of years in each time period.

land that changed use was unimproved land that became improved for the first time. The one exception was a single family residence that became a restaurant in the long-run after period.

In the before period, most of the abutting changes were due to land that changed from unimproved to public use. Changes from unimproved to commercial were predominant in the short-run after and long-run after periods. The improvement of FM 157 had a positive effect on abutting development. The rate of commercial development has steadily increased with each subsequent time period. The improved highway provided better access and created a place more conducive to commercial development on abutting land.

Nonabutting Properties. More nonabutting land changed use in the before period than any other period (Table 7). This was due to a large tract being purchased by the city for use as a park. Commercial developments accounted for the majority of changes in the short-run after and long-run after periods.

When rates of change are compared, the before period is still the time of most change on nonabutting land. The average annual rate of change was 3.09 in the before period as compared to 1.55 in the short-run after period and 1.97 in the long-run after period.

Although the before period was the period of most change and highest rate of change, the increases in developed nonabutting land in both of the after periods should not be overlooked. Over 44 acres (17.81 hectares) were committed to multiple family use in the short-run after period, 1969 through 1976. Several new streets and businesses were also added in that time period. The long-run after period also had increases in multiple-family, commercial, and street uses as well as a small change from single family to unimproved. The improvement of FM 157 was a positive influence on the nonabutting development. Better access was provided that helped attract the multiple family and commercial developments that were located on nonabutting land.

Influence of Interstate 30

Interstate 30 forms the southern boundary of the study area. Due to the high volume of traffic, this major thoroughfare could influence land use in the study area. In an effort to separate out at least part of this influence, all of the properties between Interstate 30 and Lamar Boulevard were subtracted out and new annual rates of change were calculated for the study area.

Separating out the properties near Interstate 30 changed most of the rates of development (Table 9). The most drastic differences were in the changes from unimproved to commercial. Both the abutting and nonabutting rates were lower in the short-run after period, and both rates were higher in the long-run after period with the Interstate 30 properties omitted.

However, the differences in rates of development did not change the relative standing between periods or between the abutting and nonabutting categories. The long-run after period was still the time of most development for abutting property, and the before period was still the time of most development for nonabutting property. The long-run after period remained the time of most total development. Interstate 30 definitely affected land use in the study area, but the overall comparison of periods and land use categories remains largely the same. Although it is impossible to completely separate the influences of Interstate 30 and FM 157 on land use, separating out the properties nearest Interstate 30 does not greatly alter the analysis or change the conclusions derived from looking at the total study area.

Opinions of Knowledgeable People

Officials of the City of Arlington were interviewed to obtain their opinions about the impact of the improvement of FM 157 upon land use. The consensus was that the road was improved because of the heavy volume of traffic traveling

Table 9. Average Annual Percentage Changes in Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change with the Interstate 30 Properties Omitted.

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1969		1969-1976		1976-1978		1969-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Unimproved	0	0.03	0	0	0.18	0.03	0.18	0.01
Single Family to Commercial	0	0	0	0	0.18	0	0.18	0
Unimproved to Multiple Family	0	0	0	0.96	0	1.54	0	1.09
Unimproved to Commercial	0.05	0.02	0.14	0.08	5.09	0.23	1.24	0.11
Unimproved to Public	1.89	3.62	0	0	0	0	0	0
Unimproved to Streets	0	0	0.14	0.26	0	0	0.11	0.20
Total Land Changing Use	1.93	3.66	0.28	1.30	5.45	1.80	1.43	1.41
Improved Land	0	0.03	0	0	0.36	0.03	0.08	0.01
Unimproved Land	1.93	3.63	0.28	1.30	5.09	1.77	1.35	1.40

^aDerived from absolute acreages of change with property near Interstate 30 omitted from both the amount of change and totals for the abutting and nonabutting categories. The total acreage in the abutting and nonabutting categories was divided into each type of change for each period and then that number is divided by the number of years in each period to get an annual average.

to points north of Arlington. The road improvement was generally believed to have encouraged and accelerated study area development, most of which would have eventually occurred anyway due to the decreasing supply of undeveloped land in a rapidly growing area. The multiple family residential development and the ensuing commercial development that serves the new residents was singled out as being more directly influenced by the road improvement because of the improved access.

Real estate personnel also indicated that the road improvement had encouraged development in the study area. However, they also stated that much of the land would have developed eventually anyway. Officials of the State Department of Highways and Public Transportation stated that the road improvement had been a positive influence on land use by accelerating development, encouraging high quality developments. They too felt that most of the land would have been developed regardless of whether FM 157 was improved or not.

In general, those interviewed believed that the road was a positive influence on land use change and had accelerated the change in land use. The respondents felt that most of the land along FM 157 would have developed eventually anyway because of the growth of Arlington and the remainder of the Dallas/Fort Worth Metropolitan Area.

Conclusions

The FM 157 study area has changed from an almost totally unimproved area to one of the fastest developing areas of Arlington. The improvement of the road has had a positive effect on land use change by providing a more attractive place for development, especially commercial and apartment house development. Based on the opinions of people knowledgeable about the area, the

road improvement is judged to have encouraged and accelerated the construction of improvements. If the road had not been improved, the congested situation would have discouraged development and made this area less attractive.